



## BULD118D-1

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

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

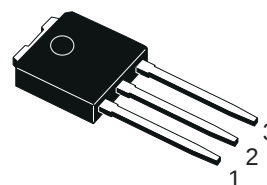
### APPLICATIONS:

- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- FLYBACK AND FORWARD SINGLE TRANSISTOR LOW POWER CONVERTERS

### DESCRIPTION

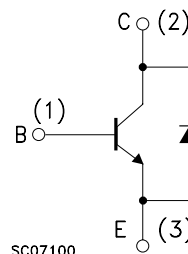
The device is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and medium voltage capability. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The device is designed for use in lighting applications and low cost switch-mode power supplies.



**IPAK  
(TO-251)**

### 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 ( $I_C = 0$ )         | 9          | V    |
| $I_C$     | Collector Current                          | 2          | A    |
| $I_{CM}$  | Collector Peak Current ( $t_p < 5$ ms)     | 4          | A    |
| $I_B$     | Base Current                               | 1          | A    |
| $I_{BM}$  | Base Peak Current ( $t_p < 5$ ms)          | 2          | A    |
| $P_{tot}$ | Total Dissipation at $T_c = 25$ °C         | 20         | W    |
| $T_{stg}$ | Storage Temperature                        | -65 to 150 | °C   |
| $T_J$     | Max. Operating Junction Temperature        | 150        | °C   |

## BULD118D-1

### THERMAL DATA

|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case    | Max | 6.25 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-Ambient | Max | 100  | °C/W |

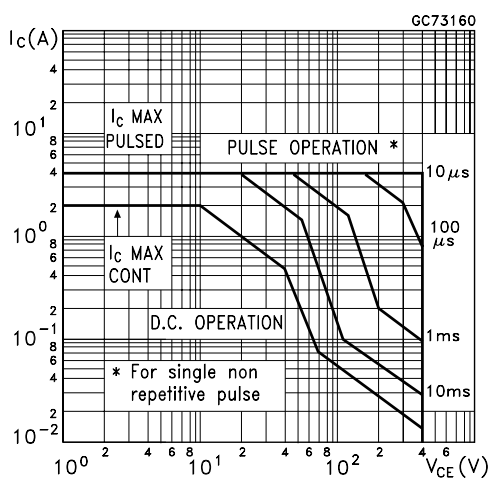
### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

| 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> = 700 V<br>V <sub>CE</sub> = 700 V T <sub>j</sub> = 125 °C                                                                  |                  |             | 100<br>500             | μA<br>μA             |
| V <sub>EBO</sub>                                   | Emitter-Base Voltage                                                           | I <sub>E</sub> = 10 mA                                                                                                                      | 9                |             |                        | V                    |
| V <sub>CEO(sus)</sub>                              | Collector-Emitter Sustaining Voltage                                           | I <sub>C</sub> = 100 mA L = 25 mH                                                                                                           | 400              |             |                        | V                    |
| I <sub>CEO</sub>                                   | Collector-Emitter Leakage Current                                              | V <sub>CE</sub> = 400 V                                                                                                                     |                  |             | 250                    | μA                   |
| 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> = 0.2 A<br>I <sub>C</sub> = 2 A I <sub>B</sub> = 0.4 A |                  |             | 0.5<br>1<br>1.5        | 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> = 0.2 A<br>I <sub>C</sub> = 2 A I <sub>B</sub> = 0.4 A |                  |             | 1.0<br>1.2<br>1.3      | V<br>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> = 2 A V <sub>CE</sub> = 5 V  | 10<br>10<br>8    |             | 50                     |                      |
| t <sub>r</sub><br>t <sub>f</sub><br>t <sub>s</sub> | RESISTIVE LOAD<br>Rise Time<br>Fall Time<br>Storage Time<br>group A<br>group B | V <sub>CC</sub> = 125 V I <sub>C</sub> = 2 A<br>I <sub>B1</sub> = 0.4 A I <sub>B2</sub> = -0.2 A<br>t <sub>p</sub> = 30 μs                  | <br><br>1.4<br>2 | 0.7<br>0.3  | <br>0.5<br>2.1<br>2.75 | μs<br>μs<br>μs<br>μs |
| t <sub>s</sub><br>t <sub>f</sub>                   | INDUCTIVE LOAD<br>Storage Time<br>Fall 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<br>0.10 |                        | μs<br>μs             |
| V <sub>F</sub>                                     | Diode Forward Voltage                                                          | I <sub>C</sub> = 1 A                                                                                                                        |                  |             | 2.5                    | V                    |

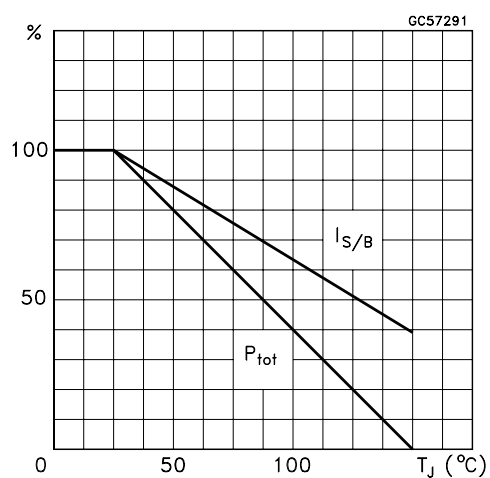
\* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

Note : Product is pre-selected in storage time (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.

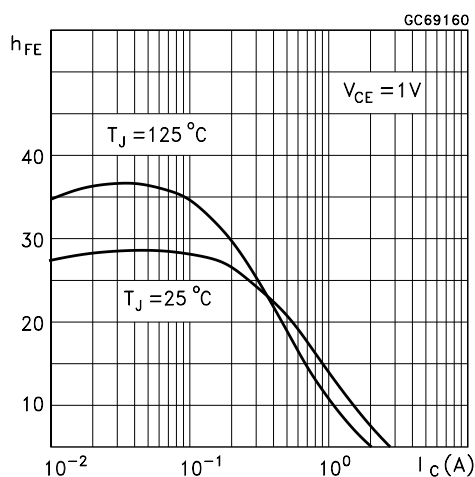
## Safe Operating Areas



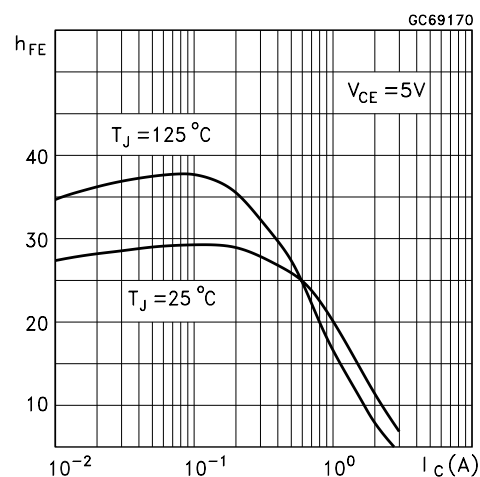
## Derating Curve



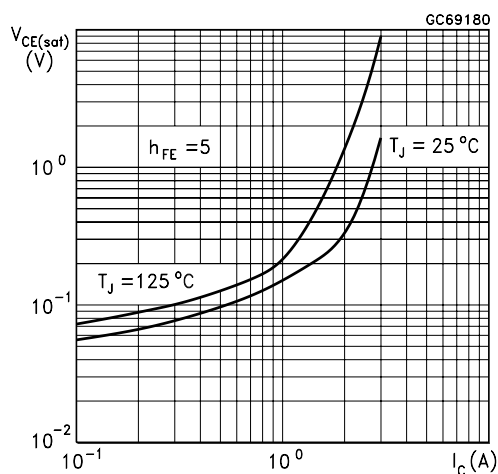
## DC Current Gain



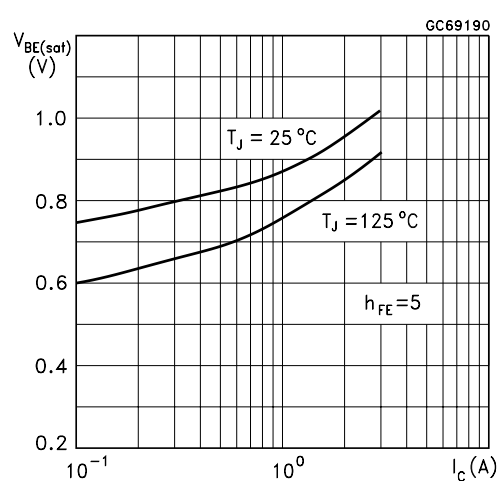
## DC Current Gain



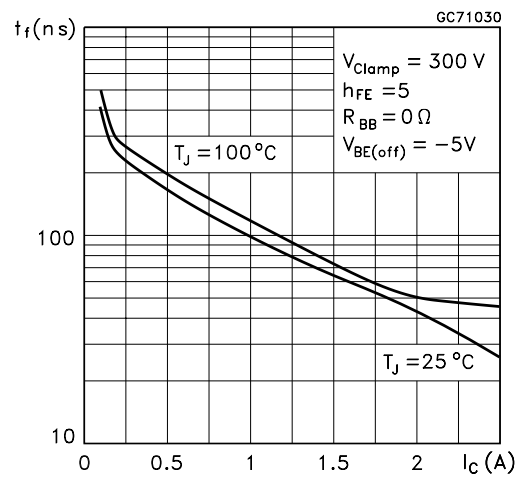
## Collector Emitter Saturation Voltage



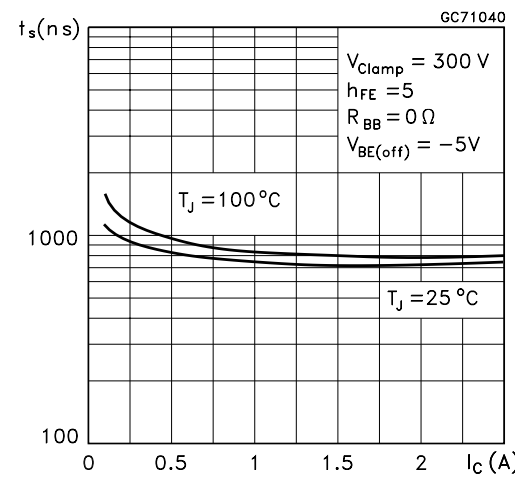
## Base Emitter Saturation Voltage



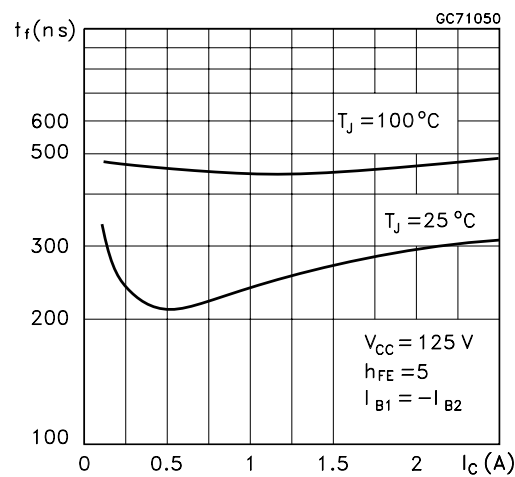
Inductive Fall Time



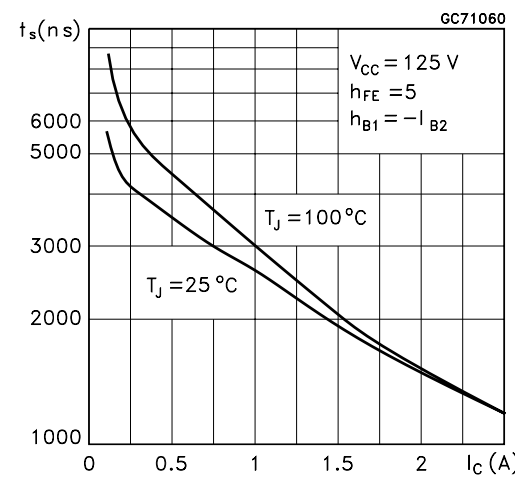
Inductive Storage Time



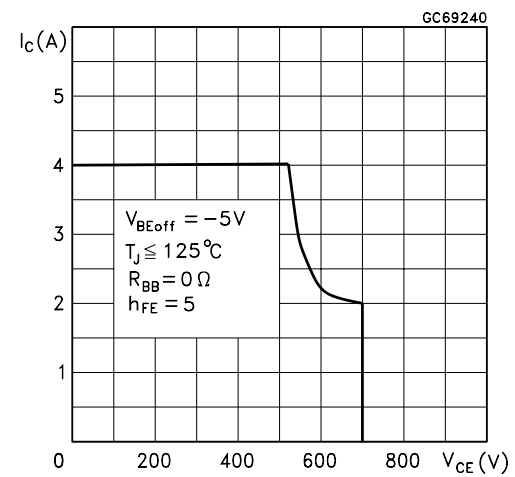
Resistive Fall Time

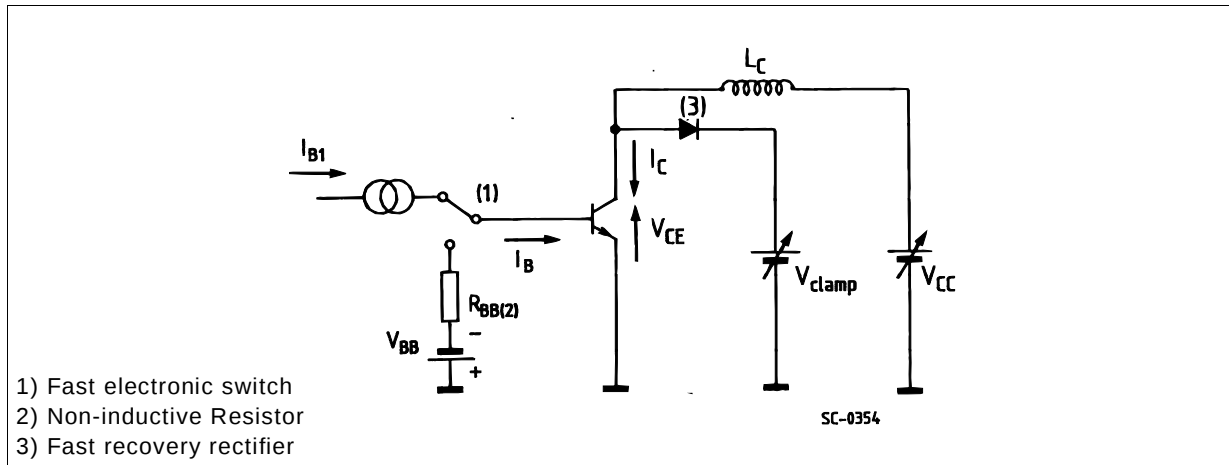
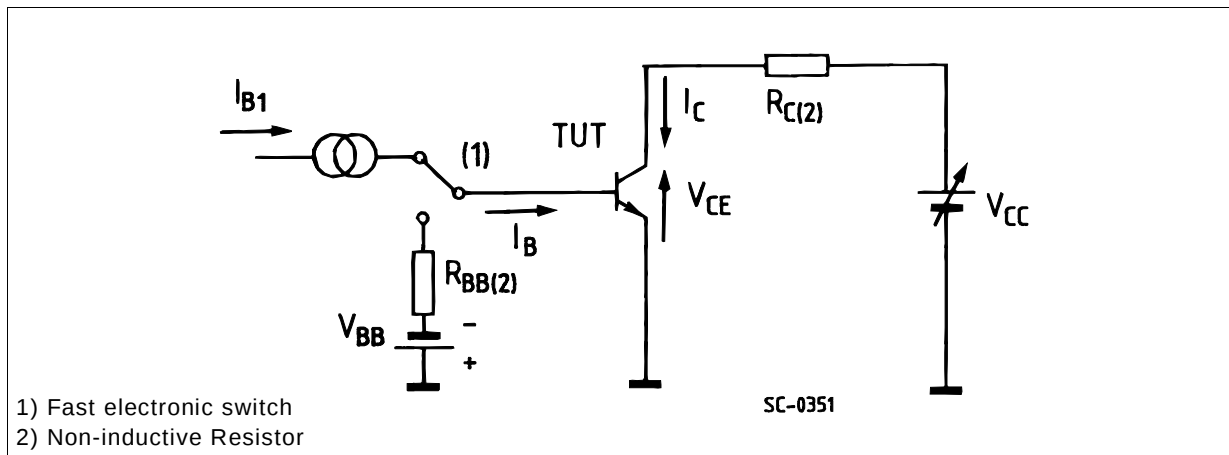


Resistive Load Storage Time



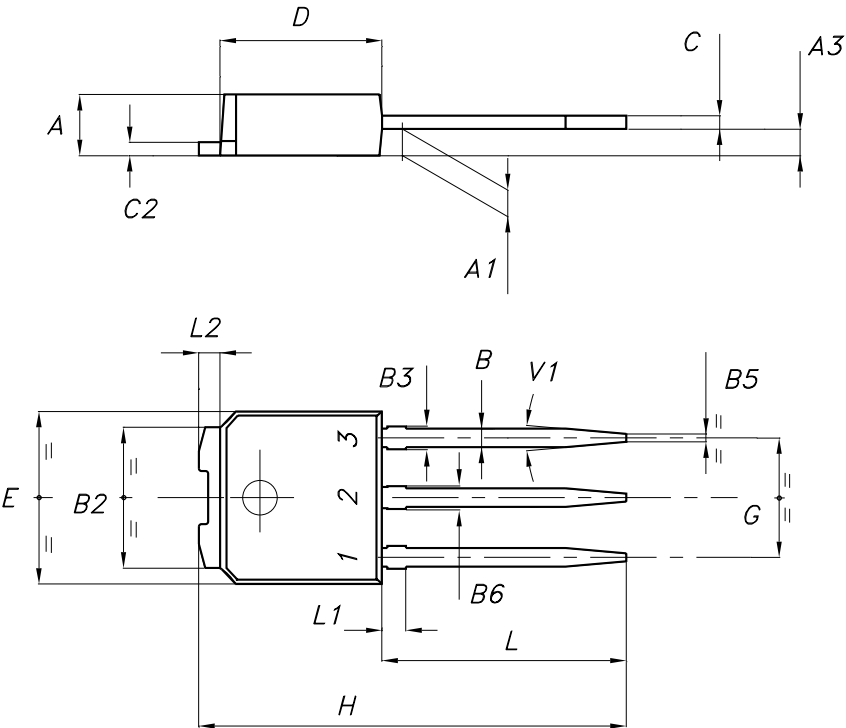
Reverse Biased SOA



**Figure 1:** Inductive Load Switching Test Circuit.**Figure 2:** Resistive Load Switching Test Circuit.

TO-251 (IPAK) MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 2.20  |      | 2.40  | 0.087 |       | 0.094 |
| A1   | 0.90  |      | 1.10  | 0.035 |       | 0.043 |
| A3   | 0.70  |      | 1.30  | 0.028 |       | 0.051 |
| B    | 0.64  |      | 0.90  | 0.025 |       | 0.035 |
| B2   | 5.20  |      | 5.40  | 0.204 |       | 0.213 |
| B3   |       |      | 0.85  |       |       | 0.033 |
| B5   |       | 0.30 |       |       | 0.012 |       |
| B6   |       |      | 0.95  |       |       | 0.037 |
| C    | 0.45  |      | 0.60  | 0.018 |       | 0.024 |
| C2   | 0.48  |      | 0.60  | 0.019 |       | 0.024 |
| D    | 6.00  |      | 6.20  | 0.237 |       | 0.244 |
| E    | 6.40  |      | 6.60  | 0.252 |       | 0.260 |
| G    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| H    | 15.90 |      | 16.30 | 0.626 |       | 0.642 |
| L    | 9.00  |      | 9.40  | 0.354 |       | 0.370 |
| L1   | 0.80  |      | 1.20  | 0.031 |       | 0.047 |
| L2   |       | 0.80 | 1.00  |       | 0.031 | 0.039 |
| V1   |       | 10°  |       |       | 10°   |       |



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