

## High voltage fast-switching NPN power transistor

### Features

- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

### Applications

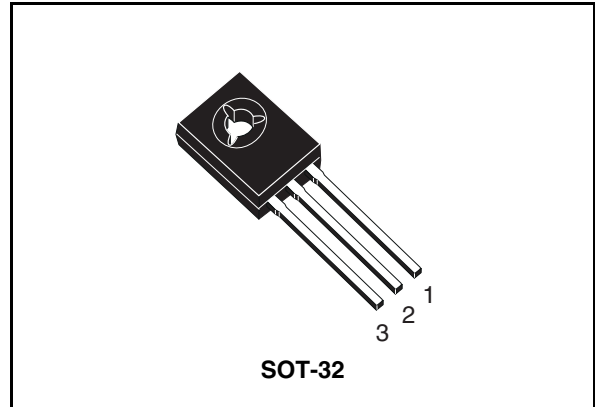
- Electronic ballast for fluorescent lighting
- Flyback and forward single transistor low power converters

### Description

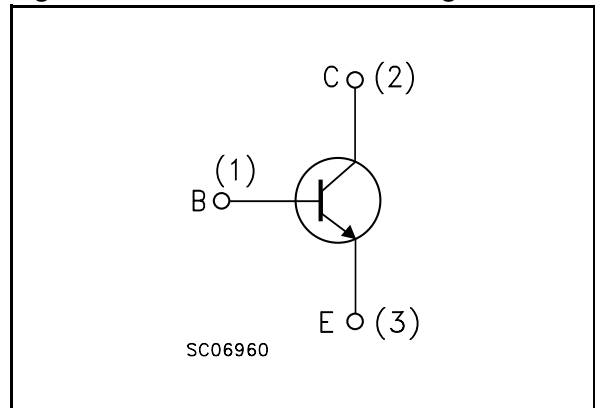
The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds and medium voltage capability.

It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The device is designed for use in lighting applications and low cost switch-mode power supplies.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

| Order code | Marking | Package | Packaging |
|------------|---------|---------|-----------|
| BULT118    | BULT118 | SOT-32  | Tube      |

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol    | Parameter                                  | Value      | Unit |
|-----------|--------------------------------------------|------------|------|
| $V_{CES}$ | Collector-emitter voltage ( $V_{BE} = 0$ ) | 700        | V    |
| $V_{CEO}$ | Collector-emitter voltage ( $I_B = 0$ )    | 400        | V    |
| $V_{EBO}$ | Emitter-base voltage ( $I_C = 0$ )         | 9          | V    |
| $I_C$     | Collector current                          | 2          | A    |
| $I_{CM}$  | Collector peak current ( $t_P < 5$ ms)     | 4          | A    |
| $I_B$     | Base current                               | 1          | A    |
| $I_{BM}$  | Base peak current ( $t_P < 5$ ms)          | 2          | A    |
| $P_{tot}$ | Total dissipation at $T_C = 25$ °C         | 45         | W    |
| $T_{stg}$ | Storage temperature                        | -65 to 150 | °C   |
| $T_J$     | Max. operating junction temperature        | 150        | °C   |

## 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                                            |
|----------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|-------------------|-------------------------------------------------|
| $I_{\text{CES}}$                                   | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )           | $V_{\text{CE}} = 700\text{ V}$<br>$V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125^{\circ}\text{C}$                                                                                 |               |                    | 100<br>500        | $\mu\text{A}$<br>$\mu\text{A}$                  |
| $I_{\text{CEO}}$                                   | Collector-emitter leakage current                              | $V_{\text{CE}} = 400\text{ V}$                                                                                                                                                        |               |                    | 250               | $\mu\text{A}$                                   |
| $V_{\text{EBO}}$                                   | Emitter-base voltage                                           | $I_{\text{E}} = 10\text{ mA}$                                                                                                                                                         | 9             |                    |                   | V                                               |
| $V_{\text{CEO(sus)}}^{(1)}$                        | Collector-emitter sustaining voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 10\text{ mA}$                                                                                                                                                         | 400           |                    |                   | V                                               |
| $V_{\text{CE(sat)}}^{(1)}$                         | Collector-emitter saturation voltage                           | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$<br>$I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.2\text{ A}$<br>$I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 0.4\text{ A}$ |               |                    | 0.5<br>1<br>1.5   | V<br>V<br>V                                     |
| $V_{\text{BE(sat)}}^{(1)}$                         | Base-emitter saturation voltage                                | $I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$<br>$I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.2\text{ A}$<br>$I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 0.4\text{ A}$ |               |                    | 1<br>1.2<br>1.3   | V<br>V<br>V                                     |
| $h_{\text{FE}}^{(1)}$                              | DC current gain                                                | $I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$<br>$I_{\text{C}} = 0.5\text{ A}$ $V_{\text{CE}} = 5\text{ V}$<br>$I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 5\text{ V}$  | 10<br>10<br>8 |                    | 50                |                                                 |
| $t_{\text{r}}$<br>$t_{\text{s}}$<br>$t_{\text{f}}$ | Resistive load<br>Rise time<br>Storage time<br>Fall time       | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CC}} = 125\text{ V}$<br>$I_{\text{B1}} = -I_{\text{B2}} = 0.2\text{ A}$                                                                         |               | 0.4<br>3.2<br>0.25 | 0.7<br>4.5<br>0.4 | $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$ |
| $t_{\text{s}}$<br>$t_{\text{f}}$                   | Inductive load<br>Storage time<br>Fall time                    | $I_{\text{C}} = 1\text{ A}$ $I_{\text{B1}} = 0.2\text{ A}$<br>$V_{\text{BE(off)}} = -5\text{ V}$ $L = 50\text{ mH}$<br>$V_{\text{Clamp}} = 300\text{ V}$                              |               | 0.8<br>0.16        |                   | $\mu\text{s}$<br>$\mu\text{s}$                  |

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

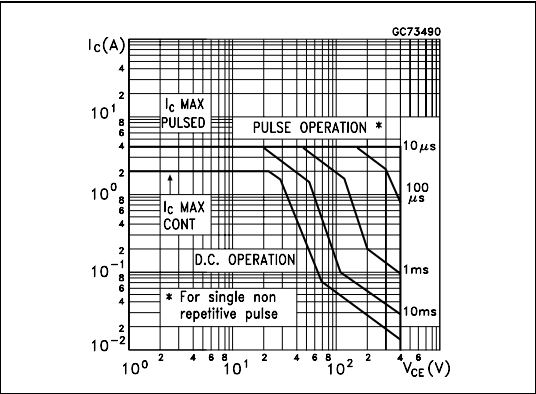


Figure 3. Derating curve

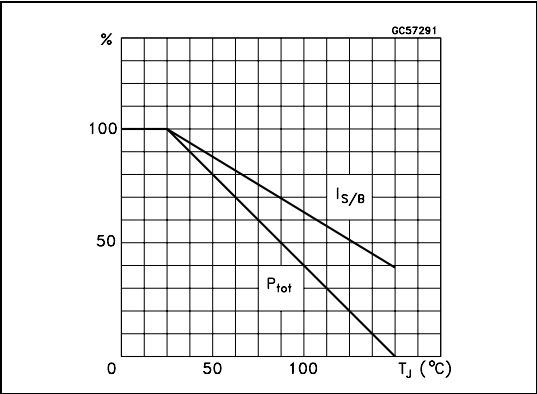


Figure 4. DC current gain

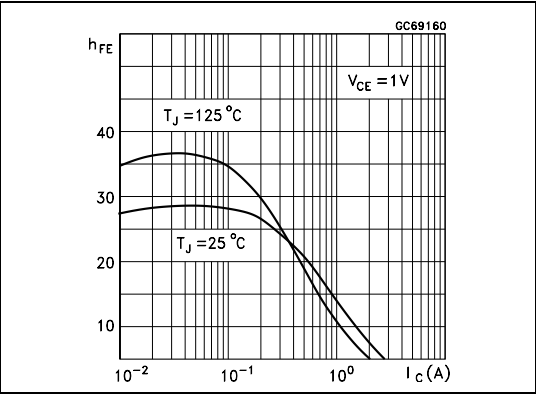


Figure 5. DC current gain

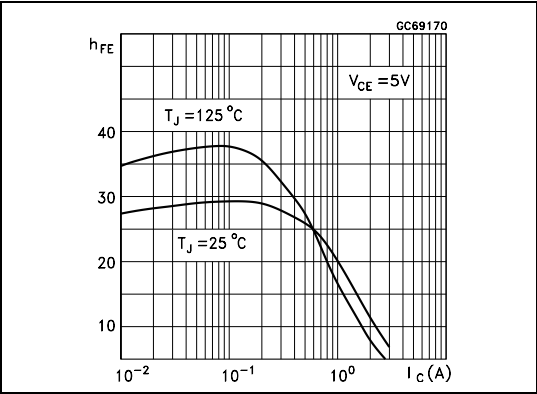


Figure 6. Collector-emitter saturation voltage

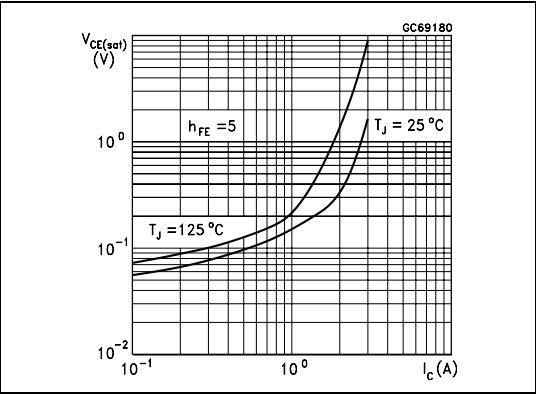


Figure 7. Base-emitter saturation voltage

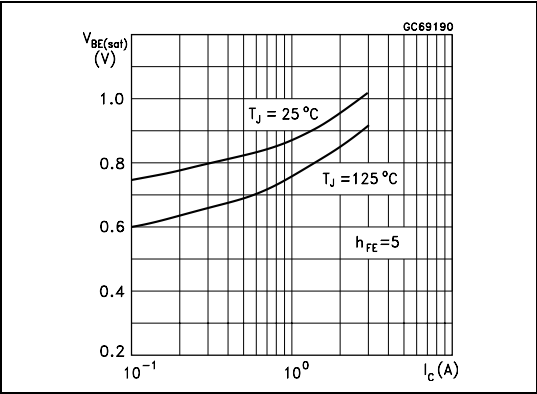


Figure 8. Inductive load fall time

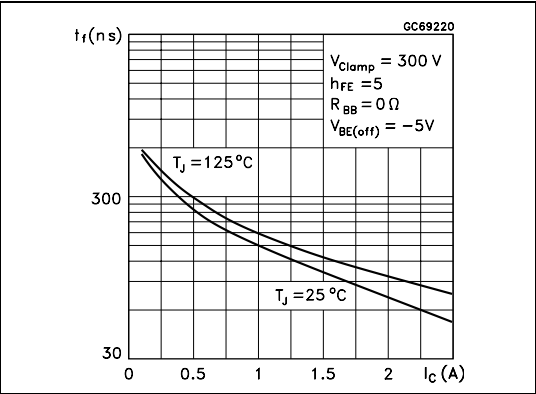


Figure 9. Inductive load storage time

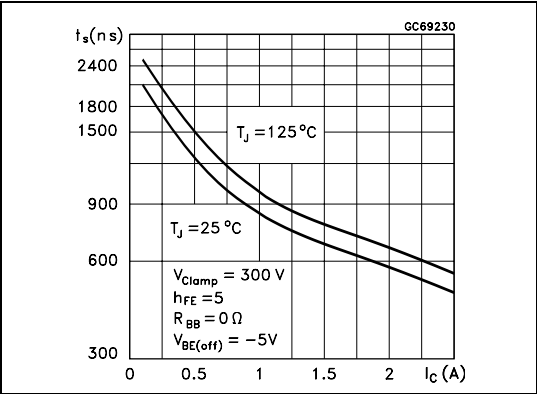


Figure 10. Resistive load fall time

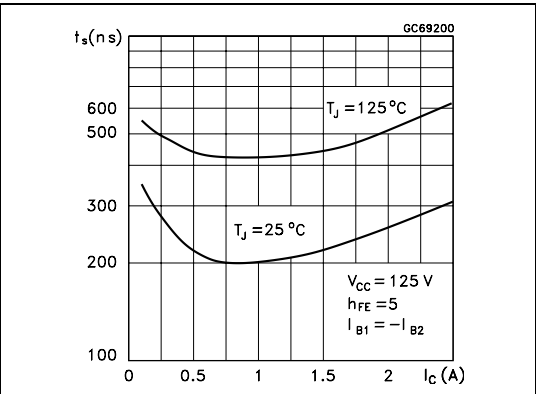


Figure 11. Resistive load storage time

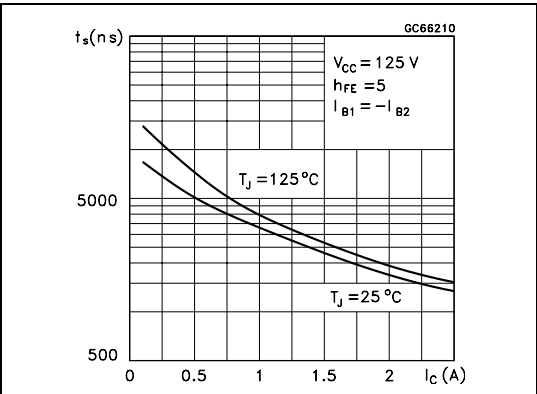
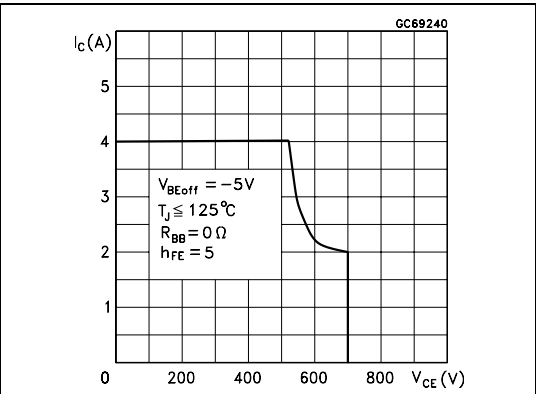
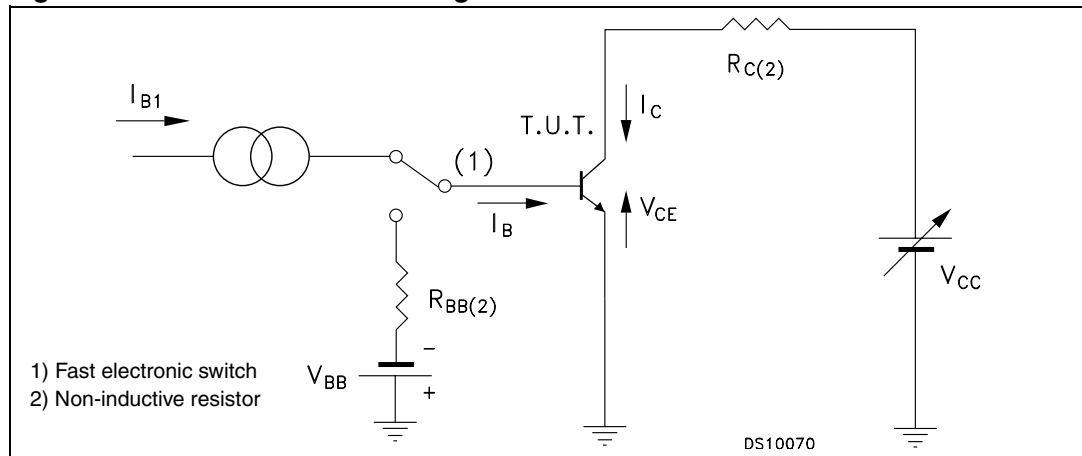


Figure 12. Reverse biased SOA

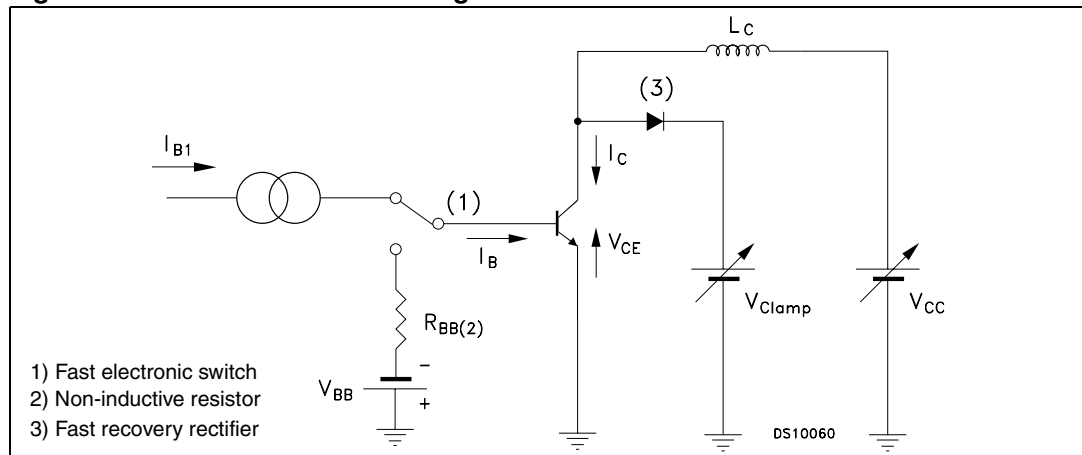


## 2.2 Test circuits

**Figure 13. Resistive load switching test circuit**



**Figure 14. Inductive load switching test circuit**

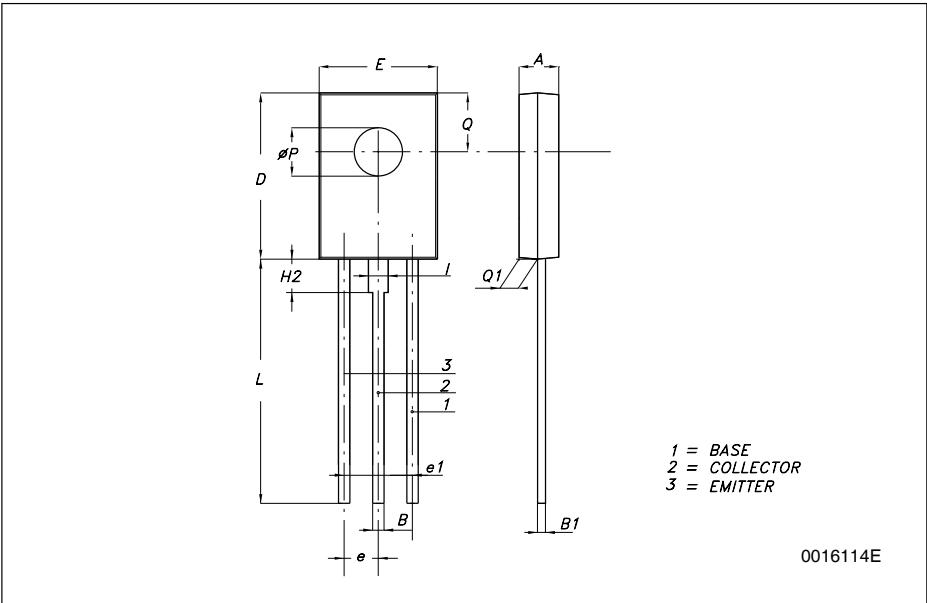


### 3      **Package mechanical data**

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)

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 |       |
| I    |      | 1.27 |       |



## 4 Revision history

**Table 4. Document revision history**

| Date        | Revision | Changes                                                                                                     |
|-------------|----------|-------------------------------------------------------------------------------------------------------------|
| 29-Sep-2003 | 1        | Initial release.                                                                                            |
| 10-Jul-2008 | 2        | Updated: $V_{CEO(sus)}$ condition in <a href="#">Table 3 on page 3</a> , SOT-32 mechanical data, cover page |

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