

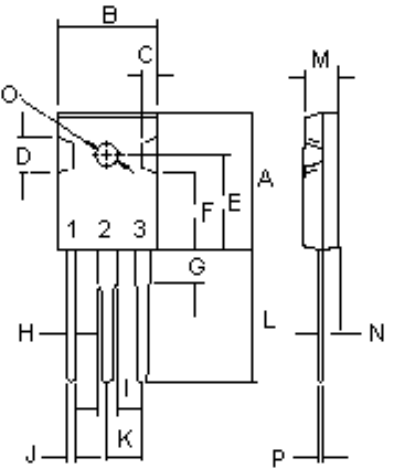
Darlington Transistors



Features:

Designed for general-purpose amplifier and low speed switching applications

- Collector-Emitter sustaining voltage
 - $V_{CEO(sus)}$ = 60 V (Minimum) - TIP145
 - = 80 V (Minimum) - TIP141, TIP146
 - = 100 V (Minimum) - TIP142, TIP147
- Collector-Emitter saturation voltage
 - $V_{CE(sat)}$ = 2 V (Maximum) at $I_C = 5 A$
- Monolithic construction with Built-in Base-Emitter shunt resistor



Pin 1. Base
2. Collector
3. Emitter

Dimensions	Minimum	Maximum
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

NPN PNP
TIP141 TIP145
TIP142 TIP146
TIP147

10 Amperes
Darlington
Complementary
Silicon
Power Transistors
60 - 100 V
125 W



TO-247 (3P)

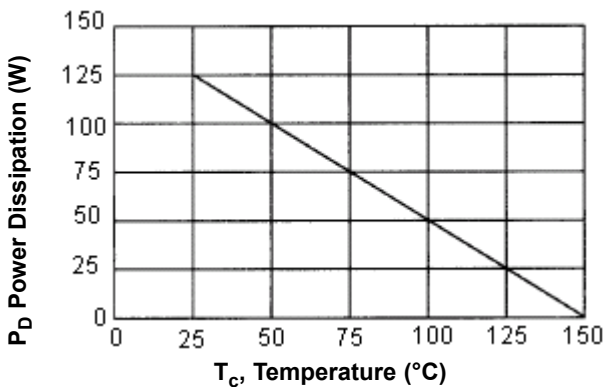


Maximum Ratings

Characteristic	Symbol	TIP145	TIP141 TIP146	TIP142 TIP147	Unit
Collector - Emitter Voltage	V _{CEO}	60	80	100	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°C Derate above 25°C	P _D	125 1			W W / °C
Operating and Storage Junction Temperature Range	T _J , T _{STG}	-65 to +150			°C

Thermal Characteristics

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



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

Characteristic	Symbol	Minimum	Maximum	Unit
OFF Characteristics				
Collector - Emitter Sustaining Voltage (1) ($I_C = 30 \text{ mA}$, $I_B = 0$) TIP145 TIP141, TIP146 TIP142, TIP147	$V_{CEO} \text{ (sus)}$	60 80 100	-	V
Collector Cut off Current ($V_{CE} = 30 \text{ V}$, $I_B = 0$) ($V_{CE} = 40 \text{ V}$, $I_B = 0$) ($V_{CE} = 50 \text{ V}$, $I_B = 0$) TIP145 TIP141, TIP146 TIP142, TIP147	I_{CEO}	-	2 2 2	mA
Collector Cut off Current ($V_{CB} = 60 \text{ V}$, $I_E = 0$) ($V_{CB} = 80 \text{ V}$, $I_E = 0$) ($V_{CB} = 100 \text{ V}$, $I_E = 0$) TIP145 TIP141, TIP146 TIP142, TIP147	I_{CBO}	-	1 1 1	
Emitter Cut off Current ($V_{EB} = 5 \text{ V}$, $I_C = 0$)	I_{EBO}	-	2	

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

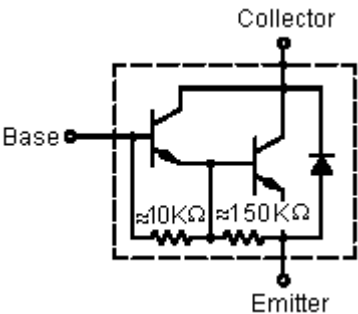
ON Characteristics (1)				
DC Current Gain ($I_C = 5\text{ A}$, $V_{CE} = 4\text{ V}$) ($I_C = 10\text{ A}$, $V_{CE} = 4\text{ V}$)	h_{FE}	1,000 500	-	-
Collector - Emitter Saturation Voltage ($I_C = 5\text{ A}$, $I_B = 10\text{ mA}$) ($I_C = 10\text{ A}$, $I_B = 40\text{ mA}$)	$V_{CE(\text{sat})}$	-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

Switching Characteristics					
Delay Time	$V_{CC} = 30\text{ V}$, $I_C = 5\text{ A}$ $I_{B1} = -I_{B2} = 20\text{ mA}$ $t_p = 20\text{ }\mu\text{s}$, Duty cycle $\leq 2\%$	t_d	0.15 (Typical)	-	μs
Rise Time		t_r	0.55 (Typical)	-	
Storage Time		t_s	2.5 (Typical)	-	
Fall Time		t_f		-	

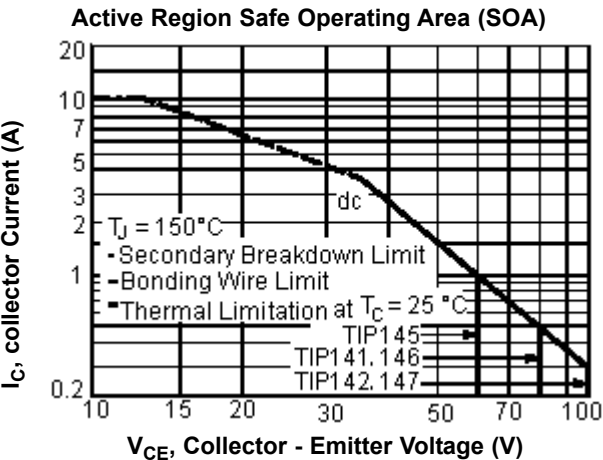
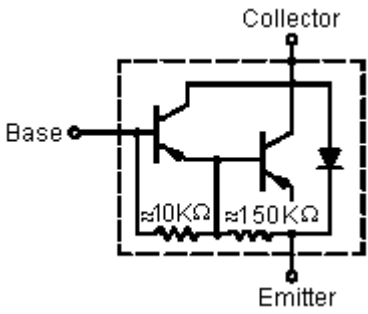
1. Pulse Test : Pulse width = 30 μs , Duty cycle = 2%

Internal Schematic Diagram

NPN : TIP141, TIP142



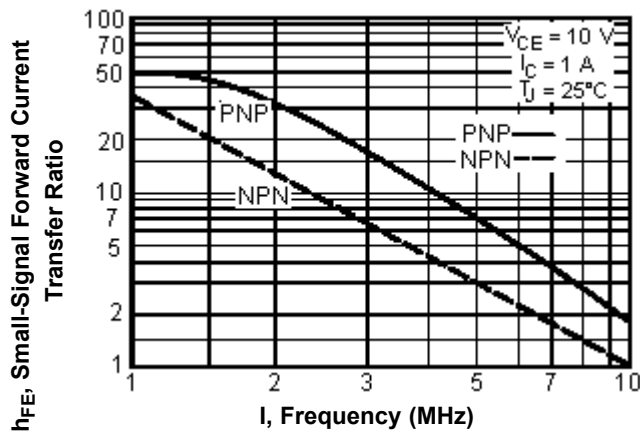
PNP : TIP145, TIP146, TIP147



There are two limitations 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 base 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

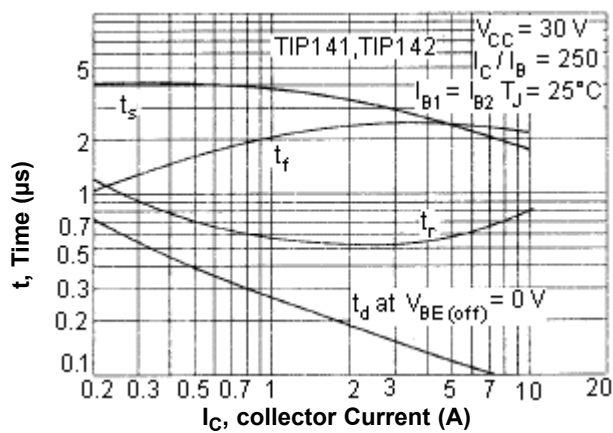
Darlington Transistors

Small-Signal Common-Emitter Forward Current Transfer Ratio

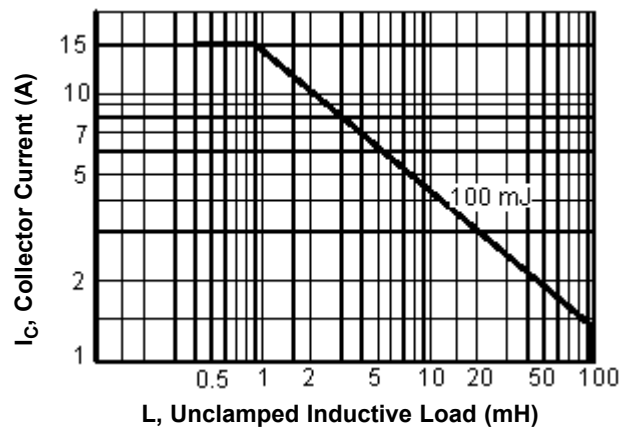


NPN : TIP141, TIP142

Switching Time

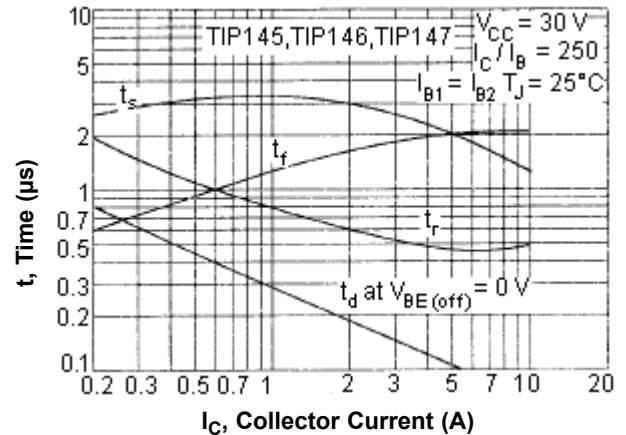


Unclamped Inductive Load

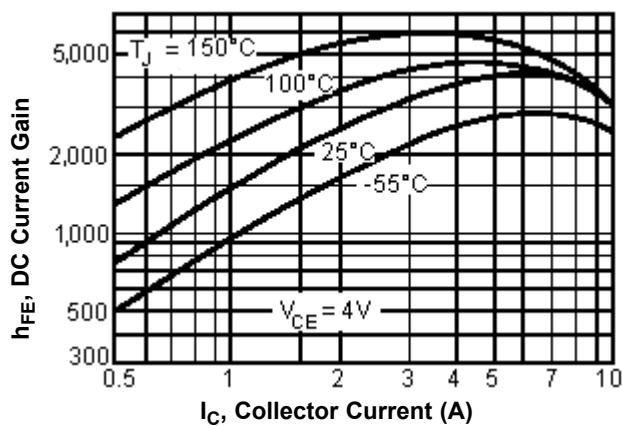


PNP : TIP145, TIP146, TIP147

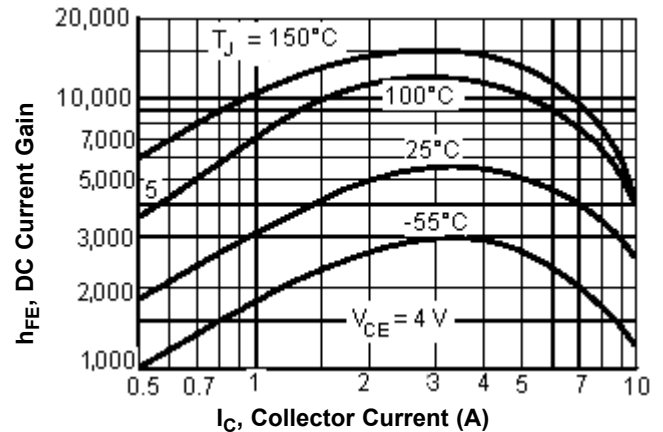
Switching Time



DC Current Gain



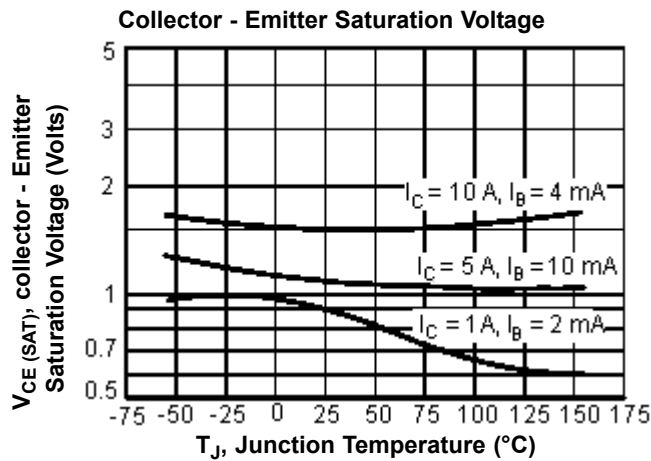
DC Current Gain



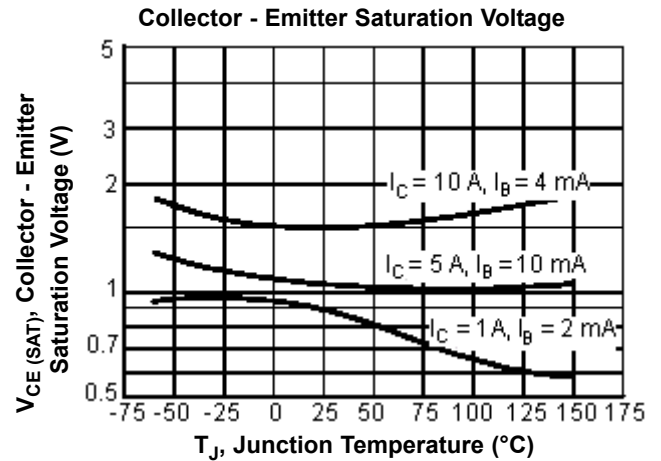
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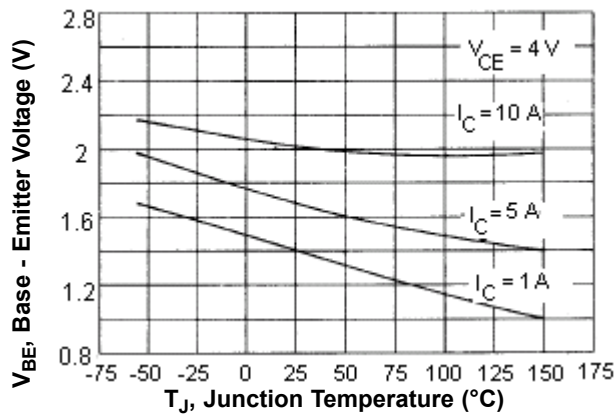
NPN : TIP141, TIP142



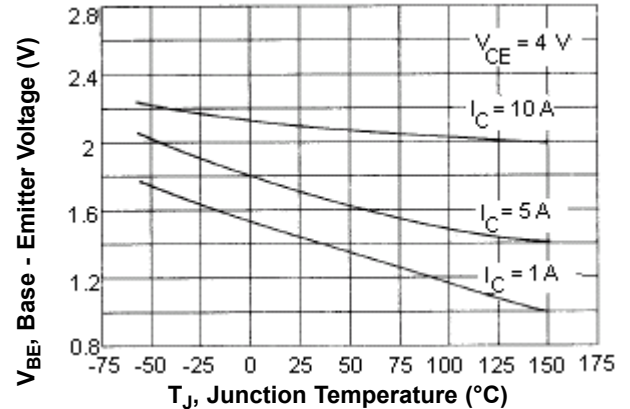
PNP : TIP145, TIP146, TIP147



Base - Emitter Voltage



Base - Emitter Voltage



Specification Table

I_C (A)	V_{CEO} Maximum (V)	h_{FE} Minimum at $I_C = 5 A$	P_{tot} at 25°C (W)	Package	Type	Part Number
10	80	1,000	125	TO-247 (3P)	NPN	TIP141
	100					TIP142
	60				PNP	TIP145
	80					TIP146
	100					TIP147

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