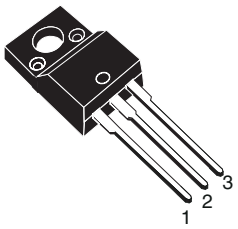
# BUL742CFP

## High voltage fast-switching NPN power transistor

## Features

- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Fully insulated power package U.L. compliant




TO-220FP

## Applications

- Electronic ballast for fluorescent lighting
- Switch mode power supplies

## Description

The device is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and high voltage capability. Thanks to an increased intermediate layer, it has an intrinsic ruggedness which enables the transistor to withstand an high collector current level during breakdown condition, without using the transil protection usually necessary in typical converters for lamp ballast.

**Figure 1. Internal schematic diagram**

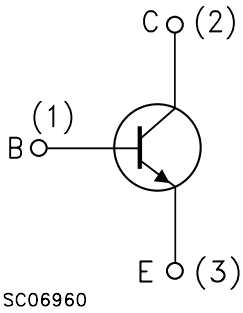



**Table 1. Device summary**

| Order code | Marking | Package | Packaging |
|---|---|---|---|
| BUL742CFP | BUL742CFP | TO-220FP | Tube |

# Contents

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-emitter voltage ($V_{BE}$ = 0) | 1050 | V |
| $V_{CEO}$ | Collector-emitter voltage ($I_B$ = 0) | 400 | V |
| $V_{EBO}$ | Emitter-base voltage ($I_C$ = 0, $I_B$ = 2 A, $t_p$ < 10 ms) | $V_{(BR)EBO}$ | V |
| $I_C$ | Collector current | 4 | A |
| $I_{CM}$ | Collector peak current ($t_P$ < 5ms) | 8 | A |
| $I_B$ | Base current | 2 | A |
| $I_{BM}$ | Base peak current ($t_P$ < 5ms) | 4 | A |
| $P_{tot}$ | Total dissipation at $T_c$ = 25°C | 30 | W |
| $V_{ISO}$ | 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 |

**Table 3. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal resistance junction - case | 4.17 | °C/W |

# 2 Electrical characteristics

($T_{case}$ = 25°C unless otherwise specified)

**Table 4. Electrical characteristics**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector cut-off current ($V_{BE}$ = 0) | $V_{CE}$ =1050 V | | 0.2 | 10 | µA |
| $I_{CEO}$ | Collector cut-off current ($I_B$ = 0) | $V_{CE}$ =400 V | | 10 | 250 | µA |
| $V_{(BR)EBO}$ | Emitter base breakdown voltage ($I_C$ = 0) | $I_E$ = 1 mA | 15 | 19 | 24 | V |
| $V_{CEO(sus)}$ (1) | Collector-emitter sustaining voltage ($I_B$ = 0) | $I_C$ =10 mA | 400 | 450 | | V |
| $V_{CE(sat)}$ (1) | Collector-emitter saturation voltage | $I_C$ = 1 A $I_B$ = 0.2 A<br>$I_C$ = 3.5 A $I_B$ = 1 A | | 0.15<br>0.6 | 0.5<br>1.5 | V<br>V |
| $V_{BE(sat)}$ (1) | Base-emitter saturation voltage | $I_C$ = 3.5 A $I_B$ = 1 A | | 1.1 | 1.5 | V |
| $h_{FE}$ (1) | DC current gain | $I_C$ = 0.1 A $V_{CE}$ = 5 V<br>$I_C$ = 0.8 A $V_{CE}$ = 3 V | 48<br>25 | 75<br>35 | 100<br>50 | |
| $t_s$<br>$t_f$ | Resistive load<br>Storage time<br>Fall time | $I_C$ = 2 A $V_{CC}$ = 125 V<br>$I_{B1}$ = -$I_{B2}$ = 400 mA<br>$t_p$ = 300 µs $V_{BE(off)}$ = -5 V | | 2.4<br>350 | 3.5<br>500 | µs<br>ns |
| $E_{ar}$ | Repetitive avalanche energy | L = 2 mH C = 1.8 nF<br>$V_{BE(off)}$ = -5 V | 6 | | | mJ |

1. Pulsed duration = 300 ms, duty cycle £1.5%

## 2.1 Electrical characteristics (curves)

**Figure 2. Safe operating area**

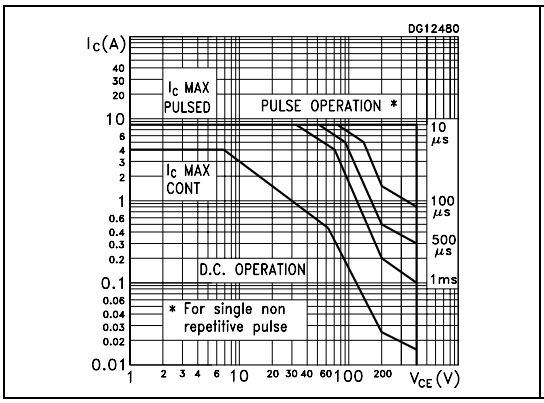



**Figure 3. Derating curve**

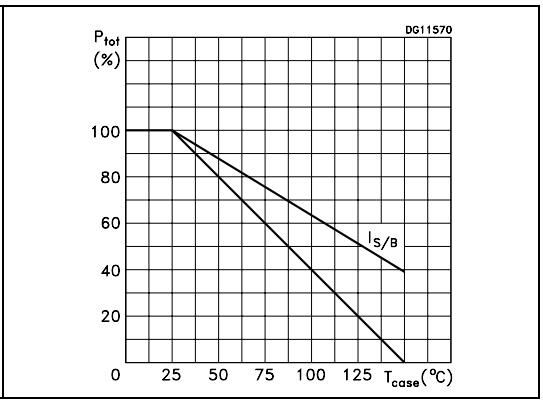



**Figure 4. Output characteristics**

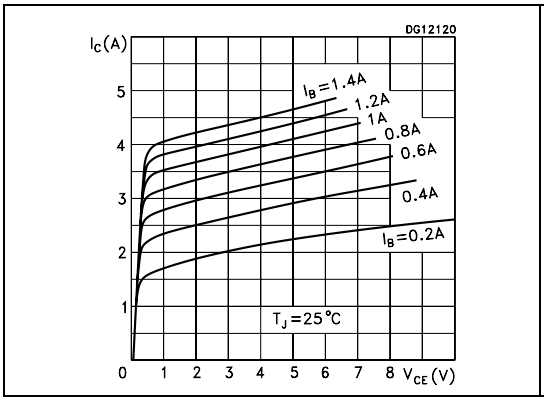



**Figure 5. DC current gain**

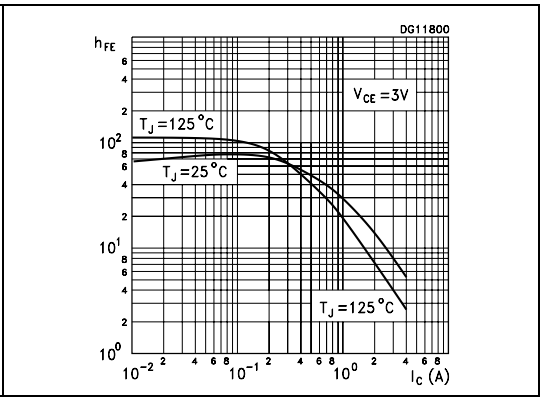



**Figure 6. DC current gain**

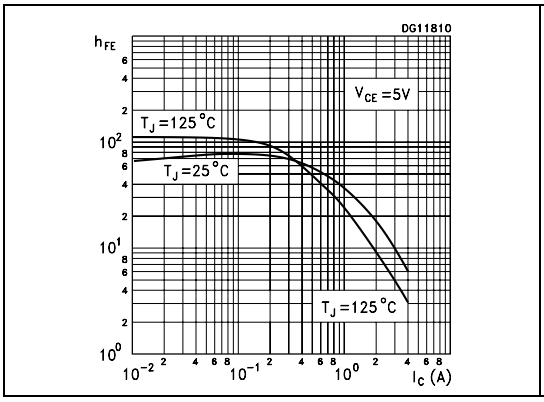



**Figure 7. Collector - emitter saturation voltage**

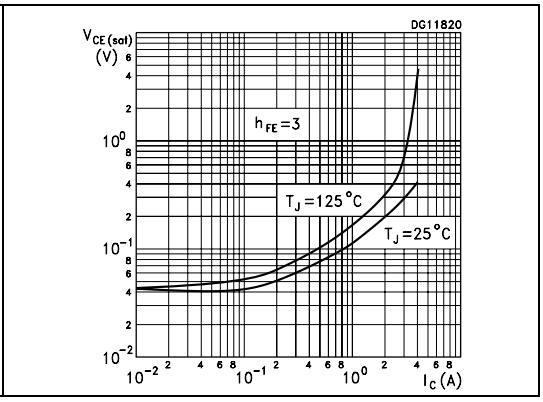


**Figure 8. Base-emitter saturation voltage**

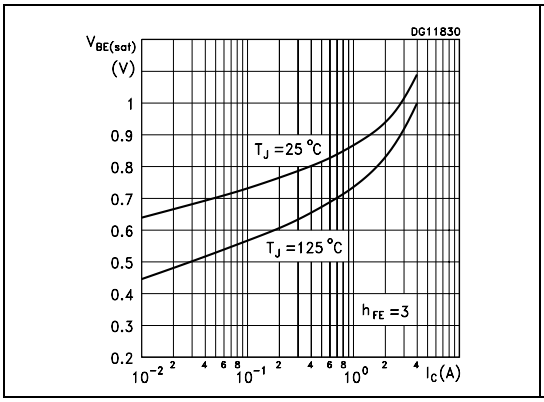



**Figure 9. Resistive load switching on times ($h_{FE}$ = 5)**

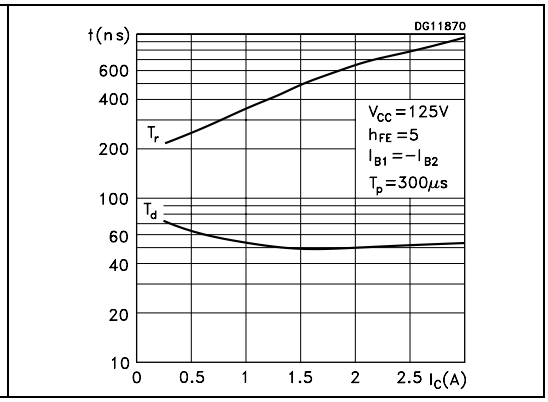



**Figure 10. Resistive load switching off times ($h_{FE}$ = 5)**

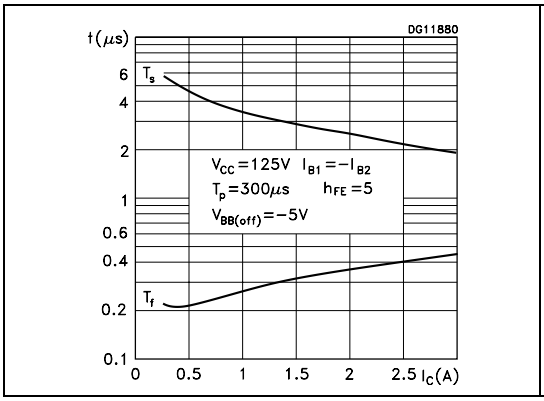



**Figure 11. Resistive load switching on times ($h_{FE}$ = 10)**

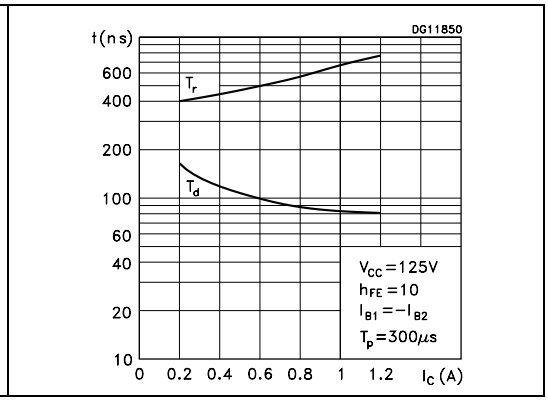



**Figure 12. Resistive load switching off times ($h_{FE}$ = 10)**

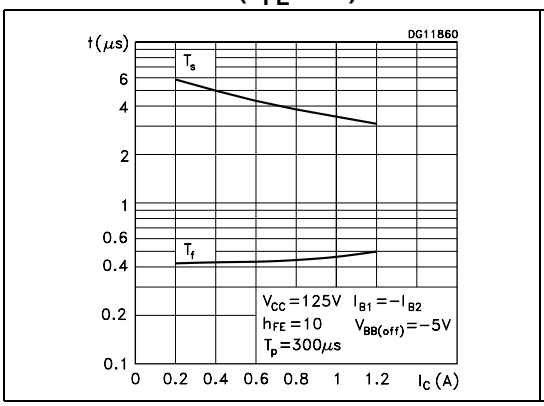
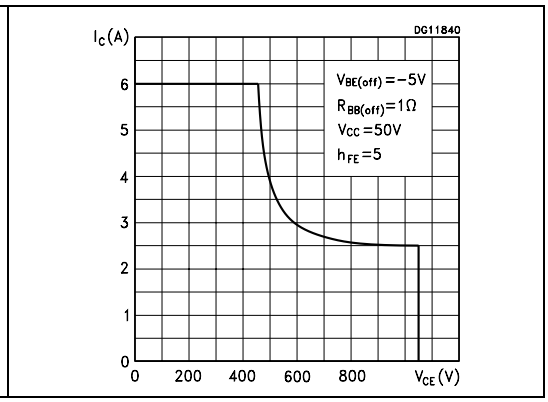



**Figure 13. Reverse biased SOA**



# 3 Test circuit

**Figure 14. Energy rating test circuit**

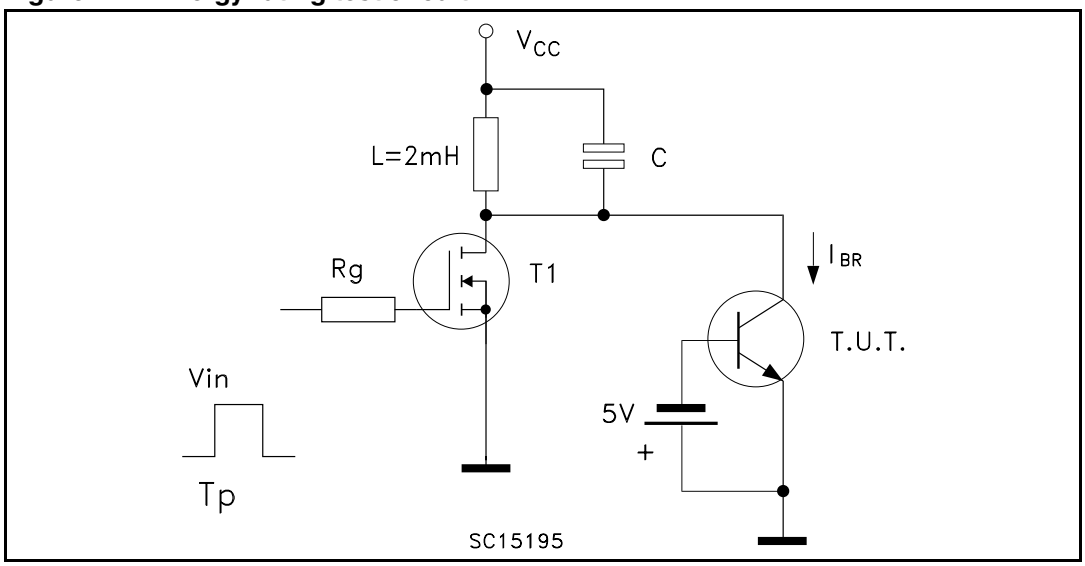
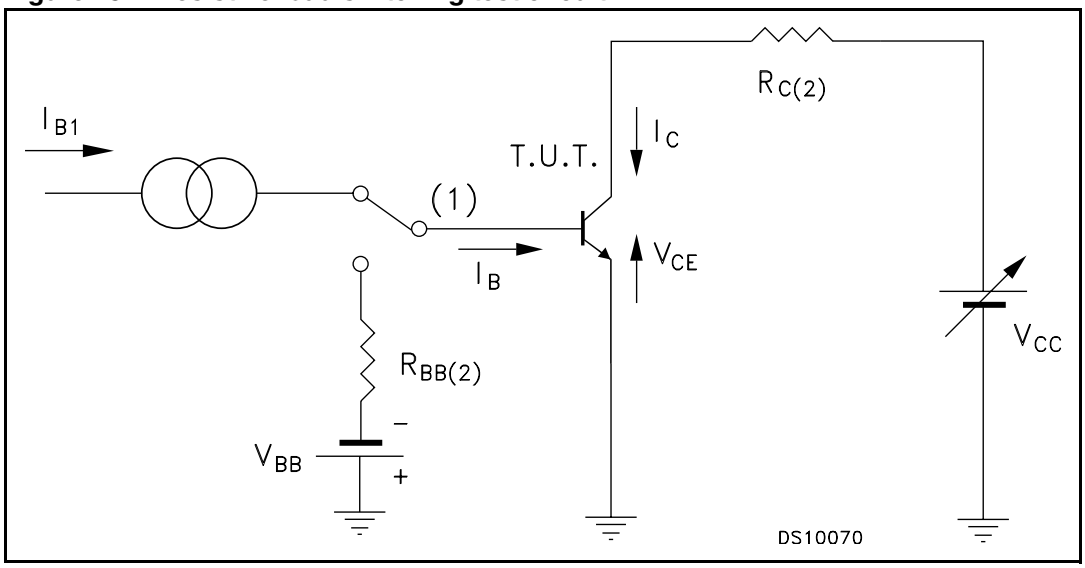



**Figure 15. Resistive load switching test circuit**

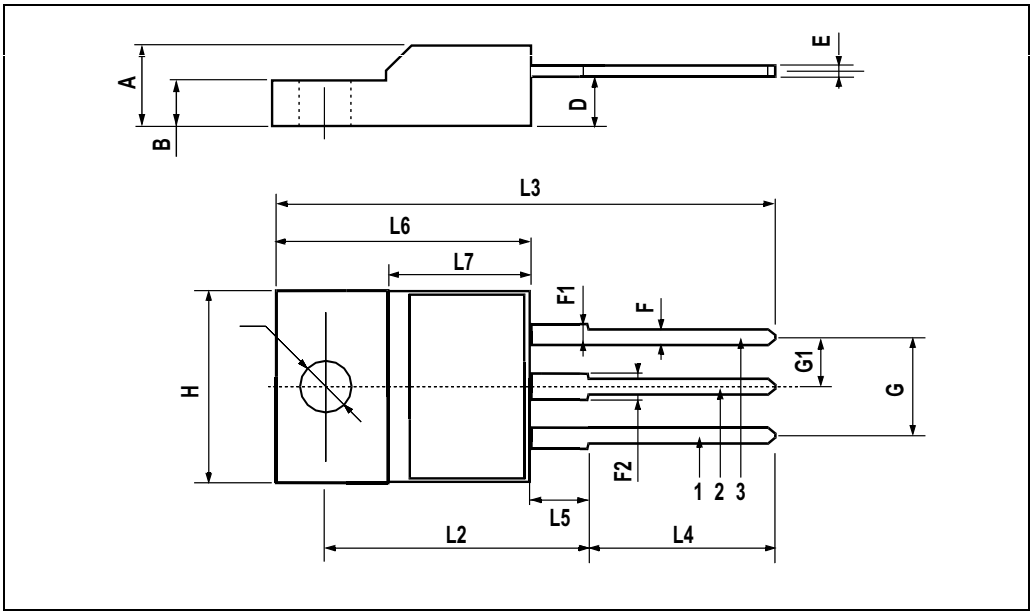


# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

## TO-220FP 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 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| F2 | 1.15 | | 1.7 | 0.045 | | 0.067 |
| 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 | .0385 | | 0.417 |
| L5 | 2.9 | | 3.6 | 0.114 | | 0.141 |
| L6 | 15.9 | | 16.4 | 0.626 | | 0.645 |
| L7 | 9 | | 9.3 | 0.354 | | 0.366 |
| Ø | 3 | | 3.2 | 0.118 | | 0.126 |



# 5 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 10-Aug-2007 | 1 | First release. |

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