The documentation and process conversion measures necessary to comply with this revision shall be completed by 16 August 2019.

INCH-POUND

MIL-PRF-19500/304F
17 April 2019
SUPERSEDING
MIL-PRF-19500/304E
20 September 2011

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER, FAST RECOVERY, TYPES 1N3885, 1N3886, 1N3888, 1N3890, 1N3891, 1N3893, 1N3890R, 1N3891R, 1N3893R, AND A-VERSIONS, 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 12 and 20 ampere, silicon, fast recovery, power rectifier diodes. Four levels of product assurance (JAN, JANTX, JANTXV, and JANS) are provided for each encapsulated device type as specified in MIL-PRF-19500, and two levels of product assurance (JANHC and JANKC) for each unencapsulated device type.

Datasheet.Live

1.2 Physical dimensions. The device package outlines are as follows: Isolated 2 terminal stud mount (DO-10) in accordance with figure 1, non-isolated 1 terminal stud mount (DO-4) in accordance with figure 2, and unencapsulated die in accordance with figure 3.

1.3 Maximum ratings. Unless otherwise specified, T_C = 25°C.

Type	V_R	V_{RWM}	I_O (1) T_C = 100°C	I_{FSM} T_C = 100°C t = 1/120 s	t_{rr}	T_C
	V	V (pk)	A dc	A (pk)	ns	°C
1N3885	100	100	12	150	200	-65 to +150
1N3885A	100	100	20	225	150	-65 to +150
1N3890, R	100	100	12	175	200	-65 to +150
1N3890A, AR	100	100	20	250	150	-65 to +150
1N3886	200	200	12	150	200	-65 to +150
1N3886A	200	200	20	225	150	-65 to +150
1N3891, R	200	200	12	175	200	-65 to +150
1N3891A, AR	200	200	20	250	150	-65 to +150
1N3888	400	400	12	150	200	-65 to +150
1N3888A	400	400	20	225	150	-65 to +150
1N3893, R	400	400	12	175	200	-65 to +150
1N3893A, AR	400	400	20	250	150	-65 to +150

(1) Derate linearly 2 percent of I_O /°C for T_C > 100°C, see figure 4.
Storage temperature: T_C = -65°C to +150°C for 1N3885, 1N3886, 1N3888 and A versions.
Storage temperature: T_C = -65°C to +175°C for 1N3890, 1N3891, 1N3893 and A, R, AR versions.
Barometric pressure reduced: 15 mmHg.

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.

AMSC N/A

FSC 5961

1.4 Primary electrical characteristics. Unless otherwise specified, T_C = 25°C.

Type	I_{R1}		I_{R2} T_A = +150°C	
	V_R (V dc)	µA dc	V_R (V dc)	mA dc
1N3885, A, 1N3890, A, 1N3890R, AR	100	10.0	100	2
1N3886, A, 1N3891, A, 1N3891R, AR	200	10.0	200	2
1N3888, A, 1N3893, A, 1N3893R, AR	400	10.0	400	2

Type	$R_{\theta JC}$ (°C/W)
Isolated non - A	3.0
Isolated A	2.5
Non isolated non - A	2.0
Non isolated A	1.5 (1)

(1) See figure 5 for thermal impedance curves.

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, 6.5 for a list of available PINs, and 6.6 for supersession information.

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 that are applicable for this specification sheet are "JANHC" and "JANKC".

1.5.2 Device type. The designation system for the devices covered by this specification sheet is as follows.

1.5.2.1 First number and first letter symbols. The devices 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 devices covered by this specification sheet are as follows: "3885", "3886", "3888", "3890", "3891" and "3893".

1.5.3 Suffix symbols. The following suffix symbol(s) are incorporated into the PINs for this specification sheet.

	A blank designator identifies that the device uses the electrical parameters of the registered device.
A	An "A" designator identifies that the device has modified electrical parameters in comparison to the registered device.
R	A "R" designator identifies that the device terminals have been reversed (reverse polarity).
AR	An "AR" designators identifies that the device has both suffix symbol attributes (modified electrical parameters and reverse polarity terminals).

1.5.3.1 Device types with no suffix symbols. Applicable to all device types.

1.5.3.2 Device types with an "A" suffix symbol. Applicable to all device types.

1.5.3.3 Device types with either a "R" or "AR" suffix symbols. Device types 1N3890, 1N3891, 1N3893 only.

1.5.5 Lead finish. The lead finishes applicable to this specification sheet are listed on QPDSIS-19500.

1.5.6 Die identifiers for un-encapsulated devices. The only manufacturer die identifier that is applicable for this specification sheet is "A" (see 6.5 and figure 3).

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 documents cited in section 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.

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 specification and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in MIL-PRF-19500 and as modified herein.

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

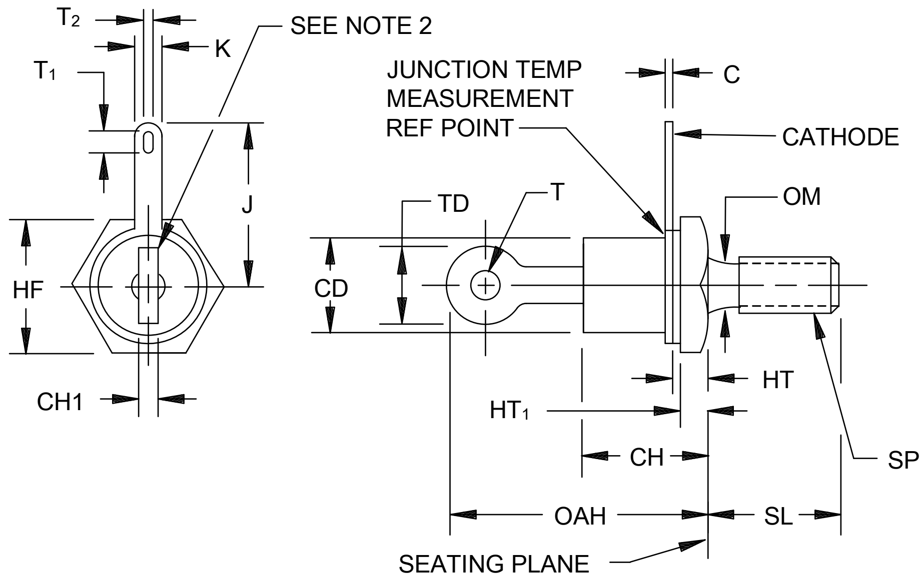
3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

P_{RM} Peak reverse power

3.4 Interface requirements and physical dimensions. The Interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1 and 2 for encapsulated devices, and figure 3 for unencapsulated die.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500. Where a choice of lead finish is desired, it shall be specified in the contract or purchase order (see 6.2).

3.4.2 Diode types 1N3885, 1N3886, and 1N3888 (see figure 1). Diode types1N3885, 1N3886, and 1N3888 have the stud and seating plane electrically insulated from the anode, cathode, and case.



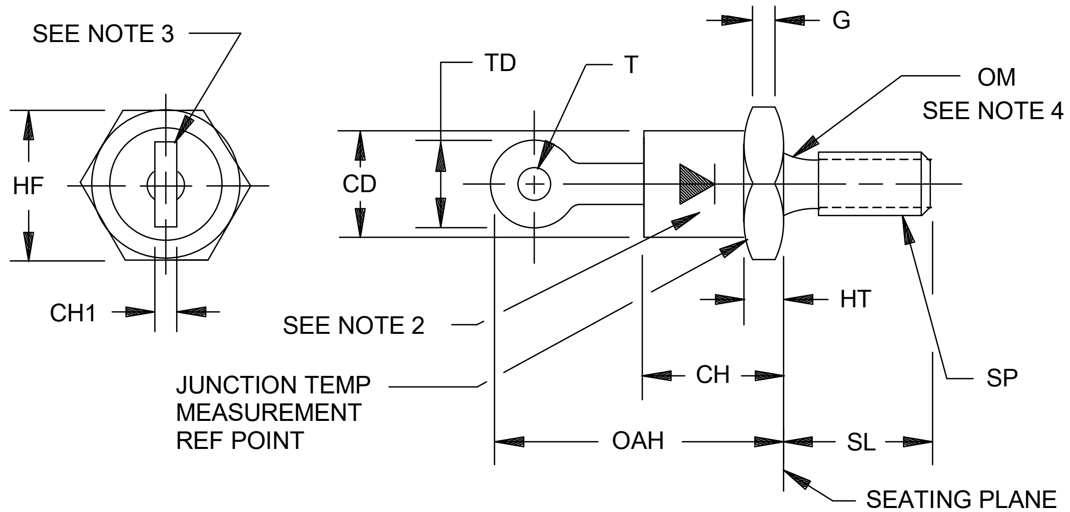
Isolated types: 1N3885, 1N3885A, 1N3886, 1N3886A, 1N3888, and 1N3888A

LTR	Dimensions				Notes	LTR	Dimensions				Notes
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
C	.020	.038	0.51	0.97		OAH		.950		24.13	
CD		.487		12.37		OM	.163	.189	4.14	4.80	3
CH		.550		13.97		SL	.422	.453	10.72	11.50	
CH_1		.050		1.27		SP					4, 5, 6, 7
HF	.487	.500	12.37	12.70		T	.060		1.52		
HT	.085	.160	2.16	4.06		T_1	.110	.140	2.79	3.56	
HT_1	.040		1.02			T_2	.055	.075	1.40	1.90	
J	.750	.875	19.05	22.22		TD		.250		6.35	
K	.110	.140	2.79	3.56	2						

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Angular orientation of this terminal is undefined. Square or radius on end of terminals is optional.
3. Diameter variations within these limits are permitted.
4. The ASME thread reference is 10-32 UNF-2A.
5. Max pitch diameter of plated threads shall be basic pitch diameter .169 inch (4.29 mm).
6. Units shall not be damaged by torque of 15 inch-pounds (1.7 N-m) applied to 10-32 UNF-2B nut assembled on thread.
7. Complete threads to extend to within .078 inch (1.98 mm) of the seating plane.
8. Stud and seating plane shall be electrically insulated from the case, cathode, and anode.
9. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions of DO-10 package.



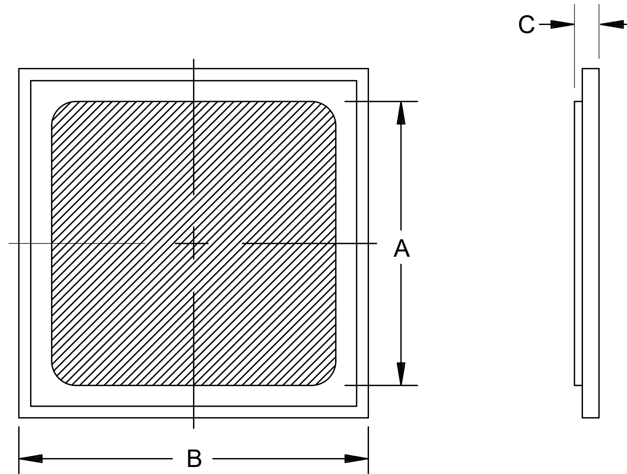
Non-isolated types: 1N3890, 1N3890A, 1N3891, 1N3891A, 1N3893, 1N3893A, 1N3890R, 1N3890AR, 1N3891R, 1N3891AR, 1N3893R, and 1N3893AR

LTR	Dimensions				Notes	LTR	Dimensions				Notes
	Inches		Millimeters				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
CD		.424		10.77		OAH		.800		20.32	
CH		.405		10.29		OM	.163	.189	4.14	4.80	
CH_1	.020	.065	0.51	1.65	5	SL	.422	.453	10.72	11.50	
G	.060		1.52			SP					6, 7, 8, 9
HF	.424	.437	10.77	11.10		T	.060		1.52		
HT	.075	.175	1.90	4.44		TD		.250		6.35	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Forward polarity (cathode to stud) marking is shown.
3. Angular orientation of this terminal is undefined. Square or radius on end of terminals is optional.
4. Diameter variations within these limits are permitted.
5. Terminal-end shape is unrestricted.
6. The ASME thread reference is 10-32 UNF-2A.
7. Max pitch diameter of plated threads shall be basic pitch diameter .169 inch (4.29 mm).
8. Units shall not be damaged by torque of 15 inch-pounds (1.7 N-m) applied to 10-32 UNF-2B nut assembled on thread.
9. Complete threads to extend to within 0.078 inch (1.98 mm) of the seating plane.
10. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimensions of DO-4 package.



A version

LTR	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.114	.117	2.89	2.97
B	.130	.133	3.30	3.37
C	.009	.010	.228	.254

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2 The physical characteristics of the die are as follows:
   Metallization:
   Top (anode): Cr/Ni/Ag
   Back (cathode): Cr/Ni/Ag
   Ag thickness = 3,000 Å minimum,
   Ni thickness = 1,500 Å minimum,
   Cr thickness = 800 Å minimum.

FIGURE 3. Physical dimensions of enencapsulated die, A version (JANHCA and JANKCA).

3.4.3 Diode types 1N3890, 1N3891, and 1N3893 (see figure 2). Diode types1N3890, 1N3891, and 1N3893 (forward polarity) have the cathode electrically connected to the stud and case.

3.4.4 Diode types 1N3890R, 1N3891R, and 1N3893R (see figure 2). Diode types1N3890R, 1N3891R, and 1N3893R (reverse polarity) have the anode electrically connected to the stud and case.

3.4.5 Dissimilar construction. Types utilizing construction as shown on figure 1 shall not be considered structurally identical to types utilizing construction as shown in figure 2.

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

3.5.1 Polarity. The polarity shall be indicated by a graphic symbol with the arrow pointing toward the negative end for forward bias. The reversed units shall also be marked with an R following the last digit in the PIN.

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.

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).

d. Element evaluation (see 4.6).

4.1.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-PRF-19500 and herein, except lot accumulation period shall be 3 months in lieu of 6 weeks.

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500, and as specified herein. Tests in either polarity shall be sufficient to obtain qualification approval of both polarities.

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

4.2.2 Qualification for JANHC and JANKC. Qualification for JANHC and JANKC devices shall be in accordance with MIL-PRF-19500.

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

Screen	Measurement	
	JANS level	JANTX and JANTXV levels
3b (1)	Surge current (see 4.3.1)	Surge current (see 4.3.1)
3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9	V_{F2} and I_{R1} (2)	V_{F2} and I_{R1} (2)
10	Method 1038, of MIL-STD-750, test condition A, t = 96 hours	Method 1038, of MIL-STD-750, test condition A, t = 48 hours
11	Subgroup 2 of table I herein, V_{F2} and I_{R1}; ΔV_{F2} = 0.1 V (pk) from initial value; ΔI_{R1} = ±5 µA dc or 100 percent from the initial value, whichever is greater.	Subgroup 2 of table I herein, V_{F2} and I_{R1}; ΔV_{F2} = 0.1 V(pk) from initial value; ΔI_{R1} = ±5 µA dc or 100 percent from the initial value, whichever is greater.
12	Burn-in see 4.3.3 and 4.5.2	Not applicable
13	Subgroup 2 and 3 of table I herein, V_{F2} and I_{R1}; ΔV_{F2} = 0.1 V (pk); ΔI_{R1} = ±5 µA dc or 100 percent from the initial value, whichever is greater	Not applicable

(1) Surge shall precede thermal response. These tests shall be performed anytime after screen 3 and before screen 9.
(2) I_{R1} measurement shall not be indicative of an open condition.

4.3.1 Surge current. The surge current test shall be performed in accordance with condition A of method 4066 of MIL-STD-750. The following details shall apply: I_O = 0; $V_{RM(w)}$ = 0; six surges; T_A = 25°C, tp = 8.3 ms, one surge per minute maximum; I_{FSM} values shall be as listed below:

Surge current value (I_{FSM})		
	A - version	Non A - version
1N3885	290	190
1N3886	290	190
1N3888	290	190
1N3890, R	310	210
1N3891, R	310	210
1N3893, R	310	210

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, t_{MD}, and K factor where appropriate. The limit will be statistically derived. See appendix E, table E-IX, subgroup 4, of MIL-PRF-19500 and table II, subgroup 4 herein.

4.3.3 Burn-in and life test. Power burn-in conditions shall be in accordance with test condition B of method 1038 of MIL-STD-750. The following details shall apply: T_C = 100°C, rated I_O, see 4.5.2.

a. 1N3885, 1N3890, 1N3890R V_R = 100 V (pk)

b. 1N3886, 1N3891, 1N3891R V_R = 200 V (pk)

c. 1N3888, 1N3893, 1N3893R V_R = 400 V (pk)

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 MIL-PRF-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VIA (JANS) and table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and 4.4.2.1 and 4.4.2.2 herein. Delta electrical measurements shall be in accordance with table III herein.

4.4.2.1 Quality level JANS.

Subgroup	Method	Condition
B3	4066	Condition A, T_C = 100°C; V_R = rated V_R (see 1.3), six surges, one surge per minute maximum, tp = 8.3 ms. Non-A version devices, I_{FS} = 150 A; I_O = 12 A dc A version devices, I_{FS} = 225 A; I_O = 20 A dc.
B4	1037	0.25 rated I_O < I_O applied < rated I_O (see 4.5.4) 2,000 cycles.
B5	1027	I_F = 35 A dc at: T_A = 125°C for 96 hours, or adjusted as required by the chosen T_A to give an average lot T_J = 275°C; f = 60 Hz; V_R = rated V_R (pk) (see 1.3). For irradiated devices, include trr as an end-point measurement.
B6	3101	$R_{\theta JC}$ = rated $R_{\theta JC}$ (see 1.4); I_M = 50 mA ≤ I_M ≤ 250 mA; t_H = 30 s minimum; t_{MD} = 50 - 300 µs.
B8	4065	P_{RM} ≥ 636 W for square wave in accordance with test method 4065 of MIL-STD-750 (P_{RM} ≥ 1,000 W for half-sine wave). Test shall be performed on each sublot; 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.

Subgroup	Method	Condition
B2	1051	Insulated types -55°C to + 175°C; uninsulated types -55°C to + 175°C.
B2	4066	Condition A, T_C = 100°C; V_R = rated V_R (see 1.3), six surges, one surge per minute maximum, tp = 8.3 ms. Non-A version devices, I_{FS} = 150 A; I_O = 12 A dc A version devices, I_{FS} = 225 A; I_O = 20 A dc.
B3	1037	0.25 rated I_O < I_O applied < rated I_O (see 4.5.4) 2,000 cycles. For irradiated devices, include t_{rr} as an end-point measurement.
B3	1038 or 1049	Condition A; 340 hrs (separate samples may be used). For irradiated devices, include t_{rr} as an end-point measurement.
B5		Not applicable.
B6	1032	T_A = 150°C.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VII of MIL-PRF-19500 and as follows. Delta electrical measurements shall be in accordance with table III herein.

Subgroup	Method	Condition
C2	1056	Test condition B.
C2	2036	Tension, test condition A, t = 15 s. For 1N3885, A, 1N3886, A, 1N3888, A weight = 5 pounds (2.27 kg). For 1N3890, A, R, AR, 1N3891, A, R, AR, 1N3893, A, R, AR, weight = 20 pounds (9.07 kg).
C2	2036	Bending stress, test condition F, method B: t = 15 s. For 1N3885, A, 1N3886, A, 1N3888, A weight = 1 pounds (0.45 kg). For 1N3890, A, R, AR, 1N3891, A, R, AR, 1N3893, A, R, AR, weight = 5 pounds (2.27 kg).
C2	2036	Seal torque, test condition D1, torque = 10 oz-inches (0.07 N-m), t = 15 s.
C5	3101	$R_{\theta JC}$ = rated $R_{\theta JC}$ (see 1.4); IM = 50 mA ≤ I_M ≤ 250 mA; t_H = 30 s minimum; t_{MD} = 50 to 300 µs.
C6	1037	0.25 rated I_O < I_O applied < rated I_O (see 4.5.4) 6,000 cycles. For irradiated devices, include t_{rr} 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 appendix E, table E-IX of MIL-PRF-19500, and table II herein. Delta electrical measurements shall be in accordance with table III herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and 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 steady-state operation 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 rectifier current. The forward conduction angle of the rectified current shall not be greater than 180°C nor less than 150°C.

4.5.3 Insulation resistance (case-to-stud). The case to stud insulation resistance test shall be conducted in accordance with condition C of method 1016 of MIL-STD-750. The following details shall apply. The case-to-stud insulation resistance shall be determined in terms of current flow between the case and stud. The specified test method shall be utilized except that the applied voltage shall be within ±2.0 percent of the specified value and the current shall be measured by a series microammeter with a voltage drop at 1.0 μA dc of less than 1.0 V dc, and an accuracy of ±2.0 percent at the 1.0 μA dc point.

4.5.4 DC intermittent operation life. The DC intermittent operation life test shall be conducted in accordance with method 1037 of MIL-STD-750. The following details shall apply. A cycle shall consist of an "on" period, when power is applied suddenly, not gradually, to the device for the time necessary to achieve a delta case temperature of 85°C, +15°C, -5°C, followed by an "off" period, when the power is suddenly removed, for cooling. Auxiliary (forced) cooling is permitted during the off period only.

> $t_{heating} \leq 5$ minutes. $P = V_F \times I_F$ or $P = V_{F(pk)} \times I_{av}$ if using sine wave current. DC full wave current shall be used for the power required during the "on" period (or equivalent half sine wave current).

Within the time interval of 50 cycles before to 500 cycles after the termination of the test, the sample units shall be removed from the specified test conditions and allowed to reach room ambient test conditions. Specified end-point measurements for qualification and conformance inspection shall be completed within 96 hours after removal of sample units from the specified test conditions. Additional readings may be taken at the discretion of the manufacturer.

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 sublot.

4.6 Element evaluation of unencapsulated die. The element evaluation of unencapsulated die shall be in accordance with appendix G of MIL-PRF-19500. For subgroup G3, the test samples shall be assembled in a DO-4 package.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical inspection	2071					
Subgroup 2						
Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$			°C/W
Forward voltage	4011	Condition B, tp < 8.3 ms, duty cycle < 2 percent pulse I_F = 38 A(pk)	V_{F2}		1.5	V dc
Reverse current	4016	DC method, V_R = rated V_R (see 1.3)	I_{R1}		10	µA dc
Insulation resistance (case to stud) applicable only to 1N3885, 1N3885A 1N3886, 1N3886A 1N3888, 1N3888A	1016	Test condition C, see 4.5.3	R_{ISO}	109		Ohms
Subgroup 3						
High temperature operation:		$T_A = T_C$ = 150°C				
Reverse current	4016	DC method V_R = rated $V_{R(pk)}$ (see 1.3)	I_{R2}		2	mA dc
Subgroups 4 and 5						
Not applicable						
Subgroup 6 2/						
Forward voltage	4011	Condition B, $I_F = I_{FS}$; tp = 800 µs	V_{F1}		2.75	V dc
Forward voltage	4011	Condition B, $I_F = I_{FS}$; tp = 8.3 ms	V_{F1}		2.55	V dc
Subgroup 7						ns
Reverse recovery time	4031	T_C = 55°C; I_F = 1 A dc; V_R = 30 V dc, di/dt = -25 A/µs; $I_{r(rec)} \leq$ 2 A (pk)	t_{rr}			
Non A version					200	
A-versions					150	

1/ For sampling plan, see MIL-PRF-19500.
2/ V_{F1} shall be performed with either tp = 800 µs or tp = 8.3 ms.

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

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
Subgroup 1			45 devices, c = 0
Thermal shock	1056	0°C to 100°C, 100 cycles	
Hermetic seal	1071		
Electrical measurements		See table I subgroup 2 and table III herein	
Subgroup 2			45 devices, c = 0
Steady-state dc blocking life	1038	Condition A; 1,000 hrs	
Electrical measurements		See table I subgroup 2 and table III herein. (Except $Z_{\theta JX}$ need not be performed)	
Subgroup 4			
Thermal impedance curves		See MIL-PRF-19500	
Subgroup 5			22 devices, c = 0
Barometric pressure, reduced (altitude operation)	1001	Hg = rated Hg (see 1.3), t = 60 s, while the test is being performed, I_R shall be monitored and shall not exceed 25 μ dc. T_C = 25°C	
Subgroup 6			
ESD	1020		
Subgroup 8			45 devices
Peak reverse power	4065	P_{RM} shall be characterized by the supplier and this data shall be available to the Government. The test (see 4.5.5) shall be performed on each sublot.	
Electrical measurements		See 4.5.5	
Subgroup 10			22 devices, c = 0
Forward surge	4066	Condition A, ten surges of 8.3 ms each at 1 minute intervals, V_{RWM} = rated V_{RWM} (see 1.3). T_C = +100°C. Non-A version devices, I_{FS} = 150 A; I_O = 12 A dc; A version devices, I_{FS} = 225 A; I_O = 20 A dc	

TABLE III. Groups B and C delta electrical measurements. 1/ 2/ 3/ 4/ 5/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Thermal response	3101	See 4.3.2, $R_{\theta JC}$ = rated $R_{\theta JC}$ (see 1.4)	ΔV_F			mV dc
2.	Forward voltage	4011	Condition B, I_F = 50 mA dc	ΔV_{F3}	+50 mV dc maximum change from previous to post intermittent life and thermal shock measurement tests (JANS only).		
3.	Reverse current	4016	DC method, V_R = rated V_R (dc) (see 1.3)	ΔI_{R1}	100 percent or ±5 µA, (whichever is greater) change from initial group A reading.		

1/ Devices which exceed the group A limits for this test shall be rejected.

2/ The delta measurements for table E-VIA (JANS) of MIL-PRF-19500 are as follows:
- a. Subgroup 3, see table III herein, steps 1 and 2.
- b. Subgroup 4, see table III herein, steps 1 and 2.
- c. Subgroup 5, see table III herein, step 3.

3/ The delta measurements for table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 are as follows:
- a. Subgroup 3, see table III herein, step 1.

4/ The delta electrical measurements for table E-VII of MIL-PRF-19500 are as follows:
- a. Subgroup 2, see table III herein, step 1.
- b. Subgroup 6, see table III herein, steps 1 and 3 (JANS); and step 1 (JAN, JANTX, and JANTXV).

5/ The delta electrical measurements for table E-IX of MIL-PRF-19500 are as follows:
- a. Subgroup 1, see table III herein, step 1.
- b. Subgroup 2, see table III herein, step 3.

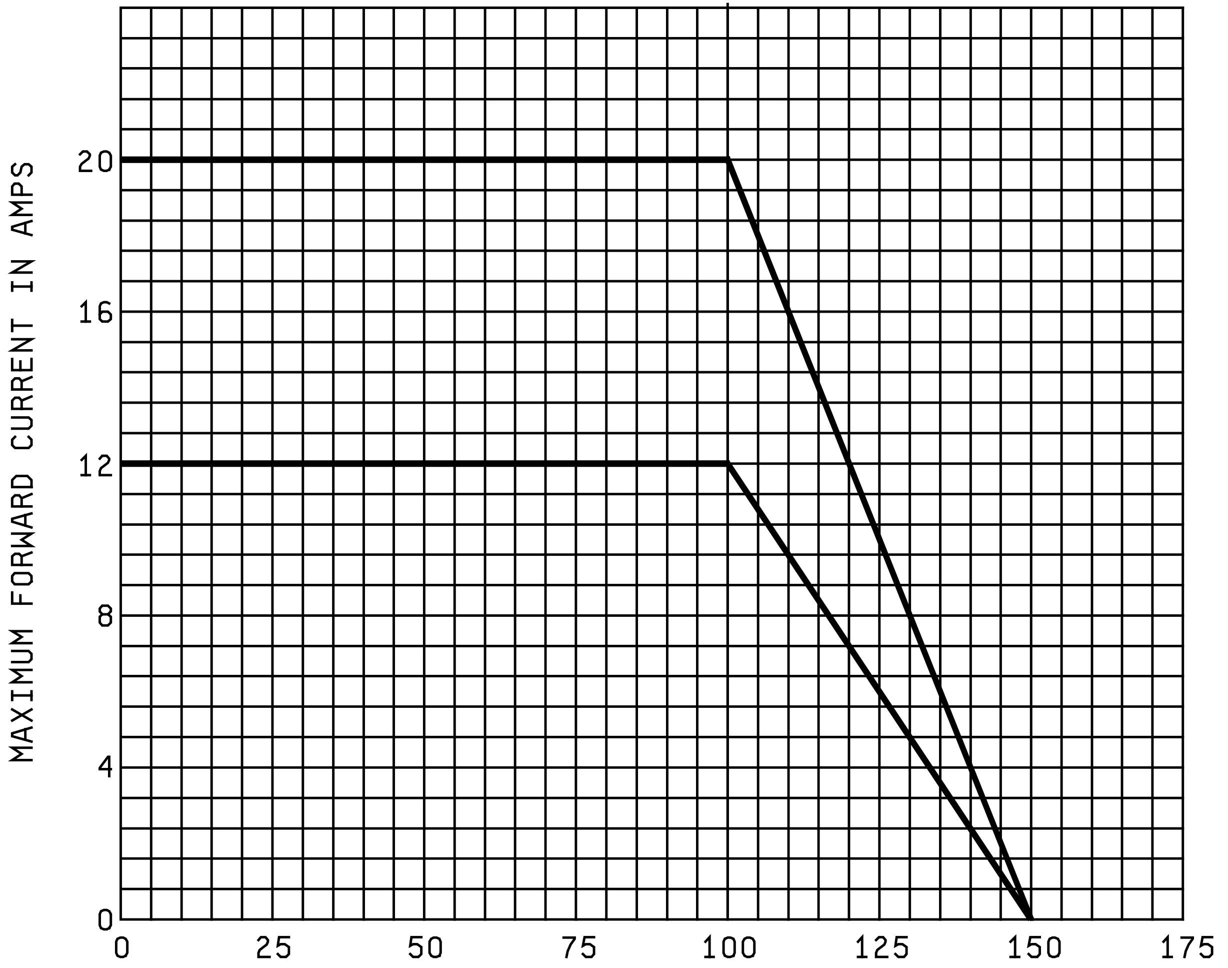


FIGURE 4. Maximum case temperature in °C.

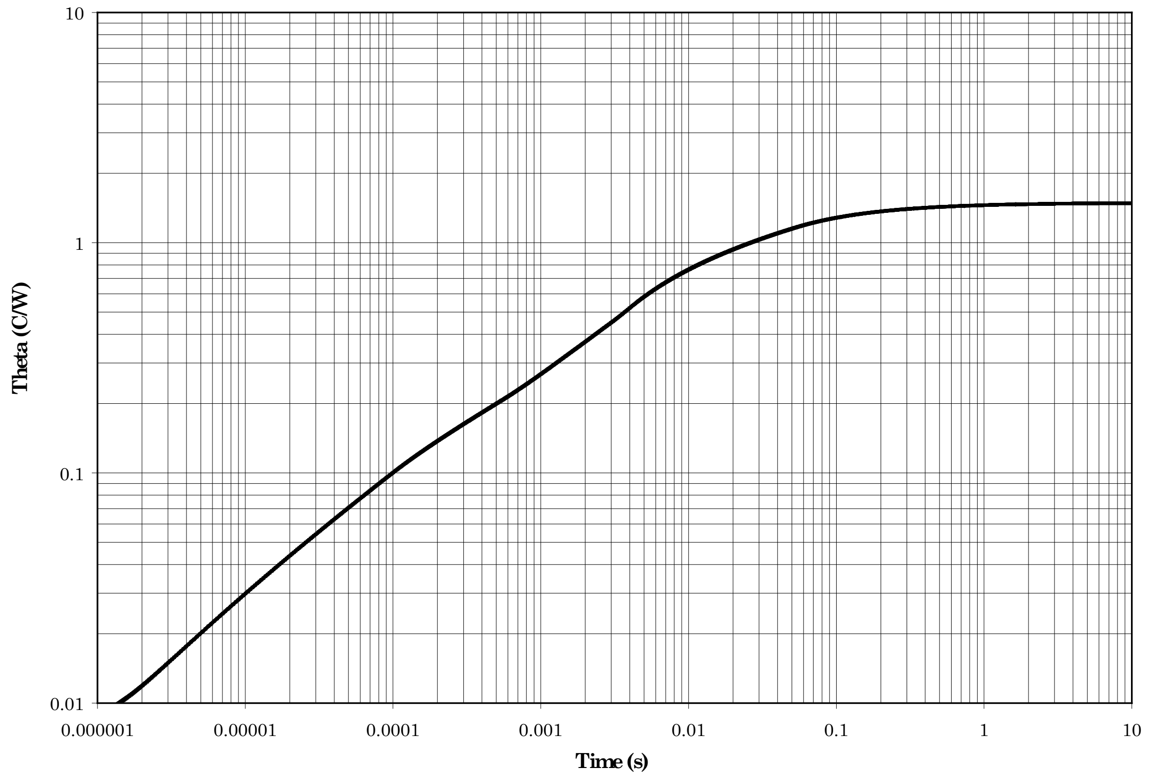


FIGURE 5. Thermal impedance graph $R_{\theta JC}$ for non isolated A type devices.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements should be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' 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).

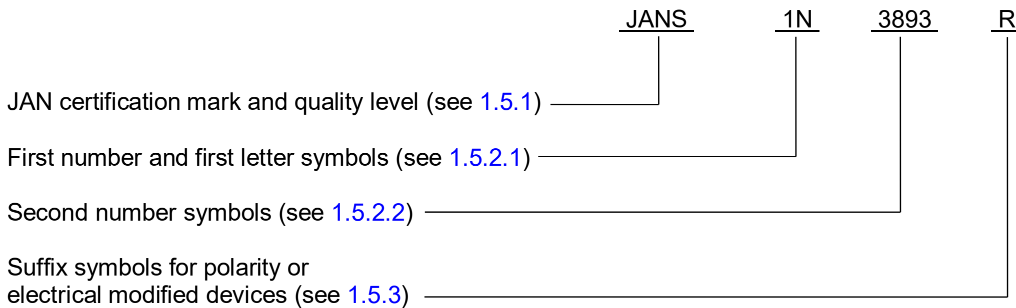
d. The complete PIN, see 1.5 and 6.4.

e. For die acquisition, the letter version should be specified (see 1.5.6 and figure 3).

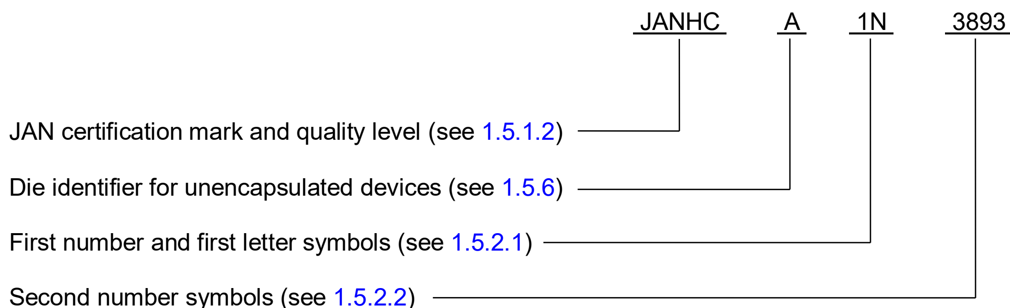
6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturer's List (QML-19500) whether or not such products have actually been so listed by that date. The attention 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, Columbus, OH 43216 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 The PINs are constructed using the following form.



6.4.2 Unencapsulated die. The PINs for unencapsulated die are constructed using the following form.



6.5 List of PINs.

6.5.1 Encapsulated devices. The following is a list of possible PINs available for encapsulated devices covered by this specification sheet.

PINs for devices in a DO-10 package			
JAN1N3885	JANTX1N3885	JANTXV1N3885	JANS1N3885
JAN1N3885A	JANTX1N3885A	JANTXV1N3885A	JANS1N3885A
JAN1N3886	JANTX1N3886	JANTXV1N3886	JANS1N3886
JAN1N3886A	JANTX1N3886A	JANTXV1N3886A	JANS1N3886A
JAN1N3888	JANTX1N3888	JANTXV1N3888	JANS1N3888
JAN1N3888A	JANTX1N3888A	JANTXV1N3888A	JANS1N3888A
PINs for devices in a DO-4 package			
JAN1N3890	JANTX1N3890	JANTXV1N3890	JANS1N3890
JAN1N3890R	JANTX1N3890R	JANTXV1N3890R	JANS1N3890R
JAN1N3890A	JANTX1N3890A	JANTXV1N3890A	JANS1N3890A
JAN1N3890AR	JANTX1N3890AR	JANTXV1N3890AR	JANS1N3890AR
JAN1N3891	JANTX1N3891	JANTXV1N3891	JANS1N3891
JAN1N3891R	JANTX1N3891R	JANTXV1N3891R	JANS1N3891R
JAN1N3891A	JANTX1N3891A	JANTXV1N3891A	JANS1N3891A
JAN1N3891AR	JANTX1N3891AR	JANTXV1N3891AR	JANS1N3891AR
JAN1N3893	JANTX1N3893	JANTXV1N3893	JANS1N3893
JAN1N3893R	JANTX1N3893R	JANTXV1N3893R	JANS1N3893R
JAN1N3893A	JANTX1N3893A	JANTXV1N3893A	JANS1N3893A
JAN1N3893AR	JANTX1N3893AR	JANTXV1N3893AR	JANS1N3893AR

6.5.2 Unencapsulated die. The following is a list of possible PINs for unencapsulated die available on this specification sheet.

Quality level JANHC	Quality level JANKC
JANHCA1N3885	JANKCA1N3885
JANHCA1N3886	JANKCA1N3886
JANHCA1N3888	JANKCA1N3888
JANHCA1N3890	JANKCA1N3890
JANHCA1N3891	JANKCA1N3891
JANHCA1N3893	JANKCA1N3893

6.6 Supersession data. The following types were superseded through a previous revision of this specification and the cancellation of MIL-S-19500/266. A-version devices may be substituted for non A-version devices. Applicable substitutes are as follows:

Substitute PIN as specified within MIL-S-19500/304C, dated 6 June 1989	Superseded types identified by but not listed on MIL-S-19500/304B, dated 14 September 1982	Superseded PIN that were specified within MIL-S-19500/304(EL), dated 21 September 1964	Superseded PIN that were specified within MIL-S-19500/266B, dated 23 September 1966
1N3885	1N3874	1N3884	1N3875
1N3886			1N3876
1N3888	1N3877	1N3887	1N3878
1N3890	1N3879	1N3889	1N3880
1N3890R	1N3879R	1N3889R	1N3880R
1N3891			1N3881
1N3891R			1N3881R
1N3893	1N3882	1N3892	1N3883
1N3893R	1N3882R	1N3892R	1N3883R

NOTE: Superseded types should not be used for new design.

6.7 Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example JANHCA1N3885) will be identified on the QML.

JANHC and JANKC ordering information	
PIN (1) (2)	Manufacturer
	43611
1N3885	JANHCA1N3885
1N3886	JANHCA1N3886
1N3888	JANHCA1N3888
1N3890	JANHCA1N3890
1N3891	JANHCA1N3891
1N3893	JANHCA1N3893

(1) Also applies to "A" suffix devices.
(2) For JANS level, replace "JANHC" prefix with "JANKC".

6.8 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 or by facsimile (614) 693-1642 or DSN 850-6939.

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - CR
Navy - EC
Air Force - 85
NASA - NA
DLA - CC

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

Preparing activity:
DLA - CC

(Project 5961-2019-036)

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.