

## SWTCHMODE SERIES NPN POWER TRANSISTORS

... designed for use in high-voltage, high-speed, power switching in inductive circuit, they are particularly suited for 115 and 220 V switchmode applications such as switching regulator's, inverters, DC -DC converter, Motor control, Solenoid/Relay drivers and deflection circuits.

### FEATURES:

\*Collector-Emitter Sustaining Voltage-

$$V_{CEO(sus)} = 400 \text{ V and } 300 \text{ V}$$

\* Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 1.0 \text{ V (Max.) @ } I_C = 1.0 \text{ A, } I_B = 0.25 \text{ A}$$

\* Switching Time -  $t_f = 0.7 \text{ us (Max.) @ } I_C = 1.0 \text{ A}$

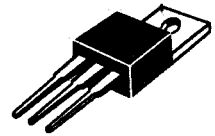
**NPN**

**MJE13002  
MJE13003**

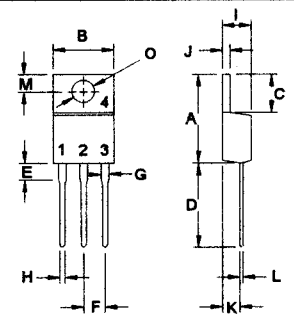
**1.5 AMPERE  
POWER  
TRANSISTORS  
300-400 VOLTS  
40 WATTS**

### MAXIMUM RATINGS

Characteristic	Symbol	MJE13002	MJE13003	Unit
Collector-Emitter Voltage	$V_{CEO}$	300	400	V
Collector-Emitter Voltage	$V_{CEV}$	600	700	V
Emitter-Base Voltage	$V_{EBO}$	9.0		V
Collector Current - Continuous - Peak	$I_C$ $I_{CM}$	1.5 3.0		A
Base current	$I_B$	0.75		A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	40 0.32		W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +150		$^\circ\text{C}$



**TO-220**

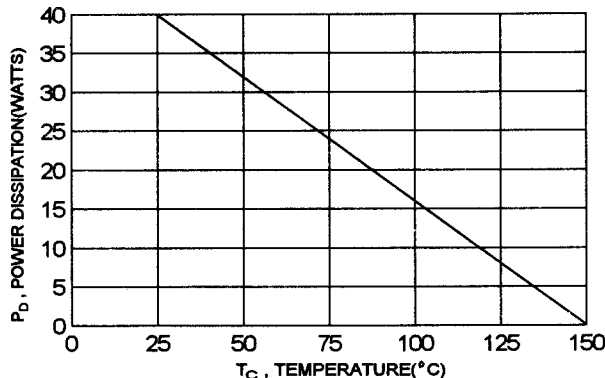


PIN 1.BASE  
2.COLLECTOR  
3.EMITTER  
4.COLLECTOR(CASE)

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	3.12	$^\circ\text{C/W}$

**FIGURE -1 POWER DERATING**



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

**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 ( $I_C = 10\text{ mA}$ , $I_B = 0$ )	MJE13002 MJE13003	$V_{CEO(sus)}$	300 400	V
Collector Cutoff Current ( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ ) ( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_C = 100^\circ\text{C}$ )		$I_{CEV}$	1.0 5.0	mA
Emitter Cutoff Current ( $V_{EB} = 9.0\text{ V}$ , $I_C = 0$ )		$I_{EBO}$	1.0	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 0.5\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )		hFE	8.0 5.0	40 25	
Collector-Emitter Saturation Voltage ( $I_C = 0.5\text{ A}$ , $I_B = 100\text{ mA}$ ) ( $I_C = 1.0\text{ A}$ , $I_B = 250\text{ mA}$ ) ( $I_C = 1.5\text{ A}$ , $I_B = 0.5\text{ A}$ )		$V_{CE(sat)}$		0.5 1.0 3.0	V
Base-Emitter Saturation Voltage ( $I_C = 0.5\text{ A}$ , $I_B = 100\text{ mA}$ ) ( $I_C = 1.0\text{ A}$ , $I_B = 250\text{ mA}$ )		$V_{BE(sat)}$		1.0 1.2	V

**DYNAMIC CHARACTERISTICS**

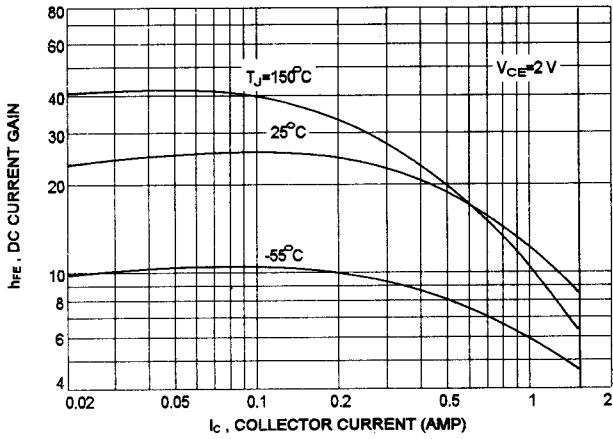
Current Gain - Bandwidth Product ( $I_C = 100\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )		$f_T$	4.0		MHz
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**SWITCHING CHARACTERISTICS**

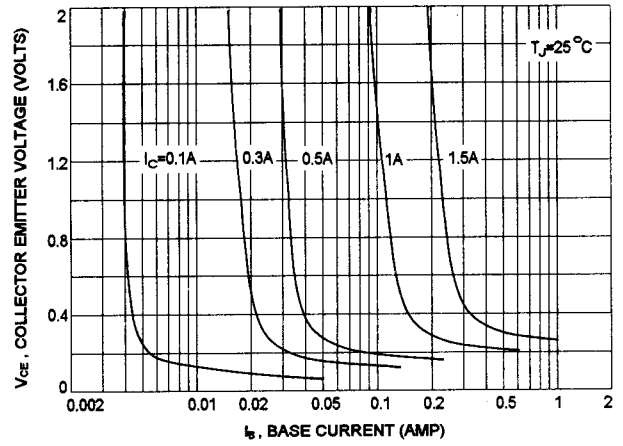
Delay Time	$V_{CC} = 125\text{ V}$ , $I_C = 1.0\text{ A}$ $I_{B1} = -I_{B2} = 0.2\text{ A}$ , $t_p = 25\text{ us}$ , Duty Cycle $\leq 1\%$	$t_d$		0.1	us
Rise Time		$t_r$		1.0	us
Storage Time		$t_s$		4.0	us
Fall Time		$t_f$		0.7	us

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

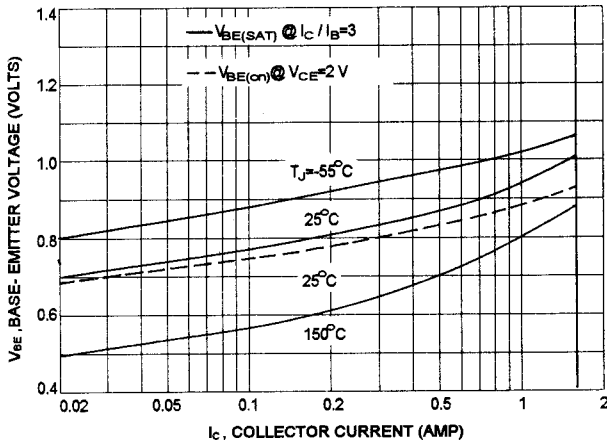
DC CURRENT GAIN



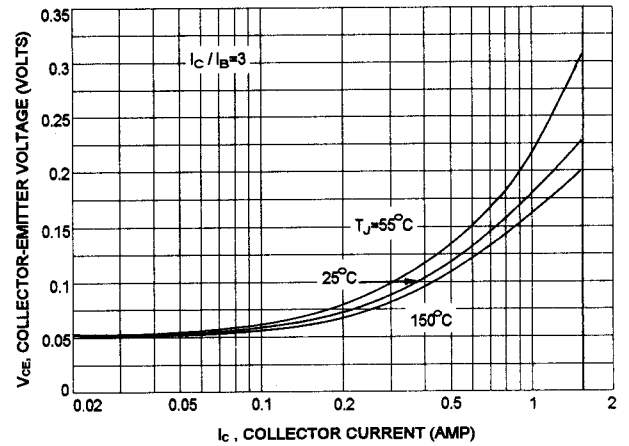
COLLECTOR SATURATION REGION



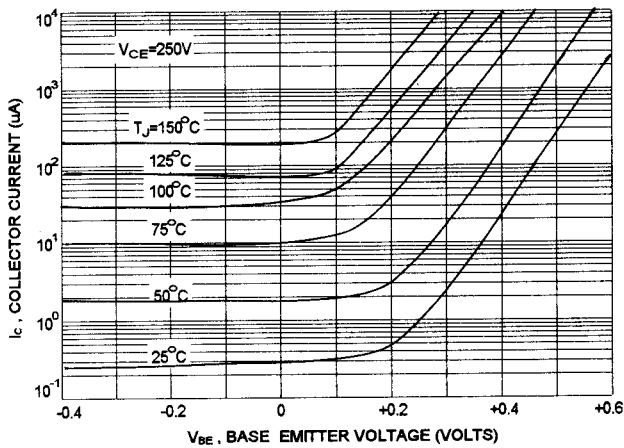
BASE-EMITTER VOLTAGE



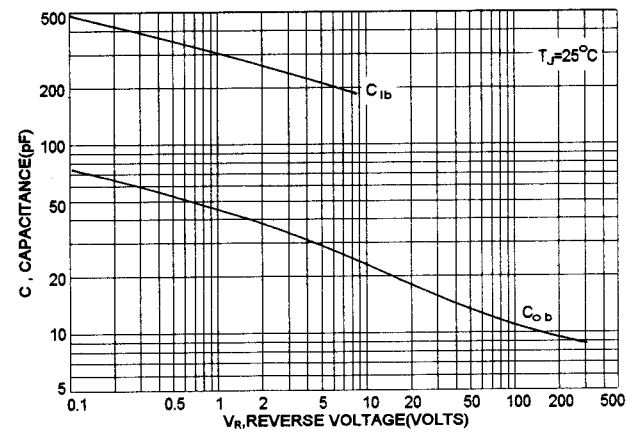
COLLECTOR-EMITTER SATURATION VOLTAGE



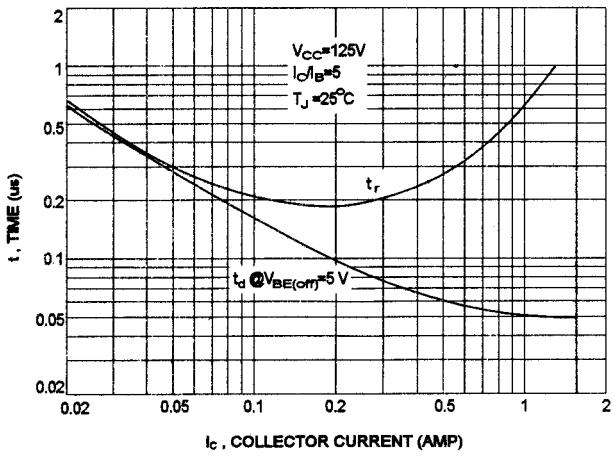
COLLECTOR CUT-OFF REGION



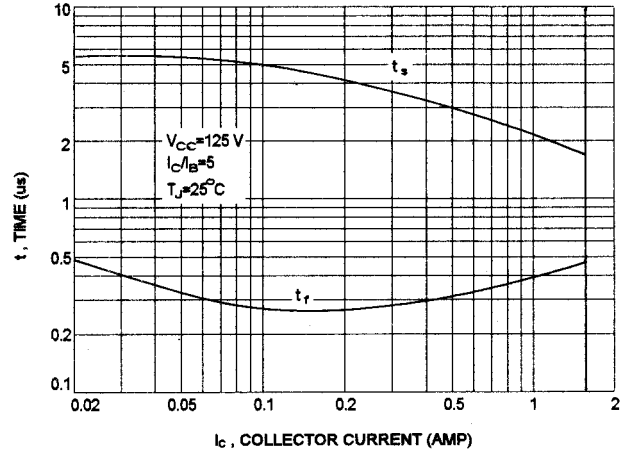
CAPACITANCE



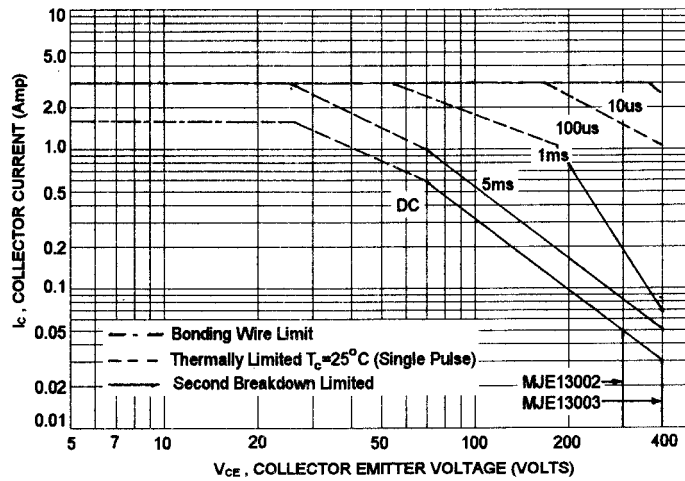
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

