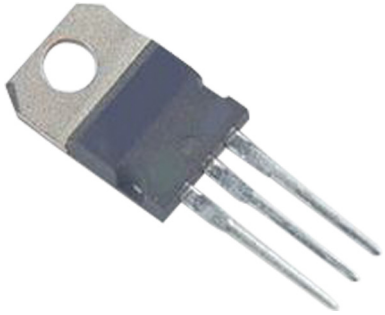
Darlington Transistor



Description:

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

Features:

- Collector-emitter sustaining voltage-$V_{CEO\ (sus)}$ = 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°C Derate above 25°C	P_D	50 0.4	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150	°C

Thermal Characteristics

Characteristic	Symbol	Max.	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	2.5	°C/W

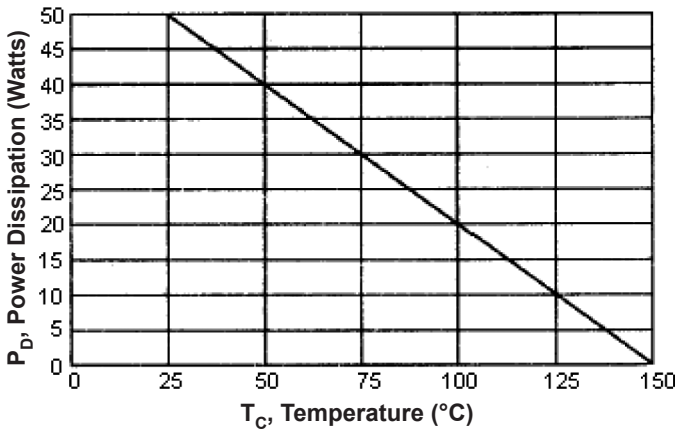
Electrical Characteristics:

(T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit
Off Characteristics				
Collector-Emitter Sustaining Voltage (1) I_C = 30mA, I_B = 0	$V_{CEO\ (sus)}$	60	-	V
Collector Cut off Current V_{CE} = 30V, I_B = 0	I_{CEO}	-	2	mA
Collector Cut off Current V_{CB} = 60V, I_E = 0	I_{CBO}	-	1	
Emitter Cut off Current V_{EB} = 5V, I_C = 0	I_{EBO}	-	2	
On Characteristics (1)				
DC Current Gain I_C = 1A, V_{CE} = 4V I_C = 2A, V_{CE} = 4V	h_{FE}	1,000 500	-	-
Collector-Emitter Saturation Voltage I_C = 2A, I_B = 8mA	$V_{CE\ (sat)}$	-	2.5	V
Base-Emitter On Voltage I_C = 2A, V_{CE} = 4V	$V_{BE\ (on)}$	-	2.8	
Dynamic Characteristics				
Small-Signal Current Gain I_C = 0.75A, V_{CE} = 10V, f = 1MHz	h_{fe}	25	-	-
Output Capacitance V_{CB} = 10V, I_E = 0, f = 0.1MHz TIP110 TIP115	C_{ob}	-	250 150	pF

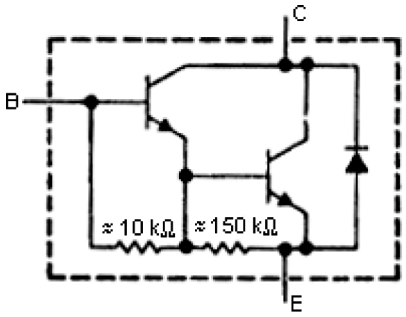
(1) Pulse Test: Pulse Width = 300µs, Duty Cycle ≤2%.

Figure - 1 Power Derating



Internal Schematic Diagram

NPN TIP110



PNP TIP115

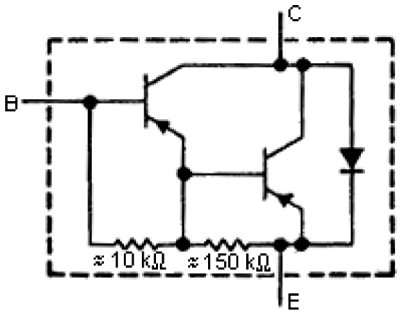


Figure - 2 Switching Time

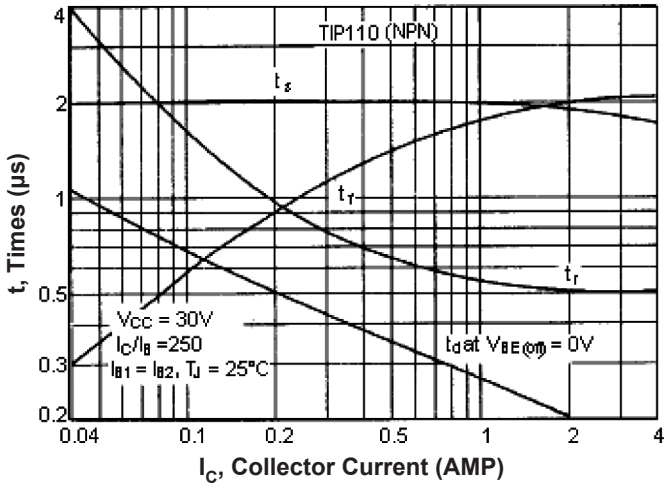


Figure - 3 Switching Time

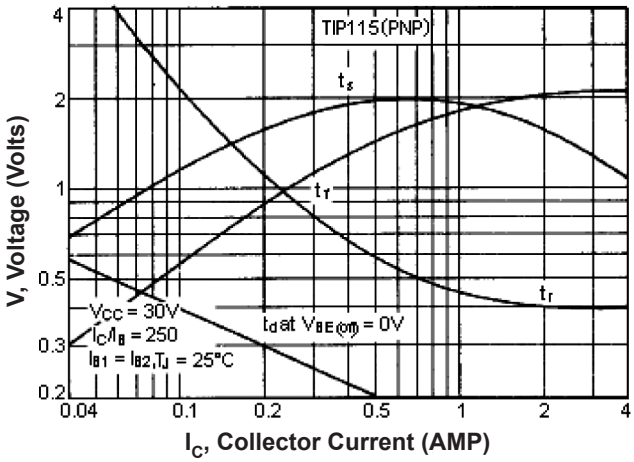


Figure - 4 Capacitances

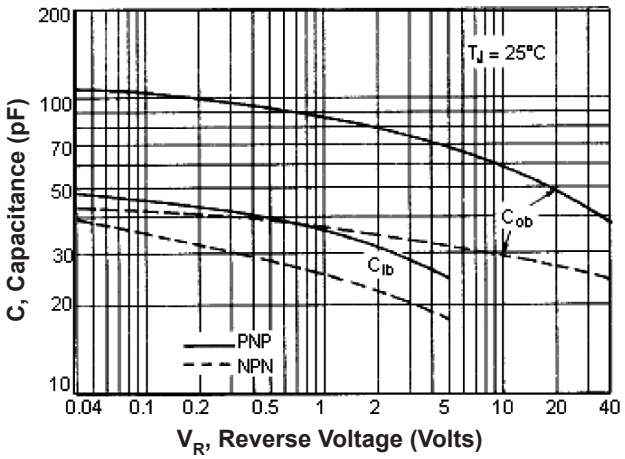


Figure - 5 Active Region Safe Operating Area

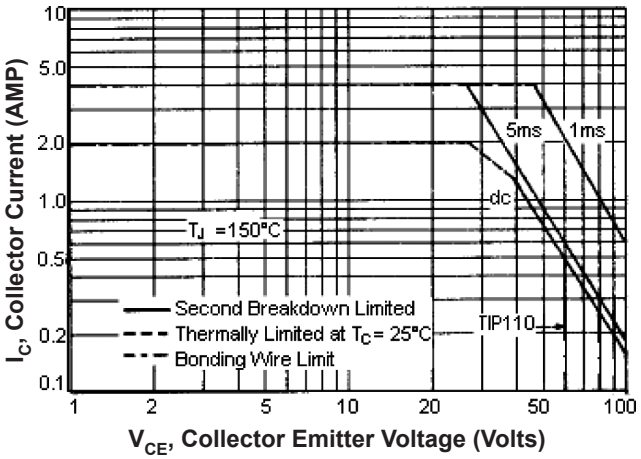
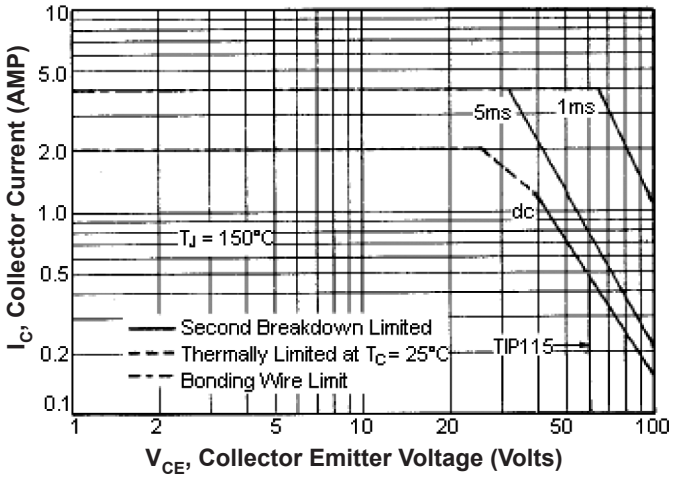
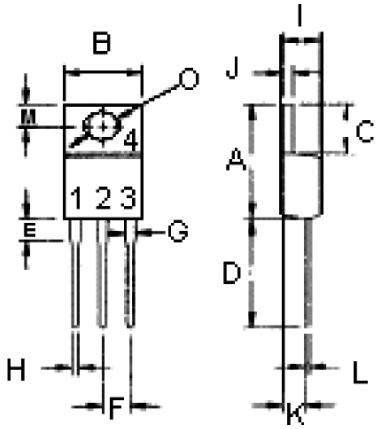


Figure - 6 Active Region Safe Operating Area





Pin Configuration:

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

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°C; T_C is variable depending on power level. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J\,(PK)}$ ≤150°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.

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