



NPN High Power Silicon Transistors

2N3902 & 2N5157

Features

- Available in JAN, JANTX, and JANTXV per MIL-PRF-19500/371
- TO-3 (TO-204AA) Package



Maximum Ratings

Ratings	Symbol	2N3902	2N5157	Units
Collector - Emitter Voltage	V_{CEO}	400	500	Vdc
Emitter - Base Voltage	V_{EBO}	5.0	6.0	Vdc
Collector - Base Voltage	V_{CBO}	7.0		Vdc
Base Current	I_B	2.0		Adc
Collector Current	I_C	3.5		Adc
Total Power Dissipation @ $T_A = +25\text{ }^\circ\text{C}$ (1) @ $T_A = +25\text{ }^\circ\text{C}$ (2)	P_T	5.0		W
		100		W
Operating & Storage Temperature Range	T_j, T_{stg}	-65 to +200		$^\circ\text{C}$

Thermal Characteristics

Characteristics	Symbol	Maximum	Units
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.25	$^\circ\text{C}/\text{W}$

- 1) Derate linearly @ 28.57 mW/ $^\circ\text{C}$ for $T_A > +25\text{ }^\circ\text{C}$
- 2) Derate linearly @ 0.8 mW/ $^\circ\text{C}$ for $T_C > +75\text{ }^\circ\text{C}$

Electrical Characteristics

OFF Characteristics	Symbol	Minimum	Maximum	Units
Collector - Emitter Cutoff Current $V_{CE} = 325\text{ Vdc}$ 2N3902 $V_{CE} = 400\text{ Vdc}$ 2N5157	I_{CEO}	---	250 250	μAdc
Collector - Emitter Cutoff Current $V_{BE} = 1.5\text{ Vdc}, V_{CE} = 700\text{ Vdc}$	I_{CEX}	---	500	μAdc
Collector - Emitter Cutoff Current $V_{EB} = 5.0\text{ Vdc}$ 2N3902 $V_{EB} = 6.0\text{ Vdc}$ 2N5157	I_{EBO}	---	200 200	μAdc
OFF Characteristics				
Base - Emitter Saturation Voltage $I_C = 1.0\text{ Adc}, I_B = 0.1\text{ Vdc}$ $I_C = 3.5\text{ Adc}, I_B = 0.7\text{ Vdc}$	$V_{BE(sat)}$	---	1.5 2.0	Vdc
Collector - Emitter Saturation Voltage $I_C = 1.0\text{ Adc}, I_B = 0.1\text{ Adc}$ $I_C = 3.5\text{ Adc}, I_B = 0.7\text{ Adc}$	$V_{CE(sat)}$	---	0.8 2.5	Vdc

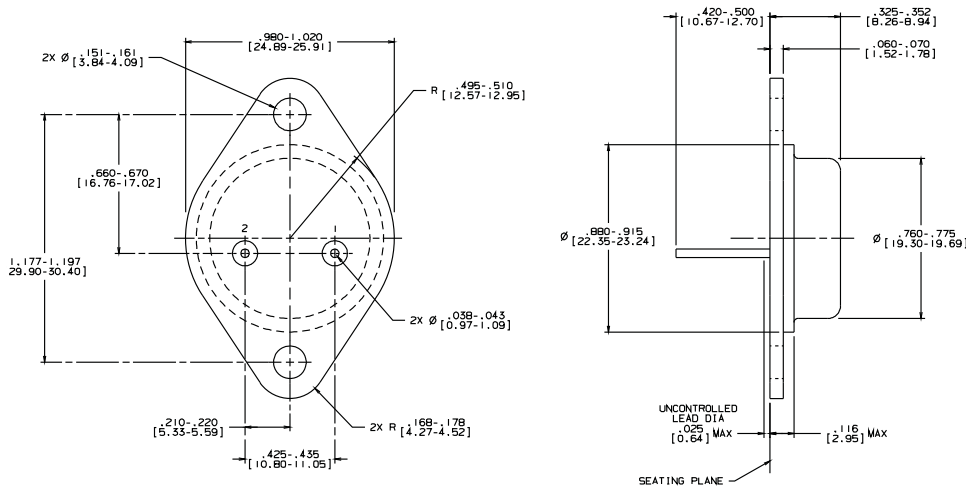


Electrical Characteristics -con't

ON Characteristics (2) (con't)		Symbol	Minimum	Maximum	Unit
Forward Current Transfer Ratio $I_C = 0.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$ $I_C = 1.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$ $I_C = 2.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$ $I_C = 3.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$		H_{FE}	25 30 10 5	90	
Collector - Emitter Sustaining Voltage $I_C = 100 \text{ mAdc}$	2N3902 2N5157	$V_{CE(sat)}$	--- ---	1.0 2.5	Vdc
DYNAMIC Characteristic					
Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 0.2 \text{ Adc}, V_{CE} = 10 \text{ Vdc}, f = 1 \text{ MHz}$		$ h_{fe} $	2.5	25	
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$		C_{obo}	---	500	pF
Switching Characteristic					
Turn-On Time $V_{CC} = 125 \text{ Vdc}, I_C = 1.0 \text{ Adc}, I_{B1} = 0.1 \text{ Adc}$		t_{on}	---	0.8	μs
Turn-Off Time $V_{CC} = 125 \text{ Vdc}, I_C = 1.0 \text{ Adc}, I_{B1} = 0.1 \text{ Adc}, -I_{B2} = 0.50 \text{ Adc}$		t_{off}	---	1.7	μs
SAFE OPERATING AREA					
DC Tests: $T_C = +25^\circ\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$ (See Figure 3 of MIL-PRF-19500/371)					
Test 1: $V_{CE} = 28.6 \text{ Vdc}, I_C = 3.5 \text{ Adc}$					
Test 2: $V_{CE} = 70 \text{ Vdc}, I_C = 1.43 \text{ Adc}$					
TEST 3: $V_{CE} = 325 \text{ Vdc}, I_C = 55 \text{ mAdc}$ 2N3902					
$V_{CE} = 400 \text{ Vdc}, I_C = 35 \text{ mAdc}$ 2N5157					
Switching Test:					
Load condition C (unclamped inductive load)					
$T_C = 25^\circ\text{C}, \text{duty cycle} \leq 10\%; R_S = 0.1 \Omega$ (See Figure 4 of MIL-PRF-19500/371)					
Test 1: $t_p = \text{approximately } 3 \text{ ms (vary to obtain } I_C), R_{BB1} = 20 \Omega, V_{BB1} = 10 \text{ Vdc}; R_{BB2} = 3 \text{ k}\Omega,$ $V_{BB2} = 1.5 \text{ Vdc}, V_{CC} = 50 \text{ Vdc}, I_C = 3.5 \text{ Adc}, L = 60 \text{ mH}, R = 3 \Omega; R_L \leq 14 \Omega$					
Test 2: $t_p = \text{approximately } 3 \text{ ms (vary to obtain } I_C), R_{BB1} = 100 \Omega, V_{BB1} = 10 \text{ Vdc}; R_{BB2} = 3 \text{ k}\Omega,$ $V_{BB2} = 1.5 \text{ Vdc}, I_C = 0.6 \text{ Adc}, V_{CC} = 50 \text{ Vdc}, L = 200 \text{ mH}, R = 8 \Omega; R_L \leq 83 \Omega$					
Switching Tests:					
Load condition (clamped inductive load)					
$T_C = 25^\circ\text{C}, \text{duty cycle} \leq 10\%$ (See Figure 5 of MIL-PRF-19500/371)					
Test 1: $t_p = \text{approximately } 30 \text{ ms (vary to obtain } I_C), R_S = 0.1 \Omega, R_{BB1} = 20 \Omega, V_{BB1} = 10 \text{ Vdc};$ $R_{BB2} = 100 \Omega, V_{BB2} = 1.5 \text{ Vdc}, V_{CC} = 50 \text{ Vdc}, I_C = 3.5 \text{ Adc}, L = 60 \text{ mH}, R = 3 \Omega; R_L \leq 0 \Omega$ (A suitable clamping circuit or diode can be used.) Clamp Voltage = 400 +0, -5 Vdc 2N3902 Clamp Voltage = 500 +0, -5 Vdc 2N5157 (Clamped voltage must be reached)					

(2) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.

Outline Drawing



- NOTES:
 1. STANDARD HEADER TYPE SOLID BASE.
 2. STANDARD LEAD FINISH PER MIL-M-58510 TYPE X OR EQUIVALENT.
 3. LEAD NOT BENT GREATER THAN 15°.
 4. DIMENSIONS BASED ON JEDEC STANDARD TO-3 PUBLICATION 95, PA

Aeroflex / Metelics, Inc.

975 Stewart Drive,
 Sunnyvale, CA 94085
 Tel: (408) 737-8181
 Fax: (408) 733-7645

Sales: 888-641-SEMI (7364)

Hi-Rel Components

9 Hampshire Street,
 Lawrence, MA 01840
 Tel: (603) 641-3800
 Fax: (978) 683-3264

www.aeroflex.com/metelics-hirelcomponents

54 Grenier Field Road,
 Londonderry, NH 03053
 Tel: (603) 641-3800
 Fax: (603)-641-3500

ISO 9001: 2008 certified companies

www.aeroflex.com/metelics metelics-sales@aeroflex.com

Aeroflex / Metelics, Inc. reserves the right to make changes to any products and services herein at any time without notice. Consult Aeroflex or an authorized sales representative to verify that the information in this data sheet is current before using this product. Aeroflex does not assume any responsibility or liability arising out of the application or use of any product or service described herein, except as expressly agreed to in writing by Aeroflex; nor does the purchase, lease, or use of a product or service from Aeroflex convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual rights of Aeroflex or of third parties.

Copyright 2012 Aeroflex / Metelics. All rights reserved.



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.