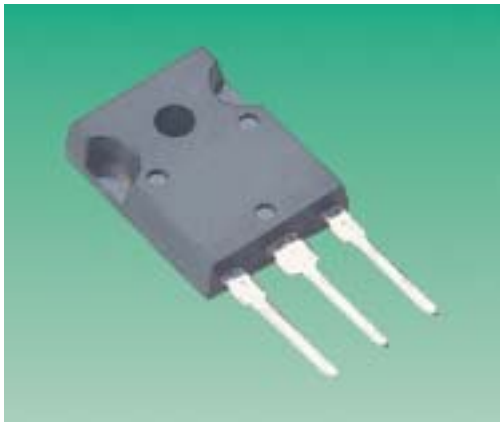
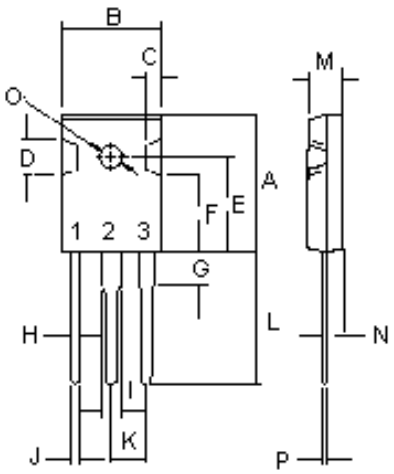
Darlington Transistors



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



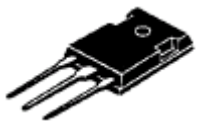
Pin 1. Base
2. Collector
3. Emitter

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
	TIP145
TIP141	TIP146
TIP142	TIP147

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



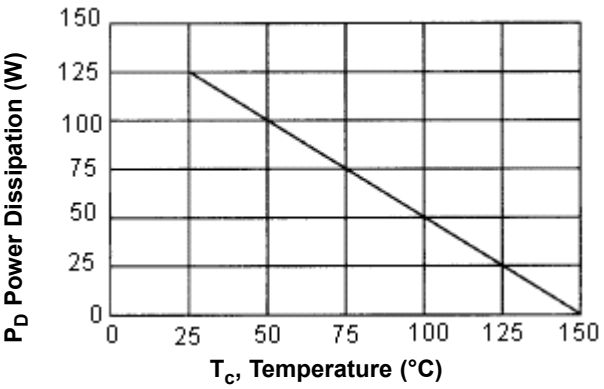
TO-247 (3P)

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	Rθjc	1	°C / W



Electrical Characteristics (T_C = 25°C unless otherwise specified)

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

Electrical Characteristics (T_c = 25°C unless otherwise specified)

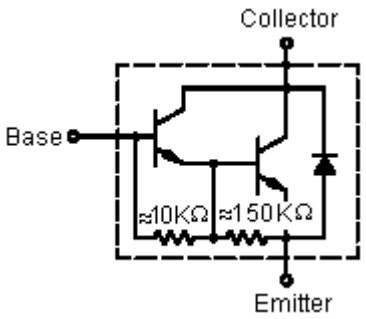
ON Characteristics (1)					
DC Current Gain (I_C = 5 A, V_{CE} = 4 V) (I_C = 10 A, V_{CE} = 4 V)	h_{FE}	1,000 500	-	-	
Collector - Emitter Saturation Voltage (I_C = 5 A, I_B = 10 mA) (I_C = 10 A, I_B = 40 mA)	$V_{CE\ (sat)}$	-	2 3	V	
Base - Emitter Saturation Voltage (I_C = 10 A, I_B = 40 mA)	$V_{BE\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

Switching Characteristics					
Delay Time	V_{CC} = 30 V, I_C = 5 A I_{B1} = -I_{B2} = 20 mA t_p = 20 µs, Duty cycle ≤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		-	

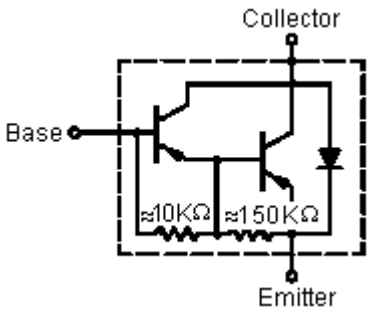
1. Pulse Test : Pulse width = 30 µs, Duty cycle = 2%

Internal Schematic Diagram

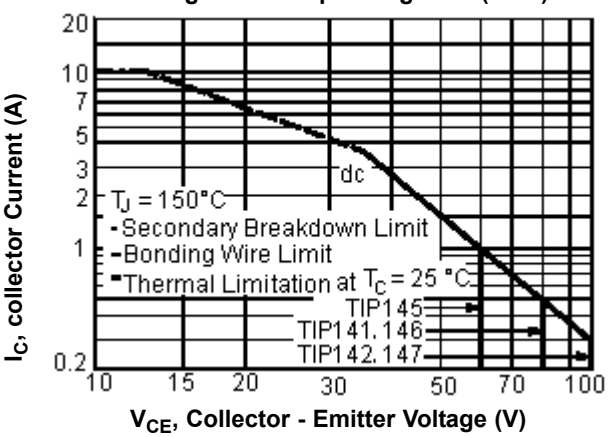
NPN : TIP141, TIP142



PNP : TIP145, TIP146, TIP147

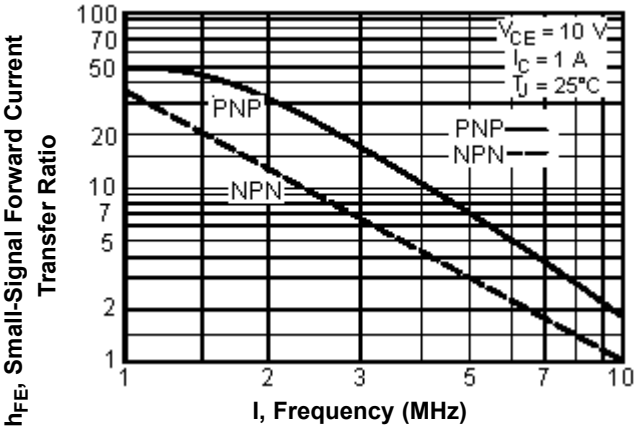


Active Region Safe Operating Area (SOA)

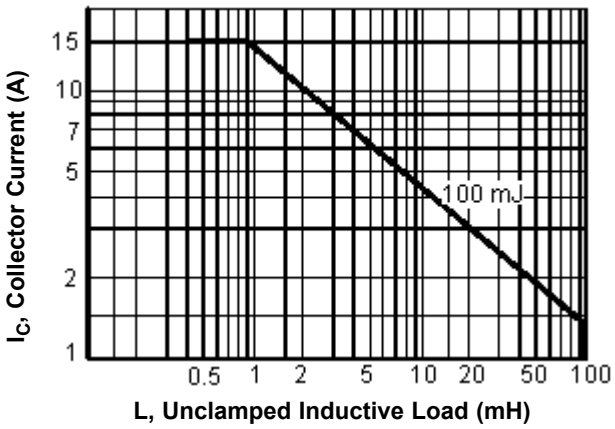


There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.
The data of SOA curve is base on $T_{J\ (PK)}$ = 150°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

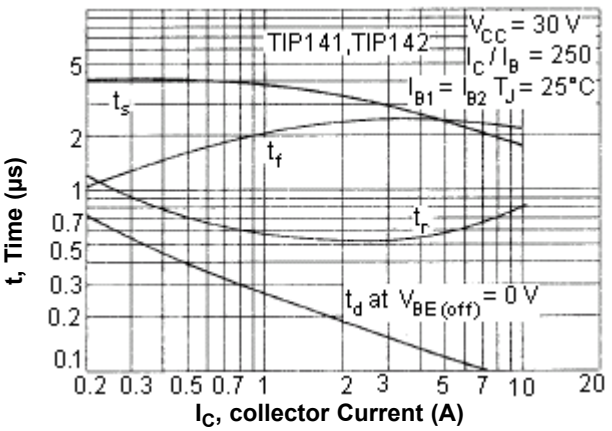


Unclamped Inductive Load



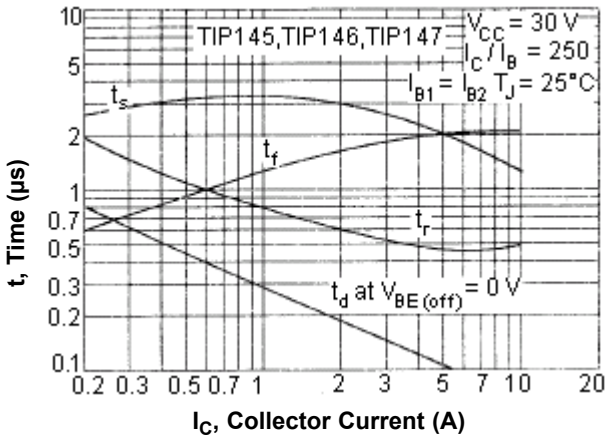
NPN : TIP141, TIP142

Switching Time

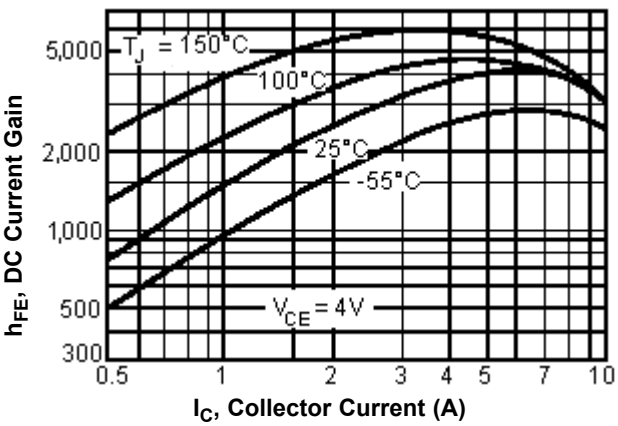


PNP : TIP145, TIP146, TIP147

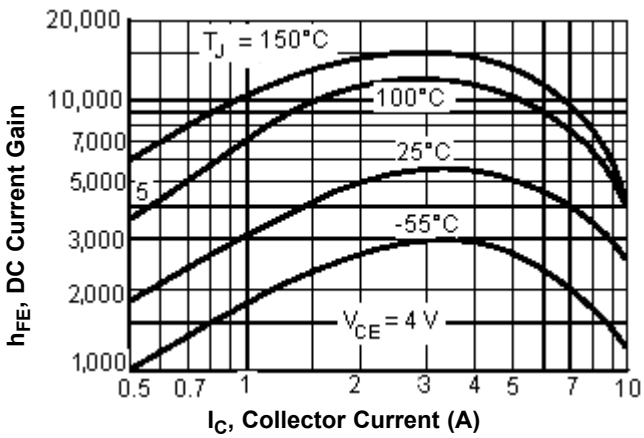
Switching Time



DC Current Gain



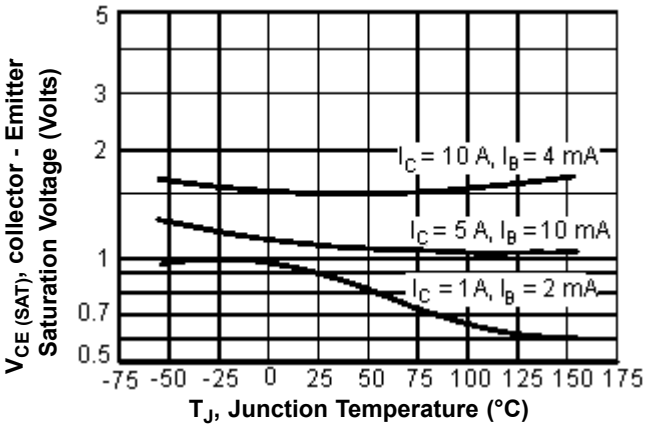
DC Current Gain



Darlington Transistors

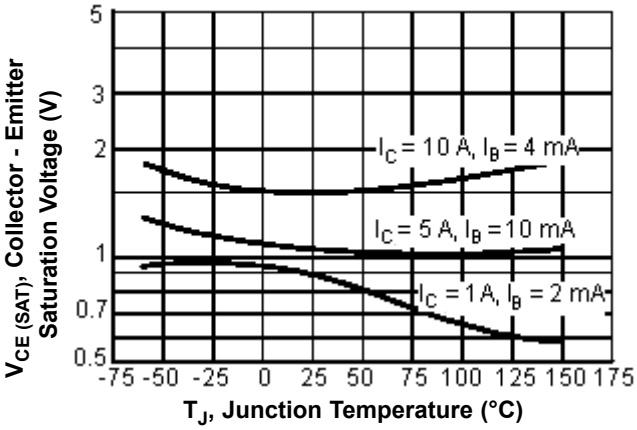
NPN : TIP141, TIP142

Collector - Emitter Saturation Voltage

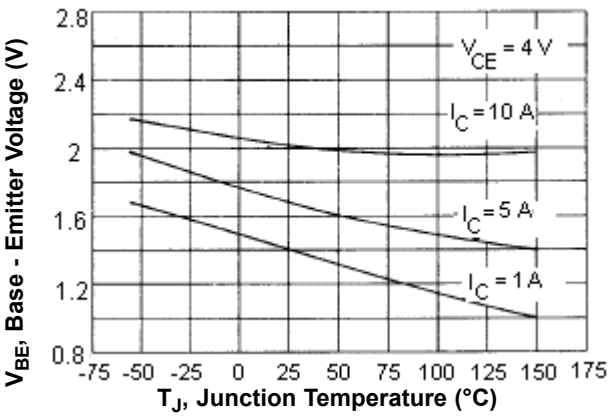


PNP : TIP145, TIP146, TIP147

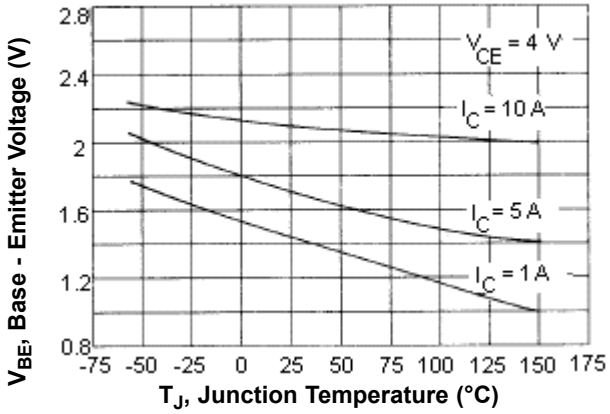
Collector - Emitter Saturation Voltage



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