The documentation and process conversion measures necessary to comply with this revision shall be completed by 15 May 2012.

INCH-POUND

MIL-PRF-19500/295F
15 February 2012
SUPERSEDING
MIL-PRF-19500/295E
1 March 2004

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, FIELD-EFFECT TRANSISTORS, P-CHANNEL, SILICON, TYPE 2N2608, JAN AND UB

Inactive for new design for the 2N2608 device after 19 September 2001.

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 performance requirements for P-channel, junction, silicon field-effect transistors. One level of product assurance is provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (similar to TO-18) and figure 2 (surface mount, UB).

1.3 Maximum ratings.

Types	P_T (1) T_A = +25°C	V_{GSS}	T_{STG} and T_J
	mW	V dc	°C
2N2608, 2N2608UB	300	30	-65 to +200

(1) Derate linearly, 1.71 mW/°C for T_A = +25°C.

1.4 Primary electrical characteristics at T_A = +25°C.

Limit	I_{DSS} V_{DS} = -5 V dc V_{GS} = 0	$V_{GS(off)}$ V_{DS} = -5 V dc I_D = -1.0 µA dc	C_{ISS} V_{DS} = 3 V dc V_{GS} = 0 V dc f = 1 MHz	$\|Y_{FS}\|$ V_{DS} = -5 V dc V_{GS} = 0 V dc f = 1 kHz	I_{GSS} V_{GS} = 15 V dc V_{DS} = 0 V dc
	mA dc	V dc	pF	µmho	nA dc
Minimum	-1.0	0.75		1,000	
Maximum	-5.0	6.00	10	4,500	7.5

* 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.daps.dla.mil/.

AMSC N/A FSC 5961

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 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 must meet all specified requirements of documents cited in sections 3, 4, or 5 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://assist.daps.dla.mil/quicksearch/ or https://assist.daps.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

* 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.

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. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1 (similar to TO-18) and figure 2 (surface mount, UB).

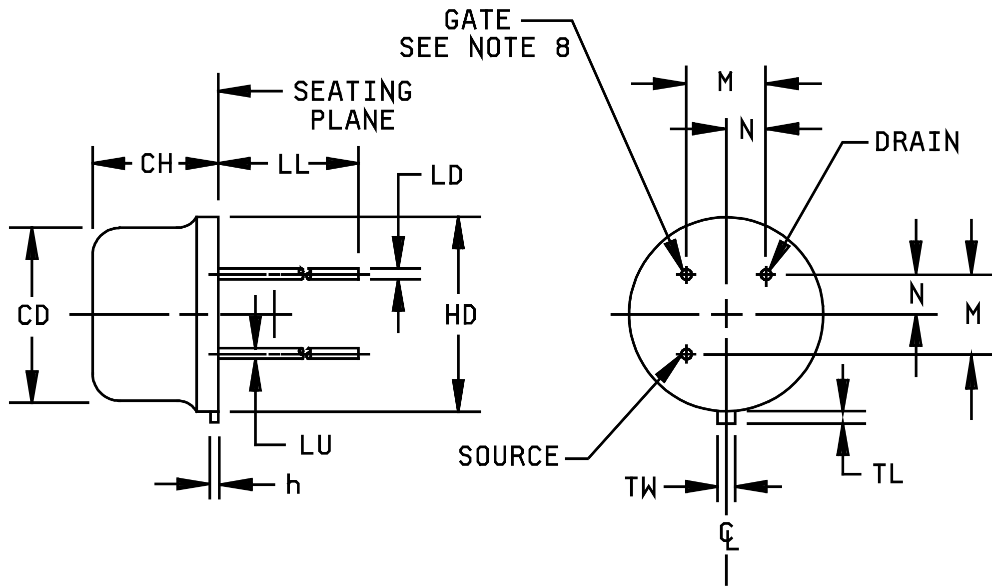
3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I.

3.6 Electrical test requirements. The electrical test requirements shall be as specified in table I.

3.7 Marking. Marking shall be in accordance with MIL-PRF-19500, except for the UB suffix package. Marking on the UB package shall consist of an abbreviated part number, the date code, and the manufacturers symbol or logo. The JAN prefix can be abbreviated as J. The "2N" prefix and the "AUB" suffix can also be omitted.

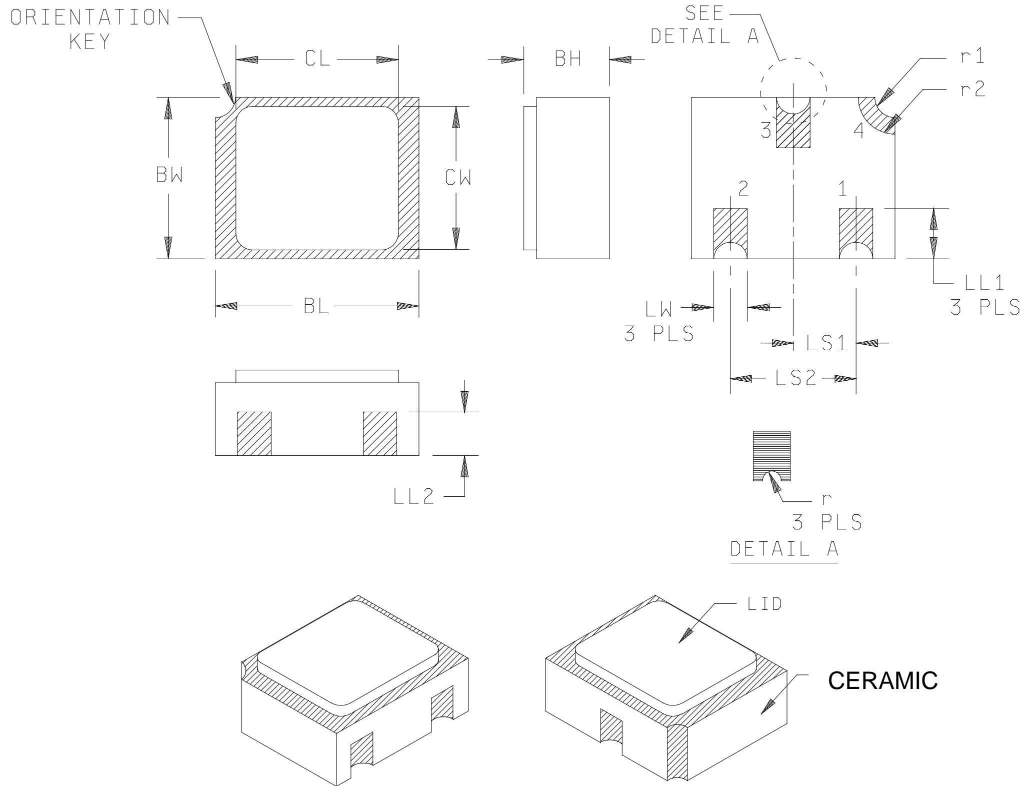
3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.170	.210	4.32	5.33	
HD	.209	.230	5.31	5.84	
h		.020		0.51	
LD	.016	.021	0.41	0.53	2, 7
LL	.500	.750	12.70	19.05	7
LU	.016	.019	0.41	0.48	3,7
M	.0707 Nom		1.80 Nom		4
N	.0354 Nom		0.90 Nom		4
TL	.028	.048	0.71	1.22	6
TW	.036	.046	0.91	1.17	

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Measured in the zone beyond .250 (6.35 mm) from the seating plane.
3. Measured in the zone .050 (1.27 mm) and .250 (6.35 mm) from the seating plane.
4. When measured in a gauging plane .054 +.001, -.000 (1.37 +0.03, -0.00 mm) below the seating plane of the transistor, maximum diameter leads shall be within .007 (0.18 mm) of their true location relative to a maximum width tab. Smaller diameter leads shall fall within the outline of the maximum diameter lead tolerance.
5. The gate shall be electrically connected to the case.
6. Measured from the maximum diameter of the actual device.
7. All three leads. (see 3.4.1)
8. Diameter of leads in this zone is not controlled.
9. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions, 2N2608.



Symbol	Dimensions				Note	Symbol	Dimensions				Note
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
BH	.046	.056	1.17	1.42		LS1	.035	.040	0.89	1.02	
BL	.115	.128	2.92	3.25		LS2	.071	.079	1.81	2.01	
BW	.085	.108	2.16	2.74		LW	.016	.024	0.41	0.61	
CL		.128		3.25		r		.008		0.20	
CW		.108		2.74		r1		.012		0.31	
LL1	.022	.038	0.56	0.96		r2		.022		0.56	
LL2	.017	.035	0.43	0.89							

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metallized areas.
4. Lid material: Kovar.
5. Pad 1 = Drain, Pad 2 = Source, Pad 3 = Gate, Pad 4 = Shielding connected to the lid.
6. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

* FIGURE 2. Physical dimensions, surface mount, 2N2608UB.

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.3 and table I, II, and III).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

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

4.3 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.3.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I herein.

* 4.3.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIB (JAN) of MIL-PRF-19500 and as follows. Electrical measurements (end-points) requirements shall be in accordance with the applicable steps of table II herein.

	Subgroup	Method	Condition
*	B3	1027	$V_{CB} \geq 10$ V dc, $T_A = +150°C$, $V_{DS} = 0$; $V_{GS} = 24$ V dc.
*	B3	2037	Bond strength, condition D.
	B5		Not applicable.
	B6	1032	$T_{STG} = +200°C$.

4.3.3 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. Electrical measurements (end-points) requirements shall be in accordance with the applicable steps of table II herein.

Subgroup	Method	Condition
C2	2036	Test condition A.
C6	1026	Steady-state operation life (accelerated): $T_A = +150°C$, $V_{DS} = 0$; $V_{GS} = 24$ V dc.

4.3.4 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 as specified in table III herein. Electrical measurements (end-points) shall be in accordance with the applicable steps of table II herein.

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

4.4.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Gate - source breakdown voltage	3401	Bias condition C; I_G = 1.0 µA dc; V_{DS} = 0.	$V_{(BR)GSS}$	30		V dc
Gate reverse current	3411	Bias condition C; V = 30 V_{GS} dc; V_{DS} = 0.	I_{GSS1}		10	nA dc
Gate reverse current	3411	Bias condition C; V = 15 V_{GS} dc; V_{DS} = 0.	I_{GSS2}		7.5	nA
Zero-gate-voltage drain current	3413	Bias condition C; V_{DS} = 5 V dc; V_{GS} = 0; pulsed.	I_{DSS1}	-1.0	-5.0	mA dc
Gate to source cutoff voltage	3403	I_D = 1 µA dc; V_{DS} = 5 V dc	$V_{GS(off)}$	0.75	6.0	V dc
Subgroup 3						
* High-temperature operation:		T_A = +150°C				
Drain current	3413	Bias condition C, V_{GS} = 0 V dc; V_{DS} = 5	I_{DSS2}	-0.56		mA dc
Gate reverse current	3411	Bias condition C; V_{GS} = 15 V dc; V_{DS} = 0.	I_{GSS3}		15	µA dc
Low-temperature operation:		T_A = -55°C				
Small-signal, common-source, short-circuit, forward transfer admittance	3455	V_{DS} = 5 V dc; V_{GS} = 0; f = 1 kHz.	$\lvert Y_{fs1} \rvert$		4,500	µmho
Subgroup 4						
Small-signal common-source, short-circuit, forward transfer admittance	3455	V_{DS} = 5 V dc; V_{GS} = 0; f = 1 kHz.	$\lvert Y_{fs2} \rvert$	1,000	4,500	µmho
Small-signal common-source, short-circuit, input capacitance	3431	V_{DS} = 5 V dc; V_{GS} = 0; f = 1 MHz.	C_{iss}		10	pF
Common-source spot noise figure		V_{DS} = 5 V dc; V_{GS} = 0; B_W = 16 percent; R_G = 1 Mohm; e_{gen} = 1.82 mV; R_L = 470 ohms; f = 1 kHz; (see figure 3).	NF		3	dB
Subgroups 5, 6, and 7						
Not applicable						

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

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

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1	Gate reverse current	3411	Bias condition C; V_{GS} = 15 V dc; V_{DS} = 0	I_{GSS1}		8	nA dc
2	Gate reverse current	3411	Bias condition C; V_{GS} = 15 V dc; V_{DS} = 0	I_{GSS2}		15	nA dc
3	Drain current	3413	Bias condition C; V_{GS} = 5 V dc; V_{DS} = 0	I_{DSS1}	-1.0	-5.0	mA dc
4	Drain current	3413	Bias condition C; V_{GS} = 5 V dc; V_{DS} = 0	I_{DSS2}	-0.90	-5.5	mA dc
5	Small-signal, common-source short-circuit, forward transfer admittance	3455	V_{DS} = 5 V dc; V_{GS} = 0; f = 1 kHz	$\|Y_{fs1}\|$	1,000	4,500	µmho
6	Small-signal, common-source short-circuit, forward transfer admittance	3455	V_{DS} = 5 V dc; V_{GS} = 0; f = 1 kHz	$\|Y_{fs3}\|$	900	4,950	µmho

1/ The electrical measurements for table E-VIB (JAN) of MIL-PRF-19500 are as follows:
a. Subgroup 2, see table II herein, steps 1, 3, and 5.
b. Subgroups 3 and 6, see table II herein, steps 2, 4, and 6.

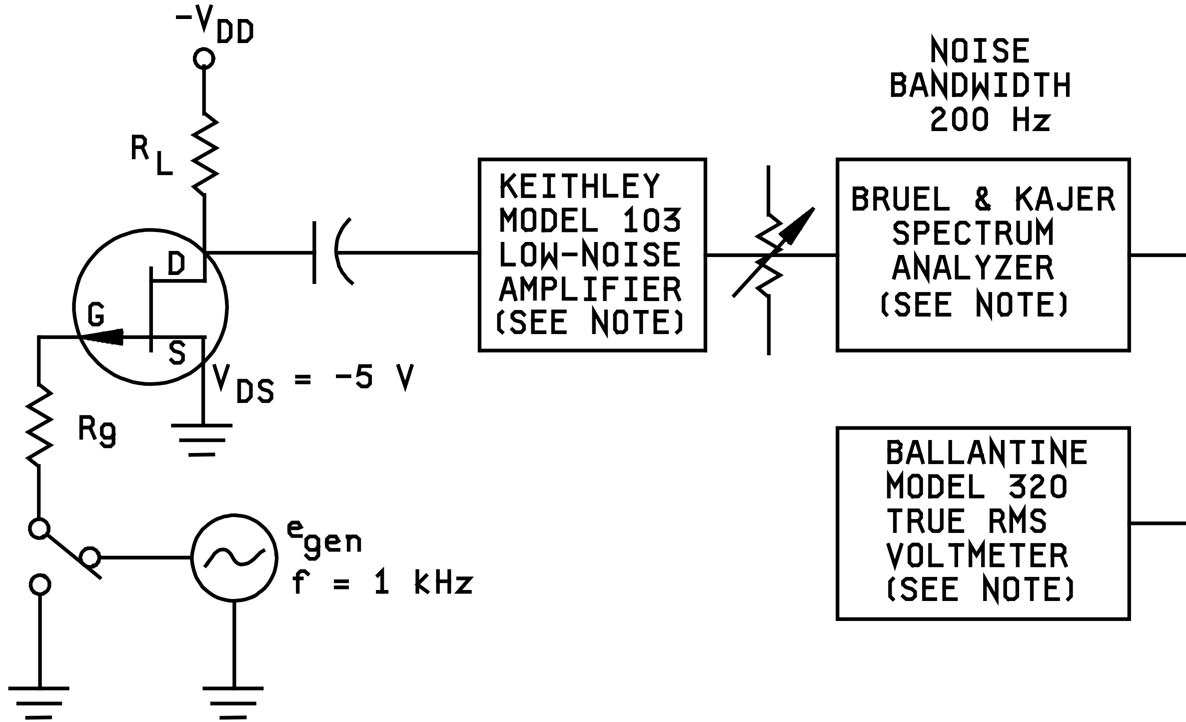
2/ The electrical measurements for table E-VII of MIL-PRF-19500 are as follows:
a. Subgroups 2 and 3, see table II herein, steps 1, 3, and 5.
b. Subgroup 6, see table II herein, steps 2, 4, and 6.

3/ The electrical measurements for table E-IX of MIL-PRF-19500 are: Subgroups 1 and 2, see table II herein, all steps.

* TABLE III. Group E inspection (all quality levels) for qualification or re-qualification only.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
Subgroup 1			45 devices c = 0
Temperature cycling	1051	-55°C to +150°C, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		See table II, all steps	
Subgroup 2 1/			45 devices c = 0
Steady-state operating life	1026	$V_{CB} \geq 10$ V dc, T_A = +150°C, V_{DS} = 0; V_{GS} = 24 V dc.	
Electrical measurements		See table II, all steps	
Subgroups 4 and 5			
Not applicable			
Subgroup 8			45 devices c = 0
Reverse stability	1033	Condition A	

1/ A separate sample for each test shall be pulled.



NOTE: Or equivalents

Procedure: The voltage and current shall be applied to the terminals, and the noise figure shall then be measured as follows:

1. Connect egen to the input of the device under test.
2. Adjust gain of system to give 0 dB reading on a convenient scale of the Ballantine voltmeter or equivalent.
3. Switch the device input to ground.
4. Increase system gain by 60 dB.
5. Read noise figure directly in dB's on Ballintine scale or equivalent.

FIGURE 3. Common-source spot noise figure test circuit.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual 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. Product assurance level and type designator.

* 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://assist.daps.dla.mil .

6.4 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. 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 - EC
Air Force - 85
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2011-068)

Review activities:
Navy - AS, MC
Air Force - 19, 99

* NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil/ .