

## SWITCHMODE 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 conveter, Motor controls, Solenoid / Relay drivers and Deflection circuits.

### FEATURES:

\*Collector-Emitter Sustaining Voltage-

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

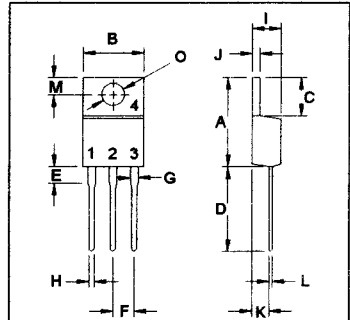
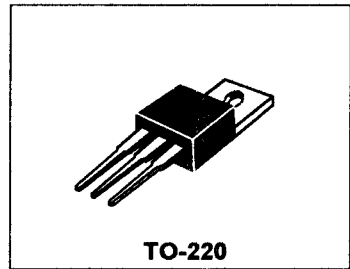
\* Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 1.0 \text{ V (Max.) @ } I_C = 4.0 \text{ A, } I_B = 1.0 \text{ A}$$

\* Switching Time -  $t_f = 0.9 \text{ us (Max.) @ } I_C = 2.0 \text{ A}$

**NPN**  
**MJE13004**  
**MJE13005**

**4 AMPERE**  
**POWER**  
**TRANSISTORS**  
**300-400 VOLTS**  
**75 WATTS**



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

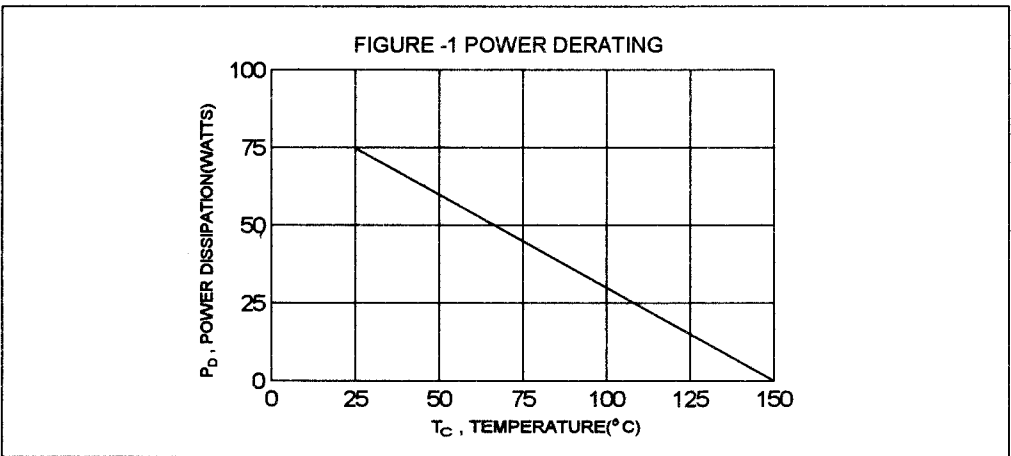
| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 14.68       | 15.31 |
| B   | 9.78        | 10.42 |
| C   | 5.01        | 6.52  |
| D   | 13.06       | 14.62 |
| E   | 3.57        | 4.07  |
| F   | 2.42        | 3.66  |
| G   | 1.12        | 1.36  |
| 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  |

### MAXIMUM RATINGS

| Characteristic                                     | Symbol         | MJE13004    | MJE13005 | 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                     | $I_C$          | 4.0         |          | A                   |
| - Peak   | $I_{CM}$       | 8.0         |          |                     |
| Base current                                       | $I_B$          | 2.0         |          | A                   |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | $P_D$          | 75          |          | W                   |
| Derate above $25^\circ\text{C}$                    |                | 0.6         |          | W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range   | $T_J, T_{STG}$ | -65 to +150 |          | $^\circ\text{C}$    |

### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max  | Unit               |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 1.67 | $^\circ\text{C/W}$ |



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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

**OFF CHARACTERISTICS**

|  |                |            |            |    |
|--|----------------|------------|------------|----|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 0$ )<br>MJE13004<br>MJE13005   | $V_{CEO(sus)}$ | 300<br>400 |            | V  |
| Collector Cutoff Current<br>( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ )<br>( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_c = 100^\circ\text{C}$ ) | $I_{CEV}$      |            | 1.0<br>5.0 | mA |
| Emitter Cutoff Current<br>( $V_{EB} = 9.0\text{ V}$ , $I_C = 0$ )  | $I_{EBO}$      |            | 1.0        | mA |

**ON CHARACTERISTICS (1)**

|   |               |           |                   |   |
|---|---------------|-----------|-------------------|---|
| DC Current Gain<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_C = 2.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )   | hFE           | 10<br>8.0 | 60<br>40          |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 1.0\text{ A}$ , $I_B = 200\text{ mA}$ )<br>( $I_C = 2.0\text{ A}$ , $I_B = 500\text{ mA}$ )<br>( $I_C = 4.0\text{ A}$ , $I_B = 1.0\text{ A}$ ) | $V_{CE(sat)}$ |           | 0.5<br>0.6<br>1.0 | V |
| Base-Emitter Saturation Voltage<br>( $I_C = 1.0\text{ A}$ , $I_B = 200\text{ mA}$ )<br>( $I_C = 2.0\text{ A}$ , $I_B = 500\text{ mA}$ )   | $V_{BE(sat)}$ |           | 1.2<br>1.6        | V |

**DYNAMIC CHARACTERISTICS**

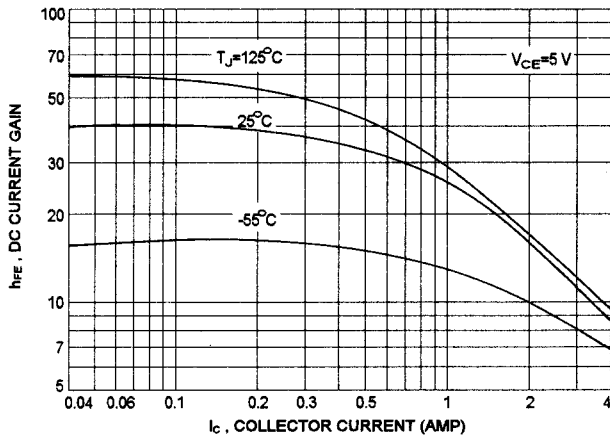
|   |       |     |  |     |
|---|-------|-----|--|-----|
| Current Gain - Bandwidth Product<br>( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $f_T$ | 4.0 |  | MHz |
|---|-------|-----|--|-----|

**SWITCHING CHARACTERISTICS**

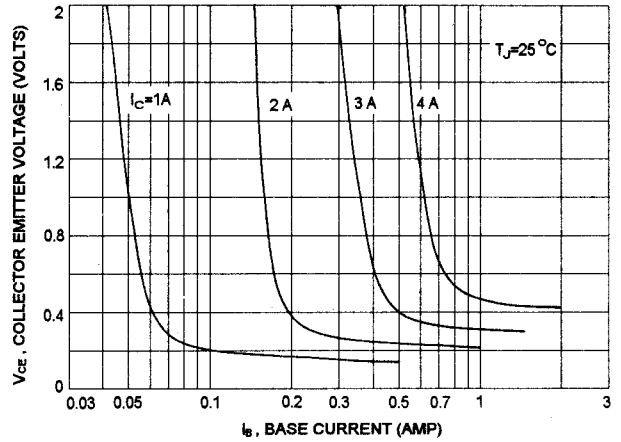
|              |   |       |     |    |
|--------------|---|-------|-----|----|
| Delay Time   | $V_{CC} = 125\text{ V}$ , $I_C = 2.0\text{ A}$<br>$I_{B1} = -I_{B2} = 0.4\text{ A}$ ,<br>$t_p = 25\text{ us}$ , Duty Cycle $\leq 1.0\%$ | $t_d$ | 0.1 | us |
| Rise Time    |   | $t_r$ | 0.7 | us |
| Storage Time |   | $t_s$ | 4.0 | us |
| Fall Time    |   | $t_f$ | 0.9 | us |

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

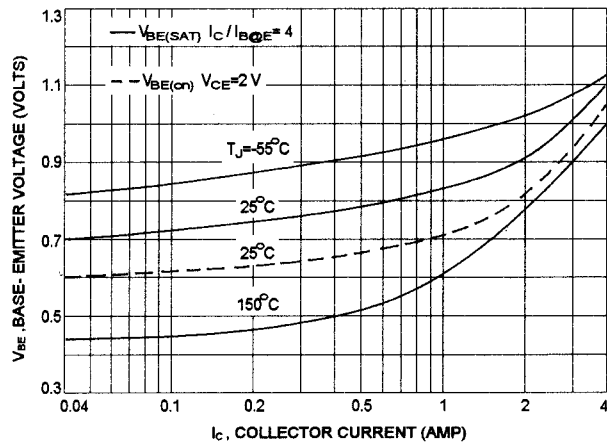
DC CURRENT GAIN



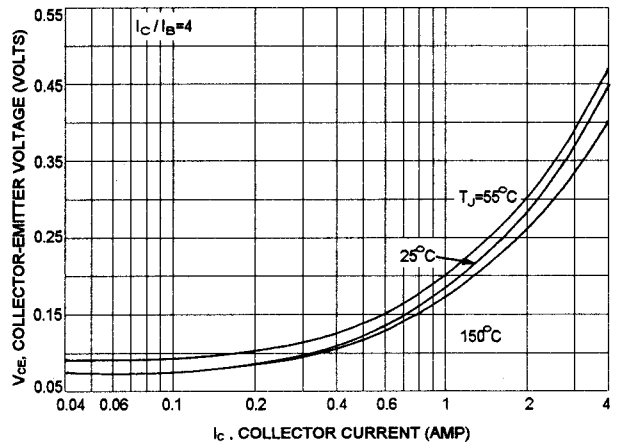
COLLECTOR SATURATION REGION



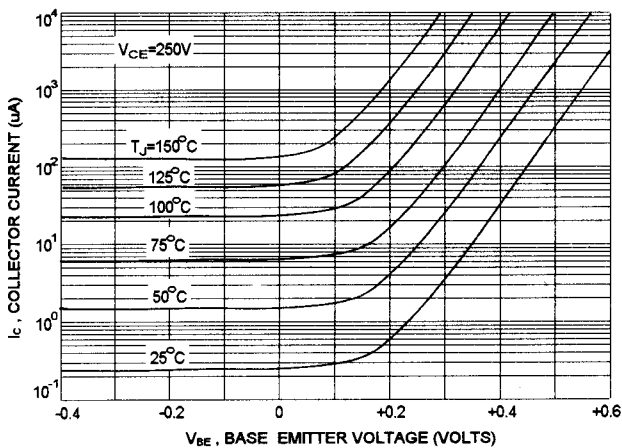
BASE-EMITTER VOLTAGE



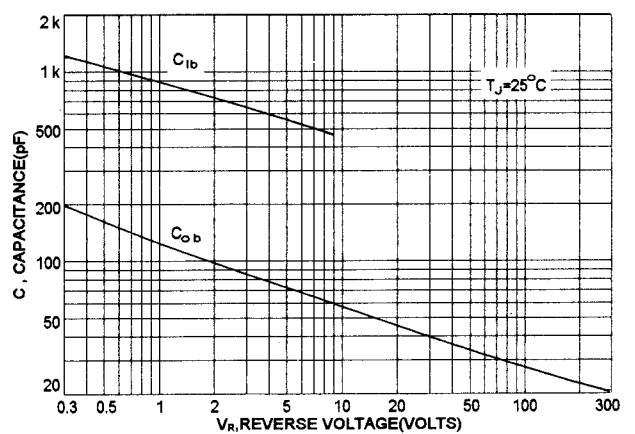
COLLECTOR-EMITTER SATURATION VOLTAGE



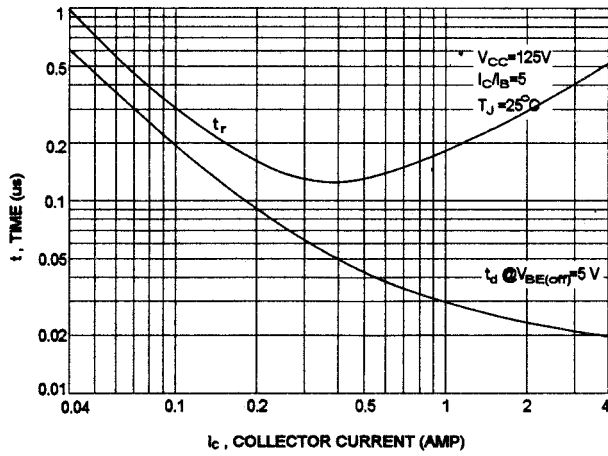
COLLECTOR CUT-OFF REGION



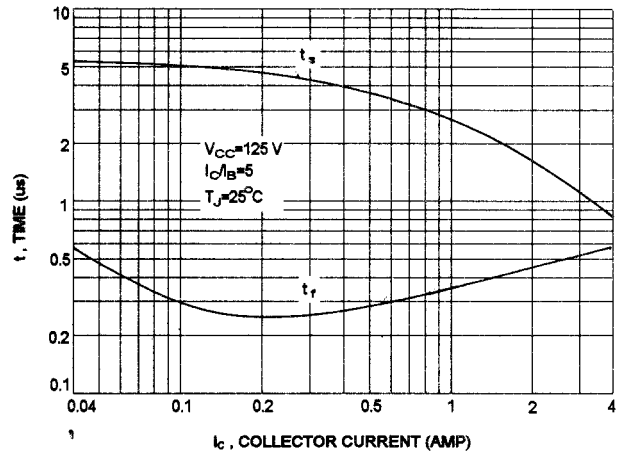
CAPACITANCE



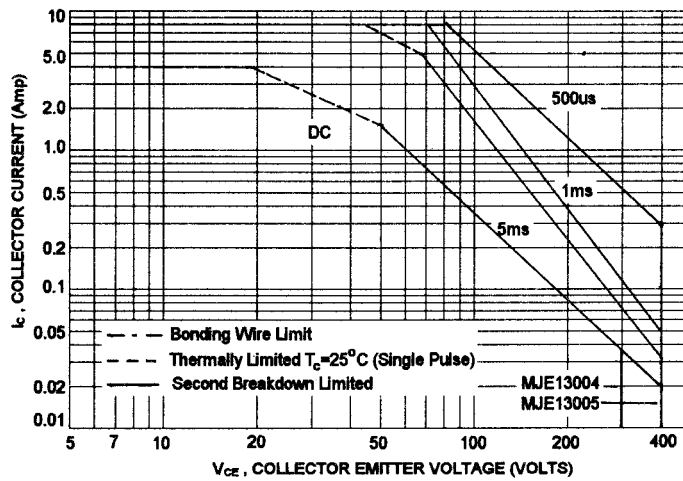
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

