

**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:**

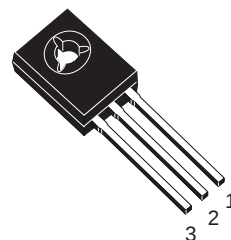
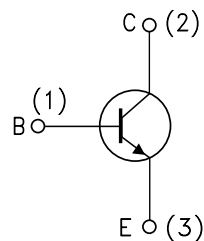
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- SWITCH MODE POWER SUPPLIES

**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 |

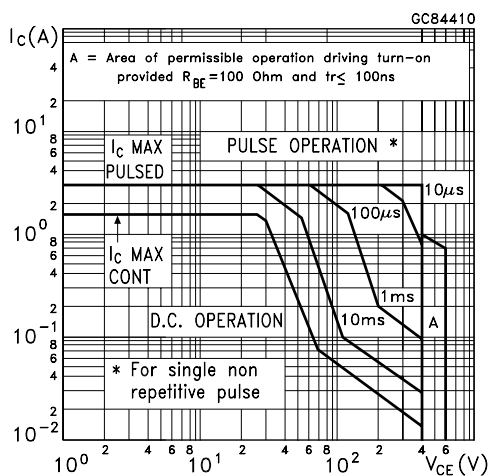
ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

| 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 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 I <sub>B</sub> = 0.1 A<br>I <sub>C</sub> = 1 A I <sub>B</sub> = 0.25 A<br>I <sub>C</sub> = 1.5 A 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 I <sub>B</sub> = 0.1 A<br>I <sub>C</sub> = 1 A 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 V <sub>CE</sub> = 2 V<br>Group A<br>Group B<br>I <sub>C</sub> = 1 A 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 V <sub>CC</sub> = 125 V<br>I <sub>B1</sub> = 0.2 A I <sub>B2</sub> = -0.2 A<br>T <sub>p</sub> = 25 μs                     |              |      | 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 I <sub>B1</sub> = 0.2 A<br>V <sub>BE</sub> = -5 V L = 50 mH<br>V <sub>clamp</sub> = 300 V                                 |              | 0.8  |                | μs             |

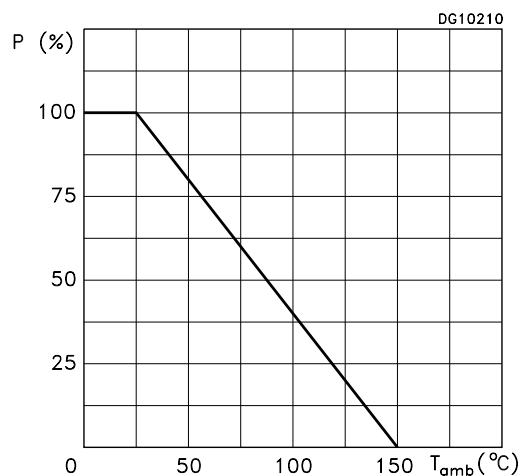
\* Pulsed: Pulse duration = 300μs, duty cycle = 1.5 %

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.

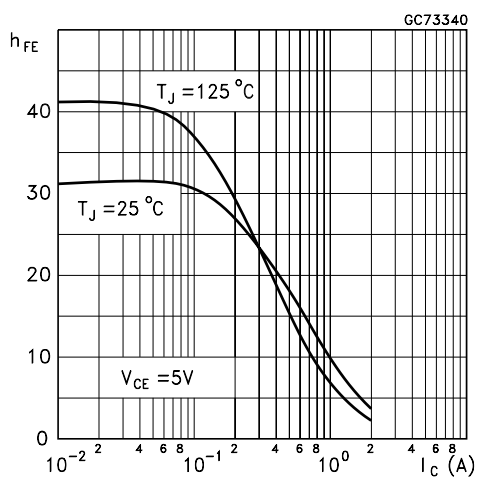
## Safe Operating Areas



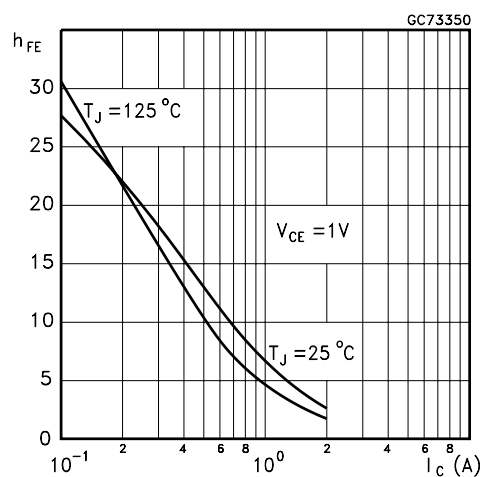
## Derating Curve



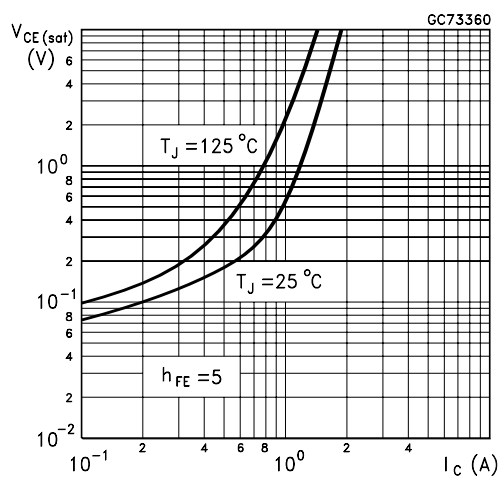
## DC Current Gain



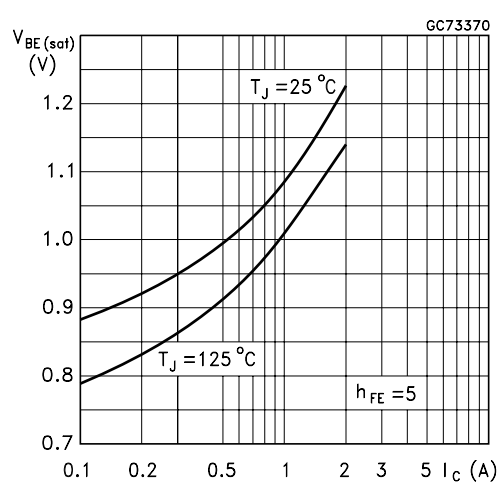
## DC Current Gain



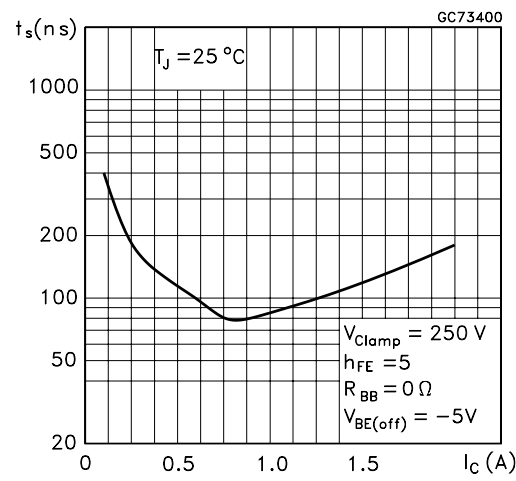
## Collector Emitter Saturation Voltage



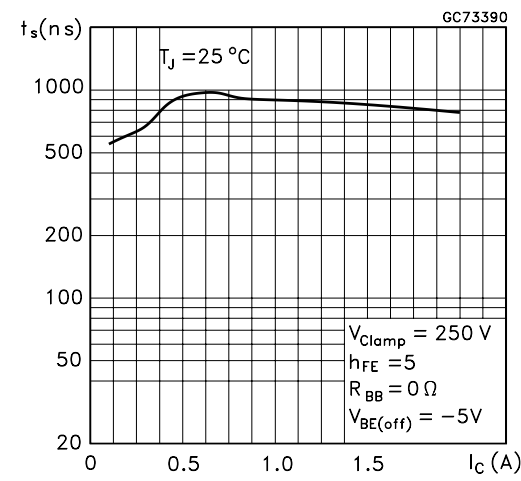
## Base Emitter Saturation Voltage



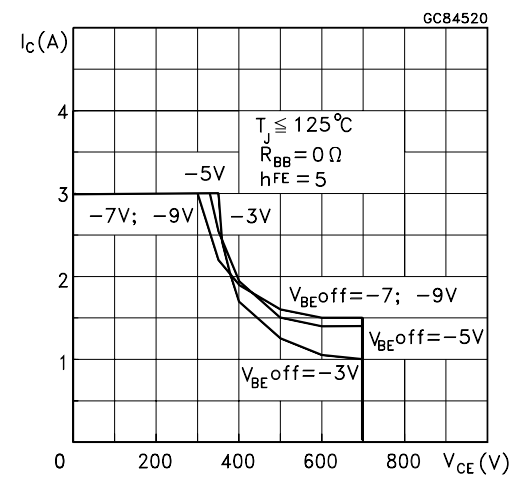
Inductive Fall Time

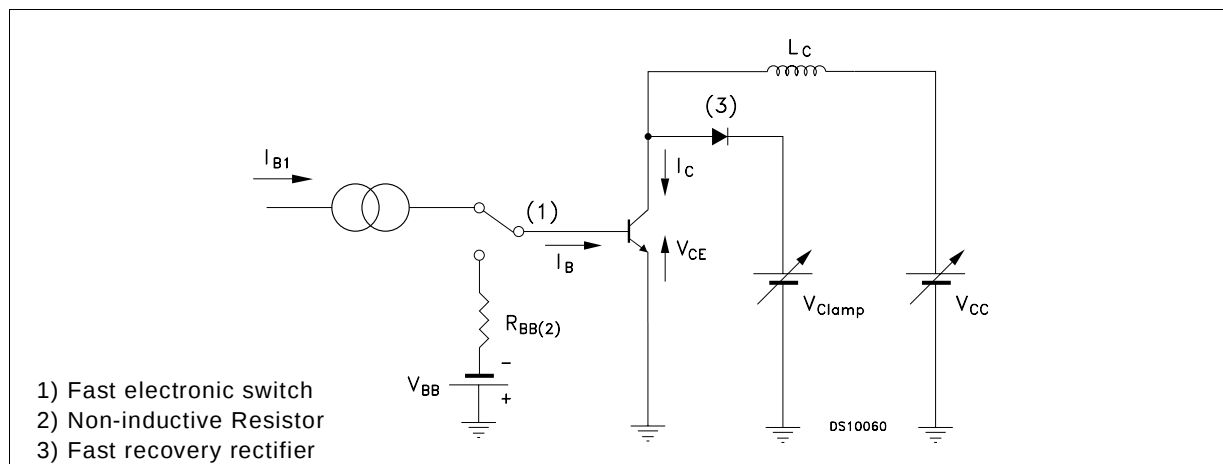
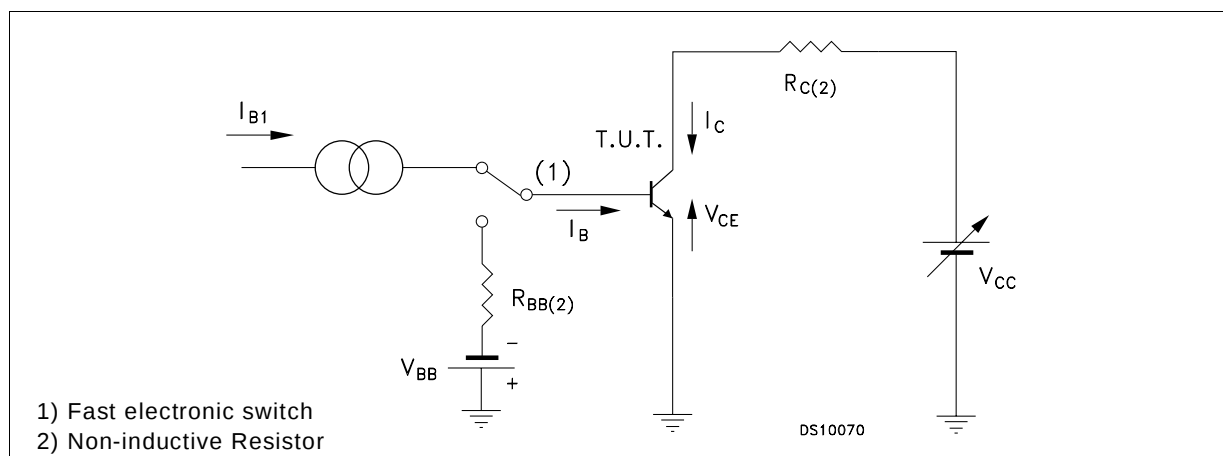


Inductive Storage Time



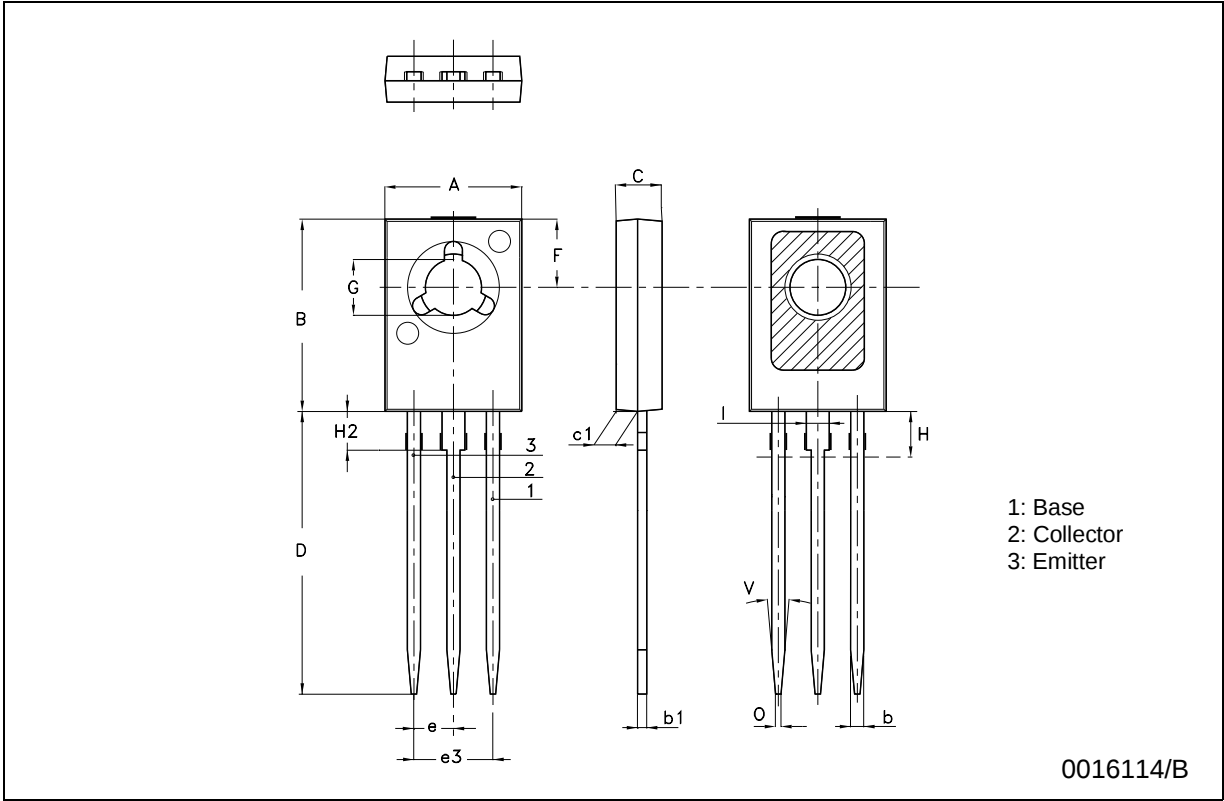
Reverse Biased SOA



**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°  |      |       | 10°   |       |



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