

The documentation and process conversion measures necessary to comply with this document shall be completed by 11 October 2025.

INCH-POUND

MIL-PRF-19500/211E
w/AMENDMENT 2
11 August 2025
SUPERSEDING
MIL-PRF-19500/211E
w/AMENDMENT 1
24 January 2024

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER,
TYPES 1N3164, 1N3168, 1N3170, 1N3172, 1N3174, 1N3175,
1N3176, 1N3177, AND R, TYPES JAN, JANTX, AND JANTXV

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of
this specification sheet and [MIL-PRF-19500](#).

1. SCOPE

1.1 Scope. This specification covers the detail requirements for silicon power rectifier. Three levels of product assurance (JAN, JANTX, and JANTXV) are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Package outline. The device package for the device types is a case mount stud package with a flexible lead similar to a DO-205AB (formerly DO-9) in accordance with [figure 1](#).

1.3 Ratings and characteristics.

Type	V _{RSM}	V _{RWM}	I _O T _C = 150°C (1)	I _O T _C = 120°C (1)	I _{FSM} 1/120 s	Barometric pressure (reduced)	T _J and T _{STG}
	<u>V (pk)</u>	<u>V (pk)</u>	<u>A</u>	<u>A</u>	<u>A (pk)</u>	<u>mm Hg</u>	<u>°C</u>
1N3164, R	240	200	200	300	6,250		-65 to +200
1N3168, R	480	400	200	300	6,250	8	-65 to +200
1N3170, R	720	600	200	300	6,250	8	-65 to +200
1N3172, R	960	800	200	300	6,250	15	-65 to +200
1N3174, R	1,200	1,000	200	300	6,250	15	-65 to +200
1N3175, R	1,440	1,200	200	300	6,250	33	-65 to +200
1N3176, R	1,680	1,400	200	300	6,250	33	-65 to +200
1N3177, R	1,920	1,600	200	300	6,250	54	-65 to +200

(1) Derate linearity at: 4.0 A/°C for +150°C < T_C < +200°C; 3.33 A/°C for +120°C < T_C < +150°C.

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1.4 Thermal resistance characteristic: $R_{\theta JC} = 0.20^{\circ}\text{C/W}$.

1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example and [6.5](#) for a list of available PINs.

1.5.1 JAN certification mark and quality level for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX", and "JANTXV".

1.5.2 Device type. The designation system for the device types of semiconductors covered by this specification sheet are as follows.

1.5.2.1 First number and first letter symbols. The semiconductors of this specification sheet use the first number and letter symbols "1N".

1.5.2.2 Second number symbols. The second number symbols for the semiconductors covered by this specification sheet are as follows: "3164", "3168", "3170", "3172", "3174", "3175", "3176" and "3177".

1.5.3 Suffix symbols. The suffix letter "R" is used on devices that are reverse polarity, reverse types have the anode connected to the stud.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-19500](#) - Semiconductor Devices, General Specification for.

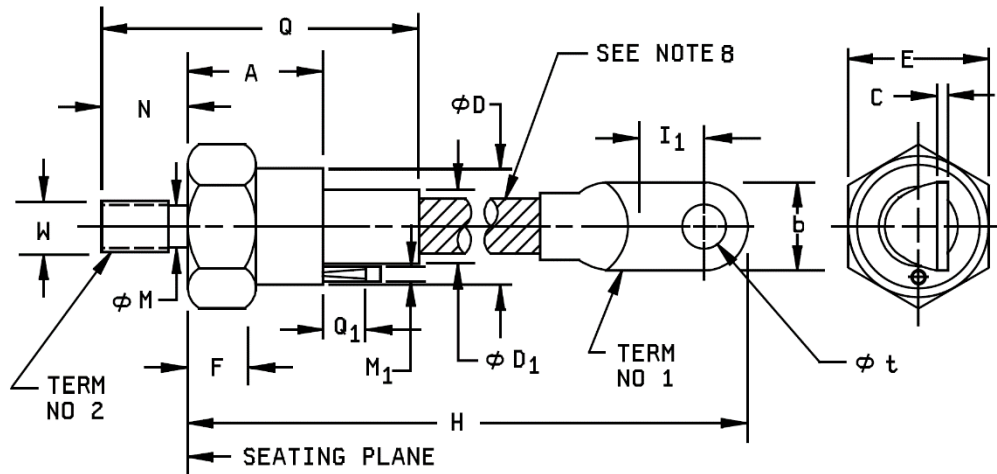
DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) - Test Methods for Semiconductor Devices.

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

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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Symbol	Dimensions				Notes
	inch Min	inch Max	mm Min	mm Max	
A		1.00		25.4	2
b	.530	.755	13.46	19.18	
C	.063	.172	1.60	4.37	
ØD		1.100		27.94	
ØD ₁		.600		15.24	
E	1.218	1.252	30.94	31.8	
F	.250	.562	6.35	14.27	3
H	5.125	6.750	130.18	171.45	
I ₁	.375		9.53		4
ØM	.660	.745	16.76	18.92	5
M ₁		.125		3.18	6
N	.793	.828	20.14	21.03	
Q		2.70		68.58	
Q ₁		.375		9.53	6
Øt	.333	.353	8.46	8.97	
W					7

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Angular orientation of terminal and tabulation with respect to hex base is undefined. Square or radius on end of terminal is undefined.
3. A chamfer (or undercut) on one, or both, ends of hexagonal portions is optional.
4. Minimum flat.
5. Complete threads to extend to within 2.5 threads of seating plane.
6. Tabulation optional.
- * 7. .750-16 UNF-2A threaded stud. Maximum pitch diameter of plated threads shall be basic pitch diameter.
- * 8. Flexible lead.

* FIGURE 1. Physical dimensions for modified DO-205AB package.

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3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in [MIL-PRF-19500](#) and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see [4.2](#) and [6.3](#)).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in [MIL-PRF-19500](#).

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-19500](#) and on [figure 1](#) (DO-205AB) herein.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with [MIL-PRF-19500](#), and as specified herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see [6.2](#)).

3.4.2 Normal and reverse types (reverse types, suffix R). Reverse and normal types are identical except: The normal types have the cathode connected to the stud and the reverse types have the anode connected to the stud. Designated values are applicable to both types.

3.5 Marking. Devices shall be marked as specified in [MIL-PRF-19500](#).

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [table I](#) herein.

3.7 Electrical test requirements. The electrical test requirements shall be as specified in [table I](#).

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of Inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see [4.2](#)).
- b. Screening (see [4.3](#)).
- c. Conformance inspection (see [4.4](#) and [tables I and II](#)).

4.2 Qualification inspection. Qualification inspection shall be in accordance with [MIL-PRF-19500](#).

4.2.1 Group E qualification. Group E qualification shall be performed herein for qualification or re-qualification only. In case qualification was awarded to a prior revision of the associated specification that did not request the performance of [table III](#) tests, the tests specified in [table III](#) herein that were not performed in the prior revision shall be performed on the first inspection lot to this revision to maintain qualification.

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4.3 Screening (JANTX and JANTXV levels only). Screening shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screening	Measurements for JANTX and JANTXV levels
1	Method 2073 of MIL-STD-750 may be used in lieu of method 2074 for compression bonded devices only.
3c	Thermal impedance (see 4.3.1).
4	2,500 G; performed prior to installation of external lead.
10	Not applicable.
11	I_{RM1} and V_{FM} of subgroup 2 of table I herein.
12	Method 1038 of MIL-STD-750, condition A; $V_{RM} = V_{RWM}$ rated (see 1.3), $T_C = 150^\circ\text{C}$; $f = 50$ to 60 Hz.
13	Subgroup 2 of table I herein: $\Delta I_{RM1} = \pm 0.5$ mA (pk) or 100 percent of initial value, whichever is greater. $\Delta V_{FM} = \pm 0.1$ V (pk).

* 4.3.1 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 of MIL-STD-750 using the guidelines in that method for determining I_M , I_H , t_H , t_{MD} , t_{SW} , (and V_H where appropriate). See table III, group E, subgroup 4 herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of MIL-PRF-19500, table I herein, and as specified herein. Delta measurements shall be in accordance with the applicable steps of table II herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and herein. Delta measurements shall be in accordance with applicable steps of table II herein.

Subgroup	Method	Condition
B3	1037	See 4.5.1, $\Delta T_J = +85^\circ\text{C}$ minimum; $I_O \geq 75$ A, 6,000 cycles.
	or	
B3	1048	Blocking life. $T_C = +185^\circ\text{C}$, -10, +0; $V_{RWM} = V_{RM}$ (see 1.3); $I_O = 0$, half sine wave, $f = 50$ to 60 Hz.
B3	1037	See 4.5.1, $\Delta T_J = +85^\circ\text{C}$ minimum; $I_O \geq 75$ A, 2,000 cycles.
B5	3101	$R_{\theta JC} = 0.20^\circ\text{C/W}$.
	or	
	4081	

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4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of MIL-PRF-19500. Delta measurements shall be in accordance with table II herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
* C2	2036	Tension (lead): Test condition A; weight = 100 pounds (45.4 Kg); t = 15 ±3 seconds. Bending stress (lead): Test condition F; 10 pounds; t = 15 ±3 seconds. Torque (stud): Test condition D2; torque = 325 inch-pounds (36.7 N-m); t = 15 ±3 seconds.
C2	1071	Gross leak. step 2 or test condition D.
C6	1037 or	See 4.5.1, $\Delta T_J = +85^\circ\text{C}$ minimum; $I_O \geq 75\text{ A}$, 6,000 cycles.
C6	1048	Blocking life. $T_C = +185^\circ\text{C}$, -10, +0; $V_{RWM} = V_{RM}$ (see 1.3); $I_O = 0$, half sine wave, f = 50 to 60 Hz.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-IX of MIL-PRF-19500 and table III herein. Delta measurements shall be in accordance with table II herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables as follows.

4.5.1 Power cycling. One complete test shall be as follows: First, heat the case to the maximum temperature specified by passing the specified amount of forward current through the diode under test. Then, remove the applied current and allow the case temperature to cool to the minimum case temperature specified. No time limit is applicable to any one cycle; however, the cycling shall be continuous until the required number of cycles have been completed. Sample size = 12, c = 0.

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TABLE I. Group A inspection.

Inspection <u>1</u> /	MIL-STD-750		Symbol	Limit	Limit	Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>2</u> /	3101	See 4.3.1	$Z_{\theta JX}$			°C/W
Forward voltage	4011	Condition B, Pulse method: $I_{FM} = 940$ A (pk); pulse width = 8.5 ms max; duty cycle = 2 percent max	V_{FM}		1.55	V (pk)
Reverse current	4016	Condition A or B, DC method or equivalent pulse	I_{RM1}			
1N3164, R		$V_{RM} = 200$ V			10	mA
1N3168, R		$V_{RM} = 400$ V			10	mA
1N3170, R		$V_{RM} = 600$ V			10	mA
1N3172, R		$V_{RM} = 800$ V			10	mA
1N3174, R		$V_{RM} = 1,000$ V			10	mA
1N3175, R		$V_{RM} = 1,200$ V			10	mA
1N3176, R		$V_{RM} = 1,400$ V			10	mA
1N3177, R		$V_{RM} = 1,600$ V			10	mA
Reverse current at peak reverse voltage	4016	Condition A or B, DC method or equivalent pulse	I_{RM2}			
1N3164, R		$V_{RM} = 240$ V			50	mA
1N3168, R		$V_{RM} = 480$ V			50	mA
1N3170, R		$V_{RM} = 720$ V			50	mA
1N3172, R		$V_{RM} = 960$ V			50	mA
1N3174, R		$V_{RM} = 1,200$ V			50	mA
1N3175, R		$V_{RM} = 1,440$ V			50	mA
1N3176, R		$V_{RM} = 1,680$ V			50	mA
1N3177, R		$V_{RM} = 1,920$ V			50	mA
<u>Subgroup 3</u>						
High temperature operation:		$T_C = +175^\circ\text{C}$				

See footnotes at end of table.

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TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit	Limit	Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u> - continued						
Reverse current	4016	Condition A or B, DC method or equivalent pulse	I_{RM3}			
1N3164, R		$V_{RM} = 200 \text{ V}$			30	mA
1N3168, R		$V_{RM} = 400 \text{ V}$			30	mA
1N3170, R		$V_{RM} = 600 \text{ V}$			30	mA
1N3172, R		$V_{RM} = 800 \text{ V}$			30	mA
1N3174, R		$V_{RM} = 1,000 \text{ V}$			30	mA
1N3175, R		$V_{RM} = 1,200 \text{ V}$			30	mA
1N3176, R		$V_{RM} = 1,400 \text{ V}$			30	mA
1N3177, R		$V_{RM} = 1,600 \text{ V}$			30	mA
Low temperature operation:		$T_C = -65^\circ\text{C}$				
Reverse current	4016	Condition A or B DC method or equivalent pulse	I_{RM4}			
1N3164, R		$V_{RM} = 200 \text{ V}$			50	mA
1N3168, R		$V_{RM} = 400 \text{ V}$			50	mA
1N3170, R		$V_{RM} = 600 \text{ V}$			50	mA
1N3172, R		$V_{RM} = 800 \text{ V}$			50	mA
1N3174, R		$V_{RM} = 1,000 \text{ V}$			50	mA
1N3175, R		$V_{RM} = 1,200 \text{ V}$			50	mA
1N3176, R		$V_{RM} = 1,400 \text{ V}$			50	mA
1N3177, R		$V_{RM} = 1,600 \text{ V}$			50	mA
<u>Subgroups 4 and 5</u>						
Not applicable						
<u>Subgroup 6</u>						
Surge current	4066	Condition A; $T_C = +150^\circ\text{C}$; $I_{FSM} = 5,000 \text{ A (pk)}$, $I_O = 200 \text{ A dc}$; ten 1/120 s surges; 1 surge each minute, $V_{RM} = V_{RWM}$ (see 1.3)				
Electrical measurements		See subgroup 2 (V_{RM} and I_{RM1})				
<u>Subgroup 7</u>						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.

2/ For end-point measurements, this test is required for the following subgroups:
Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).
Group C, subgroup 2 and 6.
Group E, subgroup 1.

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TABLE II. Groups A, B, C, and E delta measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage (change)	4011	Condition B, $I_{FM} = 940$ A (pk)	ΔV_{FM}		+0.1	V (pk)

- 1/ The delta electrical measurements taken during group B inspections for quality levels JAN, JANTX and JANTXV (table E-VIB of MIL-PRF-19500) shall be as follows: In addition to the measurements specified for subgroup 3, the measurements of step 1 of this table shall also be taken.
- 2/ The delta electrical measurements taken during group C inspections for all quality levels (table E-VII of MIL-PRF-19500) shall be as follows: In addition to the measurements specified for subgroup 6, the measurements of step 1 of this table shall also be taken.
- 3/ The delta electrical measurements taken during group E inspections for all quality levels (table E-IX of MIL-PRF-19500) shall be as follows:
- In addition to the measurements specified for subgroup 1, the measurements of step 1 of this table shall also be taken.
 - In addition to the measurements specified for subgroup 2, the measurements of step 1 of this table shall also be taken.

TABLE III. Group E inspection (all quality levels) for qualification and requalification only.

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices $c = 0$
Thermal shock	1056	100 cycles, 0°C to 100°C.	
Hermetic seal	1071		
Electrical measurement		See table I, subgroup 2 herein.	
<u>Subgroup 2</u>			45 devices $c = 0$
Steady-state reverse bias	1038	Test condition A, 1,000 hours.	
Electrical measurement		See table I, subgroup 2 herein.	
<u>Subgroup 4</u>			Sample size = N/A
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 5</u>			3 devices $c = 0$
Barometric pressure	1001	$V_{RWM} = \text{rated } V_{RWM}$ (see 1.3), pressure = rated pressure (see 1.3), $t = 1$ minute, (not applicable to 1N3164 and 1N3164R).	

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in [MIL-PRF-19500](#) are applicable to this specification.)

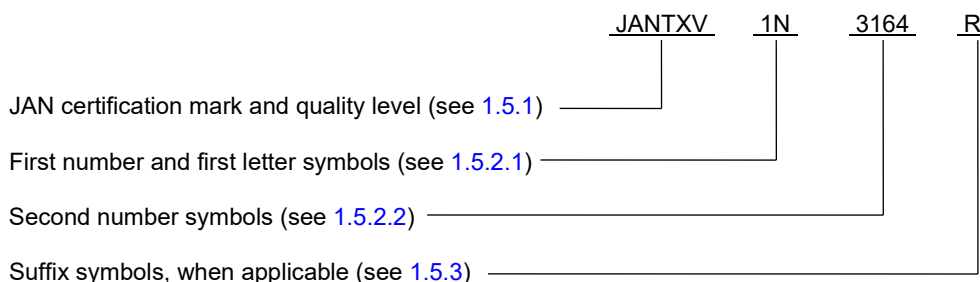
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see [5.1](#)).
- c. Lead finish (see [3.4.1](#)).
- d. The complete PIN, see [1.5](#) and 6.4.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://qpldocs.dla.mil>.

6.4 PIN construction example. The PINs for encapsulated device are constructed using the following form.



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6.5 List of PINs. The following is a list of possible PINs available on this specification sheet.

PINs for types 1N3164, 1N3168, 1N3170, 1N3172, 1N3174, 1N3175, 1N3176, AND 1N3177.		
JAN1N3164	JANTX1N3164	JANTXV1N3164
JAN1N3168	JANTX1N3168	JANTXV1N3168
JAN1N3170	JANTX1N3170	JANTXV1N3170
JAN1N3172	JANTX1N3172	JANTXV1N3172
JAN1N3174	JANTX1N3174	JANTXV1N3174
JAN1N3175	JANTX1N3175	JANTXV1N3175
JAN1N3176	JANTX1N3176	JANTXV1N3176
JAN1N3177	JANTX1N3177	JANTXV1N3177

* 6.6 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army – CR
Navy – SH
Air Force – 85
NASA – NA
DLA – CC

Preparing activity:
DLA – CC

(Project 5961-2025-070)

Review activities:
Army – AR, AV, MI, SM
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