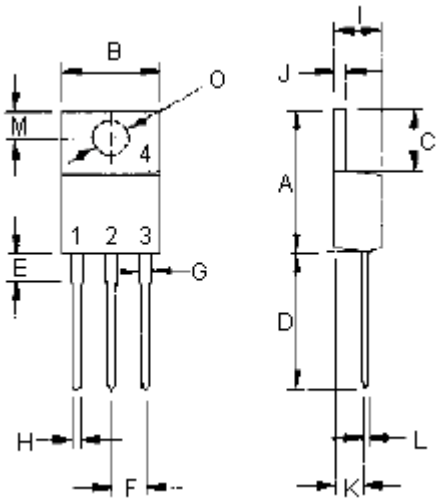
Darlington Transistors

Features:

- Designed for general-purpose amplifier and low speed switching applications
- Collector-emitter sustaining voltage - $V_{CEO\ (sus)}$ = 60 V (minimum) - TIP120, TIP125
  80 V (minimum) - TIP121, TIP126
  100 V (minimum) - TIP122, TIP127
- Collector-emitter saturation voltage - $V_{CE\ (sat)}$ = 2 V (maximum) at I_C = 3 A
- Monolithic construction with built-in base-emitter shunt resistors



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

Dimensions	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	2.2	2.97
L	0.33	0.55
M	2.48	2.98
O	3.7	3.9

Dimensions : Millimetres

NPN **PNP**
TIP120 **TIP 125**
TIP121 **TIP 126**
TIP122 **TIP 127**

5 A
Darlington
Complementary Silicon
Power Transistors
60 to 400 V
65 W

TO-220

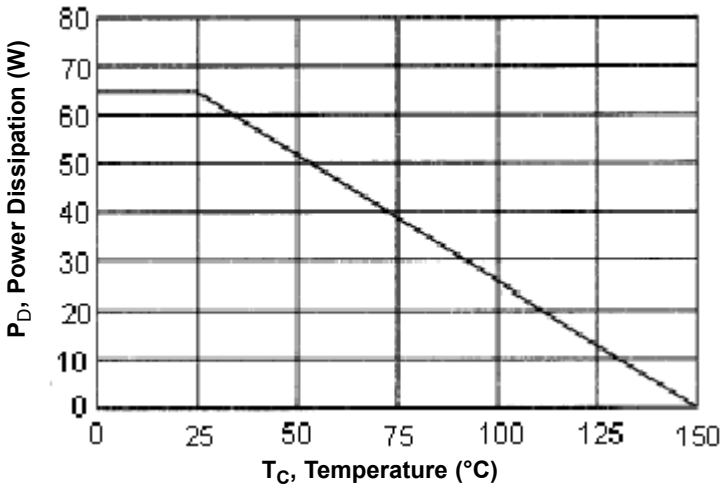
Maximum Ratings

Parameter	Symbol	TIP120 / TIP125	TIP121 / TIP126	TIP122 / TIP127	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}	5 8			A
Base Current	I_B	120			mA
Total Power Dissipation at T_C = 25°C Derate above 25°C	P_D	65 0.52			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	1.92	°C / W

Power Derating



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

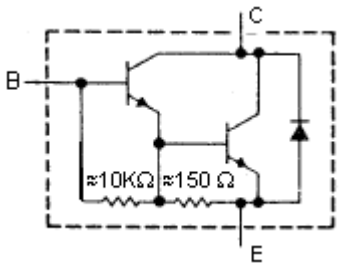
Characteristic		Symbol	Minimum	Maximum	Unit
Off Characteristics					
Collector-Emitter Breakdown Voltage (1) (I_C = 30 mA, I_B = 0)	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	$V_{CEO\ (SUS)}$	60 80 100	-	V
Collector Cut off Current (V_{CE} = 30 V, I_B = 0) (V_{CE} = 40 V, I_B = 0) (V_{CE} = 50 V, I_B = 0)	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	I_{CEO}	-	0.5 0.5 0.5	mA
Collector Cut off Current (V_{CE} = 60 V, I_B = 0) (V_{CE} = 80 V, I_B = 0) (V_{CE} = 100 V, I_B = 0)	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	I_{CBO}	-	0.2 0.2 0.2	
Collector Cut off Current (V_{EB} = 5 V, I_C = 0)		I_{EBO}	-	2	
On Characteristics (1)					
DC Current Gain (I_C = 0.5 A, V_{CE} = 3 V) (I_C = 3 A, VCE = 3 V)		h_{FE}	1,000 1,000	-	-
Collector-Emitter Saturation Voltage (I_C = 3 A, I_B = 12 mA) (I_C = 5 A, I_B = 20 mA)		$V_{CE\ (sat)}$	-	2 4	V
Base-Emitter on Voltage (I_C = 3 A, V_{CE} = 3 V)		$V_{BE\ (on)}$	-	2.5	

Dynamic Characteristics					
Small-Signal Current Gain (I_C = 3 A, V_{CE} = 4 V, f = 1 MHz)		h_{fe}	4	-	-
Output Capacitance (V_{CB} = 10 V, I_E = 0, f = 0.1 MHz)	TIP120, TIP121, TIP122 TIP125, TIP126, TIP127	C_{ob}	-	300 250	pF

(1) Pulse Test : Pulse width = 300 µs, duty cycle ≤2%

Internal Schematic Diagram

NPN
TIP120
TIP121
TIP122



PNP
TIP125
TIP126
TIP127

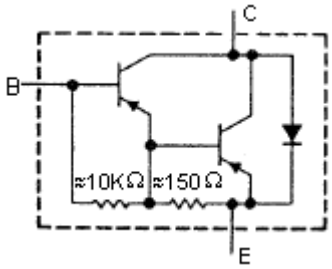


Figure - 2 Switching Time

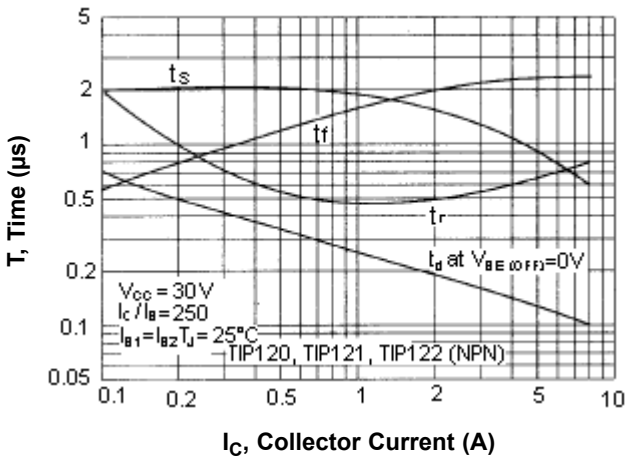


Figure - 3 Switching Time

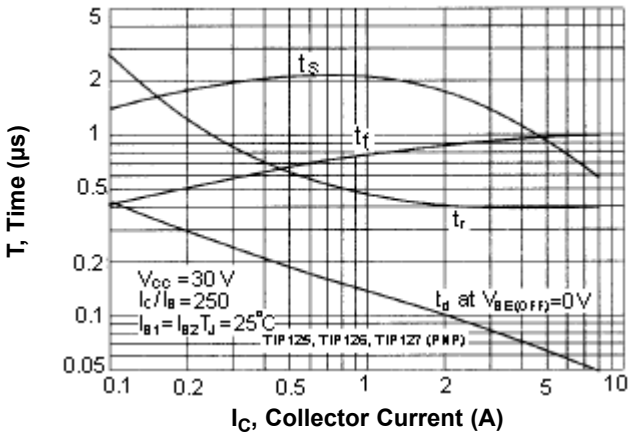


Figure - 4 Small Signal Current Gain

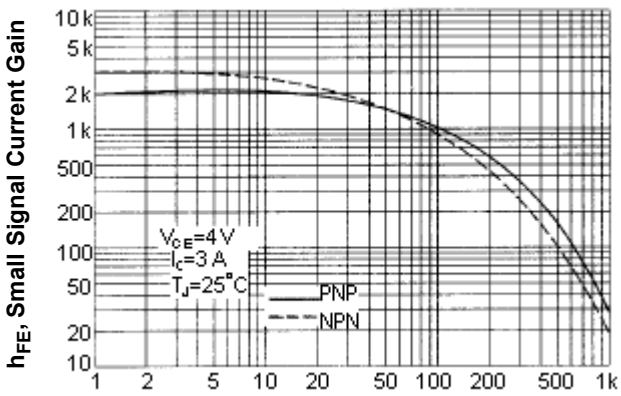


Figure - 5 Capacitances

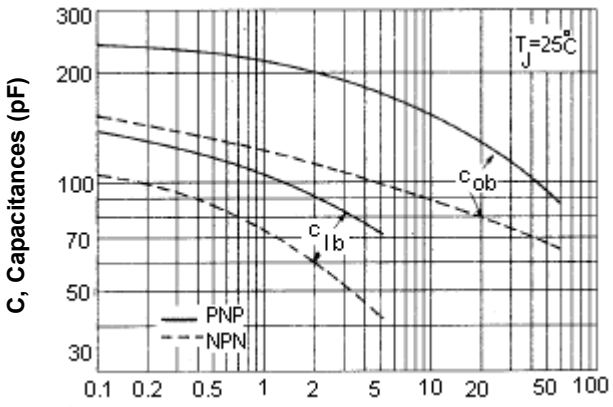
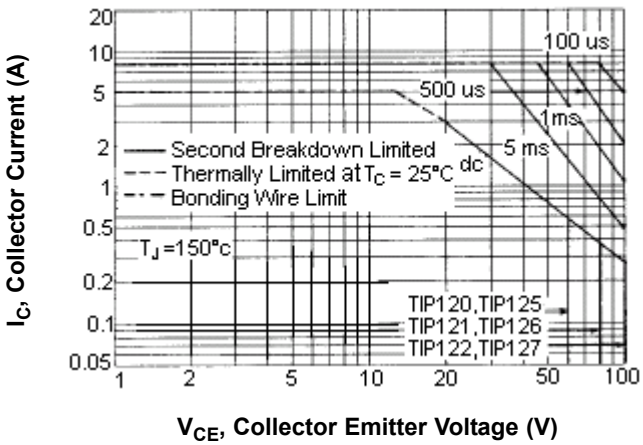
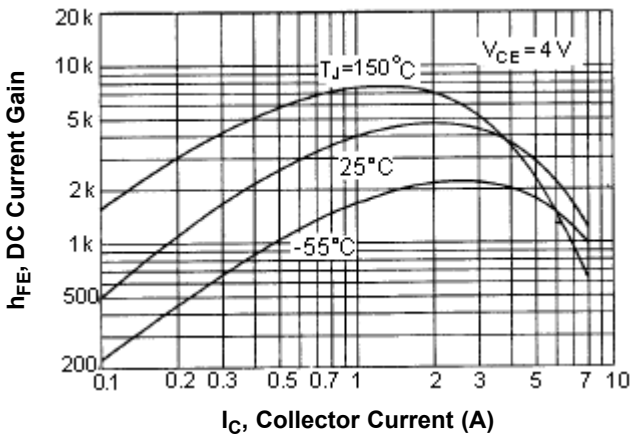


Figure - 6 Active Region Safe Operating Area



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 not be subjected to greater dissipation than the curves indicate
The data of Figure - 6 is based 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)} \leq$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

Figure - 7 DC Current Gain



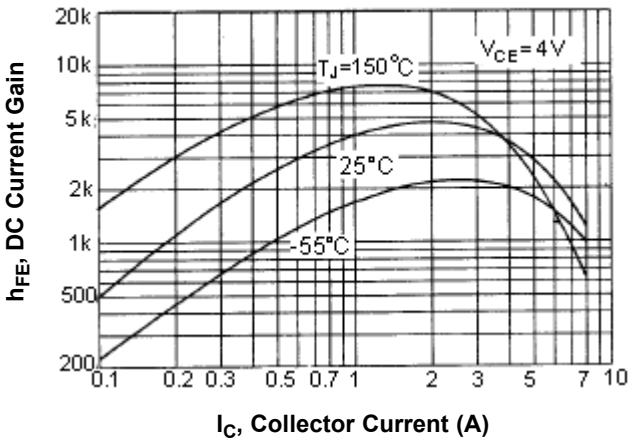
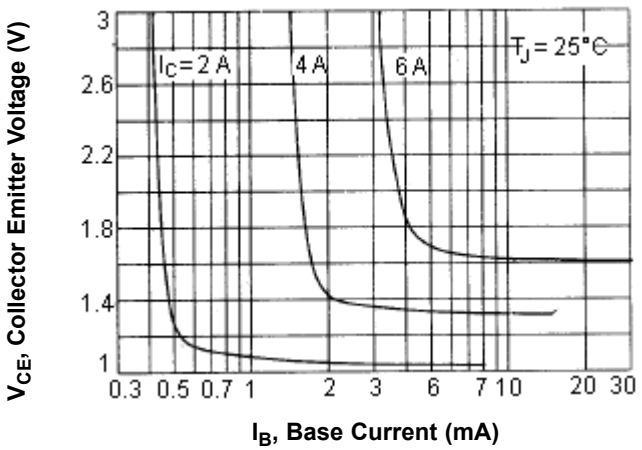


Figure - 8 Collector Saturation Region



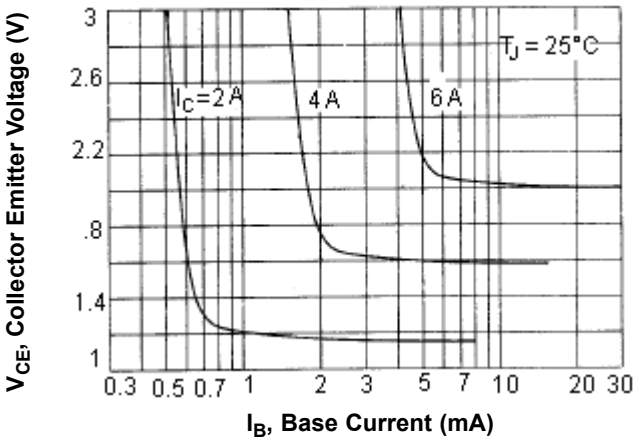
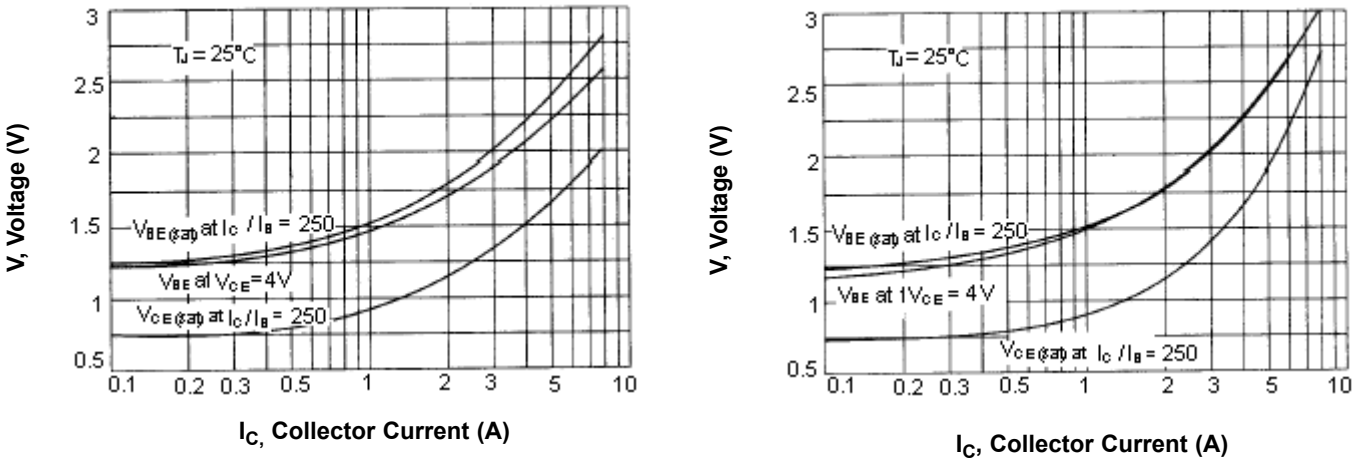


Figure - 9 "ON" Voltage



Specification Table

I_C A	V_{CEO} (Maximum) V	h_{FE} Minimum at I_C = 3A	P_{tot} at 25°C W	Package	Part Number	
					NPN	PNP
5	60	1,000	65	TO-220	TIP120	TIP125
	80				TIP121	TIP126
	100				TIP122	TIP127