TIP120, 121, 122, 125, 126, 127

Darlington Transistors

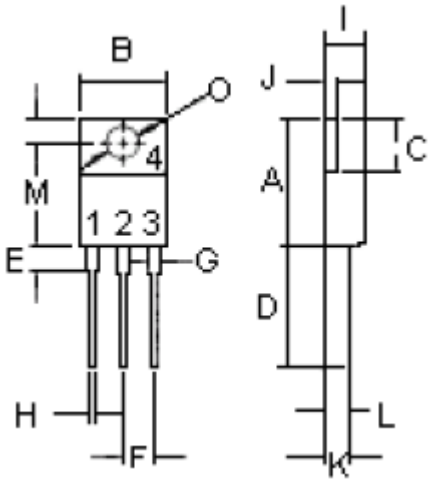
TO - 220

Features:

- 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

Application:

Designed for general-purpose amplifier and low speed switching applications



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

Pin

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

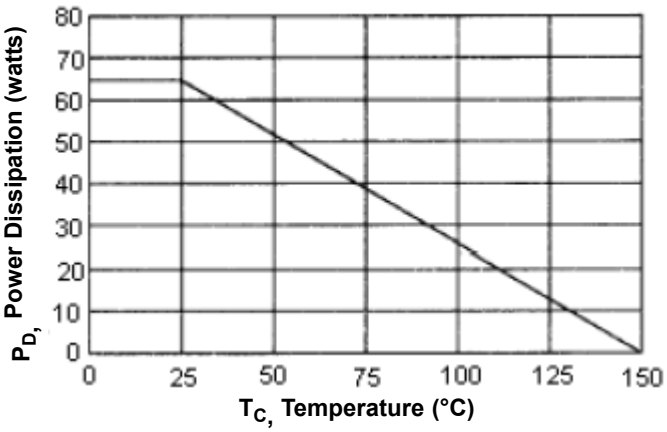
Maximum Ratings

Characteristic	Symbol	TIP120 / TIP125	TIP121 / TIP126	TIP122 / TIP127	Unit
Collector - emitter voltage	V_{CEO}	60	80	100	V
Collector - base voltage	V_{CBO}				V
Emitter - base voltage	V_{EBO}	5			V
Collector current - continuous - peak	I_C	5 8			A
Base current	I_B	120			A
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	$R_{\theta jc}$	1.92	°C/W

Figure - 1 Power Derating



Electrical Characteristics (T_C = 25°C Unless Otherwise noted)

Characteristics		Symbol	Minimum	Maximum	Units
Off Characteristics					
Collector - emitter sustaining 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_{CB} = 60 V, I_B = 0) (V_{CB} = 80 V, I_B = 0) (V_{CB} = 100 V, I_B = 0)	 TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	I_{CBO}	-	0.2 0.2 0.2	mA
Collector cut off current (V_{EB} = 5 V, I_C = 0)		I_{EBO}	-	2	mA
On Characteristics (1)					
DC current gain (I_C = 0.5 A; V_{CE} = 3 V) (I_C = 3 A; V_{CE} = 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	V

TIP120, 121, 122, 125, 126, 127

Darlington Transistors

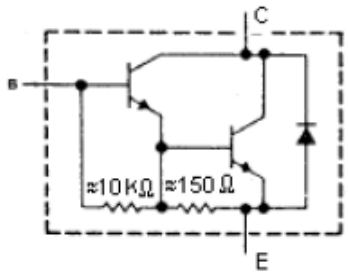
Electrical Characteristics (T_C = 25°C Unless Otherwise noted)

Characteristics	Symbol	Minimum	Maximum	Units
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}	-	300 200	pF

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

Internal Schematic Diagram

NPN
TIP120
TIP121
TIP122



PNP
TIP125
TIP126
TIP127

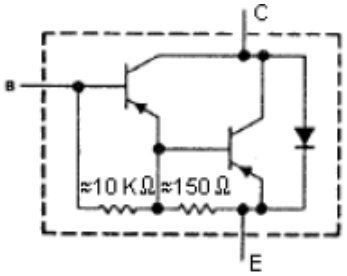


Figure-2 Switching Time

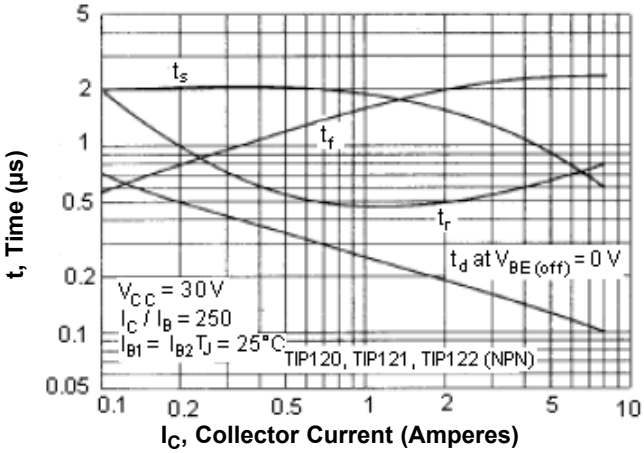


Figure-3 Switching Time

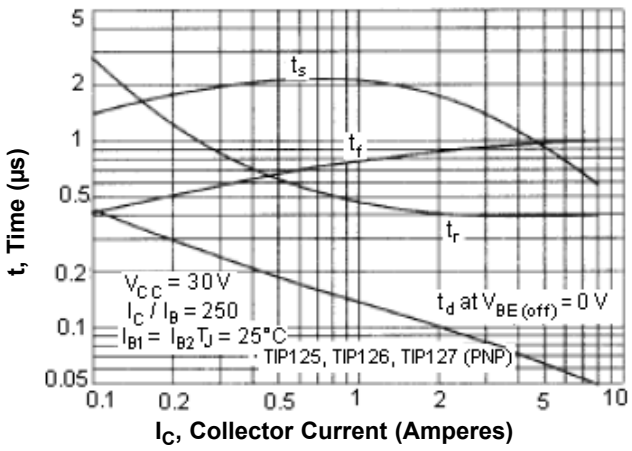


Figure-4 Small Signal Current Gain

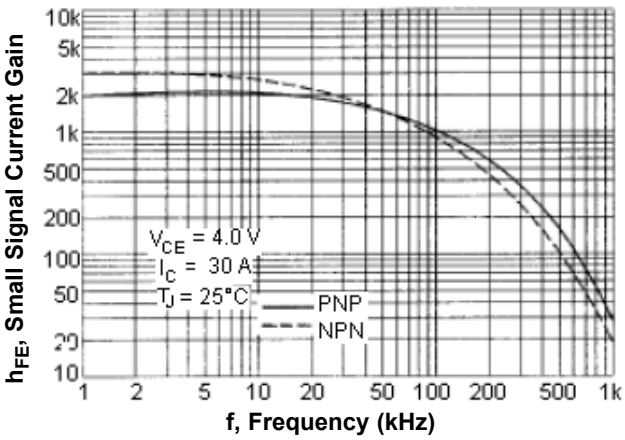


Figure-5 Capacitances

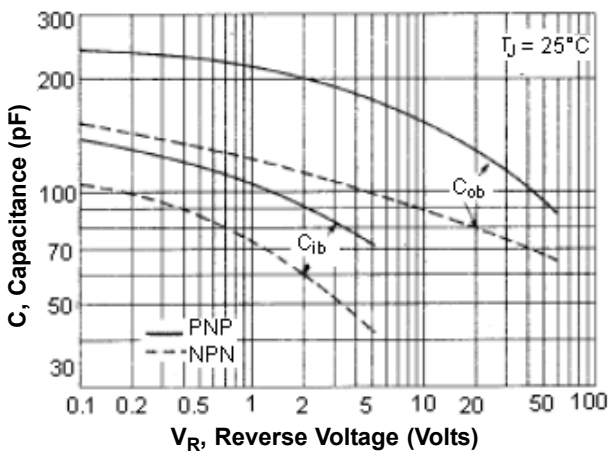
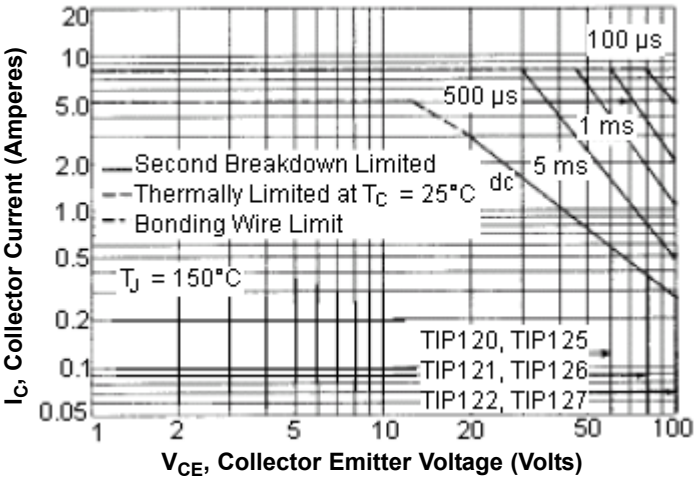


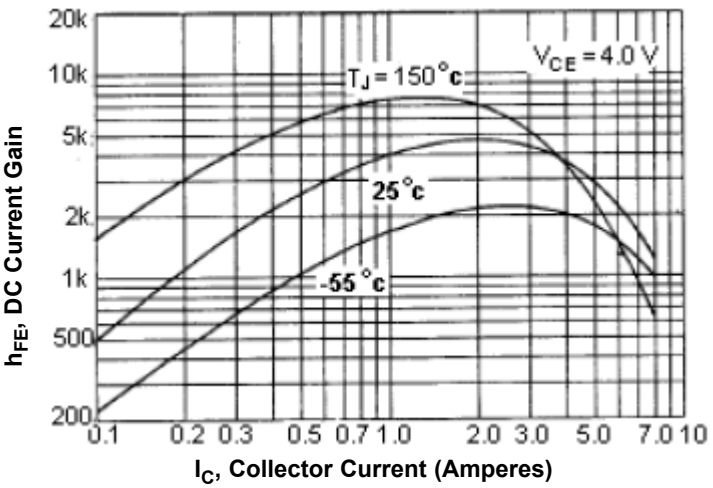
Figure-6 Active Region Safe Operating Area



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 $T_{J(PK)}$ =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



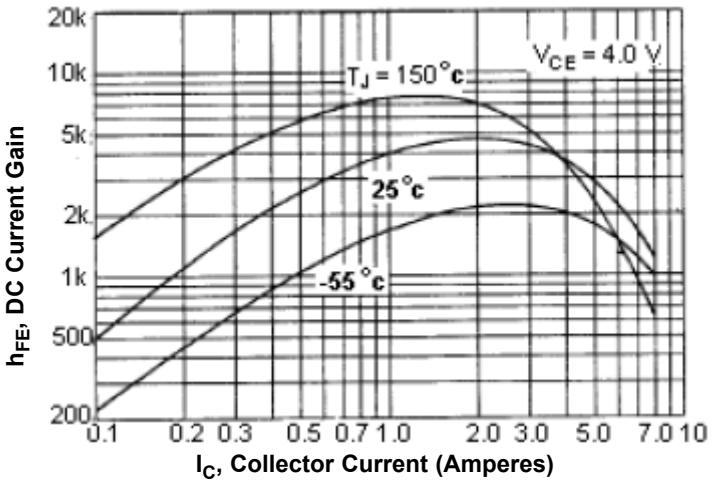
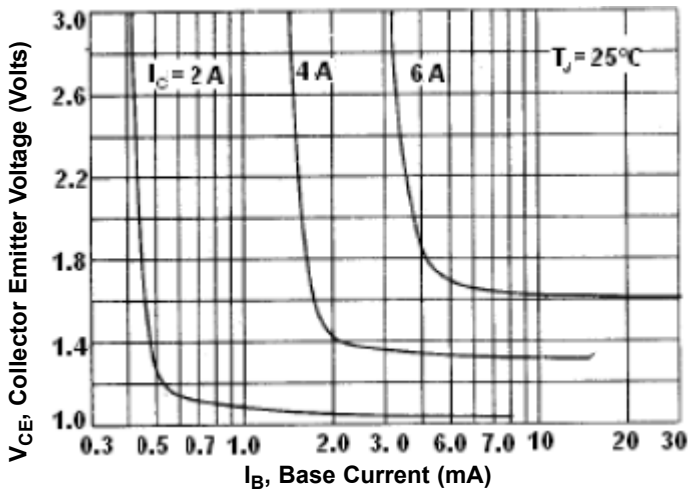


Figure-8 Collector Saturation Region



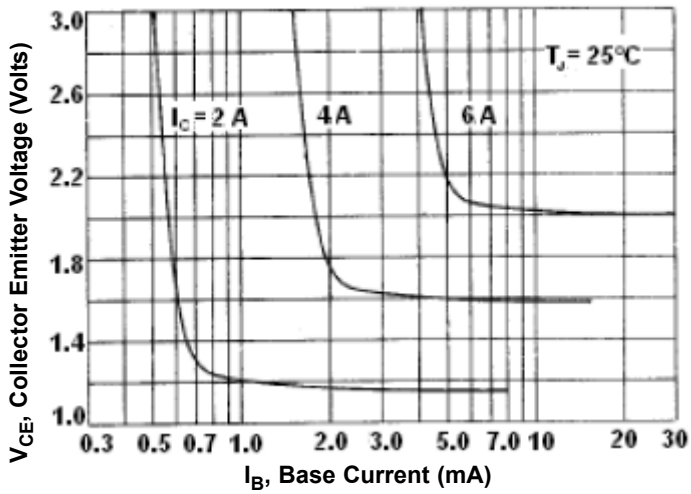
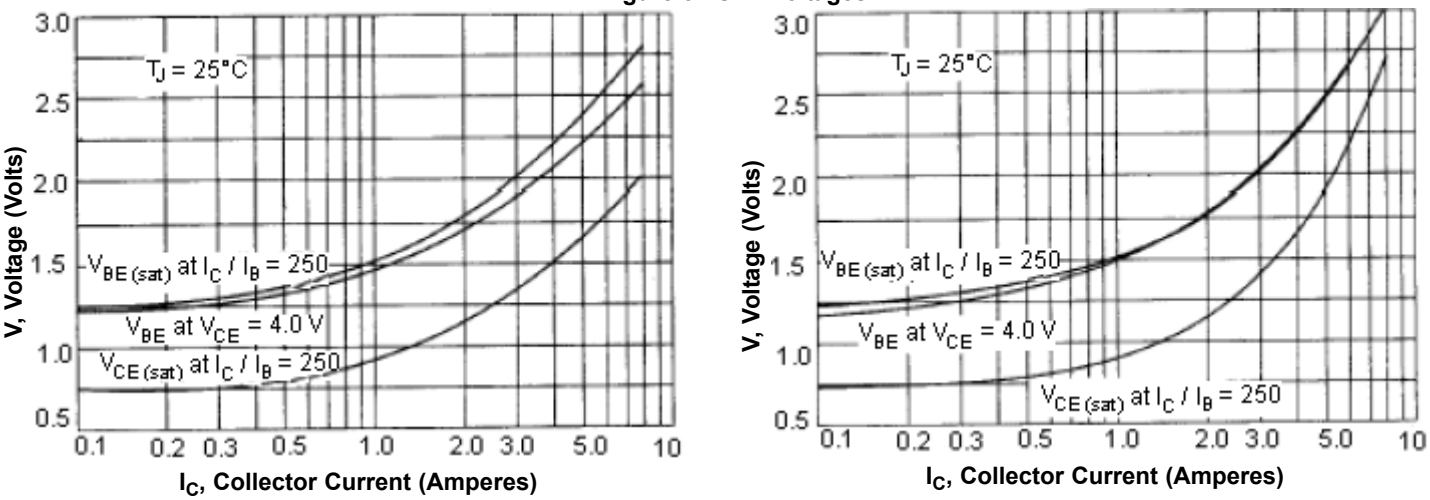


Figure-9 “ON” Voltages



Specifications Table

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