The documentation and process conversion measures necessary to comply with this revision shall be completed by 27 November 2015.

INCH–POUND

MIL–PRF–19500/413G
27 August 2015
SUPERSEDING
MIL–PRF–19500/413F
15 October 2008

PERFORMANCE SPECIFICATION SHEET

TRANSISTOR, NPN, SILICON, HIGH-POWER,
TYPES 2N3771 AND 2N3772, QUALITY LEVELS JAN, JANTX, AND JANTXV

Inactive for new design after 7 June 1999.

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 (JAN, JANTX, and JANTXV) are provided for each device type as specified in MIL–PRF–19500.

1.2 Package outline. The device package outline for this specification sheet is a TO–204AA (formerly TO–3) in accordance with figure 1 for all encapsulated device types.

1.3 Maximum ratings. Unless otherwise specified, T_A = +25ºC.

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 = +25ºC (1)	T_C = +25ºC (2)								
	W	W	ºC/W	ºC/W	V dc	V dc	V dc	V dc	A dc	ºC
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/ºC for T_A > +25ºC.
(2) Derate linearly 857 mW/ºC for T_C > +25ºC.

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
	Min	Max	Min	Max	V dc	V dc
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 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 - continued.

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

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. The three 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", and "JANTXV".

1.5.2 Type designation. The component designations for the medium power transistors covered by this specification sheet are as follows.

1.5.2.1 First number and first letter symbols. The transistors of this specification sheet are identified by the first number and letter symbols "2N".

1.5.2.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follows: "3771" and "3772".

1.5.3 Suffix symbols. Suffix symbols are not applicable for this specification sheet.

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

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

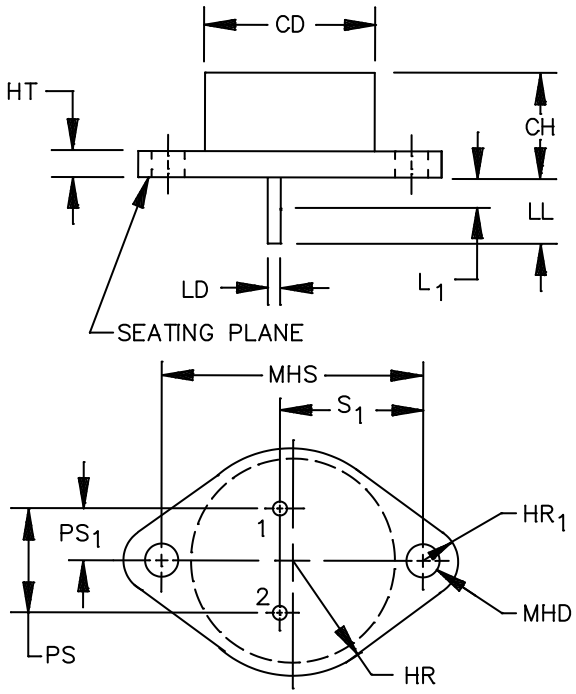
DEPARTMENT OF DEFENSE STANDARDS

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

(Copies of these documents are available online at http://quicksearch.dla.mil.)

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

Ltr	Dimension				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.22	
CH	.270	.380	6.86	9.65	
HR	.495	.525	12.57	13.33	3
HR_1	.131	.188	3.33	4.78	3
HT	.060	.135	1.52	3.43	
LD	.038	.053	0.97	1.35	3, 4
LL	.312	.500	7.92	12.70	4
L_1		.050		1.27	4
MHD	.151	.165	3.84	4.19	3
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	5
PS_1	.205	.225	5.21	5.72	5
S_1	.655	.675	16.64	17.15	



NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Terminal 1 is base; terminal 2 is emitter; case is collector. The collector shall be electrically connected to the case.
3. Two places.
4. LD within L_1. LD applies between L_1 and LL. Lead diameter shall not exceed twice LD within L_1.
5. 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.
6. 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 (0.102 mm) concave to .006 inch (0.15 mm) convex overall.
7. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions and configurations of TO–204AA (formerly TO–3) package.

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. The interface requirements and physical dimensions shall be as specified in MIL–PRF–19500, and on figure 1.

3.4.1 Lead finish. The 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).

3.4.2 Pin-out. The pin-out of the device types shall be as shown on figure 1. The collector shall be electrically connected to the case.

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 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 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. 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
	Quality levels JANTX and JANTXV
3c (1)	Thermal impedance (see 4.5.2).
9	I_{CEX1}.
11	I_{CEX1} and h_{FE2}; ΔI_{CEX1} = 100 percent of initial value or 2 μA dc, whichever is greater.
12	Burn-in (see 4.3.1).
13	Subgroup 2 of table I herein. ΔI_{CEX1} = 100 percent of initial value or 2 μA dc, whichever is greater; Δh_{FE2} = ±25 percent of initial reading.

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

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

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL–PRF–19500 and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E–V of MIL–PRF–19500 and table I herein. 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 E–VIB (JAN, JANTX, and JANTXV) of MIL–PRF–19500, and as follows. Delta measurements shall be in accordance with 4.6 herein.

Subgroup	Method	Condition
B3	1037	For solder die attach: 2,000 cycles; $V_{CB} \geq 10$ V dc; $T_A \leq +35^{\circ}C$.
B3	1027	For eutectic die attach: $T_A \leq +35^{\circ}C$, $V_{CB} \geq 10$ V dc; adjust P_T to achieve $T_J = +175^{\circ}C$ minimum.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E–VII of MIL–PRF–19500, and as follows. Delta measurements shall be in accordance with 4.6 herein.

Subgroup	Method	Condition
C2	2036	Test condition A, weight = 10 lbs (4.54 Kg), t = 15 s.
C5	3131	See 4.5.2, $R_{\theta JC}$ = 1.17ºC/W.
C6	1037	For solder die attach: 6,000 cycles; $V_{CB} \geq 10$ V dc; $T_A \leq +35$ºC.
C6	1027	For eutectic die attach: $T_A \leq +35$ºC, $V_{CB} \geq 10$ V dc; adjust P_T to achieve $T_J = +175$ºC minimum.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E–IX of MIL–PRF–19500 and as specified herein. Delta measurements shall be in accordance with 4.6 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 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_{SW}, (and V_H where appropriate). See table II, group E, subgroup 4 herein.

4.6 Delta measurements. The delta measurements for groups B, C, and E inspection shall be as specified below.

Step	Inspection	MIL–STD–750		Symbol	Limit		Unit
	(1), (2), (3), (4)	Method	Conditions		Min	Max	
1.	Forward-current transfer ratio 2N3771 2N3772	3076	V_{CE} = 4 V dc, pulsed (see 4.5.1) I_C = 15 A dc I_C = 10 A dc	Δh_{FE2} 4/			±25% change from previously measured value

(1) Devices which exceed the group A limits of table I for this test shall not be acceptable.
(2) The delta measurements for group B inspection (see 4.4.3 herein), all quality levels, shall be as follows: In addition to the measurements specified for subgroups 3 and 6 of table E–VIB of MIL–PRF–19500, the measurements of steps 1 shall also be taken.
(3) The delta measurements for group C inspection (see 4.4.3 herein), all quality levels, shall be as follows: In addition to the measurements specified for subgroups 2 and 6 of table E–VII of MIL–PRF–19500, the measurements of step 1 shall also be taken.
(4) The delta measurements for group E inspection (see 4.4.4 herein), all quality levels, shall be as follows: In addition to the measurements specified for subgroups 1 and 2 of table E–IX of MIL–PRF–19500, the measurements of step 1 shall also be taken.

TABLE I. Group A inspection.

Inspection 1/	MIL–STD–750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical Examination	2071					
Subgroup 2						
Thermal impedance 2/	3131	See 4.5.2	$Z_{\theta JX}$			°C/W
Breakdown voltage, collector to base	3011	Bias condition D, I_C = 200 mA dc, pulsed (see 4.5.1)	$V_{(BR)CEO}$			
2N3771				40		V dc
2N3772				60		V dc
Breakdown voltage collector to emitter	3011	Bias condition B, I_C = 200 mA dc, R_{BE} = 100Ω, pulsed (see 4.5.1)	$V_{(BR)CER}$			
2N3771				45		V dc
2N3772				70		V dc
Breakdown voltage, collector to emitter	3011	Bias condition A, I_C = 200 mA dc, V_{BE} = -1.5 V dc, pulsed (see 4.5.1)	$V_{(BR)CEX}$			
2N3771				50		V dc
2N3772				90		V dc
Collector-emitter cutoff current	3041	Bias condition D	I_{CEO}			
2N3771		V_{CE} = 30 V dc			5	mA dc
2N3772		V_{CE} = 50 V dc			5	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	3041	Bias condition A, V_{BE} = 1.5 V dc	I_{CEX1}			
2N3771		V_{CE} = 50 V dc			20	µA dc
2N3772		V_{CE} = 100 V dc			20	µA dc
Base emitter voltage (nonsaturated)	3066	Test condition B, V_{CE} = 4 V dc, pulsed (see 4.5.1)	V_{BE}			
2N3771		I_C = 15 A dc			2.3	V dc
2N3772		I_C = 10 A dc			2.0	V dc
Collector to emitter voltage (saturated)	3071	Pulsed (see 4.5.1)	$V_{CE(sat)1}$			
2N3771		I_C = 15 A dc, I_B = 1.5 A dc			1.5	V dc
2N3772		I_C = 10 A dc, I_B = 1.0 A dc			1.2	V dc

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

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

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL–STD–750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 – Continued						
Magnitude of common emitter small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = 4 V dc, I_C = 1.0 A dc f = 100 kHz	$\|h_{fe}\|$	6	30	
Small-signal short-circuit forward-current transfer ratio	3206	V_{CE} = 10 V dc, I_C = 1.0 A dc f = 1 kHz	h_{fe}	40		
Output capacitance (open circuit)	3236	V_{CB} = 10 V dc, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}		1,200	pF
Subgroup 5						
Safe operating area (dc operation)	3051	T_C = +25ºC, t = 1 s, 1 cycle, (see figure 3)				
Test 1 (2N3771 only)		I_C = 30 A dc V_{CE} = 5 V dc				
Test 2 (2N3771 only)		I_C = 3.75 A dc V_{CE} = 40 V dc				
Test 3 (2N3772 only)		I_C = 20 A dc V_{CE} = 7.5 V dc				
Test 4 (2N3772 only)		I_C = 2.5 A dc V_{CE} = 60 V dc				
Safe operating area (clamped inductive)	3053	Load condition B, T_C = +25ºC, duty cycle ≤ 10 percent, (vary pulse width to achieve I_C), R_s = 0.1Ω, (see figure 4)				
Test 1 (2N3771 only)		R_{BB1} = 2Ω, V_{BB1} ≤ 14 V dc, R_{BB2} = 100Ω, V_{BB2} ≤ 1.5 V dc, I_C = 30 A dc, V_{CC} = 20 ±5 V dc, R_L ≤ .67Ω, L = 5 mH, 0.01Ω (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 1/	MIL–STD–750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5 - Continued						
Test 2 (2N3772 only)		R_{BB1} = 2Ω, V_{BB1} ≤ 10 V dc, R_{BB2} = 100Ω, V_{BB2} = 1.5 V dc, I_C = 20 A dc, V_{CC} = 40 ±5 V dc, R_L ≤ 2Ω, L = 5 mH, 0.01Ω (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				
Subgroup 6						
Safe operating area (unclamped inductive)	3053	Load condition C (unclamped inductive load) see figure 5 herein; T_C = +25ºC; duty cycle ≤ 10%; R_S = 0.1Ω; R_{BB2} = 100Ω; V_{CC} ≤ 15 V dc.				
Test 1 (2N3771 only)		V_{BB2} = 1.5 V dc; R_{BB1} = 1Ω, V_{BB1} ≤ 12 V dc, I_C = 30 A dc, L = 1 mH, 0.005Ω (Signal Transformer Co. CH-100 or equivalent), t_p ≈ 5 ms.				
Test 2 (2N3772 only)		V_{BB2} = 1.5 V dc, R_{BB1} = 2Ω, V_{BB1} ≤ 12 V dc, I_C = 20 A dc, L = 2 mH, 0.01Ω (Signal Transformer Co. CH-50 or equivalent), t_p ≈ 5 ms.				
Test 3 (both types)		V_{BB2} = 0 V, R_{BB1} ≤ 30Ω, V_{BB1} ≤ 10 V dc, I_C = 5.5 A dc, L = 40 mH, 0.3Ω (Signal Transformer Co. CH-8 or equivalent), t_p ≈ 20 ms.				

See footnotes at end of table.

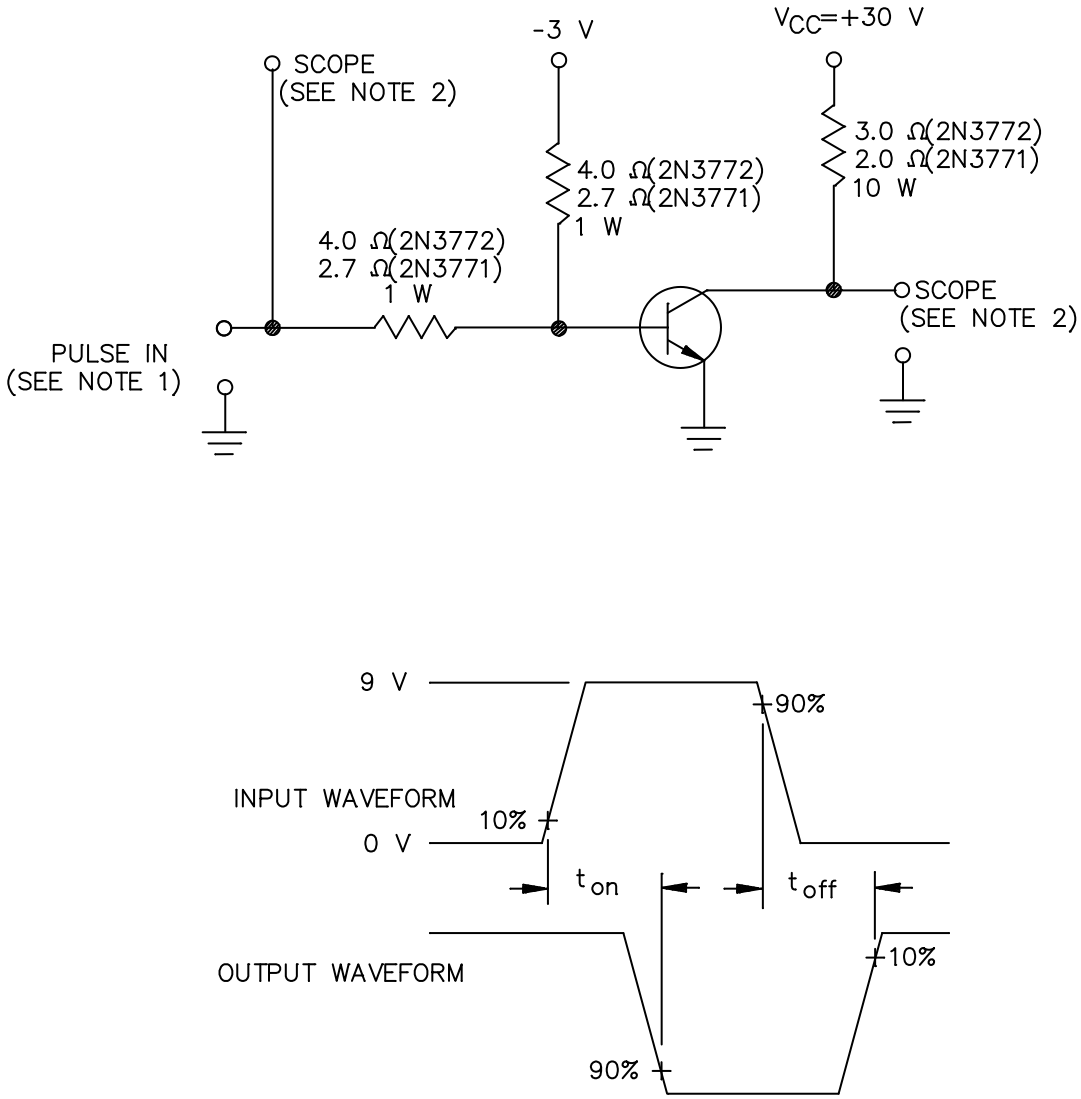
TABLE I. Group A inspection - Continued.

Inspection 1/	MIL–STD–750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 6 - Continued						
Safe operating area (clamped inductive) (destructive)	3053	Load condition B, T_C = +25ºC, duty cycle ≤ 10%, R_S = 0.1Ω, (see figure 4).				
Test 1 (2N3771 only)		R_{BB1} = 2Ω, V_{BB1} ≤ 14 V dc, R_{BB2} = 100Ω, V_{BB2} = 1.5 V dc, I_C = 30 A dc, V_{CC} = 50 +0, –5 V dc, R_L = 1.67Ω, L = 5 mH, 0.01Ω (Signal Transformer Co. CH-30 or equivalent), CR = 1N1186A, clamp voltage = 50 +0, –5 V dc.				
Test 2 (2N3772 only)		R_{BB1} = 2Ω, V_{BB1} ≤ 10 V dc, R_{BB2} = 100Ω, V_{BB2} = 1.5 V dc I_C = 20 A dc, V_{CC} = 90 +0, –5 V dc, R_L = 4.5Ω, L = 5 mH, 0.01Ω (Signal Transformer Co. CH-30 or equivalent), CR = 1N1186A, clamp voltage = 90 +0, –5 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. Group E inspection (all quality levels) for qualification or re-qualification only.

Inspection	MIL–STD–750		Sample plan
	Method	Conditions	
Subgroup 1			45 devices c = 0
Temperature cycling	1051	1,000 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		Table I, subgroup 2 and 4.6 herein.	
Subgroup 2			45 devices c = 0
Blocking life	1048	1,000 hours minimum, T_A = +150ºC, V_{CB} = 80 percent of rated.	
Electrical measurements		Table I, subgroup 2 and 4.6 herein.	
Subgroup 4			Sample size N/A
Thermal impedance curves		See MIL–PRF–19500	
Subgroup 8			45 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 ≤ 20 nanoseconds, duty cycle ≤ 2 percent, generator source impedance shall be 50Ω, pulse width = 20 μs.
2. Output sampling oscilloscope: Z_{in} ≥ 100 kΩ, C_{in} ≤ 50 pF, rise time ≤ 2.0 nanoseconds.

FIGURE 2. Pulse response test circuit.

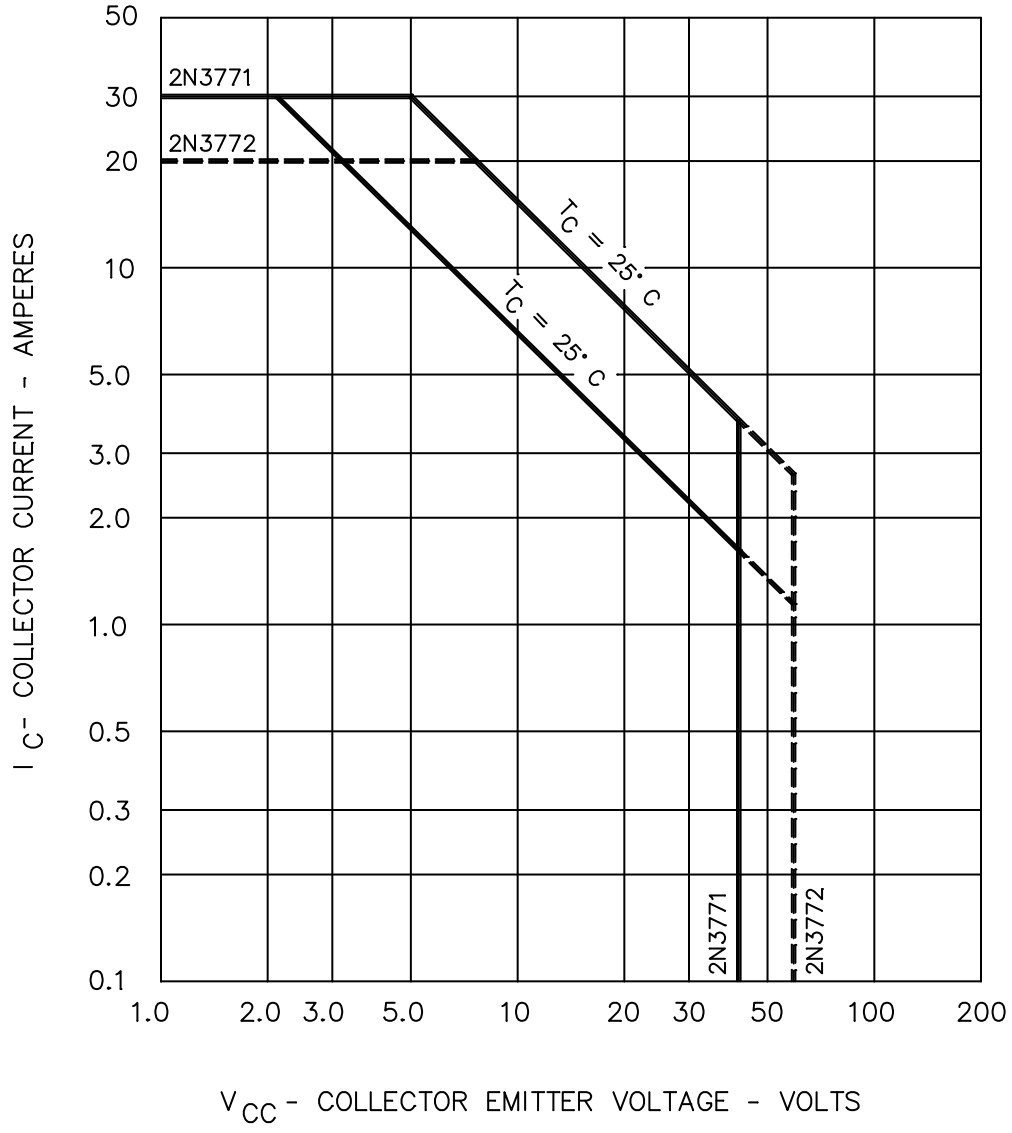


FIGURE 3. Maximum safe operating area graph (continuous dc).

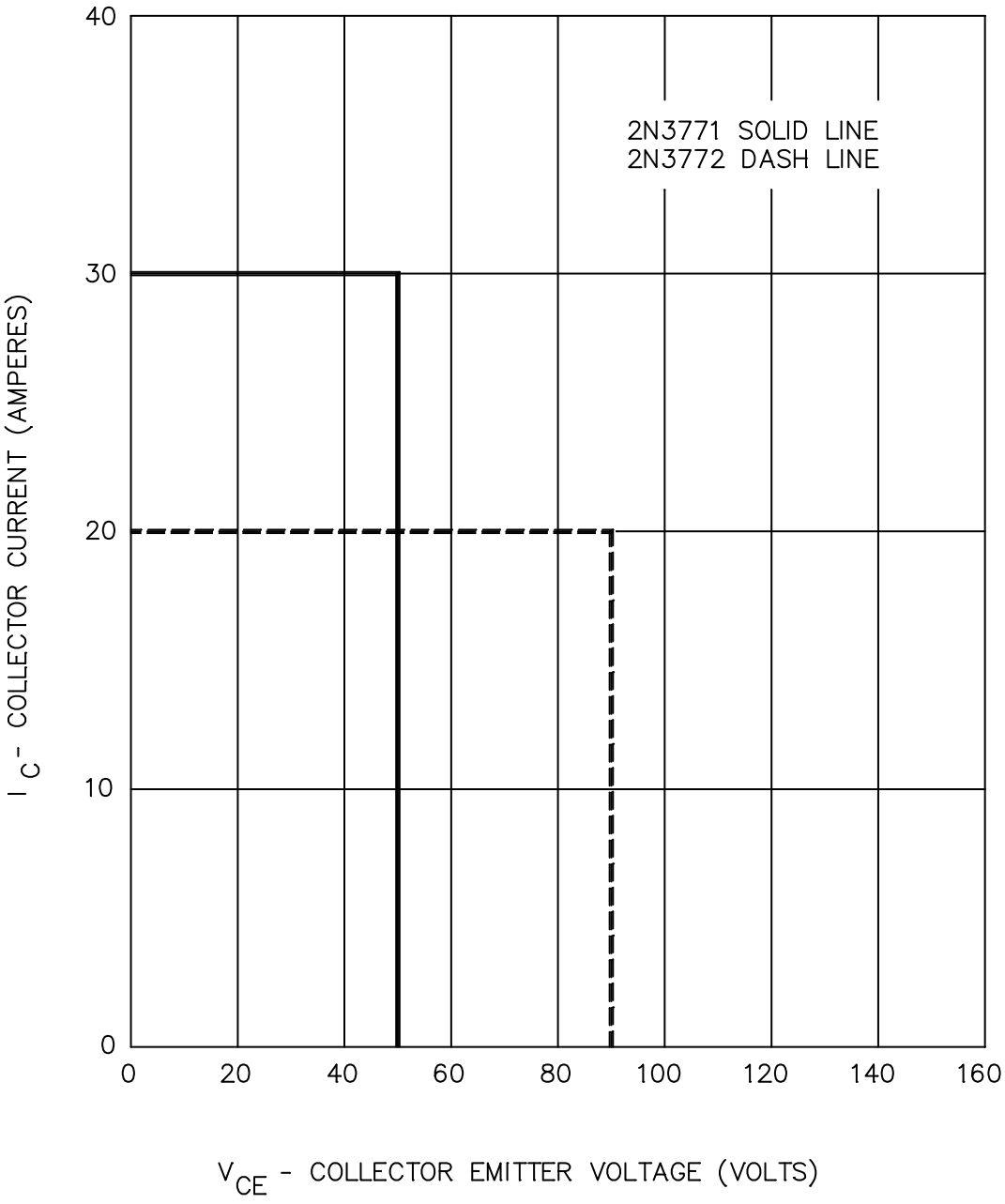


FIGURE 4. Safe operating area for switching between saturation and cutoff (clamped inductive load).

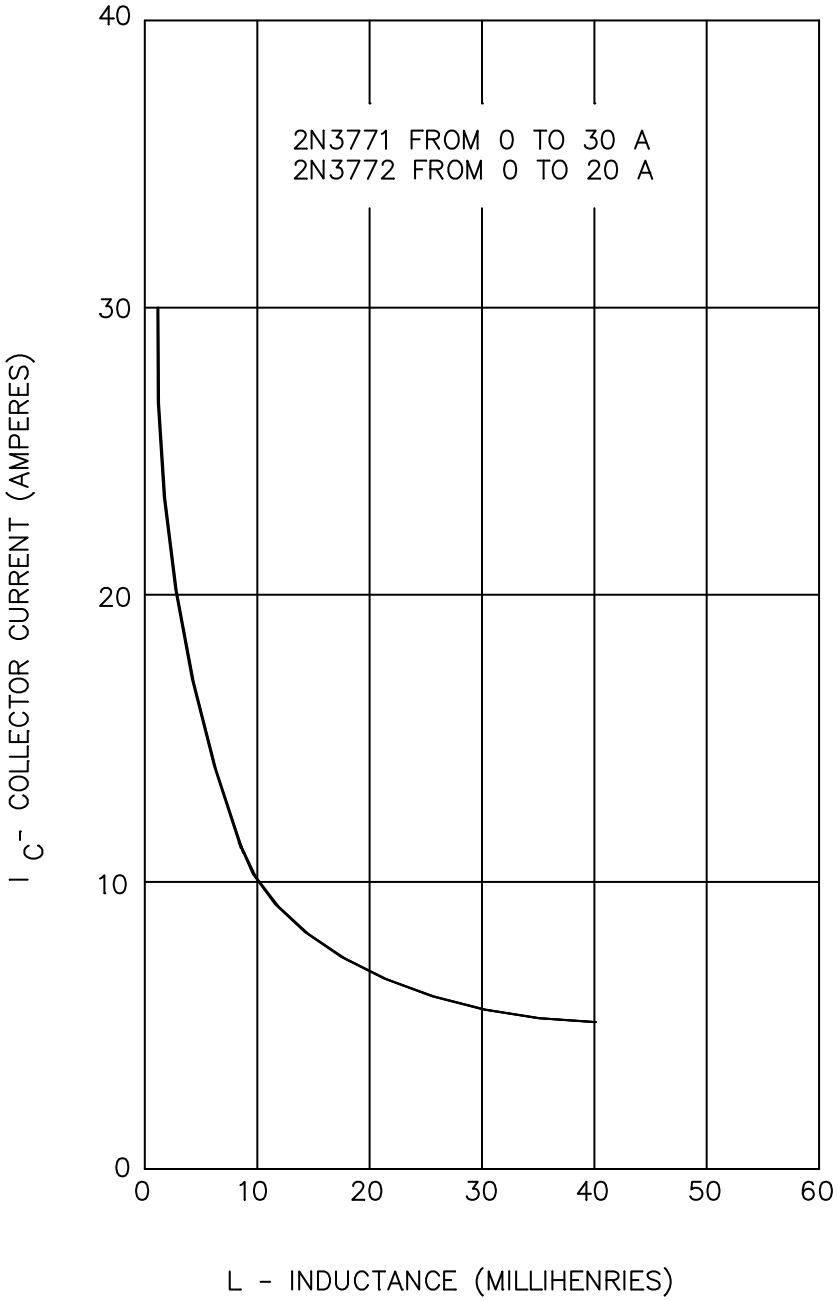


FIGURE 5. Safe operating area switching between saturation and cutoff (unclamped inductive load).

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. 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.

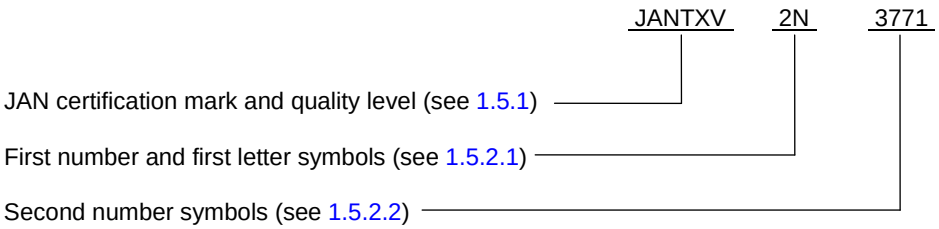
b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

d. The complete PIN, see 1.5.

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 (QPDSIS–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 http://assist.dla.mil.

6.4 PIN construction example. The PINs for encapsulated devices are construction using the following form.



6.5 List of PINs. The following is a list of possible PINs available for devices covered by this specification sheet.

PINs for devices of the base quality level	PINs for devices of the "TX" quality level	PINs for devices of the "TXV" quality level
JAN2N3771	JANTX2N3771	JANTXV2N3771
JAN2N3772	JANTX2N3772	JANTXV2N3772

6.6 Supersession information.

6.6.1 Lead finish. The original issue of this specification through MIL–S–19500/413(USAF) with amendment 3 (30 January 1974) did not specify a lead finish. MIL–S–19500/413A (3 January 1983) specified that the lead finish as "gold plated, tin plated, or solder dipped". MIL–S–19500/413B (24 March 1993) modified the lead finish to "gold or tin or solder". The requirement for a specific lead finish was removed by MIL–PRF–19500/413C (30 July 1999). Tin or tin plating is no longer acceptable as a lead finish.

6.6.2 Lead material. The original issue of this specification through MIL–S–19500/413(USAF) with Amendment 3 (30 January 1974) did not specify a lead material. MIL–S–19500/413A (3 January 1983) specified that the lead material as "Kovar or Alloy 52". Because of the performance format of MIL–PRF–19500/413C (30 July 1999) and later issues of this document, the requirement for a specific lead material has been removed.

6.7 Request for new types and configurations. Requests for new device types or configurations for inclusions in this specification sheet should be submitted to: DLA Land and Maritime, ATTN: VAC, Post Office Box 3990, Columbus, OH 43218-3990 or by electronic mail at "Semiconductor@.dla.mil" or by facsimile (614) 693–1642 or DSN 850–6939.

6.8 Changes from previous issue. The margins of this specification are marked with vertical lines 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 – 85
DLA – CC

Review activities:
Army – AR, AV, MI, SM

Preparing activity:
DLA – CC

(Project 5961–2015–064)

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.