

The documentation and process conversion measures necessary to comply with this revision shall be completed by 31 January 2015.

INCH-POUND

MIL-PRF-19500/380C
31 October 2014
SUPERSEDING
MIL-S-19500/380B
4 June 1991

PERFORMANCE SPECIFICATION SHEET

TRANSISTOR, NPN, SILICON, POWER,
FOR POWER-SWITCHING APPLICATIONS, STUD MOUNTED CASE,
TYPES 2N4865, 2N5250, AND 2N5251,
QUALITY LEVELS JANTX, JANTXV, AND JANS

Inactive for new design after 4 June 1991.

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 particular power-switching applications. Three levels of product assurance (JANTX, JANTXV, and JANS) are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Package outlines. The device package for this specification sheet is TO-114 in accordance with [figure 1](#) for all packaged device types.

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

Types	P_T (1)			$R_{\theta JC}$	V_{CBO}	V_{CEO}	V_{EBO}	I_C (2)	T_{OP} case	T_{STG}
	$T_C = +25^\circ\text{C}$	$T_C = +50^\circ\text{C}$	$T_C = +100^\circ\text{C}$							
	<u>W</u>	<u>W</u>	<u>W</u>	<u>$^\circ\text{C}/\text{W}$</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>A dc</u>	<u>$^\circ\text{C}$</u>	<u>$^\circ\text{C}$</u>
2N4865	350	300	200	0.5	100	80	10	50	(3)	(4)
2N5250	350	300	200	0.5	125	100	10	50	(3)	(4)
2N5251	350	300	200	0.5	180	150	10	50	(3)	(4)

(1) Linear derating factor = $2.0 \text{ W}/^\circ\text{C} \leq T_C = +200^\circ\text{C}$.

(2) Pulsed (see [4.5.1](#) herein) = 90 A.

(3) Temperature range = -55°C to $+200^\circ\text{C}$.

(4) Temperature range = -65°C to $+200^\circ\text{C}$.

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, $T_C = +25^\circ\text{C}$.

Types	h_{FE} (1)								$V_{BE(SAT)}$ (1)			
	$V_{CE} = 5 \text{ V dc}$ $I_C = 90 \text{ A dc}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 70 \text{ A dc}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 40 \text{ A dc}$		$V_{CE} = 5 \text{ V dc}$ $I_C = 20 \text{ A dc}$		$I_C = 70 \text{ A dc}$ $I_B = 10 \text{ A dc}$		$I_C = 40 \text{ A dc}$ $I_B = 4 \text{ A dc}$	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
2N4865	5.0	---	10	40	15	50	30	90	---	2.5	---	1.8
2N5250	5.0	---	10	40	15	50	30	90	---	2.5	---	1.8
2N5251	5.0	---	10	40	15	50	30	90	---	2.5	---	1.8

Types	$V_{CE(SAT)}$ (1)				h_{fe}		Pulse (2)		
	$I_C = 70 \text{ A dc}$ $I_B = 10 \text{ A dc}$		$I_C = 40 \text{ A dc}$ $I_B = 4 \text{ A dc}$		$f = 10 \text{ Mhz}$ $V_{CE} = 10 \text{ V dc}$ $I_C = 5 \text{ A dc}$		t_{on}	t_s	t_f
	Min	Max	Min	Max	Min	Max	Max	Max	Max
	V dc	V dc	V dc	V dc			μs	μs	μs
2N4865		2.0		1.0	1.0	7.0	2	1.5	.5
2N5250		2.0		1.0	1.0	7.0	2	1.5	.5
2N5251		2.0		1.0	1.0	7.0	2	1.5	.5

(1) Pulsed (see 4.5.1).

(2) See figure 2 for conditions at $I_C = 40 \text{ A dc}$ or $I_C = 70 \text{ A dc}$.

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: "JANTX", "JANTXV" and "JANS".

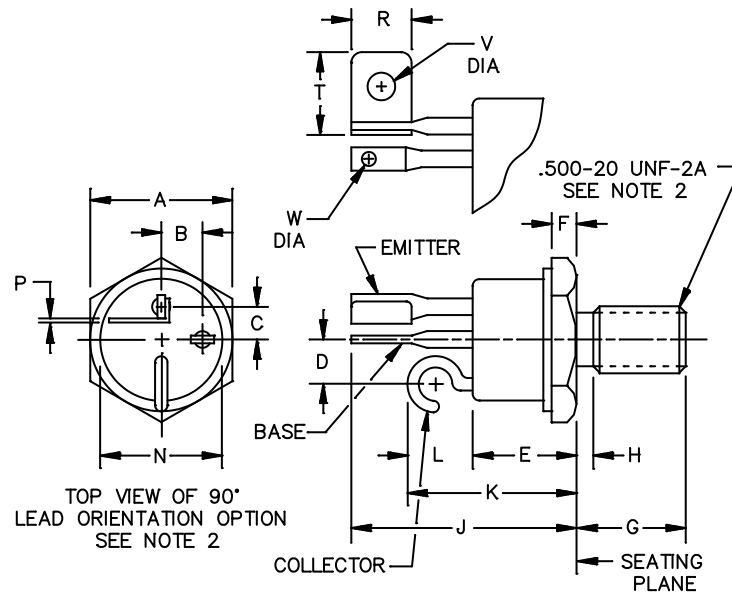
1.5.2 Device type. The designation system for the device types of transistors covered by this specification sheet are as follows.

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

1.5.2.2 Second number symbols. The second number symbols for the transistors covered by this specification sheet are as follows: "4865", "5250", and "5251".

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.



Dim.	A	B	C	D	E	F	G	H	J
Inch	1.063 1.031	.297 .317	.234 .254	.320 .340	.775	.185	.815	.125	1.680
mm	27.00 26.19	7.54 8.05	5.94 6.45	8.13 8.34	19.69	4.70	20.70	3.18	42.67
Notes								5	

Dim.	K	L	M	N	P	R	T	V	W
Inch	1.260	.485	.270	.910	.037	.450	.512	.206	.104
mm	32.00	12.32	6.86	23.11	0.94	11.43	13.01	5.23	2.64
Notes				7, 8					9

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Threads in accordance with FED-STD-H28.
3. Position of leads with respect to the hexagon is not controlled.
4. The case temperature may be measured anywhere on the seating plane within .125 inch (3.18 mm) of the stud.
5. Maximum unthreaded dimension.
6. The collector terminal may be a hook or tab at the option of the manufacturer. The collector is electrically connected to the case.
7. Dimension N is measured from center line of hook or outside edge of tab.
8. A 90° angle lead orientation as shown may be used at the option of the manufacturer. All dimensions of the basic outline except M, N, and the 120 degree lead angle apply to this option.
9. For all 3 terminals (except tab if utilized).

FIGURE 1. Physical dimensions and configuration of TO-114 package.

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.

FEDERAL

FED-STD-H28 – Screw Thread Standard for Federal Services.

(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 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.

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and figure 1 herein. The device package styles shall be as follows: TO-114 in accordance with figure 1 for all device types.

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

3.4.2 Pin-out. The pin-out of the device types shall be as shown on figure 1. Terminal 1 is the emitter, terminal 2 is base. The collector shall be electrically connected to the case.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.6 Marking. Marking shall be in accordance with MIL-PRF-19500.

3.7 Workmanship. Transistors shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4 and tables I and II).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500, and as specified herein.

4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of table II tests, the tests specified in table II herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.3 Screening (quality levels JANS, JANTX and JANTXV). 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 only
3c (1)	Transient thermal impedance (see 4.3.2)	Transient thermal impedance (see 4.3.2)
9	I_{CES} , h_{FE1} test numbers 2 and 4 of table V shall be measured and the data recorded.	Not applicable.
11	I_{CES} , h_{FE1} test numbers 2 and 4 of table V shall be measured and the data recorded. $\Delta I_{CES} = \pm 100$ percent of initial value or 10 μA dc, whichever is greater. $\Delta h_{FE} = \pm 20$ percent of initial value.	I_{CES} , h_{FE1} test numbers 2 and 4 of table V shall be measured and the data recorded.
12	See 4.3.1	See 4.3.1
13	I_{CES} and h_{FE3} of table I shall be retested and the data recorded. $\Delta I_{CES} = \pm 100$ percent of initial value or 10 μA dc, whichever is greater. $\Delta h_{FE} = \pm 20$ percent of initial value.	I_{CES} and h_{FE3} of table I shall be retested and the data recorded. $\Delta I_{CES} = \pm 100$ percent of initial value or 10 μA dc, whichever is greater. $\Delta h_{FE} = \pm 20$ percent of initial value.

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

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

- a. Power shall be applied to achieve $T_J = +187.5^\circ\text{C}$ minimum.
- b. $V_{CB} = 25 \pm 5 \text{ V dc}$.
- c. $T_A = +30^\circ\text{C} \pm 5^\circ\text{C}$; No heat sink or forced air cooling on the devices shall be permitted.

4.3.2 Transient thermal impedance. The transient thermal impedance measurements shall be performed in accordance with test method 3131 of [MIL-STD-750](#) using the guidelines in that test method for determining I_M , I_H , t_H , t_{SW} , (and V_H where appropriate). The transient thermal impedance limit used in screen 3c and subgroup 2 of [table I](#) herein shall be set statistically by the supplier. See subgroup 4 of [table II](#) (group E) herein.

4.4 Conformance inspection. Conformance inspection shall be in accordance with [MIL-PRF-19500](#), and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with [MIL-PRF-19500](#) and [table I](#) herein. Electrical measurements (end-points) shall be in accordance with subgroup 2 of [table I](#) herein. Delta requirements shall be in accordance with the applicable steps of [table III](#) 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](#) and herein. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein.

4.4.2.1 Quality level JANS (table E-VIA of [MIL-PRF-19500](#)).

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B4	1037	$t_{on} = 3$ minutes minimum, $t_{off} = 3$ minutes minimum, (see 4.3.1)
B5	2037	Al-Au die interconnects only
B6	3131	See 4.5.2

4.4.2.2 Quality levels JAN, JANTX, and JANTXV (table E-VIB of [MIL-PRF-19500](#)).

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B3	1037	$t_{on} = 3$ minutes minimum, $t_{off} = 3$ minutes minimum, (see 4.3.1)

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 [table III](#) herein.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C6	1037	$t_{on} = 3$ minutes minimum, $t_{off} = 3$ minutes minimum, (see 4.3.1)

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 III](#) herein. Electrical measurements (end-points) shall be in accordance with [table I](#), subgroup 2 herein. Delta requirements shall be in accordance with the applicable step of [table III](#) 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. Conditions for pulse response measurement shall be as specified in section 4 of [MIL-STD-750](#).

4.5.2 Steady-state thermal impedance (thermal resistance). Thermal resistance measurements shall be performed in accordance with method 3131 of [MIL-STD-750](#). The following shall apply:

- | | | | |
|----|----------|-----------------------------------|--|
| a. | I_M | Measuring current | 10 mA. |
| b. | V_{CE} | Measurement | 25 V dc. |
| c. | I_H | Collector heating current | 3 A. |
| d. | V_H | Collector-emitter heating voltage | 25 V dc. |
| e. | t_H | Heating time | Steady-state (see method 3131 of MIL-STD-750 for definitions). |
| f. | t_{MD} | Measurement time delay | 400 μ s. |
| g. | t_{SW} | Sample window time | 10 μ s maximum. |

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Transient thermal impedance <u>2/</u>	3131	See 4.3.2	$Z_{\theta JX}$		0.5	°C/W
Collector to emitter cutoff current	3041	Bias condition C	I_{CES}			
2N4865		$V_{CE} = 80 \text{ V dc}, V_{BE} = 0$			100	$\mu\text{A dc}$
2N5250		$V_{CE} = 100 \text{ V dc}, V_{BE} = 0$			100	$\mu\text{A dc}$
2N5251		$V_{CE} = 150 \text{ V dc}, V_{BE} = 0$			100	$\mu\text{A dc}$
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}, I_C = 90 \text{ A dc};$ pulsed (see 4.5.1).	h_{FE1}	5		
Emitter to base cutoff current	3061	Bias condition D, $V_{BE} = 8 \text{ V dc},$ $I_C = 0 \text{ A dc}$	I_{EBO}		5	$\mu\text{A dc}$
Collector to base, breakdown voltage	3001	Bias condition D, $I_C = 100 \mu\text{A dc},$ $I_B = 0$, pulsed (see 4.5.1)	$V_{(BR)CBO}$			
2N4865				100		V dc
2N5250				125		V dc
2N5251				180		V dc
Collector to emitter breakdown voltage	3011	Bias condition D, $I_C = 100 \mu\text{A dc},$ $I_B = 0$, pulsed (see 4.5.1)	$V_{(BR)CEO}$			
2N4865				80		V dc
2N5250				100		V dc
2N5251				150		V dc
Emitter to base, breakdown voltage	3026	Bias condition D, $I_E = .1 \text{ mA dc}$	V_{EBO}		10	V dc
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 20 \text{ A dc};$ pulsed (see 4.5.1)	h_{FE2}	30	90	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 40 \text{ A dc};$ pulsed (see 4.5.1)	h_{FE3}	15	50	
Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}; I_C = 70 \text{ A dc};$ pulsed (see 4.5.1)	h_{FE4}	10	40	

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 2</u> – continued.						
Base to emitter voltage (saturated)	3066	Test condition A, I _B = 4 A, I _C = 40 A dc; pulsed (see 4.5.1).	V _{BE(sat)1}		1.8	V dc
Base to emitter voltage (saturated)	3066	Test condition A, I _B = 10 A, I _C = 70 A dc; pulsed (see 4.5.1).	V _{BE(sat)2}		2.5	V dc
Collector to emitter voltage (saturated)	3071	I _B = 4 A dc, I _C = 40, pulsed (see 4.5.1)	V _{CE(sat)1}		1.0	V dc
Collector to emitter voltage (saturated)	3071	I _B = 10= A dc, I _C = 70, pulsed (see 4.5.1)	V _{CE(sat)2}		2.0	V dc
<u>Subgroup 3</u>						
High temperature operation:		T _A = +150°C				
Collector to emitter cutoff current	3041	Bias condition C, V _{CE} = 100 V dc, V _{BE} = 0	I _{CES}		500	μA dc
Low temperature operation:		T _A = -55°C				
Forward-current transfer ratio	3076	V _{CE} = 5 V dc; I _C = 40 A dc; pulsed (see 4.5.1)	h _{FE5}	10		
Forward-current transfer ratio	3076	V _{CE} = 5 V dc, I _C = 70 A dc; pulsed (see 4.5.1)	h _{FE6}	8		
<u>Subgroup 4</u>						
Magnitude of common-emitter small-signal short-circuit forward-current transfer ratio	3306	V _{CE} = 10 V dc, I _C = 5.0 A dc, f = 10MHz	h _{fe}	1	7	
Pulse response	3251	Test condition A, I _C = 70 A dc, I _{B(1)} = 10 A dc, I _{B(2)} = -10 A dc, see figure 2				
Turn on time			t _{on}		1.0	μsec
Storage time			t _s		0.7	μsec
Fall time			t _f		600	nsec

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 5</u>						
Safe operating area (continuous dc)	3005 (3051)	$T_C = 100^\circ\text{C}$ Pre-pulse condition, see figures 2 and 3, $V_{CE} = 0$, $I_C = 0$, Pulse condition (see 4.5.1) $t = 60$ seconds, $t_r \leq 6$ seconds $t_r \leq 6$ seconds, 1 cycle				
Test 1 (all types)		$V_{CE} = 4.0$ V dc, $I_C = 50$ A dc, $P_T = 200$ W				
Test 2 – 2N5250 (only)		$V_{CE} = 26$ V dc, $I_C = 7.8$ A dc, $P_T = 200$ W				
Test 2 – 2N5251 (only)		$V_{CE} = 37$ V dc, $I_C = 5.4$ A dc, $P_T = 200$ W				
Unclamped inductive sweep		$T_C = 25^\circ\text{C}$, $I_B = 500$ mA dc, $I_C = 5$ A dc, $L = 5$ mH, $R_C = .1$ ohm, see figure 4				
Clamped inductive sweep		$T_C = 25^\circ\text{C}$, $I_B = 3$ A dc, $I_C = 30$ A dc, $L = 5$ mH, $R_C = .1$ ohm, $V_{CE(\text{clamp})} = 150$ V, see figure 5				
End points		See table III, steps 1, 2, and 3				
<u>Subgroups 6 and 7</u>						
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 (JAN, JANTX, and JANTXV).
Group C, subgroup 2 and 6.
Group E, subgroup 1.

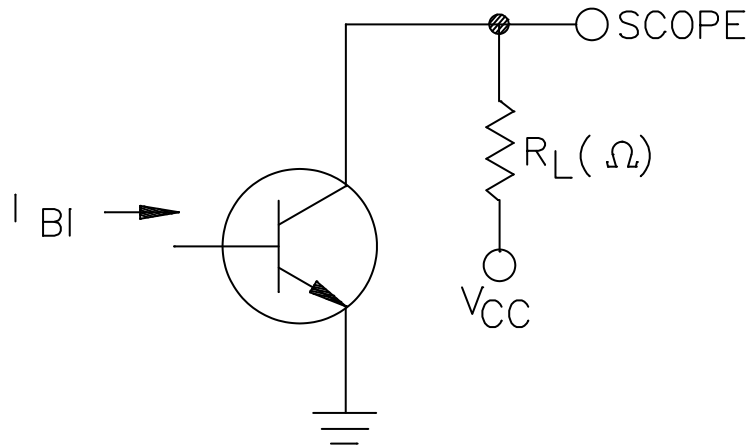
TABLE II. Group E inspection (all quality levels) – for qualification and requalification only.

Inspection	MIL-STD-750		Sample plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling	1051	Test condition C, 500 cycles.	
Hermetic seal	1071	Test conditions G or H	
Fine leak			
Gross leak			
End-point electrical measurements		See subgroup 2 of table I and steps 1, 2, and 3 of table III herein.	
<u>Subgroup 2</u>			45 devices c = 0
Blocking life	1049		
End-point electrical measurements		See subgroup 2 of table I and steps 1 and 4 of table III herein.	
<u>Subgroup 4</u>			sample size N/A
Thermal impedance curves		See MIL-PRF-19500 .	
<u>Subgroup 5</u>			
Not applicable			

TABLE III. Electrical endpoint measurements. 1/ 2/ 3/ 4/ 5/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Collector to emitter cutoff current 2N4865 2N5250 2N5251	3061	Bias condition D $V_{BE} = 8 \text{ V dc}$, $I_C = 0 \text{ A dc}$	I_{EBO}		5	$\mu\text{A dc}$
2		3041	Bias condition C, $V_{BE} = 0$	I_{CES}			
			$V_{CE} = 80 \text{ V dc}$			100	$\mu\text{A dc}$
			$V_{CE} = 100 \text{ V dc}$			100	$\mu\text{A dc}$
			$V_{CE} = 150 \text{ V dc}$			100	$\mu\text{A dc}$
3	Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}$; $I_C = 40 \text{ A dc}$; pulsed (see 4.5.1)	h_{FE3}	15	50	
4	Forward-current transfer ratio	3076	$V_{CE} = 5 \text{ V dc}$, $I_C = 90 \text{ A dc}$; pulsed (see 4.5.1).	h_{FE1}	5		
5	Pulse response	3251	Test condition A, $I_C = 40 \text{ A dc}$, $I_{B(1)} = 4 \text{ A dc}$, $I_{B(2)} = -4 \text{ A dc}$, see figure 2				
	Turn on time			t_{on}		1.0	μsec
	Storage time			t_s		0.7	μsec
	Fall time			t_f		600	nsec

- 1/ The measurements for subgroup 5 of group A (table I herein) are steps 1, 2, and 3.
- 2/ The measurements for group B quality level JANS (table E-VIA of MIL-PRF-19500) are as follows: For subgroups 3 and 4, steps 1, 2, and 3. For subgroup 5, steps 4 and 5.
- 3/ The measurements for group B quality levels JANTX and JANTXV (table E-VIB of MIL-PRF-19500) are as follows: For subgroups 2, 3 and 6, steps 1, 2, and 3.
- 4/ The measurements for group C (table E-VII of MIL-PRF-19500) are as follows: For subgroup 2, steps 1, 2, and 3. For subgroup 3, steps 4 and 5. For subgroup 6, steps 1, 2, 3, and 4.
- 5/ The measurements for group E (table E-IX of MIL-PRF-19500) are as follows: For subgroup 1, steps 1, 2, and 3. For subgroup 2, steps 1 and 4.



NOTES:

1. Circuit conditions at $I_C = 70$ A dc.
 - a. $10 \leq V_{CC} \leq 25$ V dc.
 - b. R_L (noninductive) = $(V_{CC} - V_{CE(SAT)}) / 70$ where
 - (1) $V_{CE(SAT)}$ = value at $I_C = 70$ A.
 - (2) $I_B = 10$ A.
 - (3) $I_{B1} = -I_{B2} = 10$ A.
2. Circuit conditions at $I_C = 40$ A dc, $10 \leq V_{CC} \leq 25$ V dc.
 - a. $10 \leq V_{CC} \leq 25$ V dc.
 - b. R_L (noninductive) = $(V_{CC} - V_{CE(SAT)}) / 40$ where
 - (1) $V_{CE(SAT)}$ = value at $I_C = 40$ A.
 - (2) $I_B = 4$ A.
 - (3) $I_{B1} = -I_{B2} = 4$ A.

FIGURE 2. Pulse response test circuits.

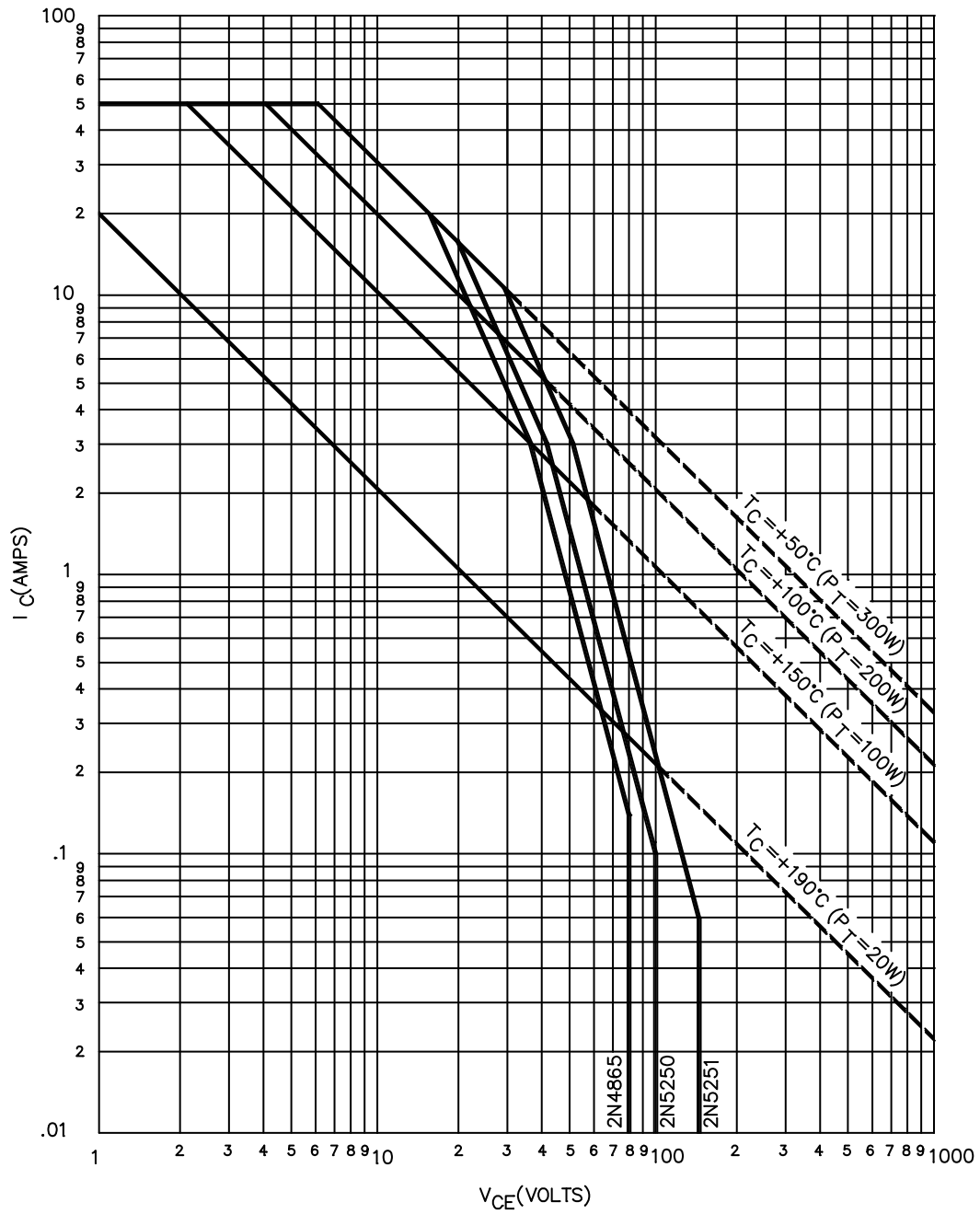
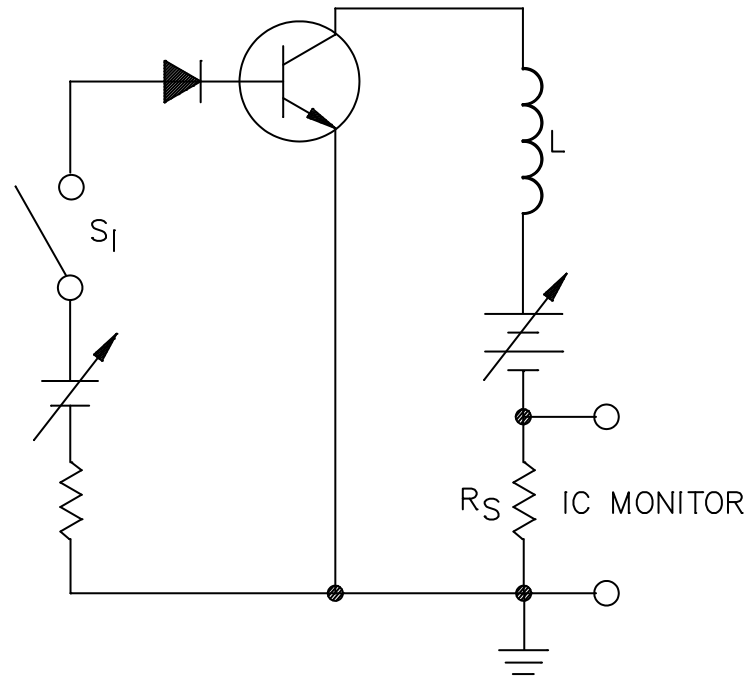


FIGURE 3. Maximum safe operating area.



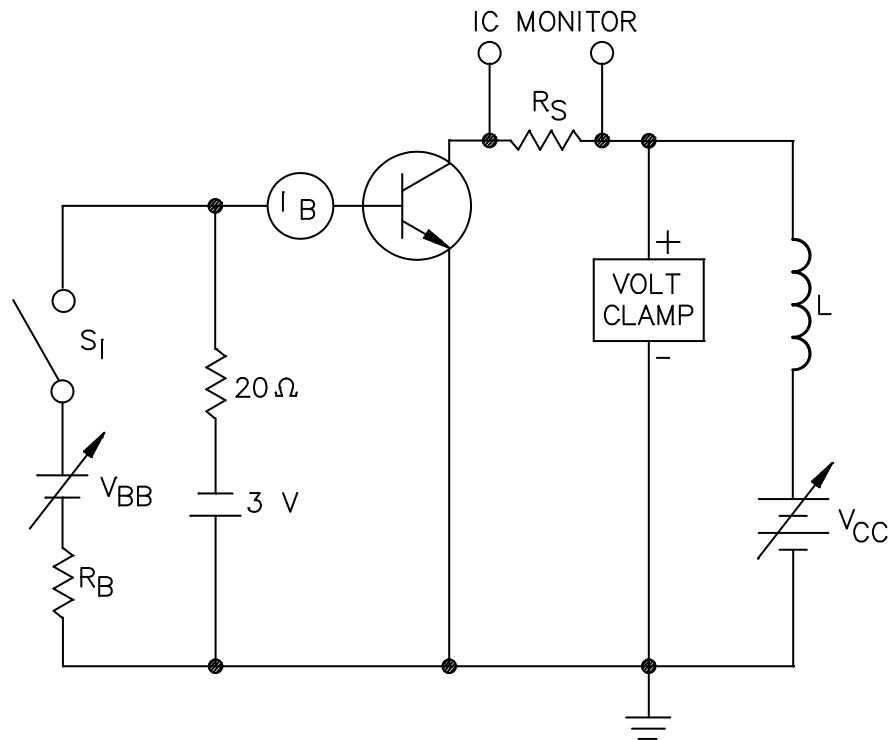
Testing procedure:

1. With switch S_1 closed, apply specified I_B and I_C (at specified T_C conditions).
2. As soon as 1 above is affected and ascertained, open switch S_1 .
3. Device fails if, now, second breakdown occurs.
4. Perform specified end-point tests.

NOTES:

1. $L = 5 \text{ mH}$; Stancor Electronics, Inc., high current filter choke type C-2689, $.03\Omega$, 22.5 A; (or equivalent).
2. $R_S = 0.1\Omega$ (non-inductive, 1.0 percent tolerance maximum).

FIGURE 4. Unclamped inductive sweep test circuit diagram.



Testing procedure:

1. With switch S_1 closed, apply specified I_B and I_C (at specified T_C conditions).
2. As soon as 1 above is affected and ascertained, open switch S_1 .
3. Device fails if clamp voltage is not reached.
4. Perform specified end-point tests.

Clamp voltages:

2N4865 = 80 V, +0, -5 V
 2N5250 = 100 V, +0, -5 V
 2N5251 = 150 V, +0, -5 V

NOTES:

1. $L = 5\text{ mH}$ (see figure 5 data). $L = 5\text{ mH}$; Stancor Electronics, Inc., high current filter choke type C-2689, .03 Ω , 22.5 A; (or equivalent).
2. $R_S = 0.1\Omega$ (non-inductive, 1.0 percent tolerance maximum).

FIGURE 5. Clamped inductive sweep test circuit diagram.

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.)

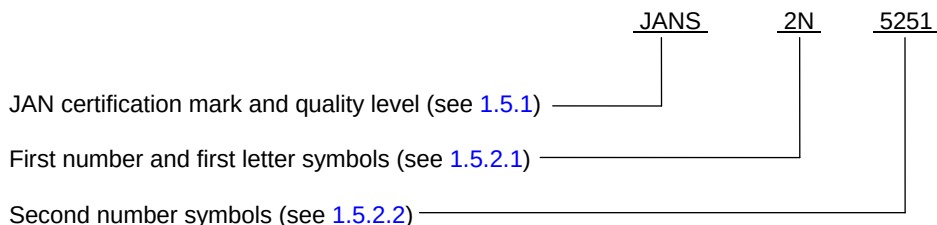
6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

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.

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 devices of the "TX" quality level	PINs for devices of the "TXV" quality level	PINs for devices of the "S" quality level
JANTX2N4865	JANTXV2N4865	JANS2N4865
JANTX2N5250	JANTXV2N5250	JANS2N5250
JANTX2N5251	JANTXV2N5251	JANS2N5251

6.6 Supersession information. Devices covered by this specification are substitutable for the manufacturer's and user's part number. This information in no way implies that manufacturer's part numbers are suitable as a substitute for the military Part or Identifying Number (PIN).

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:

Army – CR
Navy – EC
Air Force – 85
NASA – NA
DLA – CC

Preparing activity:

DLA – CC

(Project 5961–2014–003)

Review activities:

Army – AR, AV
Navy – AS, CG, MC, SH
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>.