

## SWITCHMODE SERIES NPN SILICON POWER TRANSISTORS

The MJE13070 and MJE13071 transistors are designed for high-voltage, high-speed, power switching in inductive circuits, where fall time is critical. They are particularly suited for line-operated switchmode applications such as switching regulator's, inverters, DC -DC conveter, Motor Controls, Solenoid drive and Deflection circuits.

### FEATURES:

\*Collector-Emitter Sustaining Voltage-

$V_{CEO(SUS)} = 400\text{ V and }450\text{ V}$

\* Collector-Emitter Saturation Voltage -

$V_{CE(sat)} = 3.0\text{ V (Max.) @ }I_C = 5.0\text{ A, }I_B = 1.0\text{ A}$

\* Switching Time -  $t_f = 0.5\text{ us (Max.) @ }I_C = 3.0\text{ A}$

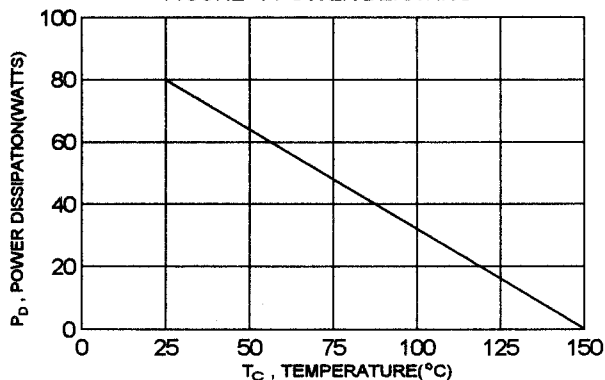
### MAXIMUM RATINGS

| Characteristic                                                      | Symbol                            | MJE13070    | MJE13071 | Unit      |
|---------------------------------------------------------------------|-----------------------------------|-------------|----------|-----------|
| Collector-Emitter Voltage                                           | V <sub>CEO</sub>                  | 400         | 450      | V         |
| Collector-Emitter Voltage                                           | V <sub>CEV</sub>                  | 650         | 750      | V         |
| Emitter-Base Voltage                                                | V <sub>EBO</sub>                  | 6           |          | V         |
| Collector Current - Continuous<br>- Peak                            | I <sub>C</sub><br>I <sub>CM</sub> | 5<br>8      |          | A         |
| Base current                                                        | I <sub>B</sub>                    | 2           |          | A         |
| Total Power Dissipation @T <sub>C</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>                    | 80<br>0.64  |          | W<br>W/°C |
| Operating and Storage Junction<br>Temperature Range                 | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 |          | °C        |

### THERMAL CHARACTERISTICS

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

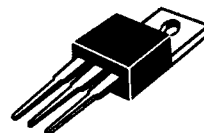
FIGURE -1 POWER DERATING



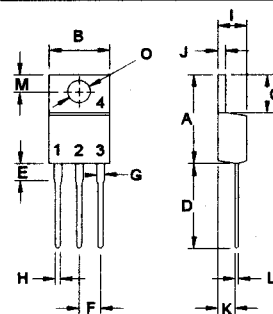
NPN

**MJE13070  
MJE13071**

**5 AMPERE  
POWER  
TRANSISTORS  
400-450 VOLTS  
80 WATTS**



TO-220



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  |

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

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

**OFF CHARACTERISTICS**

|                                                                                                                                                                                                |                |            |            |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------|------------|----|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 100\text{ mA}$ , $I_B = 0$ )<br>MJE13070<br>MJE13071                                                                                          | $V_{CEO(sus)}$ | 400<br>450 |            | V  |
| Collector Cutoff Current<br>( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ )<br>( $V_{CEV} = \text{Rated Value}$ , $V_{BE(off)} = 1.5\text{ V}$ , $T_C = 100^\circ\text{C}$ ) | $I_{CEV}$      |            | 0.5<br>2.5 | mA |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )                                                                                                                              | $I_{EBO}$      |            | 1.0        | mA |

**ON CHARACTERISTICS (1)**

|                                                                                                                                                                                                                           |               |     |                   |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|-------------------|---|
| DC Current Gain<br>( $I_C = 3.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )                                                                                                                                                     | $h_{FE}$      | 8.0 |                   |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ )<br>( $I_C = 5.0\text{ A}$ , $I_B = 1.0\text{ A}$ )<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ , $T_C = 100^\circ\text{C}$ ) | $V_{CE(sat)}$ |     | 1.0<br>3.0<br>2.0 | V |
| Base-Emitter Saturation Voltage<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ )<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.6\text{ A}$ , $T_C = 100^\circ\text{C}$ )                                                         | $V_{BE(sat)}$ |     | 1.5<br>1.5        | V |

**DYNAMIC CHARACTERISTICS**

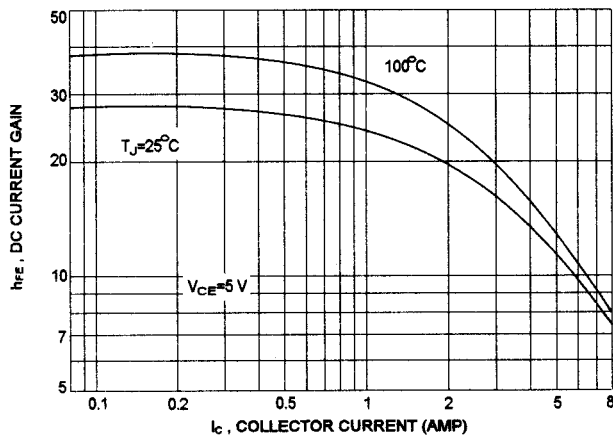
|                                                                                     |          |  |     |    |
|-------------------------------------------------------------------------------------|----------|--|-----|----|
| Output Capacitance<br>( $V_{CB} = 10\text{ V}$ , $I_E = 0$ , $f = 1.0\text{ kHz}$ ) | $C_{ob}$ |  | 250 | pF |
|-------------------------------------------------------------------------------------|----------|--|-----|----|

**SWITCHING CHARACTERISTICS**

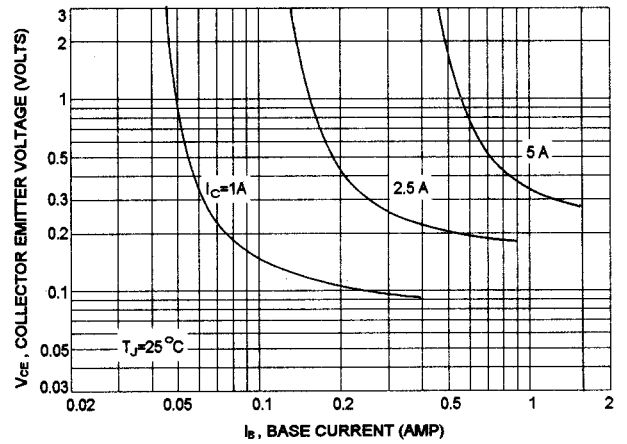
|              |                                                                                                                                                          |       |  |      |    |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--|------|----|
| Delay Time   | $V_{CC} = 250\text{ V}$ , $I_C = 3.0\text{ A}$<br>$I_{B1} = 0.4\text{ A}$ , $V_{BE(off)} = 5\text{ V}$<br>$t_p = 30\text{ us}$ , Duty Cycle $\leq 1.0\%$ | $t_d$ |  | 0.05 | us |
| Rise Time    |                                                                                                                                                          | $t_r$ |  | 0.40 | us |
| Storage Time |                                                                                                                                                          | $t_s$ |  | 1.50 | us |
| Fall Time    |                                                                                                                                                          | $t_f$ |  | 0.50 | us |

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

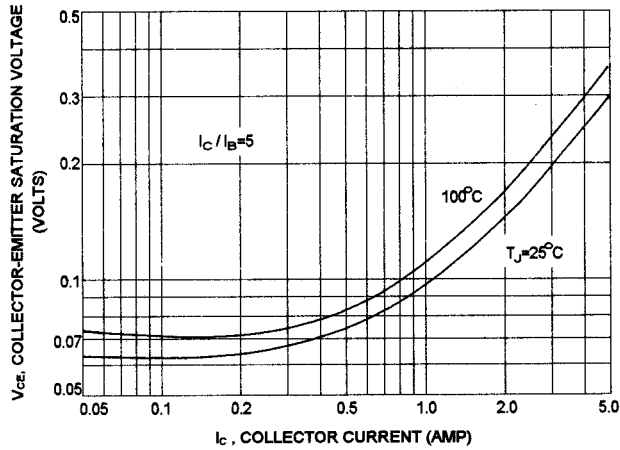
DC CURRENT GAIN



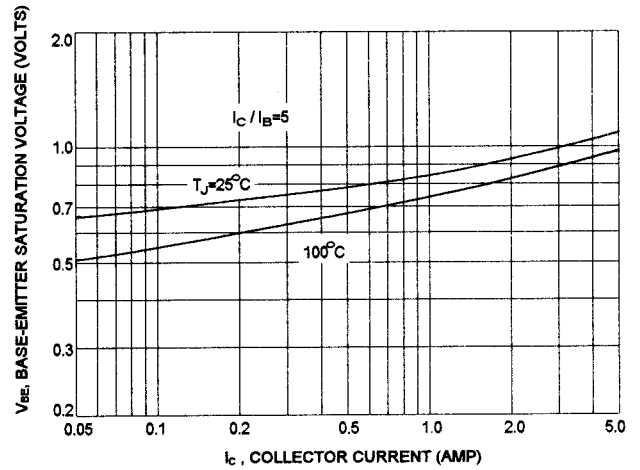
COLLECTOR SATURATION REGION



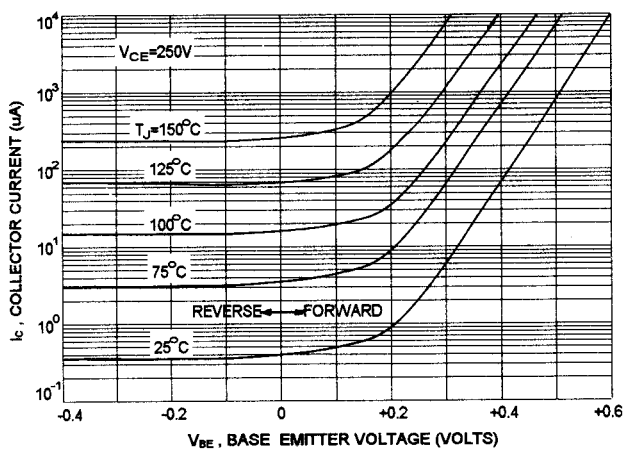
COLLECTOR-EMITTER SATURATION VOLTAGE



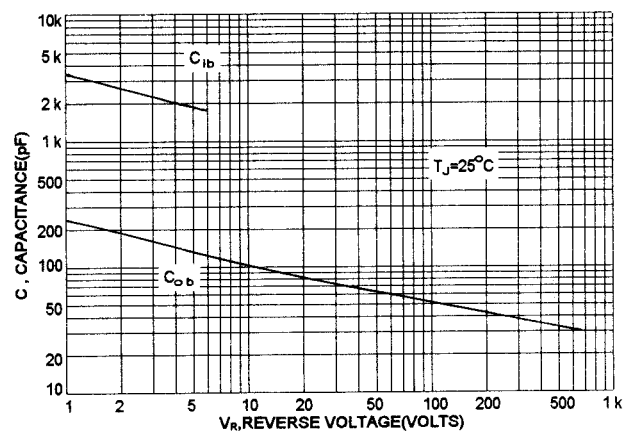
BASE-EMITTER SATURATION VOLTAGE



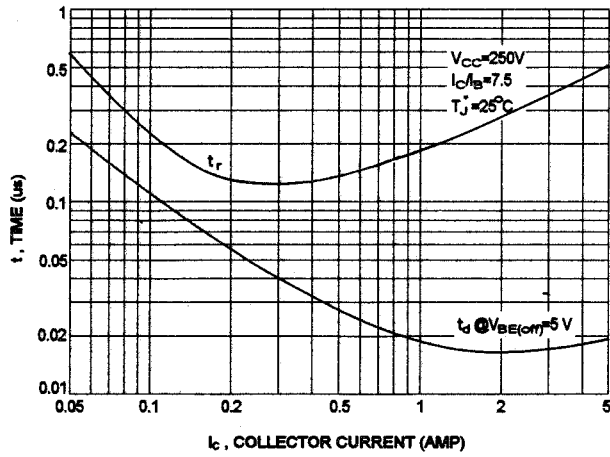
COLLECTOR CUT-OFF REGION



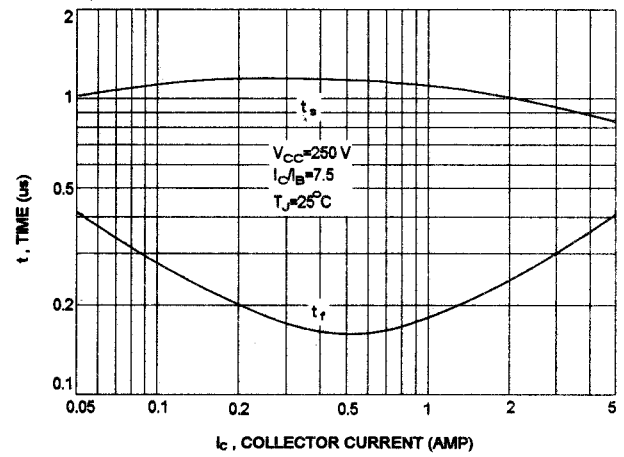
CAPACITANCE



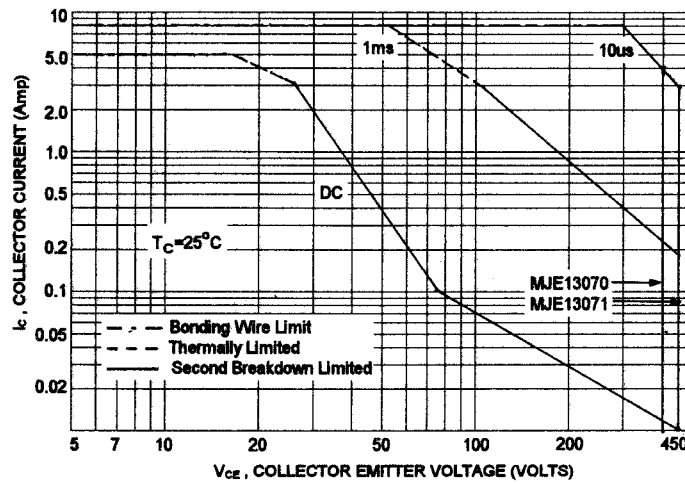
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

