



## BUL312FH

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

| Ordering Code | Marking  | Shipment |
|---------------|----------|----------|
| BUL312FH      | BUL312FH | Tube     |

- HIGH VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERIZED AT 125 °C
- LARGE R.B.S.O.A.
- FULLY INSULATED PACKAGE (U.L. COMPLIANT) FOR EASY MOUNTING

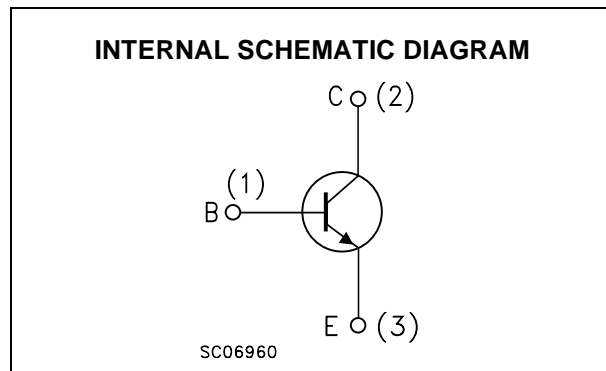
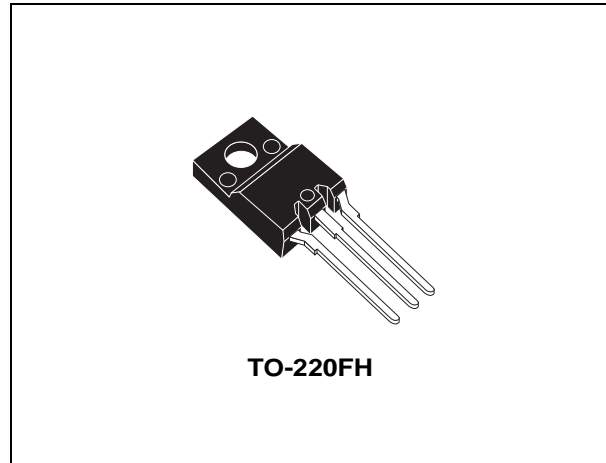
### APPLICATIONS:

- HORIZONTAL DEFLECTION FOR COLOR TV
- SWITCH MODE POWER SUPPLIES
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

### 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 R.B.S.O.A.



### ABSOLUTE MAXIMUM RATINGS

| Symbol     | Parameter  | Value      | Unit |
|------------|--|------------|------|
| $V_{CES}$  | Collector-Emitter Voltage ( $V_{BE} = 0$ )                                   | 1150       | V    |
| $V_{CEO}$  | Collector-Emitter Voltage ( $I_B = 0$ )                                      | 500        | V    |
| $V_{EBO}$  | Emitter-Base Voltage ( $I_C = 0$ )   | 9          | V    |
| $I_C$      | Collector Current  | 5          | A    |
| $I_{CM}$   | Collector Peak Current ( $t_p < 5$ ms)                                       | 10         | A    |
| $I_B$      | Base Current   | 3          | A    |
| $I_{BM}$   | Base Peak Current ( $t_p < 5$ ms)  | 4          | A    |
| $P_{tot}$  | Total Dissipation at $T_c = 25$ °C   | 36         | W    |
| $V_{isol}$ | Insulation Withstand Voltage (RMS) from All Three Leads to External Heatsink | 2500       | V    |
| $T_{stg}$  | Storage Temperature  | -65 to 150 | °C   |
| $T_j$      | Max. Operating Junction Temperature  | 150        | °C   |

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### THERMAL DATA

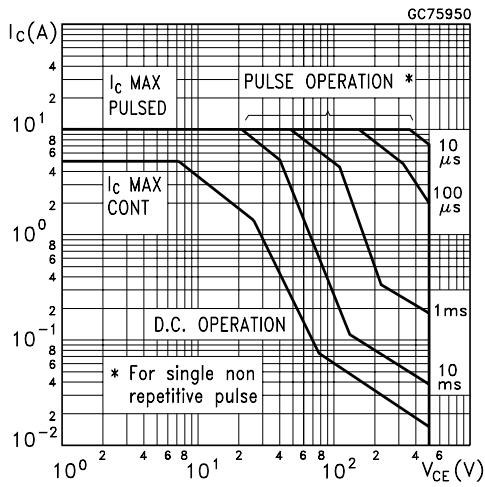
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case    | Max | 3.47 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |

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

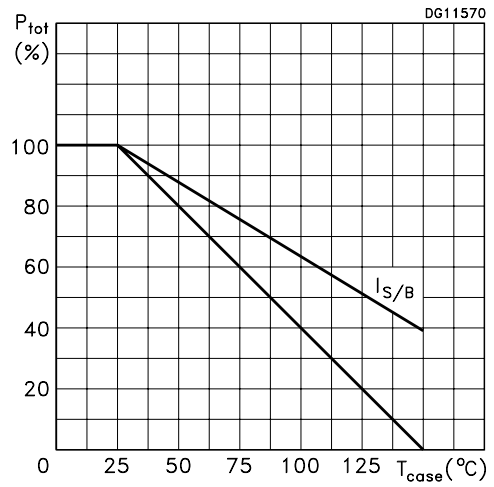
| Symbol                           | Parameter   | Test Conditions   | Min.   | Typ.       | Max.              | Unit        |
|----------------------------------|---|---|--------|------------|-------------------|-------------|
| I <sub>CES</sub>                 | Collector Cut-off Current (V <sub>BE</sub> = 0)           | V <sub>CE</sub> = 1150 V<br>V <sub>CE</sub> = 1150 V<br>T <sub>j</sub> = 125 °C   |        |            | 1<br>2            | mA<br>mA    |
| I <sub>CEO</sub>                 | Collector Cut-off Current (I <sub>B</sub> = 0)            | V <sub>CE</sub> = 500 V   |        |            | 250               | μA          |
| V <sub>EBO</sub>                 | Emitter-Base Voltage (I <sub>C</sub> = 0)                 | I <sub>E</sub> = 10 mA  | 9      |            |                   | V           |
| V <sub>CEO(sus)</sub> *          | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 100 mA   | 500    |            |                   | V           |
| V <sub>CE(sat)</sub> *           | Collector-Emitter Saturation Voltage                      | I <sub>C</sub> = 1 A<br>I <sub>C</sub> = 2 A<br>I <sub>C</sub> = 3 A<br>I <sub>B</sub> = 200 mA<br>I <sub>B</sub> = 400 mA<br>I <sub>B</sub> = 600 mA |        |            | 0.5<br>0.7<br>1.1 | V<br>V<br>V |
| V <sub>BE(sat)</sub> *           | Base-Emitter Saturation Voltage                           | I <sub>C</sub> = 1 A<br>I <sub>C</sub> = 2 A<br>I <sub>C</sub> = 3 A<br>I <sub>B</sub> = 200 mA<br>I <sub>B</sub> = 400 mA<br>I <sub>B</sub> = 600 mA |        |            | 1<br>1.1<br>1.2   | V<br>V<br>V |
| h <sub>FE</sub> *                | DC Current Gain   | I <sub>C</sub> = 10 mA<br>I <sub>C</sub> = 3 A<br>V <sub>CE</sub> = 5 V<br>V <sub>CE</sub> = 2.5 V  | 8<br>8 |            | 16                |             |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 2 A<br>I <sub>B1</sub> = 400 mA<br>L = 200 μH<br>(See Figure 1)  |        | 1.2<br>80  | 1.9<br>160        | μs<br>ns    |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 2 A<br>I <sub>B1</sub> = 400 mA<br>L = 200 μH<br>T <sub>j</sub> = 125 °C   |        | 1.8<br>150 |                   | μs<br>ns    |

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

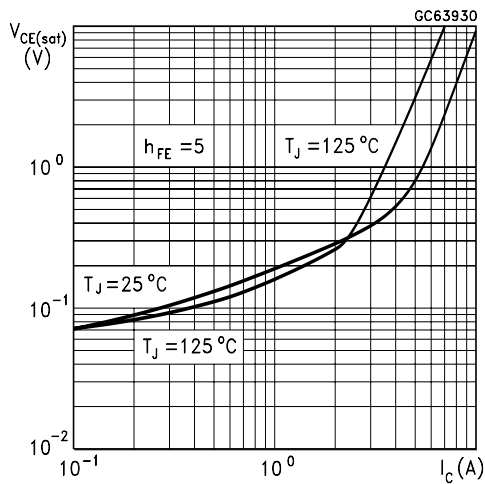
Safe Operating Area



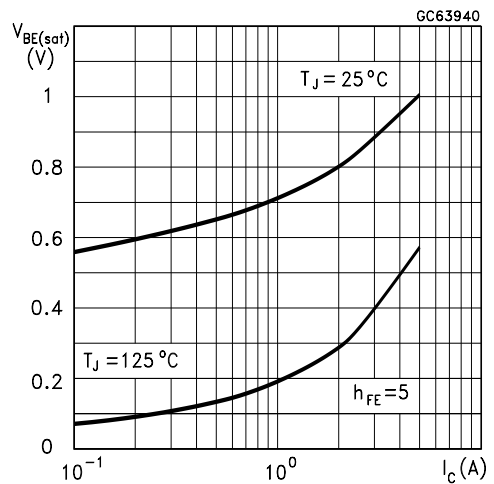
Derating Curve



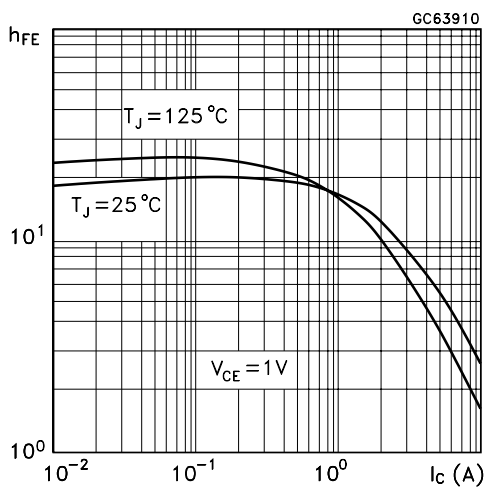
Collector-Emitter Saturation Voltage



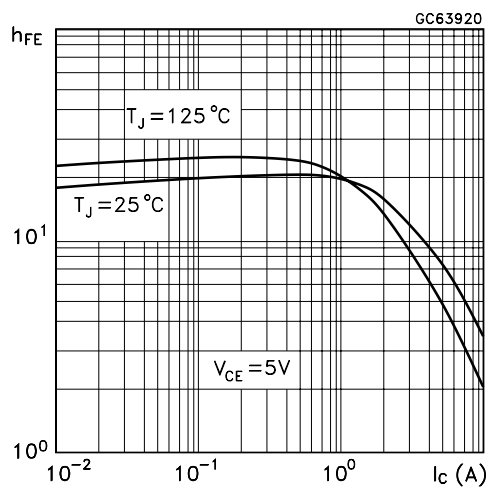
Base-Emitter Saturation Voltage



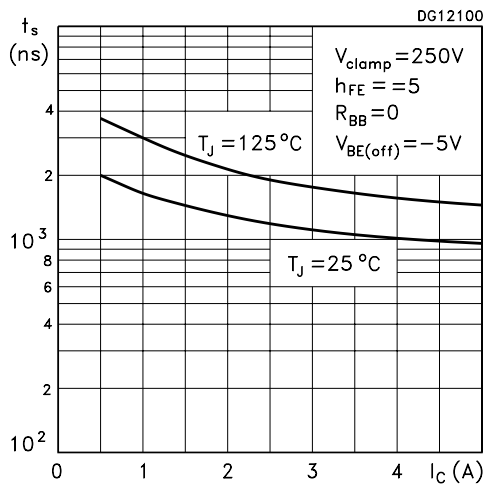
DC Current Gain



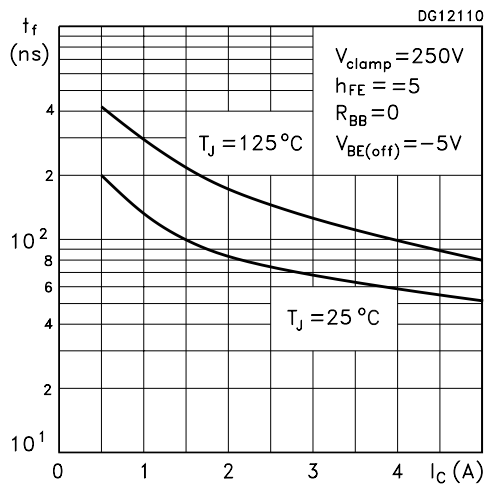
DC Current Gain



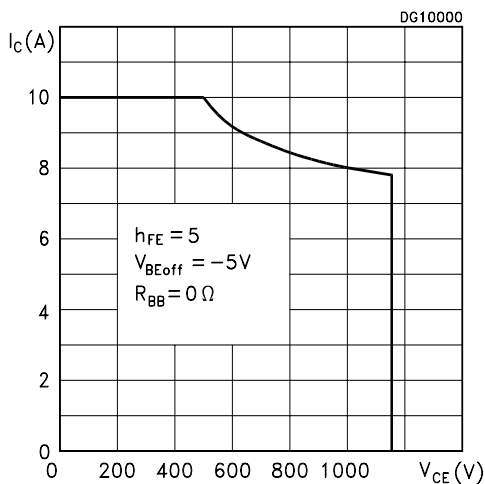
**Inductive Load Storage Time**



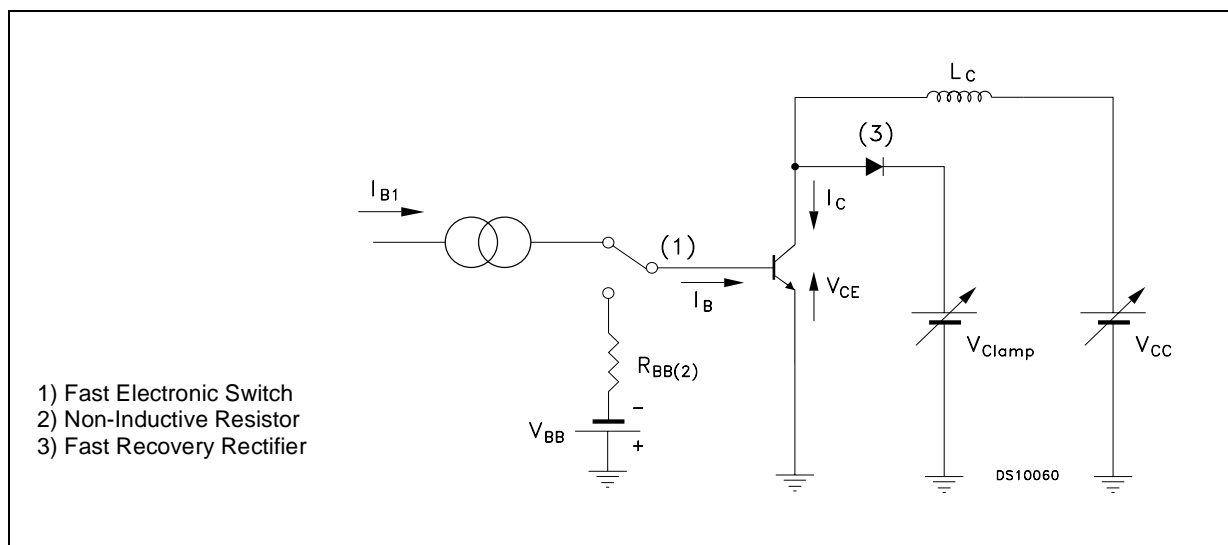
**Inductive Load Fall Time**



**Reverse Biased Safe Operating Area**

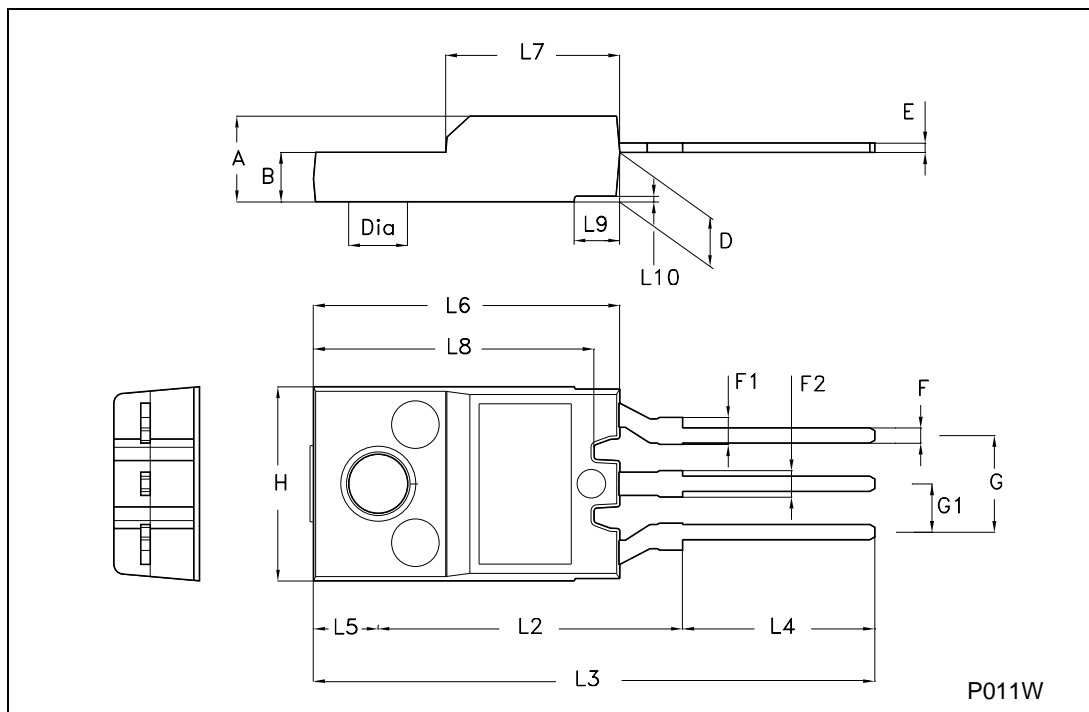


**Figure 1: Inductive Load Switching Test Circuit**



**TO-220FH (Fully plastic High voltage) MECHANICAL DATA**

| DIM. | mm   |      |      | inch  |       |       |
|------|------|------|------|-------|-------|-------|
|      | MIN. | TYP. | MAX. | MIN.  | TYP.  | MAX.  |
| A    | 4.4  |      | 4.6  | 0.173 |       | 0.181 |
| B    | 2.5  |      | 2.7  | 0.098 |       | 0.106 |
| D    | 2.5  |      | 2.75 | 0.098 |       | 0.108 |
| E    | 0.45 |      | 0.7  | 0.017 |       | 0.027 |
| F    | 0.75 |      | 1    | 0.030 |       | 0.039 |
| F1   | 1.3  |      | 1.8  | 0.051 |       | 0.070 |
| F2   | 1.3  |      | 1.8  | 0.051 |       | 0.070 |
| G    | 4.95 |      | 5.2  | 0.195 |       | 0.204 |
| G1   | 2.4  |      | 2.7  | 0.094 |       | 0.106 |
| H    | 10   |      | 10.4 | 0.393 |       | 0.409 |
| L2   |      | 16   |      |       | 0.630 |       |
| L3   | 28.6 |      | 30.6 | 1.126 |       | 1.204 |
| L4   | 9.8  |      | 10.6 | 0.385 |       | 0.417 |
| L5   |      | 3.4  |      |       | 0.134 |       |
| L6   | 15.9 |      | 16.4 | 0.626 |       | 0.645 |
| L7   | 9    |      | 9.3  | 0.354 |       | 0.366 |
| L8   | 14.5 |      | 15   | 0.570 |       | 0.590 |
| L9   |      | 2.4  |      |       | 0.094 |       |



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