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31 JANUARY 1994

MILITARY STANDARD

NASA STANDARD ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PARTS LIST

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

NASA Standard Electrical, Electronic, and Electromechanical (EEE) Parts List

MIL-STD-975M (NASA)

1. This military standard is approved for use by all elements of the National Aeronautics and Space Administration and is available for use by all departments and agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to:

MANAGER (310.A)
NASA PARTS PROJECT OFFICE
GODDARD SPACE FLIGHT CENTER
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FOREWORD

This standard is the technical baseline for standardization of Electrical, Electronic, and Electromechanical (EEE) parts. The intent of this effort is to focus part selection on EEE parts used in the design and construction of space flight hardware as well as mission-essential ground support equipment (GSE). The overall objective is to provide the designer with acceptable parts and specifications for procuring those parts for space flight missions. The result of this effort should provide the designer with EEE parts, including the necessary criteria pertaining to use, choice and applications.

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STANDARD PARTS

1. SCOPE

1.1 General. This standard provides a means of selecting, procuring and applying Electrical, Electronic, and Electromechanical (EEE) Parts for use in flight and mission-essential ground support equipment. The list is limited to the following Federal Stock Classes:

Part Types	FSC
* Capacitors	5910
* Circuit Breakers	5925
* Connectors	5935
* Crystals and Crystal Oscillators	5955
* Diodes	5961
* Fiber Optics	60GP (FSG)
* Filters	5915
* Fuses	5920
* Inductors	5950
* Microcircuits	5962
* Relays	5945
* Resistors	5905
* Thermistors	5905
* Transformers	5950
* Transistors	5961
* Wire and cable	6145

1.2 Purpose. The purpose of this standard is to provide equipment designers and manufacturers with electronic parts having quality levels considered to be most acceptable for flight and mission-essential ground support equipment.

1.3 Classification. Three levels of quality are used in this standard. Grade 1 parts are very low risk, higher quality and reliability parts intended for critical applications. Grade 2 parts are low risk, high quality and reliability parts for use in applications not requiring Grade 1 parts. Grade 3 parts are higher risk, good quality and reliability parts but are not recommended for applications requiring high product assurance levels.

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2. REFERENCED DOCUMENTS

Issues of documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

CAPACITORS (FSC 5910)

MIL-C-20	-	Capacitors, Fixed, Ceramic Dielectric (Temperature Compensating), Established and Non-established Reliability, General Specification for.
MIL-C-123	-	Capacitors, Fixed, Ceramic Dielectric, (Temperature Stable and General Purpose), High Reliability, General Specification for.
MIL-C-23269	-	Capacitors, Fixed, Glass Dielectric, Established Reliability, General Specification for.
MIL-C-39003	-	Capacitors, Fixed, Electrolytic (Solid Electrolyte), Tantalum, Established Reliability, General Specification for.
MIL-C-39006	-	Capacitors, Fixed, Electrolytic (Nonsolid Electrolyte), Tantalum, Established Reliability,General Specification for.
MIL-C-39014	-	Capacitors, Fixed, Ceramic Dielectric (General Purpose), Established Reliability, General Specification for.
MIL-C-55365	-	Capacitors, Chip, Fixed, Tantalum, Established Reliability, General Specification for.
MIL-C-55681	-	Capacitor, Chip, Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability, General Specification for.
MIL-C-83421	-	Capacitors, Fixed, Supermetallized Plastic Film Dielectric, (dc, ac, or dc and ac), Hermetically Sealed in Metal Cases, Established Reliability, General Specification for.
MIL-C-87217	-	Capacitors, Fixed, Supermetallized Plastic Film Dielectric, Direct Current for Low Energy, High Impedance Applications, Hermetically Sealed in Metal Cases, High Reliability, General Specification for.

CONNECTORS (FSC 5935)

MSFC 40M38277	-	Connectors, Electrical, Circular, Miniature, High Density, Environment Resisting, Specification for.
MSFC 40M38298	-	Connectors, Electrical, Special, Miniature Circular, Environment Resisting.
MSFC 40M39569	-	Connectors, Electrical, Miniature Circular, Environment Resisting, 200°C, Specification for.
GSFC S-311-P-4	-	Connectors (and Contacts), Electrical, Rectangular, for Space Flight Use, General Specification for.

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GSFC S-311-P-10	-	Connectors, Subminiature, Electrical and Coaxial Contact, for Space Flight Use.
MIL-C-5015	-	Connector, Electrical, Circular Threaded, AN Type, General Specification for.
MIL-C-22992	-	Connector, Plugs and Receptacles, Electrical, Waterproof, Quick Disconnect, Heavy Duty Type, General Specification for.
MIL-C-24308	-	Connector, Electric, Rectangular, Miniature Polarized Shell, Rack and Panel, General Specification for.
MIL-C-26482	-	Connector, Electrical, (Circular, Miniature, Quick Disconnect, Environment Resisting) Receptacles and Plugs, General Specification for.
MIL-C-83513	-	Connector, Electrical, Rectangular Microminiature, Polarized Shell, Crimp and Solder Contacts, General Specification for.
MIL-C-38999	-	Connector, Electrical, Circular, Miniature, High Density, Quick Disconnect, (Bayonet, Threaded and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification for.
MIL-C-39012	-	Connector, Coaxial, Radio Frequency, General Specification for.
MIL-C-39029	-	Contacts, Electrical Connector, General Specification for.
MIL-C-55302	-	Connectors, Printed Circuit Subassembly and Accessories, General Specification for.
MIL-C-85049	-	Connector Accessories, Electrical, General Specification for.

CRYSTALS & CRYSTAL OSCILLATORS (FSC 5955)

MIL-C-49468	-	Crystal Units, Quartz, Precision, General Specification for
MIL-O-55310	-	Oscillators, Crystal, General Specification for

DIODES (FSC 5961)

MIL-S-19500	-	Semiconductor Devices, General Specification for.

FILTERS (FSC 5915)

MIL-F-28861	-	Filters and Capacitors, Radio Frequency/Electromagnetic Interference Suppression, Specification for.

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INDUCTORS (FSC 5950)

MIL-STD-981	-	Design Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications.
MIL-C-39010	-	Coils, Fixed, Radio Frequency, Molded, Established Reliability, General Specification for.
MIL-C-83446	-	Coils, Chip, Fixed or Variable, General Specification for.

MICROCIRCUITS (FSC 5962)

MIL-STD-883	-	Test Methods and Procedures for Microelectronics.
MIL-M-38510	-	Microcircuits, General Specification for.
MIL-H-38534	-	Hybrid Microcircuits, General Specification for
MIL-I-38535	-	Integrated Circuits (Microcircuits) Manufacturing, General Specification for

PROTECTIVE DEVICES (FSC 5920 and 5925)

MIL-F-23419	-	Fuses, Instrument Type, General Specification for
MIL-C-39019	-	Circuit Breakers, Magnetic, Low-Power, Sealed, Trip-Free, General Specification for.

RELAYS (FSC 5945)

MIL-R-39016	-	Relays, Electromagnetic, Established Reliability, General Specification for.

RESISTORS (FSC 5905)

MIL-R-39005	-	Resistors, Fixed, Wire-Wound (Accurate), Established Reliability, General Specification for.
MIL-R-39007	-	Resistors, Fixed, Wire-Wound (Power Type), Established Reliability, General Specification for.
MIL-R-39008	-	Resistors, Fixed Composition (Insulated), Established Reliability, General Specification for.
MIL-R-39009	-	Resistors, Fixed, Wire-Wound (Power Type, Chassis Mounted), Established Reliability, General Specification for.
MIL-R-39015	-	Resistors, Variable, Wire-Wound (Lead Screw Actuated), Established Reliability, General Specification for.

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MIL-R-39017	-	Resistors, Fixed, Film (Insulated), Established Reliability, General Specification for.
MIL-R-39032	-	Resistors, Packaging of.
MIL-R-55182	-	Resistors, Fixed, Film, Established Reliability, General Specification for.
MIL-R-55342	-	Resistors, Fixed, Film, Chip, Established Reliability, General Specification for.
MIL-R-83401	-	Resistor Networks, Fixed, Film, General Specification for.

THERMISTORS (FSC 5905)

MIL-T-23648	-	Thermistor (Thermally Sensitive Resistor), Insulated, General Specification for.
GSFC S-311-P-18	-	Thermistor (Thermally Sensitive Resistor), Insulated, Negative Temperature Coefficient, Style 311P18, Specification for.

TRANSFORMERS (FSC 5950)

MIL-STD-981	-	Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications.

TRANSISTORS (FSC 5961)

MIL-S-19500	-	Semiconductor Devices, General Specification for.

WIRE & CABLE (FSC 6145)

MIL-C-17	-	Cable, Radio Frequency, Flexible and Semirigid, General Specification for.
MIL-W-5086	-	Wire, Electric, Polyvinyl Chloride Insulated, Copper or Copper Alloy
MIL-W-22759	-	Wire, Electric, Fluorocarbon Insulated, Copper or Copper Alloy.
MIL-C-27500	-	Cable, Electrical, Shielded and Unshielded, Aerospace.

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OTHER DOCUMENTS

ASTM E 595	-	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Material From Outgassing in a Vacuum Environment.
MIL-HDBK-978	-	Parts Application Handbook
NHB8060.1	-	Flammability, Odor, Offgassing and Compatibility Requirements and Test Procedures for Materials in Environments that Support Combustion.

(Copies of specifications, standards, drawings, and publications requested by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

NOTE: Additional copies may be obtained from the following center:

STANDARDIZATION DOCUMENTS ORDER DESK
BUILDING 4, SECTION D
700 ROBBINS AVENUE
PHILADELPHIA, PA 19111-5094

3. DEFINITIONS

3.1 **Standard Part.** An EEE part which is listed in Part I of this standard or is procured from a Part I listed flow in accordance with 4.4 herein.

3.2 **Nonstandard Part.** A part is considered nonstandard unless it meets either of the following criteria:

a. the part is listed in part I of this standard or

b. the part is procured from a part I listed flow for a Grade 3 application in accordance with section 4.4.2.

Grade 2 parts used in Grade 1 applications or Grade 3 parts used in Grade 1 or 2 applications are considered nonstandard.

3.3 **Grade 1 parts.** This is the classification used for standard parts intended for applications that NASA has determined to be critical. Grade 1 parts can also be used in applications designated as Grade 2 or Grade 3.

3.3.1 **Capacitors.** These are military established reliability (ER) parts purchased to either S or C failure rates except where specifically noted.

3.3.2 **Connectors.** These are connectors that are procurable to NASA/MSFC "40M" and NASA/GSFC "S-311" specifications.

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3.3.3 **Crystals and Crystal Oscillators.** There are no Grade 1 crystals listed in this standard. Crystal oscillators are Class S qualified to MIL-O-55310

3.3.4 **Diodes.** These are diodes that are MIL-S-19500 JANS qualified.

3.3.5 **Filters.** There are no Grade 1 filters listed in this standard.

3.3.6 **Inductors and Coils.** These are military established reliability (ER) parts purchased to S failure rate.

3.3.7 **Microcircuits.** The only candidates are MIL-I-38535 Appendix A JAN Class S qualified devices, MIL-I-38535 Class V qualified devices and MIL-H-38534 Class K qualified devices. Drawings for procurement are limited to one part-one part number SMDs, MIL-M-38510 detail specifications and MIL-H-38534 SMDs.

3.3.8 **Protective Devices.** There are no Grade 1 protective devices listed in this standard.

3.3.9 **Relays.** There are no Grade 1 relays listed in this standard.

3.3.10 **Resistors.** These are military established reliability (ER) parts purchased to S failure rate except where specifically noted.

3.3.11 **Thermistors.** These are thermistors that are procurable to NASA/GSFC specification S-311-P-18.

3.3.12 **Transformers.** This standard contains no transformers. All transformers must be procured to the requirements of MIL-STD-981.

3.3.13 **Transistors.** These are transistors that are MIL-S-19500 JANS qualified.

3.3.14 **Wire and Cable.** This is wire qualified to MIL-W-22759 or MIL-W-81381, and cable qualified to MIL-C-17 and MIL-C-27500.

3.3.15 **Photonics.** There are no Grade 1 photonics listed in this standard.

3.4 **Grade 2 parts.** This is the classification used for standard parts which meet the criteria for inclusion in this standard (see 4.1.1, 4.1.2 and for microcircuits, also see 4.2, herein) and are intended for applications not requiring Grade 1 parts, but still requiring high product assurance levels. Parts intermediate in quality between Grade 1 and Grade 2 may also be used in applications designated as Grade 2. (Example: If S failure rate is Grade 1 and P failure rate is Grade 2, parts with an R failure rate can be used in Grade 2 applications.) Grade 2 parts may be used in Grade 3 applications.

3.4.1 **Capacitors.** These are military established reliability (ER) parts purchased to either P or B failure rate level.

3.4.2 **Connectors.** These are connectors that are procurable to NASA/MSFC "40M," NASA/GSFC "S-311," MIL-C-5015, MIL-C-24308, MIL-C-26482, MIL-C-38999, MIL-C-39012, MIL-C-39029, MIL-C-55302, and MIL-C-83513 specifications.

3.4.3 **Crystals and Crystal Oscillators.** There are no Grade 2 crystals listed in this standard. Crystal oscillators are Class B qualified to MIL-O-55310.

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3.4.4 **Diodes.** These are JANTXV diodes that have been evaluated in accordance with the additional testing requirements of section 4 of Part I herein.

3.4.5 **Filters.** These are filters that are qualified to MIL-F-28861.

3.4.6 **Conductors and Coils.** These are military established reliability (ER) parts purchased to P failure rate except where specifically noted.

3.4.7 **Microcircuits.** The only candidates are:

a. MIL-I-38535 Appendix A, JAN Class B qualified devices, or
b. MIL-I-38535 Class Q qualified devices, or
c. MIL-H-38534 microcircuits processed on a Class K certified Line, but tested to an H assurance class.

Drawings for procurement are limited to one part-one part number SMDs, MIL-M-38510 detail specifications or MIL-H-38534 SMDs.

3.4.8 **Protective Devices.** These are devices that are qualified to MIL-F-23419/8 and MIL-C-39019/1 through MIL-C-39019/6.

3.4.9 **Relays.** These are parts qualified to MIL-R-39016 failure rate level (FRL) P.

3.4.10 **Resistors.** These are military established reliability (ER) parts purchased to P failure rate levels.

3.4.11 **Thermistors.** These are thermistors that are procurable to military control specification MIL-T-23648/19.

3.4.12 **Transformers.** This standard contains no transformers. All transformers must be procured to the requirements of MIL-STD-981.

3.4.13 **Transistors.** These are JANTXV transistors that have been evaluated in accordance with the additional testing requirements of section 13 of Part I herein.

3.4.14 **Wire and Cable.** This is wire qualified to MIL-W-22759 or MIL-W-81381, and cable qualified to MIL-C-17 and MIL-C-27500.

3.4.15 **Photonics.** To date, there are no Grade 2 photonics listed in this standard.

3.5 **Grade 3 parts.** This is the classification used for standard parts which may only be used in applications where risk of failure can be tolerated up to moderate levels or where failure risk cannot be mitigated by NASA (as described in 4.2.4). Grade 3 parts are considered nonstandard for use in Grade 1 or Grade 2 applications. Grade 3 parts must be procured as described in paragraph 4.4.2.

3.5.1 **Microcircuits.** Candidates must have been produced on a MIL-I-38535 certified and qualified manufacturing line. QPL-to-QML transitional flows are considered certified and qualified unless they fail full QML validation or qualification. No serious quality or reliability problems shall have been reported and verified against any part types produced on the MIL-I-38535 line. The Electronic Parts Information Management System (EPIMS), GIDEP and the NASA advisory system will be reviewed for any problems.

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3.5.2 **Grade 3 parts other than microcircuits.** Other than microcircuits, there are no other parts designated as Grade 3.

3.6 **Preferred Nonstandard Parts.** These are EEE parts listed in Part II of this standard which are being considered for Part I listing.

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4. GENERAL REQUIREMENTS

4.1 **Criteria for standard parts listing.** Paragraphs 4.1.1 through 4.1.2 define the criteria which must be met for listing most parts in Part I of this standard. All commodity groups and some microcircuits are covered by the criteria of 4.1. MIL-I-38535 Appendix A microcircuit criteria is found in 4.1. MIL-H-38534 and fully qualified and transitionally certified MIL-I-38535 microcircuit criteria is found in 4.2.

4.1.1 **Criteria for candidate parts selection.** A part will become a candidate for listing in this standard only if it meets all of the criteria in 4.1.1.1 through 4.1.1.4.

4.1.1.1 **Application need.** There must be multiple applications requiring the specific performance capability peculiar to the part proposed for listing. Consideration will be given to selecting parts capable of satisfying the widest range of design applications, and when applicable, parts should be compatible with existing listings (e.g., select a reference diode that is an extension of a listed series or a microcircuit that is generic to a family already listed). A definite need is assumed to exist for a part that has been used successfully in several recent space applications, if it is nonredundant (with respect to form, fit, or function) to existing listings or provides other compelling advantages (e.g., continuing availability) over such listings. In the latter case, deletion of the original listing may be in order.

4.1.1.2 **Technological maturity.** The design of the part must be finalized and must utilize proven materials and technologies. It must have been in production for a period sufficient to provide assurance that the critical design and process parameters have been identified and adequate controls have been developed. The technology also must have demonstrated suitability for flight hardware or mission-essential ground support equipment use.

4.1.1.3 **Availability of manufacturers.** The part should be in production by at least one and preferably two manufacturers whose previous performance indicates that they are capable of qualifying their product to specifications adequate for listing in this standard.

4.1.1.4 **Test or usage history.** There must be sufficient test or usage experience with the part to:

a. Determine predominant failure modes and mechanisms.

b. Provide reasonable confidence that the part will perform reliably when supplied to an adequate specification.

c. Identify the derating and application restraints necessary for reliable use in flight hardware or mission-essential ground support equipment environments.

4.1.2 **Criteria for standard parts approval.** The criteria of 4.1.2.1 through 4.1.2.4 should be met before a candidate part can be approved and listed in this standard.

4.1.2.1 **Characterization data.** A comprehensive parameter characterization test program has been conducted to identify the part's performance capability through the operating temperature spectrum and over long life. This data must indicate that the part parameters are stable during the operating temperature range and life, and must reveal peculiarities that should be considered or avoided in usage.

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4.1.2.2 **Evaluation tests.** An environmental test program shall be conducted when required by the governing specification to determine actual stress levels at which the part fails or degrades significantly.

4.1.2.3 **Specification.** The part shall have an adequate government specification that defines performance, design, materials, quality controls, and test requirements. Parameters in the specification shall realistically characterize the part during its range of specified environment and operating conditions.

4.1.2.4 **Qualification.** The part should be qualified to the applicable specification, and this qualification must be maintained in accordance with qualification retention requirements. Some parts may be listed when there is an indication that a QPL listing is imminent. **QPL listing shall be reviewed by the user for latest qualification status.** Former MIL-M-38510 microcircuit qualification is now governed by Appendix A of MIL-I-38535 and approved parts are listed in QML-38535. At some point in time, these microcircuits may no longer be produced fully in accordance with Appendix A of MIL-I-38535. When this occurs, approved sources will be listed in section 7.2 of this document and must be used for procurement of MIL-M-38510 devices. Section 7.3 may contain equivalent QML standard parts as substitutes for MIL-M-38510.

4.1.3 **Standard part removal criteria.** A part listed in this standard may be removed for any of the following reasons:

a. The part becomes obsolete.

b. There are no longer any qualified or fully compliant sources available for the part.

c. The part is replaced with a functionally similar device having improved characteristics or better reliability.

d. The part exhibits reliability problems for which no economically adequate controls or screens have been developed.

4.2 **Criteria for listing standard QML Grade 1 and Grade 2 flows and parts.** The criteria of 4.2.1 through 4.2.5 shall be met before a candidate flow may be listed in Part I as Grade 1 or Grade 2 (unless otherwise noted). Grade 2 parts compliant to MIL-H-38534 must have been produced on a Part I, Grade 1 hybrid flow (to an H assurance class). For Grade 1 and Grade 2 flows, all parts approved for use as standard parts will be listed with the flow. Criteria for listing Grade 1 and 2 parts is found in paragraph 4.2.7.

4.2.1 **Technology need.** There must be multiple applications requiring the specific technology peculiar to the flow proposed for listing. Consideration will be given to selecting flows that produce parts capable of satisfying the widest range of design applications. A definite need to list a flow is assumed for flows that produce parts that have successfully been used in several space applications.

4.2.2 **Technology maturity.** Production of devices on the candidate flow must have been in operation for a period sufficient to provide assurance that the critical design and process parameters have been identified and adequate controls have been developed. The technology also must have demonstrated suitability for flight hardware or mission-essential ground support equipment use. Devices utilizing plastic packages or semiconductor materials involving GaAs are not acceptable for Grade 1 or Grade 2.

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4.2.3 **Certification and qualification.** Grade 1 flows must be certified and qualified in accordance with MIL-I-38535 to a "V" assurance class or MIL-H-38534 to a "K" assurance class. Grade 2 MIL-I-38535 flows must be certified to "Q" assurance class. Grade 2 MIL-H-38534 flows must be certified to a "K" assurance class. For all Grade 1 flows, the NPPO or its agents must have concurred with the validation results on certification critical findings, or must have performed an independent evaluation.

4.2.4 **QML manufacturer partnering with NASA.** In order to approve a QML manufacturer for supplying microcircuits as Grade 1 or Grade 2, the manufacturer must be receptive to having an active, working partnership with NASA. A working partnership includes the following elements: Note that some requirements only apply to Grade 1.

a. The manufacturer must submit a written request to the NASA Parts Project Office (NPPO) which states their willingness to comply with the requirements of this paragraph.

b. Allowing NASA or its agents access to production and design facilities, personnel, and procedures to resolve problems or NASA concerns,

c. Providing the NPPO with copies of TRB status reports, (only applies to MIL-I-38535 and MIL-H-38534 option 4)

d. Submitting the Quality Management (QM) plan to the NPPO, (only applies to MIL-I-38535 and MIL-H-38534 option 4)

e. (Grade 1 only) Coordinating with the NPPO and providing advance notice of any proposed major changes to design, fabrication, assembly, packaging, testing or other critical areas.

f. (Grade 1 only) Involving the NPPO or its agents in the process of deleting, modifying or reducing screening and QCI testing. The NPPO or its agents will evaluate the vendor in accordance with the requirements of paragraph 4.5 of MIL-I-38535 or paragraph 30.2.5 of Appendix E of MIL-H-38534 for test optimization.

The partnership will involve working with the NPPO and NASA space centers, as well as with NASA prime contractors. NASA is particularly sensitive to manufacturer process capability, product defect rates, failure rates, reliability and failure modes.

4.2.5 **Test data or usage review.** There must be sufficient test or usage experience with parts manufactured using the candidate flow. Predominant failure modes, failure mechanisms, derating and application restraints must be identified to assure reliable use in flight hardware or mission-essential ground support equipment environments. For Grade 1, manufacturers must have demonstrably low failure rates.

4.2.6 **Removal of flows.** A Grade 1 or Grade 2 flow may be removed from this standard for any of the following reasons:

a. The flow was removed from QML-38535 or QML-38534.

b. The qualified flow has exhibited persistent, serious reliability problems affecting an array of parts for which no economically adequate controls have been developed.

c. The supplier chooses to withdraw from partnering.

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4.2.7 **Criteria for listing Grade 1 and Grade 2 microcircuits.**

4.2.7.1 The following criteria must be met before a microcircuit can be listed as a Grade 1 part from an approved flow:

a. The microcircuit must have been produced and tested on an approved, Part I listed, Grade 1 flow.

b. The MIL-H-38534 microcircuit must be marked with a Class K assurance class designator.

c. The MIL-I-38535 microcircuit must be marked with a Class V or S assurance class designator.

d. There must be an approved one part-one-part number SMD for the device which contains explicit requirements for Class V or Class K, for MIL-I-38535 devices or MIL-H-38534 devices, respectively.

4.2.7.2 The following criteria must be met before a microcircuit can be listed as a Grade 2 part from and approved flow:

a. The MIL-I-38535 microcircuit must have been produced and tested on a Part I listed, Grade 2 flow. The MIL-H-38534 microcircuit must have been produced and tested on a Part I listed, Grade 1 flow.

b. The MIL-H-38534 microcircuit must be marked with a Class H assurance class designator.

c. The MIL-I-38535 microcircuit must be marked with a Class Q or B assurance class designator.

d. There must be an approved one-part number SMD for the device which contains explicit requirements for class Q or Class H, for MIL-I-38535 devices or MIL-H-38534 devices, respectively.

4.3 **Criteria for listing standard QML Grade 3 flows.** The criteria of 4.3.1 through 4.3.3 shall be met before a Grade 3 candidate flow may be listed in Part I. Individual approved part numbers will not be listed in Part I of this standard. Nevertheless, a part from a flow which meets the requirements of 4.3.5 shall be considered a Grade 3 standard part.

4.3.1 **Technology need.** There must be multiple applications requiring the specific technology peculiar to the flow proposed for listing. Consideration will be given to selecting flows that produce parts capable of satisfying the widest range of design applications. A definite need to list a flow is assumed for flows that produce parts that have successfully been used in several space applications.

4.3.2 **Reliability history and technology restrictions.** No evidence of serious, persistent quality or reliability problems shall have been reported and verified against the candidate flow, either independently within NASA (e.g., NASA Advisories), or through the GIDEP reporting system. Devices utilizing plastic packages or semiconductor materials involving GaAs are not acceptable as part of a Grade 3 flow.

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4.3.3 **Certification and qualification.** Flows must be certified and qualified in accordance with MIL-I-38535. QPL-to-QML transitional flows are considered certified and qualified unless they fail full QML validation or qualification.

4.3.4 **Qualified flow removal.** A Grade 3 flow may be removed from this standard for any of the following reasons:

a. The flow was removed from QML-38535.

b. Parts produced in the qualified flow have exhibited serious, persistent reliability problems for which no economically adequate controls or screens have been developed.

4.3.5 **Parts from Grade 3 flows.** Parts procured from a Grade 3 listed flow which are marked with a "Q" certification mark are considered standard. Part numbers for Grade 3 applications will not be listed in this standard but may be obtained from qualified Grade 3 flow vendors. Note: There are no Grade 3 MIL-H-38534 microcircuits at this time.

4.3.5.1 **Grade 3 Parts.** Grade 3 parts from Grade 3 flows consist of one of the following types:

a. M-level SMD parts marked with a "Q" certification mark.

b. MIL-STD-883, paragraph 1.2.1 compliant parts marked with a "Q" certification mark.

c. DESC Drawing parts marked with a "Q" certification mark.

4.4 **Parts procurement.** The user is responsible for procurement of Standard Parts.

4.4.1 **Correlation of circuit requirements and detail specification test conditions.** When an application condition varies from the detail specification test condition(s), it shall be the responsibility of the contractor (or hardware designer.builder) to establish a satisfactory correlation between the circuit requirements and the detail specification requirements.

4.4.2 **Specification and marking.** All parts listed in Part I or parts produced on Grade 3 flows listed in Part I must be procured to the applicable detailed specification and marked as described below.

4.4.2.1 **Microcircuit specifications.** Grade 1 microcircuits must be procured using either a one part-one part number SMD (to a V or S assurance class), a MIL-M-38510 detail specification (to an S assurance class only), or a MIL-H-38534 SMD (K assurance class only).

Grade 2 microcircuits must be procured using either a one part-one part number SMD (to a Q or B assurance class), a MIL-M-38510 detail specification (to a B assurance class), or a MIL-H-38534 SMD (H assurance class) from a Grade 1 listed flow.

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Grade 3 microcircuits must be procured from a listed flow using:

a. any of the above listed specifications (except a MIL-H-38534 specification) or

b. a general SMD (M assurance class) or

c. a DESC drawing or

d. compliant MIL-STD-883 as described below.

Grade 3 microcircuits may also be procured without a specification when procuring a MIL-STD-883 compliant device (in accordance with paragraph 1.2.1 of MIL-STD-883); however, the device must be procured from a Part I listed flow and the device must be marked with a QML certification mark which signifies compliance with approved baselines. A "Q" certification mark must be on all Grade 3 devices.

4.4.2.2 *Specifications for parts other than microcircuits.* All parts other than microcircuits must be procured to a government or NASA approved specification.

4.4.2.3 Marking. Parts must be marked in accordance with the requirements listed below.

4.4.2.3.1 Marking of microcircuits. Grade 1 and Grade 2 microcircuits must be marked with either a JAN brand or a QML certification mark in addition to the specification marking. Approved abbreviations for these marks are also considered acceptable. Grade 1 and Grade 2 microcircuits bearing a QML certification mark or a JAN brand must also be marked with the applicable assurance class designator (e.g., S, B, V, Q, K or H).

Grade 3 parts which are procured using a government specification must be marked with a JAN brand or a QML certification mark. Grade 3 MIL-STD-883 compliant devices must be marked with a QML certification mark which signifies that the device was produced and tested in accordance with the approved baseline.

4.4.2.3.2 Marking for parts other than microcircuits. All parts other than microcircuits must be marked with the JAN brand (or approved abbreviation) or a NASA part number.

4.4.3 Additional testing. Appendix B herein defines the additional testing that is required for parts which do not fully meet the requirements for NASA programs. All parts indicated shall be subjected to these additional tests prior to use.

4.4.4 QPL Qualified manufacturers. Qualified manufacturers for Qualified Products List (QPL) parts are listed in the appropriate QPL. QPL-38510 has been deactivated and is contained as part of QML-38535. When purchasing QPL parts, the procuring activity shall solicit bids from sources listed in the applicable QPL or QML for the specific part. "Sole source" procurements are discouraged except when only one qualified source exists. The qualifying activity may be contacted to determine if qualification has been granted to additional manufacturers for the part under procurement subsequent to the publication of the

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current QPL, or if the previous qualification status of any listed manufacturers has changed. The qualifying activity for most QPL's is the Defense Electronics Supply Center (DESC-EQ), Dayton, Ohio 45444.

4.4.5 **QML Qualified Flows.** Qualified flows from QML-38535 and QML-38534 for monolithic and hybrid integrated circuits, respectively, which meet the listing requirements herein appear in Part I of this standard. When procuring QML parts, QML-38535 and QML-38534 shall be reviewed for part types having acceptable drawings. When an acceptable drawing or MIL-STD-883 compliant device is not available, users are encouraged to work with DESC in creating an SMD.

4.4.6 **Receiving inspection.** Receiving inspection should be performed on Standard Parts or devices procured from listed flows and should include:

a. Review of data shipped with parts for compliance.

b. Part count.

c. Inspection for part markings and external defects.

d. Electrical measurement (100%) of critical parameters, except sampling which may be approved by NASA projects.

Adequate security, such as an environmentally controlled bonded storage area, should be provided for storing the received parts until use, to maintain their integrity and traceability.

4.5 **Parts application.** The Standard Parts listed herein must be properly applied by the user in order to give satisfactory and reliable performance. The equipment shall be designed so that it will meet the specified performance and reliability requirements when using Standard Parts. Standard Parts must be used only for those characteristics or parameters which are controlled by the applicable detail specifications. The use of Standard Parts, as required by this standard, does not relieve the contractor (or hardware designer/builder) of the responsibility for complying with all equipment performance and other requirements set forth in the applicable system/equipment specification and contract.

4.5.1 **Minimizing parts count.** The variety of Standard Part types used in space equipment design should be the minimum necessary to provide satisfactory performance, and the user should exercise all reasonable design choices to achieve this objective.

4.5.2 **Application guidelines.** The application guidelines provided in MIL-HDBK-978, "NASA Parts Application Handbook," are recommended.

4.5.3 **Parts derating.** To achieve high reliability and good performance, derating from the qualified maximum ratings is required. All parts shall be derated in accordance with the derating criteria in Appendix A or a NASA approved derating document.

4.6 **Nonstandard parts usage.** Nonstandard parts shall be used only after they are approved by the responsible government activity.

4.7 **Conflict of data.** In the event of conflict between the technical description of Standard Parts described in this standard and the applicable specification, the specification shall govern.

4.8 **Problem reporting procedure - Standardization Document Improvement Proposal, (DD Form 1426).** Consistent with the parts standardization program, the use of the attached Standardization

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Document Improvement Proposal (DD form 1426) is encouraged as a communique for parts and commodity experience. Experience need not be restricted to problems which may lead to a part removal request, but may also include part or commodity additions to the standard. As a minimum, the "Remarks" paragraph should include the following (when appropriate): commodity ID, generic part number, user part number, and any pertinent data which may be of use for approving your request.

Reply to attention of:

MANAGER (310.A)
NASA PARTS PROJECT OFFICE
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND 20771

4.9 **Material test requirements.** Requirements imposed on materials to be used in the space environment (i.e., thermal vacuum outgassing, flammability, smoke, odor, toxicity) are application specific. EEE parts that are conformally coated by a material that meets project requirements do not need to be tested for compliance to those material requirements, if approved by the specific project.

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PREFERRED NONSTANDARD PARTS

5. SCOPE

5.1 **General.** Part II of this standard establishes a list of nonstandard EEE parts which are preferred for use in flight and mission essential ground support equipment, when a standard part is not available for listing in Part I.

5.2 **Purpose.** The purpose of Part II is to provide equipment designers and manufacturers with a list of preferred electronic parts that are advanced microcircuits which have not yet become fully approved or parts in common use by NASA programs but are not available in Part I of this standard. This section is intended to encourage standardization of device types and specifications. In addition, potential program savings can be realized through shared qualification and other relevant data. The availability of this data will streamline the Nonstandard Part Approval Request (NSPAR) process for listed part types.

5.3 **Classification.** These parts do not carry any level of classification and require a Nonstandard Part Approval Request (NSPAR) prior to use on NASA programs.

5.4 **Beneficial comments** (recommendations, additions, deletions), inquiries about the parts listed (except Advanced Microcircuit Parts Listing) and any pertinent data which may be of use in improving Part II of this document should be addressed as follows:

MANAGER (310.A)
NASA PARTS PROJECT OFFICE
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND 20771

6. REFERENCED DOCUMENTS

See individual sections.

7. DEFINITIONS

7.1 **Preferred Nonstandard Part.** This is a part that does not meet all criteria for Part I listing as a standard part, but is being recommended for use to encourage standardization.

7.2 **NSPARS.** Nonstandard Part Approval Request, required for all parts in Part II of this standard.

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8. CRITERIA FOR PREFERRED NONSTANDARD PARTS LISTING

8.1 **Listing criteria.** In order for a part to be listed in this section the following criteria must be met.

(i) The part was/is listed in the Candidate Part List (CPL)

(ii) Application need has been identified

(iii) A suitable specification must be available for procurement of the part

(iv) Suitable NASA or government approved and NASA surveyed manufacturers exist

(v) Successful qualification to the suitable specification must have been accomplished

8.2 **Removal of a nonstandard part.** A part may be removed from this section if serious quality or reliability problems have been found which are of general concern.

9. REQUIREMENTS FOR USE.

All projects are responsible to ensure that their program parts requirements are met by these parts and procurement specifications prior to use. A NSPAR is required and NASA approval needed unless specifically waived by the program.

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SECTION 1: SUMMARY OF STANDARD CAPACITORS

Page	Control Specification	Military Style	Description	Seal	Capacitance Range		Voltage Range (Volts, dc)		Operating Temperature Range(°C)		Grade 1	Grade 2
					Min	Max	Min	Max	Min	Max	FRL(1)	
1.2	MIL-C-20 (6)	CCR	Fixed, ceramic, temperature compensating	Nonhermetic	1.0 pF	0.082 µF	50	200	-55	+125	S(2)	P
1.15	MIL-C-123	CKS	Fixed, ceramic	Molded and Unencapsulated	1.0 pF	1.0 µF	50	100	-55	+125	(3)	(3)
1.45	MIL-C-23269	CYR	Fixed, glass	Hermetic	0.5pF	0.01µF	100	100	-55	+125	S	S
1.52	MIL-C-39003	CSR, CSS	Fixed, tantalum (solid) electrolytic	Hermetic	0.0047 µF	560.0 µF	10	75	-55	+125	C (4)	B
1.62	MIL-C-39006	CLR	Fixed, tantalum (non-solid) electrolytic	Hermetic	0.12 µF	1500.0 µF	10	300	-55	+125	R	P
1.80	MIL-C-39014	CKR	Fixed, ceramic	Nonhermetic	10.0 pF	0.33 µF	50	200	-55	+125	(5)	S
1.87	MIL-C-55365	CWR	Chip, fixed, tantalum	Unencapsulated	0.10 µF	100.0 µF	4	50	-55	+125	C	B
1.91	MIL-C-55681 (6)	CDR	Chip, fixed, ceramic dielectric	Unencapsulated	10.0 pF	0.33 µF	50	500	-55	+125	S (7)	P
1.106	MIL-C-83421	CRH	Fixed, metallized plastic film, DC, AC	Hermetic	0.001 µF	22.0 µF	30	400	-65	+100	S	R
1.118	MIL-C-87217	CHS	Fixed, supermetallized, plastic film, DC, low energy, high impedance	Hermetic	0.001 µF	10.0 µF	30	100	-55	+100	(3)	(3)

Refer to MIL-HDBK-978, Vol. 1, for construction and application information.

(1) Failure rate levels (FRLs). Reference the applicable Control Specification.
(2) For Grade 1 low voltage applications. Perform lot sample testing of MIL-C-123 group B, Subgroup 2. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2. c & d. Sample parts subjected to this testing shall not be used.
(3) Failure Rate Level (FRL) not applicable.
(4) CSR parts shall be subjected to screening in accordance with Appendix B prior to use. Reference MIL-HDBK-978, Vol 1, 2.6.7.2 & 3. Not applicable for style CSS.
(5) There are no MIL-C-39014 Grade 1 parts available. Use MIL-C-123 for Grade 1 applications.
(6) MIL-C-123 is the preferred specification for Grade 1 parts.
(7) Lot performance characteristics shall be assessed by use of the sample tests required by Appendix B. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2 and 3. Sample parts subjected to this testing shall not be used.

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MIL-C-20 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Part Number Explanation:

CCR**	C*	XXX	X	X
Style - CCR identifies an established reliability, ceramic-dielectric, temperature compensating, fixed capacitor; ** identifies the shape and the dimensions of the capacitor.	Characteristics - C identifies the nominal temperature coefficient (0 ppm/°C) while "*" identifies the approximate tolerance envelope for the temperature coefficient. Characteristics available are:	Capacitance - Nominal value expressed in picofarads. (1)	Capacitance tolerance - specified in accordance with the following table:	Failure rate level- (percent/ 1000 hours)

*	± ppm/°C
G	30
H	60
J	120
K	250
X	not practically measurable

X	Tolerance (±)
B	0.1pF
C	0.25pF
D	0.5pF
F	1%
G	2%
J	5%

P = 0.1
R = 0.01
S = 0.001

Part Number	Control Specification MIL-C-20	Style	Capacitance		Rated Voltage (Volts, dc) (2)	Dissipation Factor (%)	Temperature		Minimum I.R. @ Temperature		Configuration		FRL	
			Range (pF)	Tolerances Available			Range (°C)	Characteristics Available	+25°C	+125°C	Case Type	Lead Type (3)	Grade 1 (4)	Grade 2
CCR05C* XXX X X	/35	CCR05	1.0-3,300	B,C,D,F,G,J	50, 100, 200	0.15	-55 to +125	CG,CH,CJ,CK,CX	100K megohm or 1000 megohm µF whichever is less	10 K megohm or 100 megohm µF whichever is less	Rect molded	Radial	S	P, R
CCR06CG XXX X X	/36	CCR06	360-10,000	F,G,J				CG						
CCR07CG XXX X X	/37	CCR07	2,200-22,000	F,G,J				CG						
CCR08CG XXX X X	/38	CCR08	3,900-68,000	G,J				CG						
CCR75C* XXX X X	/27	CCR75	1.0-680	B,C,D,F,G,J				CG,CH,CJ,CK,CX			Tubular molded	Axial		
CCR76CG XXX X X	/28	CCR76	82-1,000	F,G,J				CG						
CCR77CG XXX X X	/29	CCR77	150-5,600	F,G,J				CG						
CCR78CG XXX X X	/30	CCR78	820-27,000	F,G,J				CG						
CCR79CG XXX X X	/31	CCR79	3,900-82,000	F,G,J				CG						

(1) See MIL-C-20 for capacitance values.
(2) For low voltage applications (<10 volts dc), capacitor rated voltage shall be at least 100 volts dc. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2.
(3) Leads are solderable. For weldable leads contact the project parts engineer.
(4) For Grade 1 low voltage applications, perform lot sample testing per Group B, Subgroup 2, of MIL-C-123. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2 C and D. Samples subjected to this testing shall not be used.

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MIL-C-20/35, STYLE CCR05 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts,dc)	Capacitance		Part Number CCR05C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	1.0	B, C	X1R0*S	X1R0*#
	1.1	B, C	X1R1*S	X1R1*#
	1.2	B, C	X1R2*S	X1R2*#
	1.3	B, C	X1R3*S	X1R3*#
	1.5	B, C	X1R5*S	X1R5*#
	1.6	B, C	X1R6*S	X1R6*#
	1.8	B, C	X1R8*S	X1R8*#
	2.0	B, C	X2R0*S	X2R0*#
	2.2	B, C	K2R2*S	K2R2*#
	2.4	B, C	K2R4*S	K2R4*#
	2.7	B, C, D	K2R7*S	K2R7*#
	3.0	B, C, D	K3R0*S	K3R0*#
	3.3	B, C, D	K3R3*S	K3R3*#
	3.6	B, C, D	K3R6*S	K3R6*#
	3.9	B, C, D	K3R9*S	K3R9*#
	4.3	B, C, D	J4R3*S	J4R3*#
	4.7	B, C, D	J4R7*S	J4R7*#
	5.1	B, C, D	J5R1*S	J5R1*#
	5.6	B, C, D	J5R6*S	J5R6*#
	6.2	B, C, D	J6R2*S	J6R2*#
	6.8	B, C, D	J6R8*S	J6R8*#
	7.5	B, C, D	J7R5*S	J7R5*#
	8.2	B, C, D	H8R2*S	H8R2*#
	9.1	B, C, D	H9R1*S	H9R1*#
	10	F, G, J	H100*S	H100*#
	11	F, G, J	H110*S	H110*#
	12	F, G, J	H120*S	H120*#
	13	F, G, J	H130*S	H130*#
	15	F, G, J	H150*S	H150*#
	16	F, G, J	H160*S	H160*#
	18	F, G, J	H180*S	H180*#
	20	F, G, J	G200*S	G200*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/35, STYLE CCR05 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability (Continued)

Rated Voltage (Volts,dc)	Capacitance		Part Number CCR05C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade2 FRL = P or R
200	22	F, G, J	G220*S	G220*#
	24		G240*S	G240*#
	27		G270*S	G270*#
	30		G300*S	G300*#
	33		G330*S	G330*#
	36		G360*S	G360*#
	39		G390*S	G390*#
	43		G430*S	G430*#
	47		G470*S	G470*#
	51		G510*S	G510*#
	56		G560*S	G560*#
	62		G620*S	G620*#
	68		G680*S	G680*#
	75		G750*S	G750*#
	82		G820*S	G820*#
	91		G910*S	G910*#
	100		G101*S	G101*#
	110		G111*S	G111*#
	120		G121*S	G121*#
	130		G131*S	G131*#
	150		G151*S	G151*#
	160		G161*S	G161*#
	180		G181*S	G181*#
	200		G201*S	G201*#
	220		G221*S	G221*#
	240		G241*S	G241*#
	270		G271*S	G271*#
	300		G301*S	G301*#
	330		G331*S	G331*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/35, STYLE CCR05 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR05C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
100	360	F, G, J	G361*S	G361*#
100	390		G391*S	G391*#
100	430		G431*S	G431*#
100	470		G471*S	G471*#
100	510		G511*S	G511*#
100	560		G561*S	G561*#
100	620		G621*S	G621*#
100	680		G681*S	G681*#
100	750		G751*S	G751*#
100	820		G821*S	G821*#
100	910		G911*S	G911*#
100	1,000		G102*S	G102*#
100	1,100		G112*S	G112*#
100	1,200		G122*S	G122*#
100	1,300		G132*S	G132*#
100	1,500		G152*S	G152*#
100	1,600		G162*S	G162*#
100	1,800		G182*S	G182*#
50	2,000		G202*S	G202*#
50	2,200		G222*S	G222*#
50	2,400		G242*S	G242*#
50	2,700		G272*S	G272*#
50	3,000		G302*S	G302*#
50	3,300		G332*S	G332*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/36, STYLE CCR06 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR06C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	360	F, G, J	G361*S	G361*#
200	390		G391*S	G391*#
200	430		G431*S	G431*#
200	470		G471*S	G471*#
200	510		G511*S	G511*#
200	560		G561*S	G561*#
200	620		G621*S	G621*#
200	680		G681*S	G681*#
200	750		G751*S	G751*#
200	820		G821*S	G821*#
200	910		G911*S	G911*#
200	1,000		G102*S	G102*#
200	1,100		G112*S	G112*#
200	1,200		G122*S	G122*#
200	1,300		G132*S	G132*#
200	1,500		G152*S	G152*#
200	1,600		G162*S	G162*#
200	1,800		G182*S	G182*#
100	2,000		G202*S	G202*#
100	2,200		G222*S	G222*#
100	2,400		G242*S	G242*#
100	2,700		G272*S	G272*#
100	3,000		G302*S	G302*#
100	3,300		G332*S	G332*#
100	3,600		G362*S	G362*#
100	3,900		G392*S	G392*#
100	4,300		G432*S	G432*#
100	4,700		G472*S	G472*#
50	5,100		G512*S	G512*#
50	5,600		G562*S	G562*#
50	6,200		G622*S	G622*#
50	6,800		G682*S	G682*#
50	7,500		G752*S	G752*#
50	8,200		G822*S	G822*#
50	9,100		G912*S	G912*#
50	10,000		G103*S	G103*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/37, STYLE CCR07 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR07C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	2,200	F, G, J	G222*S	G222*#
	2,700		G272*S	G272*#
	3,300		G332*S	G332*#
100	5,600		G562*S	G562*#
	6,800		G682*S	G682*#
	8,200		G822*S	G822*#
	10,000		G103*S	G103*#
	12,000		G123*S	G123*#
50	15,000		G153*S	G153*#
	18,000		G183*S	G183*#
	22,000		G223*S	G223*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL)

MIL-C-20/38, STYLE CCR08 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR08C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	3,900	G, J	G392*S	G392*#
200	4,700		G472*S	G472*#
100	15,000		G153*S	G153*#
100	18,000		G183*S	G183*#
50	56,000		G563*S	G563*#
50	68,000		G683*S	G683*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/27, STYLE CCR75 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR75C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	1.0	B, C	X1RO*S	X1RO*#
	1.1	B, C	X1R1*S	X1R1*#
	1.2	B, C	X1R2*S	X1R2*#
	1.3	B, C	X1R3*S	X1R3*#
	1.5	B, C	X1R5*S	X1R5*#
	1.6	B, C	X1R6*S	X1R6*#
	1.8	B, C	X1R8*S	X1R8*#
	2.0	B, C	X2R0*S	X2R0*#
	2.2	B, C	K2R2*S	K2R2*#
	2.4	B, C	K2R4*S	K2R4*#
	2.7	B, C, D	K2R7*S	K2R7*#
	3.0	B, C, D	K3R0*S	K3R0*#
	3.3	B, C, D	K3R3*S	K3R3*#
	3.6	B, C, D	K3R6*S	K3R6*#
	3.9	B, C, D	K3R9*S	K3R9*#
	4.3	B, C, D	J4R3*S	J4R3*#
	4.7	B, C, D	J4R7*S	J4R7*#
	5.1	B, C, D	J5R1*S	J5R1*#
	5.6	B, C, D	J5R6*S	J5R6*#
	6.2	B, C, D	J6R2*S	J6R2*#
	6.8	B, C, D	J6R8*S	J6R8*#
	7.5	B, C, D	J7R5*S	J7R5*#
	8.2	B, C, D	H8R2*S	H8R2*#
	9.1	B, C, D	H9R1*S	H9R1*#
	10	F, G, J	H100*S	H100*#
	11	F, G, J	H110*S	H110*#
	12	F, G, J	H120*S	H120*#
	13	F, G, J	H130*S	H130*#
	15	F, G, J	H150*S	H150*#
	16	F, G, J	H160*S	H160*#
	18	F, G, J	H180*S	H180*#
	20	F, G, J	G200*S	G200*#
	22	F, G, J	G220*S	G220*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/27, STYLE CCR75 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability (Continued)

Rated Voltage (Volts,dc)	Capacitance		Part Number CCR75C	
	Nominal Value(pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	24	F, G, J	G240*S	G240*#
	27		G270*S	G270*#
	30		G300*S	G300*#
	33		G330*S	G330*#
	36		G360*S	G360*#
	39		G390*S	G390*#
	43		G430*S	G430*#
	47		G470*S	G470*#
	51		G510*S	G510*#
	56		G560*S	G560*#
	62		G620*S	G620*#
	68		G680*S	G680*#
100	82		G820*S	G820*#
	91		G910*S	G910*#
	100		G101*S	G101*#
	110		G111*S	G111*#
	120		G121*S	G121*#
	130		G131*S	G131*#
	150		G151*S	G151*#
	160		G161*S	G161*#
	180		G181*S	G181*#
	200		G201*S	G201*#
	220		G221*S	G221*#
50	270		G271*S	G271*#
	300		G301*S	G301*#
	330		G331*S	G331*#
	360		G361*S	G361*#
	390		G391*S	G391*#
	430		G431*S	G431*#
	470		G471*S	G471*#
	510		G511*S	G511*#
	560		G561*S	G561*#
	620		G621*S	G621*#
	680		G681*S	G681*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/28, STYLE CCR76 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR76C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	82	F, G, J	G820*S	G820*#
	91		G910*S	G910*#
	100		G101*S	G101*#
	110		G111*S	G111*#
	120		G121*S	G121*#
100	270		G271*S	G271*#
	300		G301*S	G301*#
	330		G331*S	G331*#
	360		G361*S	G361*#
	390		G391*S	G391*#
50	750		G751*S	G751*#
	820		G821*S	G821*#
	910		G911*S	G911*#
	1,000		G102*S	G102*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/29, STYLE CCR77 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR77C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	150	F, G, J	G151*S	G151*#
	160		G161*S	G161*#
	180		G181*S	G181*#
	200		G201*S	G201*#
	220		G221*S	G221*#
	240		G241*S	G241*#
	270		G271*S	G271*#
	300		G301*S	G301*#
	330		G331*S	G331*#
	360		G361*S	G361*#
	390		G391*S	G391*#
	430		G431*S	G431*#
	470		G471*S	G471*#
	510		G511*S	G511*#
	560		G561*S	G561*#
	620		G621*S	G621*#
	680		G681*S	G681*#
100	750		G751*S	G751*#
	820		G821*S	G821*#
	910		G911*S	G911*#
	1,000		G102*S	G102*#
	1,100		G112*S	G112*#
	1,200		G122*S	G122*#
	1,300		G132*S	G132*#
	1,500		G152*S	G152*#
	1,600		G162*S	G162*#
	1,800		G182*S	G182*#
	2,000		G202*S	G202*#
	2,200		G222*S	G222*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/29, STYLE CCR77 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR77C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
50	2,400	F, G, J	G242*S	G242*#
	2,700		G272*S	G272*#
	3,000		G302*S	G302*#
	3,300		G332*S	G332*#
	3,600		G362*S	G362*#
	3,900		G392*S	G392*#
	4,300		G432*S	G432*#
	4,700		G472*S	G472*#
	5,100	F, G, J, K	G512*S	G512*#
	5,600	F, G, J, K	G562*S	G562*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/30, STYLE CCR78 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number CCR78C	
	Nominal Value (pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	820	F, G, J	G821*S	G821*#
	1,000		G102*S	G102*#
	1,200		G122*S	G122*#
	1,500		G152*S	G152*#
	1,800		G182*S	G182*#
	2,200		G222*S	G222*#
	2,700		G272*S	G272*#
	3,300		G332*S	G332*S
100	3,900		G392*S	G392*#
	4,700		G472*S	G472*#
	5,600		G562*S	G562*#
	6,800		G682*S	G682*#
	8,200		G822*S	G822*#
	10,000		G103*S	G103*#
	12,000		G123*S	G123*#
50	15,000		G153*S	G153*#
	18,000		G183*S	G183*#
	22,000		G223*S	G223*#
	27,000		G273*S	G273*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-20/31, STYLE CCR79 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Compensating, Established Reliability

Rated Voltage (Volts,dc)	Capacitance		Part Number CCR79C	
	Nominal Value(pF)	Tolerances Available	Grade 1 FRL = S	Grade 2 FRL = P or R
200	3,900	F, G, J	G392*S	G392*#
	4,700		G472*S	G472*#
	5,600		G562*S	G562*#
	6,800		G682*S	G682*#
	8,200		G822*S	G822*#
	10,000		G103*S	G103*#
100	15,000		G153*S	G153*#
	18,000		G183*S	G183*#
	22,000		G223*S	G223*#
	27,000		G273*S	G273*#
	33,000		G333*S	G333*#
	39,000		G393*S	G393*#
50	47,000		G473*S	G473*#
	56,000		G563*S	G563*#
	68,000		G683*S	G683*#
	82,000		G823*S	G823*#

* Choice of allowable tolerances.
\# P or R, allowable Failure Rate Levels (FRL).

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MIL-C-123 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable and General Purpose, High Reliability

Part Number Explanation:

M123	A	XX	B*	X	XXX	X	X
Military Specification Number	Modification	Slash Sheet Number	Characteristic	Voltage B: 50V C: 100V D: 200V	Capacitance Value (1)	Capacitance Tolerance C = ±0.25% D = ±0.50% F = ±1.0% J = ±5.0% K= ±10.0%	Termination (2)

*	At 0 voltage	At rated voltage
P	± 30ppm/°C	± 30ppm/°C
X	±15%	+15%, -25%
R	±15%	+15%, -40%

Part Number	Control Specif. MIL-C-123	Style CKS	Capacitance Range (pF)	Capacitance Tolerances Available	Rated Voltage (Volts, dc)	Dissipation Factor (%)	Temperature Range (°C)	Temperature Characteristics Available	Minimum I.R. At temperature +25°C	Minimum I.R. At temperature +125°C	Configuration Case Type	Configuration Lead Type	Grade
M123A01BXXXXXXX	/1	05	4.7-10,000	C,D,F,J,K	50, 100						Molded Rectangular	Radial	
M123A02BXXXXXXX	/2	06	270-470,000	F,J,K	50, 100						Molded Rectangular	Radial	
M123A04BXXXXXXX	/4	11	4.7-4700	C,D,F,J,K	50, 100						Molded Tubular	Axial	
M123A05BXXXXXXX	/5	12	110-10,000	F,J,K	50, 100	(3)	-55	See	100,000	10,000	Molded Tubular	Axial	
M123A06BXXXXXXX	/6(NA)	14	1100-47,000	F,J,K	50		to	Table I	Megohm	Megohm	Molded Tubular	Axial	
M123A07BXXXXXXX	/7	15	1100-180,000	F,J,K	50		+125	of	or	or	Molded Tubular	Axial	(4)
M123A08BXXXXXXX	/8	16	2400-1,000,000	F,J,K	50, 100			MIL-C-123	1,000	100	Molded Tubular	Axial	
M123A10BXXXXXXX	/10	51	1.0-4700	C,D,F,J,K	50				Megohm-	Megohm-	Unencapsulated Chip	Leadless	
M123A11BXXXXXXX	/11(NA)	52	300-47,000	F,J,K	50				µF	µF	Unencapsulated Chip	Leadless	
M123A12BXXXXXXX	/12(NA)	53	300-100,000	F,J,K	50						Unencapsulated Chip	Leadless	
M123A13BXXXXXXX	/13(NA)	54	1100-470,000	F,J,K	50						Unencapsulated Chip	Leadless	
M123A16BXXXXXXX	/16(NA)	22	1.0-100,000	D,F,J,K	50, 100, 200						Molded Rectangular	DIP	
M123A17BXXXXXXX	/17(NA)	23	560-220,000	F,J,K	50, 100, 200						Molded Rectangular	DIP	
M123A18BXXXXXXX	/18(NA)	24	120,000-470,000	K	50, 100						Molded Rectangular	DIP	

(1) See MIL-C-123 for capacitance values.
(2) See MIL-C-123, Table IV. The available terminations are stated on the QPL.
(3) Dissipation factor for BX and BR ≤ 2.5 percent and for BP ≤ 0.15 percent.
(4) Failure Rate Level (FRL) not applicable. These parts may be used in Grade 1 and Grade 2 applications.

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MIL-C-123/1 STYLE CKS05 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts,dc)	Capacitance		Voltage Temperature Limits	Part Number M123A01
	Nominal Value(pf)	Tolerances Available		
100	4.7	C, D	BP	BPC4R7*C
	5.1			BPC5R1*C
	5.6			BPC5R6*C
	6.2			BPC6R2*C
	6.8			BPC6R8*C
	7.5			BPC7R5*C
	8.2			BPC8R2*C
	9.1			BPC9R1*C
	10	C, J, K		BPC100*C
	11			BPC110*C
	12			BPC120*C
	13			BPC130*C
	15			BPC150*C
	16			BPC160*C
	18			BPC180*C
	20			BPC200*C
	22			BPC220*C
	24			BPC240*C
	27	F, J, K		BPC270*C
	30			BPC300*C
	33			BPC330*C
	36			BPC360*C
	39			BPC390*C
	43			BPC430*C
	47			BPC470*C
	51			BPC510*C
	56			BPC560*C
	62			BPC620*C
	68			BPC680*C
	75			BPC750*C

* Choice of allowable tolerances.

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MIL-C-123/1 STYLE CKS05 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose
High Reliability (Continued)

Rated Voltage (Volts,dc)	Capacitance		Voltage Temperature Limits	Part Number M123A01
	Nominal Value(pF)	Tolerances Available		
100	82	F, J, K	BP	BPC820*C
	91			BPC910*C
	100			BPC101*C
	110			BPC111*C
	120			BPC121*C
	130			BPC131*C
	150			BPC151*C
	160			BPC161*C
	180			BPC181*C
	200			BPC201*C
	220			BPC221*C
	240			BPC241*C
50	270			BPB271*C
	300			BPB301*C
	330			BPB331*C
	360			BPB361*C
	390			BPB391*C
	430			BPB431*C
	470			BPB471*C
	510			BPB511*C
	560			BPB561*C
	620			BPB621*C
	680			BPB681*C
	750			BPB751*C
	820			BPB821*C
	910			BPB911*C
	1,000			BPB102*C
	1,100			BPB112*C

* Choice of allowable tolerances.

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MIL-C-123/1, STYLE CKS05 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number
	Nominal Value (pF)	Tolerances Available		M123A01
50	1,200	F, J, K	BP	BPB122*C
	1,300			BPB132*C
	1,500			BPB152*C
	1,600			BPB162*C
	1,800			BPB182*C
	2,000			BPB202*C
	2,200			BPB222*C
	2,400			BPB242*C
	2,700			BPB272*C
100	270	K	BX	BXC271KC
	330			BXC331KC
	390			BXC391KC
	470			BXC471KC
	560			BXC561KC
	680			BXC681KC
	820			BXC821KC
	1,000			BXC102KC
	1,200			BXC122KC
	1,500			BXC152KC
	1,800			BXC182KC
	2,200			BXC222KC
	2,700			BXC272KC
	3,300			BXC332KC
	3,900			BXC392KC
	4,700			BXC472KC
50	5,600			BXB562KC
	6,800			BXB682KC
	8,200			BXB822KC
	10,000			BXB103KC

* Choice of allowable tolerances.

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MIL-C-123/2 STYLE CKS06 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number
	Nominal Value (pF)	Tolerances Available		M123A02
100	270	F, J, K	BP	BPC271*C
	300			BPC301*C
	330			BPC331*C
	360			BPC361*C
	390			BPC391*C
	430			BPC431*C
	470			BPC471*C
	510			BPC511*C
	560			BPC561*C
	620			BPC621*C
	680			BPC681*C
	750			BPC751*C
	820			BPC821*C
	910			BPC911*C
	1,000			BPC102*C
	1,100			BPC112*C
	1,200			BPC122*C
	1,300			BPC132*C
	1,500			BPC152*C
	1,600			BPC162*C
	1,800			BPC182*C
	2,000			BPC202*C
	2,200			BPC222*C
	2,400			BPC242*C
50	2,700			BPB272*C
	3,000			BPB302*C
	3,300			BPB332*C
	3,600			BPB362*C
	3,900			BPB392*C
	4,300			BPB432*C
	4,700			BPB472*C

* Choice of allowable tolerances.

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MIL-C-123/2, STYLE CKS06 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number (1) M123A02
	Nominal Value (pF)	Tolerances Available		
100	5,600	K	BX	BXC562KC
	6,800			BXC682KC
	8,200			BXC822KC
	10,000			BXC103KC
	12,000			BXC123KC
	15,000			BXC153KC
	18,000			BXC183KC
	22,000			BXC223KC
	27,000			BXC273KC
	33,000			BXC333KC
	39,000			BXC393KC
	47,000			BXC473KC
	56,000			BXC563KC
	68,000			BXC683KC
	82,000			BXC823KC
	100,000			BXC104KC
50	56,000			BXB563KC
	68,000			BXB683KC
	82,000			BXB823KC
	100,000			BXB104KC
	120,000			BXB124KC
	150,000			BXB154KC
	180,000			BXB184KC
	220,000			BXB224KC
	270,000			BXB274KC
	330,000			BXB334KC
	390,000			BXB394KC
	470,000			BXB474KC

(1) The capacitance tolerance and termination designation shown in this table are the only options currently available.

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MIL-C-123/4, STYLE CKS11 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A04
	Nominal Value (pF)	Tolerances Available		
100	4.7	C, D	BP	BPC4R7*W
	5.1			BPC5R1*W
	6.2			BPC6R2*W
	6.8			BPC6R8*W
	7.5			BPC7R5*W
	8.2			BPC8R2*W
	9.1			BPC9R1*W
	10	C, J, K		BPC100*W
	11			BPC110*W
	12			BPC120*W
	13			BPC130*W
	15			BPC150*W
	16			BPC160*W
	18			BPC180*W
	20			BPC200*W
	22			BPC220*W
	24			BPC240*W
	27			BPC270*W
	30			BPC300*W
	33			BPC330*W
	36			BPC360*W
	39			BPC390*W
	43			BPC430*W
	47			BPC470*W
	51			BPC510*W
	56			BPC560*W
	62			BPC620*W
	68			BPC680*W
	75			BPC750*W
	82			BPC820*W
	91			BPC910*W
	100			BPC101*W

* Choice of allowable tolerances.

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MIL-C-123/4, STYLE CKS11 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A04
	Nominal Value (pF)	Tolerances Available		
50	110	F, J, K	BP	BPB111*W
	120			BPB121*W
	130			BPB131*W
	150			BPB151*W
	160			BPB161*W
	180			BPB181*W
	200			BPB201*W
	220			BPB221*W
	240			BPB241*W
	270			BPB271*W
	300			BPB301*W
	330			BPB331*W
	360			BPB361*W
	390			BPB391*W
	430			BPB431*W
	470			BPB471*W
	510			BPB511*W
	560			BPB561*W
100	100	K	BX	BXC101KW
	120			BXC121KW
	150			BXC151KW
	180			BXC181KW
	220			BXC221KW
	270			BXC271KW
	330			BXC331KW
	390			BXC391KW
	470			BXC471KW
	560			BXC561KW
	680			BXC681KW
	820			BXC821KW
	1,000			BXC102KW

* Choice of allowable tolerances.

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MIL-C-123/4, STYLE CKS11 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number (1) M123A04
	Nominal Value (pF)	Tolerances Available		
50	1,200	K	BX	BXB122KW
	1,500			BXB152KW
	1,800			BXB182KW
	2,200			BXB222KW
	2,700			BXB272KW
	3,300			BXB332KW
	3,900			BXB392KW
	4,700			BXB472KW

(1) The capacitance tolerance and termination designation shown in this table are the only options currently available.

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MIL-C-123/5, STYLE CKS12 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A05
	Nominal Value (pF)	Tolerances Available		
100	110	F, J, K	BP	BPC111*W
	120			BPC121*W
	130			BPC131*W
	150			BPC151*W
	160			BPC161*W
	180			BPC181*W
	200			BPC201*W
	220			BPC221*W
50	240			BPB241*W
	270			BPB271*W
	300			BPB301*W
	330			BPB331*W
	360			BPB361*W
	390			BPB391*W
	430			BPB431*W
	470			BPB471*W
100	1,200	K	BX	BXC122KW
	1,500			BXC152KW
	1,800			BXC182KW
	2,200			BXC222KW
	2,700			BXC272KW
	3,300			BXC332KW
	3,900			BXC392KW
	4,700			BXC472KW
50	5,600			BXB562KW
	6,800			BXB682KW
	8,200			BXB822KW
	10,000			BXB103KW

* Choice of allowable tolerances.

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MIL-C-123/6, STYLE CKS14 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A06
	Nominal Value (pF)	Tolerances Available		
100	240	F, J, K	BP	BPC241*W
	270			BPC271*W
	300			BPC301*W
	330			BPC331*W
	360			BPC361*W
	390			BPC391*W
	430			BPC431*W
	470			BPC471*W
	510			BPC511*W
	560			BPC561*W
	620			BPC621*W
	680			BPC681*W
	750			BPC751*W
	820			BPC821*W
	910			BPC911*W
	1000			BPC102*W
	5,600	K	BX	BXC562KW
	6,800			BXC682KW
	8,200			BXC822KW
	10,000			BXC103KW
50	1,100	F, J, K	BP	BPB112*W
	1,200			BPB122*W
	1,300			BPB132*W
	1,500			BPB152*W
	1,600			BPB162*W
	1,800			BPB182*W
	2,000			BPB202*W
	2,200			BPB222*W

* Choice of allowable tolerances.

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MIL-C-123/6, STYLE CKS14 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A06
	Nominal Value (pF)	Tolerances Available		
50	2,400	F, J, K	BP	BPB242*W
	2,700			BPB272*W
	3,000			BPB302*W
	3,300			BPB332*W
	3,600			BPB362*W
	3,900			BPB392*W
	4,300			BPB432*W
	4,700			BPB472*W
	5,100			BPB512*W
	5,600			BPB562*W
	6,200			BPB622*W
	6,800			BPB682*W

* Choice of allowable tolerances.

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MIL-C-123/6, STYLE CKS14 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number (1) M123A06
	Nominal Value (pF)	Tolerances Available		
50	12,000	K	BX	BXB123KW
	15,000			BXB153KW
	18,000			BXB183KW
	22,000			BXB223KW
	27,000			BXB273KW
	33,000			BXB333KW
	39,000			BXB393KW
	47,000			BXB473KW

(1) The capacitance tolerance and termination designations shown in this table are the only options currently available.

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MIL-C-123/7 STYLE CKS15 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A07
	Nominal Value (pF)	Tolerances Available		
100	1,100	F, J, K	BP	BPC112*W
	1,200			BPC122*W
	1,300			BPC132*W
	1,500			BPC152*W
	1,600			BPC162*W
	1,800			BPC182*W
	2,000			BPC202*W
	2,200			BPC222*W
50	2,400			BPB242*W
	2,700			BPB272*W
	3,000			BPB302*W
	3,300			BPB332*W
	3,600			BPB362*W
	3,900			BPB392*W
	4,300			BPB432*W
	4,700			BPB472*W
	5,100			BPB512*W
	5,600			BPB562*W
	6,200			BPB622*W
	6,800			BPB682*W
	7,500			BPB752*W
	8,200			BPB822*W
	9,100			BPB912*W
	10,000			BPB103*W
	11,000			BPB113*W
	12,000			BPB123*W
	13,000			BPB133*W
	15,000			BPB153*W
	16,000			BPB163*W
	18,000			BPB183*W
	20,000			BPB203*W
	22,000			BPB223*W

* Choice of allowable tolerances.

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MIL-C-123/7, STYLE CKS15 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number (1) M123A07
	Nominal Value (pF)	Tolerance Available		
100	12,000	K	BX	BXC123KW
	15,000			BXC153KW
	18,000			BXC183KW
	22,000			BXC223KW
	27,000			BXC273KW
	33,000			BXC333KW
	39,000			BXC393KW
	47,000			BXC473KW
	56,000			BXC563KW
	68,000			BXC683KW
	82,000			BXC823KW
	100,000			BXC104KW
50	120,000			BXB124KW
	150,000			BXB154KW
	180,000			BXB184KW

(1) The capacitance tolerance and termination designation shown in this table are the only options currently available.

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MIL-C-123/8, STYLE CKS16 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A08
	Nominal Value (pF)	Tolerances Available		
100	2,400	F, J, K	BP	BPC242*W
	2,700			BPC272*W
	3,000			BPC302*W
	3,300			BPC332*W
	3,600			BPC362*W
	3,900			BPC392*W
	4,300			BPC432*W
	4,700			BPC472*W
	5,100			BPC512*W
	5,600			BPC562*W
	6,200			BPC622*W
	6,800			BPC682*W
	8,200			BPC822*W
	9,100			BPC912*W
	10,000			BPC103*W
50	11,000			BPB113*W
	12,000			BPB123*W
	13,000			BPB133*W
	15,000			BPB153*W
	16,000			BPB163*W
	18,000			BPB183*W
	20,000			BPB203*W
	22,000			BPB223*W

* Choice of allowable tolerances.

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MIL-C-123/8, STYLE CKS16 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number (1) M123A08
	Nominal Value (pF)	Tolerances Available		
100	120,000	K	BX	BXC124KW
	150,000			BXC154KW
	180,000			BXC184KW
	220,000			BXC224KW
	270,000			BXC274KW
	330,000			BXC334KW
	390,000			BXC394KW
	470,000			BXC474KW
50	560,000			BXB564KW
	680,000			BXB684KW
	820,000			BXB824KW
	1,000,000			BXB105KW

(1) The capacitance tolerance and termination designation shown in this table are the only options currently available.

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MIL-C-123/10, STYLE CKS51 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A10
	Nominal Value (pF)	Tolerances Available		
50	1.0	C, D	BP	BPB1R0*#
	1.1			BPB1R1*#
	1.2			BPB1R2*#
	1.3			BPB1R3*#
	1.5			BPB1R5*#
	1.6			BPB1R6*#
	1.8			BPB1R8*#
	2.0			BPB2R0*#
	2.2			BPB2R2*#
	2.4			BPB2R4*#
	2.7			BPB2R7*#
	3.0			BPB3R0*#
	3.3			BPB3R3*#
	3.6			BPB3R6*#
	3.9			BPB3R9*#
	4.3			BPB4R3*#
	4.7			BPB4R7*#
	5.1			BPB5R1*#
	5.6			BPB5R6*#
	6.2			BPB6R2*#
	6.8			BPB6R8*#
	7.5			BPB7R5*#
	8.2			BPB8R2*#
	9.1			BPB9R1*#

\# Choice of allowable terminations (M, G, S or W).
* Choice of allowable tolerances.

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MIL-C-123/10, STYLE CKS51 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A10
	Nominal Value (pF)	Tolerances Available		
50	10	C, J, K	BP	BPB100*#
	11			BPB110*#
	12			BPB120*#
	13			BPB130*#
	15			BPB150*#
	16			BPB160*#
	18			BPB180*#
	20			BPB200*#
	22			BPB220*#
	24			BPB240*#
	27	F, J, K		BPB270*#
	30			BPB300*#
	33			BPB330*#
	36			BPB360*#
	39			BPB390*#
	43			BPB430*#
	47			BPB470*#
	51			BPB510*#

\# Choice of allowable terminations (M, G, S or W).
* Choice of allowable tolerances.

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MIL-C-123/10, STYLE CKS51 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A10
	Nominal Value (pF)	Tolerance Available		
50	56	F, J, K	BP	BPB560*#
	62			BPB620*#
	68			BPB680*#
	75			BPB750*#
	82			BPB820*#
	91			BPB910*#
	100			BPB101*#
	110			BPB111*#
	120			BPB121*#
	130			BPB131*#
	150			BPB151*#
	160			BPB161*#
	180			BPB181*#
	200			BPB201*#
	220			BPB221*#
	240			BPB241*#
	270			BPB271*#

\# Choice of allowable terminations (M, G, S or W).
* Choice of allowable tolerances.

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MIL-C-123/10, STYLE CKS51 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A10
	Nominal Value (pF)	Tolerance Available		
50	330	K	BX	BXB331K#
	390			BXB391K#
	470			BXB471K#
	560			BXB561K#
	680			BXB681K#
	820			BXB821K#
	1,000			BXB102K#
	1,200			BXB122K#
	1,500			BXB152K#
	1,800			BXB182K#
	2,200			BXB222K#
	2,700			BXB272K#
	3,300			BXB332K#
	3,900			BXB392K#
	4,700			BXB472K#

Choice of allowable terminations (M, G, S or W).

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MIL-C-123/11, STYLE CKS52 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A11
	Nominal Value (pF)	Tolerances Available		
50	300	F, J, K	BP	BPB301*#
	330			BPB331*#
	360			BPB361*#
	390			BPB391*#
	430			BPB431*#
	470			BPB471*#
	510			BPB511*#
	560			BPB561*#
	620			BPB621*#
	680			BPB681*#
	750			BPB751*#
	820			BPB821*#
	910			BPB911*#
	1,000			BPB102*#
	5,600	K	BX	BXB562K#
	6,800			BXB682K#
	8,200			BXB822K#
	10,000			BXB103K#
	12,000			BXB123K#
	15,000			BXB153K#
	18,000			BXB183K#
	22,000			BXB223K#
	27,000			BXB273K#
	33,000			BXB333K#
	47,000			BXB473K#

* Choice of allowable tolerances.
\# Choice of allowable terminations (M, G, S or W).

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MIL-C-123/12, STYLE CKS53 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A12
	Nominal Value (pF)	Tolerances Available		
50	300	F, J, K	BP	BPB301*#
	330			BPB331*#
	360			BPB361*#
	390			BPB391*#
	430			BPB431*#
	470			BPB471*#
	510			BPB511*#
	560			BPB561*#
	620			BPB621*#
	680			BPB681*#
	750			BPB751*#
	820			BPB821*#
	910			BPB911*#
	1,000			BPB102*#
	5,600	K	BX	BXB562K#
	6,800			BXB682K#
	8,200			BXB822K#
	10,000			BXB103K#
	12,000			BXB123K#
	15,000			BXB153K#
	18,000			BXB183K#
	22,000			BXB223K#
	27,000			BXB273K#
	33,000			BXB333K#
	47,000			BXB473K#
	56,000			BXB563K#
	68,000			BXB683K#
	82,000			BXB823K#
	100,000			BXB104K#

* Choice of allowable tolerances.
\# Choice of allowable terminations (S or W).

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MIL-C-123/13, STYLE CKS54 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A13
	Nominal Value (pF)	Tolerances Available		
50	1,100	F, J, K	BP	BPB112*#
	1,200			BPB122*#
	1,300			BPB132*#
	1,500			BPB152*#
	1,600			BPB162*#
	1,800			BPB182*#
	2,000			BPB202*#
	2,200			BPB222*#
	2,400			BPB242*#
	2,700			BPB272*#
	3,000			BPB302*#
	3,300			BPB332*#
	3,600			BPB362*#
	3,900			BPB392*#
	4,300			BPB432*#
	4,700			BPB472*#
	5,100			BPB512*#
	5,600			BPB562*#
	6,200			BPB622*#
	6,800			BPB682*#
	7,500			BPB752*#
	8,200			BPB822*#
	9,100			BPB912*#
	10,000			BPB103*#
	120,000	K	BX	BXB124K#
	150,000			BXB154K#
	180,000			BXB184K#
	220,000			BXB224K#
	270,000			BXB274K#
	330,000			BXB334K#
	390,000			BXB394K#
	470,000			BXB474K#

* Choice of allowable tolerances.
\# Choice of allowable terminations (S or W).

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MIL-C-123/16, STYLE CKS22 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A16
	Nominal Value (pF)	Tolerances Available		
200	1.0	D	BP	BPD1R0DC
	1.2			BPD1R2DC
	1.5			BPD1R5DC
	1.8			BPD1R8DC
	2.2			BPD2R2DC
	2.7			BPD2R7DC
	3.3			BPD3R3DC
	3.9			BPD3R9DC
	4.7			BPD4R7DC
	5.6			BPD5R6DC
	6.8			BPD6R8DC
	8.2			BPD8R2DC
	10	D, J, K		BPD100*C
	12			BPD120*C
	15			BPD150*C
	18			BPD180*C
	22			BPD220*C
	27			BPD270*C
	33			BPD330*C
	39			BPD390*C
	47			BPD470*C
	56			BPD560*C
	68	F, J, K		BPD680*C
	82			BPD820*C
	100			BPD101*C
	120			BPD121*C
	150			BPD151*C
	180			BPD181*C
	220			BPD221*C
	270			BPD271*C

* Choice of allowable tolerances.

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MIL-C-123/16, STYLE CKS22 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A16
	Nominal Value (pF)	Tolerances Available		
200	330	F, J, K	BP	BPD331*C
	390			BPD391*C
	470			BPD471*C
100	560			BPC561*C
	680			BPC681*C
	820			BPC821*C
	1,000			BPC102*C
	1,200			BPC122*C
	1,500			BPC152*C
	1,800			BPC182*C
	2,200			BPC222*C
50	2,700			BPB272*C
	3,300			BPB332*C
	3,900			BPB392*C
	4,700			BPB472*C
200	270	K	BX	BXD271KC
	330			BXD331KC
	390			BXD391KC
	470			BXD471KC
	560			BXD561KC
	680			BXD681KC
	820			BXD821KC
100	1,000			BXC102KC
	1,200			BXC122KC
	1,500			BXC152KC
	1,800			BXC182KC
	2,200			BXC222KC
	2,700			BXC272KC
	3,300			BXC332KC
	3,900			BXC392KC
	4,700			BXC472KC
	5,600			BXC562KC
	6,800			BXC682KC
	8,200			BXC822KC
	10,000			BXC103KC

* Choice of allowable tolerances.

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MIL-C-123/16, STYLE CKS22 CAPACITORS (CONTINUED)
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A16
	Nominal Value (pF)	Tolerances Available		
50	12,000	K	BX	BXB123KC
	15,000			BXB153KC
	18,000			BXB183KC
	22,000			BXB223KC
	27,000			BXB273KC
	33,000			BXB333KC
	39,000			BXB393KC
	47,000			BXB473KC
	56,000			BXB563KC
	68,000			BXB683KC
	82,000			BXB823KC
	100,000			BXB104KC

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MIL-C-123/17, STYLE CKS23 CAPACITORS
Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A17
	Nominal Value (pF)	Tolerances Available		
200	560	F, J, K	BP	BPD561*C
	680			BPD681*C
	820			BPD821*C
	1,000			BPD102*C
	1,200			BPD122*C
100	2,700			BPC272*C
	3,300			BPC332*C
50	4,700			BPB472*C
	5,600			BPB562*C
	6,800			BPB682*C
	8,200			BPB822*C
	10,000			BPB103*C

* Choice of allowable tolerances.

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MIL-C-123/17, STYLE CKS23 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A17
	Nominal Value (pF)	Tolerances Available		
200	1,000	K	BX	BXD102KC
	1,200			BXD122KC
	1,500			BXD152KC
	1,800			BXD182KC
	2,200			BXD222KC
	2,700			BXD272KC
	3,300			BXD332KC
	3,900			BXD392KC
	4,700			BXD472KC
	5,600			BXD562KC
	6,800			BXD682KC
	8,200			BXD822KC
	10,000			BXD103KC
100	12,000			BXC123KC
	15,000			BXC153KC
	18,000			BXC183KC
	22,000			BXC223KC
	27,000			BXC273KC
	33,000			BXC333KC
	39,000			BXC393KC
	47,000			BXC473KC
	56,000			BXC563KC
	68,000			BXC683KC
	82,000			BXC823KC
	100,000			BXC104KC
50	120,000			BXB124KC
	150,000			BXB154KC
	180,000			BXB184KC
	220,000			BXB224KC

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MIL-C-123/18, STYLE CKS24 CAPACITORS

Fixed, Ceramic Dielectric, Temperature Stable, General Purpose, High Reliability

Rated Voltage (Volts, dc)	Capacitance		Voltage Temperature Limits	Part Number M123A18
	Nominal Value (pF)	Tolerances Available		
100	120,000	K	BR	BRC124KC
	150,000			BRC154KC
50	180,000			BRB184KC
	220,000			BRB224KC
	270,000			BRB274KC
	330,000			BRB334KC
	390,000			BRB394KC
	470,000			BRB474KC

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MIL-C-23269, CAPACITORS
Fixed, Glass Dielectric, Established Reliability

Part number explanation:

M23269 /XX -XXXX

M23269 - Identifies CYR fixed, glass dielectric, established reliability capacitors conforming to MIL-C-23269.

/XX - Identifies the appropriate military specification sheet that uniquely specifies the capacitor family.

-XXXX - Uniquely specifies the nominal capacitance value, capacitance tolerance, rated dc voltage, and failure rate level.

Part Number	Control Specification	Style (1)	Capacitance		Working Voltage (Vdc) at +125 °C	Maximum Dissipation Factor (%)	Temperature		Minimum Insulation Resistance (Gigohms) at +25°C	FRL Grade 1 and 2
			Range (pF)	Tolerance (±)			Range (°C)	Coefficient (ppm/°C)		
M23269/01-XXXX	MIL-C-23269/1	CYR10	0.5-300	0.25 pF 0.50 pF 1%, 2%, 5%	100	0.1	-55 to +125	140 ±25	100	S
M23269/02-XXXX	MIL-C-23269/2	CYR15	220-1,200	1%, 2%, 5%						
M23269/03-XXXX	MIL-C-23269/3	CYR20	560-3,300							
M23269/04-XXXX	MIL-C-23269/4	CYR30	3,600-6,200							

(1) Lead material and coating are specified in the detailed specification sheet for each device type.

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MIL-C-23269/1, STYLE CYR10 CAPACITORS
Fixed, Glass Dielectric, Established Reliability

Capacitance		Part Number M23269/01-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
0.5	0.25pF	7001
1.0	0.25pF	7002
1.5	0.25pF	7003
2.2	0.25pF	7004
	0.50pF	7005
2.7	0.25pF	7006
3.0	0.25pF	7007
	0.50pF	7008
3.3	0.25pF	7009
3.6	0.25pF	7010
	0.50pF	7011
3.9	0.25pF	7012
4.3	0.25pF	7013
	0.50pF	7014
4.7	0.25pF	7015
5.1	0.25pF	7016
5.6	0.25pF	7017
	5%	7018
6.2	0.25pF	7019
	5%	7020
6.8	0.25pF	7021
	5%	7022
7.5	0.25pF	7023
	5%	7024
8.2	0.25pF	7025
	5%	7026
9.1	0.25pF	7027
	5%	7028
10	0.25pF	7029
	5%	7030
11	0.25pF	7031
	5%	7032

Capacitance		Part Number M23269/01-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
12	0.25pF	7033
	5%	7034
13	2%	7035
	5%	7036
15	2%	7037
	5%	7038
16	2%	7039
	5%	7040
18	2%	7041
	5%	7042
20	2%	7043
	5%	7044
22	2%	7045
	5%	7046
24	2%	7047
	5%	7048
27	1%	7049
	2%	7050
	5%	7051
30	1%	7052
	2%	7053
	5%	7054
33	1%	7055
	2%	7056
	5%	7057
36	1%	7058
	2%	7059
	5%	7060
39	1%	7061
	2%	7062
	5%	7063

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MIL-C-23269/1, STYLE CYR10 CAPACITORS
Fixed, Glass Dielectric, Established Reliability (Continued)

Capacitance		Part Number M23269/01-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
43	1%	7064
	2	7065
	5	7066
47	1	7067
	2	7068
	5	7069
51	1	7070
	2	7071
	5	7072
56	1	7073
	2	7074
	5	7075
62	1	7076
	2	7077
	5	7078
68	1	7079
	2	7080
	5	7081
75	1	7082
	2	7083
	5	7084
82	1	7085
	2	7086
	5	7087
91	1	7088
	2	7089
	5	7090
100	1	7091
	2	7092
	5	7093
110	1	7094
	2	7095
	5	7096

Capacitance		Part Number M23269/01-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
120	1	7097
	2	7098
	5	7099
130	1	7100
	2	7101
	5	7102
150	1	7103
	2	7104
	5	7105
160	1	7106
	2	7107
	5	7108
180	1	7109
	2	7110
	5	7111
200	1	7112
	2	7113
	5	7114
220	1	7115
	2	7116
	5	7117
240	1	7118
	2	7119
	5	7120
270	1	7121
	2	7122
	5	7123
300	1	7124
	2	7125
	5	7126

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MIL-C-23269/2, STYLE CYR15 CAPACITORS
Fixed, Glass Dielectric, Established Reliability

Capacitance		Part Number M23269/02-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
220	1	7001
	2	7002
	5	7003
240	1	7004
	2	7005
	5	7006
270	1	7007
	2	7008
	5	7009
300	1	7010
	2	7011
	5	7012
330	1	7013
	2	7014
	5	7015
360	1	7016
	2	7017
	5	7018
390	1	7019
	2	7020
	5	7021
430	1	7022
	2	7023
	5	7024
470	1	7025
	2	7026
	5	7027
510	1	7028
	2	7029
	5	7030

Capacitance		Part Number M23269/02-
Value (pF)	Tolerance (±)	Grades 1 and 2 FRL = S
560	1	7031
	2	7032
	5	7033
620	1	7034
	2	7035
	5	7036
680	1	7037
	2	7038
	5	7039
750	1	7040
	2	7041
	5	7042
820	1	7043
	2	7044
	5	7045
910	1	7046
	2	7047
	5	7048
1,000	1	7049
	2	7050
	5	7051
1,100	1	7052
	2	7053
	5	7054
1,200	1	7055
	2	7056
	5	7057

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MIL-C-23269/3, STYLE CYR20 CAPACITORS
Fixed, Glass Dielectric, Established Reliability

Capacitance		Part Number M23269/03-
Value (pF)	Tolerance (±%)	Grades 1 and 2 FRL = S
560	1	7001
	2	7002
	5	7003
620	1	7004
	2	7005
	5	7006
680	1	7007
	2	7008
	5	7009
750	1	7010
	2	7011
	5	7012
820	1	7013
	2	7014
	5	7015
910	1	7016
	2	7017
	5	7018
1,000	1	7019
	2	7020
	5	7021
1,100	1	7022
	2	7023
	5	7024

Capacitance		Part Number M23269/03-
Value (pF)	Tolerance (±%)	Grades 1 and 2 FRL = S
1,200	1	7025
	2	7026
	5	7027
1,300	1	7028
	2	7029
	5	7030
1,500	1	7031
	2	7032
	5	7033
1,600	1	7034
	2	7035
	5	7036
1,800	1	7037
	2	7038
	5	7039
2,000	1	7040
	2	7041
	5	7042
2,200	1	7043
	2	7044
	5	7045
2,400	1	7046
	2	7047
	5	7048

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MIL-C-23269/3, STYLE CYR20 CAPACITORS
Fixed, Glass Dielectric, Established Reliability (Continued)

Capacitance		Part Number M23269/03-
Value (pF)	Tolerance (±%)	Grades 1 and 2 FRL = S
2,700	1	7049
	2	7050
	5	7051
3,000	1	7052
	2	7053
	5	7054
3,300	1	7055
	2	7056
	5	7057

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MIL-C-23269/4, STYLE CYR30 CAPACITORS
Fixed, Glass Dielectric, Established Reliability

Capacitance		Part Number M23269/04-
Value (pF)	Tolerance (±%)	Grades 1 and 2 FRL = S
3,600	1	7001
	2	7002
	5	7003
3,900	1	7004
	2	7005
	5	7006
4,300	1	7007
	2	7008
	5	7009
4,700	1	7010
	2	7011
	5	7012
5,100	1	7013
	2	7014
	5	7015
5,600	1	7016
	2	7017
	5	7018
6,200	1	7019
	2	7020
	5	7021

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MIL-C-39003, CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability

Part Number Explanation:

M39003 — /XX — -XXXX

M39003 - Identifies fixed, tantalum, electrolytic (solid electrolyte), established reliability capacitors that are hermetically sealed in metal cases.

/XX - Identifies the appropriate military specification sheet that uniquely specifies the capacitor family

-XXXX - Uniquely specifies the nominal capacitance value, capacitance tolerance, rated voltage, maximum dc leakage and dissipation factor, and failure rate level.

Part Number (1) (2)	Control Specification	Style	Capacitance		Rated Voltage (Vdc)	Operating Temperature Range (°C)	Configuration			FRL	
			Range (µF)	Tolerance (±%)			Case Type	Lead Type	Lead Material	Grade 1	Grade 2
M39003/10-XXXX* (3)	MIL-C-39003/10 Polarized	CSS13	0.12 - 220.0	10	10, 15, 20, 35, 50, 75	-55 to +125	Tubular	Axial	Tin-lead coated nickel; Solder coated nickel	C	B
M39003/01-XXXX (4)	MIL-C-39003/1 Polarized	CSR13	0.0047 - 4.7	10, 20	50				Tin-lead coated nickel; Solder coated nickel	C (5)	B
M39003/02-XXXX (4)	MIL-C-39003/2 Polarized	CSR09	0.047 - 15.0	10	10, 20, 35, 50, 75				Nickel-iron alloy	C (5)	B
M39003/10-XXXX* (3)	MIL-C-39003/10 Polarized	CSS33	1.2 - 560.0	10	10, 20, 35, 50				Tin-lead coated nickel; Solder coated nickel	C	B

(1) MIL-C-39003 capacitors shall not be used in power supply filters. Reference MIL-HDBK-978, Vol. 1, 2.6.7.2.
(2) Parts covered by this specification contain internal soldered connections which may reflow during installation. The A, A1, B, B1 case sizes are particularly susceptible and special precautions such as heat sinking are recommended when soldering onto boards.
(3) The symbol * completes the dash number thus: * = S for Sleeved, U for Unsleeved.
(4) CSR09 and CSR13 capacitors are sleeved (insulated case).
(5) All CSR13 and CSR09 capacitors must be subjected to the surge current test as specified by Appendix B. Reference MIL-HDBK-978, Vol.1, para. 2.6.7.2 and 2.6.7.3.

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MIL-C-39003/10, STYLE CSS13 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (μA)			Maximum Dissipation Factor (%)		Case Size (1)	Part Number M39003/10- (2)	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C & +25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
10	3.9	10	0.3	6.0	7.5	4	4	A	3009*	—
	4.7	10	0.4	7.0	8.8	4	4	A	3010*	
	27.0	10	2.0	40.0	50.0	6	6	B	3011*	
	33.0	10	2.5	50.0	63.0	6	6	B	3012*	
	39.0	10	2.5	50.0	63.0	6	6	B	3013*	
	82.0	10	4.0	80.0	100.0	8	8	C	3014*	
	100.0	10	5.0	100.0	125.0	8	8	C	3015*	
	120.0	10	6.0	120.0	150.0	8	8	C	3016*	
	180.0	10	9.0	180.0	226.0	8	8	D	3017*	
	220.0	10	10.0	200.0	250.0	8	8	D	3018*	
15	2.7	10	0.3	6.0	7.5	4	4	A	3019*	
	3.3	10	0.4	8.0	10.0	4	4	A	3020*	
	18.0	10	2.0	35.0	44.0	6	6	B	3021*	
	22.0	10	2.0	40.0	50.0	6	6	B	3022*	
	56.0	10	4.0	80.0	100.0	6	6	C	3023*	
	68.0	10	5.0	100.0	125.0	6	6	C	3024*	
	120.0	10	9.0	180.0	226.0	8	8	D	3025*	
	150.0	10	10.0	220.0	250.0	8	8	D	3026*	

(1) Case sizes are defined in MIL-C-39003/10.
(2) The symbol * completes the dash number thus: * = S for sleeved, U for unsleeved.

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MIL-C-39003/10, STYLE CSS13 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability (Continued)

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (μA)			Maximum Dissipation Factor (%)		Case Size (1)	Part Number M39003/10- (2)	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C & +25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
20	1.2	10	0.3	6.0	7.5	4	4	A	3027*	-
	1.5		0.3	6.0	7.5	4	4	A	3028*	
	1.8		0.3	6.0	7.5	4	4	A	3029*	
	2.2		0.4	8.0	10.0	4	4	A	3030*	
	8.2		1.0	20.0	25.0	6	6	B	3031*	
	10.0		1.5	30.0	38.0	6	6	B	3032*	
	12.0		1.8	35.0	44.0	6	6	B	3033*	
	15.0		2.0	40.0	50.0	6	6	B	3034*	
	27.0		2.5	50.0	63.0	6	6	C	3035*	
	33.0		3.5	70.0	88.0	6	6	C	3036*	
	39.0		4.0	80.0	100.0	6	6	C	3037*	
	47.0		4.5	90.0	113.0	6	6	C	3038*	
	56.0		5.5	110.0	138.0	6	6	D	-	2039*
	68.0		7.0	140.0	175.0	6	6	D		2040*
	82.0		8.0	160.0	200.0	6	6	D		2041*
	100.0		10.0	200.0	250.0	8	8	D		2042*
35	5.6		1.3	25.0	32.0	4	4	A		2043*
	6.8		1.5	30.0	38.0	6	6	B		2044*
	22.0		4.0	40.0	100.0	6	6	C		2045*
	27.0		4.5	90.0	113.0	6	6	D		2046*
	33.0		5.5	110.0	138.0	6	6	D		2047*
	39.0		7.0	140.0	175.0	6	6	D		2048*
	47.0		8.0	160.0	200.0	6	6	D		2049*
50	0.12		0.3	5.0	6.3	2	4	A	3067*	-
	0.15		0.3	5.0	6.3	2	4	A	3068*	
	0.18		0.3	5.0	6.3	2	4	A	3069*	
	0.22		0.3	5.0	6.3	2	4	A	3070*	
	0.27		0.3	5.0	6.3	2	4	A	3071*	
	0.33		0.3	5.0	6.3	2	4	A	3072*	
	0.39		0.3	5.0	6.3	2	4	A	3073*	
	0.47		0.3	5.0	6.3	2	4	A	3074*	
	0.56		0.3	5.0	6.3	2	4	A	3075*	
	0.68		0.3	5.0	6.3	2	4	A	3076*	
	0.82		0.3	5.0	6.3	2	4	A	3077*	
	1.0		0.4	8.0	10.0	2	4	A	3078*	
	1.2		0.4	9.0	11.0	4	4	B	3079*	
	1.5		0.6	12.0	15.0	4	4	B	3080*	
	1.8		0.7	14.0	18.0	4	4	B	3081*	
	2.2		0.8	17.0	22.0	4	4	B	3082*	
	2.7		1.0	20.0	25.0	4	4	B	3083*	
	3.3		1.2	25.0	32.0	4	4	B	3084*	

(1) Case sizes are defined in MIL-C-39003/10.
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MIL-C-39003/10, STYLE CSS13 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability (Continued)

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (μA)			Maximum Dissipation Factor (%)		Case Size (1)	Part Number M39003/10- (2)	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C & +25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
50	3.9	10	1.5	30.0	38.0	4	4	B	3085*	
	4.7		1.7	35.0	44.0	4	4	B		2086*
	5.6		2.2	45.0	56.0	4	4	C	3087*	
	6.8		2.2	45.0	56.0	6	6	C	3088*	
	8.2		2.5	50.0	63.0	6	6	C	3089*	
	10.0		2.5	50.0	63.0	6	6	C	3090*	2090*
	12.0		3.0	60.0	75.0	6	6	C		2091*
	15.0		4.0	80.0	100.0	6	6	C		2092*
	18.0		4.5	90.0	113.0	6	6	C		2093*
	22.0		5.5	110.0	138.0	6	6	D		2094*
75	0.15		0.3	5.0	6.3	2	4	A	3097*	
	0.18		0.3	5.0	6.3	2	4	A	3098*	
	0.22		0.3	5.0	6.3	2	4	A	3099*	
	0.27		0.3	5.0	6.3	2	4	A	3100*	
	0.33		0.3	5.0	6.3	2	4	A	3101*	
	0.39		0.3	5.0	6.3	2	4	A	3102*	
	0.47		0.3	5.0	6.3	2	4	A	3103*	
	0.56		0.3	5.0	6.3	2	4	A	3104*	
	0.68		0.3	5.0	6.3	2	4	A	3105*	
	0.82		0.3	5.0	6.3	2	4	B	3106*	
	1.0		0.4	5.0	6.3	2	4	B	3107*	
	1.2		0.4	5.0	6.3	4	4	B	3108*	
	1.5		0.6	10.0	13.0	4	4	B	3109*	
	1.8		0.7	10.0	13.0	4	4	B	3110*	
	2.2		0.8	15.0	19.0	4	4	B	3111*	
	2.7		1.0	15.0	19.0	4	4	B		2112*
	3.3		1.2	20.0	25.0	4	4	B		2113*
	3.9		1.5	20.0	25.0	4	4	B		2114*
	4.7		3.0	60.0	75.0	4	4	C		2115*
	5.6		3.0	60.0	75.0	4	4	C		2116*
	6.8		5.0	100.0	125.0	6	6	C	-	2117*
	8.2		5.0	100.0	125.0	6	6	C		2118*
	10.0		5.0	100.0	125.0	6	6	C		2119*
	12.0		5.0	100.0	125.0	6	6	D		2120*
	15.0		7.0	140.0	175.0	6	6	D	-	2121*

(1) Case sizes are defined in MIL-C-39003/10.
(2) The symbol * completes the dash number thus: * = S for sleeved, U for unsleeved.

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MIL-C-39003/1, STYLE CSR13 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum, Leakage (µA)			Maximum Dissipation Factor (%)		Case Size (1)	Part Number M39003/01-	
	Nominal Value (µF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C & +25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
50	0.0047	10	0.3	5.0	6.3	2	4	A	7124	6124
	0.0047	20							7125	6125
	0.0056	10							7127	6127
	0.0068	10							7129	6129
	0.0068	20							7130	6130
	0.0082	10							7132	6132
	0.01	10							7134	6134
	0.01	20							7135	6135
	0.012	10							7137	6137
	0.015	10							7139	6139
	0.015	20							7140	6140
	0.018	10							7142	6132
	0.022	10							7144	6144
	0.022	20							7145	6145
	0.027	10							7147	6147
	0.033	10							7149	6149
	0.033	20							7150	6150
	0.039	10							7152	6152
	0.047	10							7154	6154
	0.047	20							7155	6155
	0.056	10							7157	6157
	0.068	10							7159	6159
	0.068	20							7160	6160
	0.082	10							7162	6162

(1) Case sizes are defined in MIL-C-39003/1.

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MIL-C-39003/1, STYLE CSR13 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability (Continued)

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum, Leakage (μA)			Maximum Dissipation Factor (%)		Case Size (1)	Part Number M39003/01-	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C & +25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
50	0.1	10	0.3	5.0	6.3	2	4	A	7164	6164
	0.1	20							7165	6165
	0.12	10							7167	6167
	0.15	10							7169	6169
	0.15	20							7170	6170
	0.18	10							7172	6172
	0.22	10							7174	6174
	0.22	20							7175	6175
	0.27	10							7177	6177
	0.33	10							7179	6179
	0.33	20							7180	6180
	0.39	10							7182	6182
	0.47	10							7184	6184
	0.47	20							7185	6185
	1.2	10	0.4	9.0	11.0	4		B	7197	6197
	1.5	10	0.6	12.0	15.0				7199	6199
	1.5	20	0.6	12.0	15.0				7200	6200
	1.8	10	0.7	14.0	18.0				7202	6202
	2.2	10	0.8	17.0	22.0				7204	6204
	2.2	20	0.8	17.0	22.0				7205	6205
	2.7	10	1.0	20.0	25.0				7207	6207
	3.3	10	1.2	25.0	32.0				7209	6209
	3.3	20	1.2	25.0	32.0				7210	6210
	3.9	10	1.5	30.0	38.0				7212	6212
	4.7	10	1.7	35.0	44.0				7214	6214
	4.7	20	1.7	35.0	44.0				7215	6215

(1) Case sizes are defined in MIL-C-39003/1.

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MIL-C-39003/2, STYLE CSR09 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (μA)			Maximum Dissipation Factor (%)			Case Size (1)	Part Number M39003/02-	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C	+25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
10	1.8	10	0.6	6.0	8.0	8	6	6	A1	3006	2006
	2.2		0.6	6.0	8.0				A1	3008	2008
	10.0		2.5	20.0	34.0				B1	3010	2010
	12.0		2.5	24.0	40.8				B1	3012	2012
	15.0		2.5	30.0	51.0				B1	3014	2014
20	0.56		0.6	6.0	8.0	4	3	4	A1	3024	2024
	0.68		0.6	6.0	8.0				A1	3026	2026
	0.82		0.6	6.0	8.0				A1	3028	2028
	1.00		0.6	6.0	8.0				A1	3030	2030
	3.3		1.0	13.2	22.4				B1	3032	2032
	3.9		2.0	15.6	26.5				B1	3034	2034
	4.7		2.0	18.8	32.0				B1	3036	2036
	5.6		2.0	22.4	38.1				B1	3038	2038
	6.8		2.0	27.2	46.2				B1	3040	2040
35	0.33		0.6	6.0	8.0				A1	3042	2042
	0.39		0.6	6.0	8.0				A1	3044	2044
	0.47		0.6	6.0	8.0				A1	3046	2046
	2.2		1.4	15.4	26.2				B1	3048	2048
	2.7		1.4	18.9	32.1				B1	3050	2050
50	0.22		0.6	6.0	8.0				A1	3052	2052
	0.27		0.6	6.0	8.0				A1	3054	2054
	1.5		1.4	15.0	25.5				B1	3056	2056
	1.8		1.4	18.0	30.6				B1	3058	2058

(1) Case sizes are defined in MIL-C-39003/2.

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MIL-C-39003/2, STYLE CSR09 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability (Continued)

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (µA)			Maximum Dissipation Factor (%)			Case Size (1)	Part Number M39003/02-	
	Nominal Value (µF)	Tolerance (±%)	+25° C	+85° C	+125° C	-55° C	+25° C	+85° C & +125° C		Grade 1 FRL = C	Grade 2 FRL = B
75	0.047	10	0.6	6.0	8.0	4	3	4	A1	3060	2060
	0.056								A1	3062	2062
	0.068								A1	3064	2064
	0.082								A1	3066	2066
	0.10								A1	3068	2068
	0.12								A1	3070	2070
	0.15								A1	3072	2072
	0.18								A1	3074	2074
	0.22				8.0				B1	3076	2076
	0.27				8.0				B1	3078	2078
	0.33				8.4				B1	3080	2080
	0.39				9.9				B1	3082	2082
	0.47			7.0	12.0				B1	3084	2084
	0.56			8.4	14.3				B1	3086	2086
	0.68			10.2	17.3				B1	3088	2088
	0.82		0.7	12.3	20.9				B1	3090	2090
	1.0		0.9	15.0	25.5				B1	3092	2092
	1.2		0.9	18.0	30.6				B1	3094	2094

(1) Case sizes are defined in MIL-C-39003/2.

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MIL-C-39003/10, STYLE CSS33 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum dc Leakage (μA)			Maximum Dissipation Factor (%)	Case Size (1)	Part Number M39003/10- (2)	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C			Grade 1 FRL = C	Grade 2 FRL = B
10	6.8	10	0.5	2.0	2.0	6	A	3509*	—
	8.2		0.5	2.0	2.0	6	A	3510*	
	47.0		1.0	2.0	2.0	6	B	3511*	—
	56.0		1.0	4.0	4.0	6	B	3512*	
	68.0		1.0	4.0	4.0	6	B	3513*	
	82.0		1.0	4.0	4.0	6	B	3514*	
	220.0		1.0	7.0	7.0	8	C	—	2515*
	270.0		2.0	10.0	10.0	8	C		2516*
	390.0		2.0	16.0	16.0	10	D	3517*	—
	470.0		4.0	16.0	16.0	10	D	3518*	
	560.0		4.0	16.0	16.0	10	D	3519*	
20	2.7		0.5	2.0	2.0	4	A	3529*	—
	3.3		0.5	2.0	2.0	4	A	3530*	
	3.9		0.5	2.0	2.0	4	A	3531*	
	18.0		1.0	2.0	2.0	6	B	3532*	—
	22.0		1.0	2.0	2.0	6	B		2533*
	27.0		1.0	2.0	2.0	6	B		2534*
	56.0		1.0	10.0	10.0	6	C	3535*	
	68.0		1.0	10.0	10.0	6	C	3536*	
	82.0		1.0	10.0	10.0	6	C		2537*
	100.0		1.0	10.0	10.0	6	C		2538*
	120.0		1.0	10.0	10.0	6	C		2539*
	150.0		2.0	10.0	10.0	8	D		2540*
	180.0		2.0	10.0	10.0	8	D	—	2541*

(1) Case sizes are defined in MIL-C-39003/10.
(2) The symbol * completes the dash number thus: * = S for sleeved, U for unsleeved.

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MIL-C-39003/10, STYLE CSS33 CAPACITORS
Fixed, Tantalum (Solid) Electrolytic, Polarized, Established Reliability (Continued)

Rated Voltage @ +85° C (Volts, dc)	Capacitance		Maximum, Leakage (μA)			Maximum Dissipation Factor (%)	Case Size (1)	Part Number M39003/10- (2)	
	Nominal Value (μF)	Tolerance (±%)	+25° C	+85° C	+125° C			Grade 1 FRL = C	Grade 2 FRL = B
35	1.8	10	0.5	2.0	2.0	4	A	—	2542*
	8.2		1.0	2.0	2.0	6	B		2543*
	10.0		1.0	2.0	2.0	6	B		2544*
	33.0		1.0	5.0	5.0	6	C		2545*
	39.0		1.0	5.0	5.0	6	C		2546*
	47.0		1.0	5.0	5.0	6	C		2547*
	56.0		2.0	10.0	10.0	6	D		2548*
	68.0		2.0	10.0	10.0	6	D		2549*
50	1.2		0.5	2.0	2.0	4	A		2550*
	1.5		0.5	2.0	2.0	4	A		2551*
	5.6		1.0	2.0	2.0	4	B		2552*
	6.8		1.0	2.0	2.0	6	B		2553*
	22.0		1.0	5.0	5.0	6	C		2554*
	27.0		1.0	5.0	5.0	6	C		2555*
	33.0		1.0	9.0	9.0	6	D		2556*
	39.0		1.0	9.0	9.0	6	D		2557*

(1) Case sizes are defined in MIL-C-39003/10.
(2) The symbol * completes the dash number thus: * = S for sleeved, U for unsleeved.

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MIL-C-39006, CAPACITORS

Fixed, Tantalum (Nonsolid) Electrolytic, Hermetically Sealed, Established Reliability

Part Number Explanation:

M39006 — M39006 - Identifies CLR tantalum, electrolytic (nonsolid electrolyte), fixed capacitors (polarized and nonpolarized), hermetically sealed in metal cases with insulating sleeves, and conforming to MIL-C-39006.

/XX — /XX - Identifies the appropriate military specification sheet that uniquely specifies the capacitor family.

-XXXXH — -XXXX - Uniquely specifies the nominal capacitance value, capacitance tolerance, rated dc voltage, dc leakage, and failure rate level. The 'H' denotes a construction suitable for use in high vibration environments.

Part Number	Control Specification	Style (1)	Capacitance Range (µF)	Capacitance Tolerance (±%)	Working Voltage (Vdc) @ +85°C	Operating Temperature Range (°C)	FRL Grade 1	FRL Grade 2
M39006/01-XXXXH	MIL-C-39006/1 Polarized/Etched Foil	CLR25	8 to 580	+75, -15	15, 25 or 30	-55 to +125	R	P
			3 to 150	+50, -15	50 or 75			
			1 to 70	+30, -15	100 or 150			
M39006/02-XXXXH	MIL-C-39006/2 Nonpolarized/Etched Foil	CLR27	4.5 to 350	+75, -15	15, 25 or 30			
			1.5 to 80	+50, -15	50 or 75			
			0.5 to 35	+30, -15	100 or 150			
M39006/03-XXXXH	MIL-C-39006/3 Polarized/Plain Foil	CLR35	4.5 to 160	±20	15			
			3 to 100	±20	25			
			2.5 to 85	±20	30			
			68	±20	35			
			1.5 to 55	±20	50			
			1 to 40	±20	75			
			0.8 to 30	±20	100			
			0.5 to 20	±20	150			
			0.35 to 15	±15	200			
			0.27 to 10	±15	300			

(1) CLR25, CLR27, and CLR35 are susceptible to vibration failures. Consult the project parts engineer for recommendations.

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MIL-C-39006, CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Hermetically Sealed, Established Reliability (Continued)

Part Number	Control Specification	Style (1)	Capacitance Range (µF)	Capacitance Tolerance (±%)	Working Voltage (Vdc) @ +85°C	Operating Temperature Range (°C)	FRL Grade 1	FRL Grade 2
M39006/04-XXXXH	MIL-C-39006/4 Nonpolarized/Plain Foil	CLR37	2.5 to 100	20	15	-55 to +125	R	P
			1.5 to 60	20	25			
			1.4 to 45	20	30			
			0.8 to 30	20	50			
			0.5 to 20	20	75			
			0.4 to 15	20	100			
			0.25 to 10	20	150			
			0.15 to 7.5	15	200			
			0.15 to 6	15	250			
			0.12 to 4.7	15	300			
M39006/22-XXXXH	MIL-C-39006/22 Polarized/Sintered Slug	CLR79	20 to 750	5, 10, 20	10			
			15 to 540	5, 10, 20	15			
			8 to 300	5, 10, 20	30			
			5 to 160	5, 10, 20	50			
			3.5 to 110	5, 10, 20	75			
			2.5 to 86	5, 10, 20	100			
			1.7 to 56	5, 10, 20	125			
M39006/25-XXXXH	MIL-C-39006/25 Polarized/Sintered Slug Extended Range	CLR81	150 to 1500	10, 20	10			
			100 to 1000	10, 20	15			
			68 to 680	10, 20	25			
			56 to 560	10, 20	30			
			33 to 330	10, 20	50			
			27 to 270	10, 20	60			
			22 to 220	10, 20	75			
			10 to 120	10, 20	100			
			6.8 to 82	10, 20	125			

(1) CLR37 style is susceptible to vibration failures, CLR79 and CLR81 can be a source of transient potentials (intermittent shorts) during vibrational stimuli. Consult the project parts engineer for recommendations.

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MIL-C-39006/1, STYLE CLR25 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Polarized, Etched Foil, Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/01-	
	Nominal Value (µF)	Tolerance (%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
15	15	+75, -15	2	4	10	17.2	220	G1	3321H	3314H
	60		2	10			55	G2	3088H	3059H
	200		3	40			17	G3	3089H	3060H
	400		6	80			9	G4	3090H	3061H
	580		9	100			6	G5	3091H	3062H
25	10		2	4	15	28.8	330	G1	3322H	3315H
	40		2	13			83	G2	3092H	3063H
	120		3	40			27	G3	3093H	3064H
	250		6	80			13	G4	3094H	3065H
	350		10	100			10	G5	3095H	3066H
30	8		2	6	20	34.5	424	G1	3323H	3316H
	32		2	14			106	G2	3096H	3067H
	110		4	50			31	G3	3097H	3068H
	220		8	90			16	G4	3098H	3069H
	300		11	120			11	G5	3099H	3070H
50	4.5	+50, -15	2	4	30	57.5	730	G1	3324H	3317H
	18		2	13			180	G2	3100H	3071H
	60		3	40			55	G3	3101H	3072H
	75		4	70			52	G3	3204H	3203H
	100		4	75			33	G4	3103H	3074H
	150		5	100			22	G5	3104H	3075H
75	3	+50, -15	2	4	50	86.2	1000	G1	3325H	3318H
	12		2	13			270	G2	3105H	3076H
	30		3	34			110	G3	3106H	3077H
	70		6	80			47	G4	3107H	3078H
	100		10	100			33	G5	3108H	3079H
100	2	+30, -15	2	4	65	115	1600	G1	3326H	3319H
	8		2	12			410	G2	3109H	3080H
	25		2.5	37			130	G3	3110H	3081H
	50		5	75			66	G4	3111H	3082H
	70		7	100			47	G5	3112H	3083H
150	1	+30, -15	2	4	100	172	3000	G1	3327H	3320H
	4		2	13			750	G2	3113H	3084H
	13		3	30			250	G3	3114H	3085H
	25		5	80			130	G4	3115H	3086H
	36		8	100			94	G5	3116H	3087H

(1) Case sizes are defined in MIL-C-39006/1.

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MIL-C-39006/2, STYLE CLR27 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Non-polarized, Etched Foil, Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/02-	
	Nominal Value (µF)	Tolerance (%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
15	10	+75, -15	2	4	10	17.2	339	G1	2521H	2514H
	40		2	10			85	G2	1284H	1256H
	120		3	40			27	G3	1285H	1257H
	250		6	80			14	G4	1286H	1258H
	350		9	100			10	G5	1287H	1259H
25	5		2	4	15	28.8	680	G1	2522H	2515H
	20		2	13			170	G2	1288H	1260H
	70		3	40			49	G3	1289H	1261H
	140		6	80			24	G4	1290H	1262H
	200		10	100			17	G5	1291H	1263H
30	4.5		2	6	20	34.5	754	G1	2523H	2516H
	18		2	14			188	G2	1292H	1264H
	60		4	50			57	G3	1293H	1265H
	120		8	90			28	G4	1294H	1266H
	170		11	120			20	G5	1295H	1267H
50	2.5	+50, -15	2	4	30	57.5	1355	G1	2524H	2517H
	10		2	13			339	G2	1296H	1268H
	30		3	40			113	G3	1297H	1269H
	60		4	75			57	G4	1298H	1270H
	80		5	100			41	G5	1299H	1271H
75	1.5		2	4	50	86.2	2255	G1	2525H	2518H
	6		2	13			560	G2	1300H	1272H
	15		3	34			226	G3	1301H	1273H
	35		5	80			97	G4	1302H	1274H
	50		10	100			68	G5	1303H	1275H
100	1	+30, -15	2	4	65	115	3385	G1	2526H	2519H
	4		2	13			845	G2	1304H	1276H
	12		3	37			283	G3	1305H	1277H
	25		5	75			135	G4	1306H	1278H
	35		7	100			97	G5	1307H	1279H
150	0.5		2	4	100	172	6780	G1	2527H	2520H
	2		2	13			1693	G2	1308H	1280H
	6		3	30			565	G3	1309H	1281H
	12		5	80			283	G4	1310H	1282H
	18		8	100			188	G5	1311H	1283H

(1) Case sizes are defined in MIL-C-39006/2.

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MIL-C-39006/3, STYLE CLR35 CAPACITORS

Fixed, Tantalum (Nonsolid) Electrolytic, Polarized, Plain Foil, Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/03-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
15	4.5	20	1	2	10	17.2	495	G1	2736H	2724H
	18		2	4			125	G2	1447H	1398H
	55		2	10			41	G3	1448H	1399H
	110		4	20			20	G4	1449H	1400H
	160		5	30			14	G5	1450H	1401H
25	3		1	2	15	28.8	744	G1	2737H	2725H
	12		2	4			186	G2	1451H	1402H
	35		2	10			64	G3	1452H	1403H
	70		4	20			32	G4	1453H	1404H
	100		6	30			23	G5	1454H	1405H
30	2.5		2	5	20	34.5	893	G1	2738H	2726H
	10		2	6			265	G2	1455H	1406H
	30		2	13			75	G3	1456H	1407H
	60		4	26			37	G4	1457H	1408H
	85		6	38			27	G5	1458H	1409H
35	68		5	25	25	40.2	40	G5	1459H	1410H
50	1.5		1	4	30	57.5	1487	G1	2739H	2727H
	6		2	6			372	G2	1460H	1411H
	20		2	13			112	G3	1461H	1412H
	40		4	26			56	G4	1462H	1413H
	55		6	38			41	G5	1463H	1414H
75	1		1	4	50	86.2	2232	G1	2740H	2728H
	4		2	6			558	G2	1464H	1415H
	14		2	13			159	G3	1465H	1416H
	28		4	26			80	G4	1466H	1417H
	40		6	38			56	G5	1467H	1418H

(1) Case sizes are defined in MIL-C-39006/3.

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MIL-C-39006/3, STYLE CLR35 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Polarized, Plain Foil, Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/03-	
	Nominal Value (μF)	Tolerance (±%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
100	0.8	20	1	3.5	65	115	2790	G1	2741H	2729H
	3		2	6			743	G2	1468H	1419H
	10		2	13			223	G3	1469H	1420H
	20		3	25			112	G4	1470H	1421H
	30		6	38			74	G5	1471H	1422H
150	0.5		2	4	100	172	4454	G1	2742H	2730H
	2		2	6			1115	G2	1472H	1423H
	7		3	13			319	G3	1473H	1424H
	14		4	26			159	G4	1474H	1425H
	20		6	38			112	G5	1475H	1426H
200	0.35	15	4	25	150	230	5577	G1	2743H	2731H
	1.5		8	32			1300	G2	1476H	1427H
	5		16	64			400	G3	1477H	1428H
	10		28	100			200	G4	1478H	1429H
	15		40	160			130	G5	1479H	1430H
300	0.27		6	40	200	345	9000	G1	2745H	2733H
	1		10	50			2250	G2	1484H	1435H
	3		20	100			750	G3	1485H	1436H
	7		35	175			322	G4	1486H	1437H
	10		50	250			225	G5	1487H	1438H

(1) Case sizes are defined in MIL-C-39006/3.

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MIL-C-39006/4, STYLE CLR37 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Non-polarized, Plain Foil, Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/04-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
15	2.5	20	1	2	10	17.2	893	G1	2733H	2722H
	10		2	4			223	G2	1335H	1290H
	35		2	10			64	G3	1336H	1291H
	70		4	20			32	G4	1337H	1292H
	100		5	30			23	G5	1338H	1293H
25	1.5		1	3	15	28.8	1487	G1	2734H	2723H
	6		2	6			372	G2	1339H	1294H
	20		2	10			112	G3	1340H	1295H
	40		4	20			56	G4	1341H	1296H
	60		5	30			37	G5	1342H	1297H
30	1.4		2	5	20	34.5	1594	G1	2735H	2724H
	5.5		2	6			406	G2	1343H	1298H
	18		2	12			124	G3	1344H	1299H
	36		4	26			62	G4	1345H	1300H
	45		6	36			50	G5	1346H	1301H
50	0.8		1	4	30	57.5	2790	G1	2736H	2725H
	3		2	6			743	G2	1347H	1302H
	10		2	12			223	G3	1348H	1303H
	20		4	24			112	G4	1349H	1304H
	30		6	36			75	G5	1350H	1305H
75	0.5		1	4	50	86.2	4460	G1	2737H	2726H
	2		2	6			1115	G2	1351H	1306H
	7		2	13			319	G3	1352H	1307H
	14		4	24			159	G4	1353H	1308H
	20		6	36			112	G5	1354H	1309H

(1) Case sizes are defined in MIL-C-39006/4.

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MIL-C-39006/4, STYLE CLR37 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, Non-polarized, Plain Foil, Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Case Size (1)	Part Number M39006/04-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					Grade 1 FRL = R	Grade 2 FRL = P
100	0.4	20	1	3.5	65	115	5580	G1	2738H	2727H
	1.5		2	6			1487	G2	1355H	1310H
	5		2	13			446	G3	1356H	1311H
	10		4	24			223	G4	1357H	1312H
	15		6	36			149	G5	1358H	1313H
150	0.25		1	4	100	172	8909	G1	2739H	2728H
	1		2	6			2227	G2	1359H	1314H
	1.2		3	12			2000	G2	1360H	1315H
	3.5		3	13			638	G3	1361H	1316H
	7		4	24			319	G4	1362H	1317H
	10		6	36			223	G5	1363H	1318H
200	0.15	15	4	25	150	230	14000	G1	2740H	2729H
	0.75		8	32			2700	G2	1364H	1319H
	2.5		16	64			800	G3	1365H	1320H
	5		28	112			400	G4	1366H	1321H
	7.5		40	160			260	G5	1367H	1322H
250	0.15		6	32	165	287	13000	G1	2741H	2730H
	0.6		8	40			3300	G2	1368H	1323H
	2		16	80			1000	G3	1369H	1324H
	4		28	140			500	G4	1370H	1325H
	6		40	200			330	G5	1371H	1326H
300	0.12		4	25	200	345	17500	G1	2742H	2731H
	0.47		10	50			4500	G2	1372H	1327H
	1.5		20	100			1500	G3	1373H	1328H
	3.3		35	175			643	G4	1374H	1329H
	4.7		50	250			450	G5	1375H	1330H

(1) Case sizes are defined in MIL-C-39006/4.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS

Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
10	20	20	1	2	6	7	11.5	175	32	10.5	12	T1	0481H	0261H
		10											0482H	0262H
		5											0483H	0263H
	47	20			13			100	36	14	16	T1	0484H	0264H
		10											0485H	0265H
		5											0486H	0266H
	100	20		4	15			60				T2	0487H	0267H
		10											0488H	0268H
		5											0489H	0269H
	180	20		7	30			40				T2	0490H	0270H
		10											0491H	0271H
		5											0492H	0272H
	250	20	2	10	30			30	40			T3	0493H	0273H
		10											0494H	0274H
		5											0495H	0275H
	390	20		16	44			25	64	17.5	20	T3	0496H	0276H
		10											0497H	0277H
		5											0498H	0278H
	750	20	4		50			23	80	25	25	T4	0499H	0279H
		10											0500H	0280H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (μF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
15	15	20 10 5	1	2	5	10	17.2	155	24	10.5	12	T1	0501H 0502H 0503H	0281H 0282H 0283H
	33	20 10 5			10			90	28	14	16	T1	0504H 0505H 0506H	0284H 0285H 0286H
	70	20 10 5		4	13			75	28			T2	0507H 0508H 0509H	0287H 0288H 0289H
	120	20 10 5		7	18			50	28	17.5	20	T2	0510H 0511H 0512H	0290H 0291H 0292H
	170	20 10 5	2	10	25			35	32	14	16	T3	0513H 0514H 0515H	0293H 0294H 0295H
	270	20 10 5		16	32			30	56	17.5	20	T3	0516H 0517H 0518H	0296H 0297H 0298H
	540	20 10	6	24	40			23	80	25	25	T4	0519H 0520H	0299H 0300H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
30	8	20	1	2	4	20	34.5	275	16	8	12	T1	0541H	0321H
		10											0542H	0322H
		5											0543H	0323H
	15	20	1	2	5			175	20	10.5	12	T1	0544H	0324H
		10											0545H	0325H
		5											0546H	0326H
	40	20	1	5	10			65	24	10.5	12	T2	0547H	0327H
		10											0548H	0328H
		5											0549H	0329H
	68	20	1	8	13			60	24	13	15	T2	0550H	0330H
		10											0551H	0331H
		5											0552H	0332H
	100	20	2	12	17			40	28	10.5	12	T3	0553H	0333H
		10											0554H	0334H
		5											0555H	0335H
	150	20	2	18	23			35	48	13	15	T3	0556H	0336H
		10											0557H	0337H
		5											0558H	0338H
	300	20	8	32	31			25	60	25	25	T4	0559H	0339H
		10											0560H	0340H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
50	5	20	1	2	3	30	57.5	400	16	5	6	T1	0561H	0341H
		10											0562H	0342H
		5											0563H	0343H
	10	20			4			250	24	8	9	T1	0564H	0344H
		10											0565H	0345H
		5											0566H	0346H
	25	20		5	8			95	20	10.5	12	T2	0567H	0347H
		10											0568H	0348H
		5											0569H	0349H
	47	20		9	11			70	28	13	15	T2	0570H	0350H
		10											0571H	0351H
		5											0572H	0352H
	60	20	2	12	12			45	16	10.5	12	T3	0573H	0353H
		10											0574H	0354H
		5											0575H	0355H
	82	20		16	15				32	13	15	T3	0576H	0356H
		10											0577H	0357H
		5											0578H	0358H
	160	20	8	32	17			27	50	25	25	T4	0579H	0359H
		10											0580H	0360H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
75	3.5	20	1	2	2.5	50	86.2	650	16	5	6	T1	0601H	0381H
		10											0602H	0382H
		5											0603H	0383H
	6.8	20			3.5			300	20	8	9	T1	0604H	0384H
		10											0605H	0385H
		5											0606H	0386H
	15	20		5	6			150	16	8	9	T2	0607H	0387H
		10											0608H	0388H
		5											0609H	0389H
	33	20		10	10			90	24	10.5	15	T2	0610H	0390H
		10											0611H	0391H
		5											0612H	0392H
	40	20	2	12	9			60	16		12	T3	0613H	0393H
		10											0614H	0394H
		5											0615H	0395H
	56	20		17	11				28		15	T3	0616H	0396H
		10											0617H	0397H
		5											0618H	0398H
	110	20	9	36	12			29	35	20	20	T4	0619H	0399H
		10											0620H	0400H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
100	2.5	20	1	2	2	65	115	950	16	7	8	T1	0621H	0401H
		10											0622H	0402H
		5											0623H	0403H
	4.7	20			3			500				T1	0624H	0404H
		10											0625H	0405H
		5											0626H	0406H
	11	20		4	5			200		8		T2	0627H	0407H
		10											0628H	0408H
		5											0629H	0409H
	22	20		9	7.5			100				T2	0630H	0410H
		10											0631H	0411H
		5											0632H	0412H
	30	20	2	12	7			80				T3	0633H	0413H
		10											0634H	0414H
		5											0635H	0415H
	43	20		17	8.5			70	20			T3	0636H	0416H
		10											0637H	0417H
		5											0638H	0418H
	86	20	9	36	10			30	25	15	15	T4	0639H	0419H
		10											0640H	0420H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/22, STYLE CLR79 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Capacitance		Maximum dc Leakage (Microamps)		Maximum Dissipation Factor (%)	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Maximum Impedance (Ohms)	Capacitance Change @			Case Size (1)	Part Number M39006/22-	
	Nominal Value (µF)	Tolerance (±%)	+25°C	+85°C & +125°C					-55°C (-%)	+85°C (+%)	+125°C (+%)		Grade 1 FRL = R	Grade 2 FRL = P
125	1.7	20	1	2	2	85	144	1250	16	7	8	T1	0641H	0421H
		10											0642H	0422H
		5											0643H	0423H
	3.6	20			2.7			600				T1	0644H	0424H
		10											0645H	0425H
		5											0646H	0426H
	9	20		5	5			240				T2	0647H	0427H
		10											0648H	0428H
		5											0649H	0429H
	14	20		7	6			167				T2	0650H	0430H
		10											0651H	0431H
		5											0652H	0432H
	18	20	2	9	5			129				T3	0653H	0433H
		10											0654H	0434H
		5											0655H	0435H
	25	20		13	6			93				T3	0656H	0436H
		10											0657H	0437H
		5											0658H	0438H
	56	20	10	40	6.5			32	25	15	15	T4	0659H	0439H
		10											0660H	0440H

(1) Case sizes are defined in MIL-C-39006/22.

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MIL-C-39006/25, STYLE CLR81 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Case Size (1)	Part Number M39006/25-	
	Nominal Value (μF)	Tolerance (±%)		Grade 1 FRL = R	Grade 2 FRL = P
10	150	20	T1	0193H	0105H
	150	10	T1	0194H	0106H
	560	20	T2	0195H	0107H
	560	10	T2	0196H	0108H
	1,200	20	T3	0197H	0109H
	1,200	10	T3	0198H	0110H
	1,500	20	T4	0199H	0111H
	1,500	10	T4	0200H	0112H
15	100	20	T1	0201H	0113H
	100	10	T1	0202H	0114H
	390	20	T2	0203H	0115H
	390	10	T2	0204H	0116H
	820	20	T3	0205H	0117H
	820	10	T3	0206H	0118H
	1,000	20	T4	0207H	0119H
	1,000	10	T4	0208H	0120H
25	68	20	T1	0209H	0121H
	68	10	T1	0210H	0122H
	270	20	T2	0211H	0123H
	270	10	T2	0212H	0124H
	560	20	T3	0213H	0125H
	560	10	T3	0214H	0126H
	680	20	T4	0215H	0127H
	680	10	T4	0216H	0128H

(1) Case sizes are defined in MIL-C-39006/25.

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MIL-C-39006/25, STYLE CLR81 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Case Size (1)	Part Number M39006/25-	
	Nominal Value (μF)	Tolerance (±%)		Grade 1 FRL = R	Grade 2 FRL = P
30	56	20	T1	0217H	0129H
	56	10	T1	0218H	0130H
	220	20	T2	0219H	0131H
	220	10	T2	0220H	0132H
	470	20	T3	0221H	0133H
	470	10	T3	0222H	0134H
	560	20	T4	0223H	0135H
	560	10	T4	0224H	0136H
50	33	20	T1	0225H	0137H
	33	10	T1	0226H	0138H
	120	20	T2	0227H	0139H
	120	10	T2	0228H	0140H
	270	20	T3	0229H	0141H
	270	10	T3	0230H	0142H
	330	20	T4	0231H	0143H
	330	10	T4	0232H	0144H
60	27	20	T1	0233H	0145H
	27	10	T1	0234H	0146H
	100	20	T2	0235H	0147H
	100	10	T2	0236H	0148H
	220	20	T3	0237H	0149H
	220	10	T3	0238H	0150H
	270	20	T4	0239H	0152H
	270	10	T4	0240H	0153H

(1) Case sizes are defined in MIL-C-39006/25.

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MIL-C-39006/25, STYLE CLR81 CAPACITORS
Fixed, Tantalum (Nonsolid) Electrolytic, (Polarized, Sintered Slug), Established Reliability (Continued)

Rated Voltage (Volts, dc)	Capacitance		Case Size (1)	Part Number M39006/25-	
	Nominal Value (μF)	Tolerance (±%)		Grade 1 FRL = R	Grade 2 FRL = P
75	22	20	T1	0241H	0153H
	22	10	T1	0242H	0154H
	82	20	T2	0243H	0155H
	82	10	T2	0244H	0156H
	180	20	T3	0245H	0157H
	180	10	T3	0246H	0158H
	220	20	T4	0247H	0159H
	220	10	T4	0248H	0160H
100	10	20	T1	0249H	0161H
	10	10	T1	0250H	0162H
	39	20	T2	0251H	0163H
	39	10	T2	0252H	0164H
	68	20	T3	0253H	0165H
	68	10	T3	0254H	0166H
	120	20	T4	0255H	0167H
	120	10	T4	0256H	0168H
125	6.8	20	T1	0257H	0169H
	6.8	10	T1	0258H	0170H
	27	20	T2	0259H	0171H
	27	10	T2	0260H	0172H
	47	20	T3	0261H	0173H
	47	10	T3	0262H	0174H
	82	20	T4	0263H	0175H
	82	10	T4	0264H	0176H

(1) Case sizes are defined in MIL-C-39006/25.

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MIL-C-39014, CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Part number explanation:

M39014 — M39014 - Identifies CKR fixed, ceramic, insulated, general purpose, established reliability capacitors conforming to MIL-C-39014.

/XX — /XX - Identifies the appropriate military specification sheet that uniquely specifies the capacitor family

-XXXX — -XXXX - Uniquely specifies the nominal capacitance value, capacitance tolerance, rated dc voltage, and failure rate level (FRL) in percent/1000 hours.

Part Number	Control specification	Style	Capacitance		Rated Voltage (Vdc) @ +125°C (1)	Maximum Dissipation Factor (%)	Minimum Insulation Resistance @ +25°C	Operating Temperature Range (°C)	Configuration		FRL Grade 2
			Range (pF)	Tolerance (±%)					Case Type	Lead Type (2)	
M39014/01-XXXX	MIL-C-39014/1	CKR05	10-100,000	10, 20	50, 100, 200	2.5	100,000 Megohms or 1,000 megohm-microfarads, whichever is less	-55 to +125	Molded	Radial	S
M39014/02-XXXX	MIL-C-39014/2	CKR06	1,200-330,000								
M39014/05-XXXX	MIL-C-39014/5	CKR11	10-10,000		50, 100				Tubular	Axial	
M39014/05-XXXX	MIL-C-39014/5	CKR12	5,600-47,000								
M39014/05-XXXX	MIL-C-39014/5	CKR14	12,000-100,000								
M39014/05-XXXX	MIL-C-39014/5	CKR15	56,000-330,000		100	2.5, 3.0					

(1) For low voltage applications (<10 volts dc), capacitor rated voltage shall be at least 100 volts dc. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2 c and d.

(2) Leads are solderable. For weldable leads, contact the project parts engineer.

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MIL-C-39014/1, STYLE CKR05 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/01-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
200	10	10	1321
	10	20	1322
	15	10	1324
	15	20	1325
	22	10	1327
	22	20	1328
	33	10	1330
	33	20	1331
	47	10	1333
	47	20	1334
	68	10	1336
	68	20	1337
	100	10	1339
	100	20	1340
	150	10	1342
	150	20	1343
	220	10	1345
	220	20	1346
	330	10	1348
	330	20	1349
	470	10	1351
	470	20	1352
	680	10	1354
	680	20	1355
	1,000	10	1357
	1,000	20	1358

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/01-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	1,500	10	1360
	1,500	20	1561
	2,200	10	1563
	2,200	20	1564
	3,300	10	1566
	3,300	20	1567
	4,700	10	1569
	4,700	20	1570
	6,800	10	1572
	6,800	20	1573
	10,000	10	1575
	10,000	20	1576
50	15,000	10	1578
	15,000	20	1579
	22,000	10	1581
	22,000	20	1582
	33,000	10	1584
	33,000	20	1585
	47,000	10	1587
	47,000	20	1588
	68,000	10	1590
	68,000	20	1591
	100,000	10	1593
	100,000	20	1594

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MIL-C-39014/2, STYLE CKR06 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/02-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
200	1,200	10	1321
	1,500	10	1322
	1,500	20	1323
	2,200	10	1326
	2,200	20	1327
	3,300	10	1329
	3,300	20	1330
	4,700	10	1332
	4,700	20	1333
	6,800	10	1335
	6,800	20	1336
	10,000	10	1338
	10,000	20	1339
100	15,000	10	1340
	22,000		1342
	33,000		1343
	47,000		1345
	68,000		1347
	100,000		1350
50	120,000		1353
	150,000		1354
	180,000		1355
	220,000		1356
	270,000		1357
	330,000		1358

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MIL-C-39014/5, STYLE CKR11 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/05-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	10	10	2201
	10	20	2202
	15	10	2204
	15	20	2205
	22	10	2207
	22	20	2208
	33	10	2210
	33	20	2211
	47	10	2213
	47	20	2214
	68	10	2216
	68	20	2217
	100	10	2219
	100	20	2220
	150	10	2222
	150	20	2223
	220	10	2225
	220	20	2226
	330	10	2228
	330	20	2229

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/05-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	470	10	2231
	470	20	2232
	680	10	2234
	680	20	2235
	1,000	10	2237
	1,000	20	2238
	1,500	10	2240
	1,500	20	2241
	2,200	10	2243
	2,200	20	2244
	3,300	10	2246
	3,300	20	2247
	4,700	10	2249
	4,700	20	2250
50	6,800	10	2252
	6,800	20	2253
	10,000	10	2255
	10,000	20	2256

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MIL-C-39014/5, STYLE CKR12 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/05-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	5,600	10	2257
	6,800	10	2258
	6,800	20	2259
	8,200	10	2260
	10,000	10	2261
	10,000	20	2262
50	12,000	10	2263
	15,000	10	2264
	15,000	20	2265
	18,000	10	2266
	22,000	10	2267
	22,000	20	2268
	27,000	10	2269
	33,000	10	2270
	33,000	20	2271
	39,000	10	2272
	47,000	10	2273
	47,000	20	2274

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MIL-C-39014/5, STYLE CKR14 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/05-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	12,000	10	2275
	15,000	10	2276
	15,000	20	2277
	18,000	10	2278
	22,000	10	2279
	22,000	20	2280
	27,000	10	2281
	33,000	10	2282
	33,000	20	2283
	39,000	10	2284
	47,000	10	2285
	47,000	20	2286
50	56,000	10	2287
	68,000	10	2288
	68,000	20	2289
	82,000	10	2290
	100,000	10	2291
	100,000	20	2292

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MIL-C-39014/5, STYLE CKR15 CAPACITORS
Fixed, Ceramic Dielectric, Established Reliability

Rated Voltage (Volts, dc)	Capacitance		Part Number M39014/05-
	Value (pF)	Tolerance (±%)	Grade 2 FRL = S
100	56,000	10	2306
	68,000	10	2307
	68,000	20	2308
	100,000	10	2310
	100,000	20	2311
	120,000	10	2312
	150,000	10	2313
	150,000	20	2314
	180,000	10	2315
	220,000	10	2316
	220,000	20	2317
	270,000	10	2318
	330,000	10	2319
	330,000	20	2320

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MIL-C-55365, CAPACITORS
Chip, Fixed, Tantalum, Established Reliability

Part Number Explanation:

CWRXX	X	X	XXX	X	X
Style - The three-letter symbol "CWR" identifies established reliability, tantalum, fixed, chip capacitors and the XX identifies the design of the capacitor	Voltage - A single letter symbol identifies the voltage (rated, derated, and surge) as follows:	Termination Finish - A single letter symbol identifies the termination finish as follows: B: Gold C: Hot solder Dipped	Capacitance - the three-digit number identifies the nominal capacitance value, expressed in picofarads (pF). Where the nominal capacitance is 10 pF or greater, the first two digits represent significant figures and the last digit specifies the number of zeros to follow. For example: 10 pF = 100; 150 pF = 151; 1500 pF = 152	Capacitance tolerance - a single-letter symbol identifies the capacitance tolerance as follows: J: ±5% K: ±10% M: ±20%	Failure Rate Level - A single-letter symbol identifies the Weibull failure rate level as follows: (%/1000 hrs) B = 0.1 C = 0.01

Symbol	Voltage (volts, dc)		
	Rated (+85°C)	Derated (+125°C)	Surge (+85°C)
C	4	2.7	5.0
D	6	4.0	8.0
F	10	7.0	13.0
H	15	10.0	20.0
J	20	13.0	26.0
K	25	17.0	32.0
M	35	23.0	46.0
N	50	33.0	65.0

Part Number	Control Specification	Capacitance		Rated Voltage (dc) @ +85°C	Operating Temperature Range (°C)	FRL	
		Range (µF)	Tolerance Available			Grade 1	Grade 2
CWR06XXXXXXX	MIL-C-55365/4	0.10 - 100.0	J, K, M	C, D, F, H, J, K, M, N	-55 to +125	C	B

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MIL-C-55365/4, STYLE CWR06 CAPACITORS
Chip, Fixed, Tantalum, Established Reliability

Rated Voltage @ +85°C (Volts, dc)	Nominal Capacitance (µF)	Nominal Capacitance Tolerance (±%)	Maximum dc Leakage (µA) +25°C	Maximum dc Leakage (µA) +85°C	Maximum dc Leakage (µA) +125°C	Maximum Dissipation Factor (%) +25°C	Maximum Dissipation Factor (%) +85°C & +125°C	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Case Size (1)	Part Number CWR06 (2) Grade 1 FRL = C	Part Number CWR06 (2) Grade 2 FRL = B
4	2.2	5, 10, 20	1.0	10	12	6	8	2.7	5.0	A	C#225*C	C#225*B
	4.7		1.0	10	12	6	8			B	C#475*C	C#475*B
	6.8		1.0	10	12	6	8			C	C#685*C	C#685*B
	10.0		1.0	10	12	8	8			D	C#106*C	C#106*B
	15.0		1.0	10	12	8	10			E	C#156*C	C#156*B
	33.0		2.0	20	24	8	10			F	C#336*C	C#336*B
	68.0		3.0	30	36	10	12			G	C#686*C	C#686*B
	100.0		4.0	40	48	10	12			H	C#107*C	C#107*B
6	1.5		1.0	10	12	6	8	4.0	8.0	A	D#155*C	D#155*B
	3.3		1.0	10	12	6	8			B	D#335*C	D#335*B
	4.7		1.0	10	12	6	8			C	D#475*C	D#475*B
	6.8		1.0	10	12	6	8			D	D#685*C	D#685*B
	10.0		1.0	10	12	8	10			E	D#106*C	D#106*B
	22.0		2.0	20	24	8	10			F	D#226*C	D#226*B
	47.0		3.0	30	36	10	12			G	D#476*C	D#476*B
	68.0		4.0	40	48	10	12			H	D#686*C	D#686*B
10	1.0		1.0	10	12	6	8	7.0	13.0	A	F#105*C	F#105*B
	2.2		1.0	10	12	6	8			B	F#225*C	F#225*B
	3.3		1.0	10	12	6	8			C	F#335*C	F#335*B
	4.7		1.0	10	12	6	8			D	F#475*C	F#475*B
	6.8		1.0	10	12	6	8			E	F#685*C	F#685*B
	15.0		2.0	20	24	8	8			F	F#156*C	F#156*B
	33.0		3.0	30	36	10	12			G	F#336*C	F#336*B
	47.0		5.0	50	60	10	12			H	F#476*C	F#476*B

(1) Case sizes are defined in MIL-C-55365.
(2) Complete type designation will include termination finish and capacitance tolerance.
Choice of allowable terminations.
* Choice of allowable tolerances.

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MIL-C-55365/4, STYLE CWR06 CAPACITORS
Chip, Fixed, Tantalum, Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Nominal Capacitance (µF)	Tolerance (±%)	Maximum dc Leakage (µA) +25°C	+85°C	+125°C	Maximum Dissipation Factor (%) +25°C	+85°C & +125°C	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Case Size (1)	Part Number CWR06 (2) Grade 1 FRL = C	Grade 2 FRL = B
15	0.68	5, 10, 20	1.0	10	12	6	8	10.0	20.0	A	H#684*C	H#684*B
	1.5		1.0	10	12	6	8			B	H#155*C	H#155*B
	2.2		1.0	10	12	6	8			C	H#225*C	H#225*B
	3.3		1.0	10	12	6	8			D	H#335*C	H#335*B
	4.7		1.0	10	12	6	8			E	H#475*C	H#475*B
	10.0		2.0	20	24	6	8			F	H#106*C	H#106*B
	22.0		4.0	40	48	8	8			G	H#226*C	H#226*B
	33.0		5.0	50	60	8	8			H	H#336*C	H#336*B
20	0.47		1.0	10	12	6	8	13.0	26.0	A	J#474*C	J#474*B
	0.68		1.0	10	12					B	J#684*C	J#684*B
	1.0		1.0	10	12					B	J#105*C	J#105*B
	1.5		1.0	10	12					C	J#155*C	J#155*B
	2.2		1.0	10	12					D	J#225*C	J#225*B
	3.3		1.0	10	12					E	J#335*C	J#335*B
	6.8		2.0	20	24					F	J#685*C	J#685*B
	15.0		3.0	30	36					G	J#156*C	J#156*B
	22.0		4.0	40	48					H	J#226*C	J#226*B
25	0.33		1.0	10	12			17.0	32.0	A	K#334*C	K#334*B
	0.68		1.0	10	12					B	K#684*C	K#684*B
	1.0		1.0	10	12					C	K#105*C	K#105*B
	1.5		1.0	10	12					D	K#155*C	K#155*B

(1) Case sizes are defined in MIL-C-55365.
(2) Complete type designation will include termination finish and capacitance tolerance.
Choice of allowable terminations.
* Choice of allowable tolerances.

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MIL-C-55365/4, STYLE CWR06 CAPACITORS
Chip, Fixed, Tantalum, Established Reliability (Continued)

Rated Voltage @ +85°C (Volts, dc)	Nominal Capacitance (µF)	Nominal Capacitance Tolerance (±%)	Maximum dc Leakage (µA) +25°C	Maximum dc Leakage (µA) +85°C	Maximum dc Leakage (µA) +125°C	Maximum Dissipation Factor (%) +25°C	Maximum Dissipation Factor (%) +85°C & +125°C	Derated Voltage @ +125°C (Volts, dc)	Surge Voltage @ +85°C (Volts, dc)	Case Size (1)	Part Number CWR06 (2) Grade 1 FRL = C	Part Number CWR06 (2) Grade 2 FRL = B
25	2.2	5, 10, 20	1.0	10	12	6	8	17.0	32.0	E	K#225*C	K#225*B
	4.7		2.0	20	24					F	K#475*C	K#475*B
	6.8		2.0	20	24					G	K#685*C	K#685*B
	10.0		3.0	30	36					G	K#106*C	K#106*B
	15.0		4.0	40	48					H	K#156*C	K#156*B
35	0.22		1.0	10	12			23.0	46.0	A	M#224*C	M#224*B
	0.47		1.0	10	12					B	M#474*C	M#474*B
	0.68		1.0	10	12					C	M#684*C	M#684*B
	1.0		1.0	10	12					D	M#105*C	M#105*B
	1.5		1.0	10	12					E	M#155*C	M#155*B
	3.3		1.0	10	12					F	M#335*C	M#335*B
	4.7		2.0	20	24					G	M#475*C	M#475*B
	6.8		3.0	30	36					H	M#685*C	M#685*B
50	0.10		1.0	10	12			33.0	65.0	A	N#104*C	N#104*B
	0.15		1.0	10	12					A	N#154*C	N#154*B
	0.22		1.0	10	12					B	N#224*C	N#224*B
	0.33		1.0	10	12					B	N#334*C	N#334*B
	0.47		1.0	10	12					C	N#474*C	N#474*B
	0.68		1.0	10	12					D	N#684*C	N#684*B
	1.0		1.0	10	12					E	N#105*C	N#105*B
	1.5		1.0	10	12					F	N#155*C	N#155*B
	2.2		2.0	20	24					F	N#225*C	N#225*B
	3.3		2.0	20	24					G	N#335*C	N#335*B
	4.7		3.0	30	36					H	N#475*C	N#475*B

(1) Case sizes are defined in MIL-C-55365.
(2) Complete type designation will include termination finish and capacitance tolerance.
Choice of allowable terminations.
* Choice of allowable tolerances.

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MIL-C-55681, CAPACITORS, CHIP

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Part Number Explanation:

CDRYY	BY	YYY	Y	Y	Y	Y
Style - CDR identifies established reliability, ceramic dielectric, fixed, chip capacitor; YY identifies the dimensions of the capacitor	Rated temperature and Voltage Temperature Limits:	Capacitance (1)	Rated Voltage (Vdc) - A = 50 B = 100 C = 200 D = 300 E = 500	Capacitance Tolerance - B = ±0.10pF C = ±0.25pF D = ±0.50pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	Termination Finish - S = Solder-coated, final M = Palladium-silver N = Silver-nickel-gold U = Base Metallization-Barrier Metal-Solder coated W = Base Metallization-Barrier Metal-tinned (Tin/Lead Alloy)	Failure Rate Level: (%/1000 hrs): P = 0.1 R = 0.01 S = 0.001

Rated Temperature	Voltage Temperature Limits
B = -55°C to +125°C	P = 0 ± 30 ppm/°C X = ±15% G = 90 ± 20 ppm/°C

Part Number	Control Specification	Style	Capacitance Range (pF) (1)	Capacitance Tolerance Available	Rated Voltage @ +125°C (Vdc) (2)	Operating Temperature Range (°C)	Rated Temperature & Voltage Temperature Limits	Grade 1 (3)	Grade 2
CDR01BYYYYYYYY	MIL-C-55681/1	CDR01	10-4,700	J, K, M	100	-55 to +125	BX, BP	S	P, R
CDR03BYYYYYYYY		CDR03	330-68,000	J, K, M	50, 100		BX, BP		
CDR04BYYYYYYYY		CDR04	1,200-180,000	K, M	50, 100		BX		
CDR05BYYYYYYYY	MIL-C-55681/2	CDR05	3,900-330,000	J, K, M	50, 100		BX, BP		
CDR06BYYYYYYYY	MIL-C-55681/3	CDR06	6,800-10,000	J, K	100		BP		
CDR11BYYYYYYYY	MIL-C-55681/4	CDR11	0.1-1,000	B, C, D, F, G, J, K, M	50		BG,BP		
CDR12BYYYYYYYY		CDR12	0.1-1,000		50				
CDR13BYYYYYYYY		CDR13	0.1-5,100		50, 100, 200, 300,500				
CDR14BYYYYYYYY		CDR14	6.8-5,100						

(1) The nominal capacitance value expressed in picofarads (pF) is identified by a three-digit number; the first two digits represent significant figures and the last digit specifies the number of zeros to follow.

(2) For low voltage applications (<10 Vdc) rated voltage shall be at least 100 Vdc. Reference MIL-HDBK-978, Vol. 1, 2.2.7.2 c and d.

(3) Lot characteristics shall be assessed by performance of the sample tests required by Appendix B. Sample parts subjected to this testing shall not be used.

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MIL-C-55681/1, STYLE CDR01 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR01B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	10	J, K	0.15	BP	P100B*#S	P100B*#@
	12	J			P120BJ#S	P120BJ#@
	15	J, K			P150B*#S	P150B*#@
	18	J			P180BJ#S	P180BJ#@
	22	J, K			P220B*#S	P220B*#@
	27	J			P270BJ#S	P270BJ#@
	33	J, K			P330B*#S	P330B*#@
	39	J			P390BJ#S	P390BJ#@
	47	J, K			P470B*#S	P470B*#@
	56	J			P560BJ#S	P560BJ#@
	68	J, K			P680B*#S	P680B*#@
	82	J			P820BJ#S	P820BJ#@
	100	J, K			P101B*#S	P101B*#@
	120		0.15, 2.50	BP,BX	+121B*#S	+121B*#@
	150				+151B*#S	+151B*#@
	180				+181B*#S	+181B*#@
	220	K, M	2.50	BX	X221B*#S	X221B*#@
	270	K			X271BK#S	X271BK#@
	330	K, M			X331B*#S	X331B*#@
	390	K			X391BK#S	X391BK#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
+ = Choice of voltage temperature limits.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/1, STYLE CDR01 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR01B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	470	K, M	2.50	BX	X471B*#S	X471B*#@
	560	K			X561BK#S	X561BK#@
	680	K, M			X681B*#S	X681B*#@
	820	K			X821BK#S	X821BK#@
	1,000	K, M			X102B*#S	X102B*#@
	1,200	K			X122BK#S	X122BK#@
	1,500	K, M			X152B*#S	X152B*#@
	1,800	K			X182BK#S	X182BK#@
	2,200	K, M			X222B*#S	X222B*#@
	2,700	K			X272BK#S	X272BK#@
	3,300	K, M			X332B*#S	X332B*#@
50	3,900	K			X392AK#S	X392AK#@
	4,700	K, M			X472A*#S	X472A*#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/1, STYLE CDR03 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR03B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	330	J, K	0.15	BP	P331B*#S	P331B*#@
	390	J			P391BJ#S	P391BJ#@
	470	J, K			P471B*#S	P471B*#@
	560	J			P561BJ#S	P561BJ#@
	680	J, K			P681B*#S	P681B*#@
	820	J			P821BJ#S	P821BJ#@
	1,000	J, K			P102B*#S	P102B*#@
	12,000	K	2.50	BX	X123BK#S	X123BK#@
	15,000	K, M			X153B*#S	X153B*#@
	18,000	K			X183BK#S	X183BK#@
	22,000	K, M			X223B*#S	X223B*#@
	27,000	K			X273BK#S	X273BK#@
	33,000	K, M			X333B*#S	X333B*#@
50	39,000	K			X393AK#S	X393AK#@
	47,000	K, M			X473A*#S	X473A*#@
	56,000	K			X563AK#S	X563AK#@
	68,000	K, M			X683A*#S	X683A*#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/1, STYLE CDR04 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR04B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	1,200	J	0.15	BP	P122BJ#S	P122BJ#@
	1,500	J,K			P152B*#S	P152B*#@
	1,800	J			P182BJ#S	P182BJ#@
	2,200	J,K			P222B*#S	P222B*#@
	2,700	J			P272BJ#S	P272BJ#@
	3,300	J, K			P332B*#S	P332B*#@
	39,000	K	2.5	BX	X393BK#S	X393BK#@
	47,000	K, M			X473B*#S	X473B*#@
	56,000	K			X563BK#S	X563BK#@
100	82,000	K			X823AK#S	X823AK#@
	100,000	K, M			X104A*#S	X104A*#@
	120,000	K			X124AK#S	X124AK#@
	150,000	K, M			X154A*#S	X154A*#@
	180,000	K			X184AK#S	X184AK#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/2, STYLE CDR05 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR05B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	3,900	J, K	0.15	BP	P392B*#S	P392B*#@
	4,700				P472B*#S	P472B*#@
	5,600				P562B*#S	P562B*#@
	68,000	K, M	2.50	BX	X683B*#S	X683B*#@
	82,000	K			X823BK#S	X823BK#@
	100,000	K, M			X104B*#S	X104B*#@
	120,000	K			X124BK#S	X124BK#@
	150,000	K, M			X154B*#S	X154B*#@
50	220,000	K, M	2.50		X224A*#S	X224A*#@
	270,000	K			X274AK#S	X274AK#@
	330,000	K, M			X334A*#S	X334A*#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/3, STYLE CDR06 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		DF (%) Max	Rated Temperature and Voltage - Temperature Limits	Part Number CDR06B	
	Nominal Value (pF)	Tolerances Available			Grade 1 FRL = S (1)	Grade 2 FRL = P or R
100	6,800	J, K	0.15	BP	P682B*#S	P682B*#@
	8,200				P822B*#S	P822B*#@
	10,000				P103B*#S	P103B*#@

= Choice of termination finish (M, N, S, U, W).
* = Choice of tolerance.
@ = P or R, allowable Failure Rate Levels (FRL).
(1) Currently, there are no qualified suppliers at the S failure rate level for termination finish N.

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MIL-C-55681/4, STYLE CDR11 AND CDR12 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
50	0.1	B	BG, BP	CDR1ΣB+0R1AB#S	CDR1ΣB+0R1AB#@
	0.2	B		CDR1ΣB+0R2AB#S	CDR1ΣB+0R2AB#@
	0.3	B,C		CDR1ΣB+0R3A*#S	CDR1ΣB+0R3A*#@
	0.4	B,C		CDR1ΣB+0R4A*#S	CDR1ΣB+0R4A*#@
	0.5	B, C, D		CDR1ΣB+0R5A*#S	CDR1ΣB+0R5A*#@
	0.6			CDR1ΣB+0R6A*#S	CDR1ΣB+0R6A*#@
	0.7			CDR1ΣB+0R7A*#S	CDR1ΣB+0R7A*#@
	0.8			CDR1ΣB+0R8A*#S	CDR1ΣB+0R8A*#@
	0.9			CDR1ΣB+0R9A*#S	CDR1ΣB+0R9A*#@
	1.0			CDR1ΣB+1R0A*#S	CDR1ΣB+1R0A*#@
	1.1			CDR1ΣB+1R1A*#S	CDR1ΣB+1R1A*#@
	1.2			CDR1ΣB+1R2A*#S	CDR1ΣB+1R2A*#@
	1.3			CDR1ΣB+1R3A*#S	CDR1ΣB+1R3A*#@
	1.4			CDR1ΣB+1R4A*#S	CDR1ΣB+1R4A*#@
	1.5			CDR1ΣB+1R5A*#S	CDR1ΣB+1R5A*#@
	1.6			CDR1ΣB+1R6A*#S	CDR1ΣB+1R6A*#@
	1.7			CDR1ΣB+1R7A*#S	CDR1ΣB+1R7A*#@
	1.8			CDR1ΣB+1R8A*#S	CDR1ΣB+1R8A*#@
	1.9			CDR1ΣB+1R9A*#S	CDR1ΣB+1R9A*#@
	2.0			CDR1ΣB+2R0A*#S	CDR1ΣB+2R0A*#@
	2.1			CDR1ΣB+2R1A*#S	CDR1ΣB+2R1A*#@
	2.2			CDR1ΣB+2R2A*#S	CDR1ΣB+2R2A*#@
	2.4			CDR1ΣB+2R4A*#S	CDR1ΣB+2R4A*#@
	2.7			CDR1ΣB+2R7A*#S	CDR1ΣB+2R7A*#@
	3.0			CDR1ΣB+3R0A*#S	CDR1ΣB+3R0A*#@
	3.3			CDR1ΣB+3R3A*#S	CDR1ΣB+3R3A*#@
	3.6			CDR1ΣB+3R6A*#S	CDR1ΣB+3R6A*#@
	3.9			CDR1ΣB+3R9A*#S	CDR1ΣB+3R9A*#@
	4.3			CDR1ΣB+4R3A*#S	CDR1ΣB+4R3A*#@
	4.7			CDR1ΣB+4R7A*#S	CDR1ΣB+4R7A*#@
	5.1			CDR1ΣB+5R1A*#S	CDR1ΣB+5R1A*#@
	5.6			CDR1ΣB+5R6A*#S	CDR1ΣB+5R6A*#@
	6.2			CDR1ΣB+6R2A*#S	CDR1ΣB+6R2A*#@

Σ = choice of styles
+ = choice of voltage temperature limits
* = choice of tolerance
# = choice of termination finish (CDR 11 available with M and N; CDR 12 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR11 AND CDR12 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
50	6.8	B, C, J, K, M	BG, BP	CDR1ΣB+6R8A*#S	CDR1ΣB+6R8A*#@
	7.5			CDR1ΣB+7R5A*#S	CDR1ΣB+7R5A*#@
	8.2			CDR1ΣB+8R2A*#S	CDR1ΣB+8R2A*#@
	9.1			CDR1ΣB+9R1A*#S	CDR1ΣB+9R1A*#@
	10	F, G, J, K, M		CDR1ΣB+100A*#S	CDR1ΣB+100A*#@
	11			CDR1ΣB+110A*#S	CDR1ΣB+110A*#@
	12			CDR1ΣB+120A*#S	CDR1ΣB+120A*#@
	13			CDR1ΣB+130A*#S	CDR1ΣB+130A*#@
	15			CDR1ΣB+150A*#S	CDR1ΣB+150A*#@
	16			CDR1ΣB+160A*#S	CDR1ΣB+160A*#@
	18			CDR1ΣB+180A*#S	CDR1ΣB+180A*#@
	20			CDR1ΣB+200A*#S	CDR1ΣB+200A*#@
	22			CDR1ΣB+220A*#S	CDR1ΣB+220A*#@
	24			CDR1ΣB+240A*#S	CDR1ΣB+240A*#@
	27			CDR1ΣB+270A*#S	CDR1ΣB+270A*#@
	30			CDR1ΣB+300A*#S	CDR1ΣB+300A*#@
	33			CDR1ΣB+330A*#S	CDR1ΣB+330A*#@
	36			CDR1ΣB+360A*#S	CDR1ΣB+360A*#@
	39			CDR1ΣB+390A*#S	CDR1ΣB+390A*#@
	43			CDR1ΣB+430A*#S	CDR1ΣB+430A*#@
	47			CDR1ΣB+470A*#S	CDR1ΣB+470A*#@
	51			CDR1ΣB+510A*#S	CDR1ΣB+510A*#@
	56			CDR1ΣB+560A*#S	CDR1ΣB+560A*#@
	62			CDR1ΣB+620A*#S	CDR1ΣB+620A*#@
	68			CDR1ΣB+680A*#S	CDR1ΣB+680A*#@
	75			CDR1ΣB+750A*#S	CDR1ΣB+750A*#@
	82			CDR1ΣB+820A*#S	CDR1ΣB+820A*#@
	91			CDR1ΣB+910A*#S	CDR1ΣB+910A*#@
	100			CDR1ΣB+101A*#S	CDR1ΣB+101A*#@

Σ = choice of styles
+ = choice of voltage temperature limits
* = choice of tolerances
# = choice of termination finish (CDR 11 available with M and N; CDR 12 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR11 AND CDR12 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
50	110	F, G, J, K, M	BP	CDR1ΣBP111A*#S	CDR1ΣBP111A*#@
	120			CDR1ΣBP121A*#S	CDR1ΣBP121A*#@
	130			CDR1ΣBP131A*#S	CDR1ΣBP131A*#@
	150			CDR1ΣBP151A*#S	CDR1ΣBP151A*#@
	160			CDR1ΣBP161A*#S	CDR1ΣBP161A*#@
	180			CDR1ΣBP181A*#S	CDR1ΣBP181A*#@
	200			CDR1ΣBP201A*#S	CDR1ΣBP201A*#@
	220			CDR1ΣBP221A*#S	CDR1ΣBP221A*#@
	240			CDR1ΣBP241A*#S	CDR1ΣBP241A*#@
	270			CDR1ΣBP271A*#S	CDR1ΣBP271A*#@
	300			CDR1ΣBP301A*#S	CDR1ΣBP301A*#@
	330			CDR1ΣBP331A*#S	CDR1ΣBP331A*#@
	360			CDR1ΣBP361A*#S	CDR1ΣBP361A*#@
	390			CDR1ΣBP391A*#S	CDR1ΣBP391A*#@
	430			CDR1ΣBP431A*#S	CDR1ΣBP431A*#@
	470			CDR1ΣBP471A*#S	CDR1ΣBP471A*#@
	510			CDR1ΣBP511A*#S	CDR1ΣBP511A*#@
	560			CDR1ΣBP561A*#S	CDR1ΣBP561A*#@
	620			CDR1ΣBP621A*#S	CDR1ΣBP621A*#@
	680			CDR1ΣBP681A*#S	CDR1ΣBP681A*#@
	750			CDR1ΣBP751A*#S	CDR1ΣBP751A*#@
	820			CDR1ΣBP821A*#S	CDR1ΣBP821A*#@
	910			CDR1ΣBP911A*#S	CDR1ΣBP911A*#@
	1,000			CDR1ΣBP102A*#S	CDR1ΣBP102A*#@

Σ = choice of styles
* = choice of tolerances
# = choice of termination finish (CDR 11 available with M and N; CDR 12 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR13 AND CDR14 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
500	0.1	B	BG, BP	CDR1ΣB+0R1EB#S	CDR1ΣB+0R1EB#@
	0.2	B		CDR1ΣB+0R2EB#S	CDR1ΣB+0R2EB#@
	0.3	B,C		CDR1ΣB+0R3E*#S	CDR1ΣB+0R3E*#@
	0.4	B,C		CDR1ΣB+0R4E*#S	CDR1ΣB+0R4E*#@
	0.5	B, C, D		CDR1ΣB+0R5E*#S	CDR1ΣB+0R5E*#@
	0.6			CDR1ΣB+0R6E*#S	CDR1ΣB+0R6E*#@
	0.7			CDR1ΣB+0R7E*#S	CDR1ΣB+0R7E*#@
	0.8			CDR1ΣB+0R8E*#S	CDR1ΣB+0R8E*#@
	0.9			CDR1ΣB+0R9E*#S	CDR1ΣB+0R9E*#@
	1.0			CDR1ΣB+1R0E*#S	CDR1ΣB+1R0E*#@
	1.1			CDR1ΣB+1R1E*#S	CDR1ΣB+1R1E*#@
	1.2			CDR1ΣB+1R2E*#S	CDR1ΣB+1R2E*#@
	1.3			CDR1ΣB+1R3E*#S	CDR1ΣB+1R3E*#@
	1.4			CDR1ΣB+1R4E*#S	CDR1ΣB+1R4E*#@
	1.5			CDR1ΣB+1R5E*#S	CDR1ΣB+1R5E*#@
	1.6			CDR1ΣB+1R6E*#S	CDR1ΣB+1R6E*#@
	1.7			CDR1ΣB+1R7E*#S	CDR1ΣB+1R7E*#@
	1.8			CDR1ΣB+1R8E*#S	CDR1ΣB+1R8E*#@
	1.9			CDR1ΣB+1R9E*#S	CDR1ΣB+1R9E*#@
	2.0			CDR1ΣB+2R0E*#S	CDR1ΣB+2R0E*#@
	2.1			CDR1ΣB+2R1E*#S	CDR1ΣB+2R1E*#@
	2.2			CDR1ΣB+2R2E*#S	CDR1ΣB+2R2E*#@
	2.4			CDR1ΣB+2R4E*#S	CDR1ΣB+2R4E*#@
	2.7			CDR1ΣB+2R7E*#S	CDR1ΣB+2R7E*#@

Σ = choice of styles
+ = choice of voltage temperature limits
* = choice of tolerances
# = choice of termination finish (CDR 13 available with M and N; CDR 14 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR13 AND CDR14 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
500	3.0	B, C, D	BG, BP	CDR1ΣB+3R0E*#S	CDR1ΣB+3R0E*#@
	3.3			CDR1ΣB+3R3E*#S	CDR1ΣB+3R3E*#@
	3.6			CDR1ΣB+3R6E*#S	CDR1ΣB+3R6E*#@
	3.9			CDR1ΣB+3R9E*#S	CDR1ΣB+3R9E*#@
	4.3			CDR1ΣB+4R3E*#S	CDR1ΣB+4R3E*#@
	4.7			CDR1ΣB+4R7E*#S	CDR1ΣB+4R7E*#@
	5.1			CDR1ΣB+5R1E*#S	CDR1ΣB+5R1E*#@
	5.6			CDR1ΣB+5R6E*#S	CDR1ΣB+5R6E*#@
	6.2			CDR1ΣB+6R2E*#S	CDR1ΣB+6R2E*#@
	6.8	B, C, J, K, M		CDR1ΣB+6R8E*#S	CDR1ΣB+6R8E*#@
	7.5			CDR1ΣB+7R5E*#S	CDR1ΣB+7R5E*#@
	8.2			CDR1ΣB+8R2E*#S	CDR1ΣB+8R2E*#@
	9.1			CDR1ΣB+9R1E*#S	CDR1ΣB+9R1E*#@
	10	F, G, J, K, M		CDR1ΣB+100E*#S	CDR1ΣB+100E*#@
	11			CDR1ΣB+110E*#S	CDR1ΣB+110E*#@
	12			CDR1ΣB+120E*#S	CDR1ΣB+120E*#@
	13			CDR1ΣB+130E*#S	CDR1ΣB+130E*#@
	15			CDR1ΣB+150E*#S	CDR1ΣB+150E*#@
	16			CDR1ΣB+160E*#S	CDR1ΣB+160E*#@
	18			CDR1ΣB+180E*#S	CDR1ΣB+180E*#@

Σ = choice of styles
+ = choice of voltage temperature limits
* = choice of tolerances
# = choice of termination finish (CDR 13 available with M and N; CDR 14 available with S, U and W).
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MIL-C-55681/4, STYLE CDR13 AND CDR14 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
500	20	F, G, J, K, M	BG, BP	CDR1ΣB+200E*#S	CDR1ΣB+200E*#@
	22			CDR1ΣB+220E*#S	CDR1ΣB+220E*#@
	24			CDR1ΣB+240E*#S	CDR1ΣB+240E*#@
	27			CDR1ΣB+270E*#S	CDR1ΣB+270E*#@
	30			CDR1ΣB+300E*#S	CDR1ΣB+300E*#@
	33			CDR1ΣB+330E*#S	CDR1ΣB+330E*#@
	36			CDR1ΣB+360E*#S	CDR1ΣB+360E*#@
	39			CDR1ΣB+390E*#S	CDR1ΣB+390E*#@
	43			CDR1ΣB+430E*#S	CDR1ΣB+430E*#@
	47			CDR1ΣB+470E*#S	CDR1ΣB+470E*#@
	51			CDR1ΣB+510E*#S	CDR1ΣB+510E*#@
	56			CDR1ΣB+560E*#S	CDR1ΣB+560E*#@
	62			CDR1ΣB+620E*#S	CDR1ΣB+620E*#@
	68			CDR1ΣB+680E*#S	CDR1ΣB+680E*#@
	75			CDR1ΣB+750E*#S	CDR1ΣB+750E*#@
	82			CDR1ΣB+820E*#S	CDR1ΣB+820E*#@
	91			CDR1ΣB+910E*#S	CDR1ΣB+910E*#@
	100			CDR1ΣB+101E*#S	CDR1ΣB+101E*#@

Σ = choice of styles.
+ = choice of voltage temperature limits.
* = choice of tolerances.
# = choice of termination finish (CDR 13 available with M and N; CDR 14 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR13 AND CDR14 CHIP CAPACITORS
Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
300	110	F, G, J, K ,M	BG, BP	CDR1ΣB+111D*#S	CDR1ΣB+111D*#@
	120			CDR1ΣB+121D*#S	CDR1ΣB+121D*#@
	130			CDR1ΣB+131D*#S	CDR1ΣB+131D*#@
	150			CDR1ΣB+151D*#S	CDR1ΣB+151D*#@
	160			CDR1ΣB+161D*#S	CDR1ΣB+161D*#@
	180			CDR1ΣB+181D*#S	CDR1ΣB+181D*#@
	200			CDR1ΣB+201D*#S	CDR1ΣB+201D*#@
200	220			CDR1ΣB+221C*#S	CDR1ΣB+221C*#@
	240			CDR1ΣB+241C*#S	CDR1ΣB+241C*#@
	270			CDR1ΣB+271C*#S	CDR1ΣB+271C*#@
	300			CDR1ΣB+301C*#S	CDR1ΣB+301C*#@
	330			CDR1ΣB+331C*#S	CDR1ΣB+331C*#@
	360			CDR1ΣB+361C*#S	CDR1ΣB+361C*#@
	390			CDR1ΣB+391C*#S	CDR1ΣB+391C*#@
	430			CDR1ΣB+431C*#S	CDR1ΣB+431C*#@
	470			CDR1ΣB+471C*#S	CDR1ΣB+471C*#@
100	510			CDR1ΣB+511B*#S	CDR1ΣB+511B*#@
	560			CDR1ΣB+561B*#S	CDR1ΣB+561B*#@
	620			CDR1ΣB+621B*#S	CDR1ΣB+621B*#@
50	680			CDR1ΣB+681A*#S	CDR1ΣB+681A*#@
	750			CDR1ΣB+751A*#S	CDR1ΣB+751A*#@
	820			CDR1ΣB+821A*#S	CDR1ΣB+821A*#@
	910			CDR1ΣB+911A*#S	CDR1ΣB+911A*#@
	1,000			CDR1ΣB+102A*#S	CDR1ΣB+102A*#@

Σ = choice of styles.
+ = choice of voltage temperature limits.
* = choice of tolerances.
# = choice of termination finish (CDR 13 available with M and N; CDR 14 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-55681/4, STYLE CDR13 AND CDR14 CHIP CAPACITORS

Multiple Layer, Fixed, Unencapsulated, Ceramic Dielectric, Established Reliability (Continued)

Rated Voltage (Vdc)	Capacitance		Rated Temperature and Voltage Temperature Limits	Part Number	
	Nominal Value (pF)	Tolerances Available		Grade 1 FRL = S	Grade 2 FRL = P or R
50	1,100	F, G, J, K, M	BP	CDR1ΣBP112A*#S	CDR1ΣBP112A*#@
	1,200			CDR1ΣBP122A*#S	CDR1ΣBP122A*#@
	1,300			CDR1ΣBP132A*#S	CDR1ΣBP132A*#@
	1,500			CDR1ΣBP152A*#S	CDR1ΣBP152A*#@
	1,600			CDR1ΣBP162A*#S	CDR1ΣBP162A*#@
	1,800			CDR1ΣBP182A*#S	CDR1ΣBP182A*#@
	2,000			CDR1ΣBP202A*#S	CDR1ΣBP202A*#@
	2,200			CDR1ΣBP222A*#S	CDR1ΣBP222A*#@
	2,400			CDR1ΣBP242A*#S	CDR1ΣBP242A*#@
	2,700			CDR1ΣBP272A*#S	CDR1ΣBP272A*#@
	3,000			CDR1ΣBP302A*#S	CDR1ΣBP302A*#@
	3,300			CDR1ΣBP332A*#S	CDR1ΣBP332A*#@
	3,600			CDR1ΣBP362A*#S	CDR1ΣBP362A*#@
	3,900			CDR1ΣBP392A*#S	CDR1ΣBP392A*#@
	4,300			CDR1ΣBP432A*#S	CDR1ΣBP432A*#@
	4,700			CDR1ΣBP472A*#S	CDR1ΣBP472A*#@
	5,000			CDR1ΣBP502A*#S	CDR1ΣBP502A*#@
	5,100			CDR1ΣBP512A*#S	CDR1ΣBP512A*#@

Σ = choice of styles.
+ = choice of voltage temperature limits.
* = choice of tolerances.
# = choice of termination finish (CDR 13 available with M and N; CDR 14 available with S, U and W).
@ = P or R, allowable Failure Rate Levels (FRL).

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MIL-C-83421, CAPACITORS

Fixed, Metallized Plastic Film Dielectric, Hermetically Sealed, Established Reliability

Part Number Explanation:

M83421	XX	-X	XXX	X
M83421 - Identifies CRH established reliability, fixed, metallized plastic film dielectric capacitors that are hermetically sealed in metal cases and that conform to MIL-C-83421	/XX - Identifies the appropriate specification sheet that uniquely specifies the capacitor family	-X - Specifies the capacitor style 1 = CRH01 2 = CRH02 3 = CRH03 4 = CRH04 5 = CRH05	XXX - Uniquely specifies the capacitance value, capacitance tolerance, ac ratings, and physical dimensions of the capacitor	Failure Rate Level: R = 0.01 S = 0.001 (%/1000 hrs)

Part Number	Control Specification	Style (1)	Capacitance		Rated Voltage @ 100°C (Vdc)	Dissipation Factor (% max)	Dielectric Absorption (% max)	Operating Temperature Range (°C)	FRL	
			Range (μF)	Tolerance (±%)					Grade 1	Grade 2
M83421/01-XXXXX (2) (3)	MIL-C-83421/1	CRH01	0.001-22.0	1, 5, 10	30	0.15	0.1	-65 to +100	S	R
		CRH02	0.001-10.0		50					
		CRH03	0.001-10.0		100					
		CRH04	0.001- 3.9		200					
		CRH05	0.001- 2.0		400					

(1) Lead material and coating are specified in MIL-C-83421/1. For welding applications, consult the project parts engineer for recommendations.
(2) This capacitor is not approved for use in circuits where the energy is less than 250 microjoules. Reference MIL-HDBK-978, Vol. 1, 2.4.2.
(3) Parts covered by this specification contain internal soldered connections which may reflow during installation. The plastic dielectric in these parts is also temperature sensitive. Special precautions such as heat sinking are recommended when soldering onto boards.

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MIL-C-83421/1, STYLE CRH01 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
30	.001	22.0	.001	22.0	.001	22.0	.006	1003S	1005S	1006S	1003R	1005R	1006R
	.0012				.001		.007	1009S	1011S	1012S	1009R	1011R	1012R
	.0015				.001		.008	1015S	1017S	1018S	1015R	1017R	1018R
	.0018				.001		.010	1021S	1023S	1024S	1021R	1023R	1024R
	.002				.001		.011	1027S	1029S	1030S	1027R	1029R	1030R
	.0022				.001		.012	1033S	1035S	1036S	1033R	1035R	1036R
	.0027				.002		.015	1039S	1041S	1042S	1039R	1041R	1042R
	.0033				.002		.018	1045S	1047S	1048S	1045R	1047R	1048R
	.0039				.002		.021	1051S	1053S	1054S	1051R	1053R	1054R
	.0047				.003		.026	1057S	1059S	1060S	1057R	1059R	1060R
	.005				.003		.028	1063S	1065S	1066S	1063R	1065R	1066R
	.0056				.003		.031	1069S	1071S	1072S	1069R	1071R	1072R
	.0068				.004		.037	1075S	1077S	1078S	1075R	1077R	1078R
	.0082				.005		.045	1081S	1083S	1084S	1081R	1083R	1084R
	.01				.006		.055	1087S	1089S	1090S	1087R	1089R	1090R
	.012				.007		.066	1093S	1095S	1096S	1093R	1095R	1096R
	.015				.008		.082	1099S	1101S	1102S	1099R	1101R	1102R
	.018				.010		.10	1105S	1107S	1108S	1105R	1107R	1108R
	.02				.011		.11	1111S	1113S	1114S	1111R	1113R	1114R
	.022				.012		.12	1117S	1119S	1120S	1117R	1119R	1120R

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MIL-C-83421/1, STYLE CRH01 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
30	.027	22.0	.001	22.0	.015	22.0	.15	1123S	1125S	1126S	1123R	1125R	1126R
	.033		.002		.018		.18	1129S	1131S	1132S	1129R	1131R	1132R
	.039		.002		.021		.22	1135S	1137S	1138S	1135R	1137R	1138R
	.047		.003		.026		.26	1141S	1143S	1144S	1141R	1143R	1144R
	.05		.003		.028		.28	1147S	1149S	1150S	1147R	1149R	1150R
	.056		.003		.031		.31	1153S	1155S	1156S	1153R	1155R	1156R
	.068		.004		.037		.37	1159S	1161S	1162S	1159R	1161R	1162R
	.082		.005		.045		.45	1165S	1167S	1168S	1165R	1167R	1168R
	.1		.006		.055		.55	1171S	1173S	1174S	1171R	1173R	1174R
	.12		.007		.066		.66	1177S	1179S	1180S	1177R	1179R	1180R
	.15		.008		.082		.83	1183S	1185S	1186S	1183R	1185R	1186R
	.18		.010		.100		1.00	1375S	1377S	1378S	1375R	1377R	1378R
	.20		.011		.11	20.0	1.00	1189S	1191S	1192S	1189R	1191R	1192R
	.22		.012		.12	18.5	1.02	1195S	1197S	1198S	1195R	1197R	1198R
	.27		.015		.15	17.0	1.15	1201S	1203S	1204S	1201R	1203R	1204R
	.33		.018		.18	16.0	1.32	1207S	1209S	1210S	1207R	1209R	1210R
	.39		.021		.21	15.0	1.46	1213S	1215S	1216S	1213R	1215R	1216R
	.47		.026		.26	14.0	1.65	1219S	1221S	1222S	1219R	1221R	1222R
	.50		.028		.28	13.5	1.69	1225S	1227S	1228S	1225R	1227R	1228R
	.56		.031		.31	12.9	1.81	1231S	1233S	1234S	1231R	1233R	1234R
	.68		.037		.37	12.0	2.04	1237S	1239S	1240S	1237R	1239R	1240R
	.82		.045		.45	10.0	2.05	1243S	1245S	1246S	1243R	1245R	1246R

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MIL-C-83421/1, STYLE CRH01 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
30	1.0	22.0	.055	22.0	.55	8.4	2.10	1249S	1251S	1252S	1249R	1251R	1252R
	1.2		.066		.66	7.2	2.15	1255S	1257S	1258S	1255R	1257R	1258R
	1.5		.082		.83	5.8	2.17	1261S	1263S	1264S	1261R	1263R	1264R
	1.8		.099		.99	4.8	2.20	1267S	1269S	1270S	1267R	1269R	1270R
	2.0		.110		1.10	4.4		1273S	1275S	1276S	1273R	1275R	1276R
	2.2		.12		1.21	4.0		1279S	1281S	1282S	1279R	1281R	1282R
	2.7		.15		1.49	3.3		1387S	1389S	1390S	1387R	1389R	1390R
	3.0		.17		1.65	2.9		1291S	1293S	1294S	1291R	1293R	1294R
	3.3		.18		1.82	2.7		1297S	1299S	1300S	1297R	1299R	1300R
	3.9		.21		2.14	2.3		1303S	1305S	1306S	1303R	1305R	1306R
	4.7		.26	18.7	2.20	1.9		1315S	1317S	1318S	1315R	1317R	1318R
	5.0		.28	17.6		1.8		1321S	1323S	1324S	1321R	1323R	1324R
	5.6		.31	15.7		1.6		1327S	1329S	1330S	1327R	1329R	1330R
	6.8		.37	13.0		1.3		1333S	1335S	1336S	1333R	1335R	1336R
	8.0		.44	11.0		1.1		1339S	1341S	1342S	1339R	1341R	1342R
	8.2		.45	10.7		1.1		1345S	1347S	1348S	1345R	1347R	1348R
	10.0		.55	8.8		.88		1351S	1353S	1354S	1351R	1353R	1354R
	12.0		.66	7.3		.73		1381S	1383S	1384S	1381R	1383R	1384R
	15.0		.83	5.9		.59		1357S	1359S	1360S	1357R	1359R	1360R
	20.0		1.10	4.4		.44		1363S	1365S	1366S	1363R	1365R	1366R
	22.0		1.21	4.0		.40		1369S	1371S	1372S	1369R	1371R	1372R

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MIL-C-83421/1, STYLE CRH02 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
50	.001	36.0	.001	36.0	.001	36.0	.009	2003S	2005S	2006S	2003R	2005R	2006R
	.0012				.001		.011	2009S	2011S	2012S	2009R	2011R	2012R
	.0015				.001		.013	2015S	2017S	2018S	2015R	2017R	2018R
	.0018				.002		.016	2021S	2023S	2024S	2021R	2023R	2024R
	.002				.002		.018	2027S	2029S	2030S	2027R	2029R	2030R
	.0022				.002		.020	2033S	2035S	2036S	2033R	2035R	2036R
	.0027				.002		.024	2039S	2041S	2042S	2039R	2041R	2042R
	.0033				.003		.030	2045S	2047S	2048S	2045R	2047R	2048R
	.0039				.004		.035	2051S	2053S	2054S	2051R	2053R	2054R
	.0047		.001		.004		.042	2057S	2059S	2060S	2057R	2059R	2060R
	.005				.005		.045	2063S	2065S	2066S	2063R	2065R	2066R
	.0056				.005		.050	2069S	2071S	2072S	2069R	2071R	2072R
	.0068				.006		.061	2075S	2077S	2078S	2075R	2077R	2078R
	.0082				.007		.074	2081S	2083S	2084S	2081R	2083R	2084R
	.01				.009		.090	2087S	2089S	2090S	2087R	2089R	2090R
	.012				.011		.11	2093S	2095S	2096S	2093R	2095R	2096R
	.015		.001		.013		.14	2099S	2101S	2102S	2099R	2101R	2102R
	.018		.002		.016		.16	2105S	2107S	2108S	2105R	2107R	2108R
	.02		.002		.018		.18	2111S	2113S	2114S	2111R	2113R	2114R
	.022		.002		.020		.20	2117S	2119S	2120S	2117R	2119R	2120R
	.027		.002		.024		.24	2123S	2125S	2126S	2123R	2125R	2126R
	.033		.003		.030		.30	2129S	2131S	2132S	2129R	2131R	2132R
	.039		.004		.035		.35	2135S	2137S	2138S	2135R	2137R	2138R
	.047		.004		.042		.42	2141S	2143S	2144S	2141R	2143R	2144R
	.05		.005		.045	36.0	.45	2147S	2149S	2150S	2147R	2149R	2150R
	.056		.005		.050	36.0	.50	2153S	2155S	2156S	2153R	2155R	2156R
	.068		.006		.061	34.0	.58	2159S	2161S	2162S	2159R	2161R	2162R
	.082		.007		.074	32.0	.66	2165S	2167S	2168S	2165R	2167R	2168R

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MIL-C-83421/1, STYLE CRH02 CAPACITORS

Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
50	.1	36.0	.009	36.0	.090	30.0	.75	2171S	2173S	2174S	2171R	2173R	2174R
	.12		.011		.11	30.0	.90	2177S	2179S	2180S	2177R	2179R	2180R
	.15		.013		.14	26.0	.98	2183S	2185S	2186S	2183R	2185R	2186R
	.18		.016		.16	25.0	1.13	2189S	2191S	2192S	2189R	2191R	2192R
	.20		.018		.18	24.0	1.20	2195S	2197S	2198S	2195R	2197R	2198R
	.22		.020		.20	23.0	1.27	2201S	2203S	2204S	2201R	2203R	2204R
	.27		.024		.24	19.0	1.28	2207S	2209S	2210S	2207R	2209R	2210R
	.33		.030		.30	18.0	1.48	2213S	2215S	2216S	2213R	2215R	2216R
	.39		.035		.35	17.0	1.66	2219S	2221S	2222S	2219R	2221R	2222R
	.47		.042		.42	15.7	1.85	2225S	2227S	2228S	2225R	2227R	2228R
	.50		.045		.45	15.2	1.90	2231S	2233S	2234S	2231R	2233R	2234R
	.56		.050		.50	14.4	2.01	2237S	2239S	2240S	2237R	2239R	2240R
	.68		.061		.61	14.0	2.38	2243S	2245S	2246S	2243R	2245R	2246R
	.82		.074		.74	12.0	2.46	2249S	2251S	2252S	2249R	2251R	2252R
	1.0		.090		.90	10.0	2.50	2255S	2257S	2258S	2255R	2257R	2258R
	1.2		.11		1.08	9.1	2.73	2261S	2263S	2264S	2261R	2263R	2264R
	1.5		.14		1.35	7.7	2.90	2267S	2269S	2270S	2267R	2269R	2270R
	1.8		.16		1.62	6.6	3.00	2273S	2275S	2276S	2273R	2275R	2276R
	2.0		.18		1.80	6.2	3.10	2279S	2281S	2282S	2279R	2281R	2282R
	2.2		.20		1.98	5.8	3.20	2285S	2287S	2288S	2285R	2287R	2288R
	2.7		.24		2.43	5.0	3.34	2291S	2293S	2294S	2291R	2293R	2294R
	3.0		.27		2.70	4.5	3.40	2297S	2299S	2300S	2297R	2299R	2300R
	3.3		.30		2.97	4.2	3.50	2303S	2305S	2306S	2303R	2305R	2306R
	3.9		.35		3.51	3.7	3.60	2309S	2311S	2312S	2309R	2311R	2312R
	4.7		.42	31.0	3.60	3.1	3.60	2321S	2323S	2324S	2321R	2323R	2324R
	5.0		.45	29.0		2.9		2327S	2329S	2330S	2327R	2329R	2330R
	5.6		.50	26.0		2.6		2333S	2335S	2336S	2333R	2335R	2336R
	6.8		.61	21.2		2.1		2339S	2341S	2342S	2339R	2341R	2342R
	8.0		.72	18.0		1.8		2345S	2347S	2348S	2345R	2347R	2348R
	8.2		.74	17.6		1.8		2351S	2353S	2354S	2351R	2353R	2354R
	10.0		.90	14.4		1.4		2357S	2359S	2360S	2357R	2359R	2360R

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MIL-C-83421/1, STYLE CRH03 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
100	.001	60.0	.001	60.0	.002	60.0	.015	3003S	3005S	3006S	3003R	3005R	3006R
	.0012				.002		.018	3009S	3011S	3012S	3009R	3011R	3012R
	.0015				.002		.022	3015S	3017S	3018S	3015R	3017R	3018R
	.0018				.003		.027	3021S	3023S	3024S	3021R	3023R	3024R
	.002				.003		.030	3027S	3029S	3030S	3027R	3029R	3030R
	.0022				.003		.033	3033S	3035S	3036S	3033R	3035R	3036R
	.0027				.004		.041	3039S	3041S	3042S	3039R	3041R	3042R
	.0033				.005		.050	3045S	3047S	3048S	3045R	3047R	3048R
	.0039				.006		.058	3051S	3053S	3054S	3051R	3053R	3054R
	.0047				.007		.071	3057S	3059S	3060S	3057R	3059R	3060R
	.005				.008		.075	3063S	3065S	3066S	3063R	3065R	3066R
	.0056				.008		.084	3069S	3071S	3072S	3069R	3071R	3072R
	.0068		.001		.010	60.0	.10	3075S	3077S	3078S	3075R	3077R	3078R
	.0082		.001		.012	60.0	.12	3081S	3083S	3084S	3081R	3083R	3084R
	.01		.002		.015	60.0	.15	3087S	3089S	3090S	3087R	3089R	3090R
	.012		.002		.018	59.0	.18	3093S	3095S	3096S	3093R	3095R	3096R
	.015		.002		.022	58.0	.22	3099S	3101S	3102S	3099R	3101R	3102R
	.018		.003		.027	57.0	.26	3105S	3107S	3108S	3105R	3107R	3108R
	.02		.003		.030	55.0	.28	3111S	3113S	3114S	3111R	3113R	3114R
	.022		.003		.033	53.0	.29	3117S	3119S	3120S	3117R	3119R	3120R
	.027		.004		.041	51.0	.34	3123S	3125S	3126S	3123R	3125R	3126R
	.033		.005		.050	50.0	.41	3129S	3131S	3132S	3129R	3131R	3132R
	.039		.006		.059	48.0	.47	3135S	3137S	3138S	3135R	3137R	3138R
	.047		.007		.070	47.0	.55	3141S	3143S	3144S	3141R	3143R	3144R
	.050		.008		.075	46.0	.58	3147S	3149S	3150S	3147R	3149R	3150R
	.056		.008		.084	46.0	.64	3153S	3155S	3156S	3153R	3155R	3156R
	.068		.010		.10	42.0	.71	3159S	3161S	3162S	3159R	3161R	3162R
	.082		.012		.12	38.0	.78	3165S	3167S	3168S	3165R	3167R	3168R
	.10		.015		.15	36.0	.90	3171S	3173S	3174S	3171R	3173R	3174R
	.12		.018		.18	35.0	1.05	3177S	3179S	3180S	3177R	3179R	3180R
	.15		.022		.23	33.0	1.24	3183S	3185S	3186S	3183R	3185R	3186R
	.18		.027		.27	31.0	1.40	3189S	3191S	3192S	3189R	3191R	3192R

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MIL-C-83421/1, STYLE CRH03 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
100	.20	60.0	.030	60.0	.30	30.0	1.50	3195S	3197S	3198S	3195R	3197R	3198R
	.22		.033		.33	27.0	1.50	3201S	3203S	3204S	3201R	3203R	3204R
	.27		.041		.41	24.0	1.62	3207S	3209S	3210S	3207R	3209R	3210R
	.33		.050		.50	23.0	1.90	3213S	3215S	3216S	3213R	3215R	3216R
	.39		.058		.59	22.0	2.15	3219S	3221S	3222S	3219R	3221R	3222R
	.47		.071		.71	21.0	2.47	3225S	3227S	3228S	3225R	3227R	3228R
	.5		.075		.75	20.0	2.50	3231S	3233S	3234S	3231R	3233R	3234R
	.56		.084		.84	19.0	2.64	3237S	3239S	3240S	3237R	3239R	3240R
	.68		.10		1.02	16.0	2.72	3243S	3245S	3246S	3243R	3245R	3246R
	.82		.12		1.23	14.0	2.87	3249S	3251S	3252S	3249R	3251R	3252R
	1.00		.15		1.50	12.0	3.00	3255S	3257S	3258S	3255R	3257R	3258R
	1.20		.18		1.80	11.0	3.25	3261S	3263S	3264S	3261R	3263R	3264R
	1.50		.23		2.26	10.0	3.75	3267S	3269S	3270S	3267R	3269R	3270R
	2.0		.30		3.00	8.1	4.10	3273S	3275S	3276S	3273R	3275R	3276R
	2.2		.33		3.31	7.5	4.12	3279S	3281S	3282S	3279R	3281R	3282R
	2.7		.41		4.05	6.5	4.40	3285S	3287S	3288S	3285R	3287R	3288R
	3.0		.45	60.0	4.51	6.0	4.51	3291S	3293S	3294S	3291R	3293R	3294R
	3.3		.50	55.0	4.73	5.5	4.55	3297S	3299S	3300S	3297R	3299R	3300R
	3.9		.59	49.0	4.90	5.0	4.90	3303S	3305S	3306S	3303R	3305R	3306R
	4.7		.71	43.0	5.00	4.3	5.00	3315S	3317S	3318S	3315R	3317R	3318R
	5.0		.75	40.0	5.00	4.0	5.00	3321S	3323S	3324S	3321R	3323R	3324R
	5.6		.84	36.0		3.6		3327S	3329S	3330S	3327R	3329R	3330R
	6.8		1.02	29.0		3.0		3333S	3335S	3336S	3333R	3335R	3336R
	8.0		1.20	25.0		2.5		3339S	3341S	3342S	3339R	3341R	3342R
	8.2		1.23	24.4		2.4		3345S	3347S	3348S	3345R	3347R	3348R
	10.0		1.50	20.0		2.0		3351S	3353S	3354S	3351R	3353R	3354R

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MIL-C-83421/1, STYLE CRH04 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
200	.001	120.0	.001	120.0	.003	80.0	.020	4003S	4005S	4006S	4003R	4005R	4006R
	.0012				.004		.024	4009S	4011S	4012S	4009R	4011R	4012R
	.0015				.004		.030	4015S	4017S	4018S	4015R	4017R	4018R
	.0018				.005		.036	4021S	4023S	4024S	4021R	4023R	4024R
	.002				.006		.040	4027S	4029S	4030S	4027R	4029R	4030R
	.0022				.007		.044	4033S	4035S	4036S	4033R	4035R	4036R
	.0027				.008		.054	4039S	4041S	4042S	4039R	4041R	4042R
	.0033				.010		.066	4045S	4047S	4048S	4045R	4047R	4048R
	.0039		.001		.012		.078	4051S	4053S	4054S	4051R	4053R	4054R
	.0047		.001		.014		.094	4057S	4059S	4060S	4057R	4059R	4060R
	.005		.002		.015		.10	4063S	4065S	4066S	4063R	4065R	4066R
	.0056		.002		.017		.11	4069S	4071S	4072S	4069R	4071R	4072R
	.0068		.002		.020	80.0	.14	4075S	4077S	4078S	4075R	4077R	4078R
	.0082		.002		.025	80.0	.16	4081S	4083S	4084S	4081R	4083R	4084R
	.01		.003		.030	80.0	.20	4087S	4089S	4090S	4087R	4089R	4090R
	.012		.004		.036	78.0	.23	4093S	4095S	4096S	4093R	4095R	4096R
	.015		.004		.045	76.0	.29	4099S	4101S	4102S	4099R	4101R	4102R
	.018		.005		.054	74.0	.33	4105S	4107S	4108S	4105R	4107R	4108R
	.02		.006		.060	71.0	.36	4111S	4113S	4114S	4111R	4113R	4114R
	.022		.007		.066	68.0	.37	4117S	4119S	4120S	4117R	4119R	4120R
	.027		.008		.081	65.0	.44	4123S	4125S	4126S	4123R	4125R	4126R
	.033		.010		.099	62.0	.51	4129S	4131S	4132S	4129R	4131R	4132R
	.039		.012		.12	60.0	.59	4135S	4137S	4138S	4135R	4137R	4138R
	.047		.014		.14	57.0	.67	4141S	4143S	4144S	4141R	4143R	4144R
	.050		.015		.15	56.0	.70	4147S	4149S	4150S	4147R	4149R	4150R
	.056		.017		.17	56.0	.78	4153S	4155S	4156S	4153R	4155R	4156R
	.068		.020		.20	50.0	.85	4159S	4161S	4162S	4159R	4161R	4162R
	.082		.025		.25	44.0	.90	4165S	4167S	4168S	4165R	4167R	4168R

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MIL-C-83421/1, STYLE CRH04 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
200	.10	120.0	.030	120.0	.30	42.0	1.10	4171S	4173S	4174S	4171R	4173R	4174R
	.12		.036		.36	40.0	1.20	4177S	4179S	4180S	4177R	4179R	4180R
	.15		.045		.45	36.0	1.34	4183S	4185S	4186S	4183R	4185R	4186R
	.18		.054		.54	34.0	1.54	4189S	4191S	4192S	4189R	4191R	4192R
	.20		.060		.60	33.0	1.65	4195S	4197S	4198S	4195R	4197R	4198R
	.22		.066		.66	32.0	1.76	4201S	4203S	4204S	4201R	4203R	4204R
	.27		.081		.81	29.0	1.96	4207S	4209S	4210S	4207R	4209R	4210R
	.33		.099		.99	28.0	2.31	4213S	4215S	4216S	4213R	4215R	4216R
	.39		.12		1.17	27.0	2.63	4219S	4221S	4222S	4219R	4221R	4222R
	.47		.14		1.41	26.0	3.06	4225S	4227S	4228S	4225R	4227R	4228R
	.5		.15		1.50	25.0	3.13	4231S	4233S	4234S	4231R	4233R	4234R
	.56		.17		1.61	23.0	3.17	4237S	4239S	4240S	4237R	4239R	4240R
	.68		.20		1.87	20.0	3.40	4243S	4245S	4246S	4243R	4245R	4246R
	.82		.25		2.05	18.0	3.70	4249S	4251S	4252S	4249R	4251R	4252R
	1.0		.30		2.25	15.0	3.75	4255S	4257S	4258S	4255R	4257R	4258R
	1.2		.36		2.61	13.5	4.05	4261S	4263S	4264S	4261R	4263R	4264R
	1.5		.45	120.0	3.20	12.0	4.50	4267S	4269S	4270S	4267R	4269R	4270R
	1.8		.54	110.0	3.74	11.0	5.00	4273S	4275S	4276S	4273R	4275R	4276R
	2.0		.60	100.0	4.05	10.0	5.00	4279S	4281S	4282S	4279R	4281R	4282R
	2.2		.66	90.5	4.20	9.1	5.00	4285S	4287S	4288S	4285R	4287R	4288R
	2.5		.75	80.0	4.31	8.0	5.00	4291S	4293S	4294S	4291R	4293R	4294R
	2.7		.81	77.0	4.60	7.7	5.20	4297S	4299S	4300S	4297R	4299R	4300R
	3.0		.90	70.0	5.04	7.0	5.27	4303S	4305S	4306S	4303R	4305R	4306R
	3.3		.99	65.0	5.21	6.5	5.36	4309S	4311S	4312S	4309R	4311R	4312R
	3.9		1.20	55.0	5.39	5.5	5.40	4315S	4317S	4318S	4315R	4317R	4318R

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MIL-C-83421/1, STYLE CRH05 CAPACITORS

Fixed, Metallized Plastic Film Dielectric, Established Reliability

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
	.001		.001		.006		.025	5003S	5005S	5006S	5003R	5005R	5006R
	.0012		.001		.007		.030	5009S	5011S	5012S	5009R	5011R	5012R
	.0015		.001		.009		.037	5015S	5017S	5018S	5015R	5017R	5018R
	.0018		.001		.011		.045	5021S	5023S	5024S	5021R	5023R	5024R
	.002		.001		.012		.050	5027S	5029S	5030S	5027R	5029R	5030R
	.0022		.001		.013		.055	5033S	5035S	5036S	5033R	5035R	5036R
	.0027		.002		.016		.068	5039S	5041S	5042S	5039R	5041R	5042R
	.0033		.002		.020	100.0	.083	5045S	5047S	5048S	5045R	5047R	5048R
	.0039		.002		.023		.097	5051S	5053S	5054S	5051R	5053R	5054R
	.0047		.003		.028		.12	5057S	5059S	5060S	5057R	5059R	5060R
	.005		.003		.030		.13	5063S	5065S	5066S	5063R	5065R	5066R
	.0056		.003		.034		.14	5069S	5071S	5072S	5069R	5071R	5072R
400	.0068	240.0	.004	240.0	.041		.17	5075S	5077S	5078S	5075R	5077R	5078R
	.0082		.005		.049		.21	5081S	5083S	5084S	5081R	5083R	5084R
	.01		.006		.060		.25	5087S	5089S	5090S	5087R	5089R	5090R
	.012		.007		.072		.30	5093S	5095S	5096S	5093R	5095R	5096R
	.015		.009		.090	94.0	.35	5099S	5101S	5102S	5099R	5101R	5102R
	.018		.011		.11	90.0	.41	5105S	5107S	5108S	5105R	5107R	5108R
	.02		.012		.12	88.0	.44	5273S	5275S	5276S	5273R	5275R	5276R
	.022		.013		.13	85.0	.47	5111S	5113S	5114S	5111R	5113R	5114R
	.027		.016		.16	81.0	.55	5117S	5119S	5120S	5117R	5119R	5120R
	.033		.020		.20	78.0	.65	5123S	5125S	5126S	5123R	5125R	5126R
	.039		.023		.23	75.0	.73	5129S	5131S	5132S	5129R	5131R	5132R
	.047		.028		.28	71.0	.83	5135S	5137S	5138S	5135R	5137R	5138R
	.05		.030		.30	70.0	.88	5141S	5143S	5144S	5141R	5143R	5144R
	.056		.034		.34	67.5	.95	5147S	5149S	5150S	5147R	5149R	5150R
	.068		.041		.41	60.0	1.02	5153S	5155S	5156S	5153R	5155R	5156R
	.082		.049		.49	50.0	1.03	5159S	5161S	5162S	5159R	5161R	5162R

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MIL-C-83421/1, STYLE CRH05 CAPACITORS
Fixed, Metallized Plastic Film Dielectric, Established Reliability (Continued)

Rated Voltage @ 100°C (Volts, dc)	Nominal Capacitance Value (µF)	ac Ratings for Sinusoidal Operation, From -65°C to +100°C						Part Number M83421/01-					
								Grade 1 FRL = S			Grade 2 FRL = R		
		0 to 0.4 kHz		@ 4 kHz		@40 kHz		Capacitance Tolerance (±%)			Capacitance Tolerance (±%)		
		Volts	Amps	Volts	Amps	Volts	Amps	1.0	5.0	10.0	1.0	5.0	10.0
400	.10	240.0	.060	240.0	.60	46.0	1.20	5165S	5167S	5168S	5165R	5167R	5168R
	.12		.072		.72	44.5	1.34	5171S	5173S	5174S	5171R	5173R	5174R
	.15		.090		.83	40.0	1.50	5177S	5179S	5180S	5177R	5179R	5180R
	.18		.11		.95	38.0	1.70	5279S	5281S	5282S	5279R	5281R	5282R
	.20		.12		1.03	37.0	1.85	5183S	5185S	5186S	5183R	5185R	5186R
	.22		.13		1.10	35.0	1.93	5189S	5191S	5192S	5189R	5191R	5192R
	.27		.16		1.21	33.0	2.24	5195S	5197S	5198S	5195R	5197R	5198R
	.33		.20		1.32	32.0	2.65	5201S	5203S	5204S	5201R	5203R	5204R
	.39		.23		1.48	32.0	3.14	5207S	5209S	5210S	5207R	5209R	5210R
	.47		.28		1.68	31.0	3.64	5213S	5215S	5216S	5213R	5215R	5216R
	.5		.30		1.75	30.0	3.75	5219S	5221S	5222S	5219R	5221R	5222R
	.56		.34		1.92	29.0	4.05	5225S	5227S	5228S	5225R	5227R	5228R
	.68		.41	240.0	2.26	26.0	4.50	5231S	5233S	5234S	5231R	5233R	5234R
	.82		.49	234.0	2.63	23.4	4.80	5237S	5239S	5240S	5237R	5239R	5240R
	1.0		.60	208.0	3.00	20.8	5.20	5243S	5245S	5246S	5243R	5245R	5246R
	1.2		.72	183.0	3.48	18.3	5.50	5249S	5251S	5252S	5249R	5251R	5252R
	1.5		.90	160.0	4.14	16.0	6.00	5255S	5257S	5258S	5255R	5257R	5258R
	1.8		1.08	150.0	4.69	15.0	6.80	5261S	5263S	5264S	5261R	5263R	5264R
	2.0		1.20	140.0	5.00	14.0	7.00	5267S	5269S	5270S	5267R	5269R	5270R

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MIL-C-87217, CAPACITORS

Fixed, Supermetallized Plastic Film Dielectric, Direct Current for Low Energy, High Impedence Applications, Hermetically Sealed in Metal Cases, High Reliability

Part Number Explanation:

M87217	/01	-X	XXX	X
M87217 - Identifies CHS established reliability, fixed, supermetallized plastic film dielectric capacitors that are hermetically sealed in metal cases and that conform to MIL-C-87217	/01 - Identifies the appropriate specification sheet that uniquely specifies the capacitor family	-X - Specifies the capacitor style and rated voltage 1 = CHS01, 30V 2 = CHS02, 50V 3 = CHS03, 100V	XXX - Nonsignificant dash number from Table I, MIL-C-87217/1	X - Single Letter X = A - Sleeved X = B - Unsleeved

Part Number	Control Specification	Style (1)	Capacitance		Rated Voltage @ +100°C (Vdc)	Operating Temperature Range (°C)
			Range (µF)	Tolerances (±%)		
M87217/01-XXXXX (1) (2) (3)	MIL-C-87217/1	CHS01 CHS02 CHS03	0.001 - 10.0	0.25, 0.5, 1.0, 2.0, 5.0, 10.0	30 50 100	-55 to +100

(1) To ensure clearing of breakdown, the circuit in which capacitors of 0.1µF and greater capacitance are intended for use, shall be capable of providing at least 100 microjoules of energy.
(2) These parts may be used in Grade 1 and Grade 2 applications.
(3) Parts covered by this specification contain internal soldered connections which may reflow during installation. The plastic dielectric in these parts is also temperature sensitive. Special precautions such as heat sinking are recommended when soldering onto boards.

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MIL-C-87217/1, STYLE CHS01 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability

Rated Voltage @ +100°C (Volts, dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
30	0.001	1001*	1002*	1003*	1004*	1005*	1006*
	0.0012	1007*	1008*	1009*	1010*	1011*	1012*
	0.0015	1013*	1014*	1015*	1016*	1017*	1018*
	0.0018	1019*	1020*	1021*	1022*	1023*	1024*
	0.002	1025*	1026*	1027*	1028*	1029*	1030*
	0.0022	1031*	1032*	1033*	1034*	1035*	1036*
	0.0027	1037*	1038*	1039*	1040*	1041*	1042*
	0.0033	1043*	1044*	1045*	1046*	1047*	1048*
	0.0039	1049*	1050*	1051*	1052*	1053*	1054*
	0.0047	1055*	1056*	1057*	1058*	1059*	1060*
	0.005	1061*	1062*	1063*	1064*	1065*	1066*
	0.0056	1067*	1068*	1069*	1070*	1071*	1072*
	0.0068	1073*	1074*	1075*	1076*	1077*	1078*
	0.0082	1079*	1080*	1081*	1082*	1083*	1084*
	0.01	1085*	1086*	1087*	1088*	1089*	1090*
	0.012	1091*	1092*	1093*	1094*	1095*	1096*
	0.015	1097*	1098*	1099*	1100*	1101*	1102*
	0.018	1103*	1104*	1105*	1106*	1107*	1108*
	0.02	1109*	1110*	1111*	1112*	1113*	1114*
	0.022	1115*	1116*	1117*	1118*	1119*	1120*
	0.027	1121*	1122*	1123*	1124*	1125*	1126*
	0.033	1127*	1128*	1129*	1130*	1131*	1132*
	0.039	1133*	1134*	1135*	1136*	1137*	1138*
	0.047	1139*	1140*	1141*	1142*	1143*	1144*
	0.050	1145*	1146*	1147*	1148*	1149*	1150*
	0.056	1151*	1152*	1153*	1154*	1155*	1156*
	0.068	1157*	1158*	1159*	1160*	1161*	1162*
	0.082	1163*	1164*	1165*	1166*	1167*	1168*
	0.1	1169*	1170*	1171*	1172*	1173*	1174*
	0.12	1175*	1176*	1177*	1178*	1179*	1180*
	0.15	1181*	1182*	1183*	1184*	1185*	1186*
	0.18	1373*	1374*	1375*	1376*	1377*	1378*

* = A for sleeved, B for unsleeved

(1) These parts may be used in either Grade 1 or Grade 2 applications.

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MIL-C-87217/1, STYLE CHS01 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability (Continued)

Rated Voltage @ +100°C (Volts, dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
30	0.20	1187*	1188*	1189*	1190*	1191*	1192*
	0.22	1193*	1194*	1195*	1196*	1197*	1198*
	0.27	1199*	1200*	1201*	1202*	1203*	1204*
	0.33	1205*	1206*	1207*	1208*	1209*	1210*
	0.39	1211*	1212*	1213*	1214*	1215*	1216*
	0.47	1217*	1218*	1219*	1220*	1221*	1222*
	0.50	1223*	1224*	1225*	1226*	1227*	1228*
	0.56	1229*	1230*	1231*	1232*	1233*	1234*
	0.68	1235*	1236*	1237*	1238*	1239*	1240*
	0.82	1241*	1242*	1243*	1244*	1245*	1246*
	1.0	1247*	1248*	1249*	1250*	1251*	1252*
	1.2	1253*	1254*	1255*	1256*	1257*	1258*
	1.5	1259*	1260*	1261*	1262*	1263*	1264*
	1.8	1265*	1266*	1267*	1268*	1269*	1270*
	2.0	1271*	1272*	1273*	1274*	1275*	1276*
	2.2	1277*	1278*	1279*	1280*	1281*	1282*
	2.7	1385*	1386*	1387*	1388*	1389*	1390*
	3.0	1289*	1290*	1291*	1292*	1293*	1294*
	3.3	1295*	1296*	1297*	1298*	1299*	1300*
	3.9	1301*	1302*	1303*	1304*	1305*	1306*
	4.7	1313*	1314*	1315*	1316*	1317*	1318*
	5.0	1319*	1320*	1321*	1322*	1323*	1324*
	5.6	1325*	1326*	1327*	1328*	1329*	1330*
	6.8	1331*	1332*	1333*	1334*	1335*	1336*
	8.0	1337*	1338*	1339*	1340*	1341*	1342*
	8.2	1343*	1344*	1345*	1346*	1347*	1348*
	10.0	1349*	1350*	1351*	1352*	1353*	1354*

* = A for sleeved, B for unsleeved
(1) These parts may be used in either Grade 1 or Grade 2 applications.

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MIL-C-87217/1, STYLE CHS02 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability

Rated Voltage @ +100°C (Volts, dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
50	0.001	2001*	2002*	2003*	2004*	2005*	2006*
	0.0012	2007*	2008*	2009*	2010*	2011*	2012*
	0.0015	2013*	2014*	2015*	2016*	2017*	2018*
	0.0018	2019*	2020*	2021*	2022*	2023*	2024*
	0.002	2025*	2026*	2027*	2028*	2029*	2030*
	0.0022	2031*	2032*	2033*	2034*	2035*	2036*
	0.0027	2037*	2038*	2039*	2040*	2041*	2042*
	0.0033	2043*	2044*	2045*	2046*	2047*	2048*
	0.0039	2049*	2050*	2051*	2052*	2053*	2054*
	0.0047	2055*	2056*	2057*	2058*	2059*	2060*
	0.005	2061*	2062*	2063*	2064*	2065*	2066*
	0.0056	2067*	2068*	2069*	2070*	2071*	2072*
	0.0068	2073*	2074*	2075*	2076*	2077*	2078*
	0.0082	2079*	2080*	2081*	2082*	2083*	2084*
	0.01	2085*	2086*	2087*	2088*	2089*	2090*
	0.012	2091*	2092*	2093*	2094*	2095*	2096*
	0.015	2097*	2098*	2099*	2100*	2101*	2102*
	0.018	2103*	2104*	2105*	2106*	2107*	2108*
	0.02	2109*	2110*	2111*	2112*	2113*	2114*
	0.022	2115*	2116*	2117*	2118*	2119*	2120*
	0.027	2121*	2122*	2123*	2124*	2125*	2126*
	0.033	2127*	2128*	2129*	2130*	2131*	2132*
	0.039	2133*	2134*	2135*	2136*	2137*	2138*
	0.047	2139*	2140*	2141*	2142*	2143*	2144*
	0.050	2145*	2146*	2147*	2148*	2149*	2150*
	0.056	2151*	2152*	2153*	2154*	2155*	2156*
	0.068	2157*	2158*	2159*	2160*	2161*	2162*
	0.082	2163*	2164*	2165*	2166*	2167*	2168*

* = A for sleeved, B for unsleeved

(1) These parts may be used in either Grade 1 or Grade 2 applications.

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MIL-C-87217/1, STYLE CHS02 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability (Continued)

Rated Voltage @ +100°C (Volts, dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
50	0.1	2169*	2170*	2171*	2172*	2173*	2174*
	0.12	2175*	2176*	2177*	2178*	2179*	2180*
	0.15	2181*	2182*	2183*	2184*	2185*	2186*
	0.18	2187*	2188*	2189*	2190*	2191*	2192*
	0.20	2193*	2194*	2195*	2196*	2197*	2198*
	0.22	2199*	2200*	2201*	2202*	2203*	2204*
	0.27	2205*	2206*	2207*	2208*	2209*	2210*
	0.33	2211*	2212*	2213*	2214*	2215*	2216*
	0.39	2217*	2218*	2219*	2220*	2221*	2222*
	0.47	2223*	2224*	2225*	2226*	2227*	2228*
	0.50	2229*	2230*	2231*	2232*	2233*	2234*
	0.56	2235*	2236*	2237*	2238*	2239*	2240*
	0.68	2241*	2242*	2243*	2244*	2245*	2246*
	0.82	2247*	2248*	2249*	2250*	2251*	2252*
	1.0	2253*	2254*	2255*	2256*	2257*	2258*
	1.2	2259*	2260*	2261*	2262*	2263*	2264*
	1.5	2265*	2266*	2267*	2268*	2269*	2270*
	1.8	2271*	2272*	2273*	2274*	2275*	2276*
	2.0	2277*	2278*	2279*	2280*	2281*	2282*
	2.2	2283*	2284*	2285*	2286*	2287*	2288*
	2.7	2289*	2290*	2291*	2292*	2293*	2294*
	3.0	2295*	2296*	2297*	2298*	2299*	2300*
	3.3	2301*	2302*	2303*	2304*	2305*	2306*
	3.9	2307*	2308*	2309*	2310*	2311*	2312*
	4.7	2319*	2320*	2321*	2322*	2323*	2324*
	5.0	2325*	2326*	2327*	2328*	2329*	2330*
	5.6	2331*	2332*	2333*	2334*	2335*	2336*
	6.8	2337*	2338*	2339*	2340*	2341*	2342*
	8.0	2343*	2344*	2345*	2346*	2347*	2348*
	8.2	2349*	2350*	2351*	2352*	2353*	2354*
	10.0	2355*	2356*	2357*	2358*	2359*	2360*

* = A for sleeved, B for unsleeved
(1) These parts may be used in either Grade 1 or Grade 2 applications.

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MIL-C-87217/1, STYLE CHS03 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability

Rated Voltage @ +100°C (Volts,dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
100	0.001	3001*	3002*	3003*	3004*	3005*	3006*
	0.0012	3007*	3008*	3009*	3010*	3011*	3012*
	0.0015	3013*	3014*	3015*	3016*	3017*	3018*
	0.0018	3019*	3020*	3021*	3022*	3023*	3024*
	0.002	3025*	3026*	3027*	3028*	3029*	3030*
	0.0022	3031*	3032*	3033*	3034*	3035*	3036*
	0.0027	3037*	3038*	3039*	3040*	3041*	3042*
	0.0033	3043*	3044*	3045*	3046*	3047*	3048*
	0.0039	3049*	3050*	3051*	3052*	3053*	3054*
	0.0047	3055*	3056*	3057*	3058*	3059*	3060*
	0.005	3061*	3062*	3063*	3064*	3065*	3066*
	0.0056	3067*	3068*	3069*	3070*	3071*	3072*
	0.0068	3073*	3074*	3075*	3076*	3077*	3078*
	0.0082	3079*	3080*	3081*	3082*	3083*	3084*
	0.010	3085*	3086*	3087*	3088*	3089*	3090*
	0.012	3091*	3092*	3093*	3094*	3095*	3096*
	0.015	3097*	3098*	3099*	3100*	3101*	3102*
	0.018	3103*	3104*	3105*	3106*	3107*	3108*
	0.020	3109*	3110*	3111*	3112*	3113*	3114*
	0.022	3115*	3116*	3117*	3118*	3119*	3120*
	0.027	3121*	3122*	3123*	3124*	3125*	3126*
	0.033	3127*	3128*	3129*	3130*	3131*	3132*
	0.039	3133*	3134*	3135*	3136*	3137*	3138*
	0.047	3139*	3140*	3141*	3142*	3143*	3144*
	0.050	3145*	3146*	3147*	3148*	3149*	3150*
	0.056	3151*	3152*	3153*	3154*	3155*	3156*
	0.068	3157*	3158*	3159*	3160*	3161*	3162*
	0.082	3163*	3164*	3165*	3166*	3167*	3168*

* = A for sleeved. B for unsleeved
(1) These parts may be used in either Grade 1 or Grade 2 applications.

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MIL-C-87217/1, STYLE CHS03 CAPACITORS
Fixed, Supermetallized Plastic Film Dielectric, DC
Low Energy, High Impedance, High Reliability (Continued)

Rated Voltage @ +100°C (Volts, dc)	Nominal Capacitance Value (µF)	Part Number M87217/01- (1)					
		Capacitance tolerance value (in %)					
		±0.25	±0.5	±1.0	±2.0	±5.0	±10.0
100	0.10	3169*	3170*	3171*	3172*	3173*	3174*
	0.12	3175*	3176*	3177*	3178*	3179*	3180*
	0.15	3181*	3182*	3183*	3184*	3185*	3186*
	0.18	3187*	3188*	3189*	3190*	3191*	3192*
	0.20	3193*	3194*	3195*	3196*	3197*	3198*
	0.22	3199*	3200*	3201*	3202*	3203*	3204*
	0.27	3205*	3206*	3207*	3208*	3209*	3210*
	0.33	3211*	3212*	3213*	3214*	3215*	3216*
	0.39	3217*	3218*	3219*	3220*	3221*	3222*
	0.47	3223*	3224*	3225*	3226*	3227*	3228*
	0.50	3229*	3230*	3231*	3232*	3233*	3234*
	0.56	3235*	3236*	3237*	3238*	3239*	3240*
	0.68	3241*	3242*	3243*	3244*	3245*	3246*
	0.82	3247*	3248*	3249*	3250*	3251*	3252*
	1.0	3253*	3254*	3255*	3256*	3257*	3258*
	1.2	3259*	3260*	3261*	3262*	3263*	3264*
	1.5	3265*	3266*	3267*	3268*	3269*	3270*
	2.0	3271*	3272*	3273*	3274*	3275*	3276*
	2.2	3277*	3278*	3279*	3280*	3281*	3282*
	2.7	3283*	3284*	3285*	3286*	3287*	3288*
	3.0	3289*	3290*	3291*	3292*	3293*	3294*
	3.3	3295*	3296*	3297*	3298*	3299*	3300*
	3.9	3301*	3302*	3303*	3304*	3305*	3306*
	4.7	3313*	3314*	3315*	3316*	3317*	3318*
	5.0	3319*	3320*	3321*	3322*	3323*	3324*
	5.6	3325*	3326*	3327*	3328*	3329*	3330*
	6.8	3331*	3332*	3333*	3334*	3335*	3336*
	8.0	3337*	3338*	3339*	3340*	3341*	3342*
	8.2	3343*	3344*	3345*	3346*	3347*	3348*
	10.0	3349*	3350*	3351*	3352*	3353*	3354*

* = A for sleeved, B for unsleeved
(1) These parts may be used in either Grade 1 or Grade 2 applications.

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SECTION 2: SUMMARY OF STANDARD CONNECTORS

Page	Control Specification	Series	Description	Grade 1	Grade 2
2.2	40M38277		High-density, miniature, environment resistant, circular (contacts, backshells, etc., available with connector)	(1)	(1)
2.4	40M38298		Electrical, special, miniature circular, environment resisting, +200°C (contacts, backshells available with connector)		
2.6	40M39569		Miniature, +200°C, environment resistant, circular (contacts, backshells, etc., available with connector)		
2.8	GSFC S-311-P-4		Rack and panel, miniature, polarized shell, removable crimp contacts, rectangular		
2.11	GSFC S-311-P-10		Rack and panel, miniature, polarized shell, soldered contacts, electrical and coaxial contacts, rectangular		
2.13	MIL-C-5015 (2) (4)		Threaded coupling, AN type, circular rear release crimp contacts, hermetic solder contacts, contact sizes 8 and larger only	(3)	(3)
2.14	MIL-C-24308 (2)		Rack and panel, polarized shell, miniature rectangular		
2.20	MIL-C-26482 (2) (4)	2	Quick disconnect, environment resistant, miniature, circular (rear release crimp and solder contacts)		
2.21	MIL-C-38999 (2) (4)	I II III	Scoop proof, bayonet coupling Non-scoop proof, bayonet coupling, low silhouette Scoop-proof, triple start, self-locking, threaded coupling		
2.24	MIL-C-39012 (4)	N, TNC, SC, SMA	Coaxial, radio frequency		
2.26	MIL-C-39029		Contacts, electrical connector	(5)	(5)
2.28	MIL-C-55302 (4)		Printed circuit subassembly and accessories, non-environment-resisting	(3)	(3)
2.29	MIL-C-83513 (2)(4)		Rack and panel, polarized shell, microminiature, rectangular		
2.30	MIL-C-22992 (2)		Plugs and receptacles, waterproof, quick disconnect, heavy duty type	GSE use only	
2.31	MIL-C-85049 (2) (4)		Connector backshells and accessories	(5)	(5)

Refer to MIL-HDBK-978, Vol. 5, for construction and application information.

(1) Parts may be used for Grade 1 or Grade 2 applications.
(2) Cadmium plated connectors are not standard parts. Zinc plated connectors are not standard parts.
(3) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations for Grade 1 requirements.
(4) Outgassing properties of these connectors may not be controlled. Reference the detailed specification sheet to verify compliance to project outgassing requirements.
(5) Grade nomenclature is not applicable.

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40M38277 CONNECTORS (4)
Electrical, Circular, Miniature, High-Density, Environment Resisting

Part Number Explanation:

NLS	X(X)	X	X(X)	-35	X(X)	(X)
Series Prefix	Shell Style	Service Class	Shell Size	Insert Arrangement	Contact Type	Alternate (1) Polarization

Part Number	Control Specification	Specification Appendix	Configuration				Grades 1 and 2
			Style	Type	Mounting	Coupling	
NLS5HX(X)-35PS(X)	40M38277	D	Low Silhouette	Bulkhead feed-through	Jam-nut	Bayonet	(3)
NLS0EX(X)-35X(X)(X)		E		Receptacle	Flange		
NLS6EX(X)-35X(X)(X)		F		Plug	Cabled		
NLS6GEX(X)-35X(X)(X)		G		Plug	Cabled (2)		
NLS7EX(X)-35X(X)(X)		H		Receptacle	Jam-nut		
NLS3HX(X)-35X(X)(X)		J		Receptacle	Solder		
NLS7HX(X)-35X(X)(X)		K		Receptacle	Jam-nut		

(1) No letter is required for normal polarization. See Appendix B of 40M38277 for alternate polarization options.
(2) Electrical RFI grounding.
(3) Parts may be used for Grade 1 and 2 applications.
(4) Contacts and plastic dust covers are supplied with these connectors. Environmental class parts are also supplied with spare contacts, grommet sealing plugs and contact insertion/removal tools. Styles NLS0E, NLS6E, NLS6GE, and NLS7E are also supplied with short, straight backshells. Other types of backshells and accessories can be ordered separately and are listed on the following page. Metal dust covers are listed in Appendix M of 40M38277.

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Check the source to verify that 2-2 is the current version before use.

40M38277 CONNECTORS

Electrical, Circular, Miniature, High-Density, Environment Resisting, Backshells, Low Silhouette

Part Number Explanation:

NLS	-X(XX)	-X(X)	-X(X)
Series Prefix	Style	Shell Size	Clamp Size (1)

Part Number	Control Specification	Style	Shell Size
NLS-S-X(X)	40M38277	Straight with strain relief	8 through 24
NLS-R-X(X)		90°, with strain relief	
NLS-C-X(X)		Straight	
NLS-SCT-X(X)		Straight with strain relief and cable tie	
NLS-RCT-X(X)		90°, with strain relief and cable tie	
NLS-FCT-X(X)		45°, with strain relief and cable tie	
NLS-RFI-X(X)-X(X)		Straight, RFI	

(1) For RFI Style only.

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40M38298 CONNECTORS (2)

Electrical, Special, Miniature, Circular, Environment Resisting, +200°C

Part Number Explanation:

NBS	X(X)	X	8	-X	X	X
Series Prefix	Shell Style	Service Class	Shell Size	Insert Arrangement	Contact Type	Shell Polarization

Part Number	Control Specification	Specification Appendix	Configuration				Grades 1 and 2
			Style	Type	Mounting	Coupling	
NBS6E8-XXX	40M38298	B		Plug	Cabled	Bayonet	(1)
NBS7E8-XXX		C		Receptacle	Jam-nut		
NBS9E8-XXX		F	RFI Grounding	Plug	Cabled		
NBS0H8-XXX		G		Receptacle	Flange		
NBS3H8-XXX		H		Receptacle	Solder		
NBS8E8-XXX		I	90° RFI Grounding	Plug	Cabled		
NBS6GE8-XXX		J	RFI Grounding	Plug	Cabled		
NBS8GE8-XXX		K	90° RFI Grounding	Plug	Cabled		
NBS9GE8-XXX		M	RFI Grounding	Plug	Cabled		

(1) Parts may be used for Grade 1 and 2 applications.
(2) Contacts and plastic dust covers are supplied with these connectors. Environmental class parts are also supplied with spare contacts, grommet sealing plugs and contact insertion/removal tools. Only the following styles are supplied with back-shells: NBS9E, NBS8E, NBS8G, NBS9G. Refer to the individual appendices above and the following page for backshell options.

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40M38298 CONNECTORS

Electrical, Special, Circular, Miniature, Environment Resisting, +200°C, Backshells

Part Number Explanation:

NBS	-X(XX)	-8(X)
Series Prefix	Style	Shell Size

Part Number	Control Specification	Style
NBS-C-8	40M38298	Straight
NBS-S-8		Straight, with strain relief
NBS-R-8		90°, with strain relief
NBS-RFI-8 (1)		Straight, RFI, with strain relief
NBS-RFI-8R (1)		90°, RFI, with strain relief

(1) Crimp braid follower style designation is: RFIF, use Thomas and Betts Ferrule part number GSC17512NP or equivalent. The Ferrule is not supplied by the connector manufacturer.

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40M39569 CONNECTORS (2)
Electrical, Miniature Circular, Environment Resisting, +200°C

Part Number Explanation:

NB	X(X)	X	X(X)	-X(XX)	X(X)	X	(X)	(X)
Series Prefix	Shell Style	Service Class	Shell Size	Insert Arrangement	Contact Type	Polarizing Position	Backshell Accessory	Temperature Class

Part Number	Control Specification	Specification Appendix	Configuration				Grades 1 and 2
			Style	Type	Mounting	Coupling	
NB0EX(X)-X(XX)X(X)X(X)(X)	40M39569	B	—	Receptacle	Narrow flange	Bayonet	(1)
NB0HX(X)-X(XX)X(X)X(X)(X)		I		Receptacle	Narrow flange		
NB4EX(X)-X(XX)X(X)X(X)(X)		C		Receptacle	Wide flange		
NB6EX(X)-X(XX)X(X)X(X)(X)		D		Plug	Cabled		
NB7EX(X)-X(XX)X(X)X(X)(X)		E		Receptacle	Jam-nut		
NB3HX(X)-X(XX)X(X)X(X)(X)		F			Solder		
NB7HX(X)-X(XX)X(X)X(X)(X)		G			Jam-nut		
NB8HX(X)-X(XX)X(X)X(X)(X)		H	Extended pin		Jam-nut		
NB5HX(X)-X(XX)X(X)X(X)(X)		J	Pin-socket		Thru-bulkhead		
NB6GEX(X)-X(XX)X(X)X(X)(X)		O	RFI grounding	Plug	Cabled		

(1) Parts may be used for Grade 1 and Grade 2 applications.
(2) Contacts and plastic dust covers are supplied with these connectors. Environmental class parts are also supplied with spare contacts, grommet sealing plugs and contact insertion/removal tools. Only the following styles are supplied with backshells. NB0E, NB4E, NB6E, NB7E, and NB6G. Backshell styles are listed on the following page.

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40M39569 CONNECTORS
Electrical, Miniature, Circular, Environment Resisting, +200°C, Backshells

Part Number Explanation:

NB	-X(XX)	-X(X)	-X(X)
Series Prefix	Style	Shell Size	Cable Clamp Size (2)

Part Number	Control Specification	Style	Shell Size
NB-C-X(X)	40M39569	Straight	8 through 24
NB-S-X(X)		Straight with strain relief	
NB-R-X(X)		90° with strain relief	
NB-SCT-X(X) (1)		Straight with cable tie	
NB-RCT-X(X) (1)		Straight with 90° cable tie	
NB-FCT-X(X)		Straight with 45° cable tie	
NB-RFI-X(X)-X(X)		Straight RFI	

(1) Add a "N" to the end of the part number to order without a ground lug.
(2) For RFI style only.

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GSFC S-311-P-4 CONNECTORS (1)
Connectors, Electrical, Subminiature, Rack and Panel Non-Magnetic

Part Number Explanation:

311P4	XX	-X	X	-X	-XX
GSFC Control Specification	Detail Specification	Contact Arrangement	Contact Type P = pin S = socket	Residual Magnetism (Gamma) A = 2000 B = 200	Mounting Hole Diameter 12 = 0.120 inch 15 = 0.154 inch

Part Number	Control Specification	Contact Type (3)	GSFC Contact Arrangement	Number of Contacts: Standard Power	Number of Contacts: Coaxial and/or High Voltage	Grades 1 and 2
311P407-XX-X-XX	GSFC S-311-P-4	Power, Size 22D	-1 -2 -3 -4 -5 -6	15 26 44 62 78 104	-	(2)

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Parts may be used for Grade 1 and 2 applications.
(3) Contacts are supplied separately. See the following page listing S-311-P-4/06, /08 or /10 for appropriate part numbers.

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GSFC S-311-P-4 CONNECTORS (1)
Connectors, Electrical, Subminiature, Rack and Panel Non-Magnetic (Continued)

Part Number	Control Specification	Contact Type (3)	GSFC Contact Arrangement	Number of Contacts: Standard Power	Number of Contacts: Coaxial and/or High Voltage	Grades 1 and 2
311P405-XX-X-XX	GSFC S-311-P-4	Mixed, Power Size 20 & High Voltage or Coaxial Size 8 (4)	-6	4	1	(2)
			-7	0	3	
			-8	5	2	
			-9	10	1	
			-10	0	5	
			-11	5	4	
			-12	10	3	
			-13	15	2	
			-14	20	1	
			-15	0	8	
			-16	7	6	
			-17	12	5	
			-18	17	4	
			-19	17	4	
			-20	22	3	
			-21	25	2	
			-22	17	7	
			-23	32	4	
			-24	41	2	
			-25	46	1	
311P409-XX-X-XX		Power, Size 20	-1	9	-	
			-2	15		
			-3	25		
			-4	37		
			-5	50		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Parts may be used for Grade 1 and 2 applications.
(3) Contacts are supplied separately. See the following page listing S-311-P-4/06, /08 or /10 for appropriate part numbers.
(4) Coaxial contacts should be used for signals of 1 MHz frequency or less. The nylon hoods used on the high voltage contacts may not meet programs outgassing limits. See page 2.10 for contact part numbers.

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GSFC S-311-P-4 CONTACTS

Part Number Explanation:
For Coxial and High Volume Contacts:

G	X	(X)	X	X
	C = Coaxial H = High Voltage	Blank = Straight R = Right Angle	P = Pin S = Socket	Wire Accommodation (See table below)

For Standard Power Contacts:

G	(X)	X	X
	Detail Specification	P = Pin S = Socket	Wire Accommodation (See table below)

Part Number	Control Specification	Size	Wire Accommodation
GC(X)X1	S-311-P-4/06	8	RG-178B/U
GH(X)X6 (1)	S-311-P-4/06	8	20 AWG, Max
G08X1	S-311-P-4/08	22D	22 to 28 AWG
G10X1	S-311-P-4/10	20	20 to 24 AWG

(1) The nylon hood used on high voltage contacts may not meet program outgassing limits.

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GSFC S-311-P-10 CONNECTORS (1)

Connectors, Electrical, Rectangular, Miniature, Polarized Shell, Rack and Panel, Combination Solder, Coaxial and High Voltage Contacts, Non-Magnetic

Part Number Explanation:

311P10	(B)	-X(X)	X	-X	-XX
GSFC Control Specification	Socket Contact Designator No digit = contact springs B = split finger sleeved (PREFERRED)	Insert Arrangement	Contact Type P = pin S = socket	Residual Magnetism (Gamma) B = 200 C = 20	Mounting Hole Diameter 12 = 0.120 inch 15 = 0.154 inch

Part Number	Control Specification	Arrangement Number (2)	Number of Contacts		Grades 1 and 2
			Standard Power	Coxial and or High Voltage (4)	
311P10-X(X)X-X-XX	GSFC S-311-P-10	1	9		(3)
		2	15		
		3	25		
		4	37		
		5	50		
		6	4	1	
		7	0	3	
		8	5	2	
		9	10	1	
		10	0	5	
		11	5	4	
		12	10	3	
		13	15	2	
		14	20	1	
		15	0	8	

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Refer to Table II of the control specification for contact arrangements.
(3) Parts may be used for Grade 1 and 2 applications.
(4) Coaxial contacts should be used for signals of 1 Mhz frequency or less. The nylon hoods used on the high voltage contacts may not meet program outgassing limits. See page 2.10 for contact part numbers.

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GSFC S-311-P-10 CONNECTORS (1)
Connectors, Electrical, Rectangular, Miniature, Polarized Shell, Rack and Panel, Combination Solder, Coaxial and High Voltage Contacts, Non-Magnetic (Continued)

Part Number	Control Specification	Arrangement Number (2)	Number of Contacts		Grades 1 and 2
			Standard Power	Coxial and or High Voltage (4)	
311P10-X(X)X-X-XX	GSFC S-311-P-10	16	7	6	(3)
		17	12	5	
		18	17	4	
		20	22	3	
		21	25	2	
		22	17	7	
		23	32	4	
		24	41	2	
		25	46	1	

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Refer to Table II of the control specification for contact arrangements.
(3) Parts may be used for Grade 1 and 2 applications.
(4) Coaxial contacts should be used for signals of 1 Mhz frequency or less. The nylon hoods used on the high voltage contacts may not meet program outgassing limits. See page 2.10 for contact part numbers.

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MIL-C-5015, CONNECTORS (1)
Electrical, Circular, AN Type, Solder and Rear Release Crimp Contacts, Contact Sizes 0 thru 16

Part Number Explanation:

MSXXXX	X	X(X)(X)(X)	-X(X)	X	(X)
Basic Part Number	Class	Shell Size	Insert Arrangement	Contact Designator	Insert Position

Part Number (2) (3)	Control Specifications	Configuration				Seal	Grade 2
		Type (2)	Mounting	Coupling	Contacts		
MS3450XX(X)(X)(X)-X(X)X(X)	MIL-C-5015	Receptacle - Class L	Wall	Threaded	Crimp, rear release (5)	Environmental	(6)
MS3452XX(X)(X)(X)-X(X)X(X)		Receptacle - Class L	Box (4)				
MS3454XX(X)(X)(X)-X(X)X(X)		Receptacle - Class L	Jam-nut				
MS3456XX(X)(X)(X)-X(X)X(X)		Plug - Class L	Cabled				
MS3459XX(X)(X)(X)-X(X)X(X)		Plug - Class L	Cabled	Threaded, self-locking			

(1) These connectors may require material testing per NHB8060.1 and ASTM E 595. Consult the project engineer for program requirements.
(2) Cadmium plated connectors are not standard parts.
(3) Caution: It may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(4) The back of this connector is not protected against moisture or debris.
(5) Crimp removable contacts, if ordered separately, shall be procured to MIL-C-39029.
(6) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Nickel Finished Polarized Shell, Gold Plated Nonremovable Solder Contacts

Part Number Explanation:

M	24308/X	-X(X)
Military Designator	Specification Sheet Number	Dash Number

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Solder Contacts		
M24308/1-34	MIL-C-24308	Receptacle	Box	Auxiliary bolt	9	Non-environmental	(3)
/1-35					15		
/1-36					25		
/1-37					37		
/1-38					50		
M24308/3-23		Plug	Cabled		9		
/3-24					15		
/3-25					25		
/3-26					37		
/3-27					50		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution: it may be necessary to order accessories such as backshells, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Nickel Finished Polarized Shell, Gold Plated Removable Crimp Contacts

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Crimp Contacts (3)		
M24308/2-516	MIL-C-24308	Receptacle	Box	Friction or Auxiliary bolts	9	Non-environmental	(4)
/2-517					15		
/2-518					25		
/2-519					37		
/2-520					50		
M24308/4-335		Plug	Cabled		9		
/4-336					15		
/4-337					25		
/4-338					37		
/4-339					50		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Contacts, if ordered separately, shall be procured to MIL-C-39029.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Nickel Finished Polarized Shell High-Density, Gold Plated Removable Crimp Contacts

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Crimp Contacts (3)		
M24308/2-526	MIL-C-24308	Receptacle	Box	Auxiliary bolt	15	Non-environmental	(4)
/2-527					26		
/2-528					44		
/2-529					62		
/2-530					78		
/2-531					104		
M24308/4-345		Plug	Cabled		15		
/4-346					26		
/4-347					44		
/4-348					62		
/4-349					78		
/4-350					104		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Contacts, if ordered separately, shall be procured to MIL-C-39029.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Gold Finished Polarized Shell, Gold Plated Nonremovable Solder Contacts

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Solder Contacts		
M24308/5-34	MIL-C-24308	Receptacle	Box	Auxiliary bolt	9	Non-environmental	(3)
/5-35					15		
/5-36					25		
/5-37					37		
/5-38					50		
M24308/7-23		Plug	Cabled		9		
/7-24					15		
/7-25					25		
/7-26					37		
/7-27					50		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Gold Finished Polarized Shell, Gold Plated Removable Crimp Contacts

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Crimp Contacts (3)		
M24308/6-502	MIL-C-24308	Receptacle	Box	Friction or Auxiliary bolts	9	Non-environmental	(4)
/6-503					15		
/6-504					25		
/6-505					37		
/6-506					50		
M24308/8-335		Plug	Cabled		9		
/8-336					15		
/8-337					25		
/8-338					37		
/8-339					50		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Contacts, if ordered separately, shall be procured to MIL-C-39029.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-24308, CONNECTORS (1)
Electrical, Rectangular, Miniature, Rack and Panel, Gold Finished Polarized Shell, High-Density, Gold Plated Removable Crimp Contacts

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling (2)	Crimp Contacts (3)		
M24308/6-512	MIL-C-24308	Receptacle	Box	Auxiliary bolt	15	Non-Environmental	(4)
/6-513					26		
/6-514					44		
/6-515					62		
/6-516					78		
/6-517					104		
M24308/8-345		Plug	Cabled		15		
/8-346					26		
/8-347					44		
/8-348					62		
/8-349					78		
/8-350					104		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.
(2) Caution; it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Contacts, if ordered separately, shall be procured to MIL-C-39029.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-26482, CONNECTORS, SERIES 2 (1)
Electrical, Circular, Miniature, Quick Disconnect, Environment Resistant

Part Number Explanation:

MSXXXX	X	X(X)	X (or -)	X(X)	X	(X)
Basic Part Number	Class	Shell Size	Termination and Shell Material, Hermetic (2)	Insert Arrangement	Contact Style	Insert Position

Part Number (3) (4)	Control Specification	Configuration				Seal	Grade 2
		Type (3)	Mounting	Coupling	Contacts (5)		
MS3470XX(X)-X(X)XX MS3472XX(X)-X(X)XX MS3474XX(X)-X(X)XX	MIL-C-26482	Receptacle Classes L & A	Narrow flange Wide flange Jam-nut	Bayonet	Crimp, rear release	Environmental	(6)
MS3475XX(X)-X(X)XX		Plug, Class L, RFI shielded	Cabled				
MS3476XX(X)-X(X)XX		Plug, Classes L & A	Cabled				
MS3449XX(X)XX(X)XX		Receptacles, Class H	Jam-nut		Solder	Hermetic	

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Dash (-) denotes nonhermetic.
(3) Cadmium plated connectors are not standard parts.
(4) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/ standards listed or referenced in this connector specification.
(5) Crimp removable contacts, if ordered separately, shall be procured to MIL-C-39029.
(6) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 application.

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MIL-C-38999, CONNECTORS (SERIES I) (1)
Electrical, Circular, Miniature, High-Density, Quick Disconnect
Environment Resistant, Removable Crimp and Hermetic Solder Contacts

Part Number Explanation:

MSXXXXX	X	X(X)	X	X(X)	X	(X)
MS Number	Class T = environmental Y = hermetic	Shell Size	Finish	Insert Arrangement Number	Style (P or S)	Polarization (no letter required for normal)

Part Number (2) (3)	Control Specification	Configuration				Seal	Grade 2
		Type (2)	Mounting	Coupling	Contacts (4)		
MS27466TX(X)XX(X)X(X)	MIL-C-38999	Receptacle	Wall-flange	Bayonet	Crimp	Environmental	(5)
MS27467TX(X)XX(X)X(X)		Plug, straight	Cabled		Crimp	Environmental	
MS27468TX(X)XX(X)X(X)		Receptacle	Jam-nut		Crimp	Environmental	
MS27470YX(X)XX(X)X(X)		Receptacle	Jam-nut		Solder	Hermetic	
MS27471YX(X)XX(X)X(X)		Receptacle	Solder		Solder	Hermetic	
MS27656TX(X)XX(X)X(X)		Receptacle	Back panel, wall-flange		Crimp	Environmental	
MS27662TX(X)XX(X)X(X)		Receptacle	Thru-bulkhead		Feed through	Environmental	

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Cadmium plated connectors are not standard parts.
(3) Caution; it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(4) Crimp removable contacts, if ordered separately, shall be procured to MIL-C-39029.
(5) Parts may be used in Grade 2 applications; consult project engineer for recommendation on Grade 1 applications.

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MIL-C-38999, CONNECTORS (SERIES II, LOW SILHOUETTE) (1)
Electrical, Circular, Miniature, High-Density, Quick Disconnect, Environment Resistant, Removable Crimp and Hermetic Solder Contacts

Part Number (2) (3)	Control Specification	Configuration				Seal	Grade 2
		Type (2)	Mounting	Coupling	Contacts (4)		
MS27472TX(X)XX(X)X(X)	MIL-C-38999	Receptacle	Wall-flange	Bayonet	Crimp	Environmental	(5)
MS27474TX(X)XX(X)X(X)		Receptacle	Jam-nut		Crimp	Environmental	
MS27477YX(X)XX(X)X(X)		Receptacle	Jam-nut		Solder	Hermetic	
MS27478YX(X)XX(X)X(X)		Receptacle	Solder		Solder	Hermetic	
MS27484TX(X)XX(X)X(X)		Plug,straight	Cabled		Crimp	Environmental	
MS27497TX(X)XX(X)X(X)		Receptacle	Back panel, wall-flange		Crimp	Environmental	

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Cadmium plated connectors are not standard parts.
(3) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(4) Crimp removable contacts, if ordered separately, shall be procured to MIL-C-39029.
(5) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-38999, CONNECTORS (SERIES III, SCOOP PROOF) (1)
Electrical, Circular, Miniature, High-Density, Quick Disconnect, Environment Resistant, Removable Crimp and Hermetic Solder Contacts

Part Number Explanation:

D38999/	XX	X	X	XX	X	X
Military Specification Number	Slash Sheet	Class (5)	Shell	Insert Arrangement Number	Contact Style	Polarization Position

Part Number (2)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling	Contacts (3)		
D38999/20XXXXXX	MIL-C-38999	Receptacle	Wall-flange	Bayonet	Crimp	Environmental	(4)
D38999/21XXXXXX		Receptacle	Box-flange		Solder	Hermetic	
D38999/23XXXXXX		Receptacle	Jam-nut		Solder	Hermetic	
D38999/24XXXXXX		Receptacle	Jam-nut		Crimp	Environmental	
D38999/25XXXXXX		Receptacle	Solder		Solder	Hermetic	
D38999/26XXXXXX		Plug,straight	Cabled		Crimp	Environmental	
D38999/27XXXXXX		Receptacle	Weld		Solder	Hermetic	

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Caution: it may be necessary to order accessories such as backshells, contacts, protective caps, and sealing plugs separately. Precautions must be taken to select accessories from military specifications/standards listed or referenced in this connector specification.
(3) Crimp removable contacts, if ordered separately, shall be procured to MIL-C-39029.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.
(5) Cadmium plated connectors are not standard parts.

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MIL-C-39012, CONNECTORS (1)
Coaxial, Radio Frequency

Part Number Explanation:

M39012	/XX	-XXXX
Mil Number Prefix	Specification Sheet Number	Dash Number

Part Number (2)	Control Specification	Series	Configuration			Impedance Nominal (Ohms)	Class	Applicable Cable Number (3)	Grade 2
			Type	Mounting	Contacts				
M39012/01-0501	MIL-C-39012	N	Plug	Cabled	Pin	50	2	RG-393	(4)
M39012/01-0503			Plug	Cabled	Pin			RG-142,RG-400	
M39012/03-0501			Receptacle	Cabled, jam-nut, rear	Socket			RG-393	
M39012/03-0503			Receptacle	Cabled, jam-nut, rear	Socket			RG-142,RG-400	
M39012/04-0001			Receptacle, Hermetic	Uncabled, jam-nut, front	Socket				
M39012/04-0002			Receptacle	Flange, rear	Socket				
M39012/04-0003			Receptacle	Uncabled, jam-nut, rear	Socket				
M39012/26-0101		TNC	Plug	Cabled	Pin			RG-142,RG-400	
M39012/26-0104								RG-303	
M39012/26-0117								RG-302	
M39012/26-0018								RG-316	

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Cadmium plated connectors are not standard parts.
(3) See Section 14, MIL-C-17, in this standard.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-39012, CONNECTORS (1)
Coaxial, Radio Frequency (Continued)

Part Number (2)	Control Specification	Series	Configuration			Impedance Nominal (Ohms)	Class	Applicable Cable Number (3)	Grade 2
			Type	Mounting	Contacts				
M39012/28-0101	MIL-C-39012	TNC	Receptacle	Cabled, jam-nut, rear	Socket	50	2	RG-142,RG-400	(4)
M39012/28-0104			Receptacle	Cabled, jam-nut, rear	Socket			RG-303	
M39012/28-0117			Receptacle	Cabled, jam-nut, rear	Socket			RG-302	
M39012/28-0018			Receptacle	Cabled, jam-nut, rear	Socket			RG-316	
M39012/34-0001			Receptacle, hermetic	Uncabled, jam-nut, front	Socket				
M39012/34-0002			Receptacle, hermetic	Uncabled, jam-nut, rear	Socket				
M39012/55-3006		SMA	Plug	Cabled	Pin			RG-178	
M39012/55-3007			Plug	Cabled	Pin			RG-316	
M39012/55-3009			Plug	Cabled	Pin			RG-142	
M39012/55-3010			Plug	Cabled	Pin			RG-303	
M39012/57-3006			Receptacle	Cabled	Socket			RG-178	
M39012/57-3007			Receptacle	Cabled	Socket			RG-316	
M39012/57-3009			Receptacle	Cabled	Socket			RG-142	
M39012/57-3010			Receptacle	Cabled	Socket			RG-303	
M39012/60-3001			Receptacle	Uncabled, flange, rear	Socket				
M39012/60-3002			Receptacle	Uncabled, flange, rear	Socket				
M39012/61-3001			Receptacle	Uncabled, jam nut, rear	Socket				
M39012/61-3002			Receptacle	Uncabled, jam-nut, rear	Socket				

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.
(2) Cadmium plated connectors are not standard parts.
(3) See Section 14, MIL-C-17, in this standard.
(4) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-39029, CONTACTS
Crimp Removable, Electrical Connector

Part number explanation:

M39029/X(X) — Basic Part Number

-XXX — Bin Code

Part Number	Control Specification	Connector Specification	Contact Size		Wire Sizes	
			Pins	Sockets		
M39029/4-110	MIL-C-39029/4	MIL-C-26482 Series 2 (Pins)	20		20, 22, 24	
M39029/4-111			16		16, 18, 20	
M39029/4-113			12		12, 14	
M39029/5-115	MIL-C-39029/5	MIL-C-26482 Series 2 (Sockets)		20	20, 22, 24	
M39029/5-116				16	16, 18, 20	
M39029/5-118				12	12, 14	
M39029/29-214	MIL-C-39029/29	MIL-C-5015 (Pins)	8		8	10 (1)
M39029/29-215			4		4	6 (1)
M39029/29-216			0		0, 1	2 (1)
M39029/30-220	MIL-C-39029/30	MIL-C-5015 (Sockets)		8	8	10 (1)
M39029/30-221				4	4	6 (1)
M39029/30-222				0	0, 1	2 (1)

(1) These wires require electrically conductive bushings in accordance with MS3348.

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MIL-C-39029, CONTACTS
Crimp Removable, Electrical Connector (Continued)

Part Number	Control Specification	Connector Specification	Contact Size		Wire Sizes
			Pins	Sockets	
M39029/56-348	MIL-C-39029/56	MIL-C-38999 Series I & III (Sockets)	—	22D	22, 24, 26
M39029/56-351				20	20, 22, 24
M39029/56-352				16	16, 18, 20
M39029/56-353				12	12, 14
M39029/57-354	MIL-C-39029/57	MIL-C-38999 Series II (Sockets)		22D	22, 24, 26
M39029/57-357				20	20, 22, 24
M39029/57-358				16	16, 18, 20
M39029/57-359				12	12, 14
M39029/58-360	MIL-C-39029/58	MIL-C-38999 Series I, II & III (Pins)	22D	—	22, 24, 26
M39029/58-363			20		20, 22, 24
M39029/58-364			16		16, 18, 20
M39029/58-365			12		12, 14
M39029/106-614	MIL-C-39029/106	MIL-C-38999 Series III (Sockets)		22D	22, 24, 26
M39029/106-615				20	20, 22, 24
M39029/106-616				16	16, 18, 20
M39029/106-617				12	12, 14
M39029/107/620	MIL-C-39029/107	MIL-C-38999 Series III (Pins)	22D		
M39029/107-621			20		
M39029/107-622			16		
M39029/107/623			12		
M39029/63-368	MIL-C-39029/63	MIL-C-24308 (Sockets)	—	20	20, 22, 24
M39029/64-369	MIL-C-39029/64	MIL-C-24308 (Pins)	20	—	20, 22, 24

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MIL-C-55302, CONNECTORS, PRINTED CIRCUIT (1)
Subassembly And Accessories
Non Environment-Resisting

Part Number Explanation:

M55302	/XX	(X)	(X)	XX(X)	(X)
Military Number Prefix	Spec Sheet Number	Type of Contacts	Type of Terminal	Number of Contacts	Type of Mounting Hardware

Part Number	Control Specification	Type	Type of Terminal	Number of Contacts	Type of Mounting Hardware	Grade 2
M55302/55-XXXX	MIL-C-55302	Plug	(2)	10 thru 70	L = 0.700 slotted turning jackscrew M = 0.500 slotted turning jackscrew S = 0.200 slotted turning jackscrew H = 0.200 turning jackscrew hex F = fixed jackscrew X = full round Y = D-shaped	(3)
M55302/56-XXXX		Receptacle				
M55302/57-XXXX		Plug				
M55302/58-XXXX		Receptacle				
M55302/59-XXXX		Plug		90, 100 and 120		
M55302/60-XXXX		Receptacle				
M55302/61-XXXX		Plug		10 thru 70		
M55302/62-XXXX		Receptacle				
M55302/63-XXXX		Plug				
M55302/64-XXXX		Receptacle				
M55302/65-XXXX		Receptacle	Crimp Removable			
M55302/66-XXXX		Receptacle	Crimp Removable			

(1) These connectors may require material testing per ASTM E 595 and NHB8060.1. Consult the project parts engineer for program requirements.

(2) Available terminal types: solder cup, 0.109 inch long DIP, 0.140 inch long DIP, 0.172 inch long DIP, 0.058 inch flexible circuit, 0.234 inch long DIP, 0.100 inch flexible circuit. See specification sheets for corresponding letter identifiers.

(3) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

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MIL-C-83513, CONNECTORS (1)

Electrical, Rectangular, Microminiature, Polarized Shell, Crimp and Solder Contacts

Part Number Explanation:

M83513/0X-	X	(XX)	(N)
Specification	Insert Arrangement A = 9 E = 31 B = 15 F = 37 C = 21 G = 51 D = 25 H = 100	Wire Type (2)	Shell Finish N = Electroless Nickel

Part Number (1)	Type	Contacts	Shell	Grade 2
M83513/1-XN M83513/2-XN	Plug Receptacle	Solder	Electroless Nickel Plated Aluminum	(3), (4)
M83513/3-XXXN M83513/4-XXXN	Plug Receptacle	Crimp with M22759/11 or M22759/33 Pigtails		
M83513/6-X M83513/7-X	Plug Receptacle	Solder	All Plastic	
M83513/8-XXX M83513/9-XXX	Plug Receptacle	Crimp with M22759/11 or M22759/33 Pigtails		

(1) These connectors may require material testing per NHB8060.1 for manned space flight applications.

(2) Connectors supplied with wire types 05, 06, 07 and 08 (uninsulated copper wire pigtails) are not approved as standard parts.

(3) Parts may be used in Grade 2 applications; consult project parts engineer for recommendations on Grade 1 applications.

(4) Mounting hardware is ordered separately. For insert arrangements A through G, use MIL-C-83513/5 configurations A and B. For insert arrangement H, where applicable, use MIL-C- 83513/5 configuration C.

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MIL-C-22992, CONNECTORS

Electrical, Circular, Heavy Duty, Quick Disconnect Waterproof, Threaded Coupling (Use for Ground Support Equipment only; may not be used for Space applications.)

Part Number Explanation:

MSXXXXX	X	X	XX	X	X(X)	X
Military Spec No.	Type/ Mounting	Class (1)	Shell Size (2)	Finish (3)	Insert Arrangement (4)	Contact Type (5)

Part Number (6)	Control Specification	Configuration				Seal	Grade 2
		Type	Mounting	Coupling	Contacts		
MS17343XXXXX(X)X	MIL-C-22992	Receptacle	Wall flange	Threaded	Solder	Classes C and R (1)	(6)
MS17344XXXXX(X)X		Plug	Cabled				
MS17345XXXXX(X)X		Plug	Cabled				
MS17346XXXXX(X)X		Receptacle	Box flange				
MS17347XXXXX(X)X		Receptacle	Wall—jam-nut				
MS17348XXXXX(X)X		Receptacle	Box—jam-nut				

(1) Class C = pressurized, Class R = environment resisting.
(2) Shell sizes: 12, 14, 16, 18, 20, 22, 24, 28, 32, 36, 40, and 44.
(3) Cadmium plated connectors are not considered standard parts.
(4) Insert arrangements per MS33681 and MS33691.
(5) Contact types: P = pin, S = socket.
(6) Use on ground support equipment only.

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MIL-C-85049
Connector Accessories, Electrical

Part Number	For Use With Connector Specification	Accessory Description	Configuration	Finish	Category	Notes
M85049/42-XXDN	MIL-C-5015 Solder Contacts	Strain Relief (Saddle Clamp)	Straight	Nickel	4A	(1), (2)
M85049/42-XXDS				Passivate		
M85049/6-XXN	MIL-C-5015 Crimp, Rear Release Contacts	Backshell, Environmental Shield Termination	45°	Nickel	1A	(1)
M85049/8-XXN			90°			
M85049/10-XXN			Straight			
M85049/7-XXN		Backshell, Environmental	45°			
M85049/9-XXN			90°			
M85049/11-XXN			Straight			
M85049/24-XXN		Backshell, Nonenvironmental, Shield Termination	90°		3A	
M85049/25-XXN			Straight			
M85049/3AXXXX	MIL-C-22992	Backshell, Cable Sealing	Straight	Black Anodized	1A	(3), (4)
M85049/4AXXXX		Backshell, Cable Sealing, Step-Up				
M85049/5AXXXX		Backshell Cable Sealing Step-Down				

(1) The dash number (-XX) corresponds to the shell size and configuration of the connector and wire (cable) bundle accommodation ranges. Consult the specification sheet for application information.
(2) The MIL-C-85049/42 is also used to provide strain relief for the MIL-C-85049/6, /7, /8, /9, /10, and /11 connector accessories.
(3) The dash number (XXXX) represents the size, type and style of the accessory. Consult the specification sheet for application information.
(4) Type A is for use with MS17344. Type B is for use with MS17343, MS17345 and MS17347.

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MIL-C-85049
Connector Accessories, Electrical

PART NUMBER (1)	For Use With Connector Specification	Accessory Description	Configuration	Finish	Category	Notes
M85049/6-XXN	MIL-C-26482 Series 2	Backshell, Environmental Shield Termination	45°	Nickel	1A	(1)
M85049/8-XXN			90°			
M85049/10-XXN			Straight			
M85049/7-XXN		Backshell, Environmental	45°			
M85049/9-XXN			90°			
M85049/11-XXN			Straight			
M85049/24-XXN		Backshell, Nonenvironmental, Shield Termination	90°		3A	
M85049/25-XXN			Straight			
M85049/42-XXDN		Strain Relief (Saddle Clamp)		Nickel	4A	(1), (2)
M85049/42-XXDS				Passivate		
M85049/43-XXN			45°	Nickel	4B	(1)
M85049/51SXXN			90°	Nickel		
M85049/51SXXA						
M85049/52SXXN			Straight	Anodized		
M85049/52SXXA				Nickel		
				Anodized		

(1) The dash number (-XX) corresponds to the shell size and configuration of the connector and wire bundle accommodation ranges. Consult the specification sheet for application information.

(2) The MIL-C-85049/42 cable clamp is used to provide strain relief for the connector accessories MIL-C-85049/6, /7, /8, /9, /10, and /11.

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MIL-C-85049
Connector Accessories, Electrical

Part Number (1)	For Use With Connector Specification	Accessory Description	Configuration	Finish	Category	Notes
M85049/47SNXX	MIL-C-38999 Series I & II	Cable Clamp	90°	Nickel	4B	
M85049/47SSXX				Passivate		
M85049/49-2SXXN			Straight	Nickel		
M85049/49-2SXXS				Passivate		
M85049/56-XXN		Strain Relief	Straight	Nickel	4C	(2)
M85049/57SXXN			45°			(2), (3)
M85049/63SXXN			90°			
M85049/17XXNXX(X)		Backshell, Environmental, Shield Termination	Straight		2B	(4)
M85049/36XXNXX(X)		Backshell, Nonenvironmental, Shield Termination			3B	
M85049/38SXXN	MIL-C-38999 Series III	Cable Clamp		Nickel	4C	
M85049/38SXXS				Passivate		
M85049/38-XXA				Anodized		
M85049/39SXXN			90°	Nickel		
M85049/39SXXS				Passivate		
M85049/39-XXA				Anodized		
M85049/15SXXN		Strain Relief	45°	Nickel		
M85049/16SXXN			90°			
M85049/18XXNXX(X)		Backshell, Environmental, Shield Termination	Straight		2B	(4)
M85049/19XXNXX(X)		Backshell, Nonenvironmental, Shield Termination				
M85049/20-XXN		Backshell, Nonenvironmental			3B	

(1) The "XX" in the part number represents the dash number. Consult the specification sheet for application information.
(2) The strain relief is used with MS3367-1-X plastic strap, MIL-T-713 lacing twine, or MIL-T-43435 lacing tape or equivalent, that is not supplied with the backshell.
(3) The "S" is for the self-locking configuration; "G" would be self-locking with groundlug.
(4) The "XX(X)" is for clamp size and length code. Omit (X) for standard length.

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Section 3: Summary of Standard Crystals and Crystal Oscillators (1)

Page	Control Specification	Description	Frequency Range (Hz)	Grade	
				1	2
3.1	MIL-O-55310	Crystal Oscillators, Type 1	0.1 to 80M	S	B
3.6	MIL-C-49468 (2)	Crystal Units, Quartz, Precision	—	—	—

(1) Refer to MIL-HDBK-978, Vol. 4 for construction and application guidelines.
(2) Presently there are no Grade 1 or Grade 2 parts available. Refer to the Candidate Parts List (CPL) for additional information.

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MIL-O-55310, Oscillators, Crystal

Part Number Explanation:

M55310/XX-	X	XX	X	XXXXXXXX
Military specification designator and specification sheet number	Product assurance level (S or B)	Dash Number	Operating temperature range A = -55°C to +125°C (1) B = -55°C to +105°C C = -20°C to +70°C	Frequency

Part Number	Type	Out Frequency Range (Hz)		Construction Technology	Output Waveform	Output Compatibility	Grade	
		Min	Max				1	2 (4)
M55310/08-XXXXXXXXXXXX	1	50	50M	Hybrid	Square	TTL	S(2)	B
M55310/14-XXXXXXXXXXXX	1	0.1	25M				(3)	
M55310/16-XXXXXXXXXXXX	1	0.1	60M				S(5)	

(1) Temperature range A applicable for Class B oscillators only.
(2) Frequency available for Class S is 512 Hz through 1KHz only.
(3) Presently there are no Grade 1 parts available.
(4) For Grade 2 applications, parts shall be screened in accordance with Appendix B.
(5) Minimum frequency available for Class S is 16KHz.

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MIL-O-55310/08, Oscillator, Crystal, Type I
Hermetic Seal, Square Wave, TTL (1)

Dash Number (2)		Output Frequency Range (Hz)		Input Current Max at 5.25 Vdc (mA) (3)	Output Voltage (4)		Rise and Fall Time Max (ns)(5)	Duty Cycle at 1.4 Vdc (%)	Frequency Tolerance (ppm)			Configuration
Grade 1 (6)	Grade 2	Min	Max		Logic 1 Min (Vdc)	Logic 0 Max (Vdc)			-55 to +125°C A	-55 to +105°C B	-20 to +70°C C	
	B01AXXXXXXXX	1K	150K	158								
	B02AXXXXXXXX	150K	300K	94								14 pin
	B03AXXXXXXXX	300K	600K	94				45/55				DIP
	B04AXXXXXXXX	600K	2.5M	50			15					1 = output
	B05AXXXXXXXX	2.5M	5M	50	2.4	0.5						2 = case
	B06AXXXXXXXX	5M	10M	35	at	at			±50	±40	±25	8 = B-(GND)
	B07AXXXXXXXX	10M	20M	25	400µA	16mA						14 = B+
	B08AXXXXXXXX	20M	30M	35	source	sink	5	40/60				3-7 = NC
	B09AXXXXXXXX	30M	50M	50			5					9-13 = NC
S10BXXXXXXXX	B10AXXXXXXXX	50	1K	158			15					

(1) Operating supply voltage of 5.0V ±5%.
(2) Temperature range A applicable for Class B oscillators only.
(3) Maximum input current for no load condition.
(4) Capable of driving 1-10 standard TTL loads. A TTL load = 1.6 mA sink, 0.04 mA source, and 2pF capacitance.
(5) Measurement taken between 2.0V and 0.8V levels.
(6) Frequency available for Class S is 512 Hz through 1KHz only.

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MIL-O-55310/14, Oscillator, Crystal, Type 1
Hermetic Seal, Square Wave, TTL (1)

Dash Number (2)		Output Frequency Range (Hz)		Input Current Max at 5.5 Vdc (mA) (3)	Output Voltage (4)		Rise and Fall Time Max (ns)(5)	Duty Cycle at 1.4 Vdc (%)	Frequency Tolerance (ppm)			Configuration
Grade 1 (6)	Grade 2	Min	Max		Logic 1 Min (Vdc)	Logic 0 Max (Vdc)			-55 to +125°C A	-55 to +105°C B	-20 to +70°C C	
	B01AXXXXXXXX	0.1	1K	158								
	B02AXXXXXXXX	1K	150K	158								14 pin
	B03AXXXXXXXX	150K	300K	94	2.4	0.5						DIP
	B04AXXXXXXXX	300K	600K	94	at	at	15	45/55				5 = output
	B05AXXXXXXXX	600K	2.5M	50	400µA	16mA			±50	±40	±30	7 = B-(GND/Case)
	B06AXXXXXXXX	2.5M	5M	40	source	sink						4 = B+
	B07AXXXXXXXX	5M	10M	30								1-3 = NC
	B08AXXXXXXXX	10M	15M	20				40/60				6 = NC
	B09AXXXXXXXX	15M	25M	20			5					8-14 = NC

(1) Operating supply voltage of 5.0V ±10%.
(2) Temperature range A applicable to Class B oscillators only.
(3) Maximum input current for no load condition.
(4) Capable of driving 1-10 standard TTL loads. A TTL load = 1.6 mA sink, 0.04 mA source, and 2pF capacitance.
(5) Measurement taken between 2.0V and 0.8V levels.
(6) There are no Grade 1 parts presently available.

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MIL-O-55310/16, Oscillator, Crystal, Type 1
Hermetic Seal, Square Wave, TTL (1)

Dash Number (2)		Output Frequency Range (Hz)		Input Current Max at 5.25 Vdc (mA) (4)	Output Voltage (5)		Rise and Fall Time Max (ns)(6)	Duty Cycle at 1.4 Vdc (%)	Frequency Tolerance (ppm)			Configuration
Grade 1 (3)	Grade 2	Min	Max		Logic 1 Min (Vdc)	Logic 0 Max (Vdc)			-55 to +125°C A	-55 to +105°C B	-20 to +70°C C	
—	B01AXXXXXXXX	0.1	250	158	2.4	0.5	15	45/55	±50	±40	±25	14 pin DIP 8 = output 7 = B-(GND/Case) 14 = B+ 1-6 = NC 9-13 = NC
	B04AXXXXXXXX	0.1	250	158					±100	±80	±50	
S11BXXXXXXXX	B11AXXXXXXXX	250	150K	94					±50	±40	±25	
S14BXXXXXXXX	B14AXXXXXXXX	250	150K	94					±100	±80	±50	
S21BXXXXXXXX	B21AXXXXXXXX	150K	5M	70					±50	±40	±25	
S24BXXXXXXXX	B24AXXXXXXXX	150K	5M	70					±100	±80	±50	
S31BXXXXXXXX	B31AXXXXXXXX	4M	20M	30				40/60	±50	±40	±25	
S34BXXXXXXXX	B34AXXXXXXXX	4M	20M	30					±100	±80	±50	
S41BXXXXXXXX	B41AXXXXXXXX	20M	60M	65			5		±50	±40	±25	
S44BXXXXXXXX	B44AXXXXXXXX	20M	60M	65					±100	±80	±50	

(1) Operating supply voltage of 5.0V ±5%.
(2) Temperature range A applicable to Class B oscillators only.
(3) Minimum frequency available for Class S is 16KHz.
(4) Maximum input current for no load condition.
(5) Capable of driving 1-10 standard TTL loads, except dash 41 and 44 are limited to a maximum of 6TTL load. A TTL load = 1.6 mA sink, 0.04 mA source, and 2pF capacitance.
(6) Measurement taken between 2.0V and 0.8V levels.

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MIL-C-49468, Crystal Units, Quartz, Precision

There are no qualified sources available for the Grade 1 or Grade 2 Crystals. A number of slash sheets are listed on the Candidate Parts List (CPL) as potential candidates for space flight applications.

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SECTION 4: SUMMARY OF STANDARD DIODES

Page	Control Specification	Description	Type Designation	
			Grade 1	Grade 2 (1)
4.2	MIL-S-19500	Small signal	JANS	JANTXV
4.2		Power		
4.3		Multiple array		
4.3		Monolithic array		
4.4		Zener - voltage regulator		
4.5		Zener - voltage suppressor		
4.5		Bidirectional voltage suppressor		
4.6		FET - current regulator		
4.6		Schottky barrier		
4.7		Thyristor		

Refer to MIL-HDBK-978, Vol. 2, for construction and application information.

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500 DIODES, SILICON

Part Number Explanation:

JAN	TXV	X (2)	IN	XXXX	B	-1
Military Qualified	Quality Level	Radiation Hardness Assurance (RHA)	Component Designation	Identification Number	Modifier	Metallurgical Bonding

	Total Ionizing Dose (RAD (Si))	Neutron Fluence (N/cm²)
M	3×10^3	2×10^{11}
D	1×10^4	2×10^{12}
R	1×10^5	1×10^{13}
H	1×10^6	1×10^{13}

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics: V_F (Max) at I_F (pk) (V)	V_F (Max) at I_F (pk) (A)	I_R (Max) at V_R (μA)	I_R (Max) at V_R (V)	I_o (Max avg)	C_t (Max) (pF)	t_{rr} (Max) (ns)	Pkg Outline	Remarks
Small signal	1N645-1 (4)	1N645-1					225					
	1N647-1 (4)	1N647-1	/240	1.0	400 mA	50 nA	400	400 mA	20	—	A1	Rectifier
	1N649-1 (4)	1N649-1					600					
	1N6661	—					225					
	1N6662	—	/587	1.0	400 mA	50 nA	400	500 mA	20	_	A1	Rectifier
	1N6663	—					600					
	1N4148-1 (3)	1N4148-1 (3)	/116	1.0	10 mA	0.5	75	200 mA	4.0	5		
	1N4150-1	1N4150-1	/231	0.86	50 mA	0.1	50	200 mA	2.5	4		
		1N4153-1	/337	0.81	10 mA	0.05	50	150 mA	2.0	4		
		1N6638	/578	0.8	10 mA	0.5	125	300 mA	2.0	4.5	DO-204	
	1N6642.U	1N6642.U	/578	1.0	10 mA	0.5	75	300 mA	5.0	5.0		
	1N6643.U	1N6643.U	/578	1.0	10 mA	0.5	50	300 mA	5.0	6.0		
Power	1N5415	1N5415					50		550	150		
	1N5416	1N5416					100		430	150		
	1N5417	1N5417	/411	1.5	9 A	1.0	200	3 A	250	150	A248	Fast switching
	1N5418	1N5418					400		165	150		
	1N5419	1N5419					500		140	250		
	1N5420	1N5420					600		120	400		

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

(2) Include only for JANTXV and JANS product assurance level devices.

(3) New designs shall use MIL-S-19500/578.

(4) New designs shall use MIL-S-19500/587.

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MIL-S-19500 DIODES, SILICON (Continued)

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics: V_F (Max) at I_F (pk) (V)	I_F (pk) (A)	I_R (Max) at V_R (μA)	V_R (V)	I_o (Max avg) (A)	C_t (Max) (Pf)	t_{rr} (Max) (ns)	Pkg Outline	Remarks
Power (Continued)	1N5615	1N5615					200		45	150		
	1N5617	1N5617					400		35	150		
	1N5619	1N5619	/429	1.6	3 A	0.5	600	1A	25	250	A248	
	1N5621	1N5621					800		20	300		
	1N5623	1N5623					1000		15	500		Fast switching
	—	1N3891, A, AR	/304	1.5	38 A	10	200	12A (T_C = 100°C)	—	200	DO-203	
		1N3893, A, AR	/304	1.5	38 A	10	400	12A (T_C = 100°C)		200	DO-203	
		1N1202A	/260	1.35	38 (2)	5.0	200	12A (T_C = 150°C)		10 μs	DO-203	
	1N5550	1N5550		1.2			200					
	1N5551	1N5551		1.2			400					
	1N5552	1N5552	/420	1.2	9 (2)	1.0	600	3			A1	
	1N5553	1N5553		1.3			800					
	1N5554	1N5554		1.3			1000		—	2.0 μs		Rectifier
	1N5614	1N5614					200					
	1N5616	1N5616					400					
	1N5618	1N5618	/427	1.3	3 (2)	0.5	600	1			A248	
		1N5620					800					
		1N5622					1000					
	1N5802, US	—		0.975	2.5 (2)	1.0	50	1	25	25	A248	
	1N5804	1N5804		0.975	2.5 (2)	1.0	100	1	25	25	A248	
	1N5806	1N5806	/477	0.975	2.5 (2)	1.0	150	1	25	25	A248	
	1N5807, US	—		0.925	6.0 (2)	5.0	50	3	60	30	A1	Fast recovery
	1N5809	1N5809		0.925	6.0 (2)	5.0	100	3	60	30	A1	
	1N5811	1N5811		0.925	6.0 (2)	5.0	150	3	60	30	A1	
		1N5814	/478	0.95	20 (2)	10.0	100	5	300	35	DO-203	
		1N5816	/478	0.95	20 (2)	10.0	150	5	300	35	DO-203	
Multiple array	—	1N5768				0.1	40		4	20	TO-86	Common cathode
		1N5770				0.1	40		8	20	TO-86	Common anode
		1N5772	/474	1.0	100mA	0.1	40	300 mA	8	20	TO-86	Common anode/cathode
		1N5774				0.1	40		8	20	TO-89	Dual common anode/cathode
		1N6101				25 nA	20		4	5	TO-116	Monolithic

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

(2) Pulsed.

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MIL-S-19500 DIODES, SILICON (Continued)

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics: P_t at T_A = 25°C	V_Z (Nominal) at I_Z (V)	V_Z (Nominal) at I_Z (mA)	V_Z (Reg) or delta BV (V)	Pkg Outline
Zener-voltage regulator	1N962B-1 thru 1N973B-1	1N962B-1 thru 1N992B-1	/117	400 mW (T_A = 50°C)	11 - 200	11.5 - 0.65	0.5 - 12	DO-204
	1N754A-1 thru 1N759A-1	1N746A-1 thru 1N759A-1	/127		3.3 - 12	20	1.0 - 0.4	
	—	1N746A thru 1N759A			3.3 - 12	20	1.0 - 0.4	
		1N4370A-1			2.4	20	1.0	
		1N4371A-1			2.7	20	1.0	
		1N4372A-1			3.0	20	1.0	
		1N4614-1 thru 1N4627-1	/435	400 mW	1.8 - 6.2	120 - 61.0	—	
		1N4099-1 thru 1N4135-1	/435	400 mW	6.8 - 100	56 - 3.8		
		1N4565A-1 thru 1N4574A-1	/452 (2)	500 mW	6.4	0.5 - 1.0	5 - 100 mV	
	1N6320 thru 1N6336	—	/533	500 mW (T_L = 75°C)	6.8 - 33	20 - 3.8	1.6 - 0.35	
	1N4464 thru 1N4496	1N6309 thru 1N6336	/533	500 mW (T_L = 75°C)	2.4 - 33	20 - 3.8	1.6 - 0.3	DO-204
		1N3821A thru 1N3828A	/115	1.0 W	3.3 - 6.2	76 - 41	1.0 - 0.3	DO-202
		1N4460 thru 1N4496	/406	1.5 W	6.2 - 200	40 - 1.2	0.35 - 12	A1
	1N4954 thru 1N4992	1N4954 thru 1N4996	/356	2.25 W	6.8 - 360	175 - 3	0.7 - 35	A248
	—	1N2970 thru 1N2977 1N2979B thru 1N2980B 1N2982B 1N2984B thru 1N2986B	/124	10 W (T_C = 55°C)	6.8 - 200	370 - 12	0.4 - 9.0	DO-4
		1N2988B thru 1N2993B 1N2995B, 1N2997B 1N2999B thru 1N3005B 1N3007B thru 1N3009B 1N3011B thru 1N3012B 1N3014B thru 1N3015B						

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

(2) Reference: temperature-compensated.

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MIL-S-19500 DIODES, SILICON (Continued)

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics: P_t at T_A = 25°C	V_Z (Nominal) at I_Z (V)	V_Z (Nominal) at I_Z (mA)	V_Z (Reg) or delta BV (mV)	Pkg Outline	Remarks
Zener-voltage regulator (Continued)	—	1N821-1	/159	250 mW	6.2	7.5	96	DO-204	Reference, temperature compensated
		1N823-1					48		
		1N825-1					19		
		1N827-1					9		
		1N829-1					5		
		1N935B-1	/156	500 mW	9.0		184		
		1N937B-1 thru 1N939B-1	/156	500 mW	9.0		37 - 9		
		1N941B	/157	500 mW	11.7		239		
		1N943B	/157	500 mW	11.7		47		
Zener-voltage suppressor		1N5629A thru 1N5665A	/500	1 W	6.8 - 200	10 - 1.0	—	DO-202	Transient voltage - 1500 watts of peak power dissipation at 1.0 ms
		1N5907	/500	1 W	6.4	1.0		DO-202	
		1N5611	/434	3 W	43.7	1.0		DO-203	
Bidirectional voltage suppressor	1N6103 thru 1N6118	1N6103 thru 1N6137	/516	2 W	6.75 - 190	175 - 5.0		A298	500 W Peak power dissipation at 1.0 ms
	1N6103A thru 1N6118A	1N6103A thru 1N6137A		2 W					500 W
		1N6139 thru 1N6173		3 W					1500 W
	—	1N6139A thru 1N6173A		3 W					1500 W

(1) Refer to Appendix B for additional testing requirements for JANTX parts.

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MIL-S-19500 DIODES, SILICON (Continued)

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics					Pkg Outline
				P_O (V)	I_P (mA) (Nom)	Z_T (MΩ)	Z_K (MΩ)	V_L (Vdc)	
FET current regulator	—	1N5283 thru 1N5314	/463	100	0.27 - 4.7	14 - 0.235	1.95 - 0.012	1.00 - 2.90	DO-204

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics										Pkg Outline	Remarks
				$V_{(RM)}$ V(pk)	P_T (mW)	$V_{(BR)}$ (10 μAdc) (Vdc)	V_F at I_F (pk)		I_R at V_R		Carrier Lifetime (ps)	C_t (pf)		
							(V)	(mA)	(μA)	(V)				
Schottky barrier	—	1N5711	/444	50	250	70	1.0	15	0.2	50	100	2.0	A1	Hot carrier diode (Schottky)
		1N5712	/445	16	250	20	1.0	35	0.15	16	100	1.2	A1	
		1N6391	/553	45	—	—	0.68	50A (2)	40 mA (2)	45	—	2000	DO-203AA	Pulsed Tests
		1N6392	/554	45			0.68	60A (2)	60 mA (2)	45		3000	DO-203AB	

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

(2) T_C = 125°C, pulsed.

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MIL-S-19500 DIODES, SILICON (Continued)

Description	Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Electrical Characteristics							Pkg Outline	Remarks
				$V_{(RM)}$ V(pk)	V_{FM} (V)	I_{HOX} (mAdc)	I_O (A)	V_{KGM} V (pk)	V_{GT} (Vdc)	t_{on} (µs)		
Thyristor	—	2N2323A	/276	50	2.2	2.0	0.22	6	0.1/0.8	1.0	TO-205	Low-power SCR
		2N2324A		100								
		2N2326A		200								
		2N2328A		300								

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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SECTION 5: SUMMARY OF STANDARD FILTERS (1)

Page	Control Specification	Description	Frequency Range -55°C to +125°C		Grade 1	Grade 2
			Minimum	Maximum		
5.2	MIL-F-28861 (2)	RF & EMI suppression	15 kHz	1.0 GHz	(3)	

(1) Refer to MIL-HDBK-978, Vol. 4, for construction and application information.
(2) For stud-mounted filters, do not exceed the rated torque specification on the stud nut.
(3) These parts are for use in Grade 2 applications only. Presently there are no Grade 1 filters.

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MIL-F-28861 FILTERS
Radio Frequency/Electromagnetic Interference Suppression

Part Number Explanation:

M28861	/X	-XXX	X	X
Military Specification Sheet	Military Slash Sheet	Dash Number	Case Finish T = Tin-plated/tin-lead plated S = Silver-plated G = Gold-plated (Class S only)	Product Assurance Level B, S

Part Number (1)	Rated Voltage dc	Rated Voltage ac	Rated Current Maximum Range (Amperes)	Capacitance Minimum Range (µF)	Circuit Type	Frequency Range (kHz)	Grade 1 (2)	Grade 2 (3)
M28861/1-XXXXX	70 -200	125 (0 to 400Hz)	15	0.15 - 0.7	C or L_2	30 - 1.000		
M28861/2-XXXXX	100	-	0.25 - 5.0	0.45 - 0.9	L_1, L_2 or P_1	100 - 1.000		B
M28861/4-XXXXX	70	-	0.1 - 5.0	0.70 - 1.4	L_1, L_2 or P_1	15 - 1.000		
M28861/5-XXXXX	200	125 (0 to 400Hz)	0.25 - 50	0.15 - 0.3	L_1, L_2 or P_1	100 - 1.000		

(1) Parts covered by these specifications contain internal solder connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Presently there are no Grade 1 filters.
(3) Grade 2 parts are Class B in accordance with MIL-F-28861.

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MIL-F-28861/1, FILTERS (1)
RF/EMI Suppression

Part Number	Style	Ratings: Voltage: Volts dc	Ratings: Voltage: Volts ac	Ratings: Current: Max (Amps)	C: Min (µF)	IR Limit @ +25°C: Min (Megohms)	Minimum Insertion Loss (MIL) at -55°C and +125°C (2): Freq (kHz)	MIL (dB)	Freq (GHz)	MIL (dB)	Grade 1 (3)	Grade 2 (4)
M28861/1-003XX M28861/1-013XX M28861/1-004XX M28861/1-014XX	FS-11	70	—	15	0.7	1000	30	8	1	70	—	B
M28861/1-005XX M28861/1-015XX M28861/1-006XX M28861/1-016XX		100			0.45			4				
M28861/1-009XX M28861/1-019XX M28861/1-010XX M28861/1-020XX		200	125 (0 to 400Hz)		0.15		150	9				

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) For slash 1 parts, insertion loss measurements shall be made under full load over the frequency range of 150kHz to 10MHz. Insertion loss measurements above or below this frequency range shall be made under no load.
(3) Presently there are no Grade 1 filters.
(4) Grade 2 parts are Class B in accordance with MIL-F-28861.

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MIL-F-28861/2, FILTERS (1)
RF/EMI Suppression

Part Number	Style	Ratings: Voltage: Volts dc	Ratings: Voltage: Volts ac	Ratings: Current: Max (Amps)	C: Min (µF)	IR Limit @ +25°C: Min (Megohms)	Minimum Insertion Loss (MIL) at -55°C and +125°C (2): Freq (kHz)	MIL (dB)	Freq (GHz)	MIL (dB)	Grade 1 (3)	Grade 2 (4)
M28861/2-001XX	FS-20	100	—	0.25	0.45	1000	100	28	1	70	—	B
M28861/2-013XX					0.45			28		70		
M28861/2-002XX					0.45			28		70		
M28861/2-014XX					0.45			28		70		
M28861/2-003XX					0.90			52		80		
M28861/2-015XX					0.90			52		80		
M28861/2-004XX				1.0	0.45			13		70		
M28861/2-016XX					0.45			13		70		
M28861/2-005XX					0.45			13		70		
M28861/2-017XX					0.45			13		70		
M28861/2-006XX					0.90			38		80		
M28861/2-018XX					0.90			38		80		
M28861/2-007XX				3.0	0.45			12		70		
M28861/2-019XX					0.45			12		70		
M28861/2-008XX					0.45			12		70		
M28861/2-020XX					0.45			12		70		
M28861/2-009XX					0.90		150	23		80		
M28861/2-021XX					0.90		150	23		80		
M28861/2-010XX				5.0	0.45		100	12		70		
M28861/2-022XX					0.45		100	12		70		
M28861/2-011XX					0.45		100	12		70		
M28861/2-023XX					0.45		100	12		70		
M28861/2-012XX					0.90		300	36		80		
M28861/2-024XX					0.90		300	36		80		

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Insertion loss measurements shall be made under full load over the frequency range of 100kHz to 10MHz. Insertion loss measurements above or below this frequency range shall be made under no load.
(3) Presently there are no Grade 1 filters.
(4) Grade 2 parts are Class B in accordance with MIL-F-28861.

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Check the source to verify that this is the current version before use.

MIL-F-28861/4, FILTERS (1)
RF/EMI Suppression

Part Number	Style	Ratings: Voltage: Volts dc	Ratings: Voltage: Volts ac	Ratings: Current: Max (Amps)	C: Min (µF)	IR Limit @ +25°C: Min (Megohms)	Minimum Insertion Loss (MIL) at -55°C and +125°C (2): Freq (kHz)	MIL (dB)	Freq (GHz)	MIL (dB)	Grade 1 (3)	Grade 2 (4)
M28861/4-001XX	FS-40	70	—	0.10	0.70	1000	15	7	1	70	—	B
M28861/4-019XX					0.70	1000	15	7		70		
M28861/4-002XX					0.70	1000	15	7		70		
M28861/4-020XX					0.70	1000	15	7		70		
M28861/4-003XX					1.4	715	15	13		80		
M28861/4-021XX					1.4	715	15	13		80		
M28861/4-004XX				0.30	0.7	1000	15	4		70		
M28861/4-022XX					0.7	1000	15	4		70		
M28861/4-005XX					0.7	1000	15	4		70		
M28861/4-023XX					0.7	1000	15	4		70		
M28861/4-006XX					1.4	715	30	27		80		
M28861/4-024XX					1.4	715	30	27		80		
M28861/4-007XX				0.50	0.7	1000	15	3		70		
M28861/4-025XX					0.7	1000	15	3		70		
M28861/4-008XX					0.7	1000	15	3		70		
M28861/4-026XX					0.7	1000	15	3		70		
M28861/4-009XX					1.4	715	30	19		80		
M28861/4-027XX					1.4	715	30	19		80		

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Insertion loss measurements shall be made under full load over the frequency range of 100kHz to 10MHz. Insertion loss measurements above or below this frequency range shall be made under no load.
(3) Presently there are no Grade 1 filters.
(4) Grade 2 parts are Class B in accordance with MIL-F-28861.

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MIL-F-28861/4, FILTERS (1)
RF/EMI Suppression (Continued)

Part Number	Style	Ratings: Voltage: Volts dc	Ratings: Voltage: Volts ac	Ratings: Current: Max (Amps)	C: Min (µF)	IR Limit @ +25°C: Min (Megohms)	Minimum Insertion Loss (MIL) at -55°C and +125°C (2): Freq (kHz)	MIL (dB)	Freq (GHz)	MIL (dB)	Grade 1 (3)	Grade 2 (4)
M28861/4-010XX	FS-40	70	—	1.0	0.7	1000	15	3	1	70	—	B
M28861/4-028XX					0.7	1000	15	3		70		
M28861/4-011XX					0.7	1000	15	3		70		
M28861/4-029XX					0.7	1000	15	3		70		
M28861/4-012XX					1.4	715	30	18		80		
M28861/4-030XX					1.4	715	50	18		80		
M28861/4-013XX				3.0	0.7	1000	15	3		70		
M28861/4-031XX					0.7	1000	15	3		70		
M28861/4-014XX					0.7	1000	15	3		70		
M28861/4-032XX					0.7	1000	15	3		70		
M28861/4-015XX					1.4	715	100	15		80		
M28861/4-033XX					1.4	715	100	15		80		
M28861/4-016XX				5.0	0.70	1000	100	12		70		
M28861/4-034XX					0.70	1000	100	12		70		
M28861/4-017XX					0.70	1000	100	12		70		
M28861/4-035XX					0.70	1000	100	12		70		
M28861/4-018XX					1.4	715	150	14		80		
M28861/4-036XX					1.4	715	150	14		80		

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Insertion loss measurements shall be made under full load over the frequency range of 100kHz to 10MHz. Insertion loss measurements above or below this frequency range shall be made under no load.
(3) Presently there are no Grade 1 filters.
(4) Grade 2 parts are Class B in accordance with MIL-F-28861.

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MIL-F-28861/5, FILTERS (1)
RF/EMI Suppression

Part Number	Style	Ratings: Voltage: Volts dc	Ratings: Voltage: Volts ac	Ratings: Current: Max (Amps)	C: Min (µF)	IR Limit @ +25°C: Min (Megohms)	Minimum Insertion Loss (MIL) at -55°C and +125°C (2): Freq (kHz)	MIL (dB)	Freq (GHz)	MIL (dB)	Grade 1 (3)	Grade 2 (4)
M28861/5-001XX					0.15			20		70		
M28861/5-013XX					0.15			20		70		
M28861/5-002XX				0.25	0.15			20		70		
M28861/5-014XX					0.15			20		70		
M28861/5-003XX					0.30			32		80		
M28861/5-015XX					0.30			32		80		
M28861/5-004XX					0.15			6		70		
M28861/5-016XX					0.15			6		70		
M28861/5-005XX				1.0	0.15		100	6		70		
M28861/5-017XX					0.15			6		70		
M28861/5-006XX			125		0.30			16		80		
M28861/5-018XX	FS-50	200	(0 to		0.30	1000		16	1	80	—	B
M28861/5-007XX			400 Hz)		0.15			3		70		
M28861/5-019XX					0.15			3		70		
M28861/5-008XX				3.0	0.15			3		70		
M28861/5-020XX					0.15			3		70		
M28861/5-009XX					0.30		300	17		80		
M28861/5-021XX					0.30		300	17		80		
M28861/5-010XX					0.15		100	3		70		
M28861/5-022XX					0.15		100	3		70		
M28861/5-011XX				5.0	0.15		100	3		70		
M28861/5-023XX					0.15		100	3		70		
M28861/5-012XX					0.30		1000	49		80		
M28861/5-024XX					0.30		1000	49		80		

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Insertion loss measurements shall be made under full load over the frequency range of 100kHz to 10MHz. Insertion loss measurements above or below this frequency range shall be made under no load.
(3) Presently there are no Grade 1 filters.
(4) Grade 2 parts are Class B in accordance with MIL-F-28861.

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SECTION 6: SUMMARY OF STANDARD INDUCTORS (1)

Page	Control Specification	Description	Inductance Range		Q (min) Range	FRL	
			Min	Max		Grade 1	Grade 2
6.2	MIL-C-39010	Fixed, molded, radio frequency coil	0.1 µH	100.0 mH	75 - 18	(2)	P
6.9	MIL-C-83446	Chip, radio frequency, fixed or variable	0.01 µH	1,000 µH	75 - 19		(3)

(1) Refer to MIL-HDBK-978, Vol. 4, for construction and application information.
(2) Presently there are no Grade 1 coils.
(3) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1 herein).

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MIL-C-39010 COILS (1)
Fixed, Radio Frequency, Molded, Established Reliability

Part Number Explanation:

M39010	/XX	-X	XXX	X	X
Military Specification Designator	Slash Sheet	Class Temperature A = +105°C B = +125°C F = +150°C	Inductance Value	Inductance Tolerance J = ±5% K = ±10% L = ±20%	Failure Rate Level S = 0.001% / 1000 hrs P = 0.1% / 1000 hrs

Part Number	Inductance Range (µH)	Inductance Tolerance (±%)	Q Min Range	Self-Resonant Frequency (MHz) Min	Rated dc Current (mA)	Core Type	Construction	Operating Temperature (°C)		FRL	
								Min	Max	Grade 1	Grade 2 (3)
M39010/01-AXXXXX	0.10 - 0.82		40 - 50	180 - 250	370 - 1790	Phenolic core & iron sleeve	Shielded		+105		
M39010/02-AXXXXX	1.00 - 12.0		44 - 55	44 - 140	200 - 1070	Iron	Shielded		+105		
M39010/03-AXXXXX	15 - 100,000	5, 10	18 - 60	0.11 - 49	11 - 315	Ferrite	Shielded	-55	+105	(2)	P
M39010/06-BXXXXX	0.15 - 4.7	5, 10, 20	33 - 50	90 - 525	260 - 2450	Phenolic	Unshielded		+125		
M39010/07-AXXXXX	5.6 - 33	5, 10	45 - 75	19 - 60	165 - 495	Iron	Unshielded		+105		

(1) Parts covered by this specification contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow.
(2) Presently there are no Grade 1 parts.
(3) Grade 2 parts shall meet class B requirements of MIL-STD-981.

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MIL-C-39010/01 COILS, MICROMINIATURE
Magnetically Shielded (Phenolic Core, Iron Sleeve), Established Reliability

Dash Number		Inductance (μH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)
Grade 1	Grade 2						
	AR10*P	0.10				0.025	1790
	AR12*P	0.12	50			0.034	1530
	AR15*P	0.15				0.037	1470
	AR18*P	0.18				0.047	1300
	AR22*P	0.22	49		250	0.067	1100
(1)	AR27*P	0.27	47	25		0.11	853
	AR33*P	0.33	46			0.13	780
	AR39*P	0.39	44			0.18	670
	AR47*P	0.47	44		235	0.25	565
	AR56*P	0.56	43		210	0.33	490
	AR68*P	0.68	42		190	0.45	420
	AR82*P	0.82	40		180	0.59	370

* Choice of tolerances: J (±5%), K (±10%).
(1) Presently there are no Grade 1 coils.

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MIL-C-39010/02 COILS, MICROMINIATURE
Magnetically Shielded (Iron Core, Iron Sleeve), Established Reliability

Dash Number		Inductance (µH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)	Operating Temperature (°C)	
Grade 1	Grade 2							Min	Max
	A1R0*P	1.00		25	140	0.07	1070		
	A1R2*P	1.20			130	0.10	895		
	A1R5*P	1.50			115	0.12	815		
	A1R8*P	1.80			105	0.14	755		
	A2R2*P	2.20	44		100	0.19	650		
	A2R7*P	2.70			92	0.28	535		
	A3R3*P	3.30			85	0.35	480	-55	+105
(1)	A3R9*P	3.90		7.9	75	0.40	450		
	A4R7*P	4.70			70	0.55	380		
	A5R6*P	5.60			65	0.72	335		
	A6R8*P	6.80	50		55	1.02	280		
	A8R2*P	8.20	50		50	1.32	245		
	A100*P	10.0	50		46	1.62	220		
	A120*P	12.0	55	2.5	44	2.00	200		

* Choice of tolerances: J (±5%), K (±10%).
(1) Presently there are no Grade 1 coils.

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MIL-C-39010/03 COILS, MICROMINIATURE

Magnetically Shielded (Ferrite Core, Ferrite Sleeve), Established Reliability

Dash Number		Inductance (µH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)	Operating Temperature (°C)	
Grade 1	Grade 2							Min	Max
	A150*P	15			49	0.80	315.0		
	A180*P	18			45	0.89	300.0		
	A220*P	22	45		41	0.96	290.0		
	A270*P	27			38	1.19	260.0		
	A330*P	33			34	1.37	240.0		
	A390*P	39		2.5	29	1.93	205.0		
	A470*P	47			27	2.11	195.0		
	A560*P	56	50		25	2.23	190.0		
	A680*P	68			21	2.44	180.0		
	A820*P	82			10.5	2.70	170.0		
	A101*P	100			10.0	3.12	160.0		
	A121*P	120			9.7	3.60	150.0		
	A151*P	150			8.5	4.10	140.0		
	A181*P	180	55		8.0	4.40	135.0		
	A221*P	220			7.5	5.00	125.0		
(1)	A271*P	270			7.0	5.80	115.0		
	A331*P	330			6.5	6.40	110.0	-55	+105
	A391*P	390		0.79	6.2	7.40	105.0		
	A471*P	470			5.7	9.50	92.0		
	A561*P	560	60		4.7	10.50	90.0		
	A681*P	680			4.5	11.80	80.0		
	A821*P	820			4.2	13.00	80.0		
	A102*P	1,000			3.8	17.50	70.0		
	A122*P	1,200			1.5	22.10	60.0		
	A152*P	1,500			1.2	26.50	55.0		
	A182*P	1,800			1.0	29.90	50.0		
	A222*P	2,200	45	0.25	0.97	33.80	50.0		
	A272*P	2,700			0.92	47.30	40.0		
	A332*P	3,300			0.84	53.00	40.0		
	A392*P	3,900			0.80	73.80	35.0		
	A472*P	4,700			0.74	81.60	31.0		

* *Choice of tolerances: J (±5%), K (±10%).*

(1) Presently there are no Grade 1 coils.

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MIL-C-39010/03 COILS, MICROMINIATURE
Magnetically Shielded (Ferrite Core, Ferrite Sleeve), Established Reliability (Continued)

Dash Number		Inductance (µH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)	Operating Temperature (°C)	
Grade 1	Grade 2							Min	Max
	A562*P	5,600	44		0.73	98.9	28.0		
	A682*P	6,800	40	0.25	0.66	111.0	27.0		
	A822*P	8,200	40		0.54	119.0	26.0		
	A103*P	10,000	40		0.47	137.0	24.0		
	A123*P	12,000	30		0.33	143.0	23.0		
	A153*P	15,000	30		0.29	157.0	22.0		
	A183*P	18,000	30		0.28	175.0	21.0		
(1)	A223*P	22,000	27		0.25	274.0	17.0	-55	+105
	A273*P	27,000	27		0.21	308.0	16.0		
	A333*P	33,000	27	0.079	0.19	343.0	15.0		
	A393*P	39,000	27		0.17	376.0	15.0		
	A473*P	47,000	23		0.16	473.0	13.0		
	A563*P	56,000	23		0.14	512.0	13.0		
	A683*P	68,000	23		0.13	580.0	12.0		
	A823*P	82,000	21		0.12	618.0	11.0		
	A104*P	100,000	18		0.11	678.0	11.0		

* Choice of tolerances: J (±5%), K (±10%).
(1) Presently there are no Grade 1 coils.

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MIL-C-39010/06 COILS, MICROMINIATURE
Phenolic Core, Established Reliability

Dash Number		Inductance (μH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)	Operating Temperature (°C)	
Grade 1	Grade 2							Min	Max
	BR15*P	0.15	50		525	0.030	2450		
	BR22*P	0.22	50		460	0.055	1810		
	BR33*P	0.33	45		360	0.090	1400		
	BR47*P	0.47	45	25.0	310	0.120	1225		
	BR56*P	0.56	50		280	0.135	1150		
	BR68*P	0.68	50		250	0.150	1100		
	BR82*P	0.82	50		220	0.220	900		
(1)	B1R0*P	1.00	50		200	0.290	785	-55	+125
	B1R2*P	1.20			180	0.420	650		
	B1R5*P	1.50			160	0.500	600		
	B1R8*P	1.80			150	0.650	525		
	B2R2*P	2.20			135	0.950	435		
	B2R7*P	2.70	33	7.9	120	1.20	385		
	B3R3*P	3.30			110	2.00	300		
	B3R9*P	3.90			100	2.30	280		
	B4R7*P	4.70			90	2.60	260		

* Choices of tolerances: J (±5%), K (+10%), L (±20%, 0.15μH to 0.47μH only).
(1) Presently there are no Grade 1 coils.

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MIL-C-39010/07 COILS, MICROMINIATURE
Powdered Iron Core, Established Reliability

Dash Number		Inductance (µH)	Q Min	Test Frequency (MHz)	Self Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current (mA)	Operating Temperature (°C)	
Grade 1	Grade 2							Min	Max
	A5R6*P	5.6	45		60	0.32	495		
	A6R8*P	6.8	50	7.9	55	0.50	395		
	A8R2*P	8.2	50		50	0.60	360		
	A100*P	10	55		45	0.90	290		
(1)	A120*P	12	65		42	1.10	265	-55	+105
	A150*P	15	65		40	1.40	240		
	A180*P	18	75	2.5	34	2.25	185		
	A220*P	22	75		30	2.50	175		
	A270*P	27	60		25	2.60	170		
	A330*P	33	65		19	3.00	165		

* Choice of tolerances: J (±5%), K (±10%).
(1) Presently there are no Grade 1 coils.

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MIL-C-83446 COILS, CHIP
Fixed or Variable, Radio-frequency

Part Number Explanation:

M83446	/XX	-XX	X
Military Specification Designator	Military Slash Sheet	Dash Number	Termination Finish

A = Gold over nickel
B = Tin-lead over nickel
C = Tin plated
D = Platinum-gold
E = Palladium-silver
F = Tin-lead

Part Number	Inductance Range (μH)	Inductance Tolerance (±%)	Q Min Range	Self Resonant Frequency Range Min (MHz)	Rated dc Current Range (mA)	Configuration	Construction	Operating Temperature (°C)	
								Min	Max
M83446/04XXX	0.010 - 27.0	10, 20	22 - 60	22.0 - 2700	120 - 1270	Fixed	Unshielded	-55	+125
M83446/05XXX	0.01 - 10.0	10	42 - 60	33.0 - 2000	87 - 750	Fixed			
M83446/07XXX	0.016 - 76.1	—	19 - 55	5.0 - 1200	22 - 750	Variable			
M83446/09XXX	0.015 - 150	—	22 - 55	3.0 - 1200	22 - 750	Variable			
M83446/10XXX	0.01 - 1000.0	10	30 - 75	1.7 - 2000	25 - 1000	Fixed			

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MIL-C-83446/4 COILS, CHIP
Fixed, Radio-frequency

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) (3) Min	Operating Temperature (°C) (3) Max	Grades 1 and 2
01X	0.12	30		750	0.125	880			
02X	0.15	25		650	0.175	745			
03X	0.18	25		550	0.200	695			
04X	0.22	25		450	0.220	665			
05X	0.27	25		375	0.230	650			
06X	0.33	25	25	300	0.235	645			
07X	0.39	22		235	0.240	635			
08X	0.47	22		215	0.260	610			
09X	0.56	22		195	0.278	590			
10X	0.68	22		175	0.520	435			
11X	0.82	22		160	0.530	430			
12X	1.0	22		145	0.540	425	-55	+125	(2)
13X	1.2	22		130	0.740	360			
14X	1.5	22		115	0.840	340			
15X	1.8	22		105	0.920	325			
16X	2.2	22		85	1.00	310			
17X	2.7	24		77	1.15	290			
18X	3.3	24	7.9	70	1.40	260			
19X	3.9	24		68	1.55	250			
20X	4.7	24		60	1.80	230			
21X	5.6	22		55	2.00	220			
22X	6.8	22		50	2.20	210			
23X	8.2	22		48	2.50	195			
24X	10.0	24		40	3.45	165			

(1) X = Choice of allowable termination finish (A, B, C, D, E, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).
(3) These epoxy coated coils are sensitive to operation at or near the maximum operating temperature of +125°C. It is recommended that these coils be restricted in application to a temperature of +105°C maximum.

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MIL-C-83446/4 COILS, CHIP
Fixed, Radio-frequency (Continued)

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) (3)		Grades 1 and 2
							Min	Max	
25X	12.0	25		35	3.80	160			
26X	15.0	25		30	5.60	135			
27X	18.0	25	2.5	28	5.80	130			
28X	22.0	25		25	6.40	125			
29X	27.0	25		22	6.90	120			
30X	0.010±20%	60		2700	0.060	1270	-55	+125	(2)
31X	0.015±20%	55		2200	0.078	1110			
32X	0.022±20%	50		1800	0.108	950			
33X	0.033±20%	48	50	1450	0.120	900			
34X	0.047±20%	42		1220	0.145	820			
35X	0.068±20%	36		1000	0.195	705			
36X	0.100±20%	32		830	0.230	650			

(1) X = Choice of allowable termination finish (A, B, C, D, E, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).
(3) These epoxy coated coils are sensitive to operation at or near the maximum operating temperature of +125°C. It is recommended that these coils be restricted in application to a temperature of +105°C maximum.

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MIL-C-83446/5 COILS, CHIP
Fixed, Radio-frequency

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
01X	0.010	60		2000	0.025				
02X	0.012	60	150	2000	0.025	750			
03X	0.015	60		1800	0.040				
04X	0.018	60		1500	0.040				
05X	0.022	51		1400	0.040	750			
06X	0.027	51		1200	0.040	750			
07X	0.033	47		1200	0.050	640			
08X	0.039	47	100	1200	0.070	600			
09X	0.047	47		1000	0.080	550			
10X	0.056	47		900	0.090	520			
11X	0.068	47		900	0.10	480			
12X	0.082	47		750	0.11	470			
13X	0.100	47		700	0.11	470	-55	+125	(2)
14X	0.120	47		600	0.11	470			
15X	0.150	47		500	0.12	450			
16X	0.180	51	50	450	0.14	430			
17X	0.220	51		420	0.20	350			
18X	0.270	51		400	0.25	310			
19X	0.330	51		320	0.30	280			
20X	0.390	47		270	0.45	240			
21X	0.470	47		250	0.50	230			
22X	0.560	52		200	0.55	220			
23X	0.680	52	25	180	0.58	210			
24X	0.820	52		150	0.60	200			
25X	1.00	52		120	0.65	190			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/5 COILS, CHIP
Fixed, Radio-frequency (Continued)

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C)		Grades 1 and 2
							Min	Max	
26X	1.20	42	7.9	110	0.75	180	-55	+125	(2)
27X	1.50	42		100	1.1	160			
28X	1.80	48		95	1.2	150			
29X	2.20	48		90	1.3	140			
30X	2.70	48		65	1.5	130			
31X	3.30	48		55	1.8	120			
32X	3.90	48		45	2.0	110			
33X	4.70	48		43	2.3	100			
34X	5.60	48		40	2.5	100			
35X	6.80	46		38	2.6	98			
36X	8.20	46		35	2.8	95			
37X	10.0	46		33	3.3	87			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/7 COILS, CHIP
Variable, Radio-frequency

Dash Number (1)	Inductance Range (µH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
01X	0.016 - 0.019	52	150	1200	0.02				
02X	0.019 - 0.024	55	150	1100	0.02				
03X	0.024 - 0.030	55	150	1000	0.03				
04X	0.029 - 0.037	52	150	900	0.03	750			
05X	0.035 - 0.043	52	150	750	0.03				
06X	0.042 - 0.052	52	100	660	0.04				
07X	0.049 - 0.062	55	100	610	0.04				
08X	0.060 - 0.076	55	100	550	0.05				
09X	0.072 - 0.092	55	100	520	0.06	640			
10X	0.090 - 0.110	50	50	490	0.07	600			
11X	0.105 - 0.135	50	50	460	0.07	600			
12X	0.13 - 0.17	45	50	430	0.10	480	-55	+125	(2)
13X	0.16 - 0.20	45	50	385	0.12	450			
14X	0.19 - 0.25	45	50	330	0.15	400			
15X	0.24 - 0.31	45	50	275	0.20	350			
16X	0.29 - 0.37	45	50	240	0.25	300			
17X	0.35 - 0.44	42	50	210	0.35	260			
18X	0.42 - 0.52	40	25	190	0.40	250			
19X	0.50 - 0.62	40	25	165	0.50	230			
20X	0.60 - 0.76	40	25	155	0.75	180			
21X	0.73 - 0.92	40	25	145	0.90	160			
22X	0.88 - 1.12	40	25	130	1.80	120			
23X	1.05 - 1.35	40	25	120	1.90	115			
24X	1.3 - 1.7	22	7.9	105	3.00	90			
25X	1.5 - 2.0	22	7.9	95	3.50	85			

(1) X = Choice of allowable termination finishes (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/7 COILS, CHIP
Variable, Radio-frequency (Continued)

Dash Number (1)	Inductance Range (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
26X	1.9 - 2.5	19	7.9	85	6.5	62	-55	+125	(2)
27X	2.4 - 3.0	19		80	7.0	60			
28X	2.9 - 3.7	19		75	7.5	55			
29X	3.5 - 4.3	19		70	10.0	50			
30X	4.2 - 5.2	19		38	2.5	100			
31X	5.0 - 6.2	22		36	2.5	100			
32X	6.0 - 7.5	22		35	3.5	85			
33X	7.3 - 9.1	21		30	4.5	75			
34X	8.8 - 11.2	21		25	5.0	70			
35X	10.6 - 13.4	21		20	5.5	65			
36X	13.2 - 16.8	22	2.5	18	6.5	60			
37X	15.8 - 20.1			17	11.0	47			
38X	19.4 - 24.6			16	12.0	45			
39X	23.7 - 30.2			13	13.5	43			
40X	29.1 - 36.9			11	14.0	42			
41X	34.3 - 43.6			10	18.0	37			
42X	41.3 - 52.6			9	20.0	35			
43X	49.2 - 62.7			8	22.0	34			
44X	59.8 - 76.1			7	24.0	32			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/9 COILS, CHIP
Variable, Radio-frequency

Dash Number (1)	Inductance Range (µH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
01X	0.015 - 0.021	50		1200	0.03				
02X	0.018 - 0.026	55	150	1100	0.03	750			
03X	0.022 - 0.032	55		1000	0.03				
04X	0.027 - 0.039	55		900	0.04				
05X	0.033 - 0.047		150	750	0.04	750			
06X	0.039 - 0.056	55	100	660	0.04	750			
07X	0.047 - 0.068		100	610	0.05	700			
08X	0.055 - 0.083		100	550	0.05	700			
09X	0.067 - 0.099	55	100	520	0.06	645			
10X	0.080 - 0.120	55	100	490	0.06	645			
11X	0.096 - 0.144	50	50	460	0.07	600			
12X	0.120 - 0.180	50	50	430	0.08	560	-55	+125	(2)
13X	0.140 - 0.220		50	385	0.09	525			
14X	0.170 - 0.270	50	50	330	0.10	500			
15X	0.210 - 0.330		50	300	0.15	400			
16X	0.260 - 0.400		50	275	0.19	360			
17X	0.320 - 0.470		50	240	0.25	300			
18X	0.370 - 0.570		25	210	0.30	280			
19X	0.460 - 0.680		25	190	0.40	250			
20X	0.540 - 0.820	40	25	165	0.60	200			
21X	0.680 - 1.000			155	0.70	180			
22X	0.750 - 1.250		25	140	0.90	160			
23X	0.900 - 1.500			125	1.1	150			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/9 COILS, CHIP
Variable, Radio-frequency (Continued)

Dash Number (1)	Inductance Range (µH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
24X	1.13 - 1.87	35	7.9	115	1.3	135	-55	+125	(2)
25X	1.35 - 2.25	35		105	1.7	120			
26X	1.65 - 2.75	35		100	2.3	100			
27X	2.02 - 3.37	25		85	3.0	90			
28X	2.48 - 4.12	25		75	3.9	80			
29X	2.92 - 4.87	25		47	3.9	80			
30X	3.52 - 5.88	25		30	3.9	80			
31X	4.20 - 7.00	22		24	4.0	75			
32X	5.10 - 8.50	22		23	4.0	75			
33X	6.10 - 10.2			22	4.5	72			
34X	7.50 - 12.5			21	4.5	72			
35X	9.00 - 15.0			17	5.0	70			
36X	11.2 - 18.7		2.5	15	6.0	65			
37X	13.5 - 22.5			14	8.0	55			
38X	16.5 - 27.5			13	10.0	50			
39X	20.2 - 31.3			11	11.0	45			
40X	24.7 - 41.2			10	13.0	43			
41X	29.2 - 48.8			9	14.0	42			
42X	35.2 - 58.8			8	15.0	40			
43X	42.0 - 70.0			7	19.0	36			
44X	51.0 - 85.0	22		6	24.0	32			
45X	62.0 - 102.0	25		5	31.0	28			
46X	75.0 - 125.0	25		4	40.0	25			
47X	90.0 - 150.0	25		3	50.0	22			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/10 COILS, CHIP
Fixed, Radio-frequency

Dash Number (1)	Inductance (±10%) (µH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
01X	0.010	60		2000	0.04				
02X	0.012	70	150	1800	0.04				
03X	0.015	75		1500	0.04	1000			
04X	0.018	75		1500	0.04				
05X	0.022			1300	0.05	1000			
06X	0.027	60		1300	0.05	1000			
07X	0.033			1000	0.05	1000			
08X	0.039		100	1000	0.06	900			
09X	0.047			800	0.06	900			
10X	0.056	65		760	0.06	900	-55	+125	(2)
11X	0.068			700	0.07	840			
12X	0.082			650	0.07	840			
13X	0.100	65		570	0.07	840			
14X	0.120	65		520	0.07	840			
15X	0.150	75		400	0.08	790			
16X	0.180	75	50	360	0.08	790			
17X	0.220			320	0.08	790			
18X	0.270	70		270	0.10	700			
19X	0.330			240	0.10	700			
20X	0.390			220	0.10	700			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/10 COILS, CHIP
Fixed, Radio-frequency (Continued)

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
21X	0.470	70		190	0.14	590			
22X	0.560	70	25	170	0.19	510			
23X	0.680	70		160	0.26	430			
24X	0.820	75		150	0.30	400			
25X	1.00	75	25	130	0.34	380			
26X	1.20	65	7.9	120	0.45	330			
27X	1.50	65	7.9	110	0.57	290			
28X	1.80	65	7.9	100	0.72	260			
29X	2.20	65		80	0.9	230			
30X	2.70	65		60	1.1	210	-55	+125	(2)
31X	3.30	60		50	1.2	200			
32X	3.90	60	7.9	45	1.4	180			
33X	4.70	60		42	1.6	170			
34X	5.60	65		40	1.8	160			
35X	6.80	65		37	2.4	140			
36X	8.20	65		34	3.0	130			
37X	10.0	65	7.9	29	3.5	120			
38X	12.0	60	2.5	27	3.6	118			
39X	15.0	60	2.5	22	3.7	115			
40X	18.0	60	2.5	17	3.8	114			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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MIL-C-83446/10 COILS, CHIP
Fixed, Radio-frequency (Continued)

Dash Number (1)	Inductance (±10%) (μH)	Q (Min)	Test Frequency (MHz)	Self-Resonant Frequency Min (MHz)	dc Resistance (@ +25°C) Max (Ohms)	Rated dc Current Max (mA)	Operating Temperature (°C) Min	Operating Temperature (°C) Max	Grades 1 and 2
41X	22.0	60		16	3.9	113			
42X	27.0	65		15	4.0	110			
43X	33.0	65		14	5.0	100			
44X	39.0	65	2.5	13	7.0	84			
45X	47.0	70		12	8.0	79			
46X	56.0	70		11	10.0	70			
47X	68.0	65		10	11.0	67			
48X	82.0	60		9	12.0	64			
49X	100.0	60	2.5	8	13.0	62			
50X	120.0	40	0.79	7	14.0	59	-55	+125	(2)
51X	150.0	40	0.79	6	16.0	56			
52X	180.0	40	0.79	5	18.0	52			
53X	220.0			4	24.0	45			
54X	270.0	40		3.3	25.0	44			
55X	330.0			3.1	29.0	41			
56X	390.0		0.79	2.9	32.0	39			
57X	470.0	35		2.4	35.0	37			
58X	560.0	35		2.1	45.0	33			
59X	680.0	35		1.9	55.0	30			
60X	820.0	30		1.8	70.0	26			
61X	1000.0	30		1.7	80.0	25			

(1) X = Choice of allowable termination finish (A, C, F).
(2) These inductors may be used in Grade 2 applications. They may be used in Grade 1 applications if they meet the Class S requirements of MIL-STD-981 (see Appendix C, Table 1).

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SUMMARY OF SECTION 7: MICROCIRCUIT PART LISTINGS AND QML FLOWS

Page	Control Specification	Description	Grades
7.1.2	MIL-M-38510	MIL-M-38510 Microcircuit Part Number Information	1 & 2
7.1.3	MIL-M-38510, MIL-I-38535 and MIL-H-38534	One Part-One Part Number SMD Information	1, 2 & 3
7.2.1	MIL-I-38535 Appendix A (MIL-M-38510)	MIL-I-38535 Appendix A Standard Microcircuits	1 & 2
7.3.1	MIL-I-38535	MIL-I-38535 Approved Microcircuit Flows and Parts	1, 2 & 3
7.4.1	MIL-H-38534	MIL-H-38534 Approved Hybrid Microcircuit Flows and Parts	1 & 2

(1) Refer to MIL-HDBK-978, vol. 3, for construction and application information.

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MIL-M-38510 MICROCIRCUIT PART INFORMATION (4)

Part Number Explanation:

M38510	X (1)	XXX	XX	X (3)	X	X
Military Designator	Radiation Hardness Assurance (RHA) Designator	Detail Specification	Device Type	Device Class	Case Outline (2)	Lead Finish
		Establishes the general requirements, quality and reliability requirements, detail requirements and specific characteristics of the microcircuits	Determines the specific circuit or device type. (See detail specification for list.)	Two levels of microcircuit quality and reliability assurance are provided: Class S Class B	Single alphanumeric character defined either in MIL-STD-1835 or the detailed specification	A - Hot solder dip B - Tin plate C - Gold plate

RHA Designator	Total Dose Radiation Tolerance RAD (Si)	Level Neutron Fluence n/cm²
.	No Radiation Tolerance Specified	No RHA
M	3×10^3	2×10^{12}
D	1×10^4	2×10^{12}
P	1×10^5	2×10^{12}
H	1×10^6	2×10^{12}

(1) The device has successfully met the requirements of Method 1019, MIL-STD-883 for radiation hardness. Total dose radiation testing shall be performed only when specifically required by the purchase order or contract. The device may be supplied as a non rad-hard JAN microcircuit.

(2) The detail specification and the QML must be consulted to determine the availability of various packages (case outlines) and lead finishes. All variations are not available on all part types.

(3) Some of the Class S microcircuits listed herein appear in Part II of Section II of QML-38535 (formerly QPL-38510). Microcircuits ordered from this Part II listing require qualifying activity approval of certain lot acceptance test data prior to shipment. See paragraph 6.3.1.1 of MIL-M-38510 for further clarification.

(4) This part numbering system has been replaced by the one part-one part numbering SMD.

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ONE PART-ONE PART NUMBER SMD INFORMATION

Part Number Explanation:

5962	- or M, D, R, H X (1)	XXXXX	ZZ	X (3)	X	X
Federal Stock Class Designator	Radiation Hardness Assurance (RHA) Designator	Drawing Designator	Device Type	Device Class	Case Outline (2)	Lead Finish
		Establishes the general requirements, quality and reliability requirements, detail requirements and specific characteristics of the microcircuits	Determines the specific circuit or device type. (See detail specification for list.)	Five levels of microcircuit quality and reliability assurance are provided: Class S Class B Class V Class Q Class K Class H Class M	Single alphanumeric character defined either in MIL-STD-1835 or the detailed specification	A - Hot solder dip B - Tin plate C - Gold plate

RHA Designator	Total Dose Radiation Tolerance RAD (Si)	Low-Level Neutron Fluence (n/cm²)
.	No Radiation Tolerance Specified	No RHA
M	3×10^3	2×10^{11}
D	1×10^4	2×10^{11}
R	1×10^5	2×10^{11}
H	1×10^6	2×10^{11}

(1) The device has successfully met the requirements of Method 1019, MIL-STD-883 for radiation hardness. Total dose radiation testing shall be performed only when specifically required by the purchase order or contract. The device may be supplied as a non rad-hard JAN microcircuit.

(2) The detail specification and the QML must be consulted to determine the availability of various packages (case outlines) and lead finishes. All variations are not available on all part types.

(3) Some of the Class S microcircuits listed herein appear in Part II of Section II of QML-38535 (formerly QPL-38510). Microcircuits ordered from this Part II listing require qualifying activity approval of certain lot acceptance test data prior to shipment. See paragraph 6.3.1.1 of MIL-M-38510 for further clarification.

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SECTION 7.2: MIL-I-38535 APPENDIX A, STANDARD MICROCIRCUITS (1)

Page	Control Specification	Description	Grade 1	Grade 2
7.2.2	MIL-I-38535 Appendix A (MIL-M-38510)	Digital, Schottky, low-power TTL	JAN Class S	JAN Class B
7.2.6		Digital, Schottky, advanced low-power TTL		
7.2.8		Digital, Schottky, fast TTL		
7.2.10		Digital, CMOS, 4000B series		
7.2.12		Linear, CMOS		
7.2.13		Digital, CMOS, high speed		
7.2.15		Digital, CMOS, high-speed, TTL compatible		
7.2.16		Digital, interface		
7.2.17		Bipolar, memories		
7.2.18		CMOS, memories		
7.2.19		Microprocessors		
7.2.20		Linear		
7.2.24		Semicustom		
7.2.25		Interface Peripherals		
7.2.26		Digital, Advanced CMOS		
7.2.28		Digital, Advanced CMOS, TTL Compatible		

(1) At some point in time, these microcircuits may no longer be produced fully in accordance with Appendix A of MIL-I-38535. When this occurs, approved sources will be listed in this section, and must be used for procurement of MIL-M-38510 devices. Section 7.3 may contain equivalent QML standard parts as substitutes for MIL-M-38510.

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Low-Power TTL

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gates	54LS00	Quad, 2-input positive NAND	/30001	S*X	B*X
	54LS02	NOR, quad 2-input	/30301		B*X
	54LS03	Quad, 2-input positive NAND (open collector outputs)	/30002	S*X	B*X
	54LS04	Hex inverter	/30003	S*X	B*X
	54LS05	Hex inverter (open collector outputs)	/30004	S*X	B*X
	54LS08	AND, quad 2-input	/31004		B*X
	54LS09	AND, quad 2-input, open collector outputs	/31005		B*X
	54LS10	Triple, 3-input positive NAND	/30005	S*X	B*X
	54LS11	AND, triple 3-input	/31001	S*X	B*X
	54LS14	Hex inverter Schmitt trigger	/31302		B*X
	54LS20	Dual, 4-input positive NAND	/30007		B*X
	54LS21	AND, dual 4-input	/31003	S*X	B*X
	54LS27	NOR, triple 3-input	/30302	S*X	B*X
	54LS30	Single, 8-input positive NAND	/30009	S*X	B*X
	54LS32	OR, quad 2-input	/30501		B*X
	54LS51	AND-OR-invert, 2 wide 2 input & 2 wide 3 input	/30401		B*X
	54LS54	AND-OR-invert, 4-wide, 2-3-3-2-input	/30402		B*X
	54LS86	Exclusive-OR, quad 2-input	/30502	S*X	B*X
	54LS132	Quad 2-input Schmitt trigger, positive NAND	/31303		B*X
	54LS266	Exclusive-NOR, quad 2-input (open collector)	/30303		B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.
(3) The only remaining QPL supplier for this device will no longer be producing this device type in this grade. These parts are not recommended for new designs. Consult with your supplier for final shipment dates and/or availability information.

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Low-Power TTL (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Buffers	54LS26	Quad, 2-input inverter buffer/driver, 15 volt output	/32102		B*X
	54LS37	Quad, 2-input positive NAND buffer	/30202		B*X
	54LS38	Quad, 2-input positive NAND buffer (open collector outputs)	/30203		B*X
	54LS40	Dual, 4-input positive NAND buffer	/30201		B*X
	54LS125A	Quad, bus buffer (inverting control inputs)	/32301		B*X
	54LS126	Buffer, quad 3-state outputs	/32302		B*X
	54LS240	Octal, inverting buffer (inverting control inputs)	/32401		B*X
	54LS241	Octal, noninverting buffer (complementary control inputs)	/32402		B*X
	54LS244	Noninverting Octal buffer gates (inverting control inputs)	/32403	S*X	B*X
Drivers	54LS365	Hex, bus driver, gated enable inputs for x-y coincident bus control	/32201		B*X
	54LS366	Buffer/driver, Hex, inverting, with 3-state outputs	/32202		B*X
	54LS367	Buffer/driver, Hex, noninverting, with 3-state outputs	/32203		B*X
	54LS368	Hex, inverter bus driver, 4-line and 2-line enable inputs	/32204		B*X
Counters	54LS90	Decade counter	/31501		B*X
	54LS92	Divide-by-twelve counter	/31510		B*X
	54LS93	4-bit binary counter	/31502		B*X
	54LS160A	Synchronous 4-bit decade (asynchronous clear)	/31503		B*X
	54LS161A	Synchronous 4-bit binary (asynchronous clear)	/31504		B*X
	54LS162A	Synchronous 4-bit decade (synchronous clear)	/31511		B*X
	54LS163A	Synchronous 4-bit binary counter (synchronous clear)	/31512		B*X
	54LS190	Synchronous 4-bit decade counter (with mode control)	/31513		B*X
	54LS191	Synchronous 4-bit up/down binary (mode control)	/31509		B*X
	54LS192	Synchronous 4-bit up/down decade counter (dual clock with clear)	/31507		B*X
	54LS193	Synchronous 4-bit up/down binary (dual clock with clear)	/31508		B*X
	54LS290	Decade counter (BCD or biquinary)	/32003		B*X
	54LS293	4-bit binary counter	/32004		B*X
	54LS390	Dual decade counter with A and B inputs	/32701		B*X
	54LS393	Dual 4-bit binary counter	/32702		B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.
(3) The only remaining QPL supplier for this device will no longer be producing this device type in this grade. These parts are not recommended for new designs. Consult with the supplier for final shipment dates and/or availability information.

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Low-Power TTL (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Flip Flops	54LS73	J-K with clear, dual	/30101		B*X
	54LS74A	D-type with preset/clear, dual	/30102		B*X
	54LS76	J-K with preset/clear, dual	/30110		B*X
	54LS109	J-K with preset/clear, dual (positive)	/30109		B*X
	54LS112	J-K with preset/clear, dual (negative)	/30103		B*X
	54LS113	J-K with preset, dual (negative)	/30104		B*X
	54LS122	Single monostable multivibrator retriggerable, with clear	/31403		B*X
	54LS123	Dual monostable multivibrator retriggerable, with clear	/31401		B*X
	54LS173A	D-type, register, 4-bit, 3-state outputs	/36101		B*X
	54LS174	Hex, D-type with common clear and common clock	/30106		B*X
	54LS175	Quad, D-type with common clear and common clock	/30107		B*X
	54LS221	Dual monostable multivibrator, Schmitt trigger with clear	/31402		B*X
	54LS273	Octal D-type flip-flop with clear, cascadable	/32501		B*X
	54LS374	Octal D-type with 3-state outputs, cascadable	/32503		B*X
	54LS377	D-type, octal flip-flop with enable	/32504		B*X
Latches	54LS75	4-bit bistable latch	/31601		B*X
	54LS259	8-bit addressable latch	/31603		B*X
	54LS259B	8-bit addressable latch	/31605		B*X
	54LS279	Quad S-R Latch	/31602		B*X
	54LS373	D-type, octal transparent latch and 3-state outputs, noncascadable	/32502		B*X
	54LS375	4-bit bistable latch	/31604		B*X
Shift-registers	54LS96	5-bit asynchronous preset	/30604		B*X
	54LS164	8-bit parallel-out/serial shift	/30605	S*X	B*X
	54LS165	8-bit parallel-in with clock inhibit	/30608		B*X
	54LS166	8-bit parallel input shift register with clear	/30609		B*X
	54LS194A	4-bit bidirectional	/30601	S*X	B*X
	54LS195A	4-bit parallel access	/30602		B*X
	54LS395A	4-bit cascadable with 3-state outputs	/30607		B*X
	54LS670	4 x 4 register file with 3-state outputs, cascadable	/31901		B*X

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Low-Power TTL (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Adders/comparators/ALUs	54LS83A	4-bit binary full adder with fast carry	/31201		B*X
	54LS85	4-bit magnitude comparator	/31101		B*X
	54LS181	Arithmetic logic unit/function generator	/30801		B*X
	54LS283	4-bit binary full adder with fast carry	/31202		B*X
Decoders/encoders/multiplexers	54LS42	BCD-to-decimal decoder	/30703	S*X	B*X
	54LS47	BCD-to-seven segment decoder/driver (open collector)	/30704		B*X
	54LS138	Single 3-to-8 line decoder/demultiplexer	/30701	S*X	B*X
	54LS139	Dual 2-to-4 line decoder/demultiplexer	/30702	S*X	B*X
	54LS148	8-to-3 line priority encoder	/36001		B*X
	54LS151	8-input data selector/multiplexer, with enable	/30901		B*X
	54LS153	Dual, 4-input data selector/multiplexer, with enable	/30902	S*X	B*X
	54LS155	Dual 2-line to 4-line decoder/demultiplexer (totem pole outputs)	/32601		B*X
	54LS157	Quad, 2-input data selector/multiplexer, with enable	/30903	S*X	B*X
	54LS158	Quad, 2-input data selector/multiplexer, with enable, with inverted outputs	/30904	S*X	B*X
	54LS251	8-output data selector/multiplexer, with 3-state outputs, with enable	/30905	S*X	B*X
	54LS253	Dual, 4-input data selector/multiplexer, 3-state outputs with enable	/30908	S*X	B*X
	54LS257	Quad 2-input data selector/multiplexer, 3-state outputs, with enable	/30906		B*X
	54LS258A	Quad 2-input data selector/multiplexer, inverting 3-state outputs, with enable	/30907		B*X(3)
	54LS298	Cascadable quad, 2-input data selector/multiplexer with storage	/30909		B*X
	54LS348	8-to-3 line priority encoder with 3-state outputs	/36002		B*X
Parity checker	54LS280	9-bit odd/even parity generator/checker	/32901		B*X
Transceivers	54LS245	Octal noninverting bus transceivers with 3-state outputs	/32803		B*X

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Advanced Low-Power TTL

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M3-8510	Grade 1	Grade 2
Gates	54ALS00	Quad, 2-input positive NAND	/37001		B*X
	54ALS02	Quad, 2-input positive NOR gate	/37301		B*X
	54ALS04	Hex inverter gate	/37006		B*X
	54ALS08	AND, quad 2-input	/37401		B*X
	54ALS10	Triple, 3-input positive NAND	/37002		B*X
	54ALS11	AND, triple 3-input	/37402		B*X
	54ALS20	Dual, 4-input positive NAND	/37003		B*X
	54ALS27	Triple, 3-input positive NOR gate	/37302		B*X
	54ALS28	Quad, 2-input NOR gate, buffer outputs	/38402		B*X
	54ALS30	8-input positive NAND	/37004		B*X
	54ALS32	Quad, 2-input positive OR gate	/37501		B*X
	54ALS37	Quad, 2-input NAND gate, buffer outputs	/38401		B*X
	54ALS40	Dual 4-input NAND gate, buffer	/38407		B*X
	54ALS133	13-input positive NAND	/37005		B*X
	54ALS1000	Quad, 2-input NAND gate, buffer outputs	/38401		B*X
	54ALS1002	Quad, 2-input NOR gate, buffer outputs	/38402		B*X
	54ALS1020	Dual 4-input NAND gate, buffer	/38407		B*X
	54ALS1034	Hex noninverting gate, buffer outputs	/38411		B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Advanced Low-Power TTL (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M3-8510	Grade 1	Grade 2
Drivers	54ALS240	Inverting octal buffer gate (inverting control inputs)	/38301		B*X
	54ALS241A	Noninverting octal buffer gate (complementary control inputs)	/38302		B*X
	54ALS244	Inverting octal buffer gate (inverting control inputs)	/38303		B*X
Counters	54ALS161	Synchronous 4-bit cascadable binary counter (asynchronous clear)	/38001		B*X
	54ALS163	Synchronous 4-bit cascadable binary counter (direct clear)	/38002		B*X
	54ALS169	Synchronous 4-bit cascadable up/down binary counter	/38003		B*X
Flip-flops	54ALS74	D-type, dual with clear and preset	/37101		B*X
	54ALS109	J-K, dual with clear and preset	/37102		B*X
	54ALS112A	J-K, dual with clear and preset	/37103		B*X
	54ALS174	Hex D-type with clear, cascadable	/37201		B*X
	54ALS175	D-type, quad with clear	/37202		B*X
	54ALS374	Octal D-type flip-flop, 3-state outputs	/37204		B*X
	54ALS574	Octal D-type flip-flop, 3-state outputs, cascadable	/37104		B*X
Latches	54ALS373	Octal D-type flip-flop with transparent latch, 3-state outputs, cascadable	/37203		B*X
	54ALS573	Octal D-type transparent latch, 3-state outputs, cascadable	/38201		B*X
Decoders/Encoders, MUX	54ALS138	3 line to 8 line decoder	/37701		B*X
Transceivers	54ALS645	Octal bus transceiver, 3-state outputs	/38505		

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Fast TTL

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gates	54F00	Quad, 2-input positive NAND	/33001	S*X	B*X
	54F02	Quad, 2-input positive NOR	/33301	S*X	B*X
	54F04	Hex inverter	/33002	S*X	B*X
	54F08	AND, quad 2-input	/34001	S*X	B*X
	54F10	Triple, 3-input positive NAND	/33003	S*X	B*X
	54F11	Triple, 3-input positive AND	/34002	S*X	B*X
	54F20	Dual, 4-input positive NAND	/33004	S*X	B*X
	54F32	Quad, 2-input positive OR	/33501	S*X	B*X
	54F64	4-2-3-2 input, positive AND-OR-Invert	/33401	S*X	B*X
	54F86	XOR, quad 2-input	/34501	S*X	B*X
Drivers	54F240	Octal buffers/line drivers with 3-state inverting outputs	/33201		B*X
	54F241	Octal buffers/line drivers with 3-state outputs	/33202	S*X	B*X
	54F244	Octal buffers/line drivers with 3-state outputs	/33203	S*X	B*X
Counters	54F160A	Synchronous 4-bit decade counter (asynchronous master reset)	/34401	S*X	B*X
	54F161A	Synchronous 4-bit binary counter (asynchronous master reset)	/34301	S*X	B*X
	54F163A	Synchronous presettable binary counter	/34302	S*X	B*X
	54F193	Up/down binary counter with separate up/down clocks	/34304		B*X
Flip-flops	54F74	Dual D-type positive edge-triggered	/34101	S*X	B*X
	54F109	Dual, J-K positive edge-triggered	/34102		B*X
	54F174	Hex, D-type positive edge-triggered	/34107	S*X	B*X
	54F175	Quad, D-type positive edge-triggered	/34104		B*X
	54F374	Octal, D-type positive edge-triggered with 3-state outputs	/34105		B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.
(3) The only remaining QPL supplier for this device will no longer be producing this device type in this grade. These parts are not recommended for new designs. Consult with the supplier for final shipment dates and/or availability information.

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MIL-M-38510, MICROCIRCUITS
Digital, Schottky, Fast TTL (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Latch	54F373	Octal transparent latch with active low enable 3-state outputs	/34601	S*X	B*X
	54F533	Octal transparent latch with active low enable 3-state outputs	/34602		B*X
Register	54F398	Quad, 2-port register with complementary outputs	/35001	S*X	B*X
	54F399	Quad, 2-port register	/35002	S*X	B*X
Adder/ Comparator	54F283	4-bit binary full adder with fast carry	/34201	S*X	B*X
	54F521	8-bit identity comparator	/34701	S*X	B*X
Decoders/ MUXs	54F138	1-of-8 decoder, active low outputs with enable inputs	/33701	S*X	B*X
	54F139	Dual 1-of-4 decoder, active low outputs with enable inputs	/33702	S*X	B*X
	54F151A	8-input multiplexer	/33901	S*X	B*X
	54F153	Dual 4-input multiplexer	/33902	S*X	B*X
	54F157A	Quad 2-input multiplexer	/33903	S*X	B*X
	54F158A	Quad 2-input multiplexer with inverted outputs	/33904	S*X	B*X
	54F251A	8-input multiplexer with 3-state outputs	/33905	S*X	B*X
	54F253	Dual 4-input multiplexer with 3-state outputs	/33908	S*X	B*X
	54F257A	Quad 2-input multiplexer with 3-state outputs	/33906	S*X	B*X
	54F258A	Quad 2-input multiplexer with 3-state inverted outputs	/33907	S*X	B*X
	54F352	Dual 4-input multiplexer with inverted outputs	/33909		B*X
	54F353	Octal transparent latch with active low enable, 3-state outputs	/33910		B*X
Combinational	54F280	9-bit odd/even parity generator/checker	/34901	S*X	B*X
Transceiver	54F245	Octal noninverting bus transceiver w/ 3-state outputs	/34803	S*X	B*X

(1) Use the JAN M38510 part number for ordering.
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MIL-M-38510, MICROCIRCUITS
Digital, CMOS, 4000B Series

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gates	4001B	NOR, quad, 2-input	H05252	S*X	B*X
	4002B	NOR, dual 4-input	H05253	S*X	B*X
	4007UB	Complementary pair, dual plus inverter	H05351	S*X	B*X
	4011B	NAND, quad 2-input	H05051	S*X	B*X
	4012B	NAND, dual 4-input	H05052	S*X	B*X
	4019B	Quad AND-OR select gate	/05352		B*X
	4019B	Quad AND-OR select gate	H05352	S*X	B*X(3)
	4023B	NAND, triple 3-input	H05053	S*X	B*X
	4025B	NOR, triple 3-input	H05254	S*X	B*X
	4030B	Quad, 2-input exclusive OR gate	H05353	S*X	B*X
	4070B	Exclusive-OR, quad, 2-input	H17203	S*X	B*X
	4071B	OR, quad, 2-input	H17101	S*X	B*X
	4072B	OR, dual, 4-input	R17102		B*X
	4073B	AND, triple, 3-input	R17003		B*X
	4075B	OR, triple, 3-input	H17103	S*X	B*X
	4077B	Exclusive-NOR, quad, 2-input	R17204		B*X
	4081B	AND, quad, 2-input	H17001	S*X	B*X
	4082B	AND, dual, 4-input	R17002		B*X
	4085B	AND-OR-invert, dual, 2-wide, 2-input	H17201	S*X	B*X
	4086B	AND-OR-invert, expandable, 4-wide, 2-input	H17202	S*X	B*X

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MIL-M-38510, MICROCIRCUITS
Digital, CMOS, 4000B Series (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gates	4049UB	Inverter, hex buffer	H05553	S*X	B*X
	4050B	Buffer, hex	/05554		B*X(3)
	4050B	Buffer, hex	H05554	S*X	B*X
Buffer	4041UB	Quad true/complement buffer	R05555	S*X	B*X
	4069UB	Hex, inverter	H17401	S*X	B*X
	4502B	Hex, inverter/buffer, strobed	R17403	S*X	B*X
Flip-flops/ Latches	4098B	Dual, monostable multivibrator	R17504		B*X
	4099B	8-bit, addressable latch	R17601		B*X
	4013B	D-type, dual	H05151	S*X	B*X
	4013B	D-type dual edge-triggered flip-flop	/05151		B*X
	4027B	J-K, dual master-slave flip-flop	H05152	S*X	B*X
Counter/ Dividers	4008B	Four bit full adder	R05451	S*X	B*X
	4017B	Decade counter/divider	H05651	S*X	B*X
	4018B	OR, triple, 3-input	H05652	S*X	B*X
	4020B	14-stage ripple-carry binary counter/divider	H05653	S*X	B*X
	4022B	Octal counter with 8 decoded outputs	H05654	S*X	B*X
	4024B	7-stage ripple-carry binary counter/divider	H05655	S*X	B*X
Registers	4014B	8-stage synchronous parallel or serial input/serial output static	H05752	S*X	B*X
	4015B	Dual, 4-stage serial input/parallel outputs	H05753	S*X	B*X
	4021B	8-state asynchronous parallel input/serial outputs or synchronous serial input/serial output static shift register	H05754	S*X	B*X
Decoders/ Switches	4028B	BCD to decimal decoder	R05951	S*X	B*X
	4066B	QUAD bilateral switch	H05852	S*X	B*X

(1) Use the JAN M38510 part number for ordering.
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(3) The only remaining QPL supplier for this device will no longer be producing this device type in this grade. These parts are not recommended for new designs. Consult with the supplier for final shipment dates and/or availability information.

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MIL-M-38510, MICROCIRCUITS
Linear, CMOS

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Analog switches	200	Dual SPST, CMOS, negative logic	/12301	—	B*X
	201	Quad SPST, CMOS, negative logic	/12302		B*X
	300A	Dual SPST switch (TTL compatible)	/11601		B*X
	301A	Single SPDT switch (TTL compatible)	/11602		B*X
	302A	Dual DPST switch (TTL compatible)	/11603		B*X
	303A	Dual SPDT switch (TTL compatible)	/11604		B*X
	304A	Dual SPST switch (50 ohm, CMOS input compatible)	/11605		B*X
	305A	Single SPDT switch (50 ohm, CMOS input compatible)	/11606		B*X
	306A	Dual DPST switch (50 ohm, CMOS compatible)	/11607		B*X
	307A	Dual SPDT switch (50 ohm, CMOS compatible)	/11608		B*X
Multiplexers	506	16 channel multiplexer/demultiplexer	/19001		B*X
	507	8 channel differential multiplexer/demultiplexer	/19003		B*X
	508	8 channel multiplexer/demultiplexer	/19007		B*X
	509	4 channel differential multiplexer/demultiplexer	/19008		B*X

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MIL-M-38510, MICROCIRCUITS
Digital, CMOS, High Speed

Description	Generic Type (1) (3)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gates	54HC00	NAND, quad 2-input	/65001		B*X
	54HC02	NOR, quad 2-input	/65101		B*X
	54HC04	HEX inverter	/65701		B*X
	54HC08	AND, quad 2-input	/65203		B*X
	54HC10	NAND, triple 3-input	/65002		B*X
	54HC11	AND, triple 3-input	/65204		B*X
	54HC14	Hex inverting, Schmitt trigger	/65702		B*X
	54HC20	NAND, dual 4-input	/65003		B*X
	54HC27	NOR, triple 3-input	/65102		B*X
	54HC30	NAND, 8-input	/65004		B*X
	54HC32	OR, quad 2-input	/65201		B*X
	54HC86	XOR, quad 2-input	/65202		B*X
	54HC244	Octal non-inverting buffers with 3-state buffers	/65705		B*X
	54HC4002	NOR, dual 4-input	/65104		B*X
Counters	54HC161	4-bit binary counter, asynchronous reset, synchronous load	/66302		B*X
	54HC163	4-bit binary counter, synchronous reset and load	/66304		B*X
	54HC393	Dual 4-bit synchronous binary counter, asynchronous reset	/66309		B*X
Flip-flops /latches	54HC74	Dual D-type, positive-edge triggered with clear and preset	/65302		B*X
	54HC109	Dual J-K positive-edge triggered with clear and preset	/65304		B*X
	54HC112	Dual J-K negative-edge triggered with clear and preset	/65305		B*X
	54HC173	Quad D-type with 3-state outputs and clear	/65306		B*X
	54HC174	Hex D-flip-flop with clear	/65307		B*X
	54HC175	Quad D-flip-flop with clear	/65308		B*X
	54HC259	8-Bit addressable latch	/65402		B*X
	54HC273	Octal D-flip-flop with direct clear input	/65601		B*X
	54HC373	Octal D-type latch with 3-state outputs	/65403		B*X
	54HC374	Octal D-type flip-flop with 3-state outputs	/65602		B*X
	54HC573	Octal D-type latch with 3-state outputs	/65406		B*X
	54HC574	Octal D-type flip-flop with 3-state outputs	/65604		B*X(4)
Registers	54HC164	8-Bit parallel-out shift register	/66501		B*X
	54HC165	8-Bit parallel-in shift register with clock inhibit	/66502		B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.
(3) The "HC" technology has been shown to be vulnerable to total dose radiation levels as low as 3 Krads. D.C. parameter specification limits were exceeded after radiation exposures as low as 3 Krads and functional failures occurred at levels as low as 20 Krads. Lot by lot radiation testing is recommended.
(4) The only remaining QPL supplier for this device will no longer be producing this device type in this grade. These parts are not recommended for new designs. Consult with the supplier for final shipment dates and/or availability information.

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MIL-M-38510, MICROCIRCUITS
Digital, CMOS, High-Speed (Continued)

Description	Generic Type (1) (3)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Transceivers	54HC245	Octal noninverting bus transceiver with 3-state outputs	/65503		B*X
Decoder/MUX	54HC138	3-to-8 line decoder	/65802		B*X
	54HC139	Dual 2-to-4 line decoder	/65803		B*X
	54HC158	Quad 2-input data selector/multiplexer with enable	/66204		B*X
Buffers/Drivers	54HC240	Octal inverting buffer with 3-state outputs	/65703		B*X
	54HC241	Octal buffer with 3-state outputs	/65704		B*X
	54HC365	Hex bus driver, gated enable inputs for X-Y coincident bus control with 3-state outputs	/65706		B*X
	54HC367	Hex bus driver, 4-line and 2-line enable inputs with 3-state outputs	/65708		B*X
	54HC368	Hex inverter bus driver 4-line and 2-line enable inputs with 3-state outputs	/65709		B*X
	54HC540	Octal inverter bus driver with 3-state outputs	/65710		B*X
	54HC541	Octal noninverting bus driver with 3-state outputs	/65711		B*X

(1) Use the JAN M38510 part number for ordering.
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(3) The "HC" technology has been shown to be vulnerable to total dose radiation levels as low as 3 Krads. D.C. parameter specification limits were exceeded after radiation exposures as low as 3 Krads and functional failures occurred at levels as low as 20 Krads. Lot by lot radiation testing is recommended.

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MIL-M-38510, MICROCIRCUITS
Digital, CMOS, High-Speed, TTL Compatible

Description	Generic Type (1) (3)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Gate	54HCT04	Hex inverter	/65751		B*X
Buffers	54HCT240	Inverting Octal 3-state buffer	/65753		B*X
	54HCT244	Octal buffer with 3-state outputs	/65755		B*X
	54HCT540	Octal inverter bus driver with 3-state outputs	/65760		B*X
	54HCT541	Octal noninverting bus driver with 3-state outputs	/65761		B*X
Transceivers	54HCT245	Octal noninverting bus transceiver with 3-state outputs	/65553		B*X
Decoders	54HCT138	3-to-8 line decoder (TTL compatible)	/65852		B*X
Flip-flops/Latches	54HCT74	Dual D-type flip-flop with preset and clear with LSTTL compatible inputs	/65352		B*X
	54HCT373	Octal D-type flip-flop with 3-state and TTL compatible inputs	/65453		B*X
	54HCT374	Octal D-type flip-flop with 3-state outputs (LSTTL inputs)	/65652		B*X

(1) Use the JAN M38510 part number for ordering.
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(3) The "HC" technology has been shown to be vulnerable to total dose radiation levels as low as 3 Krads. D.C. parameter specification limits were exceeded after radiation exposures as low as 3 Krads and functional failures occurred at levels as low as 20 Krads. Lot by lot radiation testing is recommended.

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MIL-M-38510, MICROCIRCUITS
Digital, Interface

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Digital to Analog Converters	DAC-08	8-bit D/A converters, 0.19% linearity	/11301	S*X	B*X
	DAC-08A	8-bit D/A converters, 0.10% linearity	/11302		B*X
	562	12 bit digital to analog converter, external reference	/12101		B*X
	565	12 bit digital to analog converter, internal reference, high speed	/12103		B*X
	7521	12 bit D/A converter with 10 bit end-point linearity	/12703		B*X
	561	10 bit binary D/A converter, internal reference	/13301		B*X
Analog to Digital Converters	574AT	12 bit, analog to digital converter with microprocessor interface	/14002		B*X
	574AU	12 bit, analog to digital converter with microprocessor interface	/14001		B*X

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MIL-M-38510, MICROCIRCUITS
Bipolar, Memories

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
RAM	93L422	Static, 256 x 4, Low power, 3-state output	/23112		B*X
PROM	82S23	32 x 8 with open collector outputs	/20701		B*X(3)
	82S115	512 x 8 with 3-state outputs	/20803		B*X(3)
	82S123A	32 x 8 with 3-state output	/20704		B*X(3)
	82S126	256 x 4 with open collector	/20301		B*X(3)
	82S129	256 x 4 with active pull-up and 3-state output	/20302		B*X(3)
	82S129A	256 x 4 with active pull-up and 3-state output	/20304		B*X(3)
	82S130	512 x 4 with open collector	/20401		B*X(3)
	82S131	512 x 4 with active pull-up and 3-state output	/20402		B*X(3)
	82S131A	512 x 4 with active pull-up and 3-state output	/20404		B*X(3)
	82S137	1K x 4 with 3-state output	/20602		B*X(3)
	82S137A	1K x 4 with 3-state outputs	/20604		B*X(3)
	82S141	512 x 8 with active pull-up and 3-state output	/20802		B*X(3)
	82S181	1K x 8 with active pull-up and 3-state output	/20904		B*X
	82S181A	1K x 8 with active pull-up and 3-state output	/20909		B*X(3)
	82S191	2K x 8 with active pull-up and 3-state output	/21002		B*X
	82S185	2K x 4 with active pull-up and 3-state output	/20902		B*X
	82S185A	2K x 4 with active pull-up and 3-state output	/20910		B*X(3)
	82S191A	2K x 8 with active pull-up and 3-state output	/21004		B*X(3)

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MIL-M-38510, MICROCIRCUITS
CMOS, Memories

Description	Generic Type (1)	Function	JAN Part Number (2)		
			Part No.	Grade 1	Grade 2
RAM	7C147	Static, 4096 x 1, 35ns	M38510/28901		B*X
	6504	Static, 4096 x 1, 3-state output	M38510/24501		B*X
	6504RH	Static, 4k x 1, synchronous, 3-state output	M38510R24503	S*X	
	6514	Static, 1024 x 4, 3-state output	M38510/24502		B*X
	6516	Static, 2k x 8, 200 ns	M38510/29102		B*X
	65642	Static, 8k x 8, selectable mode	M38510/29205		B*X
	6716485	Static, 8k x 8, Rad-hard, 85ns	5962H3829435	S*X	B*X
	6716470	Static, 8k x 8, Rad-hard, 70ns	5962H3829436	S*X	B*X
	6716455	Static, 8k x 8, Rad-hard, 55ns	5962H3829437	S*X	B*X
	65262	Static, 16k x 1, 85ns	M38510/29103		B*X

(1) Use the JAN M38510 part number for ordering.
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MIL-M-38510, MICROCIRCUITS
Linear

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Operational amplifiers	741A	Single, internally compensated	/10101	S*X	B*X
	747A	Dual, internally compensated	/10102	S*X	B*X
	101A	Single, externally compensated	/10103	S*X	B*X
	108A	Single, externally compensated	/10104	S*X	B*X
	771	Single, low noise, BI-FET	/11904		B*X
	772	Dual, low noise, BI-FET	/11905		B*X
	774	Quad, low noise, BI-FET	/11906		B*X
	2101A	Dual, externally compensated	/10105		B*X
	2108A	Dual, externally compensated	/10106		B*X
	118	Precision, high-speed	/10107	S*X	B*X
	1558	Dual, internally compensated	/10108	S*X	B*X
	148	Quad (medium power, internal compensation)	/11001	S*X	B*X
	124	Quad (single supply, low power)	/11005	S*X	B*X
	155	JFET input, low power	/11401	S*X	B*X
	156	JFET input,wide band	/11402	S*X	B*X
	155A	JFET input, high performance, low power, low offset	/11404	S*X	B*X
	156A	JFET (high performance, wideband, low offset)	/11405	S*X	B*X
	157A	JFET (high performance, wideband, low offset undercompensated)	/11406		B*X
	2500	High slew rate, internally compensated, precision	/12204		B*X
	2510	Single, internally compensated, high slew rate	/12205		B*X
	2520	Single, externally compensated, high slew rate	/12206		B*X
	2600	Single, high impedance, internally compensated, wide band	/12202		B*X
	2620	Single, externally compensated, high impedance, wide band	/12203		B*X
	0P07	Single, low offset, internal compensation	/13502	S*X	B*X
	0P07A	Single, internal compensation, ultra-low offset	/13501	S*X	B*X
	0P27A	Single, internal compensation, ultra-low noise and offset	/13503	S*X	B*X

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MIL-M-38510, MICROCIRCUITS
Linear (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Voltage regulators	723	Positive or negative voltage regulator	/10201	S*X	B*X
	109	5-volt positive regulator, 1.5 A	/10701	S*X	B*X
	78M05	5-volt positive voltage regulator, 0.5 A	/10702	S*X	B*X
	78M12	12-volt positive voltage regulator, 0.5 A	/10703	S*X	B*X
	78M15	15-volt positive voltage regulator, 0.5 A	/10704	S*X	B*X
	140K-05	5-volt positive voltage regulator, 1.0 A	/10706	S*X	B*X
	140K-12	12-volt positive voltage regulator, 1.0 A	/10707	S*X	B*X
	140K-15	15-volt positive voltage regulator, 1.0 A	/10708	S*X	B*X
	140K-24	24-volt positive voltage regulator, 1.0 A	/10709		B*X
	120H-05	5-volt negative voltage regulator, 0.5 A	/11501	S*X	B*X
	120H-12	12-volt negative voltage regulator, 0.5 A	/11502	S*X	B*X
	120H-15	15-volt negative voltage regulator, 0.5 A	/11503	S*X	B*X
	120K-05	5-volt negative voltage regulator, 1.0 A	/11505	S*X	B*X
	120K-12	12-volt negative voltage regulator	/11506	S*X	B*X
	120K-15	15-volt negative voltage regulator, 1.0 A	/11507	S*X	B*X
	117H	3-terminal adjustable regulator, 0.5 A	/11703	S*X	B*X
	117K	3-terminal adjustable regulator, 1.5 A	/11704	S*X	B*X
	137H	3-terminal adjustable regulator, 0.5 A	/11803	S*X	B*X
	137K	3-terminal adjustable regulator, 1.5 A	/11804	S*X	B*X
Switching Regulator	1524	Regulating pulse-width modulator	/12601	S*X	B*X
	1525A	Regulating pulse-width modulator	/12602		B*X
	1526	Regulating pulse-width modulator	/12603		B*X

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MIL-M-38510, MICROCIRCUITS
Linear (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Voltage comparators	710	Single, differential	/10301		B*X
	111	Precision buffer	/10304	S*X	B*X
	119	Dual, high speed	/10306	S*X	B*X
	2111	Dual precision voltage comparator/buffer	/10305	S*X	B*X
	139	Quad, single supply, low power	/11201	S*X	B*X
	193	Dual, low power, low offset	/11202	S*X	B*X
Line drivers/ receivers	9614	Dual differential line driver (2-state outputs)	/10403		B*X
	55113	Dual differential line driver (tri-state outputs)	/10405		B*X
	55107	Dual line receiver	/10401		B*X
	55108	Dual line receiver (open collector)	/10402		B*X
	9615	Dual differential line receiver	/10404		B*X
	55463	Dual high voltage, OR gate and transistor (connected), medium speed switching	/12909		B*X
Timers	555	Single, precision	/10901	S*X	B*X
	556	Dual, precision	/10902		B*X
Multiplier	532S	4-quadrant multiplier (4% max multiplying error)	/13903		B*X
	534T	4-quadrant multiplier (1% max multiplying error)	/13901		B*X

(1) Use the JAN M38510 part number for ordering.
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MIL-M-38510, MICROCIRCUITS
Linear (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Sample and Hold Circuit	198	Sample and hold circuit, 10 K Ohms	/12501	S*X	B*X
Analog Switches	181A	Dual channel 30 Ohm SPST	/11101		B*X
	182A	Dual channel 75 Ohm SPST	/11102		B*X
	184A	Dual channel 30 Ohm DPST	/11103		B*X
	185A	Dual channel 75 Ohm DPST	/11104		B*X
	187A	Single channel 30 Ohm SPDT	/11105		B*X
	188A	Single channel 75 Ohm SPDT	/11106		B*X
	190A	Dual channel 30 Ohm SPDT	/11107		B*X
	191A	Dual channel 75 Ohm SPDT	/11108		B*X

(1) Use the JAN M38510 part number for ordering.
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MIL-M-38510, MICROCIRCUITS
Semicustom

Description	Function	JAN Part Number (1)		
		M38510	Grade 1	Grade 2
Gate Array	≤ 4,000 gate array	/60504		B*X
	≤ 25,000 gate array	H60514	S*X	
	≤ 3,000 gate array	/60603		B*X
	≤ 4,000 gate array	/60604		B*X
	≤ 6,000 gate array	/60606		B*X
	≤ 8,000 gate array	/60608		B*X
	≤ 11,000 gate array	/60611		B*X
	≤ 25,000 gate array	H60614	S*X	
	45,001-55,000 gate array	H60617	S*X	B*X
	≤ 8,000 gate array	/60708		B*X
	≤ 11,000 gate array	/60711		B*X
	≤ 25,000 gate array	H60714	S*X	
	45,001-55,000 gate array	H60717	S*X	B*X
	10,001-11,000 gate array	/60811		B*X
	15,001-25,000 gate array	H60814	S*X	
	45,001-55,000 gate array	H60817	S*X	B*X

(1) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.

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MIL-M-38510, MICROCIRCUITS
Interface Peripherals

Description	Generic Type (1)	Function	JAN Part Number (2)		
			M38510	Grade 1	Grade 2
Remote Terminal Interface	1553BRTI	Remote terminal interface (clock duty cycle logical high 10 percent to 35 percent)	/55501	-	B*X
	1553BRTIA	Remote terminal interface (clock duty cycle logical high 40 percent to 60 percent)	/55502	-	B*X

(1) Use the JAN M38510 part number for ordering.
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MIL-M-38510, MICROCIRCUITS
Digital, Advanced CMOS

Description	Generic Type (1)	Function	JAN Part Number (2)		
			Part No.	Grade 1	Grade 2
Counters	54AC161	Synchronous Presettable Binary Counter	M38510/76302	S*X	B*X
	54AC163	Synchronous Presettable Binary Counter	M38510/76304	S*X	B*X
	54AC191	Up/down Counter w/Preset and Ripple Clock	M38510/76305	S*X	B*X
Gates	54AC00	NAND, quad 2-input	M38510R75001	S*X	B*X
	54AC02	NOR, quad 2-input	M38510R75101	S*X	B*X
	54AC04	Hex inverter	M38510R75701	S*X	B*X
	54AC05	Hex inverter with open drain outputs	5962-9059001	S*X	B*X
	54AC08	AND, quad 2-input	M38510R75203	S*X	B*X
	54AC10	NAND, triple, 3-input	M38510R75002	S*X	B*X
	54AC11	AND, triple, 3-input	M38510/75204	S*X	B*X
	54AC14	HEX inverting Schmitt trigger	M38510R75702	S*X	B*X
	54AC20	NAND, dual 4-input	M38510R75003	S*X	B*X
	54AC32	OR, quad, 2-input	M38510R75201	S*X	B*X
	54AC86	XOR, quad 2-input	M38510R75202	S*X	B*X
Flip-Flops/ Latches	54AC74	Dual D-type flip-flop, positive edge-triggered	M38510/75302	S*X	B*X
	54AC109	Dual JK positive edge-triggered flip-flop	M38510/75304	S*X	B*X
	54AC174	Hex D flip-flop with master reset	M38510/75307	S*X	B*X
	54AC273	Octal D-type flip-flop with reset	M38510/75601	S*X	B*X
	54AC373	Octal transparent latch with 3-state outputs	M38510/75403	S*X	B*X
	54AC373	Octal transparent latch with 3-state outputs	M38510R75403	S*X	B*X
	54AC374	Octal D-type flip-flop with 3-state outputs	M38510/75602	S*X	B*X
	54AC377	Octal D flip-flop w/clock enable	M38510/75603	S*X	B*X
	54AC574	Octal D flip-flop w/3-state outputs	M38510/75604	S*X	B*X
Decoder/MUX	54AC138	1-of-8 decoder/demultiplexer	M38510/75802	S*X	B*X
	54AC139	Dual 1-of-4 decoder/demultiplexer	M38510/75803	S*X	B*X
	54AC151	8-input multiplexer	M38510/76201	S*X	B*X
	54AC153	Dual 4-input multiplexer	M38510/76202	S*X	B*X
	54AC157	Quad 2-input multiplexer	M38510/76203	S*X	B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.

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MIL-M-38510, MICROCIRCUITS
Digital, Advanced CMOS (Continued)

Description	Generic Type (1)	Function	JAN Part Number (2)		
			Part No.	Grade 1	Grade 2
Drivers	54AC240	Octal buffer/line driver with inverting 3-state outputs	M38510R75703	S*X	B*X
	54AC241	Octal buffer/line driver with 3-state outputs	M38510R75704	S*X	B*X
	54AC244	Octal buffer/line driver with 3-state outputs	M38510R75705	S*X	B*X
	54AC541	Octal buffer/line driver w/3 state outputs	M38510/75711	S*X	B*X
Transceivers	54AC245	Octal, bidirectional transceiver with 3-state outputs	M38510R75503	S*X	B*X
Shift Registers	54AC299	8-bit universal shift register with common parallel I/O pins	M38510R76506	S*X	B*X
Comparators	54AC520	8-bit magnitude comparator	5962-9091601	S*X	B*X
	54AC521	8-bit identify comparator	5962R9098501	S*X	B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.

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MIL-M-38510, MICROCIRCUITS
Digital, Advanced CMOS, TTL Compatible

Description	Generic Type (1)	Function	JAN Part Number (2)		
			Part No.	Grade 1	Grade 2
Gates	54ACT00	Quad 2-input NAND gate	5962-8769901	S*X	B*X
	54ACT00	Quad 2-input NAND gate	5962R8769901	S*X	B*X
Flip Flop	54ACT74	Dual D Positive Edge-Triggered Flip-Flop 35 percent)	5962-8752501	S*X	B*X
	54ACT112	Dual J-K Negative Edge-Triggered Flip-Flop	5962-8995001	S*X	B*X
	54ACT377	Octal D Flip-Flop with clock enable	5962-8769701	S*X	B*X
	54ACT574	Octal D Flip-Flop with 3-state outputs	5962-8960101	S*X	B*X
Decoder/MUX	54ACT138	1-of-8 Decoder/DDemultiplexer	5962-8755401	S*X	B*X
	54ACT151	8-input multiplexer	5962-8875601	S*X	B*X
Drivers	54ACT240	Octal buffer/line driver w/3-state outputs	5962-8775901	S*X	B*X
	54ACT240	Octal buffer/line driver w/3-state outputs	5962R8775901	S*X	B*X
	54ACT244	Octal buffer/line driver w/3-state outputs	5962-8776001	S*X	B*X
	54ACT244	Octal buffer/line driver w/3-state outputs	5962R8776001	S*X	B*X
Transceivers	54ACT245	Octal bidirectional transceiver w/3-state inputs/outputs	5962-8766301	S*X	B*X
	54ACT245	Octal bidirectional transceiver w/3-state inputs/outputs	5962R8766301	S*X	B*X

(1) Use the JAN M38510 part number for ordering.
(2) The * is for choice of package style. The X is for choice of lead finish. Refer to the QPL for specific choices.

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SECTION 7.3: MIL-I-38535 APPROVED MICROCIRCUIT FLOWS AND PARTS

The attached tables are listings of approved flows and parts based on QML-38535. Three grades of flows are shown: Grade 1, Grade 2 and Grade 3. Monolithic microcircuit flows are composed of the five (5) major operations: Design Center, Mask Development, Wafer Fabrication Operation(s), Assembly Operations(s) and Test Operation. In many cases, there are multiple locations listed for the individual operations. After each flow for Grade 1 and Grade 2 is a list of devices available from that particular flow. These parts are all considered standard to the respective Grade. No parts are listed for Grade 3 flows. For a list of parts available from Grade 3 flows, refer to QML-38535 or consult with the vendor.

The QML flows listed in this standard contain information based on the most recent QML-38535 listing as of the time of publication. If flow information was originally missing in QML-38535, and no additional information could be obtained from the manufacturer, the flow information listed herein may be incomplete.

There is no standardized assembly location coding system for QML manufacturers. Thus, the alpha-numeric designator for country of manufacture will vary widely between QML assembly sites.

In some cases, it may be necessary to contact the manufacturer directly for additional information. Some flows refer the user to the manufacturer for missing information which was not available at the time of publication. In other cases, flow information may include "TBD's", or a flow number which includes multiple "X's" which signify wildcard digits. These wildcards were included since many combinations of numbers were possible. The manufacturer's contact list on the following page may be consulted in order to obtain the missing data.

Direct contact with a manufacturer may also be necessary when ordering Grade 3 devices from listed manufacturers which have incomplete flow information. Users must verify that the device is being produced exclusively on approved QML flows. Approved flows may include transitionally certified flows. If the device is not being procured exclusively on approved flows, the device would not be considered standard for Grade 3 use.

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MANUFACTURER'S CONTACT LIST

MANUFACTURER	CONTACT POINT	PHONE NUMBER
American Microsystems, Inc.	David Locke	(208) 234-6708
Analog Devices	Jim Kaufman	(617) 937-2470
AT&T	Bill Vesperman	(215) 439-6035
Harris	Peter Brooks	(407) 724-7783
Honeywell	Bret Rinehart	(612) 954-2956
Intel	Greg Mather	(602) 554-8450
Linfinity	Tim Miller	(714) 898-8121
Loral	Dave Polak	(703) 367-3458
Motorola	Doug Max	(602) 897-3733
National Semicondutor	Susan Davis	(408) 721-3161
Siliconix	Liz Korntved	(408) 970-5260
Texas Instruments	Buf Slay	(915) 561-6689
UTMC	Myles Standish	(719) 594-8000

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES (2)
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	V	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006	Location: Plymouth, MN Line: RICMOS III Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS III Flow: 22005911	Location: Plymouth, MN Assembly Code: USA Line: RICMOS III Flow: 22009590	Electrical: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006
Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006 Procedure: GMS-10026, Rev- See Product Description for Specific Third Party Design Centers if Utilized in Product Design	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS IV Flow: 22016249	Location: Plymouth, MN Assembly Code: USA Line: RICMOS IV Flow: 22009590	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	36 - 256
Matrix Size	N/A
Lead Finish	Gold
Lead	0.020 - 0.040 inch

(1) Actual radiation hardness levels are dependent on the individual part number.
(2) RICMOS IV Gate Array ASICS have not yet been certified and qualified to Class V.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES (2)
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	V	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006 Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006

(1) Actual radiation hardness levels are dependent on the individual part number.
(2) RICMOS IV Gate Array ASICS have not yet been certified and qualified to Class V.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS (3)

MANUFACTURER

Honeywell SSEC
12001 State Highway 55
Plymouth, MN 55441

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H3829438V9X	HC6364/1XVHBT	STATIC RAM, 8K X 8 SRAM
5962H3829440V9X	HC6364/1XVHBC	STATIC RAM, 8K X 8 SRAM
5962H3829442V9X	HC6364/1XVHCT	STATIC RAM, 8K X 8 SRAM
5962H3829443V9X	HC6364/1XVHCC	STATIC RAM, 8K X 8 SRAM

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this document's release. Other SMD products produced to the "V" assurance level on this flow are also considered standard for Grade 1 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Loral Federal Systems Company - Manassas 9500 Godwin Drive Manassas, VA 22110	52088	V	2 MEG	1.0μm RHCMOS 0.8μm RHCMOS-E 0.5μm HMCMOS VCOS	SRAM, Logic, VCOS Memory, Micro-processors, and Custom and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Manassas, VA Line: VLSI Flow: MIDS/MVISA QM Plan Design Rules	Location: Dupont Photomask, Inc. Danbury, CT	Location: Manassas, VA Line: Loral FSC VLSI Flow: Q.P. 163A648 Q.P. 163A102 PP525-826 PP525-940 PP525-953 PP525-954	Location: Manassas, VA Line: Loral FSC VLSI Flow: 163A633, 163A650 163A799	Electrical: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Sections 11 & 16 Environmental: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Paragraph 26.1.2

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	32 - 308
Matrix Size	N/A
Lead Finish	Gold
Lead Pitch	0.250 - 0.635 inch

(1) Actual radiation hardness levels are dependent on the individual part number.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS (3)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H3829444V8X	LOR6408C-V55X	STATIC RAM, 8K X 8
5962H9202601VZX	LORFXPC-V49F	MICROPROCESSOR, FIXED POINT
5962H9210301VZX	LORFLPC-V47F	MICROPROCESSOR, FLOATING-POINT
5962H9210401VZX	LORAP1C-V47F	ADDRESS PROCESSOR
5962H9210601VZX	LORAP2C-V45F	ADDRESS PROCESSOR
5962H9215401VZX	LOR6401C-V55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, CMOS
5962H9215401VYX	LOR6401C-V556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, CMOS
5962H9215402VZX	LOR6401T-V55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, TTL
5962H9215402VYX	LOR6401T-V556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, TTL
5962H9215301VXX	LOR2568C-V60X	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215301VYX	LOR2568C-V60Y	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215301VNX	LOR2568C-V60I	STATIC RAM, 32K X 8, 60 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this document's release. Other SMD products produced to the "V" assurance level on this flow are also considered standard for Grade 1 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H9215301VYX	LOR2568T-V60Y	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215302VXX	LOR2568T-V60X	STATIC TAM, 32K X 8, 60 NS ACCESS TIME
5962H9215302VNX	LOR2568T-V60I	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215303VXX	LOR2568C-V40X	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215303VYX	LOR2568C-V40Y	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215303VZX	LOR2568C-V40I	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215304VXX	LOR2568T-V40X	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215304VYX	LOR2568T-V40Y	STATIC RAM, 32K 8, 40 NS ACCESS TIME
5962H9215304VZX	LOR2568T-V40I	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215313VNX	LOR2568C-V30I	STATIC RAM, 32K X 8, 30 NS ACCESS TIME, CMOS
5962H9215314VNX	LOR2568T-V30I	STATIC RAM, 32K X 8, 30 NS ACCESS TIME, TTL
5962H9312801VXX	LOR2561C-V60X	STATIC RAM, 256K X 1, 60 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this document's release. Other SMD products produced to the "V" assurance level on this flow are also considered standard for Grade 1 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 1 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H9312801VYX	LOR2561C-V60Y	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312802VXX	LOR2561T-V60X	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312802VYX	LOR2561T-V60Y	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312803VXX	LOR2561C-V40X	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312803VYX	LOR2561C-V40Y	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312804VXX	LOR2561T-V40X	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312804VYX	LOR2561T-V40Y	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9215401VZX	LOR6401C-V55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME
5962H9215401VYX	LOR6401C-V556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME
5962H9215402VZX	LOR6401T-V55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME
5962H9215402VYX	LOR6401T-V556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this document's release. Other SMD products produced to the "V" assurance level on this flow are also considered standard for Grade 1 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
American Microsystems, Inc. 2300 Buckskin Road Pocatello, ID 83201	31471	Q	N/A	1.25μm DLM CMOS	Gate Arrays

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Pocatello, ID Line: QML Design Flow: AMI 4401005 Location: San Jose, CA Line: QML Design Flow: AMI 4401005	Location: Kokomo, IN Line: QML Technology Flow (7050013) Flow: AMI 7630004 Location: Dallas, TX Line: QML Technology Flow (7050013) Flow: AMI 7630004	Location: Pocatello, ID Line: CAB Flow: AMI 7019027	Location: Pocatello ID Assembly Code: USA Line: QML Silver Glass Flow: AMI 7020040 Location: San Jose, CA Assembly Code: USA Line: QML Silver Glass Flow: AMI 7020040	Electrical: Location: Pocatello, ID Line: QML Technology Flow (7050013) Flow: AMI 7450000 Environmental: Location: Pocatello, ID Line: QML Technology Flow (7050013) Flow: AMI 5150026

PACKAGE INFORMATION		
Type	PGA	Chip Carrier
Lead Count	64 - 476	28 - 256
Matrix Size		
Lead Finish	Gold	Gold
Lead		

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
American Microsystems, Inc. 2300 Buckskin Road Pocatello, ID 83201	31471	Q	N/A	1.25µm DLM CMOS	Gate Arrays

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: San Jose, CA Line: QML Technology Flow (7050013) Flow: AMI 5150026

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES (2)
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	Q	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006	Location: Plymouth, MN Line: RICMOS III Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS III Flow: 22005911	Location: Plymouth, MN Assembly Code: USA Line: RICMOS III Flow: 22009590	Electrical: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006
Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006 Procedure: GMS-10026, Rev- See Product Description for Specific Third Party Design Centers if Utilized in Product Design	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS IV Flow: 22016249	Location: Plymouth, MN Assembly Code: USA Line: RICMOS IV Flow: 22009590	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 1006

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	36 - 256
Matrix Size	N/A
Lead Finish	Gold
Lead	0.020 - 0.040 inch

(1) Actual radiation hardness levels are dependent on the individual part number.
(2) RICMOS IV Gate Array ASICS have not yet been certified and qualified to Class Q.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES (2)
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	Q	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006 Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006

(1) Actual radiation hardness levels are dependent on the individual part number.
(2) RICMOS IV Gate Array ASICS have not yet been certified and qualified to Class Q.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3)

MANUFACTURER

Honeywell SSEC
12001 State Highway 55
Plymouth, MN 55441

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H3829438Q9X	HC6364/1XQHBT	STATIC RAM 8K X 8
5962H3829440Q9X	HC6364/1XQHBC	STATIC RAM 8K X 8
5962H3829442Q9X	HC6364/1XQHCT	STATIC RAM 8K X 8
5962H3829443Q9X	HC6364/1XQHCC	STATIC RAM 8K X 8
5962H9215305QUX	HC6856/1WQHZC	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215305QZX	HC6856/1XQHZC	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215306QUX	HC6856/1WQHZT	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215306QZX	HC6856/1XQHZT	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215307QUX	HC6856/1WQHAC	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215307QZX	HC6856/1XQHAC	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215308QUX	HC6856/1WQHAT	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215308QZX	HC6856/1XQHAT	STATIC RAM, 32K X 8, 40 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this documents release. Other SMD products produced to the "Q" assurance level on this flow are also considered standard for Grade 2 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Honeywell SSEC
12001 State Highway 55
Plymouth, MN 55441

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H92A0101QYX	1HK84	CONTROLLER, SERIAL COMMUNICATION
5962R9215305QUX	HC6856/1WQRZC	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962R9215305QZX	HC6856/1XQRZC	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962R9215306QUX	HC6856/1WQRZT	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962R9215306QZX	HC6856/1XQRZT	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962R9215307QUX	HC6856/1WQRAC	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962R9215307QZX	HC6856/1XQRAC	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962R9215308QUX	HC6856/1WQRAT	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962R9215308QZX	HC6856/1XQRAT	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962R93A0101QYX	1HL08	GATE ARRAY, SEMICUSTOM

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Loral Federal Systems Company - Manassas 9500 Godwin Drive Manassas, VA 22110	52088	Q	2 MEG	1.0μm RHCMOS 0.8μm RHCMOS-E 0.5μm HMCMOS VCOS	SRAM, Logic, VCOS Memory, Micro-processors, and Custom and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Manassas, VA Line: VLSI Flow: MIDS/MVISA QM Plan Design Rules	Location: Dupont Photomask, Inc. Danbury, CT	Location: Manassas, VA Line: Loral FSC VLSI Flow: Q.P. 163A648 Q.P. 163A102 PP525-826 PP525-940 PP525-953 PP525-954	Location: Manassas, VA Line: Loral FSC VLSI Flow: 163A633, 163A650 163A799	Electrical: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Sections 11 & 16 Environmental: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Paragraph 26.1.2

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	32 - 308
Matrix Size	N/A
Lead Finish	Gold
Lead Pitch	0.250 - 0.635 inch

(1) Actual radiation hardness levels are dependent on the individual part number.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H3829444Q8X	LOR6408C-Q55X	STATIC RAM, 8K X 8
5962H9210301QZX	LORFLPC-Q47F	MICROPROCESSOR, FLOATING-POINT
5962H9202601QZX	LORFXPC-Q49F	MICROPROCESSOR, FIXED POINT
5962H9210401QZX	LORAP1C-Q47F	ADDRESS PROCESSOR
5962H9210601QZX	LORAP2C-Q45F	ADDRESS PROCESSOR
5962H9215401QZX	LOR6401C-Q55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, CMOS
5962H9215401QYX	LOR6401C-Q556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, CMOS
5962H9215402QZX	LOR6401T-Q55X	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, TTL
5962H9215402QYX	LOR6401T-Q556	STATIC RAM, 64K X 1, 55 NS ACCESS TIME, TTL
5962H9215301QXX	LOR2568C-Q60X	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215301QYX	LOR2568C-Q60Y	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215301QNX	LOR256C-Q601	STATIC RAM, 32K X 8, 60 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H9215302QXX	LOR2568T-Q60X	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215302QYX	LOR2568T-Q60Y	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215302QNX	LOR2568T-Q60I	STATIC RAM, 32K X 8, 60 NS ACCESS TIME
5962H9215303QXX	LOR2568C-Q40X	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215303QNX	LOR2568C-Q40I	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215303QYX	LOR256C-Q40Y	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215304QXX	LOR2568T-Q40X	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215304QYX	LOR2568T-Q40Y	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215304QNX	LOR2568T-Q40I	STATIC RAM, 32K X 8, 40 NS ACCESS TIME
5962H9215313QNX	LOR2568C-Q30I	STATIC RAM, 32K X 8, 30 NS ACCESS TIME, CMOS
5962H9215314QNX	LOR2568T-Q30I	STATIC RAM, 32K X 8, 30 NS ACCESS TIME, TTL
5962H9312801QXX	LOR2561C-Q60X	STATIC RAM, 256K X 1, 60 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Loral Federal Systems
Company - Manassas
9500 Godwin Drive
Manassas, VA 22110

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
5962H9312801QYX	LOR2561C-Q60Y	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312802QXX	LOR2561T-Q60X	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312802QYX	LOR2561T-Q60Y	STATIC RAM, 256K X 1, 60 NS ACCESS TIME
5962H9312803QXX	LOR2561C-Q40X	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312803QYX	LOR2561C-Q40Y	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312804QXX	LOR2561T-Q40X	STATIC RAM, 256K X 1, 40 NS ACCESS TIME
5962H9312804QYX	LOR2561T-Q40Y	STATIC RAM, 256K X 1, 40 NS ACCESS TIME

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	Q B	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATIONS(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: 07-004-3164 AS/ALS Design Rules Location: Sherman, TX Line: SGPL Design Flow: 07-003-0387 low Power Schottky TTL Layout Rules	Location: Dallas, TX Line: Toppan Flow: 07-0003-7955, 07-0004-3165	Location: Sherman, TX Line: SGPL Flow: 2-0488BL Location: Dallas, TX Line: DLIN Flow: Dallas Linear II JAN Microcircuit Bipolar Baseline	Location: Taipei, Taiwan Assembly Code: Taiwan Line: Special Products Assembly Flow: 07-0012-2222	Electrical: Location: Taipei, Taiwan Line: Special Products Test Flow: 07-0012-2222 Environmental: Location: Taipei, Taiwan Line: Special Products Assembly Flow: 07-0012-2222

PACKAGE INFORMATION			
Type	Flat Pack	DIP	Chip Carrier
Lead Count	14 - 24	8 - 24	20
Matrix Size	N/A	N/A	N/A
Lead Finish	Solder	Solder	Solder
Lead	N/A		

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	Q B	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER (S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: ALS Design Rules Version 1.5S		Location: Dallas, TX Line: DLOG Flow: 8851JAN359		
Location: Sherman, TX Line: SGPL Design Flow: 74HC N-EPI 3/3 Twin-Well Lay-out Rules for MPA		Location: Houston, TX Line: HFAB Flow: Q86-71510		
Location: Sherman, TX Line: SGPL Design Flow: 07-004-3582 Digital Circuits Logic Schottky TTL				

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	Q B	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: 07-0004-3281 Digital Bipolar Standard TTL Rules Location: Dallas, TX Line: Programmable Flow: Logic Design Design Rules for IMPACTX Ver AD, and IMPACT Ver Q Location: Dallas, TX Line: Linear Design Flow: 07-0005-1707, Linear Bipolar Design Manual				

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3)

MANUFACTURER

Texas Instruments
P. O. Box 60488
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/10104BPA	LM108	OP AMP, GENERAL PURPOSE
M38510/10107BPA	LM118	OP AMP, HIGH-SPEED
M38510/10304BPA	LM111	VOLT. COMPARATOR/BUFFER, PRECISION
M38510/10401BCA	55107A	LINE RECEIVER, DUAL
M38510/10401BDA	55107A	LINE RECEIVER, DUAL
M38510/10402BCA	55108A	LINE RECEIVER, DUAL OC
M38510/10403BEA	55114	LINE DRIVER, DUAL DIFFERENTIAL
M38510/10403BFA	55114	LINE DRIVER, DUAL DIFFERENTIAL
M38510/10404BEA	55115	LINE RECEIVER, DUAL DIFFERENTIAL
M38510/10405BEA	55113	LINE DRIVER, DUAL DIFFERENTIAL, WITH 3-STATE OUTPUTS
M38510/10901BCA	SE555	TIMER, PRECISION
M38510/10901BPA	SE555	TIMER, PRECISION

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/10902BCA	SE556	TIMER, DUAL PRECISION
M38510/11005BCA	LM124	OP AMP, QUAD
M38510/11005BDA	LM124	OP AMP, QUAD
M38510/11201BCA	LM139	VOLT. COMPARATOR, QUAD
M38510/11201BDA	LM139	VOLT. COMPARATOR, QUAD
M38510/11202BPA	LM193	VOLT. COMPARATOR, DUAL
M38510/11905BPA	TL072	OP AMP, DUAL, BI-FET, LOW POWER
M38510/11906BCA	TL074	OP AMP, QUAD, BIFET, LOW-POWER
M38510/12902BPA	55451	PERIPHERAL DRIVER, DUAL AND
M38510/12903BPA	55452	PERIPHERAL DRIVER, DUAL NAND
M38510/12905BPA	55454	PERIPHERAL DRIVER, DUAL NOR
M38510/12908BPA	55462	PERIPHERAL DRIVER, DUAL NAND

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/12909BPA	55463	PERIPHERAL DRIVER, DUAL OR
M38510/13503BPA	OP27	OP AMP, PRECISION
M38510/30001B2A	54LS00	NAND GATE, QUAD 2-INPUT
M38510/30001BCA	54LS00	NAND GATE, QUAD 2-INPUT
M38510/30001BDA	54LS00	NAND GATE, QUAD 2-INPUT
M38510/30003B2A	54LS04	HEX INVERTER
M38510/30003BCA	54LS04	HEX INVERTER
M38510/30003BDA	54LS04	HEX INVERTER
M38510/30005B2A	54LS10	NAND GATE, TRIPLE 3-INPUT
M38510/30005BCA	54LS10	NAND GATE, TRIPLE 3-INPUT
M38510/30005BDA	54LS10	NAND GATE, TRIPLE 3-INPUT
M38510/30007B2A	54LS20	NAND GATE, DUAL 4-INPUT

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30007BCA	54LS20	NAND GATE, DUAL 4-INPUT
M38510/30007BDA	54LS20	NAND GATE, DUAL 4-INPUT
M38510/30009B2A	54LS30	NAND GATE, 8-INPUT
M38510/30009BCA	54LS30	NAND GATE, 8-INPUT
M38510/30009BDA	54LS30	NAND GATE, 8-INPUT
M38510/30102B2A	54LS74A	FLIP-FLOP, D-TYPE, DUAL
M38510/30102BCA	54LS74A	FLIP-FLOP, D-TYPE, DUAL
M38510/30102BDA	54LS74A	FLIP-FLOP, D-TYPE, DUAL
M38510/30103B2A	54LS112A	FLIP-FLOP, JK, DUAL
M38510/30103BEA	54LS112A	FLIP-FLOP, JK, DUAL
M38510/30103BFA	54LS112A	FLIP-FLOP, JK, DUAL
M38510/30106B2A	54LS174	FLIP-FLOP, D-TYPE, HEX

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30106BEA	54LS174	FLIP-FLOP, D-TYPE, HEX
M38510/30106BFA	54LS174	FLIP-FLOP, D-TYPE, HEX
M38510/30107B2A	54LS175	FLIP-FLOP, D-TYPE, 4-BIT
M38510/30107BEA	54LS175	FLIP-FLOP, D-TYPE, 4-BIT
M38510/30107BFA	54LS175	FLIP-FLOP, D-TYPE, 4-BIT
M38510/30109B2A	54LS109A	FLIP-FLOP, JK, DUAL
M38510/30109BEA	54LS109A	FLIP-FLOP, JK, DUAL
M38510/30109BFA	54LS109A	FLIP-FLOP, JK, DUAL
M38510/30110BEA	54LS76A	FLIP-FLOP, JK, DUAL, NEGATIVE EDGE-TRIGGERED
M38510/30110BFA	54LS76A	FLIP-FLOP, JK, DUAL, NEGATIVE EDGE-TRIGGERED
M38510/30203B2A	54LS38	BUFFER/DRIVER, NAND, QUAD 2-INPUT, WITH OPEN-COLLECTOR OUTPUTS
M38510/30203BCA	54LS38	BUFFER/DRIVER, NAND, QUAD 2-INPUT, WITH OPEN-COLLECTOR OUTPUTS

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this documents release. Other SMD products produced to this assurance level on this flow are also considered standard for Grade 2 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30203BDA	54LS38	BUFFER/DRIVER, NAND, QUAD 2-INPUT, WITH OPEN-COLLECTOR OUTPUTS
M38510/30301B2A	54LS02	NOR GATE, QUAD 2-INPUT
M38510/30301BCA	54LS02	NOR GATE, QUAD 2-INPUT
M38510/30301BDA	54LS02	NOR GATE, QUAD 2-INPUT
M38510/30302B2A	54LS27	NOR GATE, TRIPLE 3-INPUT
M38510/30302BCA	54LS27	NOR GATE, TRIPLE 3-INPUT
M38510/30302BDA	54LS27	NOR GATE, TRIPLE 3-INPUT
M38510/30401B2A	54LS51	AND-OR-INVERT GATE, DUAL 2-WIDE
M38510/30401BCA	54LS51	AND-OR-INVERT GATE, DUAL 2-WIDE
M38510/30401BDA	54LS51	AND-OR-INVERT GATE, DUAL 2-WIDE
M38510/30501B2A	54LS32	OR GATE, QUAD 2-INPUT
M38510/30501BCA	54LS32	OR GATE, QUAD 2-INPUT

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30501BDA	54LS32	OR GATE, QUAD 2-INPUT
M38510/30502B2A	54LS86A	EXCLUSIVE-OR GATE, QUAD 2-INPUT
M38510/30502BCA	54LS86A	EXCLUSIVE-OR GATE, QUAD 2-INPUT
M38510/30502BDA	54LS86A	EXCLUSIVE-OR GATE, QUAD 2-INPUT
M38510/30601B2A	54LS194A	SHIFT REGISTER, 4-BIT BIDIRECTIONAL
M38510/30601BEA	54LS194A	SHIFT REGISTER, 4-BIT BIDIRECTIONAL
M38510/30601BFA	54LS194A	SHIFT REGISTER, 4-BIT BIDIRECTIONAL
M38510/30602B2A	54LS195A	SHIFT REGISTER, 4-BIT PARALLEL ACCESS
M38510/30602BEA	54LS195A	SHIFT REGISTER, 4-BIT PARALLEL ACCESS
M38510/30602BFA	54LS195A	SHIFT REGISTER, 4-BIT PARALLEL ACCESS
M38510/30603BCA	54LS95B	SHIFT REGISTER, 4-BIT PARALLEL ACCESS
M38510/30604BEA	54LS96	SHIFT REGISTER, 5-BIT

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30605B2A	54LS164	SHIFT REGISTER, 8-BIT PARALLEL-OUT
M38510/30605BCA	54LS164	SHIFT REGISTER, 8-BIT PARALLEL-OUT
M38510/30605BDA	54LS164	SHIFT REGISTER, 8-BIT PARALLEL-OUT
M38510/30607B2A	54LS395A	SHIFT REGISTER, 4-BIT UNIVERSAL, WITH 3-STATE OUTPUTS
M38510/30607BEA	54LS395A	SHIFT REGISTER, 4-BIT UNIVERSAL, WITH 3-STATE OUTPUTS
M38510/30608B2A	54LS165A	SHIFT REGISTER, 8-BIT PARALLEL LOAD
M38510/30608BEA	54LS165A	SHIFT REGISTER, 8-BIT PARALLEL LOAD
M38510/30608BFA	54LS165A	SHIFT REGISTER, 8-BIT PARALLEL LOAD
M38510/30609B2A	54LS166A	SHIFT REGISTER, 8-BIT PARALLEL-IN, WITH CLEAR
M38510/30609BEA	54LS166A	SHIFT REGISTER, 8-BIT PARALLEL-IN, WITH CLEAR
M38510/30609BFA	54LS166A	SHIFT REGISTER, 8-BIT PARALLEL-IN, WITH CLEAR
M38510/30701B2A	54LS138	DECODER, 3-TO-8-LINE

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30701BEA	54LS138	DECODER, 3-TO-8-LINE
M38510/30701BFA	54LS138	DECODER, 3-TO-8-LINE
M38510/30702B2A	54LS139A	DECODER, DUAL 2-TO-4-LINE
M38510/30702BEA	54LS139A	DECODER, DUAL 2-TO-4-LINE
M38510/30702BFA	54LS139A	DECODER, DUAL 2-TO-4-LINE
M38510/30901B2A	54LS151	DATA SEL/MULTIPLEXER, 8-INPUT
M38510/30901BEA	54LS151	DATA SEL/MULTIPLEXER, 8-INPUT
M38510/30901BFA	54LS151	DATA SEL/MULTIPLEXER, 8-INPUT
M38510/30902B2A	54LS153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/30902BEA	54LS153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/30902BFA	54LS153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/30903B2A	54LS157	DATA SEL/MULTIPLEXER, QUAD 2-INPUT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30903BEA	54LS157	DATA SEL/MULTIPLEXER, QUAD 2-INPUT
M38510/30903BFA	54LS157	DATA SEL/MULTIPLEXER, QUAD 2-INPUT
M38510/30905B2A	54LS251	DATA SEL/MULTIPLEXER, 8-INPUT, WITH 3-STATE OUTPUTS
M38510/30905BEA	54LS251	DATA SEL/MULTIPLEXER, 8-INPUT, WITH 3-STATE OUTPUTS
M38510/30905BFA	54LS251	DATA SEL/MULTIPLEXER, 8-INPUT, WITH 3-STATE OUTPUTS
M38510/30906B2A	54LS257B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, AND 3-STATE OUTPUTS
M38510/30906BEA	54LS257B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, AND 3-STATE OUTPUTS
M38510/30906BFA	54LS257B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, AND 3-STATE OUTPUTS
M38510/30907B2A	54LS258B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, WITH 3-STATE OUTPUTS, WITH ENABLE
M38510/30907BEA	54LS258B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, WITH 3-STATE-OUTPUTS, WITH ENABLE
M38510/30907BFA	54LS258B	DATA SEL/MULTIPLEXER, QUAD 2-INPUT, WITH 3-STATE OUTPUTS, WITH ENABLE
M38510/30908B2A	54LS253	DATA SEL/MULTIPLEXER, QUAD 4-INPUT, WITH 3-STATE OUTPUTS, WITH ENABLE

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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/30908BEA	54LS253	DATA SEL/MULTIPLEXER, DUAL 4-INPUT, WITH 3-STATE OUTPUTS
M38510/30908BFA	54LS253	DATA SEL/MULTIPLEXER, DUAL 4-INPUT, WITH 3-STATE OUTPUTS
M38510/31001B2A	54LS11	AND GATE, TRIPLE 3-INPUT
M38510/31001BCA	54LS11	AND GATE, TRIPLE 3-INPUT
M38510/31001BDA	54LS11	AND GATE, TRIPLE 3-INPUT
M38510/31003B2A	54LS21	AND GATE, DUAL 4-INPUT
M38510/31003BCA	54LS21	AND GATE, DUAL 4-INPUT
M38510/31003BDA	54LS21	AND GATE, DUAL 4-INPUT
M38510/31004B2A	54LS08	AND GATE, QUAD 2-INPUT
M38510/31004BCA	54LS08	AND GATE, QUAD 2-INPUT
M38510/31004BDA	54LS08	AND GATE, QUAD 2-INPUT
M38510/31101B2A	54LS85	MAGNITUDE COMPARATOR, 4-BIT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/31101BEA	54LS85	MAGNITUDE COMPARATOR, 4-BIT
M38510/31101BFA	54LS85	MAGNITUDE COMPARATOR, 4-BIT
M38510/31202B2A	54LS283	ADDER, 4-BIT FULL, WITH FAST CARRY
M38510/31202BEA	54LS283	ADDER, 4-BIT FULL, WITH FAST CARRY
M38510/31202BFA	54LS283	ADDER, 4-BIT FULL, WITH FAST CARRY
M38510/31401B2A	54LS123	MULTIVIBRATOR, DUAL MONOSTABLE RETRIGGERABLE WITH CLEAR
M38510/31401BEA	54LS123	MULTIVIBRATOR, DUAL MONOSTABLE RETRIGGERABLE WITH CLEAR
M38510/31401BFA	54LS123	MULTIVIBRATOR, DUAL MONOSTABLE RETRIGGERABLE WITH CLEAR
M38510/31402B2A	54LS221	MULTIVIBRATOR, DUAL MONOSTABLE SCHMITT-TRIGGER INPUTS AND CLEAR
M38510/31402BEA	54LS221	MULTIVIBRATOR, DUAL MONOSTABLE SCHMITT-TRIGGER INPUTS AND CLEAR
M38510/31402BFA	54LS221	MULTIVIBRATOR, DUAL MONOSTABLE SCHMITT-TRIGGER INPUTS AND CLEAR
M38510/31501BCA	54LS90	DECADE COUNTER, 4-BIT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/31502BCA	54LS93	DECADE COUNTER, 4-BIT
M38510/31503B2A	54LS160A	DECADE COUNTER, 4-BIT
M38510/31503BEA	54LS160A	DECADE COUNTER, 4-BIT
M38510/31504B2A	54LS161A	BINARY COUNTER, 4-BIT SYNCHRONOUS
M38510/31504BEA	54LS161A	BINARY COUNTER, 4-BIT SYNCHRONOUS
M38510/31504BFA	54LS161A	BINARY COUNTER, 4-BIT SYNCHRONOUS
M38510/31508B2A	54LS193	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN PRESETTABLE
M38510/31508BEA	54LS193	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN PRESETTABLE
M38510/31508BFA	54LS193	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN, PRESETTABLE
M38510/31509B2A	54LS191	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN, WITH DOWN/UP MODE CONTROL
M38510/31509BEA	54LS191	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN, WITH DOWN/UP MODE CONTROL
M38510/31509BFA	54LS191	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN, WITH DOWN/UP MODE CONTROL

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60488
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/31510BCA	54LS92	COUNTER, DIVIDE-BY-12
M38510/31512B2A	54LS163A	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SYNCHRONOUS CLEAR
M38510/31512BEA	54LS163A	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SNYCHRONOUS CLEAR
M38510/31512BFA	54LS163A	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SYNCHRONOUS CLEAR
M38510/31601BEA	54LS75	LATCH, 4-BIT, BISTABLE
M38510/31601BFA	54LS75	LATCH, 4-BIT, BISTABLE
M38510/31605B2A	54LS259B	LATCH, 8-BIT, BISTABLE
M38510/31605BEA	54LS259B	LATCH, 8-BIT, BISTABLE
M38510/32003B2A	54LS290	DECADE COUNTER, 4-BIT
M38510/32003BCA	54LS290	DECADE COUNTER, 4-BIT
M38510/32004B2A	54LS293	BINARY COUNTER, 4-BIT
M38510/32004BCA	54LS293	BINARY COUNTER, 4-BIT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/32102B2A	54LS26	NAND GATE, QUAD 2-INPUT, HIGH-VOLTAGE, WITH OPEN-COLLECTOR OUTPUTS
M38510/32102BCA	54LS26	NAND GATE, QUAD 2-INPUT, HIGH-VOLTAGE, WITH OPEN-COLLECTOR OUTPUTS
M38510/32201B2A	54LS365A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32201BEA	54LS365A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32201BFA	54LS365A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32203B2A	54LS367A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32203BEA	54LS367A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32203BFA	54LS367A	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32301B2A	54LS125A	BUFFER/DRIVER, QUAD, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32301BCA	54LS125A	BUFFER/DRIVER, QUAD, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32301BCA	54LS125A	BUFFER/DRIVER, QUAD, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32401B2A	54LS240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/32401BFA	54LS240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/32401BRA	54LS240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/32402B2A	54LS241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32402BFA	54LS241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32402BRA	54LS241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32403B2A	54LS244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32403BFA	54LS244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32403BRA	54LS244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32404B2A	54LS540	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/32404BRA	54LS540	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/32405B2A	54LS541	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/32405BRA	54LS541	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS

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MIL-I-38535 (MONOLITHIC) APPROVED GENERIC MICROCIRCUIT FLOWS FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/32501B2A	54LS273	FLIP-FLOP, D-TYPE, 8-BIT, WITH CLEAR
M38510/32501BRA	54LS273	FLIP-FLOP, D-TYPE, 8-BIT, WITH CLEAR
M38510/32502BSA	54LS273	FLIP-FLOP, D-TYPE, 8-BIT, WITH CLEAR
M38510/32502B2A	54LS373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32502BRA	54LS373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32502BSA	54LS373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32503B2A	54LS374	FLIP-FLOP, D-TYPE, 8-BIT, POSITIVE EDGE-TRIGGERED, WITH 3-STATE OUTPUTS
M38510/32503BRA	54LS374	FLIP-FLOP, D-TYPE, 8-BIT, POSITIVE EDGE-TRIGGERED, WITH 3-STATE OUTPUTS
M38510/32503BSA	54LS374	FLIP-FLOP, D-TYPE, 8-BIT, POSITIVE EDGE-TRIGGERED, WITH 3-STATE OUTPUTS
M38510/32504B2A	54LS377	FLIP-FLOP, D-TYPE, 8-BIT
M38510/32504BRA	54LS377	FLIP-FLOP, D-TYPE, 8-BIT
M38510/32701B2A	54LS390	DECADE COUNTER, DUAL 4-BIT, WITH A AND B INPUTS

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/32701BEA	54LS390	DECADE COUNTER, DUAL 4-BIT, WITH A AND B INPUTS
M38510/32702B2A	54LS393	BINARY COUNTER, DUAL 4-BIT
M38510/32702BCA	54LS393	BINARY COUNTER, DUAL 4-BIT
M38510/32702BDA	54LS393	BINARY COUNTER, DUAL 4-BIT
M38510/32803B2A	54LS245	BUS TRANSCEIVER, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32803BRA	54LS245	BUS TRANSCEIVER, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32803BSA	54LS245	BUS TRANSCEIVER, 8-BIT, WITH 3-STATE OUTPUTS
M38510/32901B2A	54LS280	PARITY GENERATOR/CHECKER, 9-BIT
M38510/32901BCA	54LS280	PARITY GENERATOR/CHECKER, 9-BIT
M38510/32901BDA	54LS280	PARITY GENERATOR/CHECKER, 9-BIT
M38510/33001B2A	54F00	NAND GATE, QUAD 2-INPUT
M38510/33001BCA	54F00	NAND GATE, QUAD 2-INPUT

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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

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Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/33001BDA	54F00	NAND GATE, QUAD 2-INPUT
M38510/33002B2A	54F04	HEX INVERTER
M38510/33002BCA	54F04	HEX INVERTER
M38510/33002BDA	54F04	HEX INVERTER
M38510/33003B2A	54F10	NAND GATE, TRIPLE 3-INPUT
M38510/33003BCA	54F10	NAND GATE, TRIPLE 3-INPUT
M38510/33003BDA	54F10	NAND GATE, TRIPLE 3-INPUT
M38510/33004B2A	54F20	NAND GATE, DUAL 4-INPUT
M38510/33004BCA	54F20	NAND GATE, DUAL 4-INPUT
M38510/33004BDA	54F20	NAND GATE, DUAL 4-INPUT

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/33201B2A	54F240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/33201BRA	54F240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/33201BSA	54F240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/33202B2A	54F241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33202BRA	54F241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33202BSA	54F241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33203B2A	54F244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33203BRA	54F244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33203BSA	54F244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/33301B2A	54F02	NOR GATE, QUAD 2-INPUT
M38510/33301BCA	54F02	NOR GATE, QUAD 2-INPUT

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/33301BDA	54F02	NOR GATE, QUAD 2-INPUT
M38510/33701B2A	54F138	DECODER, 3-TO-8-LINE
M38510/33701BEA	54F138	DECODER, 3-TO-8-LINE
M38510/33701BFA	54F138	DECODER, 3-TO-8-LINE
M38510/33902B2A	54F153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/33902BEA	54F153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/33902BFA	54F153	DATA SEL/MULTIPLEXER, DUAL 4-INPUT
M38510/34002B2A	54F11	AND GATE, QUAD 2-INPUT
M38510/34002BCA	54F11	AND GATE, QUAD 2-INPUT
M38510/34002BDA	54F11	AND GATE, QUAD 2-INPUT
M38510/34101B2A	54F74	FLIP-FLOP, D-TYPE, DUAL

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/34101BCA	54F74	FLIP-FLOP, D-TYPE, DUAL
M38510/34101BDA	54F74	FLIP-FLOP, D-TYPE, DUAL
M38510/34201B2A	54F283	ADDER, 4-BIT FULL
M38510/34201BEA	54F283	ADDER, 4-BIT FULL
M38510/34201BFA	54F283	ADDER, 4-BIT FULL
M38510/34701B2A	54F521	IDENTITY COMPARATOR, 8-BIT
M38510/34701BRA	54F521	IDENTITY COMPARATOR, 8-BIT
M38510/34701BSA	54F521	IDENTITY COMPARATOR, 8-BIT
M38510/34803B2A	54F245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/34803BRA	54F245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/34803BSA	54F245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/36001B2A	54LS148	PRIORITY ENCODER, 8-LINE-TO-3-LINE

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
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Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/36001BEA	54LS148	PRIORITY ENCODER, 8-LINE-TO-3-LINE
M38510/36002B2A	54LS348	PRIORITY ENCODER, 8-LINE-TO-3-LINE, TS
M38510/36002BEA	54LS348	PRIORITY ENCODER, 8-LINE-TO-3-LINE, TS
M38510/36101B2A	54LS173A	FLIP-FLOP, D-TYPE, 4-BIT
M38510/36101BEA	54LS173A	FLIP-FLOP, D-TYPE, 4-BIT
M38510/37001B2A	54ALS00A	NAND GATE, QUAD 2-INPUT
M38510/37001BCA	54ALS00A	NAND GATE, QUAD 2-INPUT
M38510/37002B2A	54ALS10A	NAND GATE, TRIPLE 3-INPUT
M38510/37002BCA	54ALS10A	NAND GATE, TRIPLE 3-INPUT
M38510/37003B2A	54ALS20A	NAND GATE, DUAL 4-INPUT
M38510/37003BCA	54ALS20A	NAND GATE, DUAL 4-INPUT
M38510/37004B2A	54ALS30A	NAND GATE, 8-INPUT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/37004BCA	54ALS30A	NAND GATE, 8-INPUT
M38510/37005B2A	54ALS133	NAND GATE, 13-INPUT
M38510/37005BEA	54ALS133	NAND GATE, 13-INPUT
M38510/37006B2A	54ALS04B	HEX INVERTER
M38510/37006BCA	54ALS04B	HEX INVERTER
M38510/37101B2A	54ALS74A	FLIP-FLOP, D-TYPE, DUAL, POSITIVE EDGE-TRIGGERED
M38510/37101BCA	54ALS74A	FLIP-FLOP, D-TYPE, DUAL, POSITIVE EDGE-TRIGGERED
M38510/37102B2A	54ALS109A	FLIP-FLOP, JK, DUAL, WITH CLEAR AND PRESET (ACTIVE HIGH)
M38510/37102BEA	54ALS109A	FLIP-FLOP, JK, DUAL, WITH CLEAR AND PRESET (ACTIVE HIGH)
M38510/37103B2A	54ALS112A	FLIP-FLOP, JK, DUAL, WITH CLEAR AND PRESET (ACTIVE LOW)
M38510/37103BEA	54ALS112A	FLIP-FLOP, JK, DUAL, WITH CLEAR AND PRESET (ACTIVE LOW)
M38510/37104B2A	54ALS574A	FLIP-FLOP, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/37104BRA	54ALS574A	FLIP-FLOP, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/37201B2A	54ALS174	FLIP-FLOP, D-TYPE, HEX, WITH CLEAR
M38510/37201BEA	54ALS174	FLIP-FLOP, D-TYPE, HEX, WITH CLEAR
M38510/37202B2A	54ALS175	FLIP-FLOP, D-TYPE, 4-BIT, WITH CLEAR
M38510/37202BEA	54ALS175	FLIP-FLOP, D-TYPE, 4-BIT, WITH CLEAR
M38510/37203B2A	54ALS373	FLIP-FLOP, D-TYPE, 8-BIT, WITH TRANSPARENT LATCH AND 3-STATE OUTPUTS
M38510/37203BRA	54ALS373	FLIP-FLOP, D-TYPE, 8-BIT, WITH TRANSPARENT LATCH AND 3-STATE OUTPUTS
M38510/37204B2A	54ALS374	FLIP-FLOP, D-TYPE, 8-BIT, EDGE-TRIGGERED, WITH 3-STATE OUTPUTS
M38510/37204BRA	54ALS374	FLIP-FLOP, D-TYPE, 8-BIT, EDGE-TRIGGERED, WITH 3-STATE OUTPUTS
M38510/37301B2A	54ALS02	NOR GATE, QUAD 2-INPUT
M38510/37301BCA	54ALS02	NOR GATE, QUAD 2-INPUT
M38510/37302B2A	54ALS27	NOR GATE, TRIPLE 3-INPUT

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/37302BCA	54ALS27	NOR GATE, TRIPLE 3-INPUT
M38510/37401B2A	54ALS08	AND GATE, QUAD 2-INPUT
M38510/37401BCA	54ALS08	AND GATE, QUAD 2-INPUT
M38510/37402B2A	54ALS11A	AND GATE, TRIPLE 3-INPUT
M38510/37402BCA	54ALS11A	AND GATE, TRIPLE 3-INPUT
M38510/37501B2A	54ALS32	OR GATE, QUAD 2-INPUT
M38510/37501BCA	54ALS32	OR GATE, QUAD 2-INPUT
M38510/37701B2A	54ALS138	DECODER/DEMULTIPLEXER, 3-TO-8-LINE
M38510/37701BEA	54ALS138	DECODER/DEMULTIPLEXER, 3-TO-8-LINE
M38510/38001B2A	54ALS161B	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH ASYNCHRONOUS CLEAR
M38510/38001BEA	54ALS161B	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH ASYNCHRONOUS CLEAR
M38510/38002B2A	54ALS163B	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SYNCHRONOUS CLEAR

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/38002BEA	54ALS163B	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SYNCHRONOUS CLEAR
M38510/38003B2A	54ALS169B	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN
M38510/38003BEA	54ALS169B	BINARY COUNTER, 4-BIT SYNCHRONOUS UP/DOWN
M38510/38201B2A	54ALS573B	LATCH, D-TYPE, 8-BIT, TRANSPARENT, WITH 3-STATE OUTPUTS
M38510/38201BRA	54ALS573B	LATCH, D-TYPE, 8-BIT, TRANSPARENT, WITH 3-STATE OUTPUTS
M38510/38301B2A	54ALS240A	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/38301BRA	54ALS240A	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/38302B2A	54ALS241B	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/38302BRA	54ALS241B	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/38303B2A	54ALS244B	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/38303BRA	54ALS244B	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/38401B2A	54ALS1000A	BUFFER/DRIVER, NAND, QUAD 2-INPUT

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/38401BCA	54ALS1000A	BUFFER/DRIVER, NAND, QUAD
M38510/38402B2A	54ALS1002A	BUFFER/DRIVER, NOR, QUAD 2-INPUT
M38510/38402BCA	54ALS1002A	BUFFER/DRIVER, NOR, QUAD 2-INPUT
M38510/38411B2A	54ALS1034	BUFFER/DRIVER, HEX, NONINVERTING
M38510/38411BCA	54ALS1034	BUFFER/DRIVER, HEX, NONINVERTING
M38510/50401BRA	16L8A	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT AND-OR-INVERT
M38510/50402BRA	16R8A	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT AND-OR
M38510/50403BRA	16R6A	PROG. LOGIC DEVICE, 16-INPUT 6-OUTPUT AND-OR
M38510/50404BRA	16R4A	PROG. LOGIC DEVICE, 16-INPUT 4-OUTPUT AND-OR
M38510/50407BRA	16L8A-2	PROG. LOGIC DEVICE, 16-INPUT 8 OUTPUT AND-OR-INVERT
M38510/50408BRA	16R8A-2	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT REGISTERED AND-OR
M38510/50409BRA	16R6A-2	PROG. LOGIC DEVICE, 16-INPUT 6-OUTPUT REGISTERED AND-0R

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/50410BRA	16R4A-2	PROG. LOGIC DEVICE, 16-INPUT AND-OR
M38510/50501BLA	20L8-15	PROG. LOGIC DEVICE, 20-INPUT AND-OR-INVERT
M38510/50502BLA	20R8-15	PROG. LOGIC DEVICE, 20-INPUT 8 OUTPUT REGISTERED AND-OR
M38510/50503BLA	20R6-15	PROG. LOGIC DEVICE, 20-INPUT 6 OUTPUT REGISTERED AND-OR
M38510/50504BLA	20R4-15	PROG. LOGIC DEVICE, 20-INPUT 4-OUTPUT REGISTERED AND-OR
M38510/50601BRA	16L8A-15	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT AND-OR-INVERT
M38510/50602BRA	16R8A-15	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT REGISTERED AND-OR
M38510/50603BRA	16R6A-15	PROG. LOGIC DEVICE, 16-INPUT 6-OUTPUT REGISTERED AND-OR
M38510/50604BRA	16R4A-15	PROG. LOGIC DEVICE, 16-INPUT 4-OUTPUT REGISTERED AND-OR
M38510/50605BRA	16L8A	PROG. LOGIC DEVICE, 16-INPUT 8-OUTPUT AND-OR-INVERT
M38510/50606BRA	16R8A	PROG. LOGIC DEVICE, 16-INPUT AND-OR
M38510/50607BRA	16R6A	PROG. LOGIC DEVICE, 16-INPUT 6-OUTPUT REGISTERED AND-OR

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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/50608BRA	16R4A	PROG. LOGIC DEVICE, 16-INPUT 4-OUTPUT REGISTERED AND-OR
M38510/65001B2A	54HC00	NAND GATE, QUAD 2-INPUT
M38510/65001BCA	54HC00	NAND GATE, QUAD 2-INPUT
M38510/65001BDA	54HC00	NAND GATE, QUAD 2-INPUT
M38510/65002B2A	54HC10	NAND GATE, TRIPLE 3-INPUT
M38510/65002BCA	54HC10	NAND GATE, TRIPLE 3-INPUT
M38510/65002BDA	54HC10	NAND GATE, TRIPLE 3-INPUT
M38510/65003BCA	54HC20	NAND GATE, DUAL 4-INPUT
M38510/65003BDA	54HC20	NAND GATE, DUAL 4-INPUT
M38510/65004B2A	54HC30	NAND GATE, 8-INPUT
M38510/65004BCA	54HC30	NAND GATE, 8-INPUT
M38510/65004BDA	54HC30	NAND GATE, 8-INPUT

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MIL-I-38535 (MONOLITHIC)
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MANUFACTURER

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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65101B2A	54HC02	NOR GATE, QUAD 2-INPUT
M38510/65101BCA	54HC02	NOR GATE, QUAD 2-INPUT
M38510/65101BDA	54HC02	NOR GATE, QUAD 2-INPUT
M38510/65102BCA	54HC27	NOR GATE, TRIPLE 3-INPUT
M38510/65102BDA	54HC27	NOR GATE, TRIPLE 3-INPUT
M38510/65104BCA	54HC4002	NOR GATE, DUAL 4-INPUT
M38510/65104BDA	54HC4002	NOR GATE, DUAL 4-INPUT
M38510/65201B2A	54HC32	OR GATE, QUAD 2-INPUT
M38510/65201BCA	54HC32	OR GATE, QUAD 2-INPUT
M38510/65201BDA	54HC32	OR GATE, QUAD 2-INPUT
M38510/65202BCA	54HC86	EXCLUSIVE-OR GATE, QUAD 2-INPUT
M38510/65202BDA	54HC86	EXCLUSIVE-OR GATE, QUAD 2-INPUT

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MIL-I-38535 (MONOLITHIC)
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MANUFACTURER

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MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65203B2A	54HC08	AND GATE, QUAD 2-INPUT
M38510/65203BCA	54HC08	AND GATE, QUAD 2-INPUT
M38510/65203BDA	54HC08	AND GATE, QUAD 2-INPUT
M38510/65204BCA	54HC11	AND GATE, TRIPLE 3-INPUT
M38510/65204BDA	54HC11	AND GATE, TRIPLE 3-INPUT
M38510/65302B2A	54HC74	FLIP-FLOP, D-TYPE, DUAL, WITH PRESET AND CLEAR
M38510/65302BCA	54HC74	FLIP-FLOP, D-TYPE, DUAL, WITH PRESET AND CLEAR
M38510/65302BDA	54HC74	FLIP-FLOP, D-TYPE, DUAL, WITH PRESET AND CLEAR
M38510/65304B2A	54HC109	FLIP-FLOP, JK, DUAL
M38510/65304BEA	54HC109	FLIP-FLOP, JK, DUAL
M38510/65305BEA	54HC112	FLIP-FLOP, JK, DUAL, WITH SET AND RESET
M38510/65305BFA	54HC112	FLIP-FLOP, JK, DUAL, WITH SET AND RESET

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this documents release. Other SMD products produced to this assurance level on this flow are also considered standard for Grade 2 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65307BEA	54HC174	FLIP-FLOP, D-TYPE, HEX, WITH CLEAR
M38510/65307BFA	54HC174	FLIP-FLOP, D-TYPE, HEX, WITH CLEAR
M38510/65308BEA	54HC175	FLIP-FLOP, D-TYPE, 4-BIT
M38510/65308BFA	54HC175	FLIP-FLOP, D-TYPE, 4-BIT
M38510/65352BCA	54HCT74	FLIP-FLOP, D-TYPE, DUAL, WITH PRESET AND CLEAR WITH LSTTL-COMPATIBLE INPUTS
M38510/65402BEA	54HC259	LATCH, 8-BIT ADDRESSABLE
M38510/65403B2A	54HC373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65403BRA	54HC373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65403BSA	54HC373	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65406BRA	54HC573	LATCH, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65453BRA	54HCT373	LATCH, D-TYPE, 8-BIT, TRANSPARENT, WITH 3-STATE OUTPUTS, TTL-COMPATIBLE INPUTS
M38510/65453BSA	54HCT373	LATCH, D-TYPE, 8-BIT, TRANSPARENT, WITH 3-STATE OUTPUTS, TTL-COMPATIBLE INPUTS

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65503BRA	54HC245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/65503BSA	54HC245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/65553BRA	54HCT245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/65553BSA	54HCT245	BUS TRANSCEIVER, 8-BIT, WITH INVERTING 3-STATE OUTPUTS
M38510/65601BRA	54HC273	FLIP-FLOP, D-TYPE, 8-BIT, WITH CLEAR
M38510/65601BSA	54HC273	FLIP-FLOP, D-TYPE, 8-BIT, WITH CLEAR
M38510/65602BRA	54HC374	FLIP-FLOP, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65602BSA	54HC374	FLIP-FLOP, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65604BRA	54HC574	FLIP-FLOP, D-TYPE, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65652BRA	54HCT374	FLIP-FLOP, D-TYPE, 8-BIT, WITH NONINVERTING 3-STATE OUTPUTS
M38510/65652BSA	54HCT374	FLIP-FLOP, D-TYPE, 8-BIT, WITH NONINVERTING 3-STATE OUTPUTS
M38510/65701B2A	54HC04	HEX INVERTER

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65701BCA	54HC04	HEX INVERTER
M38510/65701BDA	54HC04	HEX INVERTER
M38510/65702BCA	54HC14	HEX INVERTER, SCHMITT TRIGGER
M38510/65702BDA	54HC14	HEX INVERTER, SCHMITT TRIGGER
M38510/65703B2A	54HC240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/65703BRA	54HC240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/65703BSA	54HC240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/65704BRA	54HC241	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65705B2A	54HC244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65705BRA	54HC244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65705BSA	54HC244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65706BEA	54HC365	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65708BEA	54HC367	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65708BFA	54HC367	BUFFER/DRIVER, HEX, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65709BEA	54HC368	BUFFER/DRIVER, HEX, INVERTING, WITH 3-STATE OUTPUTS
M38510/65710BRA	54HC540	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/65711BRA	54HC541	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65711BSA	54HC541	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65751BCA	54HCT04	HEX INVERTER, TTL-COMPATIBLE INPUTS
M38510/65753BRA	54HCT240	BUFFER/DRIVER, OCTAL, INVERTING, WITH 3-STATE OUTPUTS
M38510/65755BRA	54HCT244	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65760BRA	54HCT540	BUS TRANSCEIVER, 8-BIT, WITH 3-STATE OUTPUTS
M38510/65761BRA	54HCT541	BUFFER/DRIVER, OCTAL, NONINVERTING, WITH 3-STATE OUTPUTS
M38510/65802B2A	54HC138	DECODER, 3-TO-8-LINE

(1) Use the Military Drawing part number for ordering.
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MIL-I-38535 (MONOLITHIC)
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FOR GRADE 2 APPLICATIONS (3) (CONT'D)

MANUFACTURER

Texas Instruments
P. O. Box 60448
Midland, TX 79711-0448

MILITARY DRAWING PART NUMBER (2)	MANUFACTURER SIMILAR PART NUMBER (1)	PRODUCT DESCRIPTION
M38510/65802BEA	54HC138	DECODER, 3-TO-8-LINE
M38510/65802BFA	54HC138	DECODER, 3-TO-8-LINE
M38510/65803BEA	54HC139	DECODER, DUAL 2-TO-4-LINE
M38510/65803BFA	54HC139	DECODER, DUAL 2-TO-4-LINE
M38510/65852BEA	54HCT138	DECODER, 3-TO-8-LINE
M38510/66302BEA	54HC161	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH ASYNCHRONOUS CLEAR
M38510/66302BFA	54HC161	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH ASYNCHRONOUS CLEAR
M38510/66304BEA	54HC163	BINARY COUNTER, 4-BIT SYNCHRONOUS, WITH SYNCHRONOUS CLEAR
M38510/66309BCA	54HC393	BINARY COUNTER, DUAL 4-BIT
M38510/66309BDA	54HC393	BINARY COUNTER, DUAL 4-BIT

(1) Use the Military Drawing part number for ordering.
(2) The last two digits of this part number are for the choice of package style and lead finish. Refer to the individual SMD for specific choices.
(3) Additional standard products may be available from this flow. This list is based on information available as of the date of this documents release. Other SMD products produced to this assurance level on this flow are also considered standard for Grade 2 applications.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
American Microsystems, Inc. 2300 Buckskin Road Pocatello, ID 83201	31471	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	1.25μm DLM CMOS	Gate Arrays

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Pocatello, ID Line: QML Design Flow: AMI 4401005 Location: San Jose, CA Line: QML Design Flow: AMI 4401005	Location: Kokomo, IN Line: QML Technology Flow (7050013) Flow: AMI 7630004 Location: Dallas, TX Line: QML Technology Flow (7050013) Flow: AMI 7630004	Location: Pocatello, ID Line: CAB Flow: AMI 7019027	Location: Pocatello ID Assembly Code: USA Line: QML Silver Glass Flow: AMI 7020040 Location: San Jose, CA Assembly Code: USA Line: QML Silver Glass Flow: AMI 7020040	Electrical: Location: Pocatello, ID Line: QML Technology Flow (7050013) Flow: AMI 7450000 Environmental: Location: Pocatello, ID Line: QML Technology Flow (7050013) Flow: AMI 5150026

PACKAGE INFORMATION		
Type	PGA	Chip Carrier
Lead Count	64 - 476	28 - 256
Matrix Size	175	
Lead Finish	Gold	Gold
Lead		

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
American Microsystems, Inc. 2300 Buckskin Road Pocatello, ID 83201	31471	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	1.25μm DLM CMOS	Gate Arrays

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: San Jose, CA Line: QML Technology Flow (7050013) Flow: AMI 5150026

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Analog Devices 804 Woburn Street Wilmington, MA 01887	56140	SMD M Assurance Class, MIL-STD-883 and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, FLASH, STAT I, Comp Bipolar, BIMOS, ABCMOS	Data Converters, Amplifiers, Analog Signal Processors, Sensors, References

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Wilmington, MA Line: Linear and Mixed Signal Design Flow: Design Manual Ver. 1.0 Location: Beavertown, OR Line: Linear and Mixed Signal Design Flow: Design Manual Ver. 1.0	Location: Outside Location	Location: Wilmington, MA Line: 4" Linear Flow: Contact Manufacturer	Location: Wilmington, MA Assembly Code: USA Line: Wilmington Assembly Flow: F-0008, F-0142	Electrical: Location: Wilmington, MA Line: Wilmington Electrical Test Flow: W-XXXX Location: Manila, Philippines Line: Manila Electrical Test Flow: W-XXXX

PACKAGE INFORMATION				
Type	Flat Pack	DIP	Chip Carrier	Metal Can
Lead Count	2	14 - 28	132 - 256	02 - 12
Matrix Size	N/A	N/A	N/A	N/A
Lead Finish	Gold	Solder	Gold	Solder
Lead	0.50 inch	0.100 MIL	0.020 - 0.205 inch	100 - 400 MIL

(1) For an indication of part types form this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Analog Devices 804 Woburn Street Wilmington, MA 01887	56140	SMD M Assurance Class, MIL-STD-883 and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, FLASH, STAT I, Comp Bipolar, BIMOS, ABCMOS	Data Converters, Amplifiers, Analog Signal Processors, Sensors, References

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Limerick, Ireland Line: Linear and Mixed Signal Design Flow: Design Manual Ver. 1.0 Location: Greensboro, NC Line: Linear and Mixed Signal Design Flow: Design Manual Ver. 1.0 Location: Norwood, MA Line: Linear and Mixed Signal Design Flow: Design Manual Ver. 1.0			Location: Manila, Philippines Assembly Code: Philippines or 07 Line: Hermetic Flow: F-0133M, F-0152M, F-0154M	Environmental: Location: Wilmington, MA Line: Wilmington Environmental Flow: Per lot traveler Location: Manila, Philippines Line: Manila Environmental Flow: Per lot traveler

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
AT&T Microelectronics 555 Union Blvd. Allentown, PA 18103-1285	98739	SMD Q Assurance Class (2), SMD M Assurance Class, MIL-STD-883, and DESC Drawings, all with a Q cert. mark	N/A	0.9 & 1.25μm SLM and DLM	Standard Cell and Full Custom ASICS, FPGAS and DSP

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Allentown, PA Line: LAB 5285, Department 52845 Flow: A91AL0741/ A91AL1011	Location: Allentown, PA Line: Mask Shop - Allentown, PA Flow: SIF-5568	Location: Allentown, PA Line: MOS V Flow: PFC-074-LOG 84, LOG 185, LOG 94, LOG 157	Location: Allentown, PA Assembly Code: USA Line: JIT MOS Ceramic Assembly Flow: SIF-QMP3-Flow	Electrical: Location: Allentown, PA Line: JIT MOS Ceramic Flow Flow: SIF-QMP3-Flow Environmental: Location: Allentown, PA Line: Reliability Lab Flow: SIF-QMP3-Flow, IL-5337, SIF-IL5349 Flow 2

PACKAGE INFORMATION			
Type	PGA	DIP	Chip Carrier
Lead Count	133	28	132 - 256
Matrix Size	13 X 13	N/A	N/A
Lead Finish	Gold	Gold	Gold
Lead	0.100 inch	0.100 inch	0.020 - 0.205 inch

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) As of the time of publication of this revision, no formal Grade 2 partnership exists between AT&T and NASA and therefore, their Q assurance class has been listed under Grade 3.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION (2) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Harris Semiconductor Products 2401 Palm Bay Road, N.E. Palm Bay, FL 32905	34371	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, CMOS, Linear, CMOS SAJI	Memories, Logics, Switches, Timers, Microprocessors, Micro-peripherals

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Palm Bay, FL Line: Standard Products Flow: Contact Manufacturer	Location: Palm Bay, FL Line: Mask Line Flow: Contact Manufacturer	Location: Palm Bay, FL Line: Fab 54 Flow: Bipolar, CMOS SAIJ, Linear Silicon Gate, DI Bipolar, DI Linear CMOS, SAJI I Location: Palm Bay, FL Line: Fab 54 Flow: Scaled SAJI IV, SAJI V, SAJI VI, L7	Location: Palm Bay, FL Assembly Code: X Line: Hermetic Flow: 841XXX, 240XXX, 352XXX Location: Kuala Lumpur Malaysia Assembly Code: H Line: Hermetic Flow: 841XXX, 240XXX, 352XXX	Electrical: Location: Palm Bay, FL Line: Compliant Flow: Contact Manufacturer Location: Kuala Lumpur Malaysia Line: Compliant Flow: Contact Manufacturer

PACKAGE INFORMATION				
Type	Chip Carrier	PGA	DIP	Metal Can
Lead Count	20 - 44	N/A	8 - 40	8 - 12
Matrix Size	N/A	68 - 85	N/A	N/A
Lead Finish	Solder/Gold	Solder	Solder/Gold	Solder/Gold
Lead Pitch	N/A	0. 100 inch	0.100 inch	N/A

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) Actual radiation hardness levels are dependent on the individual part number.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION (2) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Harris Semiconductor Products 2401 Palm Bay Road, N.E. Palm Bay, FL 32905	34371	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, CMOS, Linear, CMOS SAJI	Memories, Logics, Switches, Timers, Microprocessors, Micro-peripherals

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
		Location: Palm Bay, FL Line: Fab 59 Flow: Bipolar, CMOS SAJI, SAJI I Scaled SAJI IV, SAJI V, SAJI VI, L7		Environmental: Location: Palm Bay, FL Line: Compliant Hermetic Flow: 86XXX, 40H-721-052-XXX, 8*XXXXX, 9*XXXXX, 54XXXX, 87XXXX, 240XXX
		Location: Findlay, OH Line: Fab 2 Flow: CMOS Metal Gate, Bipolar JI, QMOS		Location: Kuala Lumpur Malaysia Line: Compliant Hermetic Flow: 86XXX, 40H-721-052-XXX, 8*XXXXX, 9*XXXXX, 87XXXX, 240XXX

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) Actual radiation hardness levels are dependent on the individual part number.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (2) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006	Location: Plymouth, MN Line: RICMOS III Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS III Flow: 22005911	Location: Plymouth, MN Assembly Code: USA Line: RICMOS III Flow: 22009590	Electrical: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006
Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006 Procedure: GMS-10026, Rev- See Product Description for Specific Third Party Design Centers if Utilized in Product Design	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10027	Location: Plymouth, MN Line: RICMOS IV Flow: 22016249	Location: Plymouth, MN Assembly Code: USA Line: RICMOS IV Flow: 22009590	Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	36 - 256
Matrix Size	N/A
Lead Finish	Gold
Lead	0.020 - 0.040 inch

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.
(2) Actual radiation hardness levels are dependent on the individual part number.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	QUALITY ASSURANCE CLASS DESIGNATOR	RADIATION (2) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Honeywell SSEC 12001 State Highway 55 Plymouth, MN 55441-4799	34168	SMD M Assurance Class, MIL-STD-883, and DESC Drawings, all with a Q cert. mark	1 MEG	1.2μm RICMOS III 0.8μm RICMOS IV	SRAM, Logic, and Custom, Semi-Custom, Standard Cell, and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: Plymouth, MN Line: RICMOS III Flow: GMS 10006 Location: Plymouth, MN Line: RICMOS IV Flow: GMS 10006

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.
(2) Actual radiation hardness levels are dependent on the individual part number.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Intel Corporation 5000 West Chandler Blvd. Chandler, AZ 85226-4702	34649	M38510 B Assurance Class and SMD Q Assurance Class (2), SMD M Assurance Class, MIL-STD-883, and DESC Drawings, all with a Q cert. mark	N/A	1.0μm, 0.8μm CMOS 1.5μm HMOS III	Microprocessors Peripherals

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Santa Clara, CA Line: STD Products Flow: Products	Location: Santa Clara, CA Line: STD Products Flow: Products	Location: Rio Rancho, NM Line: FAB 9 Flow: CMOS IV, P648 Location: Rio Rancho, NM Line: FAB 9 Flow: CMOS V, P650	Location: Chandler, AZ Assembly Code: USA Line: A-4 Flow: 15-081 Location: Manila, Philippines Assembly Code: Philippines Line: A-2 Flow: 15-081	Electrical: Location: Chandler, AZ Line: T-7 Flow: 95-XXXX Location: Aloha, OR Line: T-16 Flow: 95-XXXX

PACKAGE INFORMATION

Type	Pin Grid Array	Flat Pack	DIP	Chip Carrier
Lead Count	N/A	68 - 196	18 - 48	28 -44
Matrix Size	62 - 208	N/A	N/A	N/A
Lead Finish	Solder	Solder	Solder	Solder
Lead	0.100 inch	0.025 inch - 0.050	300- 600 MIL	0.050 MIL

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) The reason that the B and Q assurance classes have been included as Grade 3 is that Intel has declined to have a partnership with NASA for inclusion in this standard.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Intel Corporation 5000 West Chandler Blvd. Chandler, AZ 85226-4702	34649	M38510 B Assurance Class and SMD Q Assurance Class (2), SMD M Assurance Class, MIL-STD-883, and DESC Drawings, all with a Q cert. mark	N/A	1.0μm, 0.8μm CMOS 1.5μm HMOS III	Microprocessors Peripherals

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
		Location: Rio Rancho, NM Line: FAB 7 Flow: Process 620 CMOS IV 0.8μm Location: Chandler, AZ Line: FAB 6 Flow: Process 617 Old JAN Line	Location: Penang Malaysia Assembly Code: MALAY Line: A-1 Flow: 15-081	Electrical: Location: Manila, Philippines Line: T-9 Flow: 89-0065-0258 Location: Penang, Malaysia Line: T-3 Flow: 89-0065-0258

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) The reason that the B and Q assurance classes have been included as Grade 3 is that Intel has declined to have a partnership with NASA for inclusion in this standard.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Intel Corporation 5000 West Chandler Blvd. Chandler, AZ 85226-4702	34649	M38510 B Assurance Class and SMD Q Assurance Class (2), SMD M Assurance Class, MIL-STD-883, and DESC Drawings, all with a Q cert. mark	N/A	1.0μm, 0.8μm CMOS 1.5μm HMOS III	Microprocessors Peripherals

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: Chandler, AZ Line: T-Mil/ Associated with T-7 Flow: 89-0065-0258 Location: Manila, Philippines Line: Enviro-mental Lab, T-9 Flow: 89-0065-0258 Location: Penang, Malaysia Line: T-3 Flow: 89-0065-0258

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) The reason that the B and Q assurance classes have been included as Grade 3 is that Intel has declined to have a partnership with NASA for inclusion in this standard.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Linfinity 11861 Western Avenue Garden Grove, CA 92641-2119	34333	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar	Regulators, Op Amps, Comparators, Sense Amps, Drivers, Transistor Arrays

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Garden Grove CA Line: Linear Flow: Contact Manufacturer	Location: Garden Grove CA Line: Linear Flow: Contact Manufacturer	Location: Garden Grove CA Line: Linear Flow: SGM5900	Location: Garden Grove CA Assembly Code: USA Line: Linear Flow: SGM5901, SGM5902 Location: Philippines (PSI) Assembly Code: PHIL Line: Linear Flow: SGM5901, SGM5902	Electrical: Location: Garden Grove CA Line: Linear Flow: SGM5901, SGM5902 Environmental: Location: Garden Grove CA Line: Linear Flow: SGM5901, SGM5902

PACKAGE INFORMATION				
Type	Flat Pack	DIP	Chip Carrier	Metal Can
Lead Count	10 - 24	08 - 18	20	03 - 12
Matrix Size	N/A	N/A	N/A	N/A
Lead Finish	Solder/Gold	Solder/Dip	Solder/Dip	Solder
Lead Pitch	30 - 50 MIL	100 MIL	50 MIL	N/A

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION (1) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Loral Federal Systems Company - Manassas 9500 Godwin Drive Manassas, VA 22110	52088	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	2 MEG	1.0μm RHCMOS 0.8μm RHCMOS-E 0.5μm HMCMOS VCOS	SRAM, Logic, VCOS Memory, Micro-processors, and Custom and Gate Array ASICS

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Manassas, VA Line: VLSI Flow: MIDS/MVISA QM Plan Design Rules	Location: Dupont Photomask, Inc. Danbury, CT	Location: Manassas, VA Line: Loral FSC VLSI Flow: Q.P. 163A648 Q.P. 163A102 PP525-826 PP525-940 PP525-953 PP525-954	Location: Manassas, VA Line: Loral FSC VLSI Flow: 163A633, 163A650 163A799	Electrical: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Sections 11 & 16 Environmental: Location: Manassas, VA Line: Loral FSC VLSI Flow: QM Plan Paragraph 26.1.2

PACKAGE INFORMATION	
Type	Flat Pack
Lead Count	32 - 308
Matrix Size	N/A
Lead Finish	Gold
Lead Pitch	0.250 - 0.635 inch

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Motorola, Inc. 2100 E Elliot Road Tempe, AZ 85284-1801	04713	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, linear, FAST, HCMOS, HMOS, ECL	Standard Products, Logic, Gate Array, Memory and Micro-processors

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Oakhill, TX Line: Oakhill (DSP, RISC, MPU (MOS3/5/8)) Design Flow: 12MSE90033W, 12MRE10037W, 12MSD10196W, 12EQSP203	Location: Contact Manu-facturer Line: TBD Flow: TBD	Location: Mesa, AZ Line: BP1, BP2, BP3, MOS5, MOS6 Flow: Contact Manu-facturer	Location: Tempe, AZ Assembly Code: Y Line: MPO Assembly Flow: 70ASM45992A, 70ASM51721A, 70ASM92046A	Electrical: Location: Tempe, AZ Line: MPO Test Flow: 12MRM25838A 70ASY77474A
Location: Mesa, AZ Line: Mesa, (BP2) Design Flow: Design Manual for MOSAIC 1		Location: Austin, TX Line: MOS2 (Module A) MOS3 (Module I) MOS8 (B-1) Flow: Contact Manu-facturer	Location: Selangor, Malaysia Assembly Code: Q Line: KLM Assembly Flow: 12MSQ20113A, 12MSQ20114A, 12MSQ20117A, 12MSQ20118A, 12MSQ20131A	Environmental: Location: Tempe, AZ Line: MPO Screening/ QCI Flow: 70ASY77474A 12MRM2538A

PACKAGE INFORMATION

Type	Flat Pack	DIP	PGA	Chip Carrier	Metal Can
Lead Count	14 - 28	8 - 64	N/A	20 - 132	08/10
Matrix Size	N/A	N/A	10 x 10/20 x 20	N/A	N/A
Lead Finish	Solder/Gold	Solder	Solder/Gold	Solder/Gold	Solder
Lead	0.050 MIL	0.100 MIL	0.100 inch	0.025 - 0.050 inch	45/36 DEGREE

(1) For an indication of part types from this flow, refer to QML-38535. QML does not list available MIL-STD-883 compliant devices from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Motorola, Inc. 2100 E Elliot Road Tempe, AZ 85284-1801	04713	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, FAST, HCMOS, HMOS, ECL	Standard Products, Logic, Gate Array, Memory, Microprocessors

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Mesa, AZ Line: Mesa (BP3) Design Flow: Design Manual for MOSAIC 1, 1.5, and III			Location: Seoul, Korea Assembly Code: K Line: MKL Assembly Flow: 12MSK21602A	Electrical: Location: Selangor, Malaysia Line: KLM Test Flow: 12MSQ30224A 12MRM25838A
Location: Mesa, AZ Line: Mesa (MOS2) Design Flow: 12MSD15783W			Location: Richardson, TX Assembly Code: BA Line: VLSI Assembly Flow: 100-00-103	Location: Seoul, Korea Line: MLK Test Flow: 12MSK35002A 12MRM25838A
Location: Chandler, AZ Line: ASIC H4C Design Flow: Contact Manufacturer				Environmental: Location: Selangor, Malaysia Line: KLM Test Flow: 12MSQ30224A 12MRN25838A
Location: Austin, TX Line: Austin (SRAM (MOS8)) Design Flow: 12MSE90033W				

(1) For an indication of part types from this flow, refer to QML-38535. QML does not list available MIL-STD-883 compliant devices from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFIC COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Motorola, Inc. 2100 E Elliot Road Tempe, AZ 85284-1801	04713	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, FAST, HCMOS, HMOS, ECL	Standard Products, Logic, Gate Array, Memory, Microprocessors

DESIGN CENTER	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Mesa, AZ Line: Mesa (BP1) Design Flow: BPI Design Manual				Environmental: Location: Seoul, Korea Line: MLK Screening/QCI Flow: 12MSSK35002A 12MRM25838A Location: Richardson, TX Line: VLSI Test Flow: 100-00-103

(1) For an indication of part types from this flow, refer to QML-38535. QML does not list available MIL-STD-883 compliant devices from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
National Semiconductor 2900 Semiconductor Drive Santa Clara, CA 95052-8090	27014	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, Memory, Interface and Gate Array

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Santa Clara, CA Line: National Design Flow: Contact Manufacturer	Location: Dupont Komomo, IN Line: Dupont Mask Flow: Contact Manufacturer	Location: Santa Clara, CA Line: 5" Linear Flow: PS-4005-ALIC, PS-FLCH-CLIC	Location: South Portland, ME Assembly Code: Z Line: National S. Portland Assembly Flow: SP-16080, SP-16426	Electrical: Location: Santa Clara, CA Line: National Santa Clara Flow: FC/TS-0021-ASIC
Location: Arlington, TX Line: National Design Flow: Contact Manufacturer	Location: Photronics, Danbury, CT Line: Photronics Mask Flow: Contact Manufacturer	Location: West Jordan, UT Line: MOS 3 Flow: SL-RC-3901-MOS 3	Location: Singapore Assembly Code: S Line: National Singapore Assembly Flow: (SG) FC-AS-001, (SG) FC/AS-0018-G	Environmental: Location: South Portland, ME Line: National S. Portland Environmental Flow: SP-33092

PACKAGE INFORMATION

Type	Flat Pack	DIP	PGA	Chip Carrier	Metal Can
Lead Count	10 - 256	8 - 52		20-84	2-15
Matrix Size	N/A	N/A	8X8/21X21	N/A	N/A
Lead Finish	Gold/Solder	Gold/Solder	Gold	Solder DIP	Gold/Solder
Lead	0.020 - 0.050 inch	0.100 inch	0.100 inch	0.050 inch	0.100 - 0.600 inch

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
National Semiconductor 2900 Semiconductor Drive Santa Clara, CA 95052-8090	27014	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, Memory, Interface and Gate Array

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: South Portland, ME Line: National Design Flow: Contact Manufacturer Location: D-8080 Furstenfeldbruck, Germany Line: National Design Flow: Contact Manufacturer Location: 3-14-29 Takada 171 Japan Line: National Design Flow: Contact Manufacturer	Locaton: Dupont Rousset, France Line: Dupont Mask Flow: Contact Manufacturer	Location: South Portland, ME Line: Bipolar Fab 1 Flow: SP-17275, SP-17276 SP-17504 SP-17529 SP-17528 SP-17467	Location: Exchange OFS Philippines Assembly Code: H Line: Team Pacific Assembly Flow: (PH) FC-AS-7000-G Location: Malacca Malayasia Assembly Code: M Line: National Malacca Assembly Flow: (EM) FC/AS-5000-M/A (EM) FC/AS-2200-M/A	Electrical: Location: South Portland, ME Line: National South Portland Electrical Flow: SP-33092 Environmental: Location: Singapore Line: National Singapore Environmental Flow: (SG) FC/AS-0901-M/A (SG) FC/AS-0001-M/A

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
National Semiconductor 2900 Semiconductor Drive Santa Clara, CA 95052-8090	27014	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, Memory, Interface and Gate Array

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Greenock, Scotland Line : National Design Flow: Contact Manufacturer		Location: South Portland, ME Line : 5" CMOS FACT Line Flow: SP-19101 Location: Arlington, TX Line: CMOS 1 Flow: Contact Manufacturer		<u>Electrical:</u> Location: Singapore Line: National Singapore Electrical Test Flow: (SG) FC/TS-1000-M/A, (SG) FC/TS-5003-G, (SG) FC/TS-5001-G <u>Environmental:</u> Location: Exchange OFS Philippines Line: Team Pacific Environmental Flow: (PH) FC-AS-7000-G, (PH) FC-AS-8000-G

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.
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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
National Semiconductor 2900 Semiconductor Drive Santa Clara, CA 95052-8090	27014	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, Memory, Interface and Gate Array

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
		Location: Greenock, Scotland Line: (UK) PS-4475-MOS 1 Flow: (UK) PS-1000-ELICH4 (UK) PS-5179-MOSA		Electrical: Location: Santa Clara, CA Line: National Santa Clara Flow: FC/TS-0021-ASIC Environmental: Location: Santa Clara, CA Line: Santa Clara, Environmental Flow: Per Lot Traveler

(1) For and indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant drawing devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Siliconix 2201 Laurelwood Road Santa Clara, CA 95056-0951	17856	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Metal Gate II, Silicon Gate I, CDMOS	Analog Switches

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Santa Clara, CA Line: Design Flow: 4149	Location: Santa Clara, CA Line: Mask Flow: 4016	Location: Santa Clara, CA Line: FAB II Flow: CC-8-0010 CC-8-0041 CC-8-0002 CC-8-0028 CC-8-0012 CC-8-0027 CC-8-0040 Location: Santa Clara, CA Line: FAB III Flow: CC-8-0036	Location: Dynesem, Manila Philippines Assembly Code: K Line: Assembly Flow: PF-S-0005 Location: Santa Clara, CA Assembly Code: S Line: Assembly Flow: PF-S-0005	Electrical: Location: Santa Clara, CA Line: Electrical Test Flow: PF-S-0005 Location: Siliconix, Manila Philippines Line: Electrical Test Flow: PF-S-0005

PACKAGE INFORMATION				
Type	Flat Pack	DIP	Chip Carrier	Metal Can
Lead Count	14 - 16	8 - 28	20	10
Matrix Size	N/A	N/A	N/A	N/A
Lead Finish	Solder/Gold	Solder/Gold	Gold/Solder	Gold/Solder
Lead Pitch				

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Siliconix 2201 Laurelwood Road Santa Clara, CA 95056-0951	17856	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Metal Gate II, Silicon Gate I, CDMOS	Analog Switches

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
				Environmental: Location: Dynesem, Manila Philippines Line: Environmental Flow: PF-S-0005 Location: Sanat Clara, CA Line: Environmental Flow: PF-S-0005 Location: Siliconix, Manila Philippines Line: Environmental Flow: PF-S-0005

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATIONS(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: 07-004-3164 AS/ALS Design Rules Location: Sherman, TX Line: SGPL Design Flow: 07-003-0387 low Power Schottky TTL Layout Rules	Location: Dallas, TX Line: Toppan Flow: 07-0003-7955, 07-0004-3165	Location: Sherman, TX Line: SGPL Flow: 2-0488BL Location: Dallas, TX Line: DLIN Flow: Dallas Linear II JAN Microcircuit Bipolar Baseline	Location: Taipei, Taiwan Assembly Code: Taiwan Line: Special Products Assembly Flow: 07-0012-2222	Electrical: Location: Taipei, Taiwan Line: Special Products Test Flow: 07-0012-2222 Environmental: Location: Taipei, Taiwan Line: Special Products Assembly Flow: 07-0012-2222

PACKAGE INFORMATION			
Type	Flat Pack	DIP	Chip Carrier
Lead Count	14 - 24	8 - 24	20
Matrix Size	N/A	N/A	N/A
Lead Finish	Solder	Solder	Solder
Lead	N/A		

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 Compliant devices as available from a QML Certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER (S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: ALS Design Rules Version 1.5S		Location: Dallas, TX Line: DLOG Flow: 8851JAN359		
Location: Sherman, TX Line: SGPL Design Flow: 74HC N-EPI 3/3 Twin-Well Lay-out Rules for MPA		Location: Houston, TX Line: HFAB Flow: Q86-71510		
Location: Sherman, TX Line: SGPL Design Flow: 07-004-3582 Digital Circuits Logic Schottky TTL				

(1) For an indication of part types from this flow, refer to QML-38535. QML does not list available MIL-STD-883 Compliant devices from a QML Certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1) (CONT'D)

MANUFACTURER	CAGE CODE	SPECIFICATION COVERAGE	RADIATION HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
Texas Instruments P. O. Box 60448 Midland, TX 79711-0448	01295	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	N/A	Bipolar, Linear, and CMOS	Standard Product, Logic, and Memory

DESIGN CENTER(S)	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Sherman, TX Line: SGPL Design Flow: 07-0004-3281 Digital Bipolar Standard TTL Rules				
Location: Dallas, TX Line: Programmable Logic Design Flow: Design Rules for IMPACTX Ver AD, and IMPACT Ver Q				
Location: Dallas, TX Line: Linear Design Flow: 07-0005-1707, Linear Bipolar Design Manual				

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 Compliant devices from a QML Certified flow.

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MIL-I-38535 (MONOLITHIC)
APPROVED GENERIC MICROCIRCUIT FLOWS
FOR GRADE 3 APPLICATIONS (1)

MANUFACTURER	CAGE CODE	SPECFICATION COVERAGE	RADIATION (2) HARDNESS CAPABILITY	TECHNOLOGY	PRODUCT TYPES
UTMC 1575 Garden of the Gods Road Colorado Springs, CO 80907-3486	65342	SMD M Assurance Class, MIL-STD-883, and DESC Drawing, all with a Q cert. mark	1 MEG	1.2 μm 1.5 μm CMOS	Memory, CMOS Gate Array, Linear Bipolar

DESIGN CENTERS	MASK DEVELOPMENT	WAFER FABRICATION OPERATION(S)	ASSEMBLY OPERATION(S)	TEST OPERATION
Location: Colorado Springs, CO Line: CMOS Gate Array Flow: 63202 Rev. A	Location: Colorado Springs, CO Line: CMOS Gate Array Flow: 63003 Rev. M	Location: Colorado Springs, CO Line: CMOS Gate Array Flow: 1.5 and 1.2 141280/121260 1.2μm 14101/14102 1.5 μm Location: Colorado Springs, CO Line: Memory Flow: 141210 Memory Location: Colorado Springs, CO Line: Linear Bipolar Flow: 140750/140760 Linear Bipolar	Location: Colorado Springs, CO Assembly Code: USA Line: CMOS Gate Array Flow: 30503/01 REV A 30503/02 REV A	Electrical: Location: Colorado Springs, C0 Line: CMOS Gate Array Flow: 30503/01 Rev A 30503/02 Rev A Environmental: Location: Colorado Springs, CO Line: CMOS Gate Array Flow: 30503/01 REV A 30503/02 REV A

PACKAGE INFORMATION			
Type	Flat Pack	PGA	DIP
Lead Count	28 - 304	68 - 281	24 - 40
Matrix Size	N/A	8X8/18X18	N/A
Lead Finish	Solder/Gold	Solder/Gold	Solder/Dip
Lead Pitch	20 - 50 MIL	100 MIL	50 - 100 MIL

(1) For an indication of part types from this flow, refer to QML-38535. QML-38535 does not list available MIL-STD-883 compliant devices as available from a QML certified flow.

(2) Actual radiation hardness levels are dependent on the individual part number.

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SECTION 7.4: MIL-H-38534 APPROVED HYBRID MICROCIRCUIT FLOWS AND PARTS

The attached tables are listings of approved flows based on QML-38534. No Standardized Military Drawings (SMDs) are presently available from the listed manufacturer. Grade 2 parts (H assurance class) may only be procured from a Grade 1 approved flow. Hybrid microcircuit flows are composed of three (3) major operations: Substrate Fabrication, Assembly and Test. There may be multiple locations listed for the individual operations.

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There are no Grade 1 or Grade 2 flows listed for MIL-H-38534, Class K suppliers because none of the Class K suppliers chose to have a partnership with NASA (*see paragraph* 4.2.4 *herein*).

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SECTION 8: SUMMARY OF STANDARD PROTECTIVE DEVICES (1)

Page	Control Specification	Description	Grade 1	Grade 2
8.2	MIL-F-23419/8	Fuses, instrument type, style FM08, subminiature, high performance	(2)	(3)
8.3	MIL-C-39019	Circuit breakers, magnetic, low-power		

(1) Refer to MIL-HDBK-978, Vol. 5, for construction and application information.
(2) Presently no Grade 1 parts available.
(3) For Grade 2 application only.

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MIL-F-23419/8 STYLE FM08 FUSES
Instrument Type (Subminiature, High-Performance)

Part Number Explanation:

FM08	A	XXXV	XXXXXA
Style	Characteristic A = normal interrupt time	Voltage Rating Followed by letter V	Current Rating Followed by letter A

Part Number (1)	Control Specification	Style	Current Rating (Amps)	Overload Interrupt Time -55°C to +125°C Max (sec)		Maximum Voltage Rating (Volts)	Cold Resistance (Ohms) (3)		Voltage Drop (Volts) (4)	
				200% (2)	300% (2)		Min	Max	Min	Max
FM08A125V 1/8A	MIL-F-23419/8	FM08	1/8	5	0.1	125	1.89	2.31	0.85	1.15
FM08A125V 1/4A			1/4				.639	.781	0.59	0.80
FM08A125V 3/8A			3/8				.378	.462	0.527	0.713
FM08A125V 1/2A			1/2				.252	.308	0.488	0.660
FM08A125V 3/4A			3/4				.153	.187	0.145	0.197
FM08A125V 1A			1				.112	.138	0.157	0.213
FM08A125V 1.5A			1-1/2				.072	.088	0.153	0.207
FM08A125V 2A			2				.0495	.0605	0.144	0.196
FM08A125V 2.5A			2-1/2				.0378	.0462	0.125	0.169
FM08A125V 3A			3				.0315	.0388	0.139	0.187
FM08A125V 4A			4				.0207	.0253	0.110	0.150
FM08A125V 5A			5				.0126	.0154	0.087	0.118
FM08A125V 7A			7				.0090	.0110	0.087	0.118
FM08A125V 10A			10				.0059	.0070	0.085	0.110
FM08A32V 15A			15	10.0	0.3	32	.0036	.0044	0.065	0.087

(1) These parts are to be used in Grade 2 applications only.
(2) Percentage of nominal current rating.
(3) Cold resistance is measured at 10 percent or less of rated current.
(4) Voltage drop is measured after the fuse has been subjected to rated current for not less than 5 minutes and not more than 10 minutes.

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MIL-C-39019, MAGNETIC CIRCUIT BREAKERS
Low Powered, Sealed, Trip-Free

Part Number Explanation:

M39019	/XX	-XXX	X
Military Specification Designation	Specification Slash Sheet	Dash Number	Suffix

No suffix = wire terminals (-XXX)
S = screw terminals (-XXXS)

Part Number (1) (2) (3)	Control Specification	Current Range, Amps	Contact Configuration	Voltage Rating
M39019/01-XXXX	MIL-C-39019	0.05 to 20.0	One pole	50 Vdc max and 240 Vac max at 60 and 400 Hz
M39019/02-XXXX			One pole with SPDT aux contacts (4)	
M39019/03-XXXX			Two pole	
M39019/04-XXXX			Two pole with SPDT aux contacts (4)	
M39019/05-XXXX			Three pole	
M39019/06-XXXX			Three pole with SPDT aux contacts (4)	

(1) See slash sheet for dimensions and configurations.
(2) Three trip characteristics available. Time delay A: fast; Time delay B: slow; Time delay C: no delay.
(3) High inrush capability available for time delay A and B configurations.
(4) Single-pole, double-throw auxiliary contacts rated at 0.5 amp lamp load at 50 Vdc or 120 Vac.

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SECTION 9: SUMMARY OF STANDARD RELAYS (1)

Page	Control Specification	Description	FRL	
			Grade 1	Grade 2
9.2	MIL-R-39016	Nonlatching	(2)	P

(1) Refer to MIL-HDBK-978, Vol. 5, for construction and application information.
(2) There are no Grade 1 parts.

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MIL-R-39016, RELAYS (1)
Electromagnetic

Part Number Explanation:

M39016	/XX	-XXX	X
Military Specification Designation	Specification Slash Sheet	Dash Number	(%/10,000 cycles) P = 0.1

Type	Part Number	Control Specification	Contact Rating (Amps) (2)	Contact Configuration	Package Outline (3)	FRL Grade 1	FRL Grade 2
Nonlatching	M39016/6-XXXX	MIL-R-39016	2.0	DPDT	1/2 size crystal can	(4)	P
	M39016/9-XXXX		1.0		(TO-205) TO-5		
	M39016/11-XXXX		1.0		(TO-205) TO-5		
	M39016/13-XXXX		2.0		1/2 size crystal can		
	M39016/20-XXXX		1.0		(TO-205) TO-5		
	M39016/21-XXXX		1.0		(TO-205) TO-5		
	M39016/38-XXXX		2.0		1/2 size crystal can		

(1) Platings of cadmium or zinc shall not be used. Molybdenum contact material shall not be used. Use of "unfused bright tin" plating is not recommended. Tin plating shall be fused if such plating is used externally. Unfused bright tin plate has been associated with tin whisker growth.
(2) Contact resistive rating at 28 Vdc.
(3) See appropriate slash sheet for dimensions and configurations.
(4) Suitable Grade 1 parts are not available.

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SECTION 10: SUMMARY OF STANDARD RESISTORS

Page	Control Specification	Style	Description	Resistance Range (Ohms) (1)		Power Range (Watts)		FRL	
				Min	Max	Min	Max	Grade 1	Grade 2
10.2	MIL-R-39005	RBR	Fixed, wirewound (accurate), ER	4.99	1.37 M	0.125	0.75	R	P or R
10.4	MIL-R-39007	RWR	Fixed, wirewound (power type), ER	0.1	39.2 K	1.0	10.0	S	P or R
10.7	MIL-R-39008	RCR	Fixed, composition (insulated), ER	1.0	22.0 M	0.125	2.0	S	P or R
10.9	MIL-R-39009	RER	Fixed, wirewound (power type), chassis mounted, ER	0.1	39.2 K	5.0	30.0	R	P or R
10.11	MIL-R-39015(2)	RTR	Variable, wirewound (lead screw actuated), ER	10.0	20.0 K	—	0.75	(3)	P or R
10.13	MIL-R-39017	RLR	Fixed, film (insulated), ER	4.3	10.0 M	0.125	1.0	S	P or R
10.15	MIL-R-55182	RNR	Fixed, film (hermetic) ER	10.0	7.5 M	0.1	0.5	S	P or R
10.16	MIL-R-55182	RNC	Fixed, film, ER	4.99	7.5 M	0.05	0.5	S	P or R
10.19	MIL-R-55342	RM	Fixed, Film, Chip, ER	5.6	15.0 M	0.05	1.0	S	P or R
10.21	MIL-R-83401(2)	RZO	Fixed, film, networks	50.0	0.1 M	0.025	0.2	(3)	(4)

Refer to MIL-HDBK-978, Vol. 1, for construction and application information.

(1) The resistance values may be any value within the limits of the specification; however, it is preferred that the values be chosen from the decade table following the respective detail listing. Part numbers containing nonstandard combinations of resistance values and tolerances may be considered nonconforming to the specification and may not carry the JAN certification mark.

(2) Parts covered by this specification may contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow. Welded connections are recommended for space flight use. Consult manufacturer.

(3) There are no Grade 1 parts.

(4) For use in Grade 2 applications, parts shall be subjected to additional testing in accordance with Appendix B.

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MIL-R-39005, RESISTORS
Fixed, Wirewound (Accurate), Established Reliability

Part Number Explanation:

RBR	XX	X	XXXX	X	X	X
MIL-R-39005	Size	Terminal Characteristic	Significant Figures	Number of Zeros	Resistance Tolerance (±%)	Failure Rate (%/1000 hrs)
Style		L = Solderable U = Weldable	Resistance (1) (2)		Q = 0.02 A = 0.05 B = 0.10	P = 0.1 R = 0.01

Style
The letters RBR identify established reliability, accurate, wire-wound, fixed resistors. "XX" represents a number which identifies the size and power rating of the resistors.

Part Number	Control specification	Style Size	Characteristics: Rated Power (Watts) at +125°C	Resistance (Ohms) Range Min	Resistance (Ohms) Range Max	Resistance (Ohms) Tolerance (±%)	Max Volts (dc)	FRL Grade 1	FRL Grade 2
RBR52XXXXXXXX	MIL-R-39005/1	RBR52	1/2	10	1.21 M	0.02, 0.05, 0.10	600	R	P
RBR54XXXXXXXX	MIL-R-39005/3	RBR54	1/4	4.99	562 K	0.02, 0.05, 0.10	300		
RBR56XXXXXXXX	MIL-R-39005/5	RBR56	1/8	10	220 K	0.02, 0.05, 0.10	150		
RBR57XXXXXXXX	MIL-R-39005/7	RBR57	3/4	10	1.37 M	0.02, 0.05, 0.10	600		
RBR71XXXXXXXX	MIL-R-39005/6	RBR71	1/8	10	0.15 M	0.02, 0.05, 0.10	150		
RBR74XXXXXXXX (3)	MIL-R-39005/8	RBR74	1/8	100	6520	0.1	150		
RBR75XXXXXXXX	MIL-R-39005/9	RBR75	1/8	10	150 K	0.02, 0.05, 0.10	150		

(1) For R ≥ 1000Ω, expressed by five digits, the first four are significant and the fifth is the number of zeros.
For R < 1000Ω, the letter R replaces one of the digits and is used as a decimal point and all digits are significant.
(2) For resistance, select values from chart on page 10.3.
(3) Not recommended for new design. (See MIL-R-39005/8).

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MIL-R-39005, RESISTORS
Fixed, Wirewound (Accurate), Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade at a resistance tolerance of ±0.02%, ±0.05%, and ±0.10% (Q, A, B)

10.00	12.10	14.70	17.80	21.50	26.10	31.60	38.30	46.40	56.20	68.10	82.50
10.10	12.30	14.90	18.00	21.80	26.40	32.00	38.80	47.00	56.90	69.00	83.50
10.20	12.40	15.00	18.20	22.10	26.70	32.40	39.20	47.50	57.60	69.80	84.50
10.40	12.60	15.20	18.40	22.30	27.10	32.80	39.70	48.10	58.30	70.60	85.60
10.50	12.70	15.40	18.70	22.60	27.40	33.20	40.20	48.70	59.00	71.50	86.60
10.60	12.90	15.60	18.90	22.90	27.70	33.60	40.70	49.30	59.70	72.30	87.60
10.70	13.00	15.80	19.10	23.20	28.00	34.00	41.20	49.90	60.40	73.20	88.70
10.90	13.20	16.00	19.30	23.40	28.40	34.40	41.70	50.50	61.20	74.10	89.80
11.00	13.30	16.20	19.60	23.70	28.70	34.80	42.20	51.10	61.90	75.00	90.90
11.10	13.50	16.40	19.80	24.00	29.10	35.20	42.70	51.70	62.60	75.90	92.00
11.30	13.70	16.50	20.00	24.30	29.40	35.70	43.20	52.30	63.40	76.80	93.10
11.40	13.80	16.70	20.30	24.60	29.80	36.10	43.70	53.00	64.20	77.70	94.20
11.50	14.00	16.90	20.50	24.90	30.10	36.50	44.20	53.60	64.90	78.70	95.30
11.70	14.20	17.20	20.80	25.20	30.50	37.00	44.80	54.20	65.70	79.60	96.50
11.80	14.30	17.40	21.00	25.50	30.90	37.40	45.30	54.90	66.50	80.60	97.60
12.00	14.50	17.60	21.30	25.80	31.20	37.90	45.90	55.60	67.30	81.60	98.80

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-39007, RESISTORS
Fixed, Wirewound (Power Type), Established Reliability

Part Number Explanation:

RWR	XX	X	XXX	X	X	X
MIL-R-39007	Size	Terminal Characteristics	Significant Figures	Number of Zeros	Resistance Tolerance	Failure Rate (%/1000 hrs)

Style
The letters RWR identify established reliability, axial lead, power type, wire-wound, fixed resistors. "XX" represents a number which identifies the size, wattage rating and construction of the resistors.

W = Weldable, inductively wound
S = Solderable, inductively wound
N = Solderable, noninductively wound
Z = Weldable, noninductively wound

Resistance (1) (2)

B = 0.1%
D = 0.5%
F = 1.0%

P = 0.1
R = 0.01
S = 0.001

Part Number	Control Specification	Style Size	Characteristics: Rated Power (Watts) at +25°C	Terminal Characteristic	Resistance Range (Ohms) (3)(4) Min	Resistance Range (Ohms) (3)(4) Max	Tolerance (±%)	Maximum Voltage Rating	FRL Grade 1	FRL Grade 2
RWR78XXXXXXX	MIL-R-39007/7	RWR78	10	S, W N, Z	0.1 0.1	39.2 K 19.6 K	0.1, 0.5, 1.0	E = √PR	S	P or R
RWR80XXXXXXX	MIL-R-39007/8	RWR80	2	S, W N, Z	0.1 0.1	1210 640				
RWR81XXXXXXX	MIL-R-39007/9	RWR81	1	S, W N, Z	0.1 0.1	492 234				
RWR84XXXXXXX	MIL-R-39007/10	RWR84	7	S, W N, Z	0.1 0.1	12.4 K 6.19 K				
RWR89XXXXXXX	MIL-R-39007/11	RWR89	3	S, W N, Z	0.1 0.1	3570 1780				

(1) For R ≥ 100 Ω, the first three digits are significant and the fourth is the number of zeros. For R < 100 Ω the letter R replaces one of the digits and is used as a decimal point. All digits are significant.
(2) For resistance, select value from chart on pages 10.5 & 10.6.
(3) For tolerance "B" (0.1%), terminals S and W, the minimum resistance value is 0.499 ohms.
(4) Wire size of less than 0.0001 inch (0.03 mm) in nominal diameter is not approved for NASA use. See detail specification.

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MIL-R-39007, RESISTORS
Fixed, Wirewound (Power Type), Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade at a resistance tolerance of ±0.1%, ±0.5% and ±1.0% (B, D, F)

B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)
10.0		10.0	12.4		12.4	15.4		15.4	19.1		19.1	23.7		23.7	29.4		29.4
10.1			12.6			15.6			19.3			24.0			29.8		
10.2		10.2	12.7		12.7	15.8		15.8	19.6		19.6	24.3		24.3	30.1		30.1
10.4			12.9			16.0			19.8			24.6			30.5		
10.5		10.5	13.0		13.0	16.2		16.2	20.0		20.0	24.9		24.9	30.9		30.9
10.6			13.2			16.4			20.3			25.2			31.2		
10.7		10.7	13.3		13.3	16.5		16.5	20.5		20.5	25.5		25.5	31.6		31.6
10.9			13.5			16.7			20.8			25.8			32.0		
11.0		11.0	13.7		13.7	16.9		16.9	21.0		21.0	26.1		26.1	32.4		32.4
11.1			13.8			17.2			21.3			26.4			32.8		
11.3		11.3	14.0		14.0	17.4		17.4	21.5		21.5	26.7		26.7	33.2		33.2
11.4			14.2			17.6			21.8			27.1			33.6		
11.5		11.5	14.3		14.3	17.8		17.8	22.1		22.1	27.4		27.4	34.0		34.0
11.7			14.5			18.0		18.0	22.3			27.7			34.4		
11.8		11.8	14.7		14.7	18.2		18.2	22.6		22.6	28.0		28.0	34.8		34.8
12.0			14.9			18.4			22.9			28.4			35.2		
12.1		12.1	15.0		15.0	18.7		18.7	23.2		23.2	28.7		28.7	35.7		35.7
12.3			15.2			18.9			23.4			29.1			36.1		

(Table continued) See end of table for footnote.

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MIL-R-39007, RESISTORS
Fixed, Wirewound (Power Type), Established Reliability, Standard Values (Continued)

Standard resistance values for the 10 to 100 decade at a resistance tolerance of ±0.1%, ±0.5% and ±1.0% (B, D, F)

B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)	B (1) (0.1)	D (0.5)	F (1.0)
	36.5	36.5		44.2	44.2		53.6	53.6		64.9	64.9		78.7	78.7		95.3	95.3
	37.0			44.8			54.2			65.7			79.6			96.5	
	37.4	37.4		45.3	45.3		54.9	54.9		66.5	66.5		80.6	80.6		97.6	97.6
	37.9			45.9			55.6			67.3			81.6			98.8	
	38.3	38.3		46.4	46.4		56.2	56.2		68.1	68.1		82.5	82.5			
	38.8			47.0			56.9			69.0			83.5				
	39.2	39.2		47.5	47.5		57.6	57.6		69.8	69.8		84.5	84.5			
	39.7			48.1			58.3			70.6			85.6				
	40.2	40.2		48.7	48.7		59.0	59.0		71.5	71.5		86.6	86.6			
	40.7			49.3			59.7			72.3			87.6				
	41.2	41.2		49.9	49.9		60.4	60.4		73.2	73.2		88.7	88.7			
	41.7			50.5			61.2			74.1			89.8				
	42.2	42.2		51.1	51.1		61.9	61.9		75.0	75.0		90.9	90.9			
	42.7			51.7			62.6			75.9			92.0				
	43.2	43.2		52.3	52.3		63.4	63.4		76.8	76.8		93.1	93.1			
	43.7			53.0			64.2			77.7			94.2				

(1) The resistance values for "B" tolerance may be of any value, but it is preferred that the values be chosen from tolerance "D" values in this table.

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-39008, RESISTORS
Fixed, Composition (Insulated), Established Reliability

Part Number Explanation:

RCR	XX	G	XX	X	X	X
MIL-R-39008	Size	Characteristic (1)	Significant Figures	Number of Zeros	Resistance Tolerance	Failure Rate (%/1000 hrs)
Style			Resistance (2) (3)		J = ±5% K = ±10%	P = 0.1 R = 0.01 S = 0.001

Style
The letters RCR identify established reliability, insulated, composition, fixed resistors. "XX" represents a number which identifies the size and power rating of the resistors

Part Number	Control specification	Style Size (4)	Characteristics: Rated Power (Watts) at +70°C	Resistance (Ohms) Range Min	Resistance (Ohms) Range Max	Tolerance (±%)	Max Volts (dc)	FRL Grade 1	FRL Grade 2
RCR05GXXXXX	MIL-R-39008/4	RCR05	1/8	2.7	22.0 M	5, 10	150	S	P or R
RCR07GXXXXX	MIL-R-39008/1	RCR07	1/4	2.7			250		
RCR20GXXXXX	MIL-R-39008/2	RCR20	1/2	1.0			350		
RCR32GXXXXX	MIL-R-39008/3	RCR32	1.0	1.0			500		
RCR42GXXXXX	MIL-R-39008/5	RCR42	2.0	10.0			500		

(1) Only characteristic G is available.
(2) The nominal resistance value expressed in ohms is identified by a 3 digit number. The first two digits represent significant figures and the last digit specifies the number of zeros to follow. When resistance values less than 10Ω are required, the letter "R" is substituted for one of the significant digits to represent the decimal point.

CAUTION: Resistance values can change up to 15 percent because of moisture absorption. See (4).

(3) For resistance, select value from chart on page 10.8.
(4) These resistors are sensitive to moisture. It is recommended that these resistors be baked at +100°C (with no power applied) prior to use if resistance measurements indicate they are not within limits for the following schedule: style RCR05, 25 ±4 hours; style RCR42, 130 ±4 hours; all other styles, 96 ±4 hours. Reference MIL-R-39008, Para. 6.9.

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MIL-R-39008, RESISTORS
Fixed, Composition (Insulated), Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade at a resistance tolerance of ±5% (J) and ±10% (K)

±5% (J)	±10% (K)	±5% (J)	±10% (K)
10	10	33	33
11	—	36	—
12	12	39	39
13	—	43	—
15	15	47	47
16	—	51	—
18	18	56	56
20	—	62	—
22	22	68	68
24	—	75	—
27	27	82	82
30	—	91	—

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-39009, RESISTORS
Fixed, Wirewound (Power Type, Chassis Mounted), Established Reliability

Part Number Explanation:

RER	XX	X	XXX	X	X
MIL-R-39009	Size	Resistance Tolerance	Significant Figures	Number of Zeros	Failure Rate (%/1000 hrs)
Style		F = ±1.0%	Resistance (1)(4)		P = 0.1 R = 0.01

Style: The letters RER identify established reliability, chassis mounted, power-type, wire-wound, fixed resistors. "XX" represents a number which identifies the size and power rating of the resistors

Part Number	Control specification	Style Size	Characteristics: Rated Power (Watts) (2) at +25°C	Resistance (Ohms) Range (3) Min	Resistance (Ohms) Range (3) Max	Tolerance (±%)	FRL Grade 1	FRL Grade 2
RER60FXXXXX	MIL-R-39009/1 (inductive)	RER60	5.0	0.10	3.32 K	1.0	R	P
RER65FXXXXX		RER65	10.0		5.62 K			
RER70FXXXXX		RER70	20.0		12.1 K			
RER75FXXXXX		RER75	30.0		39.2 K			
RER40FXXXXX	MIL-R-39009/2 (noninductive)	RER40	5.0	1.0	1.65 K			
RER45FXXXXX		RER45	10.0		2.80 K			
RER50FXXXXX		RER50	20.0		6.04 K			
RER55FXXXXX		RER55	30.0		19.6 K			

(1) For resistance, select value from chart on page 10.10.
(2) These aluminum-housed, chassis-mounted styles are assigned power ratings when mounted on test chassis areas of a specific size at an ambient temperature of 25°C. Reference MIL-HDBK-978, Vol. 1, 3.7.
(3) Based on use of 0.001-inch nominal diameter wire.
(4) For R ≥ 100Ω, the first three digits are significant and the fourth signifies the number of zeros. For R < 100Ω, all digits are significant; the letter R is substituted for one of the digits indicating a decimal point.

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MIL-R-39009, RESISTORS
Fixed, Wirewound (Power Type, Chassis Mounted), Established Reliability

Standard resistance values for the 1 to 10 decade (F = ±1.0%)

1.00	1.21	1.47	1.78	2.15	2.61	3.16	3.83	4.64	5.62	6.81	8.25
1.02	1.24	1.50	1.82	2.21	2.67	3.24	3.92	4.75	5.76	6.98	8.45
1.05	1.27	1.54	1.87	2.26	2.74	3.32	4.02	4.87	5.90	7.15	8.66
1.07	1.30	1.58	1.91	2.32	2.80	3.40	4.12	4.99	6.04	7.32	8.87
1.10	1.33	1.62	1.96	2.37	2.87	3.48	4.22	5.11	6.19	7.50	9.09
1.13	1.37	1.65	2.00	2.43	2.94	3.57	4.32	5.23	6.34	7.68	9.31
1.15	1.40	1.69	2.05	2.49	3.01	3.65	4.42	5.36	6.49	7.87	9.53
1.18	1.43	1.74	2.10	2.55	3.09	3.74	4.53	5.49	6.65	8.06	9.76

NOTE: The standard resistance values up to and including the maximum value for every decade shall follow the sequence demonstrated for the "1 to 10" decade, above.

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MIL-R-39015, RESISTORS (1)
Variable, Wirewound (Lead Screw Actuated), Established Reliability

Part Number Explanation:

M39015	/X	-XXX	X	X
Document Number	Specification Sheet Number	Dash Number	Terminal Type L - Flexible insulated wire leads P - Printed circuit pin (base mount) W - Printed circuit pin (edge mount) X - Printed circuit pin (edge mount - alternate configuration).	Failure Rate (%/1000 hrs) P = 0.1

Part Number	Control specification	Style Size	Characteristics								FRL (3)
			Rated Power (Watts) at +85°C	Resistance (Ohms)			Resolution Range (%)		Voltage Range (Volts)		
				Tolerance (±%)	Range						
					Min	Max	Min	Max	Min	Max	Grade 2
M39015/2-XXXXX	MIL-R-39015/2	RTR22	0.75	5.0	100	20 K	0.51	1.3	8.7	86.7	P
M39015/3-XXXXX	MIL-R-39015/3	RTR24			10	10 K	0.25	1.3	2.7	61.3	

(1) Parts covered by this specification may contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow. Welded connections are recommended for space flight use. Consult manufacturer.

(2) Variable resistors shall not be used for Grade 1 applications.

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MIL-R-39015, RESISTORS
Variable, Wirewound (Lead Screw Actuated), Established Reliability
Standard Resistance Values

M39015/2 - Style RTR22

Nominal Resistance Value (Ohms)	Maximum Resolution (%)	Maximum Working Voltage (Volts)	Dash Number
100	0.51	8.7	001
200	0.42	12.3	002
500	0.42	19.4	003
1.0 K	0.36	27.4	004
2.0 K	0.29	38.7	005
5.0 K	0.26	61.3	006
10.0 K	0.14	86.7	007
20.0 K	0.11	122.0	008

M39015/3 - Style RTR24

Nominal Resistance Value (Ohms)	Maximum Resolution (%)	Maximum Working Voltage (Volts)	Dash Number
10	1.3	2.7	001
20	1.1	3.8	002
50	0.77	6.1	003
100	0.62	8.7	004
200	0.55	12.3	005
500	0.51	19.4	006
1.0 K	0.37	27.4	007
2.0 K	0.30	38.7	008
5.0	0.25	61.3	009
10.0 K	0.10	86.7	010

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MIL-R-39017, RESISTORS
Fixed, Film (Insulated), Established Reliability

Part Number Explanation:

RLR	XX	C	XXX	X	X	X
MIL-R-39017	Size	Terminal C only: solderable/weldable	Significant Figures	Number of Zeros	Resistance Tolerance	Failure Rate (%/1000 hrs)
Style			Resistance (1) (2)		F = ±1.0% G = ±2.0%	P = 0.1 R = 0.01 S = 0.001

Style
The letters RLR identify established reliability, insulated, fixed film resistors. "XX" represents a number which identifies the size and power rating of the resistors

Part Number	Control specification	Style Size	Characteristics: Rated Power (Watts) at +70°C	Resistance (Ohms) Range Min	Resistance (Ohms) Range Max	Resistance (Ohms) Tolerance (±%)	Max Volts (dc)	FRL Grade 1	FRL Grade 2
RLR05CXXXXXX	MIL-R-39017/5	RLR05	1/8	4.7	1.0 M	1.0, 2.0	200	S	P or R
RLR07CXXXXXX	MIL-R-39017/1	RLR07	1/4	10.0	10.0 M	1.0, 2.0	250		
RLR20CXXXXXX	MIL-R-39017/2	RLR20	1/2	4.3	3.01 M	1.0, 2.0	350		
RLR32CXXXXXX	MIL-R-39017/3	RLR32	1	10.0	2.7 M	1.0, 2.0	500		

(1) For R > 100Ω, the first three digits are significant and the fourth is the number of zeros
For R < 100Ω, the letter R replaces one of the digits and represents a decimal point. All digits are significant.

(2) For resistance, select value from chart on page 10.14.

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MIL-R-39017, RESISTORS
Fixed, Film (Insulated), Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade
(A resistance tolerance of ±1.0% (F) is recommended.)

G (2.0)	F (1.0)	G (2.0)	F (1.0)	G (2.0)	F (1.0)	G (2.0)	F (1.0)
10.00	10.00		18.70		33.20		56.20
	10.20		19.10		34.00		57.60
	10.50		19.60		34.80		59.00
	10.70	20.00	20.00		35.70		60.40
11.00	11.00		20.50	36.00			61.90
	11.30		21.00		36.50	62.00	
	11.50		21.50		37.40		63.40
	11.80	22.00			38.30		64.90
12.00			22.10	39.00			66.50
	12.10		22.60		39.20	68.00	
	12.40		23.20		40.20		68.10
	12.70		23.70		41.20		69.80
13.00	13.00	24.00			42.20		71.50
	13.30		24.30	43.00			73.20
	13.70		24.90		43.20	75.00	75.00
	14.00		25.50		44.20		76.80
	14.30		26.10		45.30		78.70
	14.70		26.70		46.40		80.60
15.00	15.00	27.00		47.00		82.00	
	15.40		27.40		47.50		82.50
	15.80		28.00		48.70		84.50
16.00			28.70		49.90		86.60
	16.20		29.40	51.00			88.70
	16.50	30.00			51.10		90.90
	16.90		30.10		52.30	91.00	
	17.40		30.90		53.60		93.10
	17.80		31.60		54.90		95.30
18.00			32.40	56.00			97.60
	18.20	33.00					

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MIL-R-55182, RESISTORS
Fixed, Film, Solderable Established Reliability

Part Number Explanation:

RNR	XX	X	XXX	X	X	X
MIL-R-55182	Size	Characteristic	Significant Figures	Number of Zeros	Resistance Tolerance	Failure Rate (%/1000 hrs)

Style
The letters RNR identify established reliability, fixed film, resistors with a solderable type terminal. "XX" represents a number which identifies the size of the resistors.

E = Hermetic ±25 ppm/°C
C = Hermetic ±50 ppm/°C

Resistance (1) (2)

B = ±0.1%
D = ±0.5%
F = ±1.0%

P = 0.1
R = 0.01
S = 0.001

Part Number	Control Specification	Style Size (3)	Characteristics: Rated Power (Watts) at +125°C	Resistance (Ohms) Range Min	Resistance (Ohms) Range Max	Tolerance (±%) (4)	Max Volts (dc)	FRL Grade 1	FRL Grade 2
RNR55XXXXXXX	MIL-R-55182/1	RNR55	1/10	10.0	1.21 M	0.1, 0.5, 1.0	200	S	P or R
RNR60XXXXXXX	MIL-R-55182/3	RNR60	1/8	10.0	2.49 M	0.1, 0.5, 1.0	250		
RNR65XXXXXXX	MIL-R-55182/5	RNR65	1/4	24.9	4.99 M	0.1, 0.5, 1.0	300		
RNR70XXXXXXX	MIL-R-55182/6	RNR70	1/2	24.9	7.5 M	0.1, 0.5, 1.0	350		

(1) All styles are expressed by four digits; for R ≥ 100Ω, the first three digits are significant and the fourth is the number of zeros. For R < 100Ω, the letter R replaces one of the digits and represents a decimal point.
(2) For resistance, select value from charts on pages 10.17 & 10.18.
(3) To prevent corona effects, hollow core resistors are restricted to applied voltages below 100 Vdc. Reference GSFC AID 07-01 (Application Information and Data). Samples of lots of resistors with unknown internal structure shall be subjected to destructive physical analysis to determine application restrictions.
(4) These resistors are electrostatic sensitive. For tolerance B (±0.1%), package in accordance with MIL-R-39032 as specified for field-force protection.

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MIL-R-55182, RESISTORS
Fixed, Film, Solderable and Weldable, Established Reliability

Part Number Explanation:

RNC	XX	X	XXX(XX)	X	X	X
MIL-R-55182	Size	Characteristic (3)	Significant Figures	Number of Zeros	Resistance Tolerance	Failure Rate (%/1000 hrs)
			Resistance (1) (2)			

Style
The letters RNC identify established reliability, fixed film resistors with a solderable/weldable terminal. "XX" represents a number which identifies the size of the resistors.

H = Nonhermetic (±50 ppm/°C)
J = Nonhermetic (±25 ppm/°C)
K = Nonhermetic (±100 ppm/°C)
Y = Nonhermetic
(±5 ppm/°C, up to +125°C)
(±10 ppm/°C, +125°C to +175°C)

(6) T = ±0.01%
(7) B = ±0.1%
D = ±0.5%
F = ±1.0%

P = 0.1
R = 0.01
S = 0.001

Part Number	Control Specification	Style Size (4) (5)	Rated Power (Watts) at +125°C	Characteristics	Resistance (Ohms) Range Min	Resistance (Ohms) Range Max	Resistance (Ohms) Tolerance (±%)	Max Volts (dc)	FRL Grade 1	FRL Grade 2
RNC50XXXXXXX	MIL-R-55182/7	RNC50	0.05	H, J, K	10	796 K	0.1, 0.5, 1.0	200	S	P or R
RNC55XXXXXXX	MIL-R-55182/1	RNC55	0.1	H, J, K	10	1.21 M	0.1, 0.5, 1.0	200		
RNC60XXXXXXX	MIL-R-55182/3	RNC60	0.125	H, J, K	10	3.01 M	0.1, 0.5, 1.0	250		
RNC65XXXXXXX	MIL-R-55182/5	RNC65	0.25	H, J, K	10	4.99 M	0.1, 0.5, 1.0	300		
RNC70XXXXXXX	MIL-R-55182/6	RNC70	0.5	H, J, K	10	7.50 M	0.1, 0.5, 1.0	350		
RNC90YXXXXXX	MIL-R-55182/9	RNC90	0.3	Y	4.99	49.9 K	0.01, 0.1, 0.5, 1.0	300	R	
					4.99	121 K			—	

(1) All styles except RNC90 are expressed by four digits; for R ≥ 100Ω, the first three digits are significant and the fourth is the number of zeros. For R < 100Ω, the letter R replaces one of the digits and represents a decimal point. Style RNC90 is expressed as five significant digits and a letter. For R < 1000Ω, the letter R is used as a decimal point. For values > 1000Ω but < 1.0 MΩ the letter K is used to represent a decimal point and multiplier. All digits preceding and following the letter (R or K) of the group represent significant figures.
(2) For resistance, select value from charts on pages 10.17 & 10.18.
(3) Characteristic "Y" is only available in RNC90 style.
(4) To prevent corona effects, hollow core resistors are restricted to applied voltages below 100 Vdc. Reference GSFC AID 07-01 (Application Information and Data). Samples of lots of resistors with unknown internal structure shall be subjected to destructive physical analysis to determine application restrictions.
(5) All styles except RNC90 are electrostatic sensitive. For tolerance B (±0.1%), package in accordance with MIL-R-39032 as specified for field force protection.
(6) Tolerance T is for RNC90 style only.
(7) Tolerance B is not applicable for characteristic K.

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MIL-R-55182, RESISTORS
Fixed, Film, Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade for a resistance tolerance of ±1% (F).

10.0	12.4	15.4	18.7	23.2	28.7	35.7	44.2	54.9	68.1	84.5
10.2	12.7	15.8	19.1	23.7	29.4	36.5	45.3	56.2	69.8	86.6
10.5	13.0	16.2	19.6	24.3	30.1	37.4	46.4	57.6	71.5	88.7
10.7	13.3	16.5	20.0	24.9	30.9	38.3	47.5	59.0	73.2	90.9
11.0	13.7	16.9	20.5	25.5	31.6	39.2	48.7	60.4	75.0	93.1
11.3	14.0	17.4	21.0	26.1	32.4	40.2	49.9	61.9	76.8	95.3
11.5	14.3	17.8	21.5	26.7	33.2	41.2	51.1	63.4	78.7	97.6
11.8	14.7	18.0	22.1	27.4	34.0	42.2	52.3	64.9	80.6	
12.1	15.0	18.2	22.6	28.0	34.8	43.2	53.6	66.5	82.5	

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-55182, RESISTORS
Fixed, Film, Established Reliability, Standard Values

Standard resistance values for the 10 to 100 decade at a resistance tolerance of ±0.01%, ±0.1% and ±0.5% (T, B and D).

10.00	12.10	14.70	17.80	21.50	26.10	31.60	38.30	46.40	56.20	68.10	82.50
10.10	12.30	14.90	18.00	21.80	26.40	32.00	38.80	47.00	56.90	69.00	83.50
10.20	12.40	15.00	18.20	22.10	26.70	32.40	39.20	47.50	57.60	69.80	84.50
10.40	12.60	15.20	18.40	22.30	27.10	32.80	39.70	48.10	58.30	70.60	85.60
10.50	12.70	15.40	18.70	22.60	27.40	33.20	40.20	48.70	59.00	71.50	86.60
10.60	12.90	15.60	18.90	22.90	27.70	33.60	40.70	49.30	59.70	72.30	87.60
10.70	13.00	15.80	19.10	23.20	28.00	34.00	41.20	49.90	60.40	73.20	88.70
10.90	13.20	16.00	19.30	23.40	28.40	34.40	41.70	50.50	61.20	74.10	89.80
11.00	13.30	16.20	19.60	23.70	28.70	34.80	42.20	51.10	61.90	75.00	90.90
11.10	13.50	16.40	19.80	24.00	29.10	35.20	42.70	51.70	62.60	75.90	92.00
11.30	13.70	16.50	20.00	24.30	29.40	35.70	43.20	52.30	63.40	76.80	93.10
11.40	13.80	16.70	20.30	24.60	29.80	36.10	43.70	53.00	64.20	77.70	94.20
11.50	14.00	16.90	20.50	24.90	30.10	36.50	44.20	53.60	64.90	78.70	95.30
11.70	14.20	17.20	20.80	25.20	30.50	37.00	44.80	54.20	65.70	79.60	96.50
11.80	14.30	17.40	21.00	25.50	30.90	37.40	45.30	54.90	66.50	80.60	97.60
12.00	14.50	17.60	21.30	25.80	31.20	37.90	45.90	55.60	67.30	81.60	98.80

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-55342, RESISTORS
Fixed, Film, chip, Established Reliability

Part Number Explanation:

M55342	X	XX	X	XXXX	X
MIL Number Indicating MIL-R-55342(3)	Characteristic K = ±100 ppm/°C M = ±300 ppm/°C	Specification Sheet Number	Termination Material	Resistance Value and Tolerance (1)	Failure Rate (%/1000 hrs) P = 0.1 R = 0.01 S = 0.001

B - Solderable, base metallization barrier metal, solder coated
S - Solderable, pretinned
C - Epoxy bondable, palladium/silver or platinum/silver

Tol.	Multiplier	Symbol
1.0	X 1	D
1.0	X 1,000	E
1.0	X 1,000,000	F
2.0	X 1	G
2.0	X 1,000	H
2.0	X 1,000,000	T
5.0	X 1	J
5.0	X 1,000	K
5.0	X 1,000,000	L
10.0	X 1	M
10.0	X 1,000	N
10.0	X 1,000,000	P

Mil Sheet	Style	Chars.	Resistance Range (Ohms)	Tolerance (±%)	Voltage Raging (V)	Power Rating (mW)	One Surface	Wraparound	FRL Grade 1	FRL Grade 2
55342/2	RM0505	K,M	10 - 0.470 M	1.0, 2.0, 5.0	40	50	S (2)	B, C	S	P or R
		K,M	5.6 - 0.470 M	10.0						
55342/4	RM1505	K	5.6 - 2.000 M	1.0, 2.0, 5.0, 10.0	40	150	S (2)			
		M	5.6 - 4.700 M	1.0, 2.0, 5.0, 10.0						
55342/5	RM2208	K	5.6 - 2.000 M	1.0, 2.0, 5.0, 10.0	40	225	S (2)			
		M	5.6 -15.000 M	1.0, 2.0, 5.0, 10.0						
55342/6	RM0705	K,M	5.6 - 1.000 M	1.0, 2.0, 5.0, 10.0	40	100	S (2)			
55342/7	RM1206	K,M	5.6 - 1.000 M	1.0, 2.0, 5.0, 10.0	100	250	S (2)			
55342/8	RM2010	K	5.6 - 2.000 M	1.0, 2.0, 5.0, 10.0	150	800	S (2)			
		M	5.6 -15.000 M	1.0, 2.0, 5.0, 10.0						
55342/9	RM2512	K	5.6 - 2.000 M	1.0, 2.0, 5.0, 10.0	200	1000	S (2)			
		M	5.6 -15.000 M	1.0, 2.0, 5.0, 10.0						

(1) Nominal Resistance in ohms is identified by four characters consisting of three digits and a letter. All digits, whether preceding or following the letter, are significant. The letter, inserted in a standard resistance value, is used simultaneously as a decimal point, multiplier, and resistance tolerance indicator as shown in the subtable above.

(2) Grade 1 part is not available. This termination material may not be available for the full resistance range; consult latest QPL.

(3) MIL-R-55342/7 part numbers begin D55342, all others begin M55342.

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MIL-R-55342, RESISTORS
Fixed, Film, Chips, Established Reliability

Standard Resistance Values for the 10 to 100 Decade

(1.0)	(2.0) (5.0)	(10.0)	(1.0)	(2.0) (5.0)	(10.0)	(1.0)	(2.0) (5.0)	(10.0)	(1.0)	(2.0) (5.0)	(10.0)	(1.0)	(2.0) (5.0)	(10.0)
10.00	10.00	10.00	16.50			26.70			41.20			63.40		
10.20			16.90				27.00	27.00	42.20			64.90		
10.50			17.40			27.40				43.00		66.50		
10.70			17.80			28.00			43.20				68.00	68.00
11.00	11.00			18.00	18.00	28.70			44.20			68.10		
11.30			18.20			29.40			45.30			69.80		
11.50			18.70				30.00		46.40			71.50		
11.80			19.10			30.10				47.00	47.00	73.20		
	12.00	12.00	19.60			30.90			47.50			75.00	75.00	
12.10			20.00	20.00		31.60			48.70			76.80		
12.40			20.50			32.40			49.90			78.70		
12.70			21.00				33.00	33.00		51.00		80.60		
13.00	13.00		21.50			33.20			51.10				82.00	82.00
13.30				22.00	22.00	34.00			52.30			82.50		
13.70			22.10			34.80			53.60			84.50		
14.00			22.60			35.70			54.90			86.60		
14.30			23.20				36.00			56.00	56.00	88.70		
14.70			23.70			36.50			56.20			90.90		
15.00	15.00	15.00		24.00		37.40			57.60				91.00	
15.40			24.30			38.30			59.00			93.10		
15.80			24.90				39.00	39.00	60.40			95.30		
	16.00		25.50			39.20			61.90			97.60		
16.20			26.10			40.20				62.00				

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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MIL-R-83401, RESISTORS (1)
Networks, Fixed, Film

Part Number Explanation:

M83401	XX	X	XXXX	X	X
Detail Spec Number	Specification Sheet Number	Characteristic (2)	Resistance	Tolerance	Schematic
		C = ±50 ppm/°C (hermetic) H and V = ±50 ppm/°C (nonhermetic)	(3) (4)	B = ±0.1% G = ±2.0% D = ±0.5% J = ±5.0% F = ±1.0%	A B (5) C G

Part Number	Control Specification	Style	Pins/ Package	Schematic (5)	Power Rating at +70°C: Characteristics C and V, Element (Watts)	Power Rating at +70°C: Characteristics C and V, Network (Watts)	Power Rating at +70°C: Characteristic H, Element (Watts)	Power Rating at +70°C: Characteristic H, Network (Watts)	Resistance Range (Ohms) Min	Resistance Range (Ohms) Max	Tolerance (±%)	Maximum Working Voltage/ Element (Volts)	Grade 2
M8340101XXXXXXX	MIL-R-83401/1 (6)	RZ010	14/DIP	A	—	—	0.2	1.4	50	0.1 M	0.1, 0.5, 1.0, 2.0, 5.0	100	(7)
				B	—	—	0.1	1.3	50	70 K			
				A	0.1	0.7	—	—	100	10 K			
M8340102XXXXXXX	MIL-R-83401/2 (6)	RZ020	16/DIP	A	—	—	0.2	1.6	50	0.1 M	0.1, 0.5, 1.0, 2.0, 5.0	100	
				B	—	—	0.1	1.5	50	70 K			
				A	0.1	0.8	—	—	100	10 K			
M8340103XXXXXXX	MIL-R-83401/3	RZ030	14/FLAT	A	—	—	0.05	0.35	150	51.1 K	0.5	50	
				B	—	—	0.025	0.325	150	51.1 K			
				A	—	—	0.05	0.35	150	121 K	1.0, 2.0, 5.0		
				B	—	—	0.05	0.325	150	121 K			
M8340107XXXXXXX	MIL-R-83401/7	RZ070	6/SIP	C	—	—	0.12	0.6	100	0.1 M	0.1, 0.5, 1.0, 2.0, 5.0	50	
				G	—	—	0.12	0.36	100	0.1 M			
M8340108XXXXXXX	MIL-R-83401/8	RZ080	8/SIP	C	—	—	0.12	0.84	100	0.1 M	0.1, 0.5, 1.0, 2.0, 5.0	50	
				G	—	—	0.12	0.48	100	0.1 M			
M8340109XXXXXXX	MIL-R-83401/9	RZ090	10/SIP	C	—	—	0.12	1.08	100	0.1 M	0.1, 0.5, 1.0, 2.0, 5.0	50	
				G	—	—	0.12	0.6	100	0.1 M			

(1) Parts covered by this specification may contain internal soldered connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow. Welded connections are recommended for space flight use. Consult manufacturer.
(2) Use only hermetically sealed units for space flight applications.
(3) For R ≥ 100Ω, the first three digits are significant and the fourth signifies the number of zeros. For R < 100Ω, all digits are significant; the letter R is substituted for one of the digits indicating a decimal point.
(4) For resistance, select value from the chart on page 10.22.
(5) See control specification for applicable schematic diagram.
(6) Ceramic sandwich construction shall not be used. Reference MIL-HDBK-978, Para. 3.10.6.1.
(7) There are no Grade 1 parts. For Grade 2 applications, parts shall be screened in accordance with Appendix B.

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MIL-R-83401, RESISTORS

Network, Fixed, Film, Standard Resistance Values for the 10 to 100 Decade

F (1.0)	G J (2.0)(5.0)	F (1.0)	G J (2.0)(5.0)	F (1.0)	G J (2.0)(5.0)	F (1.0)	G J (2.0)(5.0)	F (1.0)	G J (2.0)(5.0)
10.00	10.00	16.50			27.00	42.20		64.90	
10.20		16.90		27.40			43.00	66.50	
10.50		17.40		28.00		43.20			68.00
10.70		17.80		28.70		44.20		68.10	
11.00	11.00		18.00	29.40		45.30		69.80	
11.30		18.20			30.00	46.40		71.50	
11.50		18.70		30.10		47.00	47.00	73.20	
11.80		19.10		30.90		47.50		75.00	75.00
	12.00	19.60		31.60		48.70		76.80	
12.10		20.00	20.00	32.40		49.90		78.70	
12.40		20.50			33.00		51.00	80.60	
12.70		21.00		33.20		51.10			82.00
13.00	13.00	21.50		34.00		52.30		82.50	
13.30			22.00	34.80		53.60		84.50	
13.70		22.10		35.70		54.90		86.60	
14.00		22.60			36.00		56.00	88.70	
14.30		23.20		36.50		56.20		90.90	
14.70		23.70		37.40		57.60			91.00
15.00	15.00		24.00	38.30		59.00		93.10	
15.40		24.30			39.00	60.40		95.30	
15.80		24.90		39.20		61.90		97.60	
	16.00	25.50		40.20			62.00		
16.20		26.10		41.20		63.40			
		26.70							

NOTE: For values up to and including the maximum value, use the values listed in this table multiplied by the appropriate power of 10.

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SECTION 11: SUMMARY OF STANDARD THERMISTORS

Page	Control Specification	Description	Resistance Range @ +25°C (Ohms)		Grade 1	Grade 2
			Min	Max		
11.2	MIL-T-23648/19(3)	Positive temperature coefficient	10	10 K	(1)	
11.5	GSFC S-311-P-18(3)	Negative temperature coefficient	2252	30 K	(2)	

Refer to MIL-HDBK-978, Vol. 1, for construction and application information

(1) Presently there are no Grade 1 parts. Parts may be used in Grade 2 applications only.

(2) Parts may be used in Grades 1 and 2 applications.

(3) Parts covered by this specification contain internal connections that may reflow during installation. Special care must be execrised when soldering to prevent internal solder reflow. Heat sinking is strongly recommended.

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MIL-T-23648, THERMISTORS, INSULATED (5)

Part Number Explanation:

RTHXX	.	X	X	XXX	X
Style RTH- Identifies general purpose thermistors and "XX" represents a two-digit number which identifies the physical configuration		Resistance Ratio Characteristic: E = 0.55 ±10%	Lead Type S = Solderable (S only)	Zero Power Resistance @ +25°C (1)	Zero Power Resistance Tolerance @ +25°C (2) J = ±5%

Part Number	Control Specification	Style	Temperature Coefficient	Seal	Resistance Ratio	Resistance Values @ +25°C (ohms)		Thermal Time Constant (sec) Max	Dissipation Constant Min (mW/°C)	Power Rating @ +25°C (watts)	FRL	
						Min	Max				Grade 1	Grade 2
RTH42ESXXXX	MIL-T-23648/19	RTH42	Positive	Hermetic	E = 0.55 ±10%	10	10 K	60	2.5	0.25	(3)	(4)

(1) The resistance is expressed in ohms and identified by a three-digit number. The first two digits represent significant figures and the last digit specifies the number of zeros to follow.
(2) See Resistance vs Temperature Table following.
(3) Presently there are no Grade 1 parts.
(4) FRL (failure rate level) is not applicable to these devices.
(5) Parts covered by this specification contain internal connections that may reflow during installation. Special care must be exercised when soldering to prevent internal solder reflow. Heat sinking is strongly recommended.

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MIL-T-23648, THERMISTORS, INSULATED
Standard Resistance Values for the 10 to 100 Decade at a Resistance Tolerance of ±5% (J)

10	22	47
11	24	51
12	27	56
13	30	62
15	33	68
16	36	75
18	39	82
20	43	91

NOTE: For values up to and including the maximum value, use the value listed in this table multiplied by the appropriate power of 10.

MIL-T-23648, THERMISTORS, INSULATED
Resistance Tolerance Versus Temperature for Tolerance Characteristics J

Temperature (°C)	J (± percent)
-55	20
-15	13
0	7
+25	5
+50	7
+75	9
+100	12
+125	15

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MIL-T-23648, THERMISTORS, INSULATED
Factors for Determining Resistance at Various Temperatures

Temperature (°C)	Resistance Range (Ohms)					
	10-68	82-150	180-470	560-1.2K	1.5K-5.6K	6.8K-10K
-55	0.615	0.582	0.560	0.550	0.515	0.510
-15	0.790	0.770	0.755	0.740	0.730	0.730
0	0.863	0.847	0.838	0.835	0.825	0.825
+25	1.000	1.000	1.000	1.000	1.000	1.000
+50	1.160	1.170	1.180	1.200	1.230	1.190
+75	1.350	1.370	1.400	1.420	1.450	1.400
+100	1.545	1.584	1.623	1.656	1.670	1.610
+125	1.750	1.800	1.860	1.920	1.960	1.830

The appropriate factor is selected from the column headed by the resistance range which includes the zero-power +25°C resistance of the thermistor in question. The +25°C resistance of the thermistor is multiplied by the factor selected to obtain the resistance at any given temperature.

Example: Given a thermistor with a +25°C resistance of 220 ohms, calculate the resistance at +75°C. Select +75 °C under the temperature column and go across the table to the resistance range column containing 220 ohms. The column heading is 180-470 and the factor is 1.400. Multiply this factor by 220 ohms to obtain the resistance of 308 ohms at +75°C.

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GSFC S-311-P-18, THERMISTORS

Part Number Explanation:

311P18	-XX	X	XXX
GSFC Control Specification	Dash Number corresponds to the zero-power resistance of the thermistor @ +25°C	Lead Material: S = 32 AG, type C per MIL-STD-1276 T = 28 AG, type ET per MIL-W-16878 N = 32 AG, type N-2 per MIL-STD-1276 E = insulated lead, TFE, 32 AG per MIL-I-22129; bare lead, style S; FEP tubing, M23053/11-105C	Lead Length (cm) (4)

Part Number	Control Specification	Temperature Coefficient	Seal	Zero Power Resistance (at +25°C) (Ohms)	Tolerance Limits (0 to +70°C) (±%)	Operating and Storage Temperature Limits(°C)	Thermal Time Constant (sec)Max	Dissipation Constant (mW/°C) Min	FRL Grades 1 and 2
311P18-01XXXX	GSFC S-311-P-18	Negative	Nonhermetic	2252	1.02	-55 to +90	10.0 (1)	1.0 (2)	(3)
311P18-02XXXX				2252	0.51	-55 to +70			
311P18-03XXXX				3000	1.02	-55 to +90			
311P18-04XXXX				3000	0.56	-55 to +70			
311P18-05XXXX				5000	1.02	-55 to +90			
311P18-06XXXX				5000	0.51	-55 to +70			
311P18-07XXXX				10000	0.93	-55 to +90			
311P18-08XXXX				10000	0.56	-55 to +70			
311P18-09XXXX				30000	1.00	-55 to +90			
311P18-10XXXX				30000	0.50	-55 to +70			

(1) For a thermistor suspended in still air, the thermal constant is 10.0 seconds maximum, except lead style "E", 25 seconds maximum.
(2) For thermistors suspended in still air only (does not apply for lead style "E").
(3) Parts may be used in Grades 1 and 2 applications.
(4) Standard lead lengths are from 7.6 cm to 100 cm. The lead length in centimeters (cm) is specified by three characters. For lengths from 7.6 cm to 9.9 cm the letter "R" is used as the decimal point (e.g., 7R6 (7.6)). For lengths 10 cm to 99 cm the letter "R" is used as the last character (e.g., 76R (76)). For 100 cm the characters are 101, where the last character signifies the number of zeros following the first two characters.

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SECTION 12: SUMMARY OF STANDARD TRANSFORMERS

This standard contains no transformers. All transformers must be procured to the requirements of MIL-STD-981. Refer to MIL-HDBK-978, Vol. 4, for construction and application information and Appendix C for special requirements.

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SECTION 13: SUMMARY OF STANDARD TRANSISTORS

Page	Control Specification	Description	Type Designation	
			Grade 1	Grade 2 (1)
13.2	MIL-S-19500	Low-power, NPN	JANS	JANTXV
13.3		Low-power, PNP		
13.3		Matched pair, NPN, PNP		
13.4		High Power, NPN, PNP		
13.5		Silicon RF, NPN, PNP		
13.6		FETs, N-channel, P-channel		
13.7		Choppers		
13.8		Optocoupler		

Refer to MIL-HDBK-978, Vol. 2, for construction and application information.

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, Low Power (Less Than 2W)

Part Number Explanation:

JAN	AAA	X (1)	YN	BBBB	I
Military Qualified	Quality Level S = Grade 1 TXV = Grade 2	Radiation Hardness Assurance (RHA)	Component Designator Y = number one less than the number of active element terminations.	Identification Number	Suffix Letter A, B, C, etc. (excluding L, M, R, S) - indicates a modified version which is substitutable for the non-suffixed device. M - indicates matching of specified parameters of separate devices. R - indicates reverse polarity packaging of the non-suffixed device. L or S - indicates that the terminal leads are longer or shorter, respectively, than those of the non-suffixed device.

RHA Designator	Total Dose Radiation Tolerance RAD (Si)	Level Neutron Fluence (n/cm)
M	3×10^3	2×10^{12}
D	1×10^4	2×10^{12}
R	1×10^5	1×10^{12}
H	1×10^6	1×10^{12}

Grade 1 JANS	Grade 2 JANTXV (2)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings				Electrical Characteristics							Remarks
				P_T at T_A = +25°C	BV_{CBO} (V)	BV_{CEO} (V)	I_C (A)	h_{FE} at I_C Min/Max		V_{CE}(SAT) at I_C (V)		I_{CBO} (Max) at V_{CB} (Max)	Switching Time t_{on} (ns)	Switching Time t_{off} (ns)	
Low Power NPN															
2N2219A.AL	2N2219A.AL	/251	TO-205	800 mW	75	50	0.8	100/300	150 mA	1.0	500 mA	10 nA	35	300	Comp to 2N2905A
2N2222A	2N2222A	/255	TO-206	500 mW	75	50	0.8	100/300	150 mA	1.0	500 mA	10 nA	35	300	Comp to 2N2907A
2N2369A	2N2369A	/317	TO-206	360 mW	40	15	0.2	40/120	10 mA	0.2	10 mA	0.2 µA	12	18	F_T = 500 MHz min
2N2484	2N2484	/376	TO-206	360 mW	60	60	0.05	225/800	10 mA	0.3	1.0 mA	5 nA	—	—	—
2N3019	2N3019.S	/391	TO-205	800 mW	140	80	1.0	100/300	150 mA	0.2	150 mA	10(I_{CES}) nA	—	—	$t_{on} + t_{off}$ = 30 ns
2N3418.S	2N3418.S	/393	TO-205	1.0 W	85	60	3.0	20/60	1.0 A	0.25	1.0 A	—	300	1300	—
2N3419.S	2N3419.S	/393	TO-205	1.0 W	125	80	3.0	20/60	1.0 A	0.25	1.0 A	—	300	1300	—
2N3420.S	2N3420.S	/393	TO-205	1.0 W	85	60	3.0	40/120	1.0 A	0.25	1.0 A	—	300	1300	—
2N3735.L	—	/395	TO-205	1.0 W	75	40	1.5	40/140	0.5 A	0.5	50 mA	100 nA @ 20V	43	115	—

(1) Included only for JANTXV and JANS product assurance level devices.

(2) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, Low Power (Less Than 2W) (Continued)

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings: P_T at T_A = +25°C	BV_{CBO} (V)	BV_{CEO} (V)	I_C (A)	Electrical Characteristics: h_{FE} at I_C Min/Max		V_{CE}(SAT) at I_C (V)		I_{CBO} (Max) at V_{CB} (Max)	Switching Time t_{on} (ns)	t_{off} (ns)	Remarks
Low Power PNP															
2N3421,S	2N3421,S	/393	TO-205	1.0 W	125	80	3.0	40/120	1.0 A	0.25	1.0 A		300	1300	—
2N3501L	2N3501L	/366	TO-205	1.0 W	150	150	0.3	100/300	150 mA	0.4	150 mA	50 nA @75V	115	1150	—
2N3700	2N3700	/391	TO-206	500 mW	140	80	1.0	100/300	150 mA	0.2	150 mA	10 (I_{CES}) nA			$t_{on} + t_{off}$ = 30 ns
2N4150,S	2N4150,S	/394	TO-205	1.5 W	100	70	10	40/120	5 A	0.6	5 A	100 nA	550	2000	—
2N5237,S	—	/394	TO-205	1.5 W	150	120	10	40/120	5 A	0.6	5A	100 nA	550	2000	
2N5238,S	—	/394	TO-205	1.5 W	200	170	10	40/120	5 A	0.6	5 A	100 nA	550	2000	—
2N5666	2N5666	/455	TO-205	1.2 W	250	200	5	40/120	1 A	0.4	3 A	1.0 mA	250	1500	—
2N5667	2N5667	/455	TO-205	1.2 W	400	300	5	25/75	1 A	0.4	3 A	1.0 mA	250	2000	—
2N2605	2N2605	/354	TO-206	400 mW	70	60	0.03	100/300	0.010 mA	0.3	10 mA	10 nA			low-noise amp
2N2905A,AL	2N2905A,AL	/290	TO-205	600 mW	60	60	0.6	100/300	150 mA	0.4	150 mA	10 nA	45	300	Comp to 2N2219A
2N2907A	2N2907A	/291	TO-206	400 mW	60	60	0.6	100/300	150 mA	0.4	150 mA	10 nA	45	300	Comp to 2N2222A
	2N3251A	/323	TO-206	360 mW	60	60	0.2	100/300	10 mA	0.25	10 mA	20 nA @ 40V	70	250	—
	2N3468,L	/348	TO-205	1.0 W	50	50	1.0	25/75	500 mA	0.6	500 mA	100 nA @ 30V	40	90	—
2N3634,L	—	/357	TO-205	1.0 W	140	140	1.0	50/100	50 mA	0.6	50 mA	100 nA @ 100V	200	650	
2N3635,L	—	/357	TO-205	1.0 W	140	140	1.0	100/300	50 mA	0.6	50 mA	100 nA @ 100V	200	650	
2N3636,L	—	/357	TO-205	1.0 W	175	175	1.0	50/150	50 mA	0.6	50 mA	100 nA @ 100V	200	650	
2N3637,L	2N3637,L	/357	TO-205	1.0 W	175	175	1.0	100/300	50 mA	0.6	50 mA	100 nA @ 100V	200	650	—
	2N3763,L	/396	TO-205	1.0 W	60	60	1.5	40/140	500 mA	0.5	500 mA	100 nA @ 30V	43	115	—
2N3764	—	/396	TO-205	0.5 W	60	60	1.5	40/140	0.5 A	0.5	50 mA	100 nA @ 20V	43	115	
	2N3765	/396	TO-206	500 mW	60	60	1.5	40/140	500 mA	0.5	500 mA	100 nA @ 30V	43	115	—
2N3867,S	2N3867,S	/350	TO-205	1.0 W	40	40	3.0	40/200	1.5 A	0.75	1.5 A	—	100	600	—
2N3868,S	2N3868,S	/350	TO-205	1.0 W	60	60	3.0	30/150	1.5 A	0.75	1.5 A	—	100	600	—
	2N5416,S	/485	TO-205	750 mW	350	300	1.0	30/120	50 mA	2.0	50 mA	0.05 mA	1000	10000	—
NPN Matched Pair															
2N2060	2N2060,L	/270	TO-78	600(both) mW	100	60	0.5	40/120	1 mA	0.3	50 mA	2 nA	—	—	h_{FE} matched±10%,
2N2919	2N2919,L	/355	TO-99	500(both) mW	70	60	0.03	60/240	10 µA	0.3	1.0 mA	2 nA	—	—	V_{BE} matched±5mV
2N2920	2N2920,L	/355	TO-99	500(both) mW	70	60	0.03	175/600	10 µA	0.3	1.0 mA	2 nA	—	—	—
PNP Matched Pair															
2N3810	2N3810,L	/336	TO-78	600(both) mW	60	60	0.05	150/450	1 mA	0.25	1.0 mA	10 nA	—	—	h_{FE} matched±10%,
2N3811	2N3811,L	/336	TO-78	600(both) mW	60	60	0.05	300/900	1 mA	0.25	1.0 mA	10 nA	—	—	V_{BE} matched±5 mV

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, High-Power (Greater Than 2 W)

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings: P_T at T_C = +100°C (W)	BV_{CBO} (V)	BV_{CEO} (V)	I_C (A)	Electrical Characteristics: h_{FE} at I_C Min/Max	(A)	$V_{CE(SAT)}$ at I_C (V)	(A)	I_{CBO} (Max) at V_{CB} (Max) (μA)	Switching Time t_{on} (μs)	t_{off} (μs)	Remarks
High-Power NPN															
	2N3716	/408	TO-204	85.7	100	80	10	50/150	1.0	1.0	5	1.0 mA (I_{CES}) @ 70 V	1.5	2.4	Comp to 2N3792
2N3749	2N3749	/315	MT53	30	110	80	5	40/120	1.0	0.25	1	0.2	0.36	2.0	Similar to 2N2880. Isolated collector
2N2880	—	/315	MT53	30	110	80	5	40/120	1.0	0.25	1	0.2	0.3	1.7	—
2N3996	2N3996	/374	TO-111	30	100	80	5	40/120	1.0	2.0	5	0.2(I_{CES})	0.3	1.5	—
2N3997	—	/374	TO-111	30	100	80	5	80/240	1.0	2.0	5	0.2(I_{CES})	0.3	2.0	—
2N5038	2N5038	/439	TO-204	80	150	90	20	50/200	2.0	1.0	12	1.0	0.5	2.0	—
2N5039	—	/439	TO-204	80	125	75	20	30/150	2.0	1.0	1.0	1.0	0.5	2.0	—
2N5664	2N5664	/455	TO-213	30	250	200	5	40/120	1.0	0.4	3	1000	0.25	1.5	—
2N5665	2N5665	/455	TO-213	30	400	300	5	25/75	1.0	0.4	3	1000	0.25	2.0	—
	2N5672	/488	TO-204	80	150	120	30	20/100	15.0	0.75	15	25 mA	0.5	1.5	—
	2N6308	/498	TO-204	62.5	700	350	8	12/60	3.0	1.5	3	500(I_{CEX})	0.60	3.0	—
High-Power PNP															
2N3740	—	/441	TO-213	14	60	60	4	30/120	0.25	0.6	1	0.1	0.4	1.0	—
2N3741	2N3741	/441	TO-213	14	80	80	4	30/120	0.25	0.6	1	0.1	0.4	1.0	—
	2N3792	/379	TO-204	85.7	80	80	10	50/150	1.0	1.0	5	0.5 mA (I_{CES}) @ 70 V	1.5	2.4	Comp to 2N3716
—	2N4399	/433	TO-204	115	60	60	30	25/—	15.0	1.0	15	1000	1.2	2.5	—
	2N5745	/433	TO-204	115	80	80	20	25/—	10.0	1.5	15	1000	1.2	2.5	—
	2N6546	/525	TO-204	100	—	300	15	12/60	5.0	1.5	10	—	1.0	4.7	Pulsed $V_{CE(SAT)}$
	2N6547	/525	TO-204	100	—	400	15	12/60	5.0	1.5	10	—	1.0	4.7	Pulsed $V_{CE(SAT)}$

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, RF Devices, NPN, PNP

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings		Electrical Characteristics							Remarks
				P_T $T_C = +25°C$ (W)	BV_{CBO} (Volts)	h_{FE} (Min/Max)	$\|h_{fe}\|$ at f Min/Max	(MHz)	P_{OUT} (Min/Max) (Watts)	@ P_{IN} (Watts)	f (MHz)	n (%)	
NPN													
2N918	2N918	/301	TO-206	0.3	30	20/200	6/18	100	G_{PE} = 15db min	—	200	—	—
2N2857	2N2857	/343	TO-206	0.3	30	30/150	10/21	100	G_{PE} = 12.5/21 db	—	450	—	—
	2N3375	/341	TO-60	11.6	65	15/150	3.5 min	100	7.5/14	1	100	65	—
	2N3553	/341	TO-205	7.0	65	15/150	3.5 min	100	2.5/5	0.25	175	50	—
	2N3866	/398	TO-205	1.0 @ $T_A = 25°C$	60	15/200	2.5/8	200	1.0/2.0	0.15	400	45	—
2N3866A	—	/398	TO-205	1.0 @ $T_A = 25°C$	60	25/200	2.5/8	200	1.0/2.0	0.15	400	45	—
2N5109	—	/453	TO-39	1.0 W	40	40/120	6/11	200	G_{PE} = 11dB	10dBm	200	—	—
PNP													
	2N4957	/426	TO-206	0.2 @ $T_A = 25°C$	30	30/165	12/36	100	G_{PE} = 17/25 db	—	450	—	—

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, Field Effect

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings: P_T at T_A=+25°C (mW)	V_{DG} (V)	V_{DS} (V)	I_G (mA)	Electrical Characteristics: $V_{GS(OFF)}$ (Min/Max) (V)	I_{DSS} (V_{GS}=0) (Min/Max) (mA)	$r_{ds(ON)}$ Max (Ohm)	y_{fs} (µmho)	C_{iss} Max (pF)	C_{rss} Max (pF)	Remarks
N-Channel														
2N3821	2N3821	/375	TO-206	300	50	50	10	-4 max	0.5/2.5	—	1500/4500	6.0	3.0	$\|y_{fs}\|$ @ 1 kHz
2N3822	2N3822	/375	TO-206	300	50	50	10	-6 max	2/10	—	3000/6500	6.0	3.0	$\|y_{fs}\|$ @ 1 kHz
	2N3823	/375	TO-206	300	30	30	10	-8 max	4/20	—	3500/6500	6.0	2.0	$\|y_{fs}\|$ @ 1 kHz
	2N4416A	/428	TO-206	300	35	35	10	-2.5/-6.0	5/15	—	4500/7500	4.0	0.8	$\|y_{fs}\|$ @ 1 kHz
	2N4856	/385	TO-206	360	40	40	50	-4/-10	50/175	25	—	18	8.0	Analog Sw/Chopper
	2N4857	/385	TO-206	360	40	40	50	-2/-6	20/100	40	—	18	8.0	Analog Sw/Chopper
	2N4858	/385	TO-206	360	40	40	50	-0.8/-4	8/80	60	—	18	8.0	Analog Sw/Chopper
N-Channel Radiation Hardened														
2N7261	—	/601	TO-205	800	100	100	—	—	—/-0.050	0.180	—	—	—	Radiation Level R
2N7262	—	/601	TO-205	800	200	200	—	—	—/-0.050	0.400	—	—	—	Radiation Level H
2N7268	—	/603	TO-254	4000	100	100	—	—	—/-0.050	0.070	—	—	—	Radiation Level R
2N7269	—	/603	TO-254	4000	200	200	—	—	—/-0.050	0.115	—	—	—	Radiation Level H
P-Channel														
	2N5114	/476	TO-206	500	30	30	50	5/10	-30/-90	75	—	25	7.0	Analog Sw/Chopper
	2N5115	/476	TO-206	500	30	30	50	3/6	-15/-60	100	—	25	7.0	Analog Sw/Chopper
	2N5116	/476	TO-206	500	30	30	50	1/4	-5/-25	175	—	27	7.0	Analog Sw/Chopper
	2N6804	/562	TO-204	4000	-100	-100	—	—	—/-0.025	0.3	—	800	200	—
	2N6806	/562	TO-204	4000	-200	-200	—	—	—/-0.025	0.8	—	800	90	—
	2N6845	/563	TO-205	800	-100	-100	—	—	—/-0.025	0.6	—	400	100	—
	2N6847	/563	TO-205	800	-200	-200	—	—	—/-0.025	1.50	—	400	45	—

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Silicon, Chopper

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings				Electrical Characteristics					Remarks
				P_T at T_A = +25°C (mW)	BV_{CBO} (V)	BV_{CEO} (V)	I_C (mA)	h_{FE} at I_C		$V_{EC(sat)}$ at $I_B = 0$		$r_{ec(on)}$	
								Min/Max	(mA)	Min/Max (mV)	I_B (mA)	Min/Max (Ohms)	
2N2432A	2N2432A	/313	TO-206	300	45	45	100	80/400	1	—/0.7	1	—/15	NPN
	2N2945A	/382	TO-206	400	-25	-20	-100	70/—	-1	—/-1.0	-1	—/6	PNP

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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MIL-S-19500, TRANSISTORS
Optocoupler

Grade 1 JANS	Grade 2 JANTXV (1)	Specification MIL-S-19500	Pkg Outline	Maximum Ratings: P_T at T_A=+25°C (W)	Maximum Ratings: V_{CEO} (Max) (V)	Maximum Ratings: V_R (Max) (V)	Maximum Ratings: I_C Max (mAdc)	Maximum Ratings: I_F Max (mAdc)	Electrical Characteristics: $I_{C(ON)}$ V_{CE} = 5.0 V Min/Max (mAdc)	$I_{C(ON)}$ I_F (mA)	$V_{CE(SAT)}$ @ I_C & I_F Min/Max (V)	$V_{CE(SAT)}$ I_C (mA)	$V_{CE(SAT)}$ I_F (mA)	$I_{C(OFF)}$ @ V_{CE} I_C & I_B = 0 Min/Max (nA)	$I_{C(OFF)}$ V_{CE} (V)	Remarks
—	4N23	/486	PH13	0.3	35	2	50	40	6.0/—	10	—/0.3	5	20	—/100	20	The designation A denotes isolated phototransistor.
	4N23A	/486			35				6.0/—	10		5	20			
	4N24	/486			35				10.0/—	10		10	20			
	4N24A	/486			35				10.0/—	10		10	20			
	4N47	/548			40				0.5/—	1.0		0.5	2.0			These devices are recommended for new design.
	4N48	/548							1.0/5.0			1.0	2.0			
	4N49	/548							2.0/10.0			2.0	2.0			

(1) Refer to Appendix B for additional testing requirements for JANTXV parts.

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SECTION 14: SUMMARY OF STANDARD WIRE (1)

Page	Control Specification	Description	Wire Size (AWG)		Voltage Rating Max (Volts)	Grades 1 and 2
			Min	Max		
14.2	MIL-W-22759 (2)	Extruded TFE/ETFE	30	00	600	(3)
14.14	MIL-W-5086	Polyvinyl-chloride, nylon jacket	16	0000	600	GSE only

SECTION 14: SUMMARY OF STANDARD CABLE (1)

Page	Control Specification	Description	Voltage Rating Range (V)		Grades 1 and 2
			Min	Max	
14.16	MIL-C-17	Radio frequency, flexible, coaxial (50, 75, and 93 ohms)	750	1875	(3)
14.17	MIL-C-27500	Electrical, shielded and unshielded (wire size: 000-30)	600	600	(3)

Refer to MIL-HDBK-978, Vol. 5, for construction and application information.

(1) These parts may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.

(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.

(3) May be used in Grade 1 or Grade 2 applications.

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MIL-W-22759, WIRE (1)
Electric, Fluoropolymer-Insulated, Copper or Copper Alloy

Part Number Explanation:

M22759	/X(X)	-(X)X	-XX
Military Specification Designation	Specification Slash Sheet	Wire Size (2)	Color Designation (3)

Part Number	Control Specification	Wire Size Range (2)	Insulation (4)	Coating (5)	Voltage Rating Maximum (Volts/rms)	Temperature (°C)	Grades 1 and 2
M22759/9-XX-XX	MIL-W-22759	28 - 8	Extruded TFE	Silver	1000	+200	(6)
M22759/11-XX-XX		28 - 8	Extruded TFE	Silver	600	+200	
M22759/12-XX-XX		28 - 8	Extruded TFE	Nickel		+260	
M22759/16-XX-XX		24 - 00	ETFE	Tin		+150	
M22759/18-XX-XX		26 - 10	ETFE	Tin		+150	
M22759/22-XX-XX		28 - 20	Extruded TFE	Silver		+200	
M22759/23-XX-XX		28 - 20	Extruded TFE	Nickel		+260	
M22759/32-XX-XX		30 - 12	Crosslinked ETFE	Tin		+150	
M22759/33-XX-XX		30 - 20	Crosslinked ETFE	Silver		+200	
M22759/34-XX-XX		24 - 02	Crosslinked ETFE	Tin		+150	
M22759/35-XX-XX		24 - 20	Crosslinked ETFE	Silver (7)		+200	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Wire size is a number which is the nearest AWG to actual wire size.
(3) Substitute the appropriate color code designator from MIL-STD-681.
(4) Some ETFE (Ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(5) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(6) Wire may be used in Grades 1 and 2 applications.
(7) High strength copper alloy conductor.

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MIL-W-22759/9, WIRE
Electric, Fluoropolymer-Insulated, Extruded TFE
Silver-Coated Copper Conductor, 1000-Volt, +200°C (1) (2)

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/9-28-XX	28	7 x 36	0.014	0.015	63.8	0.043 ± 0.002	1.90	(4)
M22759/9-26-XX	26	19 x 38	0.018	0.020	38.4	0.048 ± 0.002	2.57	
M22759/9-24-XX	24	19 x 36	0.023	0.025	24.3	0.053 ± 0.002	3.33	
M22759/9-22-XX	22	19 x 34	0.029	0.032	15.1	0.060 ± 0.002	4.60	
M22759/9-20-XX	20	19 x 32	0.037	0.040	9.19	0.068 ± 0.002	6.40	
M22759/9-18-XX	18	19 x 30	0.046	0.050	5.79	0.078 ± 0.002	9.10	
M22759/9-16-XX	16	19 x 29	0.052	0.057	4.52	0.085 ± 0.002	11.0	
M22759/9-14-XX	14	19 x 27	0.065	0.072	2.88	0.100 ± 0.003	16.4	
M22759/9-12-XX	12	19 x 25	0.082	0.090	1.81	0.120 ± 0.004	25.3	
M22759/9-10-XX	10	37 x 26	0.106	0.112	1.19	0.141 ± 0.004	38.2	
M22759/9-8-XX	8	133 x 29	0.158	0.169	0.558	0.207 ± 0.003	68.8	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/9-20-9; white with orange stripe - M22759/9-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/11, WIRE
Electric, Fluoropolymer-Insulated, Extruded TFE
Silver-Coated Copper Conductor, 600-Volt, +200°C (1) (2)

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/11-28-XX	28	7 x 36	0.014	0.015	63.8	0.033 ± 0.002	1.36	
M22759/11-26-XX	26	19 x 38	0.018	0.020	38.4	0.038 ± 0.002	1.90	
M22759/11-24-XX	24	19 x 36	0.023	0.025	24.3	0.043 ± 0.002	2.58	
M22759/11-22-XX	22	19 x 34	0.029	0.032	15.1	0.049 ± 0.002	3.72	
M22759/11-20-XX	20	19 x 32	0.037	0.040	9.19	0.058 ± 0.002	5.43	
M22759/11-18-XX	18	19 x 30	0.046	0.050	5.79	0.068 ± 0.002	8.14	(4)
M22759/11-16-XX	16	19 x 29	0.052	0.057	4.52	0.075 ± 0.002	10.0	
M22759/11-14-XX	14	19 x 27	0.065	0.072	2.88	0.090 ± 0.002	15.1	
M22759/11-12-XX	12	19 x 25	0.082	0.090	1.81	0.111 ± 0.003	24.1	
M22759/11-10-XX	10	37 x 26	0.106	0.112	1.19	0.139 ± 0.004	37.8	
M22759/11-8-XX	8	133 x 29	0.158	0.169	0.658	0.202 ± 0.004	65.5	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/11-20-9; white with orange stripe - M22759/11-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/12, WIRE
Electric, Fluoropolymer-Insulated, Extruded TFE Nickel-Coated Copper Conductor, 600-Volt, +260°C (1)

Part Number (2)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/12-28-XX	28	7 x 36	0.014	0.016	67.9	0.033 ± 0.002	1.36	
M22759/12-26-XX	26	19 x 38	0.018	0.021	42.2	0.038 ± 0.002	1.90	
M22759/12-24-XX	24	19 x 36	0.023	0.026	25.9	0.043 ± 0.002	2.58	
M22759/12-22-XX	22	19 x 34	0.029	0.033	16.0	0.049 ± 0.002	3.72	
M22759/12-20-XX	20	19 x 32	0.037	0.041	9.77	0.058 ± 0.002	5.43	
M22759/12-18-XX	18	19 x 30	0.046	0.051	6.10	0.068 ± 0.002	8.14	(3)
M22759/12-16-XX	16	19 x 29	0.052	0.058	4.76	0.075 ± 0.002	10.0	
M22759/12-14-XX	14	19 x 27	0.065	0.073	3.00	0.090 ± 0.002	15.6	
M22759/12-12-XX	12	19 x 25	0.082	0.092	1.89	0.111 ± 0.003	24.4	
M22759/12-10-XX	10	37 x 26	0.106	0.114	1.24	0.139 ± 0.004	39.0	
M22759/12-8-XX	8	133 x 29	0.158	0.173	0.694	0.204 ± 0.004	67.0	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/12-20-9; white with orange stripe - M22759/12-20-93.
(3) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/16, WIRE (1) (2)
Electric, Fluoropolymer-Insulated, Extruded ETFE, Medium Weight, Tin-Coated Copper, 600 Volt, +150°C

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/16-24-XX	24	19 x 36	0.023	0.024	26.2	0.045 ± 0.002	2.57	
M22759/16-22-XX	22	19 x 34	0.029	0.031	16.2	0.052 ± 0.002	3.68	
M22759/16-20-XX	20	19 x 32	0.037	0.039	9.88	0.060 ± 0.002	5.36	
M22759/16-18-XX	18	19 x 30	0.046	0.049	6.23	0.071 ± 0.002	7.89	
M22759/16-16-XX	16	19 x 29	0.052	0.055	4.81	0.079 ± 0.002	9.95	
M22759/16-14-XX	14	19 x 27	0.065	0.069	3.06	0.093 ± 0.002	14.9	
M22759/16-12-XX	12	37 x 28	0.084	0.089	2.02	0.114 ± 0.003	22.6	
M22759/16-10-XX	10	37 x 26	0.106	0.112	1.26	0.139 ± 0.003	35.1	(4)
M22759/16-8-XX	8	133 x 29	0.158	0.169	0.701	0.199 ± 0.003	63.5	
M22759/16-6-XX	6	133 x 27	0.198	0.212	0.445	0.250 ± 0.003	99.9	
M22759/16-4-XX	4	133 x 25	0.250	0.268	0.280	0.312 ± 0.004	157.0	
M22759/16-2-XX	2	665 x 30	0.320	0.340	0.183	0.388 ± 0.004	245.0	
M22759/16-1-XX	1	817 x 30	0.360	0.380	0.149	0.431 ± 0.005	314.0	
M22759/16-01-XX	0	1045 x 30	0.395	0.425	0.116	0.479 ± 0.006	391.0	
M22759/16-02-XX	00	1330 x 30	0.440	0.475	0.091	0.546 ± 0.007	504.0	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/16-20-9; white with orange stripe - M22759/16-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/18, WIRE (1) (2)
Electric, Fluoropolymer-Insulated, Extruded ETFE, Lightweight, Tin-Coated Copper, 600 Volt, +150°C

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/18-26-XX	26	19 x 38	0.018	0.020	41.3	0.032 ± 0.002	1.52	
M22759/18-24-XX	24	19 x 36	0.023	0.024	26.2	0.036 ± 0.002	2.12	
M22759/18-22-XX	22	19 x 34	0.029	0.031	16.2	0.043 ± 0.002	3.16	
M22759/18-20-XX	20	19 x 32	0.037	0.039	9.88	0.051 ± 0.002	4.76	
M22759/18-18-XX	18	19 x 30	0.046	0.049	6.23	0.061 ± 0.002	7.10	(4)
M22759/18-16-XX	16	19 x 29	0.052	0.055	4.81	0.070 ± 0.002	9.14	
M22759/18-14-XX	14	19 x 27	0.065	0.069	3.06	0.085 ± 0.002	14.1	
M22759/18-12-XX	12	37 x 28	0.084	0.089	2.02	0.107 ± 0.003	21.6	
M22759/18-10-XX	10	37 x 26	0.106	0.112	1.26	0.134 ± 0.003	34.1	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/18-20-9; white with orange stripe - M22759/18-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/22, WIRE (1) (2)
Electric, Fluoropolymer-Insulated, Extruded TFE, Silver-Coated, High-Strength Copper Alloy Conductor, 600-Volt, +200°C

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/22-28-XX	28	7 x 36	0.014	0.015	74.4	0.033 ± 0.002	1.32	
M22759/22-26-XX	26	19 x 38	0.018	0.020	44.8	0.038 ± 0.002	1.91	
M22759/22-24-XX	24	19 x 36	0.023	0.024	28.4	0.043 ± 0.002	2.61	(4)
M22759/22-22-XX	22	19 x 34	0.029	0.031	17.5	0.049 ± 0.002	3.68	
M22759/22-20-XX	20	19 x 32	0.037	0.039	10.7	0.058 ± 0.002	5.38	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/22-20-9; white with orange stripe - M22759/22-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/23, WIRE (1)
Electric, Fluoropolymer-Insulated, Extruded TFE, Nickel-Coated, High-Strength Copper Alloy Conductor, 600-Volt, +260°C

Part Number (2)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/23-28-XX	28	7 x 36	0.014	0.016	79.0	0.033 ± 0.002	1.34	
M22759/23-26-XX	26	19 x 38	0.018	0.020	49.4	0.038 ± 0.002	1.92	
M22759/23-24-XX	24	19 x 36	0.023	0.025	30.1	0.043 ± 0.002	2.63	(3)
M22759/23-22-XX	22	19 x 34	0.029	0.031	18.6	0.049 ± 0.002	3.73	
M22759/23-20-XX	20	19 x 32	0.037	0.040	11.4	0.058 ± 0.002	5.44	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/23-20-9; white with orange stripe - M22759/23-20-93.
(3) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/32, WIRE (1) (2)
Electric Fluoropolymer Insulated, Crosslinked Modified ETFE Lightweight, Tin-Coated Copper Conductor, 600V, 150°C

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/32-30-XX	30	7 x 38	.011	.013	108.4	.024 ± .002	.66	(4)
M22759/32-28-XX	28	7 x 36	.014	.016	68.6	.027 ± .002	.91	
M22759/32-26-XX	26	19 x 38	.018	.020	41.3	.032 ± .002	1.4	
M22759/32-24-XX	24	19 x 36	.023	.025	26.2	.037 ± .002	2.0	
M22759/32-22-XX	22	19 x 34	.029	.031	16.2	.043 ± .002	2.8	
M22759/32-20-XX	20	19 x 32	.037	.039	9.88	.050 ± .002	4.3	
M22759/32-18-XX	18	19 x 30	.046	.049	6.23	.060 ± .002	6.5	
M22759/32-16-XX	16	19 x 29	.052	.055	4.81	.068 ± .002	8.3	
M22759/32-14-XX	14	19 x 27	.065	.069	3.06	.085 ± .003	13.0	
M22759/32-12-XX	12	37 x 28	.084	.089	2.02	.103 ± .003	19.7	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/23-20-9; white with orange stripe - M22759/23-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/33, WIRE (1) (2) (3)
Electric, Fluoropolymer Insulated, Crosslinked Modified ETFE, Lightweight, Silver Coated, High Strength, Copper Alloy, 600 V, +200°C

Part Number (4)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/33-30-XX	30	7 x 38	.011	.012	117.4	.024 ± .002	.66	
M22759/33-28-XX	28	7 x 36	.014	.016	74.4	.027 ± .002	.91	
M22759/33-26-XX	26	19 x 38	.018	.020	44.8	.032 ± .002	1.4	(5)
M22759/33-24-XX	24	19 x 36	.023	.025	28.4	.037 ± .002	2.0	
M22759/33-22-XX	22	19 x 34	.029	.032	17.5	.043 ± .002	2.9	
M22759/33-20-XX	20	19 x 32	.037	.039	10.7	.050 ± .002	4.4	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(4) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/23-20-9; white with orange stripe - M22759/23-20-93.
(5) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/34, WIRE
Electric, Fluoropolymer-Insulated, Crosslinked Modified ETFE
Normal Weight, Tin-Coated Copper Conductor, 600-Volt, +150°C (1) (2)

Part Number (3)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/34-24-XX	24	19 x 36	0.023	0.025	26.2	0.045 ± 0.002	2.3	
M22759/34-22-XX	22	19 x 34	0.029	0.031	16.2	0.050 ± 0.002	2	
M22759/34-20-XX	20	19 x 32	0.037	0.039	9.88	0.058 ± 0.002	4.7	
M22759/34-18-XX	18	19 x 30	0.046	0.049	6.23	0.070 ± 0.003	7.2	
M22759/34-16-XX	16	19 x 29	0.052	0.055	4.81	0.077 ± 0.003	9.0	
M22759/34-14-XX	14	19 x 27	0.065	0.069	3.06	0.094 ± 0.003	13.8	
M22759/34-12-XX	12	37 x 28	0.084	0.089	2.02	0.111 ± 0.003	20.5	
M22759/34-10-XX	10	37 x 26	0.106	0.113	1.26	0.134 ± 0.004	32.4	(4)
M22759/34-8-XX	8	133 x 29	0.158	0.173	0.701	0.195 ± 0.008	60.3	
M22759/34-6-XX	6	133 x 27	0.198	0.217	0.445	0.241 ± 0.010	94.5	
M22759/34-4-XX	4	133 x 25	0.250	0.274	0.280	0.310 ± 0.010	150	
M22759/34-2-XX	2	665 x 30	0.320	0.340	0.183	0.405 ± 0.016	239	
M22759/34-1-XX	1	817 x 30	0.360	0.380	0.149	0.445 ± 0.016	290	
M22759/34-01-XX	0	1045 x 30	0.395	0.425	0.116	0.485 ± 0.016	377	
M22759/34-02-XX	00	1130 x 30	0.440	0.425	0.091	0.545 ± 0.016	487	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/34-20-9; white with orange stripe - M22759/34-20-93.
(4) Wire may be used in Grades 1 and 2 applications.

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MIL-W-22759/35, WIRE
Electric, Fluoropolymer-Insulated, Crosslinked Modified ETFE, Normal Weight, Silver-Coated High Strength Copper Alloy Conductor, 600-Volt, +200°C (1) (2) (3)

Part Number (4)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire			Grades 1 and 2
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max	
M22759/35-26-XX	26	19 x 38	0.018	0.020	44.8	0.040 ± 0.002	1.7	
M22759/35-24-XX	24	19 x 36	0.023	0.025	28.4	0.045 ± 0.002	2.3	(5)
M22759/35-22-XX	22	19 x 34	0.029	0.031	17.5	0.050 ± 0.002	3.3	
M22759/35-20-XX	20	19 x 32	0.037	0.039	10.7	0.058 ± 0.002	4.8	

(1) These wires may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.
(3) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.
(4) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 20, white - M22759/35-20-9; white with orange stripe - M22759/35-20-93.
(5) Wire may be used in Grades 1 and 2 applications.

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MIL-W-5086, WIRE
Electric, Polyvinyl-Chloride-Insulated, Copper or Copper Alloy

Part Number Explanation:

M5086	/X	-XX	-X(X)
Military Specification Designation	Specification Slash Sheet	Wire Size	Color Designation (1)

MIL-W-5086/1, WIRE
Electric, Polyvinyl-Chloride (PVC) Insulated, Nylon Jacket, Tin-Coated Copper Conductor, 600 Volts, +105°C (Use for Ground Support Equipment only.)

Part Number (1) (2)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire		
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max
M5086/1-16-XX	16	19 x 29	0.052	0.058	4.81	0.098 ± 0.004	10.70
M5086/1-14-XX	14	19 x 27	0.065	0.073	3.06	0.117 ± 0.005	16.40
M5086/1-12-XX	12	37 x 28	0.084	0.090	2.02	0.137 ± 0.005	24.70

(1) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 14, white - M5086/1-14-9; white with orange stripe - M5086/1-14-93.

(2) White insulation is preferred.

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MIL-W-5086/2, WIRE
Electric, Polyvinyl-Chloride-Insulated, PVC-Glass-Nylon, Tin-Coated Copper Conductor, 600-Volt, +105°C
(Use for Ground Support Equipment only.)

Part Number (1) (2)	Wire Size, AWG	Stranding (Number of Strands x AWG Size of Strands)	Diameter of Stranded Conductor (Inches)		Finished Wire		
			Min	Max	Resistance at +20°C (+68°F) (Ohms/1000 ft) Max	Diameter (Inches)	Weight (lbs/1000 ft) Max
M5086/2-10-XX	10	37 x 26	0.106	0.114	1.26	0.189 ± 0.007	44.0
M5086/2-8-XX	8	133 x 29	0.158	0.173	0.701	0.240 ± 0.007	70.0
M5086/2-6-XX	6	133 x 27	0.198	0.217	0.445	0.293 ± 0.007	110.0
M5086/2-4-XX	4	133 x 25	0.250	0.274	0.280	0.355 ± 0.010	165.0
M5086/2-2-XX	2	665 x 30	0.320	0.340	0.183	0.425 ± 0.010	250.0
M5086/2-1-XX	1	817 x 30	0.360	0.380	0.149	0.470 ± 0.010	305.0
M5086/2-01-XX	0	1045 x 30	0.395	0.425	0.116	0.525 ± 0.015	400.0
M5086/2-02-XX	00	1330 x 30	0.440	0.475	0.091	0.590 ± 0.015	500.0
M5086/2-03-XX	000	1665 x 30	0.500	0.540	0.071	0.650 ± 0.015	620.0
M5086/2-04-XX	0000	2109 x 30	0.565	0.605	0.056	0.720 ± 0.015	785.0

(1) Part number: The X in the part number column shall be replaced by color code designators in accordance with MIL-STD-681. Examples: Size 8, white - M5086/2-8-9; white with orange stripe - M5086/2-8-93.

(2) White insulation is preferred.

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MIL-C-17, CABLE (1)
Radio Frequency, Flexible, Coaxial

Part number explanation:

M17	/XX(X)	RGXXX
Military Specification Designation	Specification Slash Sheet	Part Type

Part Number	Control Specification	Characteristic Impedance (Ohms)	Operating Frequency Max (GHz)	Voltage Working Max (Vrms)	Braid	Attenuation Max Range (dB/100/ft)	Power Max Range (Watts)	Capacitance (pF/ft)	Diameter (Inches)		Grades 1 and 2
						(at +25°C - Sea Level)			Min	Max	
M17/60-RG142	MIL-C-17	50 ± 2	12.4	1,400	Double	4 @ 50 MHz - 66 @ 8 GHz	3500 @ 50 MHz - 180 @ 8 GHz	29.3 Nom	0.190	0.20	(2)
M17/93-RG178		50 ± 2	3	750	Single	11.6 @ 50 MHz - 94 @ 3 GHz	380 @ 50 MHz - 36 @ 3 GHz	32 Max	0.067	0.075	
M17/94-RG179		75 ± 3	3	900	Single	21 @ 400 MHz	1250 @ 50 MHz - 145 @ 3 GHz	23 Max	0.095	0.105	
M17/95-RG180		95 ± 5	3	1,100	Single	17 @ 400 MHz	1050 @ 50 MHz - 130 @ 3 GHz	17.4 Max	0.137	0.145	
M17/110-RG302		75 ± 3	3	1,700	Single	8 @ 400 MHz - 26 @ 3 GHz	3500 @ 150 MHz - 350 @ 3 GHz	22 Max	0.197	0.207	
M17/111-RG303		50 ± 2	3	1,400	Single	2.7 @ 50 MHz - 28 @ 3 GHz	3800 @ 50 MHz - 370 @ 3 GHz	32 Max	0.165	0.175	
M17/113-RG316		50 ± 2	3	900	Single	7.5 @ 50 MHz - 58 @ 3 GHz	600 @ 50 MHz - 76 @ 3 GHz	32 Max	0.094	0.102	
M17/127-RG393		50 ± 2	11	1,875	Double	1.7 @ 50 MHz - 45 @ 11 GHz	9000 @ 50 MHz - 20 @ 10 GHz	32 Max	0.380	0.400	
M17/128-RG400		50 ± 2	12.4	1,400	Double	3.2 @ 50 MHz - 90 @ 12.4 GHz	3500 @ 50 MHz - 160 @ 10 GHz	32 Max	0.190	0.200	
M17/152-00001		50 ± 2	12.4	900	Double	7.5 @ 50 MHz - 200 @ 12.4 GHz	600 @ 50 MHz - 37 @ 12.4 GHz	32 Max	0.110	0.118	

(1) These cables may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) Parts may be used in Grades 1 and 2 applications.

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MIL-C-27500 CABLE (1)
Electrical, Shielded and Unshielded, Aerospace

Part Number Explanation:

M27500	X	XX	XX	X	X	XX
Military Specification Designation	Identification Method of Cable (2)	Wire Size (3)	Basic Wire Specification (4)	No. of Wires in Cable (5)	Shield Style and Material (6)	Jacket Material (7)

(1) These cables may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.
(2) A letter symbol shall be used to designate the color coding method used for unshielded or minimum 85% shield coverage (-, A or B) or minimum 90% shield coverage (C, D, E). See MIL-C-27500 for details.
(3) Wire size is a number which is the nearest AWG to the actual wire size. All wires used in the cable shall be of the same size.
(4) A letter symbol shall be used to designate the specification, type, and class in accordance with the table on the following page.
(5) For shielded or shielded and jacketed cables, the number of wires shall be from 1 to 10. For unshielded and unjacketed or unshielded jacketed cables, the number of wires shall be from 2 to 10
(6) Shield style and material of the overall shield(s) shall be designated by a single letter in accordance with the applicable paragraph of the latest revision of MIL-C-27500.
(7) The single jacket style shall consist of an outer jacket only. The double jacket style shall be used in conjunction with a double shield jacket only and shall consist of a jacket between the two shields and an outer jacket. The inner and outer jackets shall be of the same material. The jacket style and material shall be designated by two digits in accordance with the applicable paragraph of the latest revision of MIL-C-27500.

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MIL-C-27500, CABLE (1)
Single Conductor Wire

Spec. Type. Class Symbol	Basic Wire Specification	(3) Insulation	Conductor Plating (2)	Material	Wire Size Range (AWG)	Voltage Rating (V)	Temperature Rating (°C)
LE	MIL-W-22759/9	Extruded TFE	Silver	Copper	28-8	1000	+200
RC	/11	Extruded TFE	Silver	Copper	28-8		+200
RE	/12	Extruded TFE	Nickel	Copper	28-8		+260
TE	/16	ETFE	Tin	Copper	24-00		+150
TG	/18	ETFE	Tin	Copper	26-10		+150
TM	/22	Extruded TFE	Silver	Copper alloy	28-20		+200
TN	/23	Extruded TFE	Nickel	Copper alloy	28-20	600	+260
SB	/32	Crosslinked ETFE	Tin	Cooper	30-12		+150
SC	/33	Crosslinked ETFE	Silver	Copper alloy	30-20		+200
SD	/34	Crosslinked ETFE	Tin	Copper	24-02		+150
SE	/35	Crosslinked ETFE	Silver	Copper alloy	24-20		+200

(1) These cables may require material testing per ASTM E 595 and NHB 8060.1. Consult the project parts engineer for program requirements.

(2) Silver-coated copper is susceptible to cuprous oxide corrosion ("red plague") when produced, stored or used in a moist or high humidity environment. The environment for this wire must be controlled.

(3) Some ETFE (ethyltetrafluoroethylene) insulated wire has been found to fail flammability testing in a 30% oxygen environment. Consult part specialist for flammability requirements.

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Summary of Standard Photonic Parts

There are no Grade 1 or Grade 2 photonic parts acceptable as NASA Standard Parts. The Candidate Parts List for this document includes connector, termini, fiber and cable specifications that have been developed for NASA use. Consult the project parts engineer for a listing of these specifications.

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SECTION 21: ADVANCED MICROCIRCUIT PARTS LISTING (AMPL)

1.0 SCOPE

The Advanced Microcircuit Parts Listing (AMPL), contained in Section 21 of MIL-STD-975, lists advanced microcircuits as defined in paragraph 1.1. Parts listed in QML-38534 may also be listed in the AMPL, providing they meet the definition of paragraph 1.1 and they are not listed in MIL-STD-975 Part I. The parts listed in the AMPL are nonstandard and require the submittal of a Nonstandard Part Approval Request (NSPAR) for usage.

1.1 *Definition of an Advanced Microcircuit.* An advanced microcircuit is defined for the purposes of this standard as any device that meets one of the following characteristics:

a. A monolithic digital microcircuit:

(1) intended for use as a peripheral to a microcircuit, regardless of number of transistors, provided it is manufactured on the same production line using the same processes, or

(2) a monolithic digital microcircuit that combines two or more functions to form a more complex function and has 32 or more active pins exclusive of power, ground, and No (pin) Connects (NCs).

b. A monolithic memory microcircuit meeting any of the following criteria:

(1) Static RAM (SRAM) with 64 Kbits or more.

(2) Dynamic RAM (DRAM) with 1 Mbit or more.

(3) Fusible link PROM with 16 Kbits or more.

(4) EEPROM/EPROM with 256 Kbits or more.

(5) Specialized memory (FIFO, dual-port, etc.) with 4 Kbits or more.

c. A monolithic linear/analog microcircuit that combines two or more functions to form a more complex function and has 24 or more active pins exclusive of power, ground, and NCs.

d. Monolithic microprocessors with 8-bits or more; multiple application, Application Specific Integrated Circuits (ASICs).

e. A monolithic mixed-signal microcircuit (analog-to-digital, digital-to-analog, or resolver/synchro-to-digital converters) capable of handling 12 or more bits on the digital side.

f. MultiChip or hybrid microcircuit that meets one or both of the following criteria:

(1) Contains at least one die meeting the monolithic microcircuit criteria defined in a, b, c, or d above.

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(2) Contains three or more internally interconnected microcircuit die of any size and has 32 or more active pins exclusive of power, ground, and NCs.

1.2 **Requests for Adding Parts to the AMPL Listing.** Recommendations for addition of a part(s) to the AMPL shall be submitted in written form to:

AMPL Task Manager
Jet Propulsion Laboratory
M/S 125-105
4800 Oak Grove Drive
Pasadena, CA 91109-8099
FAX: (818) 393-5245

Submissions should include identification of the part (part number and description), manufacturer, and specification number. Information regarding the project and application for the part may also be included.

2.0 PART SPECIFICATIONS, PROCUREMENT, AND APPLICATION

2.1 **Part Specifications.** In order to be approved and listed in this standard, a part shall have a specification that defines physical design, material, quality, controls, test requirements, as well as performance and function over maximum operating ranges. The specification may be any one of the following types:

a. A NASA Detail Specification prepared in accordance with this document.

b. A Qualified Manufacturer's List (QML) Standardized Military Drawing (SMD) prepared in accordance with MIL-I-38535 or MIL-H-38534.

c. A Source Control Drawing (SCD).

1.) An SCD is preferred that requires Wafer Lot Acceptance and at least the life test portion of lot acceptance testing. The life test portion consists of a Quality Conformance Inspection (QCI) or a Technology Conformance Inspection (TCI). Note that "B-Equivalent" devices do not require Wafer Lot Acceptance or either QCI or TCI.

2.) SCDs for the following class devices or equivalents will be reviewed and evaluated for listing in this standard:

- MIL-STD-883 Non-JAN Class B ("B-Equivalent") or JPL Non-JAN Class S ("S-Equivalent")
- MIL-H-38534 Classes H and K or "H-Equivalent" and "K-Equivalent"
- MIL-I-38535 Classes "Q-Equivalent" and "V-Equivalent"

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The SCD may be prepared by a NASA Center, a NASA contractor, a contractor for military or commercial spacecraft systems, a vendor, or parts supplier.

2.2 **Procurement.** All parts listed herein shall be procured to the applicable detail specifications and shall be marked with a part number that signifies that the part meets all specification requirements. The "Ordering Data" paragraph of the detail specifications should be consulted to assure that proper information is listed in the purchase order or contract. In the event of a conflict between the technical description of a part in this listing and the applicable detail specification, the detail specification shall govern.

2.3 **Application.** The microcircuits listed herein must be properly applied by the acquiring activity in order to obtain satisfactory and reliable performance. When an application condition varies from the detail specification test condition(s), it shall be the responsibility of the acquiring activity to establish a satisfactory correlation between the circuit requirements and the detail part specification requirements.

3.0 AMPL PARTS LISTING CRITERIA

The criteria of paragraphs 3.1, 3.2, or 3.3 as applicable shall be met before an advanced microcircuit is approved and listed in this standard.

3.1 Listing Criteria for Parts with NASA Detail Specifications

3.1.1 *Vendor Validation.* The NASA AMPL preparing activity shall conduct an on-site vendor validation survey in the areas of fabrication, assembly and test, design, and organization, to verify the vendor's conformance to paragraphs 3.1.2 through 3.1.5. When the validation survey is scheduled, NPPO and the NASA center that requested the part shall be notified and invited to participate.

3.1.1.1 **Deficiency Correction Procedures.** If, during the initial vendor validation survey, the vendor is found to be deficient in any listing requirements, the vendor shall produce a plan for correcting these deficiencies. Two copies of this plan shall be provided by the manufacturer to the qualifying activity. If all deficiencies are not corrected and duly documented within six (6) months after the survey, the vendor shall not be listed on this standard and a new on-site validation survey shall be required before considering the parts for listing.

3.1.2 **Quality Assurance Program.** The manufacturer shall have a quality assurance program plan equivalent to that in MIL-I-38535, Appendix C or MIL-H-38534, Appendix A.

3.1.2.1 **Configuration Management and Traceability.** The vendor shall have a configuration management system in place to ensure traceability of all materials, procedures, and test information through the part serial number and date code.

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3.1.2.2 **Field Failures.** The manufacturer shall have a documented procedure for logging and dispositioning of field failures returned by the customer, including the capability to perform failure analysis. Failure analysis reports shall be made available to any acquiring activity upon request.

3.1.3 **Device Maturity.** The manufacturer shall have fabricated the product on a production line using proven materials and technology. The critical design and process parameters shall be identified and controlled.

3.1.4 **Characterization Data.** The AMPL validation team shall review characterization data from the manufacturer and any characterization data provided by NASA centers or other agencies. The data shall indicate the consistency of the part parameters when operating over the full temperature, voltage, and current ranges. Operation over the full military operating range is a goal and not a requirement.

3.1.5 **Qualification.** The part shall be qualified to Method 5005 of MIL-STD-883.

3.1.5.1 **Pending Qualification.** Parts may also be listed when qualification has not been completed. In such cases, an appropriate notation shall be included in the listing, indicating either that qualification is in process or under contract, or that the manufacturer shall qualify the part on the first lot of parts procured to the specification.

3.2 Listing Criteria for Parts with QML SMDs

3.2.1 **Qualified Manufacturer's List (QML).** Advanced microcircuits, as defined in paragraph 1.1 above, listed in QML-38534 shall be considered for inclusion in this listing, unless they are listed in Part I of MIL-STD-975.

3.2.2 **Vendor Validation.** The listing of the manufacturer in QML-38534 shall be considered evidence of the adequacy of the manufacturer's quality management program plan, capability to produce parts of suitable quality and reliability, and meeting of these criteria.

3.3 Listing Criteria for Parts with Classes "B-, and "S-Equivalent" Specifications and SCDs

3.3.1 **Vendor Validation.** The NASA AMPL preparing activity will validate the vendors' documentation to determine whether the parts meet MIL-STD-883 Classes "B-, and "S-Equivalent" screening requirements. Verification of the manufacturer's facilities and technical capabilities is the responsibility of the user.

3.2.3 **Qualification.** The NASA AMPL preparing activity will validate the vendor's documentation to determine whether the parts meet the equivalent requirements of MIL-STD-883 Method 5005, Classes S and B. Verification and review of vendor qualification data are the responsibility of the user.

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4.0 LISTED PART REMOVAL CRITERIA

A part listed in this standard may be removed for any of the following reasons:

a. The part becomes obsolete.

b. There are no longer any qualified sources for the part.

c. The part is replaced with a functionally similar device having markedly improved characteristics or better reliability.

d. The part exhibits functionality or reliability problems.

e. Failure of the manufacturer to respond to a Government-Industry Data Exchange Program (GIDEP) Alert or to take corrective action.

4.1 **Problem Reporting.** The GIDEP Alert program provides a mechanism to report problems with part performance or reliability. If a user discovers a part problem that jeopardizes part quality and reliability, and notifies the AMPL Preparing Activity, the questionable part may be removed from the AMPL parts listing.

5.0 PART NUMBERING SYSTEM

The numbering system for NASA Detail Specifications follows the basic format of the SMD one part - one part number system. All parts bearing the NASA Specification part number shall be in full conformance with the applicable detail specification. The part number consists of two segments, the specification number and the part suffix. For paragraphs 5.1 through 5.2.4, NA62-WWXXXZZSYY shall be used as an example part number.

5.1 **Specification Number.** The specification number consists of the first ten symbols in the part number. The specification number would therefore be NA62-WWXXX.

5.1.1 **Stock Class Designator.** NA indicates NASA and 62 are the last two digits of the federal stock class designator (5962). NA has been substituted for 59 to avoid conflict with numbers assigned by DESC.

5.1.2 **Radiation Hardness Designator.** The dash position indicates the radiation-hardness of the part. A dash means the part is not radiation-hard. If the part is assured to be radiation-hard, the following letters would take the place of the dash in the part number:

3 krad	M	100 krad	R
5 krad	N	200 krad	S
10 krad	D	300 krad	T
20 krad	E	500 krad	U
30 krad	F	1000 krad	H
50 krad	G		

5.1.3 **Drawing Number Year.** WW are the last two digits of the calendar year in which the drawing number was assigned.

5.1.4 **Drawing Number.** XXX is a sequential drawing number within the calendar year.

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5.1.5 **Revision Letter.** Revisions to the specification are indicated by a sequential revision letter. The revision letter is not a part of the part number.

5.2 **Part Number Suffix.** The part number suffix consists of the last five symbols in the part number. The part number suffix would therefore be ZZSYY.

5.2.1 **Type Number.** ZZ is the type number within the drawing.

5.2.2 **Class Designator.** S is the class designator (since the parts are "Class S-Equivalent").

5.2.3 **Package Designator.** The first Y is the package designator (case outline letters) in accordance with MIL-STD-1835.

5.2.4 **Lead Finish Designator.** The second Y is the lead finish designator in accordance with MIL-I-38535, paragraph 3.7.2.

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ADVANCED MICROCIRCUIT PARTS LISTING

WARNING

These are nonstandard parts. For additional information refer to paragraph 1.0 of MIL-STD-975 Part II, Section 21, Advanced Microcircuit Parts Listing.

Microcircuit Information

Part Numbering System for NASA Detail Part Specifications:

Part Number							
Specification Number				Part Number Suffix			
NA62	X	XX	XXX	XX	S	X	X
Stock Class Designator NA62 is the designator for microcircuits based on the Federal Stock Class.	Total Dose Radiation Hardness Designator 3 krad M 5 krad N 10 krad D 20 krad E 30 krad F 50 krad G 100 krad R 200 krad S 300 krad T 500 krad U 1000 krad H	Drawing Number Year Last two digits of the year the drawing number was assigned.	Drawing Number Sequential drawing number within the fiscal year.	Type Number The type number within the drawing.	Class Designator Class S- Equivalent	Package Designator Package designator per MIL-M-38510.	Lead Finish Designator Lead finish per MIL-M-38510.

Package Type Abbreviations:

DIP = Dual In-line Package; FP = Flatpack Package; LCC = Leadless Chip Carrier; PGA = Pin Grid Array.

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ADVANCED MICROCIRCUIT PARTS LISTING

WARNING:

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INTERFACE HYBRID MICROCIRCUITS (46 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
MIL-STD-1553 (1553) Driver-Receiver, Single Ch.	5962-86049 DESC	ILC#	02TX	BUS-63106II	FP	24	H	NA	-15 V
1553 Driver-Receiver, Single Ch.	5962-86049 DESC	ILC#	02ZX	BUS-63105II	DIP	24	H	NA	-15 V
1553 Driver-Receiver, Single Ch.	5962-86049 DESC	ARX#	03YX	ARX-2402	DIP	24	H	NA	+/-15 V
1553 Driver-Receiver, Single Ch.	5962-86049 DESC	NHI#	06YX	NHI-1509	DIP	24	H	NA	+15 V
1553 Dual Redundant Remote Terminal Unit (RTU)	5962-87535 DESC	ILC#	01XX	BUS-65112	Hybrid	78	H	NA	+/-15 V
1553 Dual Redundant RTU	5962-87535 DESC	ILC#	01YX	BUS-65117	FP	82	H	NA	+/-15 V
1553 Driver-Receiver, Dual Ch.	5962-87579 DESC	ILC#	02XX	BUS-63125II	DIP	36	H	NA	-15 V
1553 Driver-Receiver, Dual Ch.	5962-87579 DESC	ILC#	02YX	BUS-63126II	FP	36	H	NA	-15 V
1553 Driver-Receiver, Dual Ch.	5962-87579 DESC	MRL#	08XX	MR63125MPR	DIP	36	H	NA	-15 V
12-Bit Data Acquisition System (DAS)	5962-88514 DESC	Sipex#	01XX	HS9403B-8	Quad	62	H	NA	+/-15 V
12-Bit DAS	5962-88514 DESC	Sipex#	02XX	HS9403B-16	Quad	62	H	NA	+/-15 V
1553 Bus Controller (BC), RTU, and Monitor Unit (MT) Dual Redundant	5962-88585 DESC	ILC#	01XX	BUS-65600	DIP	78	H	NA	+5 V
1553 Bus-to-Microprocessor Interface Unit	5962-88586 DESC	ILC#	01XX	BUS-66300II-883B	DIP	78	H	NA	+7 V
1553 Bus-to-Microprocessor Interface Unit	5962-88586 DESC	ILC#	01YX	BUS-66301II-883B	FP	82	H	NA	+7 V

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ADVANCED MICROCIRCUIT PARTS LISTING

WARNING:

These are nonstandard parts. For additional information refer to paragraph 1.0 of MIL-STD-975, Part II, Section 21, Advanced Microcircuit Parts Listing.

INTERFACE HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01XC	BUS-61553	DIP	78	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01XX	BUS-61553	DIP	78	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01XX	BUS-61563	DIP	78	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01YA	BUS-61563	FP	82	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01YC	BUS-61563	FP	82	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	01YX	BUS-61563	FP	82	H	NA	+5, -15 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	02XA	BUS-61554	DIP	78	H	NA	+5, -12 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	02XC	BUS-61554	DIP	78	H	NA	+5, -12 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	02XX	BUS-61554	DIP	78	H	NA	+5, -12 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	02YC	BUS-61564	FP	82	H	NA	+5, -12 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	03XC	BUS-61555	DIP	78	H	NA	+5 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	03YC	BUS-61565	FP	82	H	NA	+5 V
1553 BC/RTU/MT Multiplexed Terminal	5962-88692 DESC	ILC#	04XC	BUS-61556	DIP	78	H	NA	+5 V
1553 Driver-Receiver, Dual Ch. Receiver Idle	5962-89447 DESC	ILC#	04HXX	BUS-63135II	DIP	36	H	NA	-15 V

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ADVANCED MICROCIRCUIT PARTS LISTING

WARNING:

These are nonstandard parts. For additional information refer to paragraph 1.0 of MIL-STD-975, Part II, Section 21, Advanced Microcircuit Parts Listing.

INTERFACE HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
1553 Driver-Receiver, Dual Ch. Receiver Idle	5962-89447 DESC	ILC#	04HYX	BUS-63136II	FP	36	H	NA	-15 V
1553 Transceiver, Dual Ch.	5962-89522 DESC	ARX#	02XX	ARX-2453	DIP	36	H	NA	+5 V
Dual 8 Channel MUX w/Precision Sample	5962-89565 DESC	Sipex#	01XX	HS362SB	DIP	32	H	NA	+/-15 V
Dual Redundant RTU	5962-89798 DESC	ILC#	01XX	BUS-65142	Hybrid	78	H	NA	+5 V
Dual Redundant RTU	5962-89798 DESC	ILC#	01YX	BUS-65144	FP	82	H	NA	+5 V
Dual Redundant RTU	5962-89798 DESC	ILC#	02XX	BUS-65143	Hybrid	78	H	NA	+5 V
Dual Redundant RTU	5962-89798 DESC	ILC#	02YX	BUS-65145	FP	82	H	NA	+5 V
1553 Driver-Receiver, Dual Ch.	5962-89826 DESC	ILC#	01XX	BUS-63127II	DIP	36	H	NA	-12 V
1553 Driver-Receiver, Dual Ch.	5962-89826 DESC	ILC#	01YX	BUS-63128II	FP	36	H	NA	-12 V
1553 Data Terminal Bit Processor	5962-90636 DESC	MED#	01HYX	CT1820F	FP	60	H	NA	+5 V
1553 Data Terminal Bit Processor	5962-90636 DESC	MED#	02HYX	CT1820-2F	FP	60	H	NA	+5 V
1553 Data Terminal Bit Processor	5962-90636 DESC	ARX#	03HXX	ARX2410	Plug-In	56	H	NA	+5 V
1553 Data Terminal Bit Processor	5962-90636 DESC	ARX#	04HXX	ARX3410	Plug-In	56	H	NA	+5 V
1553 MUX Bus RT	5962-91687 DESC	NHI#	01HXX	NHI-1553RT	DIP	66	H	NA	+5 V

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INTERFACE HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
1553 MUX Bus RT	5962-91687 DESC	NHI#	01HYX	NHI-1553RTFP	FP	66	H	NA	+5 V
1553 MUX Bus RT	5962-91687 DESC	NHI#	02HXX	NHI-1554RT	DIP	66	H	NA	+5 V
1553 MUX Bus RTU	5962-91687 DESC	NHI#	02HYX	NHI-1554RTFP	FP	66	H	NA	+5 V
16 Channel MUX/DeMUX	PT40872 JPL	HAR	None	HS 1840	FP	28	S-Equi	200 Krad	+15 V

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INTERFACE MONOLITHIC MICROCIRCUITS (1 part)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
1553B BC/RT/M	NA62R91006 JPL	UNT@	01SKC	UT1553B BCRTMWSR	FP	84	S-Equi	100 Krad	+7 V

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ANALOG-TO-DIGITAL HYBRID MICROCIRCUITS (29 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
12-Bit A/D Converter (ADC)	5962-88508 DESC	Datel#	01XX	ADC-HX	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-88508 DESC	Datel#	02XX	ADC-HZ	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-88508 DESC	MN#	02XX	MNADC87H/B	DIP	32	H	NA	+/-15 V
12-Bit ADC Track and Hold	5962-88542 DESC	ILC#	01XX	ADC-00300-112	DIP	40	H	NA	+/-15 V
12-Bit ADC	5962-88658 DESC	ADI#	01XX	AD578SD	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-88658 DESC	ADI#	02XX	AD578TD	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-88658 DESC	ADI#	03XX	AD578ZSD	DIP	32	H	NA	+/-12 V
12-Bit ADC	5962-88658 DESC	ADI#	04XX	AD578ZTD	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-89569 DESC	MN#	01HXX	MN5295H/B	DIP	32	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	01YX	MN5200H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	02YX	MN5203H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	03YX	MN5201H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	04YX	MN5204H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	05YX	MN5202H/B	DIP	24	H	NA	+/-15 V

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ANALOG-TO-DIGITAL HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
12-Bit ADC	5962-89583 DESC	MN#	06YX	MN5205H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89583 DESC	MN#	07YX	MN5206H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	01YX	MN5210H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	02YX	MN5213H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	03YX	MN5211H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	04YX	MN5214H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	05YX	MN5212H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	06YX	MN5215H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89584 DESC	MN#	07YX	MN5216H/B	DIP	24	H	NA	+/-15 V
12-Bit ADC	5962-89595 DESC	MN#	01XX	MN5245H/B	DIP	40	H	NA	+/-15 V
12-Bit ADC	5962-89595 DESC	MN#	02XX	MN5245AH/B	DIP	40	H	NA	+/-15 V
12-Bit ADC	5962-89595 DESC	MN#	03XX	MN5246H/B	DIP	40	H	NA	+/-15 V
12-Bit ADC	5962-89595 DESC	MN#	04XX	MN5246AH/B	DIP	40	H	NA	+/-15 V
16-Bit High Speed ADC	5962-90795 DESC	Sipex#	01HXX	HS9576S/B	DIP	32	H	NA	+/-15 V

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ANALOG-TO-DIGITAL HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
16-Bit High Speed ADC	5962-90795 DESC	Sipex#	02HXX	HS9576T/B	DIP	32	H	NA	+/-15 V

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ANALOG-TO-DIGITAL MONOLITHIC MICROCIRCUITS (1 part)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
16-Bit ADC	S-311-P-704 GSFC	Crystal	None	CS5016	DIP	40	S-Equi	10 Krad	+/-6 V

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DIGITAL-TO-ANALOG HYBRID MICROCIRCUITS (20 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
12-Bit D-to-A Range Programmable Voltage	83002 DESC	ADI#	01JX	DAC87	DIP	24	H	NA	12
12-Bit DAC Bipolar Linear Quad	5962-88509 DESC	ADI#	01XX	AD390SD	DIP	28	H	NA	12
12-Bit DAC Bipolar Linear Quad	5962-88509 DESC	ADI#	02XX	AD390TD	DIP	28	H	NA	12
12-Bit DAC Bipolar Quad	5962-88510 DESC	ADI#	01XX	AD394SD	DIP	28	H	NA	12
12-Bit DAC Bipolar Quad	5962-88510 DESC	ADI#	02XX	AD394TD	DIP	28	H	NA	12
12-Bit DAC Bipolar Quad	5962-88510 DESC	ADI#	03XX	AD395SD	DIP	28	H	NA	12
12-Bit DAC Bipolar Quad	5962-88510 DESC	ADI#	04XX	AD395TD	DIP	28	H	NA	12
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	01XA	DAC02310-112	DIP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	01XC	DAC02310-112	DIP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	01YA	DAC02311-112	FP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	01YC	DAC02311-112	FP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	02XA	DAC02310-113	DIP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	02XC	DAC02310-113	DIP	32	H	NA	14
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	02YA	DAC02311-113	FP	32	H	NA	14

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DIGITAL-TO-ANALOG HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
14-Bit DAC De-glitched	5962-88517 DESC	ILC#	02YC	DAC02311-113	FP	32	H	NA	14
12-Bit DAC Binary Input Code	5962-89528 DESC	Datel#	01XX	DAC HKB	DIP	24	H	NA	12
12-Bit DAC 2s Complement	5962-89528 DESC	Datel#	02XX	DAC HKB-2	DIP	24	H	NA	12
16-Bit DAC	5962-89531 DESC	Datel#	01HXX	DAC HPB	DIP	24	H	NA	16
16-Bit DAC	5962-89531 DESC	Datel#	02HXX	DAC HPB-1	DIP	24	H	NA	16
16-Bit Track and Hold Amplifier	5962-90630 DESC	Sipex#	01HXX	SP9760B	DIP	24	H	NA	16

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DIGITAL-TO-SYNCHRO HYBRID MICROCIRCUITS (4 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
16-Bit Digital-to-Synchro and Digital-to-Resolver Converter	5962-89986 DESC	ILC#	01HXX	DSC-11520-112	DIP	36	H	NA	16
16-Bit Digital-to-Synchro and Digital-to-Resolver Converter	5962-89986 DESC	ILC#	02HXX	DSC-11520-113	DIP	36	H	NA	16
16-Bit Digital-to-Synchro and Digital-to-Resolver Converter	5962-89986 DESC	ILC#	03HXX	DSC-11520-114	DIP	36	H	NA	16
16-Bit Digital-to-Synchro and Digital-to-Resolver Converter	5962-89986 DESC	ILC#	04HXX	DSC-11520-115	DIP	36	H	NA	16

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PROCESSORS/CONTROLLERS and PERIPHERALS MONOLITHIC MICROCIRCUITS (29 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
16-Bit Parallel EDAC	54HSC/T630 MED	MED#	None	54HSC/T630	DIP	28	S-Equi	1 Mrad	16
16-Bit Parallel EDAC	54HSC/T630 MED	MED#	None	54HSC/T630	FP	28	S-Equi	1 Mrad	16
16-Bit Parallel EDAC	ACS630MS HAR	HAR	None	ACS630MS	DIP	28	S-Equi	1 Mrad	16
16-Bit Parallel EDAC	ACS630MS HAR	HAR	None	ACS630MS	FP	28	S-Equi	1 Mrad	16
16-Bit Parallel EDAC	ACTS630MS HAR	HAR	None	ACTS630MS	DIP	28	S-Equi	1 Mrad	16
16-Bit Parallel EDAC	ACTS630MS HAR	HAR	None	ACTS630MS	FP	28	S-Equi	1 Mrad	16
8-Bit Microprocessor	CS515800 JPL	HAR	1	80C85	FP	42	S-Equi	100 Krad	8
Peripheral to 80C85 (2K-Bit SRAM with I/O and Timer)	CS515801 JPL	HAR	1	81C55	FP	42	S-Equi	100 Krad	2K
Programmable DMA Controller	HS-82C37ARH HAR	HAR	None	HS-82C37ARHR	FP	42	S-Equi	100 Krad	16
5 MHz Priority Interrupt Controller	NA62-91003 JPL	HAR	01S3A	MR82C59A	LCC	28	S-Equi	NA	24
5 MHz Priority Interrupt Controller	NA62-91003 JPL	HAR	01SJC	MD82C59A	DIP	28	S-Equi	NA	24
16-Bit Microprocessor	NA62R91001 JPL	HAR	01SQC	HS1-80C86RH	DIP	40	S-Equi	100 Krad	16
16-Bit Microprocessor	NA62R91001 JPL	HAR	01SXC	HS9-80C86RH	FP	42	S-Equi	100 Krad	16
5 MHz Programmable Interval Timer	NA62R91002 JPL	HAR	01SJC	HS1-82C54RH	DIP	24	S-Equi	100 Krad	16

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PROCESSORS/CONTROLLERS and PERIPHERALS MONOLITHIC MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
5 MHz Programmable Interval Timer	NA62R91002 JPL	HAR	01SKC	HS9-82C54RH	FP	24	S-Equi	100 Krad	16
5 MHz Static Clock Controller/Generator	NA62R91004 JPL	HAR	01SJC	HS1-82C85RH	DIP	24	S-Equi	100 Krad	24
5 MHz Static Clock Controller/Generator	NA62R91004 JPL	HAR	01SKC	HS9-82C85RH	FP	24	S-Equi	100 Krad	24
Priority Interrupt Controller	S-311-P-708 GSFC	HAR	1	82C59A-1	FP (shielded)	28	S-Equi	100 Krad	24
16-Bit 8 MHz Microcontroller	S-311-P-721 GSFC	HAR	001	RTX2010RH-Q	FP	84	S-Equi	1 Mrad	16
16-Bit 8 MHz Microcontroller	S-311-P-721 GSFC	HAR	002	RTX2010RH-Q	PGA	84	S-Equi	1 Mrad	16
16-Bit Microprocessor	SSQ22662 SSF	HAR	01SQX	HS-80C86RH	DIP	40	S-Equi	100 Krad	16
Programmable Interval Timer	SSQ22663 SSF	HAR	01SJX	HS-82C54RH	DIP	24	S-Equi	100 Krad	16
5 MHz Programmable Interrupt Controller	SSQ22665 SSF	HAR	01SYX	MD82C59A-5/B	DIP	28	S-Equi	NA	24
16-Bit Microprocessor	SSQ22667 SSF	INT**	001	SQ80C186-12	Quad FP	68	S-Equi	NA	16
32-Bit Microprocessor	SSQ22668 SSF	INT**	001	SQ80386-25	Quad FP	164	S-Equi	2.5 Krad	32
80-Bit Numeric Processor	SSQ22669 SSF	INT**	001	SQ80387-25	FP	68	S-Equi	NA	80
Multi-Bus II Interface Controller	SSQ22670 SSF	INT**	001	SQ82389	Quad FP	164	S-Equi	NA	32
1553 Bus Controller, Remote Terminal	SSQ22673-001 SSF	UNT@	001	UT1553BBCRT WS	FP	84	S-Equi	NA	16

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PROCESSORS/CONTROLLERS and PERIPHERALS MONOLITHIC MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Bits
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
32-Bit DMAC	SSQ22692 SSF	INT**	001	82380-25	LCC	164	S-Equi	NA	32

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RESOLVER/SYNCHRO-TO-DIGITAL CONVERTERS HYBRID MICROCIRCUITS (20 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Accuracy (Arc Min)
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
14-Bit 11.8 V Resolver or Synchro-to-Digital Converter	5962-87687 DESC	ILC#	01XX	HSDC-8920A	DIP	36	H	NA	+/-2.6
14-Bit 11.8 V Resolver or Synchro-to-Digital Converter	5962-87687 DESC	ILC#	02XX	HSDC-8920	DIP	36	H	NA	+/-4.0
90.0 V Synchro-to-Digital Converter	5962-89498 DESC	ILC#	01XX	SDC14561-114	DIP	36	H	NA	+/-2.0
90.0 V Synchro-to-Digital Converter	5962-89498 DESC	ILC#	02XX	SDC14561-115	DIP	36	H	NA	+/-1.0
16-Bit 11.8 V Synchro-to-Digital Converter	5962-89499 DESC	ILC#	03XX	SDC14560-605	DIP	36	H	NA	+/-2.0
16-Bit 11.8 V Synchro-to-Digital Converter	5962-89908 DESC	ILC#	03XX	SDC14565-616	DIP	36	H	NA	+/-2.0
16-Bit 1.0 V Direct Resolver-to-Digital	5962-90551 DESC	ILC#	01XX	SDC14567-111	DIP	36	H	NA	+/-6.0
16-Bit 1.0 V Direct Resolver-to-Digital	5962-90551 DESC	ILC#	02XX	SDC14567-112	DIP	36	H	NA	+/-4.0
16-Bit 1.0 V Direct Resolver-to-Digital	5962-90551 DESC	ILC#	03XX	SDC14567-114	DIP	36	H	NA	+/-2.0
16-Bit 1.0 V Direct Resolver-to-Digital	5962-90551 DESC	ILC#	04XX	SDC14567-115	DIP	36	H	NA	+/-1.0
1.0 V Direct Resolver-to-Digital Converter	5962-90551 DESC	ILC#	05XX	SDC14569-111	DIP	36	H	NA	+/-6.0
1.0 V Direct Resolver-to-Digital Converter	5962-90551 DESC	ILC#	06XX	SDC14569-112	DIP	36	H	NA	+/-4.0
1.0 V Direct Resolver-to-Digital Converter	5962-90551 DESC	ILC#	07XX	SDC14569-114	DIP	36	H	NA	+/-2.0
1.0 V Direct Resolver-to-Digital Converter	5962-90551 DESC	ILC#	08XX	SDC14569-115	DIP	36	H	NA	+/-1.0

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RESOLVER/SYNCHRO-TO-DIGITAL CONVERTERS HYBRID MICROCIRCUITS (contd)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Accuracy (Arc Min)
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
14-Bit Resolver or Synchro-to-Digital	5962-90554 DESC	ILC#	01XX	HSDC-8915A	DIP	36	H	NA	+/-2.6
14-Bit Resolver or Synchro-to-Digital	5962-90554 DESC	ILC#	02XX	HSDC-8915	DIP	36	H	NA	+/-4.0
14-Bit 11.8 V Synchro-to-Digital Converter	5962-90707 DESC	ILC#	01HXX	SDC14500-635	DIP	36	H	NA	+/-2.6
14-Bit 11.8 V Synchro-to-Digital Converter	5962-90707 DESC	ILC#	02HXX	SDC14500-636	DIP	36	H	NA	+/-4.0
14-Bit 90.0 V Synchro-to-Digital Converter	5962-90707 DESC	ILC#	03HXX	SDC14502-605	DIP	36	H	NA	+/-2.6
14-Bit 90.0 V Synchro-to-Digital Converter	5962-90707 DESC	ILC#	04HXX	SDC14502-606	DIP	36	H	NA	+/-4.0

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MEMORIES MONOLITHIC MICROCIRCUITS (10 parts)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Access Time
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
64Kx1 SRAM	HS-65643RHR HAR	HAR	None	HS-65643RHR	FP	28	S-Equi	300 Krad	35 ns
8Kx8 SRAM	HS-65647RH-Q HAR	HAR	None	HS-65647RH-Q	DIP	28	S-Equi	300 Krad	50 ns
8Kx8 SRAM	HS-65647RH-Q HAR	HAR	None	HS-65647RH-Q	FP	28	S-Equi	300 Krad	35 ns
32Kx8 SRAM	HS-65758RH-Q HAR	HAR	None	HS-65758RH-Q	DIP	28	S-Equi	100 Krad	35 ns
32Kx8 SRAM	HS-65758RH-Q HAR	HAR	None	HS-65758RH-Q	FP	28	S-Equi	100 Krad	35 ns
32Kx8 SRAM	HS-65759RH-Q HAR	HAR	None	HS-65759RH-Q	FP	36	S-Equi	100 Krad	35 ns
2Kx8 PROM	NA62R91005 JPL	HAR	01SJC	6617RH	DIP	24	S-Equi	100 Krad	50 ns
2Kx8 PROM	NA62R91005 JPL	HAR	01SKC	6617RH	FP	24	S-Equi	100 Krad	50 ns
512x9 FIFO	S-311-P-705 GSFC	MED#	1	7001RH	DIP	28	S-Equi	100 Krad	90 ns
512x9 FIFO	S-311-P-705 GSFC	MED#	2	7001RH	FP	28	S-Equi	100 Krad	90 ns

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ASIC MONOLITHIC MICROCIRCUITS (1 part)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
ASIC, Gate Array Input Output Unit (IOU)	ST12186 JPL	UNT@	UTD160R	12186-E0UTD160FR	FP	84	S-Equi	100 Krad	+7 V

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ADVANCED MICROCIRCUIT PARTS LISTING

WARNING:

These are nonstandard parts. For additional information refer to paragraph 1.0 of MIL-STD-975, Part II, Section 21, Advanced Microcircuit Parts Listing.

PALS MONOLITHIC MICROCIRCUITS (1 part)

SPECIFICATION		PART					Quality Level	Radiation (TID)	Supply Voltage
Title	No./Source	Vendor	Type Number	Generic Type	Package	Leads			
Programmable Array Logic	95916 LML	TIX#	001	PAL22VP1025MJT	DIP	24	S-Equi	15 Krad	+5 V

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ADVANCED MICROCIRCUIT PARTS LISTING

IDENTIFICATION CODE LIST*

CODE	NAME
ADI#	Analog Devices, Inc.
ARX#	Aeroflex Laboratories, Inc.
AT&T**	American Telephone & Telegraph
Crystal	Crystal Semiconductor
Datel#	Datel, Inc.
DESC	Defense Electronics Supply Center
GSFC	Goddard Space Flight Center
HAR	Harris Semiconductor
HON**	Honeywell, Inc.
IBM**	International Business Machines
ILC#	ILC Data Device Corporation
INT**	Intel Corporation
JPL	Jet Propulsion Laboratory
LML	Lockheed Monitored Line
MED#	Marconi Circuit Technology (GEC Plessey)
MN#	MicroNetworks Company
MRL#	Micro-Rel Div. of Medtronic Incorporated
NHI#	National Hybrid, Inc.
Sipex#	Sipex Corporation
SSF	Space Station Freedom
STEL	Stanford Telecom
TIX#	Texas Instruments, Inc.
UNT@	United Technologies Microelectronics Center, Inc.

* These codes appear in the Advanced Microcircuit Parts Listing table under the column headers "No./Source." and "Vendor."
** These manufacturers are QML Certified and Qualified for QML-38535.
# These manufacturers are QML Certified and Qualified for QML-38534.
@ This manufacturer is transitionally QML Certified for QML-38535.

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SECTION 22: HIGH NASA USAGE

The following parts are in common use by various NASA space centers, contractors and subcontractors. They may be procured to the listed specifications, but are considered nonstandard. Nonstandard Parts Approval Requests (NSPARs) must be submitted (in accordance with the individual program requirements) in order to use these parts since they do not meet the requirements necessary for listing in Part I of this military standard (see paragraph 4.0 of Part I).

Generic Number	Specification Number	Description of Part Type
REF-01	5962-8958102	Microcircuit, Voltage Reference, Adjustable, +10V
AMP-01A	5962-8863001	Microcircuit, Instrumentation Amp, Low Noise
LM104	5962-8760501	Microcircuit, Voltage Regulator, Adjustable, Neg.
LM105	5962-8958801	Microcircuit, Voltage Regulator, Adjustable, Pos.
LM110	5962-8760601	Microcircuit, Voltage Follower, High Speed
LM136A	8418001	Microcircuit, Voltage Reference, Precision, 2.5V
LM158A	5962-8771002	Microcircuit, OP Amp, Dual, Low Power
26LS31	7802301	Microcircuit, Differential Line Driver, Quad
26LS32	7802001	Microcircuit, Differential Line Receiver, Quad

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APPENDIX A

STANDARD PARTS DERATING

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APPENDIX A
STANDARD PARTS DERATING

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STANDARD PARTS DERATING

1.0 SCOPE. Inclusion of parts in this standard is based on the premise that certain characteristics of the parts are derated for reliable operation.

2.0 INTRODUCTION. Derating is the reduction of electrical, thermal, and mechanical stresses applied to a part in order to decrease the degradation rate and prolong the expected life of the part. Derating increases the margin of safety between the operating stress level and the actual failure level for the part, providing added protection from system anomalies unforeseen by the designer. The following guidelines give basic information for the derating of component parts. The specified derating percentages and notes will assist the designer in obtaining reliable operation of parts used in space equipment. It must be emphasized that the user should evaluate all parts to the project requirements and assure that adequate deratings are accomplished. These recommended derating factors are based on the best information currently available.

3.0 DERATING CRITERIA. The derating criteria contained herein indicate the maximum recommended stress values and do not preclude further derating. When derating, the designer must first take into account the specified environmental and operating condition rating factors, consider the actual environmental and operating conditions of the application, and then apply the recommended derating criteria contained herein. Parts not appearing in these guidelines are lacking in empirical data and failure history. The derating instructions are listed for each commodity in the following paragraphs.

NOTE 1: To assure that these derating criteria are observed, an EEE parts list (item by item) shall be generated for each hardware assembly. This list shall, as a minimum, contain the maximum rated capability (such as voltage, current, power, temperature, etc.) of the part in comparison with the design requirements of the application, indicating conformance to the derating criteria specified herein.

NOTE 2: In the following derating sections, the term "ambient temperature" as applied to low pressure or space vacuum operation, is defined as follows:

For operation under conditions of very low atmospheric pressure or space vacuum, heat loss by convection is essentially zero, so ambient temperature is the maximum temperature of the heat sink or other mounting surface in contact with the part, or the temperature of the surface of the part itself (case temperature).

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3.1 CAPACITOR DERATING CRITERIA

Capacitors

Voltage derating is accomplished by multiplying the maximum operating voltage by the appropriate derating factor appearing in the chart below.

Type	Military Style	Voltage Derating Factor (2)	Specification	Maximum Ambient Temperature
Ceramic	CCR (3)	0.60	MIL-C-20	110°C
	CKS	0.60	MIL-C-123	110°C
	CKR (3)	0.60	MIL-C-39014	110°C
	CDR (3)	0.60	MIL-C-55681	110°C
Glass	CYR	0.50	MIL-C-23269	110°C
Plastic film	CRH	0.60	MIL-C-83421	85°C
	CHS	0.60	MIL-C-87217	85°C
Tantalum, foil	CLR25	0.50	MIL-C-39006/1	70°C
	CLR27	0.50	MIL-C-39006/2	70°C
	CLR35	0.50	MIL-C-39006/3	70°C
	CLR37	0.50	MIL-C-39006/4	70°C
Tantalum, wet slug	CLR79	0.60 0.40	MIL-C-39006/22	70°C 110°C
	CLR81	0.60 0.40	MIL-C-39006/25	70°C 110°C
Tantalum, solid	CSR (1)	0.50 0.30	MIL-C-39003/1,2	70°C 110°C
	CSS (1)	0.50 0.30	MIL-C-39003/10	70°C 110°C
	CWR (1)	0.50 0.30	MIL-C-55365	70°C 110°C

(1) For applications where the effective circuit resistance is less than 1 ohm per volt, contact parts specialist.
(2) Applies to the sum of peak AC ripple and DC polarizing voltages.
(3) For low-voltage applications (< 10 Vdc), rated voltage shall be at least 100 Vdc.

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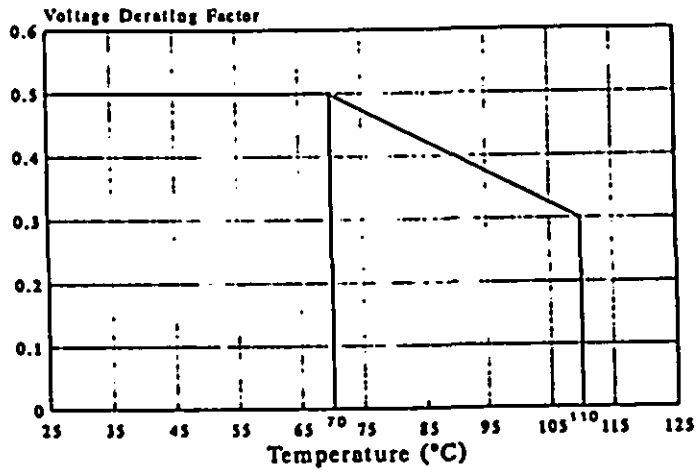
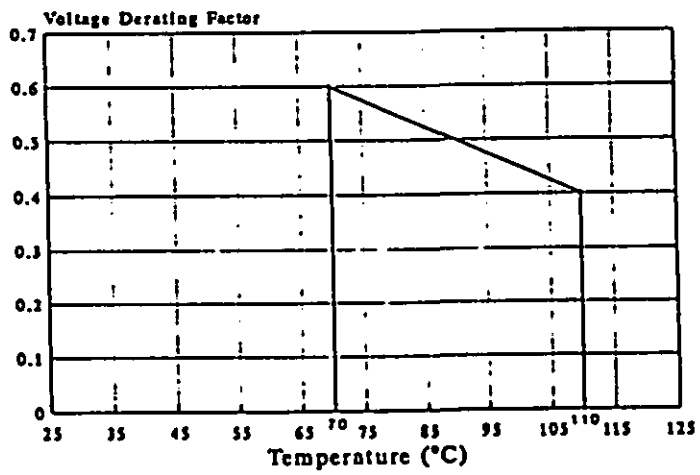
3.1.1 CAPACITOR DERATING CHARTS

Capacitors

Tantalum, Solid (CSR/CSS/CWR)



Tantalum, Wet Slug (CLR79 and CLR81)



3.1.2 CAPACITOR DERATING EXAMPLE

The principal stress parameters for capacitors are temperature and DC and/or AC voltage.

Example: A CYR style glass capacitor rated at 10 pF, 100 VDC is operated at a maximum of 70° C ambient temperature.

Applying the 0.50 derating factor, (0.5 x 100 VDC) gives a derated maximum voltage of 50 VDC.

The 70° C ambient temperature is within the maximum allowed.

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3.2 CONNECTOR DERATING CRITERIA

Connectors

Connectors are derated by limiting the temperature seen by the dielectric insert due to ambient temperature and the effects of resistive heating. See 3.16 for current derating of wire and cable.

Operating voltage derating: 25% of the rated Dielectric Withstanding Voltage at Sea Level.

Temperature rating of the dielectric insert:

$$T_{(ambient)} + T_{(ohmic\ heating)} + 50°C$$

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3.2.1 CONNECTOR DERATING EXAMPLE

Connectors

Temperature Derating

To choose an appropriate connector temperature rating for a 100°C operating temperature (ambient + ohmic heating temperatures):

$$\begin{aligned} T_{(rating)} &= \text{connector temperature} + 50°C \\ &= 100°C + 50°C \\ &= 150°C \end{aligned}$$

Choose a connector that has an operating temperature rating of greater than 150°C.

Voltage Derating

To choose an appropriate connector voltage rating for a 100 Vdc maximum application voltage:

$$\begin{aligned} V_{(rating)} &= V(\text{max operating})/0.25 \\ &= 100\ \text{Vdc}/0.25 \\ &= 400\ \text{Vdc} \end{aligned}$$

Choose a connector that has a Dielectric Withstanding Voltage (at Sea Level) rating greater than 400 Vdc.

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3.3 CRYSTAL AND CRYSTAL OSCILLATOR DERATING CRITERIA

Crystals

Presently there are no approved crystals in MIL-STD-975M.

Crystal oscillators shall be derated to the individual component level. Crystal current shall be limited to 50% of the rated value. In cases where start up time is critical, 75% of the rated value can be used.

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3.3.1 CRYSTAL AND CRYSTAL OSCILLATOR DERATING EXAMPLE

Crystals

Presently there are no approved crystals in MIL-STD-975M.

This page is intended for future use.

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3.4 DIODE DERATING CRITERIA

Diodes

Derating is accomplished by multiplying the critical stress parameter by the appropriate derating factor appearing in the chart below.

Diode Type	Critical Stress Parameter	Derating	Maximum Junction Temperature
General purpose, Rectifier, Switching, Pin/Schottky, and Thyristors	PIV	0.70	125°C (all types)
	Surge current	0.50	
	Forward current	0.50	
Varactor	Power	0.50	125°C
	Reverse voltage	0.75	
	Forward current	0.75	
Voltage Regulator	Power	0.50	125°C
	Zener current	$0.5(I_z max + I_z nom)$	
Voltage reference	Zener current	N/A (1)	125°C
Zener Voltage Suppressor	Power dissipation	0.50	125°C
Bidirectional Voltage Suppressor	Power dissipation	0.50	125°C
FET Current Regulator	Peak operating voltage	0.80	125°C

(1) Operate at the manufacturer's specified zener current (I_{ZT}) to optimize temperature compensation.

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3.4.1 DIODE DERATING EXAMPLE

Diodes

For silicon-switching and small-signal diodes, temperature, voltage, and current are the principal stress parameters. High junction temperature is the most destructive stress for diodes. Junction temperature must also be calculated and maintained below the limits allowed.

Example: A general purpose diode rated at 1 A, 200 VDC, with a thermal resistance (junction to air) θ_{JA} of 0.3°C/mW, is operating in an ambient temperature of 30°C (T_A).

Applying the derating criteria we have;

Current; 0.5 A max. (.5 x 1.0 A) = 0.5 A
PIV; 140 VDC max. (.7 x 200 VDC)= 140 VDC

Note that the maximum forward voltage (typically 0.7 V) and derated forward current (0.5 A) will give an expended power of 350 mW.

Calculating the junction temperature;

$$T_J = T_A + \theta_{JA}*W$$
$$T_J = 30°C + (350\ mW)(0.3°C/mW)$$
$$T_J = 30°C + 105°C$$
$$T_J = 135°C$$

This is greater than the allowable junction temperature of 125°C, so we must reduce the junction temperature by 10°C by reducing the forward current to 0.45 A.

Decreasing the current and recalculating T_J we have;

$$T_J = T_A + \theta_{JA}*W$$
$$T_J = 30°C + (315\ mW)(0.3°C/mW) \qquad (0.45\ A*0.7\ V) = 315\ mW$$
$$T_J = 30°C + 94.5°C$$
$$T_J = 124.5°C$$

This is less than the maximum allowable junction temperature of 125°C.

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3.5 FILTER DERATING CRITERIA

Filters

Derating is accomplished by multiplying the current and voltage by the appropriate derating factor appearing in the chart below.

Class	Derating Factor (1)	Maximum Ambient Temperature
All	0.50 of rated current 0.50 of rated voltage	+ 85°C

(1) Rated operating current or voltage, not absolute maximum.

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3.5.1 FILTER DERATING EXAMPLE

Filters

The critical parameters are dielectric voltage, current, and temperature.

Example: An EMI filter rated at 10 A, 220 VDC, and 105°C shall be derated 50% and used at no more than 5 A and 110 VDC. The ambient temperature shall be limited to 85°C maximum.

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3.6 INDUCTOR DERATING CRITERIA

Inductors

Insulation Class		Maximum Operating Parameters		
MIL-C-39010	MIL-C-15305	Rated Operating Temperature	Derated Operating Temperature	Operating Voltage
-	O	+85°C	+65°C	Derate to 50% of the rated Dielectric Withstanding Voltage
A	A	+105°C	+85°C	
B	B	+125°C	+105°C	
F	-	+150°C	+130°C	

"Inductors are derated by reducing the maximum operating temperature based on the insulation class used and reducing the operating voltage. See notes below."

a) Maximum operating temperature equals ambient temperature plus temperature rise, plus 10°C (allowance for hot spot). Compute temperature rise as follows:

Temperature Rise Test (per MIL-T-27, para. 4.8.12)

$$\text{Temperature rise (°C)} = \frac{(R - r)}{r}(t + 234.5°C) - (T - t)$$

Where R = winding resistance at elevated temperature
r = winding resistance at ambient temperature t
t = specified initial ambient temperature (°C)
T = maximum ambient temperature (°C) at time of power shutoff.
T shall not differ from t by more than 5°C

b) The insulation classes of MIL-style inductive parts generally have maximum operating temperature ratings based on a life expectancy of 10,000 hours. The maximum operating temperatures in this table are selected to extend the life expectancy to 50,000 hours.

c) Custom-made inductive devices shall be evaluated on a materials basis and stressed at levels below the maximum rated operating temperature for the materials used. Devices having a maximum rated operating temperature in the range from +85° to +130°C shall be derated as follows: maximum operating temperature (°C) equals 0.75 times maximum rated operating temperature (°C). For devices with maximum rated temperatures outside this temperature range, consult the project parts engineer for temperature derating recommendations.

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3.6.1 INDUCTOR DERATING EXAMPLE

Inductors

The parameters to be derated are dielectric stress (voltage), maximum current, and temperature.

Example: A coil rated at 1 A, 100 volts, and 105°C shall be used at no more than 1.0 A and 50 volts (50% of 100 V). The temperature rise and maximum operating temperature are calculated as follows, using the temperature rise test described in paragraph 4.8.12 of MIL-T-27. The following is a typical example.

If R=17 ohms winding resistance at the elevated temperature of 25°C, and r=15 ohms winding resistance at 21°C, then:

$$T_{RISE} = \frac{(R - r)}{r}(t + 234.5°C) - (T - t)$$

$$= \frac{(17 - 15)}{15}(21°C + 234.5°C) - (25°C - 21°C)$$

$$= 0.1333(255.5°C) - 4°C$$

$$= 34.058°C - 4°C$$

$$T_{RISE} = 30.058°C$$

Max. operating temperature $= T_A + T_{RISE} + 10°C$
$= 21°C + 30.06°C + 10°C$
$= 61.06°C$

The coil is wound with 105°C (class B) insulation, which can handle well over the calculated maximum operating temperature of 61.06°C. In fact, class O (65°C) insulation would be sufficient here.

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3.7 LINEAR MICROCIRCUIT DERATING CRITERIA

Microcircuits
Linear

Derating of microcircuits is accomplished by multiplying the appropriate parameter by the derating factor listed below. Junction temperature must be calculated and maintained below the limit of 100°C.

Parameters	Operational or Differential Amplifiers	Comparators	Sense Amplifiers	Current Amplifiers	Voltage Regulators	Analog Switches
Absolute maximum supply voltage	0.80	0.90	0.80	0.80	N/A (2)	0.90
Power dissipation (percent of rated power at maximum operating temperature)	0.75	0.75	0.75	0.75	0.80	0.80
AC input voltage (1)	1.00	1.00	1.00	1.00	N/A	N/A
Output voltage	1.00	N/A	N/A	1.00	N/A	N/A
Open collector (or drain) DC output voltage	N/A	0.90	0.90	N/A	N/A	N/A
Operating AC or DC output current	0.80	0.80	0.80	0.80	0.80	0.80
Maximum short-circuit output current	0.90	0.90	0.90	0.90	0.90	N/A
Maximum junction temp.	100°C	100°C	100°C	100°C	100°C	100°C

(1) Under no circumstances shall the input voltage be allowed to exceed the supply voltage.

(2) V_{IN} - V_{OUT} should be derated 0.80.

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3.7.1 LINEAR MICROCIRCUIT DERATING EXAMPLE

Microcircuits Linear

The principal stress parameters for linear microcircuits are the supply voltage, input voltage, output current, total device power, and junction temperature.
Note that package thermal rating will affect the junction temperature and limit the output current and power allowed.

Example: A μA741 op amp is rated at:

V^+	=	+22 VDC supply voltage, (max)
V^-	=	-22 VDC supply voltage, (max)
V_{ID}	=	±30 VDC input differential voltage (max)
I_{OS}	=	20 mA output short-circuit current (max)
V_O	=	±14 VDC output voltage swing (typical)
T_J	=	175°C metal package (TO-5)
W	=	500 mW
θ_{JC}	=	70°C/W thermal resistance (case junction) above 70°C; derate at -14.3 mW/°C

Applying the derating criteria,listed in the op amp column on the previous page, we have:

V_{CC}	=	+17.6 VDC (maximum)	(0.8 x 22 VDC)
V_{EE}	=	-17.6 VDC (maximum)	(0.8 x 22 VDC)
I_{OS}	=	18 mA	(0.9 x 20 mA)
V_O	=	±14 VDC	(1.0 x 14 VDC)
T_J	=	100°C	100°C is max
W	=	375 mW @100°C	(0.75 x 500 mW)

Operating the junction at 100°C with a case temperature of 80°C, our maximum allowable device wattage is;

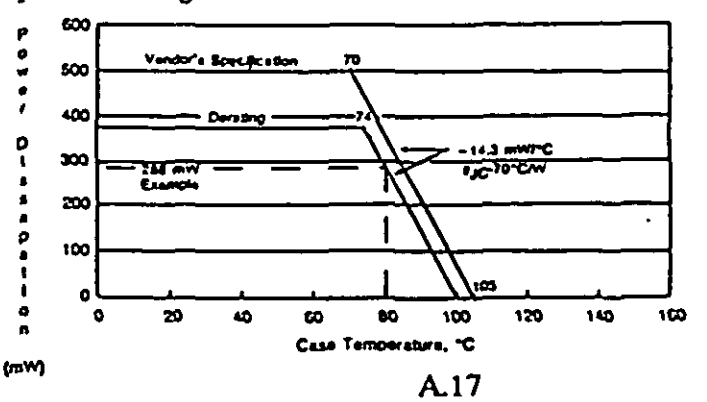
$$T_J = T_C + W \cdot \theta_{JC} \quad \text{(vacuum, no ambient air)}$$

$$\text{or } W = \frac{T_J - T_C}{\theta_{JC}}$$

$$W = \frac{100°C - 80°C}{70°C/W}$$

$$W = 0.2857 \text{ W} = 285.7 \text{ mW}$$

285.7 mW is the maximum allowable wattage at a case temperature of 80°C. Considering temperature and power, the μA741 op amp must be operated within the derating curve shown below.



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3.8 DIGITAL MICROCIRCUIT DERATING CRITERIA

Microcircuits Digital

Derating of microcircuits is accomplished by multiplying the appropriate parameter by its derating factor listed below. Junction temperature must also be calculated and maintained below the maximum limit.

Parameters (1) (2)	Bipolar	MOS	CMOS 4000 A&B (3)	CMOS HC & HCT (4)	CMOS AC & ACT (5)	Line Drivers and Receivers	Gate Arrays Bipolar MOS
Maximum junction temperature	100°C	100°C	100°C	100°C	100°C	100°C	100°C
Open collector (or drain) DC output voltage	0.80 (6)	N/A	N/A	N/A	N/A	0.75	0.80
Operating AC or DC output current or fanout	0.80 (7)	0.80 (7)	0.80 (7)	0.80 (7)	0.80 (7)	0.80	0.80
Maximum clock frequency	N/A	0.85	0.85	0.85	0.85	0.80	0.80

(1) Under no circumstances shall the input voltage be allowed to exceed the supply voltage.

(2) For those technologies where no supply voltage derating is given, in no case shall the device be operated at the absolute maximum supply voltage.

(3) The operating supply voltage shall not exceed 70% of the absolute maximum voltage.

(4) The operating supply voltage shall not exceed 79% of the absolute maximum voltage.

(5) The operating supply voltage shall not exceed 92% of the absolute maximum voltage.

(6) The derating factor for TTL open collector devices shall be 0.75.

(7) Further derating may be required for radiation environments (i.e., minimum Vcc to insure minimum DC reference for transients).

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3.8.1 DIGITAL MICROCIRCUIT DERATING EXAMPLE

Microcircuits Digital

The principal stress parameters for digital microcircuits are the output current (fanout), total device power, and junction temperature. Note that package thermal rating will affect the junction temperature and limit the output current and power allowed.

Example: A TTL 5402 quad two-input NOR gate is rated at:

V_{CC} = 5.0 ± 5% VDC supply voltage
I_{CC} = 27 mA supply current
V_{IH} = 2.0 VDC (min) input high
V_{IL} = 0.8 VDC (max) input low
V_{OH} = 2.4 VDC (min) output high
V_{OL} = 0.4 VDC (max) output low
I_{OL} = 1.6 mA each output
Fanout = 20 TTL Loads
T_j = 175°C maximum.
θ_{JC} = 28°C/W (14 pin CER-DIP)

Applying the derating criteria, we have:
Fanout = 16 (0.8 x 20)
T_j = 100°C (maximum)

For worst-case package power:
V_{CC} = 5.0 V }
I_{CC} = 27 mA } (5.0 V*27 mA) = 135 mW

Fanout = 16 }
V_{OL} = 0.4 V } 16(0.4 V*1.6 mA) = 10.24 mW
I_{OL} = 1.6 mA }

Maximum dissipated power = 145.24 mW. (1)

Operating the junction at 100°C, and assuming there is no contribution from ambient air (no convection) in space;

$$T_j = T_C + W \cdot \theta_{JC}.$$

Note that $W \cdot \theta_{JC}$ = 0.145 W (28°C/W) = 4.06°C rise. T_j = 100°C and 100°C - 4.06°C = 95.94°C T_C, which is the maximum allowable case temperature we may operate with.

Also note that the device wattage (output current) must be decreased as case temperature increases to maintain the junction temperature, T_j, below 100°C.

(1) For MOS operation also calculate and add the AC wattage contribution.

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3.9 PROTECTIVE DEVICE DERATING CRITERIA

Protective Devices

A. Fuses

Fuses are derated by multiplying the rated amperes by the appropriate Derating Factor listed below.

Fuse Current Rating (amperes)	Derating Factor (1) (2)	Remarks
2 - 15	0.50	Rating at 25°C ambient. Derating of fuses allows for loss of pressure, which lowers the blow current rating and allows for a decrease of current capability with time. (1) (3)
1 & 1.5	0.45	
0.5 & 0.75	0.40	
0.375	0.35	
0.25	0.30	
0.125	0.25	

(1) If calculations result in fractional values, use the next highest standard fuse rating.

(2) Derating factors are based on data from fuses mounted on printed circuit boards and conformally coated. For other types of mounting, consult the project parts engineer for recommendations.

(3) There is an additional derating of 0.5 percent/°C for an increase in the ambient temperature above 25°C.

B. Circuit Breakers

Circuit breaker contacts are derated by multiplying the maximum rated contact current (resistive) by the appropriate contact derating factor listed below.

Contact Application	Contact Derating Factor	Maximum Ambient Temperature
Resistive	0.75	20°C below the maximum specified
Capacitive	0.75 (4)	
Inductive	0.40	
Motor	0.20	
Filament	0.10	

(4) Series resistance shall be used to assure that circuits do not exceed the derated level.

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3.9.1 PROTECTIVE DEVICE DERATING EXAMPLE

Protective Devices

A. Fuses

The principal stress parameter is current.

Example: A board expected to be operating at 80°C ambient has a calculated maximum current of 0.9 A. The additional derating required due to temperature is calculated as shown.

$$0.5\% /°C \times (80°C - 25°C) = 27.5\%$$

The total derating factor is calculated as follows;

$$50\% - 27.5\% = 22.5\%$$

and the fuse rating is calculated as shown;

$$0.9/0.225 = 4 \text{ A}$$

A fuse with rating equal to or greater than 4 A must be used in this circuit.

B. Circuit Breakers

Contact current is the principal stress parameter. Derating level is predicated on application load. Maximum ambient temperature allowed is reduced 20°C from the specification limit.

Example: A circuit breaker is to be selected to control an electrical motor rated at 17 A, full load, 24 Vdc. The circuit breaker is to be installed in an environment with an ambient temperature ranging from 10°C to 30°C.

The temperature derating is;

$$30°C + 20°C = 50°C$$

The contact current derating is;

$$17 \text{ A}/0.20 = 85 \text{ A}$$

A circuit breaker with maximum ratings equal to or greater than 50°C and 85 A must be used for this application.

Vendor information must be consulted to determine the proper trip current/time curve of the selected circuit breaker. Thermal circuit breakers may have an additional derating or trip time due to ambient temperature effects.

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3.10 RELAY DERATING CRITERIA

Relays

The derated contact current (I_{DR}) is found by multiplying the contact rating (I) and the product of T, R, and L from the following tables.

- Table T, Ambient Operating Temperature
- Table R, Cycle Rate
- Table L, Load Application

$$I_{DR} = I \times T \times R \times L$$

TABLE T (Temperature)

Temp Range	-65°C to -21°C	-20°C to +39°C	+40°C to +84°C	+85°C to +125°C
Factor	0.85	0.9	0.85	0.7

TABLE R (Cycle Rate)

Cycle rate per hour	< 1.0	1.0 to 10	> 10
Factor	0.85	0.9	0.85

TABLE L (Load)

Load Application	A to 0.5 sec	B to 5.0 min	C Other
Factor	1.0	1.5	0.8

Load A. Make, break and/or carry loads with an on-time duration of 0 to 500 milliseconds. Off-time is equal to or greater than on-time.

Load B. Carry-only (1) loads. Relay does not make or break the load. Maximum on-time is 5 minutes. Off-time is equal to or greater than on-time

Load C. Make, break and/or carry. Those loads that do not fall into the category of loads A or B. (Limited use)

(1) "Carry-only" means that the relay contacts are closed before there is current flowing through the contacts.

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3.10.1 RELAY DERATING EXAMPLE

Relays

The principal stress parameters are continuous contact current and temperature. Using reduced coil voltages and abnormal contact voltages can reduce the life of the relay and compromise relay operation.

Example 1: A 1.0 A relay is operated in an environment with a temperature of +70°C. The relay is cycled at a rate of 5 cycles per hour. The load application is make, break, and carry, with a time duration of 400 msec.

From Table T select the +40°C to +84°C factor.
From Table R and Table L select the appropriate factors.

Contact derating factor is T x R x L = 0.85 x 0.9 x 1.0 = 0.765. The derated contact load is 0.765 x 1.0 A = 0.765 A.

Example 2: A 10 A relay is operated in an environment with a temperature of -40°C. The relay is turned on for 3 minutes once every 2 hours. The load application is carry-only. Select the appropriate factors from Tables T, R, and L.

Contact derating factor = 0.85 x 0.85 x 1.5 = 1.0838.

The derated contact load is 1.0838 x 10 A = 10.84 A.

NOTE: Although the relay is a 10 A rated relay, the derated contact load capability is 10.84 A when this unique low-use application is considered.

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3.11 RESISTOR DERATING CHARTS

Resistors

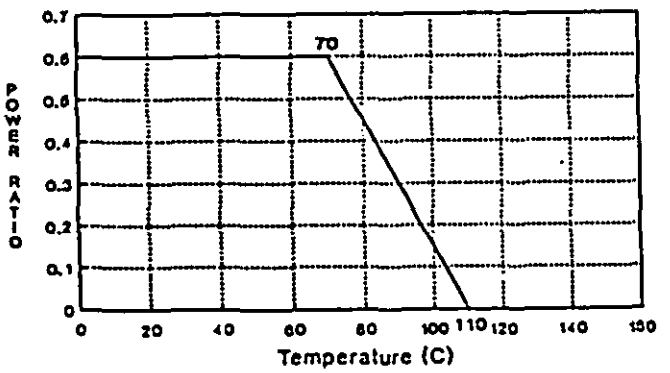
The derated power level of a resistor is obtained by multiplying the resistor's nominal power rating by the appropriate power ratio found on the (y) axis in the graphs below and on the next page. This ratio is also a function of the resistor's ambient temperature maximum (x axis).

The voltage applied to resistors must also be controlled. The maximum applied voltage should not exceed 80% of the specification maximum voltage rating or $\sqrt{PR}$ whichever is less, where:

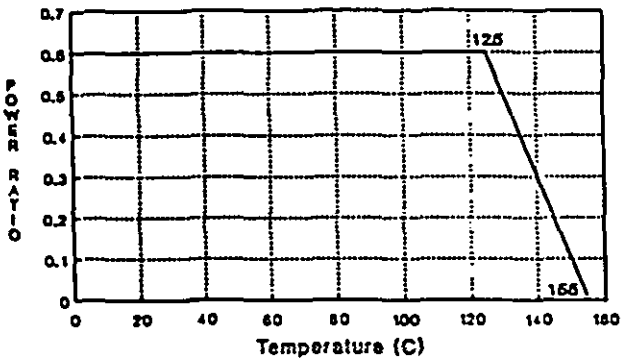
P = Derated power (watts).
R = *Resistance of that portion of the element actually active in the circuit.*

This voltage derating applies to dc and regular waveform ac applications. For pulse and other irregular waveform applications, consult MIL-HDBK-978 Vol. 1 3.1.6.2 (general), 3.2.5.2 (MIL-R-39008), 3.2.5.3 (MIL-R-55182 and 39017) or consult the manufacturer.

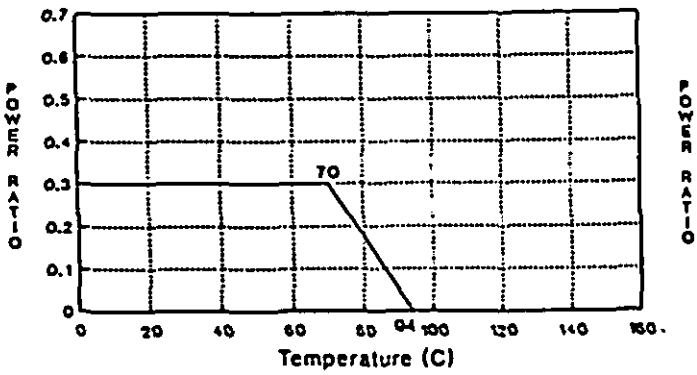
FIXED CARBON
MIL-R-39008
Type RCR



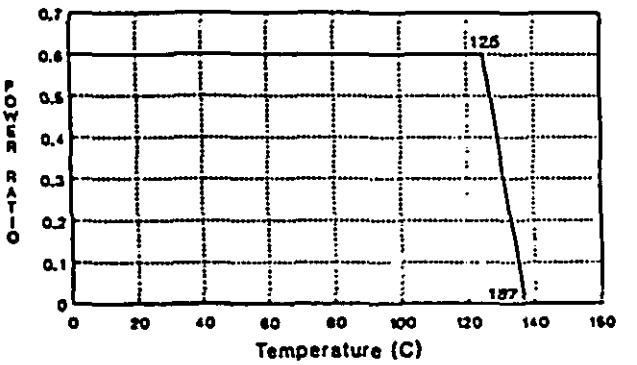
METAL FILM
MIL-R-55182
Type RNC, RNR, RNN



METAL FILM
MIL-R-39017
Type RLR



FIXED WIRE WOUND
MIL-R-39005
Type RBR



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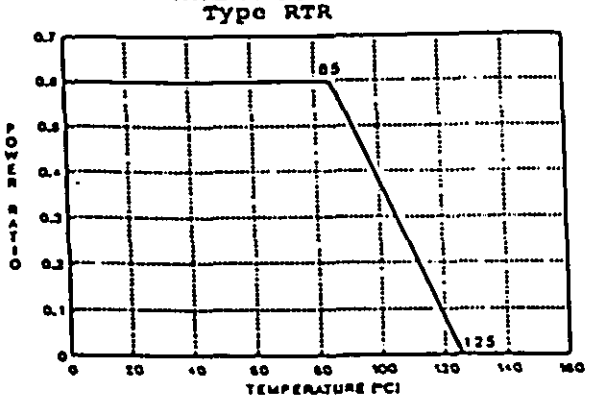
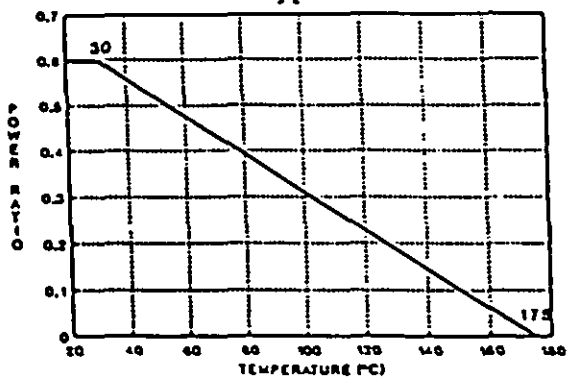
3.11 RESISTOR DERATING CHARTS

Resistors

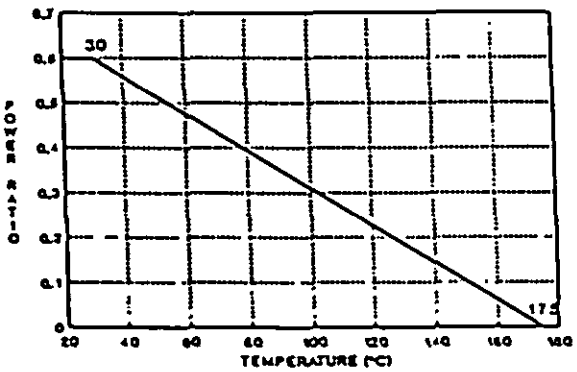
VARIABLE WIRE-WOUND
MIL-R-39015
Type RTR



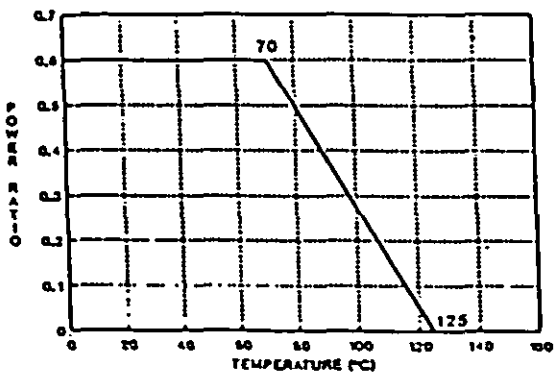
POWER WIRE-WOUND
MIL-R-39007
Type RWR



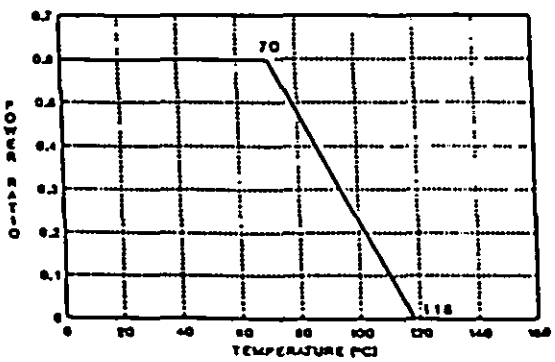
POWER, FIXED WIRE-WOUND (1)
MIL-R-39009
Type RER



RESISTOR NETWORK
MIL-R-83401
Type RZO



FIXED FILM CHIP
MIL-R-55342
Type RM



(1) Chassis mount

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3.11.1 RESISTOR DERATING EXAMPLE

Resistors

Power and ambient temperature are the principal stress parameters.

Example 1: A 0.5 W metal film resistor, type RNR70C1001FM, is used in an application where the ambient temperature is 130°C.

The derating chart for RNR resistors on page A.24 indicates that at an ambient temperature of 130°C, this resistor should be derated to 0.5 of its rated power.

Therefore: P = (0.5 x 0.5 W) = 0.25 watt

Current must be limited to maintain the derated power at 0.25 W.

Example 2: A 0.1W metal film resistor type RNC55H4753FP, is used in an application where the ambient temperature is 100°C.

The derating chart for RNC resistors on page A.24 indicates that at an ambient temperature of 100°C, this resistor should be derated to 0.6 of its rated power. This resistor has a value of 475KΩ and a specification maximum voltage rating of 200 volts.

Derated power P = (0.6 x 0.1 W) = 0.06 W

At this power, the applied voltage $E_{APP} = \sqrt{(0.06 \times 475{,}000)}$
$= 168.8$ volts.

But 80% of specification maximum voltage rating is 160 volts. So this resistor cannot be used above a continuous power level of $\frac{160^2}{475{,}000} = 0.054$ W,
or 0.54 of its maximum rated power.

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3.12 SWITCH DERATING CRITERIA

Switches

Presently there are no approved switches for inclusion in MIL-STD-975M.

This sheet is intended for future use.

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3.12.1 SWITCH DERATING EXAMPLE

Switches

Presently there are no approved switches for inclusion in MIL-STD-975M.

This sheet is intended for future use.

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3.13 THERMISTOR DERATING CRITERIA (1)

Thermistors

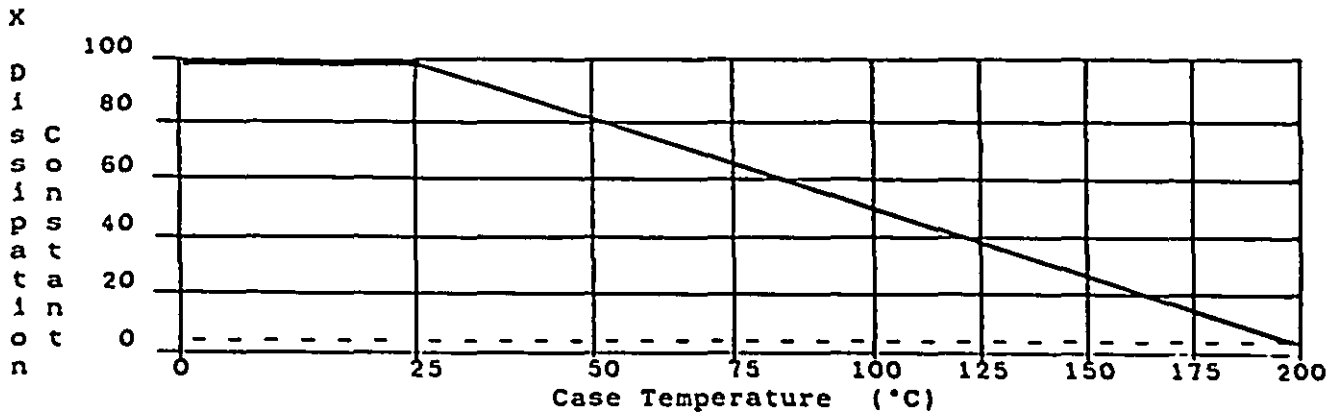
Positive Temperature Coefficient (PTC)

Positive temperature coefficient thermistors are generally operated in the self-heat mode. Derate to 50 percent of the rated power, or as required by the detailed specification.

Negative Temperature Coefficient (NTC)

Negative temperature coefficient thermistors operated in the self-heat mode shall be derated in accordance with the figure below to prevent thermal runaway. Such parts should be derated to a power level causing a maximum increase of 50 times the dissipation constant, or a maximum part temperature of 100°C, whichever is less.

DERATING CURVE FOR NEGATIVE COEFFICIENT THERMISTORS



(1) Applied voltage should not exceed 80% of the maximum rating.($E_{APP}=0.8\sqrt{PR}$)

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3.13.1 THERMISTOR DERATING EXAMPLE

Thermistors

Power and ambient temperature are the principal stress parameters.

Example: Negative Temperature Coefficient

A 0.15 Watt NTC thermistor rated at 5000 ohms at 25°C has an operating temperature range of -40°C to +200°C and a dissipation constant of 0.8 mW/°C.

For power derating multiply the dissipation constant by 50.

$$(50)(0.8\ \text{mW/°C}) = 40\ \text{mW}$$

The thermistor should be limited to a maximum power dissipation of 40 mW. The graph on page A.29 indicates that at a value of 40, the thermistor is limited in use to 125°C max. This is above the maximum allowable derated temperature of 100°C, as stated in the criteria, page A.29, so 100°C is used.

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3.14 TRANSFORMER DERATING CRITERIA

Transformers

Transformers are derated by limiting the maximum operating temperature based on the insulation class used, and limiting the rated operating voltage to 50% of its maximum.

Insulation Class		Derated Maximum Operating Parameters	
MIL-T-27	MIL-T-21038	Temperature	Dielectric Withstanding Voltage
Q (85°C)	Q (85°C)	+ 65°C	50% of maximum rated operating voltage
R (105°C)	R (105°C)	+ 85°C	
S (130°C)	S (130°C)	+ 105°C	
V (155°C)	T (155°C)	+ 130°C	
T (170°C)	U (170°C)	+ 155°C	

a) Maximum operating temperature equals ambient temperature plus temperature rise, plus 10°C (allowance for hot spot). Compute temperature rise as follows:

Temperature rise test (per MIL-T-27, para 4.8.12)

$$\text{Temperature rise (°C)} = \frac{(R - r)}{r}(t + 234.5°C) - (T - t)$$

Where R = winding resistance at elevated temperature
r = no-load winding resistance at ambient temperature t
t = initial ambient temperature (°C)
T = maximum ambient temperature (°C) at time of power shutoff.

T shall not differ from t by more than +5°C.

b) The insulation classes of MIL-style inductive parts generally have maximum operating temperature ratings based on a life expectancy of at least 10,000 hours. The maximum operating temperatures in this table are selected to extend the life expectancy to 50,000 hours.

c) Custom-made inductive devices shall be evaluated on a materials basis and stressed at levels below the maximum rated operating temperature for the materials used. Devices having a maximum rated operating temperature in the range from +85°C to +130°C, shall be derated as follows: maximum operating temperature (°C) equals 0.75 times maximum rated operating temperature (°C). For devices with maximum rated temperatures outside this temperature range, consult the project parts engineer for temperature derating recommendations.

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3.14.1 TRANSFORMER DERATING EXAMPLE

Transformers

The parameters to be derated are temperature and dielectric stress. Frequency and winding voltage are not derated.

Example: A 110 VAC / 24 VAC step-down transformer is to operate in an ambient temperature of 40°C.
Insulation is class Q.
Winding resistance is 2.5 ohms with no load (r), 2.95 ohms under load (R).
Maximum ambient temperature T reached, when loaded, was 30°C.
Ambient temperature t for the temperature rise test was 25°C.

Calculating the temperature rise per MIL-T-27, paragraph 4.8.12;

$$\delta T = \frac{(R - r)}{r} (t + 234.5°C) - (T - t)$$

$$\delta T = \frac{(2.95 - 2.5)}{2.5} (25°C + 234.5°C) - (30°C - 25°C)$$

$$\delta T = \frac{0.45}{2.5} (259.5°C) - 5°C$$

$\delta T = 0.18\ (259.5°C) - 5°C$ $\quad t = 25°C$
$\delta T = 46.7°C - 5°C$
$\delta T = 41.7°C$

The maximum operating temperature for this application is 41.7°C + 40°C + 10°C = 91.7°C. Class Q insulation is not adequate since its derated maximum operating temperature is only 65°C. Class S insulation (105°C) must be used. The dielectric withstanding voltage of the insulation must be rated at 220 VAC. (220 VAC x 50% = 110 VAC).

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3.15 TRANSISTOR DERATING CRITERIA

Transistors

Derating of transistors is accomplished by multiplying the appropriate stress parameter by its derating factor. Junction temperature must also be calculated and maintained below 125°C.

Transistor Type	Critical Stress Parameter	Derating Factor	Maximum Junction Temperature
BIPOLAR			
General purpose,	Power	0.50	
Switching, and	Current	0.75	
Power	Voltage	0.75 (1)	125°C
FIELD EFFECT			(all types)
JFET and	Power	0.50	
MOSFET (2)	Current (I_D)	0.75	
	Voltage	0.75 (1)	

(1) Worst-case combination of DC, AC, and transient voltages should be no greater than the derated limit.

(2) For power MOSFET devices, also derate the gate to source voltage (V_{GS})to 60% of the maximum rated.

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3.15.1 TRANSISTOR DERATING EXAMPLE

Transistors

Junction temperature is the most destructive stress for transistors. This parameter along with power, voltage, and current (safe operating area) must be derated.

Example: A 2N6756 MOS power transistor is derated as follows;

MAXIMUM RATINGS		DERATINGS
Power: 75 W	(75 X 0.5)	= 37.5 W
Current, I_D: 14 A	(14 X 0.75)	= 10.5 A
Voltage, V_{DS}: 100 V	(100 X 0.75)	= 75 V

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3.16 WIRE AND CABLE DERATING CRITERIA

Wire/Cable

Derating is accomplished by determining a single wire maximum current from a combination of wire size and bundle size as listed below. Adjustments are made if the insulation is other than Teflon*. (see remark 3 below)

Wire Size (AWG)	Single Wire Current (I_{SW}) (A)
30	1.3
28	1.8
26	2.5
24	3.3
22	4.5
20	6.5
18	9.2
16	13.0
14	19.0
12	25.0
10	33.0
8	44.0
6	60.0
4	81.0
2	108.0
0	147.0
00	169.0

Remarks

1. Current ratings are based on wires at +70°C in a hard vacuum. (10^{-6} to 10^{-9} torr).

2. When wires are bundled, the maximum design current for each individual wire shall be derated according to:

   FOR $1 < N \leq 15$; where:
   $I_{BW} = I_{SW} \times (29-N)/28$ N = number of wires

   FOR $N > 15$ I_{BW} = current, bundled wire
   $I_{BW} = (0.5)I_{SW}$ I_{SW} = current, single wire

3. Deratings listed are for Teflon* insulated wire (TYPE TFE) rated for +200°C

   a. For 150°C wire, use 80% of value shown in table.

   b. For 135°C wire, use 70% of value shown in table.

   c. For 105°C wire, use 50% of value shown in table.

4. Dielectric withstanding voltage rating required: at least two times the highest application voltage.

5. Derating values listed apply only to round single conductors on helically wound bundles. See project parts engineer for derating information for ribbon cable and flat conductors.

* Reg. Trademark, E.I. DuPont Chemical Co.

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3.16.1 WIRE AND CABLE DERATING EXAMPLE

Wire/Cable

Parameters to be derated are conductor current, insulation dielectric withstanding voltage, and temperature.

Example: A wiring bundle is made up of 5 conductors which will carry the following currents: 1 at 1 amperes, 2 at 6 amperes, and 2 at 8 amperes. The maximum ambient temperature will be 70°C. The highest voltage will be 100 V.

Solve for the single wire current (I_{SW}). The table on A.35 gives the wire size allowed for use.

For a 70°C ambient temperature, 200°C, 150°C or 135°C rated insulation may be used (see Remark 3, page A.35).

Case 1: 200°C rated insulation:

$I_{BW(8A)} = I_{SW} \times (29 - N)/28$ where N = 5 and
$8A = I_{SW} \times 0.86$ $I_{BW(8A)}$ = 8 amperes
$I_{SW} = 8\ A/0.86$
$I_{SW} = 9.33\ A$

The table on page A.35 gives size 16 wire as the smallest size wire that should be used for 8 amperes of application current.

$I_{BW(6A)} = I_{SW} \times (29 - N)/28$ where N = 5 and
$6A = I_{SW} \times 0.86$ $I_{BW(6A)}$ = 6 amperes
$I_{SW} = 6\ A/0.86$
$I_{SW} = 7.00\ A$

The table on page A.35 gives size 18 wire as the smallest size wire that should be used for 6 amperes of application current.

$I_{BW(1A)} = I_{SW} \times (29 - N)/28$ where N = 5 and
$1A = I_{SW} \times 0.86$ $I_{BW(1A)}$ = 1 ampere
$I_{SW} = 1\ A/0.86$
$I_{SW} = 1.17\ A$

The table on page A.35 gives size 30 wire as the smallest size wire that should be used for 1 ampere of application current.

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Case 2 and Case 3: 150°C and 135°C rated insulations:

The table on page A.35 defines I_{sw} values for these insulations as 80% and 70%, respectively, of the I_{sw} values shown for the 200°C rated insulation. To determine wire sizes required for 150°C and 135°C rated insulation, divide the answers found above as follows:

Application Current	Insulation Temperature Rating					
	200°C		150°C		135°C	
(A)	I_{sw} (A)	Wire Size Required	I_{sw} (A)	Wire Size Required	I_{sw} (A)	Wire Size Required
8	9.33	16	11.66	16	13.34	14
6	7.00	18	8.75	18	10.01	16
1	1.17	30	1.46	28	1.67	28

The minimum dielectric withstanding voltage of the insulation must be: 100 V/0.5 = 200 V

Choose wire that is rated for a minimum of 200 V dielectric withstanding voltage. The choice of insulation may further be defined by other material requirements such as weight, flammability or durability.

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APPENDIX B

ADDITIONAL TESTING REQUIREMENTS

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ADDITIONAL TESTING REQUIREMENTS

1.0 SCOPE

This appendix contains additional testing requirements for parts to be used in the design and construction of space hardware, as well as essential ground support equipment.

2.0 GENERAL

2.1 Introduction. To support the designs required by NASA Programs, this Standard Parts List includes parts that require additional testing prior to use. Therefore, the specified additional tests must be fully complied with in order to use a part for applicable grade level, and part documentation shall reflect the successful completion of additional testing requirements.

2.2 Marking. Upon successful completion of additional testing, each part shall be permanently and legibly marked with a NU, except when the contractor utilizes a Part Control Procedure to implement these requirements and specifies a unique marking, so that the part may be identified and controlled. The marking shall be legible (with a contrasting color), nontoxic, and permanent such that it meets the resistance-to-solvents requirements of MIL-STD-883, Method 2015. In addition, the marking shall meet the following outgassing criteria: a maximum total mass loss of 1.0 percent and a maximum of 0.10 percent volatile condensable materials when tested in accordance with American Society for Testing and Material (ASTM) Standard Test Method E595.

Alternate methods of part marking shall be approved by the NASA Project Parts Engineer.

3.0 ADDITIONAL TESTING REQUIREMENTS

3.1 Additional Testing Requirements for Grade 1 Applications.

3.1.1 Capacitors

3.1.1.1 Capacitors, Fixed, Tantalum (Solid) Electrolytic, (CSR). Each part shall be subjected to a surge current test of five charge/discharge surge current cycles of at least 1 second each per cycle at +25°C, -55°C, and +85°C and maximum rated voltage.[1] The surge current test circuit shall comply with the following conditions:

A. The power supply used for charging the capacitors shall be capable of supplying a regulated direct voltage, variable from 0 to 150 volts, at a 15 amp minimum current capability.

B. The energy storage bank shall be placed across the dc-power supply. It shall consist of parallel aluminum electrolytic capacitors having an aggregate capacitance of 100,000μF, -0, +30 percent, rated at 150 volts dc working or higher.

---

[1]Definition of surge current (inrush current) is the peak current, for a given duration, that the capacitor will receive from the turn-on of a bank of 100,000 μF aluminum electrolytic capacitors charged to the rated voltage of a given capacitor under test with a maximum series resistance of less than or equal to 0.3 ohm including the mercury relay, fuse, and wire.

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C. A 30-ampere mercury relay shall be used to switch the capacitor under test to the energy bank for charge and into a short circuit for discharge.

D. The total resistance of all wiring between the energy source and the capacitors under test, including the mercury relays but excluding fuses, shall not exceed 0.1 ohm.

E. The fuses in the test circuit shall have a rating of not less than 1 amp, nor more than 5 amps. A fuse shall be placed in series with each capacitor undergoing the surge current test. Each fuse shall have a maximum resistance of not more than 0.2 ohm.

F. A capacitor under test shall be considered a failure either when a fuse blows or the dc leakage current is exceeded or both.

3.1.1.2 Capacitors, Fixed, Ceramic, (CDR). Parts shall meet the destructive physical analysis criteria given in Table X, Group A Inspection, of MIL-C-123, and the humidity, steady state, low voltage criteria given in Table XI, Group B Inspection of MIL-C-123. Samples subjected to humidity, steady-state, low voltage test shall not be used.

3.2 Additional Testing Requirements for Grade 2 Application.

3.2.1 Resistor Networks. The requirements for screening resistor networks (MIL-R-83401) for use in Grade 2 applications are tabulated to Table 3.1.

TABLE 3.1. Additional Screening Requirements for Networks (MIL-R-83401) Prior To Use in Grade 2 Applications

Screening per MIL-STD-202 (100%)

Screen	Method	Requirements
Thermal shock	107 Test Condition B	Paragraph 4.6.3 of MIL-R-83401
Burn-in	108	MIL-R-83401 (150 hours)
Electrical	MIL-R-83401 Group A	Shall be within spec limits before and after screen

Marking

A unique marking to signify compliance with these requirements. See Para 2.2.

3.2.2 Crystal Oscillators. The requirements for screening the type 1 crystal oscillators for use in Grade 2 applications shall be as follows:

3.2.2.1 Particle Impact Noise Detection (PIND). Each part shall be subjected to the PIND test in accordance with MIL-STD-883, method 2020, test condition B. The test shall be performed using five independent passes and all failures found at the end of each pass are rejected. The survivors of the last pass are considered acceptable.

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3.2.2.2 **Radiography.** Each part shall be subjected to the radiographic examination in accordance with MIL-STD-883, method 2012, two views 90 degrees apart.

3.2.2.3 **Internal Water Vapor Content.** Parts shall be subjected to the internal water vapor test in accordance with MIL-STD-883, method 1018. Samples of three devices with zero failures or five devices with one failure shall be used for this test.

3.2.2.4 **Marking.** A unique marking to signify compliance with these requirements. See paragraph 2.2.

3.2.3 **Discrete Semiconductors.** Before use in Grade 2 applications all JANTXV discrete semiconductor part lots that contain an internal cavity shall be 100% PIND tested. In addition, all JANTXV discrete semiconductor parts with lot date codes:

A. before 1986 shall be rescreened in accordance with the TX requirements of the applicable detail specification of MIL-S-19500.

B. including 1986 to present shall be electrically tested to an LTPD of 5% in accordance with Table I, Group A, subgroup 2 of the applicable detail specification of MIL-S-19500. All devices in lots exceeding the above LTPD reject criteria shall be electrically tested to the Table I parameters described above.

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APPENDIX C

SPECIAL REQUIREMENTS FOR CUSTOM ELECTROMAGNETIC DEVICES

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TABLE 1. Summary of the Requirements of MIL-STD-981 Electromagnetics—Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications

TYPICAL DIFFERENCES BETWEEN GRADE 1 AND GRADE 2 ELECTROMAGNETICS
APPLICABLE SPECIFICATIONS: MIL-C-83446, MIL-T-21038, MIL-T-55361, MIL-T-27, MIL-C-15305

Element	Grade 1 (Class S) (1)	Grade 2 (Class B)
Soldering Flux	Type R	Type R or RMA
Minimum Wire Size:		
- Families 03, 04, 36, 37, 40, 41	AWG 38	AWG 44
- Families 11-14, 20, 21, 31, 50, 51	AWG 44	AWG 50
- Termination limitations:		
- Interconnected lead termination	AWG 29	AWG 32
- External terminal/self lead (2)	AWG 26	AWG 28
Lot Control	Same as Class B, plus: 1. Each design element from a single lot; 2. Solder from one supplier; 3. Each process in one continuous run; 4. Lot Date Code and production lot traceability maintained through acceptance	Lot identification, operation, quantity, date of operation, operator identification

(1) For new designs, transformers that meet Class S processing inspection and 100 percent screening requirements of MIL-STD-981 shall be used in Grade 1 applications.

(2) Spliced internal lead diameter ratios shall not exceed 5 to 1 for magnet wire sizes larger than number 44.

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TABLE 1. Summary of the Requirements of MIL-STD-981 Electromagnetics—Design, Manufacturing and Quality Standards for Custom Electromagnetic Devices for Space Applications (Continued)

Element	Grade 1 (Class S) (1)	Grade 2 (Class B)
Group A Screening	Ref. Appendix B, MIL-STD-981	Ref. Appendix B, MIL-STD-981
Group B Tests	Table IV, V, VI, or VII per MIL-STD-981 as applicable	As specified by the procurement document
Rework of Rejected Lots	Ref. MIL-STD-981	Ref MIL-STD-981
Group B Inspection	- Randomly sampled units from Group A lots.	- As specified by procurement document.
	- Two sample units subjected to tests of Subgroup 1 and two sample units to Subgroup 2 (Group B tests). A total of four samples.	- As specified by procurement document.
	- Lot has failed when number of failures exceeds number allowed in applicable table.	- As specified by procurement document.
	- Failure analysis shall be performed and forwarded to procuring activity.	- Group B inspection repeated on additional sample units.
Radiographic Inspection	- Ref. Appendix C, MIL-STD-981	- Ref. Appendix C, MIL-STD-981

(1) For new designs, transformers that meet Class S processing inspection and 100 percent screening requirements of MIL-STD-981 shall be used in Grade 1 applications.

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APPENDIX D

JAN CLASS S STOCK PROGRAM

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JAN CLASS S STOCK PROGRAM

1.0 SCOPE.

This appendix explains the procedures for obtaining JAN Class S microcircuits and semiconductors from the JAN Class S Stock Program with as little as a ten (10) day delivery time. Included are simple instructions on obtaining a DoDAAC, requisitioning parts from stock, and pursuing emergency procurement without a DoDAAC.

2.0 INTRODUCTION.

This program was established to stock JAN Class S (space quality) parts. It was initiated in 1985 by NASA, the Defense Logistics Agency (DLA), and the Space and Missile Systems Center (SMC/SDFP), specifically for NASA, SMC/SDFP, approved contractors and their supporting contractors, and manufacturers of expendable launch vehicles.

2.1 Purpose. The program allows JAN Class S parts to be obtained with reduced lead time and costs compared to typical acquisition from manufacturers.

2.2 Advantages. The program provides the following advantages:

1) Reduced procurement lead time - as little as ten (10) days.

2) Avoidance of minimum-buy requirements imposed by the parts manufacturers - buy only what is absolutely needed.

3) Rapid availability of spare parts for maintenance and emergencies.

4) Substantially reduced overall procurement costs.

2.3 Definitions.

1) MILSTRIP/FEDSTRIP - Military/Federal Standard Requisitioning and Issue Procedures.

2) DoDAAC - Department of Defense Activity Address Code issued to contractors and subcontractors as an access code to the JAN Class S stock.

3) LOA - Letter of Authorization written by the NASA contract officer to the contractor/subcontractor, authorizing the contractor/subcontractor to buy parts from the JAN Class S Stock.

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3.0 OBTAINING ACCESS TO THE PROGRAM.

To buy from the JAN Class S Stock, you must have a DoDAAC and a LOA. These can be obtained through the NASA contract officer for the prime contract. It generally takes three (3) months to obtain a DoDAAC, but if time is critical, then the process can be expedited by the NASA contract officer stating on the request for a DoDAAC that the request be expedited.

4.0 EMERGENCY PROCUREMENT WITHOUT A DoDAAC.

Under the following conditions, parts may be obtained without a DoDAAC:

1) A small amount of parts are needed.

2) Failure to meet delivery dates will involve a substantial cost increase to the Government.

3) Processes must be initiated to obtain the normally required DoDAAC.

Call the NASA JAN S Support Desk for more information. (See Paragraph 8.0.)

5.0 PROCEDURES FOR REQUISITIONING.

Once a DoDAAC is obtained, orders for the JAN Class S Stock should be through George Keolian, AF-SMC/SDFP, (310)363-2412. To place an order, the following information is required on a MILSTRIP Form DD 1348:

1) DoDAAC.

2) National Stock Number (NSN).

3) Quantity.

4) Billing Address.

5) Shipping Address.

6.0 USING THE JAN CLASS S STOCK BULLETIN BOARD.

The Space and Missile Systems Center, Component Engineering Group provides an electronic bulletin board for the JAN S Stock Program. This system lists the current availability and prices of stocked parts. It displays the NSNs, Military specification part numbers, generic part numbers, device descriptions, prices, number of parts in Destructive Physical Analysis testing, and number of parts in stock.

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6.1 ACCESS. To connect to the bulletin board, use a modem to dial 310-363-1914/1915 (if you have AUTOVON access, dial 833-1914/1915) with the following modem settings:

Terminal emulation:	VT220
Baud rate:	2400 (or 1200)
Data bits:	8
Parity:	none
Stop bits:	1

Once connected, you will see the word "CONNECT". Press <return> twice, wait two seconds and press <return> twice more. You will see "ENTER USERNAME>". Enter anything here and press <return>. At the "LOCAL" prompt, type "C SD" or "C SPACE" and press <return>. Wait two seconds and press <return> again. You will be prompted for the OSS "USERNAME:" and a first "PASSWORD:". Enter:

USERNAME:	OSSUSER
PASSWORD:	MUKRIR

Next you will see the Authorization Form screen and again be prompted by "USERNAME:" and a second "PASSWORD:". Enter:

USERNAME:	OSSUSER
PASSWORD:	LAFBEE

You will then be at the JAN Class S Stock main menu. To obtain a listing of available parts, choose the first choice on each of the first three screens ("Status Report"), then you can make your desired choices. It is suggested to down-load the list to a file and then print the file using your local word processor, rather than to print directly to the printer.

If you have problems accessing the bulletin board, call George Keolian at (310) 363-2412 of the SMC/SDFP.

7.0 PARTS' DATA ACQUISITION PROCEDURES.

Destructive Physical Analysis (DPA) is performed by DESC on each lot. Copies of the DPA reports and Quality Conformance Inspection (QCI) data can be obtained free of charge on request from the NASA JAN S Support Desk. (See paragraph 8.0.) Screening data should be obtained from the manufacturer.

8.0 NASA JAN S SUPPORT DESK.

Contact the following office for all questions regarding the JAN Class S Stock Program:

NASA Parts Project Office
Paramax Systems, UNISYS Corporation
4700 Boston Way
Lanham, Maryland 20706

POC: JAN S Support Desk
Phone: (301) 731-8918 or 731-8692
FAX: (301) 731-8603

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9.0 JAN CLASS S STOCK PROGRAM FLOW.

The flowchart on the following page demonstrates the process of obtaining a DoDAAC and LOA, ordering parts from DESC, and checking the status of orders. The next pages are form letters that the NASA contract officer sends to the DoDAAC coordinator of their NASA center to process requests for DoDAACs. These letters should be sufficient for the contract officer to simply add the appropriate information (eg., DoDAAC, contractor, contract number, contract dates).

The first letter is the Determination and Findings (D & F), which explains that it is in the best interest of the Government to allow the contractor to acquire parts from the JAN Class S Stock Program. The second letter is used to extend the authority of a DoDAAC to include the acquisition of JAN Class S parts from this Program. The third letter is the LOA written to the contractor/subcontractor that needs to be sent to the DoDAAC coordinator along with the D & F letter and the fourth letter. The fourth letter is the request for a DoDAAC, which is to be sent to the NASA center's DoDAAC coordinator (see below). The fifth letter is to help prime contractors and subcontractors assist their subcontractors in obtaining a DoDAAC. All subcontractors must have the NASA prime contractor request the NASA contract officer to submit Form Letter 4 with the enclosures to the appropriate DoDAAC coordinator.

The following is a list of the DoDAAC coordinators for each NASA center.

NASA Center	DoDAAC Coordinator	Phone	Code/Mail Stop
Ames Research Center	Paul Pinaula	(415) 604-5206	AEL: 255-3
Goddard Space Flight Center	Glenn Harris	(301) 286-3385	235.3
Headquarters	Gloria Taliaferro	(202) 358-2306	JIE
Jet Propulsion Lab	Frank Malinowski	(818) 354-4970	M/S: 180801
Johnson Space Center	Gloria Crowston	(713) 483-6694	JF-5
Kennedy Space Center	Mike Murray	(407) 867-3493	SI-SAT-1
Langley Research Center	Susan Campbell	(804) 864-3572	380
Lewis Research Center	Charles Noe	(216) 433-3079	M/S: 21-9
Marshall Space Flight Center	Pegi Dunnigan	(205) 544-5658	CN44
Stennis Space Center	Don Griffeth	(601) 688-2144	GA20

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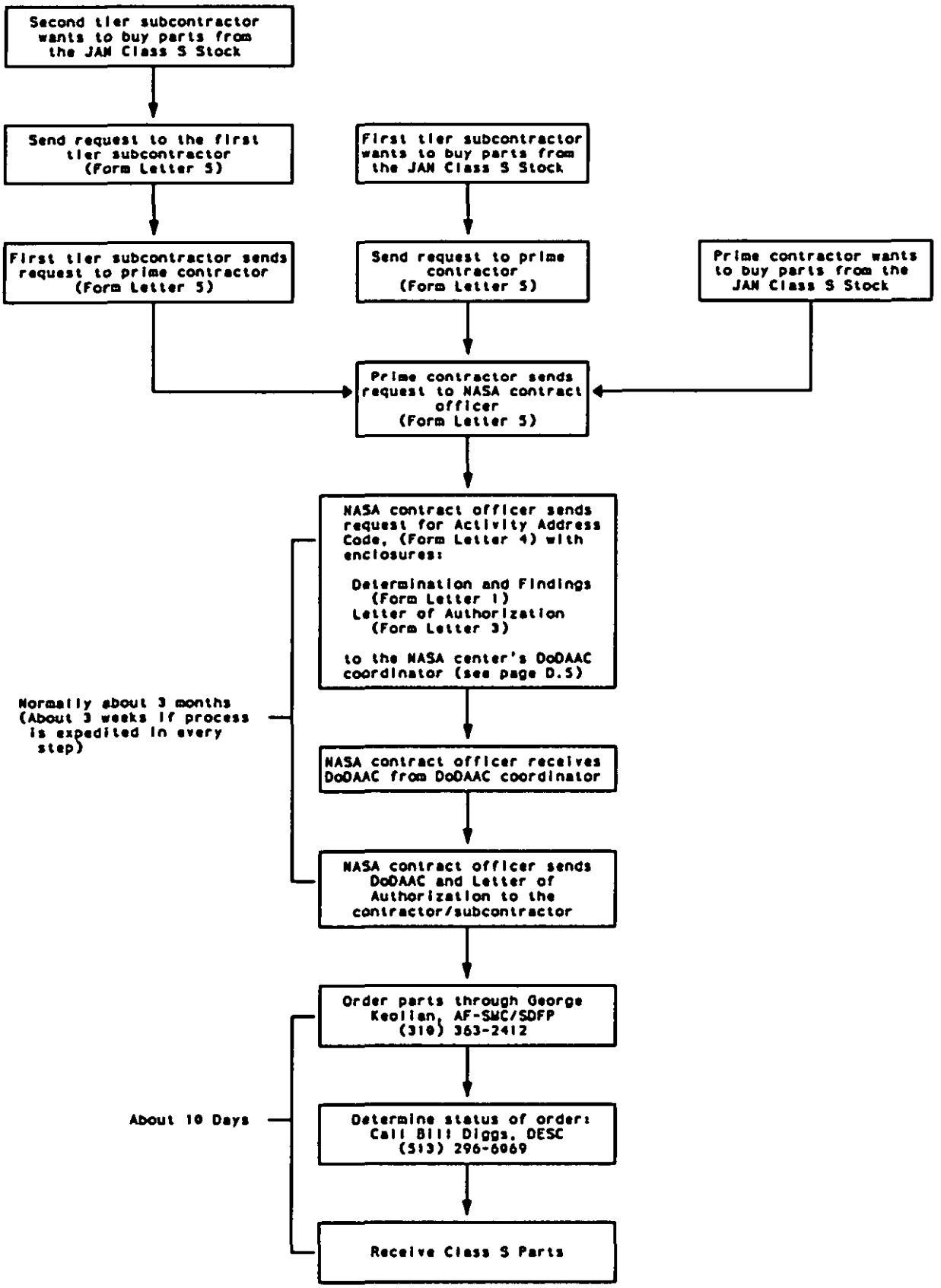
JAN Class S Stock Program Flow



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FORM LETTER 1

SUBJECT: Determination and Findings Supporting Issuance of Authorization to Use Government Supply Sources (JAN Class S Stock Program)

This Determiniaton and Findings is to provide authorization under NASA contract number _____ for the contractor/subcontractor _____. This is a cost-reimbursement contract. The following is in accordance with the FAR 51.102, and supports issuance of authorization to requisition and use the JAN Class S Stock Program maintained by the DLA, DESC.

FINDINGS

Administrative costs of placing orders with the JAN Class S Stock Program are comparable to those costs the contractor/subcontractor would incur when ordering direct from a manufacturer or distributor. All orders must have prior approval by the NASA contract officer.

The following factors were found to support authorization:

a. Lower Cost of Items Available Through Government Supply Source. The increased use of the standard parts available in the JAN Class S Stock Program would save money by reducing the need for expensive nonstandard parts and their associated engineering cost. Actual costs of items available from the Government supply source will be comparable to costs of similar items available from industry; however, substantial cost savings will be realized since contractors will be able to order smaller quantities from the Government supply source, thus avoiding minimum buy requirements imposed by part manufacturers.

b. Suitability of Items Available Through Government Supply Source. The Department of the Air Force, Space Systems Division Commander's Policy, SDR 540-12, requires the use of JAN Class S parts on all USAF space systems. The NASA Associate Administrator for Safety, Reliability, Maintainability, and Quality Assurance (SRM&QA), encourages the use of JAN Class S parts on all NASA space systems and requires their use on certain systems. JAN Class S parts are military standard high reliability electronic parts. They are bought to fully utilize military specifications, built on government audited and certified production lines, and qualified for listing on the military qualified products list (QPL). JAN Class S parts increase reliability and reduce life cycle costs through standardization.

c. Delivery Factors Such as Cost and Time. Procurement lead time for contractor acquisition of the parts will be reduced by approximately one year; the parts will have already undergone the required stringent testing and will be delivered 8 to 31 days after the requisition date. Parts analysis reports are available free of charge upon request. Contact the NASA JAN S Support Desk (301-731-8918).

d. Recommendations of Contractors. The JAN Class S Stock Program was initiated at a Senior Executive Forum hosted by the Commander of United States Air Force Space Systems Division. Industry executives specifically requested that a program such as this be implemented as soon as possible. By agreement between the DLA and NASA, this stock is also made available to authorized NASA and NASA contractor activities.

DETERMINATION

Based on the foregoing, I hereby determine that it is in the best interest of the Government, consistent with NASA's policy as set forth in NASA FAR Supplement 18-51.102, to authorize the contractor/subcontractor _____ to obtain and use the JAN Class S Stock Program under government contract number _____.

For further information contact _____.
(Contract Officer)

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FORM LETTER 2

I have previously determined, in accordance with the Federal Acquisition Regulation (FAR) 51.102, that it is in the Government's best interest to authorize _(contractor/subcontractor_ to obtain materials required in the performance of the subject contract from government sources.

Contractor's/Subcontractor's) authorization under Activity Address Code _____ is hereby extended to include the acquisition of JAN Class S parts in Federal Stock Code (FSC) 5961 (semiconductors) and FSC 5962 (microcircuits) from the Defense Logistics Agency (DLA), Defense Electronics Supply Center (DESC). JAN Class S parts as used in this authorization are space-quality military standard electronic parts as described by MIL-S-19500 for semiconductors and MIL-M-38510 for microcircuits, and associated specifications for passive electronic parts.

All orders must have prior approval by the contract officer. Orders for JAN Class S parts shall be placed in accordance with the requisitioning procedures specified by the acquisition activity. For information concerning procedures, contact the Defense Logistics Agency, Defense Electronics Supply Center, DESC-OMA, 1507 Wilmington Pike, Dayton, OH 45444-5000, phone: (513) 296-6069. For information concerning parts, (stock availability), contact the Space and Missile Systems Center, Component Engineering Group (SMC/SDFP), P.O. Box 92960, Los Angeles AFB, CA 90009-2960, phone (310) 363-2412. Bills from DESC shall be paid promptly upon receipt of billings. All payments shall be addressed to the Defense Electronics Supply Center, 1507 Wilmington Pike, Dayton, OH 45444-5000.

JAN Class S parts procured pursuant to the authorization shall be used solely in performance of Contract No. _____. This authority hereby granted is not transferable or assignable.

Contract Officer/Installation

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FORM LETTER 3

SUBJECT: Authorization to Purchase From Government Supply Source

You are hereby authorized to utilize Government sources in performing under NASA contract number _____ from _____(start date)____ through _____(end date)_____ in support of _____(NASA Installation)_____ as follows:

a. Definition: "JAN Class S parts" as used in this authorization are space-quality military standard electronic parts as described by MIL-S-19500 for semiconductors and MIL-M-38510 for microcircuits.

b. _____(Contractor/Subcontractor)_____ is authorized to acquire JAN Class S parts in Federal Stock Code FSC-5961 (semiconductors) and FSC-5962 (microcircuits) from the Defense Electronics Supply Center (DESC). JAN Class S parts procured pursuant to this authorization shall be used solely in performance of the contract identified above.

All orders must be placed in accordance with the following procedures:

a. Orders will be placed in accordance with the Federal Standard Requisitioning and Issue Procedures (FEDSTRIP)/Military Standard Requisitioning and Issue Procedures (MILSTRIP) and this authorization. FEDSTRIP parallels the MILSTRIP of the Department of Defense. Orders shall include the assigned Activity Address Code (AAC). For information concerning procedures contact Defense Logistics Agency, Defense Electronics Supply Center, DESC-OMA, 1507 Wilmington Pike, Dayton, OH 45444-5000, phone: (513) 296-6069. For information concerning parts' data, contact the NASA JAN S Support Desk, 4700 Boston Way, Lanham, MD 20706, phone: (301) 731-8918.

b. Bills will not be issued by the Government supply source until after the supplies have been shipped. Payment shall be made promptly upon receipt of billings. Payment shall be addressed to:

The Defense Electronics Supply Center
1507 Wilmington Pike
Dayton, OH 45444-5000

This authority hereby granted is not transferable or assignable.

Use of the Federal Standard Requisitioning and Issue Procedures (FEDSTRIP) system is mandatory for all civilian agencies and their authorized contractors. An Activity Address Code (AAC) is required to obtain supplies and equipment through the FEDSTRIP system from GSA and DoD sources. AACs are assigned through this office and NASA Headquarters by the General Services Administration (GSA) Central Office. This authorization is provided for in FPRM 101-26.2, and DoD Activity Address Code, and the NASA Materials Inventory Handbook (NHB 4100.1B Draft).

This authorization expires upon termination or completion of the contract specified in the first paragraph above.

Contract Officer

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FORM LETTER 4

TO: NASA Headquarters
NIE/Supply Systems Analyst

THRU: Installation AAC Coordinator

FROM: (NASA Contract Officer)

SUBJECT: Request for FEDSTRIP/MILSTRIP Activity Address Code for
_____(Contractor/Subcontractor)_____ under contract number _____

I have determined in accordance with the Federal Acquisition Regulation (FAR) 51.102, that it is in the Government's best interest to authorize the contractor to obtain supplies required in the performance of the subject contract from a government source under contract number _____.

The contractor's authorization includes use of the Federal Standard Requisitioning and Issue Procedures (FEDSTRIP)/Military Standard Requisitioning and Issue Procedures (MILSTRIP) to requisition JAN Class S parts in Federal Stock Code (FSC) 5961 (semiconductors) and FSC 5962 (microcircuits) from the Defense Logistics Agency (DLA), Defense Electronics Supply Center (DESC). Therefore, please obtain a FEDSTRIP/MILSTRIP Activity Address Code from the General Services Administration for the subject contractor.

The Determination and Findings (D & F) and the intended Letter of Authorization (LOA) to the contractor are enclosed. The duration of this authorization is from __(start date)__ through __(end date)__.

The contractor's complete name and address to which mail, freight, and billing documents are to be directed are as follows.

MAIL: _____
_____
_____

FREIGHT: _____
_____
_____

BILLING: _____
_____
_____

Please contact me at _____(Contract Officer Information)_____, if further information is needed regarding this request.

Contract Officer

2 Enclosures
1. Determination and Findings
2. Letter of Authorization

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FORM LETTER 5

TO: (NASA Contract Officer)

FROM: (Prime Contractor)

SUBJECT: Request to obtain an Activity Address Code for our subcontractor _____ under contract number _____.

(Prime Contractor) certifies that (Subcontractor) is a subcontractor under the NASA contract (Contractor Name) with NASA contract number _____. In order for (Subcontractor) to perform the necessary tasks to complete this program I request that you submit the attached letter with its enclosures to the Activity Address code Coordinator for (NASA Installation).

Please contact me if further information is needed regarding this request.

(Prime Contract Administrator)

Attachment: Request for Activity Address Code
Determination and Findings
Letter of Authorization

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CONCLUDING MATERIAL

Custodian:

NASA-NA

Preparing Activity:

NASA-NA

Project 59GP-K138

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