

NPN POWER SWITCHING SILICON TRANSISTOR

Qualified per MIL-PRF-19500/ 374

Devices

2N3996 2N3997 2N3998 2N3999

Qualified Level

JAN
JANTX
JANTXV

MAXIMUM RATINGS

Ratings	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	80	Vdc
Collector-Base Voltage	V_{CBO}	100	Vdc
Emitter-Base Voltage	V_{EBO}	8.0	Vdc
Base Current	I_B	0.5	Adc
Collector Current	I_C	5.0 10 ⁽¹⁾	Adc
Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ ⁽²⁾ @ $T_C = +100^{\circ}\text{C}$ ⁽³⁾	P_T	2.0 30	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	$R_{\theta JC}$	3.33	$^{\circ}\text{C/W}$

1) This value applies for $t_p \leq 1.0$ ms, duty cycle $\leq 50\%$

2) Derate linearly 11.4 mW/ $^{\circ}\text{C}$ for $T_A > +25^{\circ}\text{C}$

3) Derate linearly 300 mW/ $^{\circ}\text{C}$ for $T_C > +100^{\circ}\text{C}$



TO-111*

*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 $I_C = 50$ mAdc	$V_{(BR)CEO}$	80		Vdc
Collector-Emitter Breakdown Voltage $I_C = 10$ μ Adc	$V_{(BR)CBO}$	100		Vdc
Collector-Emitter Cutoff Current $V_{CE} = 60$ Vdc	I_{CEO}		10	μ Adc
Collector-Emitter Cutoff Current $V_{CE} = 80$ Vdc, $V_{BE} = 0$	I_{CES}		200	η Adc
Emitter-Base Cutoff Current $V_{EB} = 5.0$ Vdc $V_{EB} = 8.0$ Vdc	I_{EBO}		200 10	η Adc μ Adc

ELECTRICAL CHARACTERISTICS (con't)

Characteristics	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS ⁽⁴⁾				
Forward-Current Transfer Ratio $I_C = 50 \text{ mA dc}, V_{CE} = 2.0 \text{ V dc}$ $I_C = 1.0 \text{ A dc}, V_{CE} = 2.0 \text{ V dc}$ $I_C = 5.0 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$ $I_C = 50 \text{ mA dc}, V_{CE} = 2.0 \text{ V dc}$ $I_C = 1.0 \text{ A dc}, V_{CE} = 2.0 \text{ V dc}$ $I_C = 5.0 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}$	h_{FE}	30 40 15 60 80 20	120 240	
Collector-Emitter Saturation Voltage $I_C = 1.0 \text{ A dc}, I_B = 0.1 \text{ A dc}$ $I_C = 5.0 \text{ A dc}, I_B = 0.5 \text{ A dc}$	$V_{CE(sat)}$		0.25 2.0	Vdc
Base-Emitter Saturation Voltage $I_C = 1.0 \text{ A dc}, I_B = 0.1 \text{ A dc}$ $I_C = 5.0 \text{ A dc}, I_B = 0.5 \text{ A dc}$	$V_{BE(sat)}$	0.6	1.2 1.6	Vdc

DYNAMIC CHARACTERISTICS

Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0 \text{ A dc}, V_{CE} = 5.0 \text{ V dc}, f = 10 \text{ MHz}$	$ h_{fe} $	3.0	12	
Output Capacitance $V_{CB} = 10 \text{ V dc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	C_{obo}		150	pF

SAFE OPERATING AREA**DC Tests** $T_C = 100^\circ\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$ **Test 1** $V_{CE} = 80 \text{ V dc}, I_C = 0.08 \text{ A dc}$ **Test 2** $V_{CE} = 20 \text{ V dc}, I_C = 1.5 \text{ A dc}$ (4) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.