



# THE DATASHEET OF BUL138FP





## BUL138FP

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPE
- NPN TRANSISTOR
- 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
- FULLY INSULATED PACKAGE (U.L. COMPLIANT) FOR EASY MOUNTING

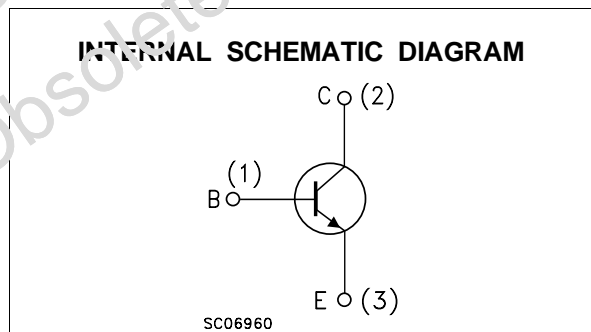
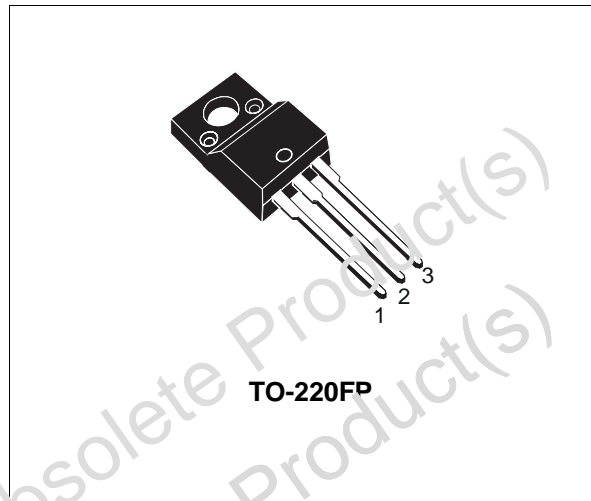
### APPLICATIONS

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

### DESCRIPTION

The BUL138FP 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.

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



### ABSOLUTE MAXIMUM RATINGS

| Symbol     | Parameter  | Value      | Unit |
|------------|--|------------|------|
| $V_{CES}$  | Collector-Emitter Voltage ( $V_{BE} = 0$ )                                   | 800        | V    |
| $V_{CE0}$  | Collector-Emitter Voltage ( $I_B = 0$ )                                      | 400        | 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   | 2          | A    |
| $I_{BM}$   | Base Peak Current ( $t_p < 5$ ms)  | 4          | A    |
| $P_{tot}$  | Total Dissipation at $T_c = 25$ °C   | 33         | W    |
| $V_{isol}$ | Insulation Withstand Voltage (RMS) from All Three Leads to External Heatsink | 1500       | V    |
| $T_{stg}$  | Storage Temperature  | -65 to 150 | °C   |
| $T_j$      | Max. Operating Junction Temperature  | 150        | °C   |

# BUL138FP

## THERMAL DATA

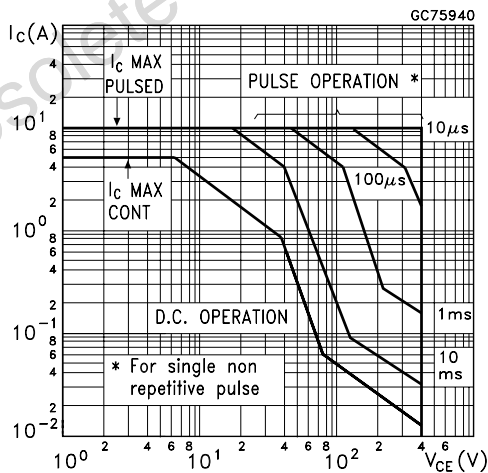
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-case    | Max | 3.8  | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-ambient | Max | 62.5 | °C/W |

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

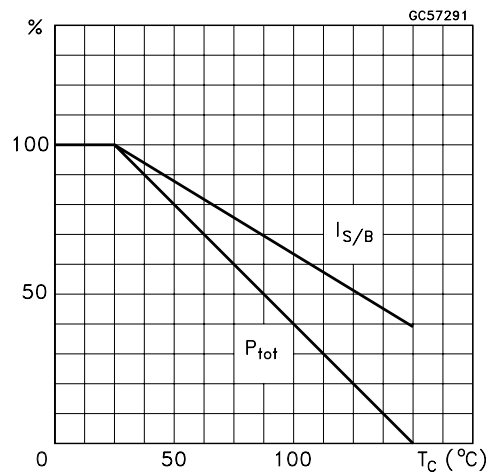
| Symbol                           | Parameter   | Test Conditions   | Min.    | Typ.      | Max.                      | Unit                  |
|----------------------------------|---|---|---------|-----------|---------------------------|-----------------------|
| I <sub>CES</sub>                 | Collector Cut-off Current (V <sub>BE</sub> = 0)           | V <sub>CE</sub> = 800 V<br>V <sub>CE</sub> = 800 V T <sub>j</sub> = 125 °C  |         |           | 100<br>500                | μA<br>μA              |
| I <sub>CEO</sub>                 | Collector Cut-off Current (I <sub>B</sub> = 0)            | V <sub>CE</sub> = 400 V   |         |           | 250                       | μA                    |
| V <sub>CEO(sus)*</sub>           | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0) | I <sub>C</sub> = 100 mA L = 25 mH   | 400     |           |                           | V                     |
| V <sub>EBO</sub>                 | Emitter-Base Voltage                                      | I <sub>E</sub> = 10 mA  | 9       |           |                           | 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 A I <sub>B</sub> = 0.4 A<br>I <sub>C</sub> = 3 A I <sub>B</sub> = 0.6 A<br>I <sub>C</sub> = 4 A I <sub>B</sub> = 1 A<br>I <sub>C</sub> = 5 A I <sub>B</sub> = 1 A |         | 0.7       | 0.5<br>0.7<br>1<br>1<br>1 | V<br>V<br>V<br>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 A I <sub>B</sub> = 0.4 A<br>I <sub>C</sub> = 3 A I <sub>B</sub> = 0.6 A   |         |           | 1.1<br>1.3<br>1.5         | V<br>V<br>V           |
| h <sub>FE*</sub>                 | DC Current Gain   | I <sub>C</sub> = 2 A V <sub>CE</sub> = 5 V<br>I <sub>C</sub> = 10 mA V <sub>CE</sub> = 5 V  | 8<br>10 |           | 40                        |                       |
| t <sub>s</sub><br>t <sub>f</sub> | INDUCTIVE LOAD<br>Storage Time<br>Fall Time               | I <sub>C</sub> = 2 A I <sub>B1</sub> = 0.4 A<br>V <sub>RL(off)</sub> = -5 V R <sub>BB</sub> = 0 Ω<br>V <sub>CE</sub> = 250 V L = 200 μH   |         | 0.7<br>50 | 1.4<br>100                | 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 I <sub>B1</sub> = 0.4 A<br>V <sub>BE(off)</sub> = -5V R <sub>BB</sub> = 0 Ω<br>V <sub>CL</sub> = 250 V L = 200 μH<br>T <sub>j</sub> = 125 °C   |         | 1<br>75   |                           | μs<br>ns              |

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

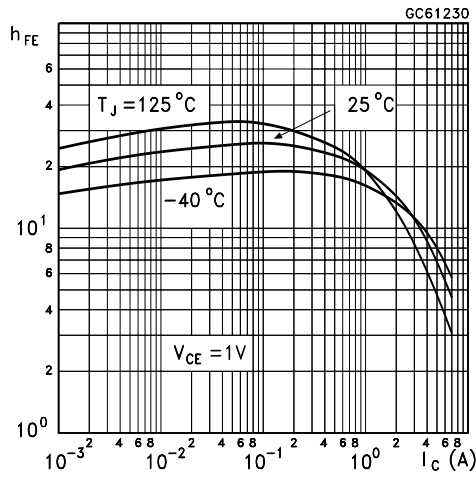
## Safe Operating Areas



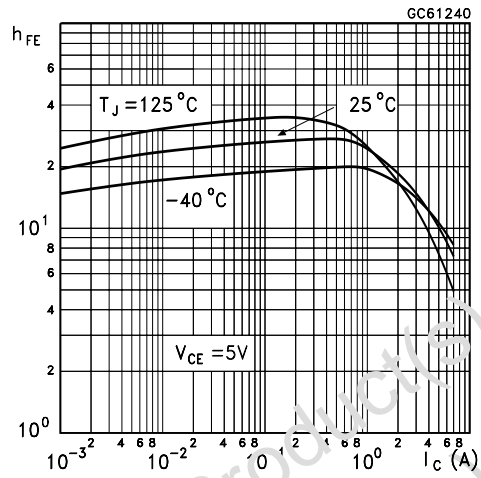
## Derating Curve



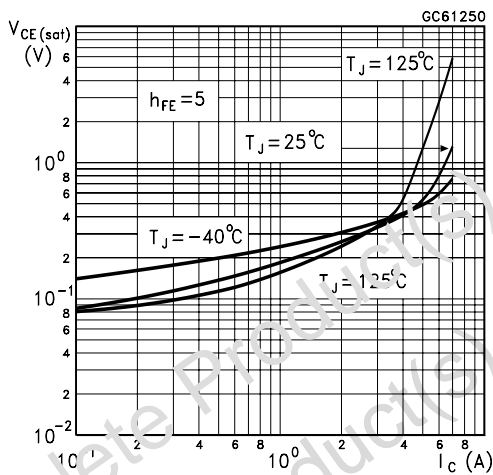
DC Current Gain



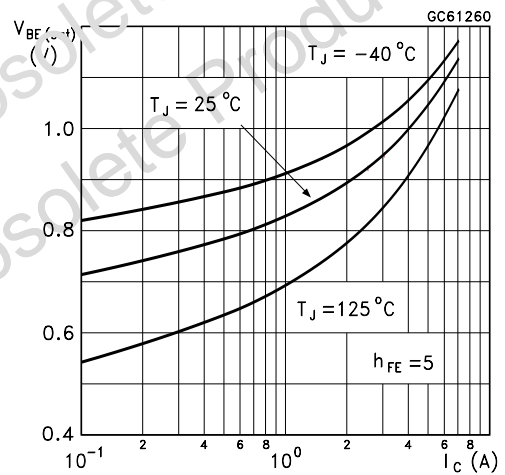
DC Current Gain



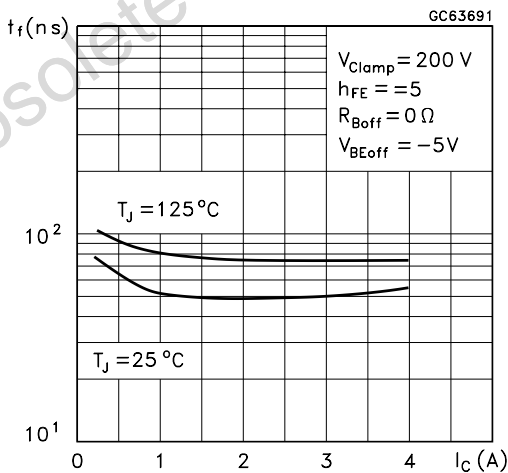
Collector-Emitter Saturation Voltage



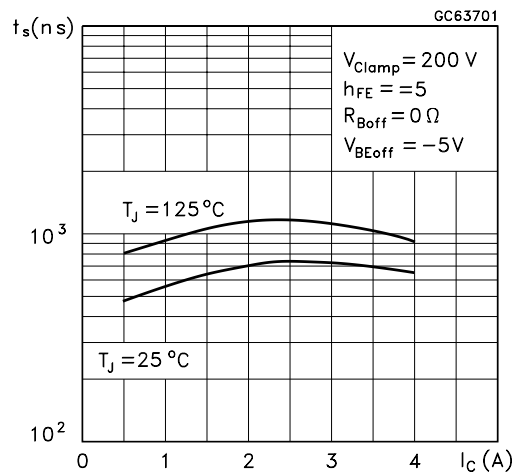
Base-Emitter Saturation Voltage



Inductive Fall Time

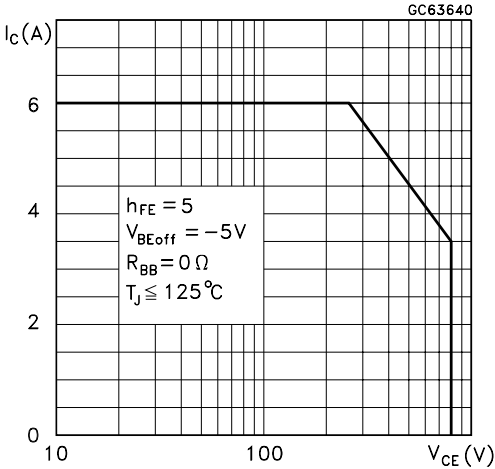


Inductive Storage Time

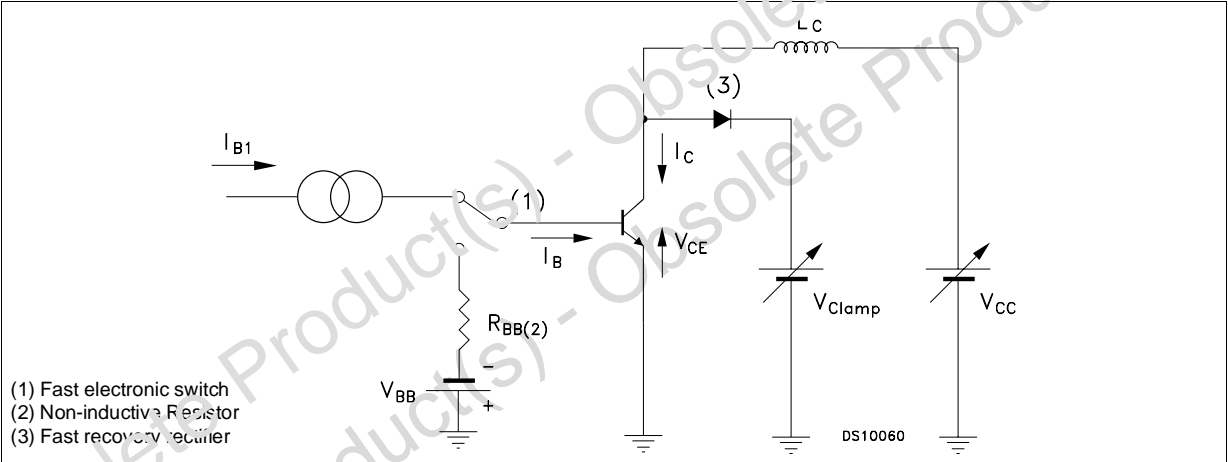


**BUL138FP**

Reverse Biased SOA



Inductive Load Switching Test Circuit





Obsolete Product(s) - Obsolete Product(s)  
Obsolete Product(s) - Obsolete Product(s)

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