

### 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.
<b>Off Characteristics</b>					
Collector - Emitter Cutoff Current	$V_{CE} = 400 \text{ Vdc}$ , 2N3902 $V_{CE} = 500 \text{ Vdc}$ , 2N5157	$I_{CEO}$	$\mu\text{Adc}$	—	100 100
Collector - Emitter Cutoff Current	$V_{BE} = 1.5 \text{ Vdc}$ , $V_{CE} = 700 \text{ Vdc}$	$I_{CEX}$	$\mu\text{Adc}$	—	20
Collector - Emitter Cutoff Current	$V_{BE} = 5 \text{ Vdc}$ , 2N3902 $V_{BE} = 6 \text{ Vdc}$ , 2N5157	$I_{EBO}$	$\mu\text{Adc}$	—	200 200
<b>On Characteristics<sup>1</sup></b>					
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
<b>Dynamic Characteristics</b>					
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  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

(Continued next page)

### Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
<b>Switching Characteristics</b>					
Turn-On Time	$V_{CC} = 125 \text{ Vdc}; I_C = 1.0 \text{ Adc}; I_{B1} = 0.1 \text{ Adc}$	$T_{ON}$	$\mu\text{s}$	—	0.8
Turn-Off Time	$V_{CC} = 125 \text{ Vdc}; I_C = 1.0 \text{ Adc}; I_{B1} = 0.1 \text{ Adc}, -I_{B2} = 0.50 \text{ Adc}$	$T_{OFF}$	$\mu\text{s}$	—	1.7
<b>Safe Operating Area</b>					
DC Tests: $T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1.0 \text{ s}$ (see Fig. 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 Tests: 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) Test 1: $t_P = \text{approximately } 3 \text{ ms}$ (vary to obtain $I_C$ ), $R_{BB1} = 20 \Omega, V_{BB1} = 10 \text{ Vdc}; R_{BB2} = 3 \text{ k}\Omega, V_{BB2} = 1.5 \text{ Vdc}, V_{CC} = 50 \text{ Vdc}, I_C = 3.5 \text{ Adc}, L = 60 \text{ mH}, R = 3 \Omega; R_L < 14 \Omega$ Test 2: $t_P = \text{approximately } 3 \text{ ms}$ (vary to obtain $I_C$ ), $R_{BB1} = 100 \Omega, V_{BB1} = 10 \text{ Vdc}; R_{BB2} = 3 \text{ k}\Omega, V_{BB2} = 1.5 \text{ Vdc}, I_C = 0.6 \text{ Adc}, V_{CC} = 50 \text{ Vdc}, L = 200 \text{ mH}, R = 8 \Omega; R_L < 83 \Omega$					
Load Condition (clamped inductive load): $T_C = +25^\circ\text{C}$ , duty cycle <10% (See Fig. 5 of MIL-PRF-19500/371) Test 1: $t_P = \text{approximately } 30 \text{ ms}$ (vary to obtain $I_C$ ), $R_S = 0.1 \Omega, R_{BB1} = 20 \Omega, V_{BB1} = 10 \text{ Vdc}; R_{BB2} = 100 \Omega, V_{BB2} = 1.5 \text{ Vdc}, V_{CC} = 50 \text{ Vdc}, I_C = 3.5 \text{ Adc}, L = 60 \text{ mH}, R = 3 \Omega; R_L < 0 \Omega$ (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)					

## NPN High Power Silicon Transistors

Rev. V1

### Absolute Maximum Ratings

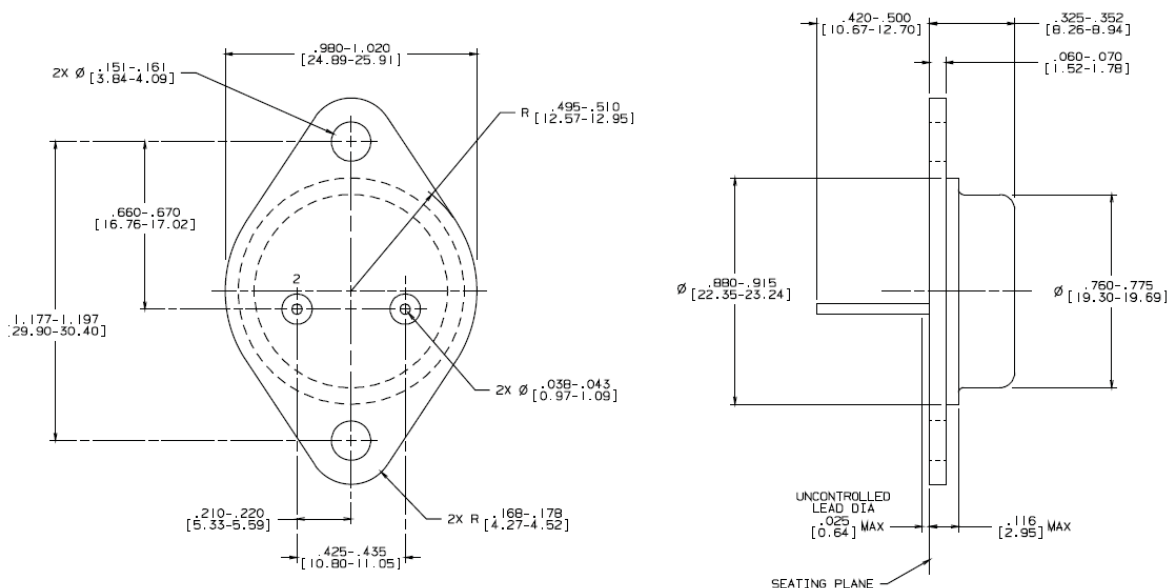
Ratings	Symbol	Value
Collector - Emitter Voltage 2N3902 2N5157	$V_{CEO}$	400 Vdc 500 Vdc
Emitter - Base Voltage 2N3902 2N5157	$V_{EBO}$	5 Vdc 6 Vdc
Collector - Base Voltage	$V_{CBO}$	700 Vdc
Base Current	$I_B$	2.0 Adc
Collector Current	$I_C$	3.5 Adc
Total Power Dissipation @ $T_A = +25^\circ\text{C}^2$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