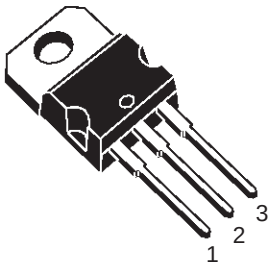
# BUL1403ED

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- INTEGRATED ANTISATURATION AND PROTECTION NETWORK
- 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
- ARCING TEST SELF PROTECTED




**TO-220**

### APPLICATIONS

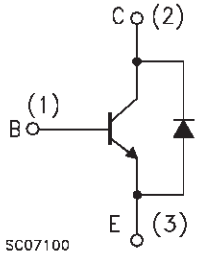
- 2/4 LAMPS ELECTRONIC BALLAST FOR FLUORESCENT LIGHTING 277 $V_{AC}$ PUSH-PULL CONFIGURATION

### DESCRIPTION

The BUL1403ED is a new device, designed for fluorescent electronic ballast 277 $V_{AC}$ push-pull applications (up to 4 lamps).

This device, it can be used without baker clamp and transil protection, reducing greatly the component count.

**INTERNAL SCHEMATIC DIAGRAM**




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage ($V_{BE}$ = 0) | 1400 | V |
| $V_{CEO}$ | Collector-Emitter Voltage ($I_B$ = 0) | 650 | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | 7 | V |
| $I_C$ | Collector Current | 3 | A |
| $I_{CM}$ | Collector Peak Current ($t_p$ < 5 ms) | 6 | 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 | 80 | W |
| $T_{stg}$ | Storage Temperature | -65 to 150 | °C |
| $T_j$ | Max. Operating Junction Temperature | 150 | °C |

## THERMAL DATA

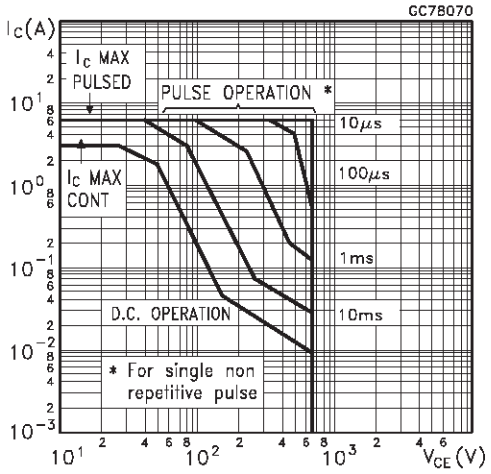
| | | | |
|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-Case | 1.56 | °C/W |
| $R_{thj\text{-}amb}$ | Max<br>Thermal Resistance Junction-Ambient Max | 62.5 | °C/W |

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

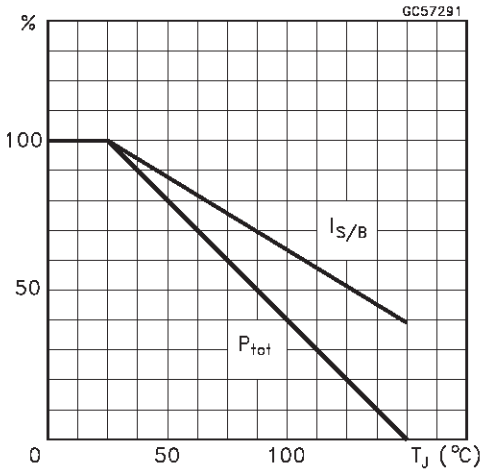
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector Cut-off Current ($V_{BE}$ = 0) | $V_{CE}$ = 1400 V | | | 1 | mA |
| $I_{EBO}$ | Base-Emitter Leakage Current | $V_{EB}$ = 7 V | | | 100 | µA |
| $V_{CEO(sus)}$ | Collector-Emitter Sustaining Voltage ($I_B$ = 0) | $I_C$ = 10 mA L = 25 mH | 650 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = 0.5 A $I_B$ = 0.05 A<br>$I_C$ = 0.25 A $I_B$ = 0.025 A | | | 2.5<br>1.5 | V<br>V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = 0.5 A $I_B$ = 0.1 A<br>$I_C$ = 1 A $I_B$ = 0.1 A<br>$I_C$ = 2 A $I_B$ = 0.4 A | | | 1.0<br>1.1<br>1.2 | V<br>V<br>V |
| $h_{FE}$* | DC Current Gain | $I_C$ = 5 mA $V_{CE}$ = 10 V<br>$I_C$ = 0.4 A $V_{CE}$ = 3 V<br>$I_C$ = 0.8 A $V_{CE}$ = 5 V | 18<br>15<br>4 | | | |
| | RESISTIVE LOAD | | | | | |
| $t_d$ | Delay Time | $I_C$ = 0.5 A $V_{CC}$ = 125 V | | | 0.3 | µs |
| $t_r$ | Rise Time | $I_{B1}$ = 0.05 A $I_{B2}$ = -0.25 A | | | 0.8 | µs |
| $t_s$ | Storage Time | D.C. = 2% P.W. = 300 µs | | | 1.2 | µs |
| $t_f$ | Fall Time | | | | 0.35 | µs |
| $E_{sb}$ | Repetitive Avalanche Energy | L = 2 mH | 6 | | | mJ |

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

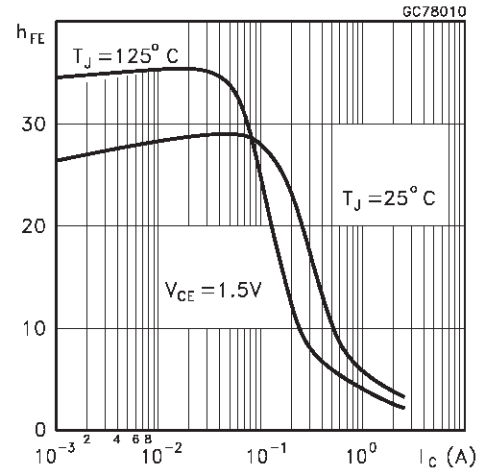
Safe Operating Areas



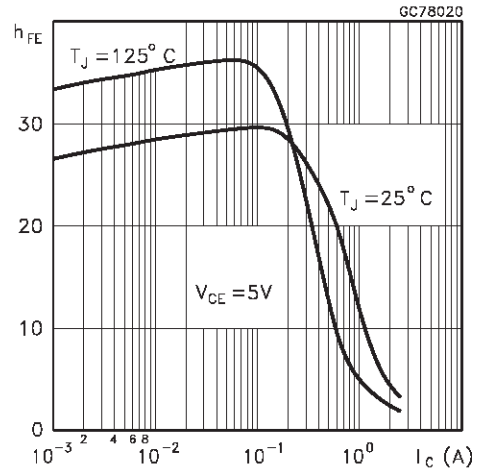

Derating Curve



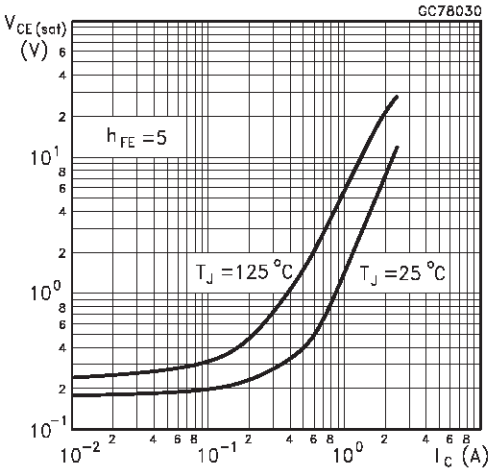

DC Current Gain



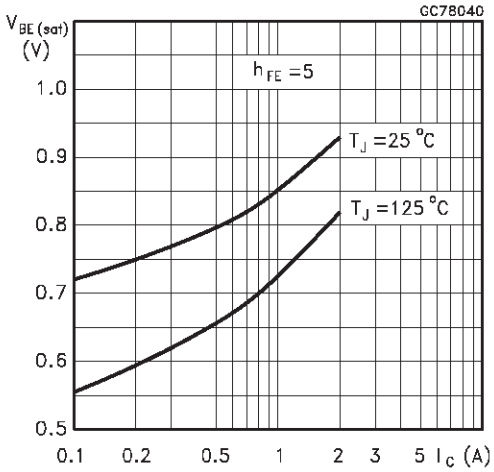

DC Current Gain



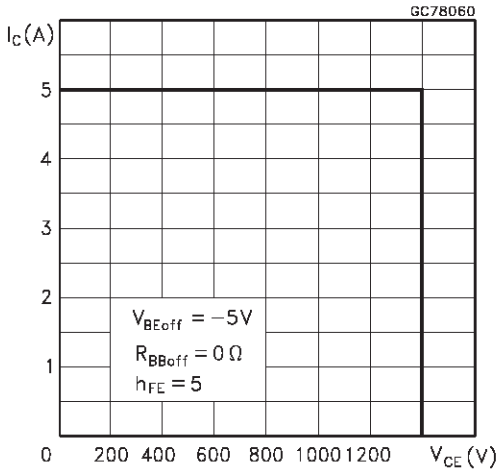

Collector Emitter Saturation Voltage



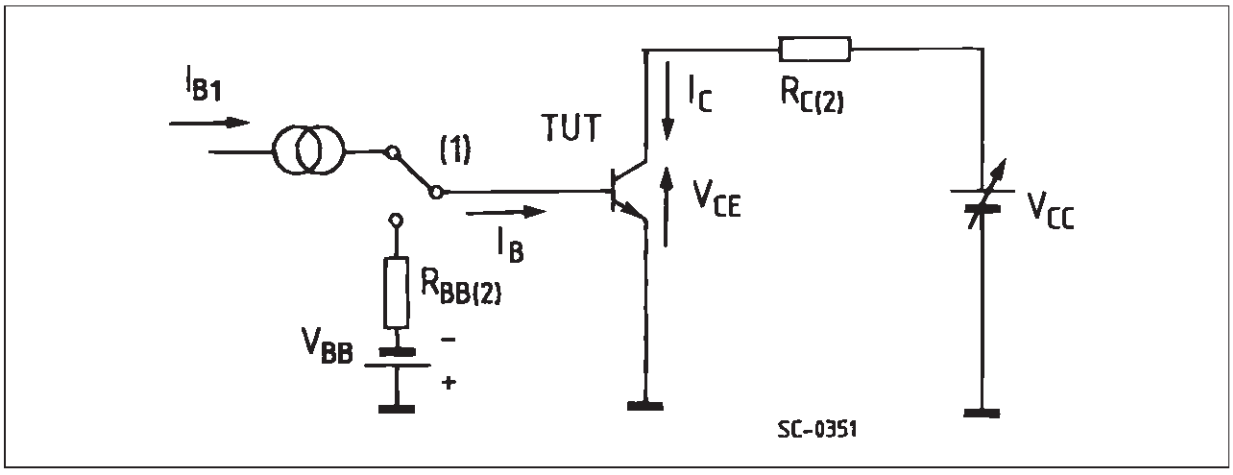

Base Emitter Saturation Voltage



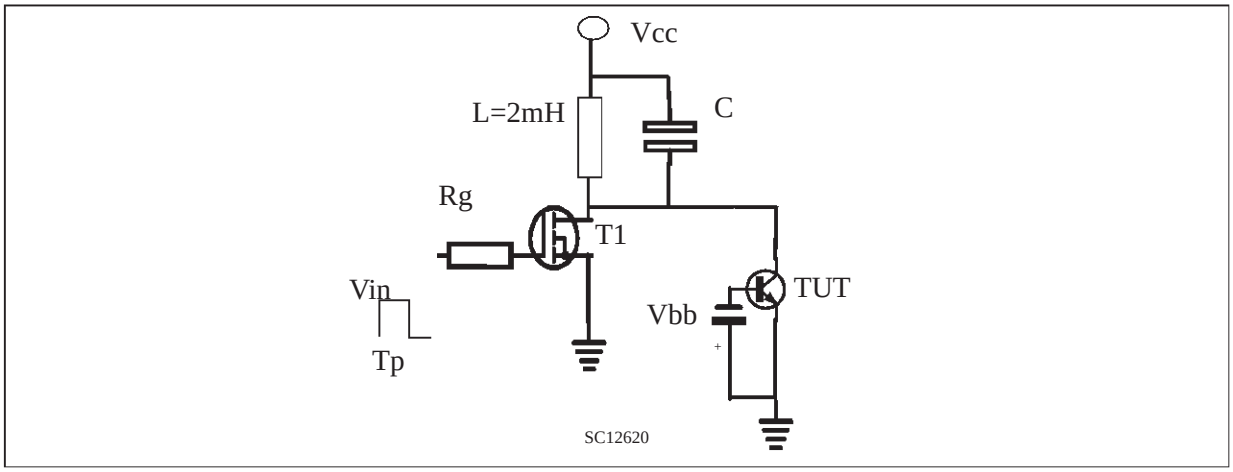
Reverse Biased SOA




Resistive Load Switching Test Circuit

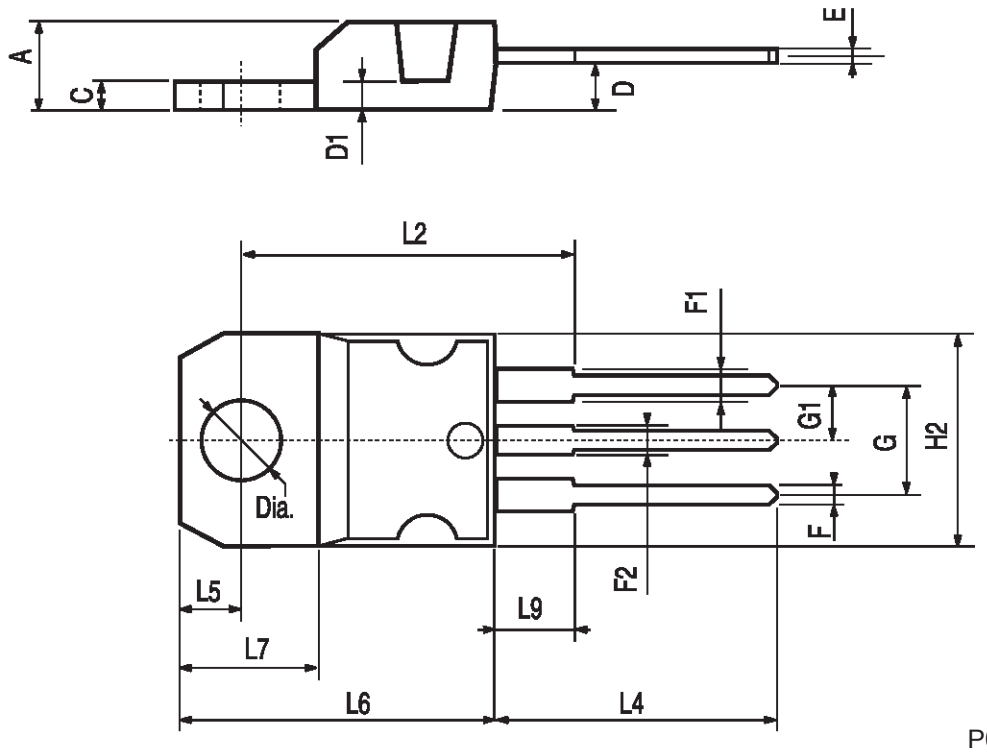



Energy Rating Test Circuit



## TO-220 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.40 | | 4.60 | 0.173 | | 0.181 |
| C | 1.23 | | 1.32 | 0.048 | | 0.051 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| D1 | | 1.27 | | | 0.050 | |
| E | 0.49 | | 0.70 | 0.019 | | 0.027 |
| F | 0.61 | | 0.88 | 0.024 | | 0.034 |
| F1 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| F2 | 1.14 | | 1.70 | 0.044 | | 0.067 |
| G | 4.95 | | 5.15 | 0.194 | | 0.203 |
| G1 | 2.4 | | 2.7 | 0.094 | | 0.106 |
| H2 | 10.0 | | 10.40 | 0.393 | | 0.409 |
| L2 | | 16.4 | | | 0.645 | |
| L4 | 13.0 | | 14.0 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.2 | | 6.6 | 0.244 | | 0.260 |
| L9 | 3.5 | | 3.93 | 0.137 | | 0.154 |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |




P011C