

MIL-PRF-19500Ram1 Change Summary

The following changes are the result of industry requests, editorial, DLA Weapons Support proposals, JEDEC task groups and audit expectations:

Item No.	Paragraph	Change Originator	Description of Change	Justification for change
1.	Multiple	DLA	Changed "DLA Land and Maritime" to "DLA Weapons Support" throughout document	Editorial, due to DLA realignment
2.	1.3.8	MIL	Changed "JANTX 'P' devices" and "JANTXV 'P' devices" to "JANTX 'P' (PIND) devices" and "JANTXV 'P' (PIND) devices".	This addition will help differentiate between the historical PIND device substitution and the recently added non hermetic JANPTX and JANPTXV device types
3.	2.3	JEDEC	Added JEP138, JEP173, JEP180, JEP 182, JEP186	Referenced documents used within the new GaN test flow addition
4.	3.7	OEM/MIL/ JEDEC	Added "conforming" to further identify the type of products being specified on the Certificate of conformance	This addition will help identify shipped devices that have been subjected to destructive testing
5.	3.7.b	OEM/DLA	Added "Statement certifying lead or terminal alterations are in accordance with 3.9.2"	This addition is being added to clarify testing needed after device lead changes
6.	3.9	OEM/DLA	Created new Leads and terminals main paragraph and renumber 3.9 to 3.91	This addition is being added to clarify testing needed after device lead changes
7.	3.9.2	OEM/DLA	Added new Alteration of leads or terminals with references to existing testing requirements paragraphs. "3.9.2 <u>Alteration of leads or terminals</u> . Leads or terminals altered to meet order requirements such as lead trimming, solder dip, and lead forming, etc., shall require that the devices complete the testing as specified herein to be compliant with MIL-PRF-19500 (see 6.2.1, E.5.3.4, E.5.4.2, and H.4.3)."	This addition is being added to clarify testing needed after device lead changes
8.	3.10.6.1	DLA	Updated to reflect the new Certificate of Registration Number for the certification mark "JAN" due to trademark reapplication. Certificate of Registration Number was changed from 504,860 to 6,069,576	Editorial
9.	3.14	MIL	3.14 Pure tin paragraph – changed paragraph reference from 6.8 to 6.7	Editorial
10.	5.1	OEM/MIL /JEDEC	Added reference to E.3.3 the updated Disposal of Samples paragraph for requirements for packaging.	This addition will help identify shipped devices that have been subjected to destructive testing
11.	6.2.1.b	DLA	Added additional paragraph and appendix reference for lead finish details	Clarification
12.	6.8	MIL	Changed paragraph from "Changes from previous issue" to "Amendment notations"	Editorial
13.	A.3.28	MIL	Removed degree symbol in front of the Kelvin (K) symbol	Editorial

MIL-PRF-19500Ram1 Change Summary

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14.	A.4.3.4	JEDEC GaN task group	Added Dynamic drain to source on-state resistance definition. Renumber A.4.3.4 – A.4.3.13	Added as part of the proposed content to cover GaN devices
15.	A.8.9	JEDEC GaN task group	Added Transient Off-State Withstand Voltage ($V_{DS(tr)}$) definition. Renumber A.8.9	Added as part of the proposed content to cover GaN devices
16.	B.3.1	JEDEC GaN task group	Added abbreviation for Gallium Nitride (GaN)	Added as part of the proposed content to cover GaN devices
17.	B.3.1	JEDEC GaN task group	Added abbreviation for High Electron Mobility Transistor (HEMT)	Added as part of the proposed content to cover GaN devices
18.	B.3.1	VEN	Added abbreviation for JAN (Joint Army-Navy)	Added to show the historical meaning of the JAN branded parts
19.	B.4.1,	DLA	Update abbreviation $V_{CEO(SUS)}$ - Remove “Breakdown” portion of the symbol definition and add “base open”	Editorial
20.	B.4.2	JEDEC GaN task group	Added symbol for Dynamic drain to source on-state resistance ($DR_{DS(on)}$)	Added as part of the proposed content to cover GaN devices
21.	B.4.2	JEDEC GaN task group	Added symbol for Transient Off-state Withstand voltage ($V_{DS(tr)}$)	Added as part of the proposed content to cover GaN devices
22.	D.2.2	DLA	Changed “JEDEC Publication 114” to “JEP114”	Editorial
23.	D.2.2	DLA	Changed “EIA-557” from EIA designation to JESD557 JEDEC	Superseded by the JEDEC version
24.	D.3.9.1	DLA	Changed EIA-557 to JESD557	Superseded by the JEDEC version
25.	D.3.9.5	DLA/ JEDEC	Added exemption for process monitors c., d., e., j., and k for JANP, JANPTX, and JANPTXV devices	Adds clarification to the existing process monitors that do not apply to the non hermetic JANP, JANPTX, and JANPTXV device types
26.	D.3.9.5.a	DLA/ JEDEC	Added JANPTX, and JANPTXV devices	Adds clarification to the existing process monitors that apply to the non hermetic JANPTX, JANPTXV devices

MIL-PRF-19500Ram1 Change Summary

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27.	D.3.9.5.b	MFR	For JANTX/JANTXV added the monitor “midway for lots greater than 5,000 devices, ...”	The addition is being added to create an additional testing point when larger lots are processed using automated bonding equipment
28.	D.3.9.5.b	DLA/ JEDEC	Added JANPTX, and JANPTXV devices	Adds clarification to the existing process monitors that apply to the non hermetic JANPTX, JANPTXV devices
29.	D.3.9.5.d	DLA	Removed “not” within the requirement statement for devices referring to those utilizing a eutectic or epoxy die attach pointing to the limits within test method 1018	Monitor previously listed two different limits for devices not utilizing a eutectic or epoxy die attach. This change will clarify conditions with and without eutectic or epoxy die attach
30.	D.3.9.5.d	DLA/MIL	Revised and restructured monitor: -Removed content that was added to the Internal Gas Analysis (IGA) test method 1018 -Restructured sealing environment requirements -Specified monitoring of each package type for each sealer -Added a baselining process with TRB review and establishing sample size, frequency, and control limits with review and adjustment to maintain control -Added requirement for proper identification of process monitor, production, engineering experiments, or conformance devices -Removed cap weld portion and moved to a new monitor	These additions will help find out of spec sealing equipment, IGA failures, and also provide more clearly labeled data.
31.	D.3.9.5.e	DLA	Changed “JEDEC Publication 114” to “JEP114”	Editorial
32.	D.3.9.5.h	JEDEC	Changed MOSFET category to list types FET, JFET, HEMT and add Dynamic $r_{DS(on)}$ (As applicable)	The addition will add lot norm parameters for JFET and HEMT devices
33.	D.3.9.5.i	DLA/ JEDEC	Added JANP, and JANPTX devices	Adds clarification to the existing process monitors that apply to the non hermetic JANP, JANPTX devices
34.	D.3.9.5.o	DLA/MIL/O EM	Added new process monitor. Glass transition temperature for non hermetic devices	This addition was added in lieu of the previous group B Glass transition temperature test that was removed in this spec action
35.	D.3.9.5.p	DLA	Cap weld monitor requirement was moved from the IGA monitor to a separate new monitor	Editorial
36.	D.3.13	DLA	Added reference to E.3.3	This addition will help identify disposal requirements of nonconforming product.

MIL-PRF-19500Ram1 Change Summary

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37.	D.3.20.1	DLA	Changed EIA-557 to JESD557	Superseded by the JEDEC version
38.	E.3.3	OEM/MIL/ JEDEC	Added additional criteria for shipping devices subjected to destructive tests, and a new reference to D.3.13 (Control of nonconforming product.)	This addition will help identify shipped devices that have been subjected to destructive testing
39.	E.3.4, E.3.5	OEM/MIL	Switch test methods 1026, 1027, from nondestructive to destructive	This change will help identify shipped devices that have been subjected to destructive testing
40.	Figure E-1	DLA	Added the note 1 reference back into the first block of the flowchart diagram	Note reference was omitted in MIL-PRF-19500P Amendment 1 during a resize of the block
41.	TABLE E-II RHA levels, Note 2	OEM/DLA	Added new low dose rate descriptions, notes, and additional details to existing high dose rate notes	Adding clarification to distinguish that the note allowance applies to each HDR/LDR condition separately and adds the condition used for each test type
42.	Table E-IV, 3.c	JEDEC GaN task group	Added TM2076 of MIL-STD-750 as an alternate to thermal impedance for Power GaN FETs	Added as part of the proposed content to cover GaN devices
43.	Table E-IV, 13.b	JEDEC GaN task group	Added Dynamic $r_{DS(on)}$ test to be include within electrical measurements for Power GaN FETs	Added as part of the proposed content to cover GaN devices
44.	Table E-IV, 17	DLA	Changed "Case Isolation" to "Dielectric withstanding voltage"	Change will align with corresponding test method.
45.	Table E-IV, 17	DLA	Changed conditions to specify the test is for power devices in case isolated packages	Updated test requirements as feedback indicated the test may not be applicable for all case isolated packages
46.	Table E-VIA, Subgroup 3, Die shear	JEDEC GaN task group	Added the placeholder exemption for group B die shear and add reference to be performed in group C	Added as part of the proposed content to cover GaN devices
47.	Table E-VIA, Subgroup 5, TM1042	JEDEC GaN task group	Changed "MOSFETs" to "FETs" to include GaN as part of the grouping	Added as part of the proposed content to cover GaN devices
48.	Table E-VIA, Subgroup 5	JEDEC GaN task group	Added Dynamic ON-Resistance	Added as part of the proposed content to cover GaN devices

MIL-PRF-19500Ram1 Change Summary

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49.	Table E-VIA, Subgroup 5, Bond strength	MFR	Added allowance for the small lot conformance inspection sample size requirements by adding “, or all device wires” and “(whichever requires the smaller number of devices.)” (B5 requires a 12 device sample then later a bond pull requirement of 20 wires. For Schottky devices that have a single wire, there would only be 12 wires available, and would not meet the 20 wire pull requirement.)	Adjustment would allow usage of existing wires available within the original sample size of the subgroup, in lieu of adding additional devices. This verbiage is the same as the bond strength test listed earlier in Group B subgroup 3 and should account for devices with a single wire.
50.	Table E-VIA, Subgroup 6, Thermal resistance	JEDEC GaN task group	Added TM2076 for the method used for power GaN devices	Added as part of the proposed content to cover GaN devices.
51.	Table E-VIA, Note 9	JEDEC GaN task group	Added note for GaN FETs allowing a group C test frequency	Added as part of the proposed content to cover GaN devices.
52.	Table E-VIB, Subgroup 3, Life Test	OEM/DLA	Reorganize subgroup into Life test, life test electrical measurements, and Post life test inspection sections	Adds clarification to the life test and post life test groupings.
53.	Table E-VII, Subgroup 2	JEDEC GaN task group	Added JEP186 as an alternate to Surge for Power GaN FETs, including a note allowing the test to be performed at any time prior to lot formation or lot acceptance testing	Added as part of the proposed content to cover GaN devices
54.	Table E-VII, Subgroup 2	JEDEC GaN task group	Added 2017 die shear for GaN flip chip construction	Added as part of the proposed content to cover GaN devices
55.	Table E-VII, Subgroup 4	MFR	Removed “Fine leak not required for double plug diodes.” and replaced with “Not required for double plug diodes.” In addition, removed a note 2 reference for glass diodes.	Clarification, as this is only required for electroless nickel phosphorus plated on Kovar packages
56.	Table E-VII, Subgroup 5, Thermal resistance	JEDEC GaN task group	Added TM2076 for the method used for power GaN devices	Added as part of the proposed content to cover GaN devices
57.	E-VII, Subgroup 6, Life Test	OEM/DLA	Reorganize subgroup into Life test, life test electrical measurements, and Post life test inspection sections	Adds clarification to the life test and post life test groupings

MIL-PRF-19500Ram1 Change Summary

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58.	Table E-VII, Subgroup 6, Die shear	JEDEC GaN task group	Added TM2017 die shear	Added as part of the proposed content to cover GaN devices
59.	Table E-VII, Note 11	JEDEC GaN task group	Added note permitting Transient Off-state withstand voltage to be performed any time prior to lot formation or lot acceptance testing	Added as part of the proposed content to cover GaN devices
60.	Table E-VII, Note 12	JEDEC GaN task group	Added note permitting die shear to be eliminated when sufficient data is collected and approved by qualifying activity	Added as part of the proposed content to cover GaN devices
61.	Table E-VIII, Subgroup 4 and note 11	JEDEC GaN task group	Added new subgroup 4 for TM1080 Single Event Effect testing	Added as part of the proposed content to cover GaN devices
62.	Table E-IX, Subgroup 2	JEDEC GaN task group	Added JEP186 as an alternate to Surge for Power GaN FETs. Including note allowing test to be performed at any time prior to lot formation or lot acceptance testing	Added as part of the proposed content to cover GaN devices
63.	Table E-IX, Subgroup 2, 1042	JEDEC GaN task group	Added new note reference requiring 2000 hrs for each condition tested for TM1042	Added as part of the proposed content to cover GaN devices
64.	Table E-IX, Subgroup 4	JEDEC GaN task group	Added requirement to use JEP138 infrared thermal imaging to characterize device, or finite analysis transient thermal modeling as an alternate	Added as part of the proposed content to cover GaN devices
65.	Table E-IX, Subgroup 10	JEDEC GaN task group	Added switching reliability test JEP180/JEP182	Added as part of the proposed content to cover GaN devices
66.	Table E-IX, Subgroup 11	JEDEC GaN task group	Added Single Event Effect test 1080	Added as part of the proposed content to cover GaN devices
67.	Table E-IX, Note 4	JEDEC GaN task group	Added note permitting Transient Off-state withstand voltage to be performed any time prior to lot formation or lot acceptance testing	Added as part of the proposed content to cover GaN devices
68.	Table E-IX, Note 5	JEDEC GaN task group	Added new note requiring 2000 hrs for each condition tested for TM1042	Added as part of the proposed content to cover GaN devices

MIL-PRF-19500Ram1 Change Summary

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69.	Table E-IX, Note 6	DLA/MIL/ JEDEC	Added note allowing an alternate test to JEP138	Added as part of the proposed content to cover GaN devices
70.	G.5.2.4.3	DLA/ MFRS	Change die sample size from 22 to 10 to match the recent correction in the G-II table in Revision R and add wafer count verbiage	Editorial and to add clarification for when a different number of wafers are being evaluated as part of the inspection lot
71.	Table G-II, subgroup 4	MFR	For TM1051 Condition C, added "or maximum storage temperature, whichever is less."	Added to align with screening
72.	H.4.3.c	DLA/MIL	Reworded the hermeticity section and added a sample for glass diodes, in addition added provisions for non-transparent glass diodes	Adds clarification from the previous effort to define separate JANS quality level testing for lead finish requirements
73.	Table H-II	DLA/MFR	Added UD package	Editorial
74.	H.5	DLA/MFR	Added UD package description and additional details on the UB shielding lead	Editorial
75.	J.3.4.2 & J.3.4.2.1	DLA/MIL	Added new paragraphs listing Epoxy/molding compound materials and glass transition test details.	Added to support the glass transition testing changes
76.	Table J-I, 2.a	DLA	Added E10 to testing guidelines change table for mold compound.	Added to retest glass transition temperature if mold compound changes
77.	Table J-I, 2.a & 2.d	DLA	Removed C7 reference	Editorial There is no C7 subgroup in Appendix J (C7 is IGA in the Appendix E hermetic test flow and is not needed in Appendix J)
78.	Table J-I	MIL	Removed JANSP testing guidelines for changes to a qualified product	Editorial
79.	Table J-II, screen 2	MFR/DLA	Added "Optional" to the JANPTX requirements column	Requirement column information was missing
80.	Table J-II	DLA	Added degrees symbol for screen 10 and 12	Editorial
81.	Table J-II, screen 12	MIL	Added T _J to the temperatures listed	Clarification
82.	Table J-II	MIL	Screen 15c, screening column – replaced "case isolation" with "Dielectric Withstanding Voltage"	Updated to reflect test method name

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83.	Table J-II, Note 6	MIL/ JEDEC	Added a note requiring screen 16 be performed until sufficient data is obtained demonstrating the manufacturing process is stable and under control	The note was a compromise from an initial request to remove the test to more closely align the screen with the corresponding hermetic screen in appendix E
84.	Table J-III, subgroups 2, 3, 4	DLA	Added degree symbol and changed “degrees” to degree symbol	Editorial
85.	Table J-IVB, Subgroup 7	DLA/MIL/O EM	Removed Glass transition temperature	This was replaced by a new process monitor in D.3.9.5.o
86.	Table J-IVB, note 5	JEDEC	Deleted 328 hr test requirement and replace with 340	This change will align with appendix E hermetic test flow and meet the 340 minimum group B life test requirement
87.	Table J-IVB, note 8	JEDEC	Removed note 8	Note 8 contained small die flow test details that were already covered by the small die flow table J-IVC
88.	Table J-IVC, Step 4	DLA/MIL/O EM	-Removed Glass transition temperature -Removed “or industry standard” from table heading since the Glass transition temperature is the only industry standard listed and the MIL-STD-750 heading will cover the remaining methods	This test is being replaced by a process monitor in D.3.9.5.o
89.	Table J-V, Subgroup 3	MFR	Add note for initial acoustic microscopy and preconditioning for applicable package types	Note provides guidance for thru hole leaded devices
90.	Table J-VI, Subgroup 1	MIL	Change “Hast” to “UHAST”	Update to reflect test method.
91.	Table J-VI, Subgroup 2	MFR	Added electrical measurements and an “or” statement to align with the subgroup E2 of appendix E	Editorial
92.	Table J-VI, Subgroup 9	DLA	Added degree symbol	Editorial
93.	Table J-VI, Subgroup 10	DLA	Changed “Glassivation Temperature (Tg)” to Glass Transition Temperature (Tg)”	Editorial
94.	Table J-VI, Subgroup 10	DLA	Added reference to new paragraphs J.3.4.2 for glass transition test details	Added to support the glass transition testing changes
95.	Table J-VI	DLA	Updated TM 5011 title	Editorial