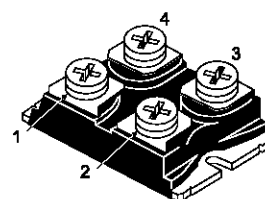


## NPN TRANSISTOR POWER MODULE

- 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:

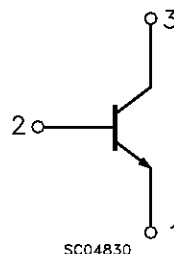
- MOTOR CONTROL
- SMPS & UPS
- DC/DC & DC/AC CONVERTERS



Pin 4 not connected

**ISOTOP**

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

| Symbol         | Parameter                                               | Value      | Unit               |
|----------------|---------------------------------------------------------|------------|--------------------|
| $V_{CEV}$      | Collector-Emitter Voltage ( $V_{BE} = -5\text{ V}$ )    | 400        | V                  |
| $V_{CEO(sus)}$ | Collector-Emitter Voltage ( $I_B = 0$ )                 | 300        | V                  |
| $V_{EBO}$      | Emitter-Base Voltage ( $I_C = 0$ )                      | 7          | V                  |
| $I_C$          | Collector Current                                       | 80         | A                  |
| $I_{CM}$       | Collector Peak Current ( $t_p = 10\text{ ms}$ )         | 120        | A                  |
| $I_B$          | Base Current                                            | 16         | A                  |
| $I_{BM}$       | Base Peak Current ( $t_p = 10\text{ ms}$ )              | 24         | 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       | $^{\circ}\text{C}$ |

## BUT32V

### THERMAL DATA

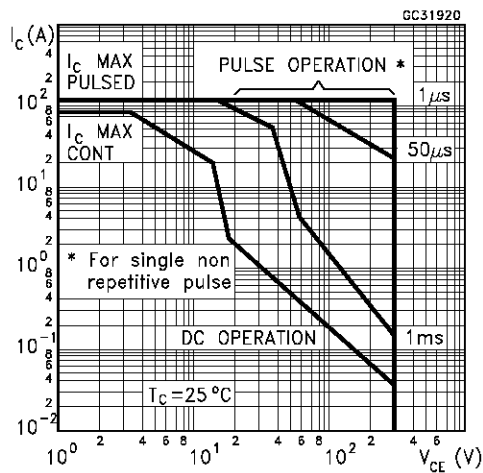
|                |                                                                 |     |      |                      |
|----------------|-----------------------------------------------------------------|-----|------|----------------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case       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

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

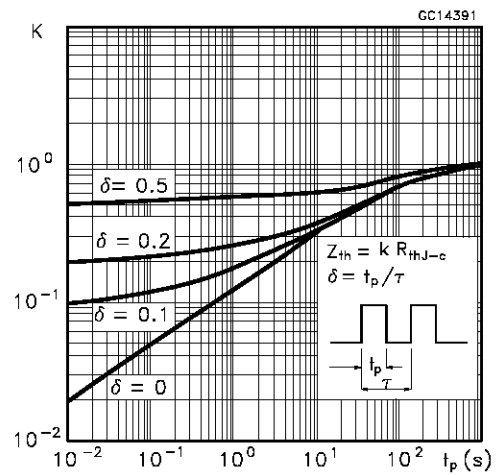
| Symbol                   | Parameter                                          | Test Conditions                                                                                                                                                                     | Min. | Typ.        | Max.       | Unit             |
|--------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|------------|------------------|
| $I_{CER}$                | Collector Cut-off Current ( $R_{BE} = 5\ \Omega$ ) | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV}$ $T_j = 100^{\circ}\text{C}$                                                                                                                |      |             | 1<br>5     | mA<br>mA         |
| $I_{CEV}$                | Collector Cut-off Current ( $V_{BE} = -5$ )        | $V_{CE} = V_{CEV}$<br>$V_{CE} = V_{CEV}$ $T_j = 100^{\circ}\text{C}$                                                                                                                |      |             | 1<br>4     | mA<br>mA         |
| $I_{EBO}$                | Emitter Cut-off Current ( $I_C = 0$ )              | $V_{EB} = 5\ \text{V}$                                                                                                                                                              |      |             | 1          | mA               |
| $V_{CEO(SUS)}^*$         | Collector-Emitter Sustaining Voltage               | $I_C = 0.2\ \text{A}$ $L = 25\ \text{mH}$<br>$V_{clamp} = 300\ \text{V}$                                                                                                            | 300  |             |            | V                |
| $h_{FE}^*$               | DC Current Gain                                    | $I_C = 40\ \text{A}$ $V_{CE} = 5\ \text{V}$                                                                                                                                         |      | 16          |            |                  |
| $V_{CE(sat)}^*$          | Collector-Emitter Saturation Voltage               | $I_C = 40\ \text{A}$ $I_B = 4\ \text{A}$<br>$I_C = 40\ \text{A}$ $I_B = 4\ \text{A}$ $T_j = 100^{\circ}\text{C}$                                                                    |      | 0.6<br>1.2  | 0.9<br>1.9 | V<br>V           |
| $V_{BE(sat)}^*$          | Base-Emitter Saturation Voltage                    | $I_C = 40\ \text{A}$ $I_B = 4\ \text{A}$<br>$I_C = 40\ \text{A}$ $I_B = 4\ \text{A}$ $T_j = 100^{\circ}\text{C}$                                                                    |      | 1.12<br>1.1 | 1.3<br>1.3 | V<br>V           |
| $di_C/dt$                | Rate of Rise of On-state Collector                 | $V_{CC} = 300\ \text{V}$ $R_C = 0$ $t_p = 3\ \mu\text{s}$<br>$I_{B1} = 6\ \text{A}$ $T_j = 100^{\circ}\text{C}$                                                                     | 120  | 180         |            | A/ $\mu\text{s}$ |
| $V_{CE(3\ \mu\text{s})}$ | Collector-Emitter Dynamic Voltage                  | $V_{CC} = 300\ \text{V}$ $R_C = 6.2\ \Omega$<br>$I_{B1} = 6\ \text{A}$ $T_j = 100^{\circ}\text{C}$                                                                                  |      | 3           | 6          | V                |
| $V_{CE(5\ \mu\text{s})}$ | Collector-Emitter Dynamic Voltage                  | $V_{CC} = 300\ \text{V}$ $R_C = 6.2\ \Omega$<br>$I_{B1} = 6\ \text{A}$ $T_j = 100^{\circ}\text{C}$                                                                                  |      | 1.8         | 3          | V                |
| $t_s$                    | Storage Time                                       | $I_C = 40\ \text{A}$ $V_{CC} = 250\ \text{V}$                                                                                                                                       |      | 1.9         | 3          | $\mu\text{s}$    |
| $t_f$                    | Fall Time                                          | $V_{BB} = -5\ \text{V}$ $R_{BB} = 0.6\ \Omega$                                                                                                                                      |      | 0.12        | 0.4        | $\mu\text{s}$    |
| $t_c$                    | Cross-over Time                                    | $V_{clamp} = 300\ \text{V}$ $I_{B1} = 4\ \text{A}$<br>$L = 0.3\ \text{mH}$ $T_j = 100^{\circ}\text{C}$                                                                              |      | 0.35        | 0.7        | $\mu\text{s}$    |
| $V_{CEW}$                | Maximum Collector Emitter Voltage Without Snubber  | $I_{CWoff} = 60\ \text{A}$ $I_{B1} = 4\ \text{A}$<br>$V_{BB} = -5\ \text{V}$ $V_{CC} = 50\ \text{V}$<br>$L = 42\ \mu\text{H}$ $R_{BB} = 0.6\ \Omega$<br>$T_j = 125^{\circ}\text{C}$ | 300  |             |            | V                |

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

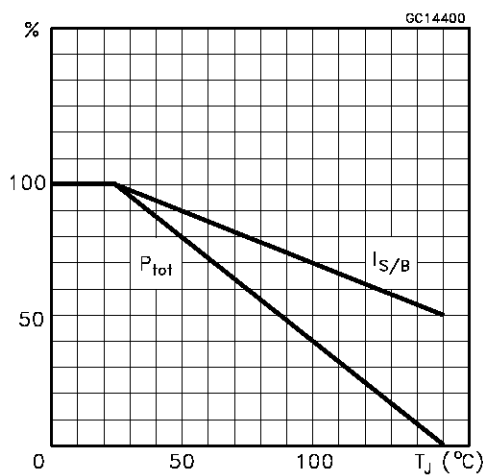
## Safe Operating Areas



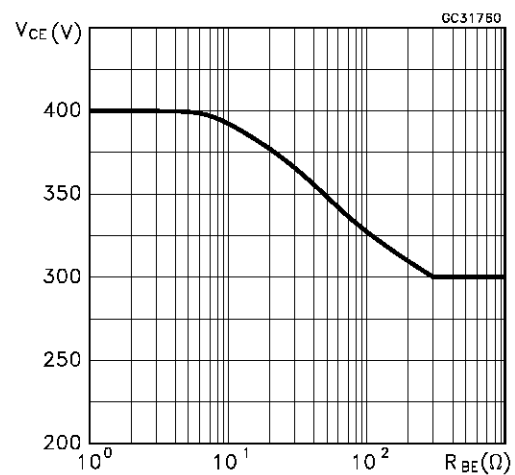
## Thermal Impedance



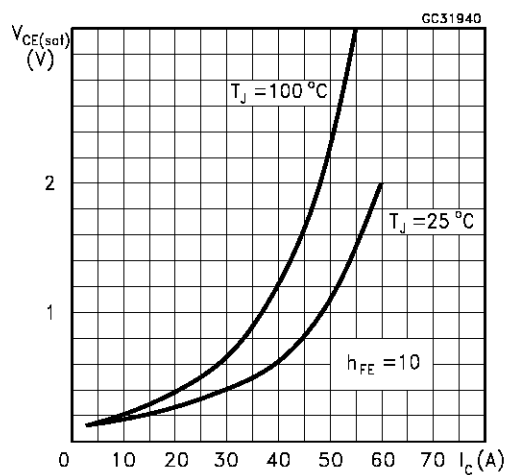
## Derating Curve



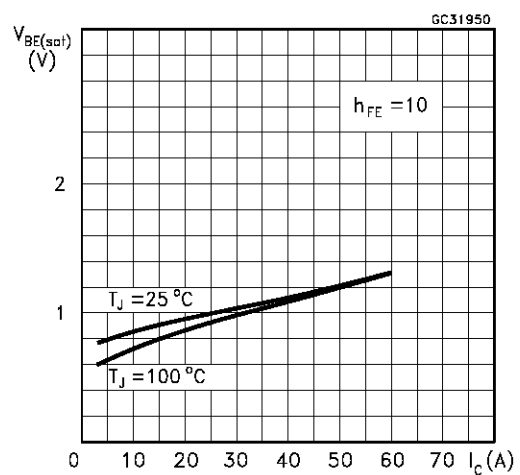
## Collector-emitter Voltage Versus base-emitter Resistance



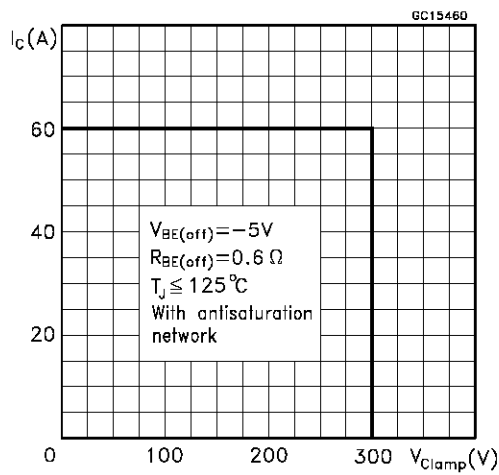
## Collector Emitter Saturation Voltage



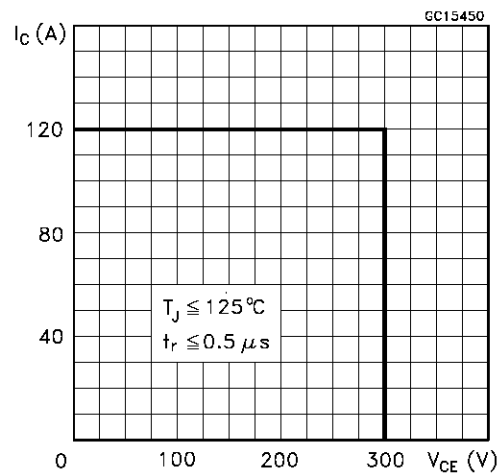
## Base-Emitter Saturation Voltage



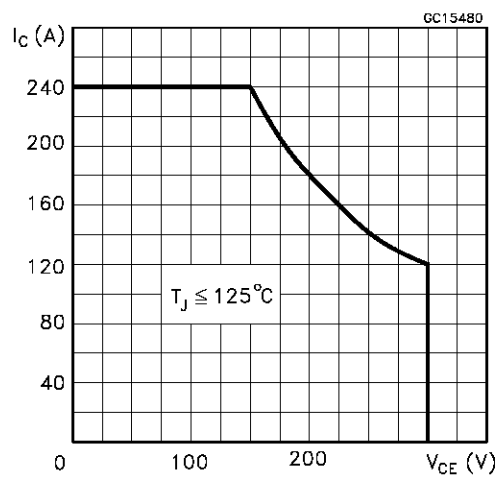
Reverse Biased SOA



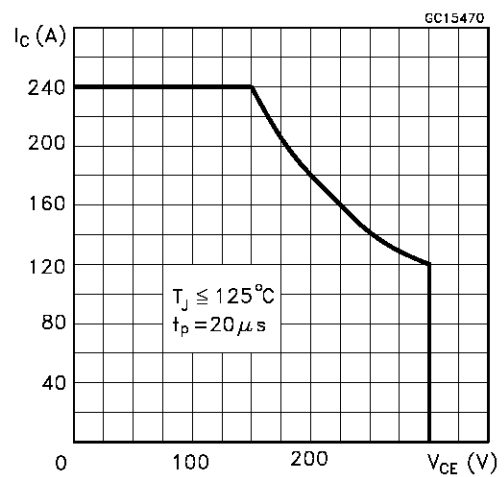
Forward Biased SOA



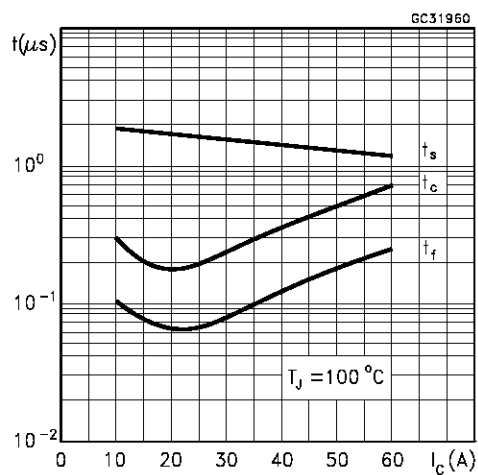
Reverse Biased AOA



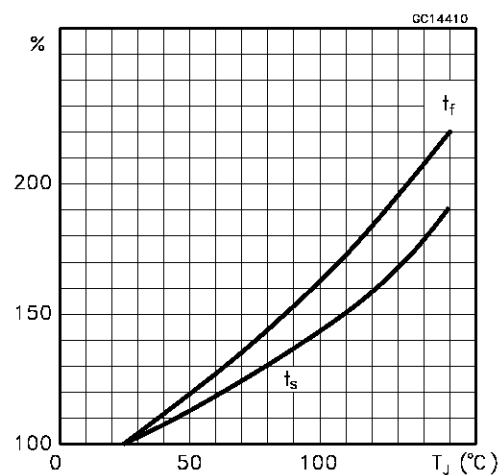
Forward Biased AOA



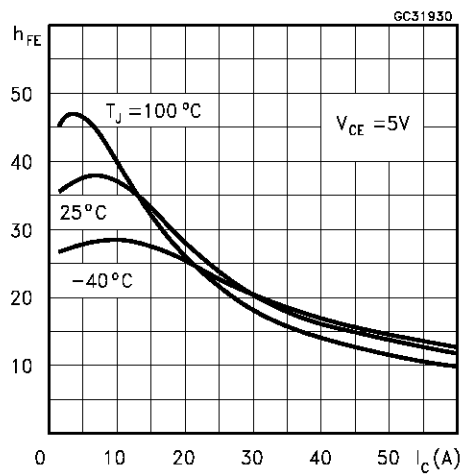
Switching Times Inductive Load



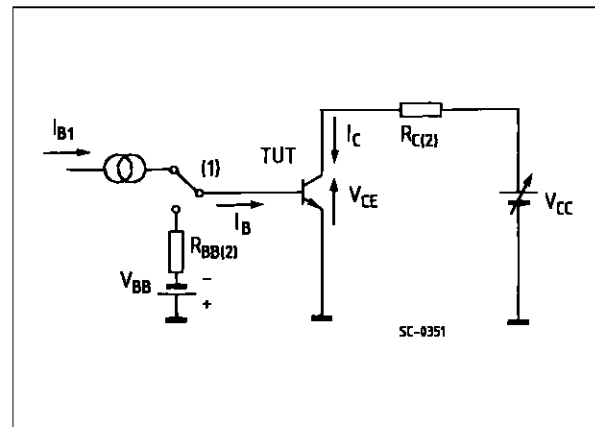
Switching Times Inductive Load Versus Temperature



## Dc Current Gain



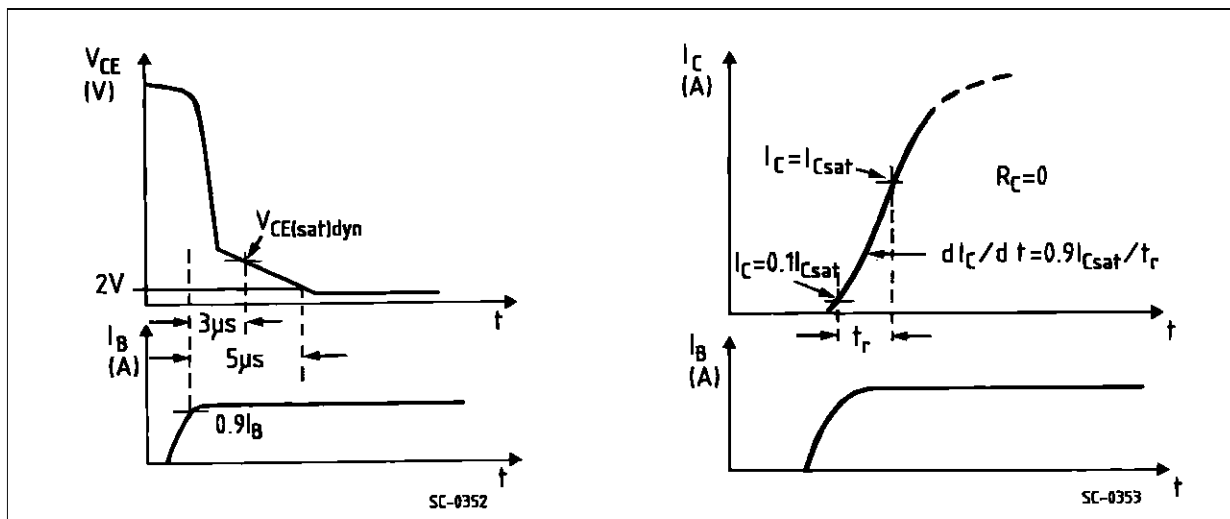
## Turn-on Switching Test Circuit



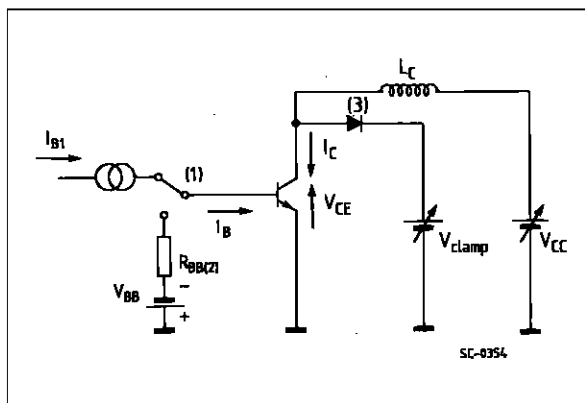
(1) Fast electronics switch

(2) Non-inductive load

## Turn-on Switching Waveforms



## Turn-off Switching Test Circuit

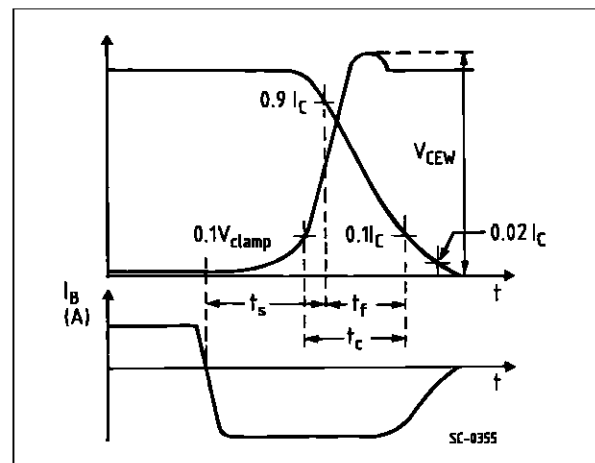


(1) Fast electronic switch

(2) Non-inductive load

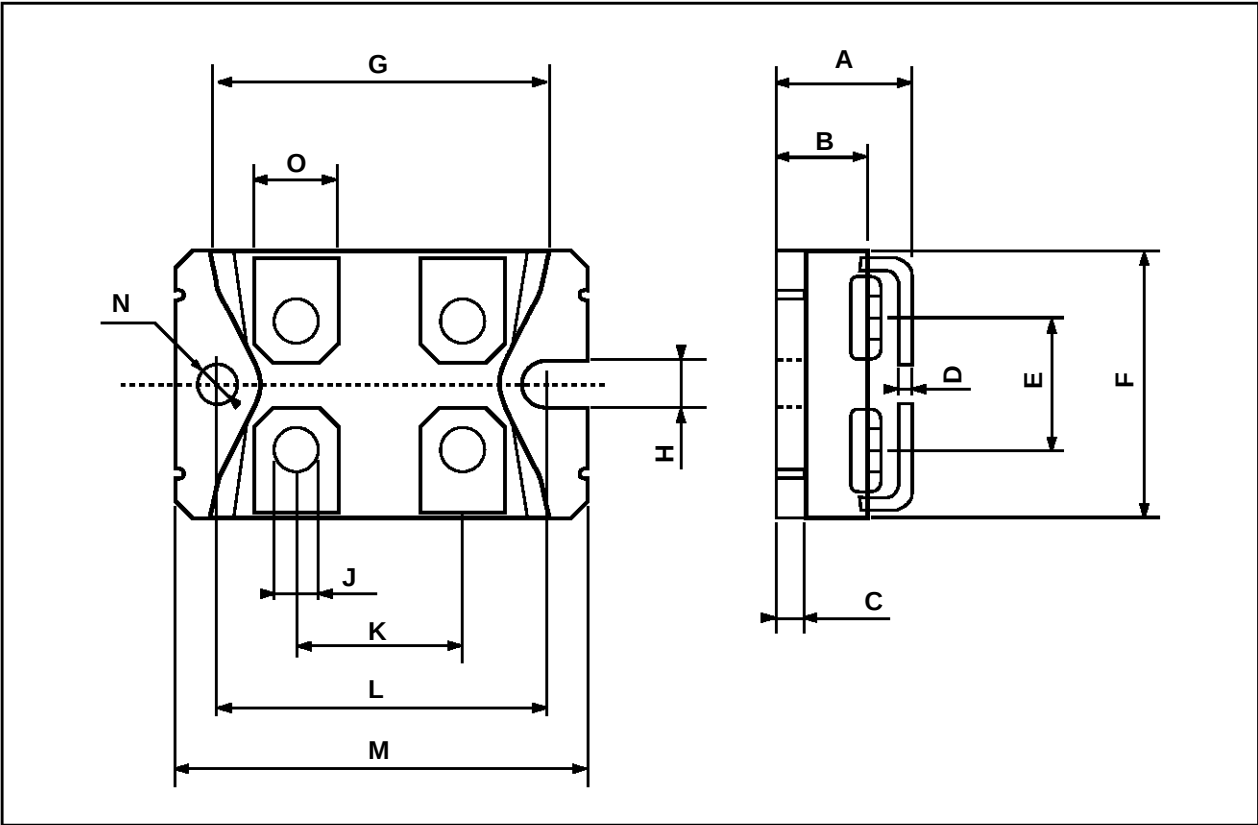
(3) Fast recovery rectifier

## 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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