

# BD135 - BD136 BD139 - BD140

### Complementary low voltage transistor

#### Features

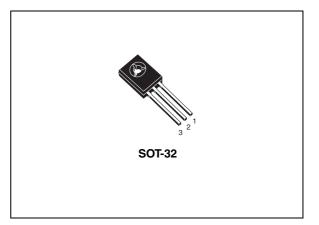
■ Products are pre-selected in DC current gain

#### Application

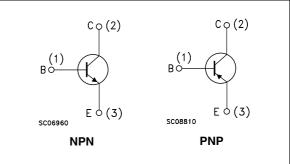
General purpose

#### Description

These epitaxial planar transistors are mounted in the SOT-32 plastic package. They are designed for audio amplifiers and drivers utilizing complementary or quasi-complementary circuits. The NPN types are the BD135 and BD139, and the complementary PNP types are the BD136 and BD140.







Order codes Marking		Package	Packaging	
BD135	BD135			
BD135-16	BD135-16			
BD136	BD136			
BD136-16	BD136-16			
BD139	BD139	SOT-32	Tube	
BD139-10	BD139-10		Tube	
BD139-16	BD139-16	BD139-16		
BD140	BD140			
BD140-10	BD140-10	]		
BD140-16	BD140-16			

#### Table 1. Device summary

May 2008

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## 1 Electrical ratings

	Parameter		Value			
Symbol			NPN		PNP	
		BD135	BD139	BD136	BD140	
V <sub>CBO</sub>	Collector-base voltage $(I_E = 0)$	45	80	-45	-80	V
V <sub>CEO</sub>	Collector-emitter voltage ( $I_B = 0$ ) 45 80 -45 -		-80	V		
V <sub>EBO</sub>	Emitter-base voltage (I <sub>C</sub> = 0)		5		-5	
۱ <sub>C</sub>	Collector current 1.5 -1		.5	А		
I <sub>CM</sub>	Collector peak current		3		-3	
۱ <sub>B</sub>	Base current0.5-0.5		0.5	А		
P <sub>TOT</sub>	Total dissipation at $T_c \le 25 \text{ °C}$		12.5			W
P <sub>TOT</sub>	Total dissipation at $T_{amb} \leq 25 \text{ °C}$		1.25			W
T <sub>stg</sub>	Storage temperature		-65 to 150			°C
Тj	Max. operating junction temperature		150			°C

	Table 3.	Thermal data
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Symbol	Parameter	Max value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case	10	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-ambient	100	°C/W

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## 2 Electrical characteristics

(T<sub>case</sub>= 25 °C unless otherwise specified)

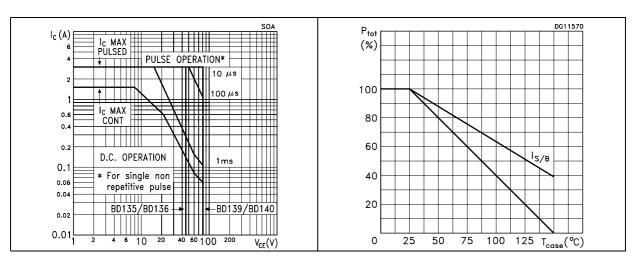
Cumhal	Parameter	Polarity	Test conditions	Value			11
Symbol				Min.	Тур.	Max.	Unit
		NPN	V <sub>CB</sub> = 30 V			0.1	μA
I <sub>CBO</sub>	Collector cut-off		$V_{CB}$ = 30 V, $T_{C}$ = 125 °C			10	μA
020	current (I <sub>E</sub> =0)	PNP	V <sub>CB</sub> = -30 V			-0.1	μA
			$V_{CB}$ = -30 V, $T_{C}$ = 125 °C			-10	μA
I <sub>EBO</sub>	Emitter cut-off current	NPN	V <sub>EB</sub> = 5 V			10	μA
EBO	(I <sub>C</sub> =0)	PNP	V <sub>EB</sub> = -5 V			-10	μA
			I <sub>C</sub> = 30 mA				
	Collector-emitter	NPN	BD135	45			V
V <sub>CEO(sus)</sub> <sup>(1)</sup>	sustaining voltage		BD139	80			V
CEO(SUS)	(I <sub>B</sub> =0)		I <sub>C</sub> = -30 mA				
		PNP	BD136	-45			V
			BD140	-80			V
V <sub>CE(sat)</sub> <sup>(1)</sup>	Collector-emitter	NPN	I <sub>C</sub> = 0.5 A, I <sub>B</sub> = 0.05 A			0.5	V
02(300)	saturation voltage	PNP	I <sub>C</sub> = -0.5 A, I <sub>B</sub> = -0.05 A			-0.5	V
V <sub>BE</sub> <sup>(1)</sup>	Base-emitter voltage	NPN	$I_{C} = 0.5 \text{ A}, V_{CE} = 2 \text{ V}$			1	V
VBE		PNP	$I_{C}$ = -0.5 A, $V_{CE}$ = -2 V			-1	V
	DC current gain		$I_{C} = 5 \text{ mA}, V_{CE} = 2 \text{ V}$	25			
		NPN	$I_{C} = 150 \text{ mA}, V_{CE} = 2 \text{ V}$	40		250	
h <sub>FE</sub> <sup>(1)</sup>			$I_{C} = 0.5 \text{ A}, V_{CE} = 2 \text{ V}$	25			
"FE		PNP	$I_{C} = -5 \text{ mA}, V_{CE} = -2 \text{ V}$	25			
			$I_{\rm C} = -150 \text{ mA}, V_{\rm CE} = -2 \text{ V}$	40		250	
			$I_{\rm C} = -0.5 \text{ A}, V_{\rm CE} = -2 \text{ V}$	25			
			I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 2 V BD139-10	63		100	
h <sub>FE</sub> <sup>(1)</sup>	h <sub>FE</sub> groups	NPN	BD139-10 BD135-16/BD139-16	63 100		160 250	
				100		200	
		PNP	I <sub>C</sub> = -150 mA, V <sub>CE</sub> = -2 V BD140-10	63		160	
			BD136-16/BD140-16	100		250	

Table 4.	On/off states

1. Pulsed: pulse duration = 300  $\mu$ s, duty cycle 1.5%



### 2.1 Electrical characteristics (curves)



#### Figure 2. Safe operating area

Figure 3. Derating



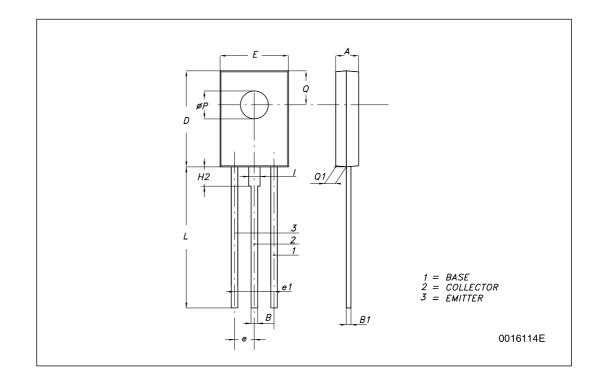
### 3 Package mechanical data

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* 



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SOT-32 (TO-126) MECHANICAL DATA					
DIM.		mm.			
DIW.	MIN.	ТҮР	MAX.		
А	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			
Ι		1.27			





## 4 Revision history

#### Table 5.Document revision history

Date	Revision	Changes
16-Sep-2001	4	
22-May-2008	5	Mechanical data has been updated.



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