

## NPN HIGH POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/439

### Devices

2N5038

2N5039

### Qualified Level

JAN  
JANTX  
JANTXV

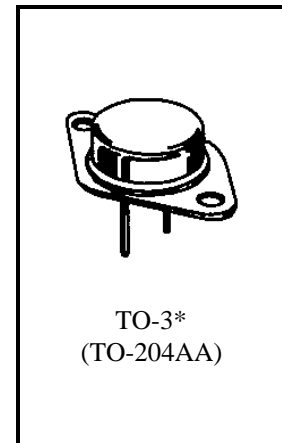
### MAXIMUM RATINGS

Ratings	Symbol	2N5038	2N5039	Units
Collector-Emitter Voltage	$V_{CEO}$	90	75	Vdc
Collector-Base Voltage	$V_{CBO}$	150	125	Vdc
Emitter-Base Voltage	$V_{EBO}$	7.0		Vdc
Base Current	$I_B$	5.0		Adc
Collector Current	$I_C$	20		Adc
Total Power Dissipation @ $T_C = +25^{\circ}\text{C}^{(1)}$	$P_T$	140		W
Operating & Storage Temperature Range	$T_{op}, T_{stg}$	-65 to +200		$^{\circ}\text{C}$

### THERMAL CHARACTERISTICS

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

1) Derate linearly 800 mW/ $^{\circ}\text{C}$  for  $T_C > +25^{\circ}\text{C}$



\*See appendix A for package outline

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min.	Max.	Unit
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### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 200 \text{ mAdc}$	2N5038 2N5039	$V_{(BR)CEO}$	90 75	Vdc
Emitter-Base Breakdown Voltage $I_E = 25 \text{ mAdc}$		$V_{(BR)EBO}$	7.0	Vdc
Collector-Base Cutoff Current $V_{CE} = 150 \text{ Vdc}$ $V_{CE} = 125 \text{ Vdc}$	2N5038 2N5039	$I_{CBO}$	1.0 1.0	$\mu\text{Adc}$
Collector-Base Cutoff Current $V_{CE} = 70 \text{ Vdc}$ $V_{CE} = 55 \text{ Vdc}$	2N5038 2N5039	$I_{CEO}$	1.0 1.0	$\mu\text{Adc}$
Emitter-Base Cutoff Current $V_{EB} = 5.0 \text{ Vdc}$		$I_{EBO}$	1.0	$\mu\text{Adc}$
Collector-Emitter Cutoff Current $V_{BE} = -1.5 \text{ Vdc } V_{CE} = 100 \text{ Vdc}$ $V_{BE} = -1.5 \text{ Vdc } V_{CE} = 85 \text{ Vdc}$	2N5038 2N5039	$I_{CEX}$	5.0 5.0	$\mu\text{Adc}$

2N5038, 2N5039, JAN SERIES

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics		Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS <sup>(2)</sup></b>					
Forward-Current Transfer Ratio I <sub>C</sub> = 0.5 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5038	h <sub>FE</sub>	50		
	2N5039		30		
I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5038		50	200	
	2N5039		30	150	
I <sub>C</sub> = 12 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5038		15		
I <sub>C</sub> = 10 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5039		15		
Collector-Emitter Saturation Voltage I <sub>C</sub> = 12 Adc, I <sub>B</sub> = 1.2 Adc	2N5038	V <sub>CE(sat)</sub>		1.0	Vdc
I <sub>C</sub> = 10 Adc, I <sub>B</sub> = 1.0 Adc	2N5039		1.0		
I <sub>C</sub> = 20 Adc, I <sub>B</sub> = 5.0 Adc	Both		2.5		
Base-Emitter Saturation Voltage I <sub>C</sub> = 20 Adc, I <sub>B</sub> = 5.0 Adc		V <sub>BE(sat)</sub>		3.3	Vdc
Base-Emitter Voltage I <sub>C</sub> = 12 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5038	V <sub>BE</sub>		1.8	Vdc
I <sub>C</sub> = 10 Adc, V <sub>CE</sub> = 5.0 Vdc	2N5039		1.8		

**DYNAMIC CHARACTERISTICS**

Forward Current Transfer Ratio I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 10 Vdc, f = 5.0 MHz		h <sub>FE</sub>	12	48	
Output Capacitance V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, 100 kHz ≤ f ≤ 1.0 MHz		C <sub>obo</sub>		500	pF

**SWITCHING CHARACTERISTICS**

Turn-On Time V <sub>CC</sub> = 30 ± 2 Vdc; I <sub>C</sub> = 12 Adc; I <sub>B1</sub> = 1.2 Adc	2N5038	t <sub>on</sub>		0.5	μs
V <sub>CC</sub> = 30 ± 2 Vdc; I <sub>C</sub> = 10 Adc; I <sub>B1</sub> = 1.0 Adc	2N5039				
Turn-Off Time V <sub>CC</sub> = 30 ± 2 Vdc; I <sub>C</sub> = 12 Adc; I <sub>B1</sub> = -I <sub>B2</sub> = 1.2 Adc	2N5038	t <sub>off</sub>		2.0	μs
V <sub>CC</sub> = 30 ± 2 Vdc; I <sub>C</sub> = 10 Adc; I <sub>B1</sub> = -I <sub>B2</sub> = 1.0 Adc	2N5039				

**SAFE OPERATING AREA**

<b>DC Tests</b> T <sub>C</sub> = +25 <sup>0</sup> C, 1 Cycle, t = 1.0 s					
<b>Test 1</b> V <sub>CE</sub> = 28 Vdc, I <sub>C</sub> = 5.0 Adc					
<b>Test 2</b> V <sub>CE</sub> = 45 Vdc, I <sub>C</sub> = 0.9 Adc					
<b>Test 3</b> V <sub>CE</sub> = 7.0 Vdc, I <sub>C</sub> = 20 Adc					
<b>Test 4</b> V <sub>CE</sub> = 90 Vdc, I <sub>C</sub> = 0.23 Adc					
	2N5038				
<b>Test 4</b> V <sub>CE</sub> = 75 Vdc, I <sub>C</sub> = 0.32 Adc					
	2N5039				

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