

**SWITCHMODE SERIES
NPN SILICON POWER TRANSISTORS**

The MJE8502 and MJE8503 transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line operated switch-mode applications such as:

- Switching Regulators
- Inverters
- Solenoid and Relay Drivers
- Motor Controls
- Deflection Circuits

Fast Turn-Off Times

- 150 ns Inductive Fall Time—25°C (Typ)
- 400 ns Inductive Crossover Time—25°C (Typ)
- 1200 ns Inductive Storage Time—25°C (Typ)

Operating Temperature Range -65 to +125°C

100°C Performance Specified for:

- Reverse-Biased SOA with Inductive Loads
- Switching Times with Inductive Loads
- Saturation Voltages
- Leakage Currents

MAXIMUM RATINGS

Rating	Symbol	MJE8502	MJE8503	Unit
Collector-Emitter Voltage	V _{CE0} (sus)	700	800	Vdc
Collector-Emitter Voltage	V _{CEV}	1200	1400	Vdc
Emitter Base Voltage	V _{EB}	8.0	8.0	Vdc
Collector Current — Continuous	I _C	5.0	5.0	Adc
Peak (1)	I _{CM}	10	10	
Base Current — Continuous	I _B	4.0	4.0	Adc
Peak (1)	I _{BM}	8.0	8.0	
Total Power Dissipation @ T _C = 25°C	P _D	80	80	Watts
@ T _C = 100°C		21	21	
Derate above 25°C		0.80	0.80	W/°C
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-65 to +125		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	1.25	°C/W
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T _L	275	°C

(1) Pulse Test: Pulse Width = 5 ms, Duty Cycle < 10%.

**MJE8502
MJE8503**

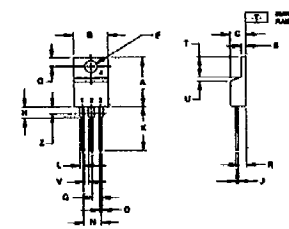
6.0 AMPERE

**NPN SILICON
POWER TRANSISTORS**

**700 and 800 VOLTS
80 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.



MILLIMETERS		INCHES	
A	16.0	0.630	±0.010
B	12.0	0.472	±0.010
C	10.0	0.394	±0.010
D	10.0	0.394	±0.010
E	10.0	0.394	±0.010
F	10.0	0.394	±0.010
G	10.0	0.394	±0.010
H	10.0	0.394	±0.010
I	10.0	0.394	±0.010
J	10.0	0.394	±0.010
K	10.0	0.394	±0.010
L	10.0	0.394	±0.010
M	10.0	0.394	±0.010
N	10.0	0.394	±0.010
O	10.0	0.394	±0.010
P	10.0	0.394	±0.010
Q	10.0	0.394	±0.010
R	10.0	0.394	±0.010
S	10.0	0.394	±0.010
T	10.0	0.394	±0.010
U	10.0	0.394	±0.010
V	10.0	0.394	±0.010
W	10.0	0.394	±0.010
X	10.0	0.394	±0.010
Y	10.0	0.394	±0.010
Z	10.0	0.394	±0.010

STYLE 1
1 BASE
2 COLLECTOR
3 EMITTER
4 COLLECTOR

NOTES
1 DIMENSIONS AND TOLERANCING PER AND 1948A USE
2 CONTROLLING DIMENSION, INCH
3 DIMENSIONS ARE SHOWN FROM ALL BODY AND LEAD REGULARITIES ARE ALLOWED

TO-220AB



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MJE8502, MJE8503

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (Table 1) (I _C = 100 mA, I _B = 0)	MJE8502 MJE8503 V _{CE0(sus)}	700 800	—	—	V _{dC}
Collector Cutoff Current (V _{CEV} = Rated Value, V _{BE(off)} = 1.5 V _{dC}) (V _{CEV} = Rated Value, V _{BE(off)} = 1.5 V _{dC} , T _C = 100°C)	I _{CEV}	—	—	0.25 5.0	mAdc
Collector Cutoff Current (V _{CE} = Rated V _{CEV} , R _{BE} = 50 Ω, T _C = 100°C)	I _{CER}	—	—	5.0	mAdc
Emitter Cutoff Current (V _{EB} = 7.0 V _{dC} , I _C = 0)	I _{EBO}	—	—	1.0	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with base forward biased	I _{g/b}	See Figure 12			
Clamped Inductive SOA with Base Reverse Biased	FB _{SOA}	See Figure 13			
ON CHARACTERISTICS (1)					
DC Current Gain (I _C = 1.0 Adc, V _{CE} = 5.0 V _{dC})	h _{FE}	7.5	—	—	—
Collector-Emitter Saturation Voltage (I _C = 2.5 Adc, I _B = 1.0 Adc) (I _C = 5.0 Adc, I _B = 2.0 Adc) (I _C = 2.5 Adc, I _B = 1.0 Adc, T _C = 100°C)	V _{CE(sat)}	—	—	2.0 5.0 3.0	V _{dC}
Base-Emitter Saturation Voltage (I _C = 2.5 Adc, I _B = 1.0 Adc) (I _C = 2.5 Adc, I _B = 1.0 Adc, T _C = 100°C)	V _{BE(sat)}	—	—	1.5 1.5	V _{dC}
DYNAMIC CHARACTERISTICS					
Output Capacitance (V _{CB} = 10 V _{dC} , I _E = 0, f _{test} = 1.0 kHz)	C _{ob}	60	—	300	pF
SWITCHING CHARACTERISTICS					
Resistive Load (Table 1)					
Delay Time	(V _{CC} = 500 V _{dC} , I _C = 2.5 A, I _{B1} = 1.0 A, V _{BE(off)} = 5.0 V _{dC} , t _p = 50 μs, Duty Cycle < 2.0%)	t _d	—	0.040	0.20 μs
Rise Time		t _r	—	0.125	2.0 μs
Storage Time		t _s	—	1.2	4.0 μs
Fall Time		t _f	—	0.65	2.0 μs
Inductive Load, Clamped (Table 1)					
Storage Time	(I _C = 2.5 A(pk), V _{clamp} = 500 V _{dC} , I _{B1} = 1.0 A, V _{BE(off)} = 5 V _{dC} , T _C = 100°C)	t _{sv}	—	1.8	5.0 μs
Crossover Time		t _c	—	0.60	2.0 μs
Storage Time	(I _C = 2.5 A(pk), V _{clamp} = 500 V _{dC} , I _{B1} = 1.0 A, V _{BE(off)} = 5 V _{dC} , T _C = 25°C)	t _{sv}	—	1.2	— μs
Crossover Time		t _c	—	0.4	— μs
Fall Time		t _{fi}	—	0.15	— μs

(1) Pulse Test: PW = 300 μs, Duty Cycle < 2%.