Microsemi LAWRENCE

TECHNICAL DATA

NPN HIGH POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/371

Devices		*Qualified Level*
2N3902	**2N5157**	**JAN** **JANTX**

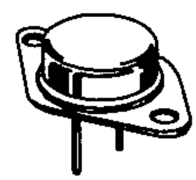
MAXIMUM RATINGS

Ratings		Symbol	2N3902	2N5157	Unit
Collector-Emitter Voltage		V_{CEO}	400	500	Vdc
Emitter-Base Voltage		V_{EBO}	5.0	6.0	Vdc
Collector-Base Voltage		V_{CBO}	700		Vdc
Base Current		I_B	2.0		Adc
Collector Current		I_C	3.5		Adc
Total Power Dissipation	@ $T_A = +25^0C$ (1) @ $T_C = +75^0C$ (2)	P_T	5.0 100		W W
Operating & Storage Temperature Range		T_j, T_{stg}	-65 to +200		^0C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.25	$^0C/W$

1) Derate linearly 29 mW/^0C for $T_A > +25^0C$
2) Derate linearly 0.8 W/^0C for $T_C > +75^0C$



TO-3 (TO-204AA)*

*See Appendix A for Package Outline

ELECTRICAL CHARACTERISTICS

Characteristics		Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Cutoff Current $V_{CE} = 325$ Vdc $V_{CE} = 400$ Vdc	 2N3902 2N5157	I_{CEO}		250 250	µAdc
Collector-Emitter Cutoff Current $V_{BE} = 1.5$ Vdc; $V_{CE} = 700$ Vdc		I_{CEX}		500	µAdc
Emitter-Base Cutoff Current $V_{EB} = 5.0$ Vdc $V_{EB} = 6.0$ Vdc	 2N3902 2N5157	I_{EBO}		200 200	µAdc
ON CHARACTERISTICS(3)					
Base-Emitter Saturation Voltage $I_C = 1.0$ Adc; $I_B = 0.1$ Adc $I_C = 3.5$ Adc; $I_B = 0.7$ Adc		$V_{BE(sat)}$		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

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ELECTRICAL CHARACTERISTICS (con't)

Characteristics		Symbol	Min.	Max.	Unit
ON CHARACTERISTICS(3) (con't)					
Forward-Current Transfer Ratio					
I_C = 0.5 Adc; V_{CE} = 5.0 Vdc		h_{FE}	25		
I_C = 1.0 Adc; V_{CE} = 5.0 Vdc			30	90	
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	$V_{CEO(sus)}$	325		Vdc
	2N5157		400		
DYNAMIC CHARACTERISTICS					
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}		250	pF
SWITCHING CHARACTERISTICS					
Turn-On Time V_{CC} = 125 Vdc; I_C = 1.0 Adc; I_{B1}= 0.1 Adc		t_{on}		0.8	µs
Turn-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 (continuous)

T_C = +25^{0}C; 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 Tests

Load condition C (unclamped inductive load)

T_C = 25^{0}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 ≤ 14Ω.

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 ≤ 83Ω.

Switching Tests

Load condition (clamped inductive load)

T_C = +25^{0}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 ≥ 0Ω.
(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)

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

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