

# BD6xxx

## Complementary power Darlington transistors

#### Features

- Good h<sub>FE</sub> linearity
- High f<sub>T</sub> frequency
- Monolithic Darlington configuration with integrated antiparallel collector-emitter diode

### **Applications**

■ Linear and switching industrial equipment

### Description

The devices are manufactured in planar base island technology with monolithic Darlington configuration.

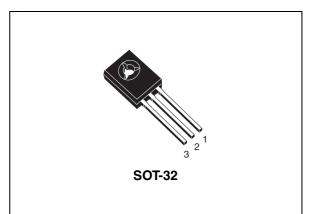
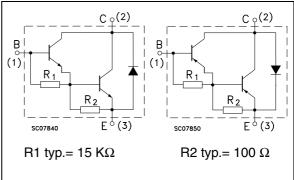


Figure 1. Internal schematic diagram



#### Table 1. Device summary

Order codes	Marking	Package	Packaging
BD677	BD677		
BD677A	BD677A		
BD678	BD678		
BD678A	BD678A		
BD679	BD679	SOT-32	Tube
BD679A	BD679A	301-32	Tube
BD680	BD680		
BD680A	BD680A		
BD681	BD681		
BD682	BD682		

January 2008

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## 1 Absolute maximum ratings

Table 2. Absolute maximum rating	Table 2.	Absolute maximum ratings
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			Value				
Symbol	Parameter	NPN	BD677 BD677A	BD679 BD679A	BD681	Unit	
		PNP	BD678 BD678A	BD680 BD680A	BD682		
V <sub>CBO</sub>	Collector-base voltage ( $I_E = 0$ )		60	80	100	v	
V <sub>CEO</sub>	Collector-emitter voltage $(I_B = 0)$				100	v	
V <sub>EBO</sub>	Emitte-base voltage ( $I_{C} = 0$ )		5			V	
Ι <sub>C</sub>	Collector current		4			А	
I <sub>CM</sub>	Collector peak current		6		А		
Ι <sub>Β</sub>	Base current		0.1		Α		
P <sub>TOT</sub>	Total dissipation at $T_{case} = 25^{\circ}C$		40			W	
T <sub>stg</sub>	Storage temperature		-65 to 150			°C	
TJ	Max. operating junction temperature		150			°C	

Note: For PNP types voltage and current values are negative



## 2 Electrical characteristics

( $T_{case} = 25^{\circ}C$ ; unless otherwise specified)

Table 3.						
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I <sub>CEO</sub>	Collector cut-off current $(I_B = 0)$	$V_{CE}$ = half rated $V_{CEO}$			0.5	mA
I <sub>CBO</sub>	Collector cut-off current $(I_E = 0)$	$V_{CE}$ = rated $V_{CBO}$ $V_{CE}$ = rated $V_{CBO}$ $T_{c}$ = 100 °C			0.2 2	mA
I <sub>EBO</sub>	Emitter cut-off current $(I_{\rm C} = 0)$	V <sub>EB</sub> = 5 V			2	mA
		for BD677, BD677A, BD678, BD678A I <sub>C</sub> = 50 mA	60			
V <sub>CEO(sus)</sub> <sup>(1)</sup>	Collector-emitter sustaining voltage (I <sub>B</sub> = 0)	for BD679, BD679A, BD680, BD680A I <sub>C</sub> = 50 mA	80			v
		for BD681, BD682 I <sub>C</sub> = 50 mA	100			
V (1)	Collector-emitter saturation	for BD677, BD678, BD679, BD680, BD681, BD682 $I_{C} = 1.5 A$ $I_{B} = 30 mA$			2.5	V
V <sub>CE(sat)</sub> <sup>(1)</sup>	voltage	for BD677A, BD678A, BD679A, BD680A $I_C = 2 A$ $I_B = 40 mA$			2.8	V
V <sub>BE</sub> <sup>(1)</sup>	Base-emitter voltage	for BD677, BD678, BD679, BD680, BD681, BD682 $I_{C} = 1.5 A$ $V_{CE} = 3 V$			2.5	V
		for BD677A, BD678A, BD679A, BD680A $I_C = 2 A$ $V_{CE} = 3 V$				

 Table 3.
 Electrical characteristics



Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
h <sub>FE</sub> <sup>(1)</sup>	DC current gain	for BD677, BD678, BD679, BD680, BD681, BD682 $I_{C} = 1.5 \text{ A} \qquad V_{CE} = 3 \text{ V}$	750			
		for BD677A, BD678A, BD679A, BD680A $I_{C} = 2 A$ $V_{CE} = 3 V$				

 Table 3.
 Electrical characteristics (continued)

1. Pulsed duration = 300 ms, duty cycle  $\ge$ 1.5%.

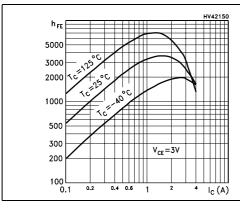
Note: For PNP types voltage e current values are negative.



### 2.1 Typical characteristic (curves)

#### Figure 2. DC current gain (NPN)

#### Figure 3. DC current gain (PNP)



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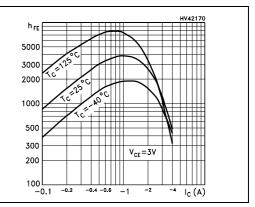


Figure 4. DC current gain (NPN)

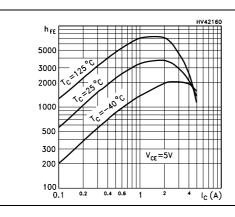


Figure 5. DC current gain (PNP)

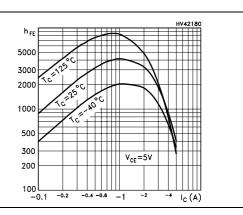
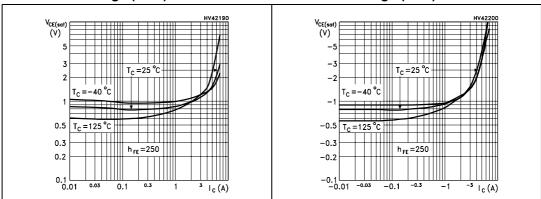


Figure 6. Collector-emitter saturation voltage (NPN)

Figure 7. Collect voltage

Collector-emitter saturation voltage (PNP)



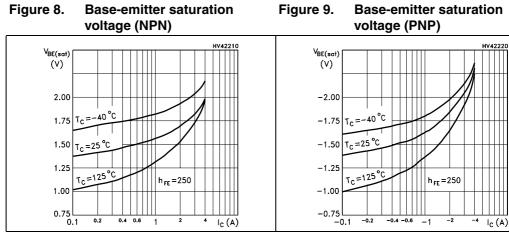
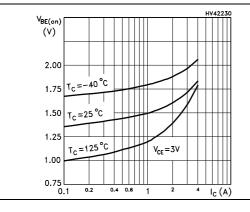


Figure 10. Base-emitter voltage (NPN)





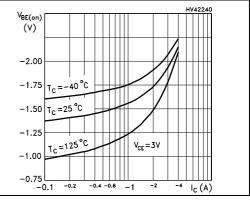


Figure 12. Resistive load switching time Figure 13. Resistive load switching time (NPN, on) (PNP, on)

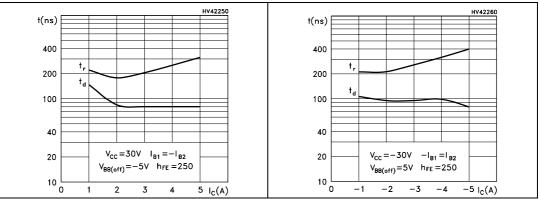
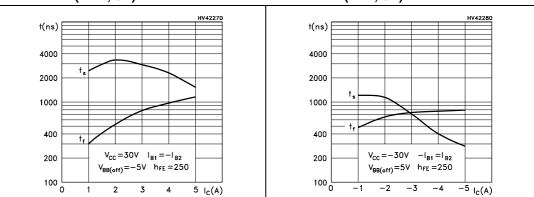




Figure 14. Resistive load switching time Figure 15. Resistive load switching time (NPN, off) (PNP, off)



### 2.2 Test circuit

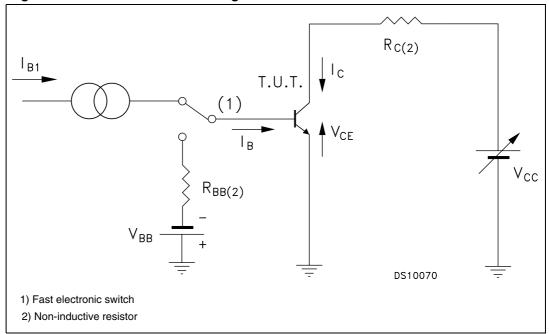


Figure 16. Resistive load switching test circuit



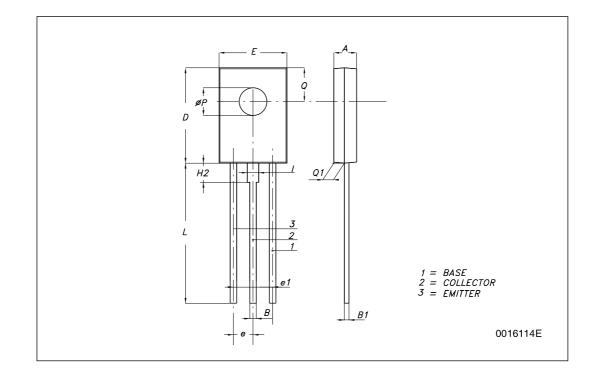
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## 3 Package mechanical data

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. ECOPACK specifications are available at: www.st.com



SOT-32 (TO-126) MECHANICAL DATA				
DIM		mm.		
DIM.	MIN.	ТҮР	MAX.	
A	2.4		2.9	
В	0.64		0.88	
B1	0.39		0.63	
D	10.5		11.05	
E	7.4		7.8	
е	2.04	2.29	2.54	
e1	4.07	4.58	5.08	
L	15.3		16	
Р	2.9		3.2	
Q		3.8		
Q1	1		1.52	
H2		2.15		
1		1.27		





## 4 Revision history

Table 4.	Document revision history
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Date	Revision	Changes
21-Jun-2004	4	
14-Jan-2008	5	<ol> <li>Technology change from epybase to planar.</li> <li>Updated Section 2.1: Typical characteristic (curves) on page 6</li> <li>Content reworked to improve readability.</li> </ol>



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