

SWITCHMODE SERIES

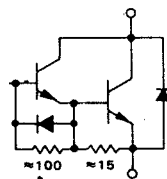
NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

The MJ10008 and MJ10009 darlington 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 switch-mode applications such as:

FEATURES:

- *Continuous Collector Current - $I_C = 20$ A
- *Switching Regulators
- *Inverters
- *Solenoid and Relay Driver
- *Motor Controls

Boca Semiconductor Corp.
<http://www.bocasemi.com>

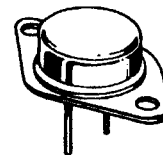


**NPN
 MJ10008
 MJ10009**

**20 AMPERE
 POWER DARLINGTON
 TRANSISTORS
 400-500 VOLTS
 175 WATTS**

MAXIMUM RATINGS

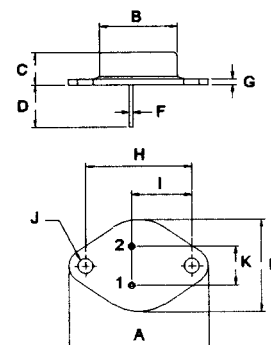
| Characteristic | Symbol | MJ10008 | MJ10009 | Unit |
|--|----------------|--------------|---------|------------|
| Collector-Emitter Voltage | V_{CEV} | 650 | 700 | V |
| Collector-Emitter Voltage | $V_{CEX(SUS)}$ | 450 | 500 | V |
| Collector-Emitter Voltage | $V_{CEO(SUS)}$ | 450 | 500 | V |
| Emitter-Base Voltage | V_{EBO} | 8.0 | | V |
| Collector Current-Continuous | I_C | 20 | | A |
| -Peak | I_{CM} | 30 | | |
| Base current | I_B | 2.5 | | A |
| Total Power Dissipation @ $T_C=25^\circ C$ | P_D | 175 | | W |
| Derate above $25^\circ C$ | | 100 | | W |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | - 65 to +200 | | $^\circ C$ |



TO-3

THERMAL CHARACTERISTICS

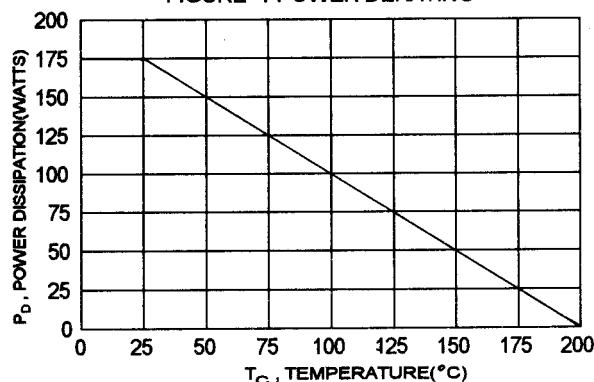
| Characteristic | Symbol | Max | Unit |
|-------------------------------------|-----------------|-----|--------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 1.0 | $^\circ C/W$ |



PIN 1.BASE
 2.EMITTER
 COLLECTOR(CASE)

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 38.75 | 39.96 |
| B | 19.28 | 22.23 |
| C | 7.96 | 9.28 |
| D | 11.18 | 12.19 |
| E | 25.20 | 26.67 |
| F | 0.92 | 1.09 |
| G | 1.38 | 1.62 |
| H | 29.90 | 30.40 |
| I | 16.64 | 17.30 |
| J | 3.88 | 4.36 |
| K | 10.67 | 11.18 |

FIGURE -1 POWER DERATING



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

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

OFF CHARACTERISTICS

| | | | | |
|---|--------------------|-----------------------|-------------|----|
| Collector - Emitter Sustaining Voltage ($I_C = 100\text{ mA}, I_B = 0, V_{\text{clamp}} = \text{Rate } V_{\text{CEO}}$) | MJ10008 MJ10009 | $V_{\text{CEO(SUS)}}$ | 450 500 | V |
| Collector Cutoff Current ($V_{\text{CE}} = \text{Rated } V_{\text{CEV}}, R_{\text{BE}} = 50\text{ ohm}, T_C = 100^\circ\text{C}$) | | I_{CER} | 5.0 | mA |
| Collector Cutoff Current ($V_{\text{CEV}} = \text{Rated Value}, V_{\text{BE(OFF)}} = 1.5\text{ V}$) ($V_{\text{CEV}} = \text{Rated Value}, V_{\text{BE(OFF)}} = 1.5\text{ V}, T_C = 100^\circ\text{C}$) | | I_{CEV} | 0.25 5.0 | mA |
| Emitter Cutoff Current ($V_{\text{EB}} = 2.0\text{ V}, I_C = 0$) | | I_{EBO} | 175 | mA |

ON CHARACTERISTICS (1)

| | | | | | |
|--|--|----------------------|----------|-------------------|---|
| DC Current Gain ($I_C = 5.0\text{ A}, V_{\text{CE}} = 5.0\text{ V}$) ($I_C = 10\text{ A}, V_{\text{CE}} = 5.0\text{ V}$) | | hFE | 40 30 | 400 300 | |
| Collector - Emitter Saturation Voltage ($I_C = 10\text{ A}, I_B = 500\text{ mA}$) ($I_C = 20\text{ A}, I_B = 2.0\text{ A}$) ($I_C = 10\text{ A}, I_B = 500\text{ mA}, T_C = 100^\circ\text{C}$) | | $V_{\text{CE(sat)}}$ | | 2.0 3.5 2.5 | V |
| Base - Emitter Saturation Voltage ($I_C = 10\text{ A}, I_B = 500\text{ mA}$) ($I_C = 10\text{ A}, I_B = 500\text{ mA}, T_C = 100^\circ\text{C}$) | | $V_{\text{BE(sat)}}$ | | 2.5 2.5 | V |
| Diode Forward Voltage ($I_F = 10\text{ A}$) | | V_F | | 5.0 | V |

DYNAMIC CHARACTERISTICS

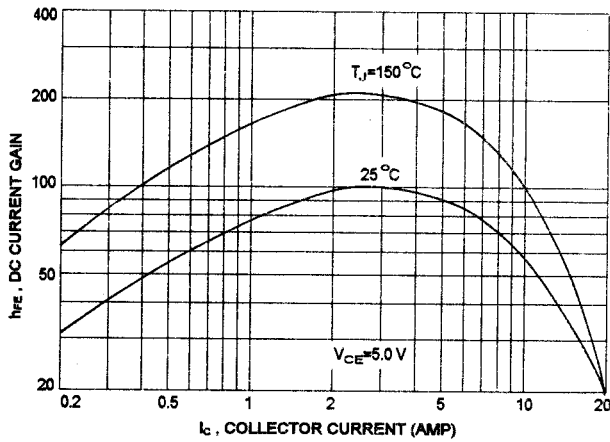
| | | | | | |
|---|--|------------|-----|--|----|
| Small-Signal Current Gain(2) ($I_C = 1.0\text{ A}, V_{\text{CE}} = 10\text{ V}, f = 1.0\text{ MHz}$) | | $ h_{fe} $ | 8.0 | | |
| Output Capacitance ($V_{\text{CB}} = 10\text{ V}, I_E = 0, f = 100\text{ kHz}$) | | C_{ob} | 100 | | pF |

SWITCHING CHARACTERISTICS

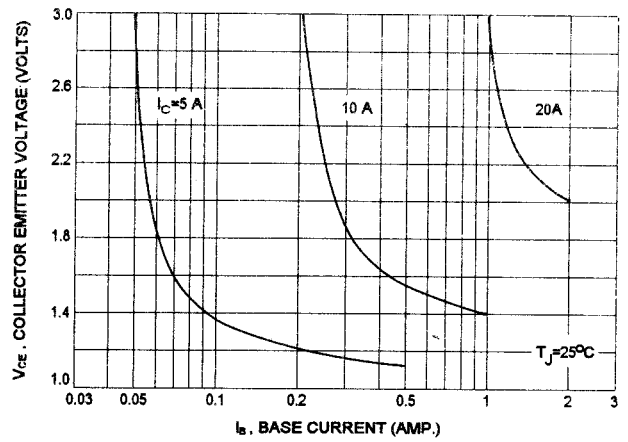
| | | | | |
|--------------|--|-------|------|----|
| Delay Time | $V_{\text{CC}} = 250\text{ V}, I_C = 10\text{ A}$ $I_{B1} = 500\text{ mA}, V_{\text{BE(off)}} = 5.0\text{ V}$ $t_p = 50\text{ us}, \text{Duty Cycle} \leq 2\%$ | t_d | 0.25 | us |
| Rise Time | | t_r | 1.5 | us |
| Storage Time | | t_s | 2.0 | us |
| Fall Time | | t_f | 0.6 | us |

(1) Pulse Test: Pulse width = 300 us , Duty Cycle $\leq 2.0\%$ (2) $f_T = |h_{fe}| \cdot f_{\text{test}}$

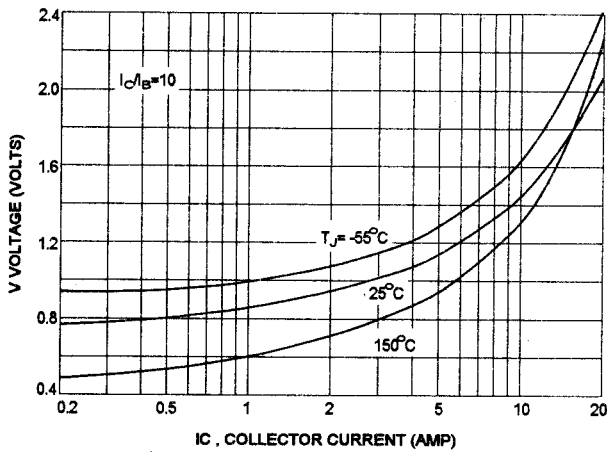
DC CURRENT GAIN



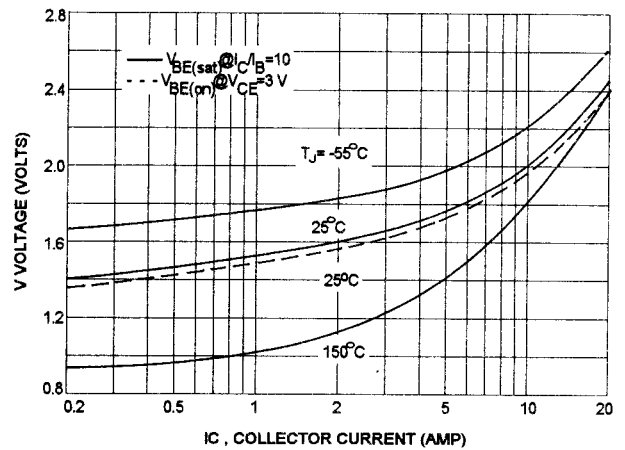
COLLECTOR SATURATION REGION



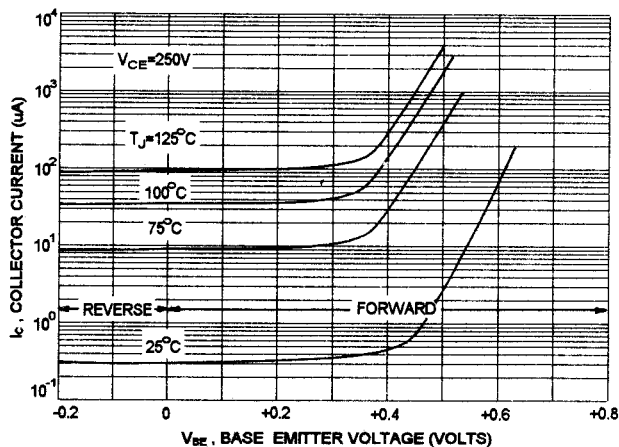
COLLECTOR-EMITTER SATURATION VOLTAGE



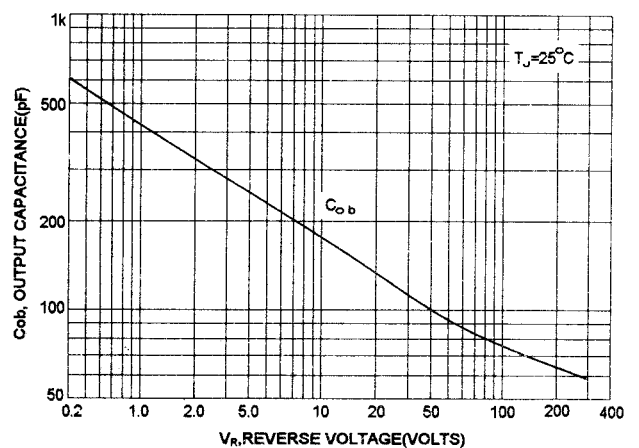
BASE-EMITTER VOLTAGE



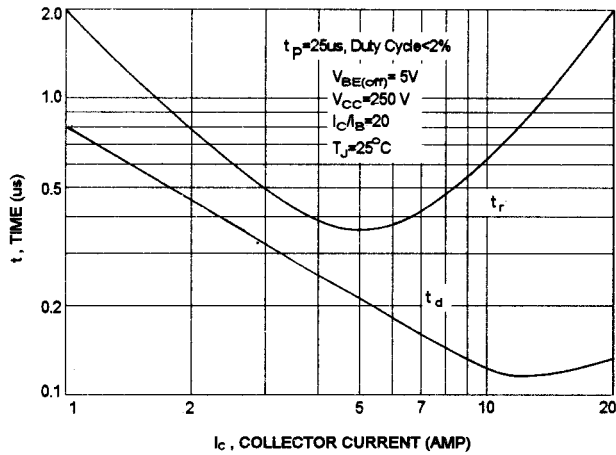
COLLECTOR CUT-OFF REGION



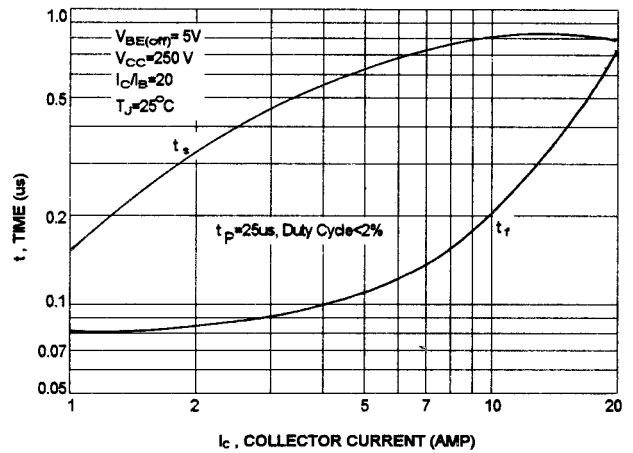
OUTPUT CAPACITANCES



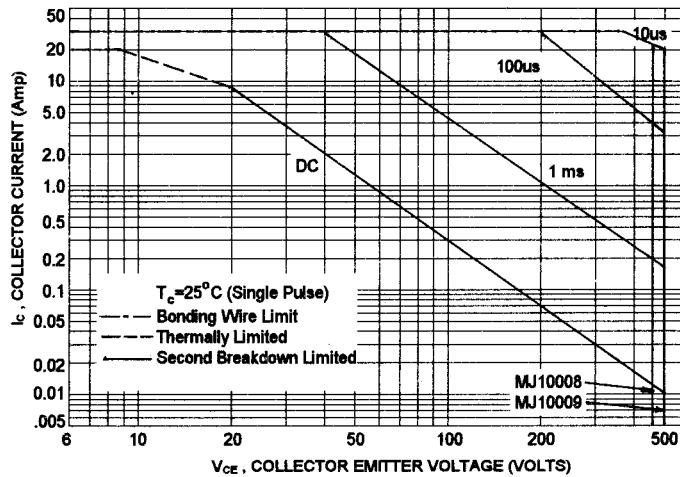
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

