

MIL-PRF-19500 Appendix J Task Group Status

Benny Damron, Jacobs Space Exploration
Group, NASA Marshall Space Flight Center

Ronan Dillon, Microchip Ireland

September 15, 2021

- 1. MIL-PRF-19500 Appendix J Task Group**
- 2. Metrics**
- 3. MIL-PRF-19500 & Non hermetic expansion**
- 4. Appendix J Status**
 1. 19500 Revision R Appendix J comments and Destructive and non destructive tests
- 5. New discussion topics**
- 6. Appendix J comparison to SAE 6294/3 and /4 document**
- 7. Appendix J differences in screening and qualification flows**
- 8. Appendix J Task Group Status Summary**
- 9. Appendix J Task Group Future Plans**
- 10. Backup data**

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.

JC13 Appendix J Task Group Metrics

- Conducted one (1) Webex/ Teleconference since May 2021 JEDEC meeting
 - Average meeting attendance was seven (7).

MIL-PRF 19500 Expanded to Include Non-hermetic

MIL-PRF-19500R
APPENDIX J

VERIFICATION SYSTEM FOR NON-HERMETIC QUALIFIED PRODUCTS

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, JANPTX, or JANPTXV 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.

ASTM INTERNATIONAL (ASTM)

- ASTM E1640 - Standard Test Method for Assignment of the Glass Transition Temperature By Dynamic Mechanical Analysis
- ASTM E595 - Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment

(Copies of this document are available online at <https://www.astm.org> or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959)

International Organization for Standardization (ISO)

- ISO/IEC 17025 - General requirements for the competence of testing and calibration laboratories

(Copies of these documents are available online at <https://www.iso.org> or from ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.)

The documentation and process conversion measures necessary to comply with this revision shall be completed by 24 January 2022.

INCH-POUND
MIL-PRF-19500R
24 July 2021
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@dlam.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>.

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MIL-PRF 19500 Expanded to Include Non-hermetic

MIL-PRF-19500R
APPENDIX J

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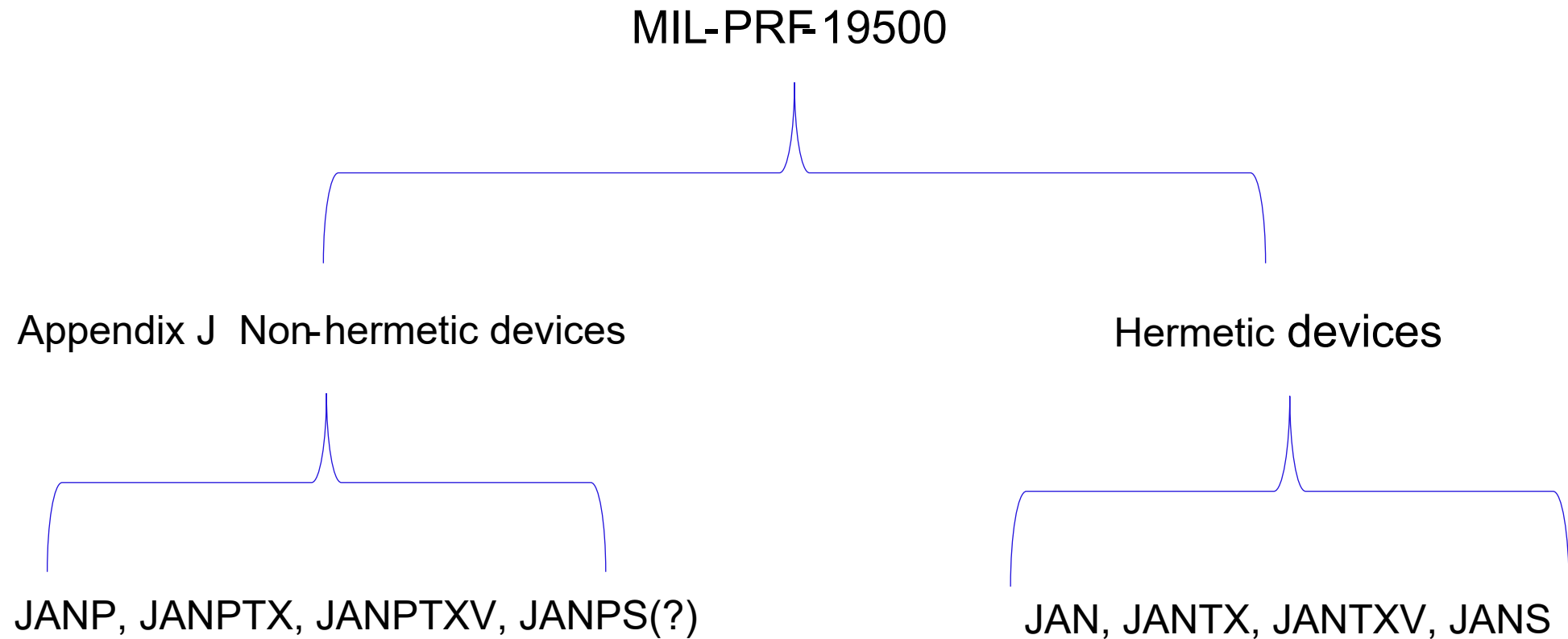
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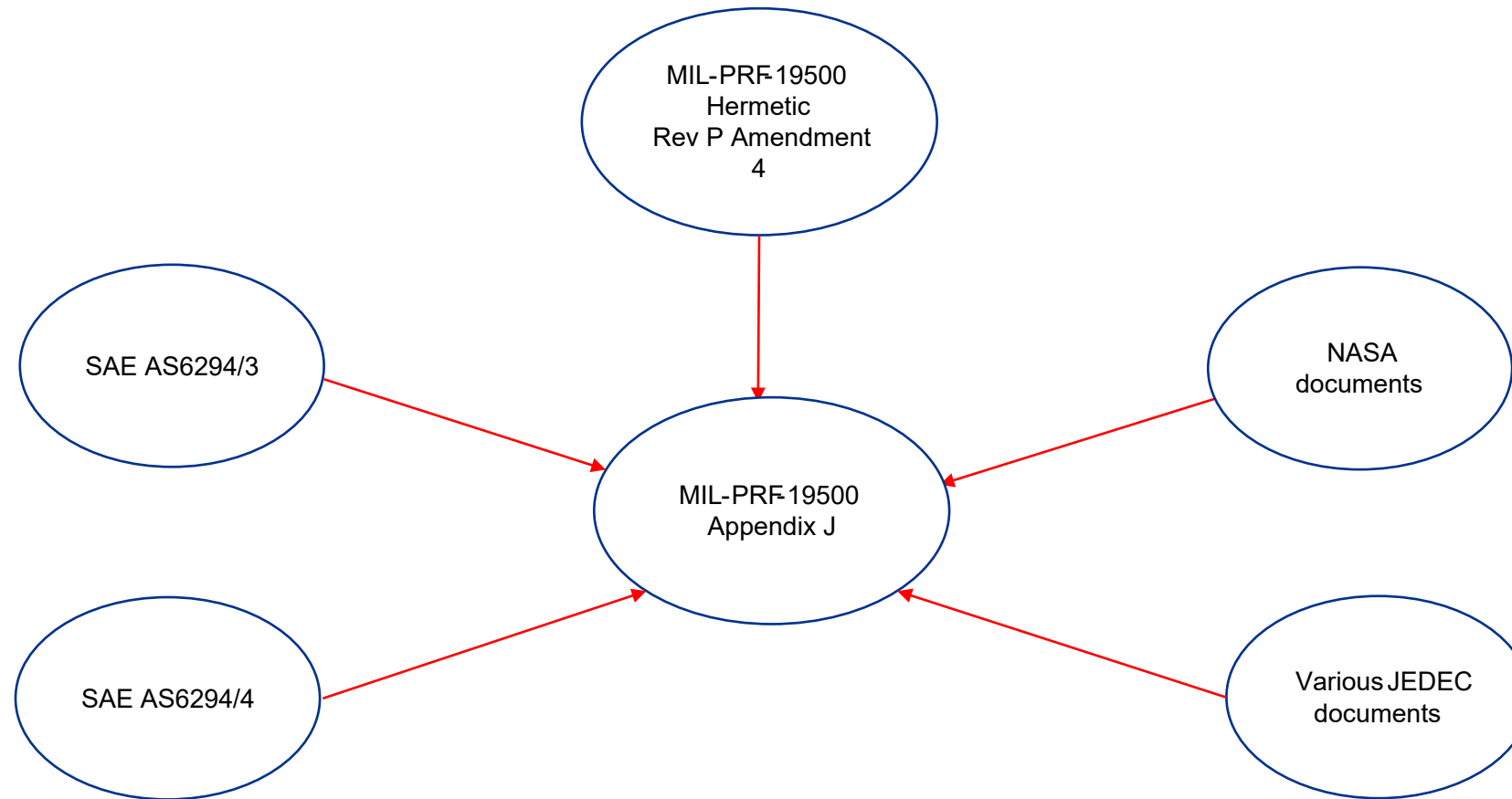
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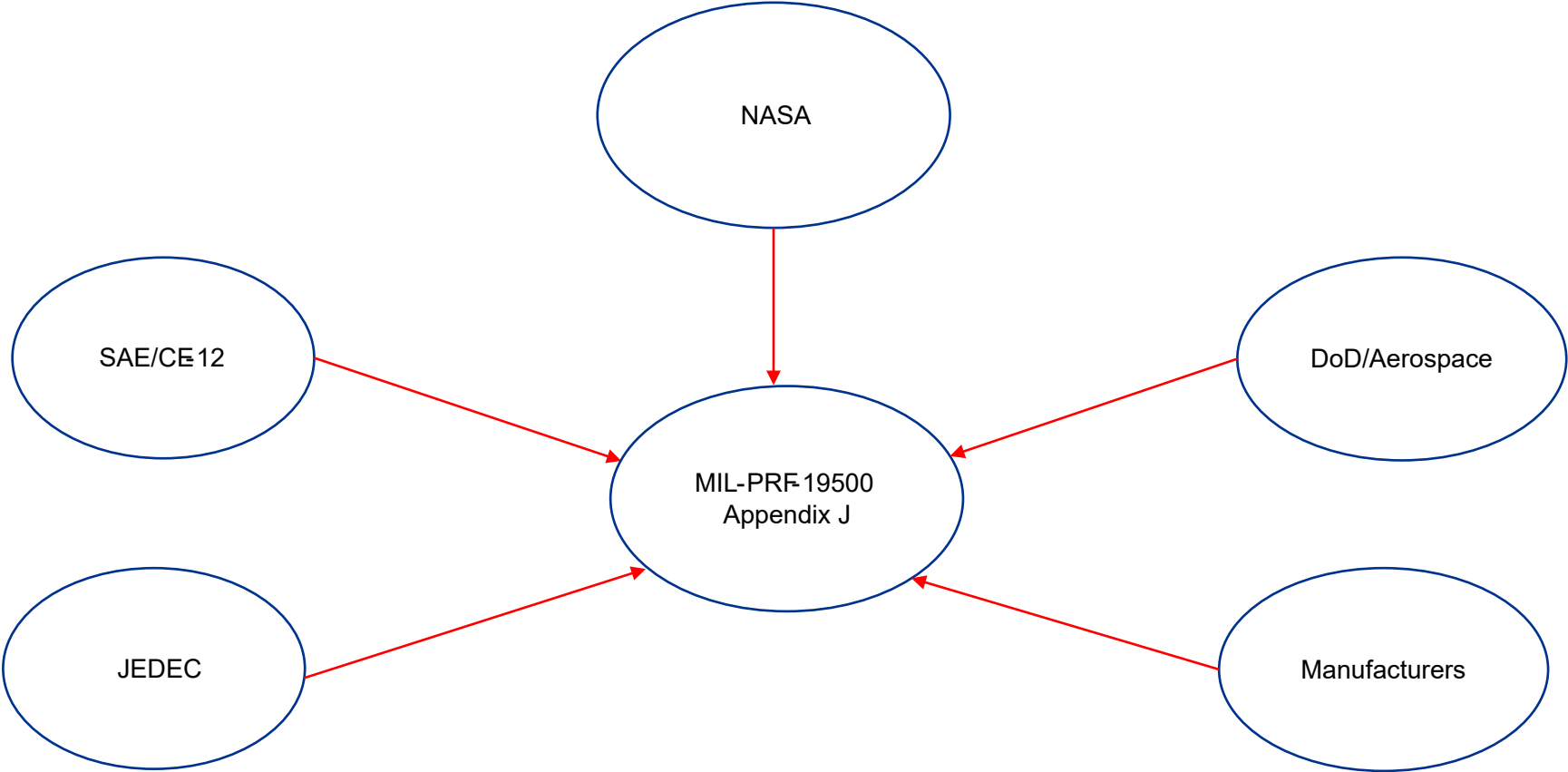
MIL-PRF 19500 Expanded to include Non-hermetic



MIL-PRF 19500 Appendix J Sources



MIL-PRF 19500 Appendix J Stakeholders



MIL-PRF-19500 Appendix J Status

- 19500 Appendix J part advantages:
 - DLA overview and audit of manufacturers
 - Standard screening and qci flow
- DLA Land and Maritime released the second draft of MIL-PRF-19500 Revision R with Appendix J incorporated on April 19, 2021. Comments are 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 JANPTX1 Nxxxx and JANPTXV1 Nxxxx, JANPTX2 Nxxxx.
- Webex was held on May 4 , 2021 to discuss 2nd draft change comments.

MILPRF-19500 Appendix J Status

- Planned slash sheets for Appendix J qualification

19500 Slash sheet	Device Type	Part number	Additional information
672		2N2222	Cross references to hermetic / 255
674		2N2484	Cross references to hermetic / 376
686		2N2907	Cross references to hermetic / 291
691			Cross references to hermetic / 116
694		2N3700	Cross references to hermetic / 391

MILPRF-19500 Appendix J Status

- Planned slash sheets for Appendix J qualification

19500 Slash sheet	Device Type	Part number	Additional information
695		2N4033	Cross references to hermetic / 512
696	MOSFET N-Channel		
714			
715			
716		1N5555 and others	Cross references to hermetic / 500
717		1N6036 – 1N6072	Cross references to hermetic / 507

MILPRF-19500 Appendix J Status

- Planned slash sheets for Appendix J qualification

672		2N2222	Cross references to hermetic /255	
674		2N2484	Cross references to hermetic / 376	
686		2N2907	Cross references to hermetic / 291	
691			Cross references to hermetic / 116	
694		2N3700	Cross references to hermetic / 391	
695		2N4033	Cross references to hermetic / 512	
696				
714				
715				
716		1N5555 and others	Cross references to hermetic / 500	
717		1N6036 - 1N6072	Cross references to hermetic / 507	

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MIL-PRF 19500 Appendix J Part Advantages

- DLA Land and Maritime overview and audits of qualified manufacturers
 - Standard screening and qualification conformance inspection flows
 - Screening and qualification conformance flows based on hermetic flow and proven Army testing.
 - No up-screening required and no schedule delays due to up-screening saving time and money...
-
- COTS appear cheaper at purchase because the cost of up-screening the lot is not included in the program parts cost.

MIL-PRF-19500 R Second draft Appendix J Comments

- Conditions for UHAST in B2 are listed as “130C/ 100% RH, 96 hours”.

UHAST, or	JESD22 -A118	130C/ 100% RH, 96 hours, or
UHAST		110C/ 85%RH, 264 hours

- Should this be “130C/ 85% RH, 96 hours” instead? Yes

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? I believe that it still would but I didn'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	Δ 0Z - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).
Class 0A	50 to 124 V	Δ 0A - single equilateral triangle (outline or solid) +0 (still acceptable as pin one designator).
Class 0B	125 V to 249 V	Δ 0B - 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	Δ A - single equilateral triangle (outline or solid) +A (still acceptable as pin one designator).
Class 1B	500 V to 999 V	Δ B - single equilateral triangle (outline or solid) +B (still acceptable as pin one designator).
Class 1C	1,000 V to 1,999 V	Δ C - single equilateral triangle (outline or solid) +C (still acceptable as pin one designator).
Class 2	2,000 V to 3,999 V	$\Delta\Delta$ - double equilateral triangle (outline or solid) (still acceptable as pin one designator).
Class 3A	4,000 V - 7,999 V	$\Delta\Delta\Delta$ A - triple equilateral triangle (outline or solid) +A (still acceptable as pin one designator).
Class 3B	8,000 V - 15,999V	$\Delta\Delta\Delta$ B - 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 nonhermetic devices
 - ESD classification documentation
 - Currently listed in QPDSIS-19500
 - New requirement – Test methods used 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 <u>Destructive tests</u> . Refer to E.3.4. Additional tests defined below are also considered destructive for appendix J products:	
<u>Method number</u>	<u>Test</u>
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 <u>Destructive tests</u> . 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/PTXV Product Subgroups required to be performed and data submitted to DLA Land and Maritime	JANPS Product 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, epitaxial properties	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, end 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

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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/PTXV Product Subgroups required to be performed and data submitted to DLA Land and Maritime	JANPS Product 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. Package properties			
a. Package material / 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 selected for testing.
- 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 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, 3.2.1.1 Non 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 nonhermetic 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 nonhermetic 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 QPDSIS19500. 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 for non hermetic encapsulated.)	

MIL-PRF-19500 Appendix J Comments

10.	3.10.3.1	JEDEC	Propose replacement of JESD22A114 with ANSI/ESDA/JEDEC JS001, and remove correlation statement. In addition add recommendation of Charge device model (CDM) testing.	JS-001 superseded JESD22A114 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 MILSTD-750-1 test method 1020 referencing JS-002. 3.10.3.1 <u>ESDS identifier</u> ESDS testing shall be done in accordance with test method <u>1020</u> of <u>MIL-STD-750</u> . The testing procedure of <u>JESD22A114</u> ANSI/ESDA/JEDEC JS001 may be used in lieu of method <u>1020</u> 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 is also recommended to be performed in accordance with ANSI/ESDA/JEDEC JS002.	
		DLA	The correlation cannot remain because the JS001 does not have the same testing requirements as the historical JESD22A114. 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 QPDSIS19500 where they are currently listed.	Rationale – there are differences between the two test methods

MIL-PRF-19500 Appendix J Comments

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 callout in section J.2. Also, JESD22A101 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	

MIL-PRF-19500 Appendix J Comments

		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	

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 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.
 - Some example 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 JANP XV and JANP X no hermeticity testing required

MIL-PRF 19500 Appendix J Screening Comparison to Hermetic Devices

	Hermetic Flow		Nonhermetic 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 Non Operating Life	Optional	Optional	Optional	Optional
Temperature Cycling	Condition C*	Condition C*	Condition G**	Condition G**

* 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		Nonhermetic flow	
Screen	JANTXV	JANTX	JANTXV-Like	JANTX-Like
Surge	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		Nonhermetic 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**

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

	Hermetic Flow		Nonhermetic 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	N/A	N/A

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
 - 110°C/ 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 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 (T_g) 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 T_g

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 or
 - 1000 hour temperature humidity test – 85°C/ 85% RH

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.

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 - T_g
 - 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 1 1
 - 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.”

Thank you!

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

- Contact information:

Benny Damron
Jacobs Space Exploration Group (JSEG)
NASA Marshall Space Flight Center
Benny.Damron@nasa.gov

Ronan Dillon
Microchip Technologies
Ronan.Dillon@microchip.com

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