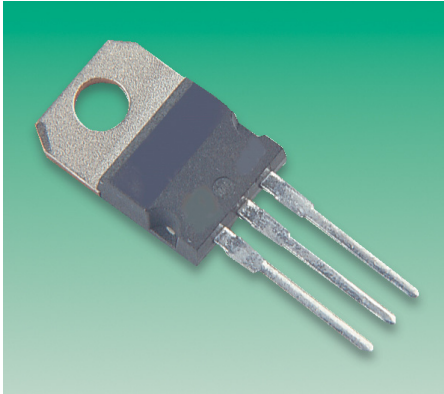


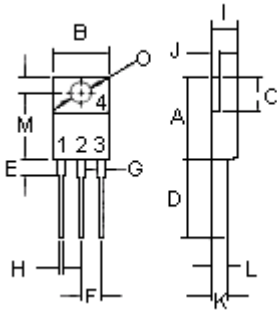
# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



### Features:

- Designed for general-purpose amplifier and low speed switching applications.
- Collector-Emitter sustaining voltage- $V_{CEO(sus)}$  = 60V (Minimum) - TIP120, TIP125  
80V (Minimum) - TIP121, TIP126  
100V (Minimum) - TIP122, TIP127.
- Collector-Emitter saturation voltage- $V_{CE(sat)}$  = 2.0V (Maximum) at  $I_C = 3.0A$ .
- Monolithic construction with built-in-base-emitter shunt resistors.



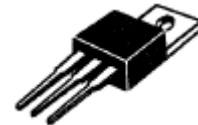
- Pin 1. Base  
2. Collector  
3. Emitter  
4. Collector (Case)

	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	1.86
H	0.72	0.96
I	4.22	4.98
J	1.14	1.38
K	2.20	2.97
L	0.33	0.55
M	2.48	2.98
O	3.70	3.90

Dimensions : Millimetres

NPN	PNP
TIP120	TIP 125
TIP121	TIP 126
TIP122	TIP 127

5.0 Ampere  
Darlington  
Complementary Silicon  
Power Transistors  
60 - 100 Volts  
65 Watts



TO-220

### Maximum Ratings

Characteristic	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	$V_{EBO}$	5.0			
Collector Current -Continuous -Peak	$I_C$	5.0			A
	$I_{CM}$	8.0			
Base Current	$I_B$	120			mA
Total Power Dissipation at $T_C = 25^\circ C$ Derate above $25^\circ C$	$P_D$	65			W
		0.52			
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-65 to +150			$^\circ C$

### Thermal Characteristics

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

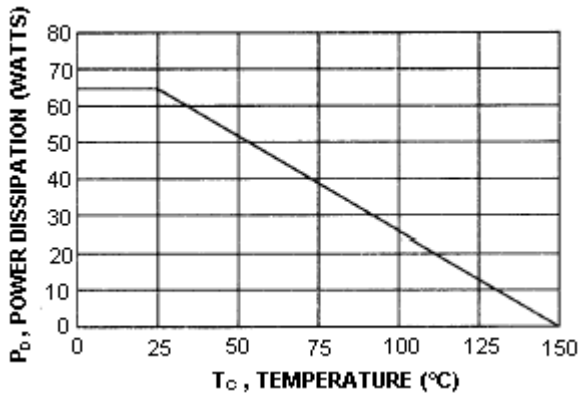


# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



FIGURE-1 POWER DERATING



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

Characteristic	Symbol	Minimum	Maximum	Unit
<b>OFF Characteristics</b>				
Collector-Emitter Sustaining Voltage (1) ( $I_C = 30\text{mA}$ , $I_B = 0$ )	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	$V_{CEO(sus)}$	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	mA
Collector Cut off Current ( $V_{CB} = 60\text{V}$ , $I_B = 0$ ) ( $V_{CB} = 80\text{V}$ , $I_B = 0$ ) ( $V_{CB} = 100\text{V}$ , $I_B = 0$ )	TIP120, TIP125 TIP121, TIP126 TIP122, TIP127	$I_{CBO}$	- 0.2 0.2	
Collector Cut off Current ( $V_{EB} = 5.0\text{V}$ , $I_C = 0$ )		$I_{EBO}$	- 2.0	
<b>ON Characteristics (1)</b>				
DC Current Gain ( $I_C = 0.5\text{A}$ , $V_{CE} = 3.0\text{V}$ ) ( $I_C = 3.0\text{A}$ , $V_{CE} = 3.0\text{V}$ )		$h_{FE}$	1000 1000	-
Collector-Emitter Saturation Voltage ( $I_C = 3.0\text{A}$ , $I_B = 12\text{mA}$ ) ( $I_C = 5.0\text{A}$ , $I_B = 20\text{mA}$ )		$V_{CE(sat)}$	- 2.0 4.0	V
Base-Emitter On Voltage ( $I_C = 3.0\text{A}$ , $V_{CE} = 3.0\text{V}$ )		$V_{BE(on)}$	- 2.5	
<b>Dynamic Characteristics</b>				
Small-Signal Current Gain ( $I_C = 3.0\text{A}$ , $V_{CE} = 4.0\text{V}$ , $f = 1.0\text{MHz}$ )		$h_{fe}$	4.0	-
Output Capacitance ( $V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 0.1\text{MHz}$ )	TIP120, TIP121, TIP122 TIP125, TIP126, TIP127	$C_{ob}$	- 300 250	pF

(1) Pulse Test : Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$



# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



INTERNAL SCHEMATIC DIAGRAM

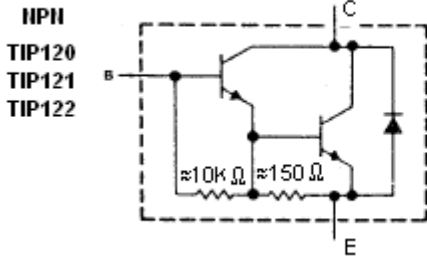


FIGURE - 2 SWITCHING TIME

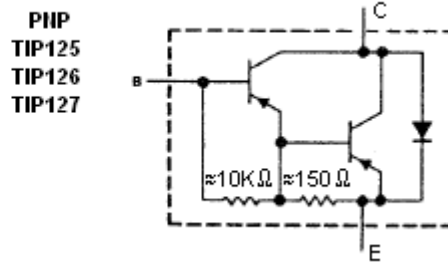


FIGURE - 3 SWITCHING TIME

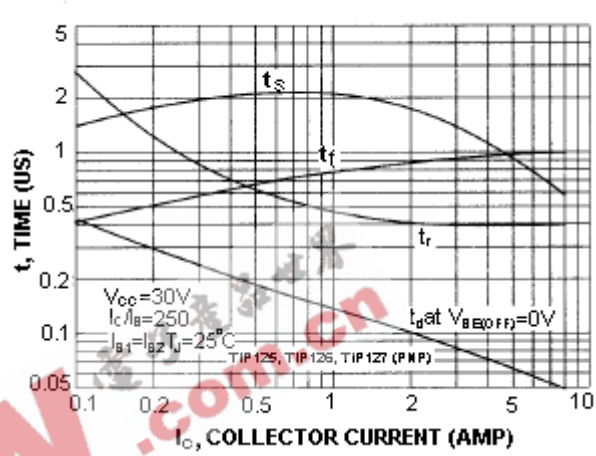
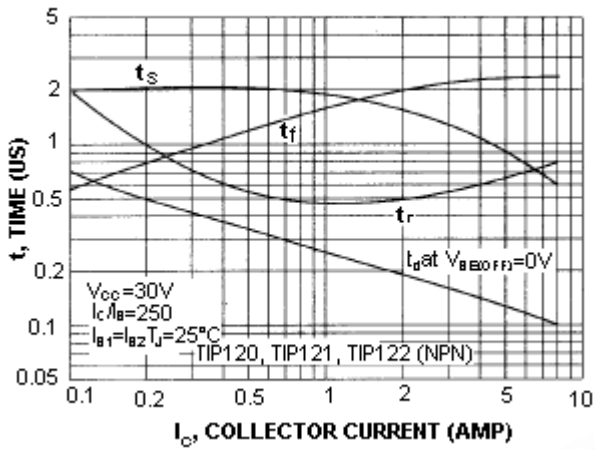


FIGURE - 4 SMALL SIGNAL CURRENT GAIN

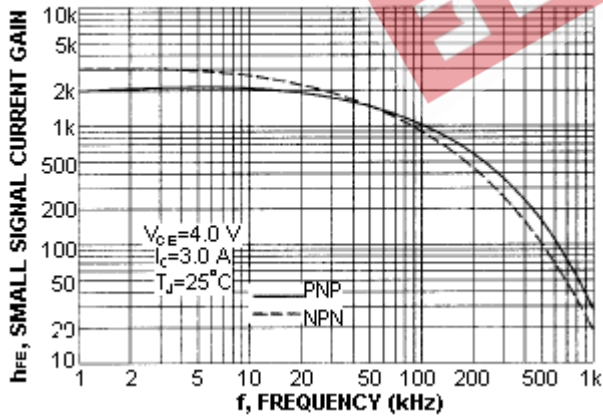
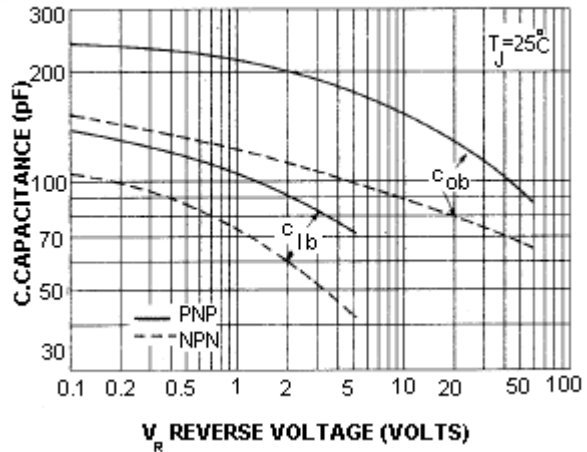


FIGURE - 5 CAPACITANCES

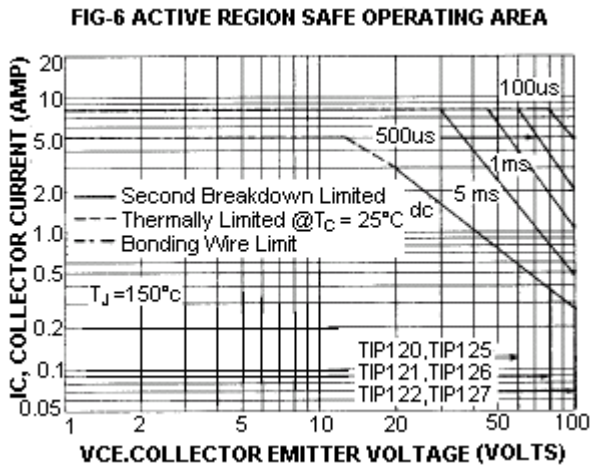


# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



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

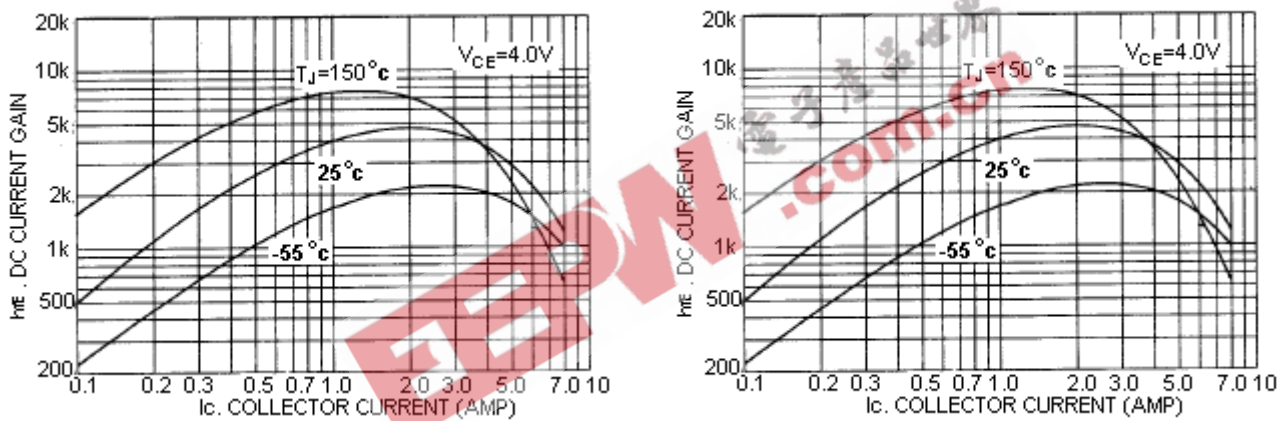
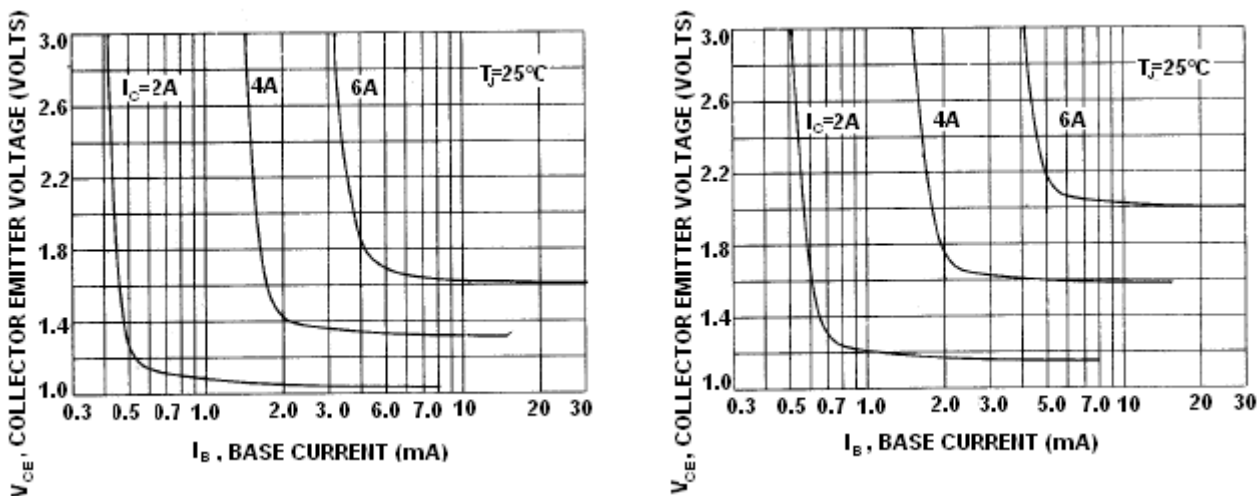


FIGURE - 8 COLLECTOR SATURATION REGION

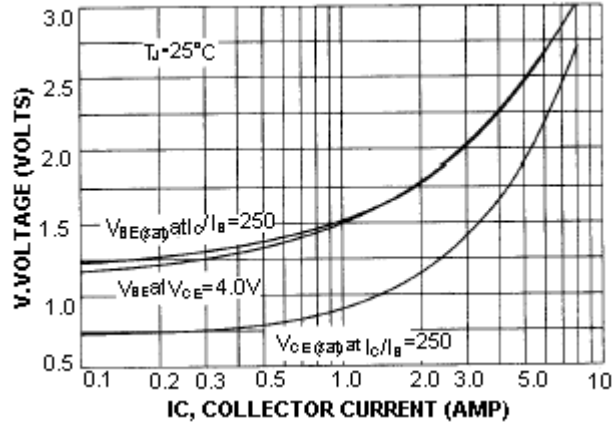
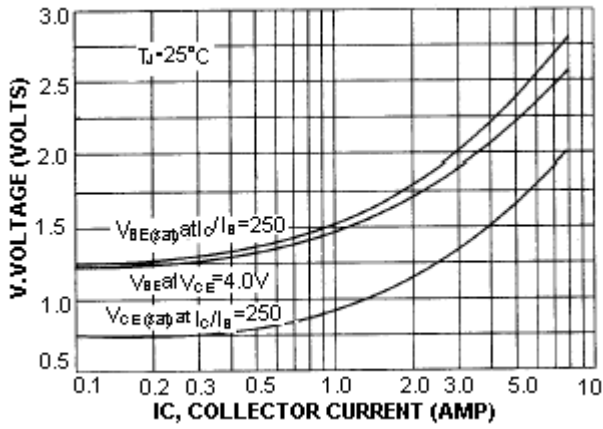


# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



FIGURE - 9 "ON" VOLTAGES



### Specifications

$I_c$ A	$V_{CE0}$ (maximum) V	$h_{FE}$ minimum at $I_c = 3A$	$P_{tot}$ at 25°C W	Package	Part Number	
					NPN	PNP
5	60	1000	65	TO-220	TIP120	TIP125
	80				TIP121	TIP126
	100				TIP122	TIP127



# TIP120, 121, 122, 125, 126, 127

## Darlington Transistors



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