



BULD116D

MEDIUM VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- INTEGRATED ANTIPARALLEL COLLECTOR- EMITTER DIODE
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX "-1")

APPLICATIONS:

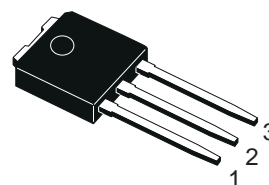
- COMPACT FLUORESCENT LAMPS UP TO 23 W AT 110 V A.C. MAINS
- FLYBACK AND FORWARD SINGLE TRANSISTOR LOW POWER CONVERTERS AT 110 V A.C. MAINS

DESCRIPTION

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

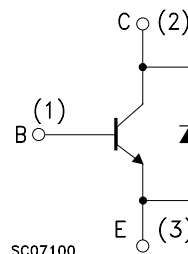
It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA.

The device is designed for use in lighting applications and low cost switch-mode power supplies.



**IPAK
TO-251**
("Suffix "-1")

INTERNAL SCHEMATIC DIAGRAM



SC07100

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|--|------------|------|
| V_{CES} | Collector-Emitter Voltage ($V_{BE} = 0$) | 400 | V |
| V_{CEO} | Collector-Emitter Voltage ($I_B = 0$) | 200 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$) | 9 | V |
| I_C | Collector Current | 5 | A |
| I_{CM} | Collector Peak Current ($t_p < 5$ ms) | 10 | 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 | 20 | W |
| T_{stg} | Storage Temperature | -65 to 150 | °C |
| T_j | Max. Operating Junction Temperature | 150 | °C |

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THERMAL DATA

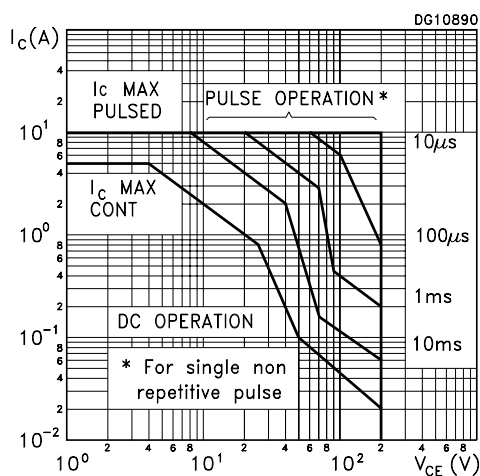
| | | | | |
|-----------------------|-------------------------------------|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-Case | Max | 6.25 | °C/W |
| R _{thj-amb} | Thermal Resistance Junction-Ambient | Max | 100 | °C/W |

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

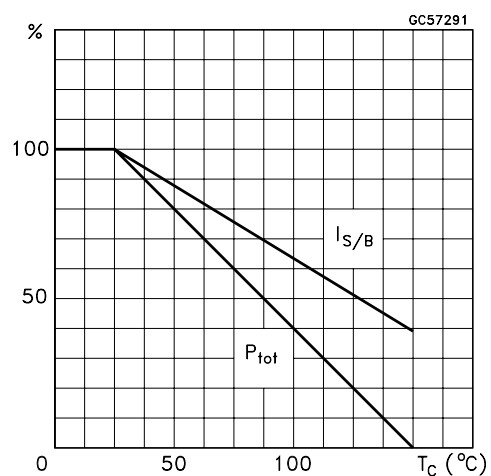
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--|---|--|---------|-------------------|---------------------------|------------------|
| I _{CES} | Collector Cut-off Current (V _{BE} = 0) | V _{CE} = 400 V V _{CE} = 400 V T _j = 125 °C | | | 100 500 | μA μA |
| V _{EBO} | Emitter-Base Voltage (I _C = 0) | I _E = 10 mA | 9 | | | V |
| V _{CEO(sus)*} | Collector-Emitter Sustaining Voltage (I _B = 0) | I _C = 100 mA L = 25 mH | 200 | | | V |
| I _{CEO} | Collector-Emitter Leakage Current | V _{CE} = 200 V | | | 250 | μA |
| V _{CE(sat)*} | Collector-Emitter Saturation Voltage | I _C = 0.5 A I _B = 50 mA I _C = 1 A I _B = 0.1 A I _C = 3 A I _B = 0.6 A I _C = 5 A I _B = 1 A | | | 0.25 0.4 0.7 1.2 | V V V V |
| V _{BE(sat)*} | Base-Emitter Saturation Voltage | I _C = 1 A I _B = 0.1 A I _C = 5 A I _B = 1 A | | | 1.1 1.5 | V V |
| h _{FE} * | DC Current Gain | I _C = 10 mA V _{CE} = 5 V I _C = 5 A V _{CE} = 5 V | 10 8 | | 20 | |
| t _r t _f t _s | RESISTIVE LOAD Rise Time Fall Time Storage Time | V _{CC} = 125 V I _C = 2 A I _{B1} = 0.4 A I _{B2} = -0.4 A t _p = 30 μs (see figure 2) | | 0.2 0.2 1.4 | 0.4 | μs μs μs |
| t _s t _f | INDUCTIVE LOAD Storage Time Fall Time | I _C = 2 A I _{B1} = 0.4 A V _{BE} = -5 V L = 500 μH V _{clamp} = 180 V (see figure 1) | | 0.5 0.10 | | μs μs |
| V _F | Diode Forward Voltage | I _C = 2 A | | | 1.5 | V |

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

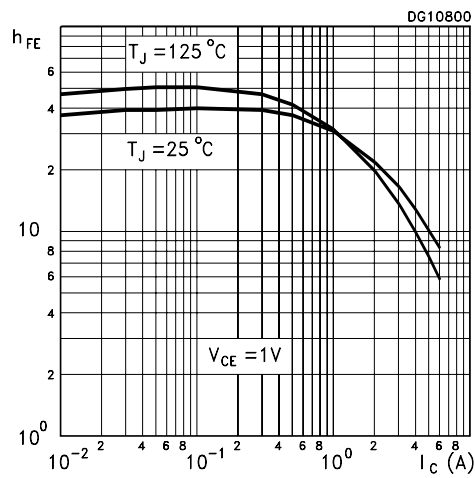
Safe Operating Area



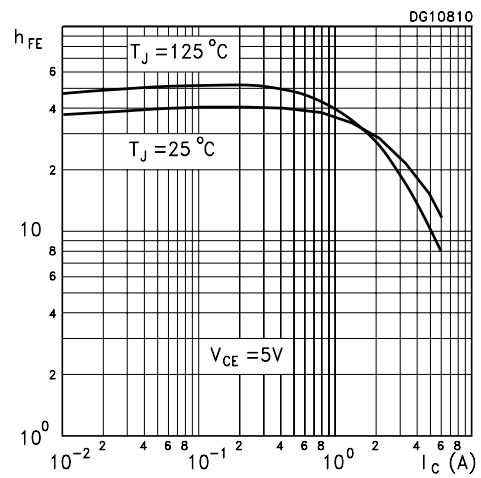
Derating Curve



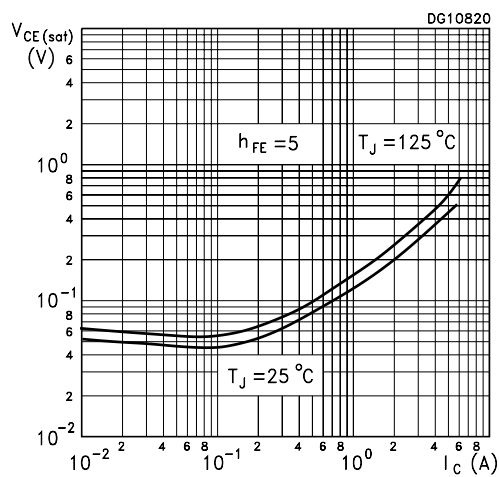
DC Current Gain



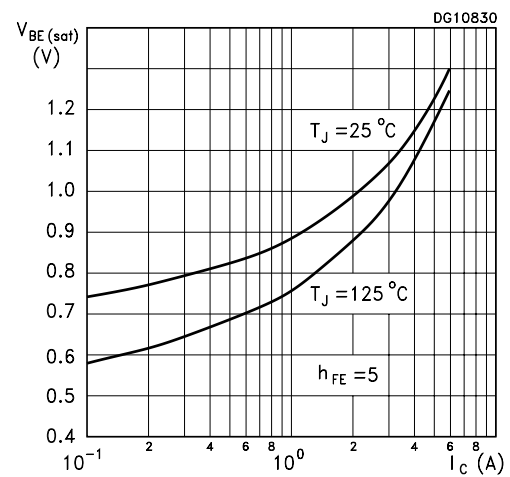
DC Current Gain



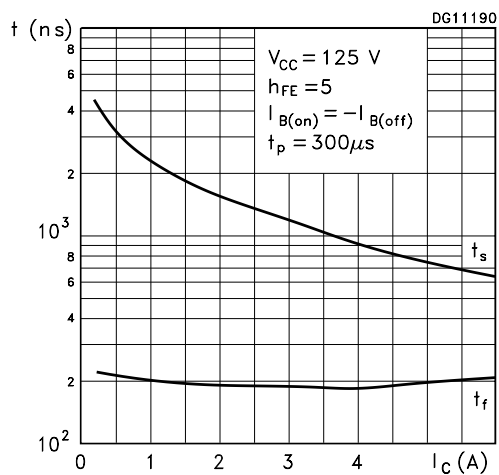
Collector-Emitter Saturation Voltage



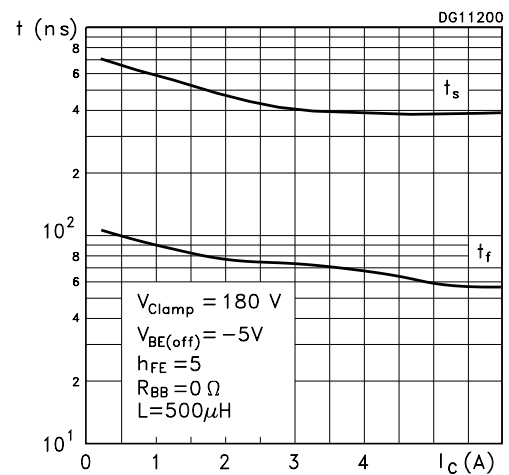
Base-Emitter Saturation Voltage



Switching Time Resistive Load



Switching Time Inductive Load



Reverse Biased SOA

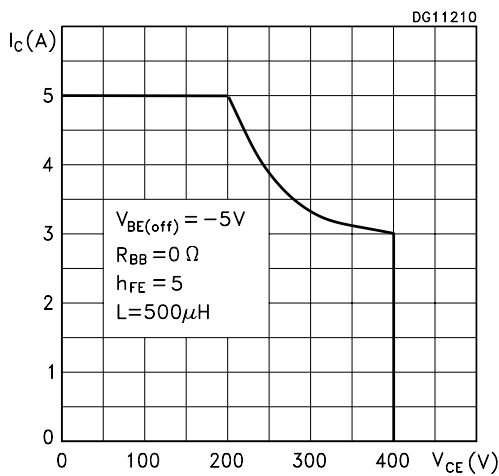


Figure 1: Inductive Load Switching Test Circuit.

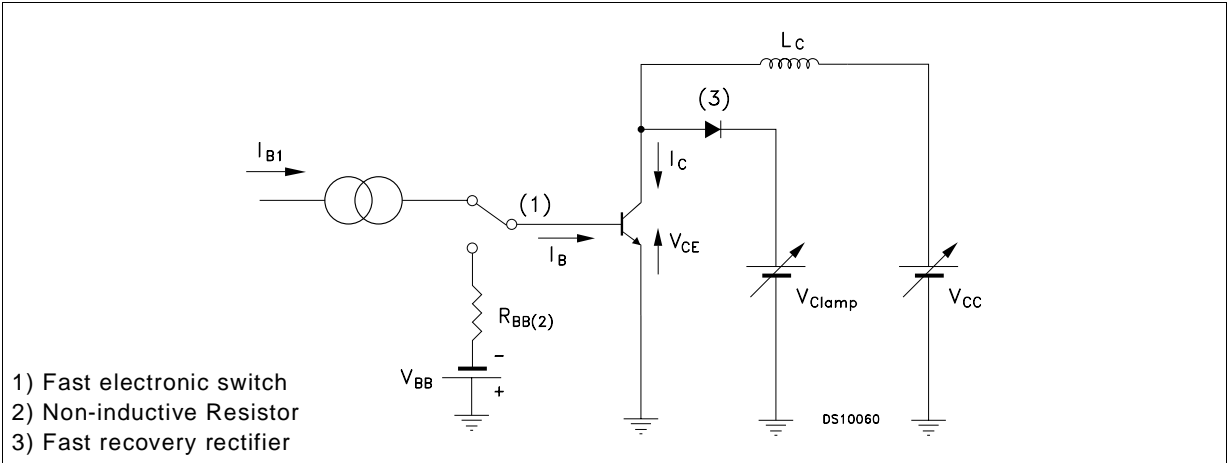
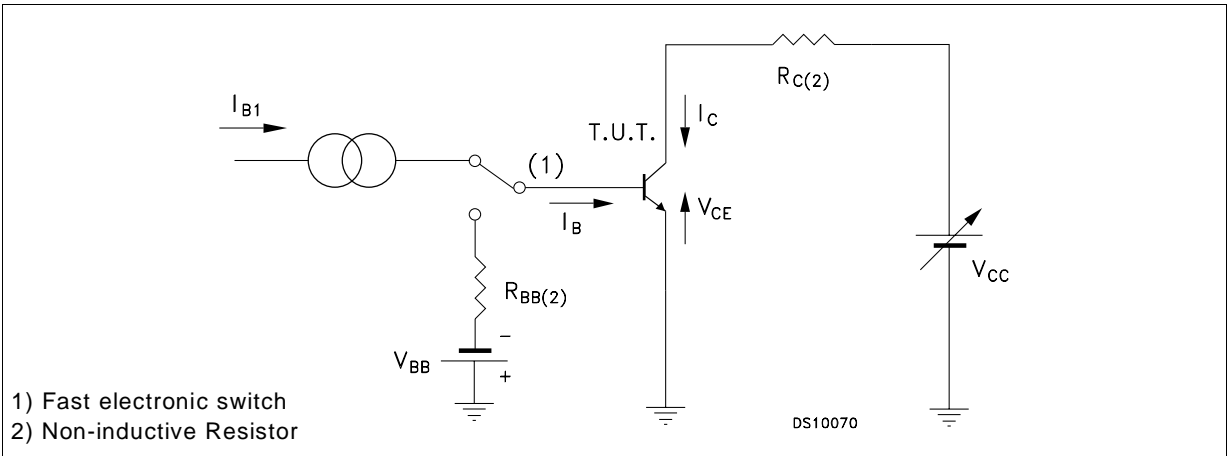
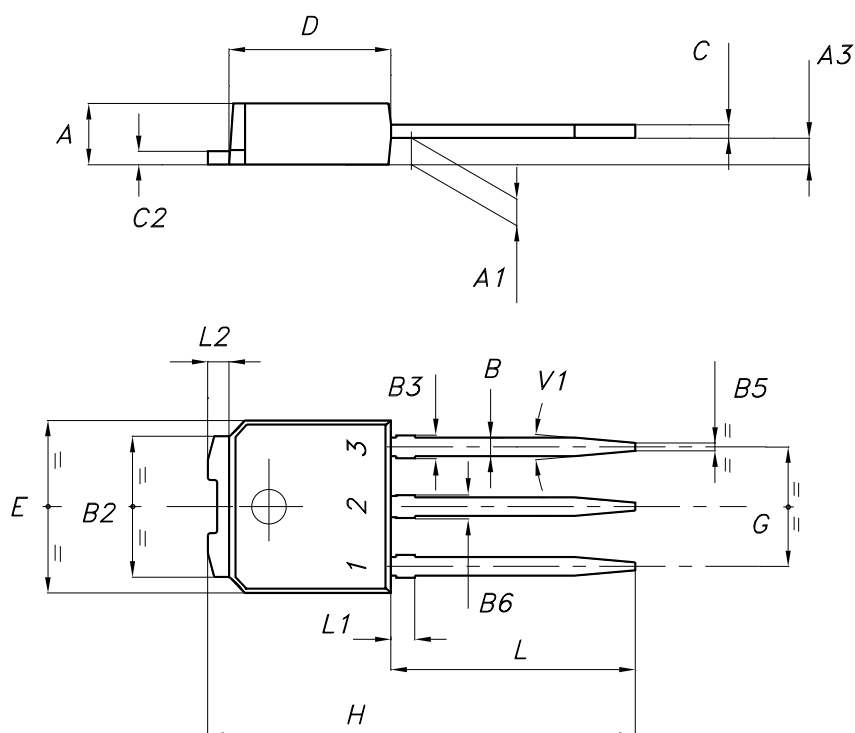


Figure 2: Resistive Load Switching Test Circuit.



TO-251 (IPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.20 | | 2.40 | 0.087 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| A3 | 0.70 | | 1.30 | 0.028 | | 0.051 |
| B | 0.64 | | 0.90 | 0.025 | | 0.035 |
| B2 | 5.20 | | 5.40 | 0.204 | | 0.213 |
| B3 | | | 0.85 | | | 0.033 |
| B5 | | 0.30 | | | 0.012 | |
| B6 | | | 0.95 | | | 0.037 |
| C | 0.45 | | 0.60 | 0.018 | | 0.024 |
| C2 | 0.48 | | 0.60 | 0.019 | | 0.024 |
| D | 6.00 | | 6.20 | 0.237 | | 0.244 |
| E | 6.40 | | 6.60 | 0.252 | | 0.260 |
| G | 4.40 | | 4.60 | 0.173 | | 0.181 |
| H | 15.90 | | 16.30 | 0.626 | | 0.642 |
| L | 9.00 | | 9.40 | 0.354 | | 0.370 |
| L1 | 0.80 | | 1.20 | 0.031 | | 0.047 |
| L2 | | 0.80 | 1.00 | | 0.031 | 0.039 |
| V1 | | 10° | | | 10° | |



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