

The documentation and process conversion measures necessary to comply with this document shall be completed by 25 September 2015.

INCH-POUND

MIL-PRF-19500/251T
 25 June 2015
 SUPERSEDING
 MIL-PRF-19500/251R
 12 May 2010

PERFORMANCE SPECIFICATION SHEET

* TRANSISTOR, NPN, SILICON, SWITCHING,
 TYPES 2N2218, AND 2N2219, JAN, JANTX, JANTXV, AND JANS

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, switching transistors. Four levels of product assurance (JAN, JANTX, JANTXV and JANS) are provided for each device type as specified in MIL-PRF-19500. RHA level designators "M", "D", "P", "L", "R", "F", "G", and "H" are appended to the device prefix to identify devices, which have passed RHA requirements.

* 1.2 Package outlines. The device packages for the encapsulated device types are as follows: TO-39 and TO-5 in accordance with [figure 1](#)

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

Types	P_T $T_A = +25^\circ\text{C}$ (1)	P_T $T_C = +25^\circ\text{C}$ (1)	V_{CBO}	V_{CEO}	V_{EBO}	I_C	T_{STG} and T_J	$R_{\theta JC}$ max (2)	$R_{\theta JA}$ max (2)
	<u>W</u>	<u>W</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>mA dc</u>	For all	<u>°C/W</u>	<u>°C/W</u>
2N2218, 2N2219	0.8	3.0	60	30	5	800	-65° to	50	195
2N2218A, 2N2219A	0.8	3.0	75	50	6	800	+200°C	50	195
2N2218AL, 2N2219AL	0.8	3.0	75	50	6	800		50	195

- (1) See derating curve, figures 2 and 3.
- (2) For thermal impedance curves, see figures 4 and 5.

* 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>.



MIL-PRF-19500/251T

1.4 Primary electrical characteristics.

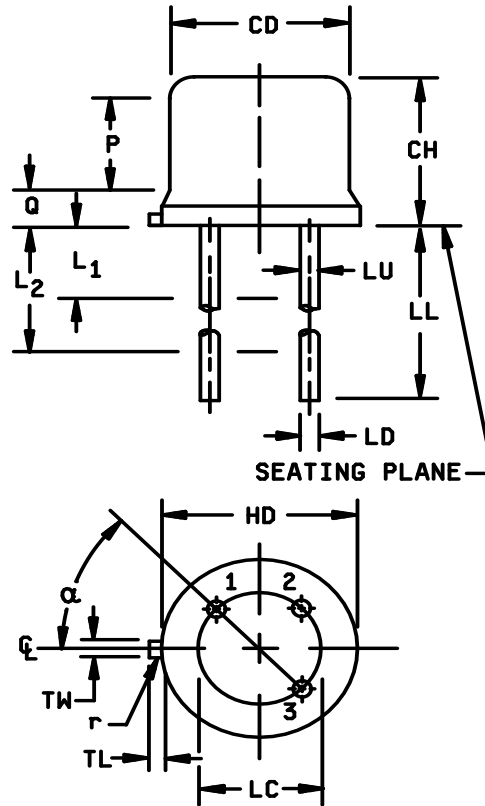
Types	h _{FE} at V _{CE} = 10 V dc									
	h _{FE1} I _C = 100 μA dc		h _{FE2} I _C = 1.0 mA dc		h _{FE3} I _C = 10 mA dc		h _{FE4} (1) I _C = 150 mA dc		h _{FE5} (1) I _C = 500 mA dc	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
2N2218	20		25	150	35		40	120	20	
2N2219	35		50	325	75		100	300	30	
2N2218A	30		35	150	40		40	120	20	
2N2219A	50		75	325	100		100	300	30	
2N2218AL	30		35	150	40		40	120	20	
2N2219AL	50		75	325	100		100	300	30	

Types	h _{fe}		C _{obo}		Switching			
	I _C = 20 mA dc V _{CE} = 20 V dc f = 100 MHz		I _E = 0, V _{CE} = 10 V dc 100 kHz ≤ f ≤ 1 MHz		t _{on}		t _{off}	
			pF		ns		ns	
	Min	Max	Min	Max	Min	Max	Min	Max
2N2218	2.5	12.0		8		40		250
2N2219	2.5	12.0		8		40		250
2N2218A	2.5	12.0		8		35		300
2N2219A	2.5	12.0		8		35		300
2N2218AL	2.5	12.0		8		35		300
2N2219AL	2.5	12.0		8		35		300

Types	V _{CE(sat)1} (1) I _C = 150 mA dc I _B = 15 mA dc		V _{CE(sat)2} (1) I _C = 500 mA dc I _B = 50 mA dc		V _{BE(sat)1} (1) I _C = 150 mA dc I _B = 15 mA dc		V _{BE(sat)2} (1) I _C = 500 mA dc I _B = 50 mA dc	
	V dc		V dc		V dc		V dc	
	min	max	min	max	min	max	min	max
2N2218		0.4		1.6	0.6	1.3		2.6
2N2219		0.4		1.6	0.6	1.3		2.6
2N2218A		0.3		1.0	0.6	1.2		2.0
2N2219A		0.3		1.0	0.6	1.2		2.0
2N2218AL		0.3		1.0	0.6	1.2		2.0
2N2219AL		0.3		1.0	0.6	1.2		2.0

(1) Pulsed (see 4.5.1).

Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		7
LD	.016	.019	0.41	0.48	8,9
LL	See note 14				
LU	.016	.019	0.41	0.48	8,9
L ₁		.050		1.27	8,9
L ₂	.250		6.35		8,9
P	.100		2.54		7
Q		.030		0.76	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		7



NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
7. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC.
8. Dimension LU applies between L₁ and L₂. Dimension LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
9. All three leads.
10. The collector shall be internally connected to the case.
11. Dimension r (radius) applies to both inside corners of tab.
12. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
13. Lead 1 = emitter, lead 2 = base, lead 3 = collector.
14. For L suffix devices (TO-5), dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. For non-L suffix types (TO-39), dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max.

FIGURE 1. Physical dimensions (similar to TO-39, TO-5).

MIL-PRF-19500/251T

* 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.

* 1.5.1 JAN certification mark and quality level.

* 1.5.1.1 Quality level designators for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: The base quality level "JAN", "JANTX" "JANTXV", and "JANS".

* 1.5.2 Radiation hardness assurance (RHA) designator. The RHA levels that are applicable for this specification sheet from lowest to highest for JANS quality levels are as follows: "M", "D", "P", "L", "R", "F", "G", and "H". The RHA levels that are applicable for this specification sheet from lowest to highest for JANTXV quality levels are as follows: "R", and "F".

* 1.5.3 Device type. The designation system for the device types 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: "2218" and "2219".

* 1.5.4 Suffix symbols. The following suffix letters are incorporated in the PIN in the order listed in the table as applicable:

	A blank first suffix indicates a TO-39 package, dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max. (see figure 1).
A	Indicates alternate electrical characteristics.
L	Indicates a TO-5 package, dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. (see figure 1).

* 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.

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](#) and as follows.

- PCBPrinted circuit board
- R_{0JA}..... Thermal resistance junction to ambient.
- R_{0JC}..... Thermal resistance junction to case.

* 3.4 Interface requirements and physical dimensions. Interface requirements 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](#)).

MIL-PRF-19500/251T

3.5 Radiation hardness assurance (RHA). Radiation hardness assurance requirements, PIN designators, and test levels shall be as defined in [MIL-PRF-19500](#).

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

3.7 Electrical test requirements. The electrical test requirements shall be as specified in [table I](#).

3.8 Marking. Marking shall be in accordance with [MIL-PRF-19500](#). The radiation hardened designator M, D, P, L, R, F, G, or H shall immediately precede (or replace) the device "2N" identifier (depending upon degree of abbreviation required).

* 3.9 Workmanship. Switching transistor 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 [table 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.

* 4.3 Screening (JAN, JANTXV, JANTX, and JANS levels). 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	
	JANS level	JANTX and JANTXV levels
(1) 3c	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9	I_{CBO2} , h_{FE4}	Not applicable
10	48 hours minimum	48 hours minimum
11	I_{CBO2} ; h_{FE4} ; ΔI_{CBO2} = 100 percent of initial value or 5 nA dc, whichever is greater. Δh_{FE4} = ± 15 percent	I_{CBO2} , h_{FE4}
12	See 4.3.1	See 4.3.1
13	Subgroups 2 and 3 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 5 nA dc, whichever is greater; Δh_{FE4} = ± 15 percent	Subgroup 2 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 5 nA dc, whichever is greater; Δh_{FE4} = ± 15 percent

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

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: V_{CB} = 10 - 30 V dc. Power shall be applied to achieve T_J = +135°C minimum using a minimum P_D = 75 percent of P_T maximum rated as defined in 1.3. T_A = 25°C ± 10 °C. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, T_J , and mounting conditions) may be used for JANTX and JANTXV quality levels. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval. Use method 3100 of MIL-STD-750 to measure T_J .

4.3.2 Thermal impedance. The thermal impedance 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 , (and V_C where appropriate). Measurement delay time (t_{MD}) = 70 μ 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. If alternate screening is being performed in accordance with MIL-PRF-19500, a sample of screened devices shall be submitted to and pass the requirements of table I, group A1 and A2 inspection only (table E-VIb, group B, subgroup 1 is not required to be performed again if group B has already been satisfied in accordance with 4.4.2 herein).

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-PRF-19500, and table I 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) of [MIL-PRF-19500](#) and [4.4.2.1](#). See [4.4.2.2](#) for JAN, JANTX, and JANTXV group B testing.

4.4.2.1 Group B inspection (JANS), table E-VIa of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
-----------------	---------------	------------------

B4	1037	$V_{CB} = 10$ V dc, adjust device current, or power, to achieve a minimum ΔT_J of $+100^\circ\text{C}$.
----	------	--

B5	1027	$V_{CB} = 10$ V dc; $P_D \geq 100$ percent of maximum rated P_T (see 1.3). (NOTE: If a failure occurs, resubmission shall be at the test conditions of the original sample.)
----	------	---

Option 1: 96 hours minimum sample size in accordance with MIL-PRF-19500, table E-VIa, adjust T_A or P_D to achieve $T_J = +275^\circ\text{C}$ minimum.

Option 2: 216 hours minimum, sample size = 45, $c = 0$; adjust T_A or P_D to achieve a $T_J = +225^\circ\text{C}$ minimum.

4.4.2.2 Group B inspection, (JAN, JANTX, and JANTXV). Separate samples may be used for each step. In the event of a lot failure, the resubmission requirements of [MIL-PRF-19500](#) shall apply. In addition, all catastrophic failures during CI, (conformance inspection), shall be analyzed to the extent possible to identify root cause and corrective action. Whenever a failure is identified as wafer lot or wafer processing related, the entire wafer lot and related devices assembled from the wafer lot shall be rejected unless an appropriate determined corrective action to eliminate the failures mode has been implemented and the devices from the wafer lot are screened to eliminate the failure mode.

<u>Step</u>	<u>Method</u>	<u>Condition</u>
-------------	---------------	------------------

1	1026	Steady-state life: 1,000 hours minimum, $V_{CB} = 10$ V dc, power shall be applied to achieve $T_J = +150^\circ\text{C}$ minimum using a minimum of $P_D = 75$ percent of maximum rated P_T as defined in 1.3 . $n = 45$ devices, $c = 0$. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.
---	------	---

2	1048	Blocking life, $T_A = +150^\circ\text{C}$, $V_{CB} = 80$ percent of rated voltage, 48 hours minimum. $n = 45$ devices, $c = 0$.
---	------	---

3	1032	High-temperature life (non-operating), $t = 340$ hours, $T_A = +200^\circ\text{C}$. $n = 22$, $c = 0$.
---	------	---

4.4.2.3 Group B sample selection. Samples selected from group B inspection shall meet all of the following requirements:

- For JAN, JANTX, and JANTXV, samples shall be selected randomly from a minimum of three wafers (or from each wafer in the lot) from each wafer lot. For JANS, samples shall be selected from each inspection lot. See [MIL-PRF-19500](#).
- Shall be chosen from an inspection lot that has been submitted to and passed [table I](#), subgroup 2, conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for life test (subgroups B4 and B5 for JANS, and group B for JAN, JANTX, and JANTXV) may be pulled prior to the application of final lead finish.

* 4.4.3 Group C inspection, Group C inspection shall be conducted in accordance with the test and conditions specified for subgroup testing in table VII of [MIL-PRF-19500](#), and in 4.4.3.1 (JANS) and 4.4.3.2 (JAN, JANTX, and JANTXV) herein for group C testing.

4.4.3.1 Group C inspection (JANS), table E-VII of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E.
C5	3131	$R_{\theta JA}$ and $R_{\theta JC}$ only, as applicable (see 1.3) and in accordance with thermal impedance curves.
C6	1026	1,000 hours at $V_{CB} = 10$ V dc; power shall be applied to achieve $T_J = +150^\circ\text{C}$ minimum and a minimum of $P_D = 75$ percent of maximum rated P_T as defined in 1.3. $n = 45$, $c = 0$. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.

4.4.3.2 Group C inspection (JAN, JANTX, and JANTXV), table E-VII of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	2036	Test condition E.
C5	3131	$R_{\theta JA}$ and $R_{\theta JC}$ only, as applicable (see 1.3) and in accordance with thermal impedance curves.
C6		Not applicable.

4.4.3.3 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes [table I](#) tests herein for conformance inspection. When the final lead finish is solder or any plating prone to oxidation at high temperature, the samples for C6 life test may be pulled prior to the application of final lead finish. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

4.4.4 Group D inspection. Conformance inspection for hardness assured JANS and JANTXV types shall include the group D tests specified in [table II](#) herein. These tests shall be performed as required in accordance with [MIL-PRF-19500](#) and method 1019 of [MIL-STD-750](#), for total ionizing dose or method 1017 of [MIL-STD-750](#) for neutron fluence as applicable (see 6.2 herein), except group D, subgroup 2 may be performed separate from other subgroups. Group D inspection may also be performed ahead of the screening lot using die selected in accordance with [MIL-PRF-19500](#) and related documents. Alternate package options may also be substituted for the testing provided there is no adverse effect to the fluence profile.

* 4.4.5 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 III](#) 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 measurement shall be as specified in section 4 of [MIL-STD-750](#).

MIL-PRF-19500/251T

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1 2/</u>						
Visual and mechanical examination <u>3/</u>	2071	n = 45 devices, c = 0				
Solderability <u>3/ 4/</u>	2026	n = 15 leads, c = 0				
Resistance to solvents <u>3/ 4/ 5/</u>	1022	n = 15 devices, c = 0				
* Salt atmosphere (corrosion)	1041	n = 6 devices, c = 0, (For laser marked devices only)				
Temp cycling <u>3/ 4/</u>	1051	Test condition C, 25 cycles. n = 22 devices, c = 0				
Hermetic seal <u>4/ 6/</u> Fine leak Gross leak	1071	n = 22 devices, c = 0				
Electrical measurements <u>4/</u>		Table I , subgroup 2				
Bond strength <u>3/ 4/</u>	2037	Precondition T _A = +250°C at t = 24 hours or T _A = +300°C at t = 2 hours n = 11 wires, c = 0				
Decap internal visual (design verification) <u>4/</u>	2075	n = 4 devices, c = 0				
<u>Subgroup 2</u>						
Thermal impedance	3131	See 4.3.2	Z _{θJX}			°C/W
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Condition D V _{CB} = 60 V dc V _{CB} = 75 V dc V _{CB} = 75 V dc	I _{CB01}		10 10 10	μA dc μA dc μA dc
Emitter to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3061	Condition D V _{EB} = 5 V dc V _{EB} = 6 V dc V _{EB} = 6 V dc	I _{EBO1}		10 10 10	μA dc μA dc μA dc
Breakdown voltage, collector to emitter 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3011	Bias condition D; I _E = 10 mA dc; pulsed (see 4.5.1).	V _{(BR)CEO}		30 50 50	V dc V dc V dc

See footnotes at end of table.

MIL-PRF-19500/251T

TABLE I. Group A inspection - Continued.

Inspection <u>1</u> /	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Collector to emitter cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3041	Bias condition C $V_{CE} = 30 \text{ V dc}$ $V_{CE} = 50 \text{ V dc}$ $V_{CE} = 50 \text{ V dc}$	I_{CES}		10 10 10	nA dc nA dc nA dc
Emitter to base cutoff current	3061	Bias condition D; $V_{EB} = 4 \text{ V dc}$	I_{EBO2}		10	nA dc
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Bias condition D $V_{CB} = 50 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$	I_{CBO2}		10 10 10	nA dc nA dc nA dc
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 0.1 \text{ mA dc}$; pulsed (see 4.5.1)	h_{FE1}	20 35 30 50		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 1.0 \text{ mA dc}$; pulsed (see 4.5.1)	h_{FE2}	25 50 35 75	150 325 150 325	
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 10 \text{ mA dc}$; pulsed (see 4.5.1)	h_{FE3}	35 75 40 100		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 150 \text{ mA dc}$; pulsed (see 4.5.1)	h_{FE4}	40 100 40 100	120 300 120 300	
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 500 \text{ mA dc}$; pulsed (see 4.5.1)	h_{FE5}	20 30 20 30		

See footnotes at end of table.

MIL-PRF-19500/251T

TABLE I. Group A inspection - Continued.

Inspection 1/ <u>Subgroup 2</u> - Continued	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.4 0.3 0.3	V dc V dc V dc
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)2}$		1.6 1.0 1.0	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 150 \text{ mA dc};$ $I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)1}$	0.6 0.6 0.6	1.3 1.2 1.2	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 500 \text{ mA dc};$ $I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)2}$		2.6 2.0 2.0	V dc V dc V dc
<u>Subgroup 3</u>						
High temperature operation		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Bias condition D $V_{CB} = 50 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$	I_{CBO3}		10	$\mu\text{A dc}$
Low temperature operation		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc}$	h_{FE6}	15 35 35		

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 4</u>						
Magnitude of common emitter small-signal short-circuit forward current transfer ratio	3306	$V_{CE} = 20 \text{ V dc}; I_C = 20 \text{ mA dc}; f = 100 \text{ MHz}$	$ h_{fe} $	2.5	12	
Small-signal short-circuit forward current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3206	$V_{CE} = 10 \text{ V dc}; I_C = 1 \text{ mA dc}; f = 1 \text{ kHz}$	h_{fe}	25 50 35 75		
Open circuit output capacitance	3236	$V_{CB} = 10 \text{ V dc}; I_E = 0; 100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{obo}		8	pF
Open circuit output capacitance	3240	$V_{EB} = 0.5 \text{ V dc}; I_C = 0; 100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{ibo}		25	pF
Saturated turn-on time 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL		(See figure 6)	t_{on}		40 35 35	ns ns ns
Saturated turn-off time 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL		(See figure 7)	t_{off}		250 300 300	ns ns ns
<u>Subgroups 5 and 6</u>						
Not applicable						

1/ For sampling plan see [MIL-PRF-19500](#).

2/ For resubmission of failed test in subgroup 1 of [table I](#), double the sample size of the failed test or sequence of tests. A failure in [table I](#), subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.

3/ Separate samples may be used.

4/ Not required for JANS devices.

5/ Not required for laser marked devices.

6/ This hermetic seal test is an end-point to temp-cycling in addition to electrical measurements.

MIL-PRF-19500/251T

TABLE II. Group D inspection.

Inspection <u>1/ 2/ 3/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1 4/</u>						
Neutron irradiation	1017	Neutron exposure $V_{CES} = 0$ V				
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Condition D $V_{CB} = 60$ V dc $V_{CB} = 75$ V dc $V_{CB} = 75$ V dc	I_{CBO1}		20 20 20	μ A dc μ A dc μ A dc
Emitter to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3061	Condition D $V_{EB} = 5$ V dc $V_{EB} = 6$ V dc $V_{EB} = 6$ V dc	I_{EBO1}		20 20 20	μ A dc μ A dc μ A dc
Breakdown voltage, collector to emitter 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3011	Bias condition D; $I_E = 10$ mA dc; pulsed (see 4.5.1).	$V_{(BR)CEO}$	30 50 50		V dc V dc V dc
Collector to emitter cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3041	Bias condition C $V_{CE} = 30$ V dc $V_{CE} = 50$ V dc $V_{CE} = 50$ V dc	I_{CES}		20 20 20	nA dc nA dc nA dc
Emitter to base cutoff current	3061	Bias condition D; $V_{EB} = 4$ V dc	I_{EBO2}		20	nA dc
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Bias condition D $V_{CB} = 50$ V dc $V_{CB} = 60$ V dc $V_{CB} = 60$ V dc	I_{CBO2}		20 20 20	nA dc nA dc nA dc
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10$ V dc; $I_C = 0.1$ mA dc; pulsed (see 4.5.1)	$[h_{FE1}]$ <u>5/</u>	[10] [17.5] [15] [25]		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10$ V dc; $I_C = 1.0$ mA dc; pulsed (see 4.5.1)	$[h_{FE2}]$ <u>5/</u>	[12.5] [25] [17.5] [37.5]	150 325 150 325	

See footnotes at end of table.

MIL-PRF-19500/251T

TABLE II. Group D inspection - Continued.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u> - Continued.						
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE3}] \underline{5/}$	[17.5] [37.5] [20] [50]		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 150 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE4}] \underline{5/}$	[20] [50] [20] [50]	120 300 120 300	
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 500 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE5}] \underline{5/}$	[10] [15] [10] [15]		
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.46 0.35 0.35	V dc V dc V dc
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)2}$		1.84 1.15 1.15	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 150 \text{ mA dc};$ $I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)1}$	0.6 0.6 0.6	1.50 1.38 1.38	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 500 \text{ mA dc};$ $I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)2}$		3.0 2.3 2.3	V dc V dc V dc

See footnotes at end of table.

MIL-PRF-19500/251T

TABLE II. Group D inspection - Continued.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u>						
Total dose irradiation 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	1019	Gamma exposure $V_{CES} = 24 \text{ V}$ $V_{CES} = 40 \text{ V}$ $V_{CES} = 40 \text{ V}$				
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Condition D $V_{CB} = 60 \text{ V dc}$ $V_{CB} = 75 \text{ V dc}$ $V_{CB} = 75 \text{ V dc}$	I_{CBO1}		20 20 20	$\mu\text{A dc}$ $\mu\text{A dc}$ $\mu\text{A dc}$
Emitter to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3061	Condition D $V_{EB} = 5 \text{ V dc}$ $V_{EB} = 6 \text{ V dc}$ $V_{EB} = 6 \text{ V dc}$	I_{EBO1}		20 20 20	$\mu\text{A dc}$ $\mu\text{A dc}$ $\mu\text{A dc}$
Breakdown voltage, collector to emitter 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3011	Bias condition D; $I_E = 10 \text{ mA dc}$; pulsed (see 4.5.1).	$V_{(BR)CEO}$	30 50 50		V dc V dc V dc
Collector to emitter cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3041	Bias condition C $V_{CE} = 30 \text{ V dc}$ $V_{CE} = 50 \text{ V dc}$ $V_{CE} = 50 \text{ V dc}$	I_{CES}		20 20 20	nA dc nA dc nA dc
Emitter to base cutoff current	3061	Bias condition D; $V_{EB} = 4 \text{ V dc}$	I_{EBO2}		20	nA dc
Collector to base cutoff current 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3036	Bias condition D $V_{CB} = 50 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$	I_{CBO2}		20 20 20	nA dc nA dc nA dc
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 0.1 \text{ mA dc}$; pulsed (see 4.5.1)	$[h_{FE1}] \underline{5/}$	[10] [17.5] [15] [25]		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}$; $I_C = 1.0 \text{ mA dc}$; pulsed (see 4.5.1)	$[h_{FE2}] \underline{5/}$	[12.5] [25] [17.5] [37.5]	150 325 150 325	

See footnotes at end of table.

MIL-PRF-19500/251T

TABLE II. Group D inspection - Continued.

Inspection <u>1/</u> <u>2/</u> <u>3/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 2</u> - Continued.						
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE3}] \underline{5/}$	[17.5] [37.5] [20] [50]		
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 150 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE4}] \underline{5/}$	[20] [50] [20] [50]	120 300 120 300	
Forward-current transfer ratio 2N2218 2N2219 2N2218A, 2N2218AL 2N2219A, 2N2219AL	3076	$V_{CE} = 10 \text{ V dc}; I_C = 500 \text{ mA dc};$ pulsed (see 4.5.1)	$[h_{FE5}] \underline{5/}$	[10] [15] [10] [15]		
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.46 0.35 0.35	V dc V dc V dc
Collector-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3071	$I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)2}$		1.84 1.15 1.15	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 150 \text{ mA dc};$ $I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)1}$	0.6 0.6 0.6	1.50 1.38 1.38	V dc V dc V dc
Base-emitter saturation voltage 2N2218, 2N2219 2N2218A, 2N2219A 2N2218AL, 2N2219AL	3066	Test condition A; $I_C = 500 \text{ mA dc};$ $I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)2}$		3.0 2.3 2.3	V dc V dc V dc

See footnotes at end of table.

TABLE II. Group D inspection - Continued.

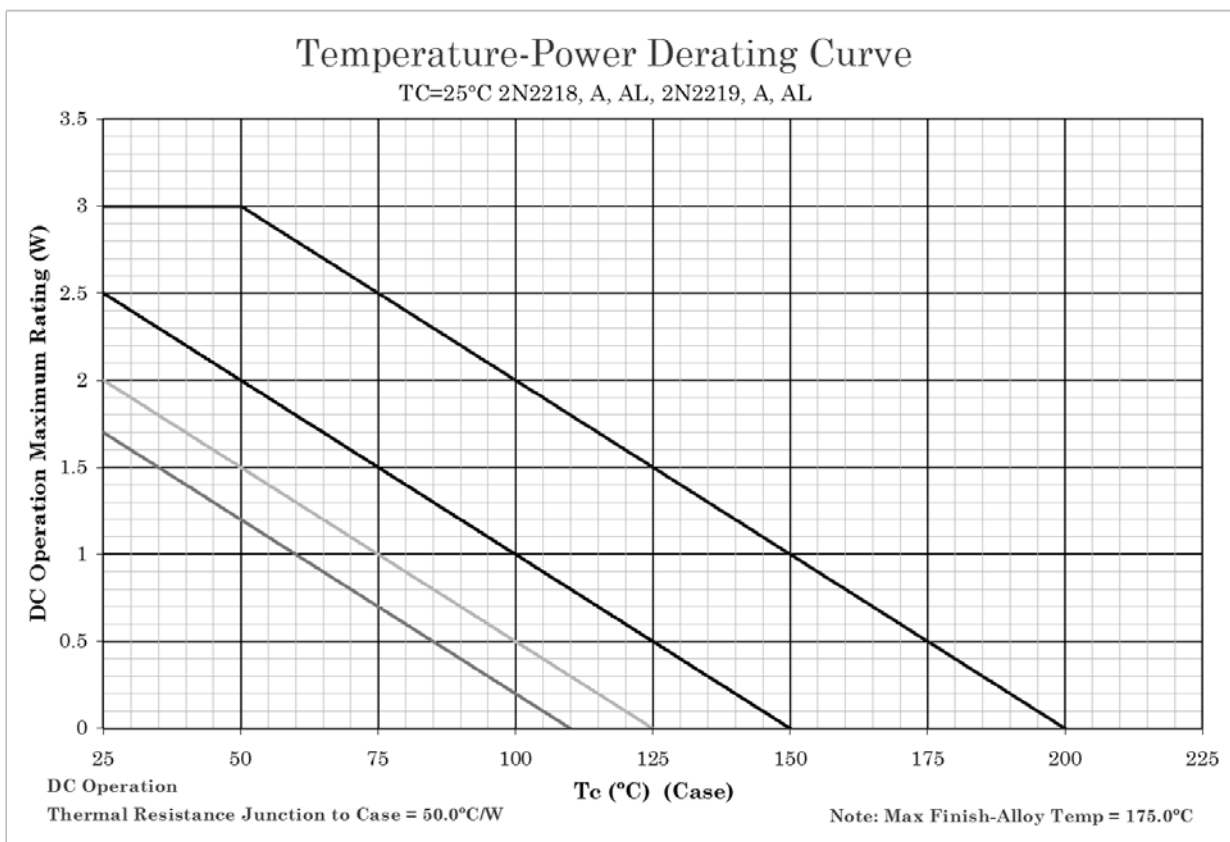
- 1/ Tests to be performed on all devices receiving radiation exposure.
- 2/ For sampling plan, see [MIL-PRF-19500](#).
- 3/ Electrical characteristics apply to device types unless otherwise noted.
- 4/ See [6.2.e](#) herein.
- 5/ See method 1019 of [MIL-STD-750](#) for how to determine $[h_{FE}]$ by first calculating the delta ($1/h_{FE}$) from the pre- and post-radiation h_{FE} . Notice the $[h_{FE}]$ is not the same as h_{FE} and cannot be measured directly. The $[h_{FE}]$ value can never exceed the pre-radiation minimum h_{FE} that it is based upon.

MIL-PRF-19500/251T

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

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal	1071		
Fine leak Gross leak			
Electrical measurements		See table I , subgroup 2 herein.	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent life	1037	V _{CB} = 10 V dc, 6,000 cycles, forced air cooling allowed on cooling cycle only. Adjust device current, or power, to achieve a minimum ΔT _J of +100°C.	
Electrical measurements		Table I , subgroup 2 herein.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500 , table E-IX, group E, subgroup 4.	
<u>Subgroup 5</u>			
Not applicable			
<u>Subgroup 6</u>			11 devices
Electrostatic discharge (ESD)	1020		
<u>Subgroup 8</u>			45 devices c = 0
Reverse stability	1033	Condition B.	

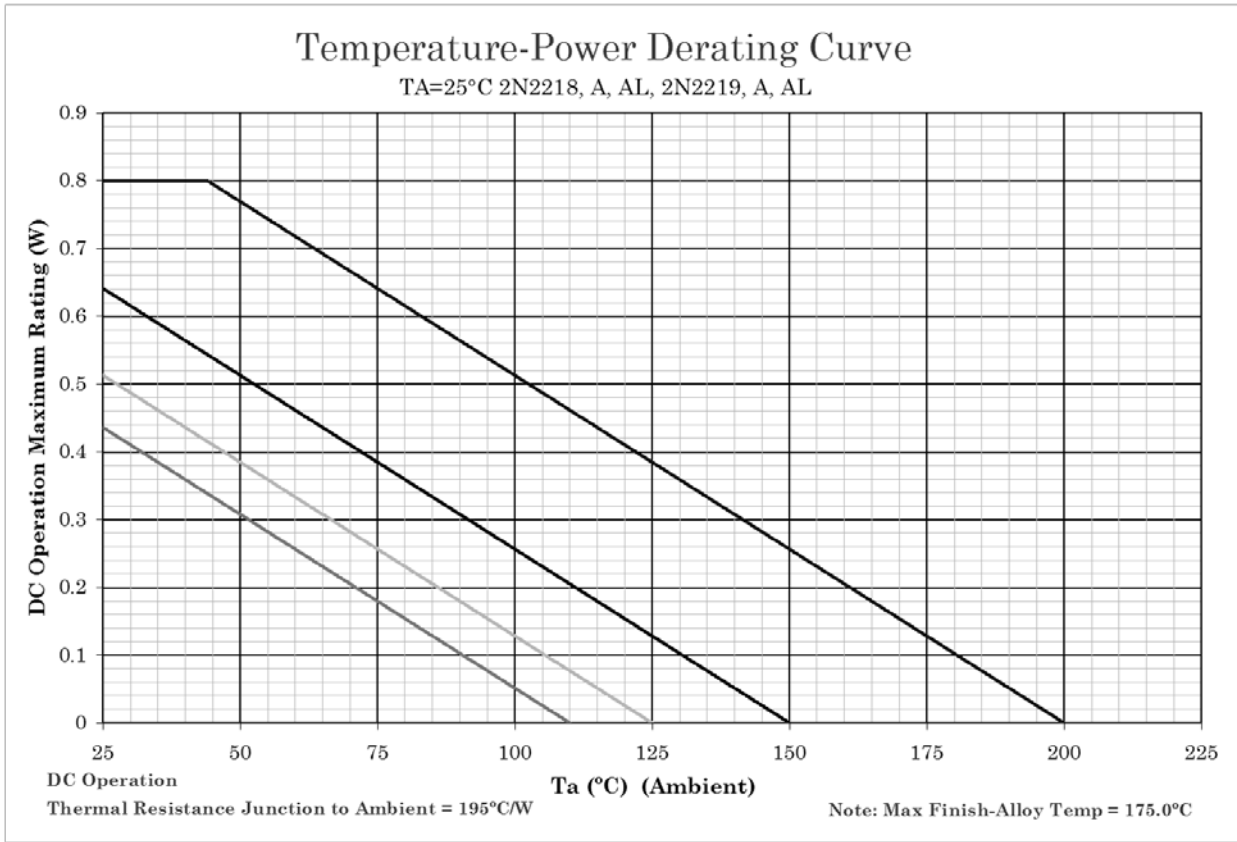
*



NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 200^\circ\text{C}$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150^\circ\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at $T_J \leq 125^\circ\text{C}$, and 110°C to show power rating where most users want to limit T_J in their application.

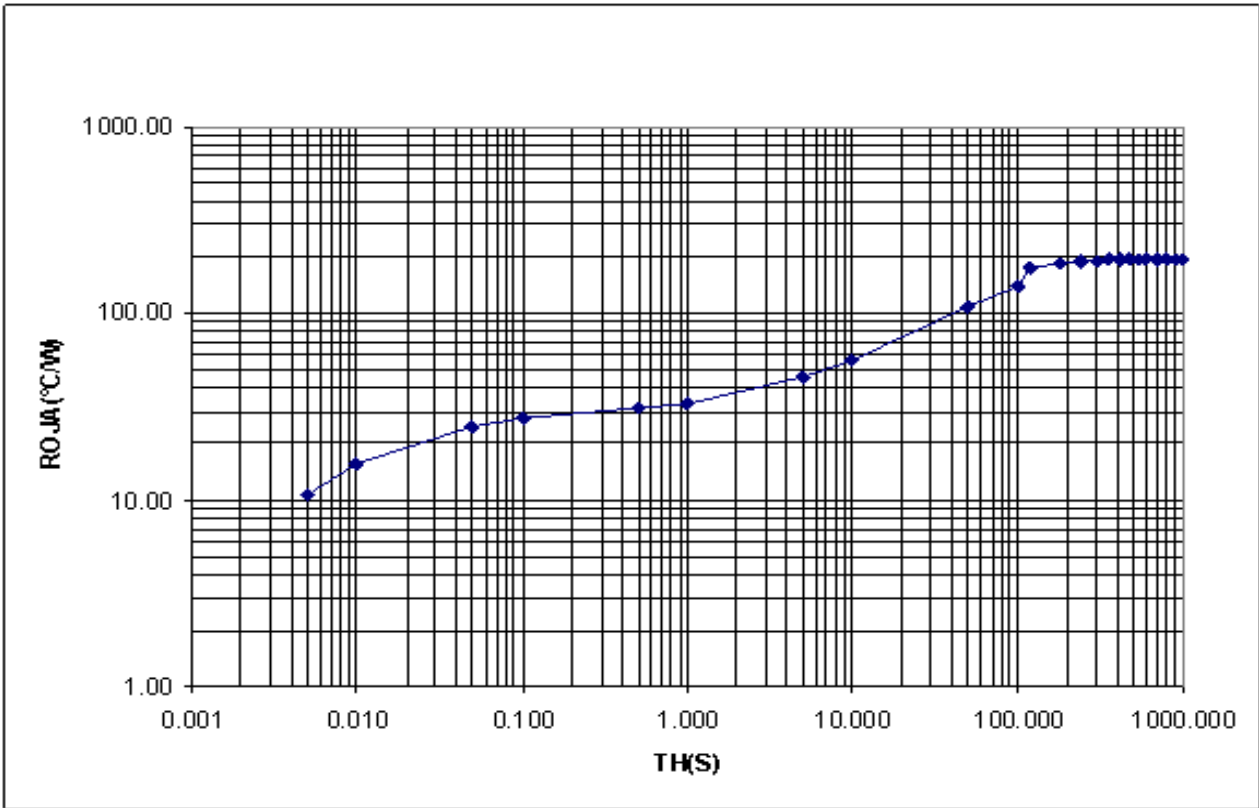
FIGURE 2. Derating for 2N2218, 2N2218A, 2N2218AL, 2N2219, 2N2219A, and 2N2219AL ($R_{\theta JC}$) (TO-39 and TO-5).



NOTES:

1. This is the true inverse of the worst case thermal resistance value. All devices are capable of operating at $\leq T_J$ specified on this curve. Any parallel line to this curve will intersect the appropriate power for the desired maximum T_J allowed.
2. Derate design curve constrained by the maximum junction temperature ($T_J \leq 200^\circ\text{C}$) and power rating specified. (See 1.3 herein.)
3. Derate design curve chosen at $T_J \leq 150^\circ\text{C}$, where the maximum temperature of electrical test is performed.
4. Derate design curve chosen at $T_J \leq 125^\circ\text{C}$, and 110°C to show power rating where most users want to limit T_J in their application.

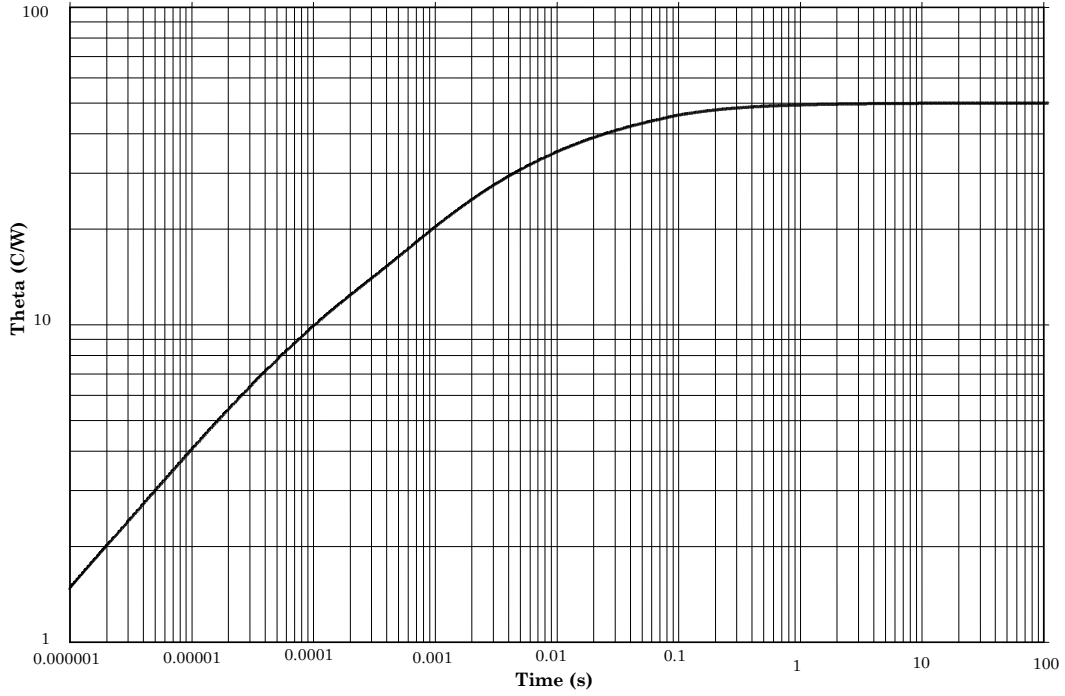
FIGURE 3. Derating for 2N2218, 2N2218A, 2N2218AL, 2N2219, 2N2219A, and 2N2219AL ($R_{\theta JA}$) (TO-39 and TO-5).



$T_A = +25^\circ\text{C}$, 800 mW, Thermal resistance $R_{\theta JA} = 195^\circ\text{C/W}$

FIGURE 4. Thermal impedance graph ($R_{\theta JA}$) for 2N2218, 2N2218A, 2N2218AL, 2N2219, 2N2219A, and 2N2219AL (TO-39 and TO-5).

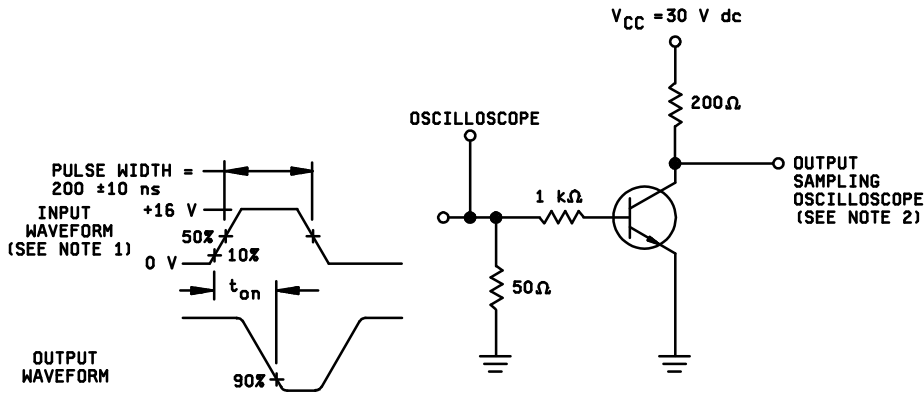
Maximum Thermal Impedance



$T_C = +25^\circ\text{C}$, 3.0 W; Thermal resistance $R_{\theta JC} = 50^\circ\text{C/W}$

FIGURE 5. Thermal impedance graph ($R_{\theta JC}$) for 2N2218, 2N2218A, 2N2218AL, 2N2219, 2N2219A, and 2N2219AL (TO-39 and TO-5).

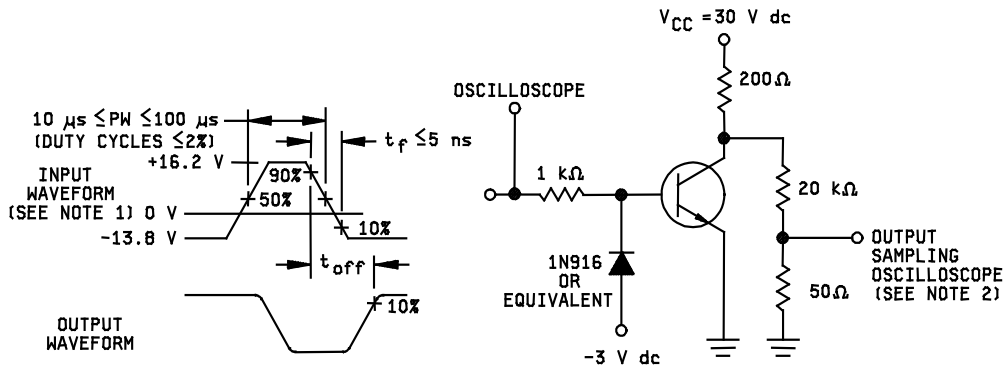
MIL-PRF-19500/251T



NOTES:

1. The rise time (t_r) of the applied pulse shall be ≤ 2.0 ns, duty cycle ≤ 2 percent and the generator source impedance shall be 50 ohms.
2. Sampling oscilloscope: $Z_{in} \geq 100$ K ohms, $C_{in} \leq 12$ pF, rise time $\leq .2$ ns.

FIGURE 6. Saturated turn-on switching time test circuit.



NOTES:

1. The rise time (t_r) of the applied pulse shall be ≤ 2.0 ns, duty cycle ≤ 2 percent and the generator source impedance shall be 50 ohms.
2. Sampling oscilloscope: $Z_{in} \geq 100$ K ohms, $C_{in} \leq 12$ pF, rise time $\leq .2$ ns.

FIGURE 7. Saturated turn-off switching time 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.)

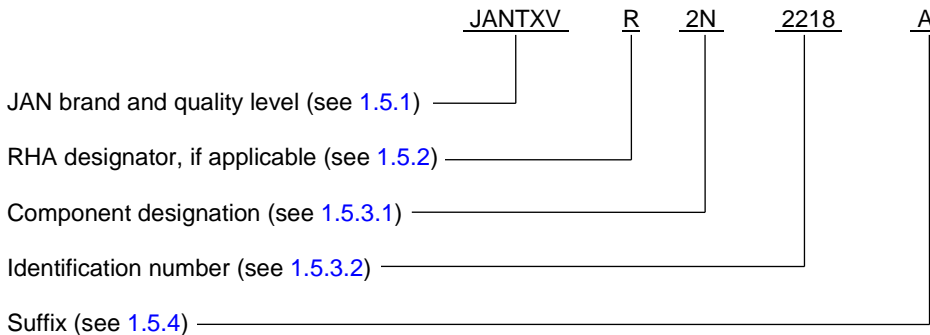
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

* 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 and 6.4.
- e. For acquisition of RHA designed devices, table II, subgroup 1 testing of group D is optional. If subgroup 1 testing is desired, it must be specified in the contract.

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

PINs for types 2N2218, and 2N2219			
JAN2N2218	JANTXV2N2218	JANTXVR2N2218	JANS#2N2218 (1)
JAN2N2218A	JANTXV2N2218A	JANTXVR2N2218A	JANS#2N2218A (1)
JAN2N2218AL	JANTXV2N2218AL	JANTXVR2N2218AL	JANS#2N2218AL (1)
JAN2N2219	JANTXV2N2219	JANTXVR2N2219	JANS#2N2219 (1)
JAN2N2219A	JANTXV2N2219A	JANTXVR2N2219A	JANS#2N2219A (1)
JAN2N2219AL	JANTXV2N2219AL	JANTXVR2N2219AL	JANS#2N2219AL (1)
JANTX2N2218	JANS2N2218	JANTXVF2N2218	
JANTX2N2218A	JANS2N2218A	JANTXVF2N2218A	
JANTX2N2218AL	JANS2N2218AL	JANTXVF2N2218AL	
JANTX2N2219	JANS2N2219	JANTXVF2N2219	
JANTX2N2219A	JANS2N2219A	JANTXVF2N2219A	
JANTX2N2219AL	JANS2N2219AL	JANTXVF2N2219AL	

(1) The # represents one of eight RHA designators available (M, D, P, L, R, F, G, or H).

* 6.6 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 previous issue.

Custodians:
 Army - CR
 Navy - EC
 Air Force - 85
 NASA - NA
 DLA - CC

Preparing activity:
 DLA - CC
 (Project 5961-2015-018)

Review activities:
 Army - AR, MI, SM
 Navy - AS, MC, SH
 Air Force - 19, 71, 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>.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for [Bipolar Transistors - Pre-Biased](#) category:

Click to view products by [Semicoa](#) manufacturer:

Other Similar products are found below :

[MMUN2217LT1G](#) [FP101-TL-E](#) [RN1607\(TE85L,F\)](#) [DRC9A14E0L](#) [DTA124GKAT146](#) [DTA144WETL](#) [DTA144WKAT146](#)

[DTC113EET1G](#) [DTC115TETL](#) [DTC115TKAT146](#) [DTC124TETL](#) [DTC144ECA-TP](#) [DTC144VUAT106](#) [MUN5241T1G](#)

[BCR158WH6327XTSA1](#) [NSBA114TDP6T5G](#) [NSBA143TF3T5G](#) [NSBA143ZF3T5G](#) [NSBC114EF3T5G](#) [NSBC114YF3T5G](#)

[NSBC123TF3T5G](#) [NSBC143TF3T5G](#) [NSVMUN2212T1G](#) [NSVMUN5111DW1T3G](#) [NSVMUN5314DW1T3G](#) [NSVUMC2NT1G](#)

[SMMUN2134LT1G](#) [SMUN2212T1G](#) [SMUN5235T1G](#) [SMUN5330DW1T1G](#) [SSVMUN5312DW1T2G](#) [2SC3650-TD-E](#) [RN1303\(TE85L,F\)](#)

[RN4605\(TE85L,F\)](#) [BCR135SH6327XT](#) [TTEPROTOTYPE79](#) [UMC3NTR](#) [DTA113EET1G](#) [EMA2T2R](#) [EMH15T2R](#) [SDTA114YET1G](#)

[SMMUN2111LT3G](#) [SMMUN2113LT1G](#) [SMMUN2114LT1G](#) [SMMUN2211LT3G](#) [SMUN2214T3G](#) [SMUN5113DW1T1G](#)

[SMUN5335DW1T1G](#) [NSBA114YF3T5G](#) [NSBC114TF3T5G](#)