BD135 - BD136
BD139 - BD140

Complementary low voltage transistor

Features

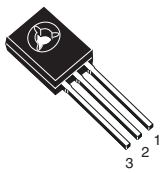
- Products are pre-selected in DC current gain

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.



SOT-32

Figure 1. Internal schematic diagram

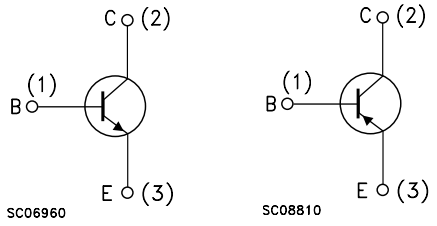


Table 1. Device summary

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

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value				Unit
		NPN		PNP		
		BD135	BD139	BD136	BD140	
V_{CBO}	Collector-base voltage (I_E = 0)	45	80	-45	-80	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	45	80	-45	-80	V
V_{EBO}	Emitter-base voltage (I_C = 0)	5		-5		V
I_C	Collector current	1.5		-1.5		A
I_{CM}	Collector peak current	3		-3		A
I_B	Base current	0.5		-0.5		A
P_{TOT}	Total dissipation at $T_c \leq 25$ °C	12.5				W
P_{TOT}	Total dissipation at $T_{amb} \leq 25$ °C	1.25				W
T_{stg}	Storage temperature	-65 to 150				°C
T_j	Max. operating junction temperature	150				°C

Table 3. Thermal data

Symbol	Parameter	Max value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	10	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	100	°C/W

2 Electrical characteristics

(T_{case}= 25 °C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Polarity	Test conditions	Value			Unit
				Min.	Typ.	Max.	
I_{CBO}	Collector cut-off current (I_E=0)	NPN	V_{CB} = 30 V V_{CB} = 30 V, T_C = 125 °C			0.1 10	µA µA
		PNP	V_{CB} = -30 V V_{CB} = -30 V, T_C = 125 °C			-0.1 -10	µA µA
I_{EBO}	Emitter cut-off current (I_C=0)	NPN	V_{EB} = 5 V			10	µA
		PNP	V_{EB} = -5 V			-10	µA
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B=0)	NPN	I_C = 30 mA BD135 BD139	 45 80			 V V
		PNP	I_C = -30 mA BD136 BD140	 -45 -80			 V V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	NPN	I_C = 0.5 A, I_B = 0.05 A			0.5	V
		PNP	I_C = -0.5 A, I_B = -0.05 A			-0.5	V
V_{BE} (1)	Base-emitter voltage	NPN	I_C = 0.5 A, V_{CE} = 2 V			1	V
		PNP	I_C = -0.5 A, V_{CE} = -2 V			-1	V
h_{FE} (1)	DC current gain	NPN	I_C = 5 mA, V_{CE} = 2 V I_C = 150 mA, V_{CE} = 2 V I_C = 0.5 A, V_{CE} = 2 V	25 40 25		250	
		PNP	I_C = -5 mA, V_{CE} = -2 V I_C = -150 mA, V_{CE} = -2 V I_C = -0.5 A, V_{CE} = -2 V	25 40 25		250	
h_{FE} (1)	h_{FE} groups	NPN	I_C = 150 mA, V_{CE} = 2 V BD139-10 BD135-16/BD139-16	 63 100		 160 250	
		PNP	I_C = -150 mA, V_{CE} = -2 V BD140-10 BD136-16/BD140-16	 63 100		 160 250	

1. Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

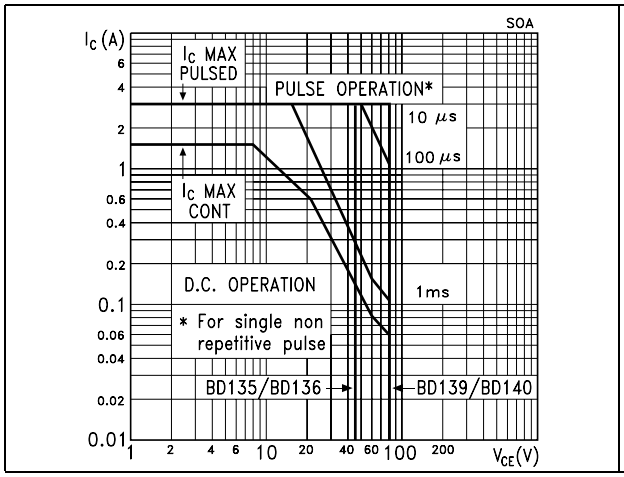
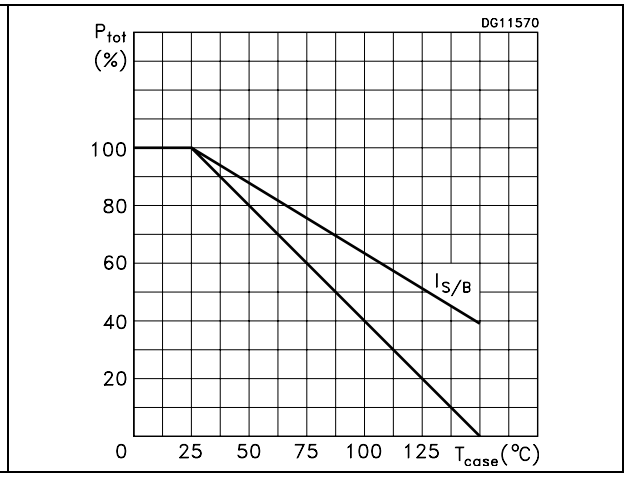


Figure 3. Derating

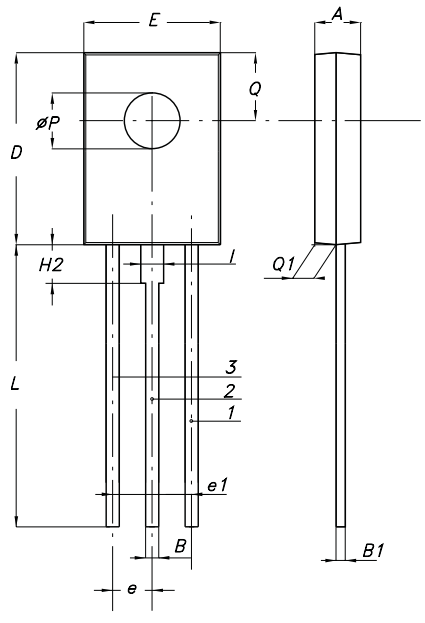


3 Package mechanical data

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*

SOT-32 (TO-126) MECHANICAL DATA

DIM.	mm.		
	MIN.	TYP	MAX.
A	2.4		2.9
B	0.64		0.88
B1	0.39		0.63
D	10.5		11.05
E	7.4		7.8
e	2.04	2.29	2.54
e1	4.07	4.58	5.08
L	15.3		16
P	2.9		3.2
Q		3.8	
Q1	1		1.52
H2		2.15	
I		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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