The documentation and process conversion measures necessary to comply with this revision shall be completed by 11 August 2009.

INCH-POUND

MIL-PRF-19500/115N
11 May 2009
SUPERSEDING
MIL-PRF-19500/115M
w/ AMENDMENT 1
14 May 2008

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, VOLTAGE REGULATOR, TYPES
1N3821A THROUGH 1N3828A, 1N3016B THROUGH 1N3051B,
1N3821A-1 THROUGH 1N3828A-1, 1N3016B-1 THROUGH 1N3051B-1,
1N3821AUR-1 THROUGH 1N3828AUR-1, 1N3016BUR-1 THROUGH 1N3051BUR-1,
PLUS C- AND D- TOLERANCE SUFFIX, JAN, JANTX, JANTXV, AND JANHC

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 1 W, silicon, voltage regulator diodes with voltage tolerances of 5 percent, 2 percent, and 1 percent. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500. One level of product assurance is provided for die.

1.2 Physical dimensions. See figures 1 (DO-13), 2 (DO-41), 3 (DO-213AB), 4, and 5 (for JANHC).

1.3 Maximum ratings. Maximum ratings are as shown in maximum test ratings (see 3.8 herein) and as follows: $-55°C \leq T_{op} \leq +175°C$; $-55°C \leq T_{STG} \leq +175°C$.

Type	P_{TL}	T_L	T_{EC}	P_{TPCB}
	W	°C	°C	W
DO-13, DO-41	1.0 (1)	+95		1
DO-213AB	1.0 (2)		+125	

(1) L = .375 inch (9.53 mm). Both ends of case or diode body to heat sink at L = .375 (9.53 mm). (Derate I_Z to 0 at P_{TL} = +175°C).

(2) Derate to 0 at P_{TEC} = +175°C.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dscc.dla.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil .

1.4 Primary electrical characteristics. Primary electrical characteristics are as shown in primary test ratings (see 3.9 herein) and as follows: 3.3 V dc ≤V_Z ≤200 V dc. A and B suffix devices are 5 percent voltage tolerance. C suffix devices are 2 percent voltage tolerance. D suffix devices are 1 percent voltage tolerance.

Type	$R_{\Theta JL}$ (1)	$R_{\Theta JEC}$ (2)	$R_{\Theta JA}$ (3)
	°C/W	°C/W	°C/W
DO-13	80		
DO-41	80		
DO-213AB		50	

(1) L = .375 inch (9.53 mm).
(2) Junction to end-caps.
(3) See figures 6, 7, and 8 for derating curves. T_A = +75°C for both axial and MELF (US) on printed circuit board (PCB), PCB = FR4 .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, still air, pads (US) = .067 inch (1.70 mm) x .105 inch (2.67 mm); pads (axial) = .092 inch (2.34 mm) diameter, strip = .030 inch (0.762 mm) x 1 inch (25.4 mm) long, axial lead length L ≤187 inch (≤4.76 mm); $R_{\Theta JA}$ with a defined thermal resistance condition included is measured at I_Z = as defined in test ratings herein.

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.

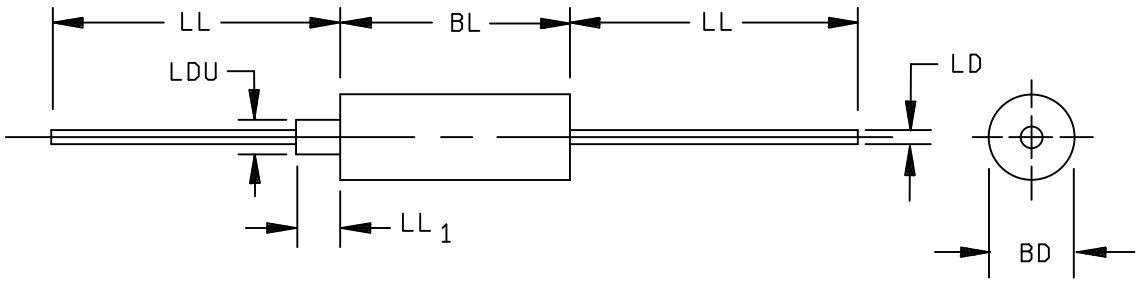
(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or http://assist.daps.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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.

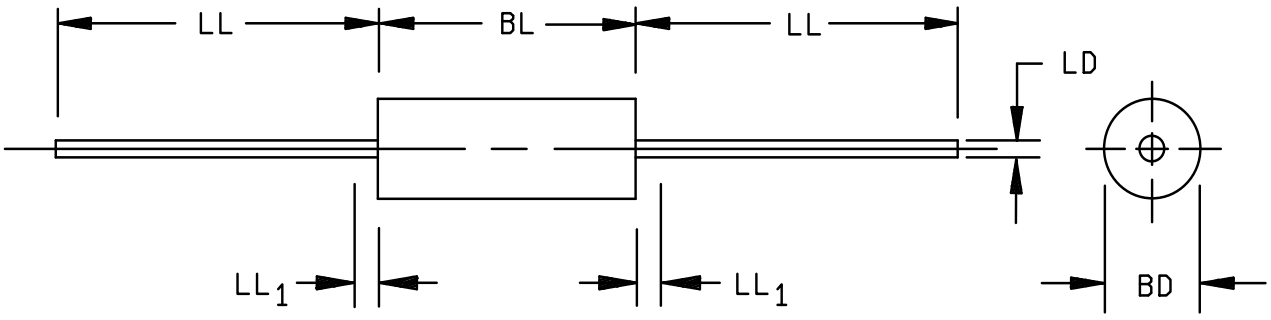
3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturer's list (QML) before contract award (see 4.2 and 6.3).



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.215	.265	5.46	6.73	3
BL	.195	.350	4.96	8.89	
LD	.026	.035	0.66	0.89	4
LDU		.110		2.79	
LL	1.000		25.40		
LL_1		.21		5.33	

NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. Dimension BD shall be measured at the largest diameter.
4. Cathode lead shall be electrically connected to the case. If tubulation is used, it shall be on the anode end.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

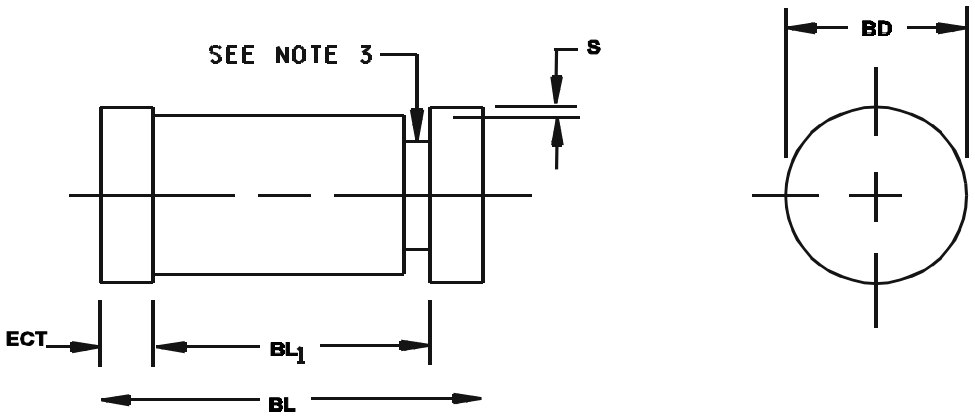
FIGURE 1. Physical dimensions types 1N3821A, C, D through 1N3828A, C, D and 1N3016B, C, D through 1N3051B, C, D (DO-13).



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BD	.080	.107	2.03	2.72	3
BL	.160	.205	4.06	5.21	3
LD	.028	.034	0.71	0.86	
LL	1.000		25.40		
LL_1		.50		12.7	4

NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. Package contour optional within BD and length BL. Heat slugs, if any, shall be included within this cylinder but shall not be subject to minimum limit of BD.
4. Within this zone lead, diameter may vary to allow for lead finishes and irregularities other than heat slugs.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

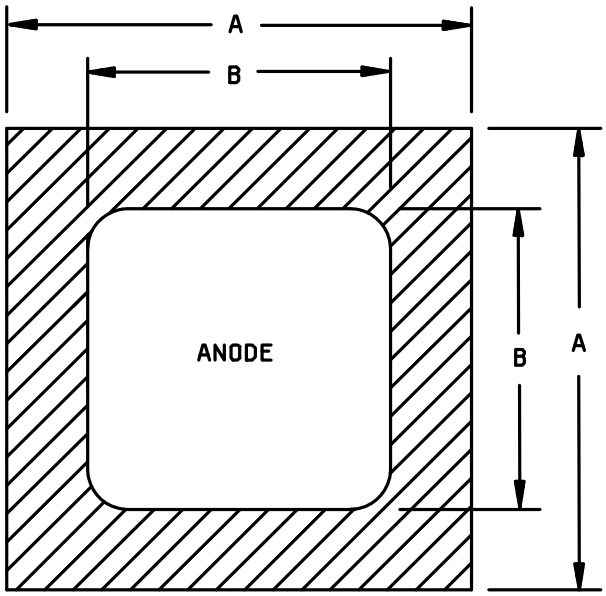
FIGURE 2. Physical dimensions types 1N3821A-1, C-1, D-1 through 1N3828A-1, C-1, D-1 and 1N3016B-1, C-1, D-1 through 1N3051B-1, C-1, D-1 (DO-41).



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BD	.094	.105	2.39	2.67
BL_1	.159 (Ref.)		4.04 (Ref.)	
BL	.189	.205	4.80	5.21
ECT	.014	.022	0.360	0.560
S	.001		0.030	

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Gap not controlled, shape of body and gap not controlled.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 3. Physical dimensions of surface mount family types 1N3821AUR-1, CUR-1, and DUR-1 through 1N3828AUR-1, CUR-1, DUR-1 and 1N3016BUR-1, CUR-1 and DUR-1 through 1N3051BUR-1, CUR-1 and DUR-1 (DO-213AB).



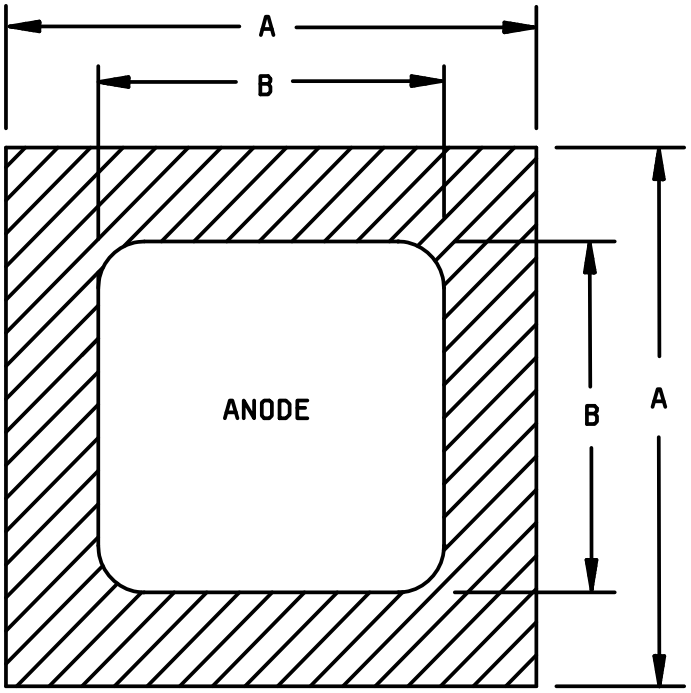
BACKSIDE IS CATHODE

A Version

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.035	.039	0.89	0.99
B	.031	.033	0.79	0.84

NOTES:
1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. The physical characteristics of the die thickness are .010 ±002 (0.25 mm).
   Metallization is:
   Top (anode) - Al, back (cathode) - Au. Al thickness = 25,000Å minimum,
   Au thickness = 4,000Å minimum.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 4. Physical dimensions JANHCA die.



BACKSIDE IS CATHODE

B Version

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.035	.039	0.89	0.99
B	.027	.031	0.68	0.79

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The physical characteristics of the die thickness are .012 ±002 (0.30 mm ±0.051 mm).
   Metallization is:
   Top (anode) - Al,
   Back (cathode) - Au,
   Al thickness = 40,000Å minimum,
   Au thickness = 5,000Å minimum.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 5. Physical dimensions JANHCB die.

3.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

Z_{ZK} – Zener knee impedance

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500, and figures 1 (DO-13), 2 (DO-41), 3 (DO-213AB), and figures 4 and 5 for (JANHC).

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

3.4.2 Diode construction. All devices shall be in accordance with the requirements of MIL-PRF-19500 and as follows.

3.4.2.1 Dash one construction. Dash one (-1) diodes shall be of metallurgically bonded double plug construction, (category I, II, and III in accordance with MIL-PRF-19500).

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.5.1 Marking of UR version devices. For UR version devices only, all marking (except polarity) may be omitted from the body, but shall be retained on the initial container.

3.5.2 Polarity. For dash one or UR dash one, the polarity shall be indicated with a contrasting color band to denote the cathode end or alternately with a minimum of three contrasting color dots spaced evenly around the periphery at the cathode end.

3.6 Selection of tight tolerance devices. The C and D suffix devices shall be selected from JAN, JANTX, or JANTXV devices, which have successfully completed all applicable screening, and groups A, B, and C testing as five (5) percent tolerance devices. All sublots of C and D suffix devices shall pass table I, subgroup 2, at tighter tolerances. Tighter tolerances for mounting clip temperature shall be maintained for reference purpose to establish correlation. For C and D tolerance levels, T_L = 30 $\pm$2°C at .375 inches (9.53 mm) from body or equivalent.

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

3.8 Electrical test requirements. The electrical test requirements shall be the subgroups specified in 4.4.2 and 4.4.3 (see table I, II, and III herein).

3.9 Maximum and primary test ratings. Maximum and primary test ratings for voltage regulator diodes are specified in table III herein.

3.10 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).

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 II tests, the tests specified in table II herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.2.2 JANHC devices. JANHC devices shall be qualified in accordance with MIL-PRF-19500.

4.2.3 Construction verification. Cross sectional photos from three devices shall be submitted in the qualification report.

4.3 Screening (JAN, JANTXV, and JANTX levels only). Screening shall be in accordance with appendix E, 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.

Screen (table E-IV of MIL-PRF-19500)	Measurement
	JANTX and JANTXV levels
3a	Temperature cycling
(1) 3c	Thermal impedance (see 4.3.2)
7a 7b	Not applicable Optional
9	Not applicable
11	I_{R1} and V_Z
12	See 4.3.3
(2) 13	Subgroup 2 of table I herein. $\Delta I_{R1} \leq$ 100 percent of initial reading or 50nA dc, whichever is greater $\Delta V_Z \leq \pm 2$ percent of initial reading.
14a (3) 14b	Applies to DO-13 devices only Required

(1) Thermal impedance may be performed any time after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3 prior to this thermal test. (Applicable to -1 and UR-1 devices only).
(2) PDA = 5 percent for screen 13, applies to ΔI_{R1}, ΔV_Z. Thermal impedance ($Z_{\Theta JX}$) is not required in screen 13.
(3) For clear glass diodes, the hermetic seal (gross leak) may be performed at anytime after temperature cycling.

4.3.1 Screening (JANHC). Screening of JANHC die shall be in accordance with MIL-PRF-19500.

4.3.1.1 JAN testing. Temperature cycling and thermal impedance testing shall be performed in accordance with JANTX requirements.

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 as applicable of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, t_{SW} (V_C and V_H where appropriate). Measurement delay time (t_{MD}) = 70 μs max. See table II, group E, subgroup 4 herein.

4.3.3 Power burn-in conditions. Power burn-in conditions are as follows (see 4.5.5): $I_{Z(min)}$ = column 8 of table III; T_A = 75°C maximum. Test conditions in accordance with method 1038 of MIL-STD-750, condition B. Adjust I_Z or T_A to achieve the required T_J. T_J = 125°C minimum. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, T_J , mounting conditions) may be used for JANTX and JANTXV quality levels. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval.

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

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with appendix E, table E-V of MIL-PRF-19500, and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroups 2 and 4 herein.

Subgroup	Method	Condition
B2	1051	-55°C to +175°C, 25 cycles.
B2	4066	See 4.5.1.
B3	1027	$I_Z = I_{ZM}$ column 8 of table III (min); adjust Iz or T_A to achieve T_J = 150°C (min).
B4	2101	Decap analysis scribe and break only.

* 4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VII of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroups 2 and 4 herein.

Subgroup	Method	Condition
C2	2036	Terminal strength: Test condition A; weight = 4 lbs; t = 15 seconds. DO-41 - weight = 12 lbs, t = 15 seconds; DO-13 - weight = 8 lbs, t = 15 seconds. Terminal strength: Test condition E. (Terminal strength not required for UR-1 devices.)
C3		Applies to DO-13 devices only.
C5	4081	See 4.5.7.
C6	1026	$I_Z = I_{ZM}$ column 8 of table III (min); adjust Iz or T_A to achieve T_J = 150°C (min).
C8	4071	$I_Z = I_Z$ column 5 of table III; T_A = +25°C ±5°C; T_2 = +125°C ± 5°C; αV_Z = columns 15 and 16 of table III; 22 devices, c = 0.

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

4.5.1 Surge current (I_{ZSM}). The peak currents shown in column 10 of table III shall be applied in the reverse direction and these shall be superimposed on the current ($I_Z = I_{Z1}$) (column 5 of table III) a total of five (5) surges at 1 minute intervals. Each individual surge shall be one-half square-wave-pulse of 1/120 second duration or an equivalent one-half sine wave with the same effective rms current.

4.5.2 Regulator voltage measurements. The test current shall be applied until thermal equilibrium is attained (90 seconds maximum) prior to reading the breakdown voltage. For this test, the surface mount device shall be mounted at the end-caps and the axial leaded device shall be suspended by its leads with mounting clips whose inside edge is located at .375 inch (9.53 mm) from the body and the mounting clips shall be maintained at a temperature of +25°C +8°C,-2°C . This measurement may be performed after a shorter time following application of the test current than that which provides thermal equilibrium if correlation to stabilized readings can be established to the satisfaction of the Government.

4.5.3 Temperature coefficient of regulator voltage (αV_Z). The device shall be temperature stabilized with current applied prior to reading regulator voltage at the specified ambient temperature as specified in 4.4.3, subgroup C8.

4.5.4 Voltage regulation $V_{Z(reg)}$. Voltage regulation shall be determined by the difference of the regulator voltage measured at different currents as specified in table I, subgroup 7. Both tests shall be performed at thermal equilibrium. This αVz shall not exceed column 9 of table III.

4.5.5 Free air burn-in and life tests. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the $I_{Z(min)}$ described in 4.3.3 and that the minimum applied voltage, where applicable, is maintained through-out the burn-in period. Use method 3100 of MIL-STD-750 to measure T_J.

4.5.6 For initial qualifications and requalifications. Read and record data in accordance with table II herein and shall be included in the qualification report.

4.5.7 Thermal resistance. Thermal resistance measurement shall be in accordance with method 4081 of MIL-STD-750 using the guidelines in that method for determining IM, IH, and tH. Measurement delay time tMD = 70 μs maximum. See MIL-PRF-19500, table E-IX, subgroup 4. Forced moving air or draft shall not be permitted across the device during test.

* TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits 2/		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Forward voltage	4011	I_F =200 mA dc	V_F		1.2	V dc
Reverse current	4016	DC method; V_R = column 11 of table III.	I_{R1}		Col. 12	μA dc
Regulator voltage (see 4.5.2)	4022	$I_{Z1} = I_Z$ = (column 5 of table III).	V_Z	Col. 3	Col. 4	V dc
Thermal impedance	3101	See 4.3.2 (-1 device only).	$Z_{\Theta JX}$			°C/W
Subgroup 3						
High-temperature operation		T_A = +150°C				
Reverse current (-1 device only)	4016	DC method: V_R = column 11 of table III.	I_{R2}		Col. 14	μA dc
Subgroup 4						
Small-signal reverse breakdown impedance	4051	I_Z = (column 5 of table III). I_{sig} =10 percent of I_Z.	Z_{ZT}		Col. 6	ohms
Small-signal knee impedance	4051	I_{ZK} = (column 17 of table III). I_{sig} =10 percent of I_{ZK}.	Z_{ZK}		Col. 7	ohms
Subgroups 5 and 6						
Not applicable						
Subgroup 7						
Voltage regulation (see 4.5.4)		I_Z = 10 percent of column 8 of table III (current 1). I_Z = 50 percent of column 8 of table III (current 2).	$V_{Z(reg)}$		Col. 9	V dc

1/ For sampling plan, see MIL-PRF-19500.
2/ Column references are to table III herein.

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

Inspection 1/	MIL-STD-750		Qualification conformance inspection
	Method	Conditions	
Subgroup 1			45 devices, c = 0
Temperature cycling	1051	500 cycles.	
Thermal shock	1056	500 cycles.	
Hermetic seal	1071		
Electrical measurements		See table I, subgroup 2 and 4.	
Subgroup 2			45 devices, c = 0
Intermittent life	1037	6,000 cycles.	
Electrical measurements		See table I, subgroup 2 and 4.	
Subgroup 3			3 devices, c = 0
Decap analysis	2101	Cross section or scribe and break. Separate samples shall be used for each test.	
Subgroup 4			
Thermal impedance curves (-1 devices only)		See MIL-PRF-19500.	
Subgroup 5 and 6			
Not applicable			
Subgroup 8			
Resistance to glass cracking (-1 devices only)	1057	Condition B. Cool down after solder immersion is permitted. Test until failure occurs on all devices with the chosen sample or to a maximum of 25 cycles, whichever comes first.	45 devices

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

* TABLE III. Test ratings for diodes types 1N3821A through 1N3828A and 1N3016B through 1N3051B (5 percent tolerance).

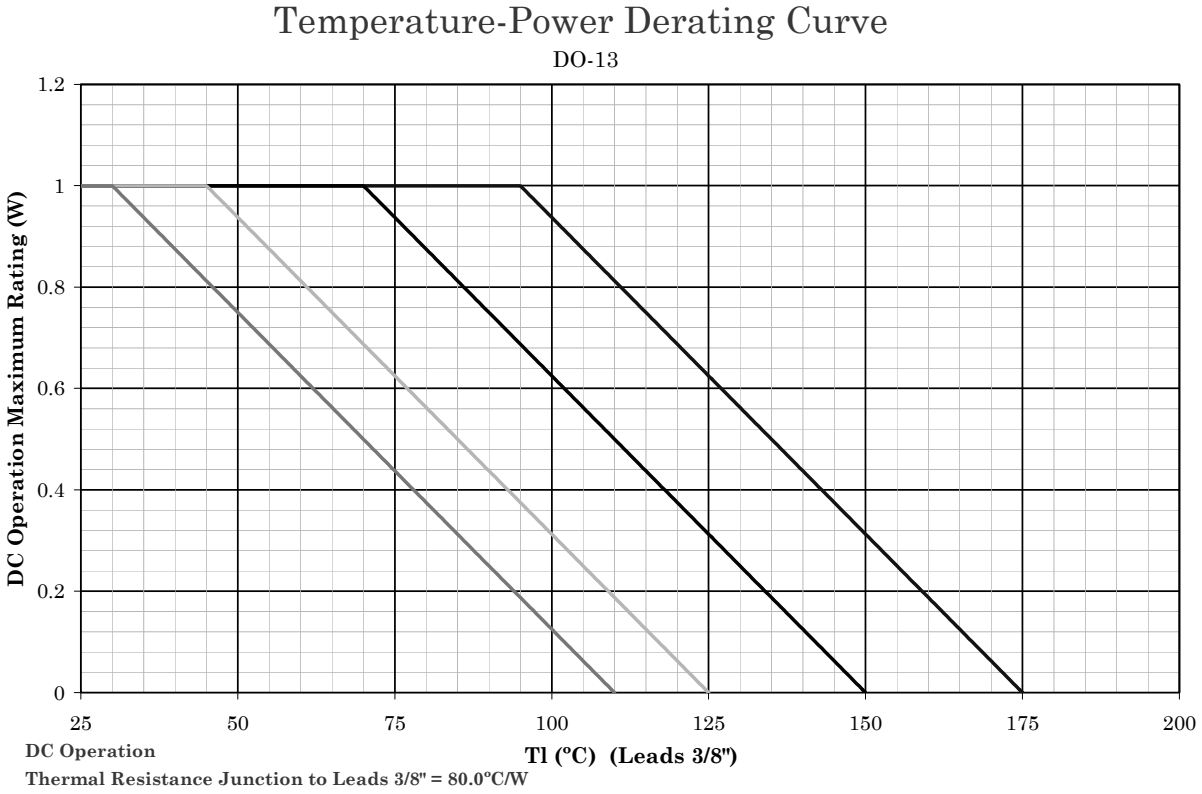
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12		Col 13		Col 14	Col 15	Col 16	Col 17
Voltage Group 1/ 2/	V_Z Nom 2/	V_Z Min 2/	V_Z Max 2/	I_Z	Z_{ZT}	Z_{ZK}	I_{ZM}	V_Z (reg)	$I_{R(Surge)}$ T_A = +25°C	V_R	I_{R1}		I_{R3}		(-1 only) I_{R2} T_A = +150°C	α_{VZ} Min	α_{VZ} Max	I_{ZK}
	Volts	Volts	Volts	mA	ohms	ohms	mA	Volts	mA	Volts	non -1 µA	-1 µA	non-1 µA	-1 µA	µA	%/°C	%/°C	mA
1N3821A	3.3	3.14	3.46	76	10	400	276	1.00	1380	1	100	100	200	150	200	-0.075		1.0
1N3822A	3.6	3.42	3.78	69	10	400	252	0.80	1260	1	100	75	200	100	150	-0.07		1.0
1N3823A	3.9	3.71	4.09	64	9	400	238	0.75	1190	1	50	25	100	40	100	-0.06		1.0
1N3824A	4.3	4.09	4.51	58	9	400	213	0.70	1070	1	10	5	20	10	50	-0.05		1.0
1N3825A	4.7	4.47	4.93	53	8	500	194	0.60	970	1	10	5	20	10	50	-0.025	0.027	1.0
1N3826A	5.1	4.85	5.35	49	7	550	178	0.50	890	1	10	3	20	6	50	-0.03	0.032	1.0
1N3827A	5.6	5.32	5.88	45	5	600	162	0.40	810	2	10	3	20	6	50		0.043	1.0
1N3828A	6.2	5.89	6.51	41	2	700	146	0.30	730	3	10	3	20	6	50		0.054	1.0
1N3016B	6.8	6.46	7.14	37	3.5	700	140	0.30	740	5.2	150	5.0	300	10	50		0.061	1.00
1N3017B	7.5	7.13	7.87	34	4.0	700	125	0.35	680	5.7	100	5.0	200	10	50		0.065	0.50
1N3018B	8.2	7.79	8.61	31	4.5	700	115	0.40	600	6.2	50	5.0	100	10	50		0.070	0.50
1N3019B	9.1	8.65	9.55	28	6.0	700	105	0.45	540	6.9	25	5.0	50	10	50		0.073	0.50
1N3020B	10	9.5	10.5	25	7	700	95	0.50	480	7.6	25	5.0	50	10	50		0.076	0.25
1N3021B	11	10.45	11.55	23	8	700	85	0.55	420	8.4	10	1.0	20	4	10		0.078	0.25
1N3022B	12	11.40	12.60	21	9	700	80	0.60	400	9.1	10	1.0	20	4	10		0.081	0.25
1N3023B	13	12.35	13.65	19	10	700	74	0.65	370	9.9	10	0.5	20	2	10		0.085	0.25
1N3024B	15	14.25	15.75	17	14	700	63	0.75	320	11.4	10	0.5	20	2	10		0.088	0.25
1N3025B	16	15.20	16.80	15.5	16	700	60	0.80	300	12.2	10	0.5	20	2	10		0.089	0.25
1N3026B	18	17.10	18.90	14.0	20	750	52	0.83	260	13.7	10	0.5	20	2	10		0.091	0.25
1N3027B	20	19.0	21.0	12.5	22	750	47	0.95	240	15.2	10	0.5	20	2	10		0.092	0.25
1N3028B	22	20.9	23.1	11.5	23	750	43	1.0	210	16.7	10	0.5	20	2	10		0.093	0.25
1N3029B	24	22.8	25.2	10.5	25	750	40	1.1	200	18.2	10	0.5	20	2	10		0.094	0.25
1N3030B	27	25.7	28.3	9.5	35	750	34	1.3	170	20.6	10	0.5	20	2	10		0.096	0.25
1N3031B	30	28.5	31.5	8.5	40	1000	31	1.4	160	22.8	10	0.5	20	2	10		0.098	0.25
1N3032B	33	31.4	34.6	7.5	45	1000	28	1.5	150	25.1	10	0.5	20	2	10		0.099	0.25
1N3033B	36	34.2	37.8	7.0	50	1000	26	1.7	130	27.4	10	0.5	20	2	10		0.100	0.25

See footnotes at end of table.

* TABLE III. Test ratings for diodes types 1N3821A through 1N3828A and 1N3016B through 1N3051B (5 percent tolerance).

Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12		Col 13		Col 14	Col 15	Col 16	Col 17
Voltage Group 1/ 2/	V_Z Nom 2/	V_Z Min 2/	V_Z Max 2/	I_Z	Z_{ZT}	Z_{ZK}	I_{ZM}	V_z (reg)	$I_{R(Surge)}$ T_A = +25°C	V_R	I_{R1}		I_{R3}		(-1 only) I_{R2} T_A = +150°C	α_{VZ} Min	α_{VZ} Max	I_{ZK}
	Volts	Volts	Volts	mA	ohms	ohms	mA	Volts	mA	Volts	non -1 µA	-1 µA	non-1 µA	-1 µA	µA	%/°C	%/°C	mA
1N3034B	39	37.1	40.9	6.5	60	1000	23	1.8	110	29.7	10	0.5	20	2	10		0.101	0.25
1N3035B	43	40.9	45.1	6.0	70	1500	21	1.9	100	32.7	10	0.5	20	2	10		0.102	0.25
1N3036B	47	44.7	49.3	5.5	80	1500	19	2.1	95	35.8	10	0.5	20	2	10		0.102	0.25
1N3037B	51	48.5	53.5	5.0	95	1500	18	2.3	90	38.8	10	0.5	20	2	10		0.103	0.25
1N3038B	56	53.2	58.8	4.5	110	2000	17	2.5	85	42.6	10	0.5	20	2	10		0.103	0.25
1N3039B	62	58.95	65.1	4.0	125	2000	15	2.7	75	47.1	10	0.5	20	2	10		0.104	0.25
1N3040B	68	64.60	71.4	3.7	150	2000	14	3.0	70	51.7	10	0.5	20	2	10		0.104	0.25
1N3041B	75	71.35	78.7	3.3	175	2000	12	3.3	63	56.0	10	0.5	20	2	10		0.105	0.25
1N3042B	82	77.95	86.1	3.0	200	3000	11	3.6	58	62.2	10	0.5	20	2	10		0.106	0.25
1N3043B	91	86.5	95.5	2.8	250	3000	10	4.0	50	69.2	10	0.5	20	2	10		0.108	0.25
1N3044B	100	95.0	105.0	2.5	350	3000	9	4.4	45	76.0	10	0.5	20	2	10		0.11	0.25
1N3045B	110	104.5	115.5	2.3	450	4000	8.3	5.0	42	83.6	10	0.5	20	2	10		0.11	0.25
1N3046B	120	114	126	2.0	550	4500	8.0	5.5	40	91.2	10	0.5	20	2	10		0.11	0.25
1N3047B	130	123.5	136.5	1.9	700	5000	6.9	6.0	35	98.8	10	0.5	20	2	10		0.11	0.25
1N3048B	150	142.5	157.5	1.7	1000	6000	5.7	7.0	29	114.0	10	0.5	20	2	10		0.11	0.25
1N3049B	160	152	168	1.6	1100	6500	5.4	8.0	27	121.6	10	0.5	20	2	10		0.11	0.25
1N3050B	180	171	189	1.4	1200	7000	4.9	10.0	25	136.8	10	0.5	20	2	10		0.11	0.25
1N3051B	200	190	210	1.2	1500	8000	4.6	12.0	23	152.0	10	0.5	20	2	10		0.11	0.25

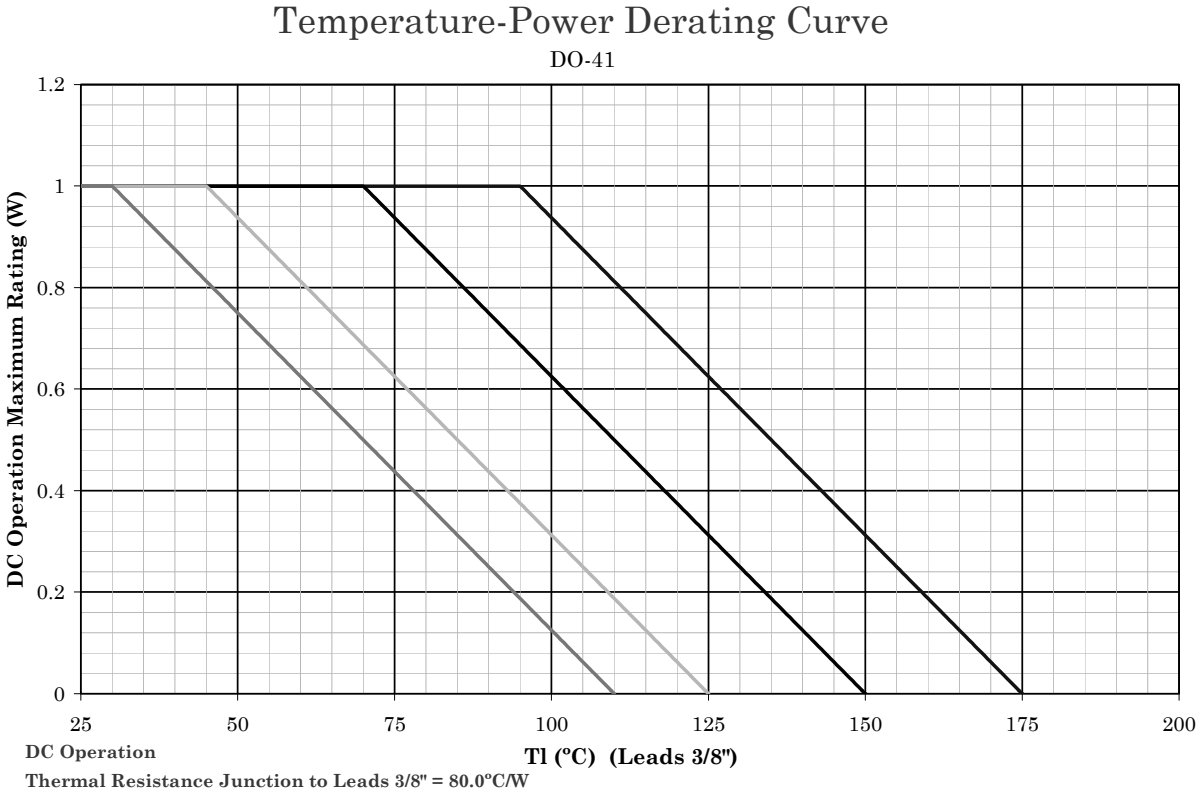
1/ Ratings also apply to dash one and surface mount devices unless otherwise noted.
2/ For 5 percent voltage, tolerances are shown in table.
For 2 percent tolerance (“C” suffix “-1” suffix and JANHC only), column 3 is 2 percent less than column 2, column 4 is 2 percent more than column 2.
For 1 percent tolerance (“D” suffix “-1” suffix and JANHC only), column 3 is 1 percent less than column 2, column 4 is 1 percent more than column 2.



NOTES:

1. All devices are capable of operating at ≤ T_J specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 175°C$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150°C$, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at $T_J \leq 125°C$, and 110°C to show power rating where most users want to limit T_J in their application.

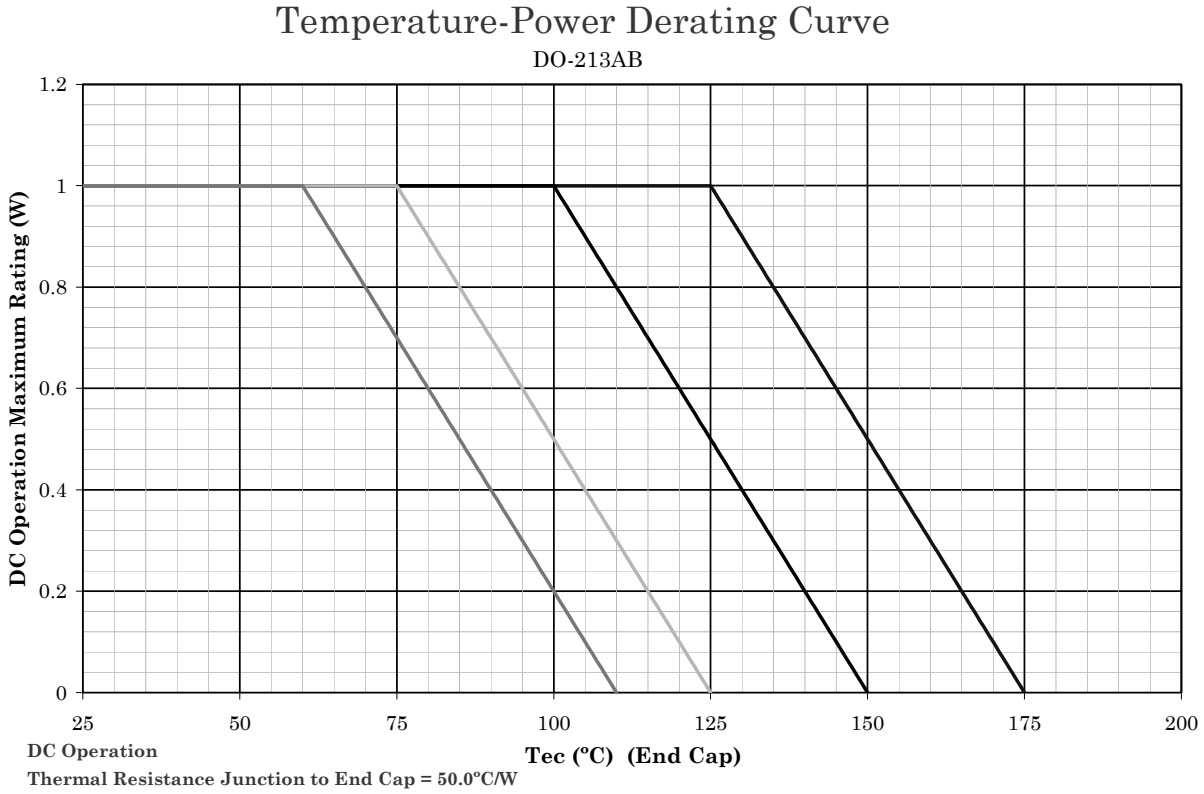
FIGURE 6. Temperature-power derating curve (DO-13).



NOTES:

1. All devices are capable of operating at ≤ T_J specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 175°C$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150°C$, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at $T_J \leq 125°C$, and 110°C to show power rating where most users want to limit T_J in their application.

FIGURE 7. Temperature-power derating curve (DO-41).



NOTES:

1. All devices are capable of operating at ≤ T_J specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature (T_J ≤ 175°C) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at T_J ≤ 150°C, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at T_J ≤ 125°C, and 110°C to show power rating where most users want to limit T_J in their application.

FIGURE 8. Temperature-power derating curve (DO-213AB).

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. 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 Defense Supply Center, Columbus, ATTN: DSCC/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 http://assist.daps.dla.mil .

6.4 Substitution information. Device types 1N3821A through 1N3828A and 1N3016B through 1N3051B (excluding JANHC devices) are inactive for new design as of the date of this specification.

6.4.1 Substitutability of 2 percent and 1 percent tolerance devices. Devices of tighter tolerance are a direct one-way substitute for the looser tolerance devices (example: JANTX1N3821D-1 substitutes for JANTX1N3821A-1).

6.4.2 Substitutability of dash one parts. The non-dash-1 parts specified in this document are inactive for new design. Users are cautioned that the new (-1) design is not form, fit, or functionally interchangeable. For new designs, the user shall use the dash-1 version of the device. For sustainment purposes the users shall evaluate the part for use in their application. The following table should be used as a guideline.

Superseded part number	Superseding part number		Superseded part number	Superseding part number		Superseded part number	Superseding part number
1N3821A	1N3821A-1		1N3023B	1N3023B-1		1N3038B	1N3038B-1
1N3822A	1N3822A-1		1N3024B	1N3024B-1		1N3039B	1N3039B-1
1N3823A	1N3823A-1		1N3025B	1N3025B-1		1N3040B	1N3040B-1
1N3824A	1N3824A-1		1N3026B	1N3026B-1		1N3041B	1N3041B-1
1N3825A	1N3825A-1		1N3027B	1N3027B-1		1N3042B	1N3042B-1
1N3826A	1N3826A-1		1N3028B	1N3028B-1		1N3043B	1N3043B-1
1N3827A	1N3827A-1		1N3029B	1N3029B-1		1N3044B	1N3044B-1
1N3828A	1N3828A-1		1N3030B	1N3030B-1		1N3045B	1N3045B-1
1N3016B	1N3016B-1		1N3031B	1N3031B-1		1N3046B	1N3046B-1
1N3017B	1N3017B-1		1N3032B	1N3032B-1		1N3047B	1N3047B-1
1N3018B	1N3018B-1		1N3033B	1N3033B-1		1N3048B	1N3048B-1
1N3019B	1N3019B-1		1N3034B	1N3034B-1		1N3049B	1N3049B-1
1N3020B	1N3020B-1		1N3035B	1N3035B-1		1N3050B	1N3050B-1
1N3021B	1N3021B-1		1N3036B	1N3036B-1		1N3051B	1N3051B-1
1N3022B	1N3022B-1		1N3037B	1N3037B-1			

* 6.4.3 Supersession information. Devices covered by this specification supersedes the manufacturers' and users' Part or Identifying Number (PIN). This information in no way implies that manufacturers' PIN are suitable as a substitute for the military PIN.

PIN	Manufacturer's CAGE code	Manufacturer's and user's PIN
1N3821A	04713	SZM20046H1/H2
1N3822A	04713	SZ11384H3
1N3826A	04713	SZ11384H6, SZ11491H42, SZ2308H
1N3827A	04713	SZM20014H24A, SZM20020H, SZM29001H
1N3828A	04713	SZM20042H2, SZ113848H8
1N3016B	04713	SZM20001H701, SZM20049H, SZ11829H101
1N3017B	04713	SZM20001H702, SZM106H, SZ11829H102
1N3018B	04713	SZM20001H703, SZ11491H3, SZ11829H103
1N3019B	04713	SZM20001H704, SZ12533H4, SZ11829H104
1N3020B	04713	SZM20001H705, SZM20024H, SZ11829H105
1N3021B	04713	SZM20001H706, SZ12533H6, SZ11829H106
1N3022B	04713	SZM20001H707, SZ12533H7, SZ11829H107
1N3023B	04713	SZM20001H708, SZ1661H, SZ11829H108
1N3024B	04713	SZM20074H, SZ12533H9, SZ11829H109
1N3025B	04713	SZM20050H, SZM20052H1, SZ11829H110
1N3026B	04713	SZM20052H2, SZ12533H11, SZ11829H111
1N3027B	04713	SZ11283H, SZ12533H12, SZ11829H112
1N3028B	04713	SZM20041H, SZ12533H13, SZ11829H113
1N3029B	04713	SZ11282H, SZ12382H, SZ11829H114
1N3030B	04713	SZ12988H10, SZ12533H15, SZ11829H115
1N3031B	04713	SZ11491H16, SZ11829H116
1N3032B	04713	SZM20019H, SZ11384H25, SZ11829H117
1N3034B	04713	SZ14307H
1N3036B	04713	SL11829H118
1N3038B	04713	SZ12125H
1N3042B	04713	SZM29000H, SZ12613H
1N3045B	04713	SZM20052H3, SZ10539H, SZ12126H
1N3046B	04713	SZM20038H1
1N3049B	04713	SZ12114H2
1N3051B	04713	SZM20034H, SZM20048H1

6.5 Suppliers of JANHC die. The qualified JANHC suppliers with the applicable letter version (example JANHCA1N3821A) will be identified on the QML.

JANHC ordering information		
PIN	Manufacturer CAGE	
	43611	12954
1N3821A through 1N3828A	JANHCA1N3821A through JANHCA1N3828A	JANHCB1N3821A through JANHCB1N3828A
1N3016B through 1N3051B	JANHCA1N3016B through JANHCA1N3051B	JANHCB1N3016B through JANHCB1N3051B

6.6 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

Review activities:
Army - AR, AV, MI, SM
Navy - AS, MC
Air Force -19, 99

Preparing activity:
DLA - CC

(Project 5961-2008-144)

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 http://assist.daps.dla.mil .