

## Complementary power transistors

### Features

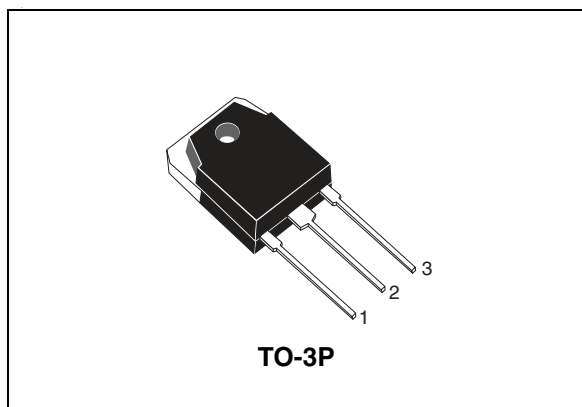
- Low collector-emitter saturation voltage
- Complementary NPN-PNP transistors

### Applications

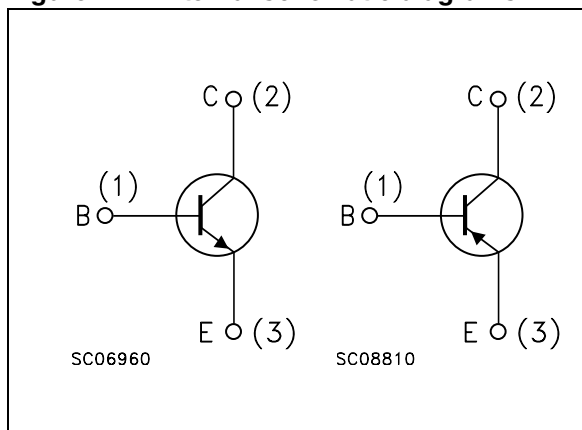
- General purpose
- Audio amplifier

### 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 |
|------------|---------|---------|-----------|
| TIP35CP    | TIP35CP | TO-3P   | Tube      |
| TIP36CP    | TIP36CP |         |           |

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol    | Parameter                               |     | Value      | Unit |
|-----------|---|-----|------------|------|
|           |   | NPN | TIP35CP    |      |
|           |   | PNP | TIP36CP    |      |
| $V_{CBO}$ | 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 |
|-----------------------------|---|---|------|------|------|------|
| $I_{\text{CEO}}$            | Collector cut-off current<br>( $I_{\text{B}} = 0$ )               | $V_{\text{CE}} = 60\text{ V}$                     |      |      | 1    | mA   |
| $I_{\text{EBO}}$            | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                 | $V_{\text{EB}} = 5\text{ V}$                      |      |      | 1    | mA   |
| $I_{\text{CES}}$            | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )              | $V_{\text{CE}} = 100\text{ V}$                    |      |      | 0.7  | mA   |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter<br>sustaining voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 30\text{ mA}$                     | 100  |      |      | V    |
| $V_{\text{CE(sat)}}^{(1)}$  | Collector-emitter<br>saturation voltage                           | $I_{\text{C}} = 15\text{ A}$                      |      |      | 1.8  | V    |
|                             |   | $I_{\text{C}} = 25\text{ A}$                      |      |      | 4    | V    |
| $V_{\text{BE(on)}}^{(1)}$   | Base-emitter voltage  | $I_{\text{C}} = 15\text{ A}$                      |      |      | 2    | V    |
|                             |   | $I_{\text{C}} = 25\text{ A}$                      |      |      | 4    | V    |
| $h_{\text{FE}}^{(1)}$       | DC current gain   | $I_{\text{C}} = 1.5\text{ A}$                     |      | 25   |      |      |
|                             |   | $I_{\text{C}} = 15\text{ A}$                      |      | 10   |      | 50   |
| $f_{\text{T}}$              | Transition frequency  | $I_{\text{C}} = 1\text{ A}$<br>$f = 1\text{ MHz}$ |      | 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

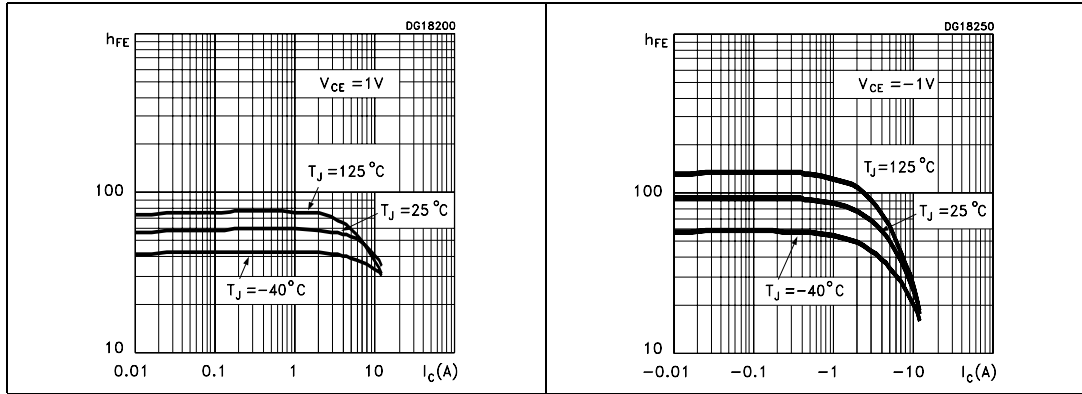


Figure 4. DC current gain for NPN type      Figure 5. DC current gain for PNP type

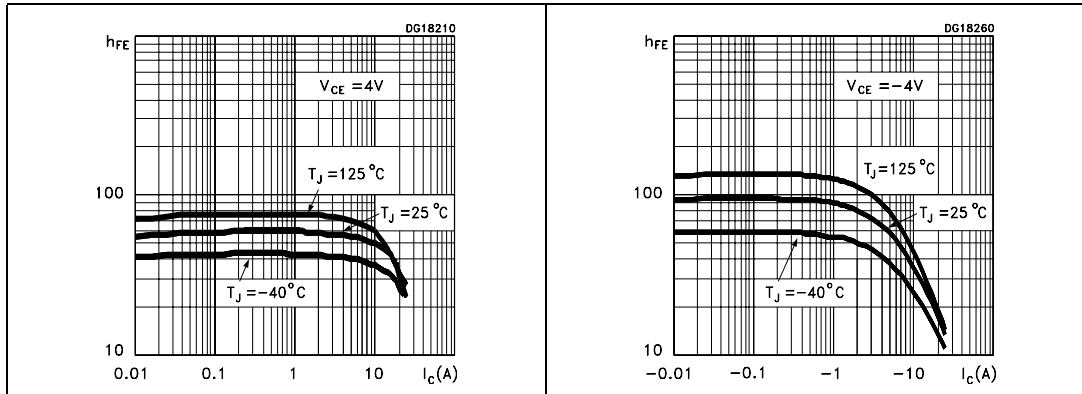
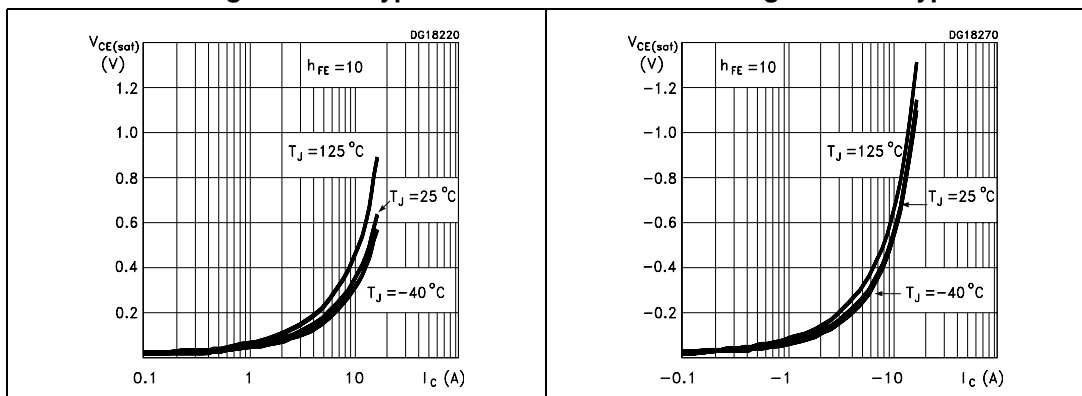
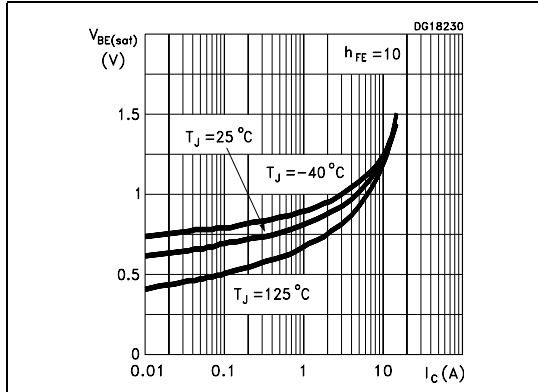


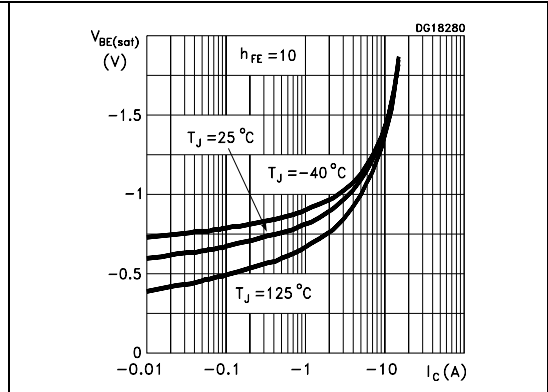
Figure 6. Collector-emitter saturation voltage for NPN type      Figure 7. Collector-emitter saturation voltage for PNP type



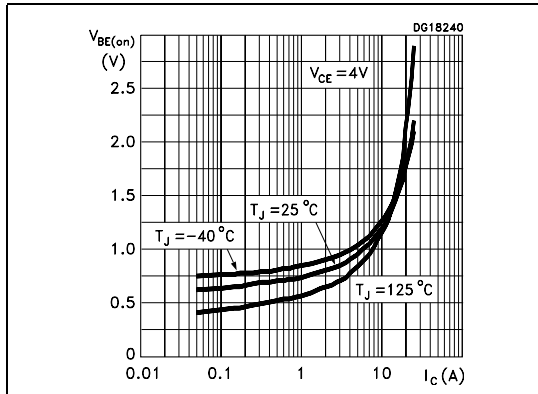
**Figure 8. Base-emitter saturation voltage for NPN type**



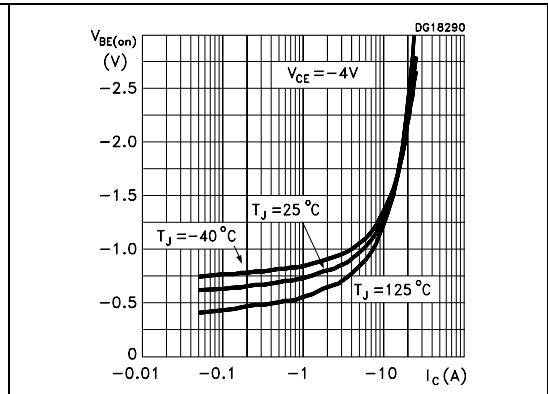
**Figure 9. Base-emitter saturation voltage for PNP type**



**Figure 10. Base-emitter on voltage for NPN type**



**Figure 11. Base-emitter on voltage for PNP type**

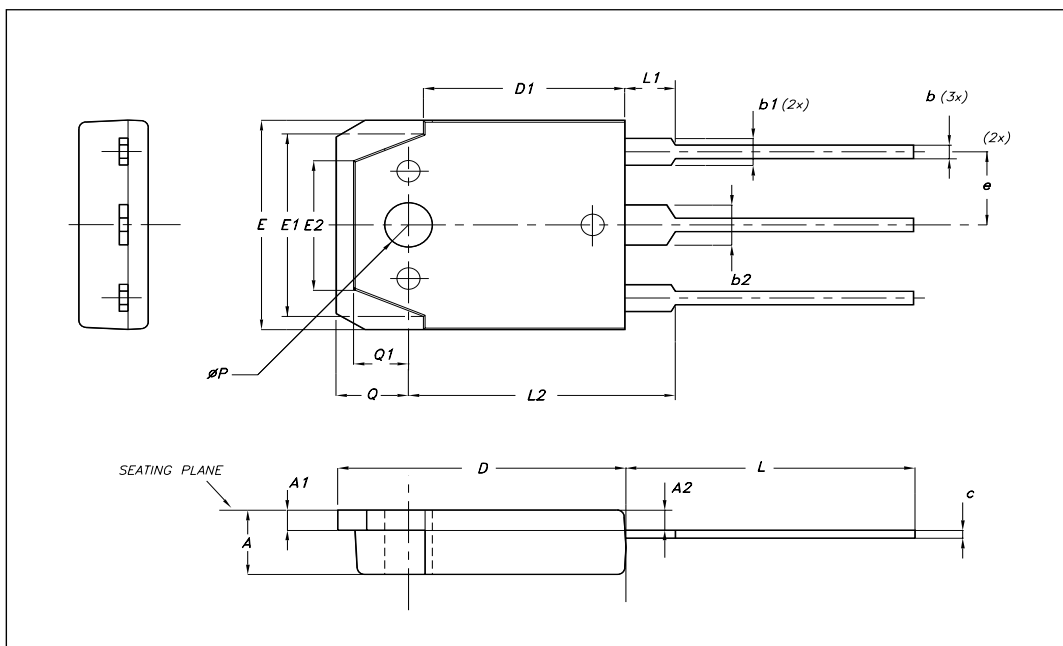


### 3 Package mechanical data

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](http://www.st.com)

**TO-3P Mechanical data**

| DIM. | mm.   |       |       |
|------|-------|-------|-------|
|      | MIN.  | TYP   | MAX.  |
| A    | 4.6   |       | 5     |
| A1   | 1.45  | 1.50  | 1.65  |
| A2   | 1.20  | 1.40  | 1.60  |
| b    | 0.80  | 1     | 1.20  |
| b1   | 1.80  |       | 2.20  |
| b2   | 2.80  |       | 3.20  |
| c    | 0.55  | 0.60  | 0.75  |
| D    | 19.70 | 19.90 | 20.10 |
| D1   |       | 13.90 |       |
| E    | 15.40 |       | 15.80 |
| E1   |       | 13.60 |       |
| E2   |       | 9.60  |       |
| e    | 5.15  | 5.45  | 5.75  |
| L    | 19.50 | 20    | 20.50 |
| L1   |       | 3.50  |       |
| L2   | 18.20 | 18.40 | 18.60 |
| P    | 3.10  |       | 3.30  |
| Q    |       | 5     |       |
| Q1   |       | 3.80  |       |



## 4 Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes   |
|-------------|----------|---|
| 21-Apr-2008 | 1        | Initial release   |
| 23-Sep-2008 | 2        | Added figures <a href="#">2</a> , <a href="#">3</a> , <a href="#">4</a> , <a href="#">5</a> , <a href="#">6</a> , <a href="#">7</a> , <a href="#">8</a> , <a href="#">9</a> , <a href="#">10</a> , <a href="#">11</a> . |



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