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1.0 FOREWORD

The NASA EEE Parts Selection List (NPSL) has been developed as a "parts selection tool" specifically geared toward design and parts engineering organizations internal to NASA and to universities and original equipment manufacturers (OEMs) that do not have the resources for a dedicated quality and reliability infrastructure in parts engineering. The NPSL is a listing of electrical, electronic, and electromechanical (EEE) part types and advanced packaging technologies such as Multi-Chip Modules (MCM) which are produced under various government and/or industry quality systems.

Since NASA's Standard EEE Parts List, MIL-STD-975, was cancelled without replacement on May 3, 1998, the NPSL provides a viable alternative for parts selection. However, there are some key differences in the philosophy of these two documents which users must be aware of:

MIL-STD-975 NPSL

Defines "Standard" and "Non-Standard" Parts Leaves standardization up to the individual flight projects Defines a "Non-Standard Parts Approval Request" (NSPAR) policy Leaves it to the individual flight projects to approve parts for the intended application Intended to be invoked as a contract requirement Not intended to be invoked as a contract requirement Very stringent requirements for parts listings Designed to facilitate listing of newer, advanced technologies

OEMs that have an established parts engineering infrastructure may elect to use the NPSL to augment their own existing part selection lists. The NPSL may be chosen, in part or in its entirety, to be a subset of a Project Approved Parts List (PAPL) or equivalent. The decision to invoke the NPSL shall be made by the project based on the parts management and control requirements for that mission. The NPSL itself, should not be imposed as a contractual requirement, but the associated part listings may be established as approved selections by the project.

2.0 ABOUT THIS DOCUMENT

2.1 General:

The NPSL is a selection tool providing designers with a list of EEE parts intended to meet system design requirements and NASA Parts Program quality/reliability levels. It is not mandatory that the parts listed herein be the only selections used to design a system, but if a particular function is needed and a suitable part is listed, the NASA EEE Parts Assurance Group (NEPAG) recommends the listed part as the first order of precedence for selection. Selecting a part from the NPSL may provide cost savings/ avoidance for the project because:

The procurement specification already exists The manufacturer has had a NASA survey or government audit performed The parts are available under one or several NASA accepted quality assurance systems Part qualification has been successfully completed All or most of the parts engineering has already been performed

The parts listed are approved for use only if NASA flight project approval is given. The document lists parts according to established quality assurance levels and NASA Parts Program knowledge of the product and manufacturer such as qualification history, GIDEP and failure trends, and delivery performance. This combination allows NEPAG to make a technical assessment of the quality, availability, capability and reliability and to list parts at a corresponding quality level within this document.

2.2 World Wide Web Access to the NPSL

The NPSL has been developed and will be maintained as an on-line World Wide Web homepage accessible via http://nepp.nasa.gov/npsl. The primary objectives of using the WWW as the platform for maintaining the NPSL are to:

Provide broad and ready access by NASA affiliated organizations world wide Facilitate quick updates, modifications, and revisions Provide links to additional EEE part information

Users will have to access the NPSL on-line and be able to download the document if a printout is desired.

2.3 Configuration Management

Under Construction

2.4 Appendices:

Appendix A (when released) will contain guidelines for derating parts. In general, these guidelines are accepted by NEPAG for use on all projects. Flight projects may elect to further develop these guidelines into requirements. Appendix A may not contain derating criteria for all part types, but guidelines provided can be used as a baseline for project derating requirements.

Appendix B is a repository of useful WWW links to additional parts information databases which can be accessed to support parts selection and application issues.

3.0 USING THIS DOCUMENT

The NPSL has been structured into four primary sections to facilitate finding the information of interest:

Welcome and User Feedback Section (Banner Page) Use Policy Section Parts Listings by Commodity Type Sections Appendices

The Parts Listings by Commodity Type Sections contains the actual part selection listings. The part types which will be covered in the NPSL consist of advanced packaging technologies such as MCMs and the commodities defined as electrical, electronic, and electromechanical (EEE) parts. The commodity types are listed below according to the Federal Stock Classification (FSC) system.

Part Types FSC

Capacitors 5910 Circuit Breakers 5925 Connectors 5935 Crystals and Crystal Oscillators 5955 Fiber Optics 60GP Filters 5915 Fuses 5920 Inductors 5950 Microcircuits (Monolithic and Hybrid) 5962 Relays 5945 Resistors 5905 Semiconductors (Diode and Transistor) 5961 Thermistors 5905 Transformers 5950 Wire and Cable 6145

Within each commodity class the parts are listed in order by procurement specifications in existence as NASA, DoD, or other space agency (e.g. ESA or NASDA) specifications. The part listing for each specification begins with a detailed explanation of the part numbering system. These explanations and the part listings which follow help the user "build" the appropriate part number for the project application. General functional descriptions and generic part number cross-references are provided to assist the user in matching functionality. The part quality levels, radiation tolerance levels (if known), and the available manufacturer sources are also identified.

Although extensive efforts have been made to maintain the accuracy of the supplier information within the part listings, users are encouraged to visit the Defense Supply Center Columbus (DSCC), http://www.dscc.dla.mil/programs/qmlqpl/. DSCC is the Department of Defense agency responsible for certifying suppliers of military specification EEE parts. At this site, users can download the latest Qualified Products List (QPL) for the part type of interest.

4.0 GENERAL REQUIREMENTS

Selection of parts for inclusion in the device listings in this document is based on a review of technical data by the NASA EEE Parts Assurance Group (NEPAG) for quality and reliability trends. The major criteria used to evaluate candidate parts are:

o Quality system and assurance level the products are produced under

o Product performance

o Product workmanship assessments

o Destructive Physical Analysis results

o Failure histories

o Reliability trends

o GIDEP alert histories of the product and manufacturer

o Qualification and screening test results

o Product availability

o Manufacturer audit and survey results

o Manufacturer responsiveness to corrective actions

o Manufacturer delivery histories

Participation by the manufacturers in a quality program such as QPL, QML, and ISO 9000. will not automatically qualify their products for listing in the NPSL. Listings will be based on results from assessments of all the major criteria listed above. EEE parts-related activities throughout NASA provide recommendations for listing parts in this document.

NOTE: Unless specifically stated within the parts selection tables of the NPSL, listing of a device technology herein does NOT imply/guarantee Radiation Hardness Assurance (RHA). Applications concerned with a device's ability to tolerate exposure to various forms of space radiation (e.g., total ionizing dose, single event effects, etc.) should be reviewed and have the device assessed by the Program's radiation assurance experts. The following resources may also be consulted for initial guidance:

NASA Goddard Radiation Effects and Analysis Jet Propulsion Laboratory Radiation Effects

4.1 NASA Parts Levels

The NPSL lists products based on three quality levels defined by NEPAG: Level 1, Level 2, and Level 3. The definitions for each Level and the criteria used to list a part in a particular Level are not part approvals nor is this document a project approved parts list. The NPSL will not provide information on whether or not a part meets individual project flight requirements. Instead, it provides a list of products and associated manufacturers that meet recognized quality assurance baselines, qualification test regimens, and screening requirements necessary for space flight acceptance based on levels of risk. The part selected must be assessed independently by the project or the NASA center or OEM's parts organization to determine if it meets the requirements for the project. The parts engineering organizations at the NASA centers will assist users in making this determination. The Levels herein are not directly related to mission classification, cost, or schedule and users should make the appropriate Level tradeoffs when considering which parts to choose from the list.

4.1.1 Level 1:

Level 1 is the highest product assurance class assigned to parts listed in this document. Level 1 parts are those produced under assurance classes recognized by NASA as providing the highest possible level of quality and reliability (e.g. QML Class V K, JANS for discrete semiconductors, QPL Class S, Failure Rate Level (FRL) S), from NASA approved manufacturing sources, and meeting NASA space level parts and packaging program assessment criteria. The technical assessment results for Level 1 products will show that no known trends exist which have a negative impact on the quality, reliability, or performance for space flight applications. The Level 1 criteria is summarized as follows:

o The supplier's facility(s) must be certified under a recognized quality assurance system (e.g. QML, QPL, ISO 9000) and produce products to the space industry recognized highest assurance classes (e.g. QML V, JANS for discrete semiconductors, QPL Class S, FRL S, GSFC S311 specification) or equivalent. There are exceptions to these levels where this preferred part reliability level is unavailable; these exceptions are shown in the individual part listings.

o A Defense Supply Center Columbus (DSCC) audit or a NASA program manufacturer survey to the highest assurance classes must have been successfully completed within the past 2 years.

o A part procurement specification, containing the highest assurance class requirements, must exist. Parts must have been procured previously by a NASA project using this specification.

o Historical DPA and other parts analysis data on the manufacturer's products must be available and not reveal poor workmanship trends or rejection trends.

o Failure analyses history for the manufacturers products should not reveal problem trends attributed to part quality and reliability.

o No recent unresolved GIDEP Alerts (past 3 years) exist that have a major impact on the Level 1 products quality or reliability. No GIDEP Alert or NASA Parts Advisory trends exist on the manufacturer or product.

o Available data on manufacturer performance must show no trend for late delivery of products to NASA projects.

o Qualification to the requirements of the procurement specification must have been successfully completed. No qualification issues exist and no problem trends from previous qualifications exist.

4.1.2 Level 2:

Level 2 is the second highest product assurance class assigned to parts listed in this document. Level 2 parts are those produced under assurance classes recognized by NASA to have a high level of quality and reliability (e.g. QML Q H, QPL Class B, JANTXV for discrete semiconductors, FRL R or P), from NASA approved manufacturing sources, and meeting NASA space level parts and packaging program assessment criteria. The Level 2 criteria is summarized as follows:

o The supplier's facility(s) must be certified under a recognized quality assurance system (e.g. QML, QPL, ISO 9000) and produce products to space industry recognized high assurance classes (e.g. QML Q, QPL B, JANTXV for discrete semiconductors, FRL R or P, GSFC S311 specification) or equivalent. Any exceptions to these levels where the preferred part reliability level is unavailable, are shown in the individual part listings.

o A Defense Supply Center Columbus (DSCC) audit or a NASA program manufacturer survey must have been successfully completed within the past 2 years.

o A part procurement specification, containing the high assurance class requirements, must exist. Parts must have been procured previously by a NASA project using this specification.

o DPA and other parts analysis data on the manufacturer's products must be available and must not reveal any significant problems due to poor workmanship and must show minimal reject rates.

o Failure analyses history for the manufacturers products should not reveal problem trends attributed to part quality and reliability.

o No unresolved GIDEP Alert trends exist that have a major impact on the Level 2 products quality or reliability. No GIDEP Alert or NASA Parts Advisory trends exist on the manufacturer or product.

o Available data on manufacturer performance must show consistent on-time delivery of products to NASA projects.

o Qualification to the requirements of the procurement specification must have been successfully completed. Qualification issues and problems from previous qualifications must have been resolved (not by waiver).

4.1.3 Level 3:

Level 3 is the minimum product assurance class assigned to parts listed in this document. Level 3 contains many advanced electronic functions (from a space flight applications standpoint) and has been created to provide a technology insertion path into NASA flight projects. Parts listed are those produced by reputable manufacturers under a recognized quality assurance system (QML, QPL, ISO 9000) or their equivalent. Typically, only a limited amount of information is available to NEPAG for these parts and NASA has minimal visibility into the manufacturing and testing of Level 3 product. The parts are usually available commercially and have the capability to be used in space applications. The intent of Level 3 listings is to provide products that are newer, have greater functionality and enhanced performance characteristics, and provide higher levels of integration. Because the product has little or no heritage in space flight application and data is unavailable or scarce, these parts are considered higher risk than the Level 1 and Level 2 parts. While the price of these parts may be less than the traditional Levels, more engineering evaluation may be needed to qualify the part for the project's application. The overall reliability and cost of ownership should be considered when selecting these parts. The Level 3 criteria is summarized as follows:

The manufacturer has supplied and qualified parts for several NASA space projects within the past 2 years. The parts and manufacturers have been recommended by one of the following NASA programs.

o PSAP o ASAP o ET o AIT

A NASA, DoD, or other space agency procurement specification (e.g. ESA SCC or NASDA QTS) exists. Available data on the manufacturer shows no significant problem trends such as GIDEP Alerts or NASA Parts Advisories, a low DPA rejection rate for the manufacturer's products in general, and no significant failures attributable to product quality and/or reliability.

NEPAG recommends selecting a Level 3 product when a higher Level part does not exist and/or enhanced functionality is required to meet system design requirements. Parts in this Level are not recommended for use in mission critical applications. Selecting these parts may require further engineering evaluation and approval by the project, but some heritage exists. Additionally, having more projects use these parts helps NEPAG acquire the technical data necessary for moving the parts into the higher Levels.

NASA Parts Selection List (NPSL)

NOTE: Unless specifically stated within the parts selection tables of the NPSL, listing of a device technology herein does NOT imply/guarantee Radiation Hardness Assurance (RHA). Applications concerned with a device's ability to tolerate exposure to various forms of space radiation (e.g., total ionizing dose, single event effects, etc.) should be reviewed and have the device assessed by the Program's radiation assurance experts. The following resources may also be consulted for initial guidance:

NASA Goddard Radiation Effects and Analysis

Jet Propulsion Laboratory Radiation Effects

Transistor Types

The following MIL-PRF-19500 transistor types are available for selection:

Type	Description
	LOW POWER
NPN	Transistor, Silicon, 0.3-2.0 W
NPN	Transistor, Silicon, Chopper, High Speed, 0.3 W

NPN	Transistor, Silicon, Matched Pair, 0.5-0.6 W
PNP	Transistor, Silicon, 0.2-1.5 W
PNP	Transistor, Silicon, Chopper, High Speed, 0.4 W
PNP	Transistor, Silicon, Matched Pair, 0.6 W
NPN/PNP	Transistor, Dual, Complementary
	HIGH POWER
NPN	Transistor, Silicon, 5.0-350 W
	Transistor, Silicon, Darlington, 5 - 175 W
PNP	Transistor, Silicon, 14-115 W
PNP	Transistor, Silicon, Darlington, 32 - 85 W
	FIELD EFFECT TRANSISTOR (FET)
N-Channel	Field Effect Transistor (FET), 0.3 - 0.4 W
N-Channel	MOSFET, Power, 1.4 - 150 W
P-Channel	Field Effect Transistor (FET), 0.5 - 4.0 W
P-Channel	MOSFET, Power, 6.25 - 125 W
	RADIO FREQUENCY (RF)
NPN	Transistor, Silicon, 0.2 - 1.0 W
PNP	Transistor, Silicon, 0.2 W
OPTOCOUPLER	Optically Coupled Isolators, < 1.0 W
NASDA-QTS-19500	Transistors

NOTE:

The activity responsible for the MIL-PRF-19500 qualified parts is the Defense Supply Center Columbus (DSCC).

The activity responsible for the QTS-19500A qualified parts is the National Space Development Agency of Japan (NASDA).

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NEPP Program Manager:

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Michael Sampson, NEPAG Manager

Website Comments:

Web Development Team

Last Modified:

August 8, 2001

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NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

Chopper, NPN, High Speed,

P

sub

T

@ T sub A = 25

deg.

C

, 0.

3 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (mA)	V sub CBO(V)	V sub CEO(V)	h sub FE Min/Max	h sub FE I sub C(A)	Level 1	Level 2, 3	Manufacturer

JAN#@2N2432	313	100	100	100	40/120	1.0	S	TXV	NES

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

Chopper, NPN

1. Derate linearly 4.0 mW/deg.C above for T sub A = +25 deg.C

2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

Chopper, PNP,

P sub T @ T sub A = 25 deg.C, 0.4 W

Part Number		Detail Specification MIL-PRF-19500/	I sub C (mA)	V sub CBO (V)		V sub CEO (V)	h sub FE Min/Max	h sub FE I sub C sub (mA)		Level 1	Level 1, 2	Manufacturer
JAN#@2N2945A		382	-100	-25		-20	70/-	-1.0		-	TXV	MC

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

Chopper, PNP

1. Derate linearly 2.3 mW/deg.C above T sub A = +25 deg.C
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

NPN, Darlington, P sub T

@

T sub C =100 deg.C, 5.0 - 175 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO(V)	V sub CEO(V)	V sub EBO(V)	h sub FE Min/Max X1000	h sub FE at Ic (A)	Level 1	Level 2, 3	Manufacturer
JAN#@2N6283	504	20	80	80	7	1.25/18	10	S	TXV	NES
JAN#@2N6284	504	20	100	100	7	1.25/18	10	S	TXV	NES

JAN#@2N6301	539	8	80	80	5	0.75/18	4	S	TXV	NES, STC
JAN#@2N6350	472	5	80	80	12	2/10	5	S	TXV	API, NES, STC
JAN#@2N6351	472	5	150	150	12	1/10	5	S	TXV	API, NES, STC
JAN#@2N6352	472	5	80	80	12	2/10	5	S	TXV	API, NES, STC
JAN#@2N6353	472	5	150	150	12	1/10	5	S	TXV	API, NES, STC
JAN#@2N6384	523	10	60	60	5	1/20	5	S	TXV	NES
JAN#@2N6385	523	10	80	80	5	1/20	5	S	TXV	NES

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

NPN, Darlington

1. For appropriate power derating factor, refer to the detailed part specification.

2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors

PNP, Darlington, P sub T

@

T sub C =100

deg.

C, 32 - 85 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE Min/Max X1000	h sub FE at Ic (A)	Level 1	Level 2, 3	Manufacturer
JAN#@2N6299	540	8	80	80	5	0.75/18	4	S	TXV	NES, STC
JAN#@2N6649	527	10	60	60	5	1/20	5	S	TXV	NES
JAN#@2N6650	527	10	80	80	5	1/20	5	S	TXV	NES

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

PNP, Darlington

1. Derate the /540 parts linearly at 0.428 W/deg.C for T sub C > 0 deg.C

2.0 Derate the /527 parts linearly at 567 mW/deg.C for T sub C > +25 deg.C

3. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

Transistors, DUAL, NPN/PNP

Complementary,

P

sub

T

@ T sub A =100

deg.

C, Each Side 0.3/0.6 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub BEO (V)	h sub FE Min/Max	h sub FE Ic (A)	Level 1	Level 2, 3	Manufacturer
JAN#@2N4854U	421	0.6	60	40	5	100/300	0.15	S	TXV	OTI

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, DUAL, NPN/PNP

Complementary

1. Derate 1.71 mW/deg.C for T sub C > +25 deg.C
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Field Effect Transistor (FET), Silicon

N-Channel, P sub T

@

T sub A =25

deg.

C, 0.3 - 0.4 W

Part Number	Detail Specification MIL-PRF-19500/	I sub G (mA)	V sub DG (V)	V sub DS (V)	V sub GS (V)	Level 1	Level 2, 3	Manufacturer
JAN#@2N3821	375	10	50	50	-50	-	TXV	SDI
JAN#@2N3822	375	10	50	50	-50	-	TXV	SDI
JAN#@2N3823	375	10	30	30	-30	-	TXV	SDI
JAN#@2N4856	385	50	40	40	-40	-	TXV	SDI
JAN#@2N4857	385	50	40	40	-40	-	TXV	SI, SDI
JAN#@2N4858	385	50	40	40	-40	-	TXV	SI, SDI
JAN#@2N4859	385	50	30	30	-30	-	TXV	SI, SDI
JAN#@2N4860	385	50	30	30	-30	-	TXV	SI, SDI
JAN#@2N4861	385	50	30	30	-30	-	TXV	SI, SDI
JAN#@2N5545	430	30	50	50	-50	S	TXV	SI, SDI
JAN#@2N5546	430	30	50	50	-50	S	TXV	SI, SDI
JAN#@2N5547	430	30	50	50	-50	-	TXV	SI, SDI

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Parts Selection
Summary
Type

NASA Parts Selection List (NPSL)

Application Notes

Field Effect Transistor (FET)

N-Channel

1. Refer to detailed part specification for applicable power derating factors.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection
Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Field Effect Transistor (FET),

P-Channel, P sub

T

@

T sub A = 25 deg.C, 0.5 W -

4.0 W

Part Number	Detail Specification MIL-PRF-19500/	I sub G (mA)	V sub DG (V)	V sub DS (V)	V sub GS (V)	Level 1	Level 1, 2	Manufacturer
JAN#@2N5114	476	50	30	30	30	-	TXV	SI, SDI
JAN#@2N5115	476	50	30	30	30	-	TXV	SI, SDI
JAN#@2N5116	476	50	30	30	30	-	TXV	SI, SDI

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Field Effect Transistor (FET)

P-Channel

1. Derate 3.0 mW/deg.C for T sub A > +25 deg.C
2. Symmetrical geometry allows operation of these devices with source/drain leads interchanged.
3. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

NPN, High Power, P sub T

@

T sub c = 100

deg.

C, 5 - 350 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE Min/Max	h sub FE at Ic (A)	Level 1	Level 2, 3	Manufacturer
JAN#@2N2151	277	2	150	100	6.0	40/120	1.0	-	TX	MC
JAN#@2N2814	415	10	120	80	5.5	50/150	1.0	-	TXV	API
JAN#@2N2880	315	5	110	80	8.0	40/120	1.0	S	TXV	API, MC
JAN#@2N3442	370	10	160	140	7.0	20/70	3.0	-	TXV	API
JAN#@2N3585	384	2	500	300	7.0	25/100	1.0	-	TXV	API, NES, STC
JAN#@2N3716	408	10	100	80	7.0	30/120	3.0	-	TXV	NES, STC
JAN#@2N3739	402	3	325	300	6.0	40/200	0.1	-	TXV	NES, STC
JAN#@2N3749	315	5	110	80	8.0	40/120	1.0	S	TXV	API, MC, STC, SDI
JAN#@2N3767	518	4	100	80	6.0	40/160	0.5	-	TXV	NES, STC
JAN#@2N3879	526	7	120	75	8.0	20/180	4.0	-	TXV	MC, NES, STC
JAN#@2N3996	374	5	100	80	8.0	40/120	1.0	S	TXV	API, MC, NES, STC, SDI
JAN#@2N3997	374	5	100	80	8.0	80/240	1.0	S	TXV	API, MC, NES, STC, SDI
JAN#@2N5004	534	5	100	80	6.0	70/200	2.5	S	TXV	MC, SS
JAN#@2N5038	439	20	150	90	7.0	50/200	2.0	S	TXV	MC, NES, SS
JAN#@2N5039	439	20	125	75	7.0	30/150	2.0	S	TXV	MC, NES, SS
JAN#@2N5157	371	3.5	700	500	7.0	30/90	1.0	-	TX	MC, STC, SDI
JAN#@2N5237	394	10	150	120	7.0	40/120	5.0	S	TXV	API, MC, NES, SS, STC
JAN#@2N5238	394	10	200	170	7.0	40/120	5.0	S	TXV	API, MC, NES, SS, STC
JAN#@2N5250	380	50	125	100	10	15/60	40.0	-	TXV	SDI
JAN#@2N5251	380	50	180	150	10	15/60	40.0	-	TXV	SDI
JAN#@2N5302	456	30	60	60	5.0	15/60	15.0	-	TXV	STC
JAN#@2N5303	456	30	80	80	5.0	15/60	10.0	-	TXV	STC
JAN#@2N5660	454	2	250	200	6.0	40/120	0.5	-	TXV	MC, NES, STC, SS
JAN#@2N5664	455	5	250	200	6.0	40/120	1.0	S	TXV	API, MC, NES, SS, STC, SDI
JAN#@2N5665	455	5	400	300	6.0	25/75	1.0	S	TXV	API, MC, NES,SS, STC, SDI
JAN#@2N5666	455	5	250	200	6.0	40/120	0.5	S	TXV	NES, SS, STC, SDI, MC
JAN#@2N5667	455	5	400	300	6.0	40/120	1.0	S	TXV	NES, SS, STC, SDI, MC
JAN#@2N5672	488	30	150	120	7.0	20/100	15	-	TXV	NES
JAN#@2N5685	464	50	60	60	5.0	15/60	25	-	TXV	NES, STC
JAN#@2N5686	464	50	80	80	5.0	15/60	25	-	TXV	NES, STC
JAN#@2N6033	528	40	150	120	8.0	10/50	40	-	TXV	NES
JAN#@2N6249	510	10	300	200	6.0	10/50	10.0	-	TXV	MC, STC
JAN#@2N6250	510	10	375	275	6.0	8/50	10	S	TXV	MC, STC
JAN#@2N6251	510	10	450	350	9.0	6/50	10	S	TXV	MC, STC
JAN#@2N6308	498	8	700	350	8.0	3/-	8.0	-	TXV	SDI
JAN#@2N6338	509	25	120	100	5.0	30/120	10.0	S	TXV	MC, NES, STC
JAN#@2N6546	525	15	-	300	9.0	12/60	1.0	-	TXV	MC, SDI
JAN#@2N6547	525	15	-	400	7.0	10/60	5.0	-	TXV	MC, SDI
JAN#@2N6676	538	15	450	300	7.0	15/40	1.0	-	TXV	NES
JAN#@2N6678	538	15	650	400	6.0	15/40	1.0	-	TXV	NES

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

NPN, High Power

1. Refer to detailed part specification for applicable power derating factors for operation beyond the specified case temperature.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:	GSFC SEU Radiation Data Bank
	JPL's Radiation Data Bank
Manufacturer:	Active Supplier Assessment Program (ASAP) Core Suppliers List
Part Procurement:	Part Number/Procurement details
Application Notes:	Applicable details
Last Update:	March 1998

Transistors, Silicon

PNP, High Power, P sub T

@

T sub C = 100

deg.

C, 14 - 115 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE Min/Max	h sub FE at Ic (A)	Level 1	Level 2, 3	Manufacturer
JAN#@2N3740	441	4	60	60	7.0	30/120	0.25	S	TXV	MC, NES, STC, SDI
JAN#@2N3741	441	4	80	80	7.0	30/100	0.25	S	TXV	MC, NES, STC, SDI
JAN#@2N3792	379	10	80	80	7.0	30/120	3.0	-	TXV	NES
JAN#@2N4399	433	30	60	60	5.0	15/60	15.0	-	TXV	NES
JAN#@2N5005	535	10	100	80	5.5	70/200	2.5	S	TXV	MC, SS
JAN#@2N5683	466	50	60	60	5.0	15/60	25.0	-	TXV	NES
JAN#@2N5684	466	50	80	80	5.0	15/60	25.0	-	TXV	NES
JAN#@2N5745	433	20	80	80	5.0	15/60	10.0	-	TXV	NES
JAN#@2N6211	461	4	80	80	6.0	30/175	1.0	S	TXV	MC, NES
JAN#@2N6212	461	2	350	300	6.0	35/175	1.0	S	TXV	MC, NES

JAN#@2N6213	461	2	400	350	6.0	30/175	1.0	S	TXV	MC, NES
JAN#@2N6438	508	25	140	120	6.0	25/100	10.0	-	TXV	MC

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

PNP, High Power

1. Refer to detailed part specification for applicable ambient or case temperature power derating factors.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

NPN, Low Power, P sub T

@

T sub A = 25

deg.

C, 0.5 - 0.6 W

Matched Pair

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE (Min/ Max)	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N2060	270	0.5	100	60	7	40/120	1.0	-	TXV	MC, NES
JAN#@2N2060L	270	0.5	100	60	7	40/120	1.0	-	TXV	MC, NES
JAN#@2N2919	355	0.03	70	60	6	60/240	0.01	-	TXV	MC, NES
JAN#@2N2919L	355	0.03	70	60	6	60/240	0.01	-	TXV	MC, NES
JAN#@2N2920	355	0.03	70	60	6	175/600	0.01	-	TXV	MC, NES
JAN#@2N2920L	355	0.03	70	60	6	175/600	0.01	-	TXV	MC, NES

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

NPN, Low Power

Matched Pair, 0.5 - 0.6 W

1. Refer to the detailed specification sheet for applicable power derating factors.

2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

Transistors, Silicon
NPN, Low Power, P sub
T
@ T sub A = 25 deg.C, 0.3 - 2 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE (Min/ Max)	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N2219	251	0.8	60	30	5.0	50/325	1.0	S	TXV	MC
JAN#@2N2219A	251	0.8	75	50	6.0	75/325	1.0	S	TXV	MC, NES, SS, STC
JAN#@2N2219AL	251	0.8	75	75	6.0	75/325	1.0	S	TXV	MC, NES, SS, STC
JAN#@2N2222A	255	0.8	75	50	6.0	75/325	1.0	S	TXV	MI, MC, NES OTI, STC,
JAN#@2N2222AU	255	0.80	75	50	6.0	75/325	1.0	S	TXV	MI, OTI, STC, SS
JAN#@2N2369A	317	0.2	40	15	4.5	30/120	30	S	TXV	MC, NES, STC
JAN#@2N2484	376	0.05	60	60	6.0	200/500	1.0	S	TXV	MC, NES
JAN#@2N3019	391	1.0	140	80	7.0	100/300	150	S	TXV	MC, NES, SS
JAN#@2N3019S	391	1.0	140	80	7.0	100/300	150	S	TXV	MC, NES, SS
JAN#@2N3418	393	3.0	85	60	8.0	20/60	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3418S	393	3.0	125	80	8.0	20/60	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3419	393	3.0	125	125	8.0	20/60	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3419S	393	3.0	125	125	8.0	20/60	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3420	393	3.0	85	60	8.0	40/120	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3420S	393	3.0	85	60	8.0	40/120	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3421	393	3.0	125	80	8.0	40/120	1.0	S	TXV	NES, PPC, STC, SDI
JAN#@2N3439	368	1.0	450	350	7.0	40/160	20	S	TXV	NES, PPC, STC,SDI
JAN#@2N3440	368	1.0	300	250	7.0	40/160	20	S	TXV	NES, PPC, STC, SDI
JAN#@2N3501L	366	0.3	150	150	5.0	100/300	150	S	TXV	MC, SS
JAN#@2N3507	349	3.0	80	50	5.0	30/150	1500	-	TXV	SS,STC
JAN#@2N3700	391	1.0	140	80	7.0	100/300	150	S	TXV	MC, NES, SS
JAN#@2N3735	395	1.5	75	40	5.0	40/140	500	-	TXV	MC
JAN#@2N3735L	395	1.5	75	40	5.0	40/140	500	-	TXV	MC
JAN#@2N4150	394	10.0	100	70	7.0	40/120	5000	S	TXV	API, PPC
JAN#@2N4150S	394	10	100	70	7.0	40/120	5000	S	TXV	PPC, NES, SS, STC, SDI
JAN#@2N5237	394	10.0	150	120	7.0	40/120	5000	S	TXV	PPC, NES, SS, STC, SDI
JAN#@2N5237S	394	10	150	120	7.0	40/120	5000	S	TXV	PPC, NES
JAN#@2N5238	394	10	200	170	7.0	40/120	5000	S	TXV	PPC, NES, SS,STC, SDI
JAN#@2N5238S	394	10	200	170	7.0	40/120	5000	S	TXV	PPC, NES
JAN#@2N5339	560	5.0	100	100	6.0	60/240	2000	S	TXV	PPC, NES, SS
JAN#@2N5660	454	2.0	250	200	6.0	40/120	500	-	TXV	PPC, NES, STC, SS
JAN#@2N5662	454	2.0	250	200	6.0	40/120	500	-	TXV	PPC, NES, STC, SS
JAN#@2N5663	454	2.0	250	200	6.0	40/120	500	-	TXV	PPC, NES, STC, SS
JAN#@2N5666	455	5.0	250	200	6.0	40/120	1000	S	TXV	SS, STC, SDI, PPC
JAN#@2N5667	455	5.0	400	300	6.0	25/75	1000	S	TXV	STC, SDI, PPC

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

NPN, Low Power, 0.3 - 2 W

1. Refer to the detailed specification sheet for applicable power derating factors.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

PNP, Low Power, P sub T

@

T sub A = 25

deg.

C, 0.6 W

Matched Pair

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE (Min/ Max)	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N3810	336	0.05	60	60	5	150/450	0.1-1.0	-	TXV	NES, SS

JAN#@2N3810L	336	0.05	60	60	5	150/450	0.1-1.0	-	TXV	NES, SS
JAN#@2N3811	336	0.05	60	60	5	300/900	0.1-1.0	-	TXV	NES, SS
JAN#@2N3811L	336	0.05	60	60	5	300/900	0.1-1.0	-	TXV	NES, SS

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

PNP, Low Power,

Matched Pair

1. Refer to detailed specification sheet for applicable power derating factors.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

PNP, Low Power, P sub

T

@

T sub A = 25
deg.
C, 0.2-1.5 W

Part Number	Detail Specification MIL-PRF-19500/	I sub C (A)	V sub CBO (V)	V sub CEO (V)	V sub EBO (V)	h sub FE (Min/Max)	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N2605	354	0.03	70	60	6.0	100/300	0.01	S	TXV	MC
JAN#@2N2905A	290	0.6	60	60	5.0	100/300	150	S	TXV	STC, SS, MC, NES
JAN#@2N2905AL	290	0.6	60	60	5.0	100/300	150	S	TXV	STC, SS, MC, NES
JAN#@2N2907A	291	0.6	60	60	5.0	100/300	150	S	TXV	MI, MC, NES,OTI, STC, SS
JAN#@2N3251A	323	0.2	60	60	5.0	100/300	10	-	TXV	MC, NES
JAN#@2N3468	348	1.0	50	50	-5.0	25/75	500	-	TXV	MC, SS
JAN#@2N3468L	348	1.0	50	50	-5.0	25/75	500	-	TXV	MC, SS
JAN#@2N3634	357	1.0	140	140	5.0	50/100	50	S	TXV	MC, NES
JAN#@2N3634L	357	1.0	140	140	5.0	50/100	50	S	TXV	MC, NES
JAN#@2N3635	357	1.0	140	140	5.0	100/300	50	S	TXV	NES
JAN#@2N3635L	357	1.0	140	140	5.0	100/300	50	S	TXV	NES
JAN#@2N3636	357	1.0	175	175	5.0	50/150	50	S	TXV	NES
JAN#@2N3636L	357	1.0	175	175	5.0	50/150	50	S	TXV	NES
JAN#@2N3637	357	1.0	175	175	5.0	50/150	50	S	TXV	NES
JAN#@2N3637L	357	1.0	175	175	5.0	100/300	50	S	TXV	NES
JAN#@2N3763	396	1.5	60	60	5.0	40/140	500	-	TXV	MC, NES, SS
JAN#@2N3763L	396	1.5	60	60	5.0	40/140	500	-	TXV	MC, NES, SS
JAN#@2N3764	396	1.5	60	60	5.0	40/140	500	S	TXV	NES, SS
JAN#@2N3765	396	1.5	60	60	5.0	40/140	500	-	TXV	NES, SS
JAN#@2N3867	350	3.0	40	40	4.0	40/200	1500	S	TXV	API, PPC, NES, STC
JAN#@2N3867S	350	3.0	40	40	4.0	40/200	1500	S	TXV	API, PPC, NES, STC
JAN#@2N3868	350	3.0	60	60	4.0	30/150	1500	S	TXV	API, PPC, NES, STC
JAN#@2N3868S	350	3.0	60	60	4.0	40/150	1500	S	TXV	API, PPC, NES, STC
JAN#@2N5415	485	1.0	200	200	6.0	30/120	50	S	TXV	PPC, NES, SDI
JAN#@2N5416	485	1.0	350	300	6.0	30/120	50	S	TXV	PPC, NES, SDI
JAN#@2N5416S	485	1.0	350	300	6.0	30/120	50	S	TXV	PPC, NES, SDI

NPSL Home Page
Parts Selection
Summary
Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon
PNP, Low Power, 0.2 - 1.5 W

1. Refer to detailed specification sheet for applicable power derating factors.

2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

3. The leaded package (case) is designated for transistors which are available in leaded and unleaded (U designation) configurations. Refer to the detailed specification for surface mount (unleaded) package outlines.

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Optocoupler

LED/PhotoTransistor,

P sub T @ T sub A = 25

deg.

C, <1.0 W

Part Number	Detail Specification MIL-PRF-19500/	I sub F (mA)	I sub P (A)	V sub F atI sub F V sub dc	V sub F atI sub F mA	V sub CBO (V)	V sub EBO (V)	V sub CEO (V)	Level 1	Level 2, 3	Ma
JAN#@4N22	486	40	1	1.3	10	35	4	35	S	TXV	MI
JAN#@4N23	486	40	1	1.3	10	35	4	35	S	TXV	MI
JAN#@4N23A	486	40	1	1.3	10	35	4	35	S	TXV	MI
JAN#@4N24	486	40	1	1.3	10	35	4	35	S	TXV	MI
JAN#@4N24A	486	40	1	1.3	10	35	4	35	S	TXV	MI
JAN#@4N47	548	40	1	1.3	10	45	7	40	S	TXV	MI
JAN#@4N48	548	40	1	1.3	10	45	7	40	S	TXV	MI
JAN#@4N49	548	40	1	1.3	10	45	7	40	S	TXV	MI

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Optocoupler

LED/Phototransistor

1. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A.

2. These optocouplers are sensitive to proton radiation damage. Use appropriate derating factors (typically a factor of five or more for current transfer ratio) when the using the 4N49 to ensure that proton damage is minimized for use in the space environment.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

MOSFET, N-Channel

Power, P sub

T

@

T sub c = 25

deg.

C, 1.4 - 150 W

Part Number	Detail Specification MIL-PRF-19500/	I sub D (A) T sub c=25deg. C	V sub DS (V sub dc)	V sub GS (V sub dc)	r sub DS (on) (Ohm) V sub GS=10V	Level 1	Level 2, 3	Manufacturer
JAN#@2N6660	547	0.99	60	+/-20	3.0	-	TXV	SI
JAN#@2N6661	547	0.86	90	+/-20	4.0	-	TXV	SI
JAN#@2N6756	542	14.0	100	+/-20	0.18	-	TXV	HSC, IRC

JAN#@2N6758	542	9.0	200	+/-20	0.4	-	TXV	HSC, IRC
JAN#@2N6760	542	5.5	400	+/-20	1.0	-	TXV	HSC, IRC
JAN#@2N6762	542	4.5	500	+/-20	1.5	-	TXV	HSC, IRC
JAN#@2N6764	543	38.0	100	+/-20	0.055	-	TXV	HSC, IRC
JAN#@2N6766	543	30.0	200	+/-20	0.085	-	TXV	HSC, IRC
JAN#@2N6768	543	14.0	400	+/-20	0.30	-	TXV	HSC, IRC
JAN#@2N6770	543	12.0	500	+/-20	0.40	-	TXV	HSC, IRC
JAN#@2N6782	556	3.50	100	+/-10	0.6	-	TXV	HSC, IRC
JAN#@2N6784	556	2.25	200	+/-20	1.5	-	TXV	HSC, IRC
JAN#@2N6786	556	1.25	400	+/-20	3.6	-	TXV	HSC, IRC
JAN#@2N6788	555	6.0	100	+/-20	0.30	-	TXV	HSC, IRC
JAN#@2N6790	555	3.5	200	+/-20	0.80	-	TXV	HSC, IRC
JAN#@2N6792	555	2.0	400	+/-20	1.80	-	TXV	HSC, IRC
JAN#@2N6794	555	1.5	500	+/-20	3.0	-	TXV	HSC, IRC
JAN#@2N6796	557	8.0	100	+/-20	0.18	-	TXV	HSC, IRC
JAN#@2N6798	557	5.5	200	+/-20	0.4	-	TXV	HSC, IRC
JAN#@2N6800	557	3.0	400	+/-20	1.0	-	TXV	HSC, IRC
JAN#@2N6802	557	2.5	500	+/-20	1.5	-	TXV	HSC, IRC
JAN#@2N6901	570	1`.69	100	+/-10	1.4	-	TXV	HSC
JAN#@2N6902	566	12	100	+/-10	0.20	-	TXV	HSC
JAN#@2N6903	570	0.98	200	+/-20	3.65	-	TXV	HSC
JAN#@2N6904	566	8.0	200	+/-10	0.65	-	TXV	HSC
JAN#@2N7218U	596	28.0	100	+/-20	0.077	S	TXV	IRC
JAN#@2N7219U	596	18.0	200	+/-20	0.18	S	TXV	IRC
JAN#@2N7221U	596	10.0	400	+/-20	0.55	S	TXV	IRC
JAN#@2N7222U	596	8.0	500	+/-20	0.85	S	TXV	IRC
JAN#@2N7224U	592	34.0	100	+/-20	0.07	S	TXV	HSC
JAN#@2N7225	592	27.0	200	+/-20	0.10	-	TXV	HSC, IRC
JAN#@2N7227	592	14.0	400	+/-20	0.315	-	TXV	APT, IRC, HSC
JAN#@2N7228U	592	12.0	500	+/-20	0.415	S	TXV	APT, IRC, HSC
JAN#@2N7261	601	8.0	100	+/-20	0.18	S	TXV	IRC
JAN#@2N7262	601	5.5	200	+/-20	0.4	S	TXV	IRC
JAN#@2N7268	603	34.0	100	+/-20	0.065	S	TXV	IRC
JAN#@2N7269	603	26.0	200	+/-20	0.100	S	TXV	IRC

NPSL Home Page

Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

MOSFET, N-Channel

Power

1. Refer to the detailed part specification for applicable power derating factors.

2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

3. For transistors which are available in leaded and unleaded (U designation) configurations, the leaded package (case) is designated. Refer to the detail specification for surface mount (unleaded) package outlines.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

MOSFET, P-Channel

Power, P sub

T

@

T sub c = 25

deg.

C, 6.25 - 125 W

Part Number	Detail Specification MIL-PRF-19500/	I sub D (A) T sub c = 25deg. C	V sub DS (V sub dc)	V sub GS (V sub dc)	r sub DS (on) (Ohm) V sub GS=10V	Level 1	Level 2, 3	Manufacturer
JAN#@2N6804	562	1.25	400	+/-20	3.6	-	TXV	HSC
JAN#@2N6806	562	6.0	100	+/-20	0.30	-	TXV	HSC
JAN#@2N6845	563	0.86	90	+/-20	4.0	-	TXV	IRC
JAN#@2N6847	563	1`.69	100	+/-10	1.4	-	TXV	IRC
JAN#@2N6849	564	0.98	200	+/-20	3.65	-	TXV	HSC, IRC
JAN#@2N6851	564	3.50	100	+/-10	0.6	-	TXV	HSC, IRC
JAN#@2N6895	565	0.99	60	+/-20	3.0	-	TXV	HSC
JAN#@2N6896	565	2.25	200	+/-20	1.5	-	TXV	HSC
JAN#@2N6897	565	3.5	200	+/-20	0.80	-	TXV	HSC

JAN#@2N6898	565	25	100	+/-20	0.2	-	TXV	HSC
JAN#@2N7236	595	-11	-100	+/-20	0.2	S	TXV	IRC
JAN#@2N7236U	595	-14	-100	+/-20	0.2	S	TXV	IRC
JAN#@2N7237	595	-11	-200	+/-20	0.51	S	TXV	IRC
JAN#@2N7237U	595	-8	-200	+/-20	0.51	S	TXV	IRC

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

MOSFET, P-Channel

Power

1. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

2. For transistors which are available in leaded and unleaded (U designation) configurations, the lesded package (case) is designated. Refer to the detail specification for surface mount (unleaded) package outlines.

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Parts Selection

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NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

RF, NPN, P sub T

@

T sub c = 25

deg.

C, 0.2 - 1.0 W

Part Number	Detail Specification MIL-PRF-19500/	F (Mhz)	I sub C (A)	V sub CBO (V)	V sub CEO (V)	h sub FE Min/ Max	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N918	301	100	0.05	30	15	20/200	3.0	S	TXV	MC, SS
JAN#@2N2857	343	450	0.04	30	15	30/150	3.0	S	TXV	M/A, SS
JAN#@2N3866A	398	400	0.04	60	30	25/200	50.0	S	TXV	MC, SS
JAN#@2N5109	453	200	0.04	40	20	40/120	50.0	S	TXV	MC, SS

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

RF, NPN

1. Derate 2N918 linearly at 1.71 mW/deg.C for T sub C > +25 deg.C. Refer to the detailed specification regarding derating factor for other parts listed herein.
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Radiation Test:

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

Manufacturer:

Active Supplier Assessment Program (ASAP) Core Suppliers List

Part Procurement:

Part Number/Procurement details

Application Notes:

Applicable details

Last Update:

March 1998

Transistors, Silicon

RF, PNP, P sub

T

@

T sub A = 25

deg.

C, 0.2 W

Part Number	Detail Specification MIL-PRF-19500/	F (Mhz)	I sub C (A)	V sub CBO (V)	V sub CEO (V)	h sub FE (Min/Max)	h sub FE at Ic (mA)	Level 1	Level 2, 3	Manufacturer
JAN#@2N4957	426	450	0.03	30	30	30/165	5.0	-	TXV	SS

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Parts Selection

Summary

Type

NASA Parts Selection List (NPSL)

Application Notes

Transistors, Silicon

RF, PNP, P sub

T

@

T sub A = +25

deg.

C, 0.2 W

1. Derate at 1.14 mW/deg.C for operation above T sub A = +25 deg.C
2. All JANTXV transistors must be PIND tested in accordance with MIL-STD-750, Method 2052, Condition A. Additional testing is not required when procured directly from the manufacturer with PIND testing in accordance with MIL-PRF-19500.

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Parts Selection

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NASA Parts Selection List (NPSL)

TRANSISTORS

MIL-PRF-19500

Part Number Explanation

Example: JAN#@2N2369AR where,

JAN	Joint Army and Navy (JAN) Military Part Designator
#	Quality Level (JAN, JANTX, JANTXV, JANS and JANFS)
@	Indicates Radiation Hardness Assurance (RHA) Level
2N	Component designator for Transistors
2369	Identification Number
AR	Suffix Letters

Quality Level, (#)

S	Highest Quality level 1
TXV	Level 2, 3

Radiation Hardness Assurance Level, (@)

RHA Designator	Total Ionizing Dose (RAD (Si))	Neutron Fluence (N/cm**2)
M	3 x 10**3	2 x 10**12
D	1 x 10**4	2 x 10**12
L	5 x 10**4	2 x 10**12
R	1 x 10**5	2 x 10**12
F	3 x 10**5	2 x 10**12
G	6 x 10**5	2 x 10**12
H	1 x 10**6	2 x 10**12

NOTE: Unless specifically stated within the parts selection tables of the NPSL, listing of a device technology herein does NOT imply/guarantee Radiation Hardness Assurance (RHA). Applications concerned with a device's ability to tolerate exposure to various forms of space radiation (e.g., total ionizing dose, single event effects, etc.) should be reviewed and have the device assessed by the Program's radiation assurance experts. The following resources may also be consulted for initial guidance:

NASA Goddard Radiation Effects and Analysis

Jet Propulsion Laboratory Radiation Effects

Suffix letters

A, B, C, etc	Indicates a modified version that is substitutable for the basic part number (non-suffix) device
M	Indicates matching of specified parameters of separate devices
R	Indicates reverse polarity packaging of the basic part number device
L or S	Indicates that the terminal leads are longer or shorter, respectively than those of the basic part number device
U	Indicates leaded or surface mounted devices
UR	Indicates leaded or surface mounted (round end cap diodes)
US	Indicates leaded or surface mounted (square end cap diodes)
-1	Indicates metallurgical bond

NPSL Parts Selection List (NPSL)

Transistor Manufacturer Listing

Click

here

for additional information regarding parts technologies offered by these manufacturers listed in the Active Supplier Assessment Program (ASAP) Core Suppliers List.

Listed below are links to manufacturer data sites that may provide additional part related information. The linked sites are not under the control of NPSL and NASA is not responsible for information contained in the linked site. These links are provided for your convenience only.

APT
Advanced Power Technology
405 Southwest Columbia Street
Bend, OR 97702-1000
Cage Code: ODY74
Phone No: 541.382.8028 x1181

API
API Electronics, Inc.
375 Rabro Drive
Hauppage, NY 11788-4227
Cage Code: 52333, 30045
Phone No: 516.582.6767

HSC
Harris Semiconductor
Route 202
Somerville, NJ 08876-9999
Cage Code: 18722
Phone No: 717.474.3252

IRC
International Rectifier Corporation
Semiconductor Division
233 Kansas Street
El Segundo, CA 90245-4382
Cage Code: 59993
Phone No: 310.607.8883

M/A
M/A-COM, Inc.
1011 Pawtucket Blvd.

P.O.Box 3295
Lowell, MA 01853-3295
Cage Code: 96341
Phone No: 617.564.3038
MI
Micropac Industries, Inc.
P.O.Box 469017
Garland, TX 75046-9017
Cage Code: 31757
Phone No: 214.272.3571 x274
MC
Microsemi Corporation - Watertown Division
580 Pleasant Street
Watertown, MA 02172-2497
Cage Code: 12969
Phone No: 617.926.0404
MC-PPC
Division of Microsemi Corp.
7516 Central Indusytrial Drive
Riviera Beach, FL 33404-3499
Cage Code: 33178
Phone No: 561.848.9606
NES
New England Semiconductor
6 Lake Street
Lawrence, MA 01841-3011
Cage Code: 43611
Phone No: 978.794.7557
OTI
Optek Technology, Inc.
1215 West Crosby Road
Carrollton, TX 75006-6989
Cage Code: 32694
Phone No: 214.323.2272
SS
Semicoa Semiconductors
333 McCormick Avenue
Costa Mesa, CA
Cage Code: 34156
Phone No: 714.979.1900

SI
Siliconix, Inc.
2201 Laurelwood Road
Santa Clara, CA 95054-1593
Cage Code: 17856
Phone No: 408.970.3957
STC (site not available)
Silicon Transistor Corporation
27 Katrina Road
Chelmsford, MA 01824-2842
Cage Code: 07256
Phone No: 978-256-3321
SDI
Solitron Devices, Inc.
3301 Electronics Way
West Palm Beach, FL 33407-4636
Cage Code: 21845
Phone No: 561.848.4311 Xt 220

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Active Parts Core Suppliers List (CSL)

The Active Parts Core Suppliers Listing (CSL) is a listing of manufacturers who are considered preferred suppliers of monolithic microcircuits, hybrid microcircuits, transistors or diodes by NASA. The CSL consists of two parts:

Core Suppliers List Part I

Introduction Section I - Microcircuits Section II - Hybrids Section III - Diodes Section IV - Transistors

Core Suppliers List Part II

Japanese Space Agency (NASDA) Listings European Space Agency (ESA) Listings

NOTE: A Portable Document Format (PDF) reader will be needed to view the CSL files on this page. A PDF reader, along with installation instructions, can be obtained free from Adobe Systems Incorporated.

Part I follows, and includes only those suppliers who satisfy the following criteria:

Are listed in QML-38535 (Qualified Manufacturers List of Advanced Microcircuits Qualified Under Military Specification MIL-PRF-38535?), QML-38534 (?Qualified Manufacturers List of Custom Hybrid Microcircuits Qualified under Military Specification List of Custom Hybrid Microcircuits Qualified under Military Specification MIL-H-38534?) or QPL-19500 (?Qualified Products List of Products Qualified under Military Specification MIL-S-19500) Offer one or more products which are currently listed in either MIL-STD-975 or the GSFC PPL Offer QML/QPL products to quality assurance levels which are considered suitable for spaceflight use Have established a history of providing high reliability parts to NASA.

The CSL, Part II, includes active part suppliers, who are not necessarily QML/QPL-certified, but who satisfy the following criteria:

Manufacturers parts on DESC certified and qualified lines Have compiled a satisfactory history of supplying high reliability parts which are currently procured through contractor (or OEM) SCDs Manufacture parts to NASA specifications Are certified and qualified by ESA/NASDA to provide parts to ESA/SCC or NASDA specifications)

The CSL is intended to assist NASA project management, parts/reliability engineers and designers in avoiding EEE part reliability/mission schedule problems which can result when parts are procured from unproven suppliers or suppliers who show recent trends indicative of unsatisfactory performance.

For each manufacturer listed in the CSL, Part I, herein, there is accompanying information related to the processing technologies and product lines for which the manufacturer is considered a core supplier and the name/phone number of a company representative to whom questions may be directed.

The information described in this report was obtained from NASA GSFC Preferred Parts List (PPL-21), NASA Standard Electrical, Electronic and Electromechanical parts list (MIL-STD-975), Qualified Manufacturers List for Monolithic Microcircuits (QML-38535), Qualified Manufacturers list for Custom Hybrid Microcircuits (QML- 38534), and Qualified Products List for Diodes and Transistors (QPL-19500).

For convenience, the listings have been grouped by part commodity. Introductory remarks for each section provide an explanation of the information contained therein. Please note that the manufacturer's listing and the accompanying information are considered accurate at the time of issue of this document. However, the semiconductor industry is one known for rapid change of technology and development including fabrication processes and assembly locations. As a result, the listings are subject to change without notice; revisions or amendments will be issued, as necessary.

For additional information regarding this Core Suppliers Listing, please contact:

Ashok Sharma NASA Goddard Space Flight Center Greenbelt, Maryland 20771 Attn: Ashok Sharma (Active Parts Specialist Code 562) (301) 286-6165 (301) 286-1695 (fax)

Appendix A Derating Criteria

Under Construction.

Appendix B Additional Parts Information Links

Listed below are some useful Links to other data sites that can be used in obtaining additional part related information:

NASA Parts and Packaging Program (NPPP)

Site managed by the Jet Propulsion Laboratory (JPL) -- This Site Contains Electronic Parts Reliability Information Studies of Emerging Microelectronics Technologies Radiation Effects Information JPL's Electronic Parts Information Network System (EPINS)

Electronic Parts Information Management System (EPIMS) User ID/Password Controlled -- This Site Contains GIDEP Alerts GSFC Parts Analysis Web System (PAWS) NASA Parts Advisories NASA Project Parts Lists Nonstandard Part Approval Requests Manufacturer CAGE code/address look up

GSFC SEU Radiation Data Bank

JPL's Radiation Data Bank

GSFC Procurement Specifications

Appendix C Prohibited Materials Section

The following section of the NASA Parts Selection List (NPSL) has been developed to identify materials often used in the manufacture and assembly of EEE parts that shall be prohibited from use in high reliability NASA electronic systems and flight hardware. Users are strongly urged to familiarize themselves with these issues to minimize the risk of introducing potential problems. In addition to the issues noted in this section, each commodity section within the NPSL has application notes that are unique to the commodity. Therefore, users should also review the application notes contained in each commodity section.

1. Pure Tin Plating 2. Cadmium Plating 3. Zinc Plating

Pure Tin Plating Prohibition

Policy:

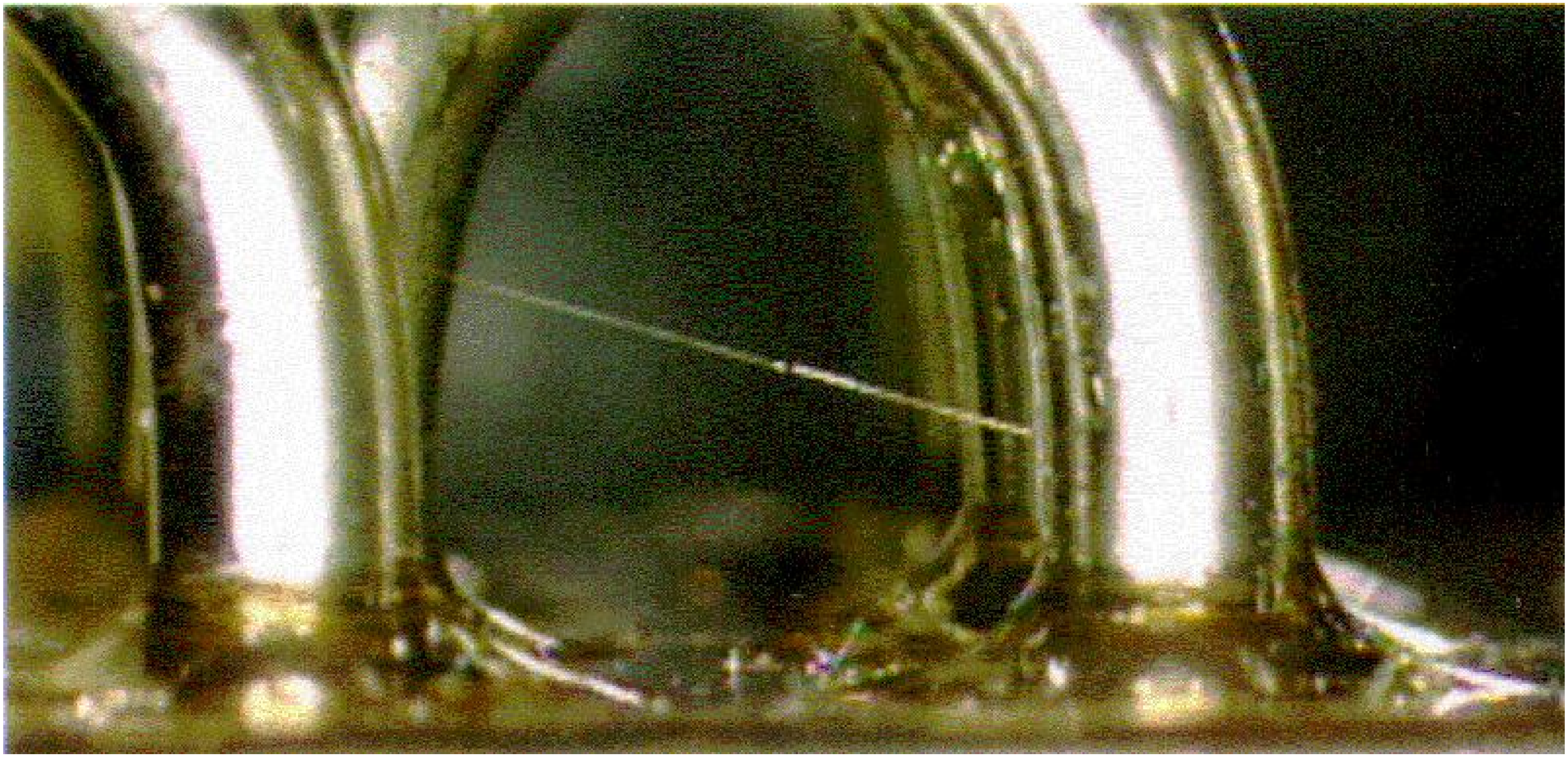
Pure tin plating is prohibited as a final finish on EEE parts and associated hardware

Reference:

NASA Advisory NA-044 October 23, 1998 NASA Advisory NA-044A December 17, 1998 NASA GSFC Tin Whisker Homepage

Rationale:

Pure tin finishes are susceptible to the spontaneous growth of electrically conductive single crystal structures known as tin whiskers. Over time these whiskers may grow to be several millimeters (mm) long. Tin whiskers are capable of causing electrical failures ranging from parametric deviations to sustained plasma arcing (in vacuum) that can result in catastrophic short circuits.



An Example of a Tin Whisker

Several instances have been reported where tin whiskers have caused system failures in both earth and space-based applications including at least 3 reports where a tin whisker induced short circuit resulted in complete failure of the commercial satellite.

The general risks fall into four categories:

Stable short circuits in low voltage, high impedance circuits.In such circuits there may be insufficient current available to fuse the whisker open and a stable short circuit results. Depending on the diameter and length of the whisker, it can take more than 50 milliamps (mA) to fuse one open. More typical is ~10mA Transient short circuits. At atmospheric pressure, if the available current exceeds the fusing current of the whisker, the circuit may only experience a transient glitch as the whisker fuses open. Plasma arcing in vacuum.In vacuum a much more destructive phenomenon can occur. If currents of above a few amps are available, the whisker will fuse open but the vaporized tin may initiate a plasma that can conduct over 200 amps. An adequate supply of tin from the plated surface is necessary to sustain the arc. This phenomenon is reported to have occurred on several commercial satellites resulting in blown fuses that rendered the spacecraft non-operational. Debris/Contamination.Whiskers or parts of whiskers may break loose and bridge isolated conductors or interfere with optical surfaces

Recommendations:

At this time, the only sure way of avoiding tin whiskers is not to use parts plated with pure tin. Despite procurement specification requirements that prohibit pure tin, errors sometimes occur resulting in pure tin plated components being delivered. Therefore, users are advised to independently test and analyze the plating composition of the products received as a verification that pure tin plating is not in use. Simple visual inspection is generally not sufficient because pure tin plating may appear similar to other plated finishes such as tin/lead or nickel.

Utilization of procurement specifications that have clear restrictions against the use of pure tin plating is still recommended. Most, but not all, of the commonly used military specifications currently have prohibitions against pure tin plating. Studies have shown that alloying tin with a second metal reduces the propensity for whisker growth. Alloys of tin and lead are acceptable where the alloy contains a minimum of 3% lead by weight.

In the event pure tin plated parts cannot be avoided, there are some additional processing techniques that may be used to reduce but not eliminate the risks associated with tin whiskers. The effectiveness of these approaches is variable and most require further evaluation to determine their suitability for long duration missions. Examples of these approaches include:

Solder dipping pure tin plated terminations and leads using a leaded solder. The effectiveness of this approach at covering all pure tin plated surfaces can be variable. Application of conformal coat material to pure tin plated surfaces. Conformal coat appears to reduce the growth rate of tin whiskers, but whiskers are still capable of growing through some conformal coat materials such as polyurethanes. For some device types manufacturers may be willing to replate surfaces using finishes such as tin/lead or nickel which are substantially less prone to whisker formation.

Cadmium Plating Prohibition

Policy:

Cadmium plating is prohibited on EEE parts and associated hardware. In some applications use of Cadmium plating may be acceptable via a Project approved waiver process that includes review and approval by both Materials and Parts Engineering disciplines.

Reference:

MSFC-HDBK-527, Materials Selection List for Space Hardware Systems JSC 11123, Space Transportation System Payload Safety Guidelines Handbook

Rationale:

There are several reasons for prohibiting the use of Cadmium plating in space flight electronic systems.

Cadmium is known to sublimate in a hard vacuum environment (especially at temperatures above 75°C). The sublimation products, which are conductive, can redeposit resulting in short circuits. The sublimation products may also interfere with sensitive optics. Cadmium is a toxic material that should not be used in manned spaceflight applications Cadmium is subject to the spontaneous growth of Cadmium whiskers. The propensity of Cadmium to grow whiskers appears to be lower than that of zinc and especially tin. Cadmium whiskers (like tin whiskers) grow spontaneously and are capable of causing electrical failures ranging from parametric deviations to sustained plasma arcing that can result in catastrophic short circuits. See prohibition against pure tin plating for additional insight regarding the risks of metal whiskers.

Recommendations:

Cadmium plating is commonly used on connectors, connector hardware and mechanical hardware such as fasteners. It provides excellent resistance to salt corrosion and is therefore offered in many military specifications predominantly for use in naval applications. However, most NASA applications are not concerned with salt corrosion and the risks associated with use of Cadmium plating noted above outweigh the benefits of its use in spaceflight applications. There are several alternatives to Cadmium plating that are suited for spaceflight use. For connectors, electroless nickel plating is preferred. Gold plating is preferred when the application requires additional shielding effectiveness or low residual magnetism. Passivated stainless steel is the preferred material for hardware items such as fasteners. Consult your materials or parts specialists for suggested alternatives to Cadmium plating.

Zinc Plating Prohibition

Policy:

Zinc plating is prohibited on EEE parts and associated hardware. In some applications use of Zinc plating may be acceptable via a Project approved waiver process that includes review and approval by both Materials and Parts Engineering disciplines.

Reference: NA

Rationale:

There are several reasons for prohibiting the use of Zinc plating in space flight electronic systems.

Zinc is known to sublimate in a vacuum environment (especially at elevated temperatures). The sublimation products are conductive and can result in short circuits. Zinc is subject to the spontaneous growth of Zinc whiskers. Zinc whiskers (like tin whiskers) grow spontaneously and are capable of causing electrical failures ranging from parametric deviations to sustained plasma arcing that can result in catastrophic short circuits. See prohibition against pure tin plating for additional insight regarding the risks of metal whiskers

Recommendations:

Zinc (galvanized) plating is occasionally used on mechanical hardware such as fasteners for its corrosion resistant properties. By using alternative plating materials most NASA applications can avoid the risks associated with the use of Zinc plating while still achieving suitable corrosion resistance. Consult your materials or parts specialists for suggested alternatives to Zinc plating.