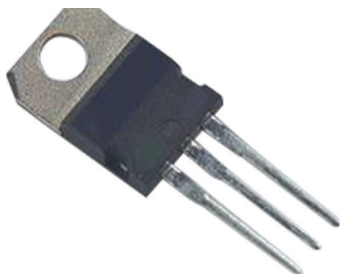


Darlington Transistor



Description:

Designed for general-purpose amplifier and low speed switching applications.

Features:

- Collector-Emitter sustaining voltage- $V_{CEO(sus)} = 60V$ (Min.) - TIP140
- Collector-Emitter saturation voltage- $V_{CE(sat)} = 2.5V$ (Max.) at $I_C = 5A$
- Monolithic construction with built-in-base-emitter shunt resistor

Maximum Ratings

Characteristic	Symbol	TIP140	Unit
Collector-Emitter Voltage	V_{CEO}	60	V
Collector-Base Voltage	V_{CBO}		
Emitter-Base Voltage	V_{EBO}	5	
Collector Current-Continuous -Peak	I_C I_{CM}	10 15	A
Base Current	I_B	0.5	
Total Power Dissipation at $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	125 1	W W/ $^\circ C$
Operation and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150	$^\circ C$

Thermal Characteristics

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

Darlington Transistor



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 (1) $I_C = 30\text{mA}$, $I_B = 0$	$V_{CEO(sus)}$	60	-	V
Collector Cut off Current $V_{CE} = 30\text{V}$, $I_B = 0$	I_{CEO}	-	2	mA
Collector Cut off Current $V_{CB} = 60\text{V}$, $I_E = 0$	I_{CBO}	-	1	
Emitter Cut off Current $V_{EB} = 5\text{V}$, $I_C = 0$	I_{EBO}	-	2	

On Characteristics (1)

DC Current Gain $I_C = 5\text{A}$, $V_{CE} = 4\text{V}$ $I_C = 10\text{A}$, $V_{CE} = 40\text{V}$	h_{FE}	1,000 500	-	-
Collector-Emitter Saturation Voltage $I_C = 5\text{A}$, $I_B = 10\text{mA}$ $I_C = 10\text{A}$, $I_B = 40\text{mA}$	$V_{CE(sat)}$	-	2 3	V
Base-Emitter Saturation Voltage $I_C = 10\text{A}$, $I_B = 40\text{mA}$	$V_{BE(sat)}$		3.5	
Base-Emitter On Voltage $I_C = 10\text{A}$, $V_{CE} = 4\text{V}$	$V_{BE(on)}$	-	3.0	

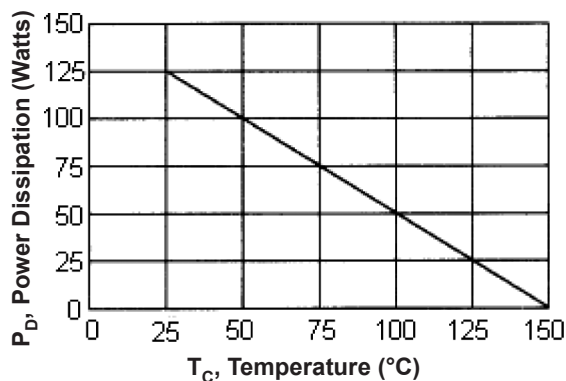
Switching Characteristics

Delay Time	$V_{CC} = 30\text{V}$, $I_C = 5\text{A}$ $I_{B1} = -I_{B2} = 20\text{mA}$ $t_P = 20\text{ms}$, Duty Cycle $\leq 2\%$	t_d	0.15 (Typ.)	-	μs
Rise Time		t_r	0.55 (Typ.)	-	
Storage Time		t_s	2.5 (Typ.)	-	
Fall Time		t_f	2.5 (Typ.)	-	

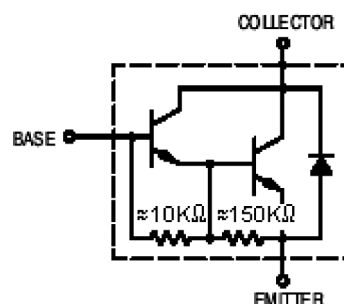
(1) Pulse Test: Pulse Width = $300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Darlington Transistor

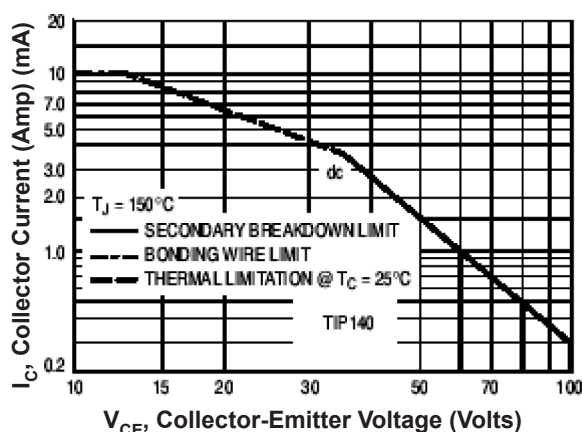
Figure - 1 Power Derating



Internal Schematic Diagram



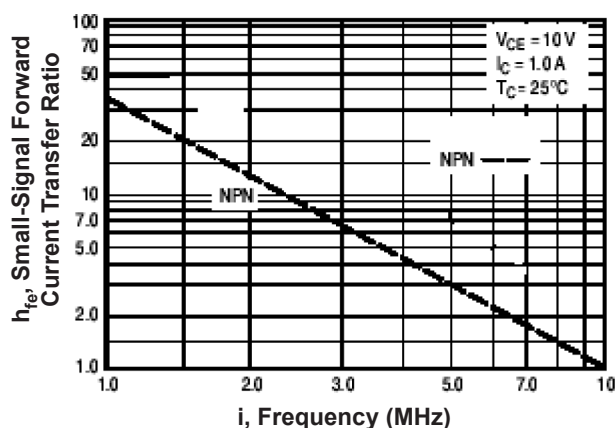
Active Region Safe Operating Area (SOA)



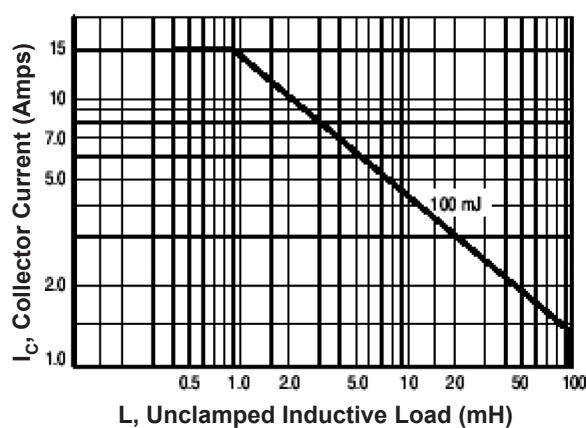
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is based on $T_{J(PK)} = 150^\circ\text{C}$; T_C is variable depending on conditions. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

Small-Signal Common-Emitter Forward Current Transfer Ratio



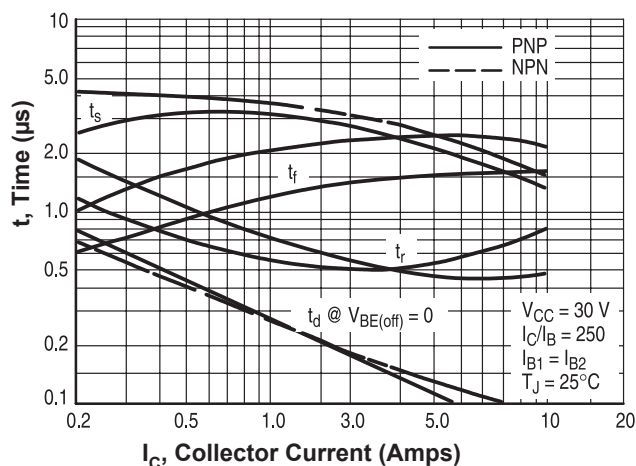
Unclamped Inductive Load



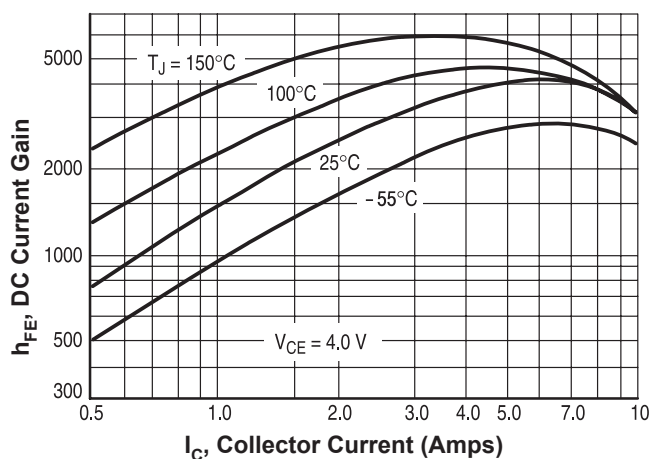
Darlington Transistor



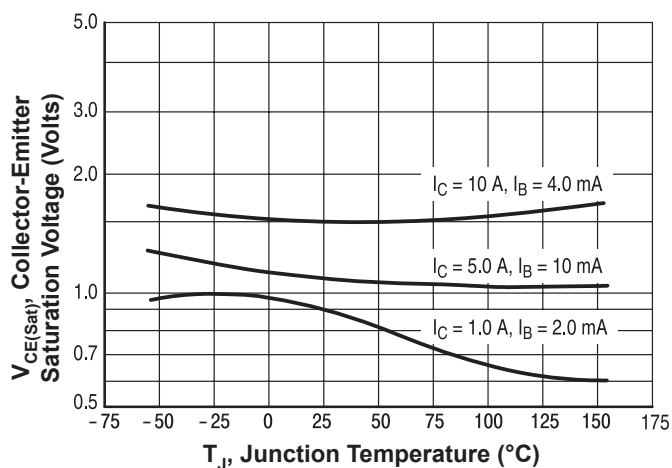
Switching Time



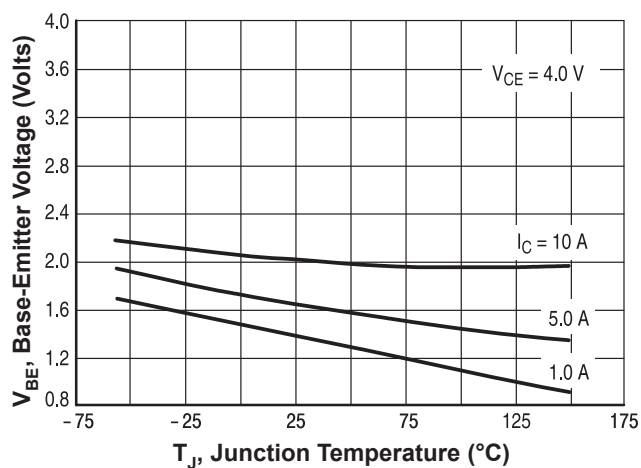
DC Current Gain



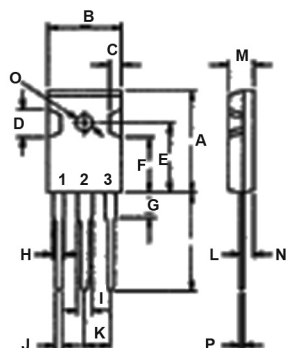
Collector-Emitter Saturation Voltage



Base-Emitter Voltage



Darlington Transistor



Pin Configuration:

1. Base
2. Collector
3. Emitter

Dimensions	Min.	Max.
A	20.63	22.38
B	15.38	16.2
C	1.9	2.7
D	5.1	6.1
E	14.81	15.22
F	11.72	12.84
G	4.2	4.5
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.5	21.5
M	4.68	5.36
N	2.4	2.8
O	3.25	3.65
P	0.55	0.7

Dimensions : Millimetres

Part Number Table

Description	Part Number
Darlington Transistor, NPN, TO-247	TIP140

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