

### General features

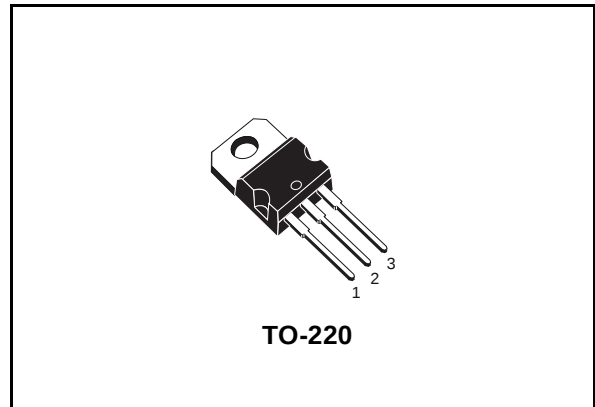
- New enhanced series
- High switching speed
- $h_{FE}$  improved linearity

### Applications

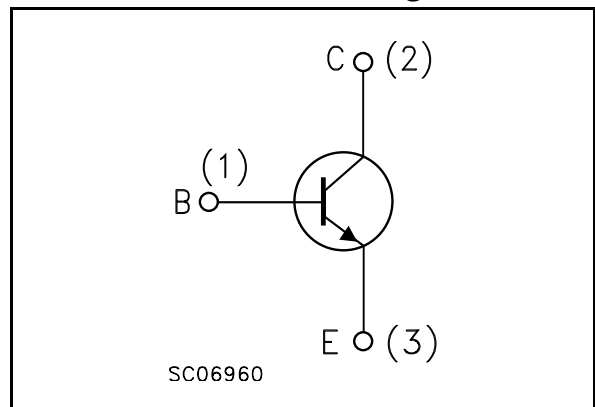
- Linear and switching industrial application

### Description

The TIP31A is a base island technology NPN power transistor in TO-220 plastic package with better performances than the industry standard TIP31A that make this device suitable for audio, power linear and switching applications. The PNP type is TIP32A.



### Internal schematic diagram



### Order codes

| Part Number | Marking | Package | Packing |
|-------------|---------|---------|---------|
| TIP31A      | TIP31A  | TO-220  | Tube    |

Contents

1      **Electrical ratings** ..... 3

2      **Electrical characteristics** ..... 4

      2.1    Electrical characteristics (curve) ..... 5

3      **Package mechanical data** ..... 6

4      **Revision history** ..... 8

# 1 Absolute maximum ratings

**Table 1. Absolute maximum ratings**

| Symbol    | Parameter                                          | Value      | Unit             |
|-----------|----------------------------------------------------|------------|------------------|
| $V_{CBO}$ | Collector-base voltage ( $I_E = 0$ )               | 60         | V                |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )            | 60         | 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 $T_{case} = 25^\circ\text{C}$ | 40         | W                |
|           | Total dissipation at $T_{amb} = 25^\circ\text{C}$  | 2          | W                |
| $T_{stg}$ | Storage temperature                                | -65 to 150 | $^\circ\text{C}$ |
| $T_J$     | Max. operating junction temperature                | 150        | $^\circ\text{C}$ |

## 2 Electrical characteristics

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

**Table 2. Electrical characteristics**

| Symbol                      | Parameter                                                      | Test conditions                                                                                                      | Min.     | Typ. | Max. | Unit |
|-----------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------|------|------|------|
| $I_{\text{CEO}}$            | Collector cut-off current<br>( $I_{\text{B}} = 0$ )            | $V_{\text{CE}} = 30\text{ V}$                                                                                        |          |      | 0.3  | mA   |
| $I_{\text{EBO}}$            | Emitter cut-off current ( $I_{\text{C}} = 0$ )                 | $V_{\text{EB}} = 5\text{ V}$                                                                                         |          |      | 1    | mA   |
| $I_{\text{CES}}$            | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )           | $V_{\text{CE}} = 60\text{ V}$                                                                                        |          |      | 0.2  | mA   |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter<br>sustaining voltage ( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 30\text{ mA}$                                                                                        | 60       |      |      | V    |
| $V_{\text{CE(sat)}}^{(1)}$  | Collector-emitter saturation<br>voltage                        | $I_{\text{C}} = 3\text{ A}$ $I_{\text{B}} = 375\text{ mA}$                                                           |          |      | 1.2  | V    |
| $V_{\text{BE(on)}}^{(1)}$   | Base-emitter voltage                                           | $I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 4\text{ V}$                                                             |          |      | 1.8  | V    |
| $h_{\text{FE}}^{(1)}$       | DC current gain                                                | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 4\text{ V}$<br>$I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | 25<br>10 |      | 50   |      |

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

# 2.1 Electrical characteristics (curve)

Figure 1. Safe Operating area

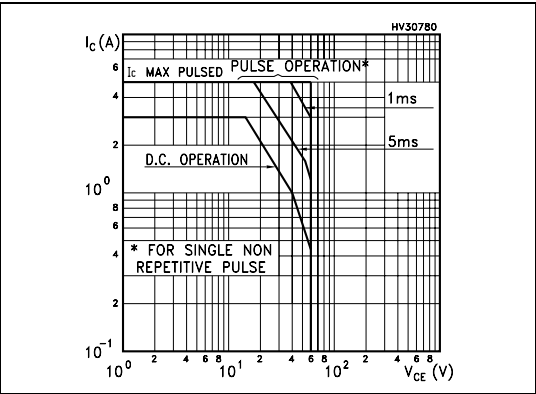


Figure 2. Derating curves

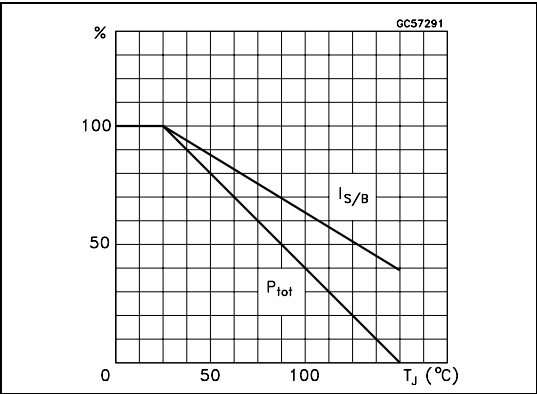


Figure 3. DC-current gain

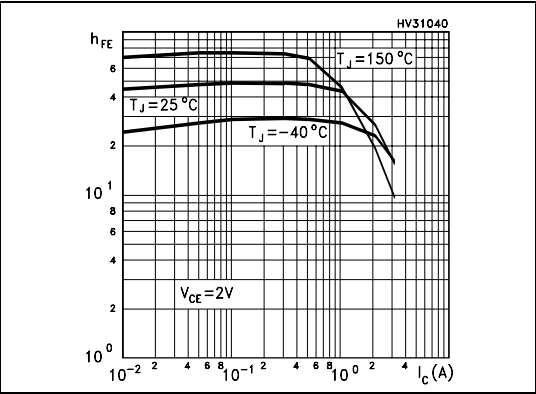


Figure 4. DC-current gain

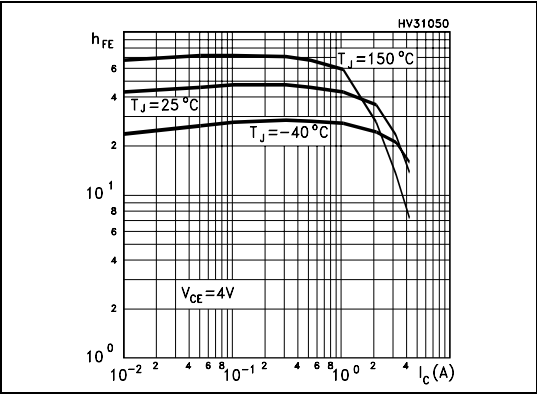


Figure 5. Collector-emitter saturation voltage

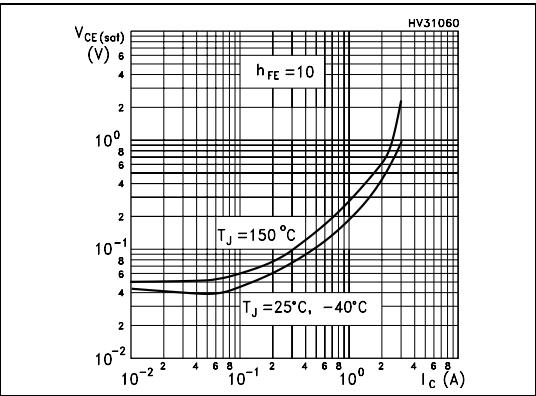


Figure 6. Base-emitter saturation voltage

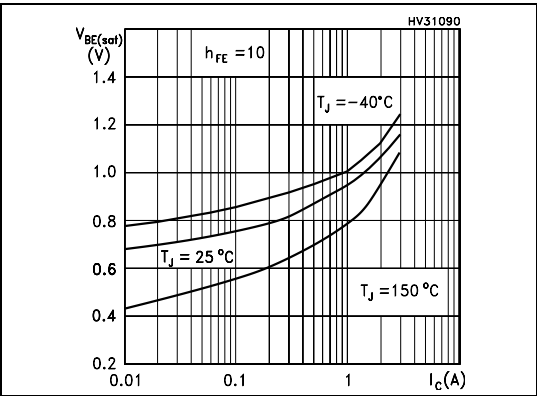
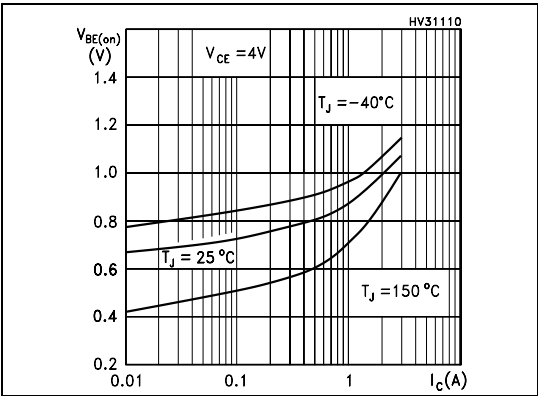


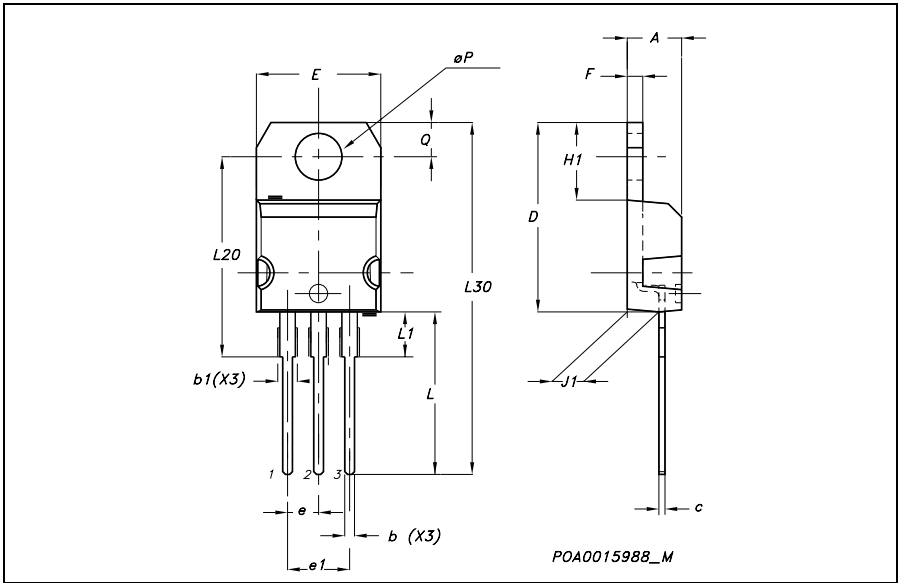
Figure 7. Base-emitter on voltage



### 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-220 MECHANICAL DATA |       |       |       |       |       |       |
|------------------------|-------|-------|-------|-------|-------|-------|
| DIM.                   | mm.   |       |       | inch  |       |       |
|                        | MIN.  | TYP   | MAX.  | MIN.  | TYP.  | MAX.  |
| A                      | 4.40  |       | 4.60  | 0.173 |       | 0.181 |
| b                      | 0.61  |       | 0.88  | 0.024 |       | 0.034 |
| b1                     | 1.15  |       | 1.70  | 0.045 |       | 0.066 |
| c                      | 0.49  |       | 0.70  | 0.019 |       | 0.027 |
| D                      | 15.25 |       | 15.75 | 0.60  |       | 0.620 |
| E                      | 10    |       | 10.40 | 0.393 |       | 0.409 |
| e                      | 2.40  |       | 2.70  | 0.094 |       | 0.106 |
| e1                     | 4.95  |       | 5.15  | 0.194 |       | 0.202 |
| F                      | 1.23  |       | 1.32  | 0.048 |       | 0.052 |
| H1                     | 6.20  |       | 6.60  | 0.244 |       | 0.256 |
| J1                     | 2.40  |       | 2.72  | 0.094 |       | 0.107 |
| L                      | 13    |       | 14    | 0.511 |       | 0.551 |
| L1                     | 3.50  |       | 3.93  | 0.137 |       | 0.154 |
| L20                    |       | 16.40 |       |       | 0.645 |       |
| L30                    |       | 28.90 |       |       | 1.137 |       |
| øP                     | 3.75  |       | 3.85  | 0.147 |       | 0.151 |
| Q                      | 2.65  |       | 2.95  | 0.104 |       | 0.116 |



## 4 Revision history

**Table 3.** Revision history

| Date        | Revision | Changes     |
|-------------|----------|-------------|
| 20-Apr-2006 | 1        | New release |

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