

The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 March 1994

INCH-POUND

MIL-S-19500/115H
20 December 1993
SUPERSEDING
MIL-S-19500/115G
2 April 1990

MILITARY SPECIFICATION

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.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for 1 Watt, silicon, voltage regulator diodes with voltage tolerances of 5 percent (2 percent and 1 percent tolerance options are available on the -1 suffix devices and JANHC). Three levels of product assurance are provided for each device type as specified in MIL-S-19500. One level of product assurance is provided for die.

1.2 Physical dimensions. See figures 1 (DO-13), 2 (similar to DO-41), 3 and 4 (JANHC).

1.3 Maximum ratings. Maximum ratings are as shown in columns 8 and 10 of table IV herein and as follows:

$P_T = 1.0 \text{ W}$ (DO-13 and DO-41) at $T_L = 95^\circ\text{C}$, $L = .375$ (9.53 mm); both ends of case or diode body to heat sink at $L = .375$ (9.53 mm). (Derate I_Z to 0.0 mA dc at $T_L = +175^\circ\text{C}$).

$P_T = 1.0 \text{ W}$ (DO-213AB) at $T_{EC} = 125^\circ\text{C}$. (Derate to 0 at $T_{EC} = 175^\circ\text{C}$).

$-65^\circ\text{C} \leq T_{op} \leq +175^\circ\text{C}$; $-65^\circ\text{C} \leq T_{stg} \leq +175^\circ\text{C}$.

1.4 Primary electrical characteristics. Primary electrical characteristic columns 2, 9, 12, and 15 of table IV herein and as follows:

3.3 V dc $\leq V_Z \leq 200 \text{ V dc}$

1N3821D-1 through 1N3828D-1 and 1N3016D-1 through 1N3051D-1 are 1 percent voltage tolerance.

1N3821C-1 through 1N3828C-1 and 1N3016C-1 through 1N3051C-1 are 2 percent voltage tolerance.

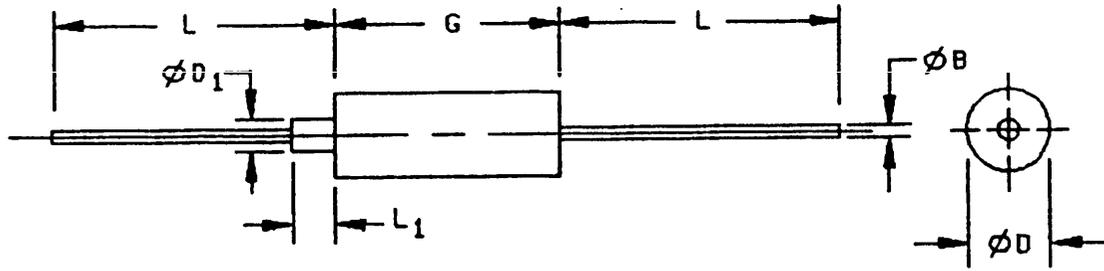
1N3821A through 1N3828A and 1N3016B through 1N3051B are 5 percent voltage tolerance.

1N3821A-1 through 1N3828A-1 and 1N3016B-1 through 1N3051B-1 are 5 percent voltage tolerance.

$R_{\theta JL} = 80^\circ\text{C/W}$ (maximum) at $L = .375$ inch (9.53 mm) (DO-13 and DO-41).

$R_{\theta JEC} = 50^\circ\text{C/W}$ (maximum) junction to endcaps (DO-213AB).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, ATTN: DESC-ECT, 1507 Wilmington Pike, Dayton, OH 45444-5270, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

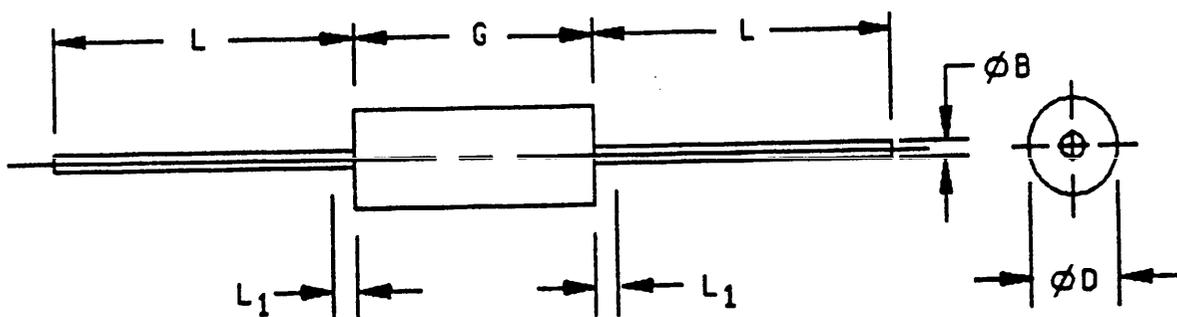


Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
ϕB	.026	.035	0.66	0.89	
ϕD	.215	.265	5.46	6.73	4
ϕD_1		.110		2.79	
G	.195	.350	4.96	8.89	
L	1.000		25.40		
L_1		.21		5.33	

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimension ϕD 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.

FIGURE 1. Semiconductor device, diode, types 1N3821A through 1N3828A, and 1N3016B through 1N3051B.

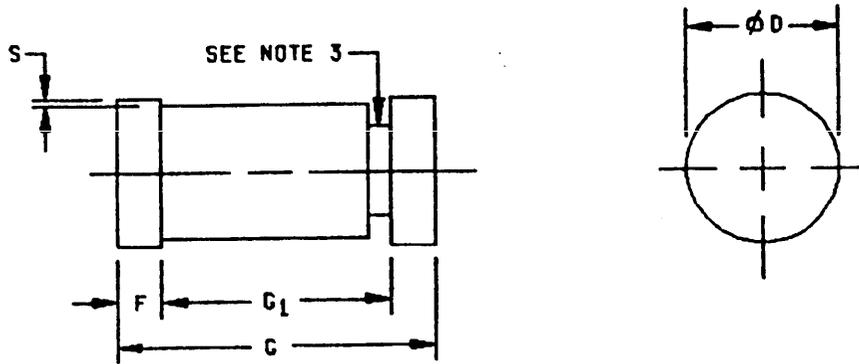


Ltr	Dimensions				
	Inches		Millimeters		
	Min	Max	Min	Max	
ϕB	.028	.034	0.71	0.86	
ϕD	.080	.107	2.03	2.72	3
G	.160	.205	4.06	5.21	3
L	1.110	---	28.19	---	
L1	---	.050	---	1.27	4

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Package contour optional within cylinder of diameter ϕD and length G. Slugs, if any shall not be included within this cylinder but shall not be subject to the minimum limit of ϕD .
4. Lead diameter not controlled in this zone to allow for flash, lead finish build-up, and minor irregularities other than slugs.

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

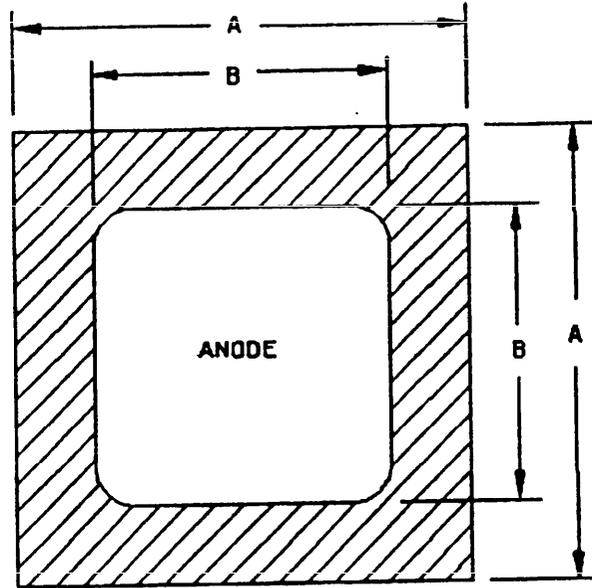


Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
ϵ	.189	.205	4.80	5.21
ϕD	.094	.105	2.39	2.67
G_1	.159 REF.		4.04 REF.	
F	.014	.022	.36	.56
S	.001	---	.03	---

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Gap not controlled, shape of body and gap not controlled.

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



BACKSIDE IS CATHODE

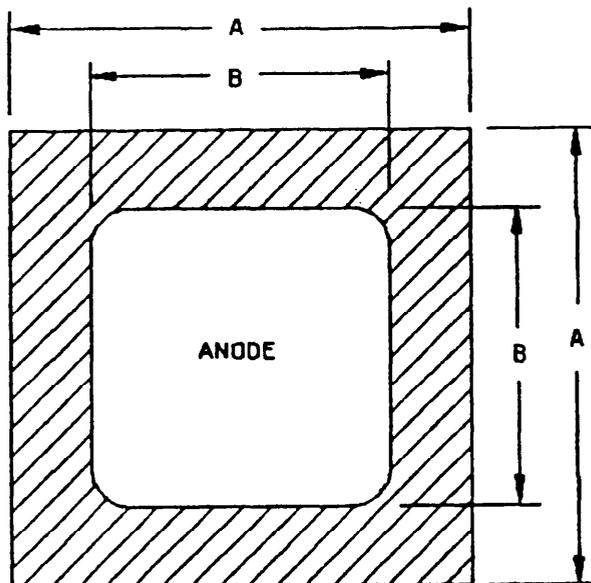
A Version

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.035	.039	.89	.99
B	.031	.033	.79	.84

NOTES:

1. Dimensions are in inches.
2. Metric 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 = 4000Å minimum.

FIGURE 4. Physical dimensions JANHCA die.



BACKSIDE IS CATHODE

B Version

Ltr	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. Metric equivalents are given for general information only.
3. The physical characteristics of the die thickness are .012 ±.002 (0.30 mm). Metallization is: Top (anode) - Al, back (cathode) - Au. Al thickness = 40,000Å minimum, Au thickness = 5000Å minimum.

FIGURE 5. Physical dimensions JANHCB die.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

MILITARY

MIL-S-19500 - Semiconductor Devices, General Specification for.

STANDARD

MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-S-19500, and as specified herein.

3.2 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions shall be as specified in MIL-S-19500.

EC ----- endcap.

3.3 Design, construction, and physical dimensions. Design, construction, and physical dimensions shall be as specified in MIL-S-19500, and figures 1 (DO-13), 2 (DO-41), 3 (DO-213AB), and figures 4 and 5 for (JANHC).

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

3.3.2 Dash one construction. Dash one (-1) diodes shall be of metallurgically bonded double plug construction in accordance with MIL-S-19500.

3.4 Marking. Marking shall be in accordance with MIL-S-19500.

3.4.1 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.

3.4.2 Polarity. 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.

3.5 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 5 percent tolerance devices. All sublots of C and D suffix devices shall pass group A, 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, $T_L = 30 \pm 2^\circ\text{C}$ at 0.375" from body or equivalent.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

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

4.2.1 JANHC devices. JANHC devices shall be qualified in accordance with appendix H of MIL-S-19500.

4.2.2 Construction verification. Cross sectional photos from 3 devices shall be submitted in the qualification report.

4.3 Screening (JAN, JANTXV and JANTX levels only). Screening shall be in accordance with MIL-S-19500 (table II), 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 (see table II of MIL-S-19500)	Measurement	
	JANTX and JANTXV levels	JAN Level
3a	Temperature cycling	Temperature cycling in accordance with MIL-S-19500 JANTX level)
3c 1/	Thermal impedance (see 4.5.5)	Thermal impedance (see 4.5.5)
9	Not applicable	Not applicable
11	I_R and V_Z	
12	See 4.3.2, $t = 48$ hours	
13 2/	$\Delta I_{R1} \leq 100\%$ of initial reading or 50 nA dc, whichever is greater; $\Delta V_Z \leq \pm 2\%$ of initial reading, subgroup 2 of table I herein.	

1/ Thermal impedance may be performed any time after sealing provided temperature cycling is performed in accordance with MIL-S-19500, screen 3 prior to this thermal test.

2/ PDA = 5 percent for screen 13, applies to ΔI_{R1} , ΔV_Z and subgroup 2 of table I herein. Thermal impedance ($Z_{\theta JX}$) is not required in screen 13.

4.3.1 Screening (JANHC). Screening of JANHC die shall be in accordance with MIL-S-19500, appendix H. As a minimum, die shall be 100-percent probed in accordance with group A, subgroup 2.

4.3.2 Power burn-in conditions. Power burn-in conditions are as follows: I_Z = column 8 of table IV minimum; mounting and test conditions in accordance with MIL-STD-750, method 1038, test condition B, T_{EC} = +75°C to +125°C for surface mount devices. To better utilize burn-in equipment, higher values of I_Z shall be permitted provided:

- a. The junction temperature does not exceed +175°C.
- b. The power dissipation does not exceed 1.2 W.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-S-19500, and table I herein. The following test conditions shall be used for $Z_{\theta JX}$, group A inspection:

- a. I_M measurement current - - - - - 1 mA - 10 mA.
- b. I_H forward heating current - - - - - 1.0 A - 2.0 A.
- c. t_H heating time - - - - - 10 ms.
- d. t_{MD} measurement delay time - - - - - 70 μ s maximum.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table I1b (JAN, JANTX and JANTXV) of MIL-S-19500, and as follows. Electrical measurements (endpoints) and delta requirements shall be in accordance with the applicable footnotes and steps of table III herein.

Subgroup	Method	Condition
B2	4066	See 4.5.1
B3	1027	$I_Z = I_{ZM}$ column 8 of table IV; $T_A = +30^\circ \pm 5^\circ C$.
B4	---	Not applicable
B5	---	Not applicable

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table V of MIL-S-19500, and as follows. Electrical measurements (endpoints) and delta requirements shall be in accordance with the applicable footnotes and steps of table III herein.

Subgroup	Method	Condition
C2	2036	Terminal strength: Test condition A; weight = 4 lbs; $t = 15$ seconds. Terminal strength: Test condition E; (Terminal strength is not required for UR-1 suffix devices).
C6	1026	$I_Z = I_Z$ column 8 of table IV; $T_A = +30^\circ C \pm 5^\circ C$.
C7	4071	$I_Z = I_Z$ column 5 of table IV; $T_A = +25^\circ C \pm 5^\circ C$; $T_2 = +125^\circ C \pm 5^\circ C$; $\alpha V_Z =$ column 15 of table IV; LTPD = 10.

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 IV shall be applied in the reverse direction and these shall be superimposed on the current ($I_Z = I_{Z1}$)(column 5 of table IV) a total of 5 surges at 1 minute intervals. Each individual surge shall be one-half square-wave-pulse of one one-hundred twentieth second duration or an equivalent one-half sinewave 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 endcaps and the axial leaded device shall be suspended by its leads with mounting clips whose inside edge is located at 0.375 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 table III, group C, subgroup 7.

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, group A, subgroup 7. Both tests shall be performed at thermal equilibrium. This ΔV_z shall not exceed column 9 of table IV.

4.5.5 Thermal impedance $Z_{\theta JX}$ measurements for screening. The $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, method 3101. The maximum limit (not to exceed the group A, subgroup 2 limit) for $Z_{\theta JX}$ in screening (table II of MIL-S-19500) shall be derived by each vendor by means of statistical process control. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X, R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for Engineering evaluation and disposition.

4.5.5.1 For initial qualification or requalification. Read and record data ($Z_{\theta JX}$) shall be supplied to the qualifying activity on one lot (random sample of 500 devices minimum). Twenty-two serialized devices shall be sent to the qualifying activity for test correlation.

4.5.6 Thermal resistance. Thermal resistance measurement shall be in accordance with MIL-STD-750, method 3101 or 4081. Forced moving air or draft shall not be permitted across the device during test. The maximum limit for $R_{\theta JL}$ under these test conditions shall be $R_{\theta JL}(\max) = 80^\circ\text{C/W}$ or $R_{\theta JEC} = 50^\circ\text{C/W}$. The following conditions shall apply when using method 3101:

- a. I_H ----- 1 mA to 10 mA
- b. I_H ----- .5 A to 1.0 A
- c. t_H ----- 25 seconds minimum
- d. t_{HD} ----- 70 μs maximum

LS = Lead spacing = 3/8 inch as defined on figure 6 below:
 LS = 0 inches for "UR" suffix devices.

4.5.6.1 For initial qualifications and requalifications. Read and record data in accordance with group E herein and shall be included in the qualification report.

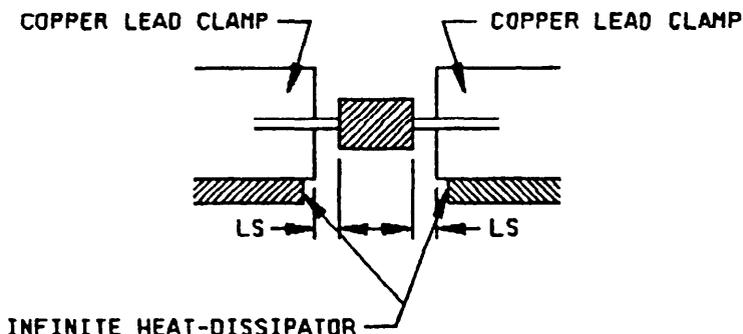


FIGURE 6. Mounting conditions.

TABLE I. Group A inspection.

Inspection 1/ Method	MIL-STD-750		Symbol	2/ Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Forward voltage	4011	$I_F = 200 \text{ mA dc}$	V_F		1.2	V dc
Reverse current	4016	DC method; $V_R =$ column 11 of table IV	I_{R1}		Column 12	$\mu\text{A dc}$
Regulator voltage (see 4.5.2)	4022	$I_{Z1} = I_Z =$ (column 5 of table IV)	V_Z	Column 3	Column 4	V dc
Thermal impedance	3101	See 4.5.5	$Z_{\theta JX}$		15	$^{\circ}\text{C/W}$
<u>Subgroup 3</u>						
High-temperature operation		$T_A = +150^{\circ}\text{C}$				
Reverse current	4016	DC method; $V_R =$ column 11 of table IV	I_{R2}		Column 14	$\mu\text{A dc}$
<u>Subgroup 4</u>						
Small-signal reverse breakdown impedance	4051	$I_Z =$ column 5 of table IV. $I_{sig} = 10\%$ of I_Z	Z_Z		Column 6	ohms
Small-signal knee impedance	4051	$I_{ZK} =$ column 16 of table IV; $I_{sig} = 10\%$ of I_{ZK}	Z_{ZK}		Column 7	ohms
<u>Subgroups 5, and 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Voltage regulation (see 4.5.4)		$I_Z = 10\%$ of column 8 of table IV (current 1) $I_Z = 50\%$ of column 8 of table IV (current 2)	ΔV_Z (reg)		Column 9	V dc

1/ For sampling plan, see MIL-S-19500

2/ Column references are to table IV herein.

TABLE II. Group E inspection (all product assurance levels).

Inspection ^{1/}	MIL-STD-750		Qualification conformance inspection (LTPD)
	Method	Conditions	
<u>Subgroup 1</u>			
Temperature cycling	1051	500 cycles	45/0
Electrical measurements		See table III, steps 1, 2, 3, and 5.	
<u>Subgroup 2</u>			
Steady-state dc intermittent life	1037	6,000 cycles	45/0
Electrical measurements		See table III, steps 1, 2, and 3.	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			22 devices, c = 0
Thermal resistance surface mount	3101 or 4081	$R_{\theta JEC} = 50^{\circ}\text{C/W}$ (maximum) at zero lead length. $+25^{\circ}\text{C} \leq T_R \leq +35^{\circ}\text{C}$, (see 4.5.6).	
Thermal resistance leaded	3101 or 4081	$R_{\theta JL} = 80^{\circ}\text{C/W}$ (maximum) at .375 inches lead length $+25^{\circ}\text{C} \leq T_R \leq 35^{\circ}\text{C}$, (see 4.5.6).	22 devices, c = 0

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

TABLE III. Group A, B, C, and E electrical end-point measurements. 1/, 2/, 3/

Step	Inspection	MIL-STD-750		Symbol	Limits 1/		Unit
		Method	Conditions		Min	Max	
1.	Reverse current	4016	DC method, V_R = column 11 of table IV	I_{R1}		Column 13	μA dc
2.	Breakdown voltage (see 4.5.2)	4022	I_Z = column 5 of table IV	V_Z	Column 3	Column 4	V dc
3.	Small-signal breakdown impedance	4051	I_Z = column 5 I_{sig} = 10% of I_Z	Z_Z		Column 6	ohms
4.	Thermal impedance	3101	See 4.5.5	$Z_{\theta JX}$		15	$^{\circ}C/W$

1/ Column references are to table IV herein.

2/ The electrical measurements for table IVb (JAN, JANTX, and JANTXV) of MIL-S-19500 are as follows:

- a. Subgroup 2, see table III herein, steps 1, 2, 3, and 4.
- b. Subgroups 3 and 6, see table III herein, steps 1, 2, and 3.

3/ The electrical measurements for table V of MIL-S-19500 are as follows:

- a. Subgroup 2, see table III herein, steps 1, 2, 3, and 4.
- b. Subgroup 3, (00-13 devices only), see table III herein, steps 1, 2, and 3.
- b. Subgroup 6, see table III herein, steps 1, 2, and 3.

TABLE IV. Test ratings for diodes, types 1N3821A through 1N3828A and 1N30168 through 1N30518 (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
Voltage group 1/ 2/	Vz Nom	Vz Min	Vz Max	Iz Test current	Zz Imped- ance	Zzk Knee Imped- ance	Izm Max dc current	Vz (reg)	IR (Surge) TA = 25°C	VR Reverse voltage	IR Reverse current dc	IR1 Reverse current dc	IR2 Reverse current dc; TA =+150°C	aVz Temperature coefficient	Izk Test current
	Volts	Volts	Volts	mA	ohms	ohms	mA	Volts	mA	Volts	Non -1	Non -1	μA	μA	%/°C
1N3821A	3.3	3.14	3.46	76	10	400	276	1.00	1380	1	100	100	200	-0.075	1.0
1N3822A	3.6	3.42	3.78	69	10	400	252	0.80	1260	1	100	75	150	-0.070	1.0
1N3823A	3.9	3.71	4.09	64	9	400	238	0.75	1190	1	50	25	100	-0.060	1.0
1N3824A	4.3	4.09	4.51	58	9	400	213	0.70	1070	1	10	5	20	-0.050	1.0
1N3825A	4.7	4.47	4.93	53	8	500	194	0.60	970	1	10	5	20	±.025	1.0
1N3826A	5.1	4.85	5.35	49	7	550	178	0.50	890	1	10	3	20	±.030	1.0
1N3827A	5.6	5.32	5.88	45	5	600	162	0.40	810	2	10	3	20	±.040	1.0
1N3828A	6.2	5.89	6.51	41	2	700	146	0.30	730	3	10	3	20	±.050	1.0
1N30168	6.8	6.46	7.14	37	3.5	700	140	0.30	740	5.2	150	5.0	300	±.057	1.0
1N30178	7.5	7.13	7.87	34	4.0	700	125	0.35	680	5.7	100	5.0	200	±.061	.5
1N30188	8.2	7.79	8.61	31	4.5	700	115	0.40	600	6.2	50	5.0	100	±.065	.5
1N30198	9.1	8.65	9.55	28	6.0	700	105	0.45	540	6.9	25	5.0	50	±.068	.5
1N30208	10	9.5	10.5	25	7	700	95	0.50	480	7.6	25	5.0	50	±.071	.25
1N30218	11	10.45	11.55	23	8	700	85	0.55	420	8.4	10	1.0	20	±.073	.25
1N30228	12	11.40	12.60	21	9	700	80	0.60	400	9.1	10	1.0	20	±.076	.25
1N30238	13	12.35	13.65	19	10	700	74	0.65	370	9.9	10	.5	20	±.079	.25
1N30248	15	14.25	15.75	17	14	700	63	0.75	320	11.4	10	.5	20	±.082	.25
1N30258	16	15.20	16.80	15.5	16	700	60	0.80	300	12.2	10	.5	20	±.083	.25
1N30268	18	17.10	18.90	14.0	20	750	52	0.83	260	13.7	10	.5	20	±.085	.25
1N30278	20	19.0	21.0	12.5	22	750	47	0.95	240	15.2	10	.5	20	±.086	.25
1N30288	22	20.9	23.1	11.5	23	750	43	1.0	210	16.7	10	.5	20	±.087	.25
1N30298	24	22.8	25.2	10.5	25	750	40	1.1	200	18.2	10	.5	20	±.088	.25
1N30308	27	25.7	28.3	9.5	35	750	34	1.3	170	20.6	10	.5	20	±.090	.25
1N30318	30	28.5	31.5	8.5	40	1000	31	1.4	160	22.8	10	.5	20	±.092	.25
1N30328	33	31.4	34.6	7.5	45	1000	28	1.5	150	25.1	10	.5	20	±.091	.25
1N30338	36	34.2	37.8	7.0	50	1000	26	1.7	130	27.4	10	.5	20	±.093	.25
1N30348	39	37.1	40.9	6.5	60	1000	23	1.8	110	29.7	10	.5	20	±.094	.25
1N30358	43	40.9	45.1	6.0	70	1500	21	1.9	100	32.7	10	.5	20	±.095	.25
1N30368	47	44.7	49.3	5.5	80	1500	19	2.1	95	35.8	10	.5	20	±.095	.25
1N30378	51	48.5	53.5	5.0	95	1500	18	2.3	90	38.8	10	.5	20	±.096	.25
1N30388	56	53.2	58.8	4.5	110	2000	17	2.5	85	32.6	10	.5	20	±.096	.25

See footnotes at end of table.

TABLE IV. Test ratings for diodes, types 1N3821A through 1N3828A and 1N30168 through 1N3051B (5 percent tolerance). - Continued

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	
Voltage group 1/ 2/	VZ Nom	VZ Min	VZ Max	IZ Test current	ZZ Imped- ance	I _{ZK} (Knee Imped- ance)	I _{ZM} Max dc current	VZ (reg)	I _{ZSM} (Surge) TA = 25°C	VR Reverse voltage	IR Reverse current dc	I _{R1} Reverse current dc	IR2 Reverse current dc; TA =+150°C	aVZ Temperature Coefficient	I _{ZK} Test current
	Volts	Volts	Volts	mA	ohms	ohms	mA	Volts	mA	Volts	μA	μA	μA	%/°C	mA
1N3039B	63	58.95	65.1	4.0	125	2000	15	2.7	75	47.1	10	.5	20	+ 0.097	.25
1N3040B	68	64.60	71.4	3.7	150	2000	14	3.0	70	51.7	10	.5	20	+ .097	.25
1N3041B	75	71.35	78.7	3.3	175	2000	12	3.3	63	56.0	10	.5	20	+ .098	.25
1N3042B	82	77.95	86.1	3.0	200	3000	11	3.6	58	62.2	10	.5	20	+ .098	.25
1N3043B	91	86.5	95.5	2.8	250	3000	10	4.0	50	69.2	10	.5	20	+ .099	.25
1N3044B	100	95.0	105.0	2.5	350	3000	9	4.4	45	76.0	10	.5	20	+ .100	.25
1N3045B	110	104.5	115.5	2.3	450	4000	8.3	5.0	42	83.6	10	.5	20	+ .100	.25
1N3046B	120	114	126.0	2.0	550	4500	8.0	5.5	40	91.2	10	.5	20	+ .100	.25
1N3047B	130	123.5	136.5	1.9	700	5000	6.9	6.0	35	98.8	10	.5	20	+ .100	.25
1N3048B	150	142.5	157.5	1.7	1000	6000	5.7	7.0	29	114.0	10	.5	20	+ .100	.25
1N3049B	160	152	168.0	1.6	1100	6500	5.4	8.0	27	121.6	10	.5	20	+ .100	.25
1N3050B	180	171	189.0	1.4	1200	7000	4.9	10.0	25	136.8	10	.5	20	+ .100	.25
1N3051B	200	190	210.0	1.2	1500	8000	4.6	12.0	23	152.0	10	.5	20	+ .100	.25

1/ Ratings also apply to dash one and surface mount devices unless otherwise noted.

2/ 5 percent voltage tolerances are shown in table.

For 2 percent tolerance ("C" 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 ("0" suffix; for "-1" suffix and JANHC only), column 3 is 1 percent less than column 2, column 4 is 1 percent more than column 2.

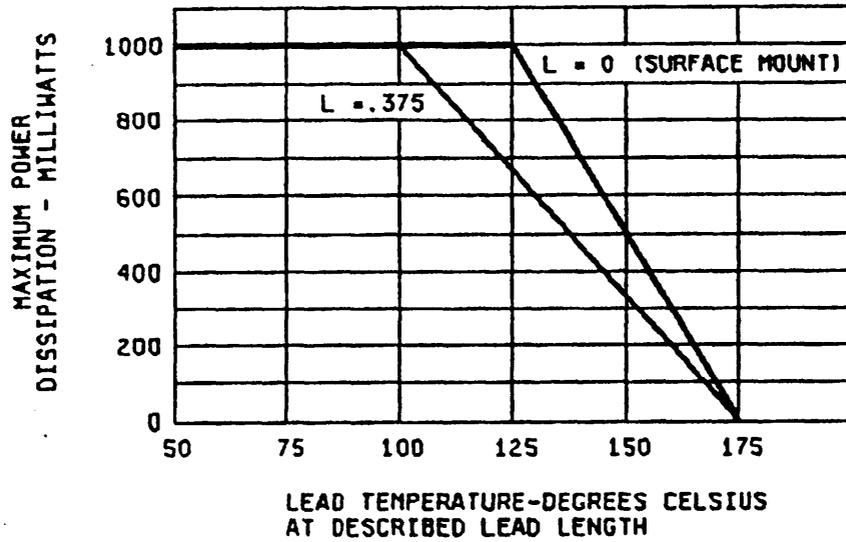


FIGURE 7. Maximum power versus lead temperature and lead length (see 6.4).

5. PACKAGING

5.1 Packaging requirements. Packaging shall be in accordance with MIL-S-19500.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Notes. The notes specified in MIL-S-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Issue of DODISS to be cited in the solicitation.
- b. Lead finish (see 3.3.1).
- c. For die acquisition, the JANHC letter version should be specified (see figures 4 and 5).
- d. Product assurance level and type designation.

6.3 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's part number. This information in no way implies that manufacturers' part numbers are suitable as a substitute for the military part number.

6.3.1 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 Maximum power versus lead temperature. Typical maximum power rating as a function of lead temperature for various lead lengths is shown on figure 7.

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

JANHC ordering information		
PIN	Manufacturer CAGE	
	55801	12954
1N3821A through 1N3828A	JANHCA1N3821A through JANHCA1N3828A	JANHCB1N3821A through JANHCB1N3828A
1N3016B through 1N3051B	JANHCA1N3016B through JANHCA1N3051B	JANHCB1N3016B through JANHCB1N3051B

NOTE: C and D tolerance suffix are applicable to JANHC.

6.6 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-S-19500/115H

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 17
NASA - NA

Review activities:

Army - AR, AV, MI, SM
Navy - AS, CG, MC
Air Force - 13, 19, 85, 99
DLA - ES .

Preparing activity:

Navy - EC

Agent:

DLA - ES

(Project 5961-1538)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-S-19500/115H

2. DOCUMENT DATE (YYMMDD)
20 December 1993

3. DOCUMENT TITLE 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, JANHC, AND JANKC

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)

7. DATE SUBMITTED
(YYMMDD)

- (1) Commercial
- (2) AUTOVON
(if applicable)

8. PREPARING ACTIVITY

a. NAME
Alan Barone

b. TELEPHONE (Include Area Code)
(1) Commercial (513)-296-6048
(2) AUTOVON 986-6048

c. ADDRESS (Include Zip Code)
DESC-ECT
Dayton, OH 45444-5270

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