The documentation and process conversion measures necessary to comply with this document shall be completed by 6 September 2001.

INCH-POUND

MIL-PRF-19500/441F
6 June 2001
SUPERSEDING
MIL-PRF-19500/441E
1 August 1997

PERFORMANCE SPECIFICATION

SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, SILICON, POWER
TYPES 2N3740 AND 2N3741,
JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the performance requirements for PNP, silicon, power transistors. Four levels of product assurance are provided for each encapsulated device type as specified in MIL-PRF-19500, and two levels of product assurance for each unencapsulated device type die.

1.2 Physical dimensions. See figure 1, TO-213AA (formerly TO-66) encapsulated devices, figures 2 and 3 for unencapsulated devices (JANHC and JANKC).

1.3 Maximum ratings.

Types	P_T (1)		V_{CBO}	V_{CEO}	V_{EBO}	I_B	I_C	T_{STG} and T_J
	T_C = +25°C	T_C = +100°C						
	W	W	V dc	V dc	V dc	V dc	V dc	°C
2N3740	25	14	60	60	7	2	4	-65 to +200
2N3741	25	14	80	80	7	2	4	-65 to +200

(1) Derate at 143 mW/°C above T_C = +25°C.

1.4 Primary electrical characteristics at T_C = +25°C.

Limits	h_{FE2} (1) V_{CE} = 1 V dc I_C = 250 mA dc	h_{FE4} (1) V_{CE} = 1 V dc I_C = 1 A dc	$\|h_{fe}\|$ V_{CE} = 10 V dc I_C = 100 mA dc f = 5 MHz	$V_{CE(sat)2}$ (1) I_C = 1.0 A dc I_B = 125 mA dc	C_{obo} V_{CB} = 10 V dc I_E = 0 100 kHz ≤ f ≤ 1 MHz	Pulse response		$R_{\theta JC}$
						t_{on}	t_{off}	
				V dc	pF	ns	µs	°C/W
Min	30	10	1					
Max	120		12	0.6	100	400	1	7

(1) Pulsed (see 4.5.1).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center Columbus, ATTN: DSCC-VAC, Post Office Box 3990, Columbus, OH 43216-5000, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5961

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATION

DEPARTMENT OF DEFENSE

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

STANDARD

DEPARTMENT OF DEFENSE

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. 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.

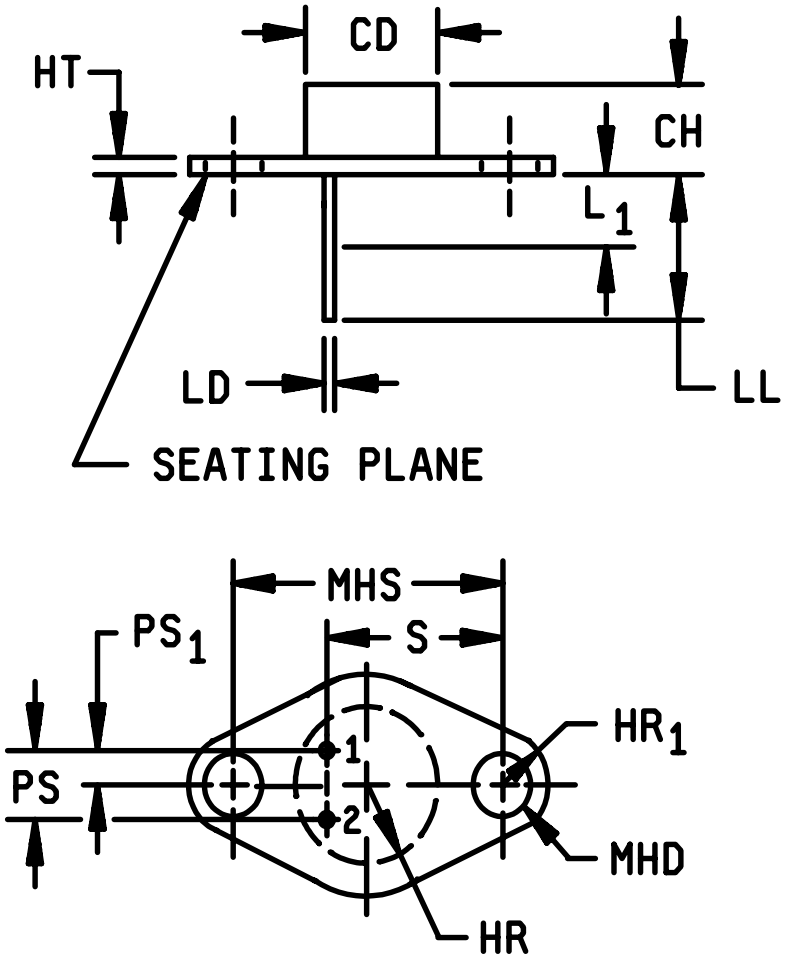
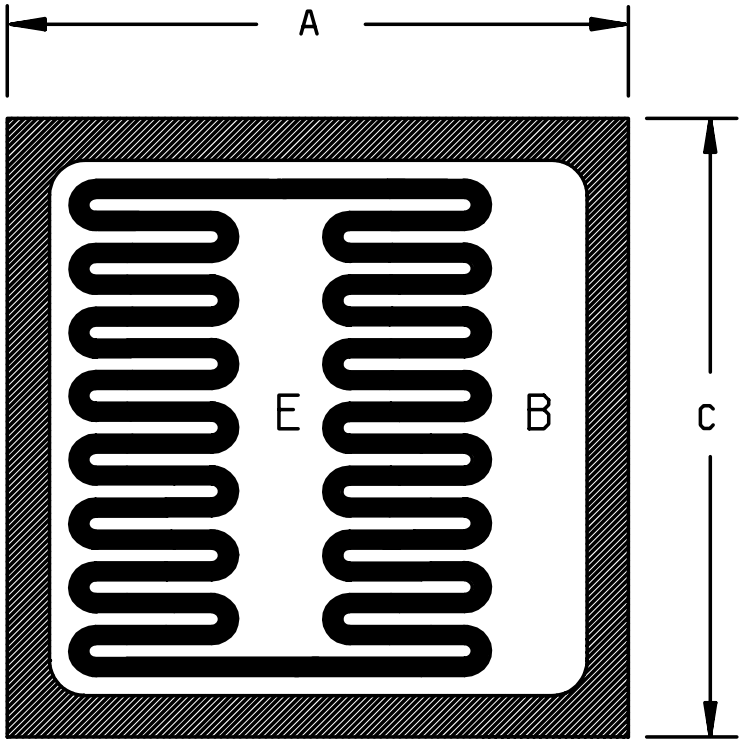


FIGURE 1. Physical dimensions, TO-213AA.

Symbol	Dimensions				Notes	Symbol	Dimensions				Notes
	Inches		Millimeter				Inches		Millimeters		
	Min	Max	Min	Max			Min	Max	Min	Max	
CD		.620		15.75	9	LL	.360	.500	9.14	12.70	4, 8
CH	.250	.340	6.35	8.54		L_1		.050		1.27	4, 8
HT	.050	.075	1.27	1.91		MHD	.142	.152	3.61	3.86	6, 9
HR		.350		8.89		MHS	.958	.962	24.33	24.43	
HR_1	.115	.145	2.92	3.68	5	PS	.190	.210	4.83	5.33	3
LD	.028	.034	0.71	0.86	4, 8, 9	PS_1	.093	.107	2.36	2.72	3
						s_1	.570	.590	14.48	14.99	3

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. These dimensions should be measured at points .050 to .055 below seating plane. When gauge is not used, measurement will be made at seating plane.
4. Both terminals.
5. At both ends.
6. Two holes.
7. The collector shall be electrically connected to the case.
8. LD applies between L_1 and LL. Diameter is uncontrolled in L_1.
9. In accordance with ANSI Y14.5M, diameters are equivalent to ϕ symbology.

FIGURE 1. Physical dimensions, TO-213AA - Continued.

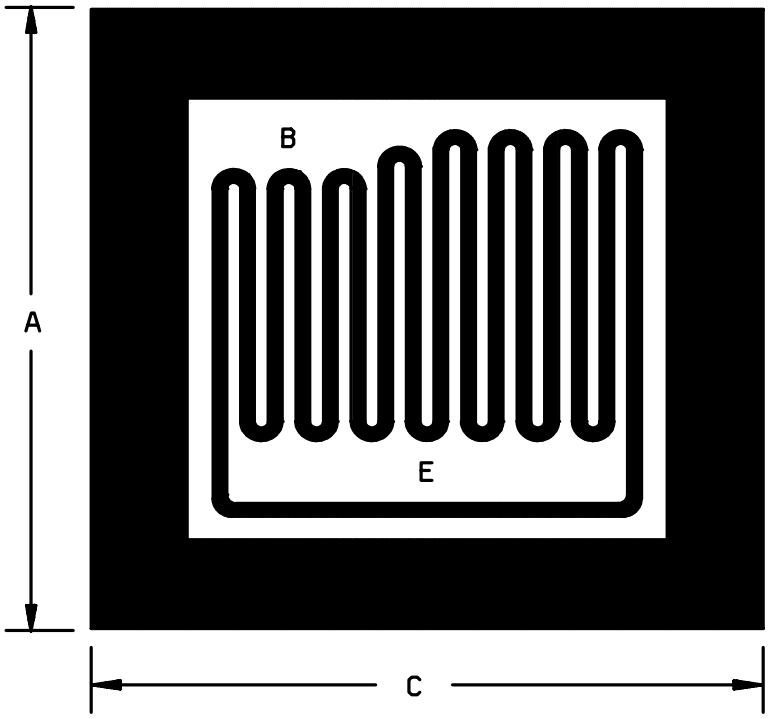


A - version

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.059	.069	1.49	1.76
C	.059	.069	1.49	1.76

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The physical characteristics of the die are:
   Thickness: .008 inch (0.20 mm) to .012 inch (0.30 mm).
   Top metal: Aluminum 25,000 Å minimum, 30,000 Å nominal.
   Back metal: Gold 2,500 Å minimum, 3,000 Å nominal.
   Back side: Collector.
   Bonding pad:
   B = .045 inch (1.14 mm) x .0075 inch (0.19 mm).
   E = .039 inch (0.99 mm) x .0075 inch (0.19 mm).
4. Element evaluation shall be performed on case outline TO-213AA.

FIGURE 2. Physical dimensions, JANHC and JANKC die.



B - version

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.083	.087	2.11	2.21
C	.083	.087	2.11	2.21

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. The physical characteristics of the die are:
   Thickness: .014 inch (0.36 mm) to .018 inch (0.46 mm).
   Top metal: Aluminum 20,000 Å minimum, 30,000 Å nominal 50,000 Å maximum.
   Back metal: T1 = 5,000 Å nominal ±2,000 Å; N1 = 10,000 Å nominal ±2,000 Å;
   AG = 10,000 Å nominal ±2,000 Å.
   Back side: Collector.
   Bonding pad: B = .021 inch (0.53 mm) x .008 inch (0.20 mm) ±.002 inch (0.05 mm).
   E = .040 inch (1.01 mm) x .008 inch (0.20 mm) ±.002 inch (0.05 mm).
4. Element evaluation shall be performed on case outline TO-213AA.

FIGURE 3. Physical dimensions, JANHC and JANKC die.

3. REQUIREMENTS

3.1 General. The requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

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 (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500.

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in MIL-PRF-19500 and herein.

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).

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. At the option of the manufacturer, marking may be omitted from the body, but shall be retained on the initial container.

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

3.7 Electrical test requirements. The electrical test requirements shall be the subgroups specified in group A, table I, 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).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500.

4.2.1 JANHC and JANKC devices. JANHC and JANKC devices are qualified in accordance with MIL-PRF-19500.

4.3 Screening (JANS, JANTXV, and JANTX levels only). Screening shall be in accordance with appendix E, table 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 appendix E, table IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
1a 1b	Not required Required	Not required Required
2	Optional	Optional
3a 3b (1) 3c	Required Not applicable Thermal impedance (see 4.3.3)	Required Not applicable Thermal response (see 4.3.3)
4	Required	Optional
5	Required	Not applicable
6	Required	Not applicable
7a and 7b	Required	Required
8	Required	Not required
9	I_{CEX1} and h_{FE2}	Not applicable
10	48 hours minimum	48 hours minimum
11	I_{CEX1} and h_{FE2}; ΔI_{CEX1} = 100 percent of initial value or 50 nA dc, whichever is greater, Δh_{FE2} = ± 25 percent of initial value.	I_{CEX1} and h_{FE2}
12	See 4.3.1	See 4.3.1
13	Subgroups 2 and 3 of table I herein; ΔI_{CEX1} = 100 percent of initial value or 50 nA dc; whichever is greater; Δh_{FE2} = ± 25 percent of initial value.	Subgroup 2 of table I herein; ΔI_{CEX1} = 100 percent of initial value or 50 nA dc, whichever is greater; Δh_{FE2} = ± 25 percent of initial value.
14a and 14b	Optional	Optional
15	Required	Not required
16	Required	Not required

(1) This test shall be performed anytime before screen 9.

4.3.1. Power burn-in conditions. Power burn-in conditions are as follows: V_{CB} = 10 - 30 Vdc. Power shall be applied to the device to achieve a junction temperature, Tj = +175 °C minimum and a minimum P_D = 75 percent of P_T maximum rated as defined in 1.3.

4.3.2. Screening (JANHC and JANKC). Screening of JANHC and JANKC die shall be in accordance with MIL-PRF-19500. As a minimum, die shall be 100 percent probed in accordance with group A, subgroup 2.

4.3.3. Thermal response (ΔV_{BE} measurements). The ΔV_{BE} measurements shall be performed in accordance with method 3131 of MIL-STD-750. The ΔV_{BE} conditions (I_H and V_H) and maximum limit shall be derived by each vendor. The chosen ΔV_{BE} measurement and conditions for each device in the qualification lot shall be submitted in the qualification report and a thermal response curve shall be plotted. The chosen ΔV_{BE} shall be considered final after the manufacturer has had the opportunity to test five consecutive lots. One-hundred percent safe operating area (SOA) testing may be performed in lieu of thermal response testing herein, provided that the appropriate conditions of temperature, time, current, and voltage to achieve die attach integrity are approved by the qualifying activity. The following parameter measurements shall apply:

a.	I_M measurement	10 mA.
b.	V_{CE} measurement voltage	16 V (same as V_H).
c.	I_H collector heating current	1 A (minimum).
d.	V_H collector-emitter heating voltage	16 V (minimum).
e.	t_H heating time	10 ms.
f.	t_{MD} measurement delay time	50 μs.
g.	t_{SW} sample window time	10 μs (maximum).

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 appendix E, table V of MIL-PRF-19500, and table I herein. End-point electrical measurements shall be in accordance with the applicable steps of 4.5.4 herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in VIa (JANS) of MIL-PRF-19500 and 4.4.2.1 herein. Electrical measurements (end-points) requirements shall be in accordance with group A, subgroup 2 herein. Delta requirements shall be in accordance with 4.5.4 herein. See 4.4.2.2 herein for JAN, JANTX, and JANTXV group B testing.

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

Subgroup	Method	Conditions
B4	1037	$V_{CB} \geq$ 10V for 2,000 cycles.
B5	1027	V_{CB} = 25 V dc ±5V, P_T = 3W at T_A = +100°C or adjusted as required by the chosen T_A to give an average lot T_J = +275°C.
B6	3131	Thermal resistance; see 4.5.2 herein.

4.4.2.2 Group B inspection, (JAN, JANTX and JANTXV) herein. 1/

Step	Method	Conditions
1	1037	$V_{CB} \geq 10$ V dc
2	1037	The life test of step 1 shall be extended to 6,000 cycles for each die design. Samples shall be selected from a wafer lot every twelve months of wafer production, however, group B shall not be required more than once for any single wafer lot. n = 45, c = 0.
3	1032	High-temperature life (non-operating), T = +200°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:

a. 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.

b. Must be chosen from an inspection lot that has been submitted to and passed group A, 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 conditions specified for subgroup testing in table VII of MIL-PRF-19500, and 4.4.3.1 (JANS), and 4.4.3.2 (JAN, JANTX, and JANTXV) herein for group C testing. Electrical measurements (end-points) and delta requirements shall be in accordance with group A, subgroup 2 and 4.5.4 herein.

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

Subgroup	Method	Conditions
C2	2036	Test condition E.
C6	1037	Intermittent operation life (sampling plan); $V_{CB} \geq 10$ V dc, $t_{on} \geq 1$ minute, $t_{off} \geq t_{on}$, for 6,000 cycles.

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

Subgroup	Method	Conditions
C2	2036	Test condition E.
C6		Not applicable.

1/ Separate samples may be used for each step. In the event of a group B failure, the manufacturer may pull a new sample at double size from either the failed assembly lot or from another assembly lot from the same wafer lot. If the new “assembly lot” option is exercised, the failed assembly lot shall be scrapped.

4.4.3.3 Group C inspection sample selection. Samples for subgroups in group C shall be chosen at random from any lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes group A tests for conformance inspection. Testing of a group 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 E inspection. Group E inspection shall be conducted in accordance with MIL-PRF-19500 and herein. End-point electrical measurements, see group A, subgroup 2 and 4.5.3 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.

4.5.2 Thermal resistance. Thermal resistance measurements shall be performed in accordance with method 3131 of MIL-STD-750. The following details shall apply:

a I_M measurement..... 10 mA.

b. V_{CE} measurement voltage ..... 16 V dc.

c. I_H collector heating current ..... 0.5 A, minimum.

d. V_H collector-emitter heating voltage ..... 16 V dc.

e. t_H heating time ..... Steady-state (see method 3131 of MIL-STD-750 for definitions) or 1.0 s minimum.

f. t_{MD} measurement delay time ..... 50 to 80 μs.

g. t_{SW} sample window time ..... 10 μs maximum

4.5.3 Inspection conditions. Unless otherwise specified, all inspections shall be conducted at a case temperature of +25°C ±3°C.

4.5.4 Delta requirements. Delta requirements shall be as specified below.

Step	Inspection (1) (2) (3)	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Collector to emitter cutoff current 2N3740 2N3741	3041	Bias condition A; V_{BE} = 1.5 V dc V_{CE} = 60 V dc V_{CE} = 80 V dc	ΔI_{CEX1}		100 percent of initial value or 50 nA dc, whichever is greater.	
2.	Forward-current transfer ratio	3076	V_{CE} = 1 V dc; I_C = 250 mA dc; Pulsed (see 4.5.1)	Δh_{FE2}		± 25 percent change from initial reading.	
3.	Saturation voltage and resistance	3071	I_C = 250 mA dc; I_B = 25 mA dc; pulsed (see 4.5.1)	$\Delta V_{CE(sat)1}$		50 mV dc change from initial value	
4.	Thermal response (4)	3131	See 4.3.3	ΔV_{BE}			

(1) The electrical measurements for appendix E, table VIa (JANS) of MIL-PRF-19500 are as follows:
   a. Subgroup 4, table II, steps 3, 4.
   b. Subgroup 5, table II, steps 1, 2, 3, 4.

(2) The electrical measurements for appendix E, table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows: Subgroup 3, table II, step 4.

(3) The electrical measurements for appendix E, table VII of MIL-PRF-19500 are as follows: Subgroup 6, table II, steps 1, 2, and 4 (JANS); steps 2, and 4 (JANTX and JANTXV).

(4) SOA testing may be performed in lieu of thermal response testing herein provided that appropriate conditions of temperature, time, current, and voltage to achieve die attach integrity are submitted to the qualifying activity.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1 2/						
Visual and mechanical 3/ examination	2071	n = 45 devices, c = 0				
Solderability 3/ 4/	2026	n = 15 leads, c = 0				
Resistance to 3/ 4/ 5/ solvent	1022	n = 15 devices, c = 0				
Temp cycling 3/ 4/	1051	Test condition C, 25 cycles. n = 22 devices, c = o				
Heremetic seal 4/	1071	n = 22 devices, c = 0				
Fine leak Gross leak						
Electrical measurements 4/	2037	Group A, subgroup 2 herein				
Bond strength 3/ 4/		Precondition T_A = +250°C at t = 24 hrs or T_A = +300°C at t = 2 hrs, n = 11 wires, c = 0				
Subgroup 2						
Breakdown voltage, collector to emitter	3011	Bias condition D; I_C = 100 mA dc; pulsed (see 4.5.1)	$V_{(BR)CEO}$			
2N3740 2N3741				60 80		V dc V dc
Collector to emitter cutoff current	3041	Bias condition D	I_{CEO}		10	µA dc
2N3740 2N3741		V_{CE} = 40 V dc V_{CE} = 60 V dc				
Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 7 V dc	I_{EBO}		100	nA dc
Collector to emitter cutoff current	3041	Bias condition A; V_{BE} = 1.5 V dc	I_{CEX1}		300	nA dc
2N3740 2N3741		V_{CE} = 60 V dc V_{CE} = 80 V dc				
Collector to base cutoff current	3036	Bias condition D	I_{CBO}		100	nA dc
2N3740 2N3741		V_{CE} = 60 V dc V_{CE} = 80 V dc				

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 2 -Continued						
Base emitter voltage (nonsaturated)	3066	Test condition B; V_{CE} = 1 V dc; I_C = 250 mA dc pulsed (see 4.5.1)	V_{BE}		1	V dc
Saturation voltage and resistance	3071	I_C = 250 mA dc; I_B = 25 mA dc pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.4	V dc
Saturation voltage and resistance	3071	I_C = 1 A dc; I_B = 125 mA dc pulsed (see 4.5.1)	$V_{CE(sat)2}$		0.6	V dc
Forward-current transfer ratio	3076	V_{CE} = 1 V dc; pulsed (see 4.5.1)				
		I_C = 100 mA dc	h_{FE1}	40		
		I_C = 250 mA dc	h_{FE2}	30		
		I_C = 500 mA dc	h_{FE3}	20	120	
		I_C = 1 A dc	h_{FE4}	10		
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 4 A dc pulsed (see 4.5.1)	h_{FE5}	3		
Subgroup 3						
High temperature operation:		T_A = +150°C				
Collector to emitter cutoff current	3041	Bias condition A, V_{BE} = 1.5 V dc	I_{CEX2}		25	µA dc
2N3740		V_{CE} = 60 V dc				
2N3741		V_{CE} = 80 V dc				
Low temperature operation:	3076	T_A = -55°C				
Forward-current transfer ratio		V_{CE} = 1 V dc; I_C = 250 mA dc pulsed (see 4.5.1)	h_{FE6}	10		
Subgroup 4						
Small-signal short-circuit forward-current transfer ratio	3206	V_{CE} = 10 V dc; I_C = 50 mA dc; f = 1 kHz	h_{fe}	25	250	
Small-signal short-circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc; I_C = 100 mA dc; f = 5 MHz	$\|h_{fe}\|$	1	12	
Open circuit output capacitance	3236	V_{CB} = 10 V dc; I_E = 0; 100 KHz ≤ f ≤ 1 MHz	C_{obo}		100	pF
Pulse response						
Turn-on time		I_C = 1 A dc; I_{B1} = 0.1 A dc (see figure 4)	t_{on}		400	ns
Turn-off time		I_C = 1 A dc; I_{B1} = I_{B2} = 0.1 A dc (see figure 4)	t_{off}		1	µs

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

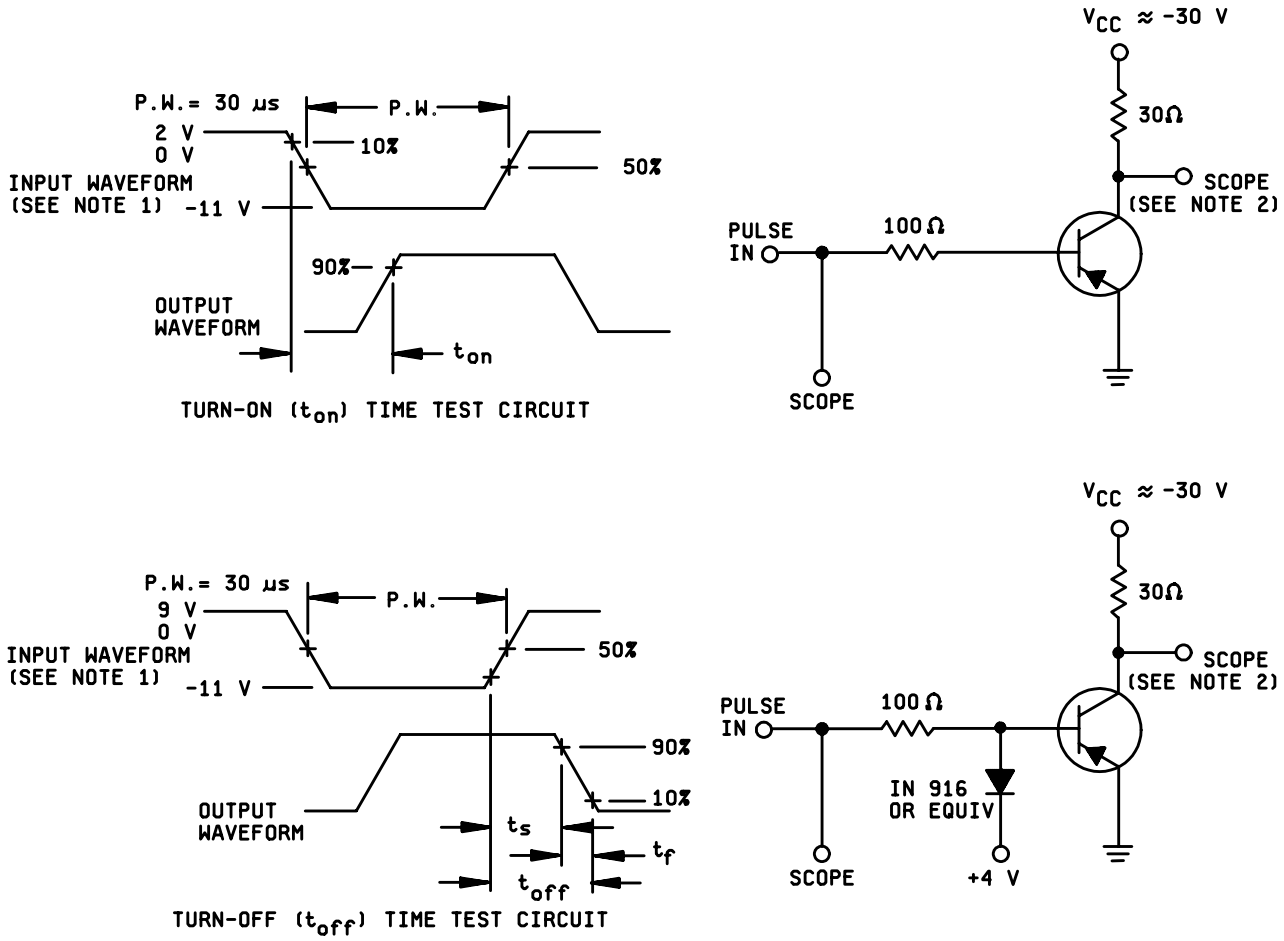
Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5						
SOA (continuous dc)	3051	T_C = +25°C; power application time = 1 s; 1 cycle (see figure 5)				
Test 1		V_{CE} = 6.25 V dc; I_C = 4 A dc				
Test 2		V_{CE} = 20 V dc; I_C = 1.25 A dc				
Test 3		I_C = 150 mA dc				
2N3740		V_{CE} = 50 V dc				
2N3741		V_{CE} = 65 V dc				
SOA (clamped switching)		T_A = +25°C; V_{CC} = 15 V dc; duty cycle ≤ 5 percent, t_p = 1.5 ms (vary to obtain I_C), I_C = 4 A dc (see figures 6 and 7)				
2N3740		Clamp voltage = 60 V dc				
2N3741		Clamp voltage = 80 V dc				
End-point electrical measurements		See table II, steps 1 and 3				
SOA (switching)	3053	Load condition C (unclamped inductive) (see figure 8); T_A = +25°C; duty cycle ≤ 5 percent, R_S = 0.1Ω; $t_r = t_f$ ≤ 500 ns; R_{BB1} = 50 Ω; V_{BB1} = 10 V dc; R_{BB2} = ∞; V_{BB2} = 0; V_{CC} ≥ 20 V dc				
Test 1		t_p = 375 μs (vary to obtain I_C); I_C = 1 A dc; L = 5 mH (min) at 1 A with maximum dc resistance of 0.5 Ω. For reference only: 2 ESSEX Stancor C-2688 (in parallel), or equivalent.				
Test 2		t_p = 1.5 ms (vary to obtain I_C); I_C = .25 A dc; L = 80 mH (min) at .25 A with a maximum dc resistance of 1 Ω. For reference only. ESSEX Stancor C-2691 or Triad C = 48				

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 5						
SOA (clamped switching) (destructive)		T_A = +25°C; V_{CC} = 55 V dc (see figures 6 and 7); duty cycle ≤ 5 percent, t_p = 1.5 ms (vary to obtain I_C); I_C = 4 A dc				
2N3740		Clamp voltage = 60 V dc				
2N3741		Clamp voltage = 80 V dc				
End-point electrical measurements		See table II, steps 1 and 3				
Subgroups 6 and 7						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.
2/ For resubmission of failed subgroup A1, double the sample size of the failed test or sequence of tests.
3/ Separate samples may be used.
4/ Not required for JANS.
5/ Not required for laser marked devices.



NOTES:

1. The rise time (t_r) of the applied pulse shall be ≤ 20 ns; duty cycle ≤ 2 percent; generator source impedance shall be 50 Ω.
2. Output sampling oscilloscope: Z_{in} ≥ 100 kΩ; C_{i_n} ≤ 12 pF; rise time ≤ 2 ns.

FIGURE 4. Pulse response test circuits.

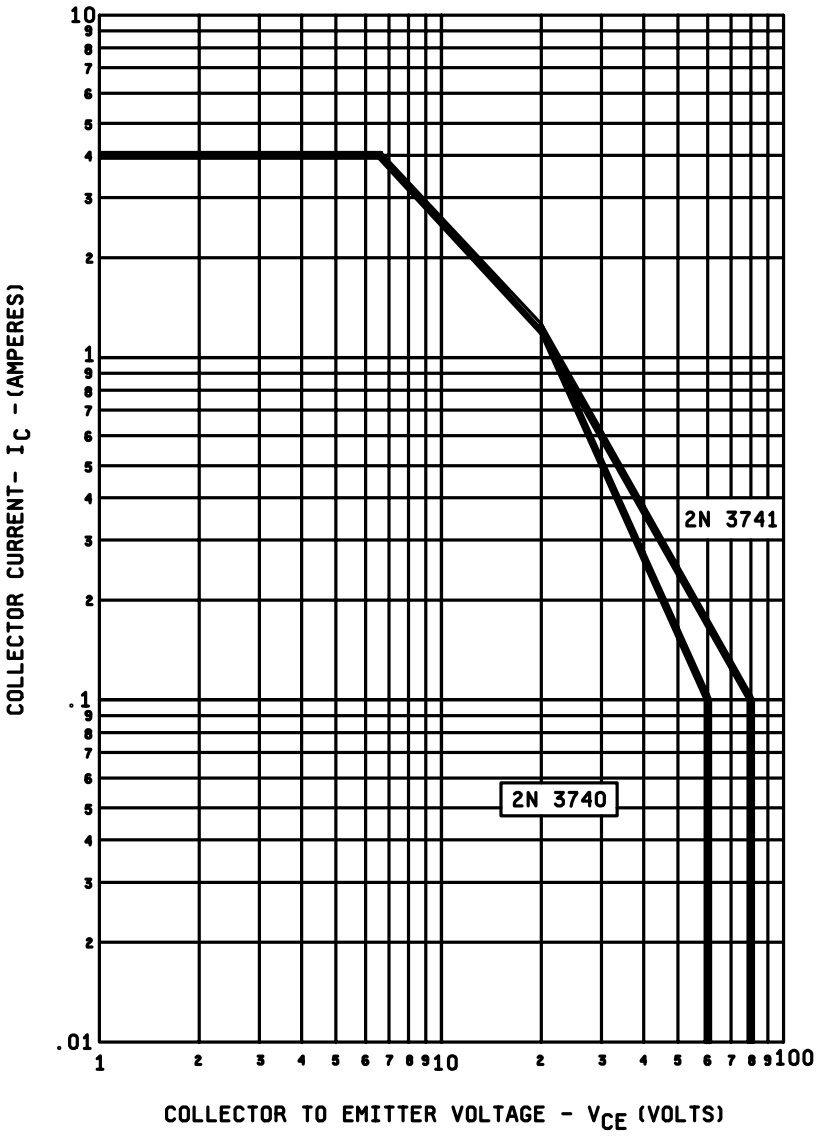
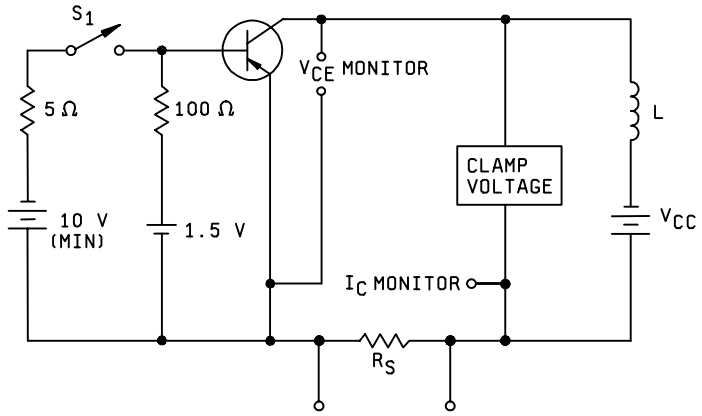


FIGURE 5. Maximum SOA graph (continuous dc).



$R_S \leq .1\Omega$ 12W; 1 percent tolerance maximum (noninductive).

L = 5 mH at 4 A with a maximum dc resistance of 0.5 Ω.
Reference only: 2 ESSEX Stancor C-2688 (in parallel),
or equivalent.

Procedure

1. With switch S_1 closed, set the specified test conditions.
2. Open S_1. Device fails if the clamp voltage is not reached.
3. Perform specified end-point tests.

FIGURE 6. Clamped inductive sweep test circuit.

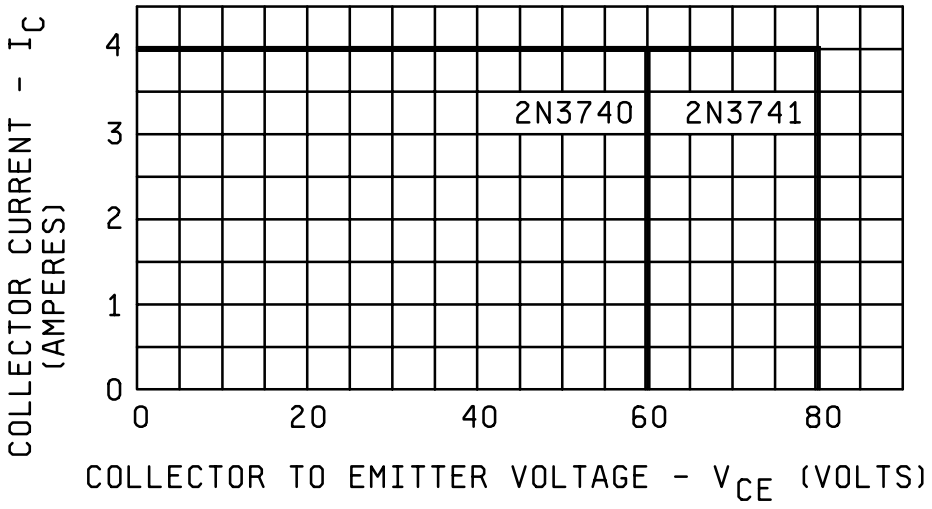


FIGURE 7. SOA for switching between saturation and cutoff (clamped inductive load).

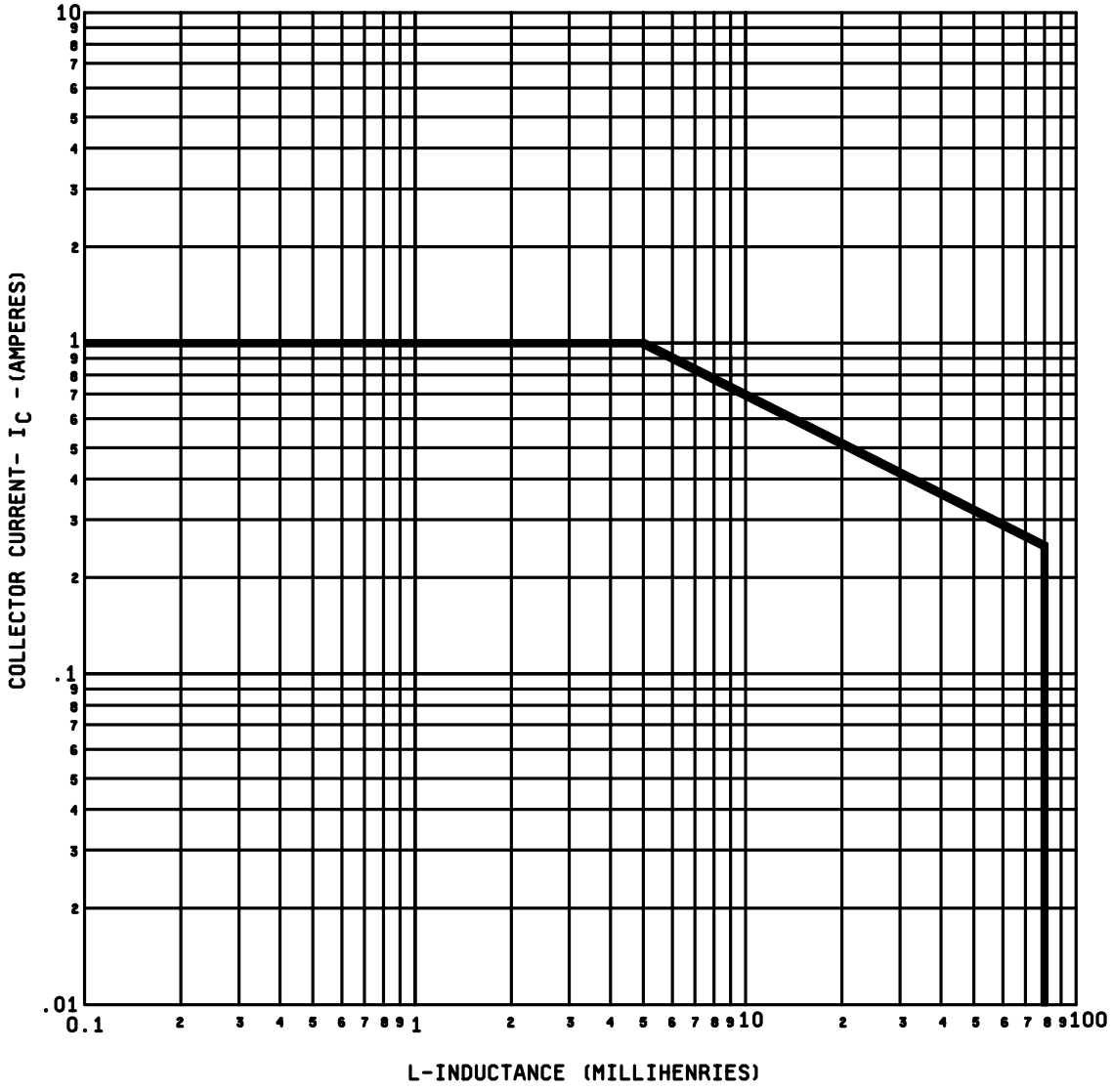


FIGURE 8. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

5. PACKAGING

5.1. Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' 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.)

6.1. Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2. Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2).

c. Lead finish as specified (see 3.4.1).

d. Product assurance level and type designator.

e. Packaging requirements (see 5.1).

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 Manufacturer 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 Defense Supply Center, Columbus, ATTN: DSCC-VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.4. Suppliers of JANHC and JANKC die. The qualified JANHC and JANKC suppliers with the applicable letter version (example, JANHCA3740) will be identified on the Qualified Manufacturers List.

JANC ordering information		
PIN	Manufacturer	
	33178	43611
2N3740	JANHCA2N3740	JANHCB2N3740
2N3740	JANKCA2N3740	JANKCB2N3740
2N3741	JANHCA2N3741	JANHCB2N3741
2N3741	JANKCA2N3741	JANKCB2N3741

6.5. 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 - NW
Air Force - 11
DLA - CC

Review activities:
Army - AR, AV, MI, SM
Navy - AS, CG, MC
Air Force - 13, 19, 99

Preparing activity:
DLA - CC

(Project 5961-2162)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/441F	2. DOCUMENT DATE 6 June 2001

3. **DOCUMENT TITLE**
SEMICONDUCTOR DEVICE, TRANSISTOR, PNP, SILICON, POWER TYPES 2N3740, AND 2N3741 JAN, JANTX, JANTXV, JANS, JANHC, AND JANKC.

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED

8. PREPARING ACTIVITY

a. Point of Contact Alan Barone	b. TELEPHONE Commercial 614-692-0510	DSN 850-0510	FAX 614-692-6939	EMAIL alan.barone@dscc.dla.mil
c. ADDRESS Defense Supply Center Columbus ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888			

DD Form 1426, Feb 1999 (EG) Previous editions are obsolete WHS/DIOR, Feb 99