

## SWITCHMODE SERIES NPN SILICON POWER TRANSISTORS

... designed for use in high-voltage, high-speed, power switching in inductive circuit, where fall time and RBSOA are critical. They are particularly well-suited for line-operated switchmode applications such as switching regulator's, inverters, Motor Controls, and Deflection circuits

### FEATURES:

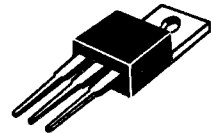
- \* Collector-Emitter Sustaining Voltage -  $V_{CEO} = 450V$
- \* Collector-Emitter Saturation Voltage -  $V_{CE(sat)} = 2.5 V$  (Max.) @  $I_C = 3.0 A$ ,  $I_B = 0.4A/0.3A$
- \* Switching Time -  $t_f = 0.4 \mu s$  (Max.) @  $I_C = 3.0 A$
- \* SOA and Switching Application Information:

**NPN**  
**MJE16002**  
**MJE16004**

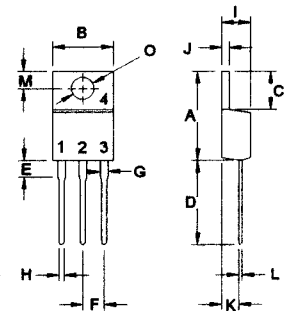
**5 AMPERE**  
**POWER**  
**TRANSISTORS**  
**450 VOLTS**  
**80 WATTS**

### MAXIMUM RATINGS

Characteristic	Symbol	MJE16002, MJE16004	Unit
Collector-Emitter Voltage	$V_{CEO}$	450	V
Collector-Emitter Voltage	$V_{CEV}$	850	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Collector Current - Continuous - Peak	$I_C$ $I_{CM}$	5 10	A
Base current	$I_B$	4	A
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	$P_D$	80 640	W mW/ $^\circ C$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +150	$^\circ C$



TO-220



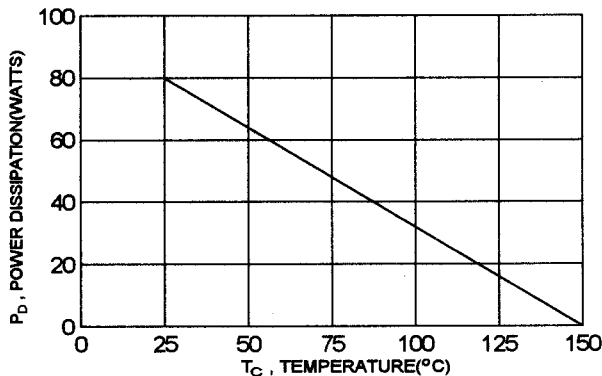
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR (CASE)

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.56	$^\circ C/W$

DIM	MILLIMETERS	
	MIN	MAX
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Sustaining Voltage ( $I_C = 100\text{ mA}$ , $I_B = 0$ )	$V_{CEO(sus)}$	450		V
Collector Cutoff Current ( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ ) ( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_c = 100^\circ\text{C}$ )	$I_C$		0.25 1.5	mA
Emitter Cutoff Current ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$		1.0	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 5.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )	MJE16002 MJE16004	hFE	5.0 7.0	
Collector-Emitter Saturation Voltage ( $I_C = 1.5\text{ A}$ , $I_B = 200\text{ mA}$ ) ( $I_C = 1.5\text{ A}$ , $I_B = 150\text{ mA}$ ) ( $I_C = 3.0\text{ A}$ , $I_B = 400\text{ mA}$ ) ( $I_C = 3.0\text{ A}$ , $I_B = 300\text{ mA}$ )	MJE16002 MJE16004 MJE16002 MJE16004	$V_{CE(sat)}$	1.0 1.0 2.5 2.5	V
Base-Emitter Saturation Voltage ( $I_C = 3.0\text{ A}$ , $I_B = 400\text{ mA}$ ) ( $I_C = 3.0\text{ A}$ , $I_B = 300\text{ mA}$ )	MJE16002 MJE16004	$V_{BE(sat)}$	1.5 1.5	V

**DYNAMIC CHARACTERISTICS**

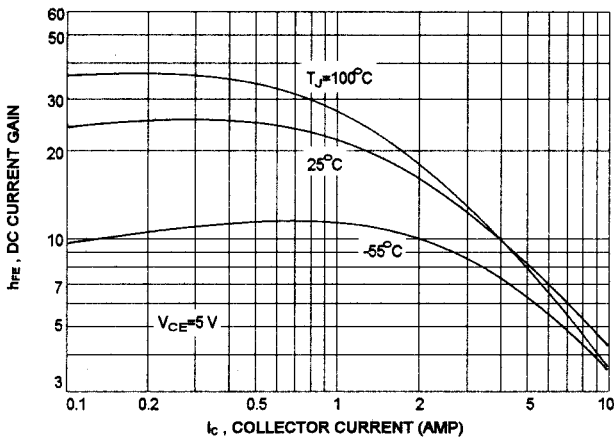
Output Capacitance ( $V_{CB} = 10\text{ V}$ , $I_E = 0$ , $f = 1.0\text{ kHz}$ )	$C_{ob}$		200	pF
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**SWITCHING CHARACTERISTICS**

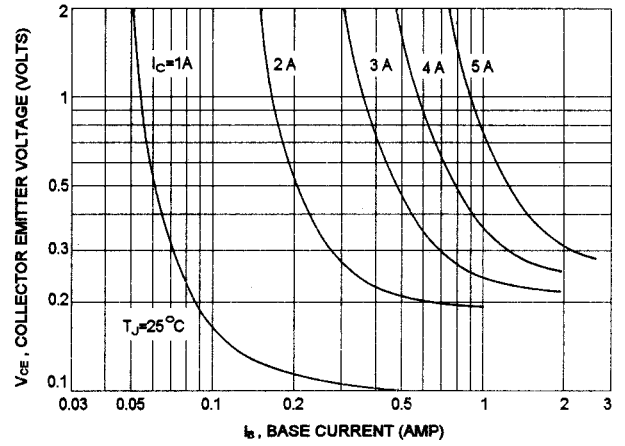
Delay Time	$V_{CC} = 250\text{ V}$ , $I_C = 3.0\text{ A}$ $2I_{B1} = -I_{B2} = 0.8\text{ A}$ $t_p = 30\text{ us}$ , Duty Cycle $\leq 2.0\%$	$t_d$		0.1	us
Rise Time		$t_r$		0.4	us
Storage Time		$t_s$		3.0	us
Fall Time		$t_f$		0.4	us

(1) Pulse Test: Pulse Width = 300 us, Duty Cycle  $\leq 2.0\%$

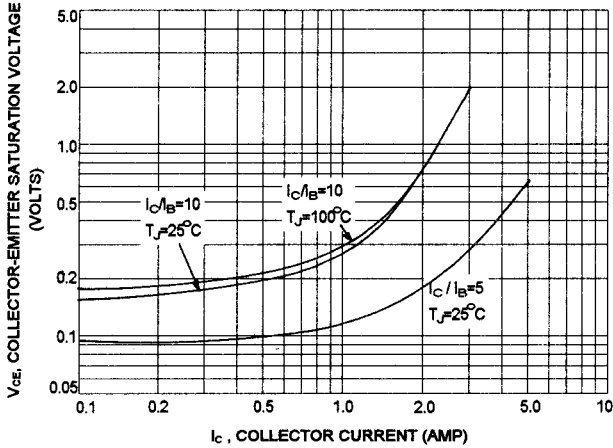
DC CURRENT GAIN



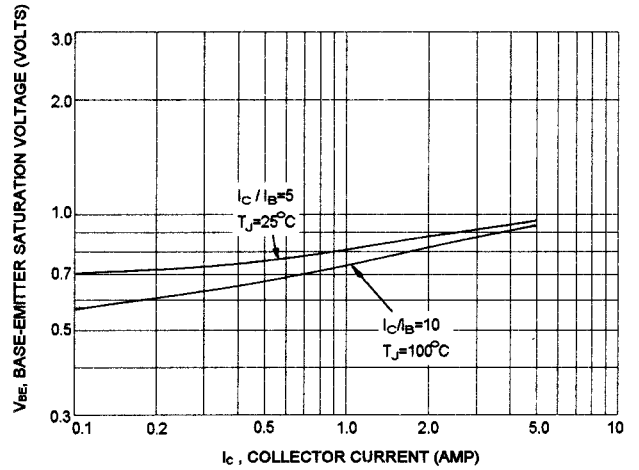
COLLECTOR SATURATION REGION



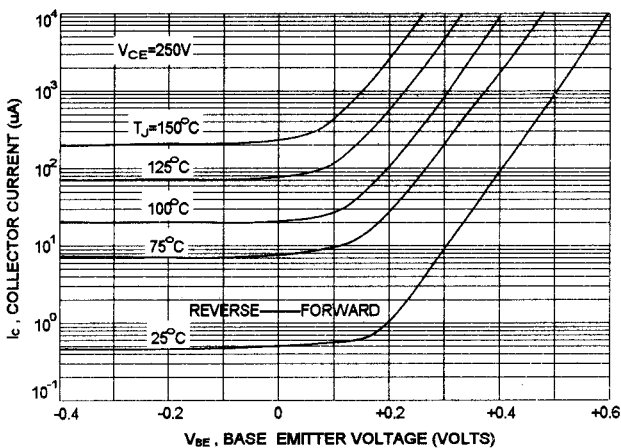
COLLECTOR-EMITTER SATURATION VOLTAGE



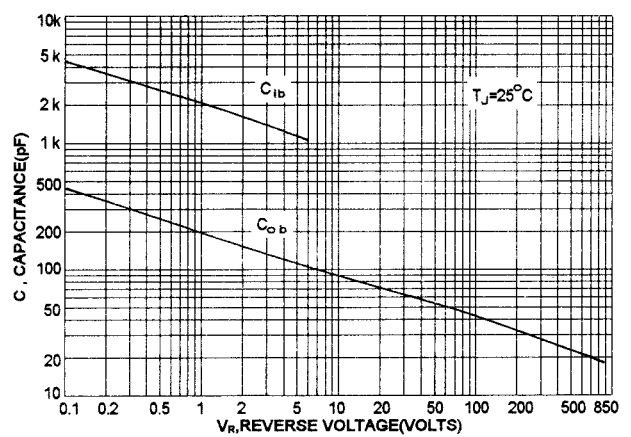
BASE-EMITTER SATURATION VOLTAGE



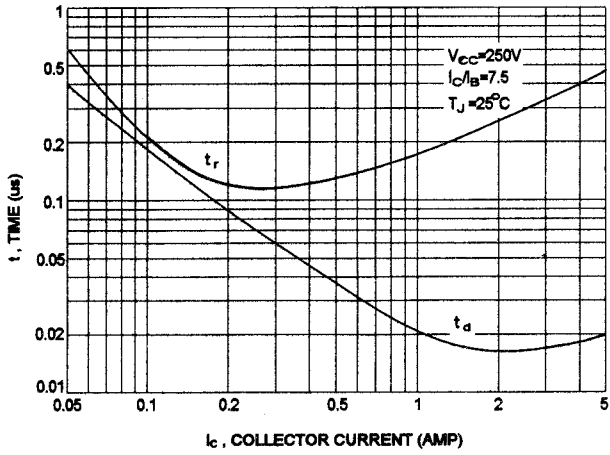
COLLECTOR CUT-OFF REGION



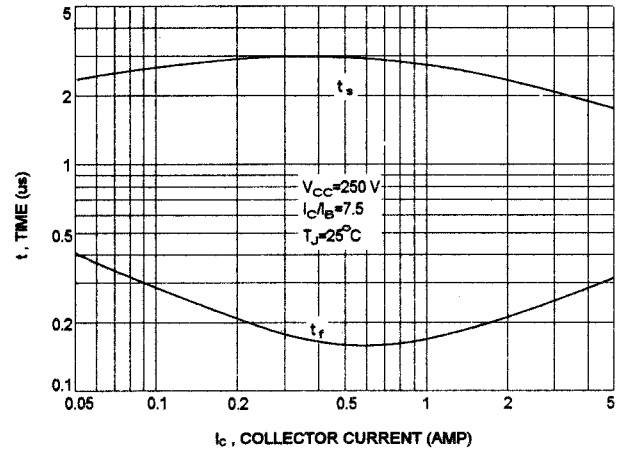
CAPACITANCE



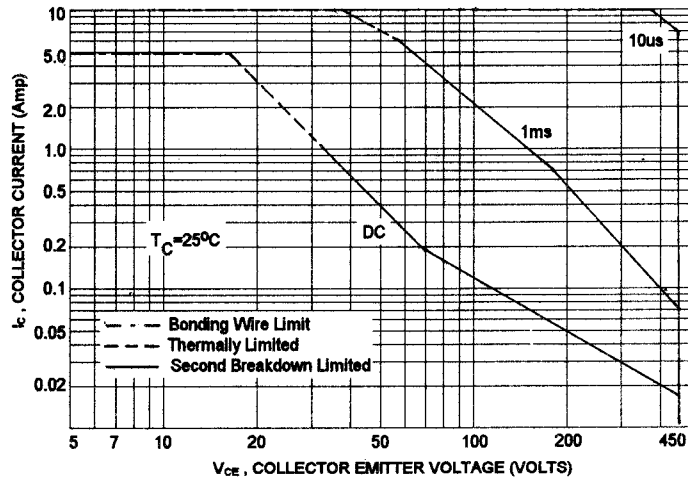
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

