

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.

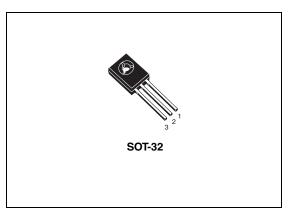
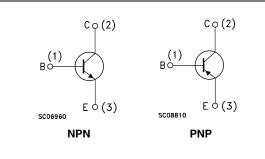


Figure 1. Internal schematic diagram



| 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 | 501-52 | Tube |
| BD139-16 | BD139-16 | | |
| BD140 | BD140 | | |
| BD140-10 | BD140-10 | | |
| BD140-16 | BD140-16 | | |

Table 1. Device summary

May 2008

Contents

| 1 | Electrical ratings |
|---|---|
| 2 | Electrical characteristics4 |
| | 2.1 Electrical characteristics (curves) 5 |
| 3 | Package mechanical data 6 |
| 4 | Revision history |



1 Electrical ratings

| | | Value | | | | |
|------------------|---|----------|-------|-------|-------|---|
| Symbol | Parameter | | 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 | | 5 | V | |
| Ι _C | Collector current | 1.5 -1.5 | | .5 | А | |
| I _{CM} | Collector peak current | 3 -3 | | 3 | А | |
| ا _B | Base current 0.5 -0.5 | | .5 | А | | |
| P _{TOT} | Total dissipation at $T_c \le 25 \text{ °C}$ | | 12 | 2.5 | | W |
| P _{TOT} | Total dissipation at $T_{amb} \leq 25 \ ^{\circ}C$ 1.25 | | | W | | |
| T _{stg} | Storage temperature -65 to 150 | | | °C | | |
| Тj | Max. operating junction temperature 150 | | | °C | | |

Table 2.Absolute maximum ratings

| Symbol | Parameter | Max value | Unit |
|-----------------------|-------------------------------------|-----------|------|
| R _{thj-case} | Thermal resistance junction-case | 10 | °C/W |
| R _{thj-amb} | Thermal resistance junction-ambient | 100 | °C/W |



2 Electrical characteristics

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

| Symbol | Parameter | Polority | Test conditions | Value | | | Unit |
|--------------------------------------|--|----------|--|----------------|------|-------------|----------|
| Symbol | Farameter | Polarity | Test conditions | Min. | Тур. | Max. | Unit |
| 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 | μΑ μΑ |
| | | PNP | V _{CB} = -30 V V _{CB} = -30 V, T _C = 125 °C | | | -0.1 -10 | μΑ μΑ |
| | Emitter cut-off current (I _C =0) | NPN | V _{EB} = 5 V | | | 10 | μA |
| I _{EBO} | | PNP | V _{EB} = -5 V | | | -10 | μA |
| V _{CEO(sus)} ⁽¹⁾ | Collector-emitter sustaining voltage (I _B =0) | NPN | l _C = 30 mA BD135 BD139 | 45 80 | | | V V |
| | | PNP | l _C = -30 mA BD136 BD140 | -45 -80 | | | V V |
| V (1) | Collector-emitter saturation voltage | NPN | $I_{\rm C} = 0.5 \text{ A}, I_{\rm B} = 0.05 \text{ A}$ | | | 0.5 | V |
| V _{CE(sat)} ⁽¹⁾ | | PNP | $I_{C} = -0.5 \text{ A}, I_{B} = -0.05 \text{ A}$ | | | -0.5 | V |
| V _{BE} ⁽¹⁾ | Base-emitter voltage | NPN | $I_{C} = 0.5 \text{ A}, V_{CE} = 2 \text{ V}$ | | | 1 | V |
| VBE (| Dase-emilier voltage | PNP | $I_{C} = -0.5 \text{ A}, V_{CE} = -2 \text{ V}$ | | | -1 | V |
| h _{FE} ⁽¹⁾ | DC current gain | NPN | $\begin{split} I_{C} &= 5 \text{ mA}, \text{ V}_{CE} = 2 \text{ V} \\ I_{C} &= 150 \text{ mA}, \text{ V}_{CE} = 2 \text{ V} \\ I_{C} &= 0.5 \text{ A}, \text{ V}_{CE} = 2 \text{ V} \end{split}$ | 25 40 25 | | 250 | |
| | | PNP | $I_{C} = -5 \text{ mA}, V_{CE} = -2 \text{ V}$ $I_{C} = -150 \text{ mA}, V_{CE} = -2 \text{ V}$ $I_{C} = -0.5 \text{ A}, V_{CE} = -2 \text{ V}$ | 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 μ s, duty cycle 1.5%

2.1 Electrical characteristics (curves)

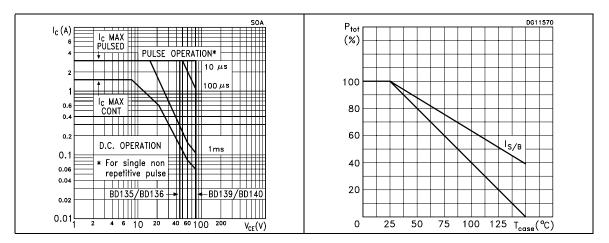


Figure 2. Safe operating area

Figure 3. Derating

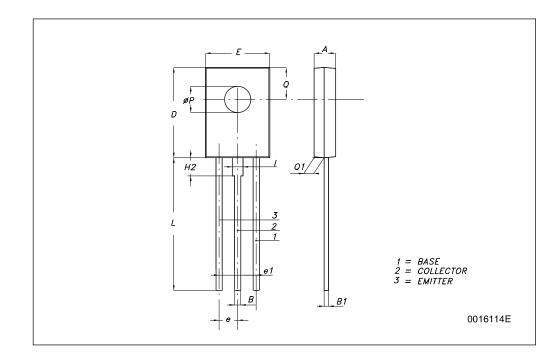


3 Package mechanical data

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*



| | 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 | | | |
| I | | 1.27 | | | |



57

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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9/9