

SWITCHMODE SERIES

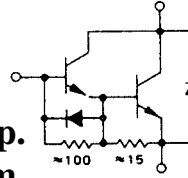
NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

The MJ10004 and MJ10005 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 - $I_C = 20\text{ A}$
- *Switching Regulators
- *Inverters
- *Solenoid and Relay Drivers
- *Motor Controls

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

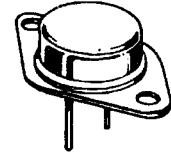


**NPN
 MJ10004
 MJ10005**

**20 AMPERE
 POWER DARLINGTON
 TRANSISTORS
 350-400 VOLTS
 175 WATTS**

MAXIMUM RATINGS

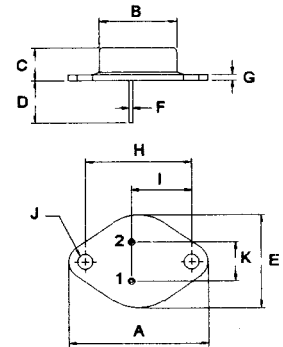
Characteristic	Symbol	MJ10004	MJ10005	Unit
Collector-Emitter Voltage	V_{CEV}	450	500	V
Collector-Emitter Voltage	$V_{CEX(SUS)}$	400	450	V
Collector-Emitter Voltage	$V_{CEO(SUS)}$	350	400	V
Emitter-Base Voltage	V_{EBO}	8.0		V
Collector Current-Continuous	I_C	20		A
-Peak	I_{CM}	30		A
Base current	I_B	2.5		A
Total Power Dissipation @ $T_C=25^\circ\text{C}$	P_D	175		W
Derate above 25°C		100		W
		1.0		W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	- 65 to +200		$^\circ\text{C}$



TO-3

THERMAL CHARACTERISTICS

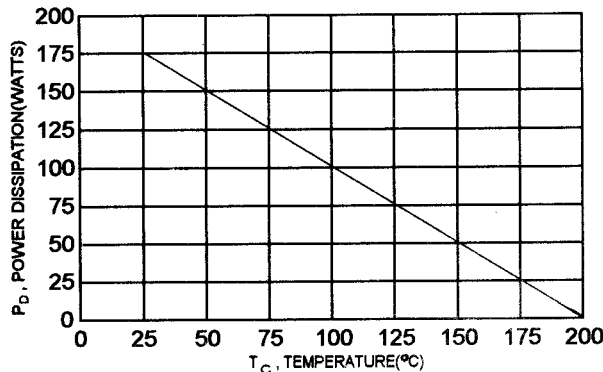
Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.0	$^\circ\text{C/W}$



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
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OFF CHARACTERISTICS

Collector - Emitter Sustaining Voltage ($I_C = 250 \text{ mA}, I_B = 0, V_{\text{clamp}} = \text{Rate } V_{\text{CEO}}$)	MJ10004 MJ10005	$V_{\text{CEO(sus)}}$	350 400	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	50 40	600 400
Collector - Emitter Saturation Voltage ($I_C = 10 \text{ A}, I_B = 400 \text{ mA}$) ($I_C = 20 \text{ A}, I_B = 2.0 \text{ A}$) ($I_C = 10 \text{ A}, I_B = 400 \text{ mA}, T_C = 100^\circ\text{C}$)		$V_{\text{CE(sat)}}$		1.9 3.0 2.0
Base - Emitter Saturation Voltage ($I_C = 10 \text{ A}, I_B = 400 \text{ mA}$) ($I_C = 10 \text{ A}, I_B = 400 \text{ mA}, T_C = 100^\circ\text{C}$)		$V_{\text{BE(sat)}}$		2.5 2.5
Diode Forward Voltage ($I_F = 10 \text{ A}$)		V_F		5.0

DYNAMIC CHARACTERISTICS

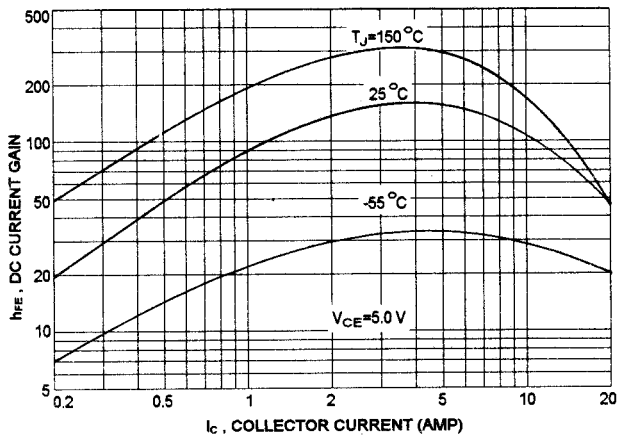
Small-Signal Current Gain(2) ($I_C = 1.0 \text{ A}, V_{\text{CE}} = 10 \text{ V}, f = 1.0 \text{ MHz}$)		$ h_{fe} $	10	
Output Capacitance ($V_{\text{CB}} = 10 \text{ V}, I_E = 0, f = 100 \text{ kHz}$)		C_{ob}	100	pF

SWITCHING CHARACTERISTICS

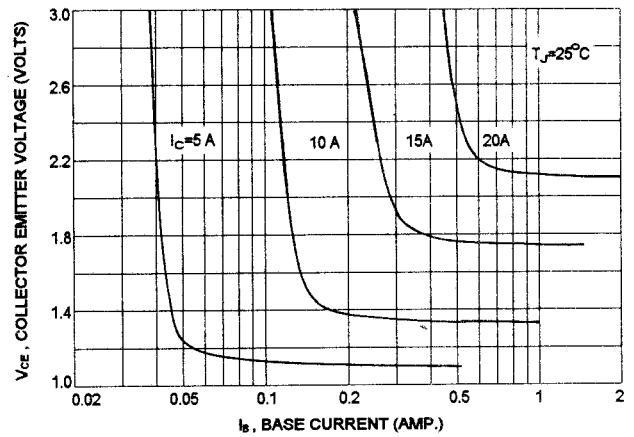
Delay Time	$V_{\text{CC}} = 250 \text{ V}, I_C = 10 \text{ A}$ $I_{\text{B1}} = 400 \text{ mA}, V_{\text{BE(off)}} = 5.0 \text{ V}$ $t_p = 50 \text{ us}, \text{Duty Cycle} \leq 2\%$	t_d	0.2	us
Rise Time		t_r	0.6	us
Storage Time		t_s	1.5	us
Fall Time		t_f	0.5	us

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

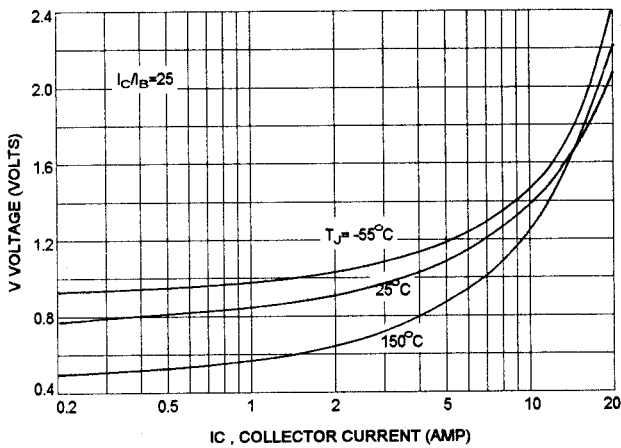
DC CURRENT GAIN



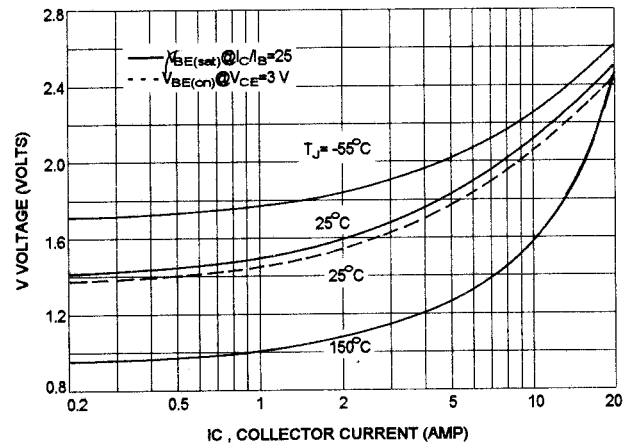
COLLECTOR SATURATION REGION



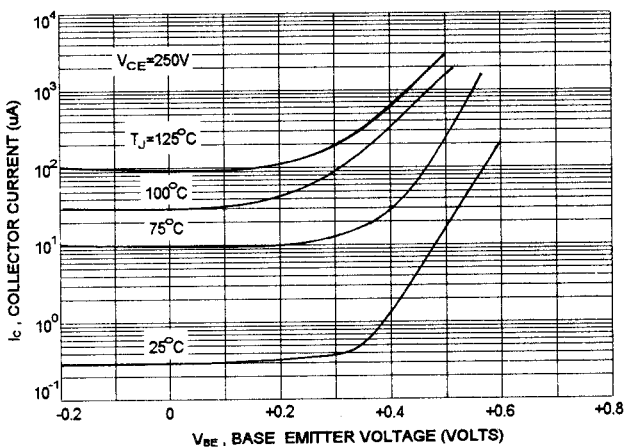
COLLECTOR EMITTER SATURATION VOLTAGE



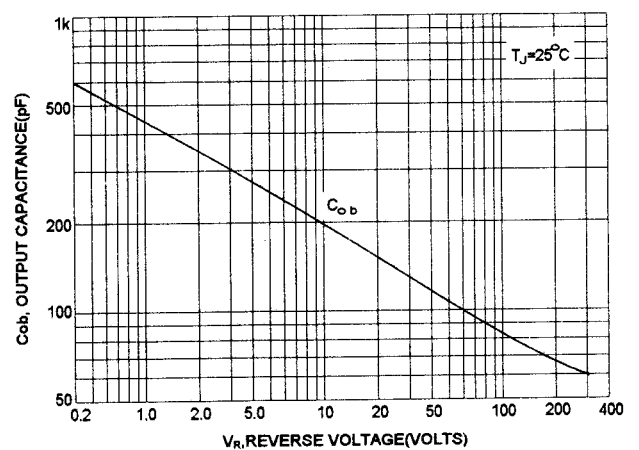
BASE EMITTER VOLTAGE



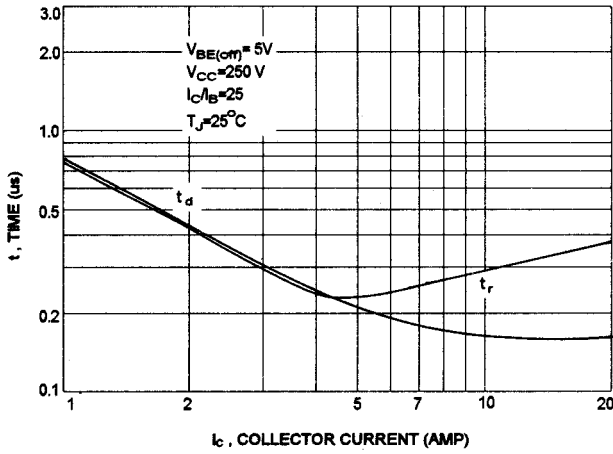
COLLECTOR CUT-OFF REGION



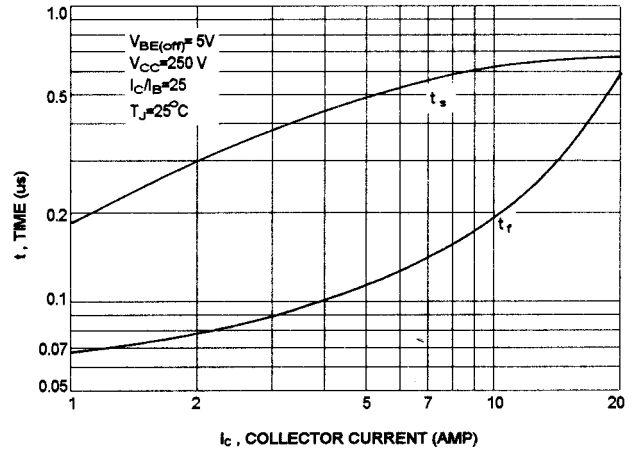
OUTPUT CAPACITANCES



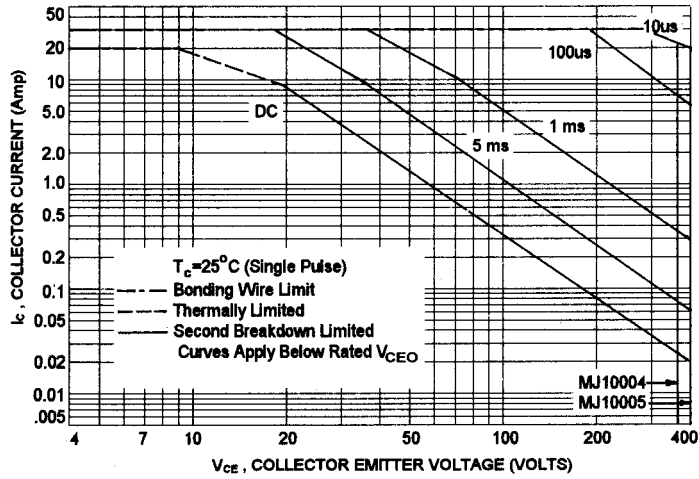
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

