



# TIP120, TIP121, TIP122 TIP125, TIP126, TIP127

## Complementary power Darlington transistors

### Features

- Low collector-emitter saturation voltage
- Complementary NPN - PNP transistors

### Applications

- General purpose linear and switching

### Description

The devices are manufactured in planar technology with "base island" layout and monolithic Darlington configuration. The resulting transistors show exceptional high gain performance coupled with very low saturation voltage.

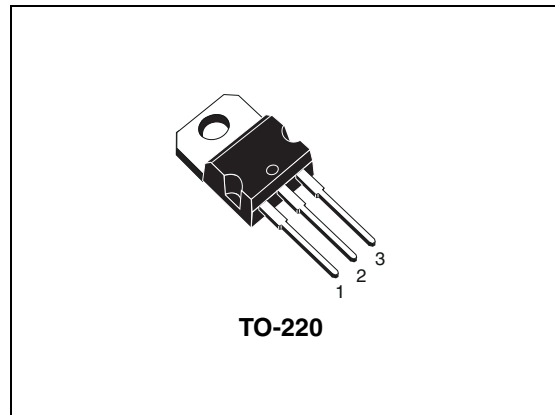


Figure 1. Internal schematic diagrams

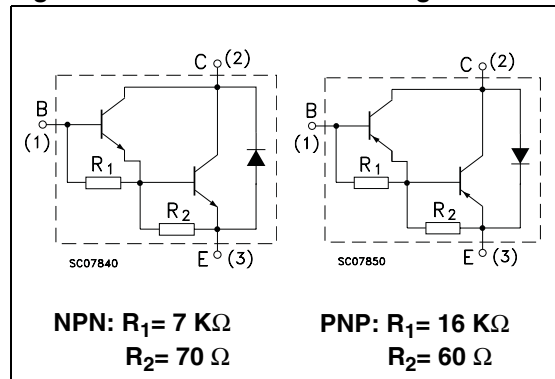


Table 1. Device summary

Order codes	Marking	Package	Packaging
TIP120	TIP120	TO-220	Tube
TIP121	TIP121		
TIP122	TIP122		
TIP125	TIP125		
TIP126	TIP126		
TIP127	TIP127		

# 1 Electrical ratings

**Table 2. Absolute maximum rating<sup>(1)</sup>**

Symbol	Parameter	Value				Unit
		NPN	TIP120	TIP121	TIP122	
		PNP	TIP125	TIP126	TIP127	
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	60	80	100	V	
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	60	80	100	V	
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5			V	
$I_C$	Collector current	5			A	
$I_{CM}$	Collector peak current	8			A	
$I_B$	Base current	0.12			A	
$P_{TOT}$	Total dissipation at $T_c \leq 25\text{ °C}$ $T_{amb} \leq 25\text{ °C}$	65			W	
		2				
$T_{stg}$	Storage temperature	-65 to 150			°C	
$T_J$	Max. operating junction temperature	150				

1. For PNP types voltage and current values are negative.

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max.	1.92	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max.	62.5	

## 2 Electrical characteristics

( $T_{\text{case}} = 25\text{ °C}$ ; unless otherwise specified)

**Table 4. Electrical characteristics<sup>(1)</sup>**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	for TIP120/125 $V_{\text{CE}} = 30\text{ V}$			0.5	mA
		for TIP121/126 $V_{\text{CE}} = 40\text{ V}$			0.5	mA
		for TIP122/127 $V_{\text{CE}} = 50\text{ V}$			0.5	mA
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	for TIP120/125 $V_{\text{CE}} = 60\text{ V}$			0.2	mA
		for TIP121/126 $V_{\text{CE}} = 80\text{ V}$			0.2	mA
		for TIP122/127 $V_{\text{CE}} = 100\text{ V}$			0.2	mA
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5\text{ V}$			2	mA
$V_{\text{CEO(sus)}}^{(2)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 30\text{ mA}$ for TIP120/125	60			V
		for TIP121/126	80			V
		for TIP122/127	100			V
$V_{\text{CE(sat)}}^{(2)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 3\text{ A}$ $I_{\text{B}} = 12\text{ mA}$			2	V
		$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 20\text{ mA}$			4	V
$V_{\text{BE(on)}}^{(2)}$	Base-emitter on voltage	$I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 3\text{ V}$			2.5	V
$h_{\text{FE}}^{(2)}$	DC current gain	$I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 3\text{ V}$	1000			
		$I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 3\text{ V}$	1000			

1. For PNP types voltage and current values are negative.

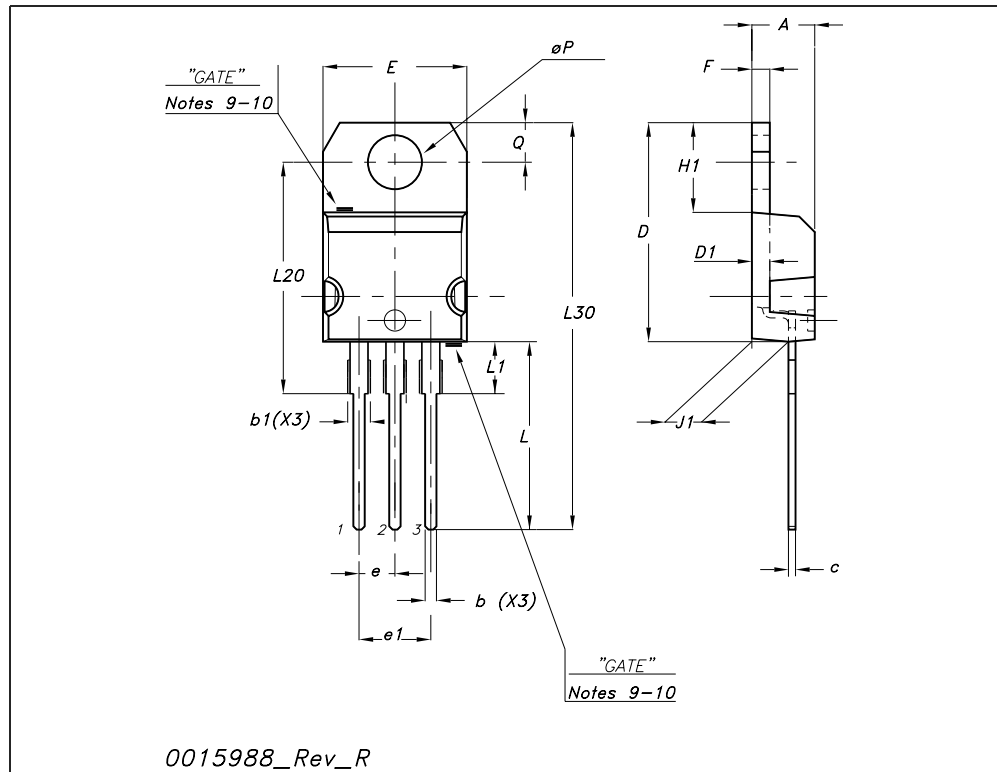
2. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark.

TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.48		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



**TO-220 type E mechanical data**

DIM.	mm.		
	MIN.	TYP	MAX.
A	4.47		4.67
b	0.70		0.91
b1	1.17		1.37
c	0.31		0.53
D	14.60		15.70
E	9.96		10.36
e		2.54	
e1	4.98	5.08	5.18
F	1.17		1.37
H1	6.10		6.80
J1	2.52		2.82
L	12.70		13.80
L1	3.20		3.96
L20	15.21		16.77
øP	3.73		3.94
Q	2.59		2.89

