

*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

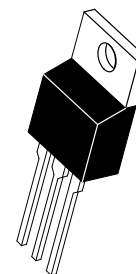
**Featuring**

- 1500 Volt Collector-Base Breakdown Capability
- Fast Switching:
  - 180 ns Typical Fall Times
  - 450 ns Typical Crossover Times
  - 1.2  $\mu$ s Typical Storage Times
- Low Collector-Emitter Leakage Current — 100  $\mu$ 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** ( $T_C = 25^\circ\text{C}$  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 @ $T_C = 25^\circ\text{C}$ @ $T_C = 100^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	80 21 0.8	Watts W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to +125	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 5 sec.	$T_L$	275	$^\circ\text{C}$

(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.

# MJE8503A

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 100 mA, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	700	—	—	Vdc
Collector Cutoff Current (V <sub>CE</sub> = 1500 Vdc, V <sub>BE</sub> = 0, T <sub>C</sub> = 25°C) (V <sub>CE</sub> = 1500 Vdc, V <sub>BE</sub> = 0, T <sub>C</sub> = 125°C)	I <sub>CES</sub>	— —	— —	0.1 2.0	mA
Collector Cutoff Current (V <sub>CE</sub> = 1500 Vdc, R <sub>BE</sub> = 50 Ohms, T <sub>C</sub> = 100°C)	I <sub>CER</sub>	—	—	5.0	mA
Emitter Cutoff Current (V <sub>EB</sub> = 6.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	—	1.0	mA

## SECOND BREAKDOWN

Second Breakdown Collector with Base Forward Biased	I <sub>S/b</sub>	See Figure 2			
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## ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 5.0 Vdc) (I <sub>C</sub> = 4.5 A, V <sub>CE</sub> = 5.0 Vdc)	h <sub>FE</sub>	7.5 2.25	— —	— —	—
Base-Emitter Saturation Voltage (I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 1.0 A) (I <sub>C</sub> = 4.5 A, I <sub>B</sub> = 2.0 A)	V <sub>BE(sat)</sub>	— —	— —	1.5 1.5	Vdc
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 1.0 A) (I <sub>C</sub> = 4.5 A, I <sub>B</sub> = 2.0 A)	V <sub>CE(sat)</sub>	— —	— —	2.0 3.0	Vdc

## DYNAMIC CHARACTERISTICS

Current-Gain — Bandwidth Product (I <sub>C</sub> = 0.1 A, V <sub>CE</sub> = 5.0 Vdc, f <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>	—	7.0	—	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f <sub>test</sub> = 0.1 MHz)	C <sub>ob</sub>	—	125	—	pF

## SWITCHING CHARACTERISTICS

Resistive Load (Table 1)						
Delay Time	(I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 1.0 A, V <sub>CC</sub> = 500 Vdc V <sub>BE(off)</sub> = 5.0 Vdc, t <sub>p</sub> = 50 μs)	t <sub>d</sub>	—	0.06	0.2	μs
Rise Time		t <sub>r</sub>	—	0.08	2.0	
Storage Time		t <sub>s</sub>	—	1.2	4.0	
Fall Time		t <sub>f</sub>	—	0.7	2.0	
Inductive Load (Table 1)						
Storage Time	(I <sub>C</sub> = 2.5 A, I <sub>B</sub> = 1.0 A, V <sub>clamp</sub> = 500 Vdc V <sub>BE(off)</sub> = 5.0 Vdc, t <sub>p</sub> = 50 μs)	t <sub>sv</sub>	—	1.2	—	μs
Crossover Time		t <sub>c</sub>	—	0.45	—	
Fall Time		t <sub>fi</sub>	—	0.18	—	

(1) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2%

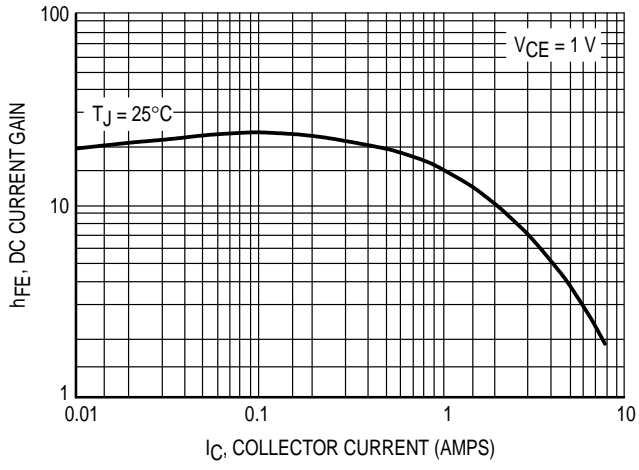


Figure 1. DC Current Gain

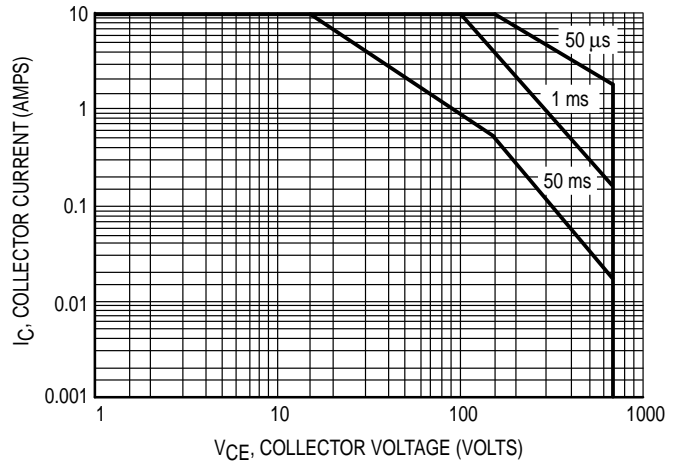
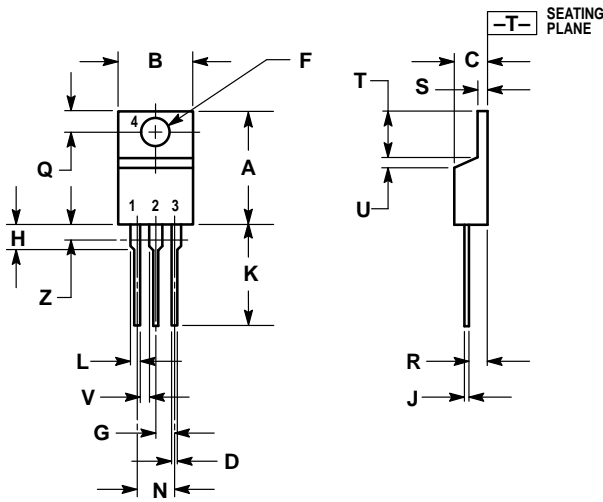


Figure 2. Forward Bias Safe Operating Area (FBSOA)

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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