



BUL3P5

MEDIUM VOLTAGE FAST-SWITCHING PNP POWER TRANSISTOR

Features

- MEDIUM VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED

Applications

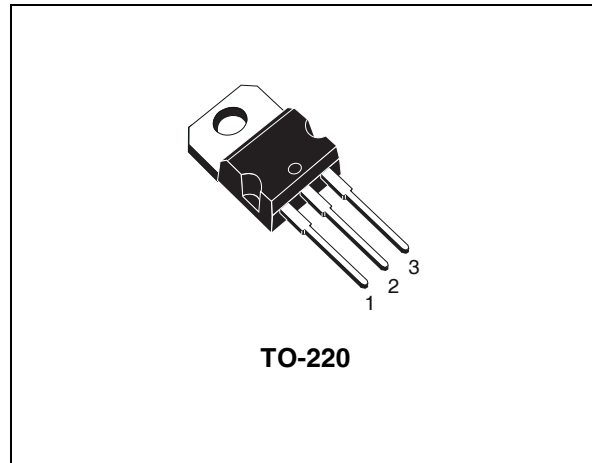
- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING

Description

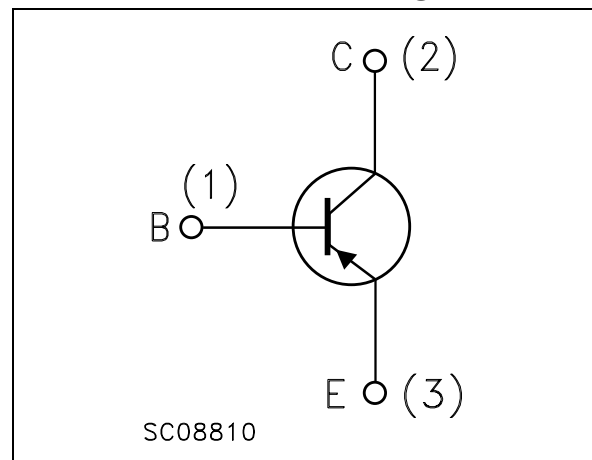
The BUL3P5 is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and medium voltage capability.

It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The device is expressly designed for a new solution to be used in compact fluorescent lamps, H.F. ballast voltage FED where it is coupled with the BUL3N7, its complementary NPN transistor.



Internal Schematic Diagram



Order Codes

| Part Number | Marking | Package | Packing |
|-------------|---------|---------|---------|
| BUL3P5 | BUL3P5 | TO-220 | TUBE |

1 Absolute Maximum Ratings

Table 1. Absolute Maximum Rating

| Symbol | Parameter | Value | Unit |
|-----------|--|---------------|------------------|
| V_{CES} | Collector-Emitter Voltage ($V_{BE} = 0$) | -500 | V |
| V_{CEO} | Collector-Emitter Voltage ($I_B = 0$) | -400 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$, $I_B = -0.75$ A, $t_p < 100$ ms, $T_j < 150^\circ\text{C}$) | $V_{(BR)EBO}$ | V |
| I_C | Collector Current | -3 | A |
| I_{CM} | Collector Peak Current ($t_p < 5$ ms) | -6 | A |
| I_B | Base Current | -1.5 | A |
| I_{BM} | Base Peak Current ($t_p < 5$ ms) | -3 | A |
| P_{TOT} | Total dissipation at $T_C = 25^\circ\text{C}$ | 60 | W |
| T_{stg} | Storage Temperature | -65 to 150 | $^\circ\text{C}$ |
| T_J | Max. Operating Junction Temperature | 150 | $^\circ\text{C}$ |

Table 2. Thermal Data

| Symbol | Parameter | Value | Unit |
|----------------|--|-------|---------------------------|
| $R_{thJ-case}$ | Thermal Resistance Junction-Case Max | 2.08 | $^\circ\text{C}/\text{W}$ |
| $R_{thJ-amb}$ | Thermal Resistance Junction-Ambient Max | 62.5 | $^\circ\text{C}/\text{W}$ |

2 Electrical Characteristics

Table 3. Electrical Characteristics ($T_{CASE} = 25^{\circ}C$; unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|--|---|------|------|------|---------|
| I_{CES} | Collector Cut-off Current ($V_{BE} = 0$) | $V_{CE} = -500 V$ | | | -0.1 | mA |
| | | $V_{CE} = -500 V$ $T_C = 125^{\circ}C$ | | | -0.5 | mA |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage ($I_C = 0$) | $I_E = -10 mA$ | -5 | | -10 | V |
| $V_{CEO(sus)}$ <i>Note: 1</i> | Collector-Emitter Sustaining Voltage ($I_B = 0$) | $I_C = 100 mA$ | -400 | | | V |
| $V_{CE(sat)}$ <i>Note: 1</i> | Collector-Emitter Saturation Voltage | $I_C = -0.7 A$ $I_B = -0.1 A$ | | | -0.5 | V |
| | | $I_C = -1 A$ $I_B = -0.2 A$ | | | -0.5 | V |
| $V_{BE(sat)}$ <i>Note: 1</i> | Base-Emitter Saturation Voltage | $I_C = -0.5 A$ $I_B = -0.1 A$ | | | -1.1 | V |
| | | $I_C = -1 A$ $I_B = -0.2 A$ | | | -1.2 | V |
| | | $I_C = -2 A$ $I_B = -0.4 A$ | | | -1.3 | V |
| h_{FE} | DC Current Gain | $I_C = -10 mA$ $V_{CE} = -5 V$ | 10 | | | |
| | | $I_C = -0.7 A$ $V_{CE} = -5 V$ | 18 | | 34 | |
| | | $I_C = -2 A$ $V_{CE} = -5 V$ | 4 | | | |
| t_r t_s t_f | RESISTIVE LOAD Rise Time Storage Time Fall Time | $I_C = -0.7 A$ $V_{CC} = -250 V$ | | 100 | | ns |
| | | $I_{B1} = -0.14 A$ $I_{B2} = 0.14 A$ | | 2.4 | | μs |
| | | $T_p = 30 \mu s$ | | 80 | | ns |
| t_s t_f | INDUCTIVE LOAD Storage Time Fall Time | $I_C = -1 A$ $I_{B1} = -0.2 A$ | | 450 | | ns |
| | | $V_{BE(off)} = 5 V$ $R_{bb} = 0 \Omega$ $L = 1 mH$ $V_{clamp} = 200 V$ | | 70 | | ns |

Note: 1 Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$.

2.1 Typical Characteristics

Figure 1. Safe Operating Area

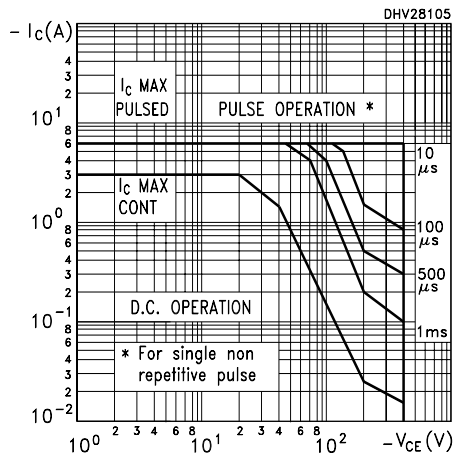


Figure 3. DC Current Gain

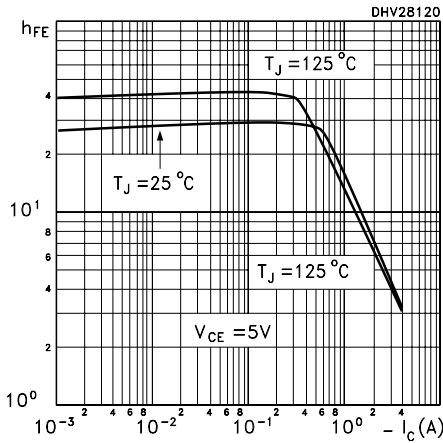


Figure 5. Base Emitter Saturation Voltage

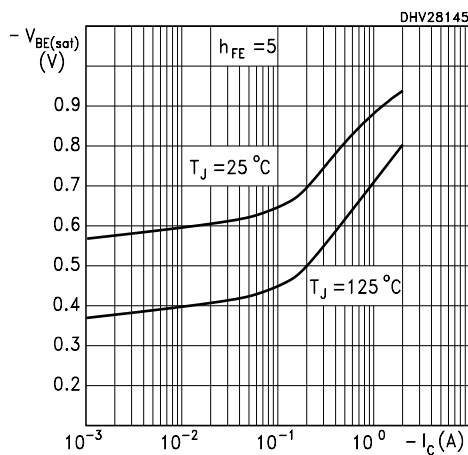


Figure 2. DC Current Gain

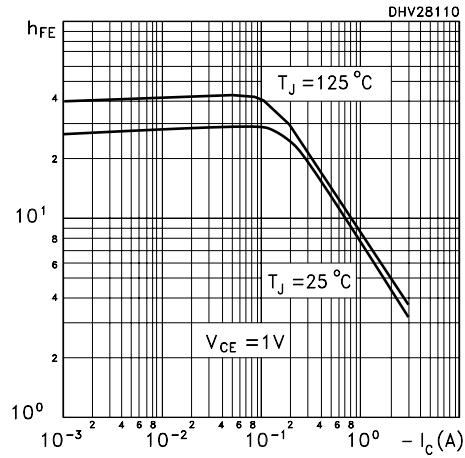


Figure 4. Collector Emitter Saturation Voltage

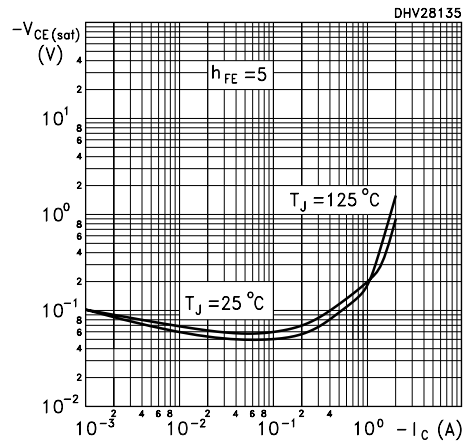


Figure 6. Switching Times Resistive Load

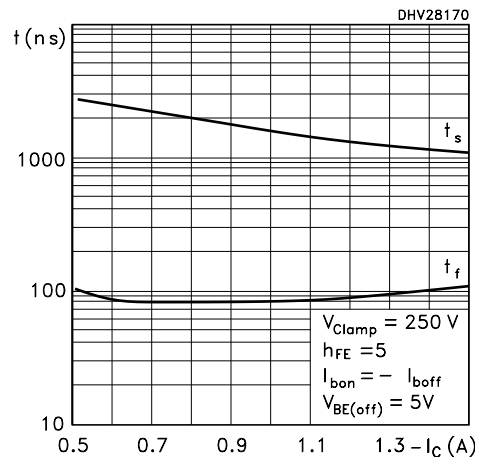


Figure 7. Switching Times Inductive Load

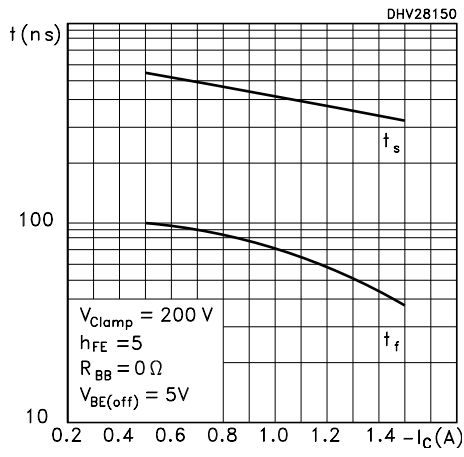
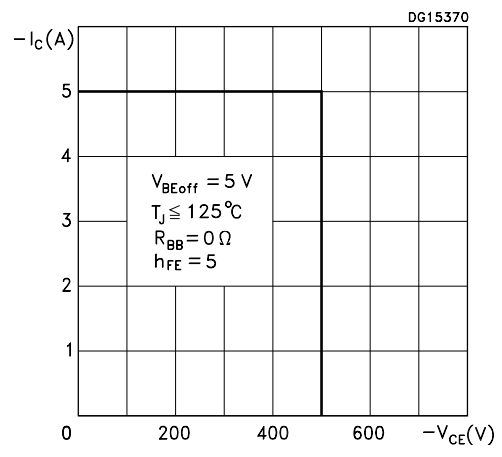


Figure 8. Reverse Biased SOA



3 Test Circuits

Figure 9. Inductive Load Switching Test Circuit

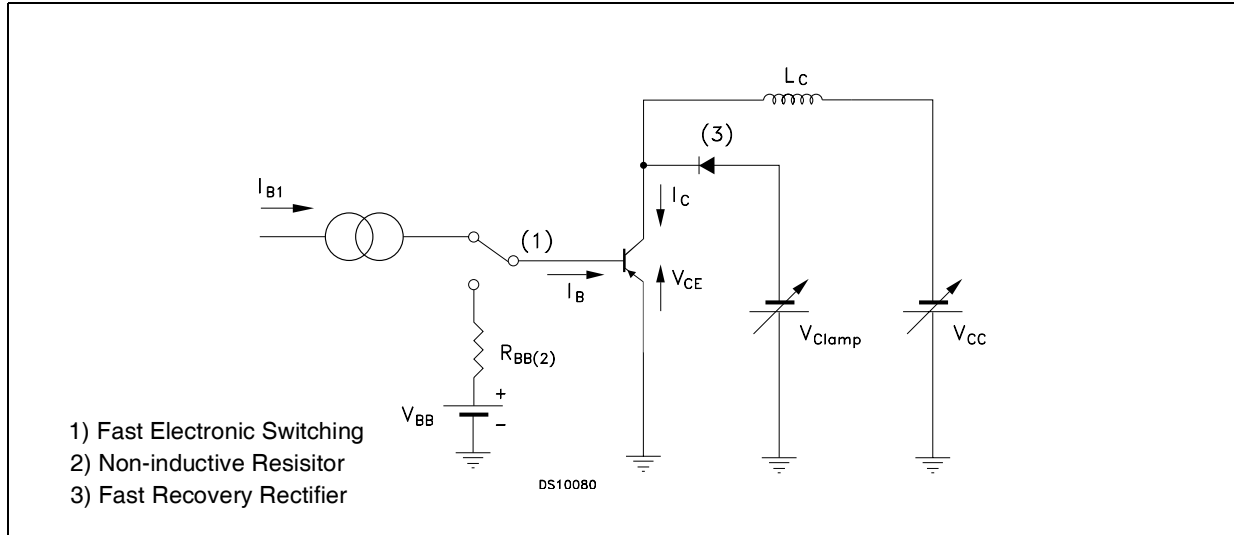
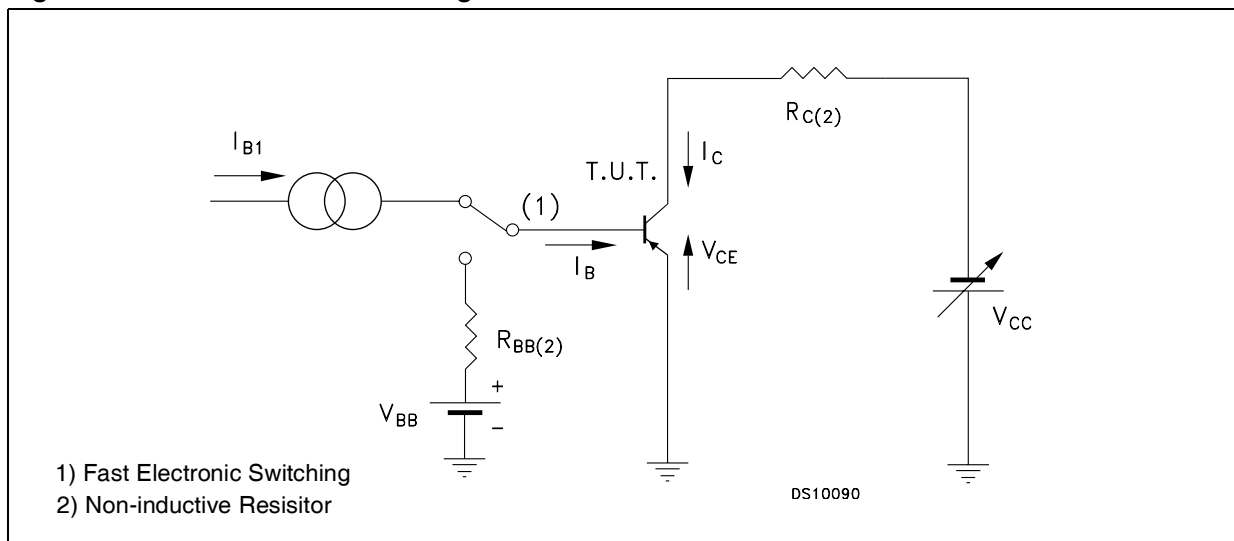


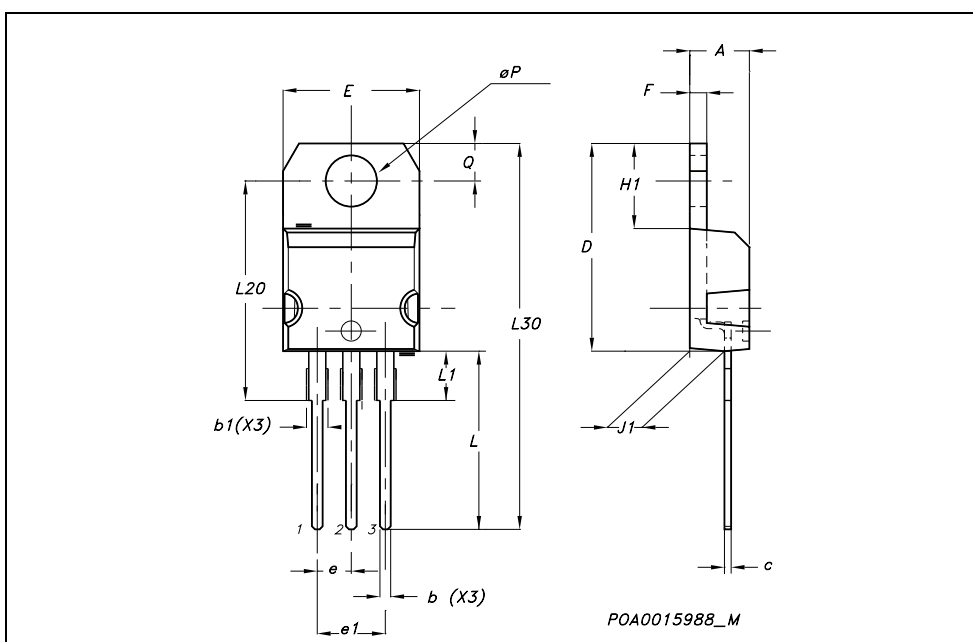
Figure 10. Resistive Load Switching Test Circuits



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-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 | 1.15 | | 1.70 | 0.045 | | 0.066 |
| c | 0.49 | | 0.70 | 0.019 | | 0.027 |
| D | 15.25 | | 15.75 | 0.60 | | 0.620 |
| 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 | | 0.052 |
| 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 | |
| øP | 3.75 | | 3.85 | 0.147 | | 0.151 |
| Q | 2.65 | | 2.95 | 0.104 | | 0.116 |



5 Revision History

| Date | Revision | Changes |
|-------------|----------|-----------------|
| 09-Dec-2005 | 2 | Inserted curves |

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