# BUL743

## High voltage fast-switching NPN power transistor

## Features

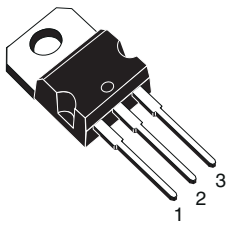
- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

## Applications

- Electronic ballast for fluorescent lighting up to 256 W (8 x 32 W)
- Switch mode power supplies

## Description

The device is manufactured using the diffused collector in planar technology adopting new and enhanced high voltage structure. 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.




**TO-220**

**Figure 1. Internal schematic diagram**

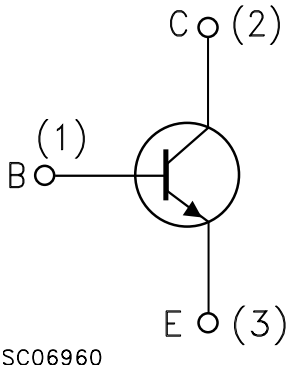



**Table 1. Device summary**

| Order code | Marking | Package | Packaging |
|---|---|---|---|
| BUL743 | BUL743 | TO-220 | Tube |

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-emitter voltage ($V_{BE}$ = 0) | 1200 | V |
| $V_{CEO}$ | Collector-emitter voltage ($I_B$ = 0) | 500 | V |
| $V_{EBO}$ | Emitter-base voltage ($I_C$ = 0, $I_B$ = 6 A, $t_p$ < 10 ms) | $V_{(BR)EBO}$ | V |
| $I_C$ | Collector current | 12 | A |
| $I_{CM}$ | Collector peak current ($t_P$ < 5 ms) | 24 | A |
| $I_B$ | Base current | 6 | A |
| $I_{BM}$ | Base peak current ($t_P$ < 5 ms) | 12 | A |
| $P_{tot}$ | Total dissipation at $T_c$ = 25 °C | 100 | W |
| $T_{stg}$ | 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 | 1.25 | °C/W |
| $R_{thj\text{-}amb}$ | Thermal resistance junction - ambient | 62.5 | °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) | $V_{CE}$ = 1200 V | | 0.2 | 10 | µA |
| $I_{CEO}$ | Collector cut-off current ($I_B$ = 0) | $V_{CE}$ = 500 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) | $I_C$ = 50 mA | 500 | | | V |
| $V_{CE(sat)}$ (1) | Collector-emitter saturation voltage | $I_C$ = 3 A $I_B$ = 0.6 A<br>$I_C$ = 10 A $I_B$ = 2.5 A | | 0.15<br>0.6 | 0.5<br>1.5 | V<br>V |
| $V_{BE(sat)}$ (1) | Base-emitter saturation voltage | $I_C$ = 10 A $I_B$ = 2.5 A | | 1.1 | 1.5 | V |
| $h_{FE}$ (1) | DC current gain | $I_C$ = 0.5 A $V_{CE}$ = 5 V<br>$I_C$ = 2 A $V_{CE}$ = 3 V | 35<br>24 | 55<br>34 | 80<br>45 | |
| <br>$t_s$<br>$t_f$ | Resistive load<br>Storage time<br>Fall time | $I_C$ = 6 A $V_{CC}$ = 125 V<br>$I_{B(on)}$ = -$I_{B(off)}$ = 1.2 A<br>$t_p$ = 300 µs $V_{BE(off)}$ = -5 V | | <br>2.5<br>400 | <br>3.8<br>500 | <br>µs<br>ns |
| $E_{ar}$ | Repetitive avalanche energy | L = 2 mH C = 1.8 nF<br>$V_{BE(off)}$ = -5 V | 3 | | | mJ |

1. Pulsed duration = 300 µs, duty cycle ≤ 1.5%

## 2.1 Electrical characteristics (curves)

**Figure 2. Safe operating area**

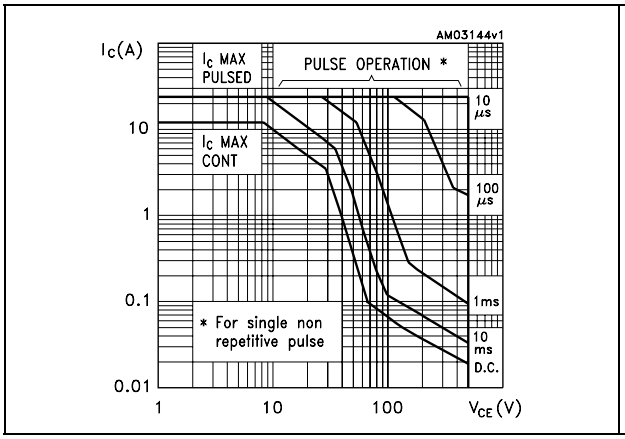



**Figure 3. Derating curve**

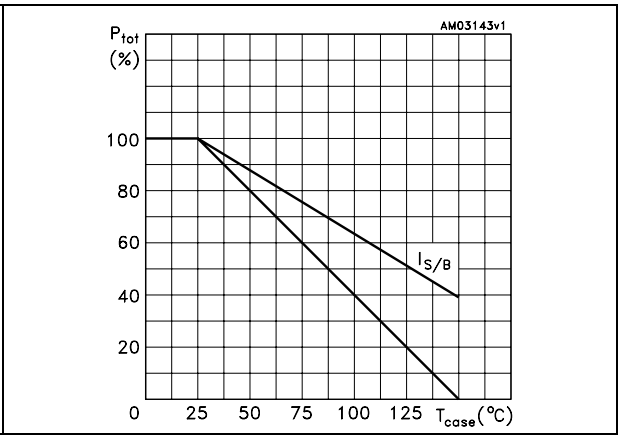



**Figure 4. DC current gain ($V_{CE}$ = 3 V)**

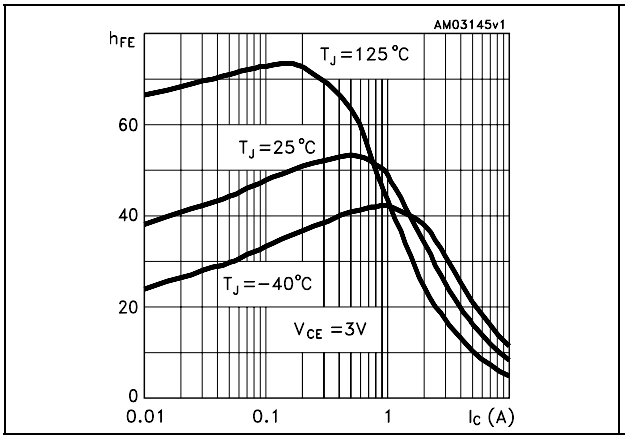



**Figure 5. DC current gain ($V_{CE}$ = 5 V)**

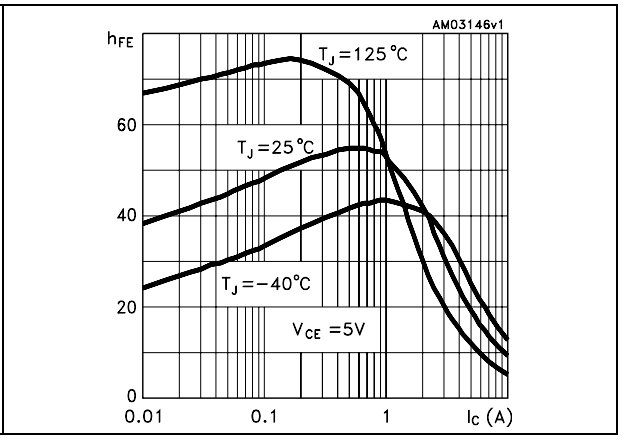



**Figure 6. Collector-emitter saturation voltage**

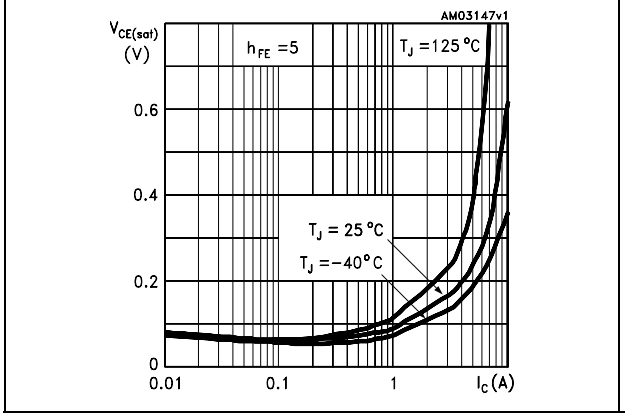



**Figure 7. Base-emitter saturation voltage**

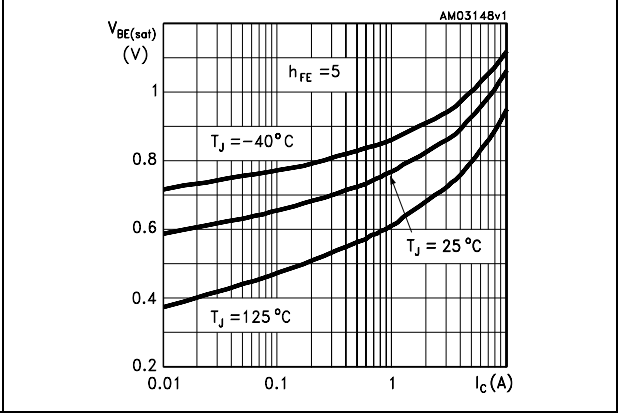


**Figure 8. Output characteristics**

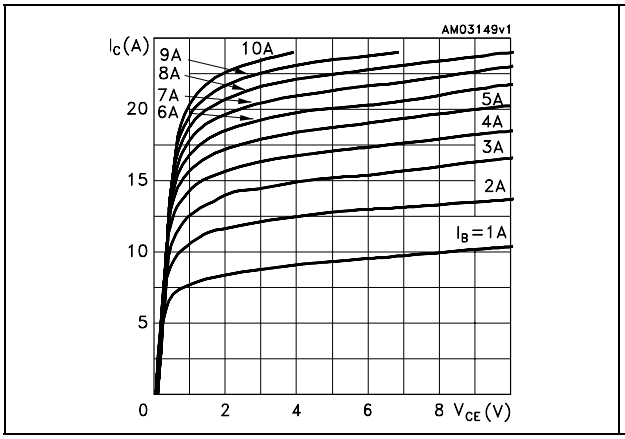



**Figure 9. Reverse biased safe operating area**

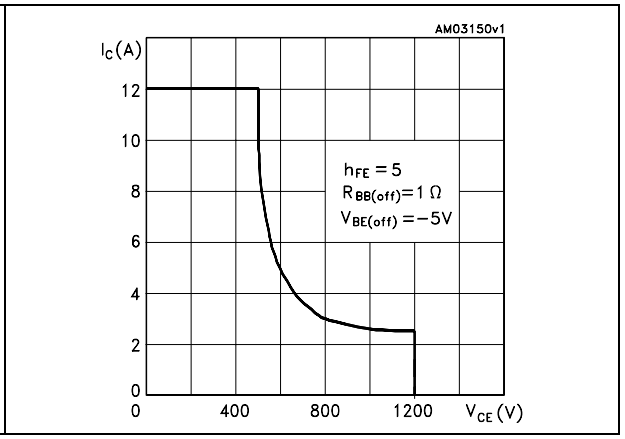



**Figure 10. Resistive load switching time (on)**

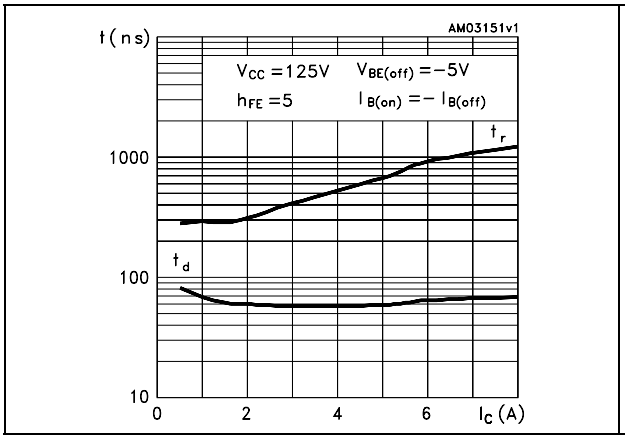
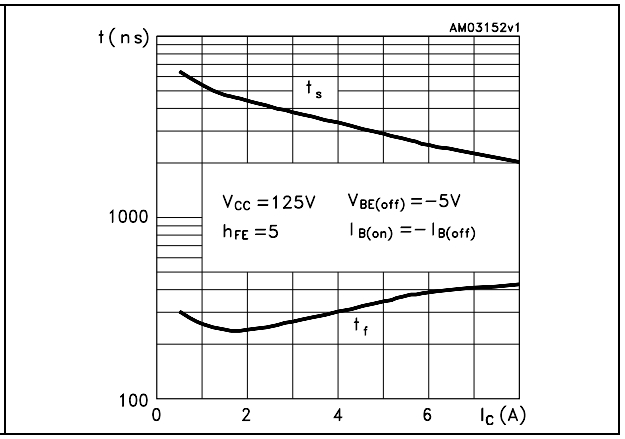



**Figure 11. Resistive load switching time (off)**



## 2.2 Test circuits

**Figure 12. Energy rating test circuit**

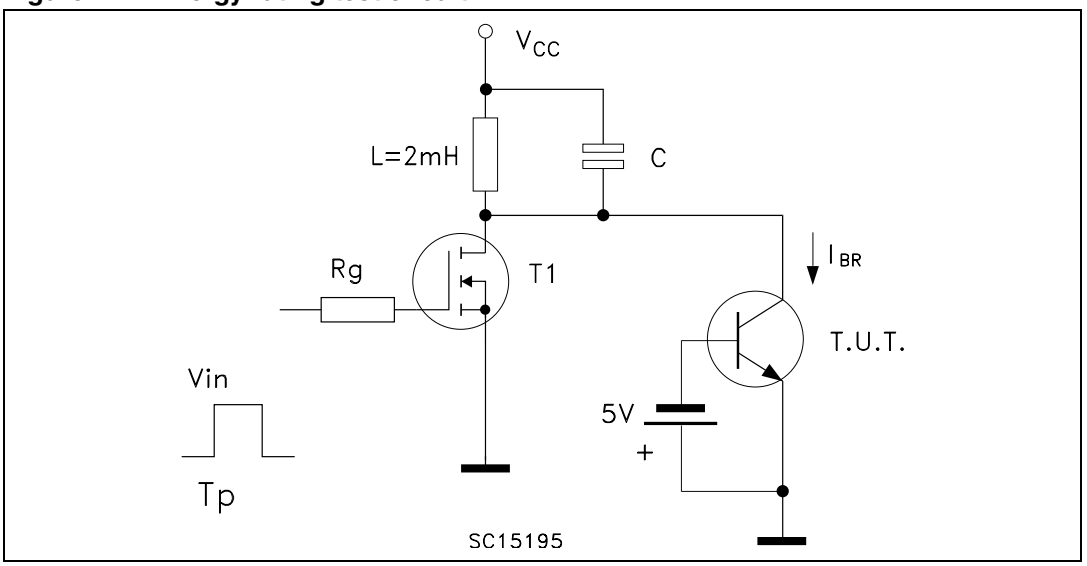
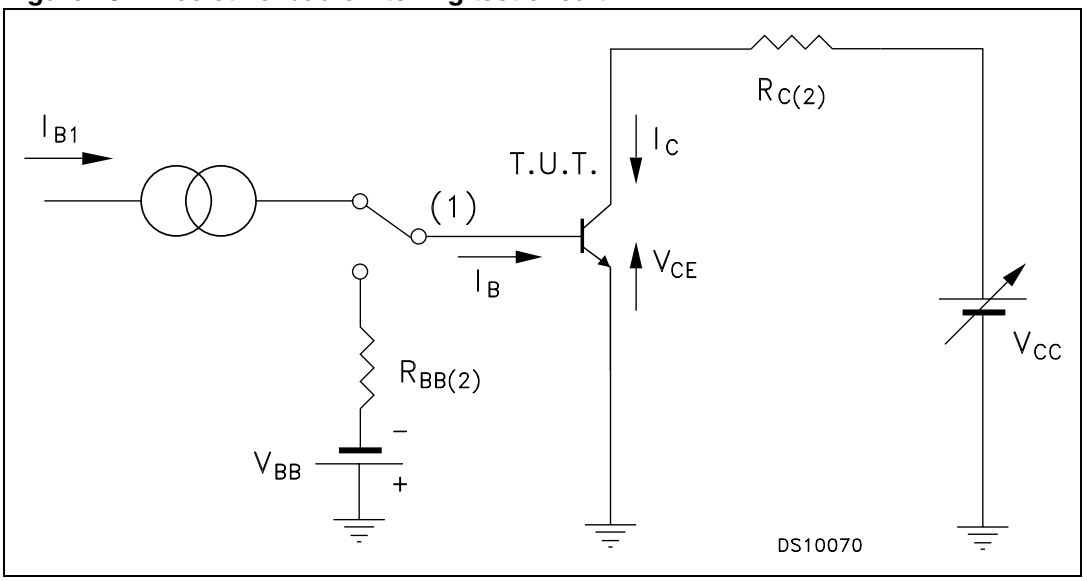



**Figure 13. Resistive load switching test circuit**



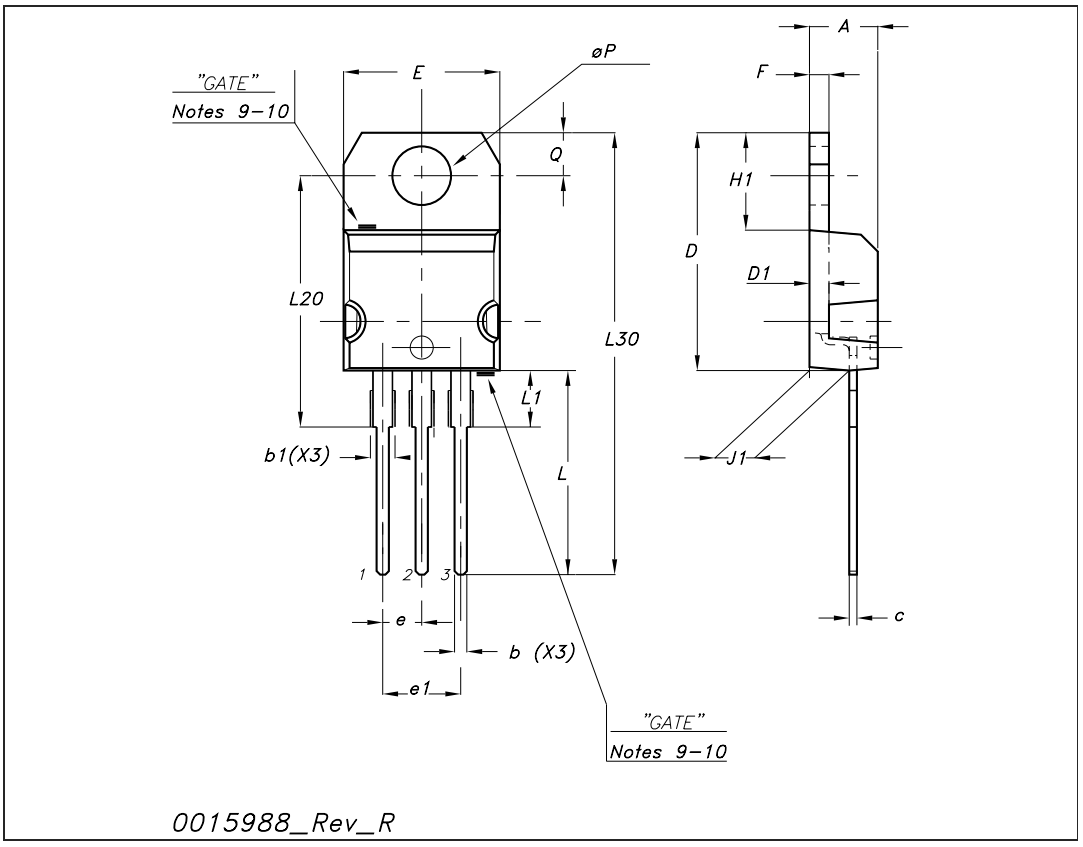

1. Fast electronic switch
2. Non-inductive resistor

# 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
ECOPACK® is an ST trademark.

## TO-220 mechanical data

| Dim | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| b | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b1 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| c | 0.48 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.6 | | 0.62 |
| D1 | | 1.27 | | | 0.050 | |
| E | 10 | | 10.40 | 0.393 | | 0.409 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| e1 | 4.95 | | 5.15 | 0.194 | | 0.202 |
| F | 1.23 | | 1.32 | 0.048 | | 0.051 |
| H1 | 6.20 | | 6.60 | 0.244 | | 0.256 |
| J1 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| L | 13 | | 14 | 0.511 | | 0.551 |
| L1 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| L20 | | 16.40 | | | 0.645 | |
| L30 | | 28.90 | | | 1.137 | |
| ∅P | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |



# 4 Revision history

Table 5. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 09-Dec-2008 | 1 | First release |
| 20-Mar-2009 | 2 | Added *Section 2.1Section 2.1: Electrical characteristics (curves) on page 4* |
| 25-May-2009 | 3 | Document status promoted from preliminary data to datasheet |

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