

Advance Information

SWITCHMODE™ Series

NPN Bipolar Power Transistor

The MJE8503A transistor is designed for high voltage, high speed, power switching in inductive circuits where fall time is critical. They are suited for line operated switchmode applications such as:

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

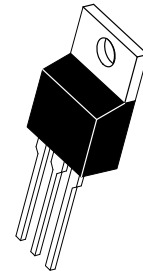
Featuring

- 1500 Volt Collector-Base Breakdown Capability
- Fast Switching:
 - 180 ns Typical Fall Times
 - 450 ns Typical Crossover Times
 - 1.2 μ s Typical Storage Times
- Low Collector-Emitter Leakage Current — 100 μ A Max @ 1500 V_{CES}

MJE8503A*

*Motorola Preferred Device

POWER TRANSISTORS
5.0 AMPERES
1500 VOLTS — V_{CES}
80 WATTS



CASE 221A-06
TO-220AB

MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO(sus)}	700	Vdc
Collector-Emitter Voltage	V _{CES}	1500	Vdc
Collector-Base Voltage	V _{CBO}	1500	Vdc
Emitter-Base Voltage	V _{EBO}	5.0	Vdc
Collector Current — Continuous — Peak (1)	I _C	5.0 10	Adc
Collector Current — Continuous — Peak	I _B I _{BM}	4.0 4.0	Adc
Total Power Dissipation @ T _C = 25°C @ T _C = 100°C Derate above 25°C	P _D	80 21 0.8	Watts W/°C
Operating and Storage 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 sec.	T _L	275	°C

(1) Pulse Test: Pulse Width = 5.0 ms, Duty Cycle < 10%.

SWITCHMODE is a trademark of Motorola Inc.

This document contains information on a new product. Specifications and information herein are subject to change without notice.

Preferred devices are Motorola recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage ($I_C = 100\text{ mA}$, $I_B = 0$)	$V_{CE(sus)}$	700	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 1500\text{ Vdc}$, $V_{BE} = 0$, $T_C = 25^\circ\text{C}$) ($V_{CE} = 1500\text{ Vdc}$, $V_{BE} = 0$, $T_C = 125^\circ\text{C}$)	I_{CES}	— —	— —	0.1 2.0	mA
Collector Cutoff Current ($V_{CE} = 1500\text{ Vdc}$, $R_{BE} = 50\text{ Ohms}$, $T_C = 100^\circ\text{C}$)	I_{CER}	—	—	5.0	mA
Emitter Cutoff Current ($V_{EB} = 6.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	—	1.0	mA

SECOND BREAKDOWN

Second Breakdown Collector with Base Forward Biased	$I_{S/b}$	See Figure 2			
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ON CHARACTERISTICS

DC Current Gain ($I_C = 1.0\text{ A}$, $V_{CE} = 5.0\text{ Vdc}$) ($I_C = 4.5\text{ A}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	7.5 2.25	— —	— —	—
Base-Emitter Saturation Voltage ($I_C = 2.5\text{ A}$, $I_B = 1.0\text{ A}$) ($I_C = 4.5\text{ A}$, $I_B = 2.0\text{ A}$)	$V_{BE(sat)}$	— —	— —	1.5 1.5	Vdc
Collector-Emitter Saturation Voltage ($I_C = 2.5\text{ A}$, $I_B = 1.0\text{ A}$) ($I_C = 4.5\text{ A}$, $I_B = 2.0\text{ A}$)	$V_{CE(sat)}$	— —	— —	2.0 3.0	Vdc

DYNAMIC CHARACTERISTICS

Current-Gain — Bandwidth Product ($I_C = 0.1\text{ A}$, $V_{CE} = 5.0\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)	f_T	—	7.0	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f_{test} = 0.1\text{ MHz}$)	C_{ob}	—	125	—	pF

SWITCHING CHARACTERISTICS

Resistive Load (Table 1)						
Delay Time	(I _C = 2.5 Adc, I _B = 1.0 Adc, V _{CC} = 500 Vdc V _{BE(off)} = 5.0 Vdc, t _p = 50 μs)	t _d	—	0.06	0.2	μs
Rise Time		t _r	—	0.08	2.0	
Storage Time		t _s	—	1.2	4.0	
Fall Time		t _f	—	0.7	2.0	
Inductive Load (Table 1)						
Storage Time	(I _C = 2.5 Adc, I _B = 1.0 Adc, V _{clamp} = 500 Vdc V _{BE(off)} = 5.0 Vdc, t _p = 50 μs)	t _{sv}	—	1.2	—	μs
Crossover Time		t _c	—	0.45	—	
Fall Time		t _{fi}	—	0.18	—	

(1) Pulse Test: Pulse Width = $300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$

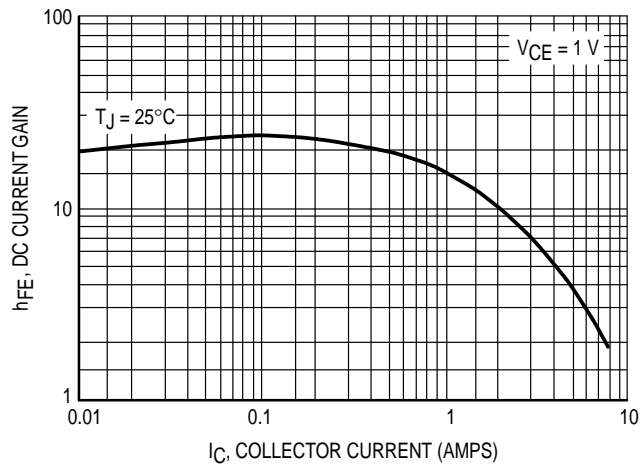


Figure 1. DC Current Gain

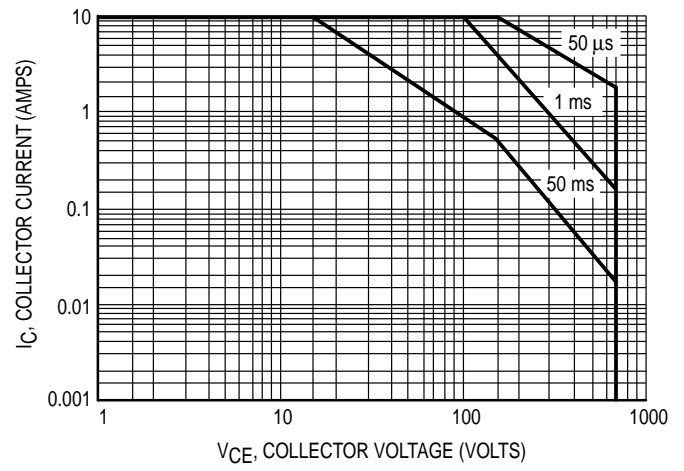
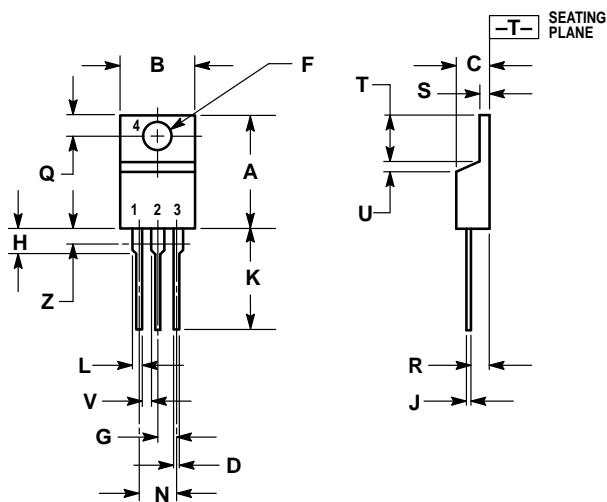


Figure 2. Forward Bias Safe Operating Area (FBSOA)

PACKAGE DIMENSIONS



NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	—	1.15	—
Z	—	0.080	—	2.04

STYLE 1:

- PIN 1: BASE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR

CASE 221A-06
 TO-220AB
 ISSUE Y

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