

# MOTOROLA SEMICONDUCTOR TECHNICAL DATA

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T-33-35

## NPN Silicon Power Transistor Module Energy Management Series

These power transistors are designed for industrial service under practical operating environments found in switching high power inductive loads.

- Energy Efficient Package
- Isolated Mounting Plate (2500 Volts RMS)
- Low Saturation Voltage
- Low Thermal Resistance
- Internal Flyback and Speed-Up Diodes
- High DC Current Gain
- Low Current Terminals Separated from High Current Terminals

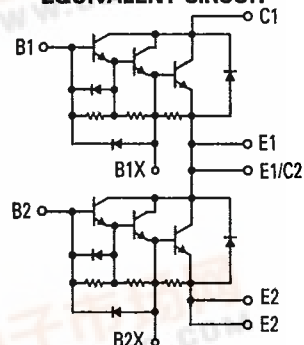


CASE 814-01

MJ100BX100

**DUAL  
TRI-STAGE  
POWER TRANSISTORS  
100 AMPERES  
1000 VOLTS  
700 WATTS**

## EQUIVALENT CIRCUIT



### MAXIMUM RATINGS (Per Device and $T_C = 25^\circ\text{C}$ unless otherwise noted.)

Rating	Symbol	Value	Unit
Collector-Emitter Sustaining Voltage ( $I_B = 0$ )	$V_{CEO}$	880	Vdc
Collector-Emitter Voltage ( $V_{BE} = -2\text{ V}$ )	$V_{CEX(sus)}$	1000	Vdc
Collector-Base Voltage	$V_{CBO}$	1000	Vdc
Emitter-Base Voltage	$V_{EB}$	7	Vdc
Isolation Voltage (ac for 1 minute)	$V_{ISOL}$	2500	Vac
Collector Current — Continuous — Peak Nonrepetitive for 1 ms	$I_C$	100 200	A
Base Current — Continuous	$I_B$	10	A
Total Device Dissipation Derate above $T_C = 25^\circ\text{C}$	$P_D$	700 5.59	Watts W/°C
Operating Junction and Storage Temperature Range	$T_J$ $T_{stg}$	-40 to +150 -40 to +125	°C

### MECHANICAL RATINGS

Mounting Torque	—	26	in.-lb.
Terminal Torque	—	26	in.-lb.
Per Unit Weight	—	470	grams

### THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Maximum Thermal Resistance, Junction to Case Transistor C-E Diode	$R_{\theta JC}$	0.179 0.65	°C/W

**ELECTRICAL CHARACTERISTICS** (Per Device and  $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Sustaining Voltage (1) ( $I_C = 1 \text{ Adc}$ , $L = 40 \text{ mH}$ )	$V_{CEO(sus)}$	880	—	—	Vdc
Collector Cutoff Current ( $V_{CE} = \text{Rated } V_{CB}$ , $I_E = 0$ )	$I_{CBO}$	—	—	4	mA
Emitter Cutoff Current ( $V_{CB} = 7 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	—	400	mA

**SAFE OPERATING AREA**

Second Breakdown Collector Current with Base Forward-Biased	FBSOA	See Figure 7			
Clamped Inductive SOA with Base Reverse-Biased	RBSOA	See Figure 8			

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 100 \text{ Adc}$ , $V_{CE} = 5 \text{ Vdc}$ )	$h_{FE}$	100	—	—	—
Collector-Emitter Saturation Voltage ( $I_C = 100 \text{ Adc}$ , $I_B = 2 \text{ Adc}$ )	$V_{CE(sat)}$	—	—	2.5	Vdc
Base-Emitter Saturation Voltage ( $I_C = 100 \text{ Adc}$ , $I_B = 2 \text{ Adc}$ )	$V_{BE(sat)}$	—	—	3.5	Vdc


**SWITCHING CHARACTERISTICS**

Resistive Load						
Turn-On Time	$V_{CC} = 600 \text{ Vdc}$ , $I_C = 100 \text{ A}$ , $I_{B1} = I_{B2} = 2 \text{ A}$ , $t_p = 50 \mu\text{s}$ , Duty Cycle $\leq 0.5\%$	$t_{on}$	—	—	2	$\mu\text{s}$
Storage Time		$t_s$	—	—	15	
Fall Time		$t_f$	—	—	5	

**C-E DIODE CHARACTERISTICS**

Forward Voltage (1) ( $I_F = 100 \text{ Adc}$ )	$V_F$	—	—	1.8	Vdc
Reverse Recovery Time ( $I_F = 100 \text{ Adc}$ , $V_{EB} = 3 \text{ V}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ )	$t_{rr}$	—	—	1	$\mu\text{s}$

(1) Pulse Test: Pulse width of  $300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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TYPICAL ELECTRICAL CHARACTERISTICS

COLLECTOR SATURATION REGION  
(PER DEVICE)

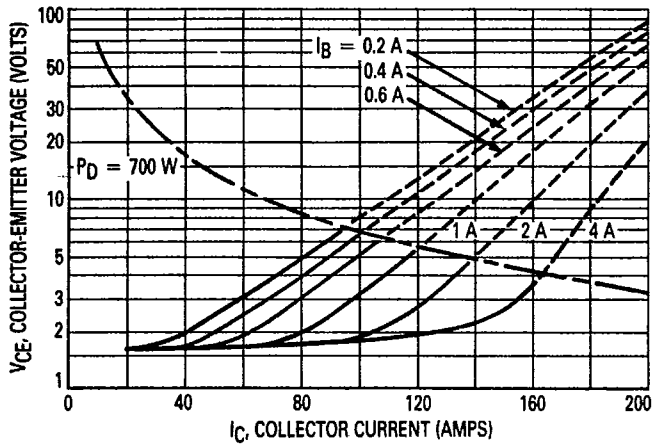


Figure 1.  $T_C = +25^\circ\text{C}$

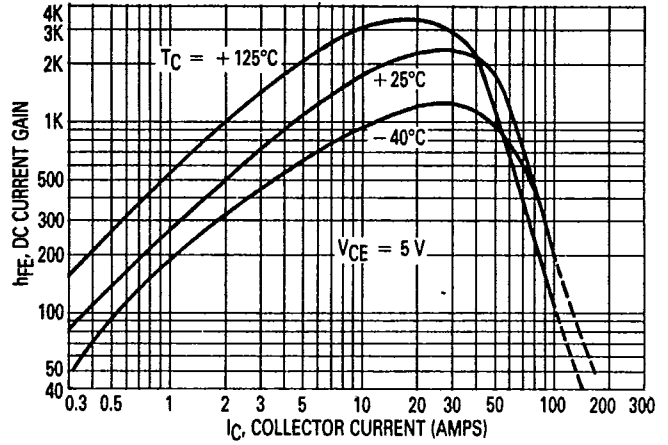


Figure 4. Typical DC Current Gain

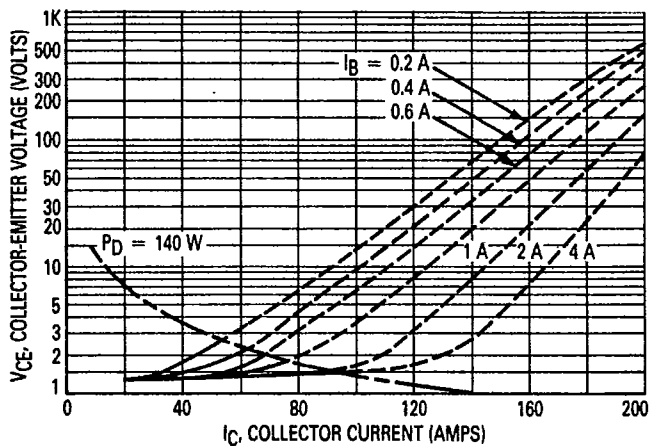


Figure 2.  $T_C = +125^\circ\text{C}$

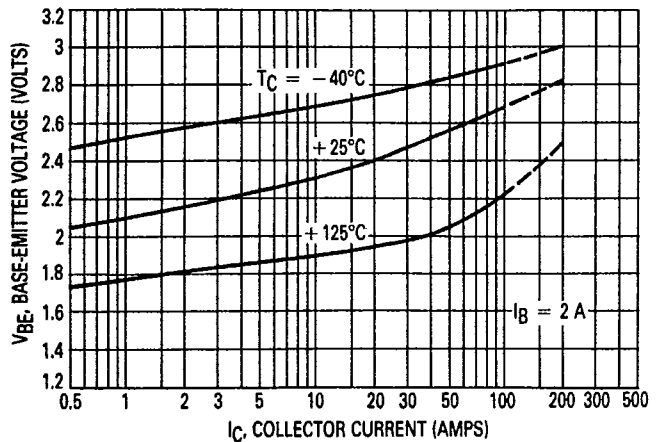


Figure 5. Typical Base-Emitter Saturation Region

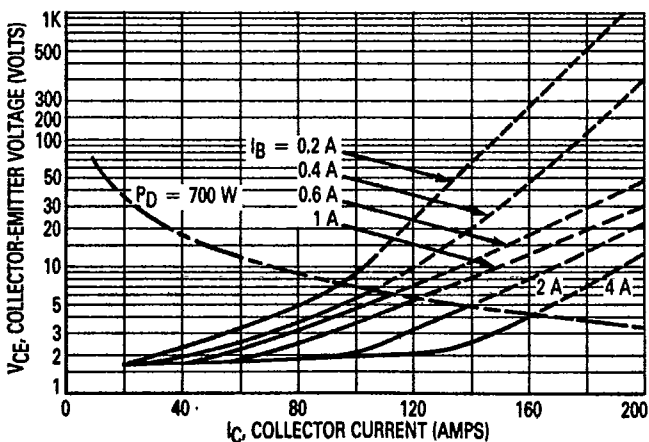


Figure 3.  $T_C = -40^\circ\text{C}$

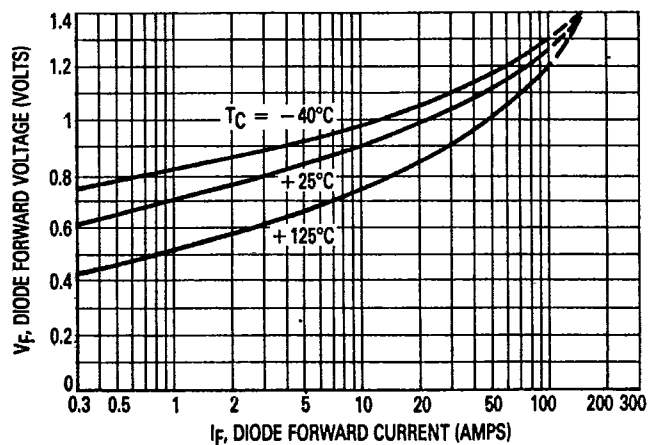
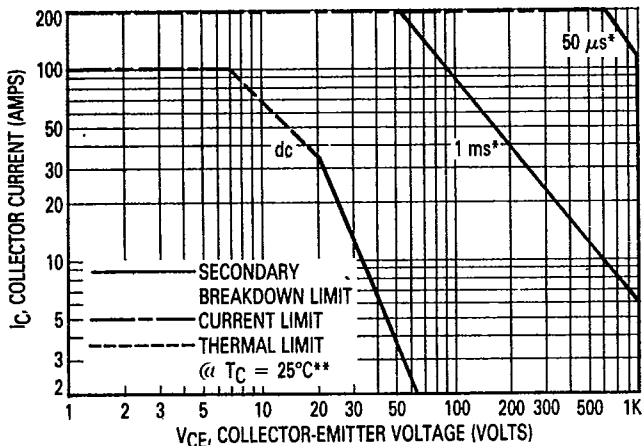


Figure 6. Typical Collector-Emitter Diode Forward Characteristics



\*Single nonrepetitive pulse  
\*\*Curves must be derated linearly with increased temperature

Figure 7. Forward Bias Safe Operating Area

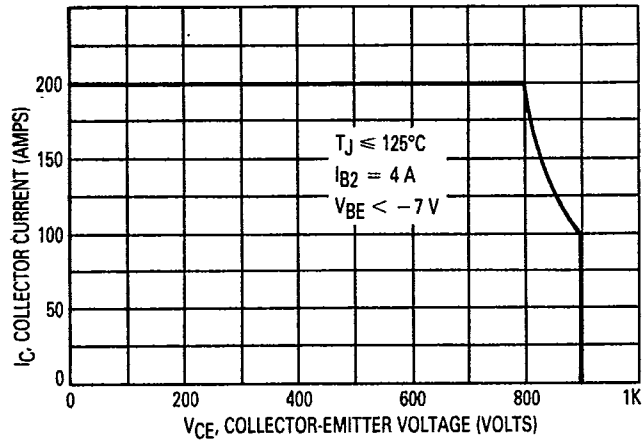


Figure 8. Reverse Bias Safe Operating Area

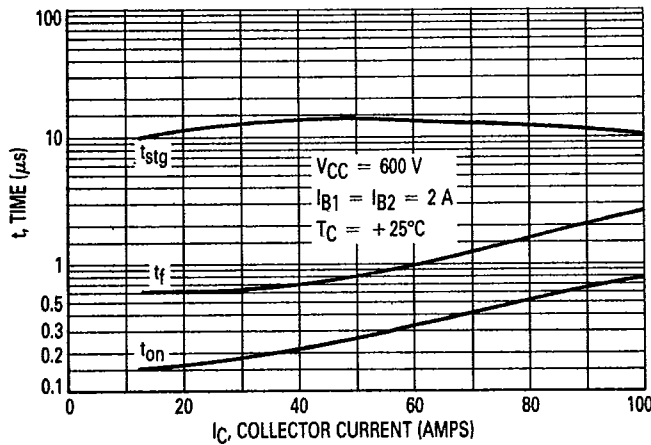
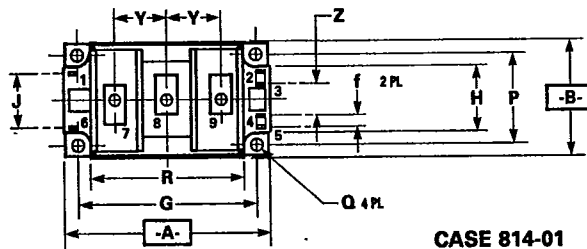


Figure 9. Typical Resistive Switching Times

OUTLINE DIMENSIONS



CASE 814-01

- NOTES:
1. POSITIONAL TOLERANCE FOR Q DIMENSION (4 PL):  $\pm \phi 0.36 (0.014) \text{ (M) X A (M) B (M)}$
  2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  3. CONTROLLING DIMENSION: MILLIMETER.
  4. TERMINALS 1, 2, 3, 4, 5 AND 6 ARE FAST-ON-TAB # 110.
  5. TERMINALS 7, 8, AND 9 USE M5 SCREWS.

- STYLE 1:
1. BASE 2X
  2. BASE 2
  3. EMITTER 2
  4. EMITTER 1
  5. BASE 1
  6. BASE 1X
  7. COLLECTOR 2/EMITTER 1
  8. EMITTER 2
  9. COLLECTOR 1

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	107.2	108.8	4.221	4.283
B	61.2	62.8	2.410	2.472
C	22.0	25.0	0.867	0.984
D	2.5	3.5	0.099	0.137
E	24.5	25.5	0.965	1.003
F	21.0	22.0	0.827	0.866
G	93.0 BSC		3.661 BSC	
H	34.2	35.8	1.347	1.409
J	28.5	29.5	1.122	1.161
K	7.4	8.6	0.292	0.338
L	—	38.0	—	1.496
N	53.2	54.8	2.095	2.157
P	48.0 BSC		1.890 BSC	
Q	6.2	6.8	0.244	0.267
R	79.2	80.8	3.119	3.181
T	105.2	106.8	4.142	4.204
V	59.2	60.8	2.331	2.393
W	3.5	4.5	0.138	0.177
Y	27.5	28.5	1.083	1.122
Z	16.5	17.5	0.650	0.688
e	48.5	49.5	1.910	1.948
f	5.5	6.5	0.217	0.255

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