



MJE13009

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

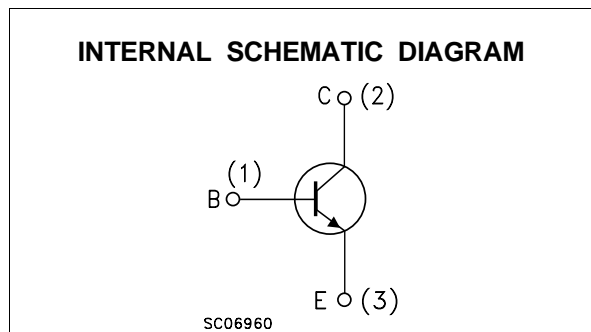
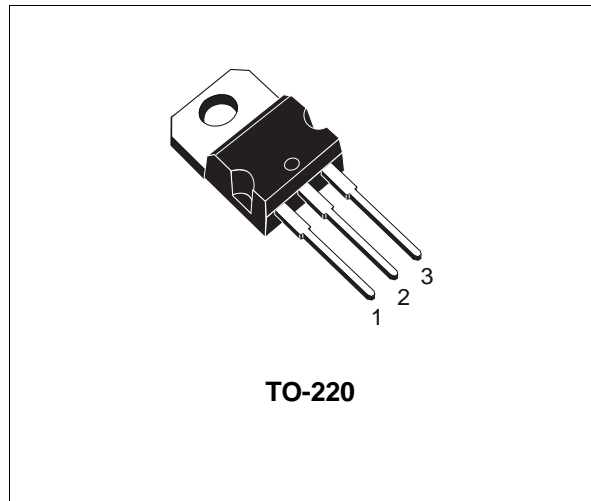
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- LOW BASE-DRIVE REQUIREMENTS
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERIZED AT 125°C

APPLICATIONS

- ELECTRONIC TRANSFORMER FOR HALOGEN LAMPS
- SWITCH MODE POWER SUPPLIES

DESCRIPTION

The MJE13009 is a high voltage Multiepitaxial Mesa NPN transistor mounted in Jedec TO-220 plastic package. It uses a Hollow Emitter structure to enhance switching speeds.



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------|------------------------------------------------|------------|------|
| V_{CEO} | Collector-Emitter Voltage ($I_B = 0$) | 400 | V |
| V_{CEV} | Collector-Emitter Voltage ($V_{BE} = -1.5$ V) | 700 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$) | 9 | V |
| I_C | Collector Current | 12 | A |
| I_{CM} | Collector Peak Current ($t_p \leq 10$ ms) | 25 | A |
| I_B | Base Current | 6 | A |
| I_{BM} | Base Peak Current ($t_p \leq 10$ ms) | 12 | A |
| I_E | Emitter Current | 18 | A |
| I_{EM} | Emitter Peak Current | 36 | A |
| P_{tot} | Total Power Dissipation at $T_c \leq 25$ °C | 110 | W |
| T_{stg} | Storage Temperature | -65 to 150 | °C |
| T_j | Max. Operating Junction Temperature | 150 | °C |

MJE13009

THERMAL DATA

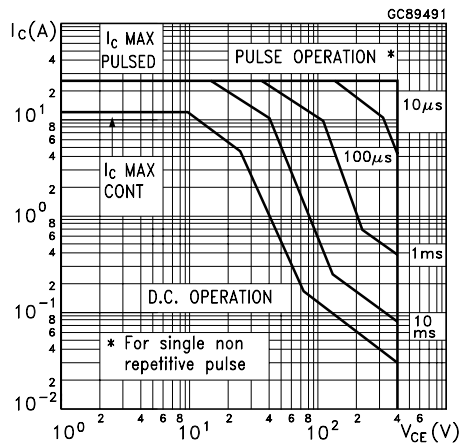
| | | | | |
|-----------------------|----------------------------------|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case | Max | 1.14 | °C/W |
|-----------------------|----------------------------------|-----|------|------|

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

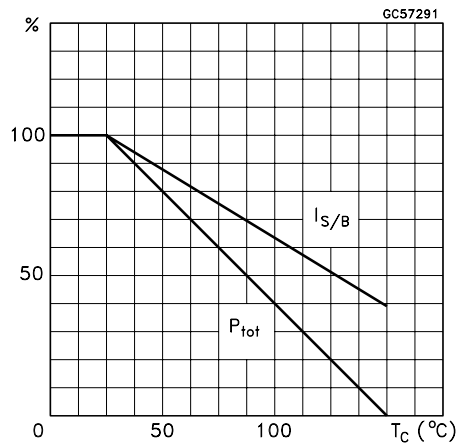
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------|------|------|------|------|
| I _{CEV} | Collector Cut-off Current (V _{EB} = -1.5 V) | V _{CE} = 700 V | | | 1 | mA |
| | | V _{CE} = 700 V T _{case} = 100°C | | | 5 | mA |
| I _{EBO} | Emitter Cut-off Current (I _C = 0) | V _{EB} = 9 V | | | 1 | mA |
| V _{CEO(sus)*} | Collector-Emitter Sustaining Voltage (I _B = 0) | I _C = 10 mA | 400 | | | V |
| V _{CE(sat)*} | Collector-Emitter Saturation Voltage | I _C = 5 A I _B = 1 A | | | 1 | V |
| | | I _C = 8 A I _B = 1.6 A | | | 1.5 | V |
| | | I _C = 12 A I _B = 3 A | | | 3 | V |
| | | I _C = 8 A I _B = 1.6 A T _{case} = 100°C | | | 2 | V |
| V _{BE(sat)*} | Base-Emitter Saturation Voltage | I _C = 5 A I _B = 1 A | | | 1.2 | V |
| | | I _C = 8 A I _B = 1.6 A | | | 1.6 | V |
| | | I _C = 8 A I _B = 1.6 A | | | 1.5 | V |
| | | T _{case} = 100°C | | | 1.5 | V |
| h _{FE} * | DC Current Gain | I _C = 5 A V _{CE} = 5 V | 8 | | 40 | |
| | | I _C = 8 A V _{CE} = 5 V | 6 | | 30 | |
| f _T | Transition Frequency | I _C = 500 mA V _{CE} = 10 V | 4 | | | MHz |
| C _{OB} | Output Capacitance (I _E = 0) | V _{CB} = 10 V f = 0.1 MHz | | 180 | | pF |
| t _{on} t _s t _f | RESISTIVE LOAD Turn-on Time Storage Time Fall Time | V _{CC} = 125 V I _C = 8 A | | | 1.1 | μs |
| | | I _{B1} = -I _{B2} = 1.6 A t _p = 25 μs | | | 3 | μs |
| | | Duty Cycle ≤ 1 (see figure 2) | | | 0.7 | μs |

* Pulsed: Pulse duration = 300μs, duty cycle ≤ 2 %

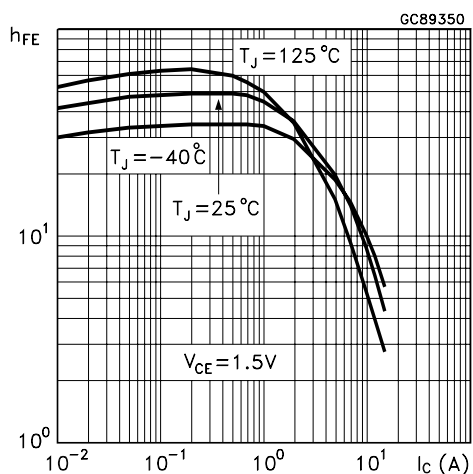
Safe Operating Areas



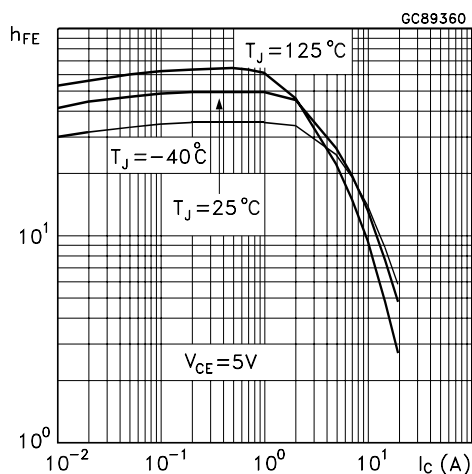
Derating Curve



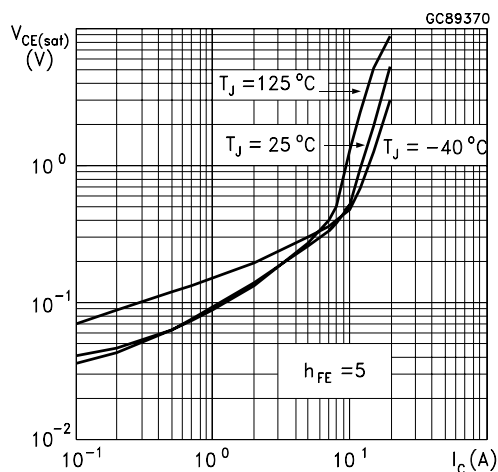
DC Current Gain



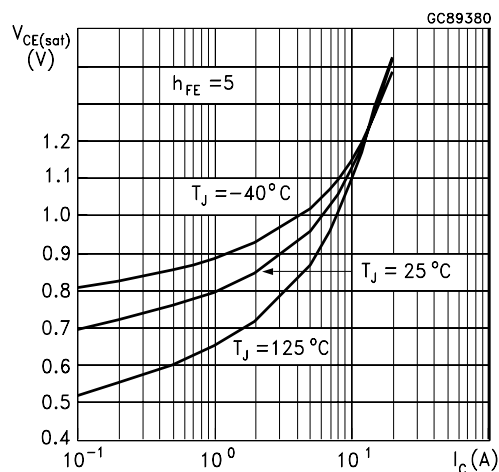
DC Current Gain



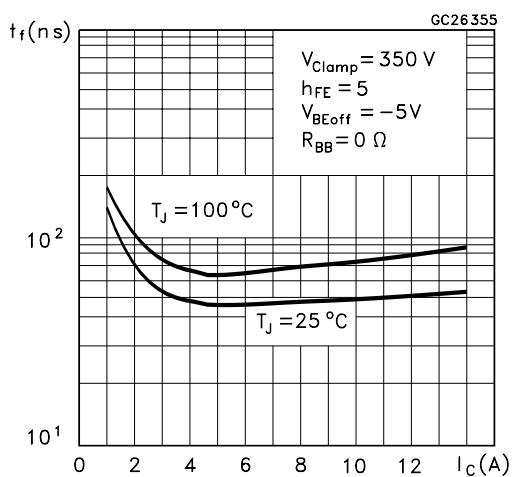
Collector Emitter Saturation Voltage



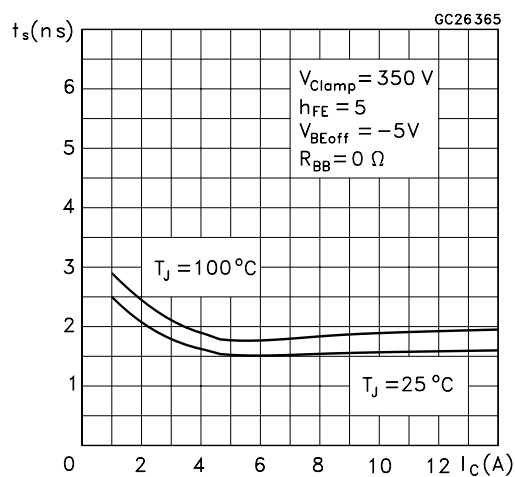
Base Emitter Saturation Voltage



Inductive Load Fall Time



Inductive Load Storage Time



Reverse Biased SOA

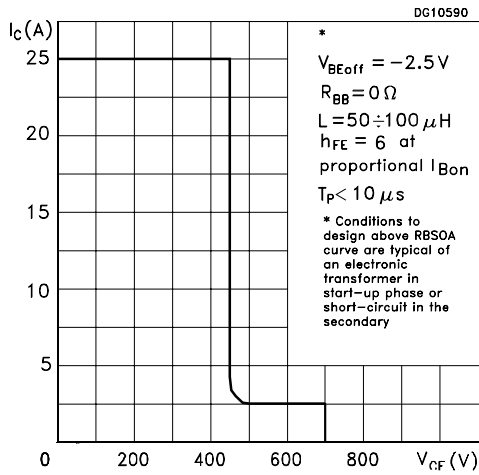


Figure 1: Inductive Load Switching Test Circuit

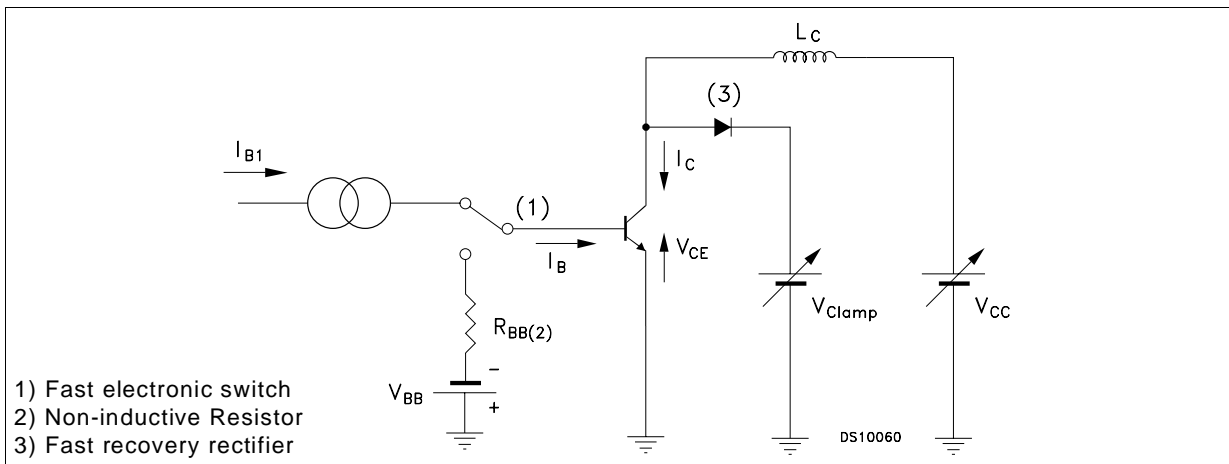
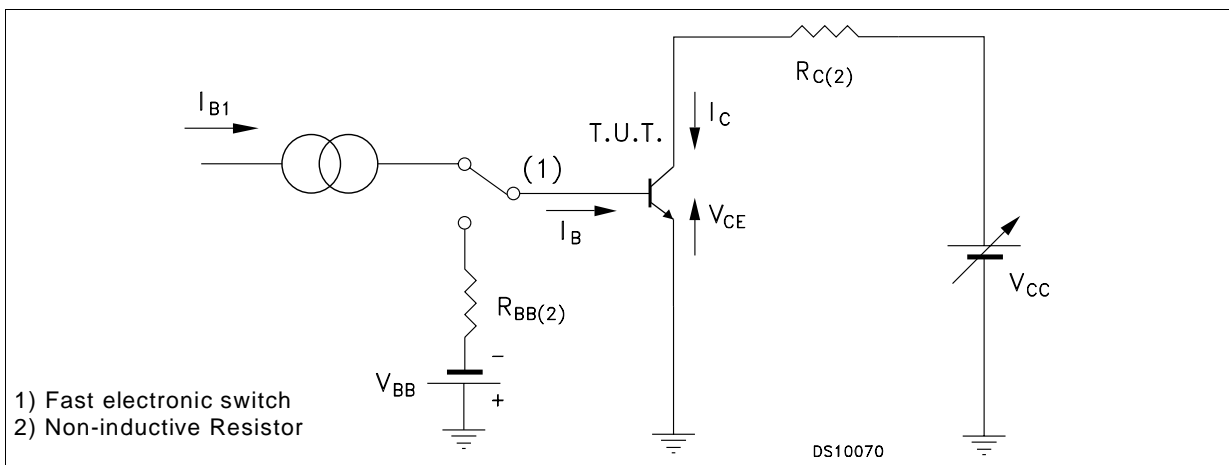
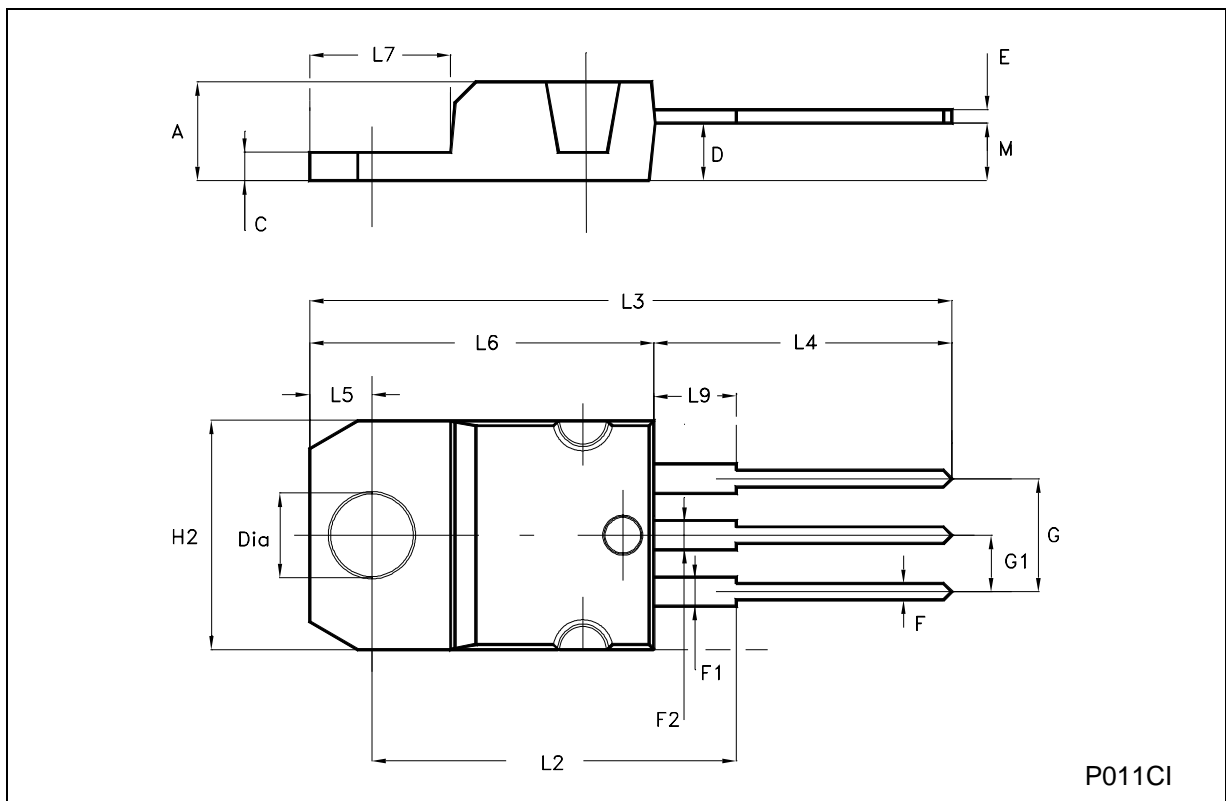


Figure 2: Resistive Load Switching Test Ciurcuit



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 | | 0.052 |
| D | 2.40 | | 2.72 | 0.094 | | 0.107 |
| 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 | | 0.202 |
| G1 | 2.40 | | 2.70 | 0.094 | | 0.106 |
| H2 | 10.00 | | 10.40 | 0.394 | | 0.409 |
| L2 | | 16.40 | | | 0.645 | |
| L4 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| L5 | 2.65 | | 2.95 | 0.104 | | 0.116 |
| L6 | 15.25 | | 15.75 | 0.600 | | 0.620 |
| L7 | 6.20 | | 6.60 | 0.244 | | 0.260 |
| L9 | 3.50 | | 3.93 | 0.137 | | 0.154 |
| M | | 2.60 | | | 0.102 | |
| DIA. | 3.75 | | 3.85 | 0.147 | | 0.151 |



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