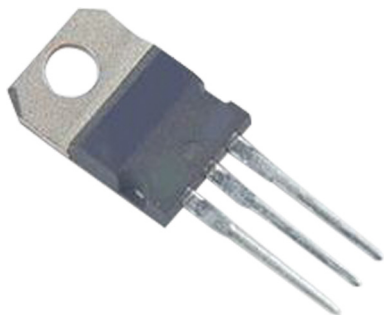


Darlington Transistor



Description:

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

Features:

- Collector-emitter sustaining voltage- $V_{CE(sus)} = 60V$ (Min.) - TIP110, TIP115
- Collector-emitter saturation voltage- $V_{CE(sat)} = 2.5V$ (Max.) at $I_C = 2A$
- Monolithic construction with built-in-base-emitter shunt resistor

Maximum Ratings

Characteristic	Symbol	TIP110 TIP115	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}	2 4	A
Base Current	I_B	50	mA
Total Power Dissipation at $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	50 0.4	W W/ $^\circ C$
Operating 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	$R_{\theta jc}$	2.5	$^\circ C/W$

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)

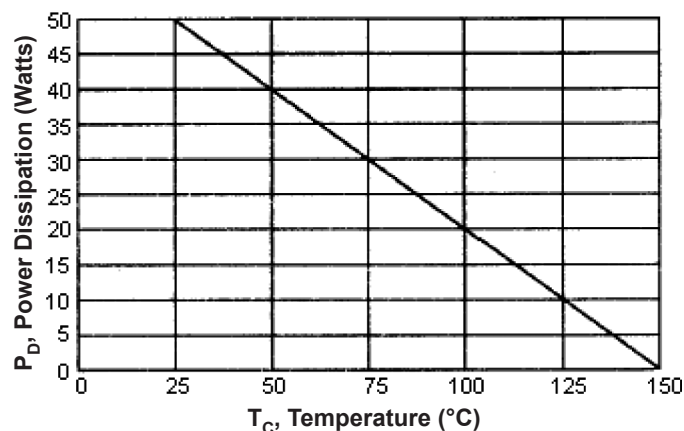
DC Current Gain $I_C = 1\text{A}$, $V_{CE} = 4\text{V}$ $I_C = 2\text{A}$, $V_{CE} = 4\text{V}$	h_{FE}	1,000 500	-	-
Collector-Emitter Saturation Voltage $I_C = 2\text{A}$, $I_B = 8\text{mA}$	$V_{CE(sat)}$	-	2.5	V
Base-Emitter On Voltage $I_C = 2\text{A}$, $V_{CE} = 4\text{V}$	$V_{BE(on)}$	-	2.8	

Dynamic Characteristics

Small-Signal Current Gain $I_C = 0.75\text{A}$, $V_{CE} = 10\text{V}$, $f = 1\text{MHz}$	h_{fe}	25	-	-
Output Capacitance $V_{CB} = 10\text{V}$, $I_E = 0$, $f = 0.1\text{MHz}$ TIP110 TIP115	C_{ob}	-	250 150	pF

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

Figure - 1 Power Derating



Darlington Transistor

Internal Schematic Diagram

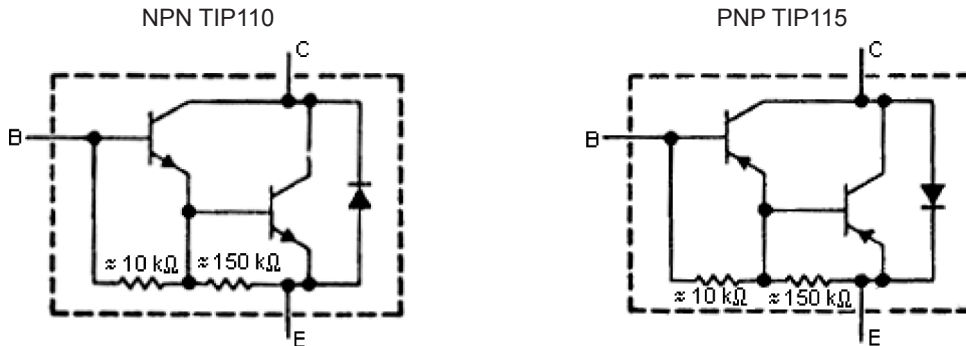


Figure - 2 Switching Time

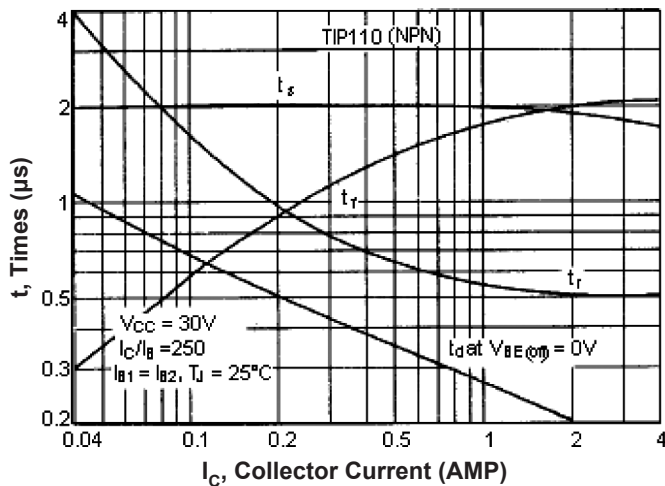


Figure - 3 Switching Time

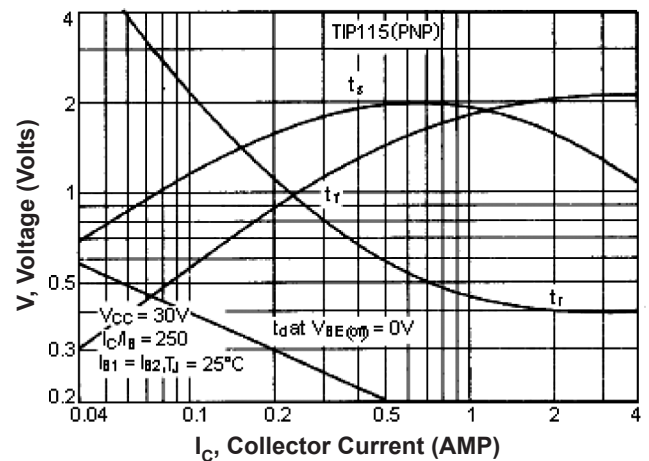


Figure - 4 Capacitances

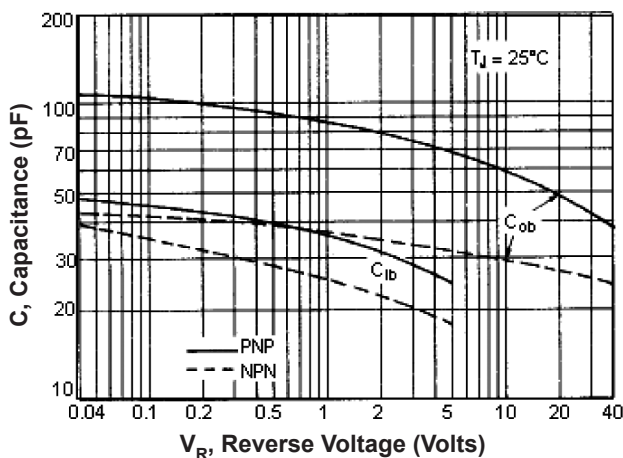
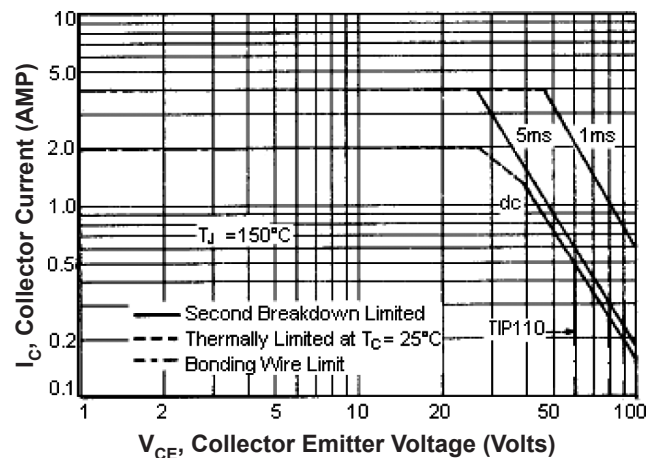


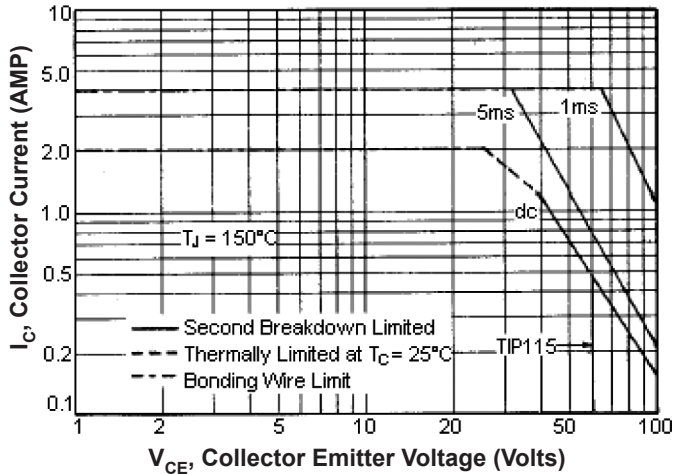
Figure - 5 Active Region Safe Operating Area



Darlington Transistor

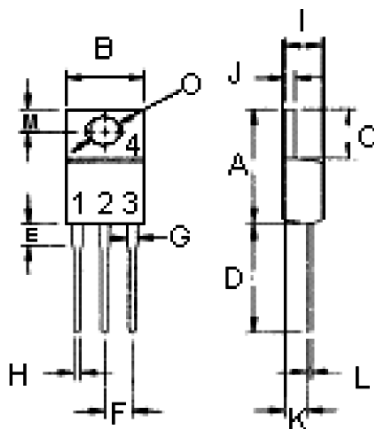


Figure - 6 Active Region Safe Operating Area



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 the curves indicate.

The data of Figure - 5 and 6 is base on $T_{J(PK)} = 150^\circ\text{C}$; T_C is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 150^\circ\text{C}$. At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



Pin Configuration:

1. Base
2. Collector
3. Emitter
4. Collector(Case)

Dimensions	Min.	Max.
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.2	2.97
L	0.33	0.55
M	2.48	2.98
O	3.7	3.9

Dimensions : Millimetres

Part Number Table

Description	Part Number
Darlington Transistor, NPN, TO-220	TIP110
Darlington Transistor, PNP, TO-220	TIP115

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