### **NPN High Power Silicon Transistors**

#### Features

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

### **Electrical Characteristics**

Off Characteristics

On Characteristics<sup>1</sup>

**Dynamic Characteristics** 

**Parameter** 

Collector - Emitter Cutoff Current

Collector - Emitter Cutoff Current

Collector - Emitter Cutoff Current

Forward Current Transfer Ratio

Collector - Emitter Saturation Voltage

Base - Emitter Saturation Voltage

Small-Signal Short-Circuit Forward Current

Transfer Ratio

**Output Capacitance** 

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

(Continued next pa	age)
MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice	

**Test Conditions** 

V<sub>CE</sub> = 400 Vdc, 2N3902

V<sub>CE</sub> = 500 Vdc, 2N5157

 $V_{BE}$  = 1.5 Vdc,  $V_{CE}$  = 700 Vdc

V<sub>BE</sub> = 5 Vdc, 2N3902

V<sub>BE</sub> = 6 Vdc, 2N5157

 $I_{C} = 0.5 \text{ Adc}, V_{CE} = 5 \text{ Vdc}$ 

 $I_C$  = 1.0 Adc,  $V_{CE}$  = 5 Vdc

 $I_C = 2.5 \text{ Adc}, V_{CE} = 5 \text{ Vdc}$ 

 $I_{C} = 3.5 \text{ Adc}, V_{CE} = 5 \text{ Vdc}$ 

 $I_{C}$  = 1.0 Adc,  $I_{B}$  = 0.1 Adc

 $I_{C}$  = 3.5 Adc,  $I_{B}$  = 0.7 Adc

 $I_{C}$  = 1.0 Adc,  $I_{B}$  = 0.1 Adc

 $I_{\rm C}$  = 3.5 Adc,  $I_{\rm B}$  = 0.7 Adc

 $I_{C}$  = 0.2 Adc,  $V_{CE}$  = 10 Vdc, f = 1 MHz

V<sub>CB</sub> = 10 Vdc, I<sub>E</sub> = 0, 100 kHz ≤ f ≤ 1 MHz

1

OM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.



Symbol Units

ICEO

**I**CEX

I<sub>EBO</sub>

HFF

V<sub>CE(SAT)</sub>

V<sub>CE(SAT)</sub>

| H<sub>FE</sub> |

COBO

µAdc

µAdc

µAdc

Vdc

Vdc

-

pF



Min.

25

30

10

5

2.5

Rev. V1

Max.

100

100

20

200

200

90

0.8

2.5

1.5

2.0

25

250

### **NPN High Power Silicon Transistors**

Rev. V1

#### **Electrical Characteristics**

	Parameter	Test Conditions	Symbol	Units	Min.	Max.			
Switching Characteristics									
Turn-On Time		$V_{CC}$ = 125 Vdc; I <sub>C</sub> = 1.0 Adc; I <sub>B</sub> 1 = 0.1 Adc	T <sub>ON</sub>	μs	_	0.8			
	Turn-Off Time	$V_{CC}$ = 125 Vdc; I <sub>C</sub> = 1.0 Adc; I <sub>B</sub> 1 = 0.1 Adc, -I <sub>B</sub> 2 = 0.50 Adc	T <sub>OFF</sub>	μs	_	1.7			
Safe Operatir	ng Area								
DC Tests: Test 1: Test 2: Test 3:	$\begin{split} T_{C} &= +25^{\circ}\text{C}, \text{ I Cycle, } t = 1.0 \text{ s (see Fig. 3 of MIL-PRF-19500/371)} \\ V_{CE} &= 28.6 \text{ Vdc, } I_{C} = 3.5 \text{ Adc} \\ V_{CE} &= 70 \text{ Vdc, } I_{C} = 1.43 \text{ Adc} \\ V_{CE} &= 325 \text{ Vdc, } I_{C} = 55 \text{ mAdc, } 2N3902 \\ V_{CE} &= 400 \text{ Vdc, } I_{C} = 35 \text{ mAdc, } 2N5157 \end{split}$								
Switching Tes Load Conditio Test 1: Test 2:	n C (unclamped inductive load): tP = approximately 3 ms (va V <sub>BB2</sub> = 1.5 Vdc, V <sub>CC</sub> = 50 Vd tP = approximately 3 ms (va	$T_{C} = +25^{\circ}C$ , duty cycle <10%; $R_{S} = 0.1 \Omega$ ry to obtain I <sub>C</sub> ), $R_{BB1} = 20 \Omega$ , $V_{BB1} = 10 V_{C}$ c, I <sub>C</sub> = 3.5 Adc, L = 60 mH, R = 3 $\Omega$ ; $R_{L} < 10 V_{C}$ ry to obtain I <sub>C</sub> ), $R_{BB1} = 100 \Omega$ , $V_{BB1} = 10 V_{CC}$ $V_{CC} = 50 Vdc$ , L = 200 mH, R = 8 $\Omega$ ; $R_{L} < 10 V_{CC}$	dc; R <sub>BB2</sub> = 3 14 Ω /dc; R <sub>BB2</sub> =	3 kΩ,	L-PRF-195	00/371)			
$            Load Condition (clamped inductive load): T_{C} = +25^{\circ}C, duty cycle <10\% (See Fig. 5 of MIL-PRF-19500/371) \\             Test 1: tP = approximately 30 ms (vary to obtain I_{C}), R_{S} = 0.1 \Omega, R_{BB1} = 20 \Omega, V_{BB1} = 10 Vdc; \\              R_{BB2} = 100 \Omega, V_{BB2} = 1.5 Vdc, V_{CC} = 50 Vdc, I_{C} = 3.5 Adc, L = 60 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 \\                                  $									



### **NPN High Power Silicon Transistors**

Rev. V1

MACOM

#### **Absolute Maximum Ratings**

Ratings	Symbol	Value
Collector - Emitter Voltage 2N3902 2N5157	V <sub>CEO</sub>	400 Vdc 500 Vdc
Emitter - Base Voltage 2N3902 2N5157	V <sub>EBO</sub>	5 Vdc 6 Vdc
Collector - Base Voltage	V <sub>CBO</sub>	700 Vdc
Base Current	Ι <sub>Β</sub>	2.0 Adc
Collector Current	Ιc	3.5 Adc
Total Power Dissipation (a) $T_A = +25^{\circ}C^2$ (b) $T_A = +25^{\circ}C^3$	PT	5 W 100 W
Operating & Storage Temperature Range	$T_{OP},T_{STG}$	-65°C to +200°C

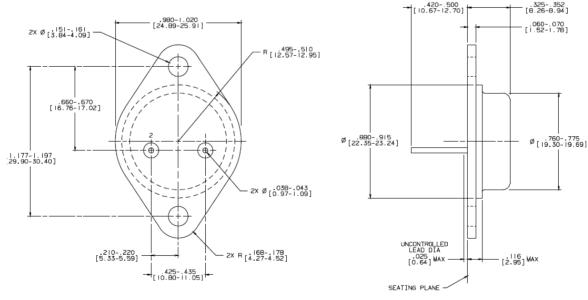
2. Derate linearly @ 28.57 mW / °C for T<sub>A</sub> >+25°C.

3. Derate linearly @ 0.8 mW / °C for T<sub>A</sub>>+75°C.

#### **Thermal Characteristics**

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{ extsf{ heta}JC}$	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° Dimensions based on JEDEC standard TO-3 publication 95, PA

> MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.

3

**NPN High Power Silicon Transistors** 



Rev. V1

MACOM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with MACOM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

<sup>4</sup> 

MACOM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit <u>www.macom.com</u> for additional data sheets and product information.