

Features

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



Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Off Characteristics					
Collector - Emitter Cutoff Current	$V_{CE} = 400 \text{ Vdc}$, 2N3902 $V_{CE} = 500 \text{ Vdc}$, 2N5157	I_{CEO}	μAdc	—	100 100
Collector - Emitter Cutoff Current	$V_{BE} = 1.5 \text{ Vdc}$, $V_{CE} = 700 \text{ Vdc}$	I_{CEX}	μAdc	—	20
Collector - Emitter Cutoff Current	$V_{BE} = 5 \text{ Vdc}$, 2N3902 $V_{BE} = 6 \text{ Vdc}$, 2N5157	I_{EBO}	μAdc	—	200 200
On Characteristics¹					
Forward Current Transfer Ratio	$I_C = 0.5 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$ $I_C = 1.0 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$ $I_C = 2.5 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$ $I_C = 3.5 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$	H_{FE}	-	25 30 10 5	90
Collector - Emitter Saturation Voltage	$I_C = 1.0 \text{ Adc}$, $I_B = 0.1 \text{ Adc}$ $I_C = 3.5 \text{ Adc}$, $I_B = 0.7 \text{ Adc}$	$V_{CE(SAT)}$	Vdc	—	0.8 2.5
Base - Emitter Saturation Voltage	$I_C = 1.0 \text{ Adc}$, $I_B = 0.1 \text{ Adc}$ $I_C = 3.5 \text{ Adc}$, $I_B = 0.7 \text{ Adc}$	$V_{CE(SAT)}$	Vdc	—	1.5 2.0
Dynamic Characteristics					
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	$V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{OBO}	pF	—	250

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

(Continued next page)

Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Switching Characteristics					
Turn-On Time	$V_{CC} = 125 \text{ Vdc}; I_C = 1.0 \text{ Adc}; I_{B1} = 0.1 \text{ Adc}$	T_{ON}	μs	—	0.8
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}	μs	—	1.7
Safe Operating Area					
<p>DC Tests: $T_C = +25^\circ\text{C}$, 1 Cycle, $t = 1.0 \text{ s}$ (see Fig. 3 of MIL-PRF-19500/371)</p> <p>Test 1: $V_{CE} = 28.6 \text{ Vdc}, I_C = 3.5 \text{ Adc}$</p> <p>Test 2: $V_{CE} = 70 \text{ Vdc}, I_C = 1.43 \text{ Adc}$</p> <p>Test 3: $V_{CE} = 325 \text{ Vdc}, I_C = 55 \text{ mAdc}$, 2N3902 $V_{CE} = 400 \text{ Vdc}, I_C = 35 \text{ mAdc}$, 2N5157</p> <p>Switching Tests:</p> <p>Load Condition C (unclamped inductive load): $T_C = +25^\circ\text{C}$, duty cycle $<10\%$; $R_S = 0.1 \Omega$ (See Fig. 4 of MIL-PRF-19500/371)</p> <p>Test 1: $t_P =$ approximately 3 ms (vary to obtain I_C), $R_{BB1} = 20 \Omega$, $V_{BB1} = 10 \text{ Vdc}$; $R_{BB2} = 3 \text{ k}\Omega$, $V_{BB2} = 1.5 \text{ Vdc}$, $V_{CC} = 50 \text{ Vdc}$, $I_C = 3.5 \text{ Adc}$, $L = 60 \text{ mH}$, $R = 3 \Omega$; $R_L < 14 \Omega$</p> <p>Test 2: $t_P =$ approximately 3 ms (vary to obtain I_C), $R_{BB1} = 100 \Omega$, $V_{BB1} = 10 \text{ Vdc}$; $R_{BB2} = 3 \text{ k}\Omega$, $V_{BB2} = 1.5 \text{ Vdc}$, $I_C = 0.6 \text{ Adc}$, $V_{CC} = 50 \text{ Vdc}$, $L = 200 \text{ mH}$, $R = 8 \Omega$; $R_L < 83 \Omega$</p> <p>Load Condition (clamped inductive load): $T_C = +25^\circ\text{C}$, duty cycle $<10\%$ (See Fig. 5 of MIL-PRF-19500/371)</p> <p>Test 1: $t_P =$ approximately 30 ms (vary to obtain I_C), $R_S = 0.1 \Omega$, $R_{BB1} = 20 \Omega$, $V_{BB1} = 10 \text{ Vdc}$; $R_{BB2} = 100 \Omega$, $V_{BB2} = 1.5 \text{ Vdc}$, $V_{CC} = 50 \text{ Vdc}$, $I_C = 3.5 \text{ Adc}$, $L = 60 \text{ mH}$, $R = 3 \Omega$; $R_L < 0 \Omega$ (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)</p>					

NPN High Power Silicon Transistors

Rev. V1

Absolute Maximum Ratings

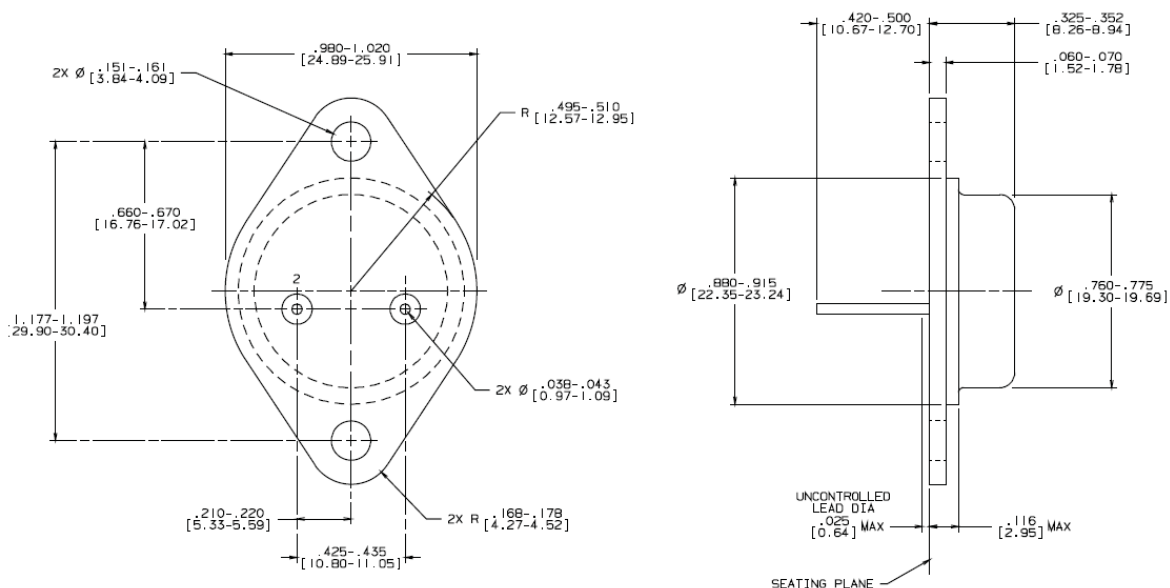
Ratings	Symbol	Value
Collector - Emitter Voltage 2N3902 2N5157	V_{CEO}	400 Vdc 500 Vdc
Emitter - Base Voltage 2N3902 2N5157	V_{EBO}	5 Vdc 6 Vdc
Collector - Base Voltage	V_{CBO}	700 Vdc
Base Current	I_B	2.0 Adc
Collector Current	I_C	3.5 Adc
Total Power Dissipation @ $T_A = +25^\circ\text{C}^2$ @ $T_A = +25^\circ\text{C}^3$	P_T	5 W 100 W
Operating & Storage Temperature Range	T_{OP}, T_{STG}	-65°C to $+200^\circ\text{C}$

- Derate linearly @ 28.57 mW / °C for $T_A > +25^\circ\text{C}$.
- Derate linearly @ 0.8 mW / °C for $T_A > +75^\circ\text{C}$.

Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25°C/W

Outline Drawing



- Notes:
- Dimensions in inches [mm]
 - Standard header type solid base.
 - Standard lead finish: per MIL-M-38510 type x or equivalent.
 - Lead not bent $>15^\circ$
 - Dimensions based on JEDEC standard TO-3 publication 95, PA

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