



# TECHNICAL DATA

## NPN HIGH POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/439

### Devices

2N5038

2N5039

### Qualified Level

JAN  
JANTX  
JANTXV

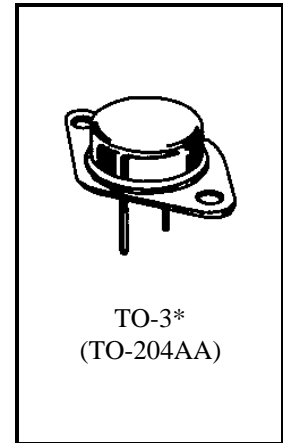
### MAXIMUM RATINGS

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 @ $T_C = +25^{\circ}C$ (1)	$P_T$	140		W
Operating & Storage Temperature Range	$T_{op}, T_{stg}$	-65 to +200		$^{\circ}C$

### THERMAL CHARACTERISTICS

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

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



\*See appendix A for package outline

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

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

Collector-Emitter Breakdown Voltage $I_C = 200$ mAdc	2N5038 2N5039	$V_{(BR)CEO}$	90 75	Vdc
Emitter-Base Breakdown Voltage $I_E = 25$ mAdc		$V_{(BR)EBO}$	7.0	Vdc
Collector-Base Cutoff Current $V_{CE} = 150$ Vdc $V_{CE} = 125$ Vdc	2N5038 2N5039	$I_{CBO}$	1.0 1.0	$\mu$ Adc
Collector-Base Cutoff Current $V_{CE} = 70$ Vdc $V_{CE} = 55$ Vdc	2N5038 2N5039	$I_{CEO}$	1.0 1.0	$\mu$ Adc
Emitter-Base Cutoff Current $V_{EB} = 5.0$ Vdc		$I_{EBO}$	1.0	$\mu$ Adc
Collector-Emitter Cutoff Current $V_{BE} = -1.5$ Vdc $V_{CE} = 100$ Vdc $V_{BE} = -1.5$ Vdc $V_{CE} = 85$ Vdc	2N5038 2N5039	$I_{CEX}$	5.0 5.0	$\mu$ 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 $I_C = 0.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038	$h_{FE}$	50	200	
	2N5039		30		
$I_C = 2.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038		50		
	2N5039		30		
$I_C = 12 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038		15		
$I_C = 10 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5039		15		
Collector-Emitter Saturation Voltage $I_C = 12 \text{ Adc}, I_B = 1.2 \text{ Adc}$	2N5038	$V_{CE(sat)}$		1.0	Vdc
$I_C = 10 \text{ Adc}, I_B = 1.0 \text{ Adc}$	2N5039		1.0		
$I_C = 20 \text{ Adc}, I_B = 5.0 \text{ Adc}$	Both		2.5		
Base-Emitter Saturation Voltage $I_C = 20 \text{ Adc}, I_B = 5.0 \text{ Adc}$		$V_{BE(sat)}$		3.3	Vdc
Base-Emitter Voltage $I_C = 12 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038	$V_{BE}$		1.8	Vdc
$I_C = 10 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5039		1.8		

**DYNAMIC CHARACTERISTICS**

Forward Current Transfer Ratio $I_C = 2.0 \text{ Adc}, V_{CE} = 10 \text{ Vdc}, f = 5.0 \text{ MHz}$	$ h_{FE} $	12	48	
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$		500	pF

**SWITCHING CHARACTERISTICS**

Turn-On Time $V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 12 \text{ Adc}; I_{B1} = 1.2 \text{ Adc}$	2N5038	$t_{on}$	0.5	$\mu\text{s}$
$V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 10 \text{ Adc}; I_{B1} = 1.0 \text{ Adc}$	2N5039			
Turn-Off Time $V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 12 \text{ Adc}; I_{B1} = -I_{B2} = 1.2 \text{ Adc}$	2N5038	$t_{off}$	2.0	$\mu\text{s}$
$V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 10 \text{ Adc}; I_{B1} = -I_{B2} = 1.0 \text{ Adc}$	2N5039			

**SAFE OPERATING AREA**

<b>DC Tests</b>					
$T_C = +25^{\circ}\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$					
<b>Test 1</b>					
$V_{CE} = 28 \text{ Vdc}, I_C = 5.0 \text{ Adc}$					
<b>Test 2</b>					
$V_{CE} = 45 \text{ Vdc}, I_C = 0.9 \text{ Adc}$					
<b>Test 3</b>					
$V_{CE} = 7.0 \text{ Vdc}, I_C = 20 \text{ Adc}$					
<b>Test 4</b>					
$V_{CE} = 90 \text{ Vdc}, I_C = 0.23 \text{ Adc}$	2N5038				
<b>Test 4</b>					
$V_{CE} = 75 \text{ Vdc}, I_C = 0.32 \text{ Adc}$	2N5039				

(2) Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq$  2.0%.

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