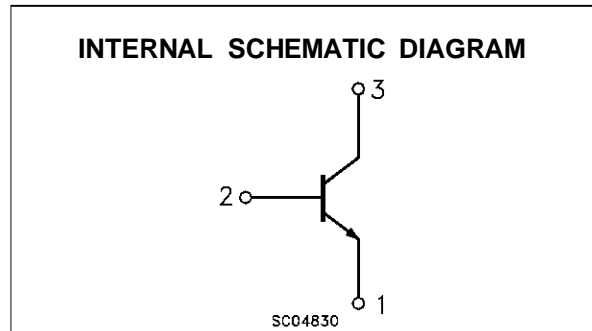
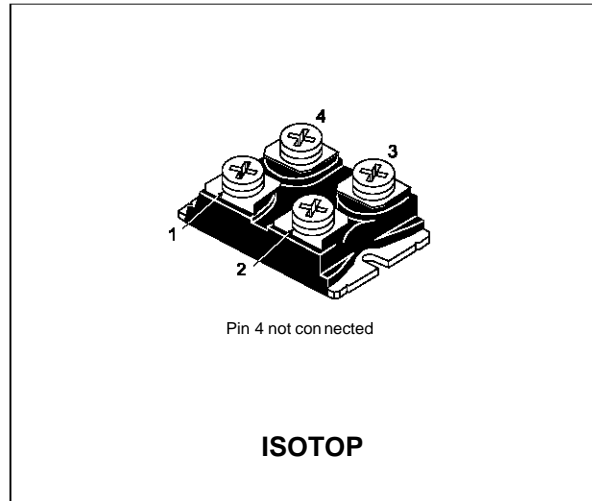


**NPN TRANSISTOR POWER MODULE**

- NPN TRANSISTOR
- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW  $R_{th}$  JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ISOLATED CASE (2500V RMS)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

**APPLICATIONS:**

- MOTOR CONTROL
- SMPS & UPS
- WELDING EQUIPMENT



**ABSOLUTE MAXIMUM RATINGS**

| Symbol         | Parameter  | Value      | Unit |
|----------------|--|------------|------|
| $V_{CEV}$      | Collector-Emitter Voltage ( $V_{BE} = -5\text{ V}$ ) | 200        | V    |
| $V_{CEO(sus)}$ | Collector-Emitter Voltage ( $I_B = 0$ )              | 125        | V    |
| $V_{EBO}$      | Emitter-Base Voltage ( $I_C = 0$ )                   | 7          | V    |
| $I_C$          | Collector Current                                    | 100        | A    |
| $I_{CM}$       | Collector Peak Current ( $t_p = 10\text{ ms}$ )      | 150        | A    |
| $I_B$          | Base Current   | 20         | A    |
| $I_{BM}$       | Base Peak Current ( $t_p = 10\text{ ms}$ )           | 30         | A    |
| $P_{tot}$      | Total Dissipation at $T_C = 25\text{ °C}$            | 250        | W    |
| $T_{stg}$      | Storage Temperature                                  | -55 to 150 | °C   |
| $T_j$          | Max. Operating Junction Temperature                  | 150        | °C   |
| $V_{ISO}$      | Insulation Withstand Voltage (AC-RMS)                | 2500       | V    |

# BUT30V

## THERMAL DATA

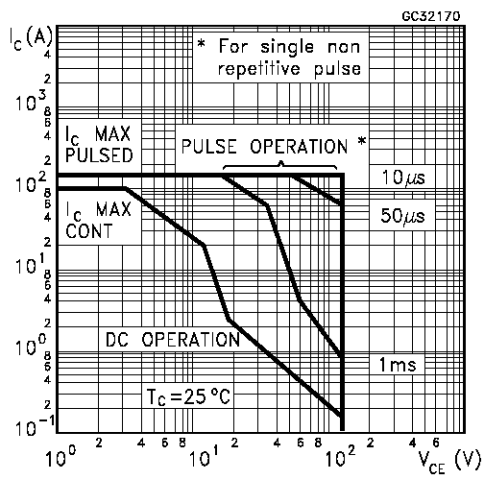
|                |  |     |      |               |
|----------------|--|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case                                 | Max | 0.5  | $^{\circ}C/W$ |
| $R_{thc-h}$    | Thermal Resistance Case- heatsink With Conductive Grease Applied | Max | 0.05 | $^{\circ}C/W$ |

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

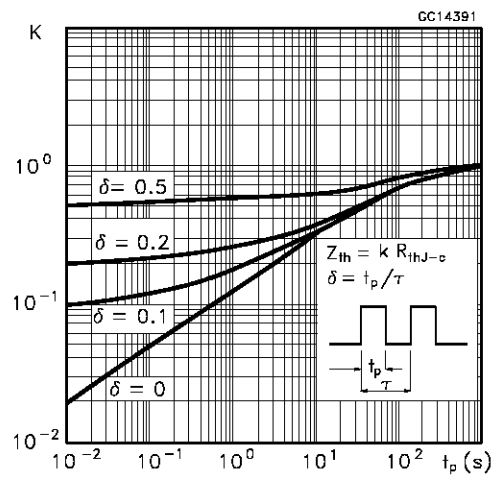
| Symbol            | Parameter   | Test Conditions  | Min. | Typ.                        | Max.                     | Unit             |
|-------------------|---|--|------|-----------------------------|--------------------------|------------------|
| $I_{CER}$         | Collector Cut-off Current ( $R_{BE} = 5 \Omega$ ) | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$  |      |                             | 1<br>5                   | mA<br>mA         |
| $I_{CEV}$         | Collector Cut-off Current ( $V_{BE} = -5V$ )      | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$  |      |                             | 1<br>4                   | mA<br>mA         |
| $I_{EBO}$         | Emitter Cut-off Current ( $I_C = 0$ )             | $V_{EB} = 5 V$   |      |                             | 1                        | mA               |
| $V_{CEO(SUS)}^*$  | Collector-Emitter Sustaining Voltage              | $I_C = 0.2 A \quad L = 25 mH$<br>$V_{clamp} = 125 V$   | 125  |                             |                          | V                |
| $h_{FE}^*$        | DC Current Gain                                   | $I_C = 100 A \quad V_{CE} = 5 V$   |      | 27                          |                          |                  |
| $V_{CE(sat)}^*$   | Collector-Emitter Saturation Voltage              | $I_C = 50 A \quad I_B = 2.5 A$<br>$I_C = 50 A \quad I_B = 2.5 A \quad T_j = 100^{\circ}C$<br>$I_C = 100 A \quad I_B = 10 A$<br>$I_C = 100 A \quad I_B = 10 A \quad T_j = 100^{\circ}C$ |      | 0.45<br>0.55<br>0.7<br>0.9  | 0.9<br>1.2<br>0.9<br>1.5 | V<br>V<br>V<br>V |
| $V_{BE(sat)}^*$   | Base-Emitter Saturation Voltage                   | $I_C = 50 A \quad I_B = 2.5 A$<br>$I_C = 50 A \quad I_B = 2.5 A \quad T_j = 100^{\circ}C$<br>$I_C = 100 A \quad I_B = 10 A$<br>$I_C = 100 A \quad I_B = 10 A \quad T_j = 100^{\circ}C$ |      | 1.15<br>1.1<br>1.45<br>1.55 | 1.4<br>1.4<br>1.8<br>1.9 | V<br>V<br>V<br>V |
| $di_C/dt$         | Rate of Rise of On-state Collector                | $V_{CC} = 300 V \quad R_C = 0 \quad t_p = 3 \mu s$<br>$I_{B1} = 15 A \quad T_j = 100^{\circ}C$   | 270  | 350                         |                          | A/ $\mu s$       |
| $V_{CE(3 \mu s)}$ | Collector-Emitter Dynamic Voltage                 | $V_{CC} = 300 V \quad R_C = 1 \Omega$<br>$I_{B1} = 15 A \quad T_j = 100^{\circ}C$  |      | 2.7                         | 3.5                      | V                |
| $V_{CE(5 \mu s)}$ | Collector-Emitter Dynamic Voltage                 | $V_{CC} = 300 V \quad R_C = 1 \Omega$<br>$I_{B1} = 15 A \quad T_j = 100^{\circ}C$  |      | 2                           | 2.5                      | V                |
| $t_s$             | Storage Time                                      | $I_C = 100 A \quad V_{CC} = 90 V$  |      | 1                           | 2                        | $\mu s$          |
| $t_f$             | Fall Time   | $V_{BB} = -5 V \quad R_{BB} = 0.47 \Omega$   |      | 0.1                         | 0.2                      | $\mu s$          |
| $t_c$             | Cross-over Time                                   | $V_{clamp} = 125 V \quad I_{B1} = 10 A$<br>$L = 45 \mu H \quad T_j = 100^{\circ}C$   |      | 0.2                         | 0.35                     | $\mu s$          |
| $V_{CEW}$         | Maximum Collector Emitter Voltage Without Snubber | $I_{CWOFF} = 150 A \quad I_{B1} = 10 A$<br>$V_{BB} = -5 V \quad V_{CC} = 90 V$<br>$L = 30 \mu H \quad R_{BB} = 0.5 \Omega$<br>$T_j = 125^{\circ}C$                                     | 125  |                             |                          | V                |

\* Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %

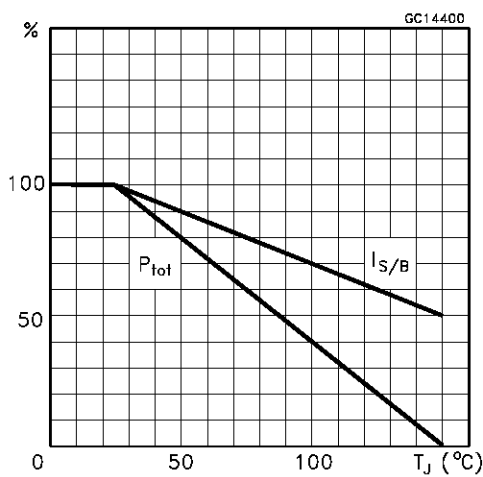
Safe Operating Areas



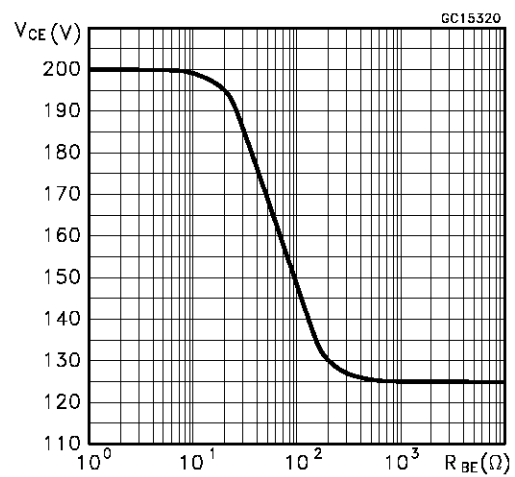
Thermal Impedance



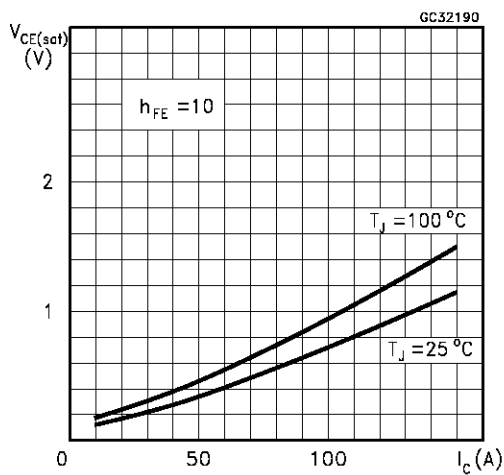
Derating Curve



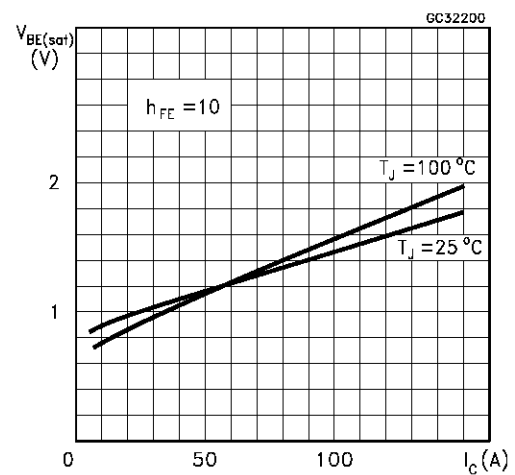
Collector-emitter Voltage Versus base-emitter Resistance



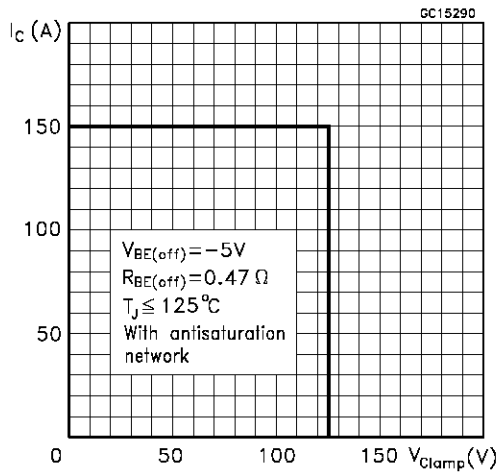
Collector Emitter Saturation Voltage



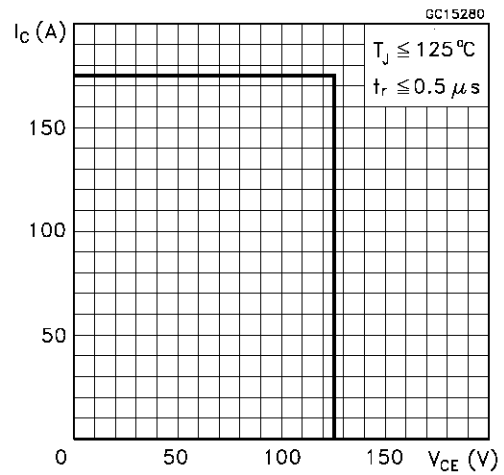
Base-Emitter Saturation Voltage



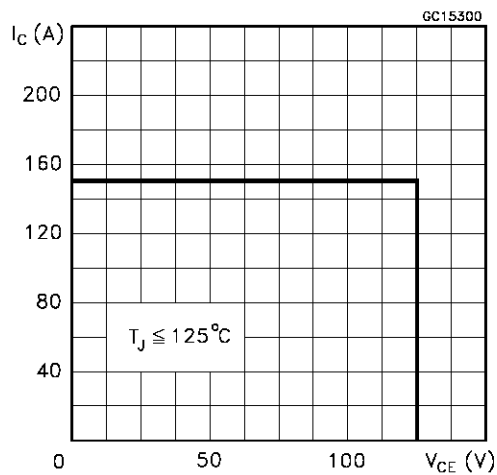
Reverse Biased SOA



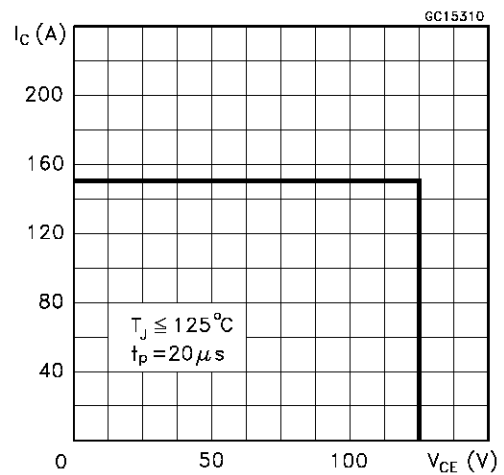
Forward Biased SOA



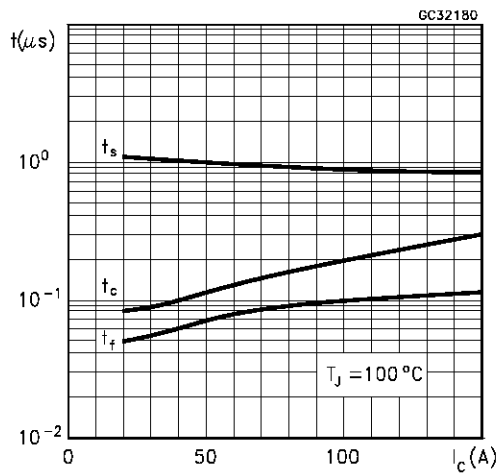
Reverse Biased AOA



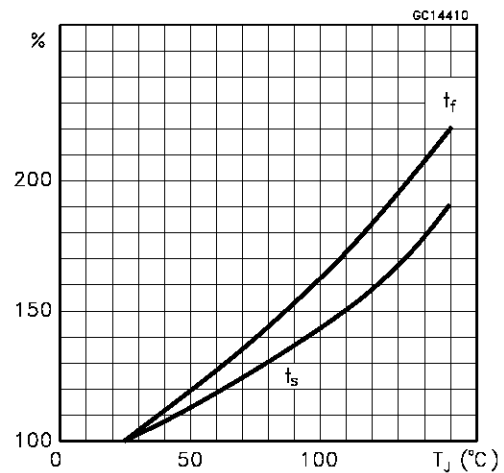
Forward Biased AOA



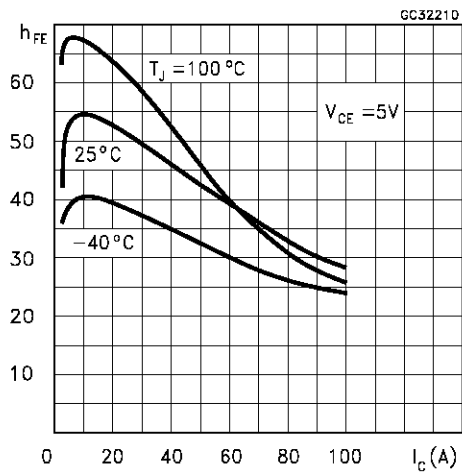
Switching Times Inductive Load



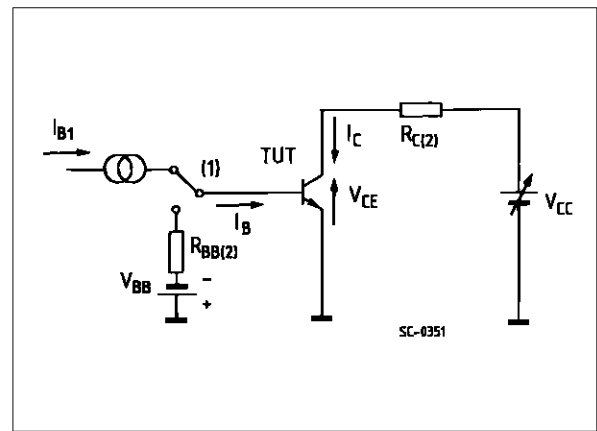
Switching Times Inductive Load Versus Temperature



Dc Current Gain

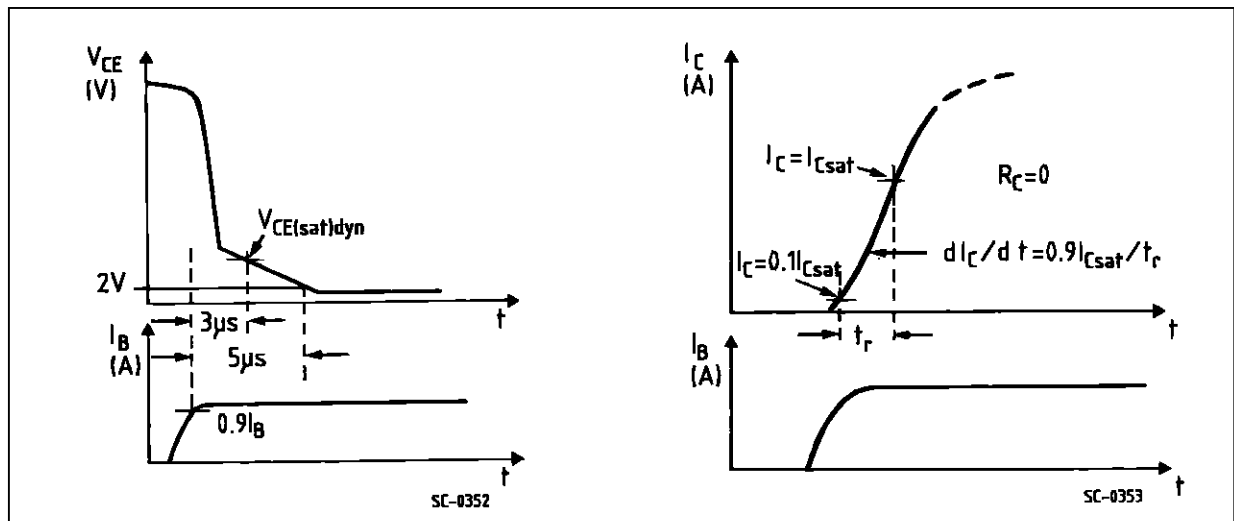


Turn-on Switching Test Circuit

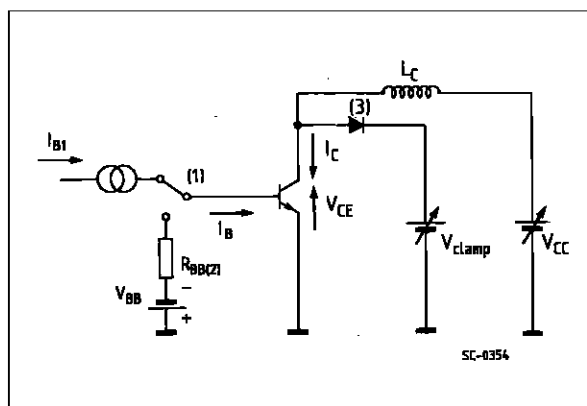


(1) Fast electronic switch (2) Non-inductive load

Turn-on Switching Waveforms

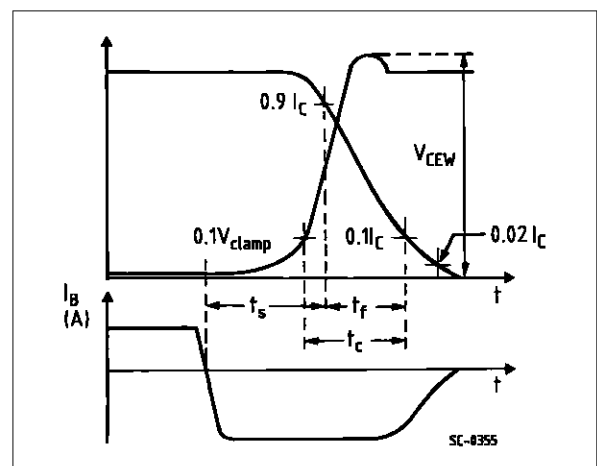


Turn-off Switching Test Circuit



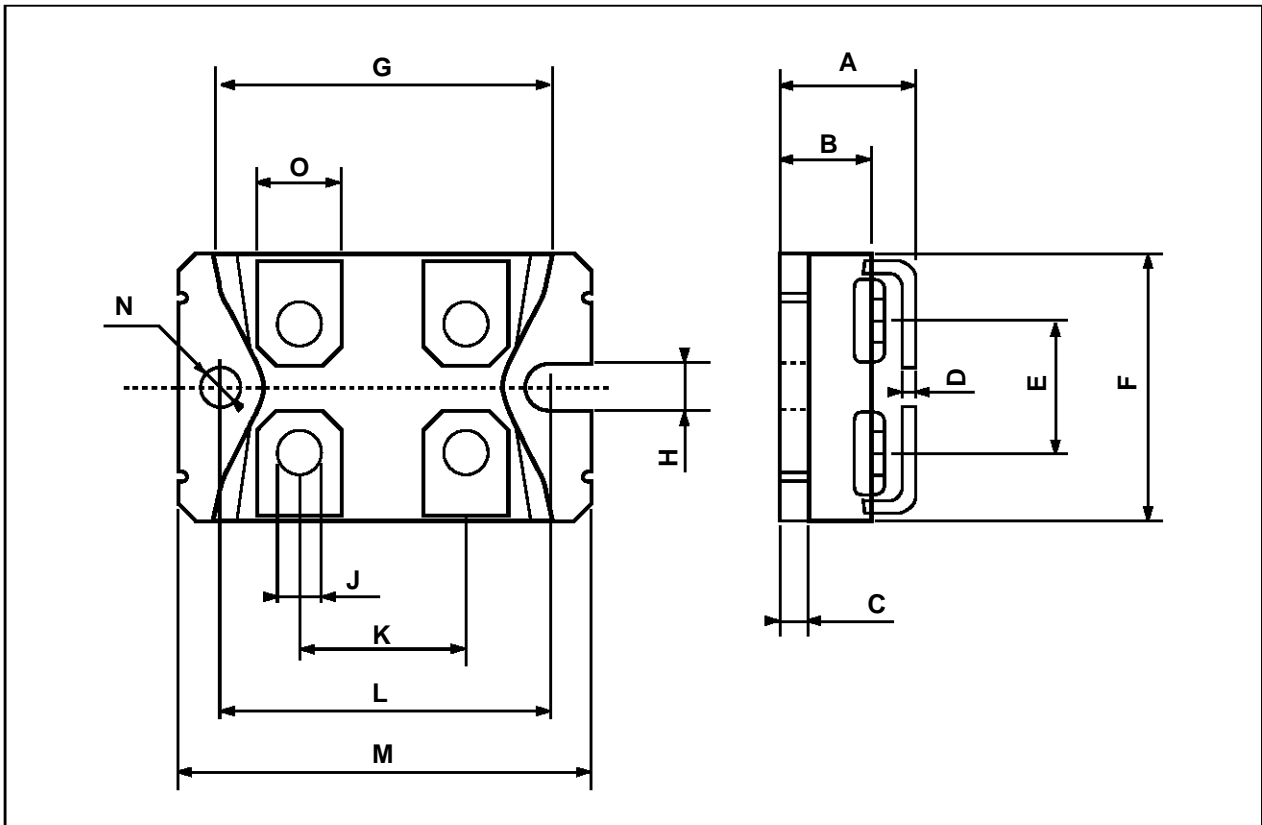
(1) Fast electronic switch (2) Non-inductive load (3) Fast recovery rectifier

Turn-off Switching Waveforms



ISOTOP MECHANICAL DATA

| DIM. | mm    |      |      | inch  |      |       |
|------|-------|------|------|-------|------|-------|
|      | MIN.  | TYP. | MAX. | MIN.  | TYP. | MAX.  |
| A    | 11.8  |      | 12.2 | 0.466 |      | 0.480 |
| B    | 8.9   |      | 9.1  | 0.350 |      | 0.358 |
| C    | 1.95  |      | 2.05 | 0.076 |      | 0.080 |
| D    | 0.75  |      | 0.85 | 0.029 |      | 0.033 |
| E    | 12.6  |      | 12.8 | 0.496 |      | 0.503 |
| F    | 25.15 |      | 25.5 | 0.990 |      | 1.003 |
| G    | 31.5  |      | 31.7 | 1.240 |      | 1.248 |
| H    | 4     |      |      | 0.157 |      |       |
| J    | 4.1   |      | 4.3  | 0.161 |      | 0.169 |
| K    | 14.9  |      | 15.1 | 0.586 |      | 0.594 |
| L    | 30.1  |      | 30.3 | 1.185 |      | 1.193 |
| M    | 37.8  |      | 38.2 | 1.488 |      | 1.503 |
| N    | 4     |      |      | 0.157 |      |       |
| O    | 7.8   |      | 8.2  | 0.307 |      | 0.322 |



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