



# BUL903ED

## 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

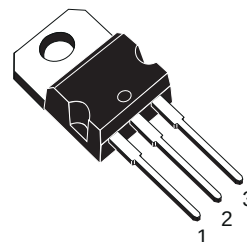
### APPLICATIONS

- LAMP ELECTRONIC BALLAST FOR FLUORESCENT LIGHTING USING 277V HALF BRIDGE CURRENT-FED CONFIGURATION

### DESCRIPTION

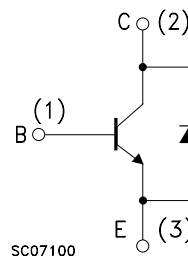
The BUL903ED is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capability.

The device has been designed to operate without baker clamp and transil protection. This enables saving from 2 up to 10 components in the application.



TO-220

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol    | Parameter                                  | Value      | Unit |
|-----------|--------------------------------------------|------------|------|
| $V_{CES}$ | Collector-Emitter Voltage ( $V_{BE} = 0$ ) | 900        | V    |
| $V_{CEO}$ | Collector-Emitter Voltage ( $I_B = 0$ )    | 400        | V    |
| $V_{EBO}$ | Emitter-Base Voltage ( $I_C = 0$ )         | 7          | V    |
| $I_C$     | Collector Current                          | 5          | 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   |

## THERMAL DATA

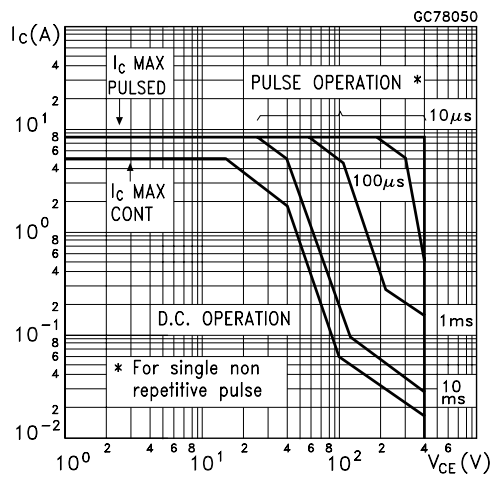
|                       |                                     |     |      |      |
|-----------------------|-------------------------------------|-----|------|------|
| R <sub>thj-case</sub> | Thermal Resistance Junction-Case    | Max | 1.8  | °C/W |
| R <sub>thj-amb</sub>  | Thermal Resistance Junction-Ambient | Max | 62.5 | °C/W |

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

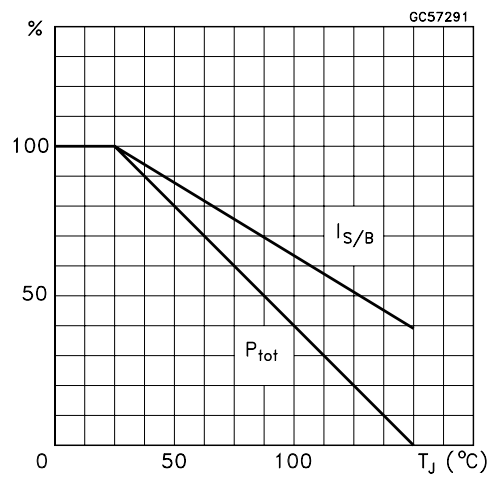
| Symbol                                                               | Parameter                                                              | Test Conditions                                                                                                                                           | Min.    | Typ. | Max.                      | Unit                 |
|----------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|---------------------------|----------------------|
| I <sub>CES</sub>                                                     | Collector Cut-off Current (V <sub>BE</sub> = 0)                        | V <sub>CE</sub> = 900 V                                                                                                                                   |         |      | 1                         | mA                   |
| I <sub>EBO</sub>                                                     | Base-Emitter Leakage Current                                           | V <sub>EB</sub> = 7 V                                                                                                                                     |         |      | 100                       | μA                   |
| V <sub>CEO(sus)</sub> *                                              | Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)              | I <sub>C</sub> = 10 mA    L = 25 mH                                                                                                                       | 400     |      |                           | V                    |
| V <sub>CE(sat)</sub> *                                               | Collector-Emitter Saturation Voltage                                   | I <sub>C</sub> = 1 A    I <sub>B</sub> = 0.15 A                                                                                                           |         |      | 1.0                       | V                    |
| V <sub>BE(sat)</sub> *                                               | Base-Emitter Saturation Voltage                                        | I <sub>C</sub> = 0.1 A    I <sub>B</sub> = 0.05 A<br>I <sub>C</sub> = 0.5 A    I <sub>B</sub> = 0.1 A<br>I <sub>C</sub> = 2.0 A    I <sub>B</sub> = 0.4 A |         |      | 1.0<br>1.1<br>1.2         | V<br>V<br>V          |
| h <sub>FE</sub> *                                                    | DC Current Gain                                                        | I <sub>C</sub> = 5 mA    V <sub>CE</sub> = 10 V<br>I <sub>C</sub> = 0.5 A    V <sub>CE</sub> = 3 V                                                        | 8<br>20 |      |                           |                      |
| V <sub>F</sub>                                                       | Parallel Diode Forward Voltage                                         | I <sub>F</sub> = 3 A                                                                                                                                      |         |      | 1.2                       | V                    |
| t <sub>d</sub><br>t <sub>r</sub><br>t <sub>s</sub><br>t <sub>f</sub> | RESISTIVE LOAD<br>Delay Time<br>Rise Time<br>Storage Time<br>Fall Time | V <sub>CC</sub> = 125 V    I <sub>C</sub> = 0.7 A<br>I <sub>B1</sub> = 0.05 A    I <sub>B2</sub> = 0.4 A<br>t <sub>p</sub> = 300 μs                       |         |      | 0.2<br>1.0<br>0.8<br>0.25 | μs<br>μs<br>μs<br>μs |
| t <sub>d</sub><br>t <sub>r</sub><br>t <sub>s</sub><br>t <sub>f</sub> | RESISTIVE LOAD<br>Delay Time<br>Rise Time<br>Storage Time<br>Fall Time | V <sub>CC</sub> = 125 V    I <sub>C</sub> = 0.5 A<br>I <sub>B1</sub> = 0.045 A    I <sub>B2</sub> = 0.5 A<br>t <sub>p</sub> = 300 μs                      |         |      | 0.2<br>0.5<br>0.8<br>0.5  | μs<br>μs<br>μs<br>μs |
| T <sub>RR</sub>                                                      | Diode Reverse Recovery Time                                            | I <sub>F</sub> = 1 A    di/dt = 100 A/μs<br>V <sub>DD</sub> = 30 V                                                                                        |         | 300  |                           | ns                   |
| E <sub>sb</sub>                                                      | Avalanche Energy                                                       | L = 2 mH                                                                                                                                                  | 6       |      |                           | mJ                   |

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

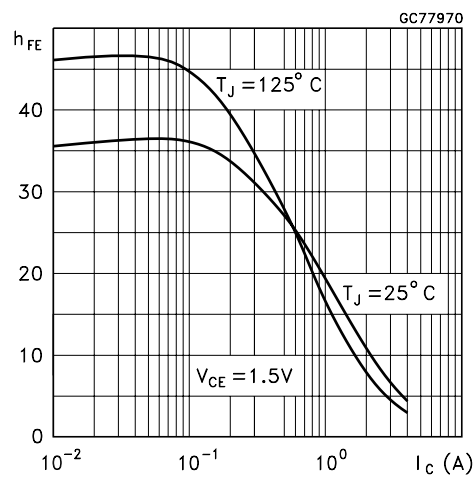
### Safe Operating Areas



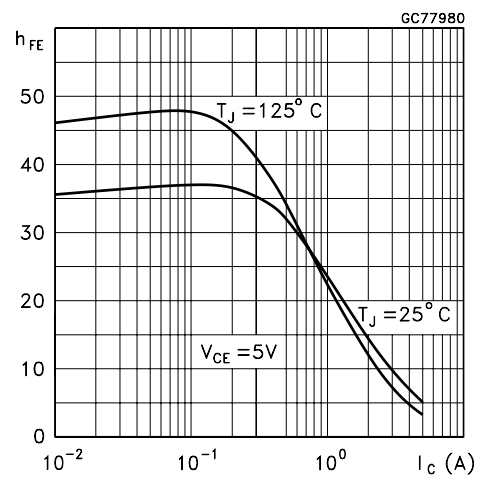
### Derating Curve



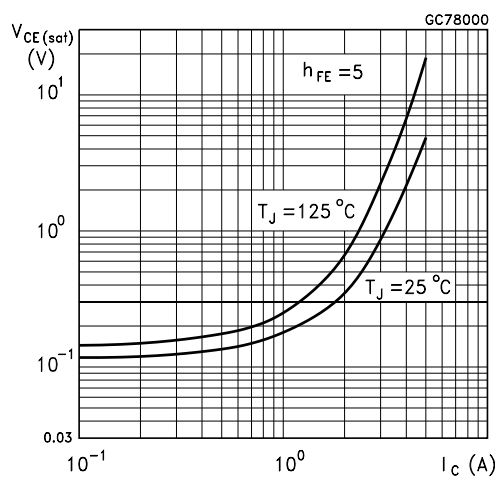
### DC Current Gain



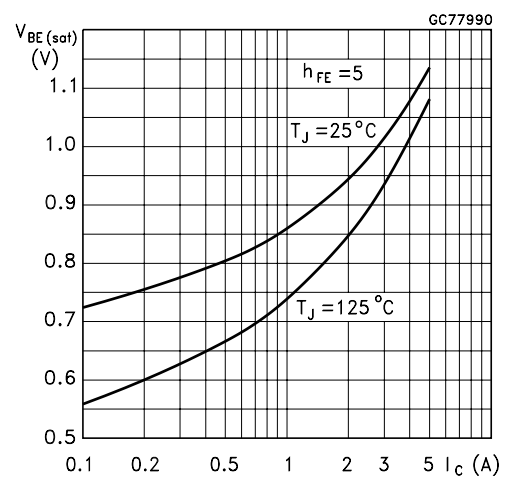
### DC Current Gain



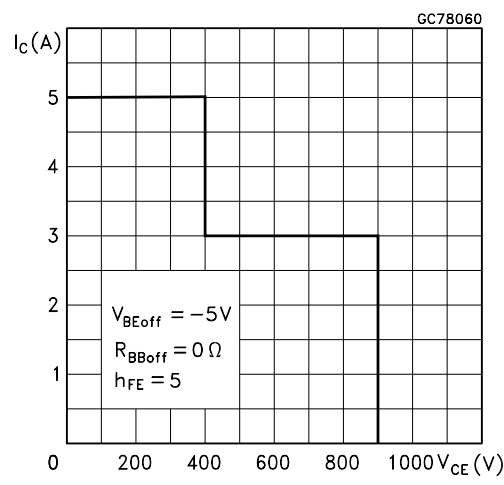
### Collector Emitter Saturation Voltage



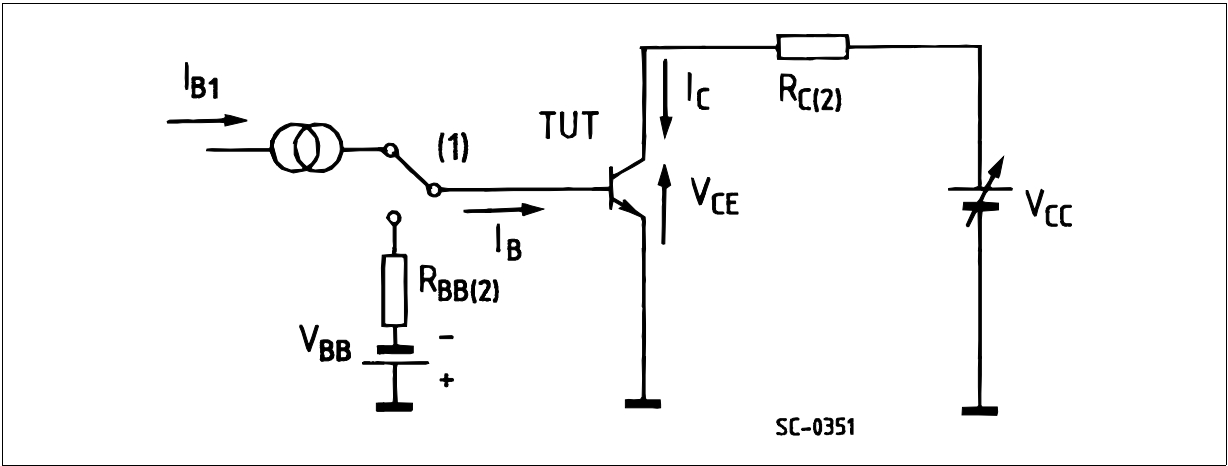
### Base Emitter Saturation Voltage



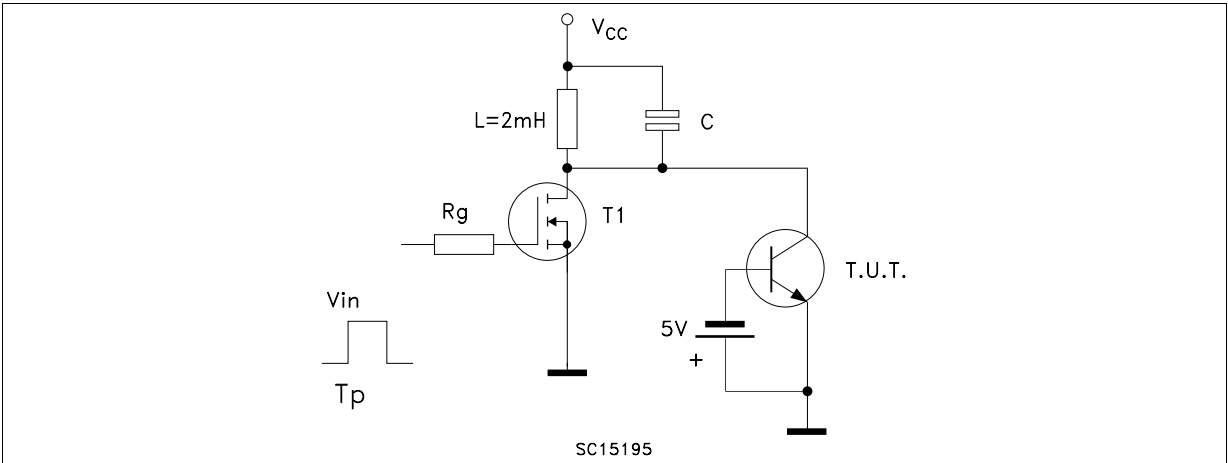
Reverse Biased SOA



Resistive Load Switching Test Circuit

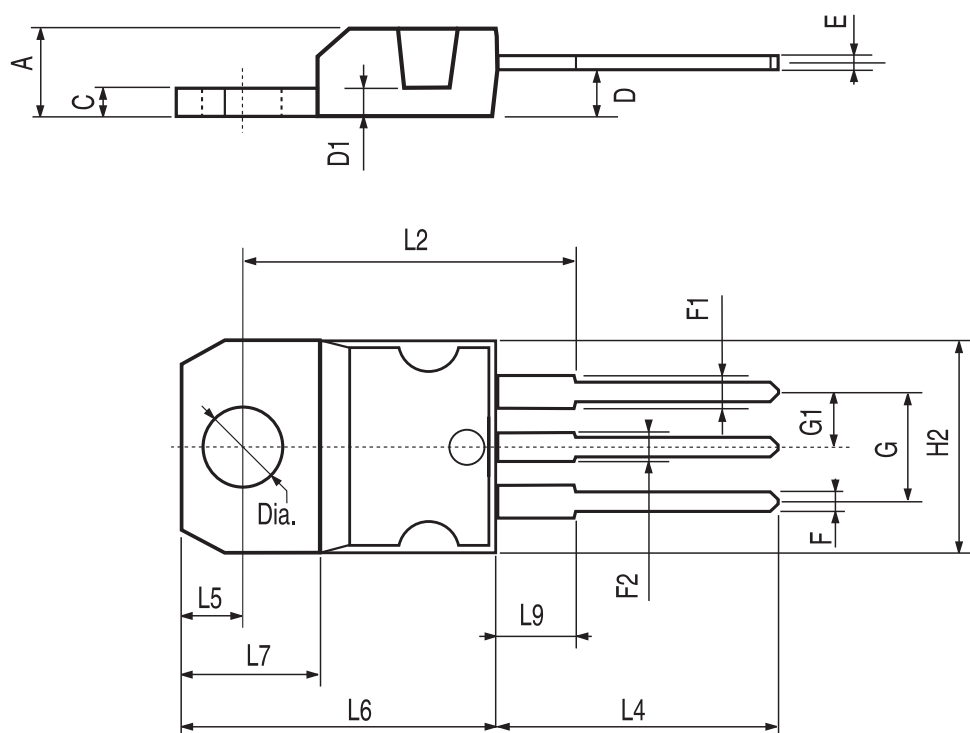


Energy Rating Test Circuit



## 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 |



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