

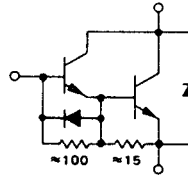
SWITCHMODE SERIES

NPN SILICON POWER DARLINGTON TRANSISTORS

The MJ10013 and MJ10014 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 - $I_C = 10$ A
- *Switching Regulators
- *Inverters
- *Solenoid and Relay Drivers
- *Motor Controls

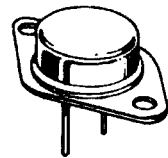


NPN
MJ10013
MJ10014

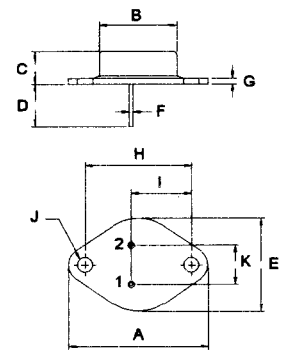
10 AMPERE
POWER DARLINGTON
TRANSISTORS
550-600 VOLTS
175 WATTS

MAXIMUM RATINGS

Characteristic	Symbol	MJ10013	MJ10014	Unit
Collector-Emitter Voltage	V_{CEV}	650	700	V
Collector-Emitter Voltage	$V_{CEO(SUS)}$	550	600	V
Emitter-Base Voltage	V_{EBO}	8.0		V
Collector Current-Continuous -Peak	I_C	10		A
	I_{CM}	15		
Base current	I_B	7.0		A
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$ @ $T_C = 100^\circ C$	P_D	175		W
		100		W
		1.0		W/ $^\circ C$
Operating and Storage Junction Temperature Range	T_J, T_{STG}	- 65 to +200		$^\circ C$



TO-3

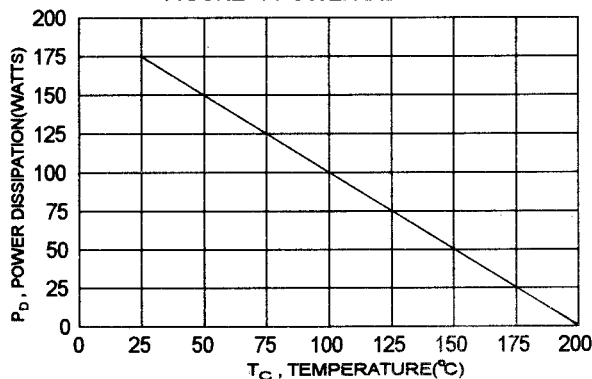


PIN 1. BASE
2. EMITTER
COLLECTOR(CASE)

THERMAL CHARACTERISTICS

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

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
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OFF CHARACTERISTICS

Collector - Emitter Sustaining Voltage ($I_C = 100 \text{ mA}, I_B = 0$)	MJ10013 MJ10014	$V_{CE0(SUS)}$	550 600	V
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CEV}, R_{BE} = 50 \text{ ohm}, T_C = 100^\circ\text{C}$)		I_{CER}	5.0	mA
Collector Cutoff Current ($V_{CEV} = \text{Rated Value}, V_{BE(OFF)} = 1.5 \text{ V}$) ($V_{CEV} = \text{Rated Value}, V_{BE(OFF)} = 1.5 \text{ V}, T_C = 100^\circ\text{C}$)		I_{CEV}	0.3 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 ($I_C = 5.0 \text{ A}, V_{CE} = 5.0 \text{ V}$) ($I_C = 10 \text{ A}, V_{CE} = 5.0 \text{ V}$)		h_{FE}	20 10	500 250	
Collector - Emitter Saturation Voltage ($I_C = 10 \text{ A}, I_B = 2.0 \text{ A}$) ($I_C = 10 \text{ A}, I_B = 2.0 \text{ A}, T_C = 100^\circ\text{C}$)		$V_{CE(sat)}$		2.5 2.6	V
Base - Emitter Saturation Voltage ($I_C = 10 \text{ A}, I_B = 2.0 \text{ A}$) ($I_C = 10 \text{ A}, I_B = 2.0 \text{ A}, T_C = 100^\circ\text{C}$)		$V_{BE(sat)}$		3.0 3.0	V
Diode Forward Voltage ($I_F = 10 \text{ A}$)		V_F		5.0	V

DYNAMIC CHARACTERISTICS

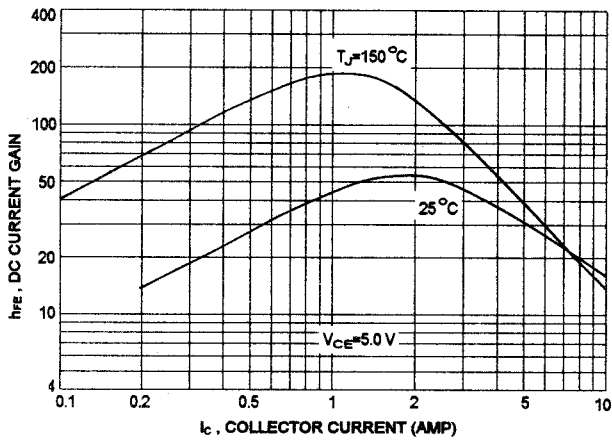
Small-Signal Current Gain(2) ($I_C = 1.0 \text{ A}, V_{CE} = 10 \text{ V}, f = 1.0 \text{ MHz}$)		$ h_{fe} $	10		
Output Capacitance ($V_{CB} = 10 \text{ V}, I_E = 0, f = 100 \text{ kHz}$)		C_{ob}	100		pF

SWITCHING CHARACTERISTICS

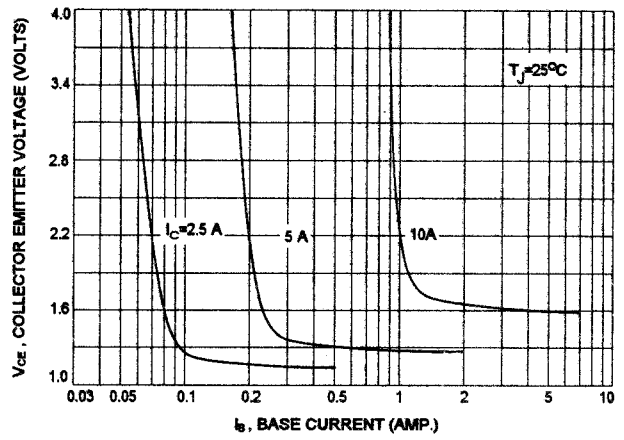
Delay Time	$V_{CC} = 250 \text{ V}, I_C = 10 \text{ A}$ $I_{B1} = 400 \text{ mA}, V_{BE(off)} = 5.0 \text{ V}$ $t_p = 50 \mu\text{s}, \text{Duty Cycle} \leq 2\%$	t_d	0.2	μs
Rise Time		t_r	2.0	μs
Storage Time		t_s	4.0	μs
Fall Time		t_f	1.0	μs

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

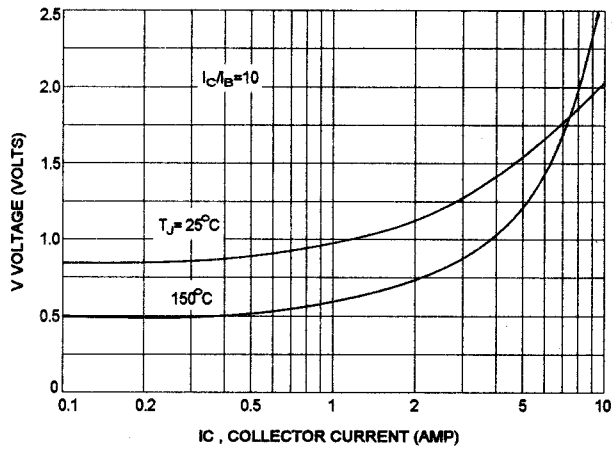
DC CURRENT GAIN



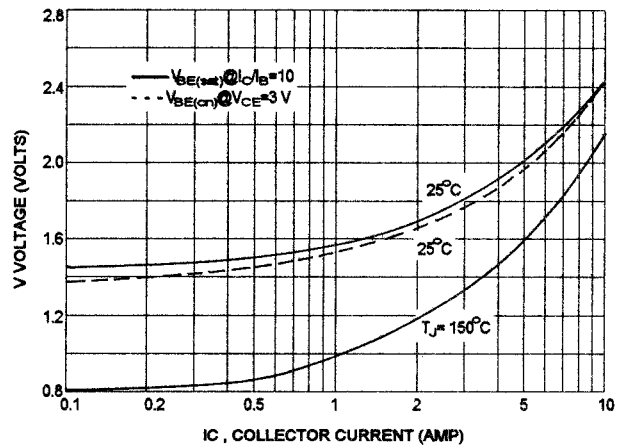
COLLECTOR SATURATION REGION



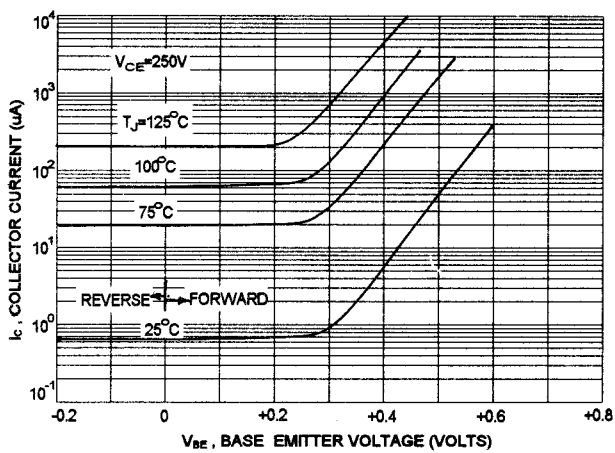
COLLECTOR EMITTER SATURATION VOLTAGE



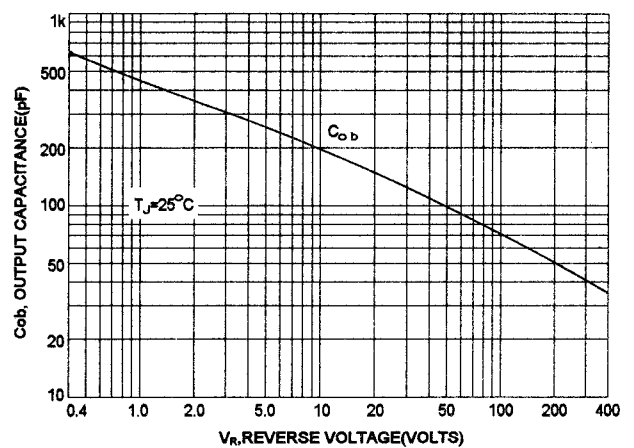
BASE EMITTER VOLTAGE



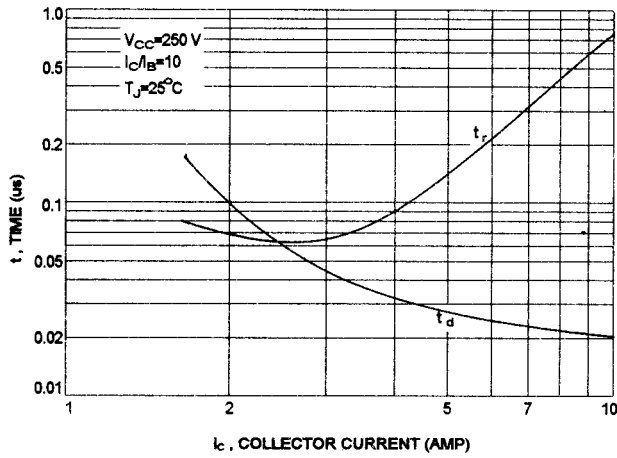
COLLECTOR CUT-OFF REGION



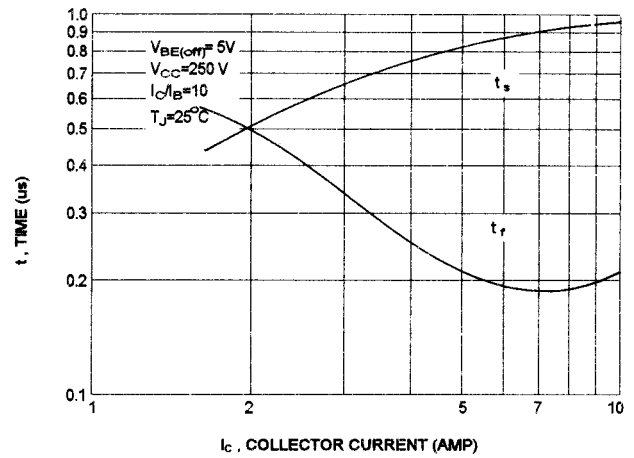
OUTPUT CAPACITANCES



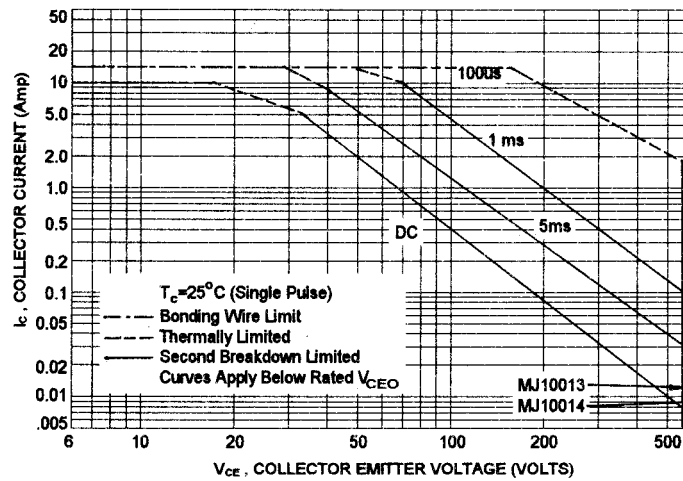
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

