New Jersey Semi-Conductor Products, Inc.

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2N3445 thru 2N3448

HIGH-SPEED SILICON ANNULAR NPN POWER TRANSISTORS

. . . for switching and amplifier applications

FEATURES

- Fast Switching: Total Switching Time = 1.2 μs (Typ) @ 5.0 A
- High Gain: H_{FE} = 40 to 120 @ 5.0 Amps (2N3447-48)
- Guaranteed DC Safe Area: 1.5 Amps (Min) @ V_{CE} = 40 Vdc
- Low $V_{CE(sat)}$: 1.0 Volt (Typ), 1.5 Volts (Max) @ 5.0 Amps
- Excellent Beta Linearity

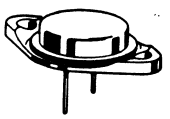
APPLICATIONS

- Specified safe area of this series allows reliable design for inverters, converters, hammer, and servo drivers.
- Fast response makes it ideal for series regulators; high switching speeds enhance its use in switching regulators.
- Wide bandwidth and flat beta hold-up result in exceptional amplifier characteristics.

7.5 AMPERE

POWER TRANSISTORS SILICON NPN

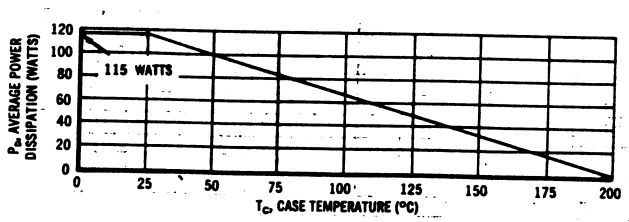
60-80 VOLTS
115 WATTS



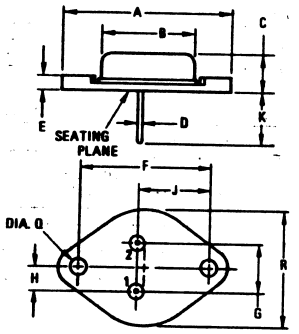
MAXIMUM RATING

Rating	Symbol	2N3445 2N3447	2N3446 2N3448	Unit
Collector-Emitter Voltage	V_{CEO}	60	80	Vdc
Collector-Base Voltage	V_{CB}	80	100	Vdc
Emitter-Base Voltage	V_{EB}	6.0	10	Vdc
Collector Current-Continuous	I_C	7.5		Adc
Base Current - Continuous	I_B	4.0		Adc
Total Device Dissipation	P_D	Figure 1, 2	Figure 1, 3	Watts
Operating Junction Temperature Range	T_J	−65 to +200		°C

FIGURE 1 – POWER DERATING CURVE



These transistors are also subject to safe area curves as indicated by Figures 2, 3. Both limits are applicable and must be observed.



STYLE 1:
PIN 1. BASE
2. EMITTER
CASE: COLLECTOR

NOTE:
1. DIM "Q" IS DIA.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	–	39.37	–	1.550
B	–	21.08	–	0.830
C	6.35	7.62	0.250	0.300
D	0.89	1.09	0.038	0.043
E	–	3.43	–	0.135
F	29.90	30.40	1.177	1.197
G	10.67	11.18	0.420	0.440
H	5.33	5.59	0.210	0.220
J	16.64	17.15	0.655	0.675
K	11.18	12.19	0.440	0.480
Q	3.84	4.09	0.151	0.161
R	–	26.67	–	1.050

Collector connected to case.
CASE 11-01
(TO-3)

Quality Semi-Conductors

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2N3445 thru 2N3448

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Emitter-Base Cutoff Current		I_{EBO}				mAdc
(V_{EB} = 6 Vdc)	2N3445, 2N3447		–	–	0.25	
(V_{EB} = 10 Vdc)	2N3446, 2N3448		–	–	0.25	
Collector-Emitter Cutoff Current		I_{CEX}				mAdc
(V_{CE} = 60 Vdc, V_{BE} = -1 Vdc)	2N3445, 2N3447		–	–	0.1	
(V_{CE} = 60 Vdc, V_{BE} = -1 Vdc, T_C = 150°C)	2N3445, 2N3447		–	–	1.0	
(V_{CE} = 80 Vdc, V_{BE} = -1 Vdc)	2N3446, 2N3448		–	–	0.1	
(V_{CE} = 80 Vdc, V_{BE} = -1 Vdc, T_C = 150°C)	2N3446, 2N3448		–	–	1.0	
Collector-Emitter Cutoff Current		I_{CEO}				mAdc
(V_{CE} = 40 Vdc, I_B = 0)	2N3445, 2N3447		–	–	1.0	
(V_{CE} = 60 Vdc, I_B = 0)	2N3446, 2N3448		–	–	1.0	
Collector-Base Breakdown Voltage		BV_{CBO}				Vdc
(I_C = 1 mAdc, I_E = 0)	2N3445, 2N3447		80	–	–	
	2N3446, 2N3448		100	–	–	
Collector-Emitter Sustaining Voltage		$V_{CEO(sus)}$				Vdc
(I_C = 100 mAdc, I_B = 0)	2N3445, 2N3447		60	–	–	
	2N3446, 2N3448		80	–	–	
DC Current Gain		h_{FE}				–
(I_C = 0.5 Adc, V_{CE} = 5 Vdc)	2N3445, 2N3446		20	45	–	
	2N3447, 2N3448		40	85	–	
(I_C = 3 Adc, V_{CE} = 5 Vdc)	2N3445, 2N3446		20	40	60	
(I_C = 5 Adc, V_{CE} = 5 Vdc)	2N3447, 2N3448		40	75	120	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 3 Adc, I_B = 0.3 Adc)	2N3445, 2N3446		–	0.6	1.5	
(I_C = 5 Adc, I_B = 0.5 Adc)	2N3447, 2N3348		–	0.8	1.5	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$				Vdc
(I_C = 3 Adc, I_B = 0.3 Adc)	2N3445, 2N3446		–	1.0	1.5	
(I_C = 5 Adc, I_B = 0.5 Adc)	2N3447, 2N3338		–	1.0	1.5	
Base-Emitter Voltage		V_{BE}				Vdc
(I_C = 3 Adc, V_{CE} = 5 Vdc)	2N3445, 2N3446		–	1.0	1.5	
(I_C = 5 Adc, V_{CE} = 5 Vdc)	2N3447, 2N3448		–	1.0	1.4	
Small Signal Current Gain		h_{fe}				–
(V_{CE} = 10 Vdc, I_C = 0.5 Adc, f = 1 KHz)	2N3445, 2N3446		20	–	100	
	2N3447, 2N3448		40	–	200	
(V_{CE} = 10 Vdc, I_C = 0.5 Adc, f = 10 MHz)	All Types		1.0	1.6	–	
Common Base Output Capacitance		C_{ob}				pf
(V_{CB} = 10 Vdc, f = 0.1 MHz)	All Types		–	260	400	
Switching Times						μs
(V_{CC} = 25 Vdc, R_L = 5 ohms, I_C = 5 A, I_{B1} = I_{B2} = 0.5 A)						
Delay Time plus Rise Time		$t_d + t_r$	–	0.15	0.35	
Storage Time		t_s	–	0.9	2.0	
Fall Time		t_f	–	0.15	0.35	

SAFE OPERATING AREAS

FIGURE 2 – 2N3445, 2N3447

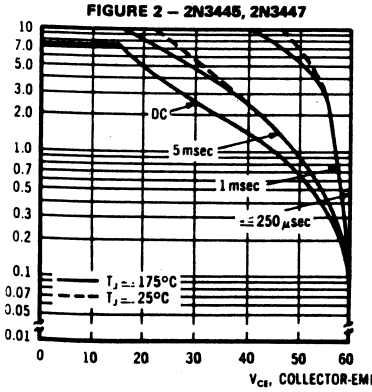
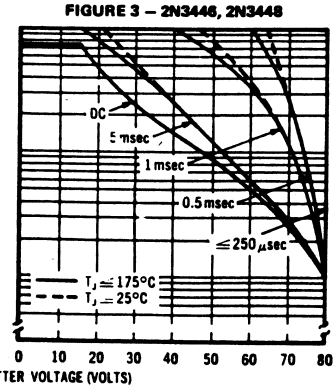


FIGURE 3 – 2N3446, 2N3448



V_{CE}, COLLECTOR-EMITTER VOLTAGE (VOLTS)

The Safe Operating Area Curves indicate $I_C - V_{CE}$ limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter short. (Duty cycle of the excursions make no significant change in these safe areas.) To insure operation below the maximum T_J, the power-temperature derating curve must be observed for both steady state and pulse power conditions.