

TIP110, TIP115

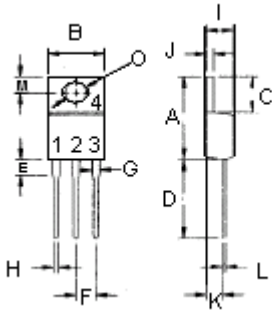
Darlington Transistors



Features:

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

- Collector-emitter sustaining voltage- $V_{CEO(sus)} = 60V$ (Minimum) - TIP110, TIP115.
- Collector-emitter saturation voltage- $V_{CE(sat)} = 2.5V$ (Maximum) at $I_C = 2.0A$.
- Monolithic construction with built-in-base-emitter shunt resistor.



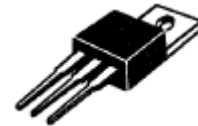
- Pin 1. Base
 2. Collector
 3. Emitter
 4. Collector (Case)

Dimension	Minimum	Maximum
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	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

Dimensions : Millimetres

NPN	PNP
TIP110	TIP115

2.0 Ampere
 Darlington
 Complementary Silicon
 Power Transistors
 60 Volts
 50 Watts



TO-220

Maximum Ratings

Characteristic	Symbol	TIP110 TIP115	Unit
Collector-Emitter Voltage	V_{CEO}	60	V
Collector-Base Voltage	V_{CBO}		
Emitter-Base Voltage	V_{EBO}	5.0	
Collector Current-Continuous Peak	I_C	2.0	A
	I_{CM}	4.0	
Base Current	I_B	50	mA
Total Power Dissipation at $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	50	W
		0.4	
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150	$^\circ C$

Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	2.5	$^\circ C/W$

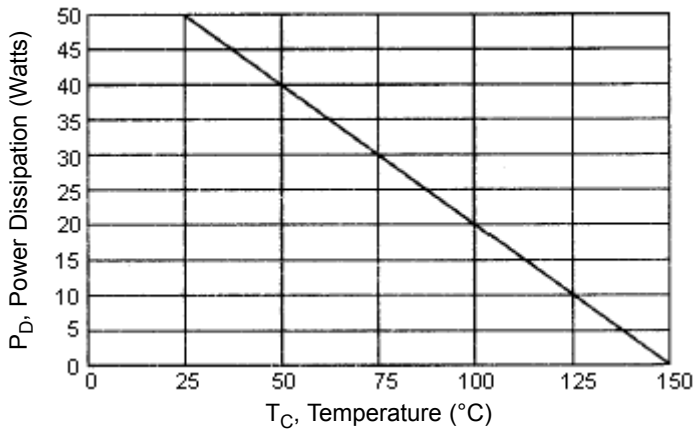


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Figure - 1 Power Derating



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

Characteristic	Symbol	Minimum	Maximum	Unit
OFF Characteristics				
Collector-Emitter Sustaining Voltage (1) ($I_C = 30\text{mA}$, $I_B = 0$)	TIP110, TIP115 $V_{CEO(sus)}$	60	-	V
Collector Cut off Current ($V_{CE} = 30\text{V}$, $I_B = 0$)	TIP110, TIP115 I_{CEO}	-	2.0	mA
Collector Cut off Current ($V_{CB} = 60\text{V}$, $I_E = 0$)	TIP110, TIP115 I_{CBO}	-	1.0	
Emitter Cut off Current ($V_{EB} = 5.0\text{V}$, $I_C = 0$)	I_{EBO}	-	2.0	
ON Characteristics (1)				
DC Current Gain ($I_C = 1.0\text{A}$, $V_{CE} = 4.0\text{V}$) ($I_C = 2.0\text{A}$, $V_{CE} = 4.0\text{V}$)	h_{FE}	1000 500	-	-
Collector-Emitter Saturation Voltage ($I_C = 2.0\text{A}$, $I_B = 8.0\text{mA}$)	$V_{CE(sat)}$	-	2.5	V
Base-Emitter On Voltage ($I_C = 2.0\text{A}$, $V_{CE} = 4.0\text{V}$)	$V_{BE(on)}$	-	2.8	
Dynamic Characteristics				
Small-Signal Current Gain ($I_C = 0.75\text{A}$, $V_{CE} = 10\text{V}$, $f = 1.0\text{MHz}$)	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 $\leq 2.0\%$.

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Internal Schematic Diagram

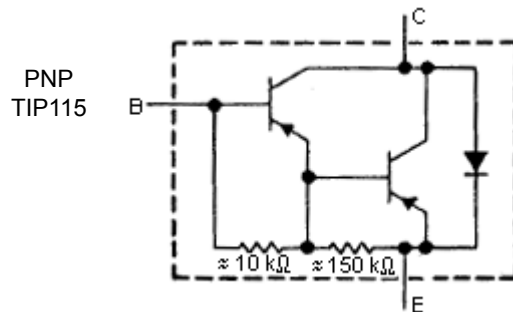
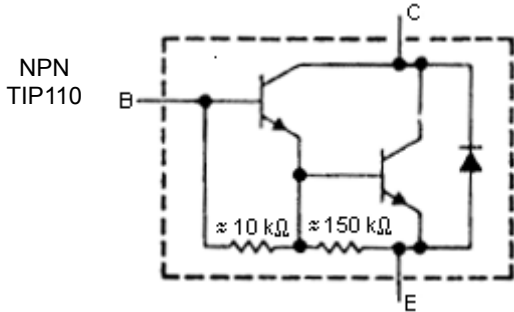


Figure - 2 Switching Time

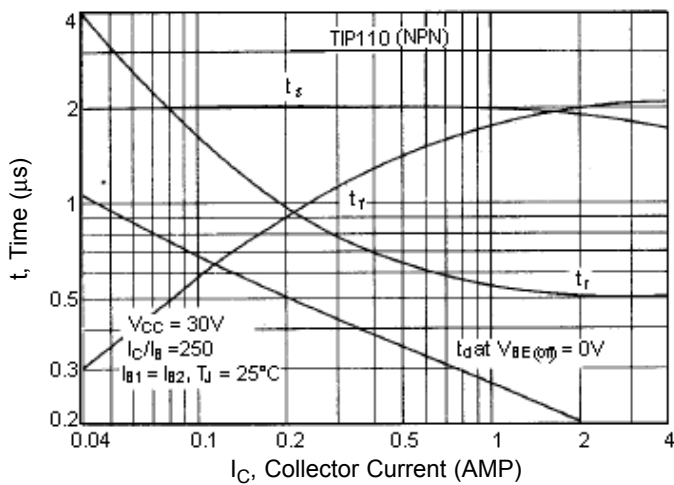


Figure - 3 Switching Time

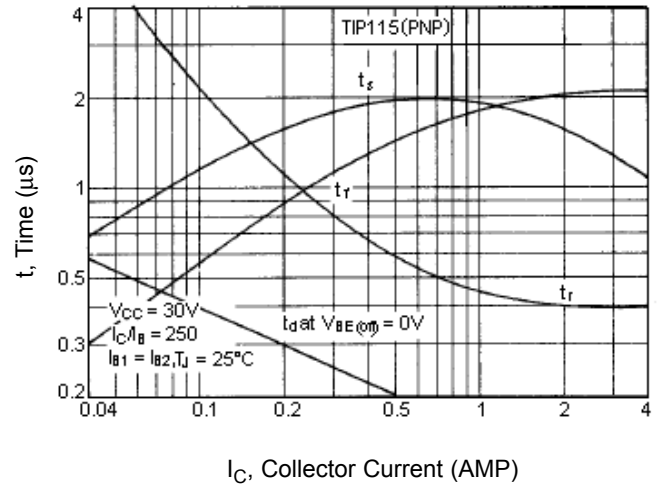


Figure - 4 Capacitances

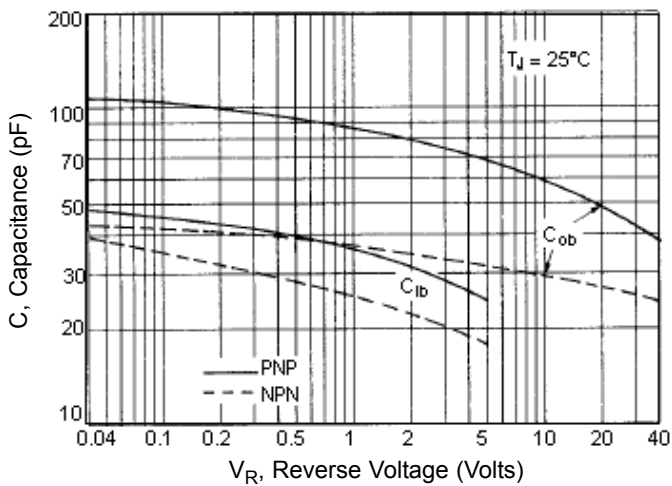
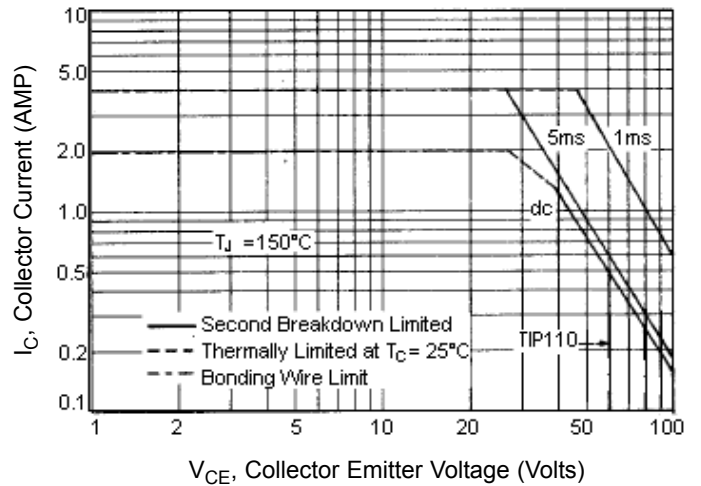


Figure - 5 Active Region Safe Operating Area

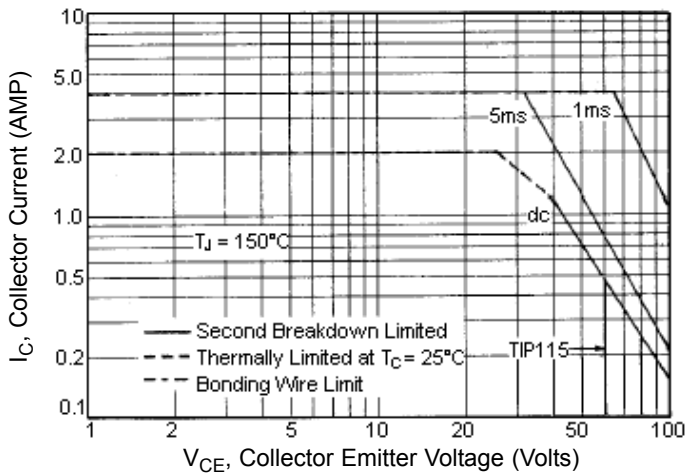


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Figure - 6 Active Region Safe Operating Area



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.

Specifications

I_C (av) maximum (A)	V_{CE0} maximum V	h_{FE} minimum at $I_C = 1\text{A}$	P_{tot} at 25°C (W)	Package	Type	Part Number
2	60	1000	50	TO-220	NPN	TIP110
					PNP	TIP115

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