

The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 July 2025.

INCH-POUND

MIL-PRF-19500/477N
w/AMENDMENT 2
19 March 2025
SUPERSEDING
MIL-PRF-19500/477N
w/AMENDMENT 1
9 December 2022

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER, ULTRAFAST RECOVERY, ENCAPSULATED (THROUGH-HOLE AND SURFACE MOUNT PACKAGES), AND UN-ENCAPSULATED, TYPES 1N5802, 1N5804, 1N5806, 1N5807, 1N5809, AND 1N5811, QUALITY LEVELS JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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 silicon, ultrafast recovery, power rectifier diodes. Four levels of product assurance (JAN, JANTX, JANTXV, and JANS) are provided for each encapsulated device types as specified in [MIL-PRF-19500](#). Two levels of product assurance (JANHC and JANKC) are provided for each unencapsulated device type.

* 1.2 Package outlines and die topography. The device package for the encapsulated device type are as follows: Axial leaded in accordance with [figure 1](#), square end-cap (US) surface mount version in accordance with [figure 2](#), round and square end-cap (URS) surface mount version in accordance with [figure 3](#), and planar ceramic (UMC) surface mount version in accordance with [figure 4](#). The UDA dimensions are in accordance with [figure 5](#). The UDB dimensions are in accordance with [figure 6](#). The characteristics, dimensions and topography for JANHC and JANKC un-encapsulated die are as follows: E version die in accordance with [figure 7](#), F version die in accordance with [figure 8](#), G version die in accordance with [figure 9](#) and H version die in accordance with [figure 10](#).

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.dla.mil>.

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FSC 5961



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1.3 Maximum ratings. Unless otherwise specified, $T_A = +25^\circ\text{C}$.

1.3.1 Ratings applicable to all types. $T_{STG} = T_{J(\text{max})} = -65^\circ\text{C}$ to $+175^\circ\text{C}$.

* 1.3.2 Ratings applicable to individual types.

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10
Types (1)	V_{RWM}	I_{O1} $T_A = +55^\circ\text{C}$ (2) (3)	$I_{O(L)}$ $T_L = +75^\circ\text{C}$ (4) (5)	I_{FSM} $T_A = +25^\circ\text{C}$ (6)	t_{rr}	$R_{\theta JL}$ (5)	$R_{\theta JEC}$ (5) (7)	$R_{\theta JX}$ (3)	$R_{\theta JSP(IS)}$ (8)
	<u>V</u>	<u>A</u>	<u>A</u>	<u>A(pk)</u>	<u>ns</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>	<u>°C/W</u>
1N5802, US, URS (2)	50	1.0	2.5	35	25	36	13	154	
1N5804, US, URS (2)	100	1.0	2.5	35	25	36	13	154	
1N5806, US, URS (2)	150	1.0	2.5	35	25	36	13	154	
1N5802UMC	50	1.0	2.5	35	25			127.7	22.4
1N5804UMC	100	1.0	2.5	35	25			127.7	22.4
1N5806UMC	150	1.0	2.5	35	25			127.7	22.4
1N5802UDA	50	1.0	2.5	35	25			91.2	36.2
1N5804UDA	100	1.0	2.5	35	25			91.2	36.2
1N5806UDA	150	1.0	2.5	35	25			91.2	36.2
1N5807, US, URS (3)	50	3.0	6.0	125	30	22	6.5	52	
1N5809, US, URS (3)	100	3.0	6.0	125	30	22	6.5	52	
1N5811, US, URS (3)	150	3.0	6.0	125	30	22	6.5	52	
1N5807UDB	50	3.0	6.0	125	30			67	19.0
1N5809UDB	100	3.0	6.0	125	30			67	19.0
1N5811UDB	150	3.0	6.0	125	30			67	19.0

- (1) Electrical characteristics for the surface mount devices are identical to the non-suffix axial leaded device.
- * (2) Derate at $8.33 \text{ mA}/^\circ\text{C}$ for T_A above $+55^\circ\text{C}$ for 1.0 amp ratings. Derate at $25 \text{ mA}/^\circ\text{C}$ for T_A above $+55^\circ\text{C}$ for 3.0 amp ratings.
- (3) For the 1 and 3 A ratings at 55°C ambient, these I_O ratings are for a thermal mounting methods (PC boards or other) where the lead or end-cap temperatures cannot be maintained and where the thermal resistance from mounting point to ambient is still sufficiently controlled where $T_{J(\text{MAX})}$ in 1.3.1 is not exceeded. This equates to $R_{\theta JX} \leq 154^\circ\text{C}/\text{W}$ for the 1N5802 thru 1N5806 and $R_{\theta JX} \leq 52^\circ\text{C}/\text{W}$ for the 1N5807 thru 1N5811 as shown in col. 9. Also see application notes in 6.6.1.
- (4) Derate at $25 \text{ mA}/^\circ\text{C}$ for T_L above $+75^\circ\text{C}$ for 2.5 amp ratings. Derate at $60 \text{ mA}/^\circ\text{C}$ for T_L above $+75^\circ\text{C}$ for 6.0 amp ratings.
- (5) T_L at $L = .375 \text{ in. (9.52 mm)}$ for axial leaded devices; $T_{EC} = T_L$ at $L = 0$ for US suffix devices.
- (6) Operating at I_{O1} with $t_P = 8.3 \text{ ms}$.
- (7) US suffix devices only.
- (8) UMC and UD suffix devices only.

* 1.4 Primary electrical characteristics. Unless otherwise specified, $T_A = +25^\circ\text{C}$.

Types	V_{BR} at $100 \mu\text{A}$, pulse $\leq 20 \text{ ms}$	I_{R1} at $V_R = V_{RWM}$ $T_A = +25^\circ\text{C}$, pulsed $V_R \leq 20 \text{ ms}$	I_{R2} at $V_R = V_{RWM}$ $T_A = +125^\circ\text{C}$, pulsed $V_R \leq 20 \text{ ms}$
	<u>V</u>	<u>μA</u>	<u>μA</u>
1N5802, US, URS, UMC, UDA	60	1.0	175
1N5804, US, URS, UMC, UDA	110	1.0	175
1N5806, US, URS, UMC, UDA	160	1.0	175
1N5807, US, URS, UDB	60	5.0	525
1N5809, US, URS, UDB	110	5.0	525
1N5811, US, URS, UDB	160	5.0	525

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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.

1.5.1.1 Quality level designators 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", "JANTXV", and "JANS".

1.5.1.2 Quality level designators for unencapsulated devices (die). The quality level designators for unencapsulated devices (die) that are applicable for this specification sheet from the lowest to the highest level are as follows: "JANHNC" and "JANKC".

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: "5802", "5804", "5806", "5807", "5809", and "5811".

* 1.5.3 Suffix symbols. The following suffix symbols are incorporated in the PIN as applicable.

	A blank suffix symbol indicates a through-hole mount axial leaded package (see figure 1).
US	Indicates a surface mount package with square end-caps (see figure 2).
URS	Indicates a surface mount package with one round end-cap and one square end-cap (see figure 3).
UMC	Indicates a planar ceramic surface mount package (see figure 4).
UDA	Indicates a surface mount LCC 3 leads (land pattern of A-body [US]). Pad 3 = shielding, connected to the lid (See figure 5)
UDB	Indicates a surface mount LCC 3 leads (land pattern of B-body [US]). Pad 3 = shielding, connected to the lid (See figure 6).

1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on [QPDSIS-19500](#).

1.5.5 Die identifiers for unencapsulated devices (manufacturers and critical interface identifiers). The manufacturer die identifiers that are applicable for this specification sheet are "E", "F", "G", and "H" (see [figures 7, 8, 9, 10](#) and [6.5](#)).

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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.

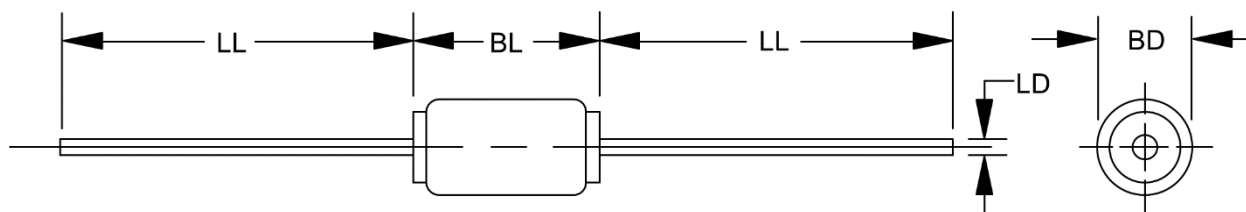
DEPARTMENT OF DEFENSE STANDARDS

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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Dimensions for types 1N5802, 1N5804, 1N5806

Symbol	Inch	Inch	mm	mm	Notes
	Min	Max	Min	Max	
BD	.065	.085	1.65	2.16	3
BL	.125	.250	3.18	6.35	4
LD	.027	.032	0.69	0.81	4
LL	.700	1.30	17.78	33.02	

Dimensions for types 1N5807, 1N5809, 1N5811

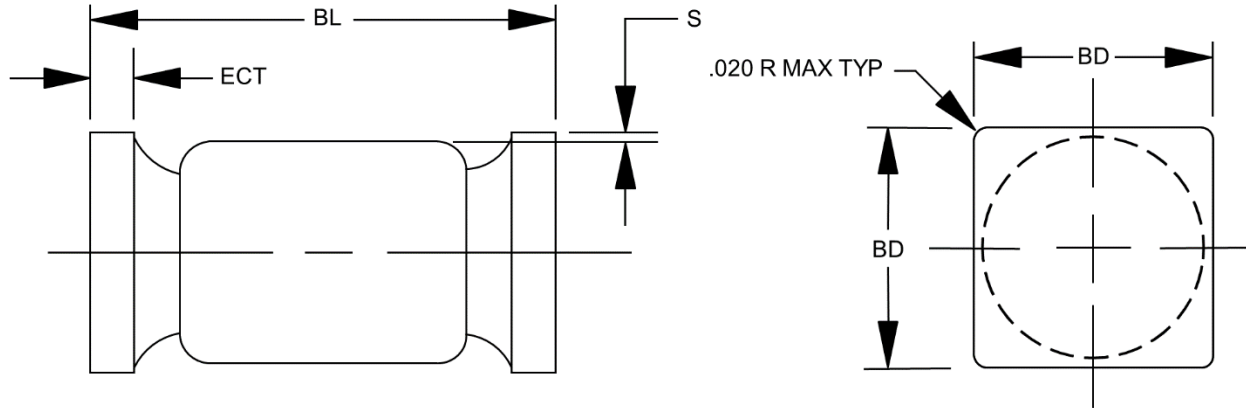
Symbol	Inch	Inch	mm	mm	Notes
	Min	Max	Min	Max	
BD	.115	.142	2.92	3.61	3
BL	.130	.300	3.30	7.62	4
LD	.036	.042	0.91	1.07	4
LL	.900	1.30	22.86	33.02	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.
3. Dimension BD shall be measured at the largest diameter.
4. Dimension BL shall include the entire body including plugs and sections of the lead over which the diameter is uncontrolled. This uncontrolled area is defined as the zone between the edge of the diode body and extending .050 inch (1.27 mm) onto the leads.
5. The shape of the body, within the bounds of the dimensions is optional.

FIGURE 1. Physical dimensions of axial leaded package.

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Dimensions for types 1N5802US, 1N5804US, 1N5806US

Symbol	Inch	Inch	mm	mm
	Min	Max	Min	Max
BD	.091	.103	2.31	2.62
BL	.168	.200	4.27	5.08
ECT	.019	.028	0.48	0.71
S	.003		0.08	

Dimensions for types 1N5807US, 1N5809US, 1N5811US

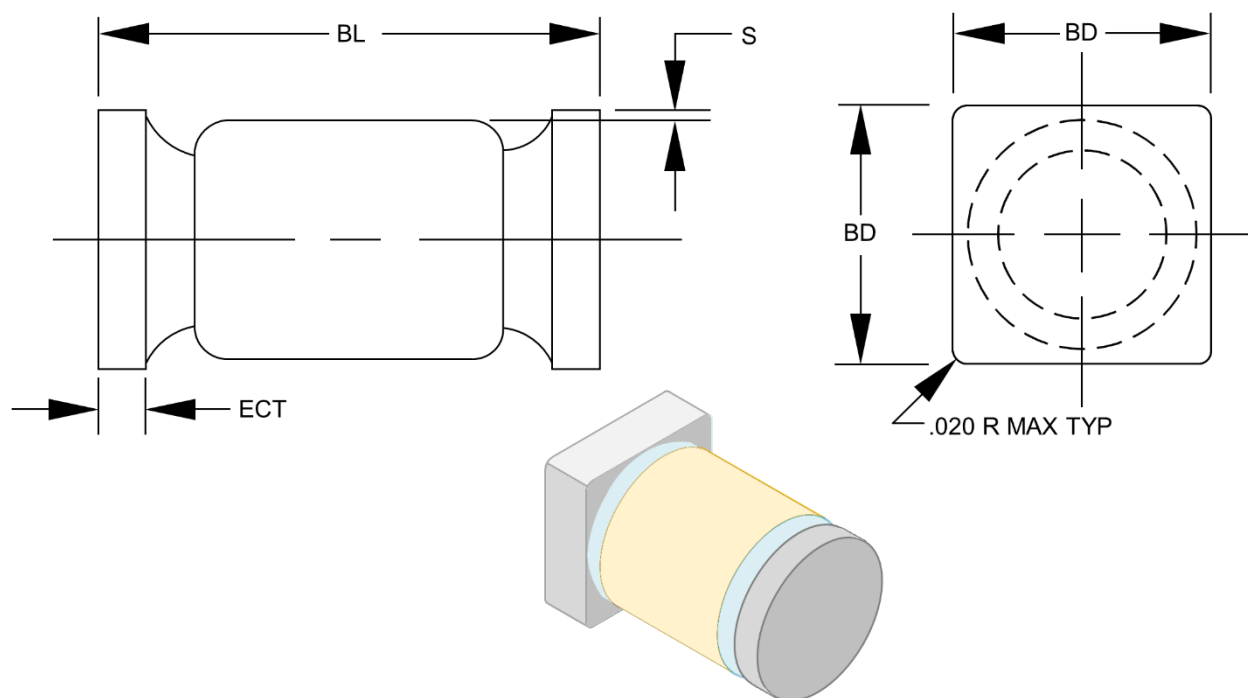
Symbol	Inch	Inch	mm	mm
	Min	Max	Min	Max
BD	.137	.148	3.48	3.76
BL	.200	.225	5.08	5.72
ECT	.019	.028	0.48	0.71
S	.003		0.08	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.
3. The S dimension is minimum clearance of glass body to mounting surface on all orientations.

FIGURE 2. Physical dimensions of square end-cap surface mount (US) package.

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Dimensions for device types 1N5802URS, 1N5804URS, 1N5806URS

Symbol	Inch	Inch	mm	mm	Notes
	Min	Max	Min	Max	
BD	.091	.103	2.31	2.62	2
BL	.168	.200	4.27	5.08	
ECT	.019	.028	0.48	0.71	2
S	.003		0.08		

Dimensions for device types 1N5807URS, 1N5809URS, 1N5811URS

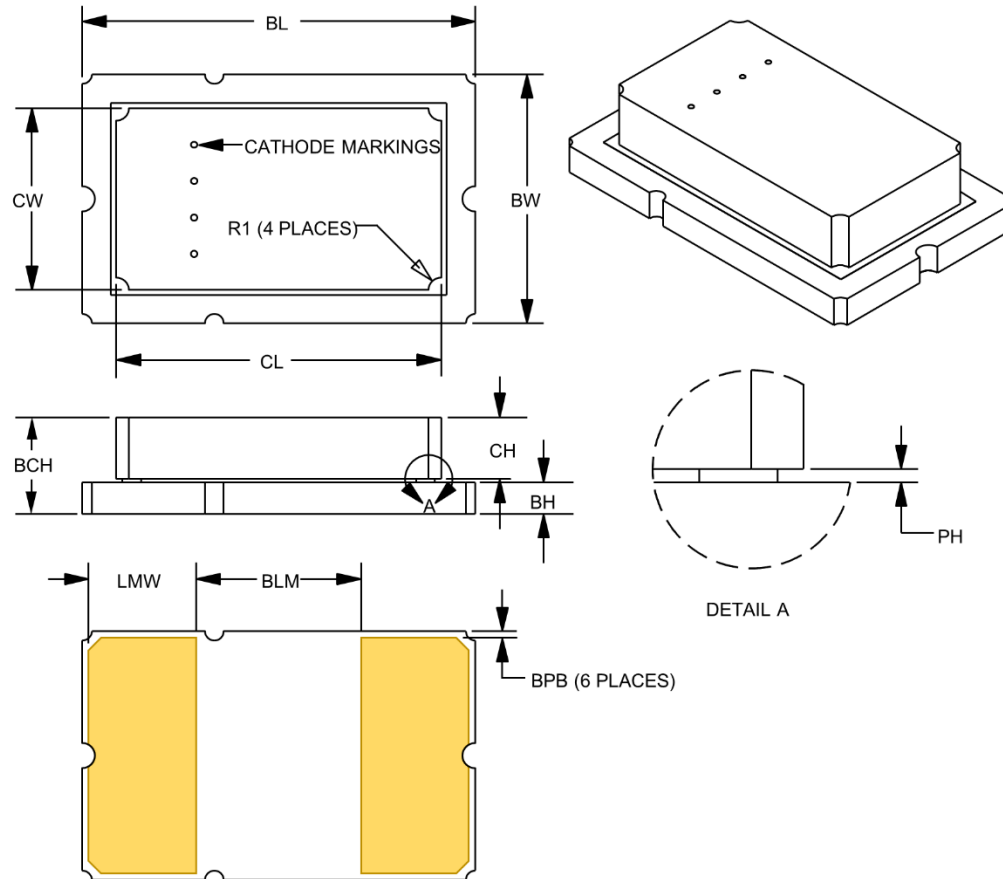
Symbol	Inch	Inch	mm	mm	Notes
	Min	Max	Min	Max	
BD	.137	.148	3.48	3.76	2
BL	.200	.225	5.08	5.72	
ECT	.019	.028	0.48	0.71	2
S	.003		0.08		

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. One endcap shall be square and the other end-cap shall be round.
3. Dimensions are pre-solder dip.
4. Minimum clearance of glass body to mounting surface on all orientations.

FIGURE 3. Physical dimensions of round and square end-cap surface mount (URS) package.

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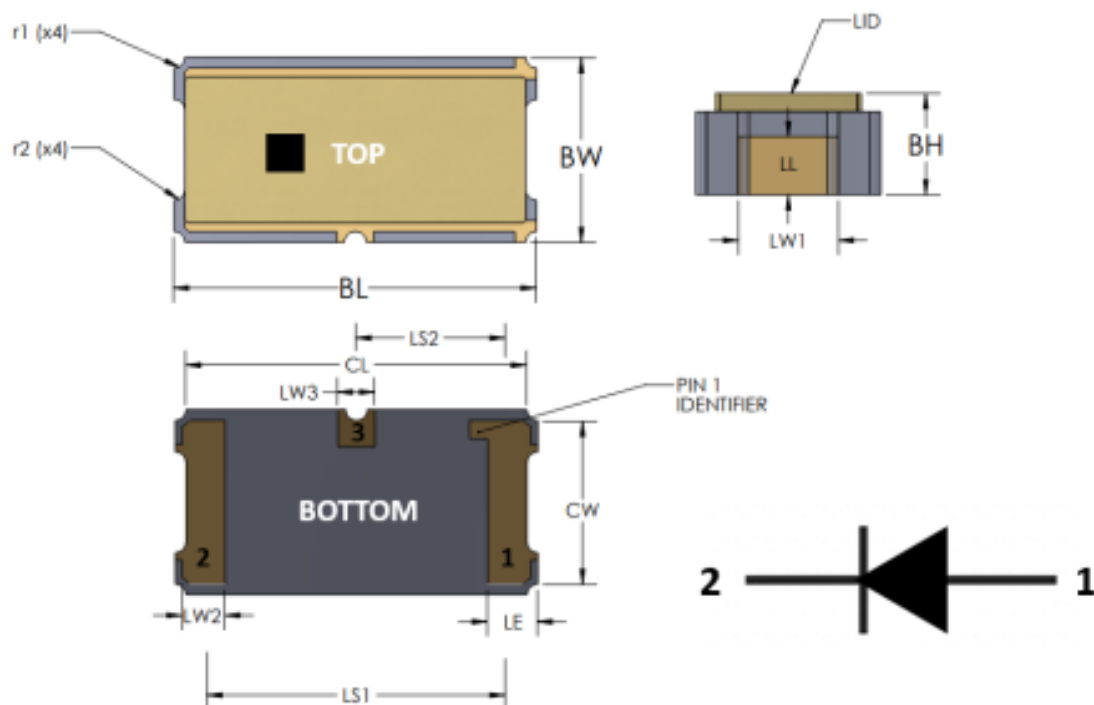
Symbol	Inches	Inches	mm	mm	Symbol	Inches	Inches	mm	mm
	Min	Max	Min	Max		Min	Max	Min	Max
BCH	.058	.064	1.46	1.63	CH	.038	.040	0.98	1.01
BH	.018	.022	0.46	0.56	CL	.199	.211	5.06	5.36
BL	.242	.254	6.15	6.45	CW	.109	.120	2.76	3.06
BLM	.098	.110	2.49	2.79	LMW	.062	.074	1.58	1.88
BW	.151	.163	3.84	4.14	PH	.001	.003	0.03	0.07
BPB	.003 Nominal		0.08 Nominal		R1	.006 Nominal		0.15 Nominal	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Shaded areas denote metallized areas.

FIGURE 4. Physical dimensions of planar ceramic (UMC) surface mount package.

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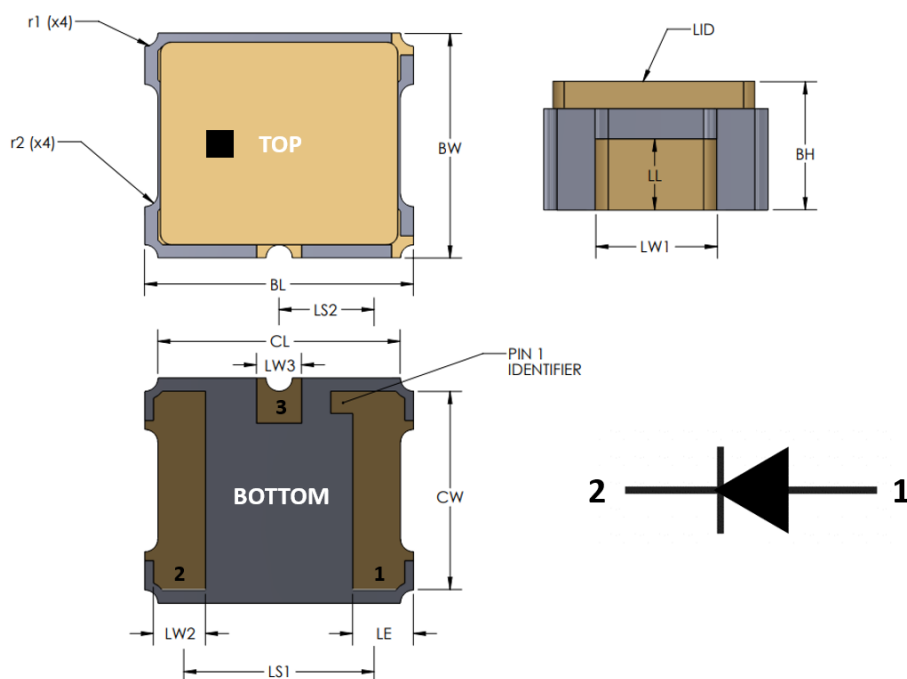
Symbol	Inches	Inches	mm	mm	Symbol	Inches	Inches	mm	mm
	Min	Max	Min	Max		Min	Max	Min	Max
BH	0.052	0.061	1.32	1.55	LW1	0.052	0.056	1.32	1.42
BL	0.189	0.205	4.8	5.21	LW2	0.019	0.027	0.48	0.69
BW	0.092	0.108	2.34	2.74	LW3	0.018	0.022	0.46	0.56
CL	0.183	0.187	4.65	4.75	LE	0.021	0.033	0.53	0.84
CW	0.087	0.089	2.21	2.26	r1		0.006		0.15
LL	0.028	0.032	0.76	0.81	r2		0.006		0.15
LS1	0.166	0.174	4.22	4.42					
LS2	0.083	0.087	2.11	2.21					

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Pad 3 = shielding, connected to the lid.
3. Equivalent pad layout to 1N5802US, 1N5804US, and 1N5806US.
4. Cathode marked with a square.

* FIGURE 5. Physical dimensions of surface mount 1N5802UDA 1N5804UDA 1N5806UDA.

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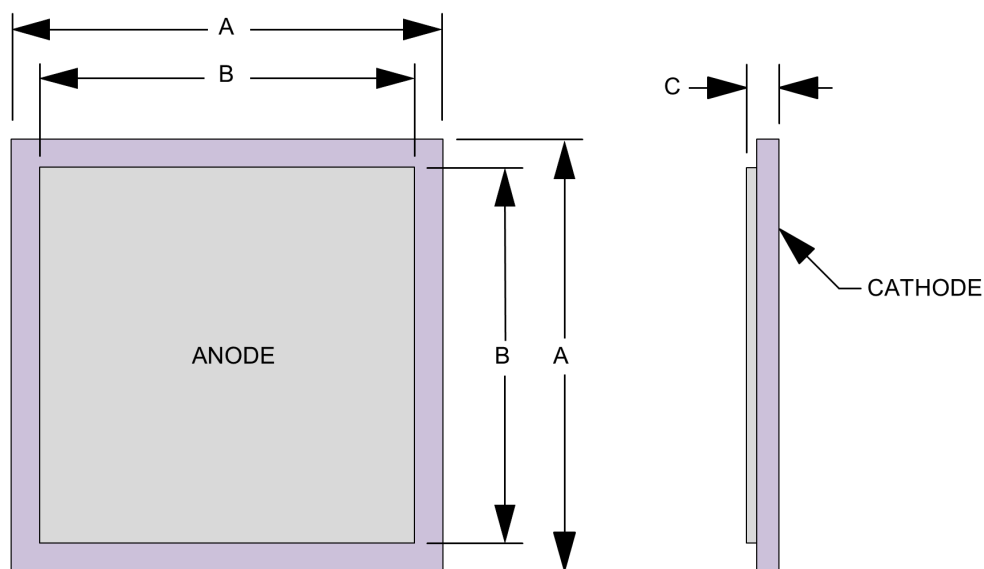
Symbol	Inches	Inches	mm	mm	Symbol	Inches	Inches	mm	mm
	Min	Max	Min	Max		Min	Max	Min	Max
BH	.079	.091	2.01	2.31	LW1	.053	.057	1.35	1.45
BL	.205	.22	5.21	5.59	LW2	.02	.026	0.51	0.66
BW	.137	.148	3.48	3.76	LW3	.019	.021	0.48	0.53
CL	.196	.206	4.98	5.23	LE	.022	.032	0.56	0.81
CW	.126	.136	3.20	3.45	r1		.008		0.20
LL	.052	.058	1.32	1.47	r2		.006		0.15
LS1	.178	.184	4.52	4.67					
LS2	.088	.094	2.24	2.39					

NOTES:

1. Dimensions are in inches. Millimeter equivalents are given for general information only.
2. Pad 3 = shielding, connected to the lid.
3. Equivalent pad layout to 1N5807US, 1N5809US, and 1N5811US.
4. Cathode marked with a square.

* FIGURE 6. Physical dimensions of surface mount 1N5807UDB 1N5809UDB 1N5811UDB.

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E-version

Dimensions for 1N5802, 1N5804, 1N5806

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.043	.047	1.10	1.20
B	.032	.036	0.82	0.92
C	.008	.012	0.20	0.30

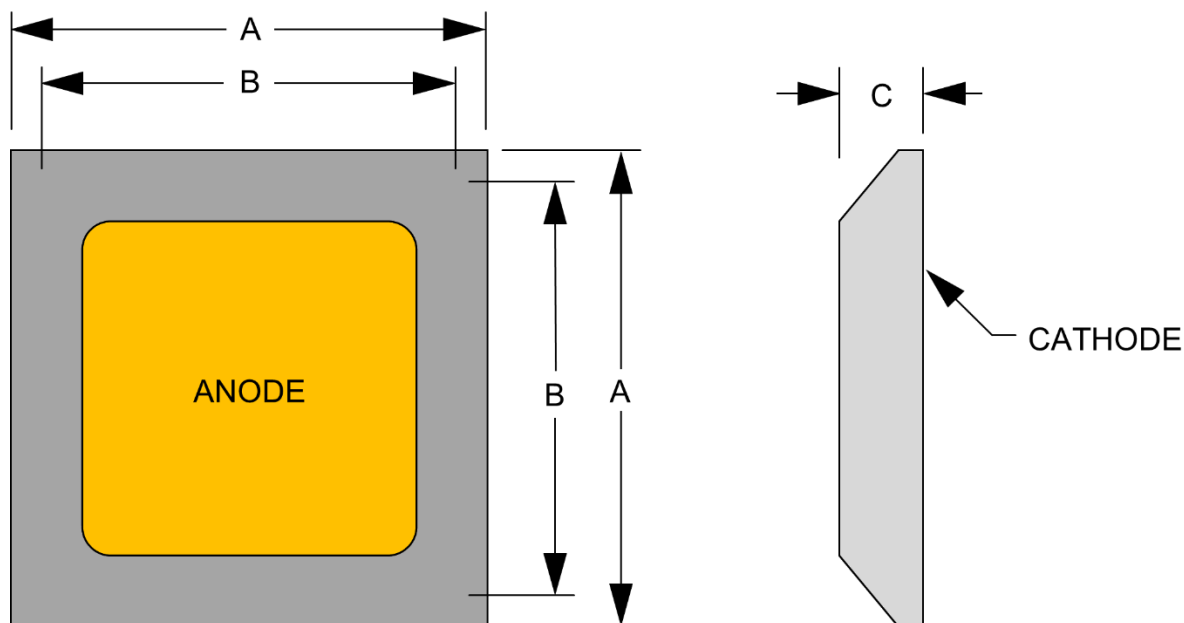
Dimensions for 1N5807, 1N5809, 1N5811

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.068	.072	1.73	1.83
B	.057	.061	1.45	1.55
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The metallization characteristics of the die are:
Top metal: Anode is aluminum at 38,000 Å minimum.
Back metal: Cathode is gold at 3,500 Å minimum.

FIGURE 7. Physical dimensions and characteristics for JANC (E-version) die.



F-version

Dimensions for 1N5802, 1N5804, 1N5806

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.043	.047	1.09	1.19
B	.031	.035	0.79	0.89
C	.008	.012	0.20	0.30

Dimensions for 1N5807, 1N5809, 1N5811

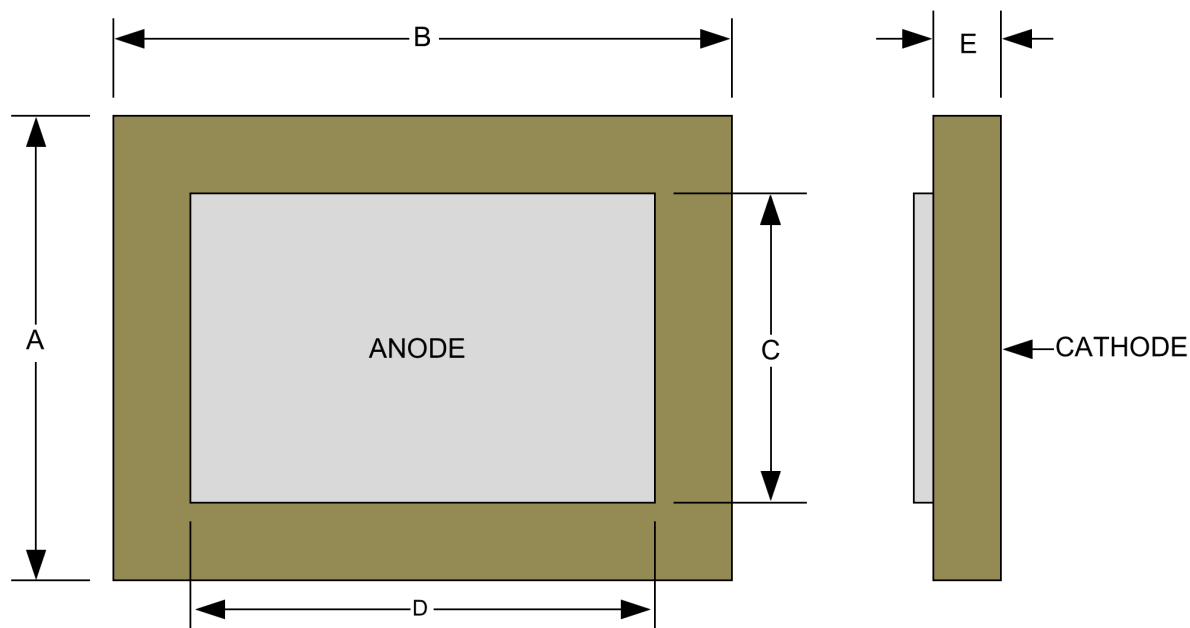
Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.062	.068	1.57	1.73
B	.046	.052	1.17	1.32
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches. Millimeter equivalents are given for general information only.
2. The metallization characteristics of the die are:
Top metal: Anode is aluminum at 34,000 Å minimum.
Back metal: Cathode is Ti 1,200Å nominal, Ni 1,800Å nominal, Au 4,000Å nominal

FIGURE 8. Physical dimensions and characteristics for JANC (F-version) die.

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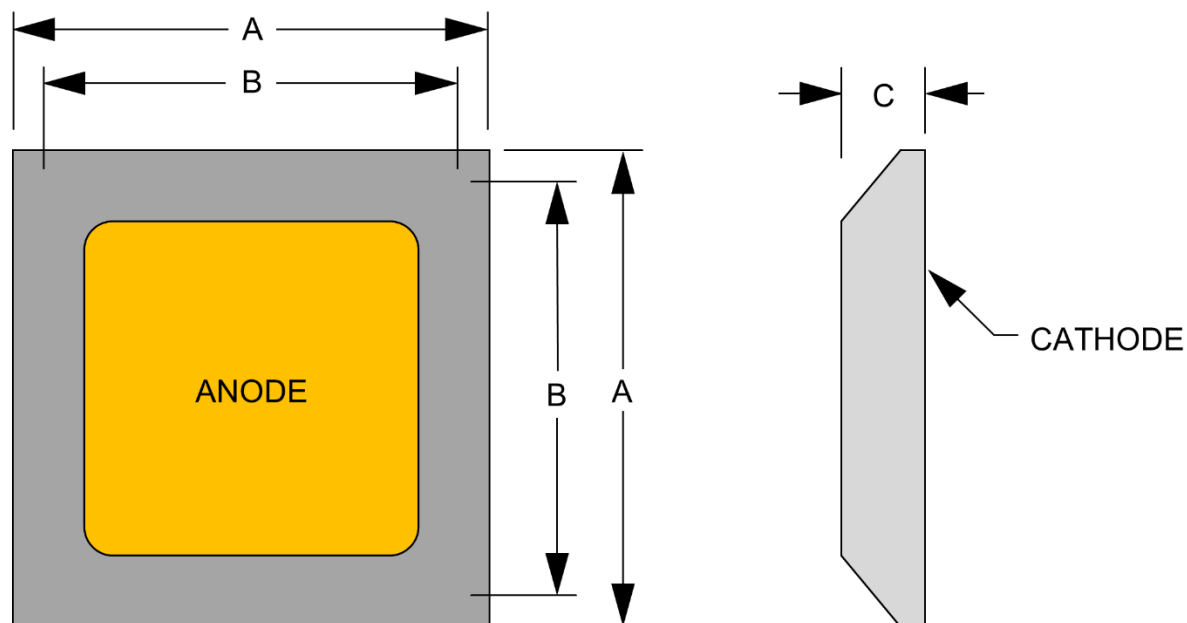
G-version

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.040	.050	1.016	1.270
B	.055	.065	1.397	1.651
C	.024	.034	0.610	0.864
D	.039	.049	0.991	1.245
E	.003	.013	0.076	0.330

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The metallization characteristics of the die are:
 Top metal: Anode is aluminum at $30,000 \text{ \AA} \pm 5,000 \text{ \AA}$.
 Back metal: Cathode is gold at $5,000 \text{ \AA} \pm 1,000 \text{ \AA}$.

FIGURE 9. Physical dimensions and characteristics for JANC (G-version) die.



H-version

Dimensions for 1N5802, 1N5804, 1N5806

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.043	.047	1.09	1.19
B	.031	.035	0.79	0.89
C	.008	.012	0.20	0.30

Dimensions for 1N5807, 1N5809, 1N5811

Letter	Inches	Inches	mm	mm
	Min	Max	Min	Max
A	.062	.068	1.57	1.73
B	.046	.052	1.17	1.32
C	.008	.012	0.20	0.30

NOTES:

1. Dimensions are in inches. Millimeter equivalents are given for general information only.
2. The metallization characteristics of the die are:
 Top metal: Anode is aluminum at 34,000 Å minimum.
 Back metal: Cathode is Ti 1,200Å nominal / Ni 1,800Å nominal / Ag 30,000Å nominal

FIGURE 10. Physical dimensions and characteristics for JANC (H-version) die.

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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](#) and as follows:

I _(BR)	Current for testing breakdown voltage.
P _{RM}	Peak reverse power.
UMC	Planar ceramic surface mounted diode with ceramic lid.
V _{FR}	Forward recovery voltage.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-19500](#), and [figures 1, 2, 3, 4, 5, 6, 7, and 8](#) herein.

3.4.1 Lead finish. Unless otherwise specified, lead, end-cap or pad finish shall be solderable in accordance with [MIL-PRF-19500](#), [MIL-STD-750](#), and herein. When solder alloy is used for finish, the maximum lead temperature is limited to 175°C maximum. Where a choice of finish is desired, it shall be specified in the acquisition document (see [6.2](#)).

3.4.2 Diode construction.

3.4.2.1 Axial leaded. The axial leaded devices shall be constructed utilizing non-cavity double plug construction with high temperature metallurgical bonding between both sides of the silicon die and terminal pins. Metallurgical bond shall be in accordance with the requirements of category I of [MIL-PRF-19500](#). Point contact construction shall not be allowed. Silver button Dumet design shall not be acceptable.

* 3.4.2.2 Surface mount. US and URS version devices shall be structurally identical to the non-surface mount devices except for lead terminations. The surface mount URS version shall be considered structurally identical to the US version except for end-cap shape. One end-cap shall be square and the other end-cap shall be round. The UMC, UDA, and UDB version devices shall be eutectically mounted and wire bonded in a ceramic package.

3.5 Marking. Marking shall be in accordance with [MIL-PRF-19500](#).

3.5.1 Marking of US and URS versions. For US versions only, all marking (except for polarity) may be omitted from the device. For URS versions only, all marking may be omitted from the device. All marking which is omitted from the body of the devices shall appear on the label of the initial container.

* 3.5.2 Polarity. The polarity of all types except URS and UMC shall be indicated with a contrasting color band to denote the cathode end. Alternately, for US version surface mount devices, a minimum of three evenly spaced contrasting color dots around the periphery of the cathode end may be used. No color coding will be permitted. For URS version surface mount devices only, cathode shall be connected to the round end-cap. For UMC version surface mount devices polarity shall consist as a minimum of 4 contrasting color dots marked on the lid. For the UDA and UDB package, the cathode end will be indicated by a square symbol on the lid surface.

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 the subgroups specified in [table I](#) herein.

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.

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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 table I, table II, and table III).
- d. Element evaluation of un-encapsulated die (see 4.6).

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

4.2.1 Group E inspection. 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 to this revision to maintain qualification.

4.2.2 JANHC and JANKC die. Qualification shall be in accordance with appendix G of MIL-PRF-19500 and as specified herein.

4.3 Screening (quality levels JANS, JANTXV and JANTX only). Screening of packaged devices 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.

Screen	Measurement for quality level JANS	Measurement for quality levels JANTXV and JANTX
(1) 3c	Thermal impedance (see 4.3.1)	Thermal impedance (see 4.3.1)
9	I_{R1} , V_{FM1} or V_{FM4} .	Not required
10	Method 1038 of MIL-STD-750, condition A	Method 1038 of MIL-STD-750, condition A
11	Required I_{R1} , V_{FM1} , or V_{FM4} ; $\Delta I_{R1} \leq \pm 100$ percent of initial reading or ± 150 nA dc (1N5802, 1N5804, 1N5806) or ± 500 nA dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM} \leq \pm 0.05$ V dc.	Required I_{R1} , V_{FM1} , or V_{FM4}
12	Required, see 4.3.2	Required, see 4.3.2
(2) 13	Subgroups 2 and 3 of table I herein; $\Delta I_{R1} \leq \pm 100$ percent of initial reading or ± 150 nA dc (1N5802, 1N5804, 1N5806) or ± 500 nA dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM} \leq \pm 0.05$ V dc. Scope display evaluation (see 4.5.3)	Subgroup 2 of table I herein; $\Delta I_{R1} \leq \pm 100$ percent of initial reading or ± 250 nA dc (1N5802, 1N5804, 1N5806) or ± 1 μ A dc (1N5807, 1N5809, 1N5811), whichever is greater. $\Delta V_{FM} \leq \pm 0.05$ V dc. Scope-display evaluation (see 4.5.3).

- (1) Thermal impedance shall be performed anytime after sealing provided temperature cycling is performed in accordance with MIL-PRF-19500, screen 3a prior to this thermal test. Quality levels TX and TXV levels do not need to be repeated in screening requirements.
- (2) Thermal impedance is not required in screen 13, if already previously performed.

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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_{MD} , t_H , t_{MD} , and K factor where appropriate. The limits will be statistically derived. See table E-IX of [MIL-PRF-19500](#), group E, and [table II](#), subgroup 4 herein.

4.3.2 Free air power burn-in conditions. Power burn-in shall be performed in accordance with condition B of method 1038 of [MIL-STD-750](#). The details of [4.5.2](#) and those that follows shall apply: $I_{O(min)}$ = rated I_{O1} (see [1.3](#) herein). T_A = 55°C maximum. Adjust I_O or T_A to achieve the required T_J . T_J = 135°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 table E-V of [MIL-PRF-19500](#), and [table I](#) herein. The $Z_{\theta JX}$ end-point shall be derived by the supplier and approved by the qualifying activity. This $Z_{\theta JX}$ end-point shall also be documented in the qualification report.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing in table E-VIA (JANS) and table E-VIB (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#) and herein. Delta measurements, when applicable, shall be as specified in [table III](#) herein.

4.4.2.1 Quality level JANS (see table E-VIA of [MIL-PRF-19500](#)).

Subgroup	Method	Condition
B3	4066	Condition A, I_{FSM} = rated I_{FSM} (see col. 5 of 1.3.2); ten surges of 8.3 ms each at 1 minute intervals, superimposed on I_{O1} (See col. 3 of 1.3.2), V_{RWM} = rated V_{RWM} (see col. 2 of 1.3.2), T_A = 25°C.
B4	1037	See 4.5.2 . I_O = I_{O1} rated minimum (see col. 3 of 1.3.2); V_R = rated V_{RWM} (see col. 2 of 1.3.2); 2,000 cycles.
B5	1027	See 4.5.2 . I_O = I_{O1} rated minimum (see col. 3 of 1.3.2); apply V_R = rated V_{RWM} (see col. 2 of 1.3.2) adjust I_O or T_A to achieve T_J = 175°C minimum; f = 50 to 60 Hz; t = 1,000 hours; $n=45$, $c=0$. Temporary leads may be added for surface mount devices. For irradiated devices, include t_{rr} as an end-point measurement.
B8	4065	For 1N5802 through 1N5806, $P_{RM} \geq 318$ W for square wave and $P_{RM} \geq 500$ W for half sine-wave. For 1N5807 through 1N5811, $P_{RM} \geq 636$ W for square wave and $P_{RM} \geq 1,000$ W for half sine-wave. Test shall be performed on each subplot; sampling plan: $n = 10$, $c = 0$, electrical end-points, see table I , subgroup 2 herein.

4.4.2.2 Quality levels JAN, JANTX and JANTXV (see table E-VIB of [MIL-PRF-19500](#)).

Subgroup	Method	Condition
B3	1027	See 4.5.2 ; I_O = I_{O1} rated minimum (see col. 3 of 1.3.2). Adjust I_O or T_A to achieve the required T_J of +150°C minimum. Apply V_R = rated V_{RWM} (see col. 2 of 1.3.2), f = 50 to 60 Hz. Temporary leads may be added for surface mount devices. For irradiated devices, include t_{rr} as an end-point measurement.

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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](#), and as follows. Delta measurements when applicable shall be as specified in [table III](#) herein.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Axial leaded devices only: Tension: For 1N5802, 1N5804, 1N5806; Condition A, weight = 8 pounds (3.62 Kg) (silver leads), 12 pounds (5.44 Kg) (copper leads), t = 15s. For 1N5807, 1N5809, 1N5811; Condition A, weight = 12 pounds (5.44 Kg) (silver leads), 20 pounds (9.07 Kg) (copper leads), t = 15s. Lead fatigue: Condition E for all types, 2 pounds (0.91 Kg).
C2	2038	US, URS surface mount devices only: Tab pull: For 1N5802US, 1N5804US, 1N5806US Condition B, 8 pounds (silver tabs), 12 pounds (5.44 Kg) (copper tabs), t = 15s. For 1N5807US, 1N5809US, 1N5811US Condition B, 12 pounds (silver tabs), 20 pounds (9.07 Kg) (copper tabs), t = 15s. Test method 2038 not required for UMC, UDA, and UDB devices.
C5	4081	See 4.3.1. For axial leaded devices, $R_{\theta JL}$ (maximum) see col. 7 of 1.3.2; L = .375 inch (9.53 mm). For US surface mount devices, $R_{\theta JEC}$, see col. 8 of 1.3.2. For UMC surface mount devices, $R_{\theta JSP(IS)}$ see col. 10 of 1.3.2. For UDA surface mount devices, $R_{\theta JSP(IS)}$ see col. 10 of 1.3.2. For UDB surface mount devices, $R_{\theta JSP(IS)}$ see col. 10 of 1.3.2.
C6	1027	See 4.5.2. $I_O = I_{O1}$ rated minimum (see col. 3 of 1.3.2); adjust I_O or T_A to achieve $T_J = 150^\circ\text{C}$ minimum, apply $V_R =$ rated V_{RWM} (see col. 2 of 1.3.2), f = 50 to 60 Hz. Temporary leads may be added for surface mount devices. For irradiated devices, include t_{ir} as an end-point measurement.

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 as specified herein. See [table III](#) herein for delta measurements when applicable.

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

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of [MIL-STD-750](#).

4.5.2 Burn-in and life tests. These tests shall be conducted with a half-sine waveform of the specified peak voltage impressed across the diode in the reverse direction followed by a half-sine waveform of the specified average rectified current. The forward conduction angle of the rectified current shall be neither greater than 180 degrees, nor less than 150 degrees. The use of a current limiting or ballast resistor is permitted provided that each DUT still sees the full required T_J and I_O and that the minimum required voltage, where applicable, is maintained through-out the burn-in period. Method 3100 of [MIL-STD-750](#) shall be used to measure T_J . T_J shall be 135°C minimum for screening and 150°C minimum for life tests. $T_A = 55^\circ\text{C}$ maximum.

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4.5.3 Scope display evaluation. Scope display evaluation shall be performed using condition A (stable only) in accordance with method 4023 of [MIL-STD-750](#). Scope display may be performed on ATE (automatic test equipment) for screening only with the approval of the qualifying activity. Scope display in [table I](#), subgroup 4 shall be performed on a curve tracer. The reverse current (I_{BR}) over the knee shall be 500 μ A peak.

* 4.5.4 Thermal resistance. Thermal resistance measurement shall be performed in accordance with method 4081 of [MIL-STD-750](#) using the guidelines in that method for determining I_M , I_H , and t_H . See table E-IX of [MIL-PRF-19500](#), subgroup 4, and figures [11](#), [12](#), and [13](#), [14](#), [15](#), [16](#), [17](#), [18](#), and [19](#) herein. Forced moving air or draft shall not be permitted across the devices during test.

4.5.5 Peak reverse power characterization. The testing to characterize P_{RM} shall be conducted in accordance with method 4065 of [MIL-STD-750](#). The following details shall apply:

- a. During the test, the voltage (V_{BR}) shall be monitored to verify it has not collapsed.
- b. Any collapse in V_{BR} during or after the test, or rise in leakage current (I_R) after the test that exceeds I_{R1} in [table I](#), shall be considered a failure to that level of applied P_{RM} .
- c. Progressively higher levels of P_{RM} shall be applied until failure occurs on all devices within the chosen sample size to characterize each subplot.

4.6 Element evaluation of un-encapsulated die. The element evaluation of unencapsulated die shall be in accordance with appendix G of [MIL-PRF-19500](#). As a minimum, die shall be 100-percent probed to ensure compliance with [table I](#), subgroup 2. Burn-in duration for the JANKC level follows JANS requirements; the JANHC follows JANTX requirements.

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* TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance 2/	3101	See 4.3.1	$Z_{\theta JX}$			°C/W
Forward voltage	4011	Condition B, Duty cycle ≤ 2 percent (pulsed see 4.5.1); tp = 8.3 ms (max)				
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_{FM} = 1.0 \text{ A}$	V_{FM1}		0.875	V
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_{FM} = 2.5 \text{ A}$	V_{FM2}		0.975	V
Forward voltage	4011	Condition B, Duty cycle ≤ 2 percent (pulsed see 4.5.1); tp = 8.3 ms (max)				
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 3.0 \text{ A}$	V_{FM3}		0.865	V
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 4.0 \text{ A}$	V_{FM4}		0.875	V
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 6.0 \text{ A}$	V_{FM5}		0.925	V

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 2</u> – continued						
Reverse current	4016	Condition A or B	I _{R1}			
1N5802, US, URS, UMC, UDA		V _R = 50 V			1.0	μA
1N5804, US, URS, UMC, UDA		V _R = 100 V			1.0	μA
1N5806, US, URS, UMC, UDA		V _R = 150 V			1.0	μA
1N5807, US, URS, UDB		V _R = 50 V			5.0	μA
1N5809, US, URS, UDB		V _R = 100 V			5.0	μA
1N5811, US, URS, UDB		V _R = 150 V			5.0	μA
Breakdown voltage	4021	I _(BR) = 100 μA pulse ≤ 20 ms	V _{(BR)1}			
1N5802, US, URS, UMC, UDA				60		V
1N5807, US, URS, UDB						
1N5804, US, URS, UMC, UDA				110		V
1N5809, US, URS, UDB						
1N5806, US, URS, UMC, UDA				160		V
1N5811, US, URS, UDB						
<u>Subgroup 3</u>						
High temperature operation:		T _A = +125°C minimum.				
Reverse current	4016	Condition A or B	I _{R2}			
1N5802, US, URS, UMC, UDA		V _R = 50 V			175	μA
1N5804, US, URS, UMC, UDA		V _R = 100 V			175	μA
1N5806, US, URS, UMC, UDA		V _R = 150 V			175	μA
1N5807, US, URS, UDB		V _R = 50 V			525	μA
1N5809, US, URS, UDB		V _R = 100 V			525	μA
1N5811, US, URS, UDB		V _R = 150 V			525	μA

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						
Forward voltage	4011	Condition B, duty cycle ≤ 2 percent (pulsed see 4.5.1); tp = 8.3 ms (max)				
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_{FM} = 1.0 \text{ A}$	V_{FM6}		0.800	V
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 4.0 \text{ A}$	V_{FM7}		0.800	V
Low-temperature operation:		$T_A = -65^\circ\text{C}$ minimum.				
Forward voltage	4011	Condition B, duty cycle ≤ 2 percent (pulsed see 4.5.1); tp = 8.3 ms (max)	V_{FM8}			
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_{FM} = 1.0 \text{ A}$			1.075	V
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 4.0 \text{ A}$			1.075	V
Breakdown voltage	4021	$I_{(BR)} = 100 \mu\text{A}$ dc	$V_{(BR)2}$			
1N5802, US, URS, UMC, UDA 1N5807, US, URS, UDB				50		V dc
1N5804, US, URS, UMC, UDA 1N5809, US, URS, UDB				100		V dc
1N5806, US, URS, UMC, UDA 1N5811, US, URS, UDB				150		V dc

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		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u>						
Reverse recovery time	4031	Condition B	t_{rr}			
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_F = I_{RM} = 0.5 \text{ A};$ $i_{i(REC)} = 0.05 \text{ A};$ $di/dt = 65 \text{ A}/\mu\text{s (min)}$			25	ns
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_F = I_{RM} = 1.0 \text{ A},$ $i_{i(REC)} = 0.1 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s (min)}$			30	ns
Capacitance	4001	$V_R = 10 \text{ V}; f = 1 \text{ MHz};$ $V_{sig} = 50 \text{ mV (p-p)}$	C_J			
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA					25	pF
1N5807, US, URS 1N5809, US, URS 1N5811, US, URS					60	pF
1N5807UDB 1N5809UDB 1N5811UDB		$V_R = 15 \text{ V}; f = 1 \text{ MHz};$ $V_{sig} = 50 \text{ mV (p-p)}$			60	pF
Forward recovery voltage	4026	$t_r = 8 \text{ ns}$	$V(\text{peak})$			
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_F = 250 \text{ mA}$			2.2	V
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_F = 500 \text{ mA}$			2.2	V
Forward recovery time	4026	$t_p \geq 20 \text{ ns}, t_r = 8 \text{ ns}, \text{ the test}$ $\text{is measured at } V_{FR} = 1.1 \times$ V_F	t_{fr}			
1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_F = 250 \text{ mA}$			15	ns
1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_F = 500 \text{ mA}$			15	ns
Scope display evaluation	4023	See 4.5.3, $n = 116, c = 0$				

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 5</u> Not applicable	4066	Condition A, I_{FSM} = rated I_{FSM} (see 1.3.2); ten surges of 8.3 ms each at 1 minute intervals superimposed on I_O = rated I_{O1} (see 1.3.2); V_{RWM} = rated V_{RWM} (see 1.3.2); T_A = + 25°C. See table I, subgroup 2 except $Z_{\theta JX}$.				
<u>Subgroup 6</u> Forward surge current						
Electrical measurements						
<u>Subgroup 7</u> Not applicable						

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

2/ Not applicable to JANHC and JANKC devices. For end-point measurements, this test is required for the following subgroups:

Group B, subgroups 3, 4 and 5 (JANS).

Group B, subgroups 2 and 3 (JAN, JANTX, JANTXV).

Group C, subgroups 2 and 6.

Group E, subgroup 1.

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TABLE II. 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 (liquid to liquid)	1056	20 cycles, except low temperature shall be achieved using liquid nitrogen (-195°C). Perform a visual for cracked glass. (Not applicable for UMC package.).	
Temperature cycling (air to air)	1051	-65°C to +175°C, 500 cycles.	
Hermetic seal <u>1</u> /	1071		
Electrical measurement		See table I , subgroup 2 and table III , steps 1 and 2.	
<u>Subgroup 2</u>			45 devices, c = 0
Steady-state dc blocking life	1048	t = 1,000 hours; T _A = +150°C; V _R dc = 80 to 85 percent rated V _{RWM} (see 1.3.2).	
Electrical measurement		See table I , subgroup 2 herein, except Z _{θJX} need not to be performed, and table III , steps 1 and 2 herein. For irradiated devices, include t _{rr} as an end-point measurement.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500 .	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 8</u>			45 devices
Peak reverse power	4065	P _{RM} shall be characterized by the supplier and this data shall be available to the Government. Test shall be performed on each subplot.	
Electrical measurement		See 4.5.5 .	

See footnotes at end of table.

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

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 9</u> Resistance to glass cracking	1057	Test condition B. Test until failure occurs or up to a maximum of 25 cycles whichever comes first. Not applicable for UMC, UDA, and UDB package.	45 devices
<u>Subgroup 10</u> Forward surge current	4066	Condition A, I_{FSM} = rated I_{FSM} (see col. 5 of 1.3.2); ten surges of 8.3 ms each at 1 minute intervals superimposed on I_O = rated I_{O1} (see col. 3 of 1.3.2); V_{RWM} = rated V_{RWM} (see col. 2 of 1.3.2); T_A = + 25°C.	22 devices, c = 0
Electrical measurement		See table I, subgroup 2.	

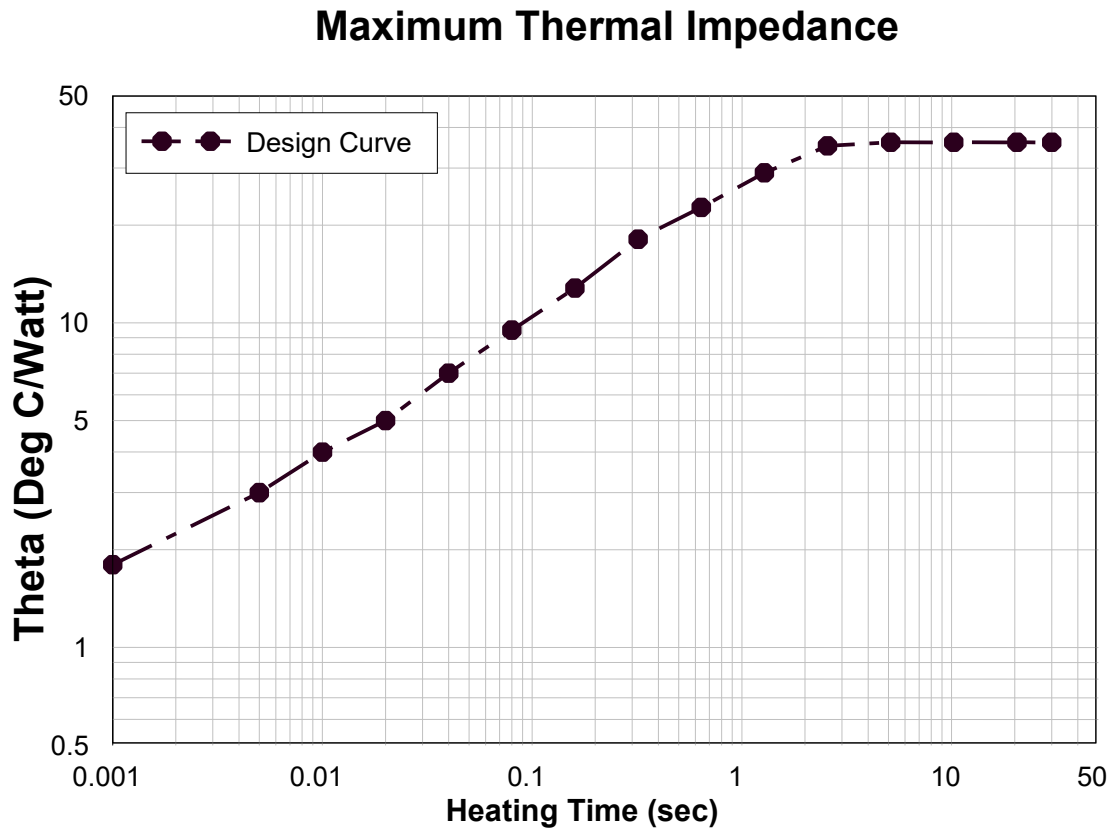
1/ Opaque glass double plug non-cavity axial leaded diodes may use test method 2068 in lieu of test method 1071 of MIL-STD-750.

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TABLE III. Delta measurements for groups B, C, and E inspections. 1/ 2/ 3/ 4/ 5/

Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1.	Forward voltage	4011	Condition B, Duty cycle ≤ 2 percent (pulsed see 4.5.1); $t_p = 8.3$ ms (max)			
	1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$I_{FM} = 1.0$ A(pk)	ΔV_{FM1}	± 50 mV dc change from initial value	
	1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$I_{FM} = 4.0$ A(pk)	ΔV_{FM4}	± 50 mV dc change from initial value	
2.	Reverse current	4016	Condition A or B	ΔI_{R1}		
	1N5802, US, URS, UMC, UDA 1N5804, US, URS, UMC, UDA 1N5806, US, URS, UMC, UDA		$V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc		100-percent or ± 150 nA dc change from initial reading, whichever is greater.	
	1N5807, US, URS, UDB 1N5809, US, URS, UDB 1N5811, US, URS, UDB		$V_R = 50$ V dc $V_R = 100$ V dc $V_R = 150$ V dc		100-percent or ± 500 nA dc change from initial reading, whichever is greater.	

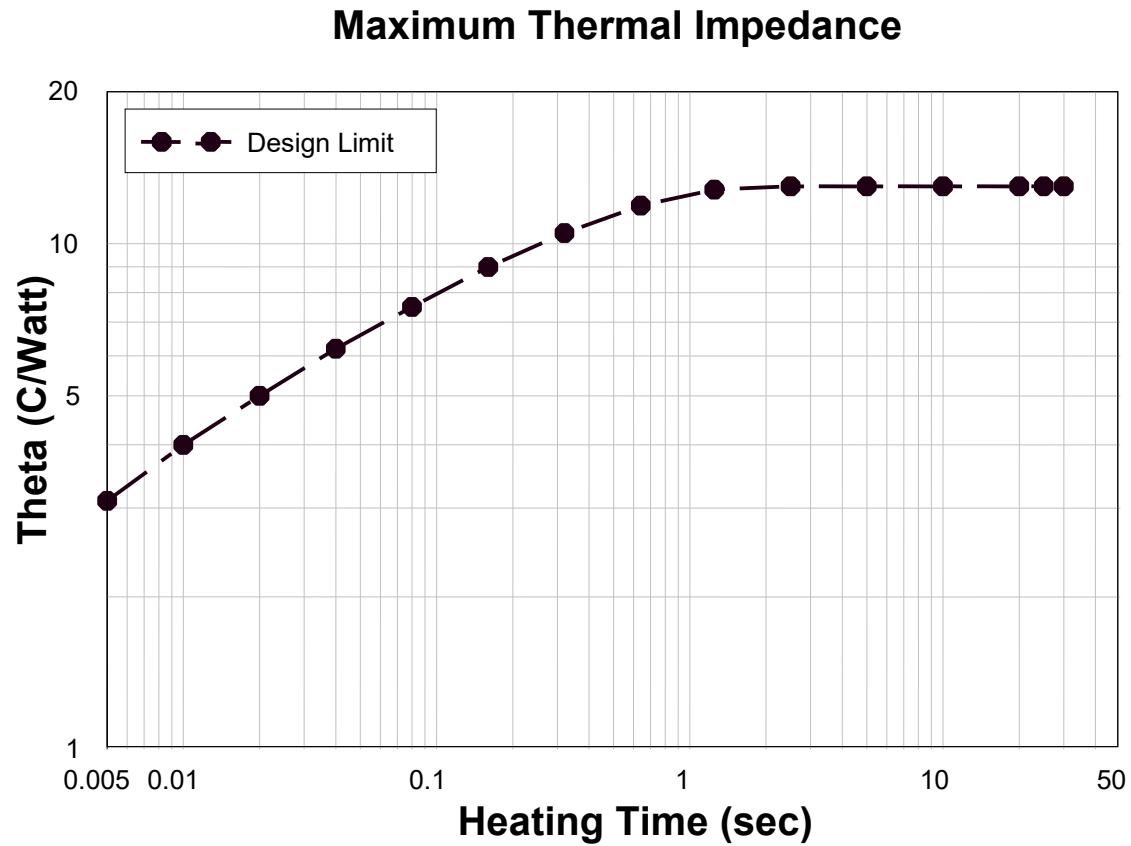
- 1/ The delta measurements taken during group B inspections for quality level JANS (table E-VIA of MIL-PRF-19500) shall be as follows: In addition to the measurements specified for subgroups 4 and 5, the measurements of steps 1 and 2 of this table shall also be taken.
- 2/ The delta measurements taken 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 steps 1 and 2 of this table shall also be taken.
- 3/ The delta 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 steps 1 and 2 of this table shall also be taken.
- 4/ The delta 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 subgroups 1 and 2, the measurements of steps 1 and 2 of this table shall also be taken.
- 5/ Devices which exceed the table I limits for this test shall not be accepted.



NOTES:

1. $Z_{\theta JX} = 4^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JL} = 36^{\circ}\text{C/W}$.

FIGURE 11. Thermal impedance curve ($R_{\theta JL}$) of axial leaded package for 1N5802, 1N5804, and 1N5806.

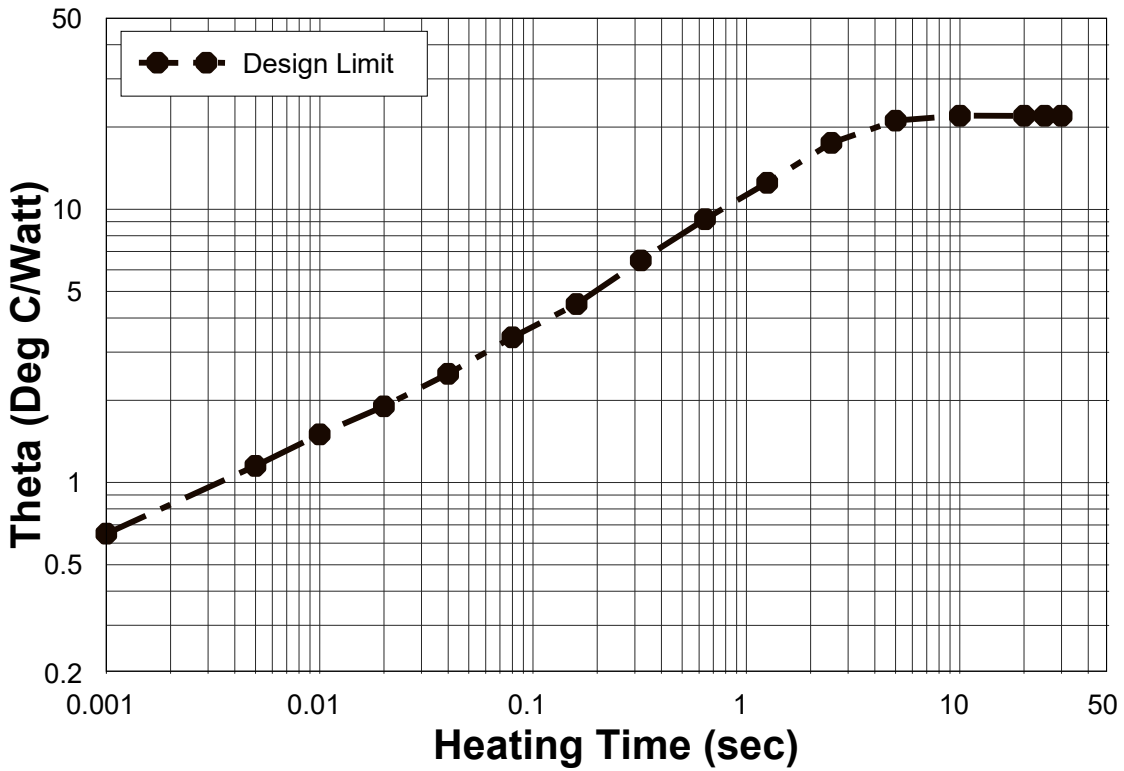


NOTES:

1. $Z_{\theta JX} = 4^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JEC} = 13^{\circ}\text{C/W}$.

FIGURE 12. Thermal impedance curve ($R_{\theta JEC}$) of US package for 1N5802US, 1N5804US, and 1N5806US.

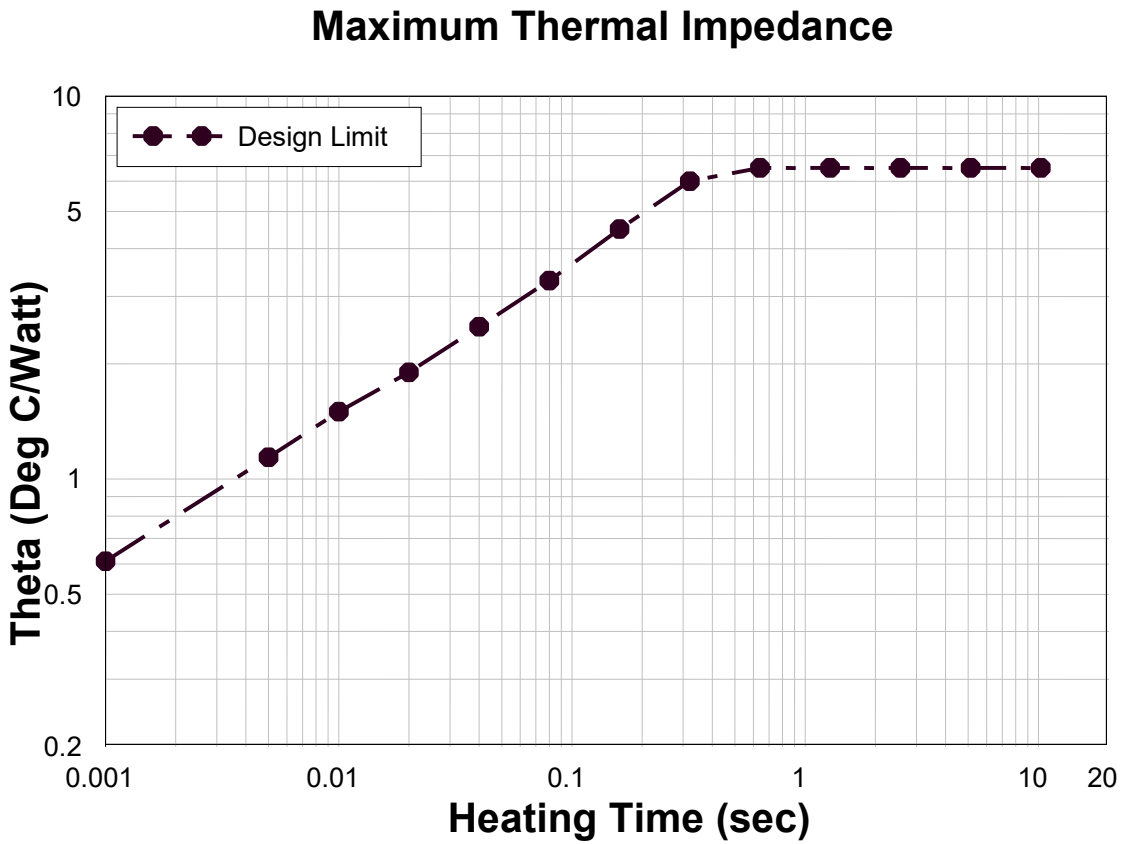
Maximum Thermal Impedance



NOTES:

1. $Z_{\theta JX} = 1.5^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JL} = 22^{\circ}\text{C/W}$.

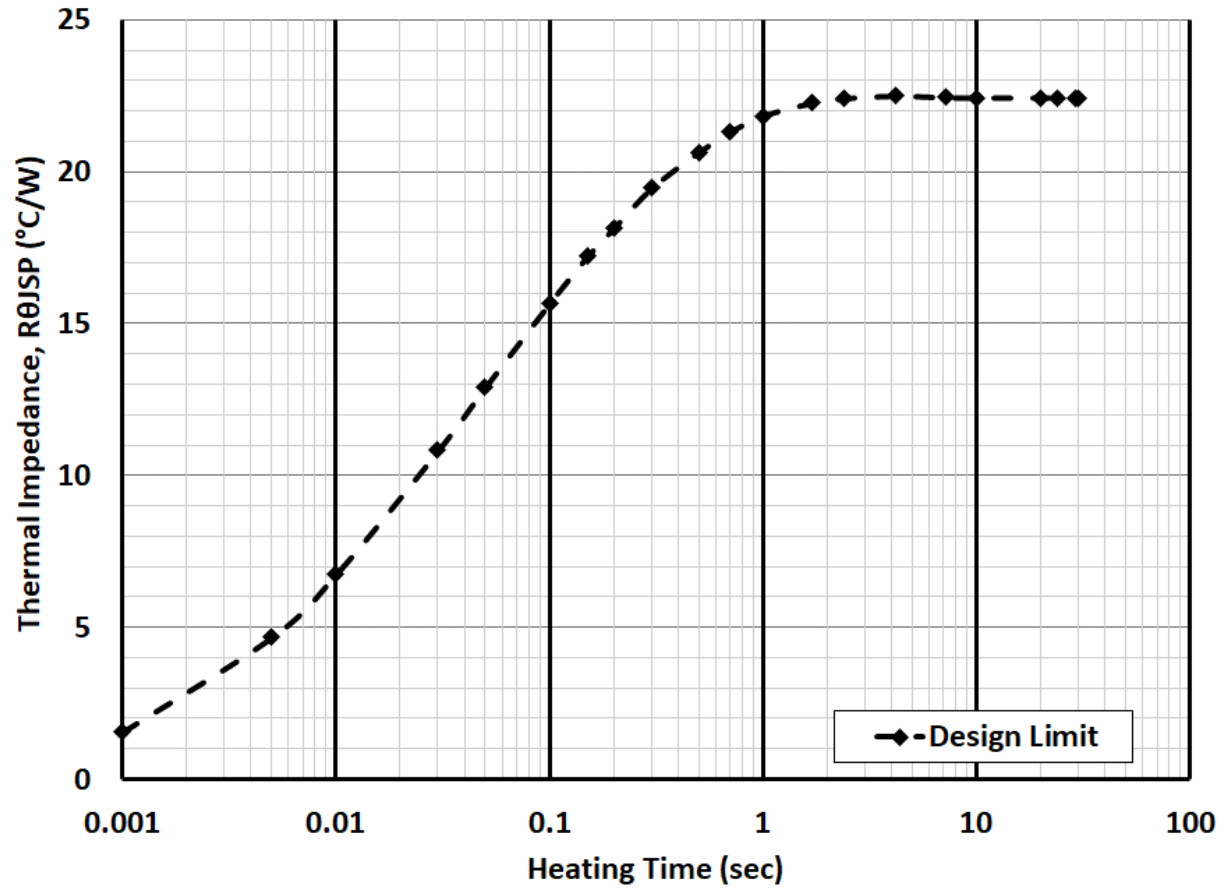
FIGURE 13. Thermal impedance curve ($R_{\theta JL}$) of axial leaded package for 1N5807, 1N5809, and 1N5811.



NOTES:

1. $Z_{\theta JX} = 1.5^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JEC} = 6.5^{\circ}\text{C/W}$.

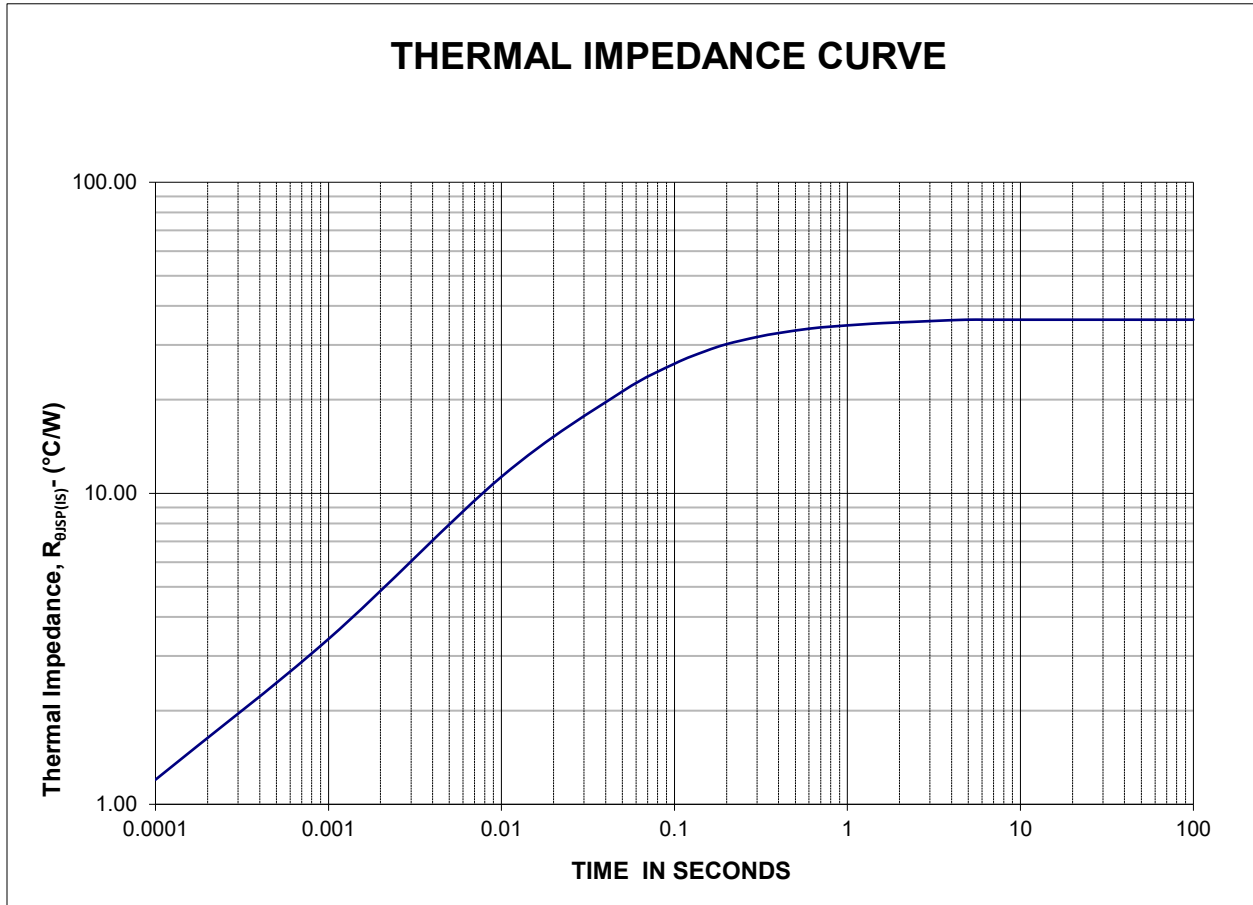
FIGURE 14. Thermal impedance curve ($R_{\theta JEC}$) of US package for 1N5807US, 1N5809US, and 1N5811US.



NOTES:

1. $Z_{\theta JX} = 6.75$ $^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JSP} = 22.4$ $^{\circ}\text{C/W}$.
3. PCB pad size = 1.5 inch x 1.5 inch (38.1 mm x 38.1 mm).
4. Base material type = FR4.
5. Copper weight = 1.0 ounce/ft².

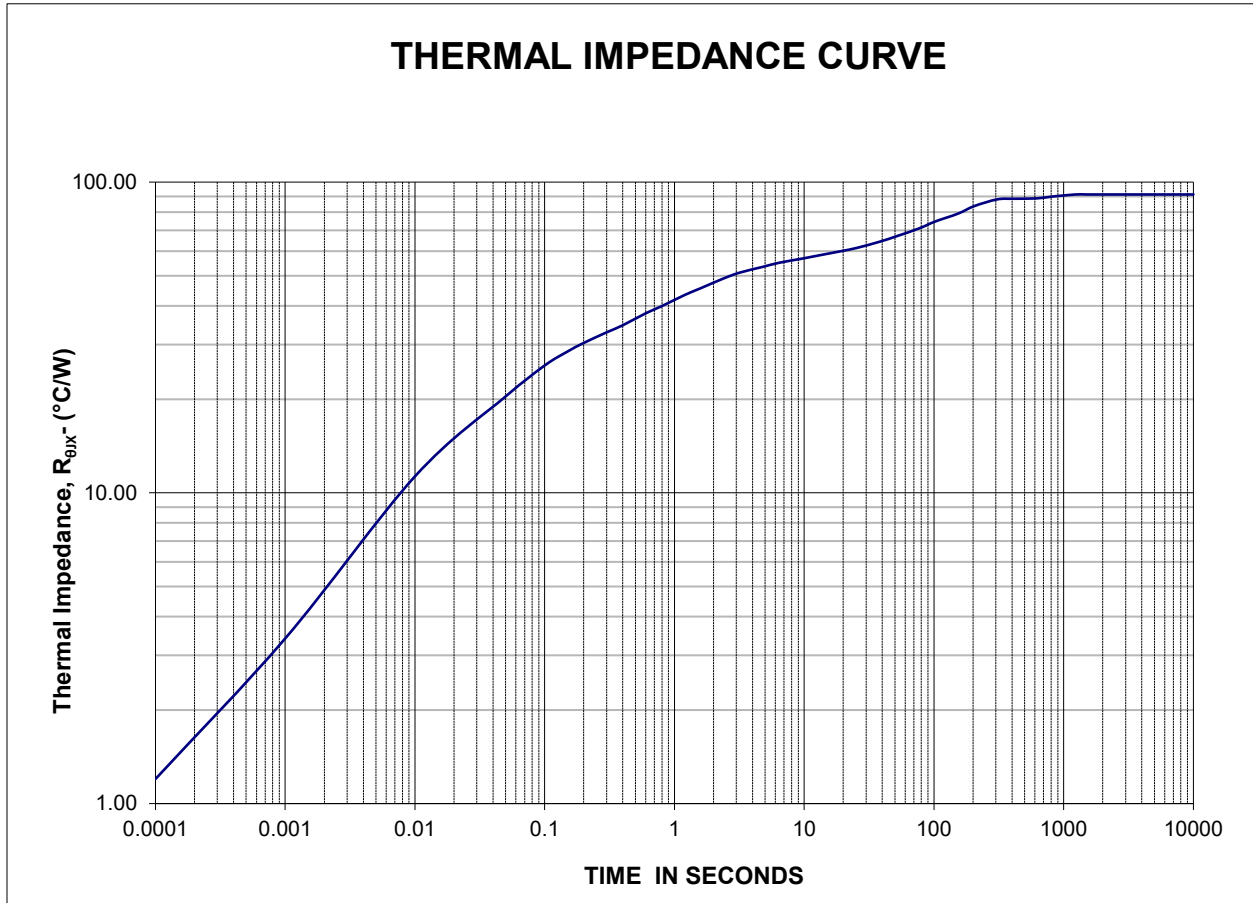
FIGURE 15. Thermal impedance curve ($R_{\theta JSP}$) of UMC package for 1N5802UMC, 1N5804UMC, and 1N5806UMC.



NOTES:

1. $Z_{\theta JX} = 11.3^{\circ}C/W$ at 10 ms.
2. $R_{\theta JSP} = 36.2^{\circ}C/W$.

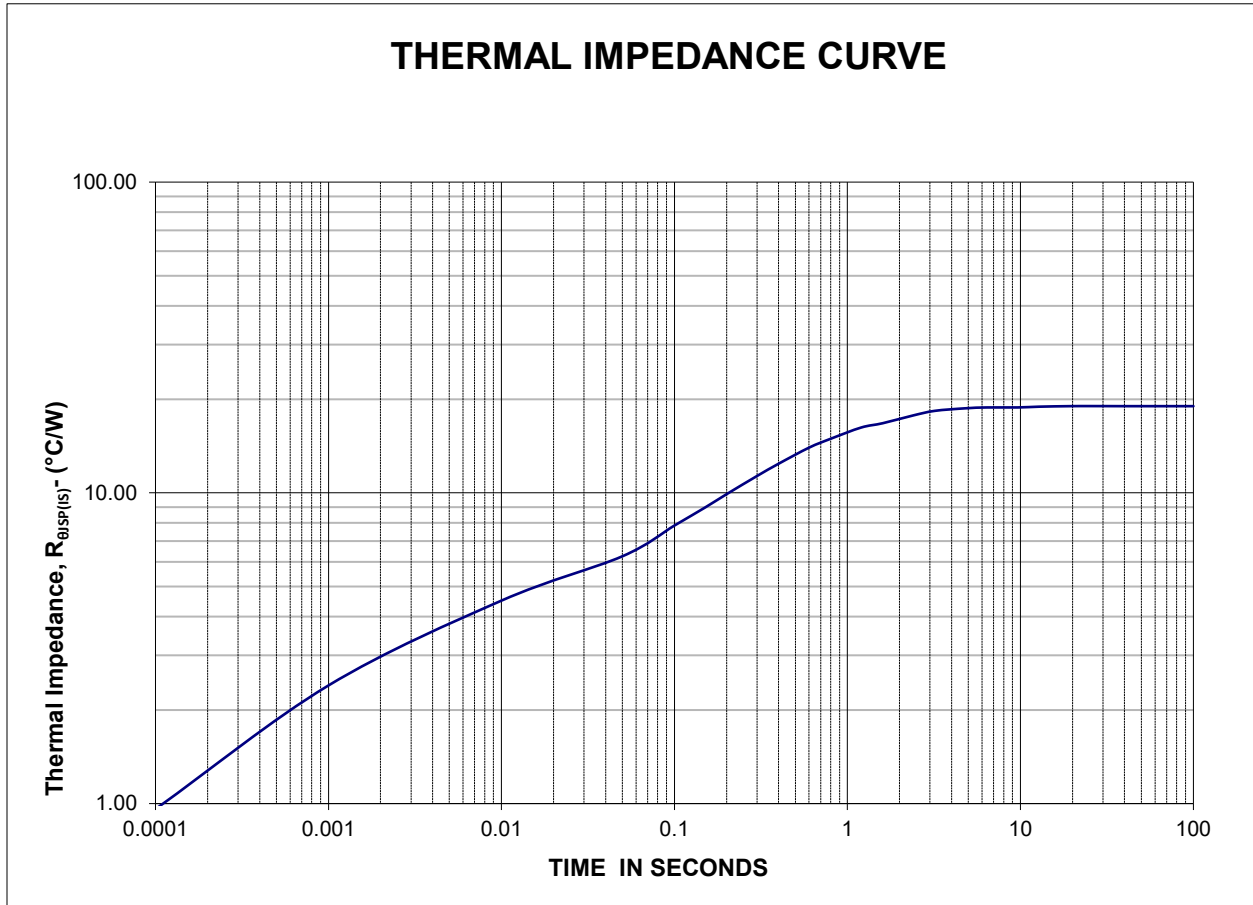
* FIGURE 16. Thermal impedance curve ($R_{\theta JSP}$) of UDA package for 1N5802UDA, 1N5804UDA, and 1N5806UDA.



NOTES:

1. $Z_{\theta JX} = 11.3^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JX} = 91.2^{\circ}\text{C/W}$.

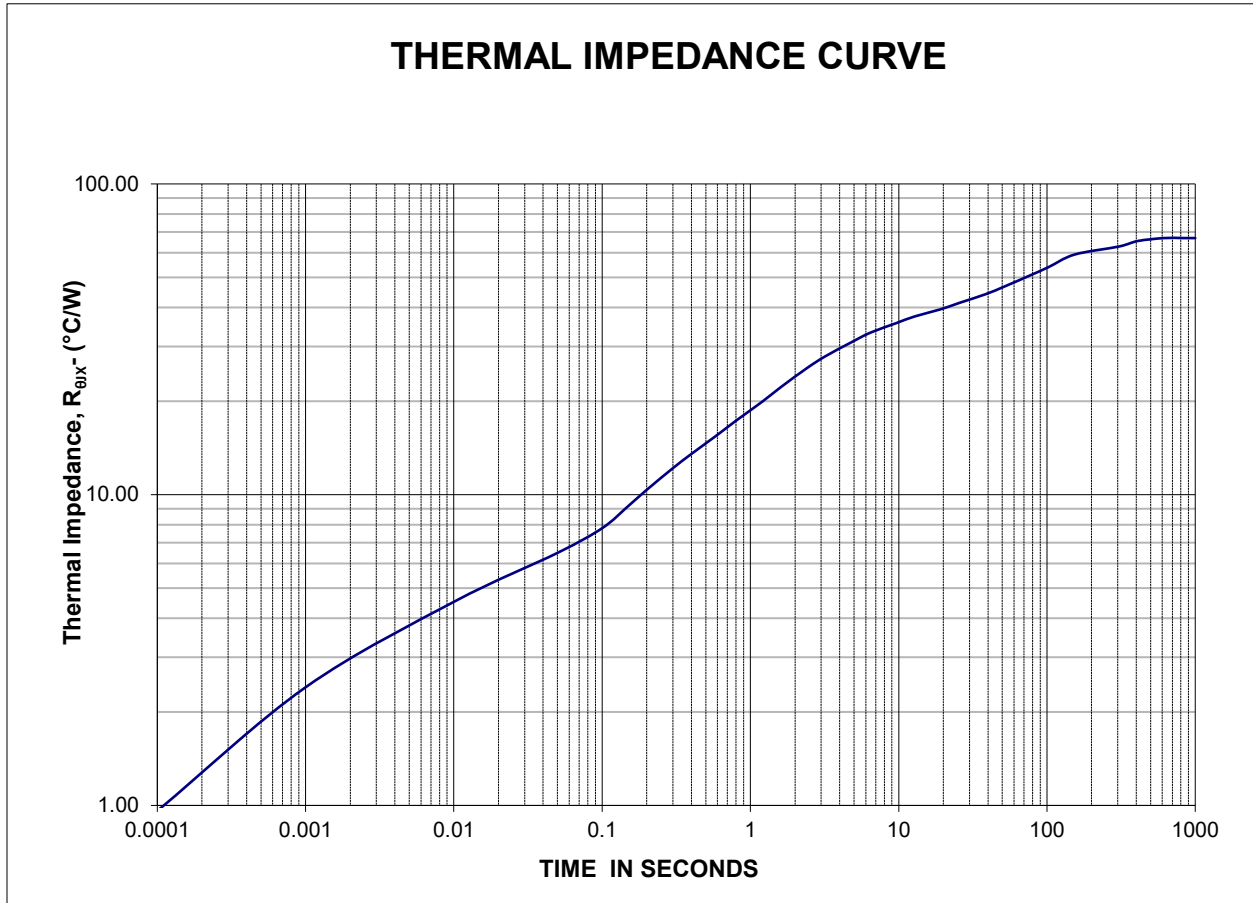
* FIGURE 17. Thermal impedance curve ($R_{\theta JX}$) of UDA package for 1N5802UDA, 1N5804UDA, and 1N5806UDA.



NOTES:

1. $Z_{\theta JX} = 4.5^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JSP} = 19^{\circ}\text{C/W}$.

* FIGURE 18. Thermal impedance curve ($R_{\theta JSP}$) of UDB package for 1N5807UDB, 1N5809UDB, and 1N5811UDB.



NOTES:

1. $Z_{\theta JX} = 4.5^{\circ}\text{C/W}$ at 10 ms.
2. $R_{\theta JX} = 67^{\circ}\text{C/W}$.

* FIGURE 19. Thermal impedance curve ($R_{\theta JX}$) of UDB package for 1N5807UDB, 1N5809UDB, and 1N5806UDB.

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.

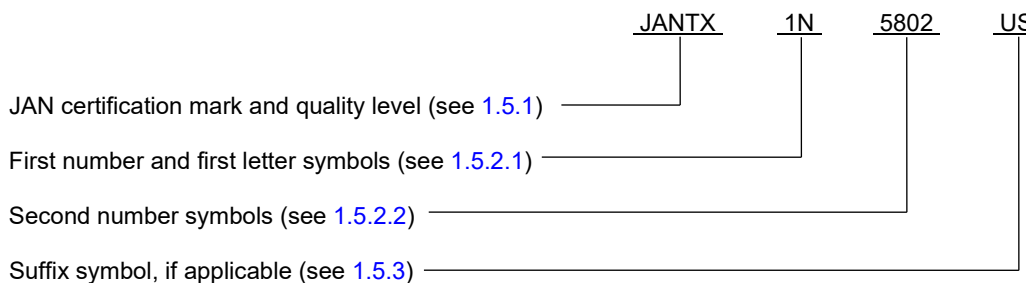
6.2 Acquisition requirements. Acquisition documents should specify the following:

- 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.
- e. For die acquisition, the JANHC or JANKC letter version shall be specified (see figures 5, 6, 7, and 8).

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>.

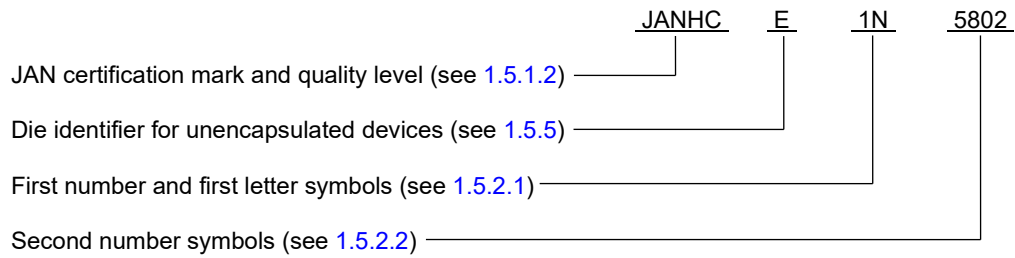
6.4 PIN construction examples.

6.4.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.



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6.4.2 Un-encapsulated devices. The PINs for un-encapsulated devices are constructed using the following form.



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6.5 List of PINs.

* 6.5.1 List of PINs for encapsulated devices. The following is a list of possible PINs for encapsulated devices available on this specification sheet.

PINs for devices of the base quality level	PINs for devices of the "TX" quality level	PINs for devices of the "TXV" quality level	PINs for devices of the "S" quality level
Devices in an axial leaded package			
JAN1N5802	JANTX1N5802	JANTXV1N5802	JANS1N5802
JAN1N5804	JANTX1N5804	JANTXV1N5804	JANS1N5804
JAN1N5806	JANTX1N5806	JANTXV1N5806	JANS1N5806
JAN1N5807	JANTX1N5807	JANTXV1N5807	JANS1N5807
JAN1N5809	JANTX1N5809	JANTXV1N5809	JANS1N5809
JAN1N5811	JANTX1N5811	JANTXV1N5811	JANS1N5811
Devices in a US package			
JAN1N5802US	JANTX1N5802US	JANTXV1N5802US	JANS1N5802US
JAN1N5804US	JANTX1N5804US	JANTXV1N5804US	JANS1N5804US
JAN1N5806US	JANTX1N5806US	JANTXV1N5806US	JANS1N5806US
JAN1N5807US	JANTX1N5807US	JANTXV1N5807US	JANS1N5807US
JAN1N5809US	JANTX1N5809US	JANTXV1N5809US	JANS1N5809US
JAN1N5811US	JANTX1N5811US	JANTXV1N5811US	JANS1N5811US
Devices in a URS package			
JAN1N5802URS	JANTX1N5802URS	JANTXV1N5802URS	JANS1N5802URS
JAN1N5804URS	JANTX1N5804URS	JANTXV1N5804URS	JANS1N5804URS
JAN1N5806URS	JANTX1N5806URS	JANTXV1N5806URS	JANS1N5806URS
JAN1N5807URS	JANTX1N5807URS	JANTXV1N5807URS	JANS1N5807URS
JAN1N5809URS	JANTX1N5809URS	JANTXV1N5809URS	JANS1N5809URS
JAN1N5811URS	JANTX1N5811URS	JANTXV1N5811URS	JANS1N5811URS
Devices in a UMC package			
JAN1N5802UMC	JANTX1N5802UMC	JANTXV1N5802UMC	JANS1N5802UMC
JAN1N5804UMC	JANTX1N5804UMC	JANTXV1N5804UMC	JANS1N5804UMC
JAN1N5806UMC	JANTX1N5806UMC	JANTXV1N5806UMC	JANS1N5806UMC
Devices in a UDA package			
JAN1N5802UDA	JANTX1N5802UDA	JANTXV1N5802UDA	JANS1N5802UDA
JAN1N5804UDA	JANTX1N5804UDA	JANTXV1N5804UDA	JANS1N5804UDA
JAN1N5806UDA	JANTX1N5806UDA	JANTXV1N5806UDA	JANS1N5806UDA
Devices in a UDB package			
JAN1N5807UDB	JANTX1N5807UDB	JANTXV1N5807UDB	JANS1N5807UDB
JAN1N5809UDB	JANTX1N5809UDB	JANTXV1N5809UDB	JANS1N5809UDB
JAN1N5811UDB	JANTX1N5811UDB	JANTXV1N5811UDB	JANS1N5811UDB

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6.5.2 List of PINs for un-encapsulated devices. The following is a list of possible PINs available on this specification sheet for unencapsulated die. The qualified JANHC and JANKC suppliers with the applicable letter version (example, JANHCE1N5802) will be identified on the QML.

PIN	Manufacturers		
	43611, 52GC4	13409	34156
1N5802	JANHCE1N5802, JANKCE1N5802	JANHCF1N5802, JANKCF1N5802 JANHCH1N5802 JANKCH1N5802	JANHCG1N5802, JANKCG1N5802
1N5804	JANHCE1N5804, JANKCE1N5804	JANHCF1N5804, JANKCF1N5804 JANHCH1N5804 JANKCH1N5804	JANHCG1N5804, JANKCG1N5804
1N5806	JANHCE1N5806, JANKCE1N5806	JANHCF1N5806, JANKCF1N5806 JANHCH1N5806 JANKCH1N5806	JANHCG1N5806, JANKCG1N5806
1N5807	JANHCE1N5807, JANKCE1N5807	JANHCF1N5807, JANKCF1N5807 JANHCH1N5807 JANKCH1N5807	
1N5809	JANHCE1N5809, JANKCE1N5809	JANHCF1N5809, JANKCF1N5809 JANHCH1N5809 JANKCH1N5809	
1N5811	JANHCE1N5811, JANKCE1N5811	JANHCF1N5811, JANKCF1N5811 JANHCH1N5811 JANKCH1N5811	

6.6 Applications data.

6.6.1 Half-sine-wave application with 1N5807, 1N5809, and 1N5811 (axial leaded and US). For a printed board mounting example with FR4 base material where the full 3 amp I_O rating (half-sine-wave) is used at a T_J of 175°C and ambient temperature of 55°C, the following steps guide the user in what the printed board copper mounting pad size will need to be with 1 ounce, 2 ounce, and 3 ounce copper for 1N5807(US), 1N5809(US), and 1N5811(US). For axial leaded, the lead length for mounting will be .187 inch (4.76 mm) or less from body to entry point on PCB surface. See 6.6.3 for the smaller example devices 1N5802 to 1N5806 or 1N5802US to 1N5806US.

- a. Use the I_O versus P_O curve on [figure 20](#) to look up 3 amps (X-axis) and follow up to the $T_J=175^\circ\text{C}$ curve (lower) for 2.30 watts.
- b. Calculate maximum thermal resistance needed $(175^\circ\text{C} - 55^\circ\text{C}) / 2.30 \text{ W} = 52^\circ\text{C/W}$.
- c. Look up thermal resistance of 52 °C/W on Y-axis using a thermal resistance versus copper mounting pad area plot on one of the three curves on [figure 21](#) for different weights of copper foil and then intersect curve horizontally to get the answer. These curves assume still air and horizontal printed board position.
- d. In this example, the copper mounting pad sizes for the different copper foil weights would be as follows:
 - 1) .50 in² (322.6 mm²) for 1 ounce copper foil.
 - 2) .30 in² (193.5 mm²) for 2 ounce copper foil.
 - 3) .20 in² (129.0 mm²) for 3 ounce copper foil.
- e. Add a conservative guard-band to the copper mounting pad size (larger) to keep T_J below 175°C.

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6.6.2 Square-wave application with 1N5807, 1N5809, and 1N5811 (axial leaded and US package). For a printed board mounting example with FR4 base material to support a 1 amp I_O square wave switching at a 0.50 duty factor (50 percent duty cycle) at $T_J=125^\circ\text{C}$ and ambient temperature of 55°C , the following steps guide the user in what the printed board copper mounting pad size will need to be with 1 ounce, 2 ounce, and 3 ounce copper.

- a. Find size of copper mounting pads on standard FR4 base material to support operation at 1 amp I_O square wave switching at a 0.50 duty factor (50 percent duty cycle) at $T_J = 125^\circ\text{C}$ with $T_A = 55^\circ\text{C}$.
- b. Calculate peak $I_F = 1 \text{ A} / 0.50 \text{ duty factor} = 2 \text{ amps}$.
- c. Use the V_F versus I_F curve on [figure 22](#) to look up $I_F = 2 \text{ A}$ (Y-axis) and follow across to the $T_J = 125^\circ\text{C}$ curve (middle) for $V_F = 0.65 \text{ V}$.
- d. Calculate power = $I_F * V_F * \text{duty factor} = 2 * 0.65 * 0.50 = 0.65 \text{ W}$.
- e. Calculate maximum thermal resistance needed $(125^\circ\text{C} - 55^\circ\text{C}) / 0.65 \text{ W} = 107^\circ\text{C/W}$.
- f. Look up thermal resistance of 107°C/W on the Y-axis using a thermal resistance versus copper mounting pad area plot on one of the three curves on [figure 16](#) for different weights of copper foil cladding and then intersect curve horizontally to get the answer. Curves assume still air and horizontal printed board position.
- g. In this example, the copper mounting pad sizes for the different copper foil weights would be as follows:
 - 1) $.058 \text{ in}^2$ (37.42 mm^2) for 1 ounce copper foil.
 - 2) $.038 \text{ in}^2$ (24.52 mm^2) for 2 ounce copper foil.
 - 3) $.024 \text{ in}^2$ (15.48 mm^2) for 3 ounce copper foil.
- h. A conservative pad guard-band is optional since T_J is only 125°C .

NOTE: Multilayer printed boards or forced air cooling will improve performance. Closed confinement of the printed boards or will do the opposite. Use sound thermal management.

6.6.3 Half-sine-wave application with 1N5802, 1N5804, 1N5806 (axial leaded and US package). For a PCB mounting example with FR4 base material where the full 1 amp I_O rating (half-sine-wave) is used at a T_J of 175°C and ambient temperature of 55°C , the following steps guide the user in what the PCB copper mounting pad size will need to be with 1 ounce, 2 ounce, and 3 ounce copper for a 1N5802US, 1N5804US, and 1N5806US. For axial-leaded, the lead length for mounting will be $.187 \text{ inch}$ (4.76 mm) or less from body to entry point on PCB surface.

- a. Use the I_O versus P_O curve on [figure 23](#) to look up 1 amp (X-axis) and follow up to the $T_J = 175^\circ\text{C}$ curve (lower) for 0.78 watts.
- b. Calculate maximum thermal resistance needed $(175^\circ\text{C} - 55^\circ\text{C}) / 0.78 \text{ W} = 154^\circ\text{C/W}$.
- c. Locate the thermal resistance of 154°C/W on Y-axis using a thermal resistance versus copper mounting pad area plot on one of the three curves on [figure 24](#) for different weights of copper foil and then intersect curve horizontally to get the answer. These curves assume still air and horizontal printed board position.
- d. In this example, the copper mounting pad sizes for the different copper foil weights would be as follows:
 - 1) $.013 \text{ in}^2$ (8.39 mm^2) for 1 ounce copper foil.
 - 2) $.0080 \text{ in}^2$ (5.161 mm^2) for 2 ounce copper foil.
 - 3) $.0053 \text{ in}^2$ (3.42 mm^2) for 3 ounce copper foil.
- e. Add a conservative guard-band to the copper mounting pad size (larger) to keep T_J below 175°C .

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6.6.4 Square-wave application with 1N5802US, 1N5804US, 1N5806US. For a PCB mounting example with FR4 base material to support a 0.5 amp I_O square wave switching at a 0.50 duty factor (50 percent duty cycle) at $T_J=125^\circ\text{C}$ and ambient temperature of 55°C , the following steps guide the user in what the PCB copper mounting pad size will need to be with 1 ounce, 2 ounce, and 3 ounce copper.

- a. Find size of copper mounting pads on standard FR4 base material to support operation at 0.5 Amp I_O square wave switching at a 0.50 duty factor (50 percent duty cycle) at $T_J = 125^\circ\text{C}$ with $T_A = 55^\circ\text{C}$.
- b. Calculate peak $I_F = 0.5\text{A} / 0.50 \text{ duty factor} = 1 \text{ amp}$.
- c. Use the V_F versus I_F curve on [figure 25](#) to look up $I_F = 1 \text{ A}$ (Y-axis) and follow across to the $T_J = 125^\circ\text{C}$ curve (middle) for $V_F = 0.70 \text{ V}$.
- d. Calculate power = $I_F * V_F * \text{duty factor} = 2 * 0.70 * 0.50 = 0.70 \text{ W}$.
- e. Calculate maximum thermal resistance needed $(125^\circ\text{C} - 55^\circ\text{C}) / 0.70 \text{ W} = 100^\circ\text{C/W}$.
- f. Locate the thermal resistance of 100°C/W on the Y-axis using a thermal resistance versus copper mounting pad area plot on one of the three curves on [figure 24](#) for different weights of copper foil cladding and then intersect curve horizontally to get the answer. Curves assume still air and, horizontal printed board position.
- g. In this example, the. copper mounting pad sizes for the different copper foil weights would be as follows:
 - 1) .084 in² (54.19 mm²) for 1 ounce copper foil.
 - 2) .051 in² (32.90 mm²) for 2 ounce copper foil.
 - 3) .034 in² (21.94 mm²) for 3 ounce copper foil.
- h. A conservative pad guard-band is optional since T_J is only 125°C .

NOTE: Multilayer PCBs or, forced air cooling will improve performance. Closed confinement of the printed boards or will do the opposite. Use sound thermal management.

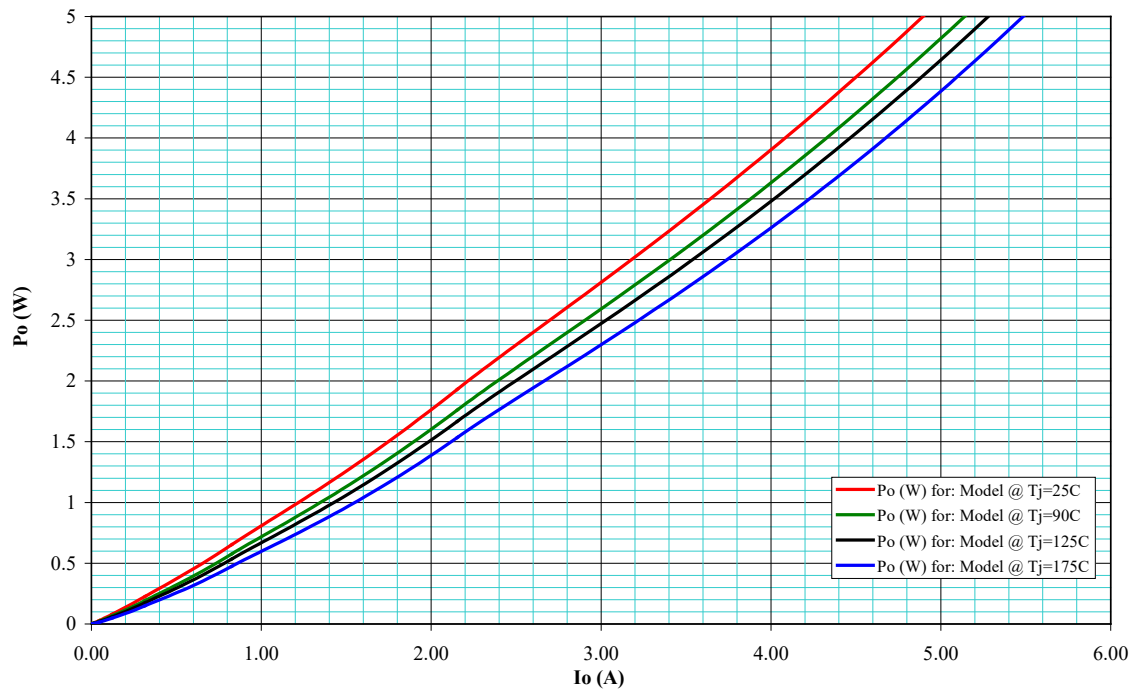
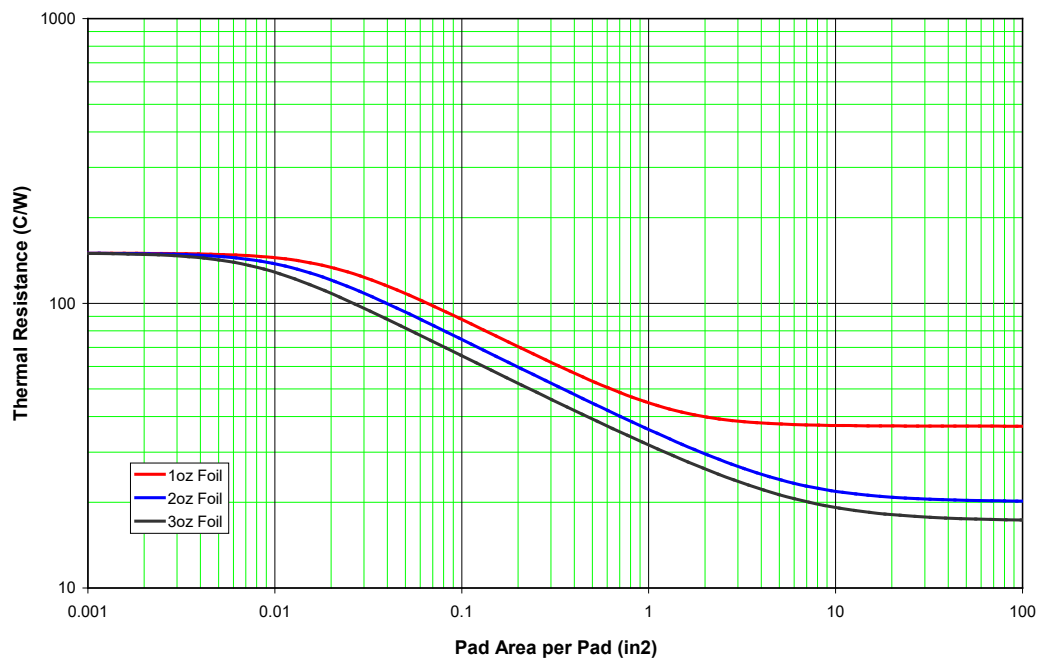


FIGURE 20. Rectifier power P_O versus I_O (average forward current) for 1N5807US, 1N5809US, and 1N5811US.



NOTES:

1. Base material type is FR4.
2. Copper foil weights are 1, 2, and 3 ounce per ft².
3. PCB mounting is horizontal in still air.

FIGURE 21. Thermal resistance versus pad area (for each pad) for 1N5807US, 1N5809US, and 1N5811US.

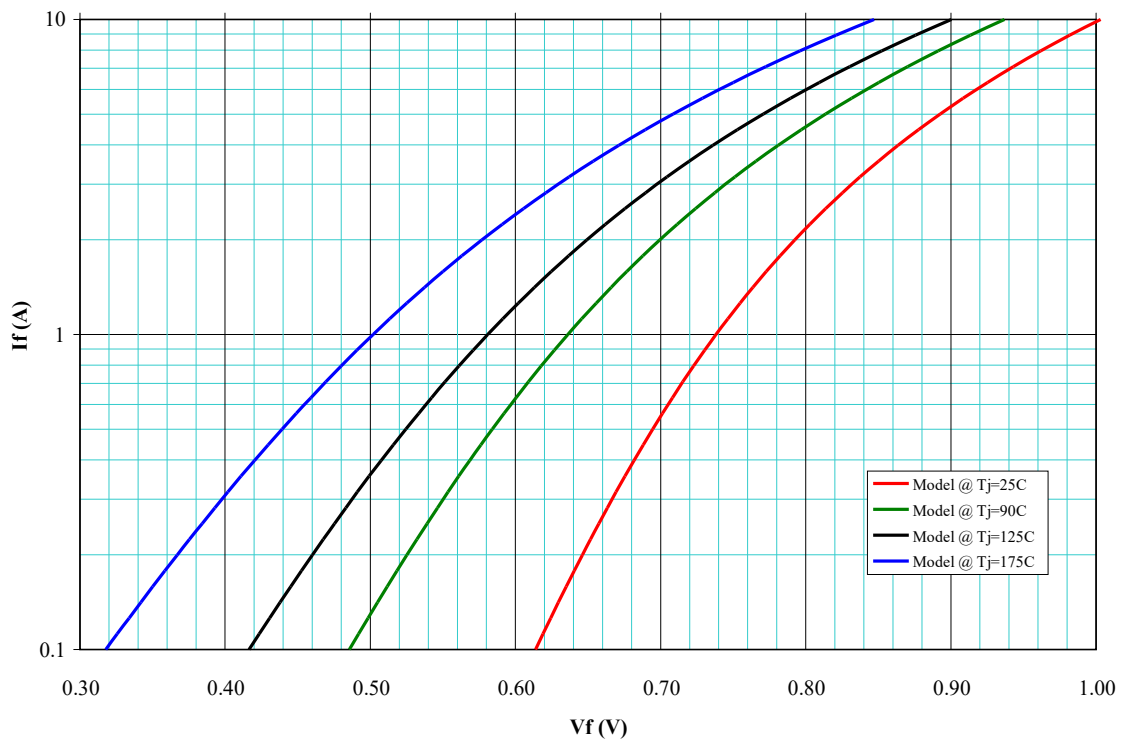


FIGURE 22. Forward voltage versus forward current for 1N5807US, 1N5809US, and 1N5811US.

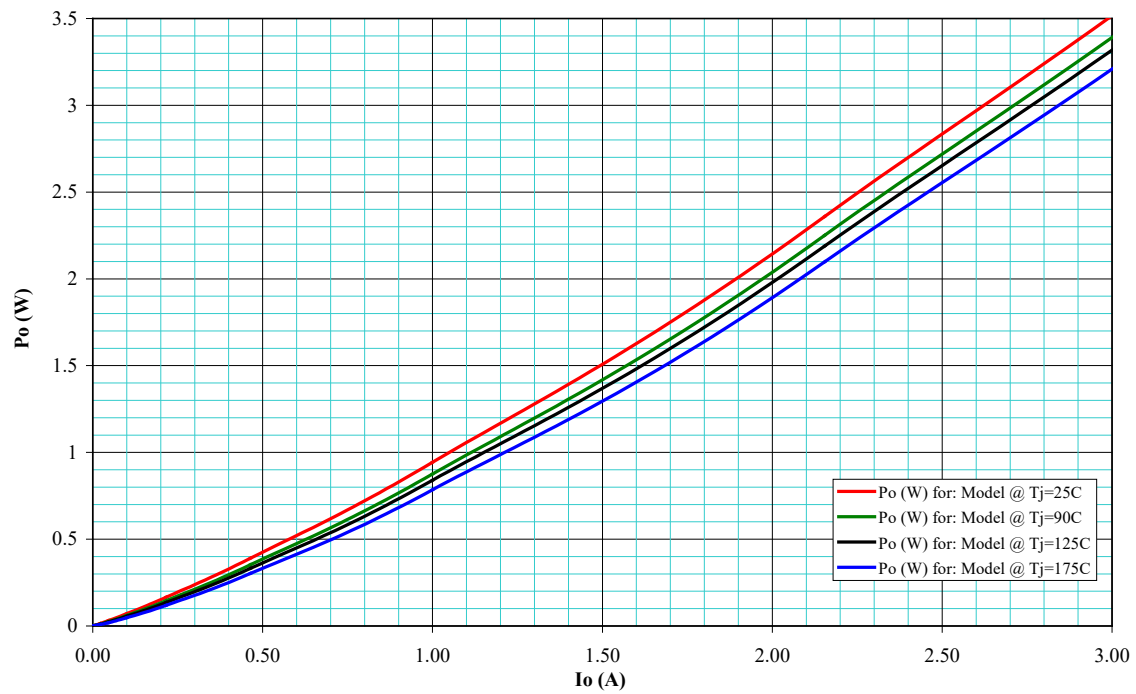
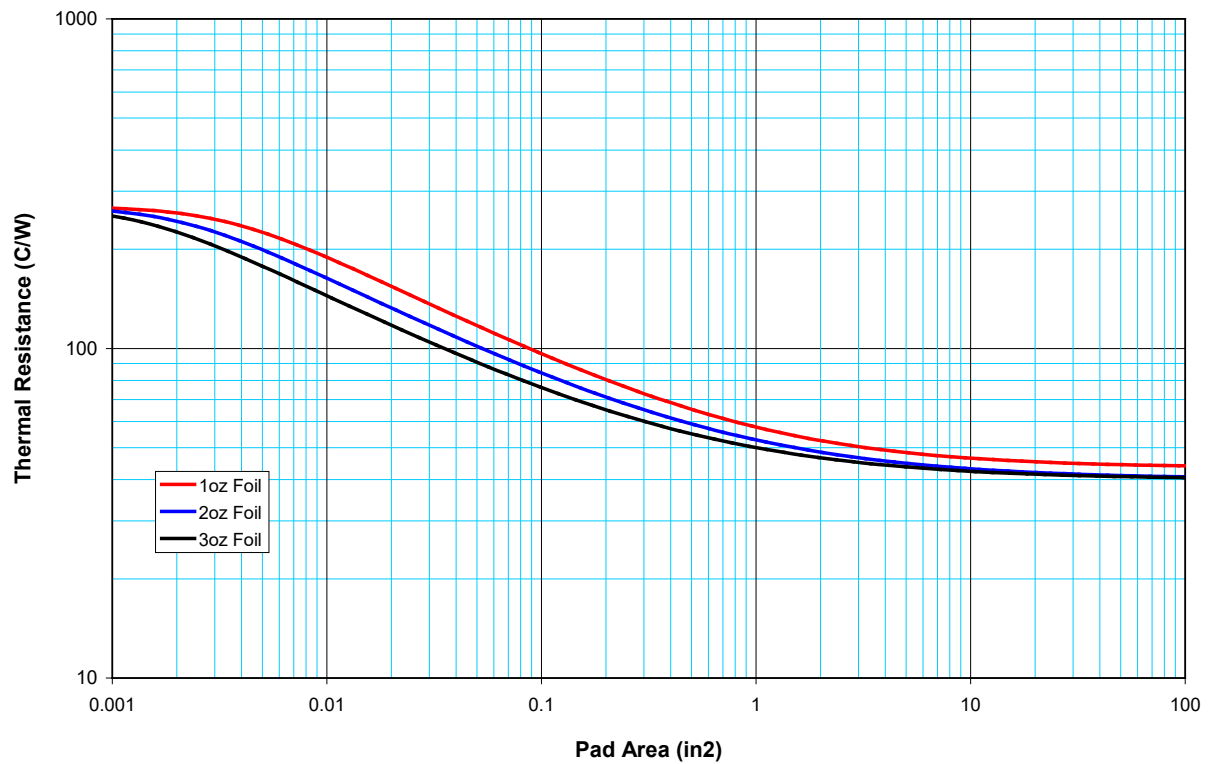


FIGURE 23. Rectifier power P_O versus I_O (average forward current) for 1N5802US, 1N5804US, and 1N5806US.



NOTES:

1. Base material type is FR4.
2. Copper foil weights are 1, 2, and 3 ounce.
3. PCB mounting is horizontal in still air.

FIGURE 24. Thermal resistance versus pad area (for each pad) for 1N5802US, 1N5804US, and 1N5806US.

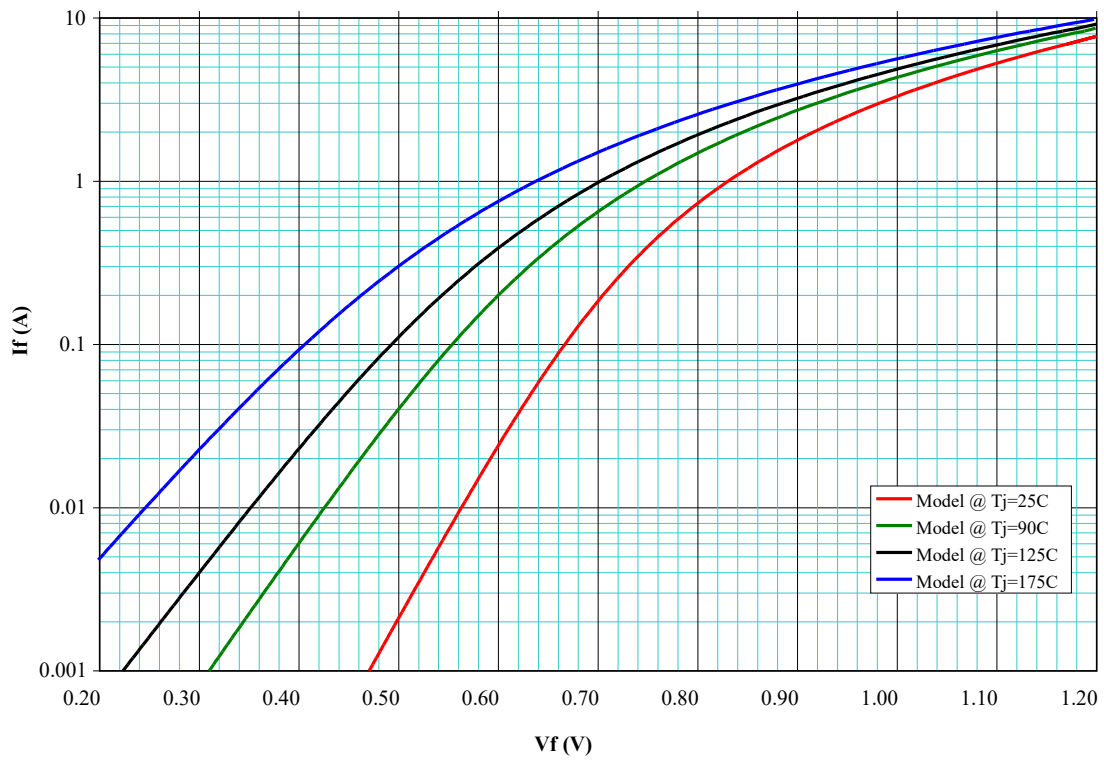


FIGURE 25. Forward voltage versus forward current for 1N5802US, 1N5804US, and 1N5806US.

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* 6.7 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at Semiconductor@dla.mil.

6.7 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 5961-2025-026)

Review activities:
Army – AR, AV, MI, SM
Navy – AS, MC
Air Force – 19, 71

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.dla.mil>.