

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/534

### Devices

2N5002

2N5004

### Qualified Level

JAN  
JANTX  
JANTXV

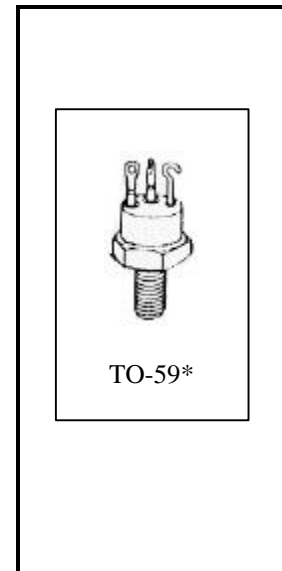
### MAXIMUM RATINGS

Ratings	Symbol	Value	Units
Collector-Emitter Voltage	$V_{CEO}$	80	Vdc
Collector-Base Voltage	$V_{CBO}$	100	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.5	Vdc
Collector Current	$I_C$ $I_C^{(3)}$	5.0 10	Adc
Total Power Dissipation @ $T_A = 25^{\circ}\text{C}^{(1)}$ @ $T_C = 25^{\circ}\text{C}^{(2)}$	$P_T$	2.0 58	W
Operating & Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200	$^{\circ}\text{C}$

### THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	3.0	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	88	$^{\circ}\text{C}/\text{W}$

- 1) Derate linearly 11.4 mW/ $^{\circ}\text{C}$  for  $T_A > 25^{\circ}\text{C}$
- 2) Derate linearly 331 mW/ $^{\circ}\text{C}$  for  $T_C > 25^{\circ}\text{C}$
- 3) This value applies for  $P_W \leq 8.3$  ms, duty cycle  $\leq 1\%$



\*See appendix A for package outline

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

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

Collector-Emitter Breakdown Voltage $I_C = 100$ mAdc,	$V_{(BR)CEO}$	80		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 40$ Vdc, $I_B = 0$	$I_{CEO}$		50	$\mu\text{Adc}$
Collector-Emitter Cutoff Current $V_{CE} = 60$ Vdc, $V_{BE} = 0$ $V_{CE} = 100$ Vdc, $V_{BE} = 0$	$I_{CES}$		1.0 1.0	$\mu\text{Adc}$ mAdc
Emitter-Base Cutoff Current $V_{BE} = 4.0$ Vdc, $I_C = 0$ $V_{BE} = 5.5$ Vdc, $I_C = 0$	$I_{EBO}$		1.0 1.0	mAdc mAdc

**2N5002, 2N5004 JAN SERIES**

**ELECTRICAL CHARACTERISTICS (Con't)**

Characteristics	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS</b>				
Forward-Current Transfer Ratio I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> I <sub>C</sub> = 2.5 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> I <sub>C</sub> = 5.0 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> 2N5002	h <sub>FE</sub>	20	90	
I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> I <sub>C</sub> = 2.5 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> I <sub>C</sub> = 5.0 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> 2N5004		30		
		20		
Base-Emitter Voltage Non-saturated V <sub>CE</sub> = 5.0 A <sub>dc</sub> , I <sub>C</sub> = 2.5 A <sub>dc</sub>	V <sub>BE</sub>		1.45	V <sub>dc</sub>
Collector-Emitter Saturation Voltage I <sub>C</sub> = 2.5 A <sub>dc</sub> , I <sub>B</sub> = 250 mA <sub>dc</sub> I <sub>C</sub> = 5.0 A <sub>dc</sub> , I <sub>B</sub> = 500 mA <sub>dc</sub>	V <sub>CE(sat)</sub>		0.25 1.5	V <sub>dc</sub>
Base-Emitter Saturation Voltage I <sub>C</sub> = 2.5 A <sub>dc</sub> , I <sub>B</sub> = 250 mA <sub>dc</sub> I <sub>C</sub> = 5.0 A <sub>dc</sub> , I <sub>B</sub> = 500 mA <sub>dc</sub>	V <sub>BE(sat)</sub>		1.45 2.2	V <sub>dc</sub>

**DYNAMIC CHARACTERISTICS**

Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> , f = 10 MHz 2N5002 2N5004	h <sub>fe</sub>	6.0 7.0		
Output Capacitance V <sub>CB</sub> = 10 V <sub>dc</sub>	C <sub>obo</sub>		250	pF

**SWITCHING CHARACTERISTICS**

Turn-On Time I <sub>C</sub> = 5 A <sub>dc</sub> ; I <sub>B1</sub> = 500 mA <sub>dc</sub>	t <sub>on</sub>		0.5	μs
Storage Time I <sub>B2</sub> = -500 mA <sub>dc</sub>	t <sub>s</sub>		1.4	μs
Fall Time V <sub>BE(OFF)</sub> = 3.7 V <sub>dc</sub>	t <sub>f</sub>		0.5	μs
Turn-Off Time R <sub>L</sub> = 6 Ω	t <sub>off</sub>		1.5	μs

**SAFE OPERATING AREA**

<p><b>DC Tests</b> T<sub>C</sub> = +25°C, V<sub>CE</sub> = 0, t<sub>p</sub> = 1 second 1 Cycle</p> <p><b>Test 1</b> V<sub>CE</sub> = 12 V<sub>dc</sub>, I<sub>C</sub> = 5 A<sub>dc</sub></p> <p><b>Test 2</b> V<sub>CE</sub> = 32 V<sub>dc</sub>, I<sub>C</sub> = 1.7 A<sub>dc</sub></p> <p><b>Test 3</b> V<sub>CE</sub> = 80 V<sub>dc</sub>, I<sub>C</sub> = 100 mA<sub>dc</sub></p>
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