

**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**

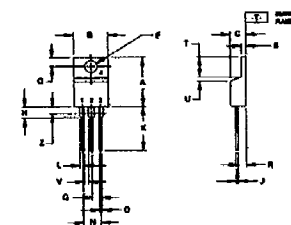
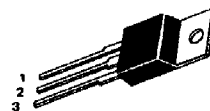
6.0 AMPERE

**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	10.0	0.394	0.394
B	1.5	0.059	0.059
C	1.5	0.059	0.059
D	1.5	0.059	0.059
E	1.5	0.059	0.059
F	1.5	0.059	0.059
G	1.5	0.059	0.059
H	1.5	0.059	0.059
I	1.5	0.059	0.059
J	1.5	0.059	0.059
K	1.5	0.059	0.059
L	1.5	0.059	0.059
M	1.5	0.059	0.059
N	1.5	0.059	0.059
O	1.5	0.059	0.059
P	1.5	0.059	0.059
Q	1.5	0.059	0.059
R	1.5	0.059	0.059
S	1.5	0.059	0.059
T	1.5	0.059	0.059
U	1.5	0.059	0.059
V	1.5	0.059	0.059
W	1.5	0.059	0.059
X	1.5	0.059	0.059
Y	1.5	0.059	0.059
Z	1.5	0.059	0.059

STYLE 1
1 BASE
2 COLLECTOR
3 EMITTER
4 COLLECTOR

NOTES
1 DIMENSIONS AND TOLERANCING PER AND 1943B. 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%.

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