

Darlington Power Transistors



NPN Silicon

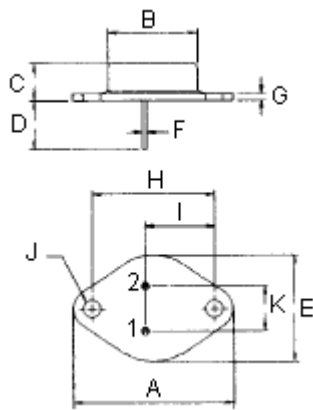


TO-3

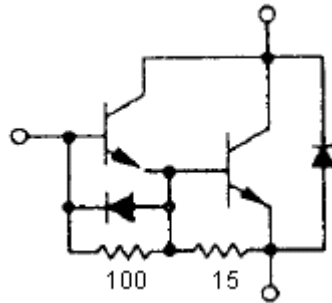
The Darlington transistors are designed for high-voltage, high-speed, power switching in inductive circuits where fall time is critical. They are particularly suited for line operated switch-mode applications such as:

Features:

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



Pin 1. Base
2. Emitter
Collector (Case)



Dimensions	Minimum	Maximum
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

Dimensions : Millimetres

Maximum Ratings

Characteristic	Symbol	MJ10005	Unit
Collector - Emitter Voltage	V_{CEV}	500	V
	$V_{CEX(SUS)}$	450	
	$V_{CEO(SUS)}$	400	
Emitter - Base Voltage	V_{EBO}	8	
Collector Current - Continuous - Peak	I_C	20	A
	I_{CM}	30	
Base Current	I_B	2.5	
Total Power Dissipation at $T_C = 25^\circ\text{C}$ at $T_C = 100^\circ\text{C}$ Derate above 25°C	P_D	175	W
		100	W
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +200	$^\circ\text{C}$

Thermal Characteristics

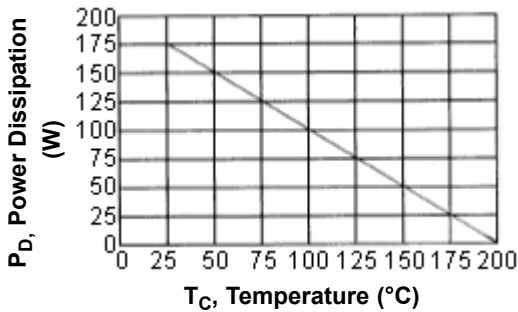
Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1	$^\circ\text{C} / \text{W}$

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Figure - 1 Power Derating



Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Minimum	Maximum	Unit
OFF Characteristics				
Collector - Emitter Sustaining Voltage ($I_C = 250\text{ mA}$, $I_B = 0$, $V_{\text{Clamp}} = \text{Rate } V_{\text{CEO}}$)	$V_{\text{CEO (sus)}}$	400	-	V
Collector Cut off Current ($V_{\text{CE}} = \text{Rated } V_{\text{CEV}}$, $R_{\text{BE}} = 50\ \Omega$, $T_C = 100^\circ\text{C}$)	I_{CER}	-	5	mA
Collector Cut off 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	
Emitter Cut off Current ($V_{\text{EB}} = 2\text{ V}$, $I_C = 0$)	I_{EBO}	-	175	
ON Characteristics (1)				
DC Current Gain ($I_C = 5\text{ A}$, $V_{\text{CE}} = 5\text{ V}$) ($I_C = 10\text{ A}$, $V_{\text{CE}} = 5\text{ V}$)	h_{FE}	50 40	600 400	-
Collector - Emitter Saturation Voltage ($I_C = 10\text{ A}$, $I_B = 400\text{ mA}$) ($I_C = 20\text{ A}$, $I_B = 2\text{ A}$) ($I_C = 10\text{ A}$, $I_B = 400\text{ mA}$, $T_C = 100^\circ\text{C}$)	$V_{\text{CE (sat)}}$	-	1.9 3 2	V
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	
Dynamic Characteristics				
Small - Signal Current Gain (2) ($I_C = 1\text{ A}$, $V_{\text{CE}} = 10\text{ V}$, $f = 1\text{ MHz}$)	$ h_{\text{fe}} $	10	-	-
Output Capacitance ($V_{\text{CB}} = 10\text{ V}$, $I_E = 0\text{ V}$, $f = 100\text{ kHz}$)	C_{ob}	100	-	pF
Switching Characteristics				
Delay Time	$V_{\text{CC}} = 250\text{ V}$, $I_C = 10\text{ A}$ $I_{\text{B1}} = 400\text{ mA}$, $V_{\text{BE (o(f))}} = 5\text{ V}$ $t_p = 50\ \mu\text{s}$, Duty Cycle $\leq 2\%$	t_d	-	0.2
Rise Time		t_r	-	0.6
Storage Time		t_s	-	1.5
Fall Time		t_f	-	0.5

(1) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2\%$

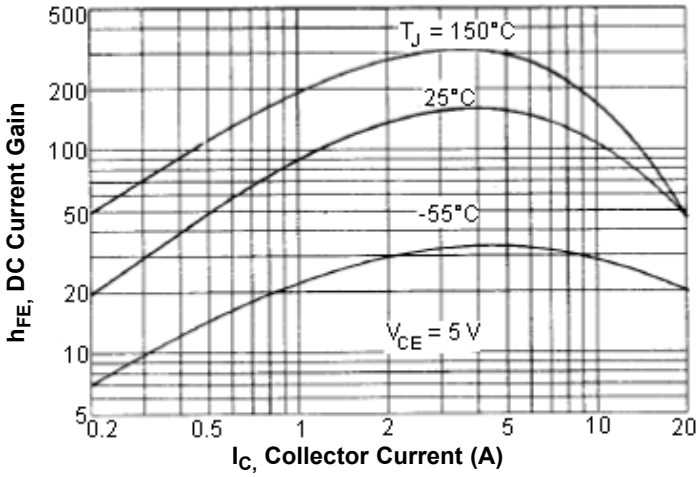
(2) $f_T = |h_{\text{fe}}| \cdot f_{\text{test}}$

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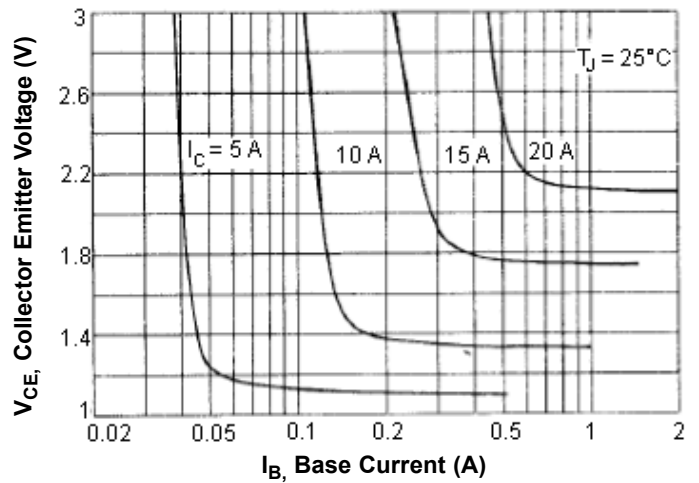


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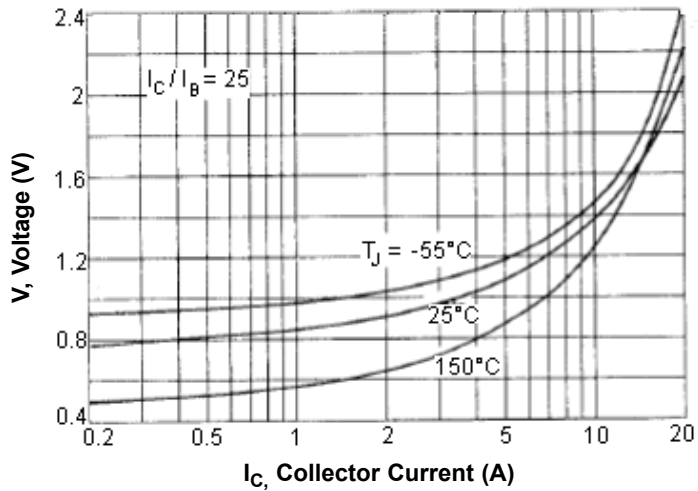
DC Current Gain



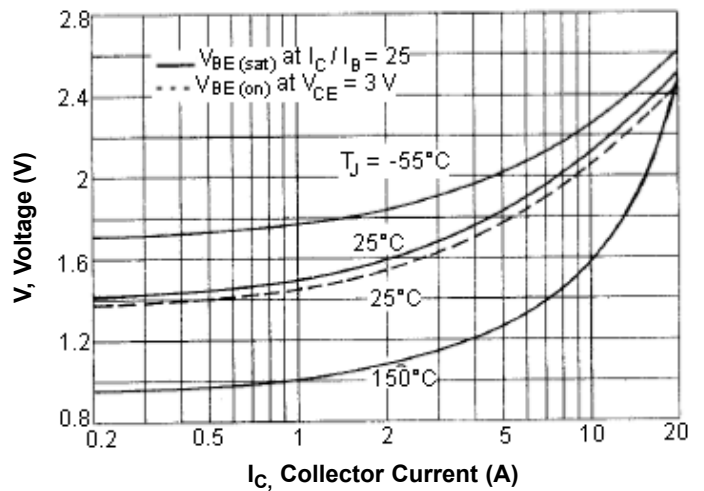
Collector Saturation Region



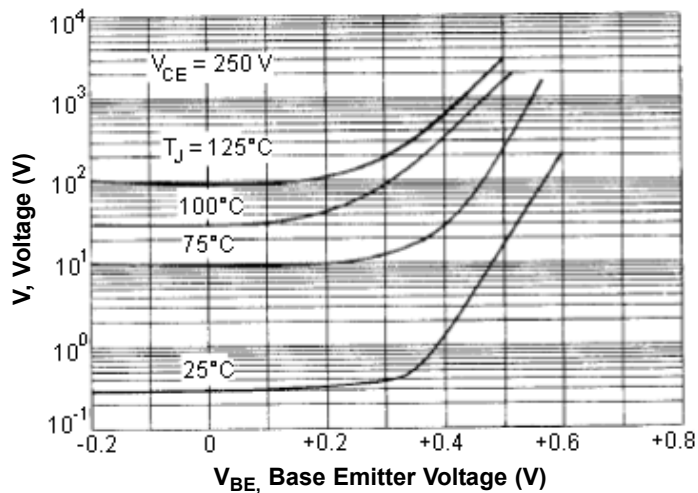
Collector Emitter Saturation Voltage



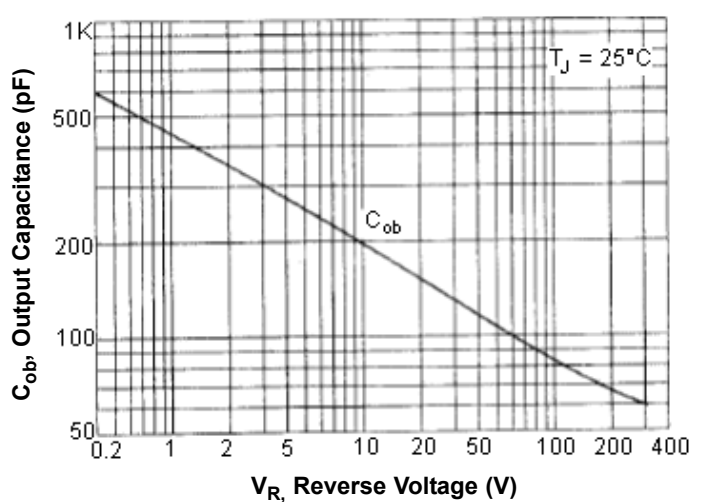
Base Emitter Voltage



Collector Cut-off Region



Output Capacitances

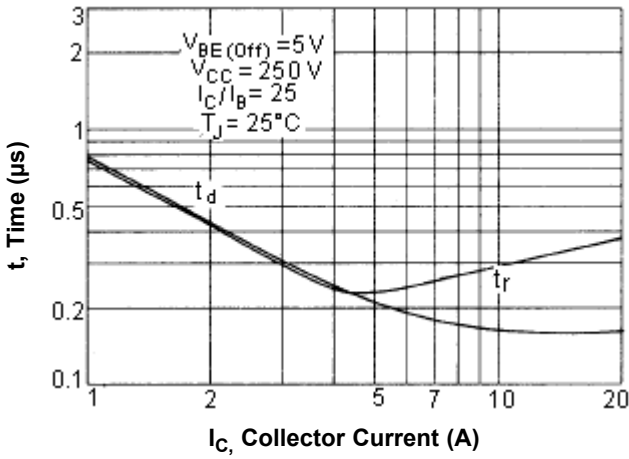


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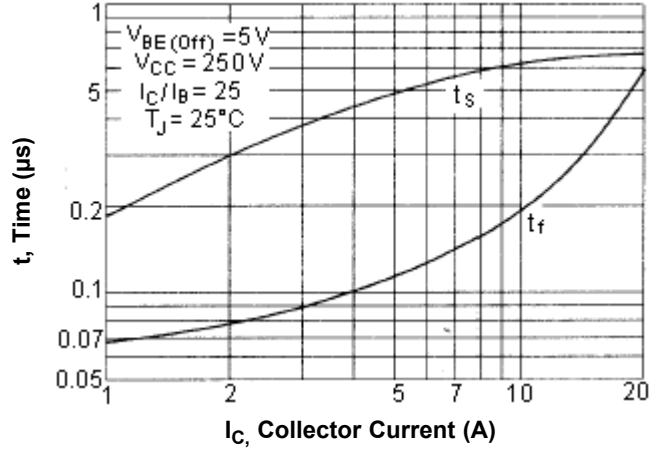


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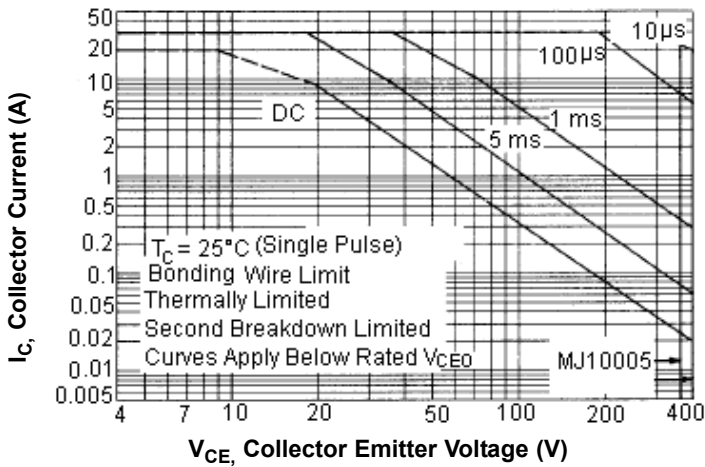
Turn - on Time



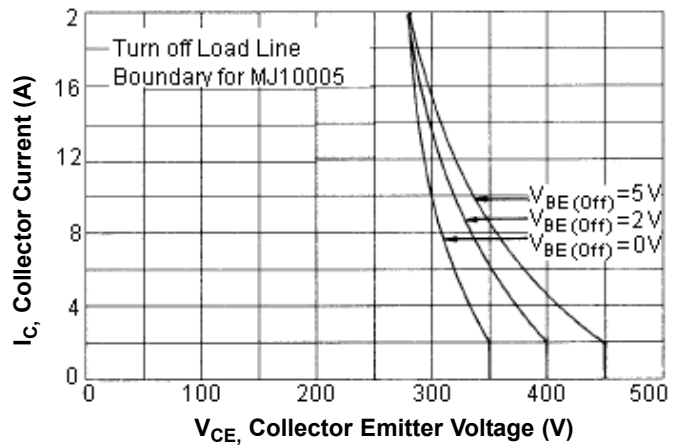
Turn - off Time



Active Region Safe Operating Area



Reverse Bias Switching Safe Operating Area



Part Number Table

Description	Part Number
Darlington Transistor, TO-3	MJ10005

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