



## BUL85D

### MEDIUM VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- INTEGRATED ANTIPARALLEL COLLECTOR-EMITTER DIODE
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- HIGH RUGGEDNESS

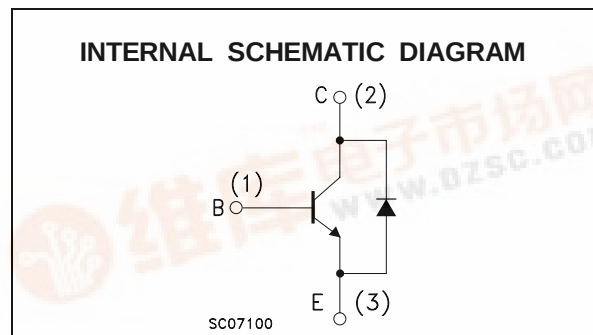
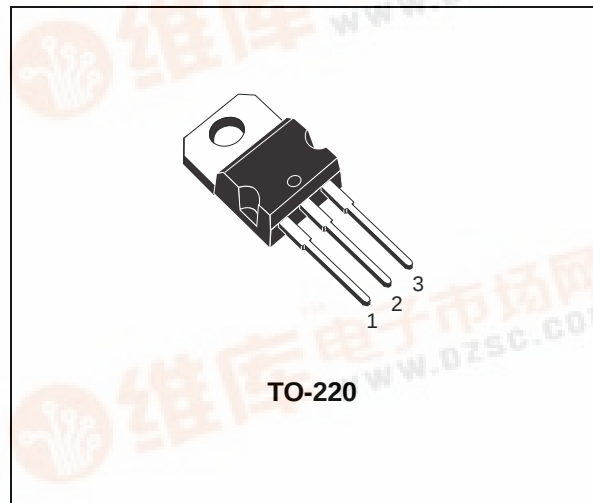
#### APPLICATIONS

- 110V AC ELECTRONIC TRANSFORMERS FOR HALOGEN LAMPS UP TO 100 W
- SWITCH MODE POWER SUPPLIES

#### DESCRIPTION

The BUL85D is manufactured using Multi Epitaxial Planar technology for high switching speeds and medium voltage capability.

The BUL85D is designed for use in 110V AC electronic transformers for halogen lamps.



#### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                                                                                    | Value         | Unit       |
|-----------|----------------------------------------------------------------------------------------------|---------------|------------|
| $V_{CES}$ | Collector-Emitter Voltage ( $V_{BE} = 0$ )                                                   | 500           | V          |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ )                                                      | 250           | V          |
| $V_{EBO}$ | Emitter-Base Voltage<br>( $I_C = 0$ , $I_B < 2.5$ A, $t_p < 10\mu s$ , $T_J < 150^\circ C$ ) | $V_{(BR)EBO}$ | V          |
| $I_C$     | Collector Current                                                                            | 8             | A          |
| $I_{CM}$  | Collector Peak Current ( $t_p < 5$ ms)                                                       | 15            | A          |
| $I_B$     | Base Current                                                                                 | 4             | A          |
| $I_{BM}$  | Base Peak Current ( $t_p < 5$ ms)                                                            | 8             | A          |
| $P_{tot}$ | Total Dissipation at $T_c = 25^\circ C$                                                      | 80            | W          |
| $T_{stg}$ | Storage Temperature                                                                          | -65 to 150    | $^\circ C$ |
| $T_J$     | Max. Operating Junction Temperature                                                          | 150           | $^\circ C$ |

## BUL85D

### THERMAL DATA

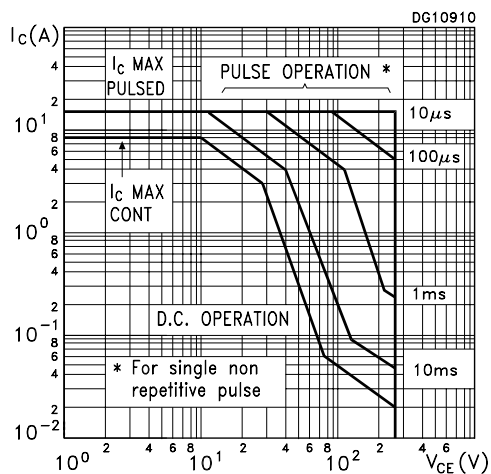
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case    | Max | 1.56 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-Ambient | Max | 62.5 | °C/W |

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

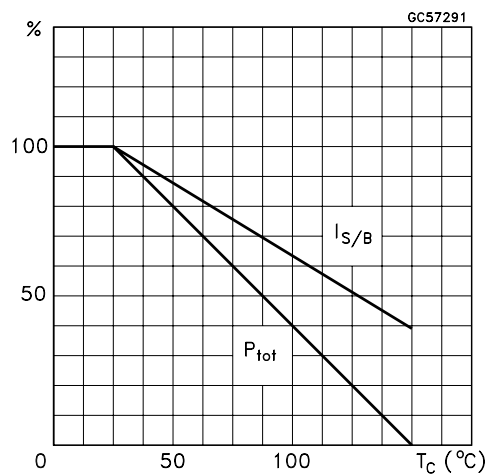
| Symbol                           | Parameter                                                 | Test Conditions                                                                                                                                                                    | Min.    | Typ.      | Max.              | Unit        |
|----------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|-------------------|-------------|
| I <sub>CES</sub>                 | Collector Cut-off Current (V <sub>BE</sub> = 0)           | V <sub>CE</sub> = 500 V<br>V <sub>CE</sub> = 500 V      T <sub>j</sub> = 125 °C                                                                                                    |         |           | 100<br>500        | μA<br>μA    |
| I <sub>EBO</sub>                 | Emitter Cut-off Current (I <sub>C</sub> = 0)              | V <sub>EB</sub> = 9 V                                                                                                                                                              |         |           | 100               | μA          |
| V <sub>(BR)EBO</sub>             | Emitter-Base Breakdown Voltage (I <sub>C</sub> = 0)       | I <sub>E</sub> = 10mA                                                                                                                                                              | 10      |           | 18                | V           |
| V <sub>CEO(sus)</sub> *          | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 10 mA      L = 25 mH                                                                                                                                              | 250     |           |                   | V           |
| V <sub>CE(sat)</sub> *           | Collector-Emitter Saturation Voltage                      | I <sub>C</sub> = 2 A      I <sub>B</sub> = 0.4 A<br>I <sub>C</sub> = 4 A      I <sub>B</sub> = 0.8 A<br>I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A                           |         | 0.1       | 0.3<br>0.6<br>1.2 | V<br>V<br>V |
| V <sub>BE(sat)</sub> *           | Base-Emitter Saturation Voltage                           | I <sub>C</sub> = 2 A      I <sub>B</sub> = 0.4 A<br>I <sub>C</sub> = 8 A      I <sub>B</sub> = 1.6 A                                                                               |         |           | 1.1<br>1.5        | V<br>V      |
| h <sub>FE</sub> *                | DC Current Gain                                           | I <sub>C</sub> = 10 mA      V <sub>CE</sub> = 5 V<br>I <sub>C</sub> = 0.5 A      V <sub>CE</sub> = 5 V<br>I <sub>C</sub> = 14 A      V <sub>CE</sub> = 10 V                        | 10<br>4 |           | 60<br>10          |             |
| t <sub>s</sub><br>t <sub>f</sub> | RESISTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 4 A      V <sub>CC</sub> = 150 V<br>I <sub>B(on)</sub> = -I <sub>B(off)</sub> = 0.8 A<br>t <sub>p</sub> ≥ 30 μs      (see figure 2)                               | 1.2     | 1.8       | 2.4<br>250        | μs<br>ns    |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 4 A      V <sub>CL</sub> = 200 V<br>I <sub>B</sub> = 0.8 A      V <sub>BE(off)</sub> = -3 V<br>R <sub>BB</sub> = 0 Ω      t <sub>p</sub> ≥ 30μs<br>(see figure 1) |         | 0.7<br>50 |                   | μs<br>ns    |
| V <sub>f</sub>                   | Diode Forward Voltage                                     | I <sub>C</sub> = 5 A                                                                                                                                                               |         |           | 1.5               | V           |

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

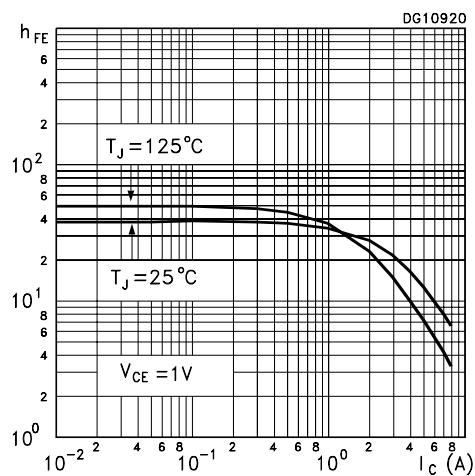
Safe Operating Area



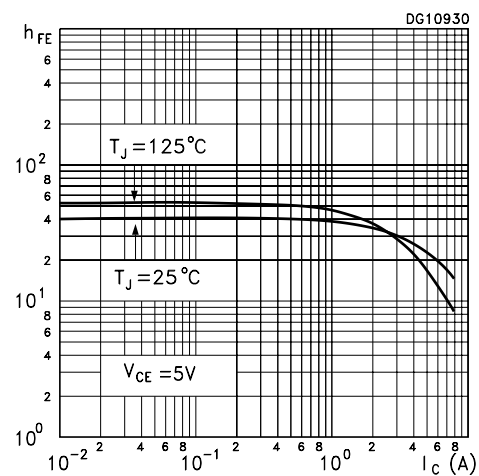
Derating Curve



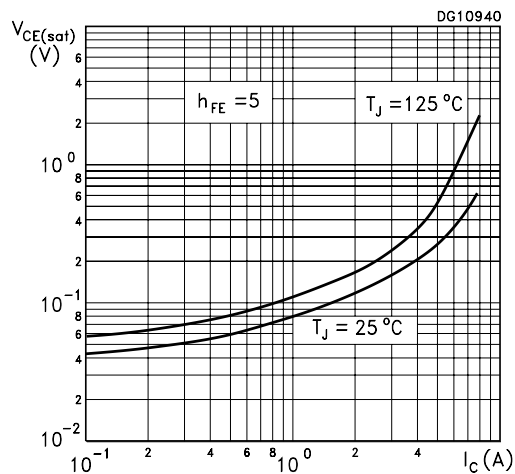
DC Current Gain



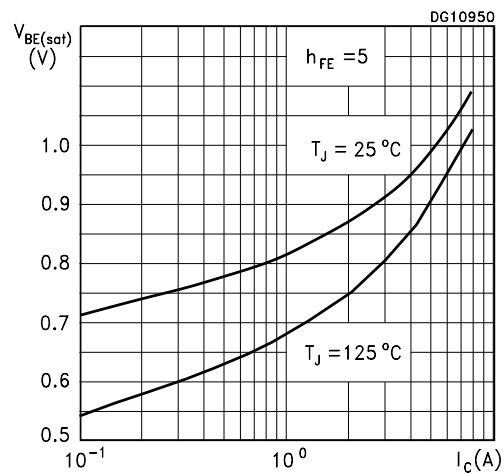
DC Current Gain



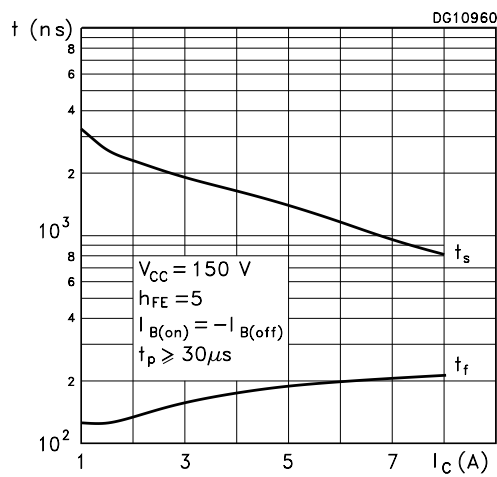
Collector Emitter Saturation Voltage



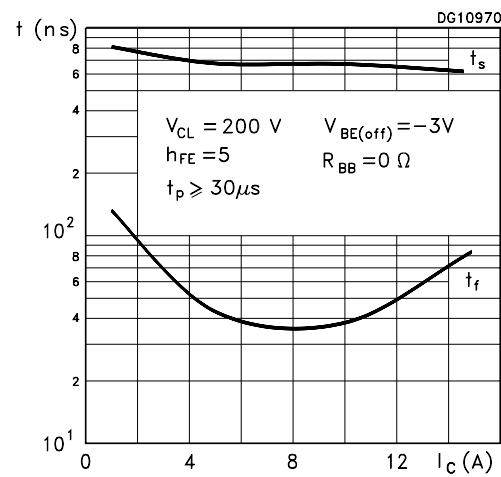
Base Emitter Saturation Voltage



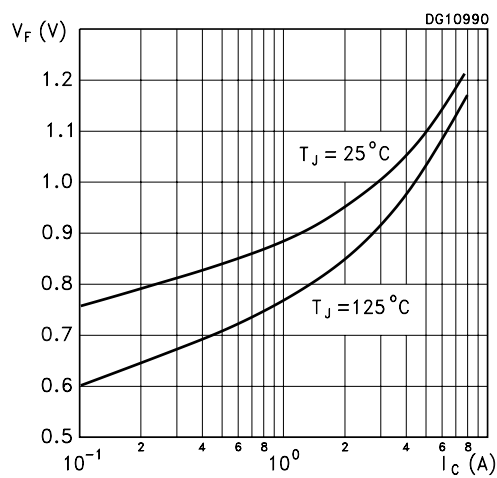
Switching Time Resistive Load



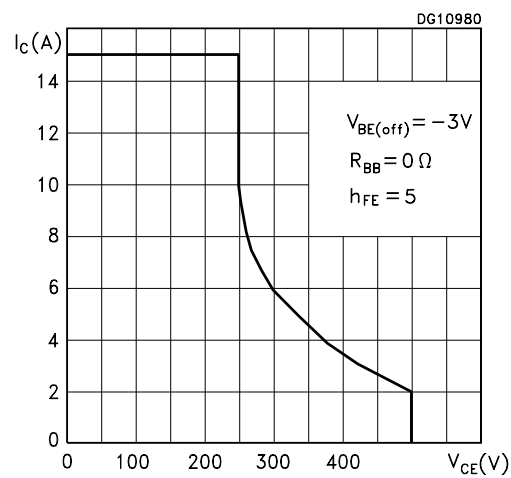
Switching Time Inductive Load

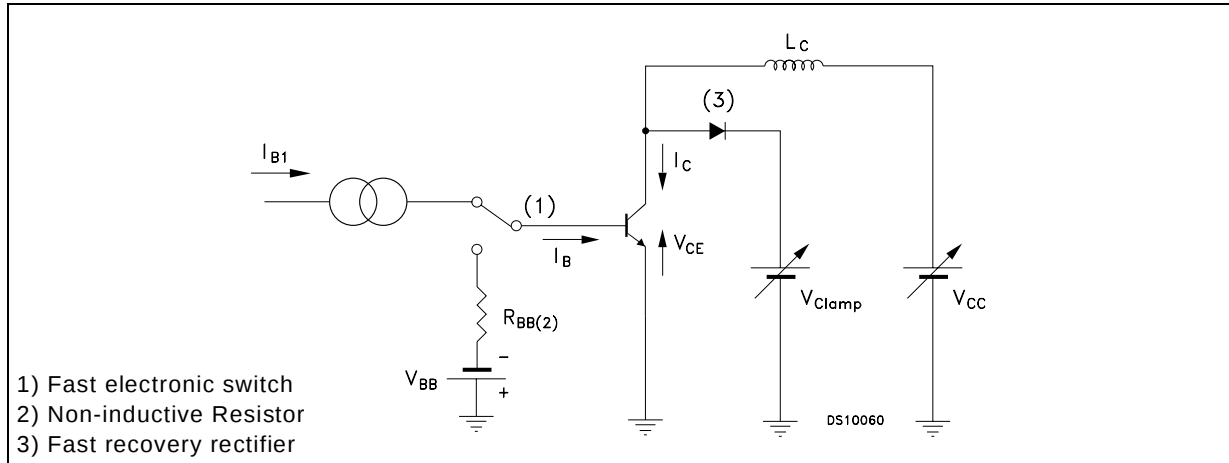
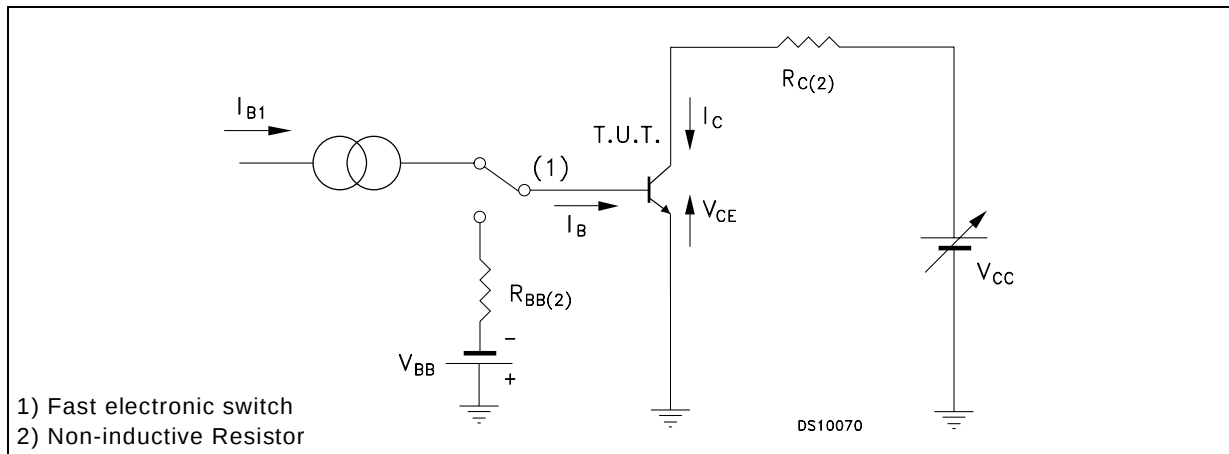


Diode Forward Voltage



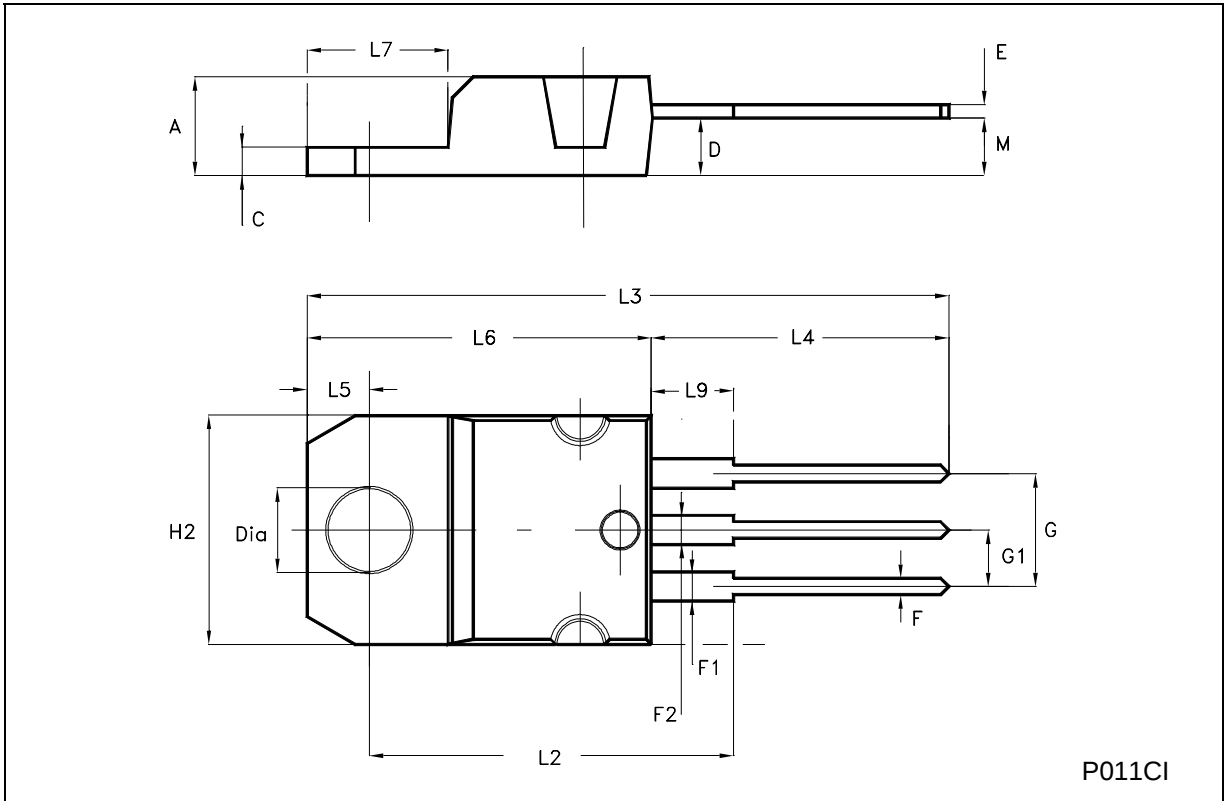
Reverse Biased SOA



**Figure 1:** Inductive Load Switching 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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