



**ST13003**

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- MEDIUM VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED

### APPLICATIONS:

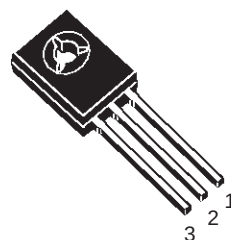
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- SWITCH MODE POWER SUPPLIES

### DESCRIPTION

The device is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and medium voltage capability.

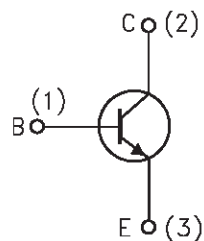
It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

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



**SOT-32**

### INTERNAL SCHEMATIC DIAGRAM



SC06960

### ABSOLUTE MAXIMUM RATINGS

| 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<br>( $I_C = 0$ , $I_B = 0.75$ A, $t_p < 10\mu s$ , $T_j < 150^\circ C$ ) | $BV_{EBO}$ | V          |
| $I_C$     | Collector Current                                                                             | 1.5        | A          |
| $I_{CM}$  | Collector Peak Current ( $t_p < 5$ ms)                                                        | 3          | A          |
| $I_B$     | Base Current                                                                                  | 0.75       | A          |
| $I_{BM}$  | Base Peak Current ( $t_p < 5$ ms)                                                             | 1.5        | A          |
| $P_{tot}$ | Total Dissipation at $T_c = 25^\circ C$                                                       | 40         | W          |
| $T_{stg}$ | Storage Temperature                                                                           | -65 to 150 | $^\circ C$ |
| $T_j$     | Max. Operating Junction Temperature                                                           | 150        | $^\circ C$ |

## THERMAL DATA

|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case    | Max | 3.12 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient | Max | 89   | °C/W |

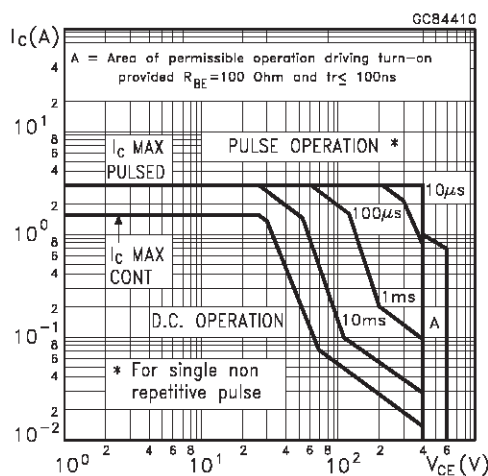
ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

| Symbol                                             | Parameter                                                 | Test Conditions                                                                                                                                         | Min.         | Typ. | Max.           | Unit           |
|----------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------|----------------|----------------|
| I <sub>CEV</sub>                                   | Collector Cut-off Current (V <sub>BE</sub> = -1.5V)       | V <sub>CE</sub> = 700V<br>V <sub>CE</sub> = 700V<br>T <sub>j</sub> = 125°C                                                                              |              |      | 1<br>5         | mA<br>mA       |
| BV <sub>EBO</sub>                                  | Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)       | I <sub>E</sub> = 10 mA                                                                                                                                  | 9            |      | 18             | V              |
| V <sub>CEO(sus)*</sub>                             | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 10 mA<br>L = 25 mH                                                                                                                     | 400          |      |                | V              |
| V <sub>CE(sat)*</sub>                              | Collector-Emitter Saturation Voltage                      | I <sub>C</sub> = 0.5 A<br>I <sub>C</sub> = 1 A<br>I <sub>C</sub> = 1.5 A<br>I <sub>B</sub> = 0.1 A<br>I <sub>B</sub> = 0.25 A<br>I <sub>B</sub> = 0.5 A |              |      | 0.5<br>1<br>3  | V<br>V<br>V    |
| V <sub>BE(sat)*</sub>                              | Base-Emitter Saturation Voltage                           | I <sub>C</sub> = 0.5 A<br>I <sub>C</sub> = 1 A<br>I <sub>B</sub> = 0.1 A<br>I <sub>B</sub> = 0.25 A                                                     |              |      | 1<br>1.2       | V<br>V         |
| h <sub>FE*</sub>                                   | DC Current Gain                                           | I <sub>C</sub> = 0.5 A<br>Group A<br>Group B<br>I <sub>C</sub> = 1 A<br>V <sub>CE</sub> = 2 V<br>V <sub>CE</sub> = 2 V                                  | 8<br>15<br>5 |      | 20<br>35<br>25 |                |
| t <sub>r</sub><br>t <sub>s</sub><br>t <sub>f</sub> | RESISTIVE LOAD<br>Rise Time<br>Storage Time<br>Fall Time  | I <sub>C</sub> = 1 A<br>I <sub>B1</sub> = 0.2 A<br>T <sub>p</sub> = 25 μs<br>V <sub>CC</sub> = 125 V<br>I <sub>B2</sub> = -0.2 A                        |              |      | 1<br>4<br>0.7  | μs<br>μs<br>μs |
| t <sub>s</sub>                                     | INDUCTIVE LOAD<br>Storage Time                            | I <sub>C</sub> = 1 A<br>V <sub>BE</sub> = -5 V<br>V <sub>clamp</sub> = 300 V<br>I <sub>B1</sub> = 0.2 A<br>L = 50 mH                                    |              | 0.8  |                | μs             |

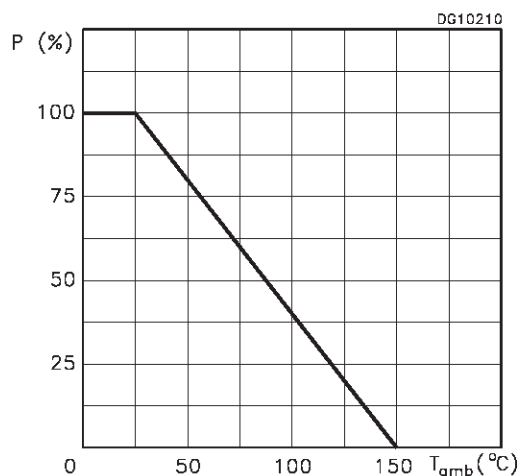
\* Pulsed: Pulse duration = 300μs, duty cycle = 1.5 %

Note: Product is pre-selected in DC current gain (GROUP A and GROUP B). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

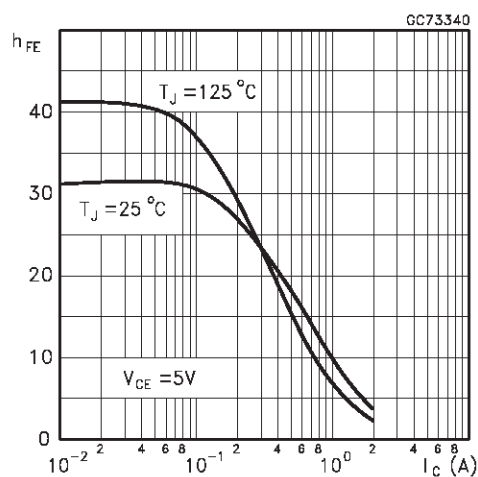
## Safe Operating Areas



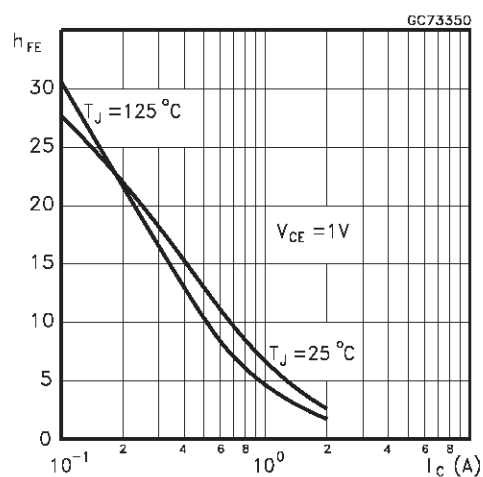
## Derating Curve



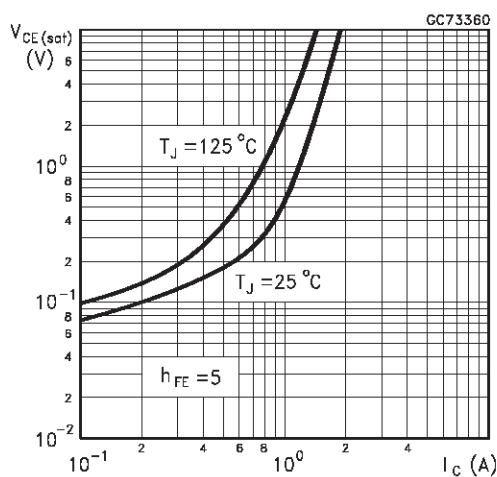
## DC Current Gain



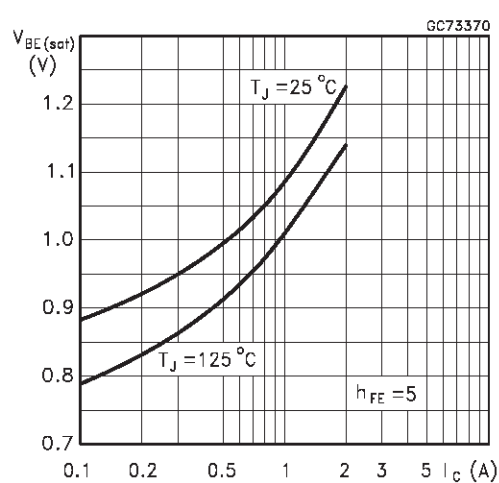
## DC Current Gain



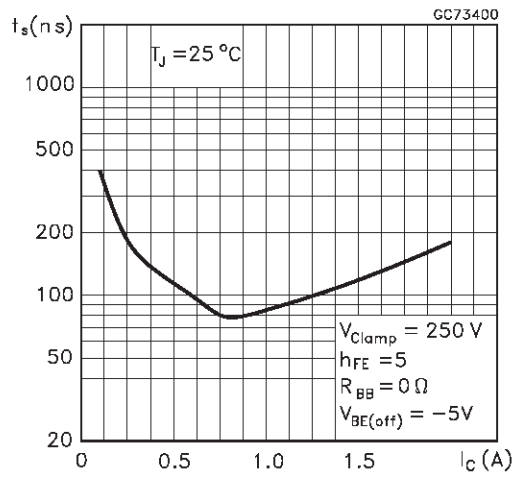
## Collector Emitter Saturation Voltage



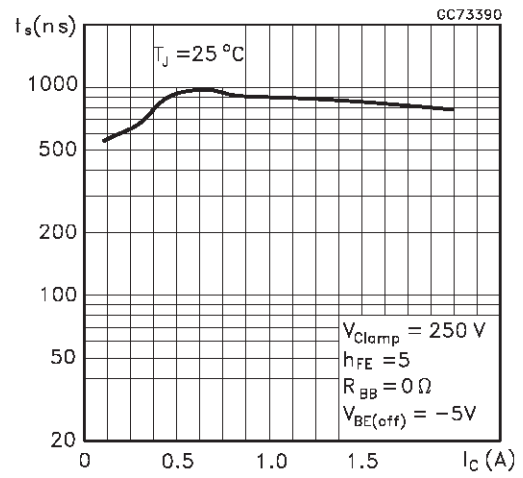
## Base Emitter Saturation Voltage



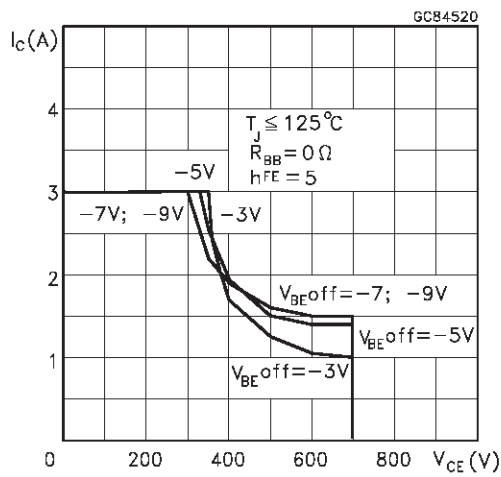
Inductive Fall Time

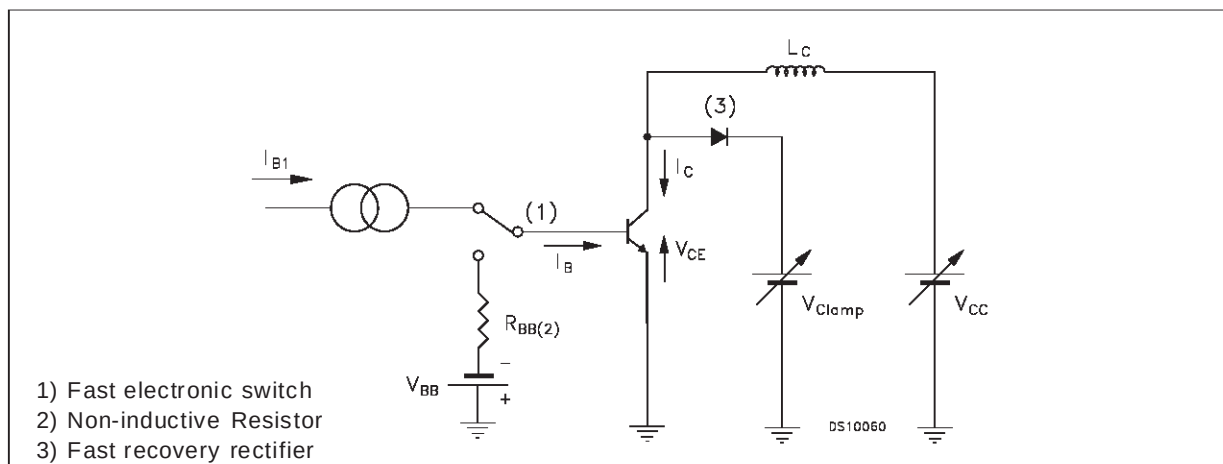
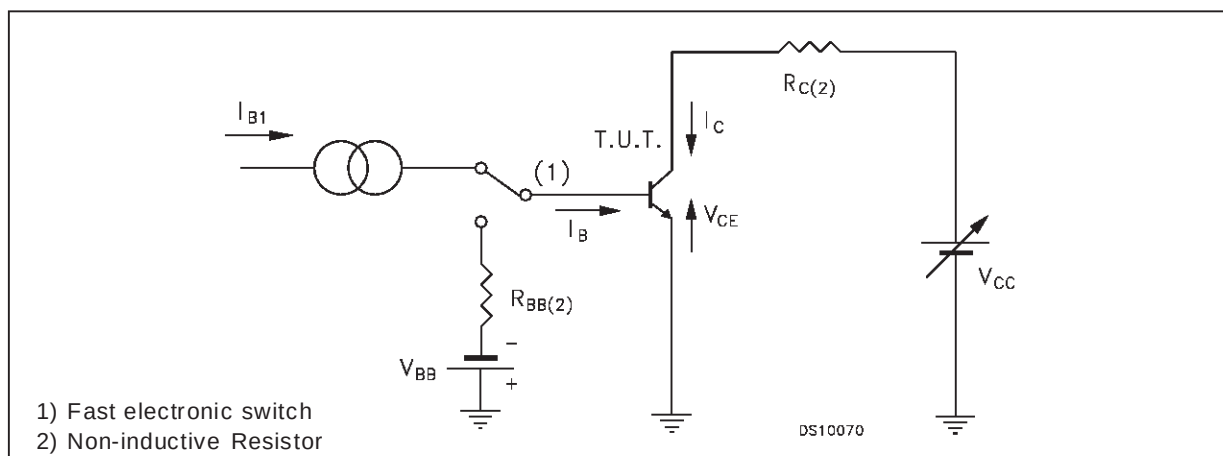


Inductive Storage Time



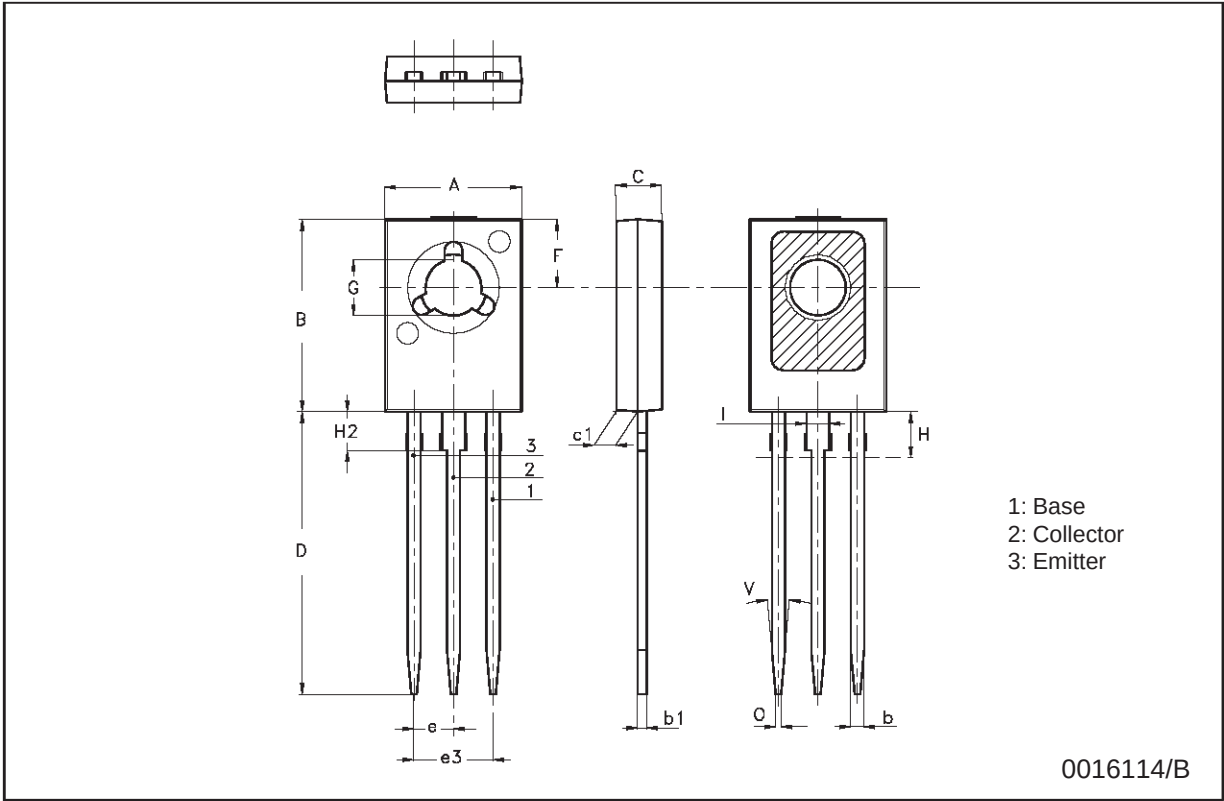
Reverse Biased SOA



**Figure 1:** Inductive Load Switching Test Circuits.**Figure 2:** Resistive Load Switching Test Circuits.

SOT-32 (TO-126) MECHANICAL DATA

| DIM. | mm   |                 |      | inch  |                 |       |
|------|------|-----------------|------|-------|-----------------|-------|
|      | MIN. | TYP.            | MAX. | MIN.  | TYP.            | MAX.  |
| A    | 7.4  |                 | 7.8  | 0.291 |                 | 0.307 |
| B    | 10.5 |                 | 10.8 | 0.413 |                 | 0.425 |
| b    | 0.7  |                 | 0.9  | 0.028 |                 | 0.035 |
| b1   | 0.40 |                 | 0.65 | 0.015 |                 | 0.025 |
| C    | 2.4  |                 | 2.7  | 0.094 |                 | 0.106 |
| c1   | 1.0  |                 | 1.3  | 0.039 |                 | 0.051 |
| D    | 15.4 |                 | 16.0 | 0.606 |                 | 0.630 |
| e    |      | 2.2             |      |       | 0.087           |       |
| e3   |      | 4.4             |      |       | 0.173           |       |
| F    |      | 3.8             |      |       | 0.150           |       |
| G    | 3    |                 | 3.2  | 0.118 |                 | 0.126 |
| H    |      |                 | 2.54 |       |                 | 0.100 |
| H2   |      | 2.15            |      |       | 0.084           |       |
| I    |      | 1.27            |      |       | 0.05            |       |
| O    |      | 0.3             |      |       | 0.011           |       |
| V    |      | 10 <sup>0</sup> |      |       | 10 <sup>0</sup> |       |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 2001 STMicroelectronics – Printed in Italy – All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - U.S.A.

<http://www.st.com>

