



## BULB39D

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- HIGH RUGGEDNESS
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263) POWER PACKAGE IN TAPE & REEL (Suffix "T4")

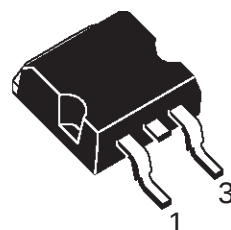
### APPLICATIONS

- ELECTRONIC TRANSFORMERS FOR HALOGEN LAMPS
- SWITCH MODE POWER SUPPLIES

### DESCRIPTION

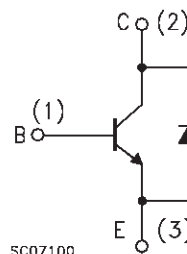
The BULB39D is manufactured using high voltage Multi Epitaxial Planar technology to enhance switching speeds while maintaining wide RBSOA.

The BUL series is designed for use in electronics transformers for halogen lamps.



**D<sup>2</sup>PAK  
(TO-263)**  
(Suffix "T4")

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                                  | Value      | Unit |
|-----------|--------------------------------------------|------------|------|
| $V_{CES}$ | Collector-Emitter Voltage ( $V_{BE} = 0$ ) | 850        | V    |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ )    | 450        | V    |
| $V_{EBO}$ | Emitter-Base Voltage ( $I_C = 0$ )         | 9          | 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   |

## BULB39D

### THERMAL DATA

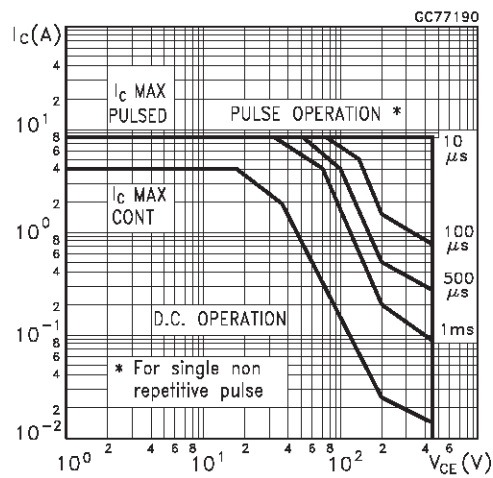
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case    | Max | 1.78 | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-Ambient | Max | 70   | °C/W |

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

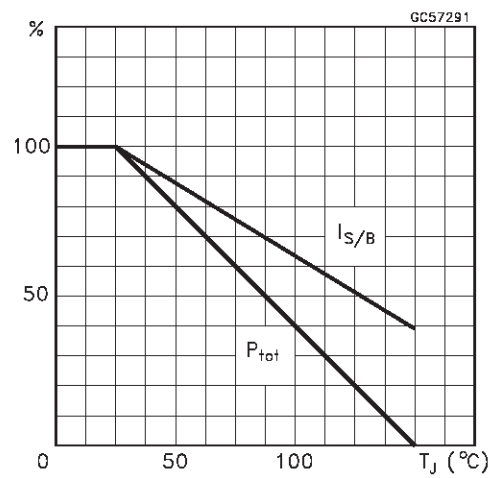
| Symbol                           | Parameter                                                 | Test Conditions                                                                                                                                           | Min.    | Typ.      | Max.       | Unit     |
|----------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|------------|----------|
| I <sub>CES</sub>                 | Collector Cut-off Current (V <sub>BE</sub> = 0)           | V <sub>CE</sub> = 850 V<br>V <sub>CE</sub> = 850 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>CEO(sus)*</sub>           | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 100 mA      L = 25 mH                                                                                                                    | 450     |           |            | V        |
| V <sub>CE(sat)*</sub>            | Collector-Emitter Saturation Voltage                      | I <sub>C</sub> = 1 A      I <sub>B</sub> = 0.2 A<br>I <sub>C</sub> = 2.5 A      I <sub>B</sub> = 0.5 A                                                    |         | 0.13      | 0.5<br>1.1 | V<br>V   |
| V <sub>BE(sat)*</sub>            | Base-Emitter Saturation Voltage                           | I <sub>C</sub> = 1 A      I <sub>B</sub> = 0.2 A<br>I <sub>C</sub> = 2.5 A      I <sub>B</sub> = 0.5 A                                                    |         |           | 1.1<br>1.3 | V<br>V   |
| h <sub>FE*</sub>                 | DC Current Gain                                           | I <sub>C</sub> = 5 A      V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 10 mA      V <sub>CE</sub> = 5 V                                                     | 4<br>10 |           |            |          |
| V <sub>CEW</sub>                 | Maximum Collector Emitter Voltage Without Snubber         | I <sub>C</sub> = 6 A      R <sub>BB</sub> = 0 Ω<br>V <sub>BB</sub> = -2.5 V      L = 50μH<br>t <sub>p</sub> = 10 μs                                       | 450     |           |            | V        |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 2.5 A      I <sub>B(on)</sub> = 0.5 A<br>V <sub>BE(off)</sub> = -5 V      R <sub>BB</sub> = 0 Ω<br>V <sub>CL</sub> = 300 V      L = 1 mH |         | 0.7<br>50 | 1.5<br>100 | μs<br>ns |
| V <sub>f</sub>                   | Diode Forward Voltage                                     | I <sub>C</sub> = 2 A                                                                                                                                      |         |           | 1.5        | V        |

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

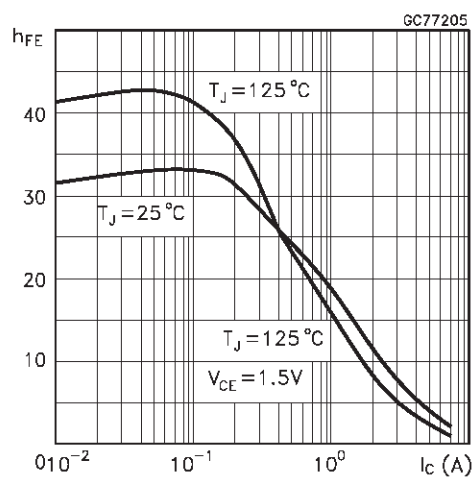
## Safe Operating Areas



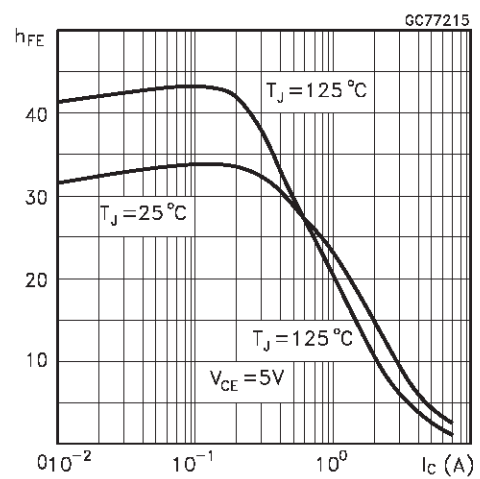
## Derating Curve



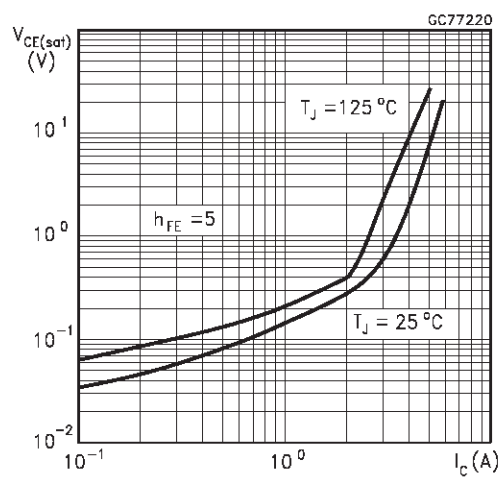
## DC Current Gain



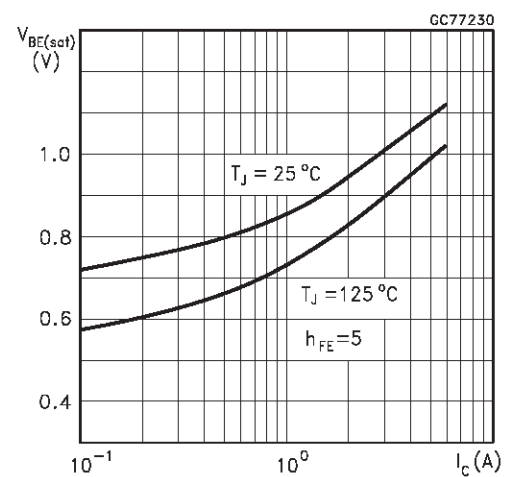
## DC Current Gain



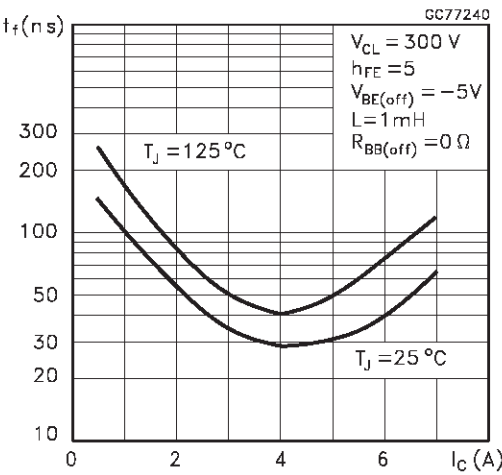
## Collector Emitter Saturation Voltage



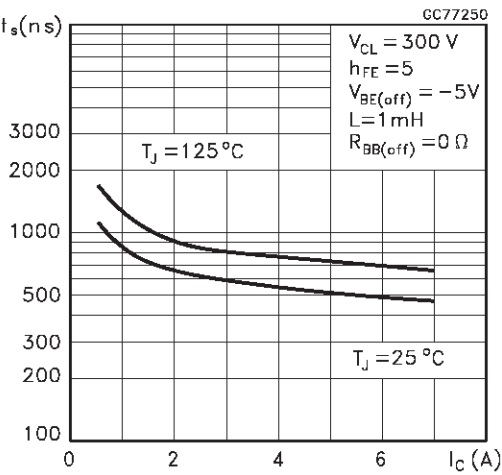
## Base Emitter Saturation Voltage



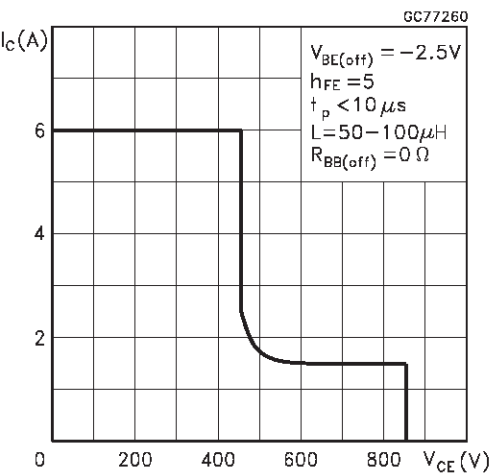
Inductive Fall Time



Inductive Storage Time

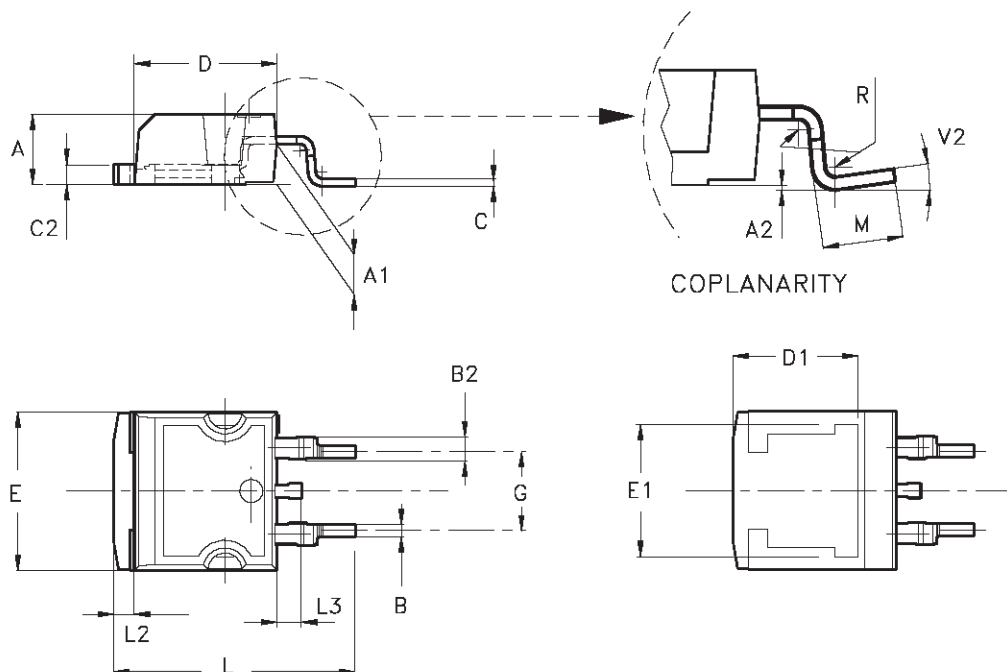


Reverse Biased SOA



TO-263 (D<sup>2</sup>PAK) MECHANICAL DATA

| DIM. | mm    |      |       | inch  |       |       |
|------|-------|------|-------|-------|-------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP.  | MAX.  |
| A    | 4.40  |      | 4.60  | 0.173 |       | 0.181 |
| A1   | 2.49  |      | 2.69  | 0.098 |       | 0.106 |
| A2   | 0.03  |      | 0.23  | 0.001 |       | 0.009 |
| B    | 0.70  |      | 0.93  | 0.027 |       | 0.036 |
| B2   | 1.14  |      | 1.70  | 0.044 |       | 0.067 |
| C    | 0.45  |      | 0.60  | 0.017 |       | 0.023 |
| C2   | 1.23  |      | 1.36  | 0.048 |       | 0.053 |
| D    | 8.95  |      | 9.35  | 0.352 |       | 0.368 |
| D1   |       | 8.00 |       |       | 0.315 |       |
| E    | 10.00 |      | 10.40 | 0.393 |       | 0.409 |
| E1   |       | 8.50 |       |       | 0.334 |       |
| G    | 4.88  |      | 5.28  | 0.192 |       | 0.208 |
| L    | 15.00 |      | 15.85 | 0.590 |       | 0.624 |
| L2   | 1.27  |      | 1.4   | 0.050 |       | 0.055 |
| L3   | 1.40  |      | 1.75  | 0.055 |       | 0.068 |
| M    | 2.40  |      | 3.2   | 0.094 |       | 0.126 |
| R    |       | 0.40 |       |       | 0.016 |       |
| V2   | 0°    |      | 8°    | 0°    |       | 8°    |



- Weight : 1.38 g (typ.)
- The planaty of the slug must be within 30 µm

P011P6/G

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