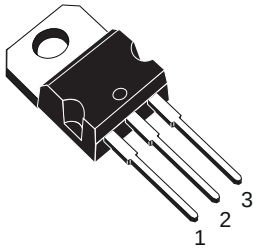
# BUL1102E

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

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




**TO-220**

### APPLICATIONS

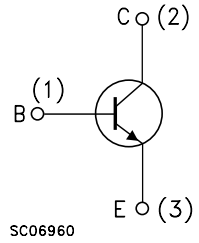
- FOUR LAMP ELECTRONIC BALLAST FOR:
  120 V MAINS IN PUSH-PULL CONFIGURATION;
  277 V MAINS IN HALF BRIDGE CURRENT FEED CONFIGURATION.

### DESCRIPTION

The device is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capability. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand a high collector current level during Breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.

**INTERNAL SCHEMATIC DIAGRAM**




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage ($V_{BE}$ = 0) | 1100 | V |
| $V_{CEO}$ | Collector-Emitter Voltage ($I_B$ = 0) | 450 | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | 12 | V |
| $I_C$ | Collector Current | 4 | A |
| $I_{CM}$ | Collector Peak Current ($t_p$ <5 ms) | 8 | A |
| $I_B$ | Base Current | 2 | A |
| $I_{BM}$ | Base Peak Current ($t_p$ <5 ms) | 4 | A |
| $P_{tot}$ | Total Dissipation at $T_c$ = 25 °C | 70 | W |
| $T_{stg}$ | Storage Temperature | -65 to 150 | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | °C |

## THERMAL DATA

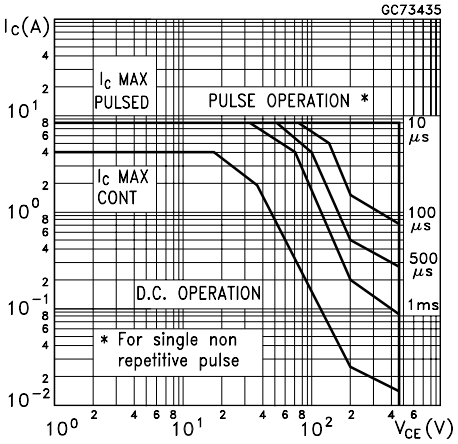
| | | | | |
|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-Case | Max | 1.78 | °C/W |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 °C unless otherwise specified)

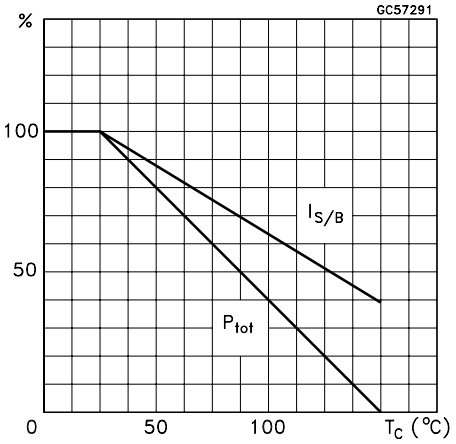
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector Cut-off Current ($V_{BE}$ = 0) | $V_{CE}$ = 1100 V | | | 100 | µA |
| $I_{EBO}$ | Emitter Cut-off Current ($I_B$ = 0) | $V_{EB}$ = 12 V | | | 1 | mA |
| $V_{CEO(sus)}$* | Collector-Emitter Sustaining Voltage ($I_B$ = 0) | $I_C$ = 100 mA | 450 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = 2 A $I_B$ = 400 mA | | | 1.5 | V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = 2 A $I_B$ = 400 mA | | | 1.5 | V |
| $h_{FE}$* | DC Current Gain | $I_C$ = 250 mA $V_{CE}$ = 5 V<br>$I_C$ = 2 A $V_{CE}$ = 5 V | 35<br>12 | | 70<br>20 | |
| $t_s$<br>$t_f$ | RESISTIVE LOAD<br>Storage Time<br>Fall Time | $I_C$ = 2.5 A $V_{CC}$ = 250 V<br>$I_{B1}$ = 0.5 A $I_{B2}$ = 1 A<br>$T_P$ = 30 µs (see figure 2) | | | <br>2.5<br>300 | <br>µs<br>ns |
| $E_{ar}$ | Avalanche Energy | L = 2 mH C = 1.8 nF<br>$I_{BR} \leq$ 2.5A 25°C < $T_C$ <125°C<br>(see figure 1) | 6 | | | mJ |

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

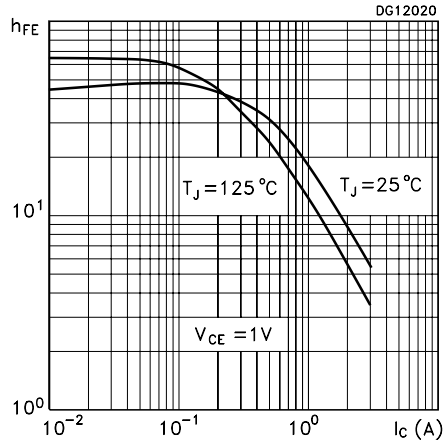
Safe Operating Areas



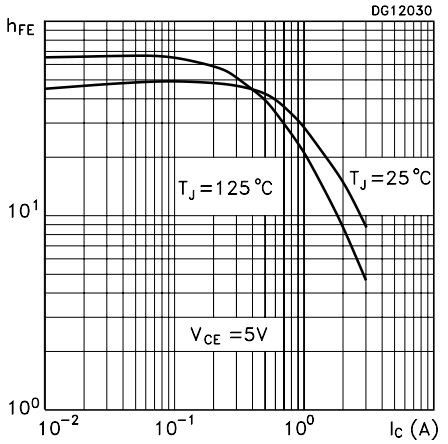

Derating Curve



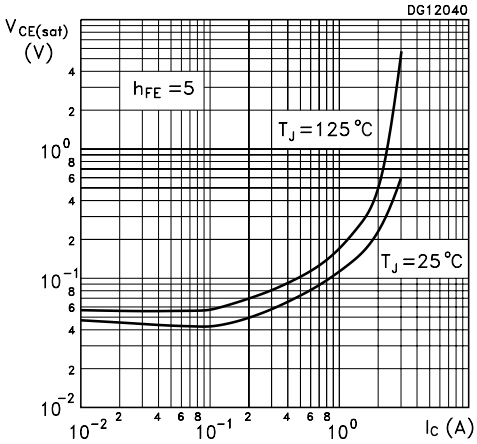
DC Current Gain



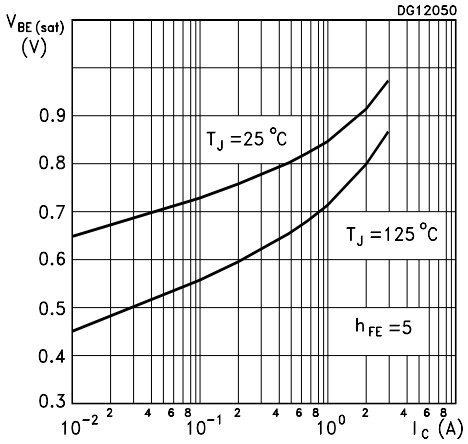

DC Current Gain



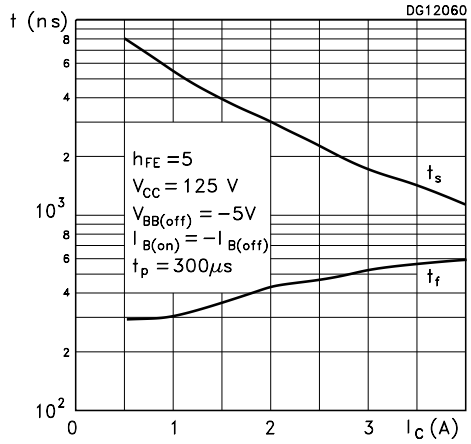

Collector Emitter Saturation Voltage



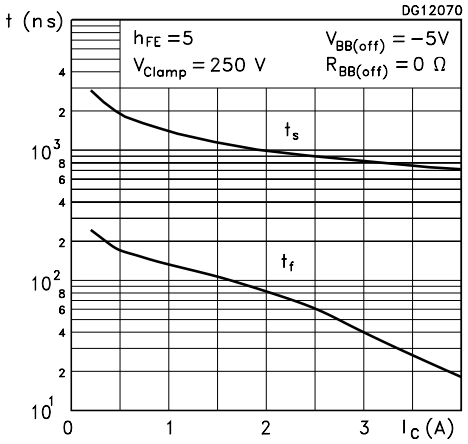

Base Emitter Saturation Voltage




Switching Time Resistive Load




Switching Time Inductive Load



Reverse Biased SOA

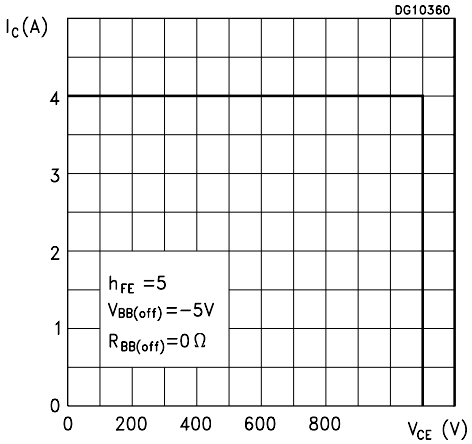



**Figure 1:** Energy Rating Test Circuit

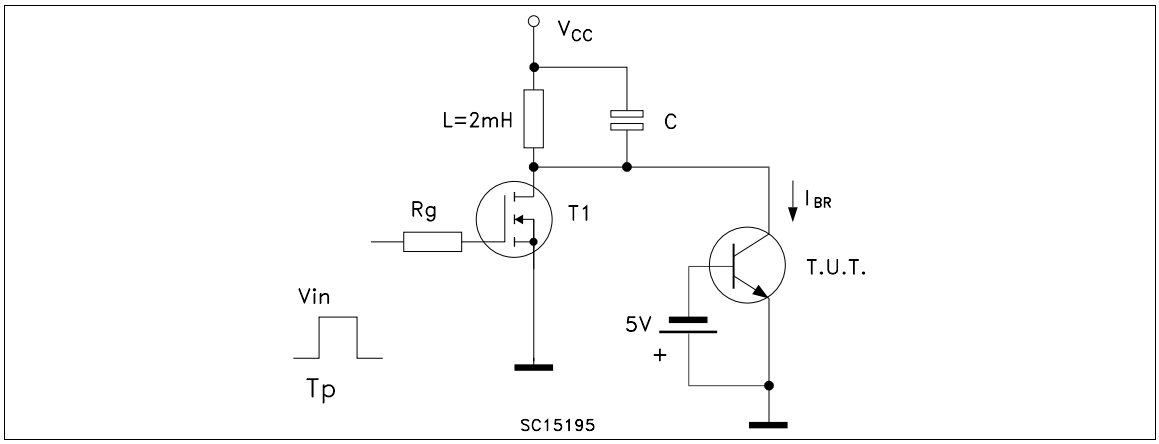
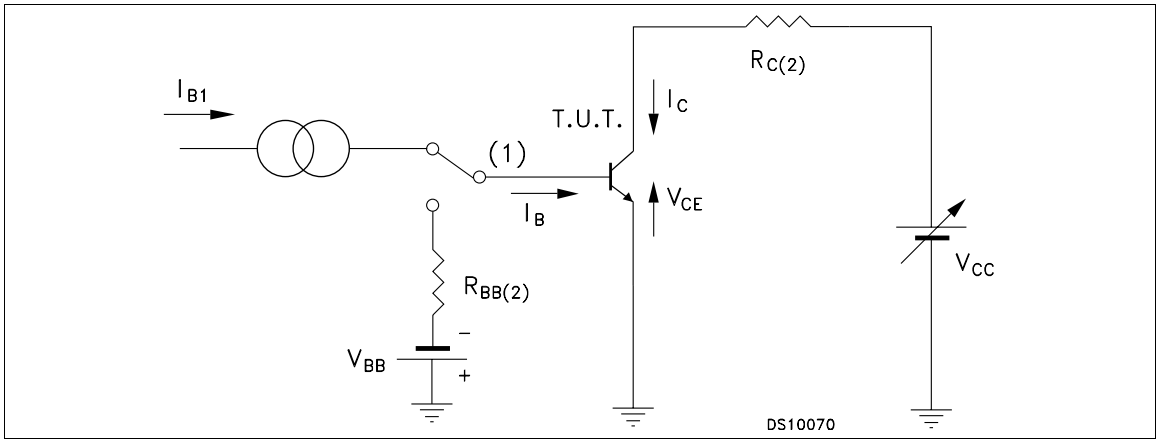
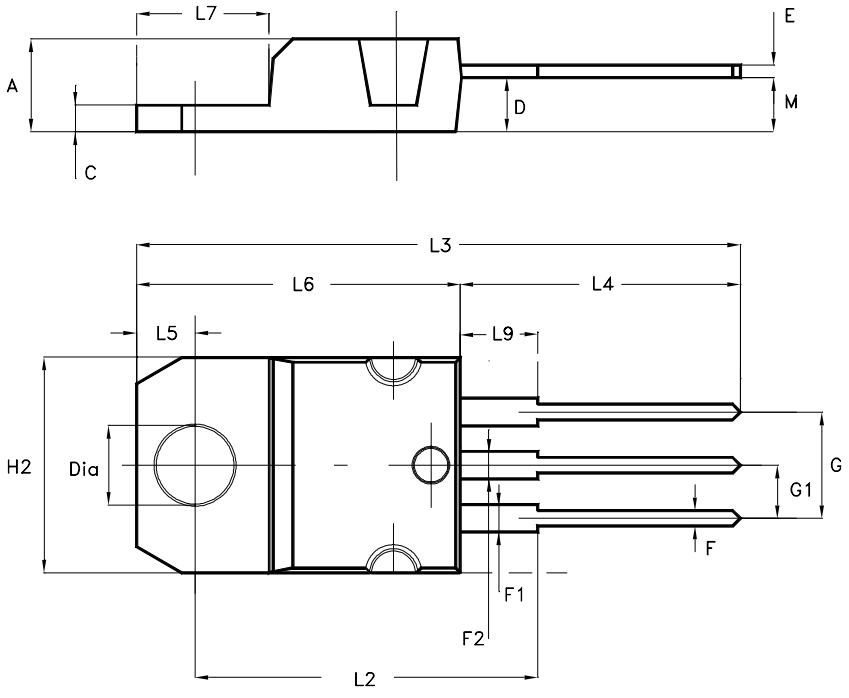



**Figure 2:** Resistive Load Switching Test Circuit



## TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.052 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.202 |
| G1 | 2.40 | | 2.70 | 0.094 | | 0.106 |
| H2 | 10.00 | | 10.40 | 0.394 | | 0.409 |
| L2 | | 16.40 | | | 0.645 | |
| L4 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.20 | | 6.60 | 0.244 | | 0.260 |
| L9 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| M | | 2.60 | | | 0.102 | |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |

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