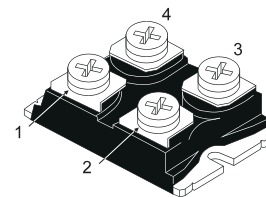


## NPN DARLINGTON POWER MODULE

- 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

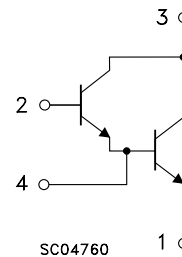
### INDUSTRIAL APPLICATIONS:

- MOTOR CONTROL
- SMPS & UPS
- WELDING EQUIPMENT



**ISOTOP**

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                             | Value      | Unit             |
|----------------|-------------------------------------------------------|------------|------------------|
| $V_{CEV}$      | Collector-Emitter Voltage ( $V_{BE} = -5\text{ V}$ )  | 1000       | V                |
| $V_{CEO(sus)}$ | Collector-Emitter Voltage ( $I_B = 0$ )               | 450        | V                |
| $V_{EBO}$      | Emitter-Base Voltage ( $I_C = 0$ )                    | 7          | V                |
| $I_C$          | Collector Current                                     | 72         | A                |
| $I_{CM}$       | Collector Peak Current ( $t_p = 10\text{ ms}$ )       | 108        | A                |
| $I_B$          | Base Current                                          | 8          | A                |
| $I_{BM}$       | Base Peak Current ( $t_p = 10\text{ ms}$ )            | 16         | A                |
| $P_{tot}$      | Total Dissipation at $T_c = 25\text{ }^\circ\text{C}$ | 250        | W                |
| $T_{stg}$      | Storage Temperature                                   | -55 to 150 | $^\circ\text{C}$ |
| $T_j$          | Max. Operating Junction Temperature                   | 150        | $^\circ\text{C}$ |
| $V_{iso}$      | Insulation Withstand Voltage (AC-RMS)                 | 2500       | $^\circ\text{C}$ |

# 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 | $^{\circ}C/W$ |

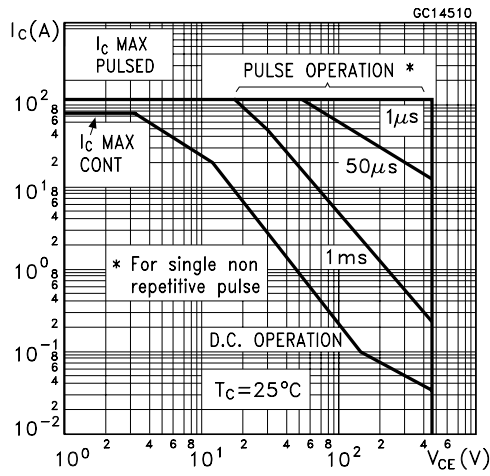
# ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}C$ unless otherwise specified)

| Symbol                      | Parameter                                         | Test Conditions                                                                                                                                                                    | Min. | Typ.                      | Max.          | Unit                          |
|-----------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------|---------------|-------------------------------|
| $I_{CER} \#$                | Collector Cut-off Current ( $R_{BE} = 5 \Omega$ ) | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$                                                                                                                  |      |                           | 1.5<br>22     | mA<br>mA                      |
| $I_{CEV} \#$                | Collector Cut-off Current ( $V_{BE} = -5$ )       | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV} \quad T_j = 100^{\circ}C$                                                                                                                  |      |                           | 1<br>15       | 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>$V_{clamp} = 450 V$                                                                                                                               | 450  |                           |               | V                             |
| $h_{FE}^*$                  | DC Current Gain                                   | $I_C = 60 A \quad V_{CE} = 5 V$                                                                                                                                                    |      | 150                       |               |                               |
| $V_{CE(sat)}^*$             | Collector-Emitter Saturation Voltage              | $I_C = 50 A \quad I_B = 1 A$<br>$I_C = 50 A \quad I_B = 1 A \quad T_j = 100^{\circ}C$<br>$I_C = 60 A \quad I_B = 2.4 A$<br>$I_C = 60 A \quad I_B = 2.4 A \quad T_j = 100^{\circ}C$ |      | 1.2<br>1.6<br>1.3<br>1.55 | 2<br>2        | V<br>V<br>V<br>V              |
| $V_{BE(sat)}^*$             | Base-Emitter Saturation Voltage                   | $I_C = 60 A \quad I_B = 2.4 A$<br>$I_C = 60 A \quad I_B = 2.4 A \quad T_j = 100^{\circ}C$                                                                                          |      | 2.1<br>2.15               | 3             | 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>$I_{B1} = 3.6 A \quad T_j = 100^{\circ}C$                                                                                    | 450  | 500                       |               | A/ $\mu s$                    |
| $V_{CE(3 \mu s)}^{\bullet}$ | Collector-Emitter Dynamic Voltage                 | $V_{CC} = 300 V \quad R_C = 5 \Omega$<br>$I_{B1} = 3.6 A \quad T_j = 100^{\circ}C$                                                                                                 |      | 4                         | 7             | V                             |
| $V_{CE(5 \mu s)}^{\bullet}$ | Collector-Emitter Dynamic Voltage                 | $V_{CC} = 300 V \quad R_C = 5 \Omega$<br>$I_{B1} = 3.6 A \quad T_j = 100^{\circ}C$                                                                                                 |      | 2.5                       | 4             | V                             |
| $t_s$<br>$t_f$<br>$t_c$     | Storage Time<br>Fall Time<br>Cross-over Time      | $I_C = 60 A \quad V_{CC} = 50 V$<br>$V_{BB} = -5 V \quad R_{BB} = 0.3 \Omega$<br>$V_{clamp} = 450 V \quad I_{B1} = 2.4 A$<br>$L = 0.04 mH \quad T_j = 100^{\circ}C$                |      | 4.6<br>0.4<br>1.2         | 6<br>0.6<br>2 | $\mu s$<br>$\mu s$<br>$\mu s$ |
| $V_{CEW}$                   | Maximum Collector Emitter Voltage Without Snubber | $I_{CWoff} = 72 A \quad I_{B1} = 2.4 A$<br>$V_{BB} = -5 V \quad V_{CC} = 50 V$<br>$L = 35 \mu H \quad R_{BB} = 0.3 \Omega$<br>$T_j = 125^{\circ}C$                                 | 450  |                           |               | V                             |

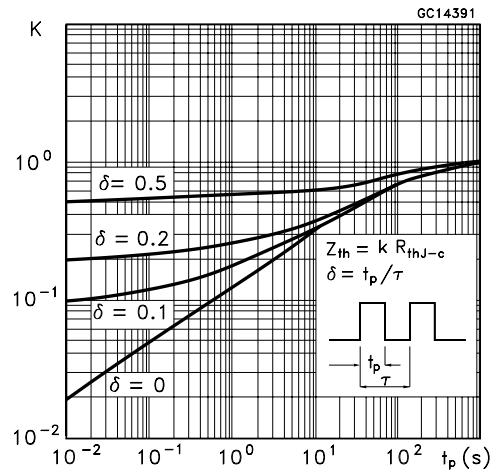
\* Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %

# See test circuits in databook introduction

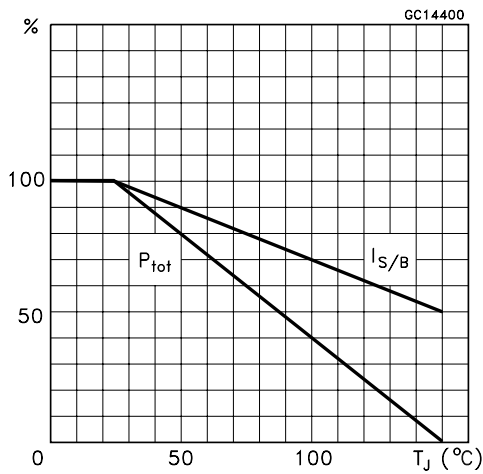
## Safe Operating Areas



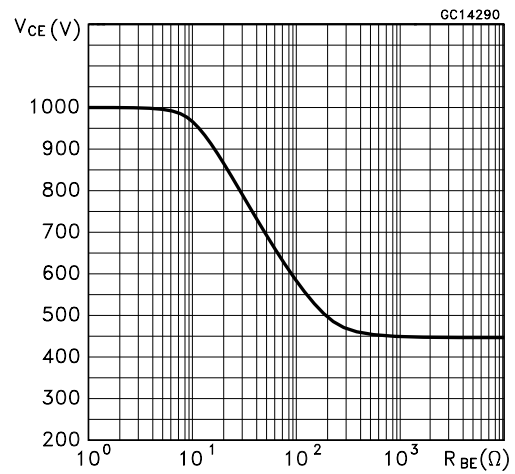
## Thermal Impedance



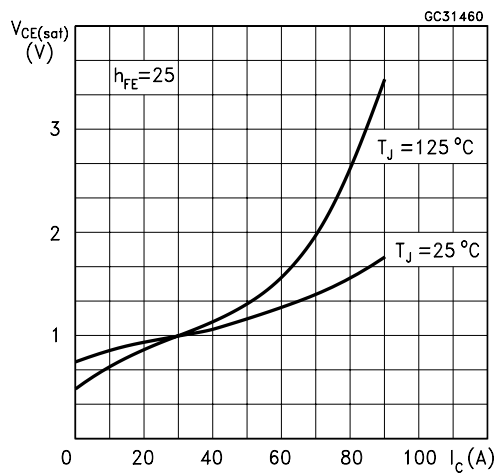
## Derating Curve



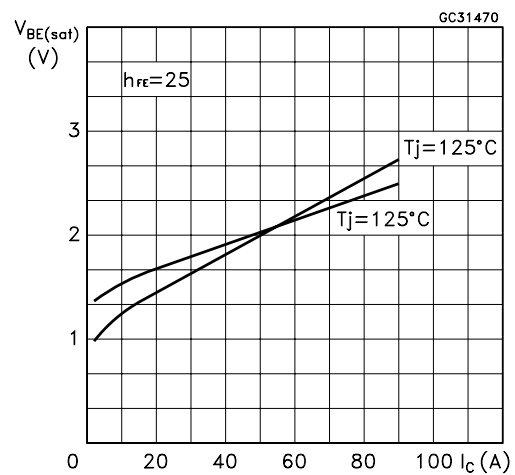
## Collector-emitter Voltage Versus base-emitter Resistance



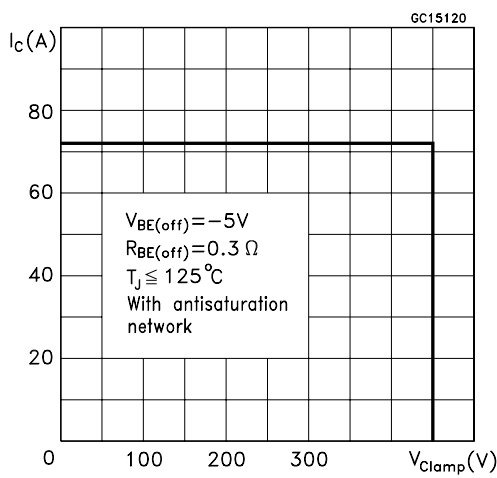
## Collector Emitter Saturation Voltage



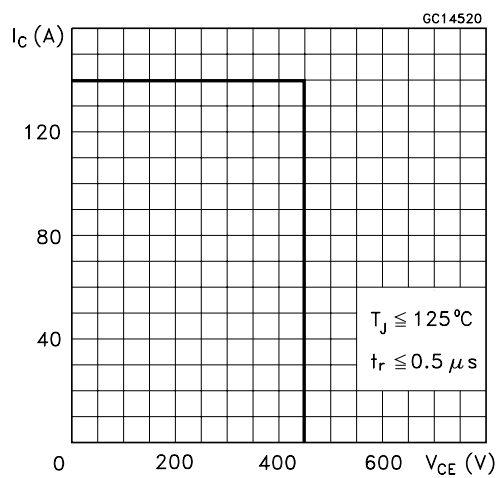
## Base-Emitter Saturation Voltage



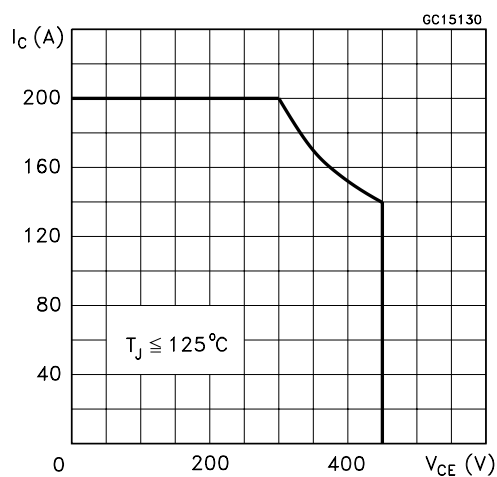
Reverse Biased SOA



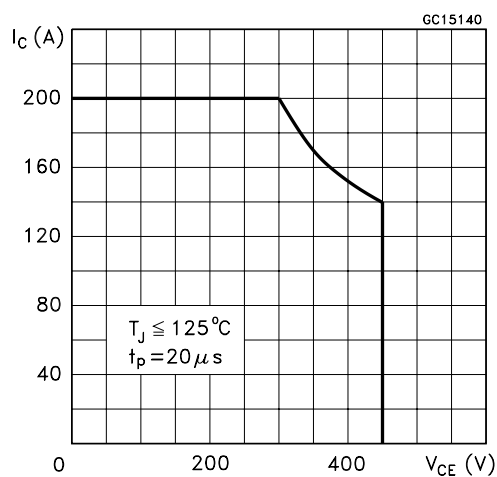
Foward Biased SOA



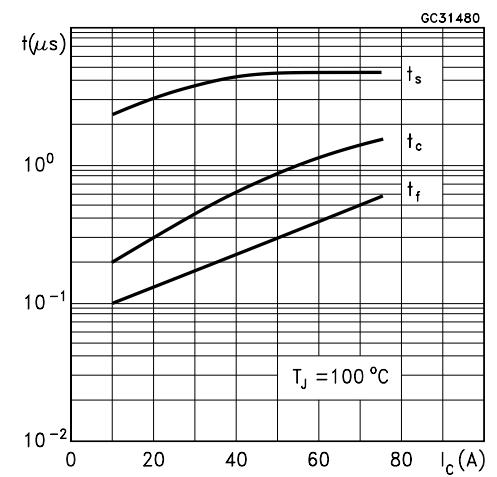
Reverse Biased AOA



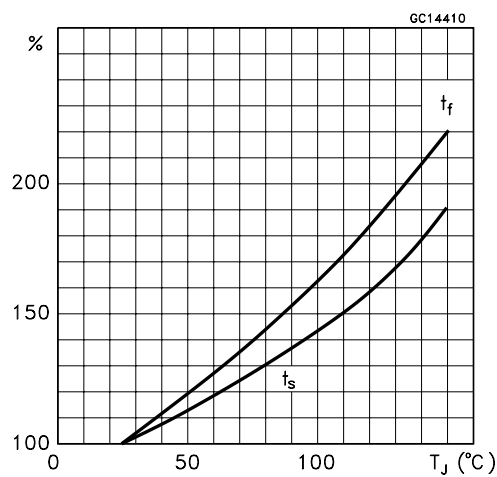
Forward Biased AOA



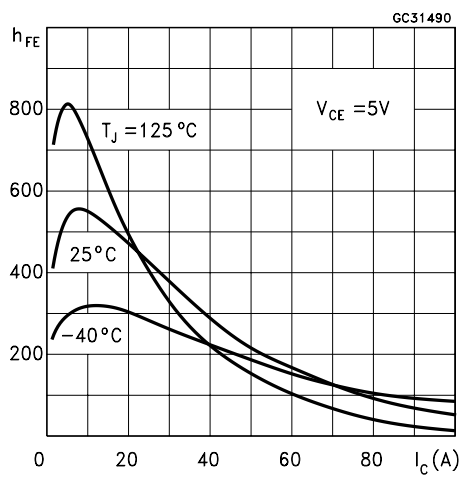
Switching Times Inductive Load



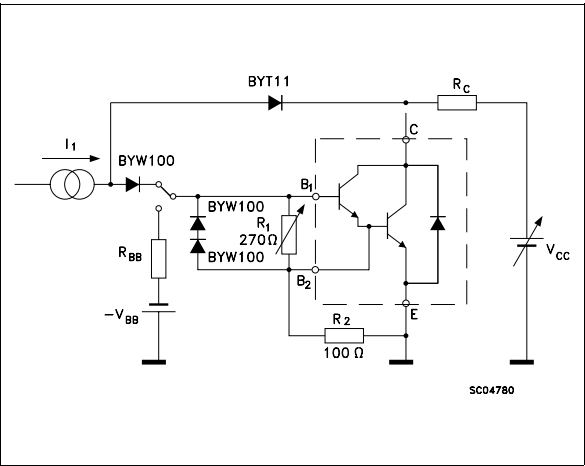
Switching Times Inductive Load Versus Temperature



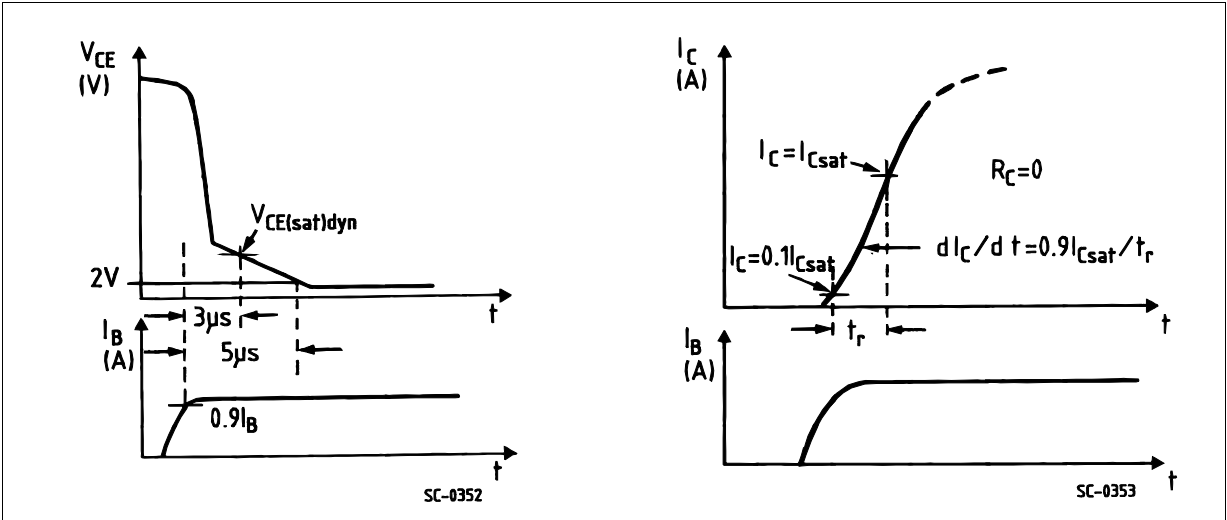
Dc Current Gain



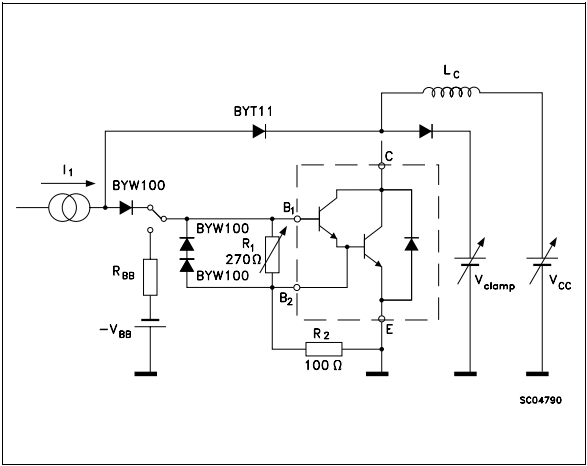
Turn-on Switching Test Circuit



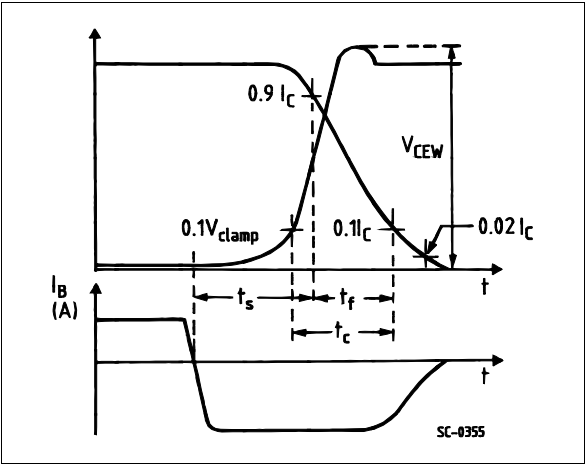
Turn-on Switching Waveforms



Turn-off Switching Test Circuit

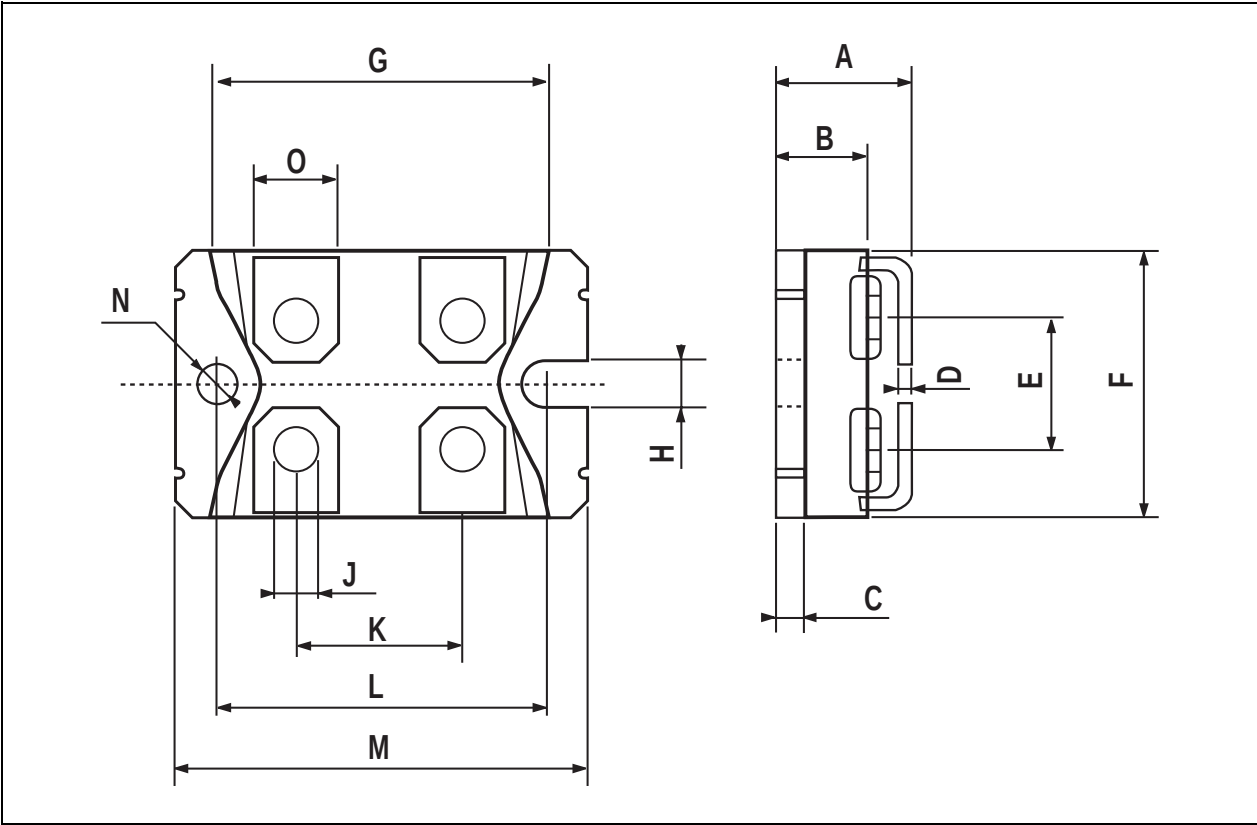


Turn-off Switching Waveforms



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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