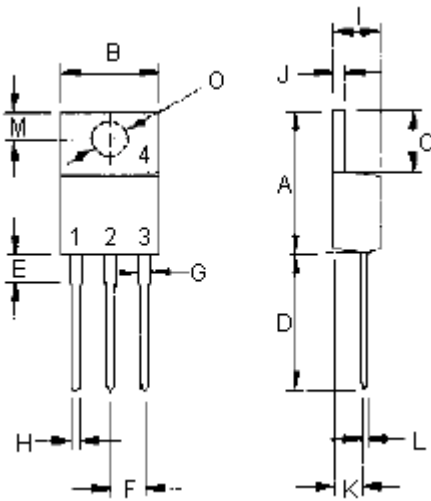


Darlington Transistors



Features:

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



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

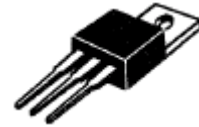
Dimensions	Minimum	Maximum
A	14.68	15.31
B	9.78	10.42
C	5.01	6.52
D	13.06	14.62
E	3.57	4.07
F	2.42	3.66
G	1.12	1.36
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.2	2.97
L	0.33	0.55
M	2.48	2.98
O	3.7	3.9

Dimensions : Millimetres

NPN
TIP120
TIP121
TIP122

PNP
TIP 125
TIP 126
TIP 127

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



TO-220

Maximum Ratings

Parameter	Symbol	TIP120	TIP121	TIP122	Unit
		TIP125	TIP126	TIP127	
Collector-Emitter Voltage	V_{CEO}	60	80	100	V
Collector-Base Voltage	V_{CBO}				
Emitter-Base Voltage	V_{EBO}	5			
Collector Current - Continuous	I_C	5			A
- Peak	I_{CM}	8			
Base Current	I_B	120			mA
Total Power Dissipation at $T_C = 25^\circ\text{C}$	P_D	65			W
Derate above 25°C		0.52			
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-65 to +150			$^\circ\text{C}$

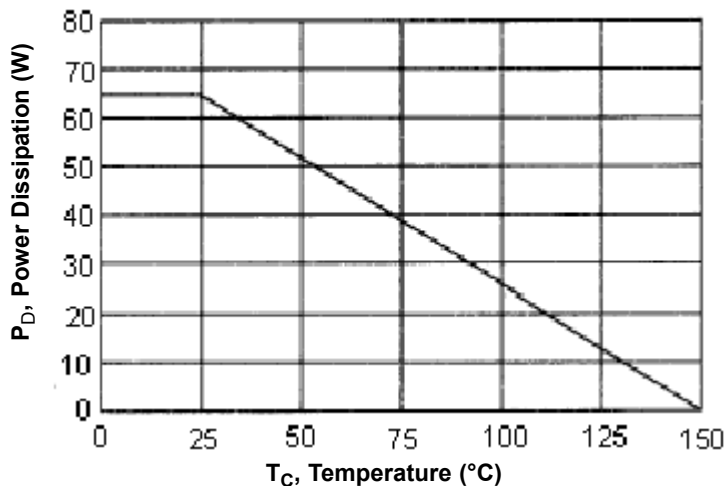
Darlington Transistors



Thermal Characteristics

Characteristic	Symbol	Maximum	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.92	$^{\circ}\text{C} / \text{W}$

Power Derating



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

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

Darlington Transistors

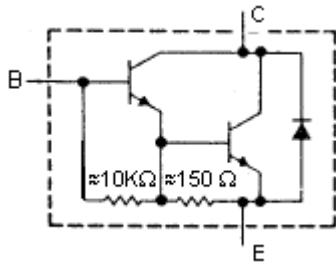


Dynamic Characteristics				
Small-Signal Current Gain ($I_C = 3\text{ A}$, $V_{CE} = 4\text{ V}$, $f = 1\text{ MHz}$)	h_{fe}	4	-	-
Output Capacitance ($V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	C_{ob}	-	300 250	pF

(1) Pulse Test : Pulse width = 300 μs , duty cycle $\leq 2\%$

Internal Schematic Diagram

NPN
TIP120
TIP121
TIP122



PNP
TIP125
TIP126
TIP127

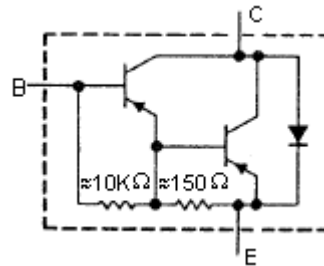


Figure - 2 Switching Time

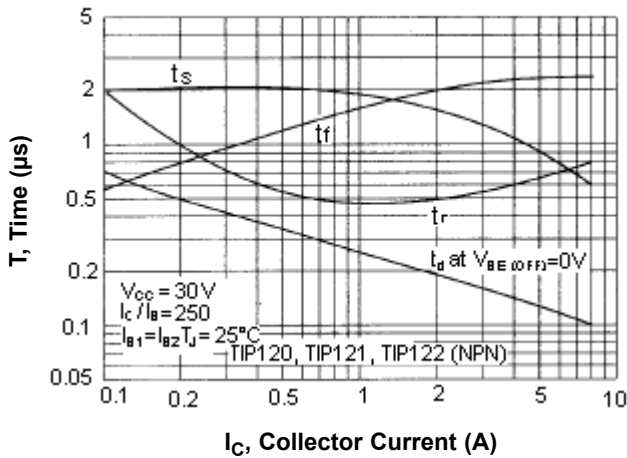


Figure - 3 Switching Time

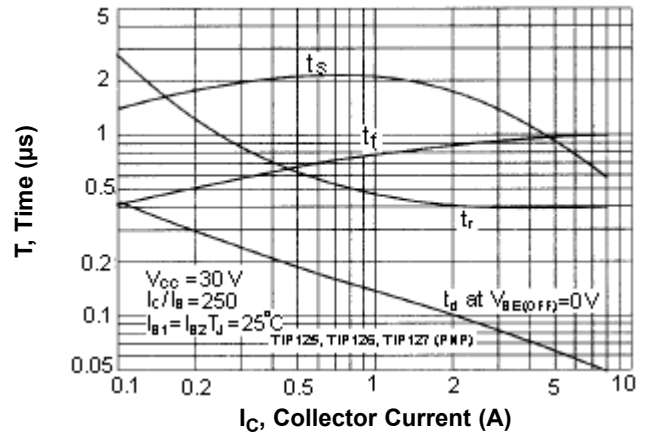


Figure - 4 Small Signal Current Gain

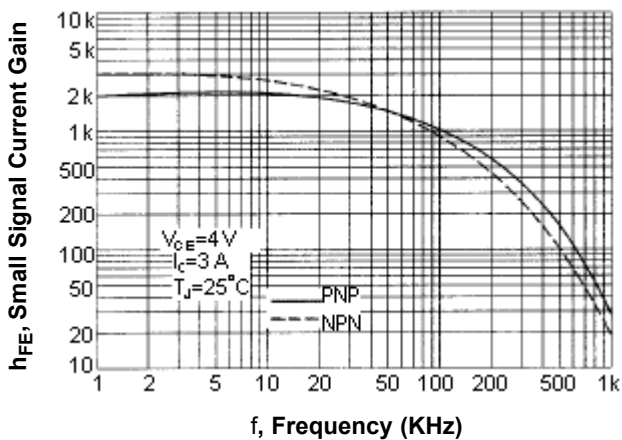


Figure - 5 Capacitances

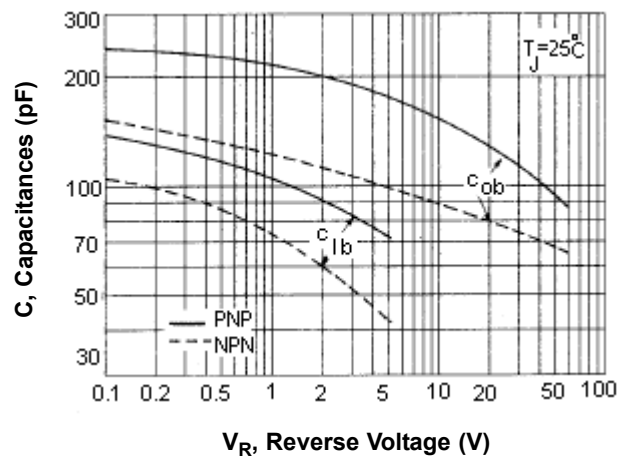
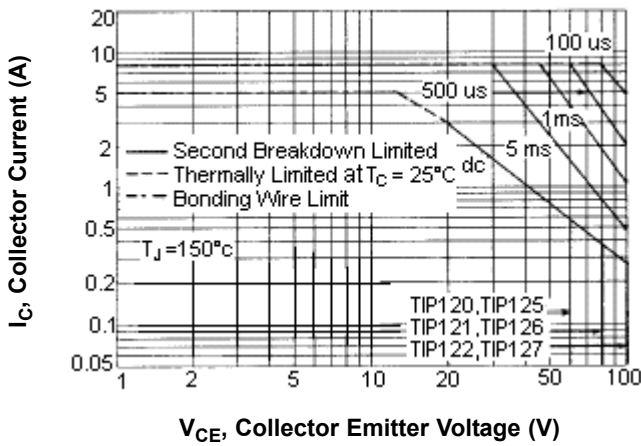


Figure - 6 Active Region Safe Operating Area



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 $T_{J(PK)} = 150^\circ\text{C}$; 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.

Figure - 7 DC Current Gain

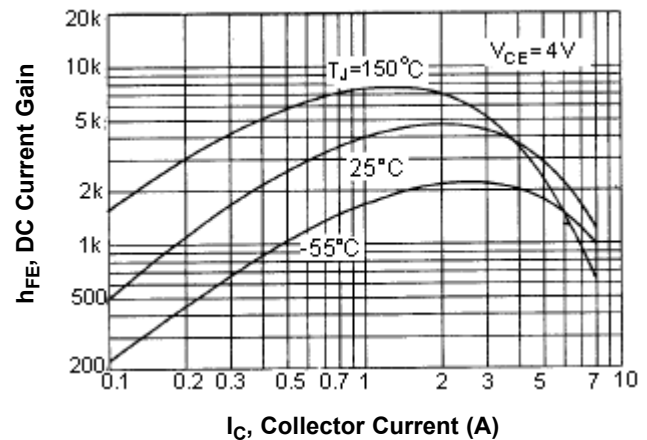
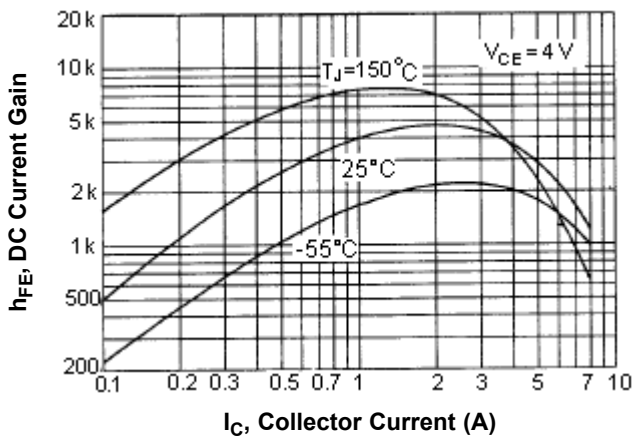
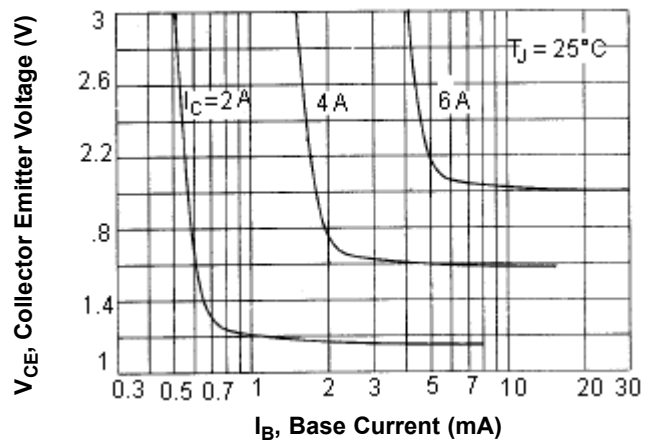
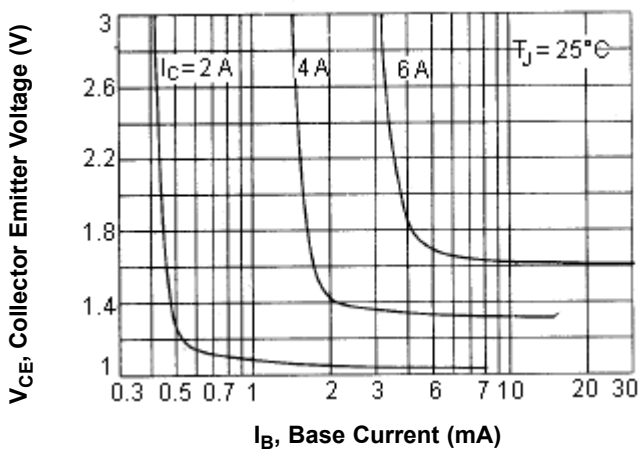
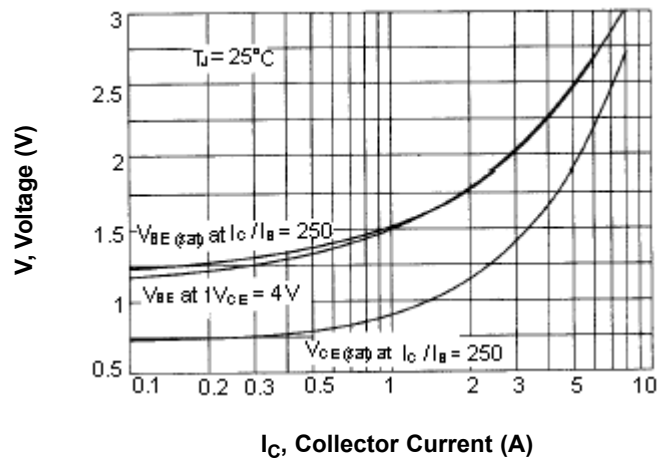
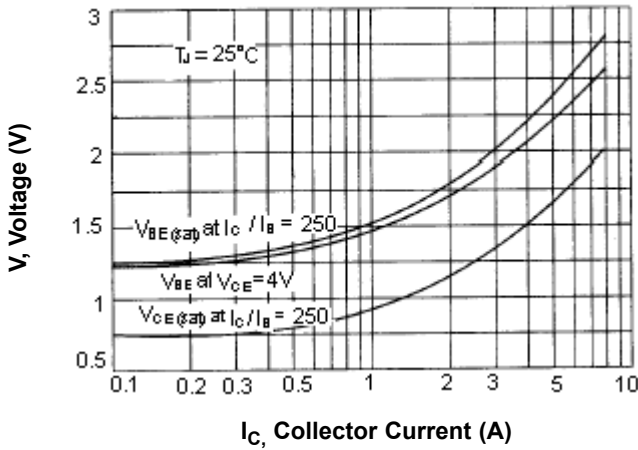


Figure - 8 Collector Saturation Region



Darlington Transistors

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

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