

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

INCH-POUND

MIL-PRF-19500/413D  
 21 March 2006  
 SUPERSEDING  
 MIL-PRF-19500/413C  
 30 July 1999

\* PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, NPN, SILICON, HIGH-POWER,  
 TYPES 2N3771 AND 2N3772, 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, high-power transistors for use in high-speed power-switching applications. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (TO-3).

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

Type	$P_T$		$R_{\theta JC}$	$R_{\theta JA}$	$V_{CBO}$	$V_{CEO}$	$V_{EBO}$	$I_B$	$I_C$	$T_{STG}$ and $T_J$
	$T_A = +25^\circ\text{C}$ (1)	$T_C = +25^\circ\text{C}$ (2)								
	<u>W</u>	<u>W</u>	<u><math>^\circ\text{C/W}</math></u>	<u><math>^\circ\text{C/W}</math></u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u><math>^\circ\text{C}</math></u>
2N3771	6	150	1.17	29.2	50	40	7	7.5	30	-65 to +200
2N3772	6	150	1.17	29.2	100	60	7	5.0	20	-65 to +200

(1) Derate linearly 34.2 mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$ .

(2) Derate linearly 857 mW/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$ .

\* 1.4 Primary electrical characteristics.

Type	$h_{FE2}$ at $V_{CE} = 4$ V dc				$V_{CE(SAT)1}$ (1)	
	$I_C = 15$ A dc		$I_C = 10$ A dc		$I_C = 15$ A dc $I_B = 1.5$ A dc	$I_C = 10$ A dc $I_B = 1.0$ A dc
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>	<u>V dc</u>	<u>V dc</u>
2N3771	15	60			1.5 Max	
2N3772			15	60		1.2 Max

(1) Pulsed (see 4.5.1).

\* 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](mailto: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 - continued.

Limits	$ h_{fe} $	$C_{obo}$	Switching (see figure 2)			
	$V_{CE} = 4 \text{ V dc}$ $I_C = 1 \text{ A dc}$ $f = 100 \text{ kHz}$	$V_{CB} = 10 \text{ V dc}$ $I_E = 0$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$t_{on}, t_{off}$ 2N3771		$t_{on}, t_{off}$ 2N3772	
Min	6		$\mu\text{s}$	$\mu\text{s}$	$\mu\text{s}$	$\mu\text{s}$
Max	30	1,200 pF	10	12	8	10

## 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.

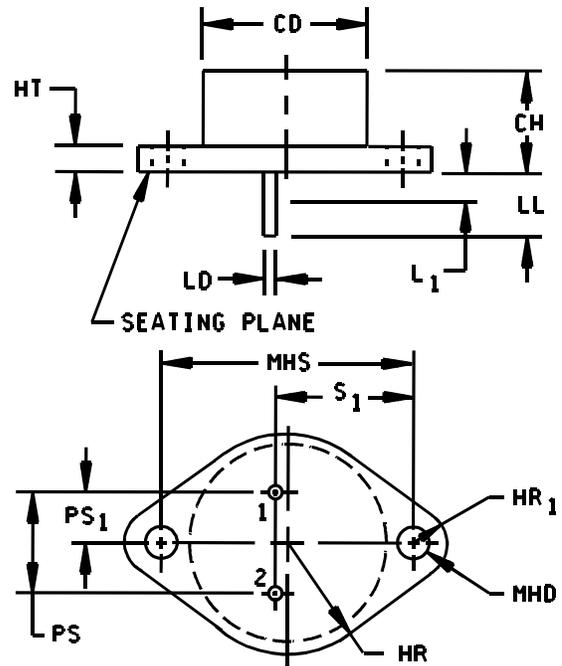
## \* DEPARTMENT OF DEFENSE STANDARDS

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.

Ltr	Dimension				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CH	.270	.380	6.86	9.65	
CD		.875		22.22	
HR	.495	.525	12.57	13.33	
HR <sub>1</sub>	.131	.188	3.33	4.78	
HT	.060	.135	1.52	3.43	
LD	.038	.053	0.97	1.35	7
LL	.312	.500	7.92	12.70	7
L <sub>1</sub>		.050		1.27	7
MHD	.151	.165	3.84	4.19	
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	4
PS <sub>1</sub>	.205	.225	5.21	5.72	4
S <sub>1</sub>	.655	.675	16.64	17.15	



NOTES:

1. Dimensions are in inches.
- \* 2. Millimeters are given for general information only.
3. Terminal 1 is base; terminal 2 is emitter; case is collector.
4. These dimensions should be measured at points .050 - .055 inch (1.27 mm - 1.40 mm) below seating plane. When gauge is not used, measurement will be made at seating plane.
5. The seating place of the header shall be flat within .004 inch (0.102 mm) inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .004 inch (0.03 mm) concave to .006 inch (0.15 mm) convex overall.
6. Collector shall be electrically connected to the case.
- \* 7. LD applies between L<sub>1</sub> and LL. Lead diameter shall not exceed twice LD within L<sub>1</sub>.
- \* 8. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.

\* FIGURE 1. Physical dimensions, TO-3.

### 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. At the option of the manufacturer, the country of origin marking may be omitted from the body of the transistor.

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 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 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.

MIL-PRF-19500/413D

\* 4.3 Screening. 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
3c	Thermal impedance (see 4.3.2)
7	Optional.
9	$I_{CEX1}$ .
11	$I_{CEX1}$ and $h_{FE2}$ ; $\Delta I_{CEX1}$ = 100 percent of initial value or 200 $\mu$ A dc, whichever is greater.
12	Burn-in (see 4.3.1).
13	Subgroup 2 of table I herein. $\Delta I_{CEX1}$ = 100 percent of initial value or 500 $\mu$ A dc, whichever is greater; $\Delta h_{FE2}$ = $\pm 25$ percent of initial reading.
14	Required.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows:  $T_A \leq +35^\circ\text{C}$ ;  $V_{CB} = 25 \text{ V dc} \pm 5 \text{ V dc}$ ;  $T_J = +187.5^\circ\text{C} \pm 12.5^\circ\text{C}$ . NOTE: No heat sink or forced air cooling on the devices shall be permitted.

\* 4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3161 of MIL-STD-750 using the guidelines in that method for determining  $I_M$ ,  $I_H$ ,  $t_H$ ,  $t_{SW}$ , (and  $V_H$  where appropriate). Measurement delay time ( $t_{MD}$ ) = 70  $\mu$ s max. See table III, group E, subgroup 4 herein.

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 IV of MIL-PRF-19500 and table I herein. End-point electrical measurements shall be in accordance with 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 table VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500, and as follows. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta requirement shall be in accordance with table II herein.

4.4.2.1 Group B inspection, table VIb (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1037	For solder die attach: Intermittent operation life; 2,000 cycles; $V_{CB} \geq 10$ V dc; $T_A \leq +35^\circ\text{C}$
B3	1027	For eutectic die attach: $T_A \leq +35^\circ\text{C}$ , $V_{CB} \geq 10$ V dc; adjust $P_T$ to achieve $T_J = +175^\circ\text{C}$ minimum.
B3	2037	Bond strength; test condition A or C as applicable. All internal leads for each device shall be pulled separately.
* B5		Not applicable.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition A, weight = 10 lbs., t = 15 s.
* C5	3131	See 4.3.2, $R_{\theta JC} = 1.17^\circ\text{C/W}$ .
C6	1037	For solder die attach: Intermittent operation life; 6,000 cycles; $V_{CB} \geq 10$ V dc; $T_A \leq +35^\circ\text{C}$
C6	1027	For eutectic die attach: $T_A \leq +35^\circ\text{C}$ , $V_{CB} \geq 10$ V dc; adjust $P_T$ to achieve $T_J = +175^\circ\text{C}$ minimum.

\* 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 table I, subgroup 2 herein.. Delta requirements 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.

MIL-PRF-19500/413D

\* TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>2/</u>	3131	See 4.3.2	$Z_{\theta JX}$			°C/W
Breakdown voltage, collector to base 2N3771 2N3772	3011	Bias condition D, pulsed (see 4.5.1), $I_C = 200$ mA dc	$V_{(BR)CEO}$	40 60		V dc V dc
Breakdown voltage collector to emitter  2N3771 2N3772	3011	Bias condition B, $I_C = 200$ mA dc, $R_{BE} = 100\Omega$ , pulsed (see 4.5.1)	$V_{(BR)CER}$	45 70		V dc V dc
Breakdown voltage, collector to emitter  2N3771 2N3772	3011	Bias condition A, $I_C = 200$ mA dc, $V_{BE} = -1.5$ V dc, pulsed (see 4.5.1)	$V_{(BR)CEX}$	50 90		V dc V dc
Collector-emitter cutoff current 2N3771 2N3772	3041	Bias condition D  $V_{CE} = 30$ V dc $V_{CE} = 50$ V dc	$I_{CEO}$		5 5	mA dc mA dc
Emitter to base cutoff current	3061	Bias condition D, $V_{BE} = 7.0$ V dc	$I_{EBO}$		2.0	mA dc
Collector-emitter cutoff current  2N3771 2N3772	3041	Bias condition A, $V_{BE} = 1.5$ V dc  $V_{CE} = 50$ V dc $V_{CE} = 100$ V dc	$I_{CEX1}$		500 500	$\mu$ A dc $\mu$ A dc
Base emitter voltage (nonsaturated)  2N3771 2N3772	3066	Test condition B, $V_{CE} = 4$ V dc, pulsed (see 4.5.1),  $I_C = 15$ A dc $I_C = 10$ A dc	$V_{BE}$		2.3 2.0	V dc V dc
Collector to emitter voltage (saturated) 2N3771 2N3772	3071	Pulsed (see 4.5.1)  $I_C = 15$ A dc, $I_B = 1.5$ A dc $I_C = 10$ A dc, $I_B = 1.0$ A dc	$V_{CE(sat)1}$		1.5 1.2	V dc V dc

See footnotes at end of table.

\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Collector to emitter voltage (saturated) 2N3771 2N3772	3071	Pulsed (see 4.5.1)  $I_C = 30 \text{ A dc}$ , $I_B = 6 \text{ A dc}$ $I_C = 20 \text{ A dc}$ , $I_B = 4 \text{ A dc}$	$V_{CE(sat)2}$		4 4	V dc V dc
Forward-current transfer ratio	3076	Pulsed (see 4.5.1), $V_{CE} = 4 \text{ V dc}$ , $I_C = 1.0 \text{ A dc}$	$h_{FE1}$	40		
Forward current transfer ratio 2N3771 2N3772	3076	Pulsed (see 4.5.1), $V_{CE} = 4 \text{ V dc}$  $I_C = 15 \text{ A dc}$ $I_C = 10 \text{ A dc}$	$h_{FE2}$	15 15	60 60	
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +150^\circ\text{C}$				
Collector to emitter cutoff current 2N3771 2N3772	3041	Bias condition A, $V_{BE} = -1.5 \text{ V dc}$ $V_{CE} = 50 \text{ V dc}$ $V_{CE} = 100 \text{ V dc}$	$I_{CEX2}$		1.5 1.5	mA dc mA dc
Low temperature operation:		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio 2N3771 2N3772	3076	Pulsed (see 4.5.1), $V_{CE} = 4 \text{ V dc}$ $I_C = 15 \text{ A dc}$ $I_C = 10 \text{ A dc}$	$h_{FE3}$	10 10		
<u>Subgroup 4</u>						
Pulse response	3251	Test condition A except test circuit and pulse requirements in accordance with figure 2 herein				
Turn on time 2N3771 2N3772		$V_{CC} = 30 \text{ V dc}$ $I_C = 15 \text{ A dc}$ , $I_{B1} = 1.5 \text{ A dc}$ $I_C = 10 \text{ A dc}$ , $I_{B1} = 1 \text{ A dc}$	$t_{on}$		10 8	$\mu\text{s}$ $\mu\text{s}$
Turn off time 2N3771  2N3772		$V_{CC} = 30 \text{ V dc}$ $I_C = 15 \text{ A dc}$ , $I_{B1} = 1.5 \text{ A dc}$ $I_{B2} = -1.5 \text{ A dc}$ $I_C = 10 \text{ A dc}$ , $I_{B1} = 1 \text{ A dc}$ $I_{B2} = -1 \text{ A dc}$	$t_{off}$		12 10	$\mu\text{s}$ $\mu\text{s}$

See footnotes at end of table.

\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u> - Continued						
Magnitude of common emitter small-signal short-circuit forward-current transfer ratio	3306	$V_{CE} = 4 \text{ V dc}$ , $I_C = 1.0 \text{ A dc}$ $f = 100 \text{ kHz}$	$ h_{fe} $	6	30	
Small-signal short-circuit forward-current transfer ratio	3206	$V_{CE} = 10 \text{ V dc}$ , $I_C = 1.0 \text{ A dc}$ $f = 1 \text{ kHz}$	$h_{fe}$	40		
Output capacitance (open circuit)	3236	$V_{CB} = 10 \text{ V dc}$ , $I_E = 0$ , $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$C_{obo}$		1,200	pF
<u>Subgroup 5</u>						
Safe operating area (dc operation)	3051	$T_C = +25^\circ\text{C}$ , $t = 1 \text{ s}$ , 1 cycle, see figure 3				
Test 1 (2N3771 only)		$I_C = 30 \text{ A dc}$ $V_{CE} = 5 \text{ V dc}$				
Test 2 (2N3771 only)		$I_C = 3.75 \text{ A dc}$ $V_{CE} = 40 \text{ V dc}$				
Test 3 (2N3772 only)		$I_C = 20 \text{ A dc}$ $V_{CE} = 7.5 \text{ V dc}$				
Test 4 (2N3772 only)		$I_C = 2.5 \text{ A dc}$ $V_{CE} = 60 \text{ V dc}$				
Safe operating area (clamped inductive)	3053	Load condition B, $T_C = +25^\circ\text{C}$ , duty cycle $\leq 10$ percent, (vary pulse width to achieve $I_C$ ), $R_s = 0.1\Omega$ , (see figure 4)				
Test 1 (2N3771 only)		$R_{BB1} = 2\Omega$ , $V_{BB1} \leq 14 \text{ V dc}$ , $R_{BB2} = 100\Omega$ , $V_{BB2} \leq 1.5 \text{ V dc}$ , $I_C = 30 \text{ A dc}$ , $V_{CC} = 20 \pm 5 \text{ V dc}$ , $R_L \leq .67\Omega$ , $L = 5 \text{ mH}$ , 0.01 (Signal transformer Co. CH-30 or equivalent), CR = 1N1186A, clamp voltage = 50 +0, -5 V dc, (device fails if clamp voltage not reached)				

See footnotes at end of table.

\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 5</u> - Continued						
Test 2 (2N3772 only)		$R_{BB1} = 2\Omega$ , $V_{BB1} \leq 10$ V dc, $R_{BB2} = 100\Omega$ , $V_{BB2} = 1.5$ V dc, $I_C = 20$ A dc, $V_{CC} = 40 \pm 5$ V dc, $R_L \leq 2\Omega$ , $L = 5$ mH, $0.01\Omega$ (Signal transformer Co. CH-30 or equivalent), CR = 1N1186A, clamp voltage = $90 +0, -5$ V dc, (device fails if clamp voltage not reached)				
Electrical measurements		See table I, subgroup 2				
<u>Subgroup 6</u>						
Safe operating area (unclamped inductive)	3053	Load condition C (unclamped inductive load) see figure 5 herein; $T_C = +25^\circ\text{C}$ ; duty cycle $\leq 10\%$ ; $R_S = 0.1\Omega$ ; $R_{BB2} = 100\Omega$ ; $V_{BB2} = 1.5$ V dc; $V_{CC} \leq 15$ V dc.				
Test 1 (2N3771 only)		$R_{BB1} = 1\Omega$ ; $V_{BB1} \leq 12$ V dc; $I_C = 30$ A dc; $L = 1$ mH, $0.005\Omega$ (Signal transformer Co. CH-100 or equivalent); $t_p \approx 5$ ms.				
Test 2 (2N3772 only)		$R_{BB1} = 2\Omega$ ; $V_{BB1} \leq 12$ V dc; $I_C = 20$ A dc; $L = 2$ mH, $0.01\Omega$ (Signal transformer Co. CH-50 or equivalent); $t_p \approx 5$ ms.				
Test 3 (both types)		$R_{BB1} \leq 30\Omega$ ; $V_{BB1} \leq 10$ V dc; $I_C = 5$ A dc; $L = 40$ mH, $0.3\Omega$ (Signal transformer Co. CH-8 or equivalent); $t_p \approx 20$ ms.				

See footnotes at end of table.

MIL-PRF-19500/413D

\* TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u> - Continued						
Safe operating area (clamped inductive) (destructive)	3053	Load condition B; $T_C = +25^\circ\text{C}$ ; duty cycle $\leq 10\%$ ; $R_S = 0.1\Omega$ ; (see figure 4).				
Test 1 (2N3771 only)		$R_{BB1} = 2\Omega$ ; $V_{BB1} \leq 14\text{ V dc}$ ; $R_{BB2} = 100\Omega$ ; $V_{BB2} = 1.5\text{ V dc}$ ; $I_C = 30\text{ A dc}$ ; $V_{CC} = 50 +0, -5$ $\text{V dc}$ ; $R_L = 1.67\Omega$ ; $L = 5\text{ mH}$ , $0.01\Omega$ (Signal transformer Co. CH-30 or equivalent); CR = 1N1186A; Clamp voltage = $50 +0, -5\text{ V dc}$ .				
Test 2 (2N3772 only)		$R_{BB1} = 2\Omega$ ; $V_{BB1} \leq 10\text{ V dc}$ ; $R_{BB2} = 100\Omega$ ; $V_{BB2} = 1.5\text{ V dc}$ $I_C = 20\text{ A dc}$ ; $V_{CC} = 90 +0, -5$ $\text{V dc}$ ; $R_L = 4.5\Omega$ ; $L = 5\text{ mH}$ , $0.01\Omega$ (Signal transformer Co. CH-30 or equivalent); CR = 1N1186A; Clamp voltage = $90 +0, -5\text{ V dc}$ .				
Electrical measurements		See table I, subgroup 2				

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

2/ This test required for the following end-point measurements only:  
Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).  
Group C, subgroup 2 and 6.  
Group E, subgroup 1.

\* TABLE II. Groups B, C, and E delta measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1.	Forward-current transfer ratio  2N3771 2N3772	3076	$V_{CE} = 4\text{ V dc}$ , pulsed (see 4.5.1)  $I_C = 15\text{ A dc}$ $I_C = 10\text{ A dc}$	$\Delta h_{FE2}$ <u>4/</u>			$\pm 25\%$ change from previously measured value

1/ The delta measurements for table IX of MIL-PRF-19500 are subgroups 1 and 2.

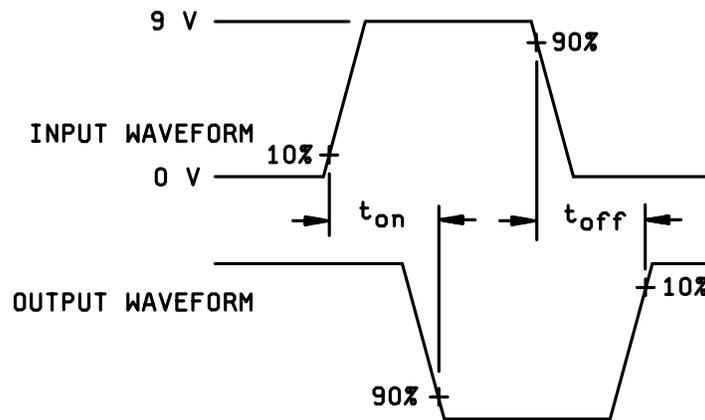
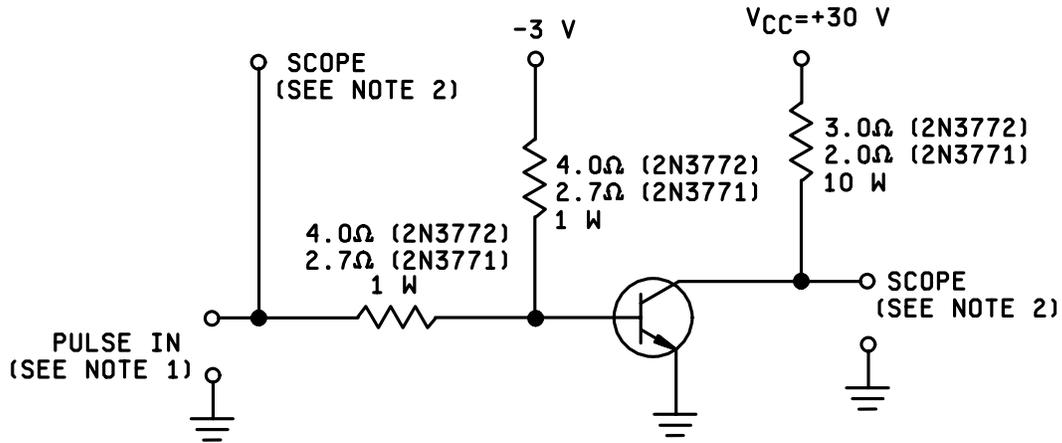
2/ The delta measurements for table VIb, (JAN, JANTX and JANTXV) of MIL-PRF-19500 are subgroups 3 and 6.

3/ The delta measurements for table VII of MIL-PRF-19500 are subgroups 2 and 6.

4/ Devices which exceed the group A limits for this test shall not be acceptable.

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

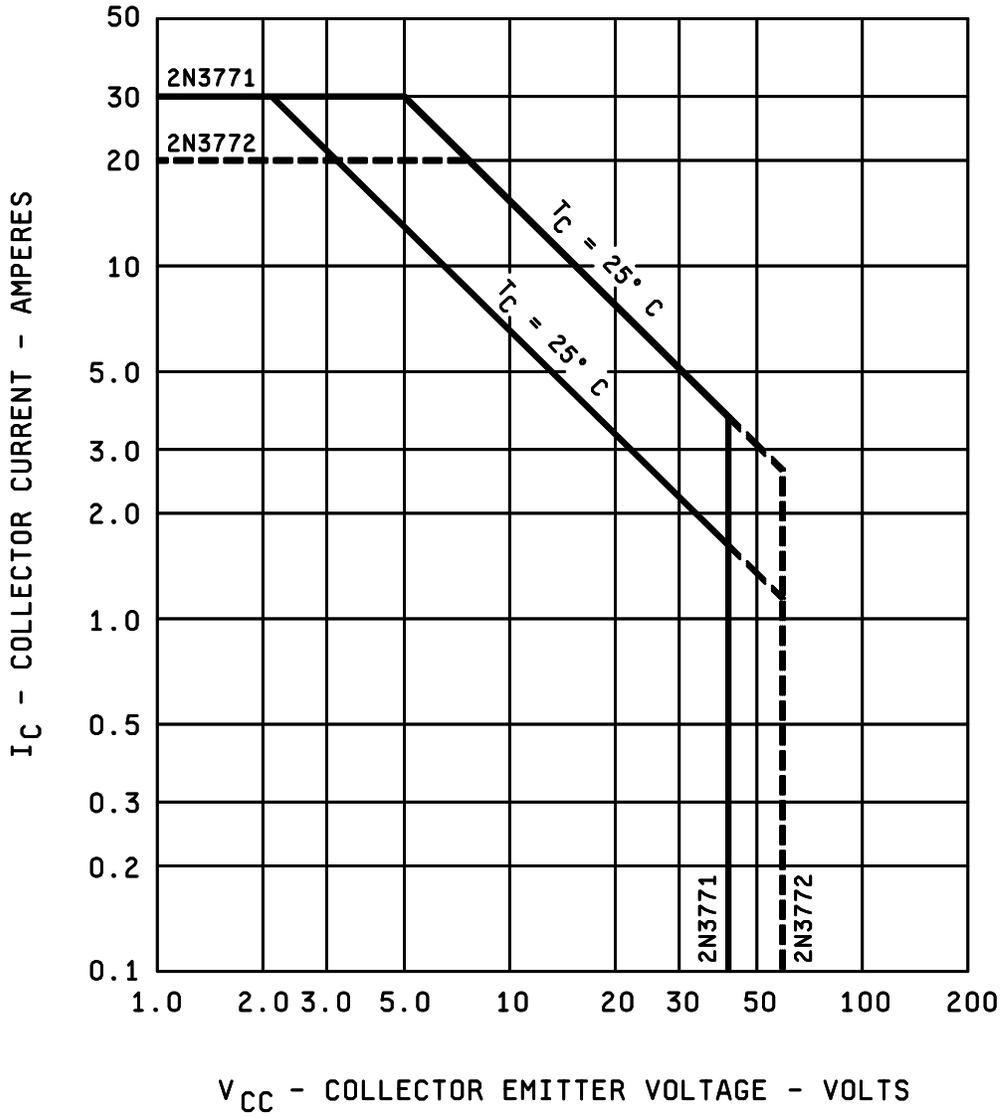
Inspection	MIL-STD-750		Qualification and large lot quality conformance inspection
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling	1051	1,000 cycles	
Hermetic seal	1071		
Fine leak		Test conditions G or H	
Gross leak		Test conditions C or D	
Electrical measurements		Table I, subgroup 2 and table II herein.	
<u>Subgroup 2</u>			45 devices c = 0
Blocking life	1048	1,000 hours minimum, $T_A = +150^\circ\text{C}$ , $V_{CB} = 80$ percent of rated.	
Electrical measurements		Table I, subgroup 2 and table II herein.	
<u>Subgroup 4</u>			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500.	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			3 devices
ESD	1020	Testing is not required for class 3 listing. Testing is required for a nonsensitive listing to prove capability.	
<u>Subgroup 8</u>			22 devices c = 0
Reverse stability	1033	Condition B	



## NOTES:

1. The rise time ( $t_r$ ) and fall time ( $t_f$ ) of the applied pulse shall be each  $\leq 20$  nanoseconds; duty cycle  $\leq 2$  percent; generator source impedance shall be  $50\Omega$ ; pulse width =  $20\ \mu\text{s}$ .
2. Output sampling oscilloscope:  $Z_{in} \geq 100\ \text{k}\Omega$ ;  $C_{in} \leq 50\ \text{pF}$ ; rise time  $\leq 2.0$  nanoseconds.

FIGURE 2. Pulse response test circuit.



\* FIGURE 3. Maximum safe operating area graph (continuous dc).

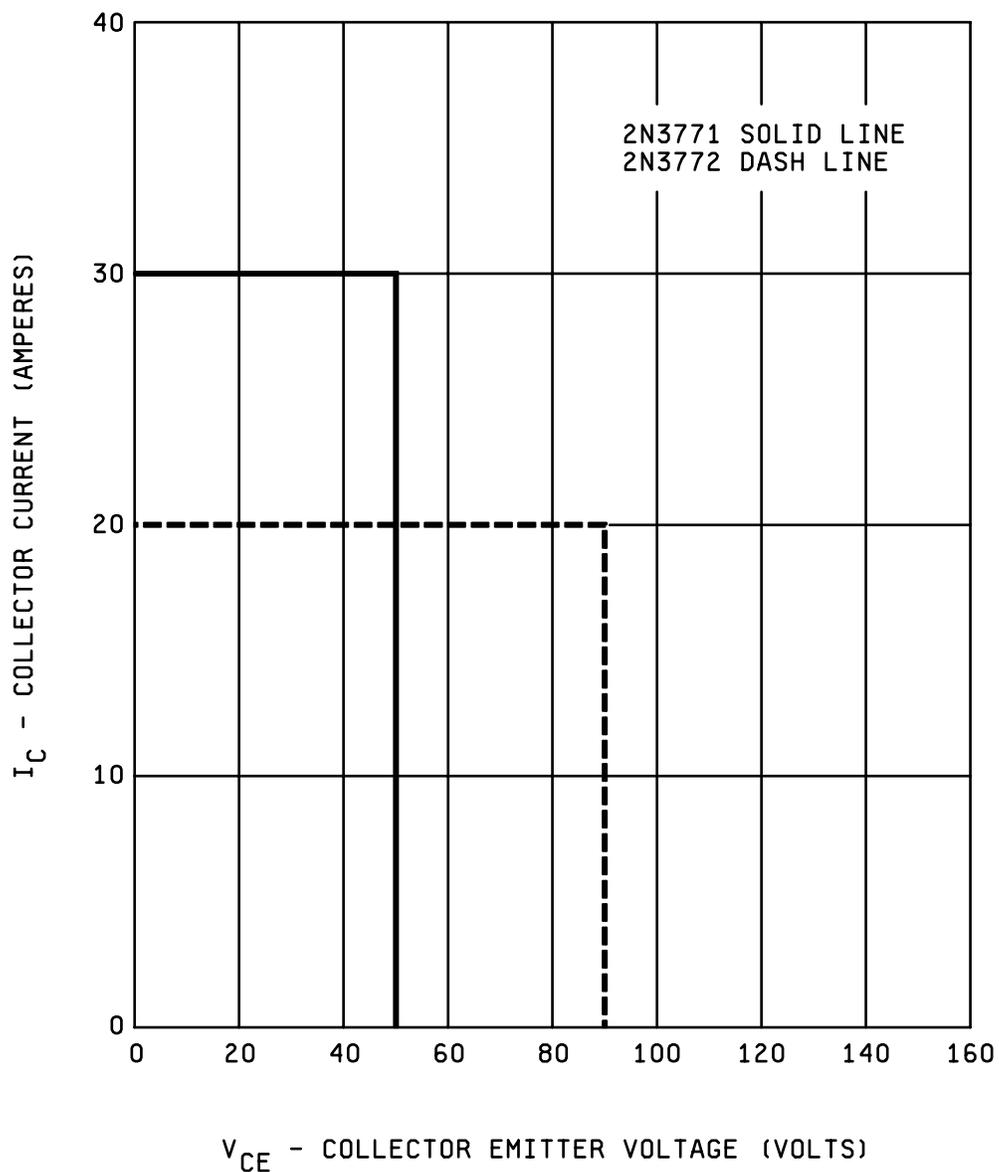


FIGURE 4. Safe operating area for switching between saturation and cutoff (clamped inductive load).

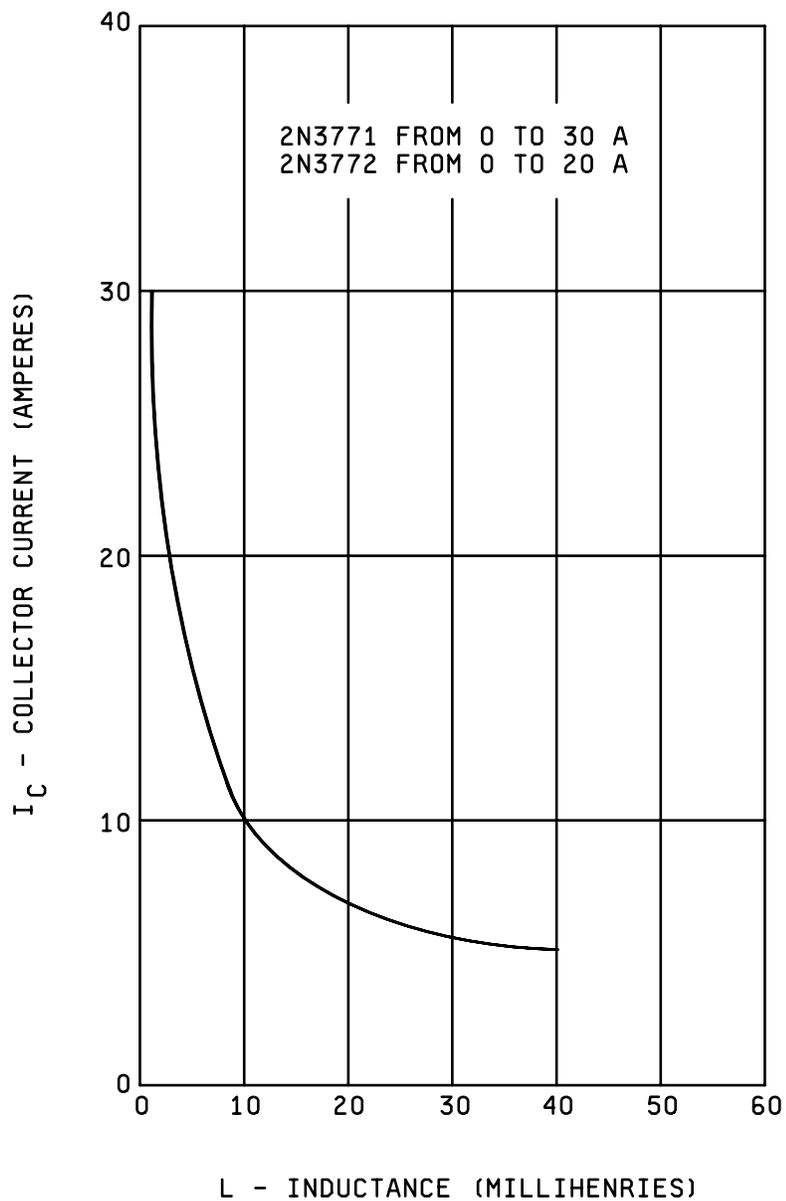


FIGURE 5. Safe operating area switching between saturation and cutoff (unclamped inductive load).

## 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 43218-3990 or e-mail [vqe.chief@dla.mil](mailto: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  
NASA - NA  
DLA - CC

Preparing activity:  
DLA - CC  
  
(Project 5961-3024)

Review activity:  
Air Force - 19, 99

\* 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 <http://assist.daps.dla.mil/>.