The documentation and process conversion measures necessary to comply with this revision shall be completed by 22 March 2015.

INCH-POUND

MIL-PRF-19500/461G
22 December 2014
SUPERSEDING
MIL-PRF-19500/461F
30 May 2008

PERFORMANCE SPECIFICATION SHEET

* TRANSISTOR, PNP, SILICON, HIGH-POWER,
TYPE 2N6211, 2N6212, 2N6213, 2N6213A, JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

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 PNP silicon, high-voltage transistors. Four levels of product assurance are provided for each encapsulated device (JAN, JANTX, JANTXV, and JANS). Two levels of product assurance are provided for each unencapsulated device (JANHC and JANKC).

* 1.2 Package outlines. The device package outlines are as follows: TO-66 in accordance with figure 1 for all encapsulated device types. See figure 2 for unencapsulated devices.

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

Type	P_T (1) T_A = +25°C	P_T (2) T_C = +25°C	V_{CBO}	V_{CEO}	V_{EBO}	I_B	I_C	T_J and T_{STG}	$R_{\theta JC}$ (max)	$Z_{\theta JX}$
	W	W	V dc	V dc	V dc	A dc	A dc	°C	°C/W	°C/W
2N6211	3.0	35	-275	-225	-6.0	-1.0	-2.0	-65 to +200	5.0	1.75
2N6212	3.0	35	-350	-300	-6.0	-1.0	-2.0	-65 to +200	5.0	1.75
2N6213	3.0	35	-400	-350	-6.0	-1.0	-2.0	-65 to +200	5.0	1.75
2N6213A	3.0	35	-500	-450	-6.0	-1.0	-2.0	-65 to +200	5.0	1.75

(1) Derate linearly at 17.1 mW/°C for T_A > +25°C.
(2) Derate linearly at 200 mW/°C for T_C > +25°C.

* 1.4 Primary electrical characteristics. Unless otherwise specified, T_C = +25°C.

Limit	h_{FE1} (1)	$V_{CE(SAT)}$ (1)			C_{obo}	$\lvert h_{fe} \rvert$		Pulse response	
	V_{CE} = -5 V dc	I_C = -1.0 A dc I_B = -0.125 A dc			100 kHz ≤ f ≤ 1 MHz V_{CB} = -10 V dc	f = 5 MHz I_C = -0.2 A dc V_{CE} = -10 V dc		t_{on}	t_{off}
	I_C = -1 A dc	2N6211	2N6212	2N6213 2N6213A	I_E = 0	2N6211 2N6212 2N6213	2N6213A		
		V dc	V dc	V dc	pF			µs	µs
Minimum	30					4	1.5		
Maximum	175	-1.4	-1.6	-2.0	220	20	10	0.6	3.1

(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.

* 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 from the lowest to the highest level are as follows: “JAN”, “JANTX”, “JANTXV” and "JANS".

* 1.5.2 Quality level designators for unencapsulated devices (die). The quality level designators for unencapsulated devices (die) that are applicable for this specification sheet from the lowest to the highest level are as follows: "JANHC" and "JANKC".

* 1.5.3 Device type. The designation system for the device types of transistors covered by this specification sheet are as follows.

* 1.5.3.1 First number and first letter symbols. The transistors of this specification sheet use the first number and letter symbols "2N".

* 1.5.3.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follows: "6211", "6212", and "6213".

* 1.5.4 Suffix letters. The suffix letter "A" indicates that the transistor is a modified version of the associated identification number (2N6213A only).

* 1.5.5 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

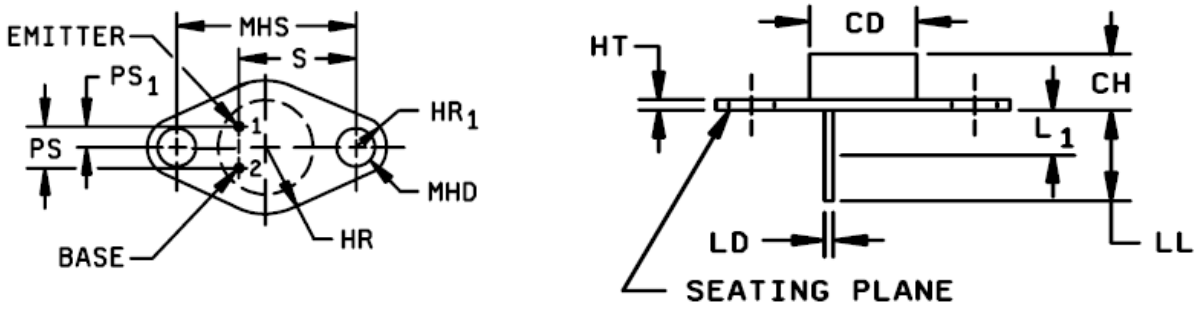
MIL-PRF-19500 - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

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

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

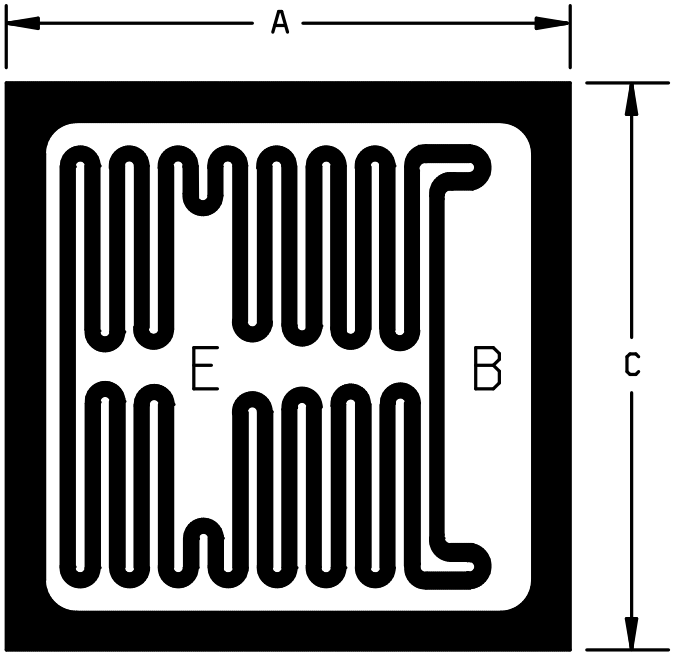
2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific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



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CH	.250	.340	6.35	8.64	
LD	.028	.034	0.71	0.86	7,9
CD	.470	.500	11.94	12.70	2
PS	.190	.210	4.83	5.33	3
PS_1	.093	.107	2.36	2.72	3
HT	.050	.075	1.27	1.91	2, 5
LL	.360	.500	9.14	12.70	7
L_1		.050		1.27	4
MHD	.142	.152	3.61	3.86	
MHS	.958	.962	24.33	24.43	
HR		.350		8.89	
HR_1	.115	.145	2.92	3.68	
S	.570	.590	14.48	14.99	3

NOTES:
1. Dimensions are in inches. Millimeters are given for general information only.
2. Body contour is optional within zone defined by CD.
3. 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.
4. Within this zone the lead diameter may vary to allow for lead finishes and irregularities.
5. HT dimension does not include sealing flanges.
6. The seating plane of header shall be flat within .001 inch (0.025 mm), concave to .004 inch (0.101 mm), convex inside a .520 inch (13.20 mm) diameter circle on the center of the header, and flat within .001 inch (0.025 mm), concave to .006 inch (0.152 mm), convex overall.
7. Both terminals.
8. The collector shall be electrically connected to the case.
9. LD applies between L_1 and LL. Lead diameter shall not exceed twice LD within L_1.
10. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions.



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A	.119	.125	3.02	3.18	
B	.119	.125	3.02	3.18	

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. The physical characteristics of the die are:
   Thickness: .006 inch (0.15 mm) to .012 inch (0.30 mm).
   Top metal: Aluminum 50,000 Å nominal, 37,500 Å minimum.
   Back metal: Gold 3,000 Å nominal.
   Back side: Collector.
   Bonding pad: B = .015 inch (0.38 mm) x .072 inch (1.83 mm).
   E = .015 inch (0.38 mm) x .060 inch (1.52 mm).
4. Junctions passivated with thermal silicon dioxide.

FIGURE 2. JANHC and JANKC (A-version) die 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 manufacturer's list (QML) before contract award (see 4.2 and 6.4).

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 (T0-66) and 2 (die) herein.

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

3.5 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 table I as specified herein.

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 table II herein.

4.2.1 JANHC and JANKC qualification. JANHC and JANKC qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.2 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 by the first inspection lot of this revision to maintain qualification.

* 4.3 Screening.

* 4.3.1 Screening (JANS, JANTX, and JANTXV levels only). Screening of packaged devices shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	Thermal impedance (see 4.3.1.1)	Thermal impedance (see 4.3.1.1)
9	h_{FE1} and I_{CEX1}	
11	h_{FE1} and I_{CEX1}; ΔI_{CEX} = ±100 percent of initial value or -5 μA dc, whichever is greater. Δh_{FE1} = ±15 percent.	h_{FE1} and I_{CEX1}
12	Burn-in (see 4.3.1.2)	Burn-in (see 4.3.1.2)
13	Subgroups 2 and 3 of table I herein; ΔI_{CEX1} = 100 percent of initial value or -5 μA dc, whichever is greater. Δh_{FE1} = ±15 percent	Subgroup 2 of table I herein; ΔI_{CEX1} = 100 percent of initial value or -0.1 mA dc, whichever is greater. Δh_{FE1} = ±25 percent.

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

* 4.3.1.1 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). Measurement delay time (t_{MD}) = 70 μs max. See table II, group E, subgroup 4 herein.

* 4.3.1.2 Power burn-in conditions. Power burn-in conditions are as follows: Method 1039 of MIL-STD-750, test condition B. T_A = room ambient as defined in the general requirements in 4.5 of MIL-STD-750; $V_{CB} \geq$ -20 V dc, P_T = 3.0 W. NOTE: No heat sink or forced air cooling on the devices shall be permitted.

* 4.3.2 Screening of unencapsulated die (JANHC and JANKC). Screening of JANHC and JANKC unencapsulated die shall be in accordance with appendix G of MIL-PRF-19500.

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

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

Subgroup	Method	Conditions
B4	1037	$V_{CB} \geq$ -10 V dc, forced air cooling on the devices shall be permitted only during the t_{off} time.
B5	1027	$V_{CE} \geq$ -10 V dc, $T_A \leq$ +125°C, adjust T_A and power to achieve a $T_J \geq$ +275°C, t = 96 hours. P_T = 3 W minimum.

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

Subgroup	Method	Conditions
B3	1037	$V_{CB} \geq$ -10 V dc, forced air cooling on the devices shall be permitted only during the t_{off} time.
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 E-VII of MIL-PRF-19500.

Subgroup	Method	Conditions
C2	2036	Test condition A, weight = 10 pounds, t = 15 seconds.
* C5	3131	Thermal impedance, see 4.3.1.1, $R_{\theta JC(max)}$ = 5°C/W.
C6	1037	$V_{CB} \geq$ -10 V dc, forced air cooling on the devices shall be permitted only during the t_{off} time.

* 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.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurements shall be as specified in section 4 of MIL-STD-750.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071	n = 45 devices, c = 0				
Subgroup 2						
Thermal impedance 2/	3131	See 4.3.1.1	$Z_{\theta JX}$			°C/W
Collector to emitter breakdown voltage	3011	Bias condition D, I_C = -200 mA dc, pulsed (see 4.5.1), (or L = 10 mH, f = 30-60 Hz)	$V_{(BR)CEO}$			
2N6211				-225		V dc
2N6212				-300		V dc
2N6213				-350		V dc
2N6213A				-450		V dc
Collector to emitter breakdown voltage	3011	Bias condition D, I_C = -200 mA dc, pulsed (see 4.5.1), (or L = 10 mH, f = 30-60 Hz) R_{BE} = 50 Ω	$V_{(BR)CER}$			
2N6211				-250		V dc
2N6212				-325		V dc
2N6213				-375		V dc
2N6213A				-475		dc
Collector to emitter breakdown voltage	3011	Bias condition D, I_C = -200 mA dc, pulsed (see 4.5.1), (or L = 10 mH, f = 30-60 Hz) R_{BE} = 50 Ω, V_{BE} = +1.5 V dc	$V_{(BR)CEX}$			
2N6211				-275		V dc
2N6212				-350		V dc
2N6213				-400		V dc
2N6213A				-500		V dc
Collector to emitter cutoff current	3041	Bias condition C; V_{CE} = -150 V dc	I_{CEO}		-5.0	mA dc
Collector to emitter cutoff current	3041	Bias condition C; V_{BE} = +1.5 V dc	I_{CEX1}		0.5	mA dc
2N6211		V_{CE} = -250 V dc				
2N6212		V_{CE} = -315 V dc				
2N6213		V_{CE} = -360 V dc				
2N6213A		V_{CE} = -400 V dc				

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 2 - Continued.						
Emitter to base cutoff current	3061	Bias condition D; V_{EB} = -6 V dc	I_{EBO}		-0.5	mA dc
Collector to base cutoff current	3036	Bias condition D	I_{CBO}		-15	mA dc
2N6211		V_{CB} = -275 V dc				
2N6212		V_{CB} = -350 V dc				
2N6213		V_{CB} = -400 V dc				
2N6213A		V_{CB} = -500 V dc				
Forward-current transfer ratio	3076	I_C = -1 A dc, pulsed (see 4.5.1)	h_{FE1}	10	100	
2N6211		V_{CE} = -2.8 V dc				
2N6212		V_{CE} = -3.2 V dc				
2N6213		V_{CE} = -4.0 V dc				
2N6213A		V_{CE} = -4.0 V dc				
Forward-current transfer ratio	3076	V_{CE} = -5 V dc, I_C = -1 A dc, pulsed (see 4.5.1)	h_{FE2}			
2N6211				30	175	
2N6212				30	175	
2N6213				30	150	
2N6213A				30	150	
Collector to emitter saturated voltage	3071	I_C = -1 A dc, I_B = -0.125 A dc, pulsed (see 4.5.1)	$V_{CE(sat)}$			
2N6211					-1.4	V dc
2N6212					-1.6	V dc
2N6213					-2.0	V dc
2N6213A					-2.0	V dc
Base to emitter saturated voltage	3066	Test condition A, I_C = -1 A dc, I_B = -0.125 A dc, pulsed (see 4.5.1)	$V_{BE(sat)}$		1.4	V dc
Subgroup 3						
High temperature operation:		T_A = +100°C				
Collector to emitter cutoff current	3041	Bias condition A, V_{BE} = +1.5 V dc	I_{CEX2}		-5	mA dc
2N6211		V_{CE} = -250 V dc				
2N6212		V_{CE} = -315 V dc				
2N6213		V_{CE} = -360 V dc				
2N6213A		V_{CE} = -400 V dc				
Low temperature operation:		T_A = -55°C				
Forward-current transfer ratio	3076	V_{CE} = -5.0 V dc, I_C = -1 A dc, pulsed (see 4.5.1)	h_{FE3}	10		

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 4						
Pulse response	3251	Test condition A, except test circuit and pulse requirements in accordance with figure 3 herein.				
Turn-on time		V_{CC} = -200 V dc ±-10 V dc, I_C =-1 A dc, I_{B1} = -0.125 A dc	t_{on}		0.6	µs
Turn-off time		V_{CC} = -200 V dc ±-10 V dc, I_C =-1 A dc, I_{B1} = -0.125 A dc; I_{B2} = -0.125 A dc	t_{off}		3.1	µs
Small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = -10 V dc, I_C = -0.2 A dc, f = 5 MHz	$\|h_{fe}\|$			
2N6211, 2N6212, 2N6213 2N6213A				4 1.5	20 10	
Open circuit output capacitance	3236	V_{CB} = -10 V dc, I_E = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{obo}		220	pF
Subgroup 5						
Safe operating area (continuous dc)	3051	T_C = +25°C, t = 1 s, 1 cycle (see figure 4)				
Test 1 (all device types)		I_C = -2.0 A dc, V_{CE} = -17.5 V dc				
Test 2 (all device types)		I_C = -0.875 A dc, V_{CE} = -40 V dc				
Test 3 2N6211 only		I_C = -0.034 A dc, V_{CE} =- 225 V dc				
Test 4 2N6212 only		I_C = -0.02 A dc, V_{CE} = -300 V dc				
Test 5 2N6213 and A only		I_C = -0.015 A dc, V_{CE} = -350 V dc				
Electrical measurements		See table I, subgroup 2				

See footnote at end of table.

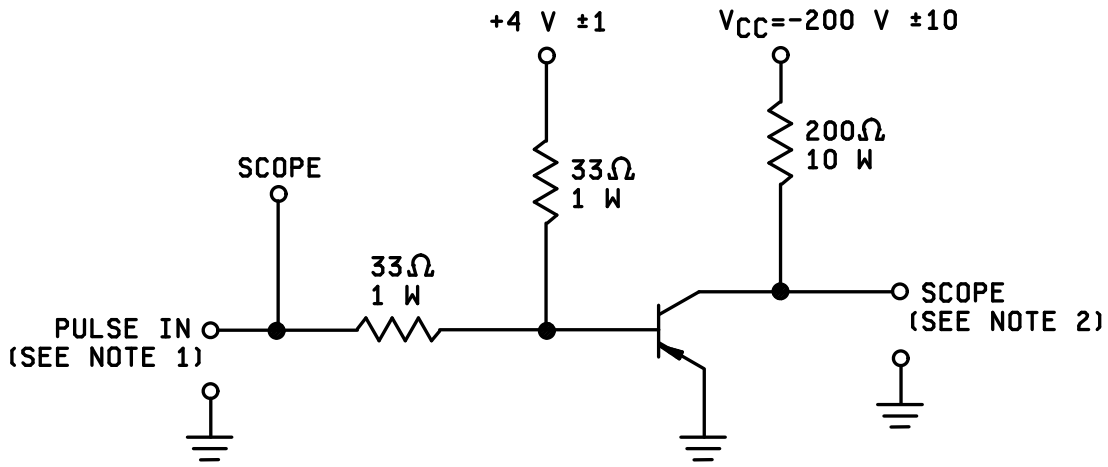
TABLE I. Group A inspection - Continued.

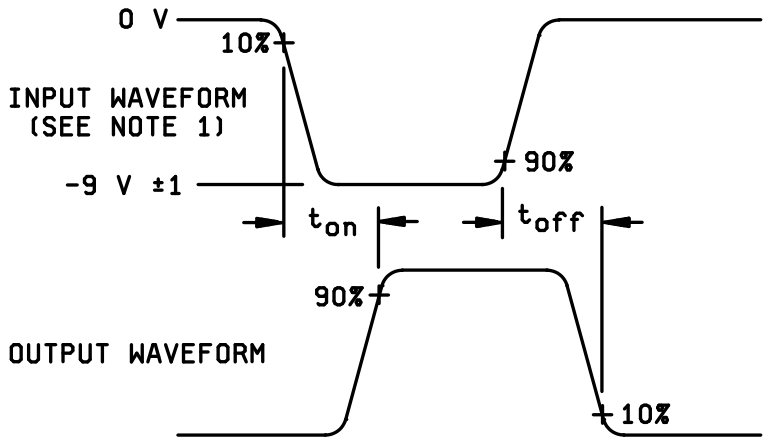
Inspection 1/	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Subgroup 5 - Continued.						
Safe operating area (switching)	3053	Load condition C (unclamped inductive load) (see figure 5) T_C = +25°C, duty cycle ≤ 10 percent				
Test 1		t_p ≈ 15 ms, R_{BB1} = 20 Ω, V_{BB1} = -10 V dc maximum, R_{BB2} = 20 Ω, V_{BB2} = -1.5 V dc, V_{CC} = -10 V dc, I_C = -2 A dc, L = 25 μH, R_S = 0.1Ω				
Test 2		t_p ≈ 15 ms, R_{BB1} = 50 Ω, V_{BB1} = -10 V dc maximum, R_{BB2} = 20 Ω, V_{BB2} = -1.5 V dc, V_{CC} = -10 V dc, I_C = -0.25 A dc, L = 3.0 mH, R_S = 1.0 Ω				
Electrical measurements		See table I, subgroup 2				
Safe operating area (switching)	3053	Load condition B, (clamped inductive load) see figure 6, T_C = +25°C, duty cycle ≤ 10 percent, t_p ≈ 15 ms, R_S = 0.1 Ω, R_{BB1} = 20 Ω, R_{BB2} = 20 Ω, V_{BB1} = -10 V dc maximum, V_{BB2} = -1.5 V, I_C = -2.0 A dc (clamped voltage must be reached)				
2N6211 2N6212 2N6213, 2N6213A		V_{CC} = -225 V dc, R_L ≤ 112.5 Ω V_{CC} = -300 V dc, R_L ≤ 150 Ω V_{CC} = -350 V dc, R_L ≤ 175 Ω, L = 250μH, CR = 1N1190A				
2N6211 2N6212 2N6213, 2N6213A		Clamp voltage = -225, +0, -5 V dc Clamp voltage = -300, +0, -5 V dc Clamp voltage = -350, +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, JANTXV).
Group B, subgroups 3 and 4 (JANS).
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	Test condition C, 500 cycles.	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I, subgroup 2.	
Subgroup 2			45 devices c = 0
Intermittent life	1037	Intermittent operation life: V_{CB} = -10 V dc, 6,000 cycles	
Electrical measurements		See table I, subgroup 2.	
Subgroup 4			Sample size N/A
Thermal impedance curves		See MIL-PRF-19500.	
Subgroup 5			3 devices c = 0
Barometric pressure 2N6211 2N6212 2N6213 2N6213A	1001	Test condition C. V_{CE} = -250 V dc V_{CE} = -315 V dc V_{CE} = -360 V dc V_{CE} = -400 V dc	
Subgroup 8			45 devices c = 0
Reverse stability	1033	Condition B	

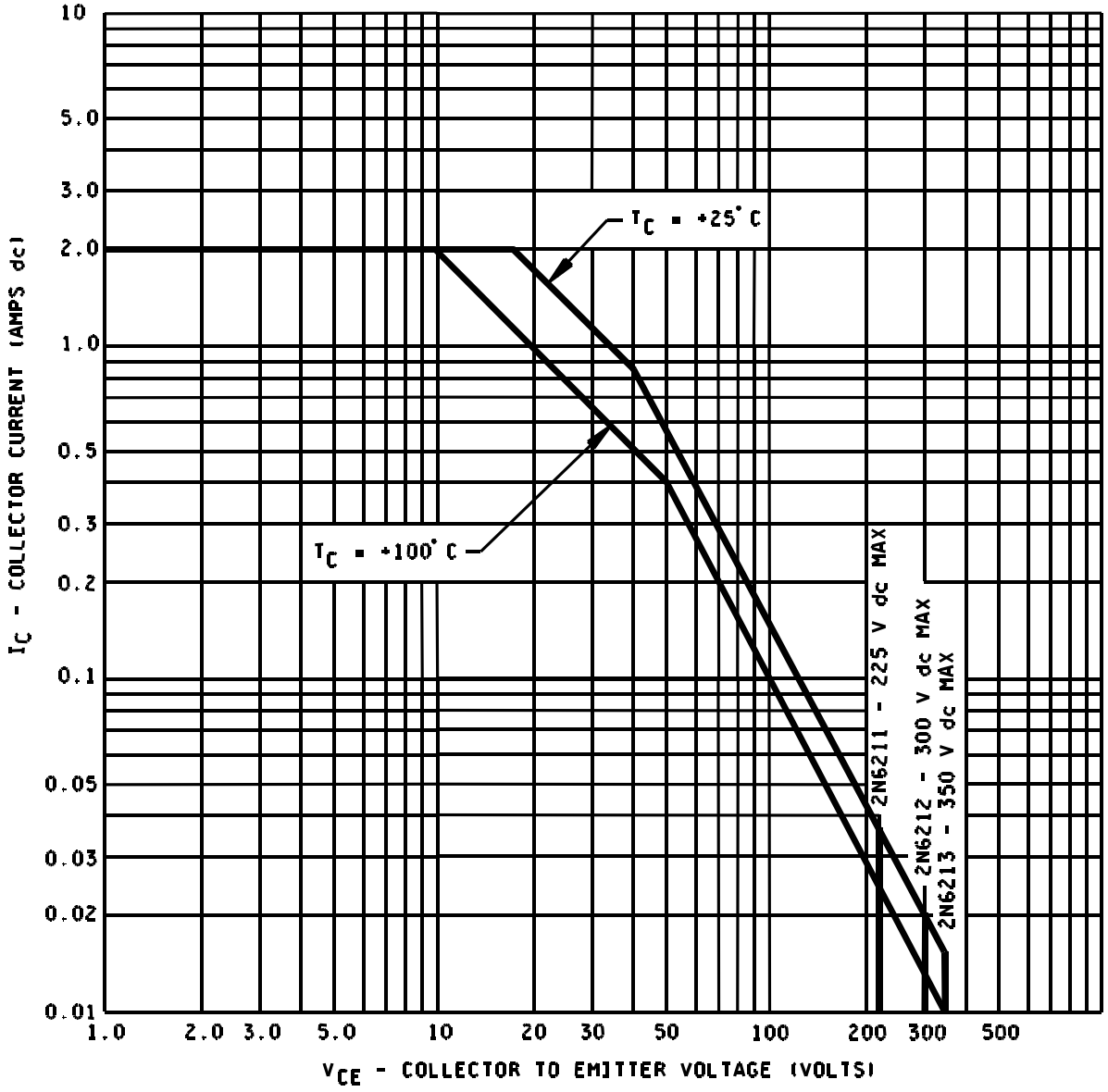




NOTES:

1. The rise time (t_r) and fall time (t_f) of the applied pulse shall be each ≤ 20 ns, duty cycle ≤ 2 percent, generator source impedance shall be 50 Ω; pulse width = 20 μs.
2. Output sampling oscilloscope: Z_{in} ≥ 100 kΩ, C_{in} ≤ 50 pF, rise time ≤ 20 ns.

FIGURE 3. Pulse response test circuit.



NOTE: Electrical characteristics for 2N6213A are identical to the 2N6213 unless otherwise noted.

FIGURE 4. Maximum safe operating graph (continuous dc).

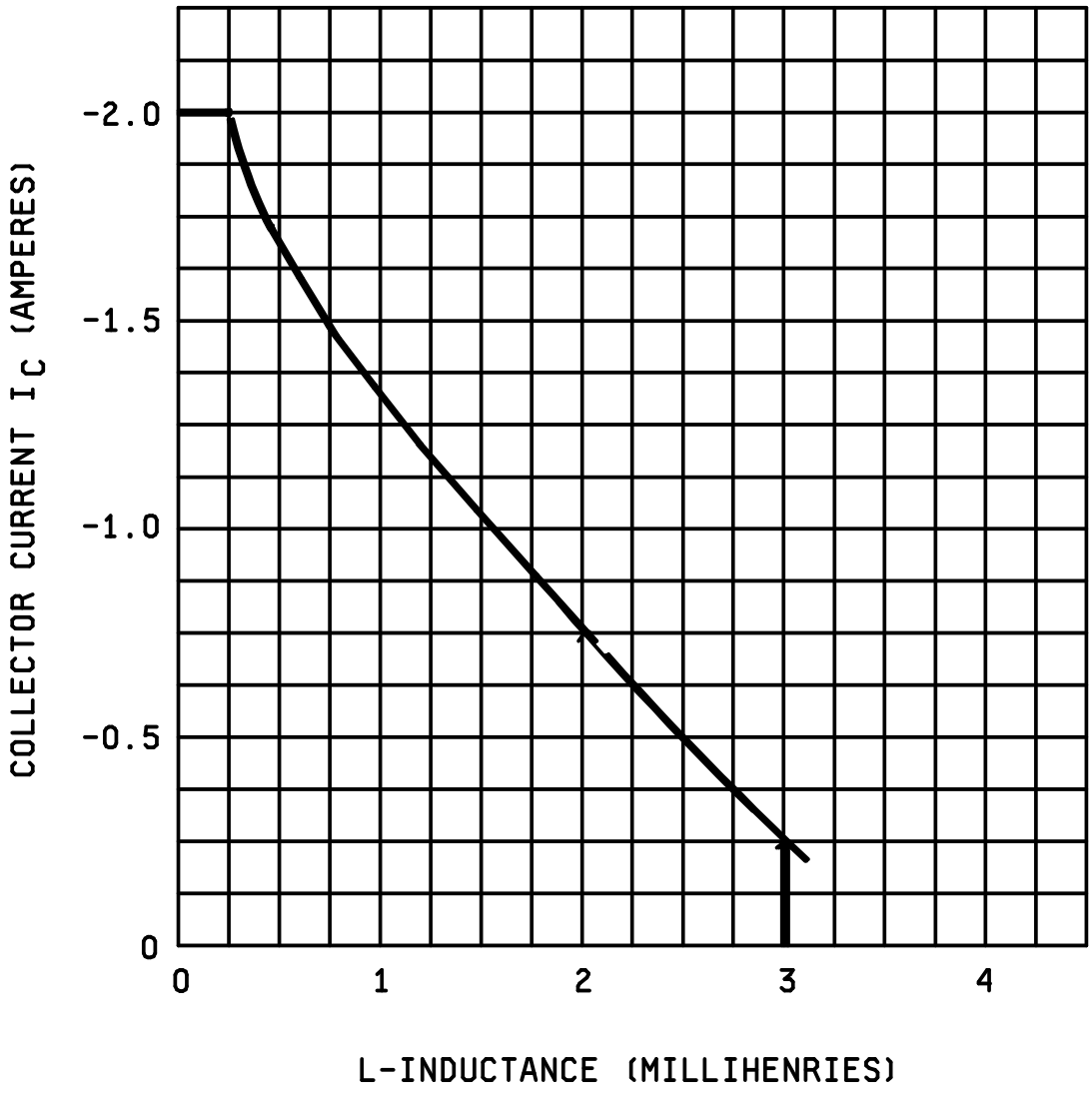
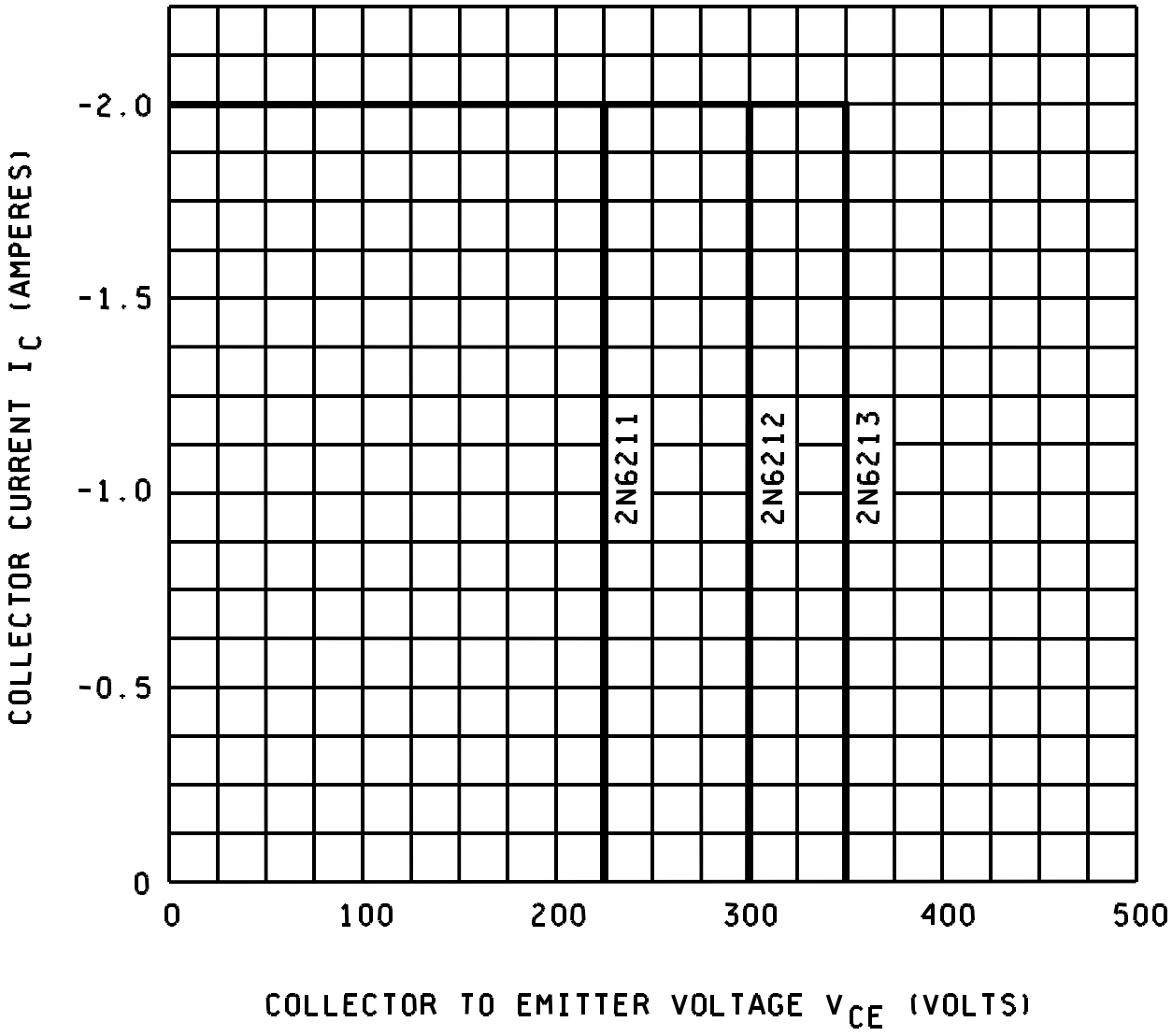


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).



NOTE: Electrical characteristics for 2N6213A are identical to the 2N6213 unless otherwise noted.

FIGURE 6. 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. 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.

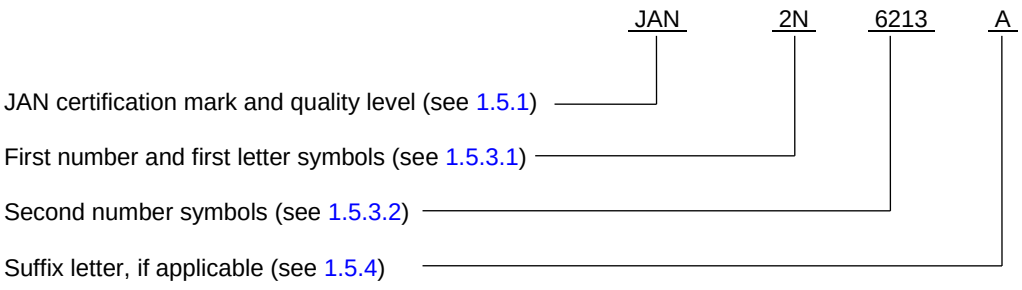
b. Packaging requirements (see 5.1).

c. Lead finish (see 3.4.1).

* d. The complete 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. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.dla.mil.

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



* 6.5 List of PINs.

* 6.5.1 List of PINs. The following is a list of possible PINs available on 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	PINs for devices of the "S" quality level
JAN2N6211	JANTX2N6211	JANTXV2N6211	JANS2N6211
JAN2N6212	JANTX2N6212	JANTXV2N6212	JANS2N6212
JAN2N6213	JANTX2N6213	JANTXV2N6213	JANS2N6213
JAN2N6213A	JANTX2N6213A	JANTXV2N6213A	JANS2N6213A

* 6.5.2 PINs for unencapsulated devices (die). The following is a list of possible PINs for unencapsulated devices available on this specification sheet.

Quality level HC	Quality level KC
JANHCA2N6211	JANKCA2N6211
JANHCA2N6212	JANKCA2N6212
JANHCA2N6213	JANKCA2N6213

6.6 Suppliers of JANHC and JANKC die. The qualified die suppliers with the applicable letter version (example, JANHCA2N6211) will be identified on the QML.

JANC ordering information	
PIN	Manufacturer
	33178
2N6211	JANHCA2N6211 JANKCA2N6211
2N6212	JANHCA2N6212 JANKCA2N6212
2N6213	JANHCA2N6213 JANKCA2N6213

6.7 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 - 85
NASA - NA
DLA - CC

Preparing activity:
DLA - CC

(Project 5961-2014-127)

Review activity:
Army - AV
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 https://assist.dla.mil.