# STX13003

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- ST13003 SILICON IN TO-92 PACKAGE
- MEDIUM VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED

**APPLICATIONS:**

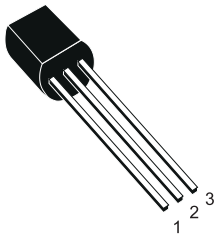
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

**DESCRIPTION**

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

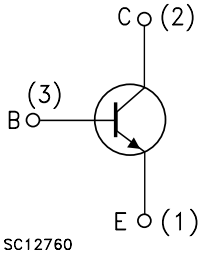
It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The STX13003 is designed for use in compact fluorescent lamp application.




**TO-92**

**INTERNAL SCHEMATIC DIAGRAM**




**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 ($I_C$ = 0, $I_B$ = 0.5 A, $t_p$ < 10µs, $T_j$ < 150°C) | $V_{(BR)EBO}$ | V |
| $I_C$ | Collector Current | 1 | A |
| $I_{CM}$ | Collector Peak Current ($t_p$ < 5 ms) | 3 | A |
| $I_B$ | Base Current | 0.5 | A |
| $I_{BM}$ | Base Peak Current ($t_p$ < 5 ms) | 1.5 | A |
| $P_{tot}$ | Total Dissipation at $T_C$ = 25 °C | 1.5 | W |
| $T_{stg}$ | Storage Temperature | -65 to 150 | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | °C |

## THERMAL DATA

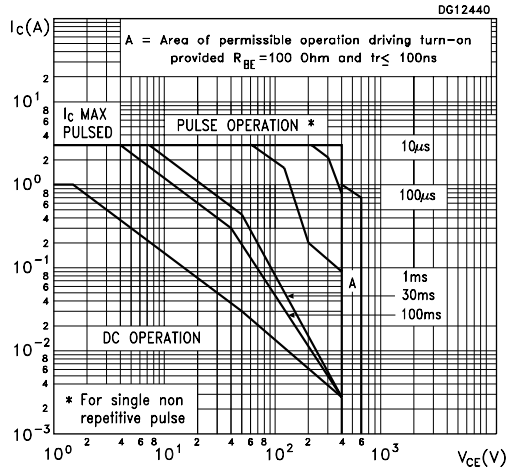
| | | | | |
|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | Max | 83.3 | $^oC/W$ |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 $^oC$ unless otherwise specified)

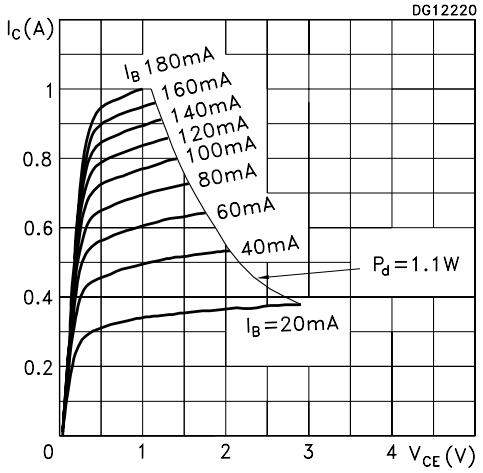
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CEV}$ | Collector Cut-off Current ($V_{BE}$ = -1.5V) | $V_{CE}$ = 700V<br>$V_{CE}$ = 700V $T_j$ = 125$^oC$ | | | 1<br>5 | mA<br>mA |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage ($I_C$ = 0) | $I_E$ = 10 mA | 9 | | 18 | V |
| $V_{CEO(sus)}$* | Collector-Emitter Sustaining Voltage ($I_B$ = 0)<br>L = 25 mH | $I_C$ = 10 mA | 400 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = 0.5 A $I_B$ = 0.1 A<br>$I_C$ = 1 A $I_B$ = 0.25 A<br>$I_C$ = 1.5 A $I_B$ = 0.5 A | | | 0.5<br>1<br>3 | V<br>V<br>V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = 0.5 A $I_B$ = 0.1 A<br>$I_C$ = 1 A $I_B$ = 0.25 A | | | 1<br>1.2 | V<br>V |
| $h_{FE}$* | DC Current Gain | $I_C$ = 0.5 A $V_{CE}$ = 2 V<br>$I_C$ = 1 A $V_{CE}$ = 2 V | 8<br>5 | | 35<br>25 | |
| $t_r$<br>$t_s$<br>$t_f$ | RESISTIVE LOAD<br>Rise Time<br>Storage Time<br>Fall Time | $I_C$ = 1 A $V_{CC}$ = 125 V<br>$I_{B1}$ = 0.2 A $I_{B2}$ = -0.2 A<br>$T_p$= 25 µs | | | 1<br>4<br>0.7 | µs<br>µs<br>µs |
| $t_s$ | INDUCTIVE LOAD<br>Storage Time | $I_C$ = 1 A $I_{B1}$ = 0.2 A<br>$V_{BE}$ = -5 V L = 50 mH<br>$V_{clamp}$ = 300 V | | 0.8 | | µs |

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

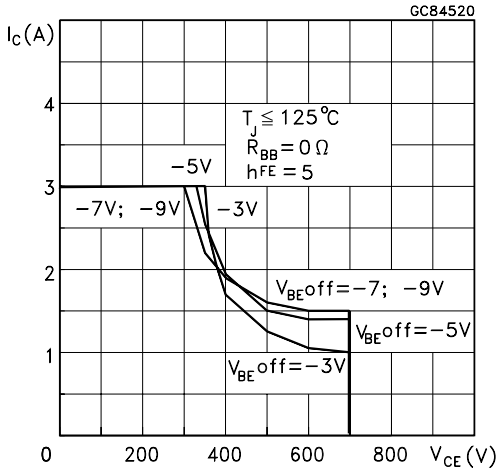
Safe Operating Area



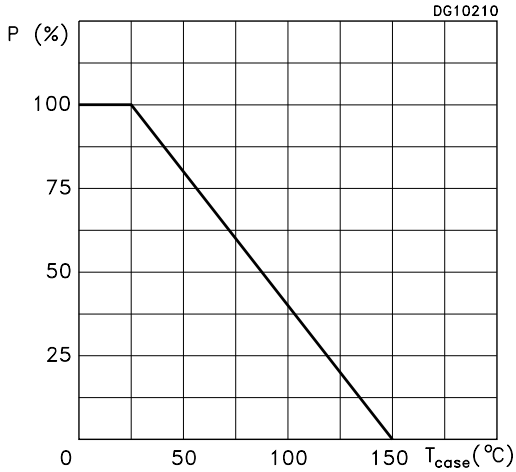

Output Characteristics



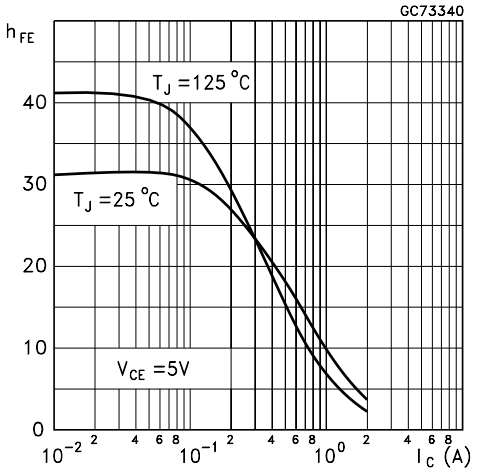
Reverse Biased SOA



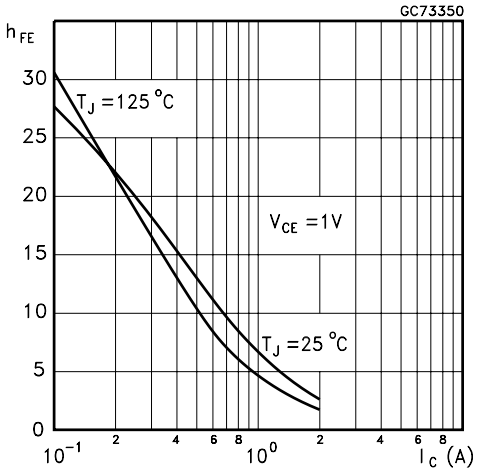

Derating Curve



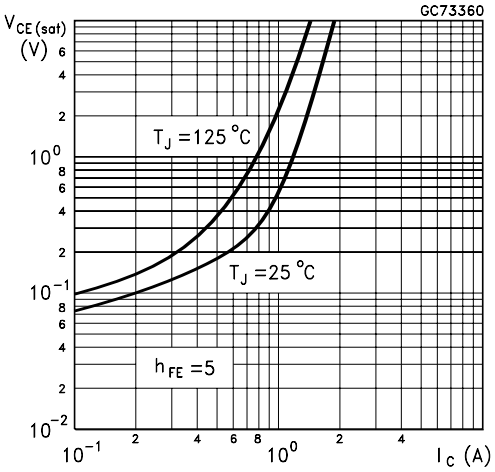

DC Current Gain



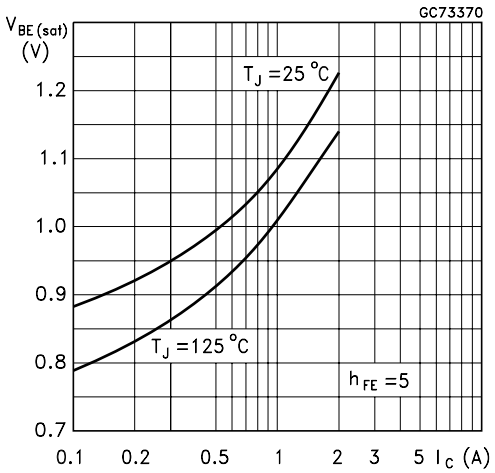

DC Current Gain



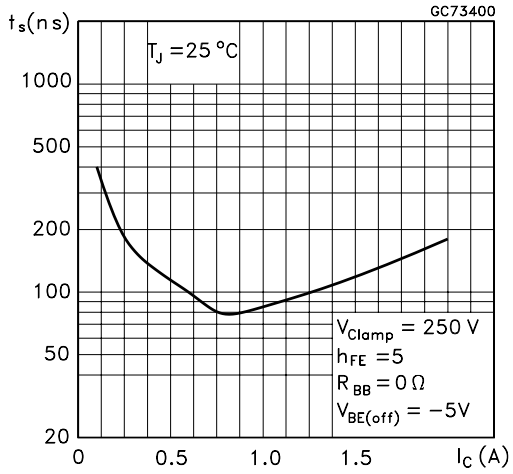

Collector Emitter Saturation Voltage




Base Emitter Saturation Voltage



Inductive Load Fall Time




Inductive Load Storage Time

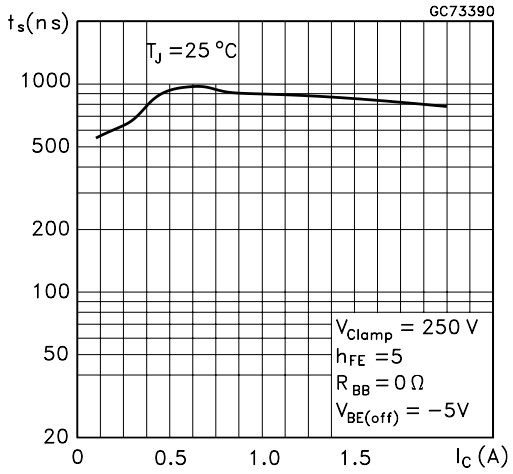


**Figure 1:** Inductive Load Switching Test Circuits.

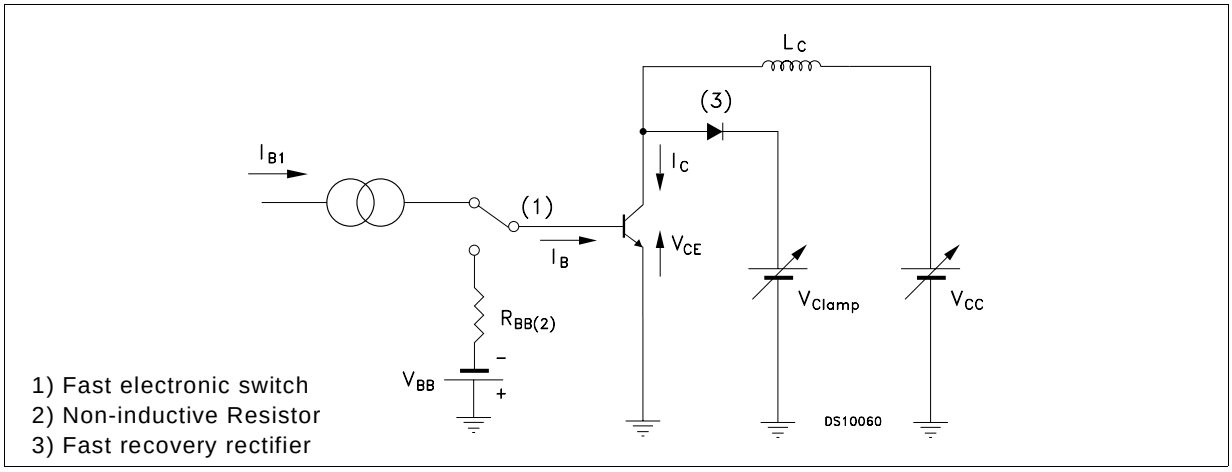
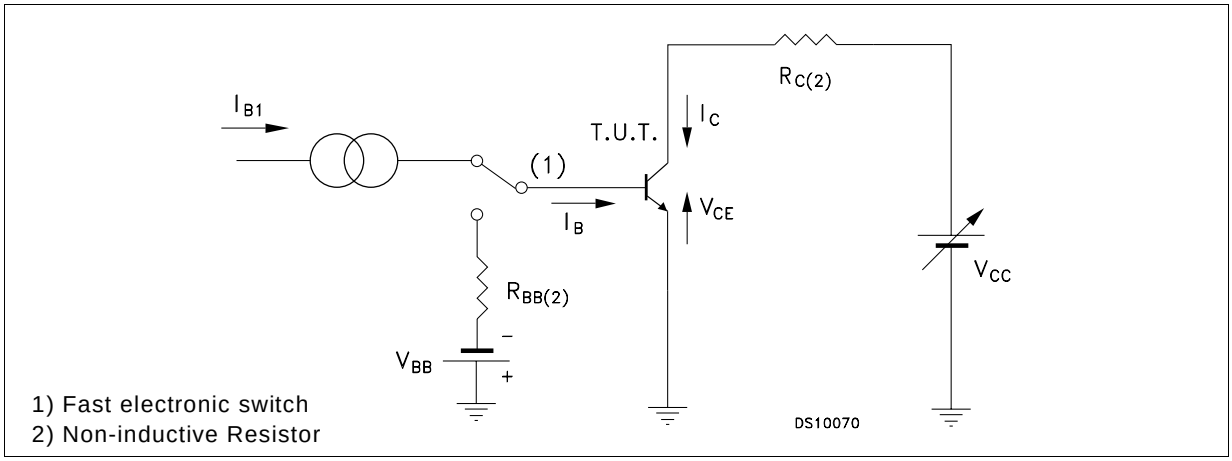



**Figure 2:** Resistive Load Switching Test Circuits.



## TO-92 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.32 | | 4.95 | 0.170 | | 0.195 |
| b | 0.36 | | 0.51 | 0.014 | | 0.020 |
| D | 4.45 | | 4.95 | 0.175 | | 0.194 |
| E | 3.30 | | 3.94 | 0.130 | | 0.155 |
| e | 2.41 | | 2.67 | 0.095 | | 0.105 |
| e1 | 1.14 | | 1.40 | 0.045 | | 0.055 |
| L | 12.70 | | 15.49 | 0.500 | | 0.609 |
| R | 2.16 | | 2.41 | 0.085 | | 0.094 |
| S1 | 1.14 | | 1.52 | 0.045 | | 0.059 |
| W | 0.41 | | 0.56 | 0.016 | | 0.022 |
| V | 4 degree | | 6 degree | 4 degree | | 6 degree |