

Complementary power Darlington transistors

Features

- Good h_{FE} linearity
- High f_T 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.

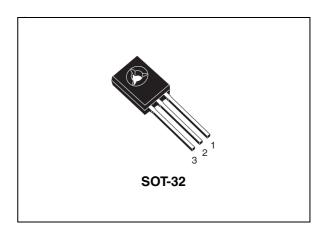


Figure 1. Internal schematic diagram

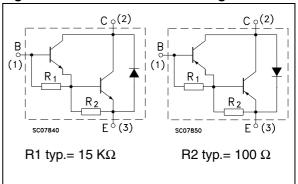


Table 1. Device summary

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

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1 Absolute maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	NPN	BD677 BD677A	BD679 BD679A	BD681	Unit
		PNP	BD678 BD678A	BD680 BD680A	BD682	
V _{CBO}	Collector-base voltage (I _E = 0)		60	80	100	V
V_{CEO}	Collector-emitter voltage (I _B = 0)		00	00	100	V
V_{EBO}	Emitte-base voltage ($I_C = 0$)		5			V
I _C	Collector current		4			Α
I _{CM}	Collector peak current		6		Α	
Ι _Β	Base current		0.1		Α	
P _{TOT}	Total dissipation at T _{case} = 25°C		40			W
T _{stg}	Storage temperature		-65 to 150			°C
T _J	Max. operating junction temperature		150		°C	

Note: For PNP types voltage and current values are negative

Electrical characteristics BD6xxx

2 Electrical characteristics

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

Table 3. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{CEO}	Collector cut-off current (I _B = 0)	V _{CE} = half rated V _{CEO}			0.5	mA
I _{CBO}	Collector cut-off current (I _E = 0)	V_{CE} = rated V_{CBO} V_{CE} = rated V_{CBO} T_c = 100 °C			0.2	mA
I _{EBO}	Emitter cut-off current (I _C = 0)	V _{EB} = 5 V			2	mA
V _{CEO(sus)} ⁽¹⁾	Collector-emitter sustaining voltage (I _B = 0)	for BD677, BD677A, BD678, BD678A I _C = 50 mA	60			V
		for BD679, BD679A, BD680, BD680A I _C = 50 mA	80			
		for BD681, BD682 I _C = 50 mA	100			
V _{CE(sat)} ⁽¹⁾ Collector-emitter saturation voltage	for BD677, BD678, BD679, BD680, BD681, BD682 $I_C = 1.5 \text{ A}$ $I_B = 30 \text{ mA}$			2.5	V	
	voltage	for BD677A, BD678A, BD679A, BD680A I _C = 2 A I _B = 40 mA			2.8	
V _{BE} ⁽¹⁾	Base-emitter voltage	for BD677, BD678, BD679, BD680, BD681, BD682 I _C = 1.5 A V _{CE} = 3 V			0.5	V
		for BD677A, BD678A, BD679A, BD680A I _C = 2 A V _{CE} = 3 V			2.5	V

 Table 3.
 Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
h _{FF} ⁽¹⁾ DC current gain	DC current gain	for BD677, BD678, BD679, BD680, BD681, BD682 I _C = 1.5 A V _{CE} = 3 V	750			
		for BD677A, BD678A, BD679A, BD680A I _C = 2 A V _{CE} = 3 V				

^{1.} Pulsed duration = 300 ms, duty cycle ≥1.5%.

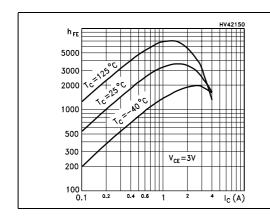
Note: For PNP types voltage e current values are negative.

Electrical characteristics BD6xxx

2.1 Typical characteristic (curves)

Figure 2. DC current gain (NPN)

Figure 3. DC current gain (PNP)



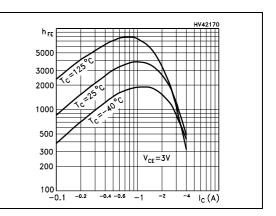
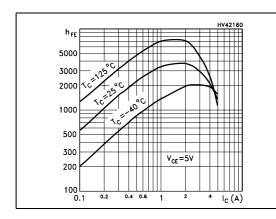


Figure 4. DC current gain (NPN)

Figure 5. DC current gain (PNP)



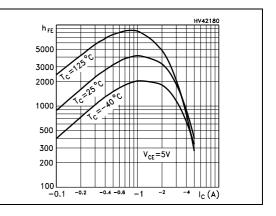
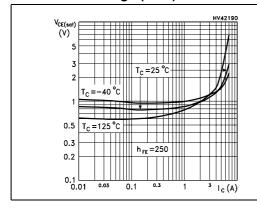


Figure 6. Collector-emitter saturation voltage (NPN)

Figure 7. Collector-emitter saturation voltage (PNP)



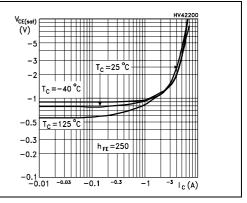


Figure 8. Base-emitter saturation voltage (NPN)

Figure 9. Base-emitter saturation voltage (PNP)

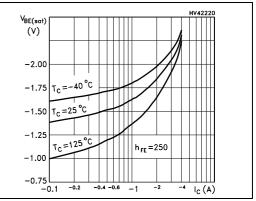
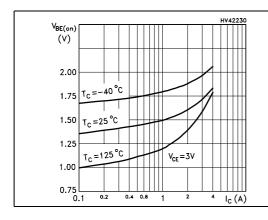


Figure 10. Base-emitter voltage (NPN)

Figure 11. Base-emitter voltage (PNP)



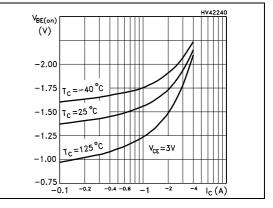
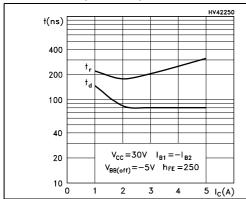
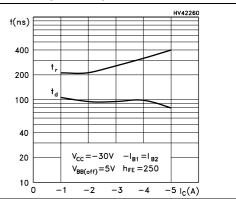


Figure 12. Resistive load switching time Figure 13. Resistive load switching time (NPN, on) (PNP, on)





Electrical characteristics BD6xxx

(NPN, off) (PNP, off) HV42270 HV42280 t(ns) t(ns) 4000 4000 2000 2000 1000 1000 400 400 $V_{CC} = 30V | I_{B1} = -I_{B2}$ $V_{CC} = -30V - I_{B1} = I_{B2}$ 200 200 $V_{BB(off)}=5V$ $h_{FE}=250$ $V_{BB(off)} = -5V$ $h_{FE} = 250$ 100 L 100 L 0

-2

-1

-3

-4

-5 I_C(A)

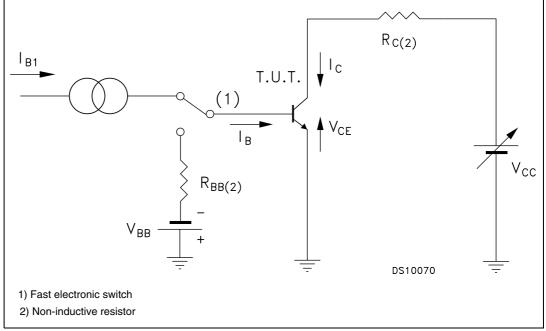
Resistive load switching time Figure 15. Resistive load switching time Figure 14.

2.2 **Test circuit**

Figure 16. Resistive load switching test circuit

3

5 I_C(A)



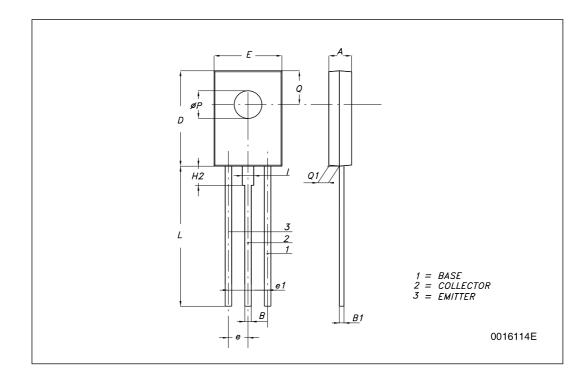
Note: For PNP types voltage e current values are negative.

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
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DIM.		mm.				
DIWI.	MIN.	TYP	MAX.			
Α	2.4		2.9			
В	0.64		0.88			
B1	0.39		0.63			
D	10.5		11.05			
Е	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				
ı		1.27				



BD6xxx Revision history

4 Revision history

Table 4. Document revision history

Date	Revision	Changes
21-Jun-2004	4	
14-Jan-2008	5	 Technology change from epybase to planar. Updated Section 2.1: Typical characteristic (curves) on page 6 Content reworked to improve readability.

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