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Complementary power transistors

Features

- Low collector-emitter saturation voltage
- Complementary NPN - PNP transistors

Applications

- General purpose
- Audio amplifier

Description

The devices are manufactured in planar technology with “base island” layout. The resulting transistors show exceptional high gain performance coupled with very low saturation voltage.

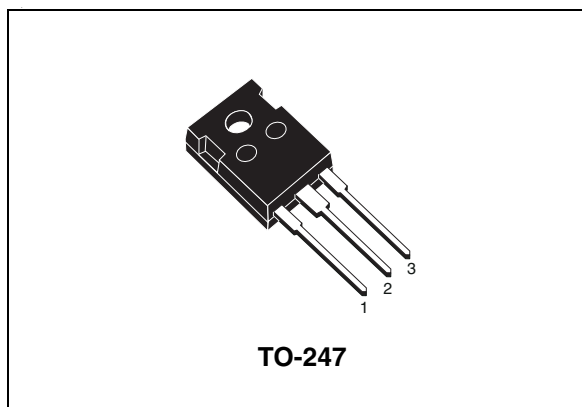


Figure 1. Internal schematic diagrams

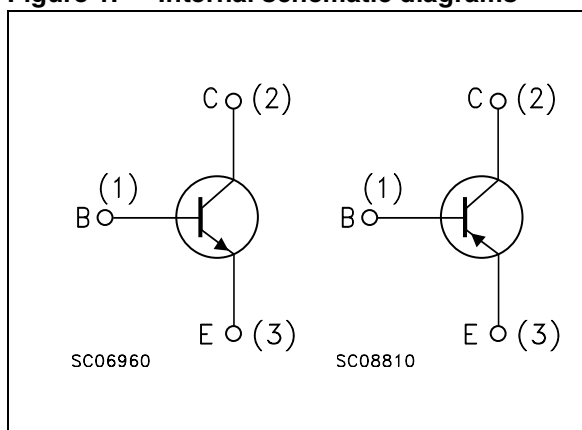


Table 1. Device summary

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-----------|
| TIP35CW | TIP35CW | TO-247 | Tube |
| TIP36CW | TIP36CW | | |

1 Electrical ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | | Value | Unit |
|-----------|---|-----|------------|------|
| | | NPN | TIP35CW | |
| | | PNP | TIP36CW | |
| V_{CBO} | Collector-base voltage ($I_E = 0$) | | 100 | V |
| V_{CEO} | Collector-emitter voltage ($I_B = 0$) | | 100 | V |
| V_{EBO} | Emitter-base voltage ($I_C = 0$) | | 5 | V |
| I_C | Collector current | | 25 | A |
| I_{CM} | Collector peak current ($t_p < 5$ ms) | | 50 | A |
| I_B | Base current | | 5 | A |
| P_{tot} | Total dissipation at $T_{case} = 25$ °C | | 125 | W |
| T_{stg} | Storage temperature | | -65 to 150 | °C |
| T_J | Max. operating junction temperature | | 150 | °C |

For PNP type voltage and current values are negative.

Table 3. Thermal data

| Symbol | Parameter | | Value | Unit |
|----------------|----------------------------------|-----|-------|------|
| $R_{thj-case}$ | Thermal resistance junction-case | max | 1 | °C/W |

2 Electrical characteristics

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

Table 4. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|---|---|------|------|------|------|
| I_{CEO} | Collector cut-off current ($I_{\text{B}} = 0$) | $V_{\text{CE}} = 60\text{ V}$ | | | 1 | mA |
| I_{EBO} | Emitter cut-off current ($I_{\text{C}} = 0$) | $V_{\text{EB}} = 5\text{ V}$ | | | 1 | mA |
| I_{CES} | Collector cut-off current ($V_{\text{BE}} = 0$) | $V_{\text{CE}} = 100\text{ V}$ | | | 0.7 | mA |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter sustaining voltage ($I_{\text{B}} = 0$) | $I_{\text{C}} = 30\text{ mA}$ | 100 | | | V |
| $V_{\text{CE(sat)}}^{(1)}$ | Collector-emitter saturation voltage | $I_{\text{C}} = 15\text{ A}$ $I_{\text{B}} = 1.5\text{ A}$ | | | 1.8 | V |
| | | $I_{\text{C}} = 25\text{ A}$ $I_{\text{B}} = 5\text{ A}$ | | | 4 | V |
| $V_{\text{BE(on)}}^{(1)}$ | Base-emitter voltage | $I_{\text{C}} = 15\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | | | 2 | V |
| | | $I_{\text{C}} = 25\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | | | 4 | V |
| $h_{\text{FE}}^{(1)}$ | DC current gain | $I_{\text{C}} = 1.5\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | 25 | | | |
| | | $I_{\text{C}} = 15\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | 10 | | 50 | |
| f_{T} | Transition frequency | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 10\text{ V}$ $f = 1\text{ MHz}$ | 3 | | | MHz |

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

For PNP type voltage and current are negative.

2.1 Electrical characteristic (curves)

Figure 2. DC current gain for NPN type Figure 3. DC current gain for PNP type

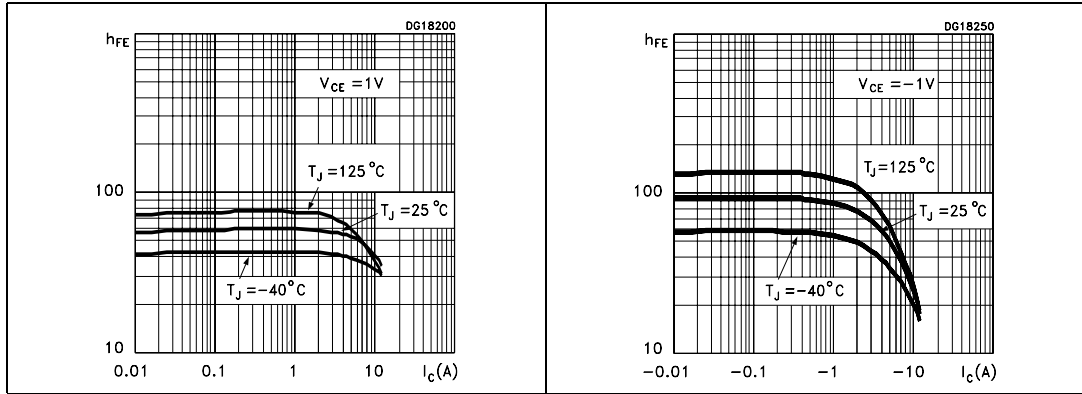


Figure 4. DC current gain for NPN type Figure 5. DC current gain for PNP type

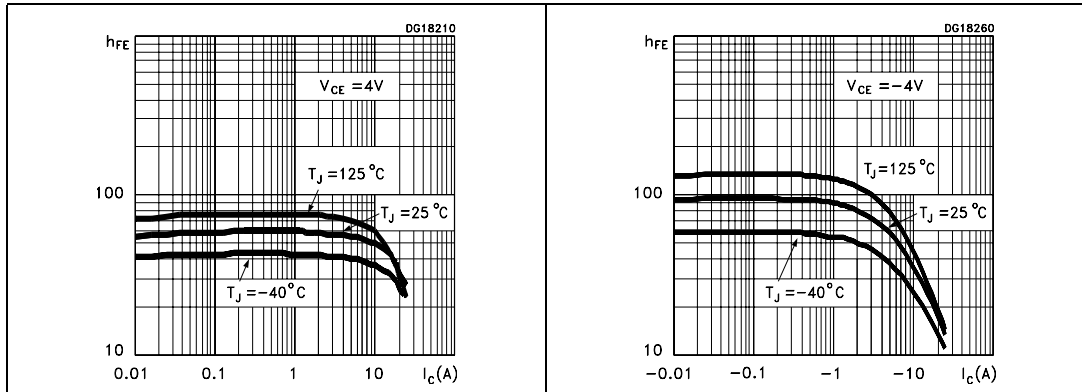


Figure 6. Collector-emitter saturation voltage for NPN type Figure 7. Collector-emitter saturation voltage for PNP type

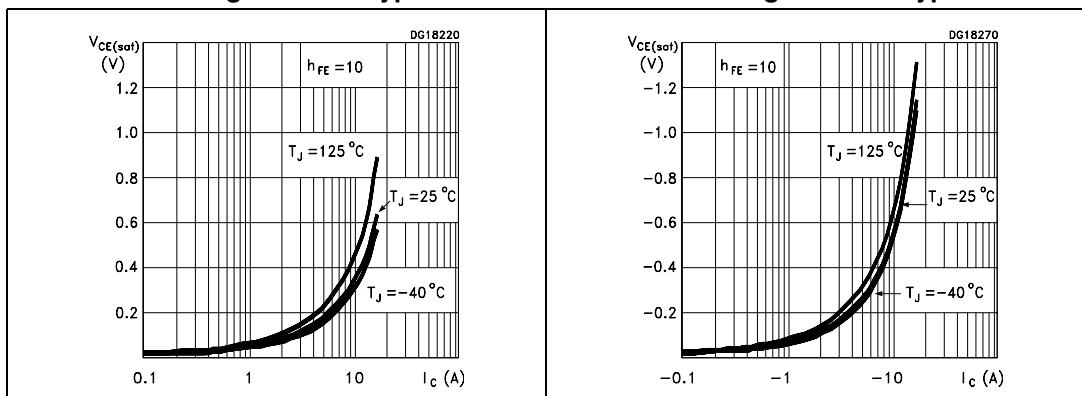


Figure 8. Base-emitter saturation voltage for NPN type

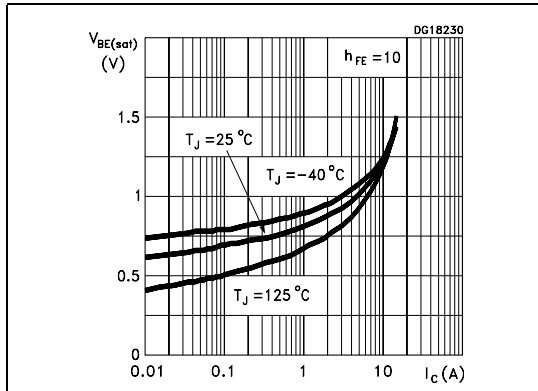


Figure 9. Base-emitter saturation voltage for PNP type

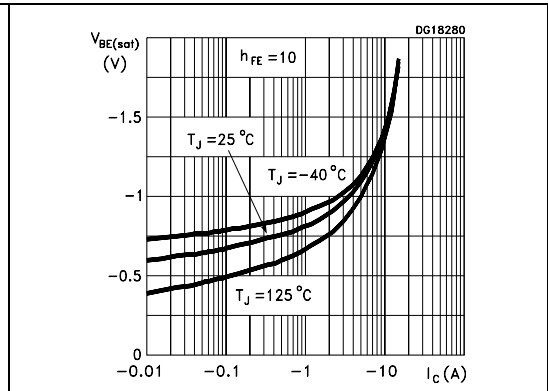


Figure 10. Base-emitter on voltage for NPN type

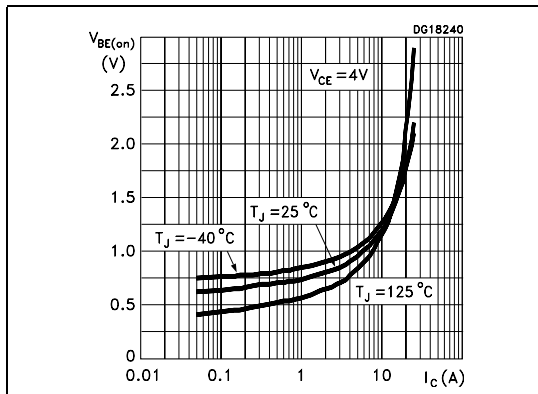
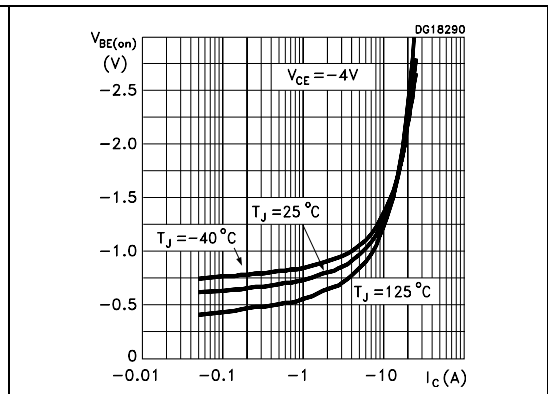


Figure 11. Base-emitter on voltage for PNP type

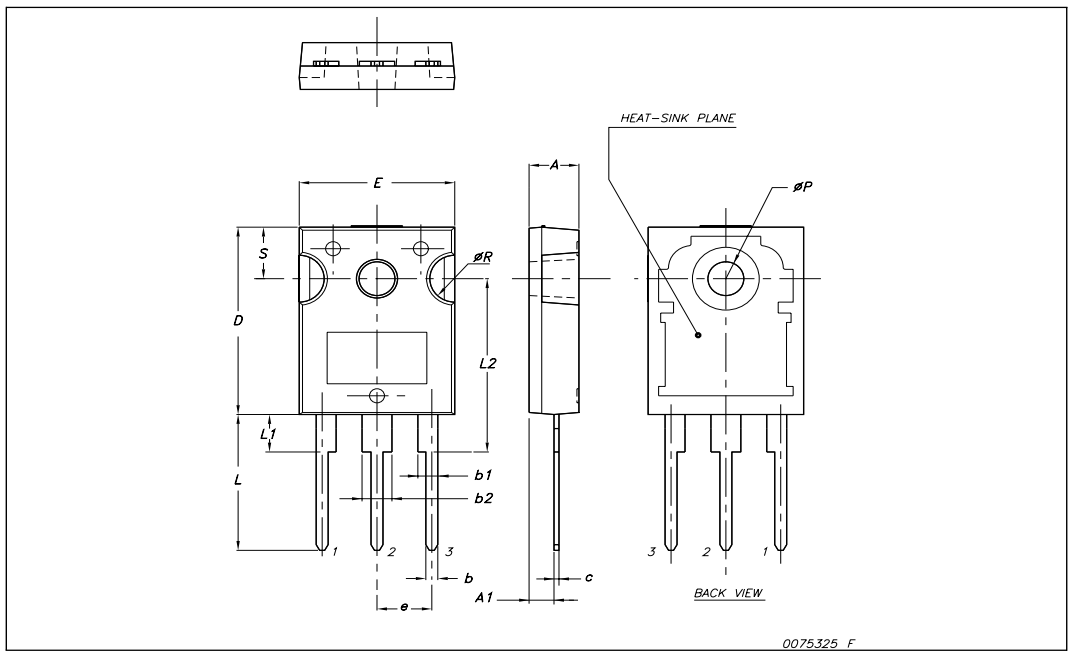


3 Package mechanical data

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

TO-247 Mechanical data

| Dim. | mm. | | |
|------|-------|-------|-------|
| | Min. | Typ | Max. |
| A | 4.85 | | 5.15 |
| A1 | 2.20 | | 2.60 |
| b | 1.0 | | 1.40 |
| b1 | 2.0 | | 2.40 |
| b2 | 3.0 | | 3.40 |
| c | 0.40 | | 0.80 |
| D | 19.85 | | 20.15 |
| E | 15.45 | | 15.75 |
| e | | 5.45 | |
| L | 14.20 | | 14.80 |
| L1 | 3.70 | | 4.30 |
| L2 | | 18.50 | |
| øP | 3.55 | | 3.65 |
| øR | 4.50 | | 5.50 |
| S | | 5.50 | |



4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 02-Nov-2005 | 1 | Initial release |
| 12-Dec-2005 | 2 | Added the ECOPACK label. |
| 07-Mar-2008 | 3 | Updated the package mechanical data. |
| 23-Sep-2008 | 4 | Added figures 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10 , 11 . |

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