

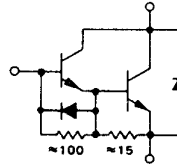
## SWITCHMODE SERIES

### 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

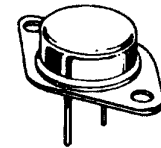


**NPN**  
**MJ10013**  
**MJ10014**

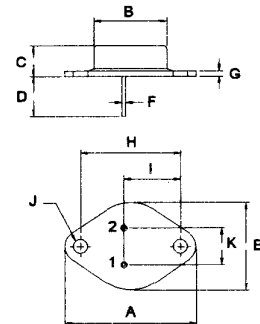
**10 AMPERE**  
**POWER DARLINGTON**  
**TRANSISTORS**  
**550-600 VOLTS**  
**175 WATTS**

#### 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	$I_C$	10		A
-Peak	$I_{CM}$	15		A
Base current	$I_B$	7.0		A
Total Power Dissipation @ $T_C=25^\circ C$	$P_D$	175		W
Derate above $25^\circ C$		100		W
		1.0		W/ $^\circ C$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	- 65 to +200		$^\circ C$



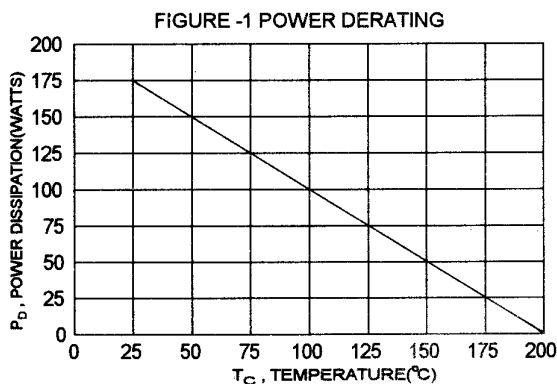
**TO-3**



PIN 1.BASE  
2.EMITTER  
COLLECTOR(CASE)

#### THERMAL CHARACTERISTICS

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



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	$V_{CEO(sus)}$	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 ( $I_C = 5.0\text{ A}, V_{CE} = 5.0\text{ V}$ ) ( $I_C = 10\text{ A}, V_{CE} = 5.0\text{ V}$ )		hFE	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**

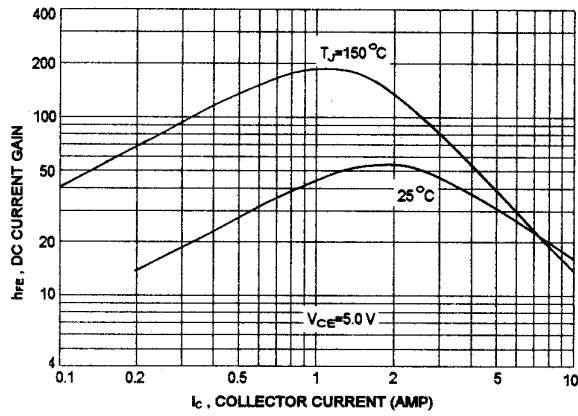
Small-Signal Current Gain(2) ( $I_C = 1.0\text{ A}, V_{CE} = 10\text{ V}, f = 1.0\text{ MHz}$ )		$ h_{fe} $	10		
Output Capacitance ( $V_{CB} = 10\text{ V}, I_E = 0, f = 100\text{ kHz}$ )		$C_{ob}$	100		pF

**SWITCHING CHARACTERISTICS**

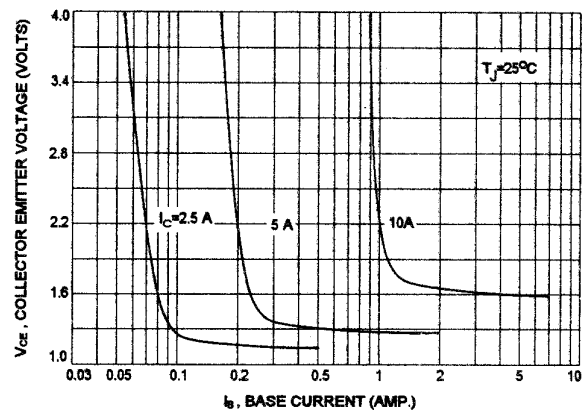
Delay Time	$V_{CC} = 250\text{ V}, I_C = 10\text{ A}$ $I_{B1} = 400\text{ mA}, V_{BE(off)} = 5.0\text{ V}$ $t_p = 50\text{ us}, \text{Duty Cycle} \leq 2\%$	$t_d$	0.2	us
Rise Time		$t_r$	2.0	us
Storage Time		$t_s$	4.0	us
Fall Time		$t_f$	1.0	us

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

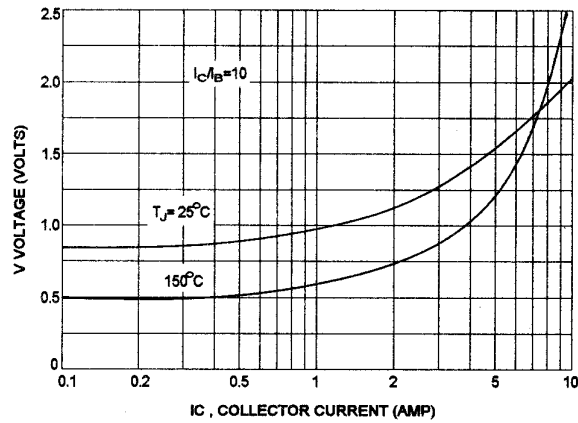
DC CURRENT GAIN



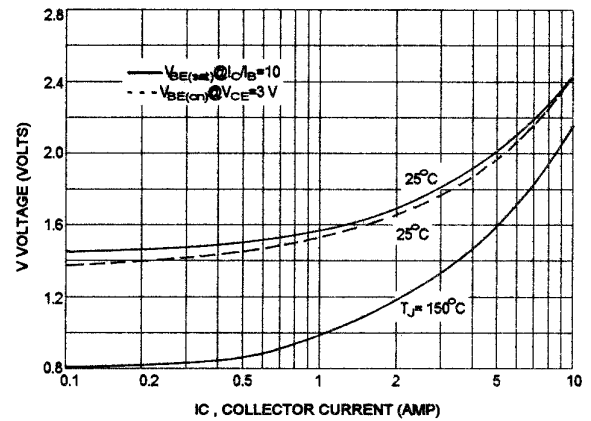
COLLECTOR SATURATION REGION



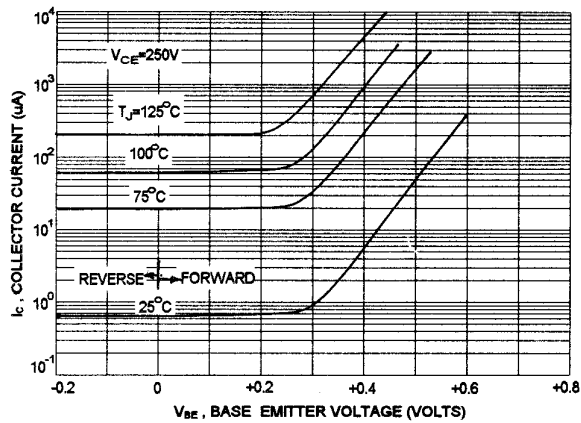
COLLECTOR EMITTER SATURATION VOLTAGE



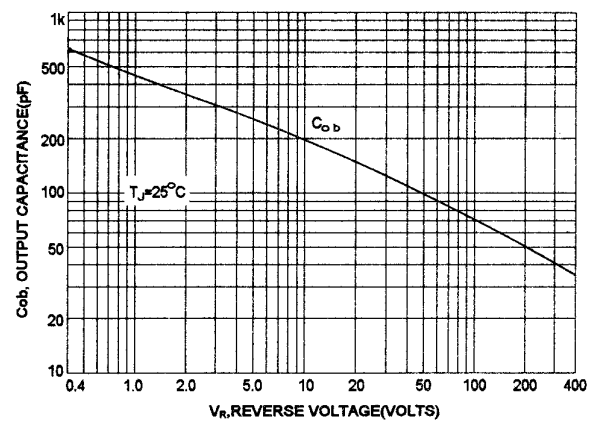
BASE EMITTER VOLTAGE



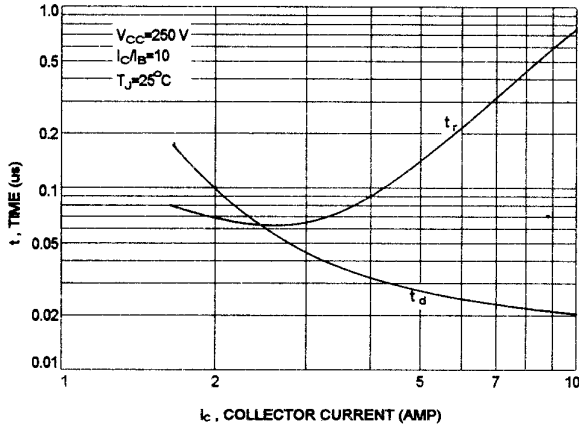
COLLECTOR CUT-OFF REGION



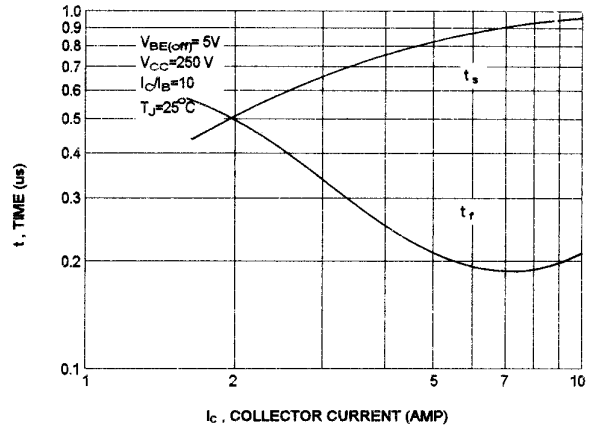
OUTPUT CAPACITANCES



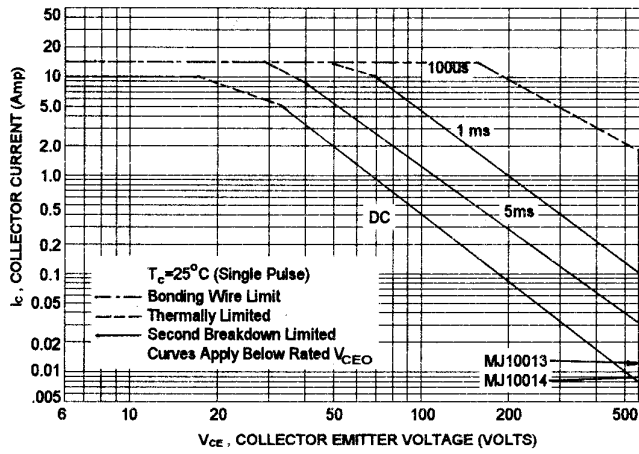
TURN-ON TIME



TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA

