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 °C (1) @ T_A = +25 °C (2)	P_T	5.0 100		W W
Operating & Storage Temperature Range	T_j, T_{stg}	-65 to +200		°C

Thermal Characteristics

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

1) Derate linearly @ 28.57 mW/°C for T_A > +25°C

2) Derate linearly @ 0.8 mW/°C for T_C > +75°C

Electrical Characteristics

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

METELICS

Revision Date: 8/5/2012

Electrical Characteristics -con't

ON Characteristics (2) (con't)	Symbol	Minimum	Maximum	Unit
Forward Current Transfer Ratio				
I_C = 0.5 Adc, V_{CE} = 5.0 Vdc	H_{FE}	25	90	
I_C = 1.0 Adc, V_{CE} = 5.0 Vdc		30		
I_C = 2.5 Adc, V_{CE} = 5.0 Vdc		10		
I_C = 3.5 Adc, V_{CE} = 5.0 Vdc		5		
Collector - Emitter Sustaining Voltage				
I_C = 100 mAdc 2N3902	$V_{CE(sat)}$	- - -	1.0	Vdc
2N5157		- - -	2.5	
DYNAMIC Characteristic				
Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 0.2 Adc, V_{CE}= 10 Vdc, f = 1 MHz	$\lvert h_{fe} \rvert$	2.5	25	
Output Capacitance V_{CB} = 10 Vdc, I_E = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{obo}	- - -	500	pF
Switching Characteristic				
Turn-On Time V_{CC} =125 Vdc, I_C = 1.0 Adc, I_{B1} = 0.1 Adc	t_{on}	- - -	0.8	µs
Tum-Off Time V_{CC} =125 Vdc, I_C = 1.0 Adc, I_{B1} = 0.1 Adc, - I_{B2} = 0.50 Adc	t_{off}	- - -	1.7	µs

SAFE OPERATING AREA

DC Tests: T_C = +25 °C, 1 Cycle, t = 1.0 s (See Figure 3 of MIL-PRF-19500/371)

Test 1: V_{CE} = 28.6 Vdc, I_C = 3.5 Adc

Test 2: V_{CE} = 70 Vdc, I_C = 1.43 Adc

TEST 3: V_{CE} = 325 Vdc, I_C = 55 mAdc 2N3902

V_{CE} = 400 Vdc, I_C = 35 mAdc 2N5157

Switching Test:

Load condition C (unclamped inductive load)

T_C = 25°C, duty cycle ≤ 10%; R_S = 0.1 Ω (See Figure 4 of MIL-PRF-19500/371)

Test 1: t_P = approximately 3 ms (vary to obtain I_C), R_{BB1} = 20 Ω, V_{BB1} = 10 Vdc; R_{BB2} = 3 kΩ, V_{BB2} = 1.5 Vdc, V_{CC} = 50 Vdc, I_C = 3.5 Adc, L = 60 mH, R = 3 Ω; R_L ≤ 14 Ω

Test 2: t_P = approximately 3 ms (vary to obtain I_C), R_{BB1} = 100 Ω, V_{BB1} = 10 Vdc; R_{BB2} = 3 kΩ, V_{BB2} = 1.5 Vdc, I_C = 0.6 Adc, V_{CC} = 50 Vdc, L = 200 mH, R = 8 Ω; R_L ≤ 83 Ω

Switching Tests:

Load condition (clamped inductive load)

T_C = 25°C, duty cycle ≤ 10% (See Figure 5 of MIL-PRF-19500/371)

Test 1: t_P = approximately 30 ms (vary to obtain I_C), R_S = 0.1 Ω, R_{BB1} = 20 Ω, V_{BB1} = 10 Vdc; R_{BB2} = 100 Ω, V_{BB2} = 1.5 Vdc, V_{CC} = 50 Vdc, I_C = 3.5 Adc, L = 60 mH, R = 3 Ω; R_L ≤ 0 Ω

(A suitable clamping circuit or diode can be used.)

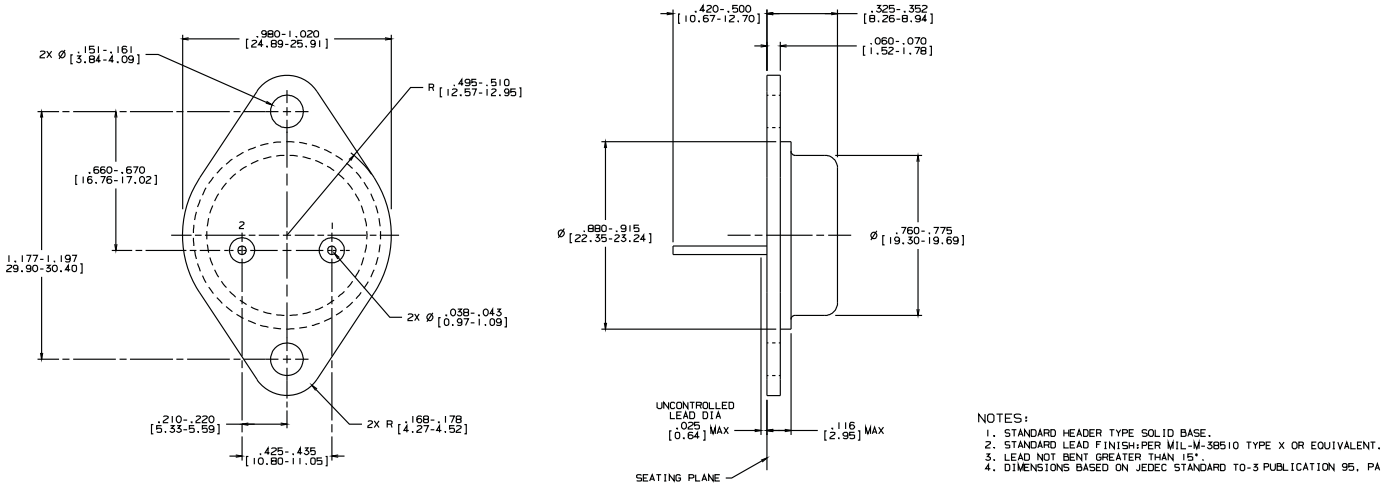
Clamp Voltage = 400 +0, -5 Vdc 2N3902

Clamp Voltage = 500 +0, -5 Vdc 2N5157

(Clamped voltage must be reached)

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

Outline Drawing



NOTES:
1. STANDARD HEADER TYPE SOLID BASE.
2. STANDARD LEAD FINISH:PER MIL-M-38510 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

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

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

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

ISO 9001: 2008 certified companies

AEROFLEX
A passion for performance.

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

Revision Date: 8/5/2012