The documentation and process conversion measures necessary to comply with this revision shall be completed by 4 May 2015.

INCH–POUND

MIL–PRF–19500/537A
2 February 2015
SUPERSEDING
MIL–S–19500/537(USAF)
22 October 1980

PERFORMANCE SPECIFICATION SHEET

TRANSISTOR, NPN, SILICON, POWER, HIGH-SPEED,
THROUGH-HOLE AND STUD MOUNT PACKAGES, TYPES 2N6674, 2N6675, 2N6689, AND 2N6690,
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, power transistors for use in high-speed power-switching applications. Three levels of product assurance (JAN, JANTX, and JANTXV) are provided for encapsulated devices as specified in MIL–PRF–19500.

1.2 Package outlines. The device package outlines are a modified TO–204AD (formerly TO–3) in accordance with figure 1 for types 2N6674 and 2N6675 or a TO–210AC (formerly TO–61) in accordance with figure 2 for types 2N6689 and 2N6690.

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

Types	P_T (1)		V_{CBO} and V_{CEX}	V_{CEO}	V_{EBO}	I_B	I_C	T_{STG} and T_{OP}
	T_A = +25°C	T_C = +25°C						
	W	W	V dc	V dc	V dc	A dc	A dc	ºC
2N6674	6	175	450	300	7	5	15	–65 to +200
2N6675	6	175	650	400	7	5	15	–65 to +200
2N6689	3	175	450	300	7	5	15	–65 to +200
2N6690	3	175	650	400	7	5	15	–65 to +200

(1) Derate linearly 1.0 W/ºC for T_C > +25°C.
Derate linearly 34.2 mW/ºC for T_A > +25ºC for types 2N6674 and 2N6675.
Derate linearly 17.1 mW/ºC for T_A > +25ºC for types 2N6689 and 2N6690.

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. Unless otherwise specified, T_C = +25ºC.

Limit	h_{FE1} (1) V_{CE} = 3 V dc I_C = 1 A dc	h_{FE2} (1) V_{CE} = 2 V dc I_C = 10 A dc	$\lvert h_{FE} \rvert$ V_{CE} = 10 V dc I_C = 1 A dc f = 5 Mhz	C_{obo} V_{CB} = 10 V dc I_E = 0 100kHz ≤ f ≤ 1 Mhz	$V_{BE(sat)}$ I_C = 10 A dc I_B = 2 A dc	$V_{CE(sat)}$ I_C = 10 A dc I_B = 2 A dc
				pf	V dc	V dc
Minimum	15	8	3	150	---	---
Maximum	40	20	20	500	1.5	1.0

Limit	$R_{\theta JC}$	Switching parameters				
		t_d	t_r	t_s	t_f	t_c
	ºC/W	µs	µs	µs	µs	µs
Minimum	---	---	---	---	---	---
Maximum	1.0	0.1	0.6	2.5	0.5	0.5

(1) Pulsed (see 4.5.1).

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 and 6.5 for a list of available PINs.

1.5.1 JAN certification mark and quality level. The quality level designators for encapsulated devices that are applicable for this specification sheet are "JAN", "TX", and "TXV".

1.5.2 Device type. The designation system for the device types of 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 use 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: "6674", "6675", "6689", and "6690".

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 QML–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.

3. REQUIREMENTS

3.1 General. The individual item requirements for the transistor shall be as specified in MIL–PRF–19500 and as specified herein.

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

3.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein shall be as specified in MIL–PRF–19500 and as follows:

R_{ISO}	Resistance offered by an insulating material to an impressed direct voltages tending to produce a leakage of current through or on the surface of the material.
$T_C = t_{off}$ cross overtime.	The time interval during which the collector voltage rises from 10 percent of its peak off-state value and the collector current falls to 10 percent of its peak on-state value (see figure 3).

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL–PRF–19500 and herein. The device package style is either a TO–204AD in accordance with figure 1 or a TO–210AC in accordance with figure 2.

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

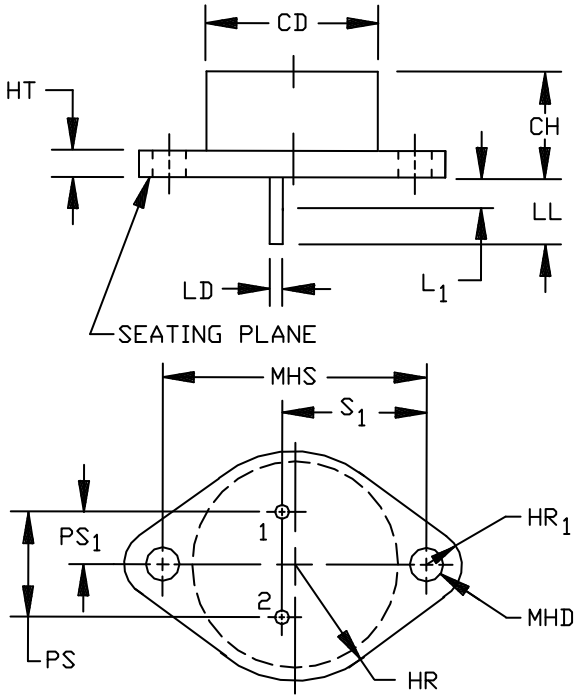
3.4.2 Pin-out. The pin-out of the packages shall be as follows. For TO–204AD packages (see figure 1), terminal 1 is the emitter and terminal 2 is the base. The collector shall be electrically connected to the case. For TO–210AC packages (see figure 2), terminal 1 is the emitter, terminal 2 is the base, and terminal 3 is the collector. All three terminals shall be isolated from the case.

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 shall be as specified in 1.3, 1.4 and table I herein.

3.7 Workmanship. 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.

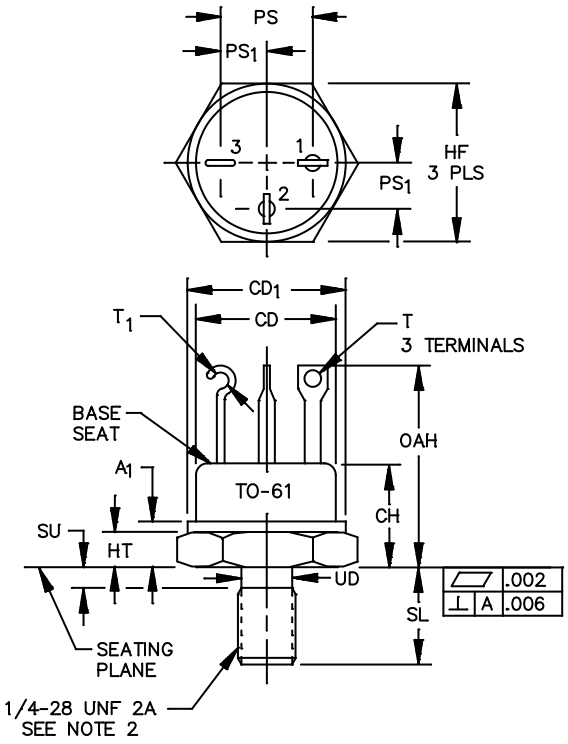
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD		.875		22.23	
CH	.270	.380	6.86	9.65	
HR	.495	.525	12.57	13.34	3
HR_1	.131	.188	3.33	4.78	3
HT	.060	.135	1.52	3.43	
LD	.038	.053	0.97	1.35	3, 4
LL	.312	.500	7.92	12.70	
L_1		.050		1.27	4
MHD	.151	.165	3.84	4.19	3
MHS	1.177	1.197	29.90	30.40	
PS	.420	.440	10.67	11.18	5, 6
PS_1	.205	.225	5.21	5.72	5,6
S_1	.655	.675	16.64	17.15	



NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Pin out: Terminal 1 = base, terminal 2 = emitter, case = collector. The collector shall be internally connected to the case.
3. Two places.
4. 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 plane of the header shall be flat within .001 inch (0.03 mm) inside a .930 inch (23.62 mm) diameter circle on the center of the header and flat within .001 inch (0.03 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 of of TO–204AD (formerly TO–3) package.



Ltr	Dimension				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A_1		.270		6.86	
CD	.570	.610	14.48	15.49	4
CD_1	.610	.687	15.49	17.45	4
CH	.325	.460	8.26	11.68	
HF	.667	.687	16.94	17.45	
HT	.090	.150	2.29	3.81	5
OAH	.640	.875	16.26	22.22	6
PS	.340	.415	8.64	10.54	7
PS_1	.170	.213	4.32	5.41	7
SL	.422	.455	10.72	11.56	
SU		.090		2.29	8
T	.047	.072	1.19	1.83	9
T_1	.046	.077	1.17	1.96	10
UD	.220	.249	5.59	6.32	

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. See FED–STD–H28, "Screw-Thread Standards for Federal Services". Maximum recommended mounting torque 20 in-lb (2.26 N-m).
3. Pin out: Terminal 1 = emitter, terminal 2 = base, terminal 3 = collector. All three terminals shall be isolated from the case.
4. Package contour with the exception of the hexagon is optional with dimensions specified.
5. Chamfer or undercut on one or both ends of hexagon portion is optional.
6. All three terminals.
7. Terminal spacing measured at seat only. Position of terminals in relation to hexagon is not controlled.
8. Length of incomplete or undercut threads.
9. Two leads (base and emitter).
10. This terminal can be hook type (shown) or a flattened and pierced (similar to terminals 1 and 2).
11. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 2. Physical dimensions of TO–210AC (formerly TO–61) package.

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 (quality levels JANTX and JANTXV 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	Measurement
	JANTX and JANTXV levels
3c (1)	Thermal resistance, see 4.5.2
9	I_{CEX1}
11	I_{CEX1} and h_{FE} ; ΔI_{CEX1} = 100 percent of initial value or 50 µA dc, whichever is greater
12	See 4.3.1
13a	Subgroup 2 of table I herein. ΔI_{CEX1} = ±100 percent of initial value or 50 µA dc, whichever is greater. Δh_{FE2} = ±20 percent of initial value.
13b	Insulation resistance test (see 4.5.3, types 2N6689 and 2N6690 only).

4.3.1 Power burn-in conditions. Power burn-in conditions shall be as follows:

T_J = +187.5ºC ±12.5ºC; V_{CB} = 100 V dc; $T_A \leq$ 100ºC

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 the conditions specified for subgroup testing table E–V (JAN, JANTX, and JANTXV) of MIL–PRF–19500 and table I herein. Electrical measurements (end-points) shall be in accordance with table I, subgroup 2 herein. Delta requirements shall be in accordance with the applicable steps of 4.6 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the tests and conditions specified for subgroup testing table E–VIB (JAN, JANTX, and JANTXV) of MIL–PRF–19500 and as follows herein. Delta requirements shall be in accordance with the applicable steps of 4.6 herein.

Subgroup	Method	Conditions
B3	1027	T_J = 187.5 ±12.5ºC, V_{CB} = 100 V dc, T_A = 25ºC.
B3	2037	Test condition D; all internal wires for each device shall be pulled separately.
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 herein. Delta requirements shall be in accordance with the applicable steps of 4.6 herein.

Subgroup	Method	Conditions
C2	2036	Tension, condition A, weight = 10 lbs (4.54 Kg), time = 15 seconds.
C2	2036	Terminal torque, condition D1, torque = 6 in-oz (4.24 N-cm), time = 15 seconds. For types 2N6689 and 2N6690 (TO–210AC stud packages).
C2	2036	Stud torque, condition D2, torque = 20 in-lbs (2.26 N-m), time = 15 seconds. For types 2N6689 and 2N6690 (TO–210AC stud packages).
C3		Not applicable for types 2N6689 and 2N6690 (TO–210AC stud packages).
C6	1026	For eutectic die attach: $V_{CB} \geq$ 20 V dc; P_T = 100 W at T_C = 100ºC or +100ºC ≤ T_C ≤ 125ºC with P_T varied according to the chosen T_C to achieve a T_J = 187.5ºC ±12.5ºC.
	or	
	1037	For solder die attach: $V_{CB} \geq$ 20 V dc.

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 in 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 response measurements. The conditions for pulse response measurement shall be as specified in section 4 of MIL–STD–750.

4.5.2 Thermal resistance. Thermal resistance measurement shall be conducted in accordance with method 3131 of MIL–STD–750. The following conditions apply:

a. Collector current magnitude during power applications shall be 2.5 A dc.

b. Collector to emitter voltage magnitude shall be 20 V dc.

c. Reference temperature measuring point shall be the case.

d. Reference point temperature shall be 25º to 75ºC.

e. Mounting arrangement shall be with heat sink to case.

f. Maximum limit of $R_{\theta JC}$ shall be 1.0ºC/W.

4.5.3 Insulation resistance test. Insulation resistance test conditions are as follows: Test condition B of method 1016 of MIL–STD–750 with the following details: Short the collector, emitter and base terminals together. The limit shall be 10^9 ohms minimum.

4.6 Delta measurements. Delta measurements for groups A, B and C shall be taken as specified below.

Step	Inspection	MIL–STD–750		Symbol	Limit		Unit
		Method	Conditions		Min	Max	
1	Collector to emitter cutoff current 2N6674, 2N6689 2N6675, 2N6690	3041	Bias condition A; V_{BE} = –1.5 V dc V_{CE} = 450 V dc V_{CE} = 650 V dc	ΔI_{CEX1} 1/	 --- ---	100 percent of initial value or 50 µA dc, whichever is greater	
2	Forward-current transfer ratio	3076	V_{CE} = 2 V dc, I_C = 10 A dc; pulsed (see 4.5.1)	Δh_{FE2} 1/	---	+25 percent change from previously measured value	
3	Collector to emitter voltage (saturated)	3071	I_C = 10 A dc, I_B = 2 A dc; pulsed (see 4.5.1)	$\Delta V_{CE(sat)}$ 1/		+100 mV change from previously measured value	

The following details shall apply:

a. The measurements for group B inspection for quality levels JAN, JANTX and JANTXV (table E–VIB of MIL–PRF–19500) are as follows: For subgroups 3 and 6, steps 1 and 2.

b. The measurements for group C inspection (table E–VII of MIL–PRF–19500) are as follows: For subgroup 6, steps 1 and 2.

c. The measurements for group E inspection (table E–IX of MIL–PRF–19500) are as follows: For subgroups 1 and 2, steps 1 and 2.

TABLE I. Group A inspection.

Inspection 1/	MIL–STD–750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Thermal resistance 2/	3131	See 4.5.2	$R_{\theta JX}$		1.0	°C/W
Collector to emitter breakdown voltage	3011	Bias condition D, I_C = 200 mA dc, pulsed (see 4.5.1)	$V_{(BR)CEO}$			
2N6674, 2N6689				300		V dc
2N6675, 2N6690				400		V dc
Collector to emitter cutoff current	3041	Bias condition A; V_{BE} = –1.5 V dc	I_{CEX1}			
2N6674, 2N6689		V_{CE} = 450 V dc			0.1	mA dc
2N6675, 2N6690		V_{CE} = 650 V dc			0.1	mA dc
Collector to base, cutoff current	3036	Bias condition D	I_{CBO}			
2N6674, 2N6689		V_{CB} = 450 V dc			1.0	mA dc
2N6675, 2N6690		V_{CB} = 650 V dc			1.0	mA dc
Emitter to base, cutoff current	3061	Bias condition D, V_{EB} = 7 V dc	I_{EBO}		2.0	mA dc
Base emitter voltage (saturated)	3066	Test condition A; I_C = 10 A dc; I_B = 2 A dc; pulsed (see 4.5.1)	$V_{BE(sat)}$		1.5	µA dc
Collector to emitter voltage (saturated)	3071	I_C = 10 A dc, I_B = 2 A dc; pulsed (see 4.5.1)	$V_{CE(sat)1}$		1.0	V dc
Collector to emitter voltage (saturated)	3071	I_C = 15 A dc, I_B = 5 A dc; pulsed (see 4.5.1)	$V_{CE(sat)2}$		5.0	V dc
Forward-current transfer ratio	3076	V_{CE} = 3 V dc, I_C = 1 A dc; pulsed (see 4.5.1)	h_{FE1}	15	40	
Forward-current transfer ratio	3076	V_{CE} = 2 V dc, I_C = 10 A dc; pulsed (see 4.5.1)	h_{FE2}	8	20	
Insulation resistance (2N6689 and 2N6690 only)	1016	See 4.5.3	R_{ISO}	$1x10^9$		ohms

See footnotes at end of table.

TABLE I. Group A inspection – Continued.

Inspection 1/	MIL–STD–750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 3						
High temperature operation		T_A = +125°C				
Collector to emitter cutoff current	3041	Bias condition A; V_{BE} = –1.5 V dc,	I_{CEX2}			
2N6674, 2N6689		V_{CE} = 450 V dc			1.0	mA dc
2N6675, 2N6690		V_{CE} = 650 V dc			1.0	mA dc
Collector to emitter voltage (saturated)	3071	I_C = 10 A dc, I_B = 2 A dc; pulsed (see 4.5.1)	$V_{CE(sat)3}$		2.0	V dc
Low temperature operation		T_A = –55°C				
Forward-current transfer ratio	3076	V_{CE} = 2 V dc, I_C = 10 A dc pulsed (see 4.5.1)	h_{FE3}	4		
Subgroup 4						
Magnitude of common emitter small-signal, short-circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc, I_C = 1 A dc; f = 5 MHz	$\lvert h_{FE} \rvert$	3	10	
Output capacitance (open circuit, common base)	3236	V_{CB} = 10 V dc, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}	150	500	pf
Switching parameters						
Pulse delay		See figure 3	t_d		0.1	µsec
Pulse rise time		See figure 3	t_r		0.6	µsec
Pulse storage time		See figure 3	t_s		2.5	µsec
Pulse fall time		See figure 3	t_f		0.5	µsec
Cross-over time		See figure 3	t_c		0.5	µsec

See footnotes at end of table.

TABLE I. Group A inspection – Continued.

Inspection 1/	MIL–STD–750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 5						
Safe operating area (continuous dc)	3051	T_C = 25°C; power application time = 1 sec, 1 cycle (see figure 4)				
Test 1						
All types		V_{CE} = 11.7 V dc, I_C = 15 A dc				
Test 2						
2N6674, 2N6675		V_{CE} = 30 V dc, I_C = 5.9 A dc				
Test 3						
All types		V_{CE} = 100 V dc, I_C = 0.25 A dc				
Test 4						
2N6689, 2N6690		V_{CE} = 25 V dc, I_C = 7 A dc				
Test 5						
2N6674, 2N6689 2N6675, 2N6690		V_{CE} = 300 V dc, I_C = 20 A dc V_{CE} = 400 V dc, I_C = 10 A dc				
Safe operating area (switching)	3053	Load condition C (unclamped inductive load), T_A = +25°C; duty cycle ≤ 10 percent; R_S = 0.1 ohms, $t_r = t_p \leq 500$ ns, (see figure 5)				
Test 1		t_p = 5 ms (vary to obtain I_C); R_{BB1} = 1 ohms; V_{BB1} = 10 V dc; R_{BB2} = 50 ohms, V_{BB2} = –4 V dc; V_{CC} = 20 V dc, I_C = 15 A dc; L = 10 μH, (approximately 10 turns, 1 row of #16 AWG wire on an air core 2.875 inch ID) .0007 ohms or equivalent				
Test 2		t_p = 5 ms (vary to obtain I_C); R_{BB1} = 100 ohms; V_{BB1} = 10 V dc; R_{BB2} = 50 ohms, V_{BB2} = –4 V dc; V_{CC} = 20 V dc, I_C = 100 mA dc, L = 1 mH (1 each Miller type 7827 in parallel with 2 each series string Miller type 7825 and this in series with 2 each string Miller type 7827) .45 ohms or equivalent				

See footnotes at end of table.

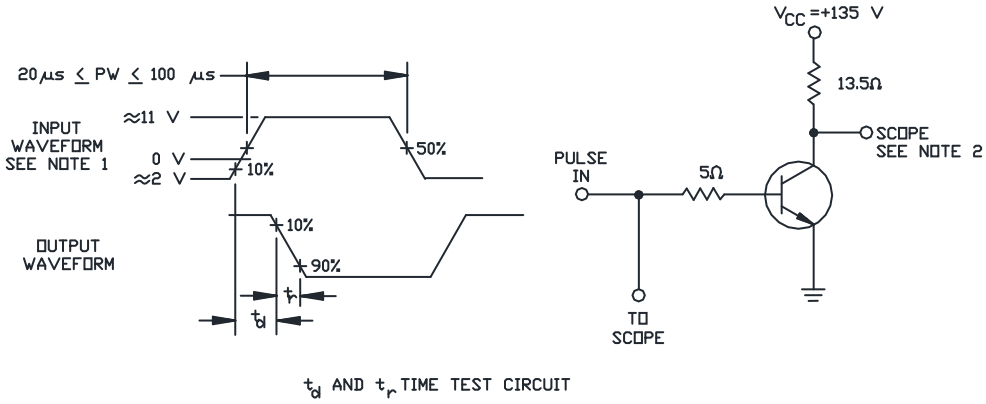
TABLE I. Group A inspection – Continued.

Inspection 1/	MIL–STD–750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 5 – continued						
Safe operating area (clamped switching)	3053	Load condition B (clamped inductive load); T_A = 25°C; V_{CC} = 15 Vdc (see figures 6 and 7); R_{BB1} = 5 Ω; R_{BB2} = 1.5 Ω; V_{BB2} = 5 V dc; L = 50 µH; R of inductor = .05 Ω; R_{LOAD} = R of inductor.				
2N6674, 2N6689		Clamp voltage = 350 V dc, I_C = 10 A dc				
2N6675, 2N6690		Clamp voltage = 450 V dc, I_C = 10 A dc				
End point electrical measurements		See table III, steps 1, 4, and 6				
Subgroups 6 and 7						
Not applicable						

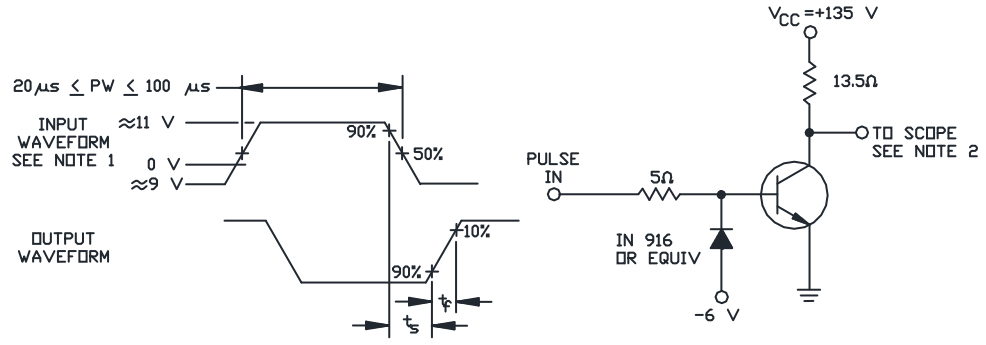
1/ For sampling plan, see MIL–PRF–19500.
2/ This test required for the following end-point measurements only:
Group B, subgroups 2 and 3.
Group C, subgroup 2 and 6.
Group E, subgroup 1.

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

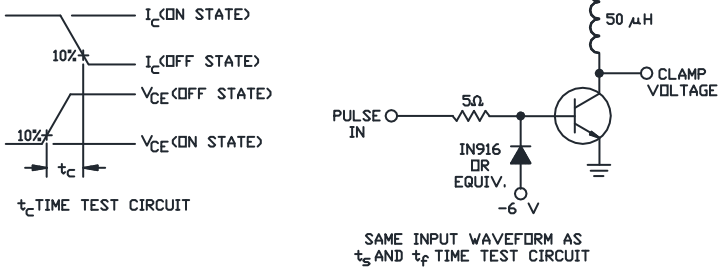
Inspection	MIL–STD–750		Qualification
	Method	Conditions	
Subgroup 1			45 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal Fine leak Gross leak	1071		
Electrical measurements		See table I, subgroup 2 and table II herein.	
Subgroup 2			45 devices c = 0
Intermittent life	1037	Intermittent operation life: $V_{CB} \geq 10$ V dc , 6,000 cycles.	
Electrical measurements		See table I, subgroup 2 and table II herein.	
Subgroup 4			Sample size N/A
Thermal impedance curves		Each supplier shall submit their (typical) design thermal impedance curves. In addition, test conditions and $Z_{\theta JX}$ limit shall be provided to the qualifying activity in the qualification report.	
Subgroup 5 and 6			
Not applicable			
Subgroup 7			45 devices c = 0
Reverse stability	1033	Condition A for devices ≥ 400 V dc. Condition B for devices ≤ 400 V dc.	



t_d AND t_r TIME TEST CIRCUIT



t_s AND t_f TIME TEST CIRCUIT



t_c TIME TEST CIRCUIT

SAME INPUT WAVEFORM AS t_s AND t_f TIME TEST CIRCUIT

NOTES:

1. The rise time (tr) of the applied pulse shall be ≤ 20 ns; duty cycle ≤ 2s; generator source impedance shall be 50 Ω.
2. Output sampling oscilloscope Z_{in} ≤ 10K; C_{in} ≤ 12 pF; rise time ≤ 20ns.

FIGURE 3. Pulse response test circuits.

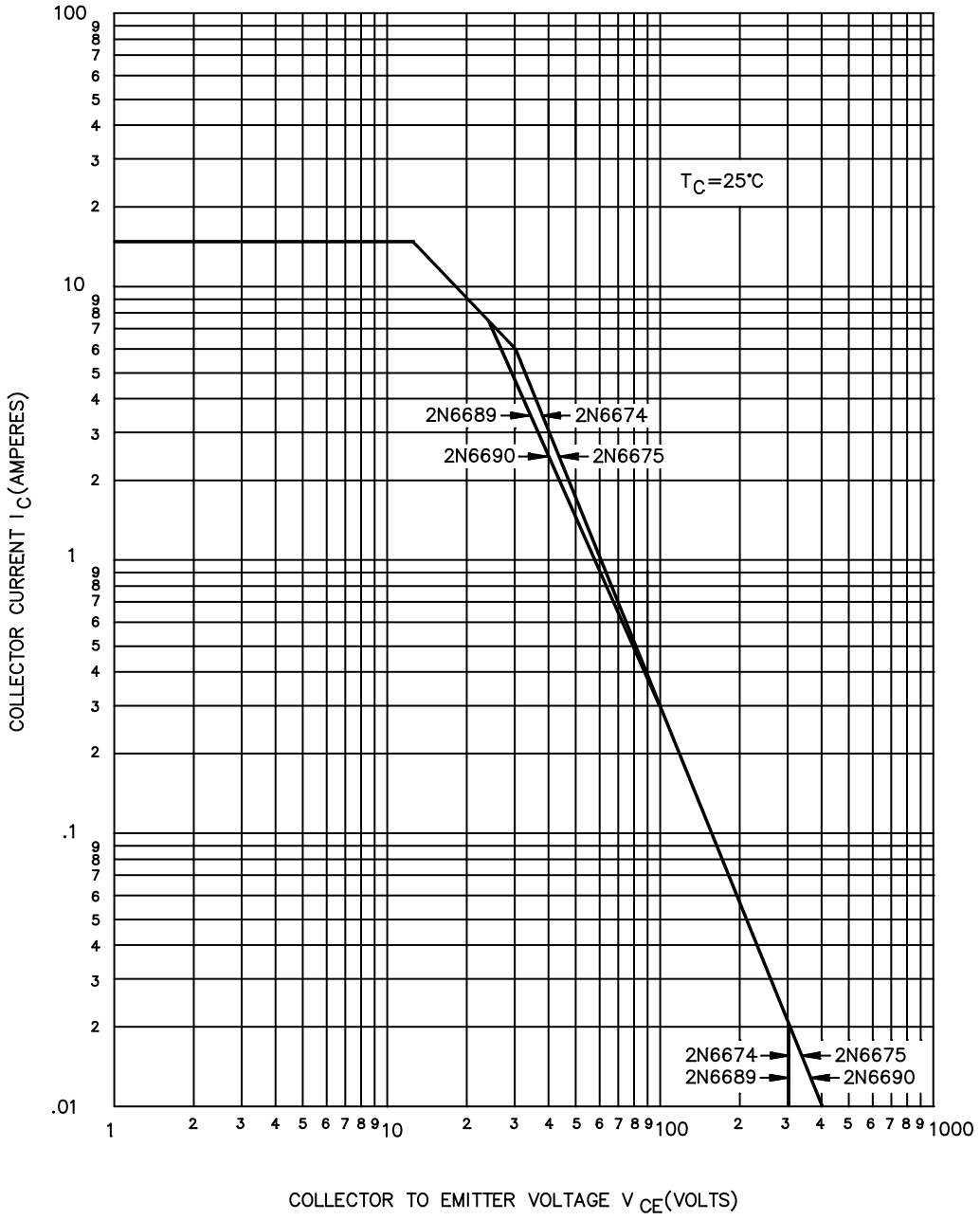


FIGURE 4. Maximum safe operating graph (DC).

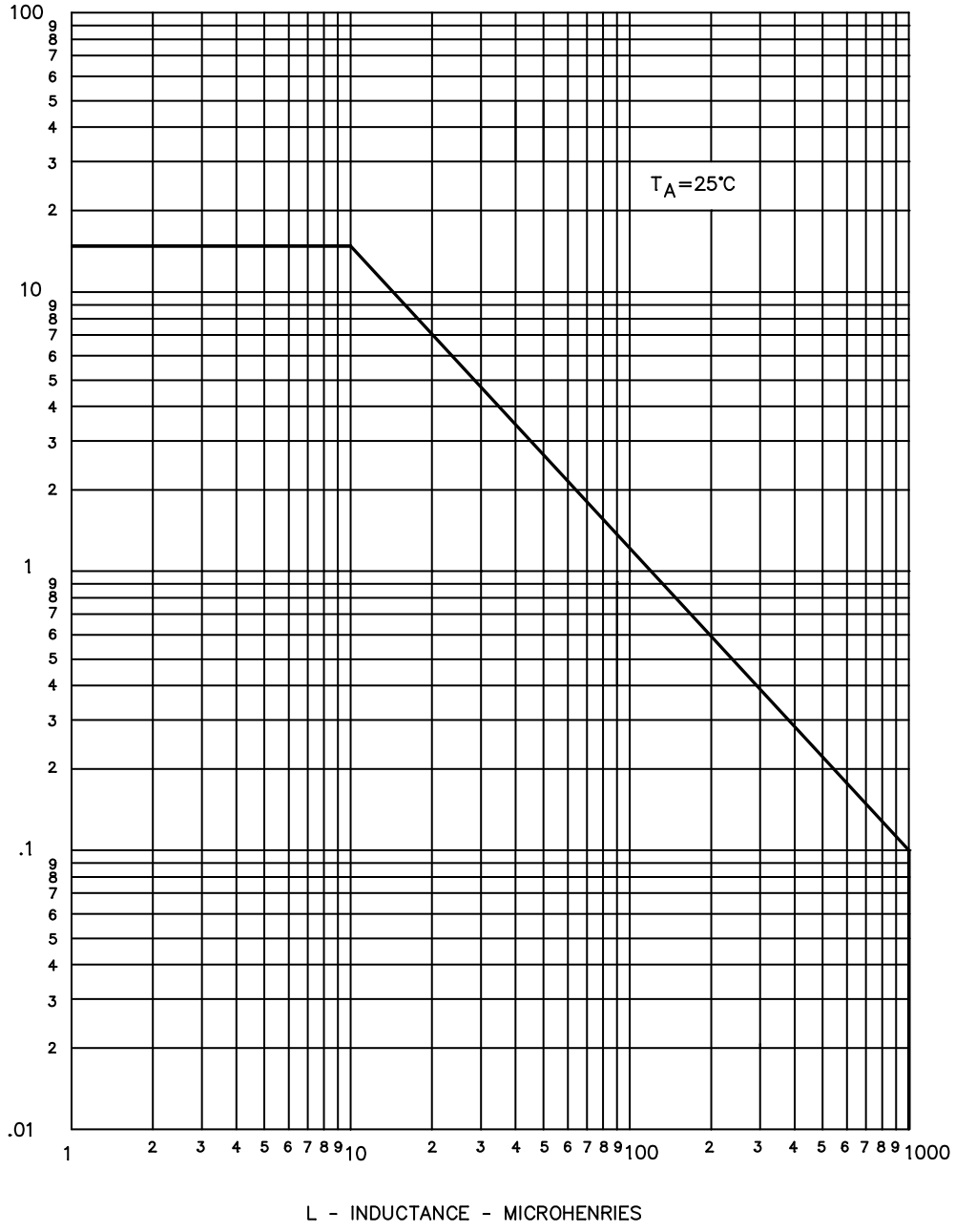


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

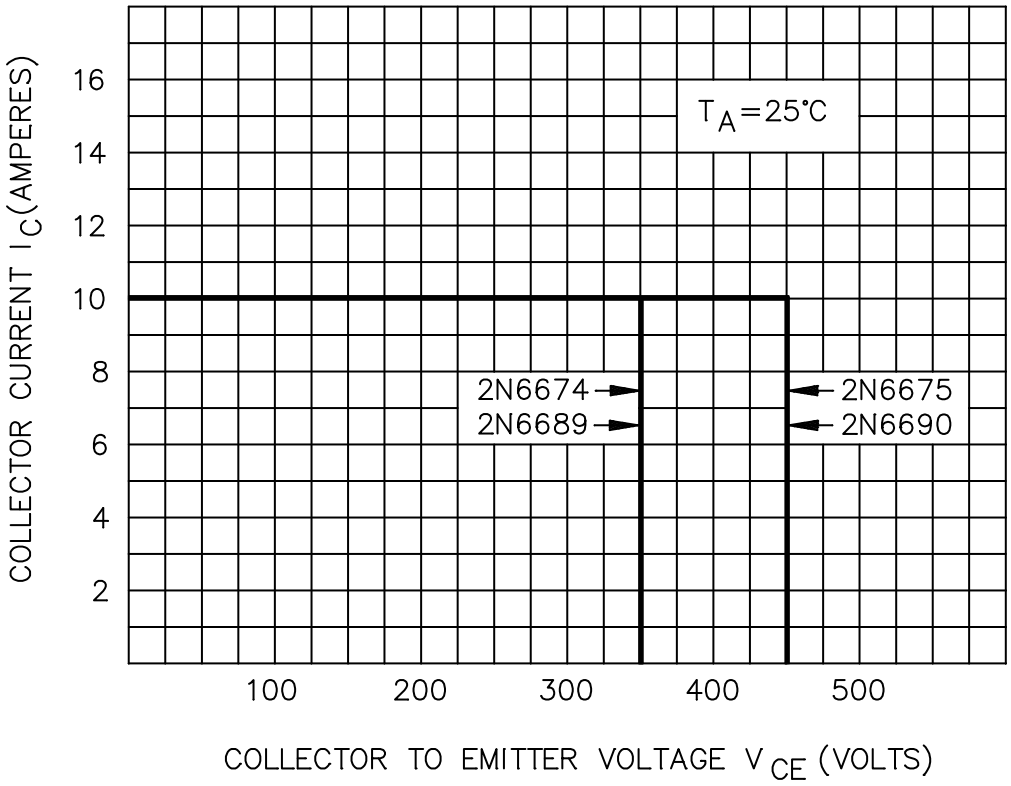
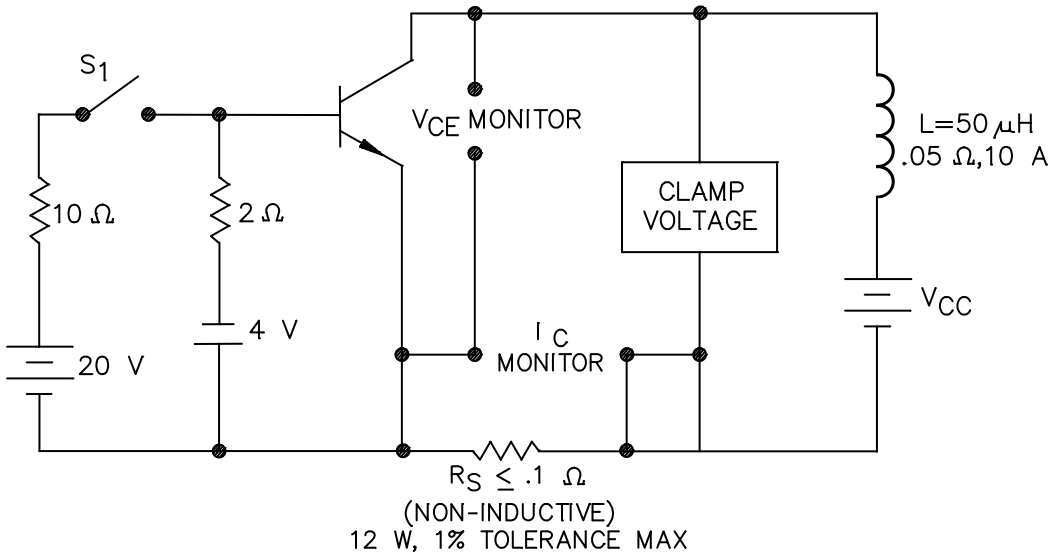


FIGURE 6. Safe operating area for switching between saturation and cutoff (clamped inductive load).



Procedure:

1. With switch S1 closed, set specified test conditions.
2. Open S1. Device fails if clamp voltage not reached.
3. Perform specified end point tests.

FIGURE 7. Clamped inductive sweep test circuit.

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. Transistors 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.

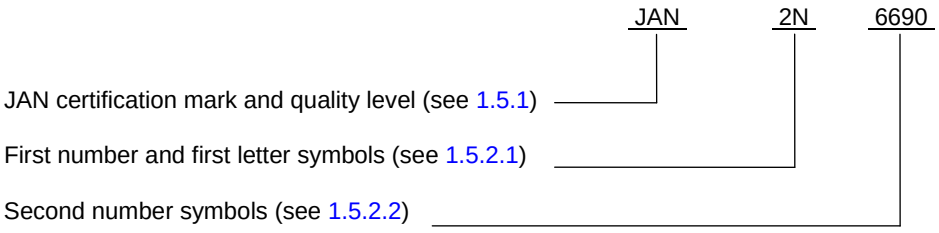
b. Packaging requirements (see 5.1).

c. Lead material and finish (see 3.4.1).

d. The complete Part or Identifying Number (PIN), see 1.5 and 6.4.

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.

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



6.5 List of PINs. The following is a list of possible PINs available on this specification sheet.

PINs for devices in a TO–204AE package	PINs for devices in a TO–61 package
JAN2N6674	JAN2N6689
JAN2N6675	JAN2N6690
JANTX2N6674	JANTX2N6689
JANTX2N6675	JANTX2N6690
JANTXV2N6674	JANTXV2N6689
JANTXV2N6675	JANTXV2N6690

6.6 Supersession information and superseded PINs.

6.6.1 Lead finish. The original issue of this specification, including its associated amendments, specified that the lead finish as either gold plate, tin plate, or solder dip. Tin plate is no longer acceptable as a lead finish. This revision of the specification does not specify a default lead finish.

6.6.2 Lead material. Due to the performance nature of this revision, lead material is no longer specified.

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

Custodians:
Air Force – 85
DLA – CC

Review activities:
Air Force – 19, 70, 99

Preparing activity:

DLA – CC

(Project 5961–2014–006)

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.