The documentation and process conversion measures necessary to comply with this document shall be completed by 13 February 2014.

INCH-POUND

MIL-PRF-19500/412F
13 December 2013
SUPERSEDING
MIL-PRF-19500/412E
30 April 2009

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, POWER,
TYPES 2N3846, 2N3846T1, 2N3846T3, 2N3847, 2N3847T1, AND 2N3847T3,
JAN, JANTX, JANTXV, AND JANS

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 NPN, silicon, power transistors. Four levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 herein (TO-63), figure 2 (TO-254AA), and figure 3 (TO-257AA).

1.3 Maximum ratings.

Types	P_T = T_A = +25°C	P_T = T_C = +25°C (1)	$R_{\theta JC}$ (2)	V_{EBO}	V_{CBO}	V_{CEO}	I_C	T_{STG} and T_J
	W	W	°C/W	V dc	V dc	V dc	A dc	°C
2N3846	4	150	1.0	10	300	200	20	-65 to +200
2N3846T1	4	150	1.0	10	300	200	20	-65 to +200
2N3846T3	4	(3) 125	1.3	10	300	200	20	-65 to +200
2N3847	4	150	1.0	10	400	300	20	-65 to +200
2N3847T1	4	150	1.0	10	400	300	20	-65 to +200
2N3847T3	4	(3) 125	1.3	10	400	300	20	-65 to +200

(1) For derating, see figures 4 and 5.
(2) For thermal impedance curves, see figures 6 and 7.
(3) For TO-257 devices with typical mounting and small footprint, conservatively rated at 125 W and 1.3°C/W only.

* 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.

1.4 Primary electrical characteristics.

	h_{FE3} V_{CE} = 3 V dc I_C = 10 A dc (1)	$\|h_{fe}\|$ V_{CE} = 10 V dc I_C = 1 A dc f = 1MHz	V_{BE} V_{CE} = 3 V dc I_C = 10 A dc (1)	$V_{CE(sat)}$ I_B = 1.6 A dc I_C = 10 A dc (1)	C_{obo} V_{CB} = 10 V dc I_E = 0 100 kHz ≤ f ≤ 1 MHz
			V dc	V dc	pF
Min	12	10			
Max	60	35	1.2	0.75	750

(1) Pulsed (see 4.5.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

DEPARTMENT OF DEFENSE STANDARDS

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

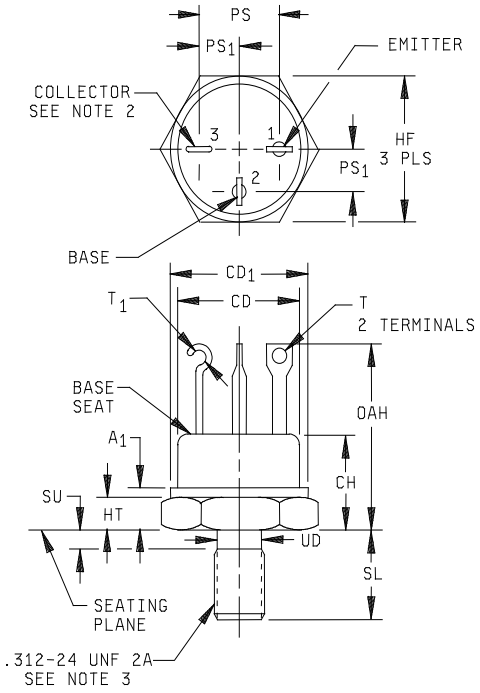
* (Copies of these documents are available online at http://quicksearch.dla.mil or https://assist.dla.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

3. REQUIREMENTS

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

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

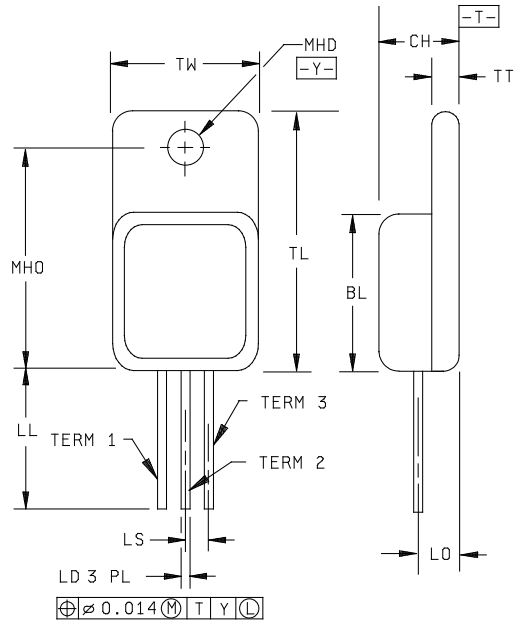


Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A_1		.300		7.62	
CD	.745 DIA	.775 DIA	18.92 DIA	19.69 DIA	
CD_1	.775 DIA	.875 DIA	19.685 DIA	22.23 DIA	
CH	.480	.535	12.19	13.59	
HF	.855	.875	21.72	22.23	
HT	.090	.167	2.29	4.24	
OAH	.937	1.030	23.80	26.16	7
PS	.485	.515	12.32	13.08	4, 6
PS_1	.240	.260	6.10	6.60	4, 6
SL	.460	.495	11.68	12.57	
SU		.105		2.67	8
T	.060 DIA	.105 DIA	1.52 DIA	2.67 DIA	
T_1	.060 DIA	.105 DIA	1.52 DIA	2.67 DIA	2
UD	.278	.312	7.06	7.92	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. See FED-STD-H28A.
4. The collector (hook) is electrically connected to the case. The other two terminals shall be electrically isolated from the case.
5. The orientation of the terminals in relation to the hex flats is not controlled.
6. The case temperature may be measured anywhere on the seating plane within .125 inch (3.18 mm) of the stud.
7. Terminal spacing measured at base seat only.
8. All three terminals.
9. Maximum unthreaded dimension.
10. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

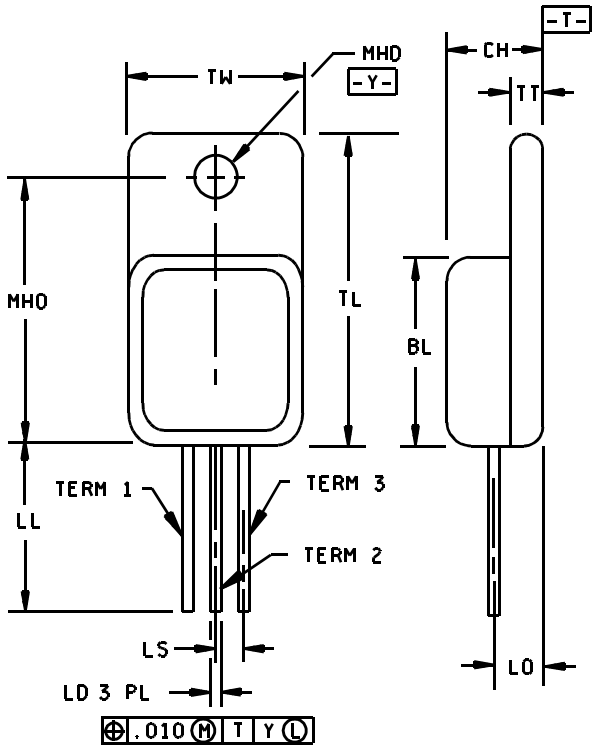
FIGURE 1. Physical dimensions 2N3846 and 2N3847 (TO-63).



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.535	.545	13.59	13.84
CH	.249	.260	6.32	6.60
LD	.035	.045	0.89	1.14
LL	.510	.570	12.95	14.48
LO	.150 BSC		3.81 BSC	
LS	.150 BSC		3.81 BSC	
MHD	.139	.149	3.53	3.78
MHO	.665	.685	16.89	17.40
TL	.790	.800	20.07	20.32
TT	.040	.050	1.02	1.27
TW	.535	.545	13.59	13.84
Term 1	Base			
Term 2	Collector			
Term 3	Emitter			

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic).
4. All terminals are isolated from case.
5. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Dimensions and configuration for 2N3846T1 and 2N3847T1 (TO-254AA).



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.410	.430	10.41	10.92
CH	.190	.200	4.83	5.08
LD	.025	.035	0.64	0.89
LL	.500	.750	12.70	19.05
LO	.120 BSC		3.05 BSC	
LS	.100 BSC		2.54 BSC	
MHD	.140	.150	3.56	3.81
MHO	.527	.537	13.39	13.63
TL	.645	.665	16.38	16.89
TT	.035	.045	0.89	1.14
TW	.410	.420	10.41	10.67
Term 1	Base			
Term 2	Collector			
Term 3	Emitter			

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Methods used for electrical isolation of the terminals feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic).
4. All terminals are isolated from case.
5. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 3. Dimensions and configuration for 2N3846T3 and 2N3847T3 (TO-257AA).

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

V_{CEX} - Collector cutoff voltage (dc) with specified circuit between base and emitter.
R_{ISO} - Resistance between device case and leads.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and in figure 1, figure 2 (TO-254AA), and figure 3 (TO-257AA) herein.

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

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

3.6 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table I, subgroup 2.

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

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 and table I and II).

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

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

* 4.3 Screening (JANS, JANTX, and JANTXV levels only). 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 (see table E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV level
(1) 3c	Thermal impedance (see 4.3.2).	Thermal impedance (see 4.3.2).
9	I_{CES} and h_{FE3} of table I shall be measured and the data recorded.	Not applicable
11	I_{CES} and h_{FE3} of table I shall be retested and the data recorded. ΔI_{CES} = 100 percent or 2 μA, whichever is greater. Δh_{FE3} = ±20 percent.	I_{CES} and h_{FE3} of table I shall be measured and the data recorded.
12	See 4.3.1.	See 4.3.1.
13	Subgroups 2 of table I herein; I_{CES} and h_{FE3} of table I shall be retested and the data recorded. ΔI_{CES} = 100 percent or 2 μA, whichever is greater. Δh_{FE3} = ±20 percent.	Subgroups 2 of table I herein; I_{CES} and h_{FE3} of table I shall be retested and the data recorded. ΔI_{CES} = 100 percent or 2 μA, whichever is greater. Δh_{FE3} = ±20 percent.
17	For TO-254AA packages: Method 1081 of MIL-STD-750 (see 4.3.3), Endpoints: Subgroup 2 of table I herein	For TO-254AA packages: Method 1081 of MIL-STD-750 (see 4.3.3), Endpoints: Subgroup 2 of table I herein

* (1) Shall be performed anytime after temperature cycling, screen 3a; JANTX and JANTXV levels do not need to be repeated in screening requirements.

4.3.1 Power burn-in conditions. V_{CB} = 10 - 30 V dc, power shall be applied to the device to achieve a junction temperature, T_J = +175°C minimum.

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3131 of MIL-STD-750 using the guidelines in that method for determining I_M, I_H, t_H, t_{MD} (and V_C where appropriate). The thermal impedance limit used in screen 3c of 4.3 herein and subgroup 2 of table I shall comply with the thermal impedance graph in figures 6 and 7 (less than or equal to the curve value at the same t_H time) and shall be less than the process determined statistical maximum limit as outlined in method 3131.

* 4.3.3 Dielectric withstanding voltage.

a. Magnitude of test voltage……900 V dc.

b. Duration of application of test voltage……..15 seconds (min).

c. Points of application of test voltage……...All leads to case (bunch connection).

d. Method of connection……..Mechanical.

e. Kilovolt-ampere rating of high voltage source…….1,200 V/1.0 mA (min).

f. Maximum leakage current……...1.0 mA.

g. Voltage ramp up time.....500 V/second.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500, and as specified herein. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of table I, subgroup 1 and 2 inspection only (table E-VIB, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2).

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 table E-VIA (JANS) and table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500 and herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

4.4.2.1 Group B inspection, table E-VIA (JANS) of MIL-PRF-19500.

Subgroup	Method	Condition
B2	2026	For 2N3846 and 2N3847, depth ≥ .10 inch (2.54 mm), t = 10 ±1 second.
B4	1037	$V_{CB} \geq 20$ V dc.
B5	1027	$V_{CB} \geq 20$ V dc, adjust P_T and T_A to achieve T_J = +175°C ±12.5°C; marking legibility requirements shall not apply; T_A = +100°C max.

4.4.2.2 Group B inspection, table E-VIB (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
B1	2026	For 2N3846 and 2N3847, depth ≥ .10 inch (2.54 mm), t = 10 ±1 second.
B3	1037	For solder die attach: 2,000 cycles, $V_{CB} \geq 20$ V dc.
B3	1026	For eutectic die attach: $V_{CB} \geq 20$ V dc, adjust P_T or T_A to achieve T_J = 175°C min., $T_A \leq$ +35°C.
B6	1032	T_A = +200°C.

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. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein.

Subgroup	Method	Condition
C2	1056	Test condition B.
C2	2036	Test condition A, for 2N3846 and 2N3847, weight = 7 lbs ±5 ounces, t = 15 seconds, tubulated leads only; for 2N3846T1, 2N3846T3, 2N3847T1, and 2N3847T3, weight = 4.5 kg, t = 10 seconds.
C2	2036	Test condition D2, 2N3846 and 2N3847 only, torque = 30 inch-pounds, t = 30 seconds.
C2	2036	Test condition D1, 2N3846 and 2N3847 only, torque = 6 inch-ounces, t = 15 seconds.
	C5	3131 See 4.3.2, $R_{\theta JC}$ = 1.3°C/W for 2N3846, 2N3846T1, 2N3847, and 2N3847T1, $R_{\theta JC}$ = 1.0°C/W for 2N3846T3 and 2N3847T3.
C6	1037	For solder die attach: 6,000 cycles, $V_{CB} \geq 20$ V dc.
C6	1026	For eutectic die attach: $V_{CB} \geq 20$ V dc, adjust P_T or T_A to achieve T_J = +175°C minimum, $T_A \leq$ +35°C.

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 as specified herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 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 Burnout by pulsing. This test shall be conducted in a circuit capable of supplying the specified pulse conditions to the transistor under test. Good engineering practices shall be utilized to eliminate inductive effects in the circuitry and power supply. Rise and fall times of the pulse shall be less than 10 percent of the specified t_p. Non-inductive monitoring techniques shall be utilized and the value of any monitoring resistor shall be less than V_{CC}/ (20 I_C).

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 2/	3131	See 4.3.2	$Z_{\theta JX}$			°C/W
Collector to emitter breakdown voltage	3011	Bias condition D; I_C = 200 mA dc; I_B = 0; pulsed (see 4.5.1)	$V_{(BR)CEO}$			
2N3846, 2N3846T1, 2N3846T3				200		V dc
2N3847, 2N3847T1, 2N3847T3				300		V dc
Collector to emitter cutoff current	3041	Bias condition C, V_{BE} = 0	I_{CES}			
2N3846, 2N3846T1, 2N3846T3		V_{CE} = 300 V dc			10	μA dc
2N3847, 2N3847T1, 2N3847T3		V_{CE} = 400 V dc			10	μA dc
Collector to emitter cutoff current	3041	Bias condition D, I_B = 0.	I_{CEO}			
2N3846, 2N3846T1, 2N3846T3		V_{CE} = 200 V dc;			5	mA dc
2N3847, 2N3847T1, 2N3847T3		V_{CE} = 300 V dc			5	mA dc
Emitter to base cutoff current	3061	Bias condition D, V_{BE} = 10 V dc, I_C = 0.	I_{EBO}		250	μA dc
Forward-current transfer ratio	3076	Pulsed (see 4.5.1), V_{CE} = 3 V dc; I_C = 1 A dc	h_{FE1}	70		
Forward-current transfer ratio	3076	Pulsed (see 4.5.1), V_{CE} = 3 V dc; I_C = 5 A dc	h_{FE2}	40	240	
Forward-current transfer ratio	3076	Pulsed (see 4.5.1), V_{CE} = 3 V dc; I_C = 10 A dc	h_{FE3}	12	60	
Base to emitter voltage	3066	Test condition B, pulsed (see 4.5.1), V_{CE} = 3 V dc; I_C = 10 A dc	V_{BE}		1.20	V dc
Base to emitter voltage (saturated)	3066	Test condition A, pulsed (see 4.5.1), I_B = 1.6 A, I_C = 10 A dc	$V_{BE(sat)}$		1.30	V dc
Collector to emitter voltage (saturated)	3071	Pulsed (see 4.5.1), I_B = 1.6 A, I_C = 10 A dc	$V_{CE(sat)}$		0.75	V dc

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 3						
High temperature operation:		T_A = +150°C				
Collector to emitter cutoff current	3041	Bias condition C; V_{BE} = 0	I_{CES}			
2N3846, 2N3846T1, 2N3846T3		V_{CE} = 300 V dc;			10	mA dc
2N3847, 2N3847T1, 2N3847T3		V_{CE} = 400 V dc			10	mA dc
Low temperature operation:		T_A = -55°C				
Forward-current transfer ratio	3076	Pulsed (see 4.5.1), V_{CE} = 3 V dc; I_C = 10 A dc	h_{FE4}	10		
Subgroup 4						
Magnitude of common-emitter small-signal short circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc, f = 1 MHz, I_C = 1.0 A dc	$\|h_{fe}\|$	10	35	
Small-signal short circuit forward-current transfer ratio	3206	V_{CE} = 10 V dc, f = 1 kHz, I_C = 5.0 A dc	h_{fe}	50	250	
Open circuit output capacitance	3236	V_{CB} = 10 V dc, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}		750	pF
Turn-on time		I_C = 10 A dc, $I_{B(1)}$ = 2 A dc, $I_{B(2)}$ = -2 A dc $V_{BE(off)}$ ≈ -7.5 V dc, R_L = 15 ohms, see figure 8	t_{on}		4	µs
Turn-off time		I_C = 10 A dc, $I_{B(1)}$ = 2 A dc, $I_{B(2)}$ = 2 A dc $V_{BE(off)}$ ≈ -7.5 V dc, R_L = 15 ohms see figure 8	t_{off}		7	µs
Subgroup 5						
Burnout by pulsing (safe operating area - dc)	3005 (3051)	T_C = +100°C; pre-pulse condition: figure 9, V_{CE} = 0; I_C = 0 pulse condition: (see 4.5.2)				
Test 1		V_{CE} = 7.5 V dc, I_C = 20 A dc, t_p = 1.0 s, 1 cycle				
Test 2		V_{CE} = 200 V dc, I_C = 100 mA dc, tp = 1.0 s, 1 cycle				
Test 3		V_{CE} = 58 V dc, I_C = 1.0 A dc tp = 1.0 s, 1 cycle				

See footnote at end of table.

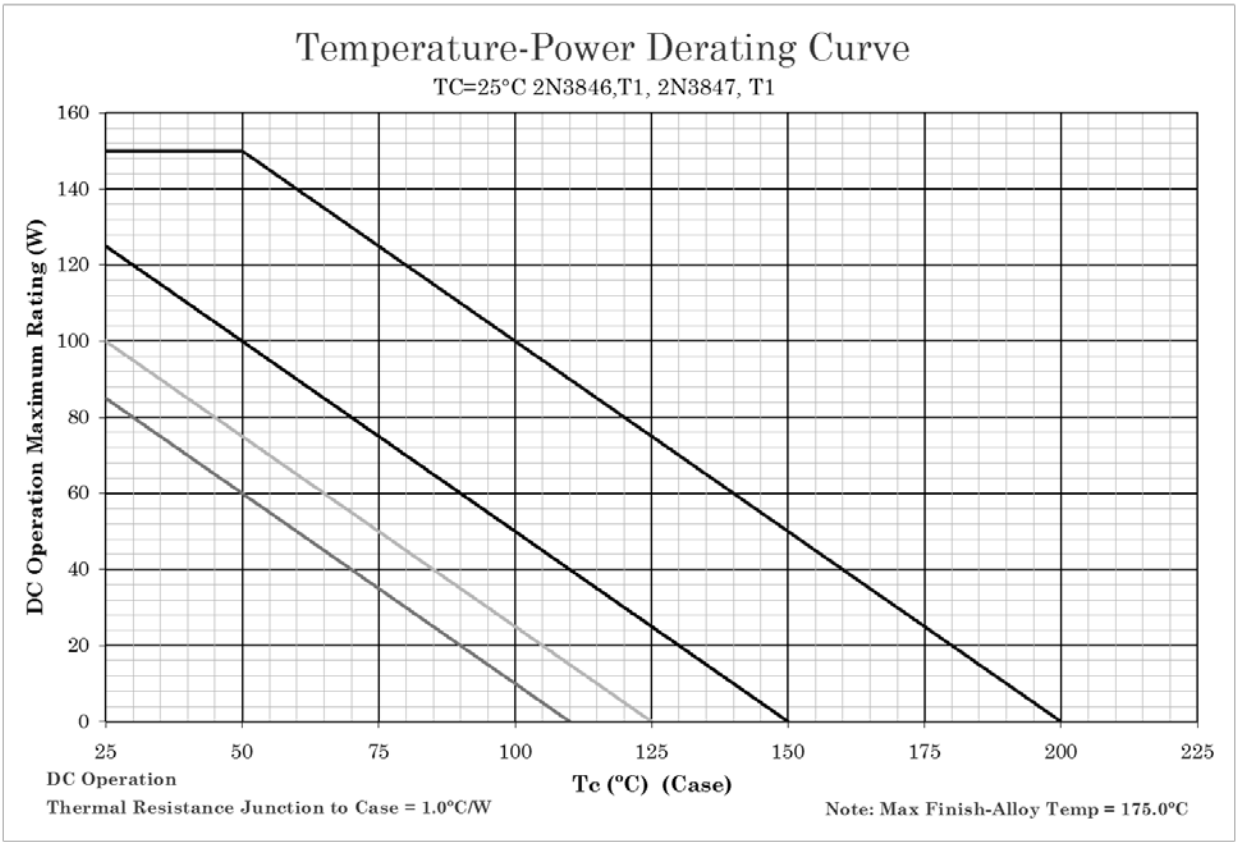
TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5 - Continued.						
Burnout by pulsing (safe operating area - dc) 2N3847, 2N3847T1, 2N3847T3 only	3005 (3051)	T_C = +100°C; pre-pulse condition: see figure 9, V_{CE} = 300 V dc, I_C = 20 mA dc, t_p = 1.0 s, 1 cycle, (T1 and T3 may require heatsink).				
Unclamped inductive sweep		T_C = +100°C, I_B = 2 A dc, I_C = 20 A dc, see figure 10				
Clamped inductive sweep		T_C = +100°C, I_B = 2 A dc, I_C = 20 A dc, see figure 11				
End-point electrical measurements		See table I, subgroup 2 herein				
Subgroups 6 and 7						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.
2/ This test required for the following end-point measurements only:
Group B, subgroups 3, 4, and 5 (JANS).
Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).
Group C, subgroup 2 and 6.
Group E, subgroup 1.

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

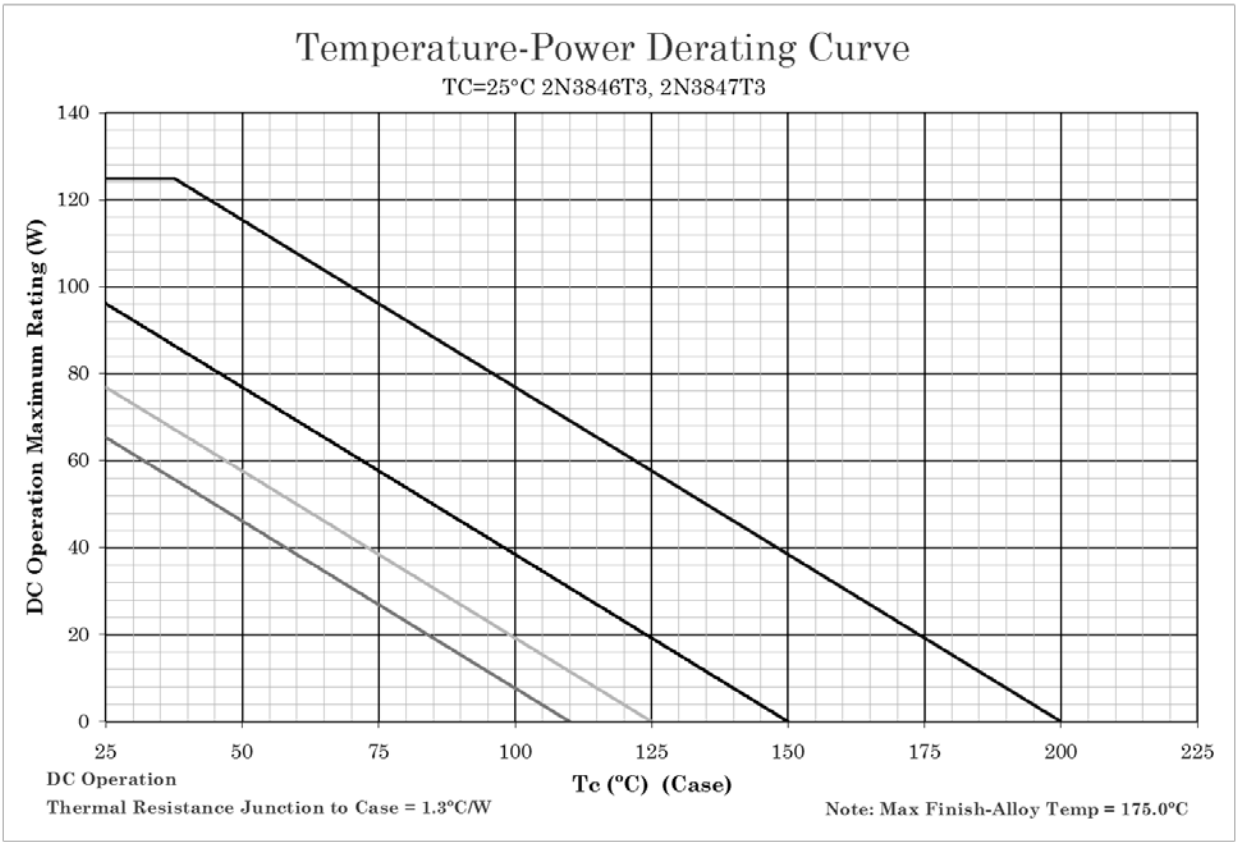
Inspection	MIL-STD-750		Qualification
	Method	Conditions	
Subgroup 1			45 devices c = 0
Thermal shock glass strain	1056	0°C to +100°C, 100 cycles	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I, subgroup 2 herein.	
Subgroup 2			45 devices c = 0
Steady-state dc blocking life	1039 or 1048	1,000 hours	
Electrical measurements		See table I, subgroup 2 herein.	
Subgroup 4			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500.	
Subgroup 5			3 devices, c = 0
Barometric pressure	1001	Pressure = 8.0 mm Hg time = 60 seconds; normal mounting	
Subgroup 8			45 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 V, Condition B for devices < 400 V.	



NOTES:

1. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq +200°C$) and power rating specified (see 1.3 herein).
3. Derate design curve chosen at $T_J \leq +150°C$ where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at $T_J \leq +125°C$ and +110°C to show power rating where most users want to limit T_J in their application.

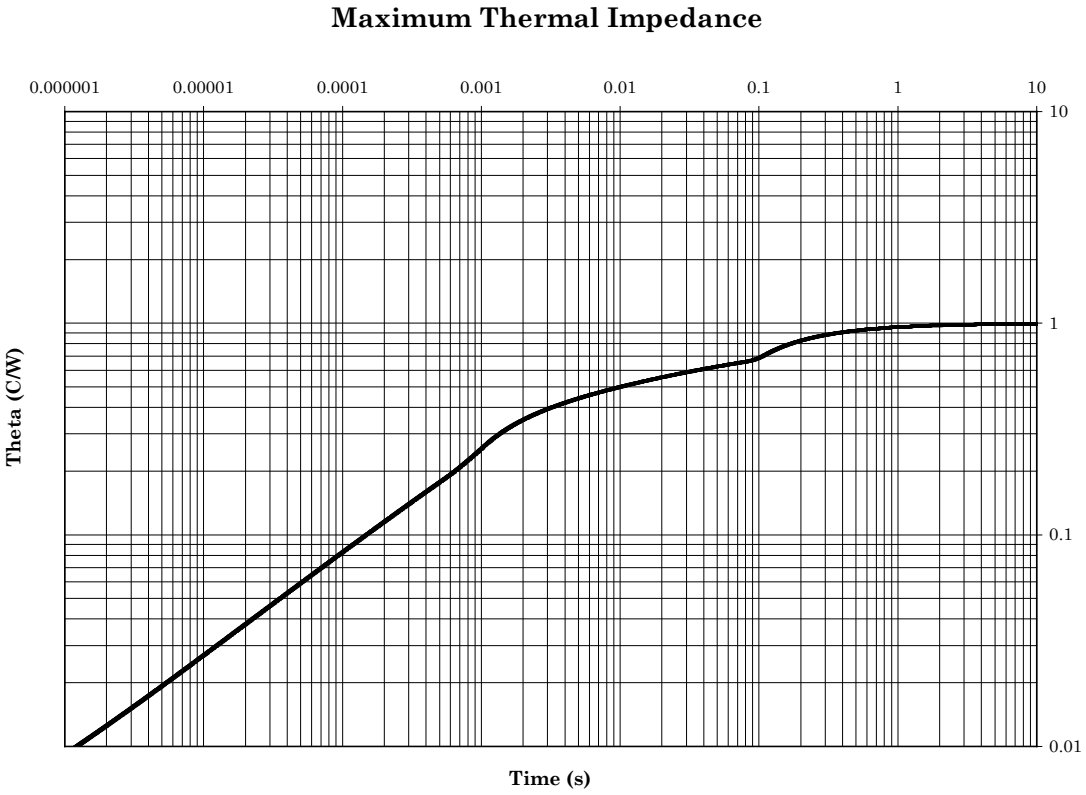
FIGURE 4. Temperature-power derating curve.



NOTES:

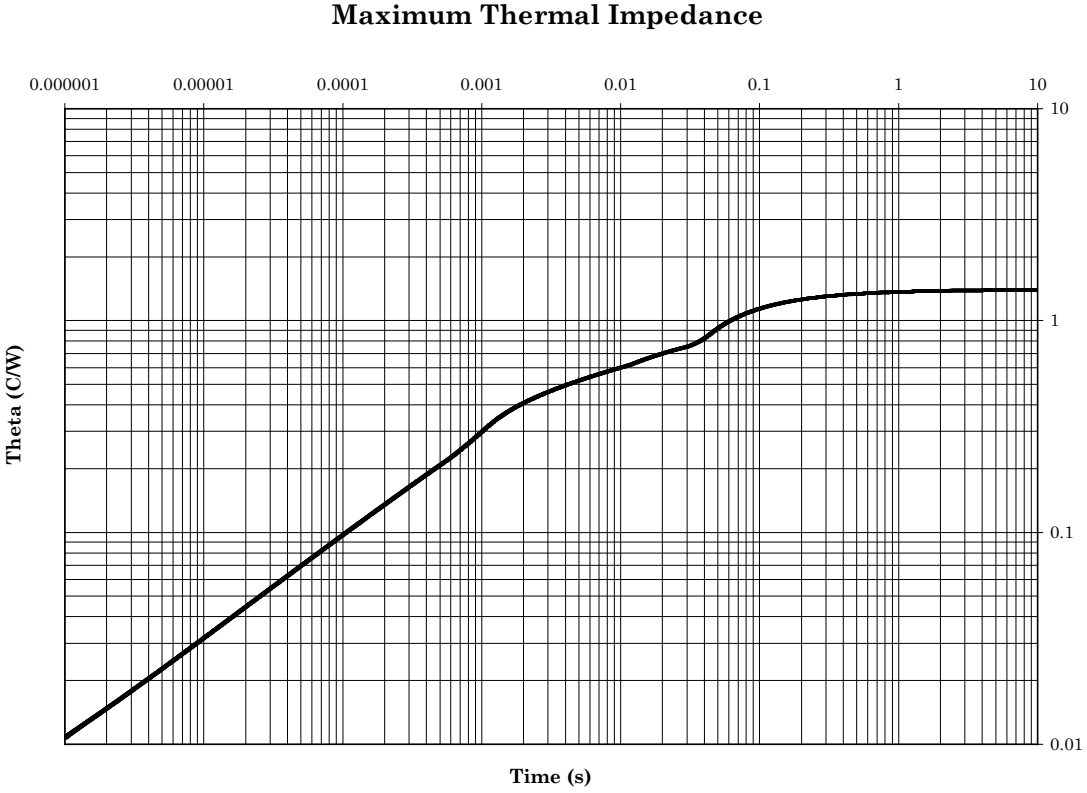
1. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq +200°C$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq +150°C$ where the maximum temperature of electrical test is performed.
4. Derate design curves chosen at $T_J \leq +125°C$ and +110°C to show power rating where most users want to limit T_J in their application.

FIGURE 5. Temperature-power derating curve - Continued.



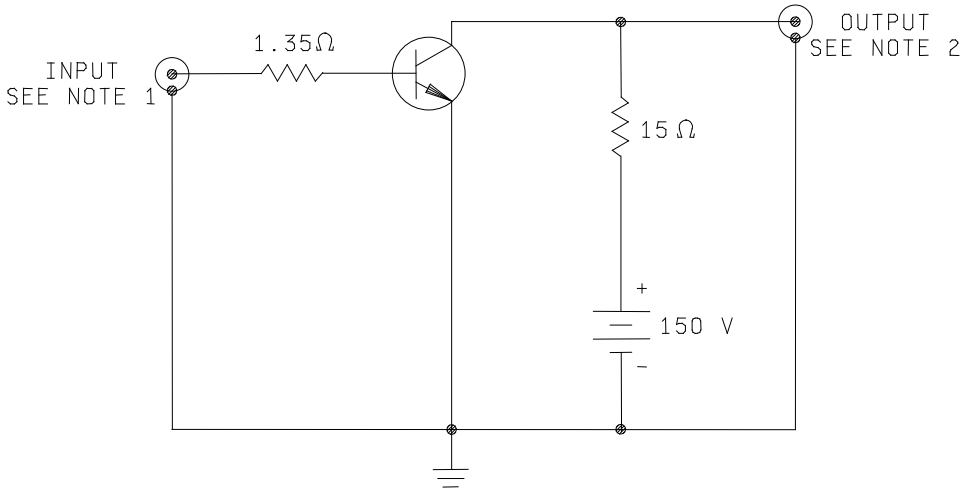
T_C = +25°C. Thermal resistance = 1.0 C/W.

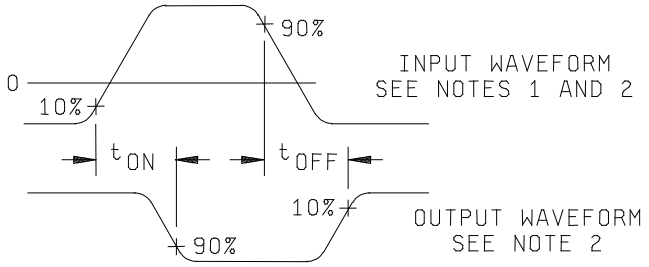
FIGURE 6. Thermal impedance graph ($R_{\theta JC}$) for 2N3846, 2N3847, 2N3846T1 and 2N3847T1.



$R_{\theta JC}$ = 1.3°C/W Caution: Maximum finish temperature for solder alloys = +175°C.

FIGURE 7. Thermal impedance graph ($R_{\theta JC}$) for 2N3846T3 and 2N3847T3.





NOTES:

1. The input waveform has the following characteristics: $t_r \leq 100$ ns, $t_f \leq 100$ ns, PW = 20 μs, duty cycle ≤ 0.2 percent.
2. Waveforms are monitored on an oscilloscope with the following characteristics: tr ≤ 5 ns, $R_{in} \geq 1$ MΩ, $C_{in} \leq 5$ pF.
3. Resistors must be noninductive types.

FIGURE 8. Switching time test circuit.

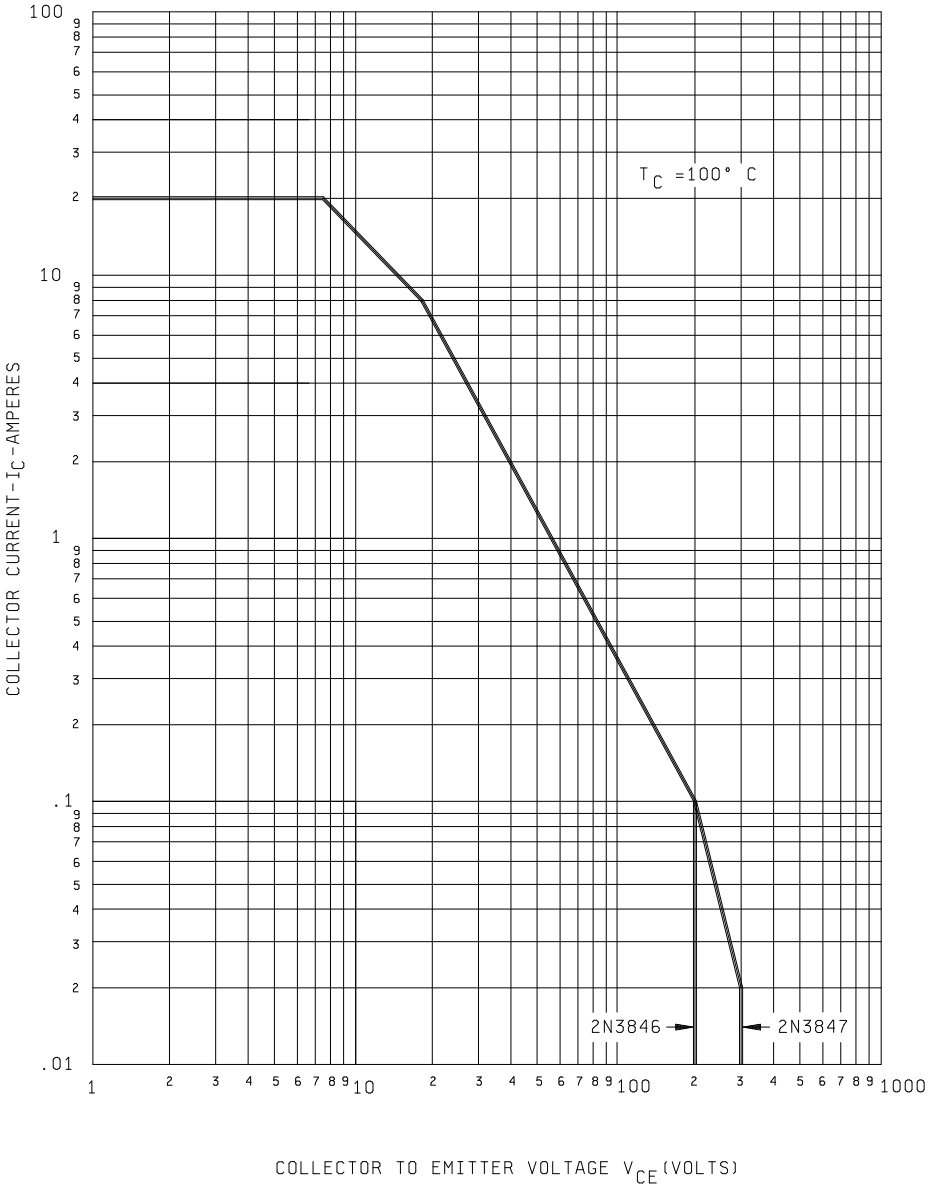
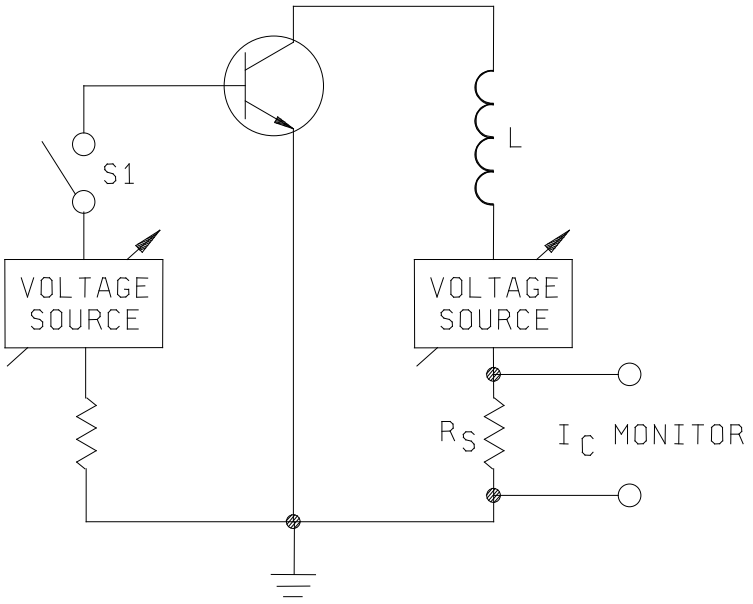


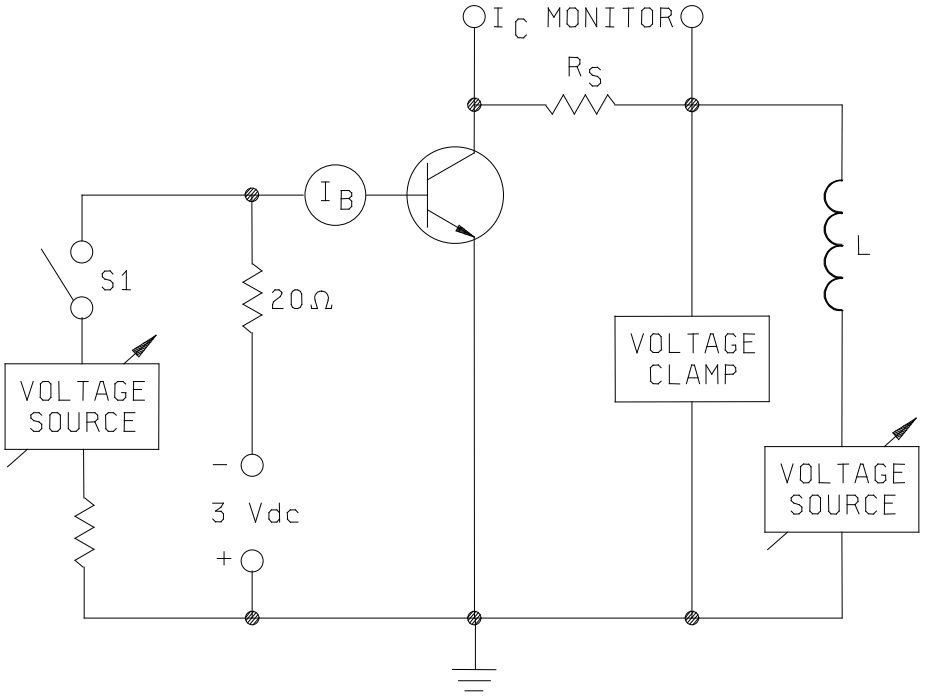
FIGURE 9. Rated safe operating region.



NOTES:
$R_S \leq 1.0$ ohm (noninductive)
L = 1.0 mH

Procedure:
1. With switch S1 closed, set the specified conditions.
2. Open S1.
3. Perform specified end-point tests.

FIGURE 10. Unclamped inductive sweep test circuit diagram.



$R_S \leq 1.0$ ohm (noninductive)
L = 1.0 mH
Voltage clamp = 2N3846, 2N3846T1, 2N3846T3 = 300 V dc
2N3847, 2N3847T1, 2N3847T3 = 400 V dc

Procedure:
1. With switch S1 closed, set the specified conditions.
2. Open S1.
3. Perform specified end-point tests.

FIGURE 11. Clamped inductive sweep test circuit diagram.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

d. Product assurance level and type designator.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

6.4 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2014-028)

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.