

# NPN Darlington Power Transistors

$V_{CE0}$  400V,  $I_c$  10A, 150W

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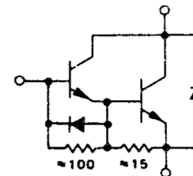
TO-3

## Description

Switch Mode Series NPN Silicon Power Darlington Transistors With Base-Emitter Speedup Diode. This darlington transistor is 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.

## Features

- Continuous collector current -  $I_c = 10$  A
- Switching Regulators
- Inverters
- Solenoid and Relay Drivers

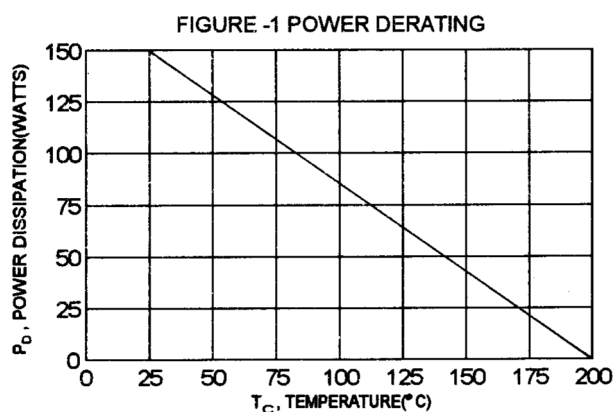


**RoHS  
Compliant**

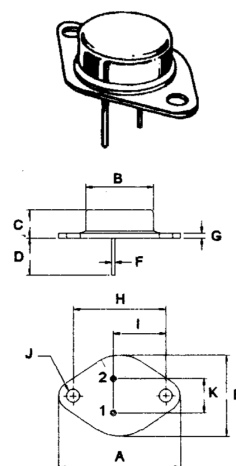
## Maximum Ratings and Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Collector-Emitter Voltage	$V_{CEV}$	500	V
Collector-Emitter Voltage	$V_{CEX(SUS)}$	450	
Collector-Emitter Voltage	$V_{CE0(SUS)}$	400	
Emitter-Base Voltage	$V_{EBO}$	8	
Collector Current-Continuous	$I_c$	10	A
Peak	$I_{CM}$	20	
Base Current	$I_B$	2.5	
Total Power Dissipation @ $T_c = 25^\circ\text{C}$	$P_D$	150	W
@ $T_c = 100^\circ\text{C}$		85	W
Derate above $25^\circ\text{C}$		0.86	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +200	$^\circ\text{C}$
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.17	$^\circ\text{C/W}$

## Thermal Characteristics



TO-3



Pin  
1. Base  
2. Emitter  
Collector (case)

DIM	MILLIMETRES	
	MIN	MAX
A	38.75	39.96
B	19.28	22.23
C	7.96	9.28
D	11.18	12.19
E	25.2	26.67
F	0.92	1.09
G	1.38	1.62
H	29.9	30.4
I	16.64	17.3
J	3.88	4.36
K	10.67	11.18

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## Electrical Characteristics (T<sub>C</sub> = 25°C Unless otherwise noted)

Characteristics	Symbol	Min	Max	Unit
Off Characteristics				
Collector - Emitter Sustaining Voltage (I <sub>C</sub> = 250mA, I <sub>B</sub> = 0) V <sub>CLAMP</sub> = Rate V <sub>CEO</sub> )	V <sub>CEO(SUS)</sub>	400	-	V
Collector Cutoff Current (V <sub>CE</sub> = Rated V <sub>CEV</sub> , R <sub>BE</sub> = 50 Ω, T <sub>C</sub> = 100°C)	I <sub>CER</sub>	-	5	mA
Collector Cutoff Current (V <sub>CEV</sub> = Rated Value, V <sub>BE(OFF)</sub> = 1.5 V) (V <sub>CEV</sub> = Rated Value, V <sub>BE(OFF)</sub> =1.5 V), T <sub>C</sub> = 100°C	I <sub>CEV</sub>	-	0.25 5	
Emitter Cutoff Current (V <sub>EB</sub> = 2 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	175	
On Characteristics (1)				
DC Current Gain (I <sub>C</sub> = 2.5A, V <sub>CE</sub> = 5V) (I <sub>C</sub> = 5A, V <sub>CE</sub> = 5V)	hFE	40 30	500 300	-
Collector - Emitter Saturation Voltage (I <sub>C</sub> = 5A, I <sub>B</sub> = 250mA) (I <sub>C</sub> = 10A, I <sub>B</sub> = 1A) (I <sub>C</sub> = 5A, I <sub>B</sub> = 250mA) T <sub>C</sub> = 100°C	V <sub>CE(sat)</sub>	-	1.9 2.9 2	V
Base - Emitter Saturation Voltage (I <sub>C</sub> = 5A, I <sub>B</sub> = 250mA) (I <sub>C</sub> = 5A, I <sub>B</sub> = 250mA) T <sub>C</sub> = 100°C	V <sub>BE(SAT)</sub>	-	2.5 2.5	
Diode Forward Voltage I <sub>F</sub> = 5A	V <sub>F</sub>	-	5	

## Dynamic Characteristics

Small-Signal Current Gain (2) (I <sub>c</sub> = 1A, V <sub>CE</sub> = 10V, f = 1MHz)	h <sub>fe</sub>	10	-	-
Output Capacitance (V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0, f = 100 KHz)	C <sub>ob</sub>	60	-	pF

## Switching Characteristics

Delay Time	V <sub>CC</sub> = 250V, I <sub>c</sub> = 5A I <sub>B1</sub> = 250 mA, V <sub>BE(off)</sub> = 5V tp = 50μs, Duty Cycle ≤ 2%	t <sub>d</sub>	-	0.2	μs
Rise Time		t <sub>r</sub>	-	0.6	
Strong Time		t <sub>s</sub>	-	1.5	
Fall Time		t <sub>f</sub>	-	0.5	

(1) Pulse Test - Pulse width = 300μs, Duty Cycle ≤ 2%

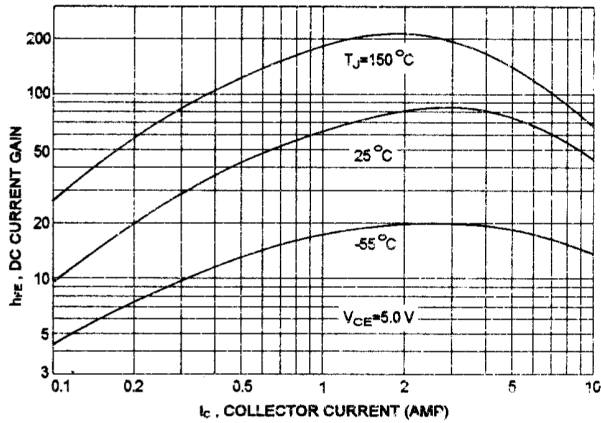
(2) f<sub>r</sub> = | h<sub>fe</sub> | ° f<sub>test</sub>

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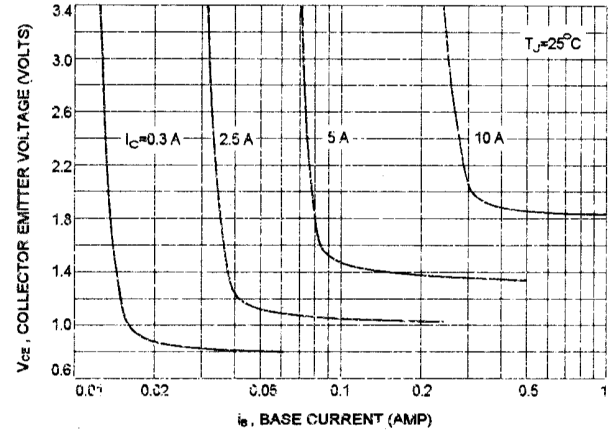
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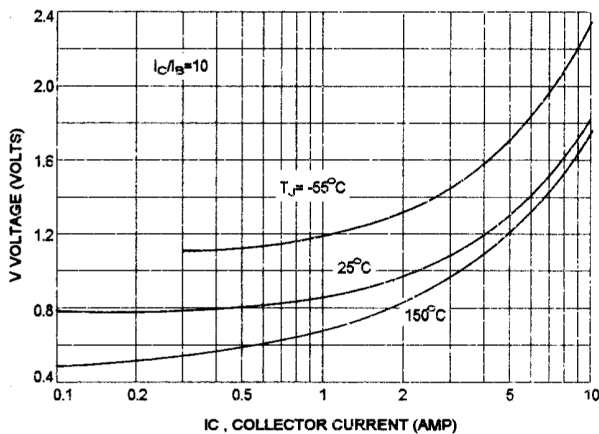
DC CURRENT GAIN



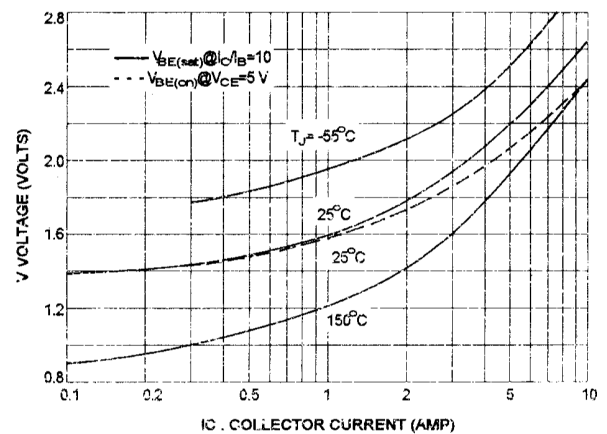
COLLECTOR SATURATION REGION



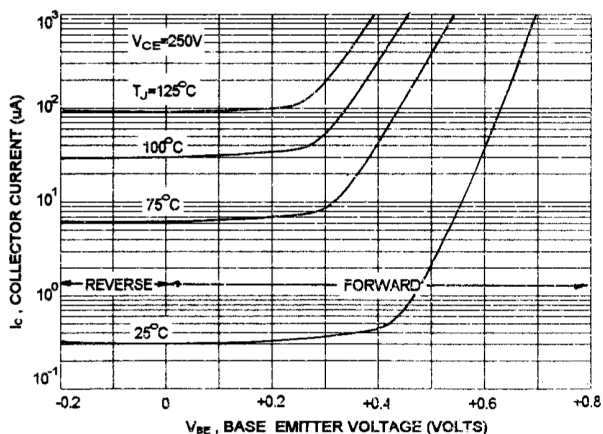
COLLECTOR-EMITTER SATURATION VOLTAGE



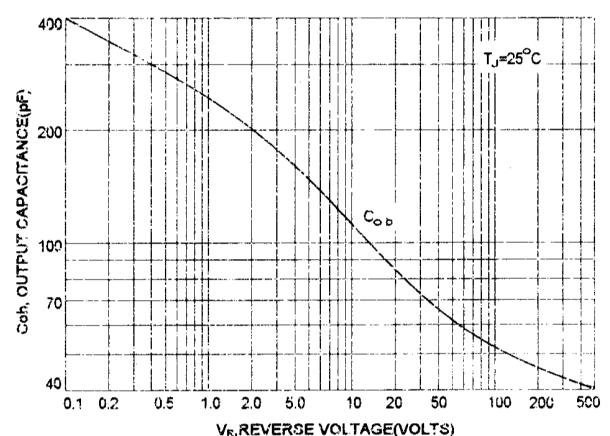
BASE-EMITTER VOLTAGE



COLLECTOR CUT-OFF REGION



OUTPUT CAPACITANCES

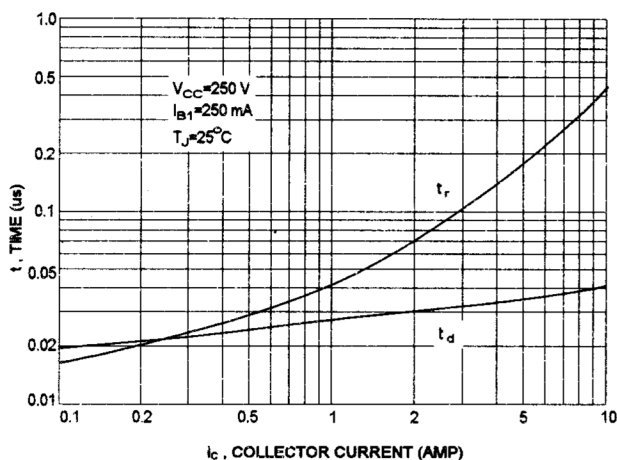


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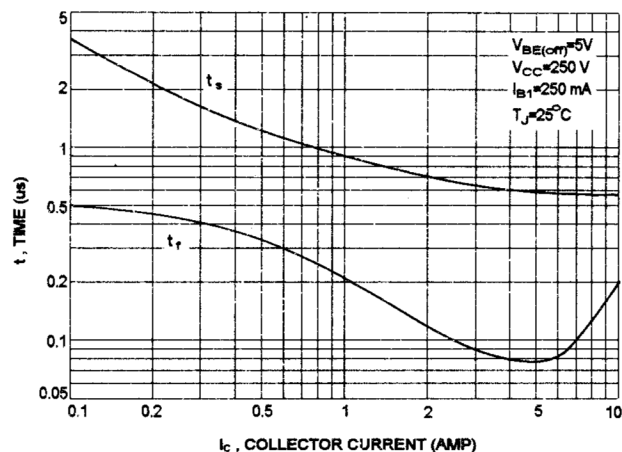
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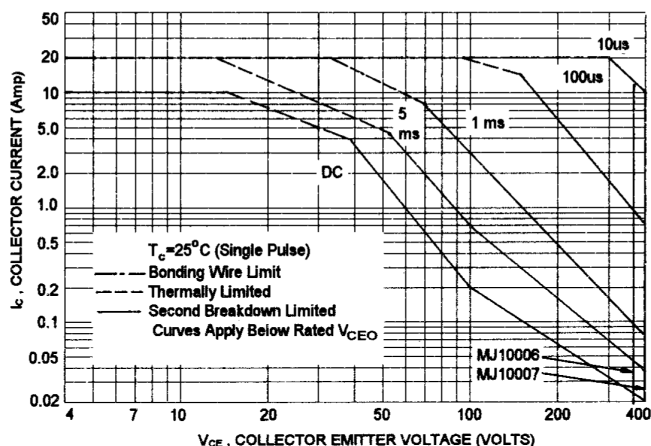
TURN-ON TIME



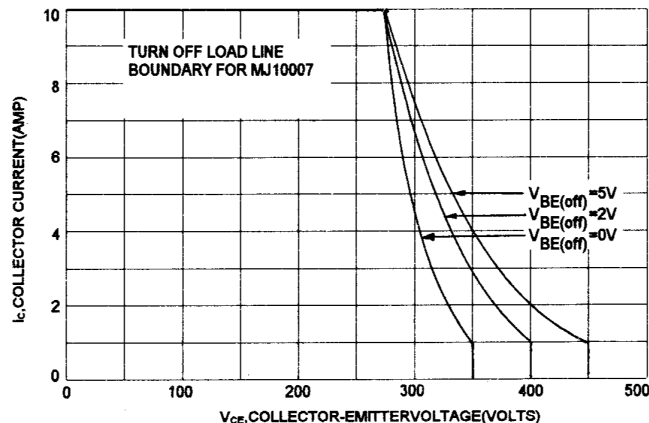
TURN-OFF TIME



ACTIVE REGION SAFE OPERATING AREA



REVERSE BIAS SWITCHING SAFE OPERATING AREA



## Part Number Table

Description	Part Number
NPN Darlington Transistor, 400V, 10A, 150W, TO-3	MJ10007

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