

The documentation and process conversion measures necessary to comply with this document shall be completed by 20 August 2005

INCH-POUND

MIL-PRF-19500/464D
 20 May 2005
 SUPERSEDING
 MIL-PRF-19500/464C
 5 August 1997

* PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON POWER, TYPES 2N5685 AND 2N5686, JAN, JANTX, AND JANTXV

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. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1, similar to TO-3.

* 1.3 Maximum ratings. $T_C = +25^\circ\text{C}$, unless otherwise specified.

Type	$P_T (1)$ $T_C = +25^\circ\text{C}$	$P_T (1)$ $T_C = +100^\circ\text{C}$	V_{CBO}	V_{CEO}	V_{EBO}	I_B	I_C	T_J and T_{STG}	$R_{\theta JC}$
	<u>W</u>	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>A dc</u>	<u>°C</u>	<u>°C/W</u>
2N5685	300	171	60	60	5	15	50	-55 to +200	.584
2N5686	300	171	80	80	5	15	50	-55 to +200	.584

(1) Between $T_C = +25^\circ\text{C}$ and $T_C = +200^\circ\text{C}$ linear derating factor 1.715 W/°C.

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

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

Type	h_{FE2} (1)		h_{FE3} (1)		$V_{BE(sat)}$ (1)		$V_{CE(sat)1}$ (1)		$V_{CE(sat)2}$ (1)	
	$V_{CE} = 2 \text{ V dc}$ $I_C = 25 \text{ A dc}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 50 \text{ A dc}$		$I_C = 25 \text{ A dc}$ $I_B = 2.5 \text{ A dc}$		$I_C = 25 \text{ A dc}$ $I_B = 2.5 \text{ A dc}$		$I_C = 50 \text{ A dc}$ $I_B = 10 \text{ A dc}$	
	Min	Max	Min	Max	V_{dc}		V_{dc}		V_{dc}	
					Min	Max	Min	Max	Min	Max
2N5685	15	60				2.0		1.0		5.0
2N5686	15	60	5			2.0		1.0		5.0

Type	C_{obo}		$ h_{fe} $		h_{fe}		Switching (see table I and figure 2 herein)			
	$V_{CB} = 10 \text{ V dc}$ $I_E = 0$ $0.1 \text{ MHz} \leq f \leq 1.0 \text{ MHz}$		$V_{CE} = 10 \text{ V dc}$ $I_C = 5 \text{ A dc}$ $f = 1 \text{ kHz}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 10 \text{ A dc}$ $f = 1 \text{ kHz}$		t_{on}		t_{off}	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	μF						μs		μs	
2N5685		1,200	2	20	15			1.5		3.0
2N5686		1,200	2	20	15			1.5		3.0

(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.

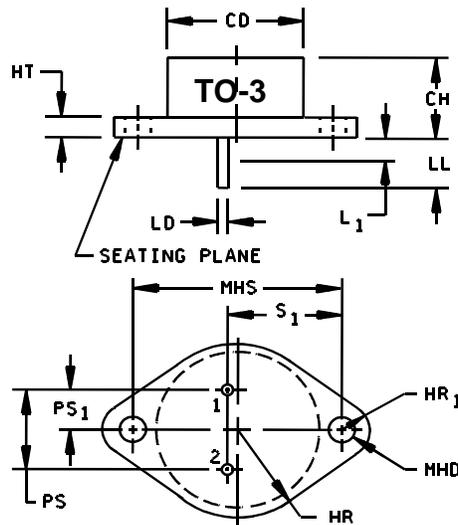
- * DEPARTMENT OF DEFENSE STANDARDS

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

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

- 2.3 Order of precedence. 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.

MIL-PRF-19500/464D



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.22	3
CH	.250	.450	6.35	11.43	
HR	.495	.525	12.57	13.34	
HR ₁	.131	.188	3.33	4.78	6
HT	.060	.135	1.52	3.43	
LD	.057	.063	1.45	1.60	4, 5, 9
LL	.312	.500	7.92	12.70	4, 5, 9
L ₁		.050		1.27	5, 9
MHD	.151	.165	3.84	4.19	7
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	
PS ₁	.205	.225	5.21	5.72	5
S ₁	.655	.675	16.64	17.15	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Body contour is optional within zone defined by CD.
4. These dimensions shall be measured at points .050 inch (1.27 mm) to .055 inch (1.40 mm) below seating plane. When gauge is not used, measurement shall be made at seating plane.
5. Both terminals.
6. At both ends.
7. Two holes.
8. The collector shall be electrically connected to the case.
9. LD applies between L₁ and LL. Lead diameter shall not exceed twice LD within L₁.
10. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

* FIGURE 1. Physical dimensions.

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 manufacturers list 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.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1.

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

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

* 3.7 Electrical test requirements. The electrical test requirements shall be as specified in table I.

* 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 tables I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

* 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 III tests, the tests specified in table III 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 (JANTX and JANTXV levels). Screening shall be in accordance with table 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 IV of MIL-PRF-19500)	Measurement
	JANTX and JANTXV levels only
7	Optional.
11	h_{FE2} and I_{CEX1}
12	See 4.3.1
13	Subgroup 2 of table I herein; ΔI_{CEX1} = 100 percent of initial value or 100 μ A dc, whichever is greater; Δh_{FE2} = 25 percent of initial value.
14	Required.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: $T_J = +187.5^\circ\text{C} \pm 12.5^\circ\text{C}$; $V_{CB} \geq 20$ V dc, $T_A \leq +100^\circ\text{C}$.

* 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, appendix E table V, and table I herein. Electrical measurements (end-points) shall be in accordance with the table I, subgroup 2 herein.

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

	<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
*	B3	1037	2,000 cycles, $V_{CE} \geq 10$ V dc, ΔT_J between cycles $\geq +100^\circ\text{C}$, adjust power or current to achieve a $\Delta T_J = +100^\circ\text{C}$.
	B5	3131	See 4.5.2.

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

	<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
	C2	2036	Test condition A, weight = 10 pounds, $t = 15$ s.
*	C6	1037	6,000 cycles, $V_{CE} \geq 10$ V dc, ΔT_J between cycles $\geq +100^\circ\text{C}$, adjust power or current to achieve a $\Delta T_J = +100^\circ\text{C}$.

* 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 IX of MIL-PRF-19500 and as specified herein. Electrical measurements (end-points) shall be in accordance with the table I, subgroup 2 herein. Delta measurements shall be in accordance with table II herein.

4.5 Method 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 Thermal resistance. Thermal resistance measurements shall be conducted in accordance with method 3131 of MIL-STD-750. The following details shall apply:

- a. Collector current magnitude during power applications shall be 1 A dc.
- b. Collector to emitter voltage magnitude shall be ≥ 5 V dc.
- c. Reference temperature measuring point shall be the case.
- d. Reference point temperature shall be $+25^{\circ}\text{C} \leq T_R \leq +75^{\circ}\text{C}$ and recorded before the test is started.
- e. Mounting arrangement shall be with heat sink to header.
- f. Maximum limit shall be $R_{\theta\text{JC}} = .584^{\circ}\text{C/W}$.

* 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>						
Breakdown voltage collector to emitter 2N5685 2N5686	3011	Bias condition D; $I_C = 100$ mA dc, pulsed (see 4.5.1)	$V_{(BR)CEO}$	60 80		V dc V dc
Collector to emitter cutoff current 2N5685 2N5686	3041	Bias condition D $V_{CE} = 30$ V dc $V_{CE} = 40$ V dc	I_{CEO}		500	μ A dc
Collector to emitter cutoff current 2N5685 2N5686	3041	Bias condition A; $V_{BE} = 1.5$ V dc $V_{CE} = 60$ V dc $V_{CE} = 80$ V dc	I_{CEX1}		500	μ A dc
Emitter to base cutoff current	3061	Bias condition D; $V_{BE} = 5$ V dc, $I_C = 0$	I_{EBO}		1.0	mA dc
Collector to base cutoff current 2N5685 2N5686	3036	Bias condition D $V_{CE} = 60$ V dc $V_{CE} = 80$ V dc	I_{CBO1}		2.0	mA dc
Base to emitter saturated	3066	Test condition A; $I_C = 25$ A dc, $I_B = 2.5$ A dc, pulsed (see 4.5.1)	$V_{BE(sat)}$		2.0	V dc
Base to emitter non-saturated	3066	Test condition B; $I_C = 25$ A dc, $V_{CE} = 2$ V dc, pulsed (see 4.5.1)	V_{BE}		2.0	V dc
Collector to emitter saturated voltage	3071	$I_C = 25$ A dc; $I_B = 2.5$ A dc pulsed (see 4.5.1)	$V_{CE(sat)1}$		1.0	V dc
Collector to emitter saturated voltage	3071	$I_C = 50$ A dc; $I_B = 10$ A dc, pulsed (see 4.5.1)	$V_{CE(sat)2}$		5.0	V dc
Forward current transfer ratio	3076	$V_{CE} = 2$ V dc; $I_C = 5$ A dc, pulsed (see 4.5.1)	h_{FE1}	30		

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Forward current transfer ratio	3076	$V_{CE} = 2 \text{ V dc}; I_C = 25 \text{ A dc}$, pulsed (see 4.5.1)	h_{FE2}	15	60	
Forward current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 50 \text{ A dc}$, pulsed (see 4.5.1)	h_{FE3}	5		
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Collector to emitter cutoff current 2N5685 2N5686	3041	Bias condition A; $V_{BE} = 1.5 \text{ V dc}$ $V_{CE} = 60 \text{ V dc}$ $V_{CE} = 80 \text{ V dc}$	I_{CEX2}		5	mA dc
Low temperature operation:		$T_A = -55^\circ\text{C}$				
Forward current transfer ratio	3076	$V_{CE} = 2.0 \text{ V dc}; I_C = 25 \text{ A dc}$, pulsed (see 4.5.1)	h_{FE4}	7		
<u>Subgroup 4</u>						
Pulse response	3251	Test condition A, except test circuit and pulse requirements (see figure 2)				
Turn-on time		$V_{CC} = 30 \text{ V dc}; I_C = 25 \text{ A dc}$, $I_{B1} = 2.5 \text{ A dc}$	t_{on}		1.5	μs
Turn-off time		$V_{CC} = 30 \text{ V dc}; I_C = 25 \text{ A dc}$, $I_{B1} = -I_{B2} = 2.5 \text{ A dc}$	t_{off}		3.0	μs
Storage time		$V_{CC} = 30 \text{ V dc}; I_C = 25 \text{ A dc}$, $I_{B1} = -I_{B2} = 2.5 \text{ A dc}$	t_s		2.0	μs
* Magnitude of common emitter small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 10 \text{ V dc}; I_C = 5 \text{ A dc}$, $f = 1 \text{ kHz}$	$ h_{fe} $	2	20	

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued						
* Small-signal short-circuit forward-current transfer ratio	3206	$V_{CE} = 5 \text{ V dc}; I_C = 10 \text{ A dc}, f = 1 \text{ kHz}$	h_{fe}	15		
Open circuit output capacitance	3236	$V_{CB} = 10 \text{ V dc}; I_E = 0, 0.1 \text{ MHz} \leq f \leq 1 \text{ MHz}$	C_{obo}		1,200	pF
<u>Subgroup 5</u>						
Safe operating area (continuous dc)	3051	$T_C = +25^\circ\text{C}; t = 1 \text{ s}, 1 \text{ cycle (see figures 3 and 4)}$				
<u>Test 1</u>		$V_{CE} = 6 \text{ V dc}; I_C = 50 \text{ A dc}$				
<u>Test 2</u>		$V_{CE} = 30 \text{ V dc}; I_C = 10 \text{ A dc}$				
* <u>Test 3</u>						
2N5685		$V_{CE} = 50 \text{ V dc}; I_C = 560 \text{ mA dc}$				
2N5686		$V_{CE} = 60 \text{ V dc}; I_C = 640 \text{ mA dc}$				
Safe operating area (switching)	3053	Load condition C (unclamped inductive load) (see figure 5) $T_C = +25^\circ\text{C}$ duty cycle ≤ 10 percent $R_S = 0.1 \Omega; t_r = t_f \leq 500 \text{ ns}$				
<u>Test 1</u>		t_p approximately 5 ms (vary to obtain I_C); $R_{BB1} = 10 \Omega;$ $V_{BB1} = 20 \text{ V dc}; R_{BB2} = \infty;$ $V_{BB2} = 0 \text{ V}; V_{CC} = 50 \text{ V dc};$ $I_C = 20 \text{ A dc}; L = 1 \text{ mH};$ Sanford Miller CK - 50, 50 A .002 Ω (or equivalent)				
<u>Test 2</u>		t_p approximately 5 ms (vary to obtain I_C); $R_{BB1} = 100 \Omega;$ $V_{BB1} = 10 \text{ V dc}; R_{BB2} = \infty;$ $V_{BB2} = 0 \text{ V}; V_C = 50 \text{ V dc};$ $I_C = 1.5 \text{ V dc}; L = 80 \text{ mH};$ (2 each signal transformer CH06, 6A) 0.4 Ω (or equivalent)				

See footnote at end of table.

* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u> - Continued						
Safe operating area (switching)	3053	Clamped inductive load (see figures 6 and 7) $T_A = +25^\circ\text{C}$; $V_{CC} = 50\text{ V dc}$				
2N5685		Clamp voltage = 60 V dc				
2N5686		Clamp voltage = 80 V dc				
Electrical measurements		See table I, subgroup 2				

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

* TABLE II. Group B and C delta measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Forward-current transfer ratio	3076	$V_{CE} = 2.0\text{ V dc}$ $I_C = 25\text{ A dc}$ pulsed (see 4.5.1)	Δh_{FE2}	± 25 percent of initial value.		

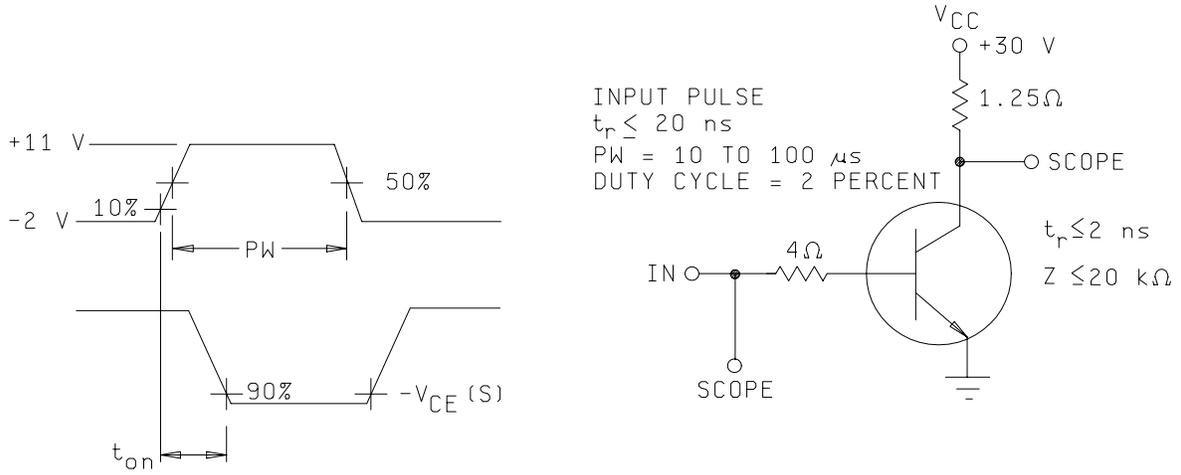
* 1/ The delta measurements for appendix E, table VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500 are in subgroups 3 and 6.

2/ The delta measurements for appendix E, table VII of MIL-PRF-19500 are in subgroup 6.

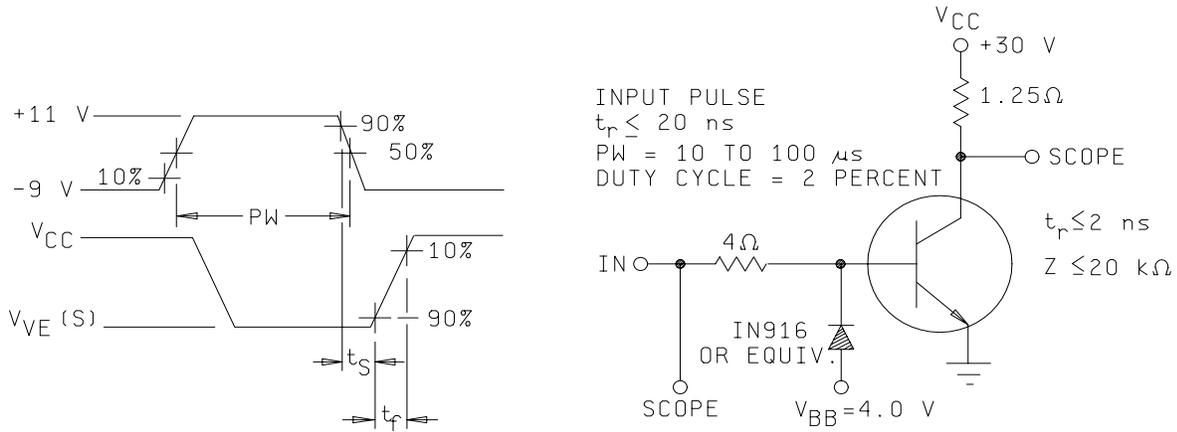
* 3/ The delta measurements for appendix E, table IX of MIL-PRF-19500 are in subgroups 1 and 2.

* TABLE III. Group E inspection (all quality levels) - for qualification or requalification only.

Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling	1051	Test condition C, 500 cycles.	
Hermetic seal Fine leak Gross leak	1071	Test conditions G or H Test conditions C or D	
End-point electrical measurements		See table I, subgroup 2 and table II herein.	
<u>Subgroup 2</u>			45 devices c = 0
Blocking life	1048	Test temperature = +125°C; V _{CB} = 30 V dc; T = 1,000 hours; pre test measurements are table I, subgroup 2.	
End-point electrical measurements		See table I, subgroup 2 and table II herein.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		Each supplier shall submit their qual-lot average and design maximum thermal impedance curves to the qualifying activity. In addition, the optimal test conditions and thermal impedance limit shall be provided to the qualifying activity in the qualification report.	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			3 devices
ESD	1020	Testing not required for class 3 listing. Testing is required for nonsensitive listing to prove capability.	
<u>Subgroup 8</u>			45 devices c = 0
Reverse stability	1033	Condition B.	



TURN-ON (t_{ON}) TIME TEST CIRCUIT



$t_{off} = t_s + t_f$

TURN-OFF (t_{OFF}) TIME TEST CIRCUIT

* FIGURE 2. Switching time test circuits.

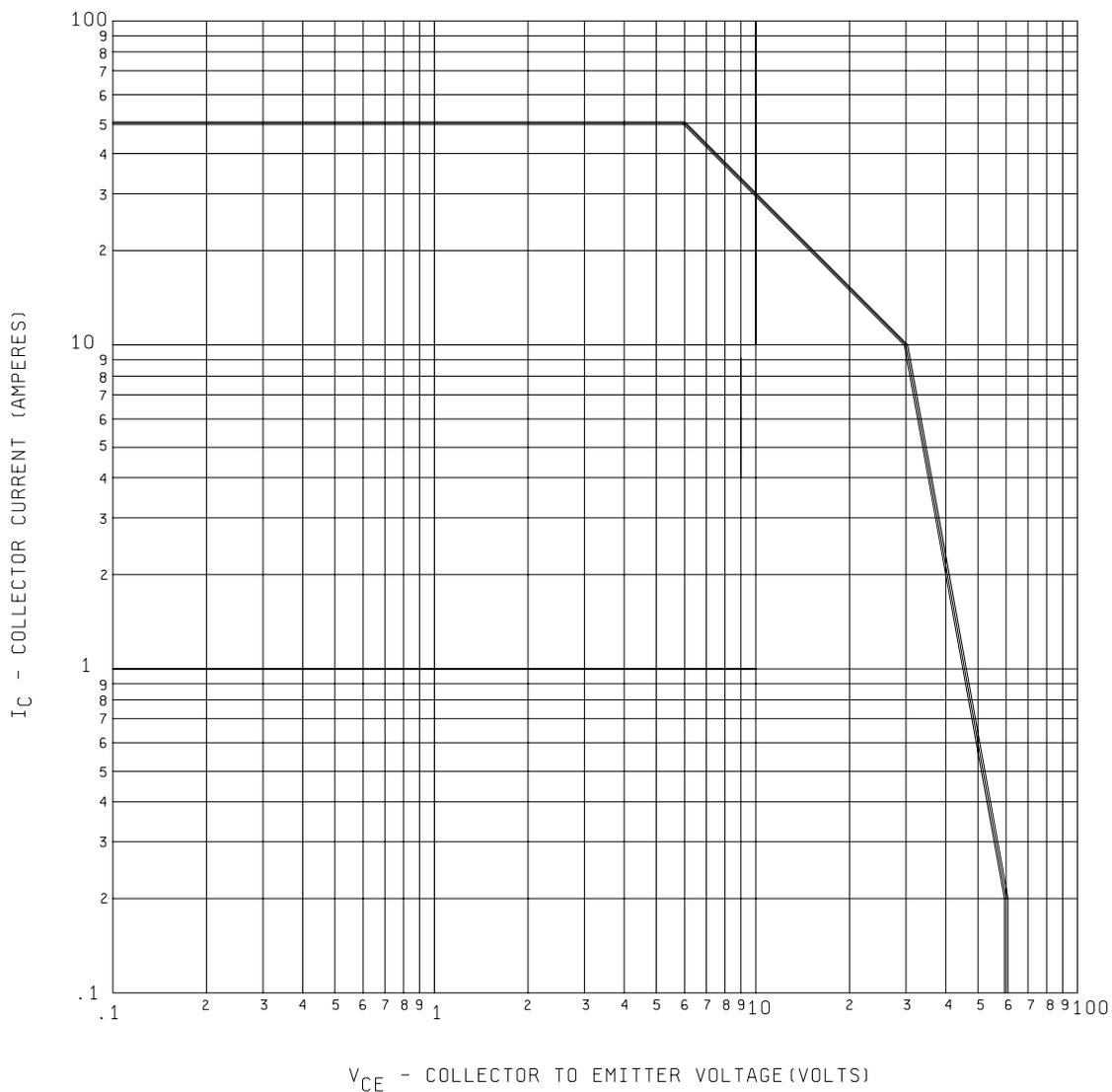


FIGURE 3. Maximum safe operating area graph continuous dc (2N5685).

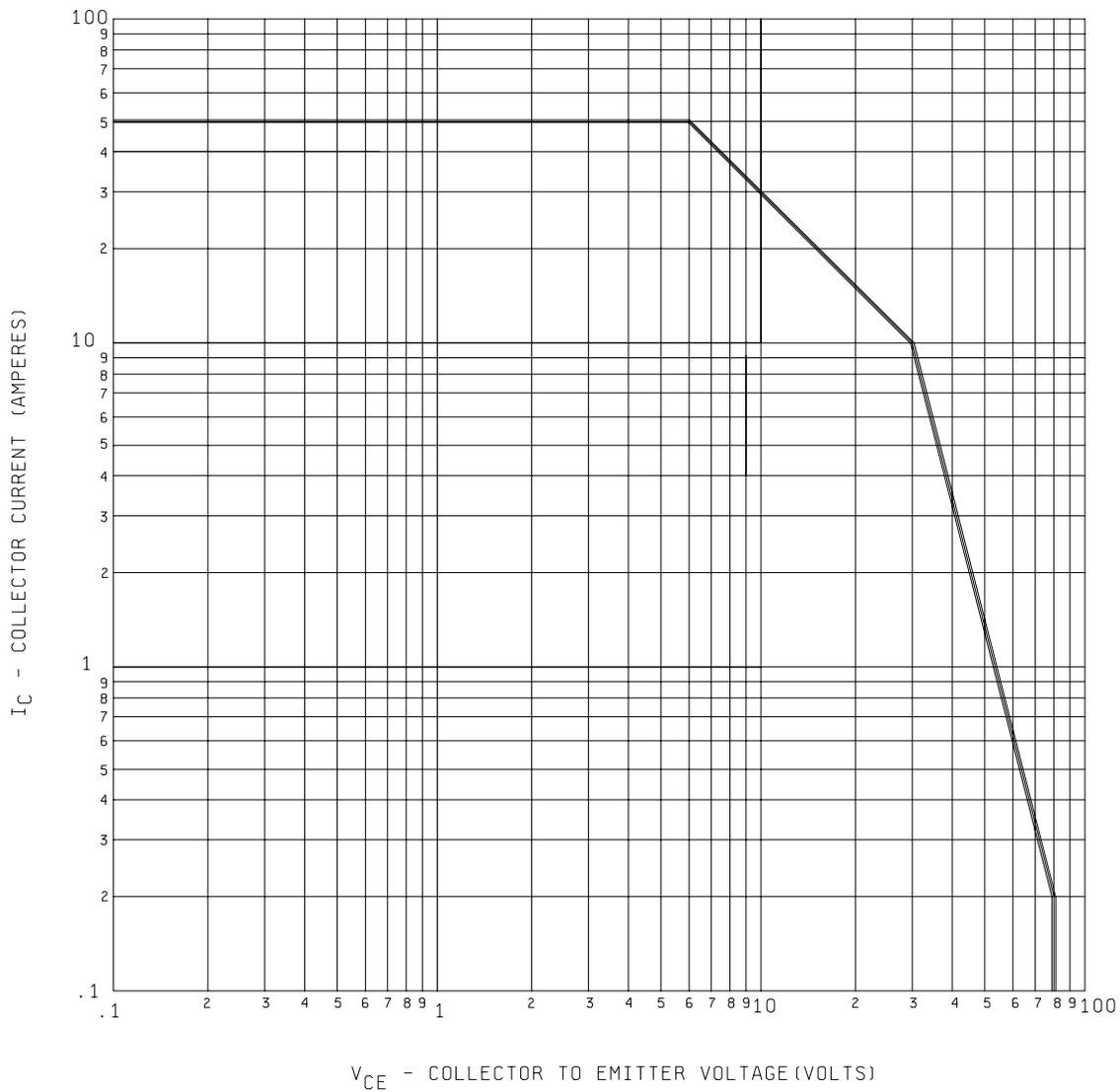


FIGURE 4. Maximum safe operating area graph continuous dc (2N5686).

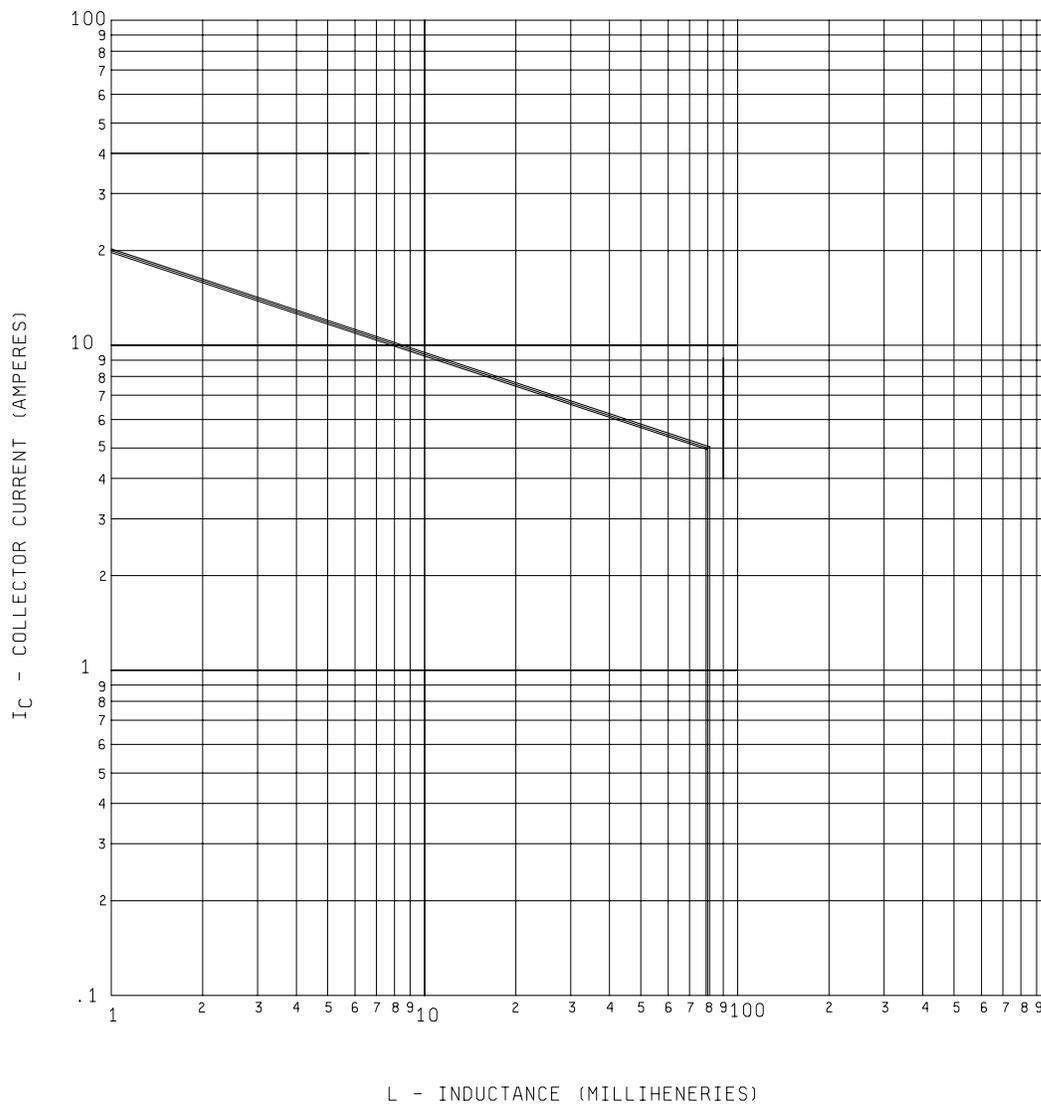
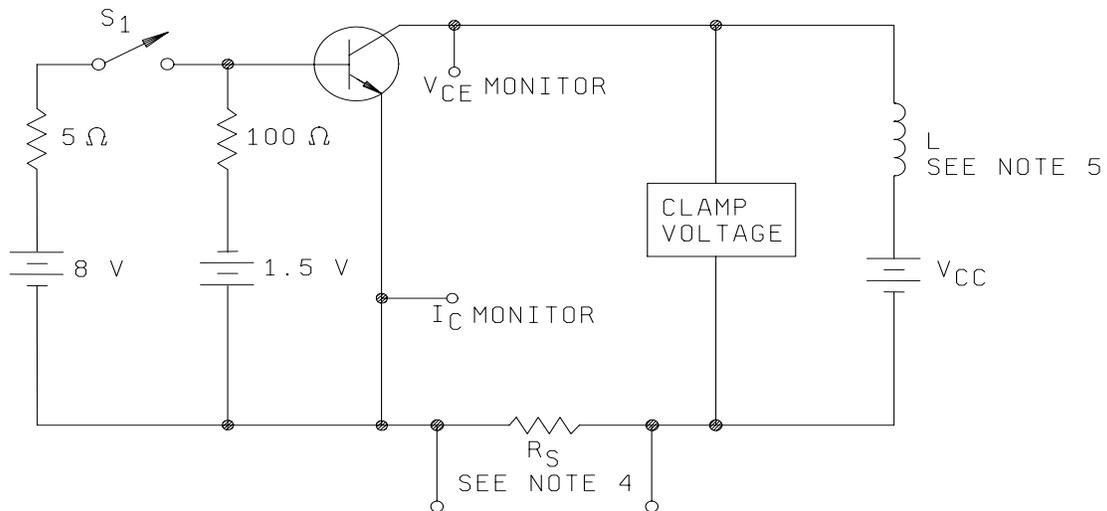


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).



Procedure:

1. With switch S1 closed, set the specified test conditions.
2. Open S1. Device fails if clamp voltage not reached.
3. Perform specified end-point tests.
4. $R_S \leq 0.1\Omega$, 12 W; 1percent tolerance maximum; (noninductive)
5. $L = 2.0$ mH (2 each 1 mH.
Sanford Miller CK-50, 50 A).
 $R = .002\Omega$.

FIGURE 6. Clamp inductive sweep test circuit.

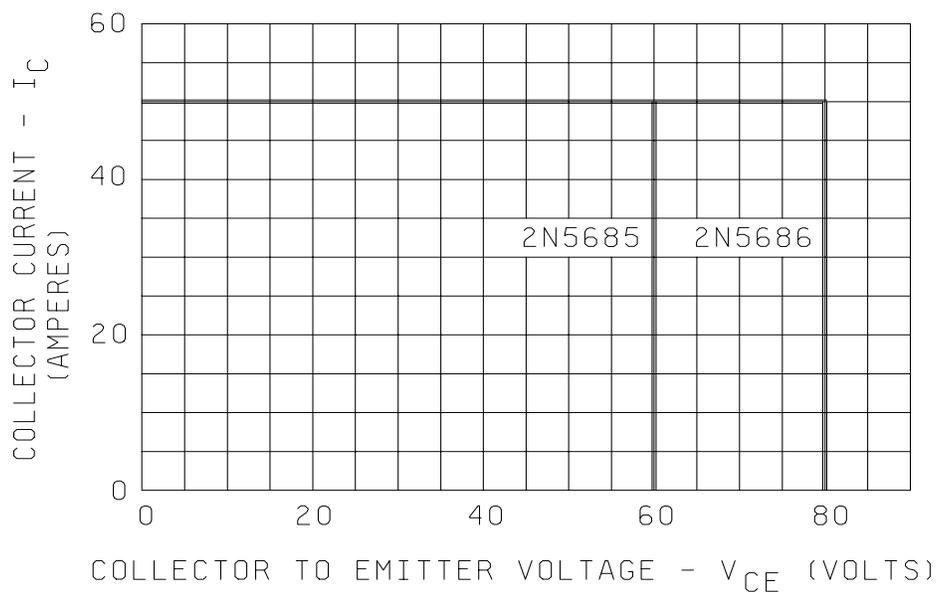


FIGURE 7. Safe operating area for switching between saturation and cutoff (clamped inductive load).

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.)

* 6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

* 6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. Product assurance level and type designator.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000 or e-mail vqe.chief@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:
Army - CR
Navy - EC
Air Force - 11
DLA-CC

Preparing activity:
DLA - CC

(Project 5961-2892)

Review activities:
Army - MI
Air Force - 19, 70, 99

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