



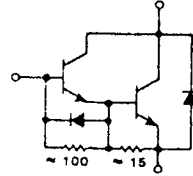
SWITCHMODE SERIES

NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

The MJ10022 and MJ10023 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 switchmode applications such as:

FEATURES:

- *Continuous Collector Current - $I_C = 40$ A
- *Switching Regulators
- *Inverters
- *Solenoid and Relay Drivers
- *AC and DC Motor Controls

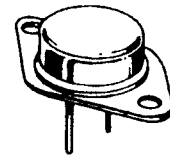


NPN
MJ10022
MJ10023

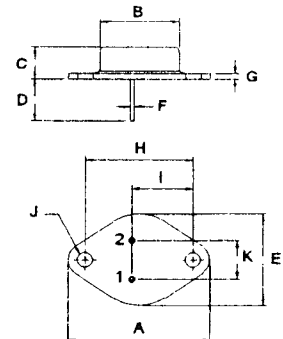
40 AMPERE
POWER DARLINGTON
TRANSISTORS
350-400 VOLTS
250 WATTS

MAXIMUM RATINGS

| Characteristic | Symbol | MJ10022 | MJ10023 | Unit |
|--|----------------|--------------|---------|---------------|
| Collector-Emitter Voltage | V_{CEV} | 450 | 600 | V |
| Collector-Emitter Voltage | $V_{CEO(SUS)}$ | 350 | 400 | V |
| Emitter-Base Voltage | V_{EBO} | 8.0 | | V |
| Collector Current-Continuous | I_C | 40 | | A |
| -Peak | I_{CM} | 80 | | A |
| Base current | I_B | 20 | | A |
| Total Power Dissipation @ $T_C = 25^\circ C$ | P_D | 250 | | W |
| Derate above $25^\circ C$ | | 143 | | W |
| | | 1.43 | | W/ $^\circ C$ |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | - 65 to +200 | | $^\circ C$ |



TO-3

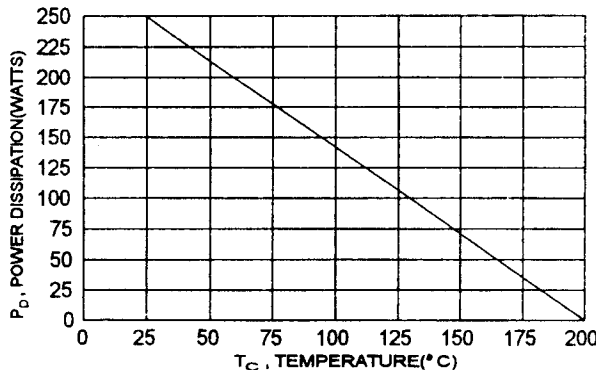


PIN 1.BASE
2.EMITTER
COLLECTOR(CASE)

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|-------------------------------------|-----------------|-----|--------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 0.7 | $^\circ C/W$ |

FIGURE -1 POWER DERATING



| 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 |

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

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

OFF CHARACTERISTICS

| | | | | |
|---|--------------------|----------------|-------------|----|
| Collector - Emitter Sustaining Voltage ($I_C = 100\text{ mA}, I_B = 0$) | MJ10022 MJ10023 | $V_{CEO(sus)}$ | 350 400 | V |
| Collector Cutoff Current ($V_{CEV} = \text{Rated Value}, V_{BE(off)} = 1.5\text{ V}$) ($V_{CEV} = \text{Rated Value}, V_{BE(off)} = 1.5\text{ V}, T_C = 150^\circ\text{C}$) | | I_{CEV} | 0.25 5.0 | mA |
| Collector Cutoff Current ($V_{CEV} = \text{Rated}, V_{CEV}, R_{BE} = 50\ \Omega, T_C = 100^\circ\text{C}$) | | I_{CER} | 5.0 | mA |
| Emitter Cutoff Current ($V_{EB} = 2.0\text{ V}, I_C = 0$) | | I_{EBO} | 175 | mA |

ON CHARACTERISTICS (1)

| | | | | | |
|--|--|---------------|----|-------------------|---|
| DC Current Gain ($I_C = 10\text{ A}, V_{CE} = 5.0\text{ V}$) | | hFE | 60 | 600 | |
| Collector - Emitter Saturation Voltage ($I_C = 20\text{ A}, I_B = 1.0\text{ A}$) ($I_C = 40\text{ A}, I_B = 5.0\text{ A}$) ($I_C = 20\text{ A}, I_B = 1.0\text{ A}, T_C = 100^\circ\text{C}$) | | $V_{CE(sat)}$ | | 2.2 5.0 2.5 | V |
| Base - Emitter Saturation Voltage ($I_C = 20\text{ A}, I_B = 1.2\text{ A}$) ($I_C = 20\text{ A}, I_B = 1.2\text{ A}, T_C = 100^\circ\text{C}$) | | $V_{BE(sat)}$ | | 2.5 2.5 | V |
| Diode Forward Voltage ($I_F = 20\text{ A}$) | | V_F | | 5.0 | V |

DYNAMIC CHARACTERISTICS

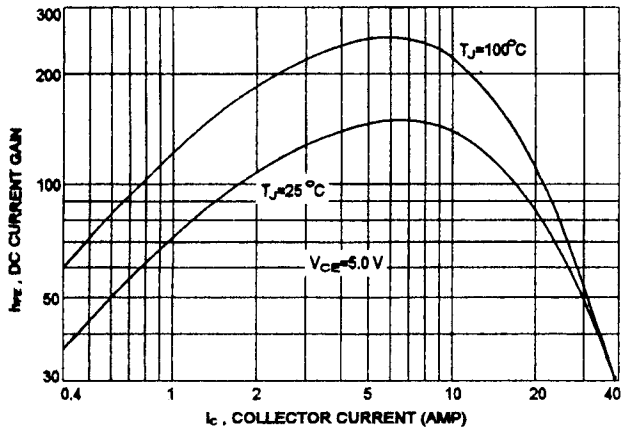
| | | | | | |
|---|--|----------|-----|-----|----|
| Output Capacitance ($V_{CB} = 10\text{ V}, I_E = 0, f = 1.0\text{ kHz}$) | | C_{ob} | 150 | 600 | pF |
|---|--|----------|-----|-----|----|

SWITCHING CHARACTERISTICS

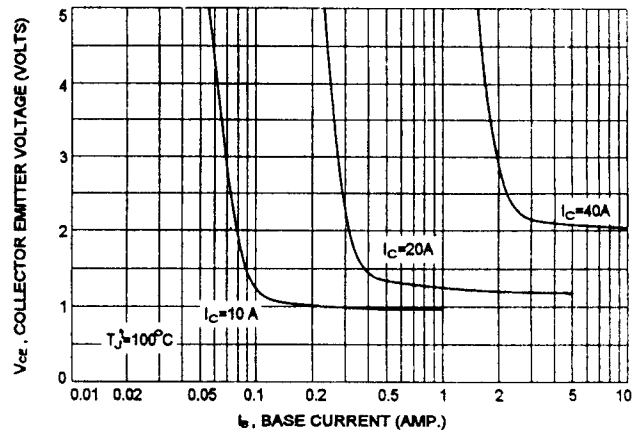
| | | | | |
|--------------|--|-------|-----|----|
| Delay Time | $V_{CC} = 250\text{ V}, I_C = 20\text{ A}$ $I_{B1} = 1.0\text{ A}, V_{BE(off)} = 5.0\text{ V}$ $t_p = 50\mu\text{s}, \text{Duty Cycle} \leq 2\%$ | t_d | 0.2 | us |
| Rise Time | | t_r | 1.5 | us |
| Storage Time | | t_s | 2.5 | us |
| Fall Time | | t_f | 1.1 | us |

(1) Pulse Test: Pulse width = $300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

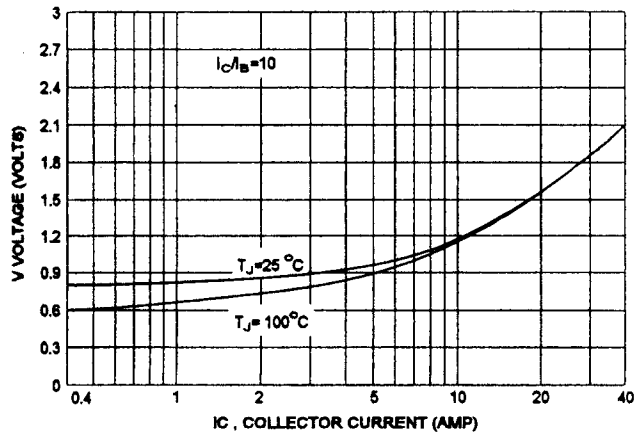
DC CURRENT GAIN



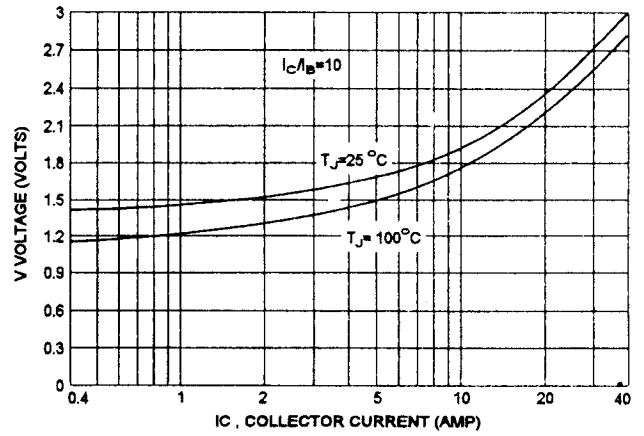
COLLECTOR SATURATION REGION



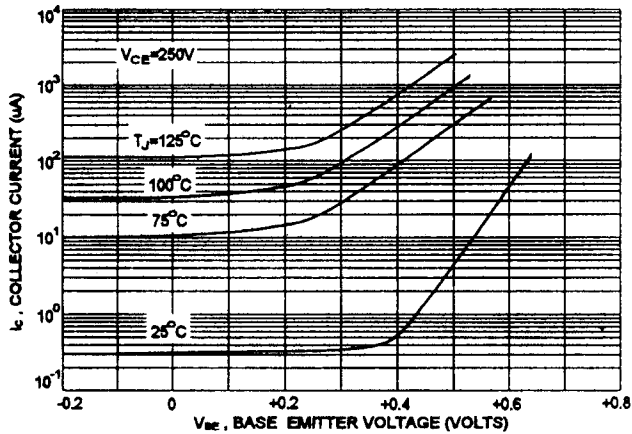
COLLECTOR-EMITTER SATURATION VOLTAGE



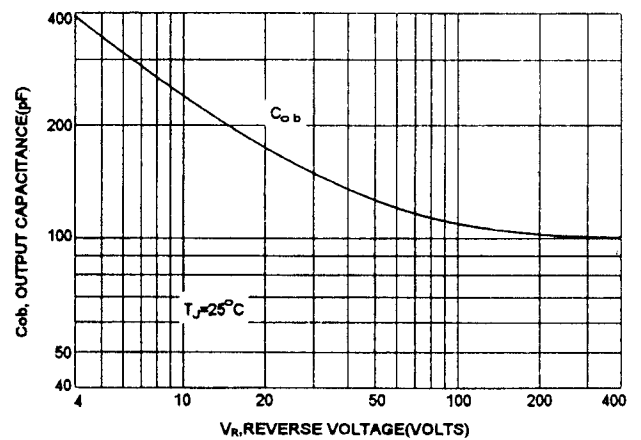
BASE-EMITTER SATURATION VOLTAGE



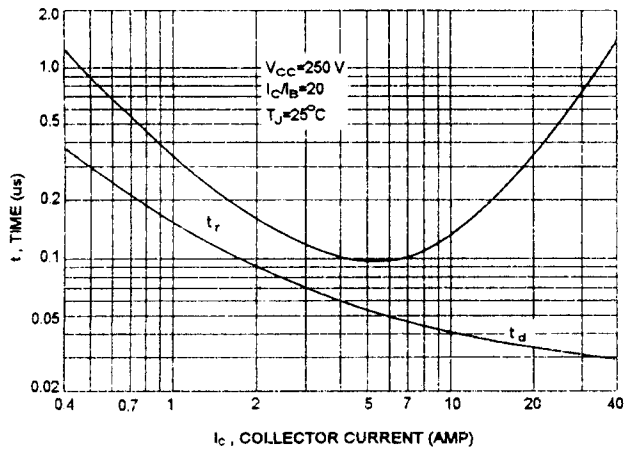
COLLECTOR CUT-OFF REGION



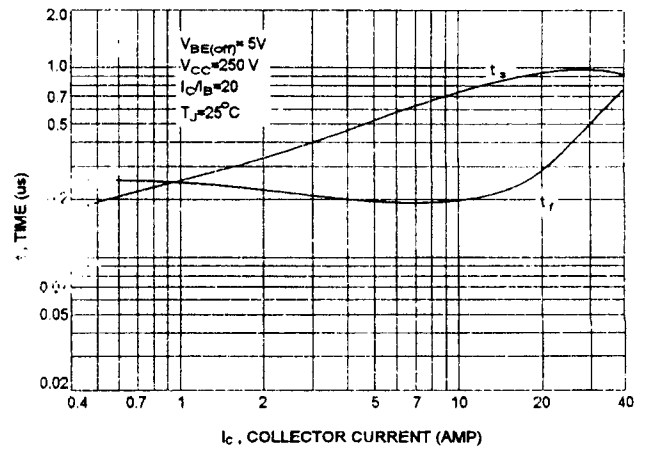
OUTPUT CAPACITANCES



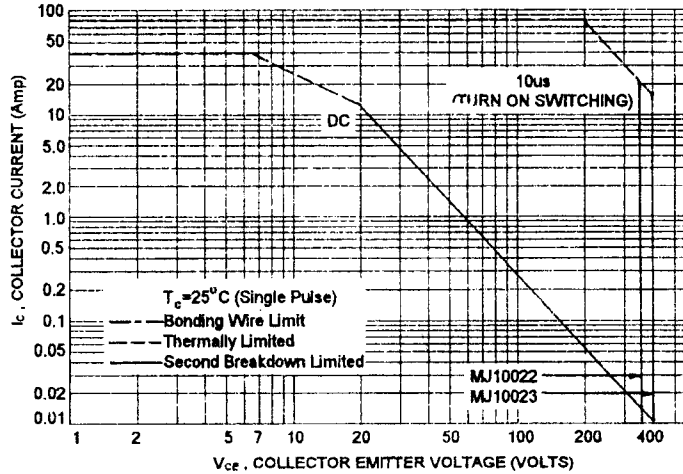
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

