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MJ10041
MJ10044
MJ10047

**25, 50, and 100 AMPERE
NPN SILICON
POWER DARLINGTON
TRANSISTOR**
250, 450 and 850 VOLTS
250 WATTS

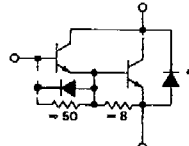
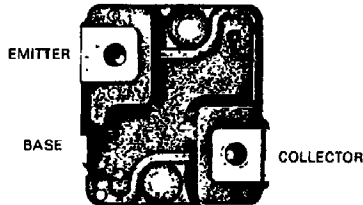
Designer's Data for
"Worst-Case" Conditions

The Designer's Data Sheet permits the design of most circuits entirely from the information presented. Limit data — representing device characteristics boundaries — are given to facilitate "worst-case" design.

25 kVA ENERGY MANAGEMENT SERIES SWITCHMODE DARLINGTON TRANSISTORS

25, 50 and 100 Ampere Operating Current

These Darlington transistors are designed for industrial service under practical operating environments requiring fast switching speed for highly efficient systems operating at high frequency such as inverters, PWM controllers and other high frequency systems operating from 120, 230 and 480 V lines.



*Emitter-Collector Diode is a fast recovery high power diode.
Note: The 8 ohm resistor is not included in the MJ10044 and MJ10047.

MAXIMUM RATINGS

Mechanical Ratings			
Rating	Value	Unit	
Mounting Torque (To heat sink with 6-32 Screw) (Note 1)	8.0	in.-lb	
Lead Torque (Lead to bus with 5 mm Screw) (Note 2)	20	in.-lb	
Per Unit Weight	41	grams	

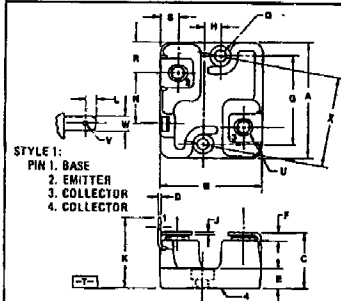
THERMAL CHARACTERISTICS

Thermal Resistance, Junction to Case, $R_{\theta JC}$	0.5	$^{\circ}C/W$
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Mica Insulators available as separate items.
0.003" thick. Motorola Part Number 14CSB12387B003.

Notes:

- A Belleville washer of 0.281" O.D., 0.138" I.D., 0.013" thick and 43 pounds flat is recommended.
- The maximum penetration of the screw should be limited to 0.50".
- To adapt the collector and emitter terminals to quick connect terminals, AMP 250 Series Faston tab P/N 81498-1 is suggested.
- The mounting holes of this package are compatible with TO-204 (formerly TO-3) mounting holes.



- NOTES:
- DIMENSIONS A AND B ARE DATUMS AND T IS BOTH A DATUM SURFACE AND SEATING PLANE.
 - POSITIONAL TOLERANCE FOR MOUNTING HOLES:

$$\pm \begin{matrix} \text{A} \\ \text{B} \\ \text{C} \\ \text{D} \\ \text{E} \\ \text{F} \end{matrix} \begin{matrix} 0.25 \\ 0.10 \\ 0.10 \\ 0.10 \\ 0.10 \\ 0.10 \end{matrix} \begin{matrix} \text{M} \\ \text{M} \\ \text{M} \\ \text{M} \\ \text{M} \\ \text{M} \end{matrix} \begin{matrix} \text{T} \\ \text{A} \\ \text{C} \\ \text{D} \\ \text{E} \\ \text{F} \end{matrix}$$

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1982.
- CONTROLLING DIMENSION: INCH EXCEPT FOR METRICALLY THREADED INSERTS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	39.11	40.13	1.540	1.580
B	33.80	34.85	1.330	1.370
C	—	30.32	—	1.200
D	0.88	0.95	0.035	0.038
E	8.30	8.91	0.327	0.349
F	—	4.40	—	0.173
G	29.67 BSC	—	1.168 BSC	—
H	5.08 BSC	—	0.200 BSC	—
J	0.93	1.09	0.037	0.043
K	—	25.40	—	1.000
L	2.62	2.90	0.103	0.114
N	17.14	17.80	0.675	0.701
O	3.73	3.88	0.147	0.153
R	10.41	10.78	0.410	0.424
S	6.84	6.95	0.270	0.274
U	MOUNTING HOLES (METRIC THREAD)			
V	1.27	1.42	0.050	0.056
W	4.69	4.85	0.185	0.191
X	30.18 BSC	—	1.189 BSC	—

CASE 363-01



NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

Quality Semi-Conductors

MJ10041, MJ10044, MJ10047

MAXIMUM RATINGS (Continued) ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Rating	Symbol	MJ10041	MJ10044	MJ10047	Unit	
Collector-Emitter Voltage ($I_B = 0$)	V_{CEO}	850	450	250	Vdc	
Collector-Emitter Voltage ($R_{BE} = 10$ Ohms)	V_{CER}	900	500	300	Vdc	
Collector-Base Voltage	V_{CB}	900	500	300	Vdc	
Emitter-Base Voltage	V_{EB}	8.0			Vdc	
Collector Current — Operating	$I_{C(op)}$	($T_C = 115^\circ\text{C}$)	25	—	—	A
		($T_C = 85^\circ\text{C}$)	—	50	—	
		($T_C = 85^\circ\text{C}$)	—	—	100*	
Collector Current — Continuous	I_C		37.5	75	100	A
— Peak Repetitive			75	150	300	
— Peak Nonrepetitive			125	250	500	
Base Current — Continuous	I_B		25			A
— Peak Nonrepetitive			50			
Total Device Dissipation	P_D		250			Watts
Derate above $T_C = 25^\circ\text{C}$			2.0			W/ $^\circ\text{C}$
For 1-minute overload			333			Watts
Operating Junction and Storage Temperature Range	T_J, T_{stg}		-55 to +150			$^\circ\text{C}$
For 1-minute overload			-55 to 200			

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) ($I_C = 125$ mAdc)	MJ10041 MJ10044 MJ10047	$V_{CEO(sus)}$	850 450 250	— — —	Vdc
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CB}, V_{BE(off)} = 1.5$ Vdc) ($V_{CE} = \text{Rated } V_{CB}, V_{BE(off)} = 1.5$ Vdc, $T_C = 150^\circ\text{C}$)		I_{CEV}	— —	2.0 10	mA
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CER}, R_{BE} = 10$ Ω , $T_C = 100^\circ\text{C}$)		I_{CER}	—	10	mA
Emitter Cutoff Current ($V_{EB} = 4.0$ Vdc, $I_C = 0$)	MJ10041 MJ10044 MJ10047	I_{EBO}	— —	500 2.5	mA

SAFE OPERATING AREA

Second Breakdown Collector Current with Base Forward-Biased	FBSOA	See Figures 32, 34 & 36
Clamped Inductive SOA with Base Reverse-Biased	RBSOA	See Figures 33, 35 & 37
Overload Safe Operating Area	OLSOA	See Figures 38, 39, 40, 41, 42 & 43

DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 10$ Vdc, $I_E = 0$, $f_{test} = 1.0$ kHz)	C_{ob}	—	2000	pF
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(1) Pulse Test, Pulse width of 300 μs , duty cycle $\leq 2.0\%$.

*This rating is with a 50% duty cycle, and is limited by power dissipation. Higher operating currents are allowable at lower duty cycles.

MJ10041, MJ10044, MJ10047

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS (1)				
MJ10041				
DC Current Gain (I _C = 25 Adc, V _{CE} = 5.0 Vdc) (I _C = 25 Adc, V _{CE} = 10 Vdc)	h _{FE}	25 40	— —	
Collector-Emitter Saturation Voltage (I _C = 25 Adc, I _B = 2.0 Adc) (I _C = 37.5 Adc, I _B = 7.5 Adc) (I _C = 25 Adc, I _B = 2.0 Adc, T _C = 100°C)	V _{CE(sat)}	— — —	2.0 5.0 2.5	Vdc
Base-Emitter Saturation Voltage (I _C = 25 Adc, I _B = 2.0 Adc) (I _C = 25 Adc, I _B = 2.0 Adc, T _C = 100°C)	V _{BE(sat)}	— —	3.0 3.0	Vdc
MJ10044				
DC Current Gain (I _C = 50 Adc, V _{CE} = 5.0 Vdc) (I _C = 50 Adc, V _{CE} = 10 Vdc)	h _{FE}	50 60	— —	
Collector-Emitter Saturation Voltage (I _C = 50 Adc, I _B = 1.67 Adc) (I _C = 75 Adc, I _B = 6.0 Adc) (I _C = 50 Adc, I _B = 1.67 Adc, T _C = 100°C)	V _{CE(sat)}	— — —	2.0 3.3 2.5	Vdc
Base-Emitter Saturation Voltage (I _C = 50 Adc, I _B = 1.67 Adc) (I _C = 50 Adc, I _B = 1.67 Adc, T _C = 100°C)	V _{BE(sat)}	— —	3.0 3.0	Vdc
MJ10047				
DC Current Gain (I _C = 100 Adc, V _{CE} = 5.0 Vdc) (I _C = 100 Adc, V _{CE} = 10 Vdc)	h _{FE}	75 90	— —	
Collector-Emitter Saturation Voltage (I _C = 100 Adc, I _B = 2.75 Adc) (I _C = 100 Adc, I _B = 2.75 Adc, T _C = 100°C)	V _{CE(sat)}	— —	2.0 2.5	Vdc
Base-Emitter Saturation Voltage (I _C = 100 Adc, I _B = 2.75 Adc) (I _C = 100 Adc, I _B = 2.75 Adc, T _C = 100°C)	V _{BE(sat)}	— —	3.5 3.5	Vdc

(1) Pulse Test: Pulse width of 300 μs, duty cycle ≤ 2.0%.

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

Characteristic	Symbol	Min	Typ	Max	Unit	
SWITCHING CHARACTERISTICS						
MJ10041						
Resistive Load						
Delay Time	V _{CC} = 300 Vdc, I _C = 25 A, I _{B1} = 2.5 A, V _{BE(OFF)} = 5.0 V, t _p = 50 μs, Duty Cycle ≤ 2.0%	t _d	—	0.03	μs	
Rise Time		t _r	—	1.2		
Storage Time		t _s	—	3.3		
Fall Time		t _f	—	1.5		
Inductive Load, Clamped						
Storage Time	I _{CM} = 25 A, V _{CEM} = 300 V, V _{BE(OFF)} = 5.0 V, I _{B1} = 2.5 A	T _J = 100°C	t _{sv}	—	5.0	μs
Crossover Time			t _c	—	3.0	
Storage Time		T _J = 25°C	t _{sv}	—	3.5	
Crossover Time			t _c	—	1.5	