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MIL-PRF-19500 Appendix J Task GroupStatus for NEPP ETW

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June 14, 2021

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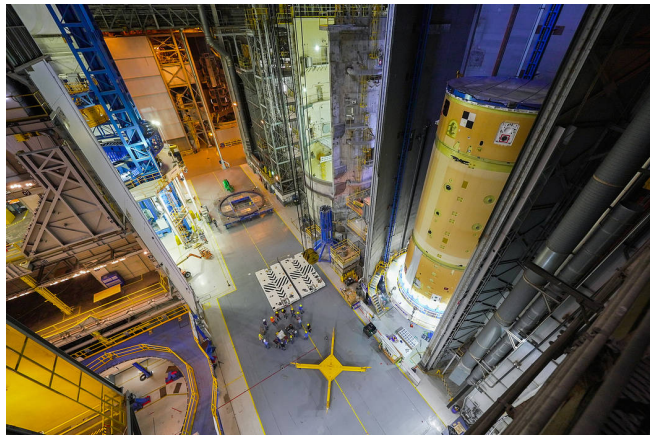
Marshall Space Flight Center (MSFC)

Orion Assembly
Photo courtesy of NASA

Charter: Space Launch, Propulsion, Exploration Systems, Materials and Manufacturing, Scientific Research Photo courtesy of NASA

3D printed packaging hardware ES33 task
Photo courtesy of NASA

Long Duration RS-25 Main Engines test
Photo courtesy of NASA



Two Major Artemis II Core Stage Structures
Photo courtesy of NASA

Marshall Space Flight Center (MSFC)

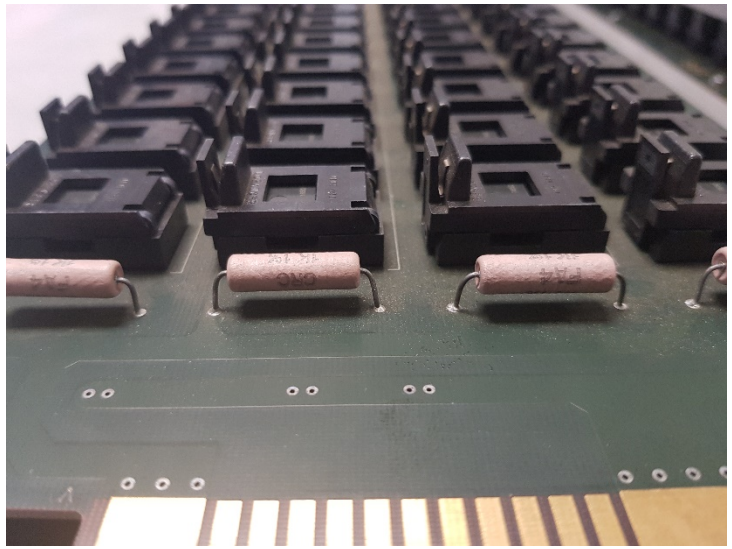
Next Generation pad abort demonstration
Photo courtesy of NASA

NASA Human Exploration Rover Challenge Photo courtesy of NASA

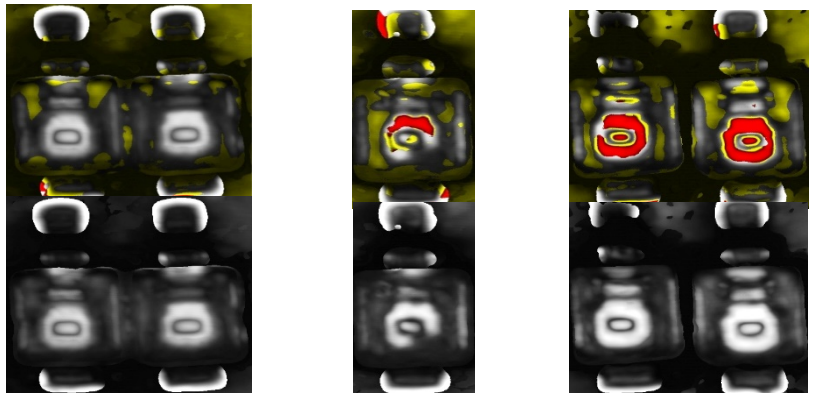
ES33 Printed Circuit Board Assembly for experiments and flight hardware
Photo courtesy of NASA

Payload Operations Center for
ISS Experiments
Photo courtesy of NASA

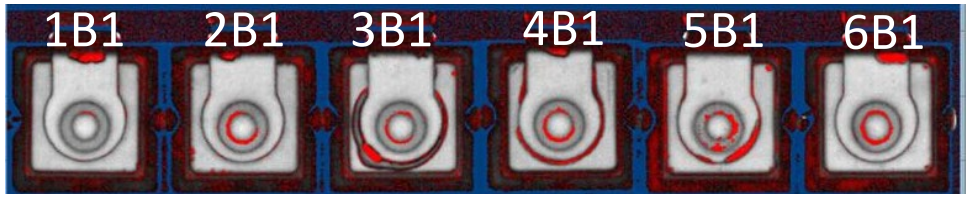
Microchip Technologies



Burn-in board for plastic encapsulated discrete semiconductors
Photo courtesy of Microchip Technologies



Acoustic microscopy images of plastic encapsulated discrete semiconductors
Photos courtesy of Microchip Technologies

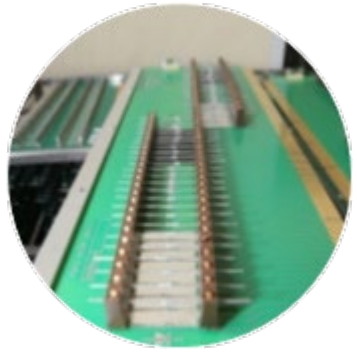


Microchip Technologies

Screening area for discrete semiconductors
Photo courtesy of Microchip Technologies

Burn-in/ Life test area for discrete semiconductors
Photo courtesy of Microchip Technologies

High temperature reverse bias burn in area for discrete semiconductors
Photo courtesy of Microchip Technologies



Burn-in board for discrete semiconductors
Photo courtesy of Microchip Technologies

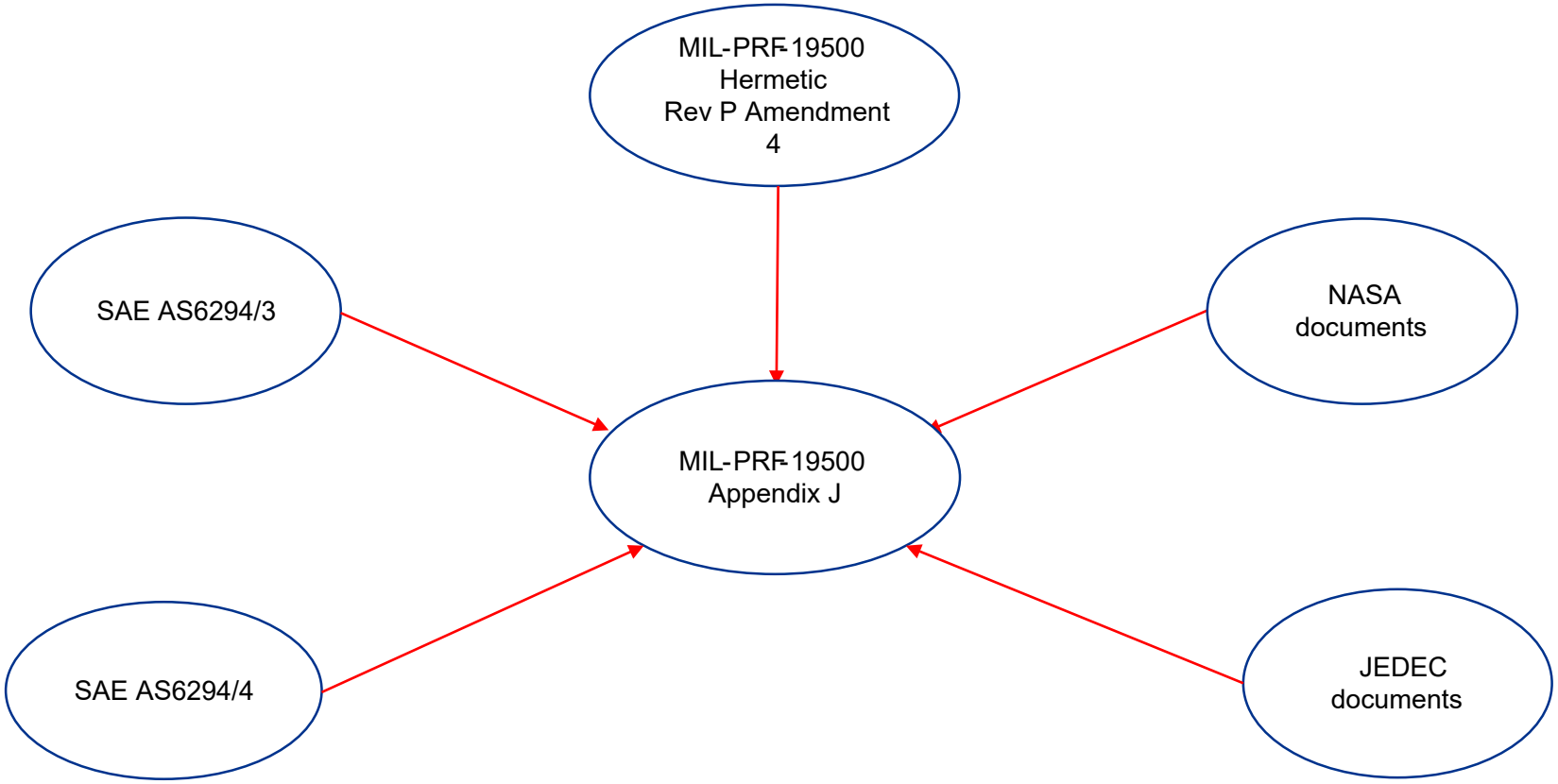
MIL-PRF-19500 Appendix J Task Group

- The Appendix J Task group was started to address the need for military grade PEDs in Department of Defense programs. Some department of defense programs use plastic encapsulated versions of military discrete semiconductors and have to screen each lot of procured devices prior to usage in their programs. The goal of this effort is to enable the user community to have access to a military qualified plastic encapsulated discrete semiconductor available and eventually have a space qualified plastic encapsulated device.
- There are several concerns with commercial off the shelf PEDs
  - No control over device changes – the military and space user community have no control or oversight into device design changes made by the device manufacturer.
  - Parts Obsolescence – Life cycle for commercial off the shelf PEDs is technology dependent and varies from manufacturer to manufacturer and by part number; whereas many military grade devices have been manufactured for decades and continue to be manufactured

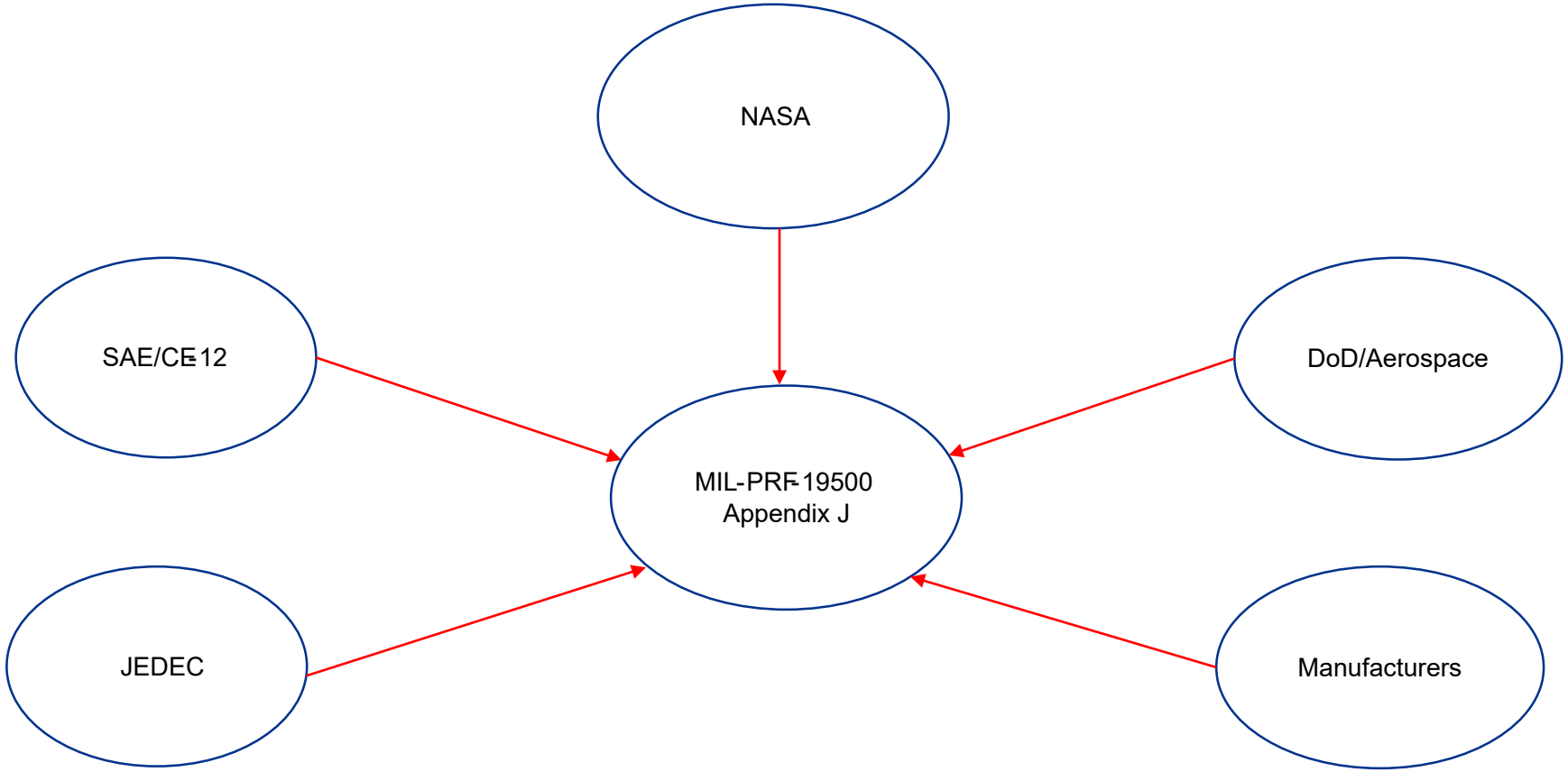
MIL-PRF-19500 Appendix J Task Group

- Lower operating temperature range – commercial off the shelf devices typically have a lower operating temperature range than comparable military grade. For example a military grade 2N2222 transistor operating temperature range is -65C to +200C, while the commercial version operating temperature range is -55C to +150C.
- Costly screening and qualification testing required for each lot of commercial off the shelf PEDs utilized because there is no guarantee that the device design won't change between procurements of the same part number.
- Traceability, traceability…. Traceability is required for military and space qualified products.

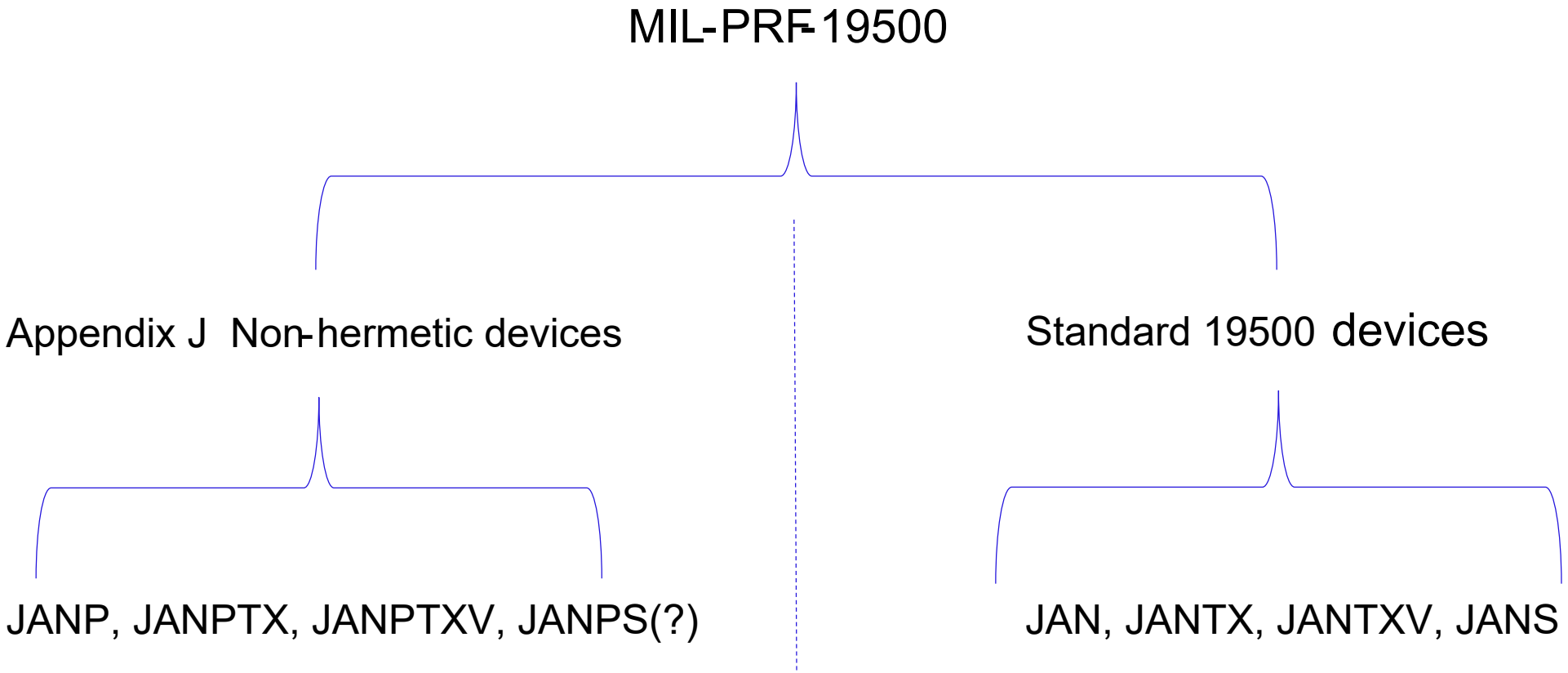
MIL-PRF-19500 Appendix J Sources



MIL-PRF-19500 Appendix J Stakeholders



MIL-PRF-19500 Expanding to include Non-hermetic



MIL-PRF-19500 Draft Revision R Includes Non-hermetic

NOTE: This draft, dated 19 April 2021prepared by DLA – CC, has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL.
(Project 5961-2020-095)
COMMENTS ARE DUE BY 11 May 2021.
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INCH-POUND
MIL-PRF-19500R
DRAFT
SUPERSEDING
MIL-PRF-19500P
w/AMENDMENT 4
18 May 2018

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICES, GENERAL SPECIFICATION FOR

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990 or emailed to semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

Appendix J

Because the entire appendix J is a new proposed addition no highlighting will be used in this appendix for the initial draft.

J.1 SCOPE

J.1.1 Scope. This appendix contains the verification system for non-hermetic semiconductor devices (hereafter referred to as 'devices'), when performed in its entirety, assures that the product will meet the performance requirements. This appendix contains details of the screening and conformance inspection procedures. (See tables J-1 through J-VI.) In order to supply non-hermetic JANP devices to this appendix a manufacturer needs to first be DLA certified and qualified for hermetic devices in accordance with appendix C or D and perform all of the required screening and quality conformance testing specified herein and in accordance with 3.2.1.1. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

Non-hermetic packages are packages that do not contain a cavity and are molded such that the entire die is encapsulated by an epoxy thermoset molding compound. The requirements for this type of package are defined in the following paragraphs.

J.2 APPLICABLE DOCUMENTS

J.2.1 General. The documents listed in this section are specified in sections J.3, J.4 and J.5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they shall meet all specified requirements of documents cited in sections J.3, J.4 and J.5 of this specification, whether or not they are listed.

J.2.1.1 Government documents

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883, Method 5011 Evaluation and Acceptance of Procedures for Polymeric Materials

(copies of these documents are available online at https://quicksearch.dla.mil.)

J.2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

NCSL INTERNATIONAL (NCSL)

NCSL Z540.3 — Requirements for the Calibration of Measuring and Test Equipment.

(Copies of this document can be obtained online at URL http://www.ncsli.org.)
International Organization for Standardization (ISO)

MIL-PRF-19500 Appendix J Status

- DLA Land and Maritime released the second draft of MIL-PRF-19500 Revision R with Appendix J incorporated on April 19, 2021. Comments were due to DLA on May 19, 2021.
- A proposed slash sheet for a non-hermetic 1500 Watt Transient Voltage Suppressor has been submitted to DLA Land and Maritime to be qualified per the new appendix.
- Proposed Part Identifying Number nomenclature is JANPTX1Nxxxx and JANPTXV1Nxxxx, JANPTX2Nxxxx.
- Webex was held on May 4 , 2021 to discuss 2nd draft change comments.

- Next step – dating MIL-PRF-19500 revision R with appendix J incorporated!

MIL-PRF-19500 R Second Draft Appendix J Comments

- Questions involved TM5011 and a type of construction that involves using a glass diode inside a plastic encapsulant.
- Does the TM5011 still apply to this encapsulant over glass diode construction? Believe that it still would but don't know if it might require a different set of conditions.
- Would an encapsulant over glass construction still need all of the sequential testing?
- Would an encapsulant over glass construction need other modifications to the test flow?

MIL-PRF-19500 Appendix J Comment/Concerns

- J.1.1 Scope. This appendix contains the verification system for non-hermetic semiconductor devices (hereafter referred to as 'devices'), when performed in its entirety, assures that the product will meet the performance requirements. This appendix contains details of the screening and conformance inspection procedures. (See tables J-I through J-VI.) In order to supply non-hermetic JANP devices to this appendix a manufacturer needs to first be DLA certified and qualified **for hermetic devices** in accordance with appendix C or D and perform all of the required screening and quality conformance testing specified herein and in accordance with 3.2.1.1. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

- Non-hermetic packages are packages that do not contain a cavity and are molded such that the entire die is encapsulated by an epoxy thermoset molding compound. The requirements for this type of package are defined in the following paragraphs

MIL-PRF-19500 Appendix J Comment/Concerns

- In order to supply non-hermetic JANP devices to this appendix a manufacturer needs to first be DLA certified and qualified for hermetic devices in accordance with appendix C or D and perform all of the required screening and quality conformance testing specified herein and in accordance with 3.2.1.1.
- Intent
  - DLA certified manufacturer
  - Manufacturer audited and certified by DLA on a periodic basis
  - Standard screening and qualification flow for plastic military grade devices.
  - DLA has control of design and manufacturing processes
- Options:
  - Revise Scope?
  - Leave unchanged?

MIL-PRF-19500 Appendix J Comment/Concerns

- 3.10.3.1 ESDS identifier. ESDS testing shall be done in accordance with test method 1020 of MIL-STD-750. The testing procedure of ~~JESD22-A114~~ ANSI/ESDA/JEDEC JS-001 may be used in lieu of method 1020 ~~provided the manufacturer is able to demonstrate correlation between the two methods~~. Unless otherwise specified, tests shall be performed for initial qualification and product redesign. Testing for Charge Device Model (CDM) sensitivity is also recommended to be performed in accordance with ANSI/ ESDA/ JEDEC JS-002.
- The reported ESD sensitivity classification level(s) shall be documented in the ~~device specification sheet~~ QPDSIS-19500. The manufacturer shall report the test method(s) used for ESD sensitivity classification in the ~~device specification sheet~~ QPDSIS-19500 or certificate of compliance (CofC). When a device's ESDS class is determined by the ESDS classification test (see E.4.2.1), the devices represented by the test may, at the option of the manufacturer, be marked as follows:

MIL-PRF-19500 Appendix J Comment/Concerns

- 3.10.3.1 ESDS identifier.

Class 0Z	Less than 50 V	ΔΔ0Z - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).
Class 0A	50 to 124 V	ΔΔ0A - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).
Class 0B	125 V to 249 V	ΔΔ0B - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).
~~Class 0~~	~~Less than 250 V~~	~~Δ0 - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).~~
Class 1A	250 V to 499 V	ΔA - single equilateral triangle (outline or solid) +A (still acceptable as pin one designator).
Class 1B	500 V to 999 V	ΔB - single equilateral triangle (outline or solid) +B (still acceptable as pin one designator).
Class 1C	1,000 V to 1,999 V	ΔC - single equilateral triangle (outline or solid) +C (still acceptable as pin one designator).
Class 2	2,000 V to 3,999 V	ΔΔ - double equilateral triangle (outline or solid) (still acceptable as pin one designator).
Class 3A	4,000 V - 7,999 V	ΔΔΔA - triple equilateral triangle (outline or solid) +A (still acceptable as pin one designator).
Class 3B	8,000 V - 15,999V	ΔΔΔB - triple equilateral triangle (outline or solid) +B (still acceptable as pin one designator).
Non-sensitive	Above 15,999 V	No designator.

MIL-PRF-19500 Appendix J Comment/Concerns

- 3.10.3.1 ESD paragraph changes:
  - Affects both hermetic and non-hermetic devices
  - ESD classification documentation
    - Currently listed in QPDSIS-19500
    - New requirement – ESD Test methods utilized shall be listed in the QPDSIS-19500 or certificate of compliance
- Differences in testing between JESD22-A114 and ANSI/ESDA/JEDEC JS-001
  - Number of zaps 1 for JS-001 and 3 zaps per MIL-STD-750-1 Test Method 1020
- Class 0 divided into 3 subclasses

- CDM testing – recommended or required? Current draft has CDM as recommended.

MIL-PRF-19500 Appendix J Comment/Concerns

- Additional destructive tests were identified for incorporation into document.

J.3.2 Destructive tests. Refer to E.3.4. Additional tests defined below are also considered destructive for appendix J products:	
Method number	Test
J-STD-020	Joint IPC/JEDEC standard Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices
JESD22-A113	Preconditioning Procedures of Plastic Surface Mount Devices Prior to Reliability Testing
JESD22-A118	Accelerated Moisture Resistance, Unbiased HAST
ASTM 1640	Standard Test Method for Assignment of the Glass Transition Temperature By Dynamic Mechanical Analysis

MIL-PRF-19500 Appendix J Comment/Concerns

J.3.2 Destructive tests. Refer to E.3.4. Additional tests defined below are also considered destructive for appendix J products:	
Method number	Test
ASTM E595	Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment
JESD22-A101	Steady-state temperature humidity bias life test (85/85) (Autoclave)
JESD22-A102	Accelerated Moisture Resistance, Unbiased Autoclave
JESD22-A110	Highly accelerated temperature and humidity stress test (HAST)
MIL-STD-883-5, Method 5011	Evaluation and acceptance procedures for polymeric adhesives

MIL-PRF-19500 Appendix J Comment/Concerns

TABLE J-I Testing guidelines for changes to a qualified product. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8

Changes(see D.3.4.2)	JANP/PTX/PTXVProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	JANPSProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	Samples to be submitted to qualifying activity in accordance with tables and subgroups herein
1. Die properties			
a. Construction technique (alloy, planar, mesa)	Group A, C6, D	Groups A, B, C, D, E	C6, 2 samples
b. Substrate, epitaxialproperties	Group A, C6, D1	Group A, C6, D1	C6, 2 samples
c. Diffusion method (alloy, ion implant, diffusion)	Group A, C6, D1, D2	Group A, B5, D1, D2	C6, 2 samples
d. Surface deposition- passivation	Group A, ~~test method 1039 of MIL-STD-750, cond A~~, Screen 10, C6,D2	Group A, B5, D2	C6, 2 samples
e. Surface deposition– front metal (material / process)	Group A, B2, and C6	Group A, B3, and C6	C6, 2 samples
f. Surface deposition– back metal (material / process)	Group A, B2, C6, and E4	Group A, B3,C5, C6, and E4	C6, 2 samples

MIL-PRF-19500 Appendix J Comment/Concerns

TABLE J-I Testing guidelines for changes to a qualified product. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8

Changes(see D.3.4.2)	JANP/PTX/PTXVProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	JANPSProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	Samples to be submitted to qualifying activity in accordance with tables and subgroups herein
1. Die properties			
g. Surface deposition– glassivation over metal (material / process)	Group A, ~~test method 1039 of MIL-STD-750, cond A~~, screen 10, C6	Group A, B5, D2	C6, 2 samples
h. Surface deposition– Die protective coating (material / process)	Group A, ~~test method 1039 of MIL-STD-750, cond A,~~ screen 10, C6	Group A, B3, C6	C6, 2 samples
i. Geometry - die size	Group A, C6, D, E4	Group A,B,C,D,E	C6, 2 samples
j. Geometry - die thickness	Group A, C6, E4, B4	Group A, C6, E4, B3	C6, 2 samples
k. Fab location move	Groups A, B, C, D, E, Notify qualifying activity	Groups A, B, C, D, E, Notify qualifying activity	One each B and C
l. Wafer diameter	Groups A, B, C, D, E, Notify qualifying activity	Groups A, B, C, D, E, Notify qualifying activity	

MIL-PRF-19500 Appendix J Comment/Concerns

TABLE J-I Testing guidelines for changes to a qualified product. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8

Changes(see D.3.4.2)	JANP/PTX/PTXVProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	JANPSProduct Subgroups required to be performed and data submitted to DLA Land and Maritime	Samples to be submitted to qualifying activity in accordance with tables and subgroups herein
2. Packageproperties			
a. Packagematerial / dimension change (base, plug, lead, lead frame, mold compound)	Groups B1, B2, B3, C1,~~C7~~, D2, E4	Group B1, B2, B3, Group C1-C6,~~C7~~, D2 and E4	
b. Die attach method / material	Groups C3, C6, E1, E4	Groups B3, C3, C6, E4	C6, 2 samples
c. Bond wire material / diameter / process	Groups B2, B3, C3, B4	Groups B3, C3, C6	B3, 2 samples
d. encapsulation process	Groups B2, B3, C3, C7, D2	Groups B3, C3, C7, D2	B3, 2 samples
e. Assembly location move	Notify qualifying activity	Notify qualifying activity	As required
f. marking qualification	Groups C2, and, test methods 1021	Groups C2, and, test methods 1021	2 samples

MIL-PRF-19500 Appendix J Comment/Concerns

TABLE J-I Testing guidelines for changes to a qualified product. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8

1/ Acceptable supporting data may be submitted to reduce or eliminate required testing.

2/ When variable data is required for applicable groups A and C testing, data histograms providing acceptable parameter data summaries may be submitted in place of variables.

3/ If changes involve more than one device type from the same certified line, contact the qualifying activity to determine appropriate selection of device type(s) to be tested

4/ The qualifying activity may add or reduce testing if warranted by specification sheet requirements or unique design or process circumstances after notification of the manufacturer.

MIL-PRF-19500 Appendix J Comment/Concerns

TABLE J-I Testing guidelines for changes to a qualified product. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8

5/ Additional testing and evaluation in accordance with group E to establish confidence in the proposed change shall be performed as required by the qualifying activity (see J.5.6).

6/ New die design requires full qualification.

7/ For small die flow use group B, step 1 in lieu of B3 and C6 requirement; and use group A subgroup 1 (small die only applicable for RHA devices).

MIL-PRF-19500 Appendix J Comparison to SAE AS6294/3,/4

- SAE AS6294/3 and AS6294/4 PEDS documents were developed to provide the user community with standard screening and qualification guidelines for commercial off the shelf discrete semiconductors utilized in space and military applications.

- MIL-PRF-19500 Appendix J document development focus has been to provide government and military users with the following: DLA Land and Maritime audited and certified manufacturers, DLA qualified military product, standard screening flows, non-hermetic part number prefix scheme, and standard products.
  - DLA Land and Maritime initial manufacturer audits required to certify and qualify manufacturing lines to supply military qualified non-hermetic MIL-PRF-19500 product.
  - Periodic DLA manufacturer re-certification audits identical to the hermetic audits with exceptions due to packaging are required.
  - Initial DLA Land and Maritime device qualification will be for JANTXV-like and JANTX-like levels only. Initial part numbering scheme prefix is planned to be JANP, JANPTX, and JANPTXV.

MIL-PRF-19500 Appendix J Screening and Qualification Flow Differences

- 19500 Appendix J provides standard military screening and qualification flows based on:
  - MIL-PRF-19500 hermetic screening and qualification flows with exceptions due to packaging.
  - Portions of SAE 6294/3 and 6294/4 that were incorporated into Appendix J such as:
    - Construction analysis
    - Sequential test flow
    - Moisture Sensitivity level
  - Major change table added to Appendix J to address different requalification requirements for plastic military qualified devices.

MIL-PRF-19500 Appendix J Screening Differences

- Non-hermetic screening flow follows the hermetic screening with differences listed below and as shown in the following slides:
  - Temperature cycling is performed at a lower temperature range than hermetic devices.
  - High Temperature Reverse Bias performed at 125°C ambient temperature or 80 percent of maximum operating temperature if maximum operating temperature is less than 150°C.
  - Burn-in performed at 125°C junction temperature or 80 percent of maximum operating temperature if maximum operating temperature is less than 150°C.
  - Radiography 'as specified'.
  - Acoustic Microscopy screening 'as specified'.
  - non-hermetic JANPXV and JANPX no hermeticity testing required

MIL-PRF-19500 Appendix J Screening Comparison to Hermetic Devices

	Hermetic Flow		non-hermetic flow	
Screen	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Die Visual for glass diodes	N/A	N/A	N/A	N/A
Internal Visual	100 Percent	N/A	100 Percent	N/A
High temperature Nonoperating life	Optional	Optional	Optional	Optional
Temperature cycling	100 Percent	100 Percent	100 Percent	100 Percent

* Method 1051 condition C temperature range is -55°C to +175°C.
** Method 1051 condition G temperature range is -55°C to +150°C or maximum storage temperature.

MIL-PRF-19500 Appendix J Screening Comparison to Hermetic Devices

	Hermetic Flow		non-hermetic flow	
Screen	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Surge – as specified	100 Percent	100 Percent	100 Percent	100 Percent
Thermal impedance	100 Percent	100 Percent	100 Percent	100 Percent
Constant Acceleration	Optional	Optional	N/A	N/A
PIND	N/A	N/A	N/A	N/A
Instability Shock Test Axial leaded diodes only	N/A	N/A	N/A	N/A
Hermetic Seal	Optional	Optional	N/A	N/A

MIL-PRF-19500 Appendix J Screening Comparison to Hermetic Devices

	Hermetic Flow		non-hermetic flow	
Screen	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Serialization	N/A	N/A	N/A	N/A
Interim Electrical Parameters	100 Percent	100 Percent	100 Percent	100 Percent
High Temperature Reverse Bias	100 Percent	100 Percent	100 Percent	100 Percent
Interim Electrical Parameters for PDA	100 Percent	100 Percent	100 Percent	100 Percent
Burn-in	100 Percent	100 Percent	100 Percent	100 Percent

*HTRB will be performed at 125C or 80% of maximum storage temperature. Burn-in performed at 125C minimum or at 80% of maximum storage temperature.

MIL-PRF-19500 Appendix J Screening Comparison to Hermetic Devices

	Hermetic Flow		non-hermetic flow	
Screen	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Final electrical parameters for PDA	100 Percent	100 Percent	100 Percent	100 Percent
Hermetic Seal	100 Percent	100 Percent	N/A	N/A
Radiography	As specified	As specified	As specified	As specified
Acoustic Microscopy	N/A	N/A	As specified	As specified
External Visual	N/A	N/A	100 Percent	100 Percent
Case Isolation	100 Percent	100 Percent	As specified	As specified

MIL-PRF-19500 Appendix J Group A Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Temperature cycling is performed at a lower temperature range than hermetic devices.
  - Added Autoclave or unbiased HAST (sequential test flow) option testing for small die flow which is Group B testing for the small die flow devices.
  - Acoustic Microscopy screening will be 'As specified' on a slash sheet by slash sheet basis for non-hermetic JANTXV-like and JANTX-like devices.

MIL-PRF-19500 Appendix J Group A Qualification Differences

- Group A subgroup 1, small die flow (Sequential Testing)
  - Highly Accelerated Stress Testing
  - 130°C/ 85% RH t = 96 hours, or
  - 110C°/ 85% RH t = 264 hours, or
  - Autoclave – 121°C/ 100% RH t = 96 hours
  - Temperature cycling test condition G instead of condition C

MIL-PRF-19500 Appendix J Group A Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, Visual and mechanical inspection (except small die flow)	116 devices, c=0	45 devices, c=0	116 devices, c=0	45 devices, c=0
Subgroup 1, (for small die flow) Visual and Mechanical inspection	116 devices, c=0	45 devices, c=0	116 devices, c=0	45 devices, c=0
Acoustic microscopy	N/A	N/A	116 devices, c=0	45 devices, c=0
Solderability	15 leads, c=0	15 leads, c=0	15 leads, c=0	15 leads, c=0
Resistance to Solvents	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0
Salt atmosphere Laser marked devices only	6 devices, c=0	6 devices, c=0	N/A	N/A

MIL-PRF-19500 Appendix J Group A Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, (for small die flow) Temperature cycling	22 devices, c=0	22 devices, c=0	N/A	N/A
Electrical measurements	22 devices, c=0	22 devices, c=0	N/A	N/A
Hermetic seal	22 devices, c=0	22 devices, c=0	N/A	N/A
Bond Strength	11 wires, c=0	11 wires, c=0	N/A	N/A
Decap internal visual design verification	4 devices, c=0	4 devices, c=0	N/A	N/A
Preconditioning	N/A	N/A	116 devices, c=0	45 devices, c=0

MIL-PRF-19500 Appendix J Group A Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, (for small die flow) Acoustic microscopy	N/A	N/A	116 devices, c=0	45 devices, c=0
Autoclave – 121C/100%, or UHAST– 130C/85%, 96 hrs, UHAST– 110C/85%, 264 hrs	N/A	N/A	22 devices, c=0	22 devices, c=0
Temperature cycling – 100 cycles	N/A	N/A	22 devices, c=0	22 devices, c=0
Autoclave – 121C/100%, or UHAST– 130C/85%, 96 hrs, UHAST– 110C/85%, 264 hrs	N/A	N/A	22 devices, c=0	22 devices, c=0
Temperature cycling – 100 cycles	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group A Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, (for small die flow) Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0
Bond Strength	N/A	N/A	11 wires, c=0	11 wires, c=0
Decap internal visual design verification	N/A	N/A	4 devices, c=0	4 devices, c=0
Subgroup 2 – DC tests at +25C, ±3 degrees C	116 devices, c=0	116 devices, c=0	116 devices, c=0	116 devices, c=0
Subgroup 3 – DC static testsat high (-0C, +10C) and low (+0C, -10C) specified temperatures	116 devices, c=0	116 devices, c=0	116 devices, c=0	116 devices, c=0
Subgroup 4 – Dynamic tests at +25C ±3 degrees C	116 devices, c=0	116 devices, c=0	116 devices, c=0	116 devices, c=0

MIL-PRF-19500 Appendix J Group A Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 5, Safe operating area (for transistors only) a. DC b. Clamped inductive (as applicable) c. Unclamped (only when applicable	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Subgroup 6 Surge current (for diodes/rectifiers only) Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Subgroup 7 selected static and dynamic tests	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group B Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Temperature cycling performed at a lower temperature range than hermetic devices.
  - Life testing (340 hours) performed at lower temperature (+125°C) or 80 percent of maximum operating temperature.
  - Acoustic Microscopy screening is required as part of the decapsulation design verification process.
  - Added Autoclave or unbiased HAST sequential testing for non small die flow products (sequential test flow).
  - Added glass transition (Tg) temperature test.

MIL-PRF-19500 Appendix J Group B Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group B subgroup 2
    - Preconditioning per J-STD-020
    - Temperature cycling 100 cycles
  - Group B subgroup 4
    - Acoustic Microscopy
    - Design verification using MIL-STD-750 test method 2075 and MIL-STD-1580 requirement 16 for plastic criteria.
  - Group B subgroup 7
    - Glass transition temperature Tg

MIL-PRF-19500 Appendix J Group B Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, Solderability	15 leads, c=0	15 leads, c=0	15 leads, c=0	15 leads, c=0
Resistance to Solvents	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0
Salt atmosphere (corrosion)	6 devices, c=0	6 devices, c=0	N/A	N/A
Subgroup 2, Thermal shock (liquid to liquid)	22 devices, c=0	22 devices, c=0	N/A	N/A
Temperature cycling (air to air)	22 devices, c=0	22 devices, c=0	N/A	N/A
Surge – as specified	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Hermetic seal	22 devices, c=0	22 devices, c=0	N/A	N/A

MIL-PRF-19500 Appendix J Group B Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Electrical measurements	22 devices, c=0	22 devices, c=0	N/A	N/A
Subgroup 2, (Sequential test flow) Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Preconditioning	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Autoclave – 121C/100%, or UHAST– 130C/85%, 96 hrs, UHAST– 110C/85%, 264 hrs	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group B Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 2 – temperature cycling – 100 cycles	N/A	N/A	22 devices, c=0	22 devices, c=0
Autoclave – 121C/100%, or UHAST– 130C/85%, 96 hrs, UHAST– 110C/85%, 264 hrs	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0
temperature cycling – 100 cycles	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group B Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 2 – Surge as specified	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0
Subgroup 3 – steady state life Electrical measurements, or Intermittent operation life Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Hermetic seal	22 devices, c=0	22 devices, c=0	N/A	N/A
Bond strength (wire or clip bonded devices)	11 wires, c=0	11 wires, c=0	11 wires, c=0	11 wires, c=0

MIL-PRF-19500 Appendix J Group B Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 4 – Acoustic Microscopy Decap internal visual (design verification)	N/A 1 device, c=0	N/A 1 device, c=0	1 device, c=0	1 device, c=0
Subgroup 5 – Thermal resistance	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0
Subgroup 6 – High temperature life (non-operating) Electrical measurements	32 devices, c=0	32 devices, c=0	32 devices, c=0	32 devices, c=0
Subgroup 7 – Glass Transition temperature	N/A	N/A	2 devices, c=0	2 devices, c=0

MIL-PRF-19500 Appendix J Group B Qualification Differences – Small Die Flow

	Hermetic QCI Flow		non-hermetic QCI flow	
Step	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Step 1 – steady state life Electrical measurements, or Intermittent operation life Electrical measurements	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Step 2 – HTRB Electrical measurements	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Step 3 – High temperature Nonoperating life Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Step 4 – Glass transition temperature	N/A	N/A	2 devices, c=0	2 devices, c=0

MIL-PRF-19500 Appendix J Group C Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group C subgroup 2
    - Preconditioning per J-STD-020
    - Temperature cycling 500 cycles

    - Group C subgroup 3
    - Moisture sensitivity level
    - Highly Accelerated Stress Testing or
    - Temperature cycling test condition G instead of condition C
    - 1000 hour temperature humidity test – 85°C/ 85% RH

MIL-PRF-19500 Appendix J Group C Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, Physical dimensions	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0
Subgroup 2, Thermal shock (liquid to liquid)	22 devices, c=0	22 devices, c=0	N/A	N/A
Temperature cycling (air to air)	22 devices, c=0	22 devices, c=0	N/A	N/A
Terminal strength Surface mount endcap integrity	22 devices, c=0	22 devices, c=0	N/A	N/A
Hermetic seal	22 devices, c=0	22 devices, c=0	N/A	N/A
Moisture resistance	22 devices, c=0	22 devices, c=0	N/A	N/A
Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group C Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 2, acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Preconditioning	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Temperature cycling (air to air)*	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0

* 500 temperature cycles condition G for non-hermetic devices.

MIL-PRF-19500 Appendix J Group C Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 3 – Shock	22 devices, c=0	22 devices, c=0	N/A	N/A
Vibration, variable frequency	22 devices, c=0	22 devices, c=0	N/A	N/A
Constant acceleration	22 devices, c=0	22 devices, c=0	N/A	N/A
Electrical measurements	22 devices, c=0	22 devices, c=0	N/A	N/A
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Preconditioning	N/A	N/A	22 devices, c=0	22 devices, c=0
HAST– 130C/85% or 110C/85%	N/A	N/A	22 devices, c=0	22 devices, c=0

MIL-PRF-19500 Appendix J Group C Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 3, Temperature cycling	N/A	N/A	22 devices, c=0	22 devices, c=0
Temperature humidity bias – 85C/85% 1000 hours	N/A	N/A	22 devices, c=0	22 devices, c=0
Acoustic microscopy	N/A	N/A	22 devices, c=0	22 devices, c=0
Electrical measurements	N/A	N/A	22 devices, c=0	22 devices, c=0
Subgroup 4 – Salt atmosphere	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0
Subgroup 5 – Thermal resistance	15 devices, c=0	15 devices, c=0	15 devices, c=0	15 devices, c=0

* 100 temperature cycles condition G for non-hermetic devices.

MIL-PRF-19500 Appendix J Group C Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 6 Steady state operation life Electrical measurements, or	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Intermittent operation life Electrical measurements, or	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Blocking life Electrical measurements	22 devices, c=0	22 devices, c=0	22 devices, c=0	22 devices, c=0
Subgroup 7 – internal gas analysis	3 devices, c=0	3 devices, c=0	N/A	N/A

MIL-PRF-19500 Appendix J Group D Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group D subgroup 2 – steady state total dose radiation testing.
  - Device burn in completion will be required prior to beginning total dose radiation testing. Sample size of 10 – 15 devices required for radiation testing is specified in the draft document.
    - J.5.5 Group D inspection. Radiation hardness qualification for plastic encapsulated discrete semiconductor devices shall be performed in accordance with the verification requirements of appendix E, see E.4 with the following exceptions due to the packaging. Radiation qualification for plastic encapsulated discrete semiconductor devices shall require radiation testing of post burn-in devices with a minimum sample size of 10 – 15 devices. The current industry recommended practice for radiation testing of plastic encapsulated devices is that the parts to be radiation tested shall require burn-in prior to radiation testing. RHA testing (TID and neutron) shall be performed on a non-hermetic encapsulated device (19500 Appendix J Task group JEDEC meeting comment).

MIL-PRF-19500 Appendix J Group D Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1 – Neutron irradiation Qualification and conformance inspection, End point electrical parameters	11 devices, c=0	N/A	11 devices, c=0	N/A
Subgroup 2 – Steady-state irradiation Qualification and conformance inspection, End point electrical parameters	11 devices, c=0	N/A	11 devices, c=0	N/A
Subgroup 3 – Power transistor electrical dose rate End point electrical parameters	11 devices, c=0	N/A	11 devices, c=0	N/A

MIL-PRF-19500 Appendix J Group E Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group E subgroup 1
  - Preconditioning per J-STD-020
  - HAST or Temperature Humidity Bias (THB)
  - Temperature cycling 200 cycles versus 500 for hermetic devices
  - Group E subgroup 1a
  - Preconditioning per J-STD-020
  - Temperature cycling 500 cycles
  - Group E subgroup 9
  - Acoustic Microscopy
  - Moisture sensitivity level
  - Acoustic microscopy

MIL-PRF-19500 Appendix J Group E Qualification Differences

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group E subgroup 10
  - Glassivation temperature - Tg
  - Plastic evaluation per MIL-STD-883 method 5011
  - Construction analysis per SAE AS6294/3
  - Outgassing and flammability per NASA-STD-6001

MIL-PRF-19500 Appendix J Comments

- Non-hermetic qualification flow = hermetic (except as noted)
  - Group E subgroup 11
  - Single Event Effect Testing – Characterization curves will be required for MOSFETs. Characterization data will be required for Schottky diodes with a forward current rating greater than or equal to one (1) Amp.
  - A note was added to Group E qualification table clarify radiation qualification process. "Radiation testing not required unless specified in the slash sheet."

MIL-PRF-19500 Appendix J Group E Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1, Thermal shock or, Temperature cycling – 500 cycles	45 devices, c=0	45 devices, c=0	N/A	N/A
Hermetic seal	45 devices, c=0	45 devices, c=0	N/A	N/A
Electrical measurements	45 devices, c=0	45 devices, c=0	N/A	N/A
Subgroup 1A – Preconditioning HAST,or Temp humidity bias, Temperature cycling 100 cycles HAST or, Temp humidity bias, Temperature cycling 100 cycles Electrical measurements	N/A	N/A	45 devices, c=0	45 devices, c=0

MIL-PRF-19500 Appendix J Group E Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 1B – Preconditioning Temperature cycling 500 cycles Electrical measurements	N/A	N/A	45 devices, c=0	45 devices, c=0
Subgroup 2 – Intermittent operating life or, Steady state life test, or Blocking life	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Electrical measurements	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0
Subgroup 3 – Not applicable	N/A	N/A	N/A	N/A

MIL-PRF-19500 Appendix J Group E Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 4 – thermal impedance curves	Yes	Yes	Yes	Yes
Subgroup 5 – Barometric pressure (reduced) required only for devices rated > 200V	3 devices, c=0	3 devices, c=0	3 devices, c=0	3 devices, c=0
Subgroup 6 – ESD	11 devices, c=0	11 devices, c=0	11 devices, c=0	11 devices, c=0
Subgroup 7 – Resistance to soldering heat Visual inspection, Hermetic seal Electrical measurements	3 devices, c=0	3 devices, c=0	3 devices, c=0 N/A	3 devices, c=0 N/A
Subgroup 8 – Reverse stability (for bipolar transistor only)	45 devices, c=0	45 devices, c=0	45 devices, c=0	45 devices, c=0

MIL-PRF-19500 Appendix J Group E Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 9 – Resistance to glass cracking (glass diodes only)	45 devices, c=0	45 devices, c=0	N/A	N/A
Acoustic microscopy	N/A	N/A	10 devices, c=0	10 devices, c=0
Moisture Sensitivity level classification	N/A	N/A	45 devices, c=0	45 devices, c=0
Acoustic microscopy	N/A	N/A	10 devices, c=0	10 devices, c=0
Bake at 125C for 24 hours	N/A	N/A	45 devices, c=0	45 devices, c=0
Electrical measurements	N/A	N/A	45 devices, c=0	45 devices, c=0

MIL-PRF-19500 Appendix J Group E Qualification Differences

	Hermetic QCI Flow		non-hermetic QCI flow	
Subgroup	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Subgroup 10 – Glassivation temperature Tg	N/A	N/A	5 devices, c=0	5 devices, c=0
Plastic evaluation per 883/5011	N/A	N/A	5 devices, c=0	5 devices, c=0
Construction analysis	N/A	N/A	5 devices, c=0	5 devices, c=0
Outgassing	N/A	N/A	5 devices, c=0	5 devices, c=0
Subgroup 11 – SEE testing As specified	N/A	N/A	3 devices, c=0	N/A

Appendix J Task Group Summary

- DLA Land and Maritime released the second draft of MIL-PRF-19500 Revision R with Appendix J incorporated on April 19, 2021.
- A proposed slash sheet for a non-hermetic 1500 Watt Transient Voltage Suppressor has been submitted to DLA Land and Maritime to be qualified per the new appendix.
- Proposed Part Identifying Number nomenclature is JANPTX1Nxxxx and JANPTXV1Nxxxx, JANPTX2Nxxxx.
- Next step – dating MIL-PRF-19500 revision R with appendix J incorporated!

MIL-PRF-19500 Appendix J Future Plans

- Develop a list of test methods for inclusion in MIL-STD-750

- Plans to add JANS flow to Appendix J will depend on user acceptance of the new Appendix J non-hermetic military products

Thank you!

- We would like to express our appreciation to the task group members, NASA NEPAG and SLS programs, Government Working Group, and Microchip Technologies for their continued support of this effort.

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Acronyms

- AC – Autoclave
- CDM – Charged Device Model
- DLA – Defense Logistics Agency
- DPA – Destructive Physical Analysis
- EEE – Electrical, Electronic, and Electromechanical
- EP – Engineering Practice
- ESD – Electrostatic Discharge
- HAST – Highly Accelerated Stress Testing
- HTRB – High Temperature Reverse Bias
- IOL – Intermittent Operating Life

Acronyms

- JAN – Joint Army Navy
- JANP – Joint Army Navy Plastic
- JANPTX - Joint Army Navy Plastic eXtra Testing
- JANPTXV - Joint Army Navy Plastic eXtra Testing with Visual
- JANPS – Joint Army Navy Plastic Space
- JANS – Joint Army Navy Space
- JANTX – Joint Army Navy eXtra Testing
- JANTXV – Joint Army Navy eXtra Testing with Visual
- JEDEC – Joint Electronic Devices Council
- NASA – National Aeronautics and Space Administration

Acronyms

- NEPAG – NASA EEE Parts Assurance Group
- PEDS – Plastic Encapsulated Discrete Semiconductors
- RH – Relative Humidity
- SAE – Society of Automotive Engineers
- SLS – Space Launch System
- t – time (i.e. t = 96 hours)
- Tg – Glassivation Temperature
- Tj – Junction Temperature
- THB – Temperature Humidity Bias
- TS – Terminal Strength
- UHAST – Unbiased Highly Accelerated Stress Test

Background information

Backup data

MIL-PRF-19500 Appendix J Comments

Initial draft Item No.	Paragraph to be changed	Change Originator	Description of Change	Justification for change
1.	1.1	DLA	Add additional levels for the proposed non-hermetic devices.	Added for Appendix J integration.
		MIL	1.1 Grammar - Consistency in this section can be improved. "Provided for" needs to be consistent throughout paragraph, four quality levels for "Hermetic"	
		DLA	Added “hermetic” to historical quality level certification mark listings.	
2.	1.2	DLA	Add description and of proposed Appendix J.	Added for Appendix J integration.
3.	1.3.1, 1.3.1.1, and 1.3.1.2	DLA	Restructure and add quality levels for non-hermetic Appendix J devices.	Added for Appendix J integration.
		MFR	Since “JANP” will be for plastic parts, we recommend that all slash sheet structure be established so that the all basic part numbers have a path for hermetic, or plastic devices.	
		DLA	The part numbering structure does take into consideration hermetic vs non-hermetic devices and the base part number (1N or 2N) could potentially be portrayed as either hermetic or non-hermetic. The testing is significantly different and would most likely require a separate slash sheet for each version. (Unless further discussion and justification would suggest otherwise.)	
		MIL	Section 1.3.1.1; for consistency with section 1.3.1.2, add the word hermetic before the word encapsulated.	
		MIL	Do you know where we can find definitions for JAN, JANTX, JANTXV, and JANS?	They are not in 19500 and probably should be.
		DLA	Additional descriptions have been added to appendix A that defines or describes each quality level.	Clarification

MIL-PRF-19500 Appendix J Comments

	1.3.8	MIL	Page 3, paragraph 1.3.8 next to last sentence should be revised to specify that JANPTX, JANPTXV device may not be remarked. The part being used for substitution may retain its original marking, or the PIN may be remarked except JANPTX and JANPTXV devices.	
		DLA	Added	
5.	3.2.1.1	DLA	Add non-hermetic certification paragraph.	Added for Appendix J integration.
		MIL	Page 5, 3.2.1.1non-hermetic certification. MIL-PRF-19500 additionally offers a non-hermetic certification option in appendix J. Certification to QPL or QML shall precede appendix J certification unless technically justified and approved by the qualifying activity.	
		DLA	Added	
6.	3.3	DLA	Add Appendix J reference.	Added for Appendix J integration.

MIL-PRF-19500 Appendix J Comments

7.	3.5	DLA	Add Appendix J JANP certification reference.	Added for Appendix J integration.
		MIL	Page 7, paragraph 3.5 Certification. Revised the paragraph to show certification levels for hermetic and non-hermetic devices. The qualifying activity shall verify that the manufacturer's quality system and device verification system meet 4.1, 4.2, and, if applicable, 4.4, and that the manufacturer is producing devices which meet 3.3. Wafer fabrication and assembly operations shall be performed in a facility or facilities certified by the qualifying activity for the applicable technology to the applicable level. The ~~two~~ ~~three~~ four levels of hermetic device certification available are (JAN, JANTX, JANTXV, and JANS) ~~certification~~, ~~and (JANS) certification~~, and three levels of non-hermetic device certification (JANP, JANPTX, and JANPTXV) ~~certification~~. There are two options for obtaining certification from the qualifying activity, either Quality Management Program of appendix C or to the Quality System of appendix D. Each manufacturer's certification status is listed in the QPDSIS-19500. Re-audits are required to maintain certification and qualification. The standard re-audit frequency is two years.	
		DLA	Concur, added additional non-hermetic quality levels. (left "three" levels of certification as there are one level for JANS, another for lower than JANS, and a new level needed fomon-hermetic encapsulated.)	

MIL-PRF-19500 Appendix J Comments

10.	3.10.3.1	JEDEC	Propose replacement of JESD22-A114 with ANSI/ESDA/JEDEC JS-001, and remove correlation statement. In addition add recommendation of Charge device model (CDM) testing.	JS-001 superseded JESD22-A114 however slight differences do not allow for correlation.
		MFR	Need justification for CDM testing for discretes. Even though adding as a recommendation at this time, it will lead to questioning.	
		MIL	Page 10, paragraph 3.10.3.1, ESD identifier – recommend leaving the correlation between JS-001 and MIL-STD-750-1020 test method. Recommend making the Charge Device model testing a requirement instead of recommended. May want to consider adding a CDM section in MIL-STD-750-1 test method 1020 referencing JS-002. 3.10.3.1 ESDS identifier.ESDS testing shall be done in accordance with test method 1020 of MIL-STD-750. The testing procedure of ~~JESD22-A114~~ ANSI/ESDA/JEDEC JS-001 may be used in lieu of method 1020 ~~provided the manufacturer is able to demonstrate correlation between the two methods~~. Unless otherwise specified, tests shall be performed for initial qualification and product redesign. Testing for Charge Devi ity is also recommended to be performed in accordance with ANSI/ESDA/JEDEC JS-002.	
		DLA	The correlation cannot remain because the JS-001 does not have the same testing requirements as the historical JESD22-A114. The number of zaps is different….. However, is it possible to keep the correlation requirement and somehow also account for or note the zap difference? Further discussion is needed regarding concerns over die size, and package size or type, making the CDM not applicable before concurrence with making this a requirement instead of a recommendation. ESD classification listing was changed from the proposed specification sheet location to the QPDSIS-19500 where they are currently listed.	Rationale – there are differences between the two test methods

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	J.2	MIL	Section J.3.4 includes a reference to NCSL Z540.3 for guidance. As such, should not be included in J.2. Section J.2; JESD 625 is called out in section 2 of the basic document, therefore does not need call-out in section J.2. Also, JESD22-A101 is referenced in the body of J appendix but not referenced in J.2.	
		DLA	-Listing documents as guidance still requires the document to also be listed in section 2. -Concur, will remove JESD 625 from J.2 -Concur, will add JESD22A101 to J.2	Editorial
	J.2.2	DLA	Remove NCSL Z540.3 and replace with ISO/IEC17025	NCSL Z540.3 has been withdrawn
	J.3.2	DLA	Add these 3 tests to the destructive test list -Autoclave JESD22-A102 -Steady-state temperature humidity bias life test (85/85) JESD22-A101 -Highly accelerated temperature and humidity stress test (HAST) JESD22A110	Editorial
	J.3.4	DLA	Remove NCSL Z540.3 and replace with ISO/IEC17025	NCSL Z540.3 has been withdrawn
	J.5.3	MIL	J.5.3, Group B inspection, first sentence – change JANTX and JANTXV to JANPX and JANPXV	
		DLA	Concur	
	Table J-III, Group A	MIL	Pages 168, 169. Table J-III, Group A inspection for non-hermetic molded package top row of table should be revised to include the P designator	Editorial
		DLA	Concur	
	Table J-III, Group A, subgroup 1, small die flow	MIL	Page 168, table J-III, Group A inspection, subgroup 1, small die flow change as follows; Remove misplaced autoclave/UHAST conditions added to the TM1051 subgroup section.	Editorial
		DLA	Concur	
		DLA	Concur	

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		DLA	Concur	
	Table J-III, Group A, note 2	MIL	table J-III, Group A inspection for non-hermetic molded package, note 2 should be revised to add the following sentence. Note 2. Resubmission not applicable for table J-III, subgroup 1, small die flow.	Rationale - Clarification. Existing requirements do not take into account the small die flow test locations of bond strength and decap in group A, subgroup 1 for small die flow.
		DLA	Concur	
	Table J-IV	MIL	Pages 171 – 174, Table J-IV title should be revised to include the P designator	Editorial
		DLA	Concur	
	Table J-IVA, Group B	MIL	Page 174, table J-IVA, Group B inspections for non-hermetic molded package (small die flow only) for JAN, JANTX, and JANTXV devices should be revised as follows: 1. Change JAN, JANTX, and JANTXV to JANP, JANPX, and JANPXV. 2. Step 3, high temperature life (non-operating), method 1032, conditions column – delete Ta = +200C and replace with maximum operating temperature per slash sheet.	Rationale – clarification and corrects the maximum operating temperature for non operating life.
		DLA	Concur	
	Table J-VI		Page 180, Group E, table JVI, subgroup 11, SEE- recommend adding a note 6/ stating that this subgroup is Not Required except for applicable JANPS or JANPXV devices submitted for radiation hardness assurance qualification as specified in the slash sheet. "X/ Group E subgroup 11 is not required unless specified in the slash sheet."	Rationale – radiation hardness testing is not required for initial device qualification unless the manufacturer is trying to qualify a radiation harden device
		DLA	Concur	
		MIL	General comment – will need to add a package and finish table in the next revision to this appendix similar to what is in appendix H for hermetic devices, once parts are qualified to appendix J	