

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/412

### Devices

2N3846

2N3847

### Qualified Level

JAN  
JANTX  
JANTXV

### MAXIMUM RATINGS

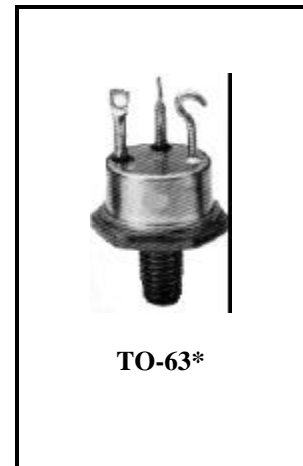
Ratings	Symbol	2N3846	2N3847	Units
Collector-Emitter Voltage	$V_{CEO}$	200	300	Vdc
Collector-Base Voltage	$V_{CBO}$	300	400	Vdc
Emitter-Base Voltage	$V_{EBO}$	10		Vdc
Collector Current	$I_C$	20		Adc
Total Power Dissipation	$P_T$	@ $T_A = +25^{\circ}\text{C}$ <sup>(1)</sup>	4.0	W
		@ $T_C = +100^{\circ}\text{C}$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

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS</b> <sup>(3)</sup>				
Forward-Current Transfer Ratio $I_C = 1 \text{ Adc}; V_{CE} = 3.0 \text{ Vdc}$ $I_C = 5 \text{ Adc}; V_{CE} = 3.0 \text{ Vdc}$ $I_C = 10 \text{ Adc}; V_{CE} = 3.0 \text{ Vdc}$	$h_{FE}$	70 40 12	240 60	
Base-Emitter Voltage $V_{CE} = 3 \text{ Vdc}; I_C = 10 \text{ Adc}$	$V_{BE}$		1.20	Vdc
Base-Emitter Saturated Voltage $I_B = 1.6 \text{ Adc}; I_C = 10 \text{ Adc}$	$V_{BE(sat)}$		1.30	Vdc
Collector-Emitter Saturated Voltage $I_B = 1.6 \text{ Adc}; I_C = 10 \text{ Adc}$	$V_{CE(sat)}$		0.75	Vdc

**DYNAMIC CHARACTERISTICS**

Magnitude of Common-Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0 \text{ Adc}, V_{CE} = 10 \text{ Vdc}, f = 1 \text{ MHz}$	$ h_{fe} $	10	35	
Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 5 \text{ Adc}, V_{CE} = 10 \text{ Vdc}, f = 1 \text{ kHz}$	$h_{fe}$	50	250	
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$		750	pF

**SWITCHING CHARACTERISTICS**

Turn-On Time $V_{BE(off)} \sim -7.5 \text{ Vdc}; I_C = 10 \text{ Adc};$ $I_{B1} = 2 \text{ Adc}; I_{B2} = -2 \text{ Adc}; R_L = 15\Omega$	$t_{on}$		4	$\mu\text{s}$
Turn-Off Time $V_{BE(off)} \sim -7.5 \text{ Vdc}; I_C = 10 \text{ Adc};$ $I_{B1} = 2 \text{ Adc}; I_{B2} = 2 \text{ Adc}; R_L = 15\Omega$	$t_{off}$		7	$\mu\text{s}$

**SAFE OPERATING AREA**

<b>DC Tests</b> $T_C = +100^\circ\text{C}; V_{CE} = 0 \text{ Vdc}, I_C = 0 \text{ Adc}$ (See Figure 3 on Mil-PRF-19500/412)
<b>Test 1</b> $V_{CE} = 7.5 \text{ Vdc}; I_C = 20 \text{ Adc}; t_p = 1.0 \text{ s}; 1 \text{ cycle}$
<b>Test 2</b> $V_{CE} = 200 \text{ Vdc}; I_C = 100 \text{ mAdc}; t_p = 1.0 \text{ s}, 1 \text{ cycle}$
<b>Test 3</b> $V_{CE} = 58 \text{ Vdc}; I_C = 1.0 \text{ Adc}; t_p = 1.0 \text{ s}, 1 \text{ cycle}$
<b>Burnout by Pulsing (2N3847 only)</b> $T_C = +100^\circ\text{C}; V_{CE} = 300 \text{ Vdc}; I_C = 20 \text{ mAdc}; t_p = 1.0 \text{ s}, 1 \text{ cycle}$
<b>Unclamped Inductive Sweep</b> $T_C = +100^\circ\text{C}; I_C = 20 \text{ Adc}; I_B = 2 \text{ Adc}$ (See Figure 4 on Mil-PRF-19500/412)
<b>Clamped Inductive Sweep</b> $T_C = +100^\circ\text{C}; I_C = 20 \text{ Adc}; I_B = 2 \text{ Adc}$ (See Figure 5 on Mil-PRF-19500/412)

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



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