

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/412

### Devices

2N3846

2N3847

### Qualified Level

JAN  
JANTX  
JANTXV

### MAXIMUM RATINGS

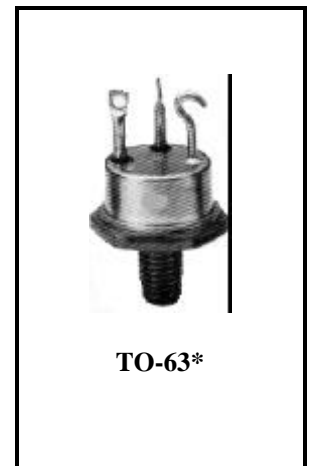
Ratings	Symbol	2N3846	2N3847	Units
Collector-Emitter Voltage	$V_{CE0}$	200	300	Vdc
Collector-Base Voltage	$V_{CBO}$	300	400	Vdc
Emitter-Base Voltage	$V_{EBO}$	10		Vdc
Collector Current	$I_C$	20		Adc
Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ <sup>(1)</sup> @ $T_C = +100^{\circ}\text{C}$ <sup>(2)</sup>	$P_T$	4.0	150	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	$R_{\theta JC}$	0.5	$^{\circ}\text{C}/\text{W}$

1) Derate linearly 26.6 mW/ $^{\circ}\text{C}$  to +175 $^{\circ}\text{C}$

2) Derate linearly 2 W/ $^{\circ}\text{C}$  to +175 $^{\circ}\text{C}$



\*See Appendix A for Package Outline

### ELECTRICAL CHARACTERISTICS

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

Collector-Emitter Breakdown Voltage $I_C = 200 \text{ mAdc}; I_B = 0$	2N3846 2N3847	$V_{(BR)CE0}$	200 300	Vdc
Collector-Emitter Cutoff Current $V_{CE} = 300 \text{ Vdc}; V_{BE} = 0$ $V_{CE} = 400 \text{ Vdc}; V_{BE} = 0$	2N3846 2N3847	$I_{CES}$	2 2	mAdc
Collector-Emitter Cutoff Current $V_{CE} = 200 \text{ Vdc}; I_B = 0$ $V_{CE} = 300 \text{ Vdc}; I_B = 0$	2N3846 2N3847	$I_{CEO}$	5 5	mAdc
Emitter-Base Cutoff Current $V_{BE} = 10 \text{ Vdc}; I_C = 0$		$I_{EBO}$	250	$\mu\text{Adc}$

2N3846, 2N3847 JAN SERIES

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS</b> <sup>(3)</sup>				
Forward-Current Transfer Ratio I <sub>C</sub> = 1 Adc; V <sub>CE</sub> = 3.0 Vdc I <sub>C</sub> = 5 Adc; V <sub>CE</sub> = 3.0 Vdc I <sub>C</sub> = 10 Adc; V <sub>CE</sub> = 3.0 Vdc	h <sub>FE</sub>	70 40 12	240 60	
Base-Emitter Voltage V <sub>CE</sub> = 3 Vdc; I <sub>C</sub> = 10 Adc	V <sub>BE</sub>		1.20	Vdc
Base-Emitter Saturated Voltage I <sub>B</sub> = 1.6 Adc; I <sub>C</sub> = 10 Adc	V <sub>BE(sat)</sub>		1.30	Vdc
Collector-Emitter Saturated Voltage I <sub>B</sub> = 1.6 Adc; I <sub>C</sub> = 10 Adc	V <sub>CE(sat)</sub>		0.75	Vdc

**DYNAMIC CHARACTERISTICS**

Magnitude of Common-Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio I <sub>C</sub> = 1.0 Adc, V <sub>CE</sub> = 10 Vdc, f = 1 MHz	h <sub>fe</sub>	10	35	
Small-Signal Short-Circuit Forward Current Transfer Ratio I <sub>C</sub> = 5 Adc, V <sub>CE</sub> = 10 Vdc, f = 1 kHz	h <sub>fe</sub>	50	250	
Output Capacitance V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, 100 kHz ≤ f ≤ 1.0 MHz	C <sub>obo</sub>		750	pF

**SWITCHING CHARACTERISTICS**

Turn-On Time V <sub>BE(off)</sub> ~ -7.5 Vdc; I <sub>C</sub> = 10 Adc; I <sub>B1</sub> = 2 Adc; I <sub>B2</sub> = -2 Adc; R <sub>L</sub> = 15Ω	t <sub>on</sub>		4	μs
Turn-Off Time V <sub>BE(off)</sub> ~ -7.5 Vdc; I <sub>C</sub> = 10 Adc; I <sub>B1</sub> = 2 Adc; I <sub>B2</sub> = 2 Adc; R <sub>L</sub> = 15Ω	t <sub>off</sub>		7	μs

**SAFE OPERATING AREA**

<p><b>DC Tests</b> T<sub>C</sub> = +100°C; V<sub>CE</sub> = 0 Vdc, I<sub>C</sub> = 0 Adc (See Figure 3 on Mil-PRF-19500/412)</p> <p><b>Test 1</b> V<sub>CE</sub> = 7.5 Vdc; I<sub>C</sub> = 20 Adc; t<sub>p</sub> = 1.0 s; 1 cycle</p> <p><b>Test 2</b> V<sub>CE</sub> = 200 Vdc; I<sub>C</sub> = 100 mAdc; t<sub>p</sub> = 1.0 s, 1 cycle</p> <p><b>Test 3</b> V<sub>CE</sub> = 58 Vdc; I<sub>C</sub> = 1.0 Adc; t<sub>p</sub> = 1.0 s, 1 cycle</p> <p><b>Burnout by Pulsing (2N3847 only)</b> T<sub>C</sub> = +100°C; V<sub>CE</sub> = 300 Vdc; I<sub>C</sub> = 20 mAdc; t<sub>p</sub> = 1.0 s, 1 cycle</p> <p><b>Unclamped Inductive Sweep</b> T<sub>C</sub> = +100°C; I<sub>C</sub> = 20 Adc; I<sub>B</sub> = 2 Adc (See Figure 4 on Mil-PRF-19500/412)</p> <p><b>Clamped Inductive Sweep</b> T<sub>C</sub> = +100°C; I<sub>C</sub> = 20 Adc; I<sub>B</sub> = 2 Adc (See Figure 5 on Mil-PRF-19500/412)</p>
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3) Pulse Test: Pulse Width = 300μs, Duty Cycle ≤ 2.0%.