

Complementary power Darlingtons

Features

- Good h_{FE} linearity
- High f_T frequency
- Monolithic Darlingtons 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 Darlingtons configuration.

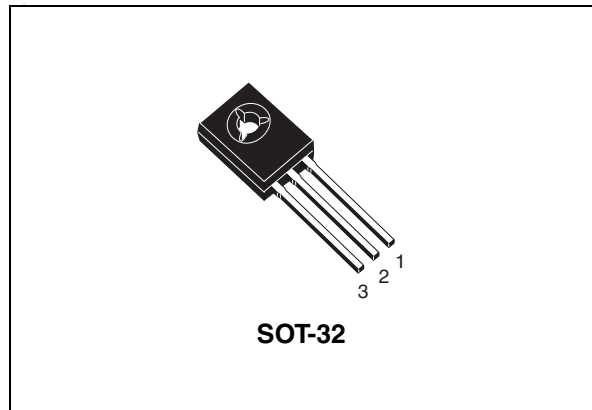


Figure 1. Internal schematic diagram

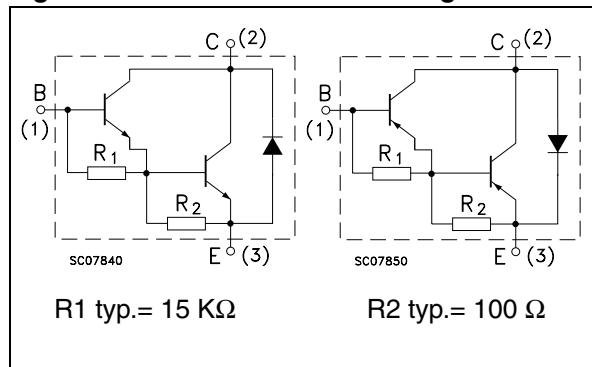


Table 1. Device summary

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

Contents

| | | |
|----------|---|-----------|
| 1 | Absolute maximum ratings | 3 |
| 2 | Electrical characteristics | 4 |
| 2.1 | Typical characteristic (curves) | 6 |
| 2.2 | Test circuit | 8 |
| 3 | Package mechanical data | 9 |
| 4 | Revision history | 11 |

1 Absolute maximum ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | | | Unit | |
|-----------|--|------------|-----------------|-----------------|------------------|-------|
| | | NPN | BD677 BD677A | BD679 BD679A | | BD681 |
| | | PNP | BD678 BD678A | BD680 BD680A | | BD682 |
| V_{CBO} | Collector-base voltage ($I_E = 0$) | 60 | 80 | 100 | V | |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | | | | | |
| V_{EBO} | Emitte-base voltage ($I_C = 0$) | 5 | | | V | |
| I_C | Collector current | 4 | | | A | |
| I_{CM} | Collector peak current | 6 | | | A | |
| I_B | Base current | 0.1 | | | A | |
| P_{TOT} | Total dissipation at $T_{case} = 25^\circ\text{C}$ | 40 | | | W | |
| T_{stg} | Storage temperature | -65 to 150 | | | $^\circ\text{C}$ | |
| T_J | Max. operating junction temperature | 150 | | | $^\circ\text{C}$ | |

Note: For PNP types voltage and current values are negative

2 Electrical characteristics

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

Table 3. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|--|--|------|------|----------|------|
| I_{CEO} | Collector cut-off current ($I_{\text{B}} = 0$) | $V_{\text{CE}} = \text{half rated } V_{\text{CEO}}$ | | | 0.5 | mA |
| I_{CBO} | Collector cut-off current ($I_{\text{E}} = 0$) | $V_{\text{CE}} = \text{rated } V_{\text{CBO}}$ $V_{\text{CE}} = \text{rated } V_{\text{CBO}}$ $T_{\text{C}} = 100^{\circ}\text{C}$ | | | 0.2 2 | mA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 5 \text{ V}$ | | | 2 | mA |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter sustaining voltage ($I_{\text{B}} = 0$) | for BD677, BD677A, BD678, BD678A $I_{\text{C}} = 50 \text{ mA}$ | 60 | | | V |
| | | for BD679, BD679A, BD680, BD680A $I_{\text{C}} = 50 \text{ mA}$ | 80 | | | |
| | | for BD681, BD682 $I_{\text{C}} = 50 \text{ mA}$ | 100 | | | |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter saturation voltage | for BD677, BD678, BD679, BD680, BD681, BD682 $I_{\text{C}} = 1.5 \text{ A}$ $I_{\text{B}} = 30 \text{ mA}$ | | | 2.5 | V |
| | | for BD677A, BD678A, BD679A, BD680A $I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 40 \text{ mA}$ | | | 2.8 | |
| $V_{\text{BE}}^{(1)}$ | Base-emitter voltage | for BD677, BD678, BD679, BD680, BD681, BD682 $I_{\text{C}} = 1.5 \text{ A}$ $V_{\text{CE}} = 3 \text{ V}$ | | | 2.5 | V |
| | | for BD677A, BD678A, BD679A, BD680A $I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 3 \text{ V}$ | | | | |

Table 3. Electrical characteristics (continued)

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|-----------------|--|------|------|------|------|
| $h_{FE}^{(1)}$ | DC current gain | for BD677, BD678, BD679, BD680, BD681, BD682 $I_C = 1.5 \text{ A}$ $V_{CE} = 3 \text{ V}$ | 750 | | | |
| | | for BD677A, BD678A, BD679A, BD680A $I_C = 2 \text{ A}$ $V_{CE} = 3 \text{ V}$ | | | | |

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

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)



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)

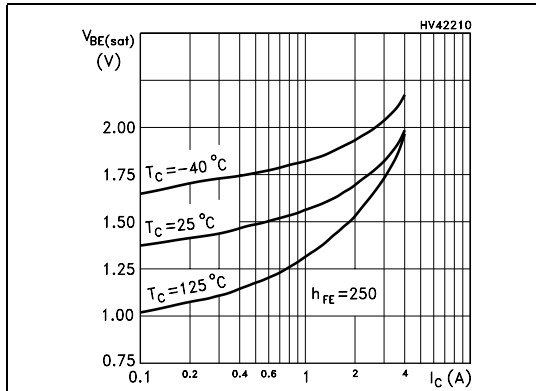


Figure 9. Base-emitter saturation voltage (PNP)

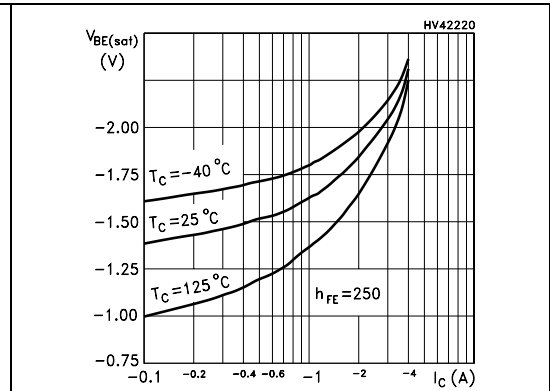


Figure 10. Base-emitter voltage (NPN)

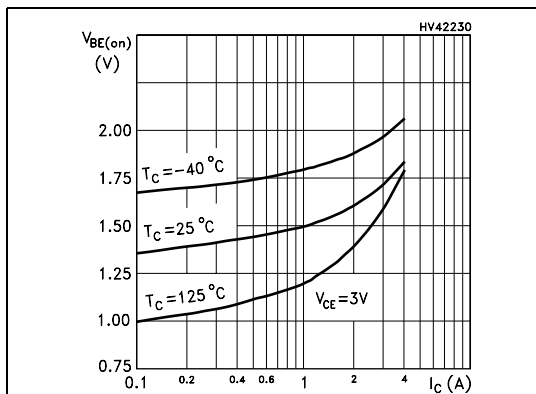


Figure 11. Base-emitter voltage (PNP)

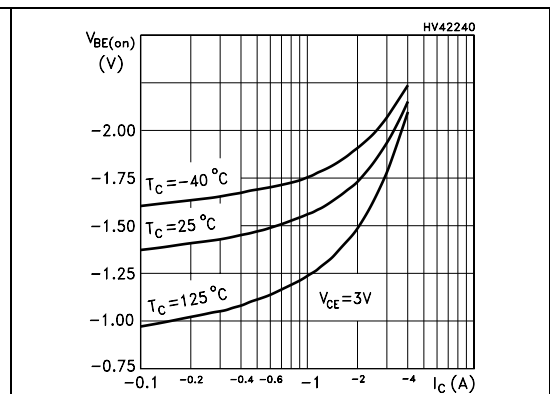


Figure 12. Resistive load switching time (NPN, on)

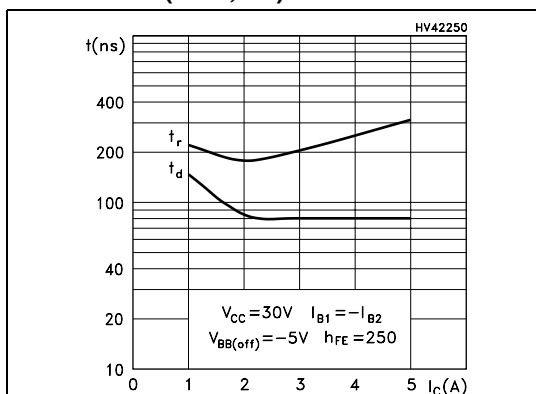


Figure 13. Resistive load switching time (PNP, on)

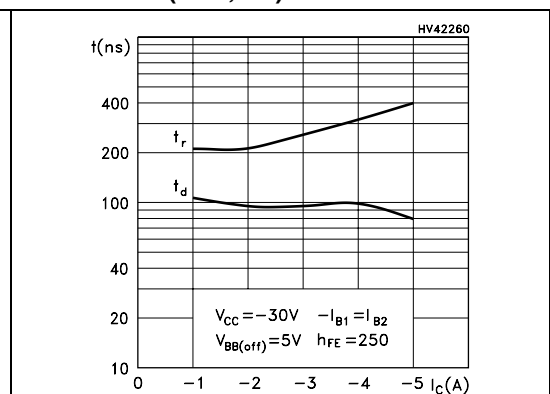


Figure 14. Resistive load switching time (NPN, off) **Figure 15. Resistive load switching time (PNP, off)**



2.2 Test circuit

Figure 16. Resistive load switching test circuit



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

| 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 | |
| l | | 1.27 | |



4 Revision history

Table 4. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 21-Jun-2004 | 4 | |
| 14-Jan-2008 | 5 | <ol style="list-style-type: none">1. Technology change from epybase to planar.2. Updated Section 2.1: Typical characteristic (curves) on page 63. Content reworked to improve readability. |

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