

## Low voltage NPN power transistor

### General features

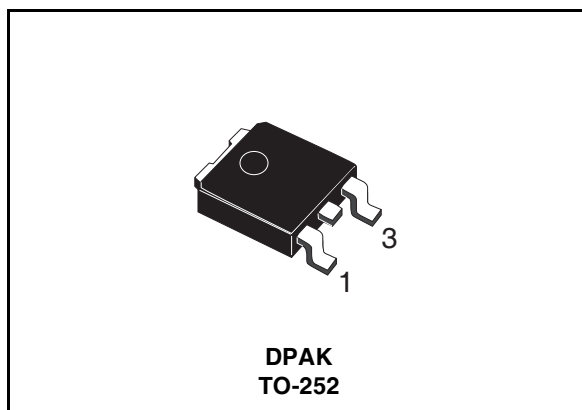
- Surface-mounting TO-252 power package in tape & reel
- In compliance with the 2002/93/EC European Directive

### Applications

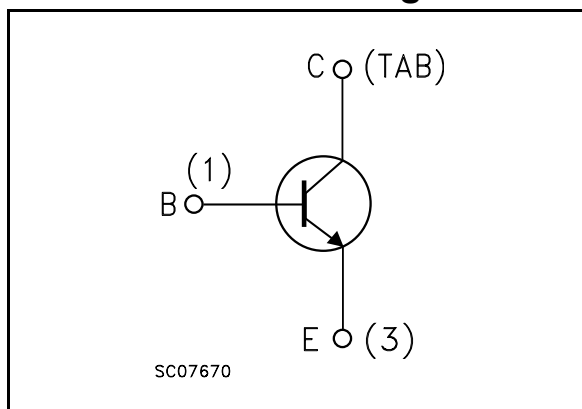
- General purpose switching and amplifier transistor

### Description

The device is manufactured in Planar technology with "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.



### Internal schematic diagram



### Order codes

| Part Number | Marking | Package | Packing     |
|-------------|---------|---------|-------------|
| MJD31CT4    | MJD31C  | DPAK    | Tape & reel |

# 1 Electrical ratings

**Table 1. Absolute maximum rating**

| Symbol    | Parameter                                     | Value      | Unit             |
|-----------|---|------------|------------------|
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )          | 100        | V                |
| $V_{CEO}$ | Collector-base voltage ( $I_B = 0$ )          | 100        | V                |
| $V_{EBO}$ | Emitter-base voltage ( $I_C = 0$ )            | 5          | V                |
| $I_C$     | Collector current                             | 3          | A                |
| $I_{CM}$  | Collector peak current                        | 5          | A                |
| $I_B$     | Base current                                  | 1          | A                |
| $P_{TOT}$ | Total dissipation at $T_C = 25^\circ\text{C}$ | 15         | W                |
| $T_{stg}$ | Storage temperature                           | -65 to 150 | $^\circ\text{C}$ |
| $T_J$     | Max. operating junction temperature           | 150        | $^\circ\text{C}$ |

## 2 Electrical characteristics

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

**Table 2. Electrical characteristics**

| Symbol              | Parameter  | Test Conditions          |                                | Min.     | Typ. | Max. | Unit    |
|---------------------|--|--------------------------|--------------------------------|----------|------|------|---------|
| $I_{CES}$           | Collector cut-off current ( $V_{BE} = 0$ )         | $V_{CE} = 100V$          |                                |          |      | 20   | $\mu A$ |
| $I_{CEO}$           | Collector cut-off current ( $I_B = 0$ )            | $V_{CB} = 60V$           |                                |          |      | 50   | $\mu A$ |
| $I_{EBO}$           | Emitter cut-off current ( $I_C = 0$ )              | $V_{EB} = 5V$            |                                |          |      | 0.1  | mA      |
| $V_{CE(sus)}^{(1)}$ | Collector-emitter sustaining voltage ( $I_B = 0$ ) | $I_C = 30mA$             |                                | 100      |      |      | V       |
| $V_{CE(sat)}^{(1)}$ | Collector-emitter saturation voltage               | $I_C = 3A$               | $I_B = 375mA$                  |          |      | 1.2  | V       |
| $V_{BE(on)}^{(1)}$  | Base-emitter on voltage                            | $I_C = 3A$               | $V_{CE} = 4V$                  |          |      | 1.8  | V       |
| $h_{FE}$            | DC current gain                                    | $I_C = 1A$<br>$I_C = 3A$ | $V_{CE} = 4V$<br>$V_{CE} = 4V$ | 25<br>10 |      | 50   |         |

Note (1) Pulsed duration = 300  $\mu s$ , duty cycle  $\leq 1.5\%$

### 2.1 Electrical characteristic (curves)

**Figure 1. Safe operating area**

**Figure 2. Derating curve**

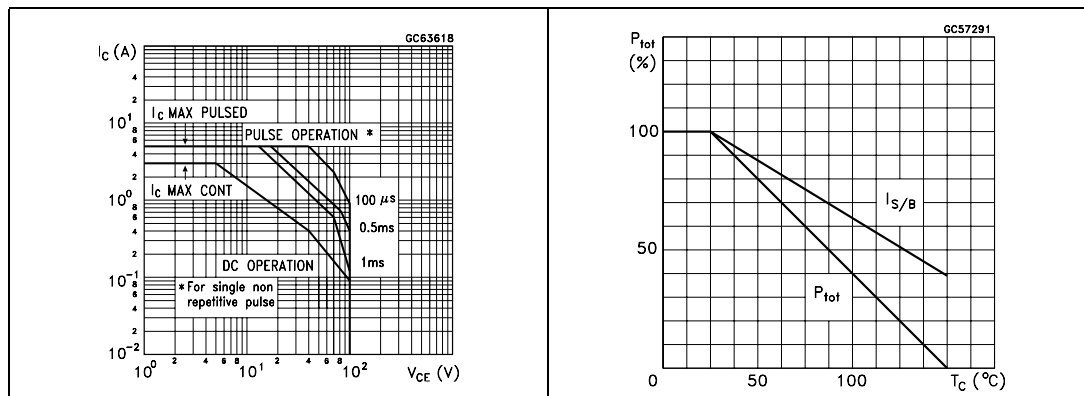


Figure 3. DC current gain

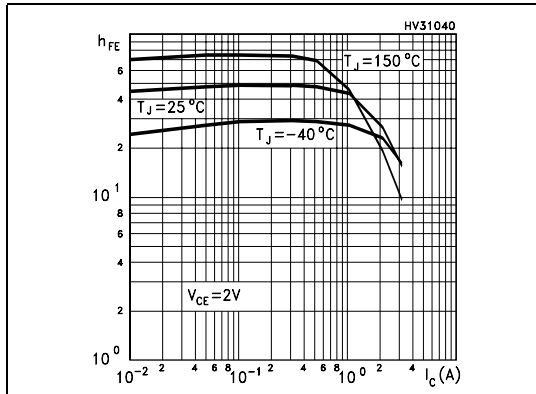


Figure 4. DC current gain

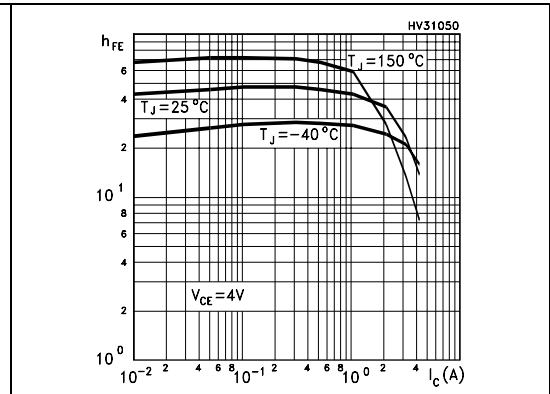


Figure 5. Collector-emitter saturation voltage

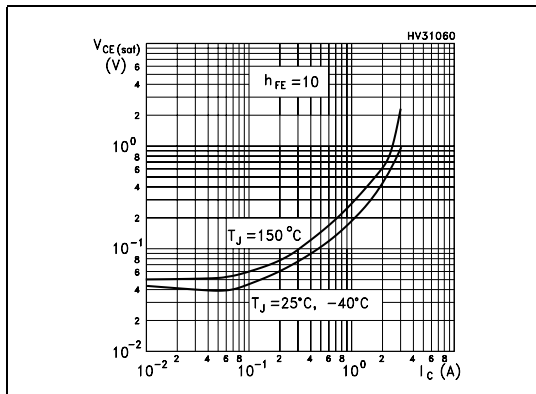


Figure 6. Base-emitter saturation voltage

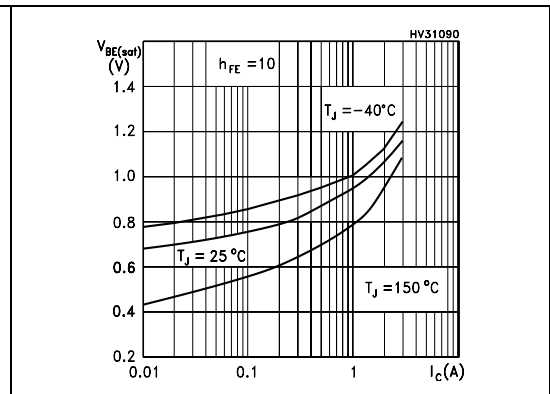


Figure 7. Collector-emitter on voltage

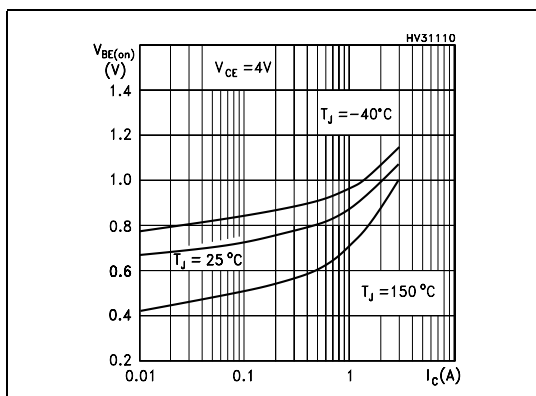


Figure 8. Resistive load switching time

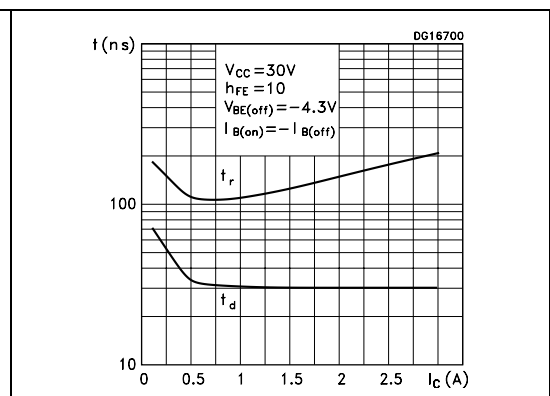
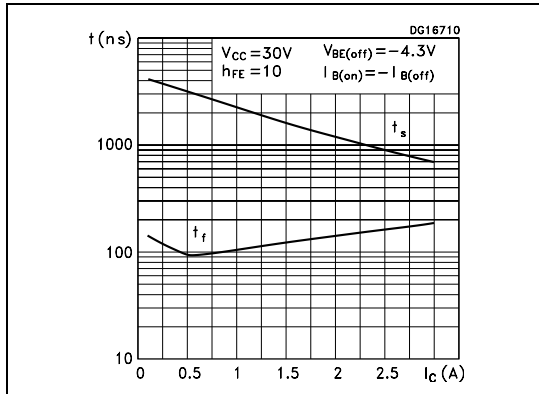


Figure 9. Resistive load switching time



## 2.2 Test circuits

Figure 10. Resistive load switching test circuit

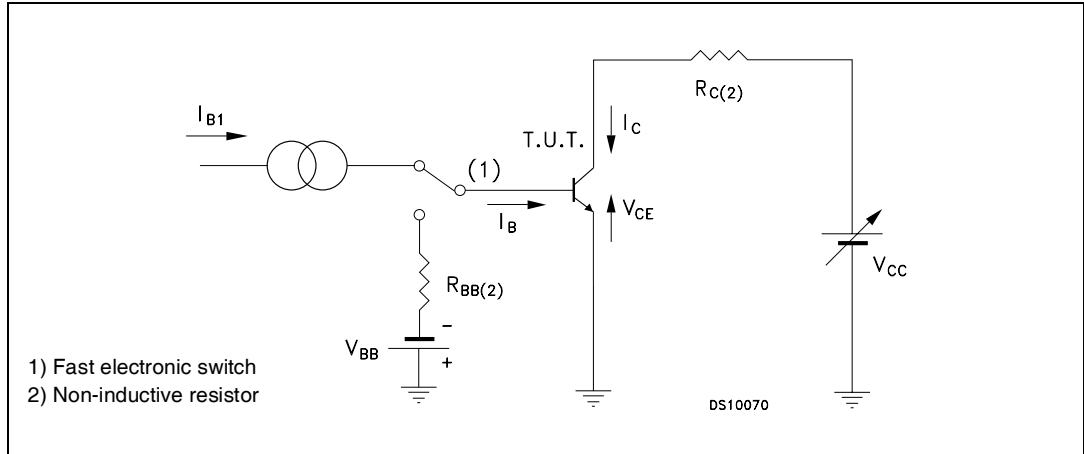
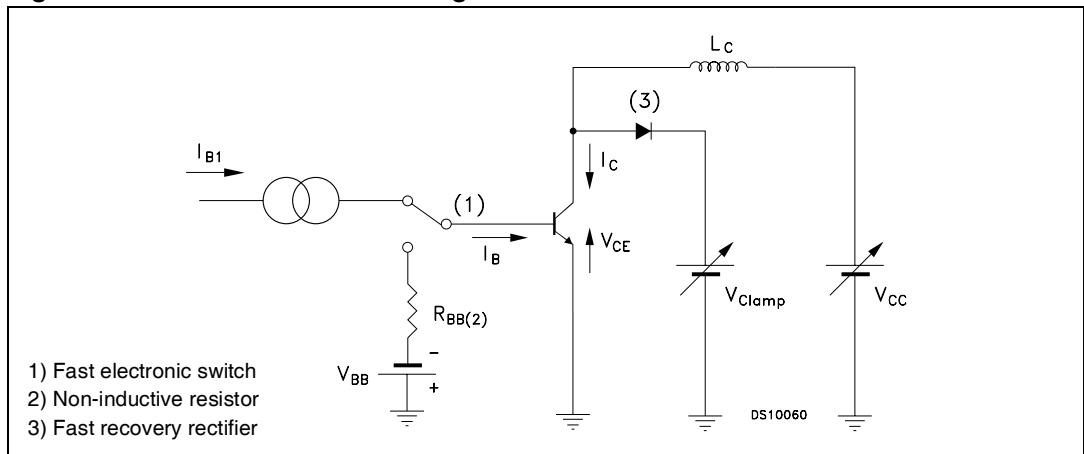


Figure 11. Inductive load switching test circuit

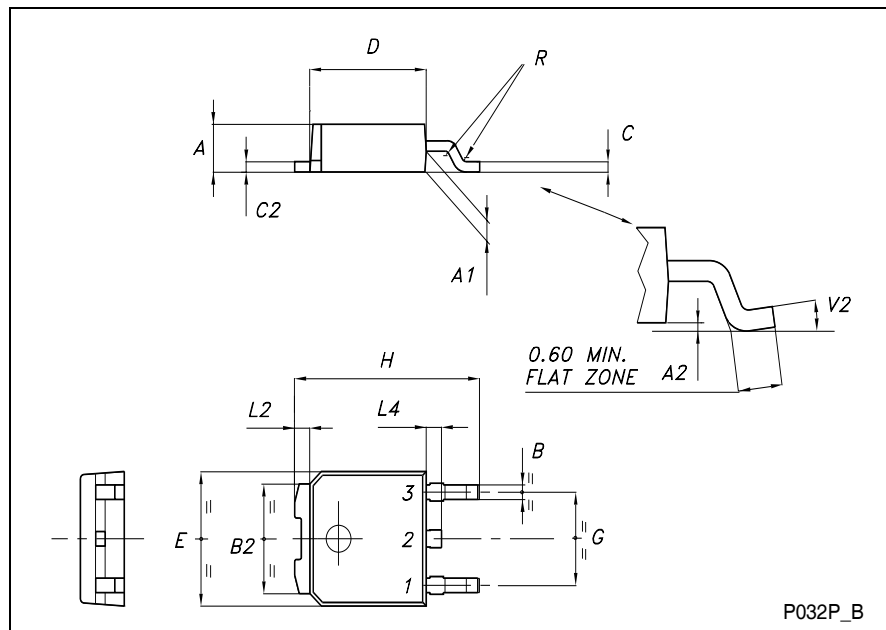


### 3 Package mechanical data

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-252 (DPAK) MECHANICAL DATA

| DIM. | mm   |      |       | inch  |       |       |
|------|------|------|-------|-------|-------|-------|
|      | MIN. | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 2.20 |      | 2.40  | 0.087 |       | 0.094 |
| A1   | 0.90 |      | 1.10  | 0.035 |       | 0.043 |
| A2   | 0.03 |      | 0.23  | 0.001 |       | 0.009 |
| B    | 0.64 |      | 0.90  | 0.025 |       | 0.035 |
| B2   | 5.20 |      | 5.40  | 0.204 |       | 0.213 |
| C    | 0.45 |      | 0.60  | 0.018 |       | 0.024 |
| C2   | 0.48 |      | 0.60  | 0.019 |       | 0.024 |
| D    | 6.00 |      | 6.20  | 0.236 |       | 0.244 |
| E    | 6.40 |      | 6.60  | 0.252 |       | 0.260 |
| G    | 4.40 |      | 4.60  | 0.173 |       | 0.181 |
| H    | 9.35 |      | 10.10 | 0.368 |       | 0.398 |
| L2   |      | 0.8  |       |       | 0.031 |       |
| L4   | 0.60 |      | 1.00  | 0.024 |       | 0.039 |
| V2   | 0°   |      | 8°    | 0°    |       | 0°    |



## 4 Revision history

**Table 3. Revision history**

| Date        | Revision | Changes  |
|-------------|----------|--|
| 01-Dec-2000 | 1        | Initial release.   |
| 20-Apr-2007 | 2        | The document has been reformatted. New graphics have been added. |



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