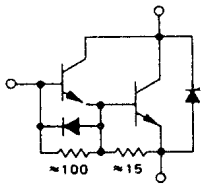
SWITCHMODE SERIES
NPN SILICON POWER DARLINGTON TRANSISTORS WITH BASE-EMITTER SPEEDUP DIODE

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 oper -ated switch-mode applications such as:

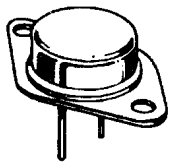
FEATURES:

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



NPN
MJ10004
MJ10005

20 AMPERE
POWER DARLINGTON
TRANSISTORS
350-400 VOLTS
175 WATTS



TO-3

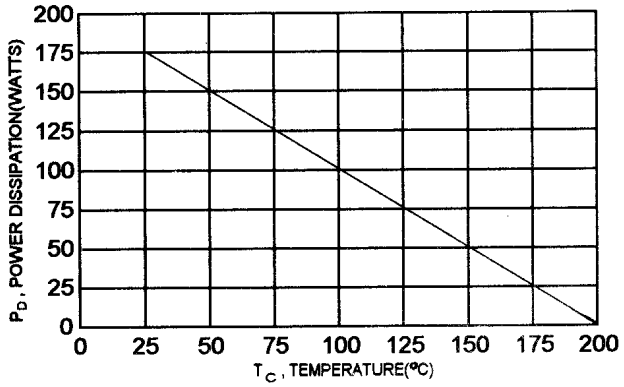
MAXIMUM RATINGS

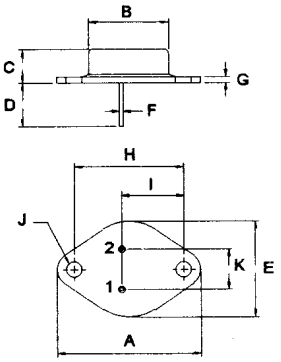
Characteristic	Symbol	MJ10004	MJ10005	Unit
Collector-Emitter Voltage	V_{CEV}	450	500	V
Collector-Emitter Voltage	$V_{CEX(SUS)}$	400	450	V
Collector-Emitter Voltage	$V_{CEO(SUS)}$	350	400	V
Emitter-Base Voltage	V_{EBO}	8.0		V
Collector Current-Continuous -Peak	I_C I_{CM}	20 30		A
Base current	I_B	2.5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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	Rθjc	1.0	°C/W

FIGURE -1 POWER DERATING





PIN 1.BASE
2.EMITTER
COLLECTOR(CASE)

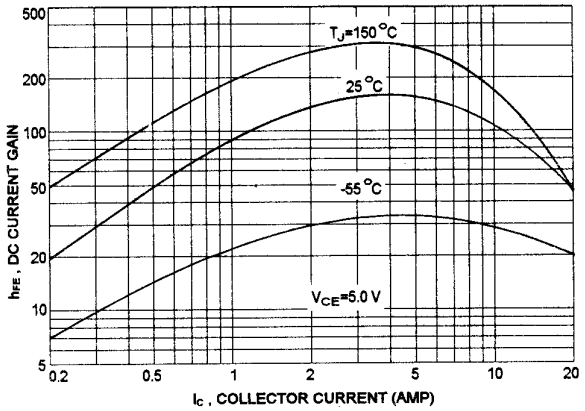
DIM	MILLIMETERS	
	MIN	MAX
A	38.75	39.96
B	19.28	22.23
C	7.96	9.28
D	11.18	12.19
E	25.20	26.67
F	0.92	1.09
G	1.38	1.62
H	29.90	30.40
I	16.64	17.30
J	3.88	4.36
K	10.67	11.18

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

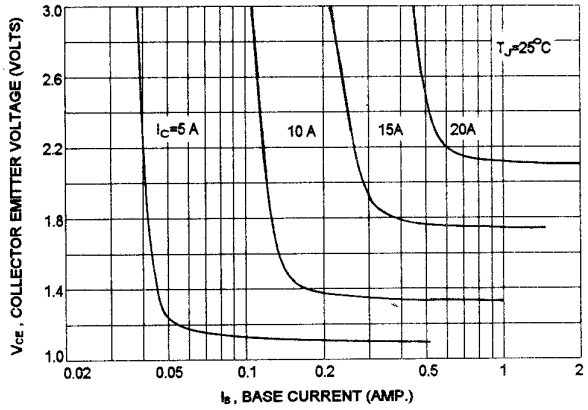
Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector - Emitter Sustaining Voltage (I_C = 250 mA, I_B = 0, V_{clamp}=Rate V_{CEO})	MJ10004 MJ10005	$V_{CEO(SUS)}$	350 400		V
Collector Cutoff Current (V_{CE}= Rated V_{CEV}, R_{BE}=50 ohm, T_C=100°C)		I_{CER}		5.0	mA
Collector Cutoff Current (V_{CEV}= Rated Value, $V_{BE(OFF)}$=1.5 V) (V_{CEV}= Rated Value, $V_{BE(OFF)}$=1.5 V, T_C=100°C)		I_{CEV}		0.25 5.0	mA
Emitter Cutoff Current (V_{EB} = 2.0 V , I_C = 0)		I_{EBO}		175	mA
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 5.0 A , V_{CE} = 5.0 V) (I_C = 10 A, V_{CE} = 5.0 V)		hFE	50 40	600 400	
Collector - Emitter Saturation Voltage (I_C = 10 A , I_B = 400mA) (I_C = 20 A, I_B = 2.0 A) (I_C = 10 A, I_B = 400 mA, T_C=100°C)		$V_{CE(sat)}$		1.9 3.0 2.0	V
Base - Emitter Saturation Voltage (I_C = 10 A, I_B = 400 mA) (I_C = 10 A, I_B =400 mA, T_C=100°C)		$V_{BE(sat)}$		2.5 2.5	V
Diode Forward Voltage (I_F = 10 A)		V_F		5.0	V
DYNAMIC CHARACTERISTICS					
Small-Signal Current Gain(2) (I_C = 1.0 A, V_{CE} = 10 V, f = 1.0 MHz)		$\lvert h_{fe} \rvert$	10		
Output Capacitance (V_{CB}=10 V, I_E=0, f =100 kHz)		C_{ob}	100		pF
SWITCHING CHARACTERISTICS					
Delay Time	V_{CC} = 250 V, I_C = 10 A I_{B1} = 400 mA, $V_{BE(off)}$=5.0V tp = 50 us, Duty Cycle ≦ 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 ≦ 2.0%
(2) $f_T = \lvert h_{fe} \rvert \cdot f_{test}$

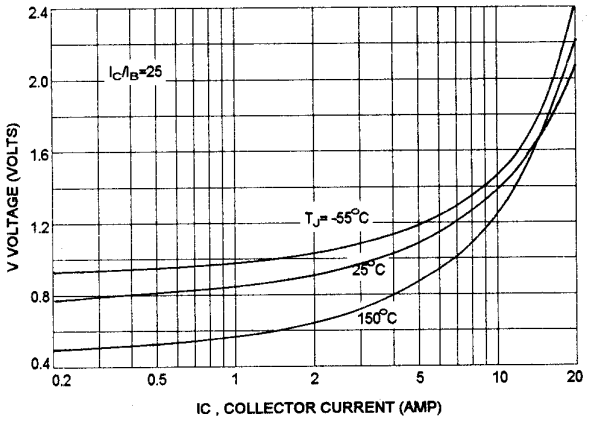
DC CURRENT GAIN



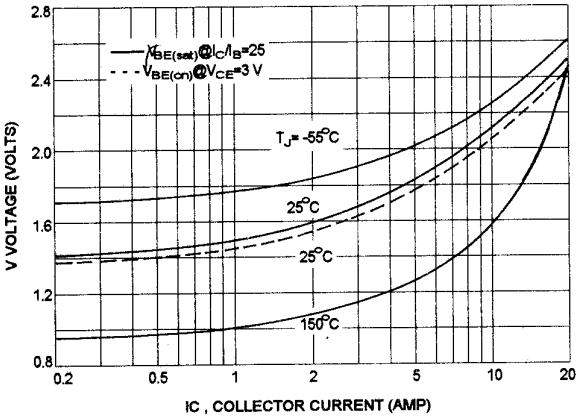
COLLECTOR SATURATION REGION



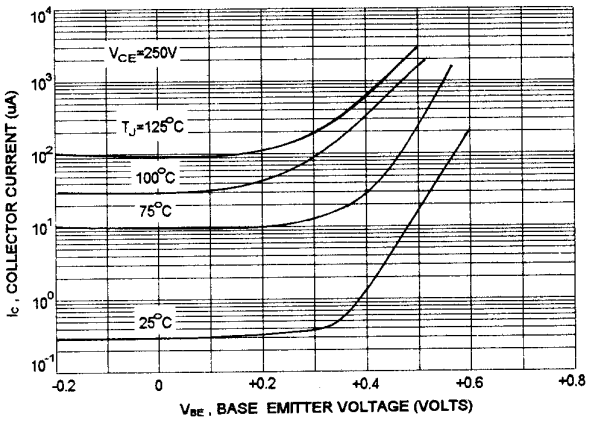
COLLECTOR EMITTER SATURATION VOLTAGE



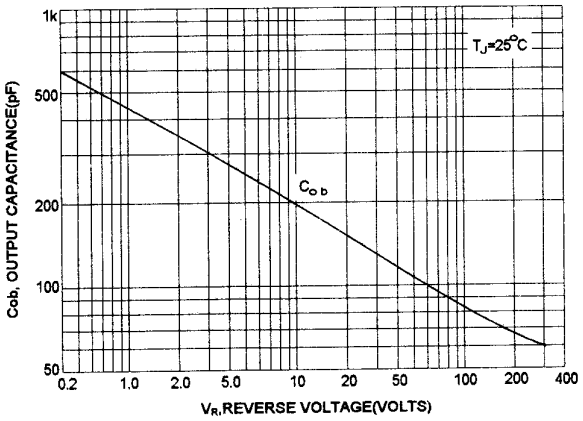
BASE EMITTER VOLTAGE



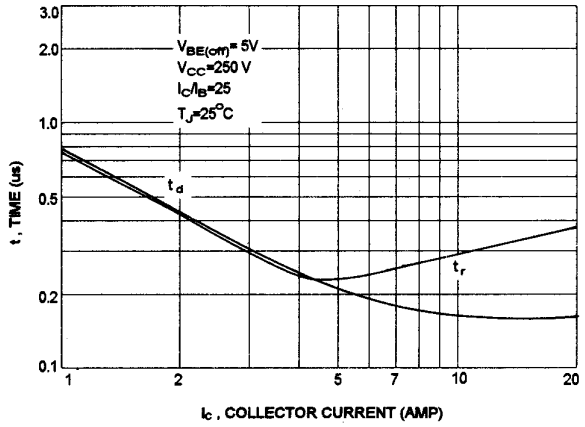
COLLECTOR CUT-OFF REGION



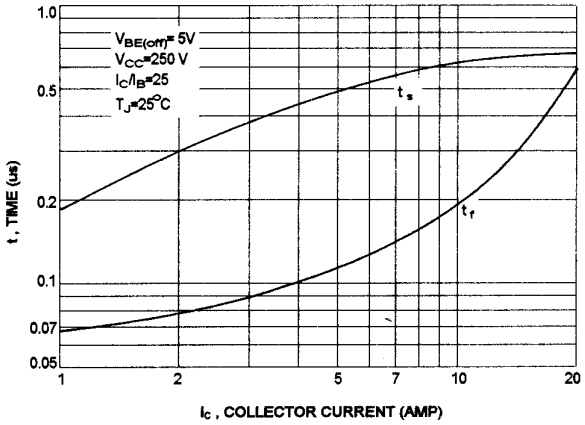
OUTPUT CAPACITANCES



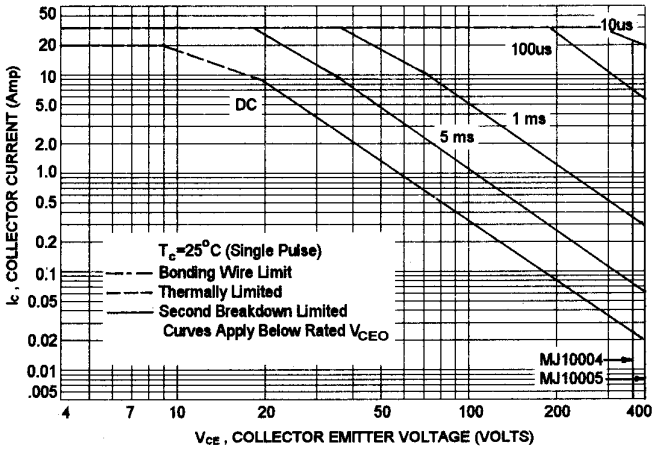
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA