

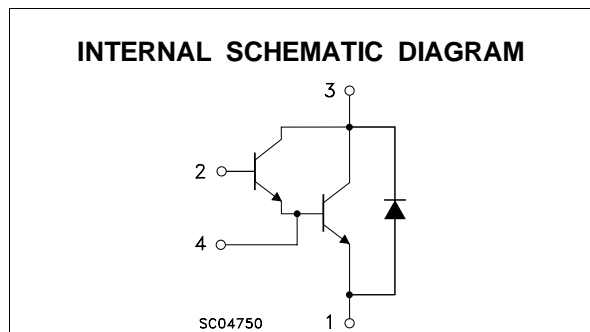
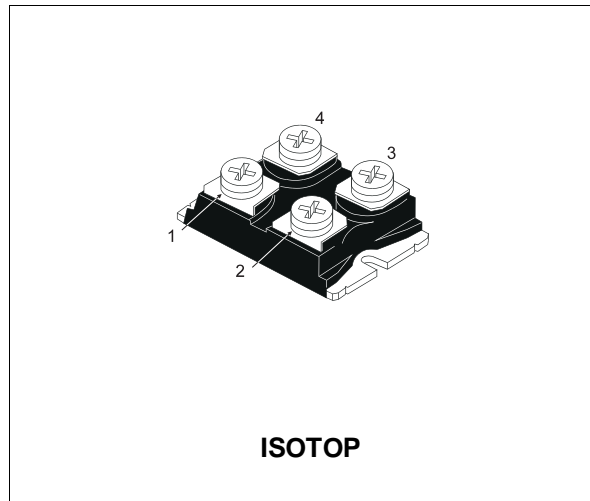


NPN DARLINGTON POWER MODULE

- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW R_{th} JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ULTRAFAST FREEWHEELING DIODE
- FULLY INSULATED PACKAGE (UL COMPLIANT)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

INDUSTRIAL APPLICATIONS:

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



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------|---|------------|------|
| V_{CEV} | Collector-Emitter Voltage ($V_{BE} = -5$ V) | 600 | 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 | 84 | A |
| I_{CM} | Collector Peak Current ($t_p = 10$ ms) | 126 | A |
| I_B | Base Current | 8 | A |
| I_{BM} | Base Peak Current ($t_p = 10$ ms) | 16 | A |
| P_{tot} | Total Dissipation at $T_c = 25$ °C | 250 | W |
| V_{isol} | Insulation Withstand Voltage (RMS) from All Four Terminals to External Heatsink | 2500 | V |
| T_{stg} | Storage Temperature | -55 to 150 | °C |
| T_j | Max. Operating Junction Temperature | 150 | °C |

ESM6045DV

THERMAL DATA

| | | | | |
|-----------------------|---|-----|------|------|
| R _{thj-case} | Thermal Resistance Junction-case (transistor) | Max | 0.5 | °C/W |
| R _{thj-case} | Thermal Resistance Junction-case (diode) | Max | 1.2 | °C/W |
| R _{thc-h} | Thermal Resistance Case-heatsink With Conductive Grease Applied | Max | 0.05 | °C/W |

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

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------------|---|--|------|---------------------------|-----------|------------------|
| I _{CER} # | Collector Cut-off Current (R _{BE} = 5 Ω) | V _{CE} = V _{CEV} V _{CE} = V _{CEV} T _j = 100 °C | | | 1.5 22 | mA mA |
| I _{CEV} # | Collector Cut-off Current (V _{BE} = -5) | V _{CE} = V _{CEV} V _{CE} = V _{CEV} T _j = 100 °C | | | 1 15 | mA mA |
| I _{EBO} # | Emitter Cut-off Current (I _C = 0) | V _{EB} = 5 V | | | 1 | mA |
| V _{CEO(SUS)} * | Collector-Emitter Sustaining Voltage (I _B = 0) | I _C = 0.2 A L = 25 mH V _{clamp} = 450 V | 450 | | | V |
| h _{FE} * | DC Current Gain | I _C = 70 A V _{CE} = 5 V | | 120 | | |
| V _{CE(sat)} * | Collector-Emitter Saturation Voltage | I _C = 50 A I _B = 1 A I _C = 50 A I _B = 1 A T _j = 100 °C I _C = 70 A I _B = 4 A I _C = 70 A I _B = 4 A T _j = 100 °C | | 1.2 1.6 1.35 1.7 | 2 2 | V V V V |
| V _{BE(sat)} * | Base-Emitter Saturation Voltage | I _C = 70 A I _B = 4 A I _C = 70 A I _B = 4 A T _j = 100 °C | | 2.3 2.4 | 3 | V V |
| di _C /dt | Rate of Rise of On-state Collector | V _{CC} = 300 V R _C = 0 t _p = 3 μs I _{B1} = 1.5 A T _j = 100 °C | 375 | 450 | | A/μs |
| V _{CE(3 μs)} ** | Collector-Emitter Dynamic Voltage | V _{CC} = 300 V R _C = 6 Ω I _{B1} = 1.5 A T _j = 100 °C | | 6 | 9 | V |
| V _{CE(5 μs)} ** | Collector-Emitter Dynamic Voltage | V _{CC} = 300 V R _C = 6 Ω I _{B1} = 1.5 A T _j = 100 °C | | 3 | 4.5 | V |
| t _s | Storage Time | I _C = 50 A V _{CC} = 50 V | | 3.5 | 5.5 | μs |
| t _f | Fall Time | V _{BB} = -5 V R _{BB} = 0.3 Ω | | 0.3 | 0.5 | μs |
| t _c | Cross-over Time | V _{clamp} = 450 V I _{B1} = 1 A L = 0.05 mH T _j = 100 °C | | 0.8 | 1.7 | μs |
| V _{CEW} | Maximum Collector Emitter Voltage Without Snubber | I _{CWoff} = 84 A I _{B1} = 4 A V _{BB} = -5 V V _{CC} = 50 V L = 0.03 mH R _{BB} = 0.3 Ω T _j = 125 °C | 450 | | | V |
| V _F * | Diode Forward Voltage | I _F = 70 A T _j = 100 °C | | 1.6 | 1.9 | V |
| I _{RM} | Reverse Recovery Current | V _{CC} = 200 V I _F = 70 A di _F /dt = -375 A/μs L < 0.05 μH T _j = 100 °C | | 38 | 45 | A |

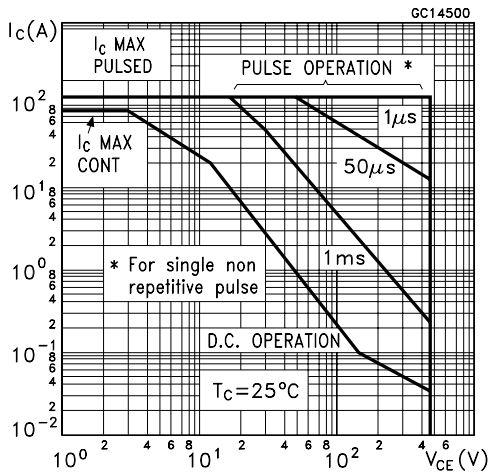
* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

See test circuits in databook introduction

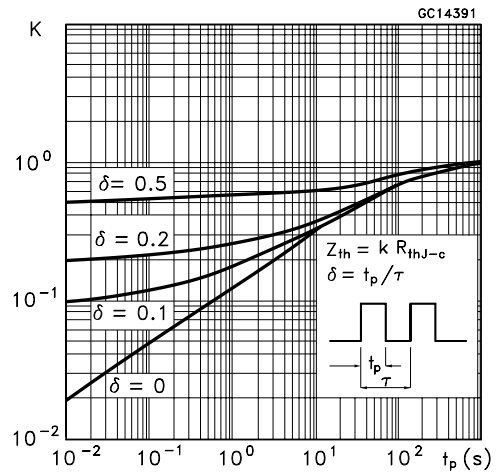
To evaluate the conduction losses of the diode use the following equations:

$$V_F = 1.5 + 0.0055 I_F \quad P = 1.5 I_{F(AV)} + 0.0055 I_{F(RMS)}^2$$

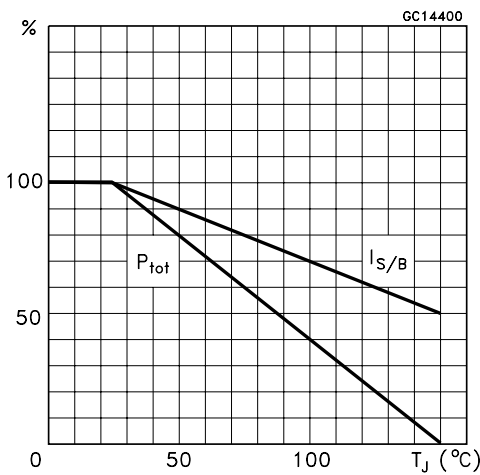
Safe Operating Areas



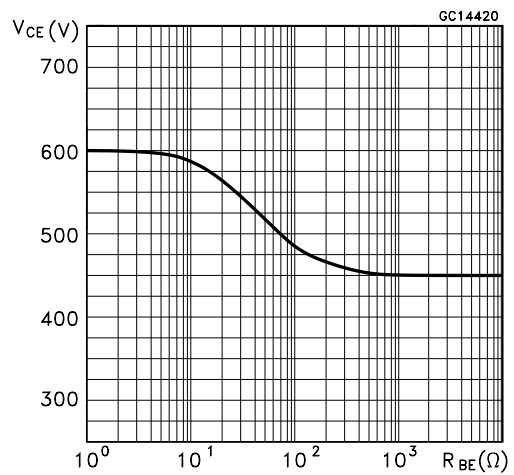
Thermal Impedance



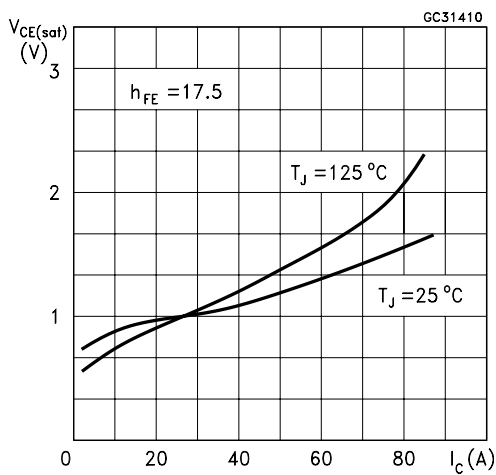
Derating Curve



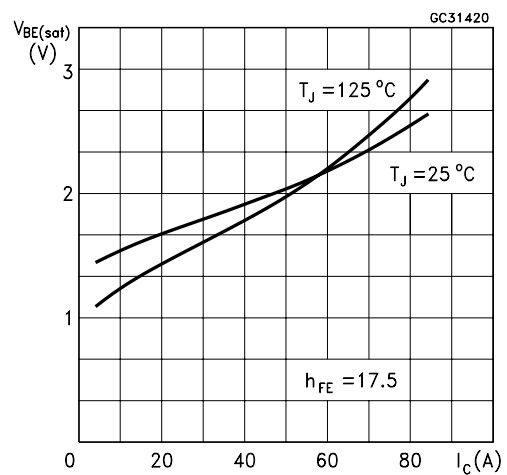
Collector-emitter Voltage Versus base-emitter Resistance



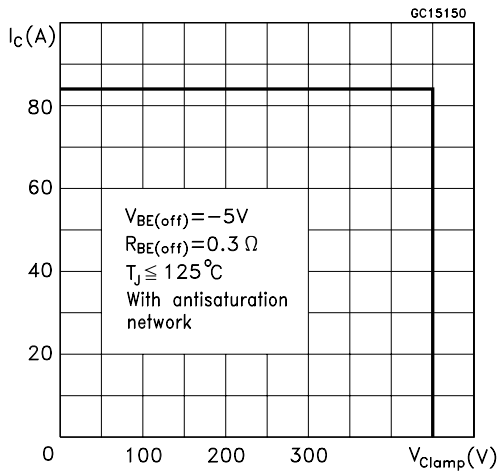
Collector Emitter Saturation Voltage



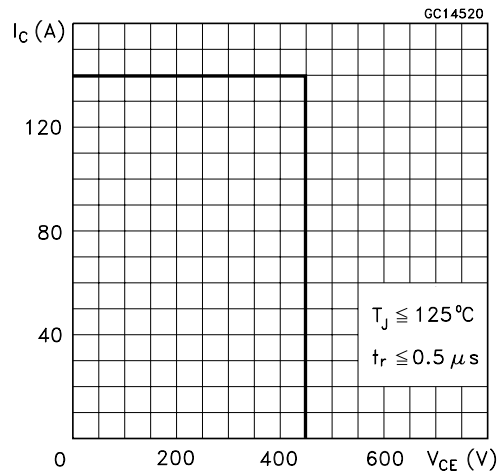
Base-Emitter Saturation Voltage



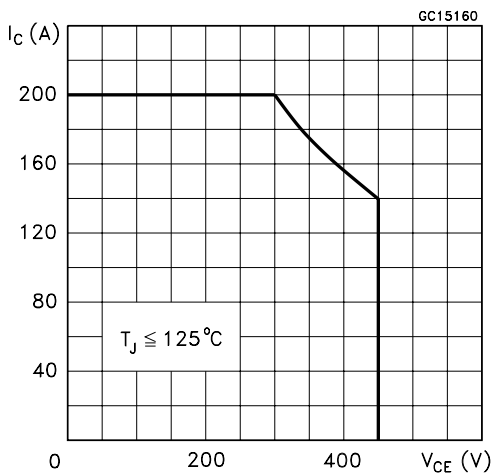
Reverse Biased SOA



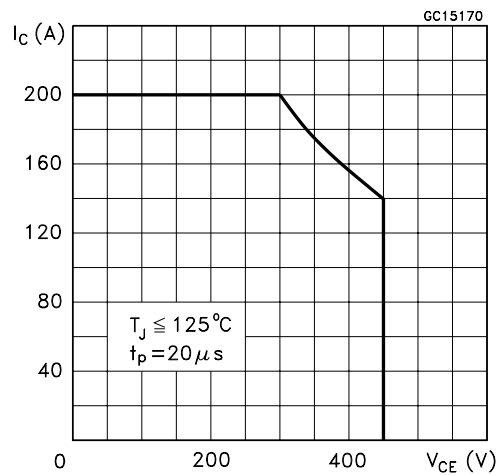
Forward Biased SOA



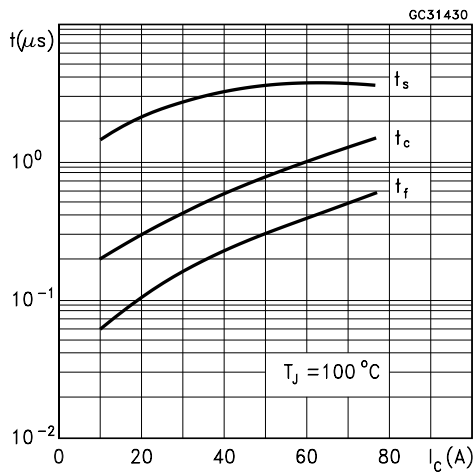
Reverse Biased AOA



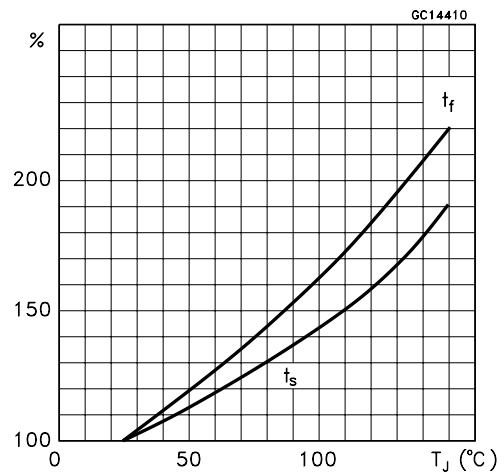
Forward Biased AOA



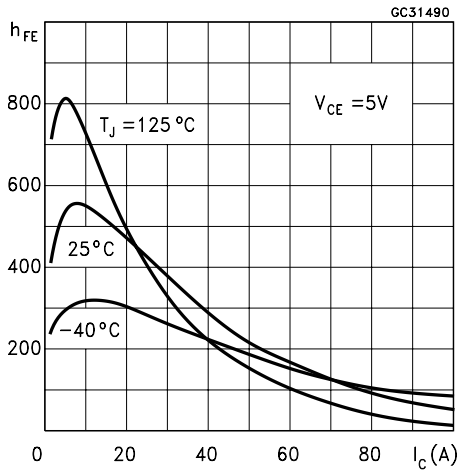
Switching Times Inductive Load



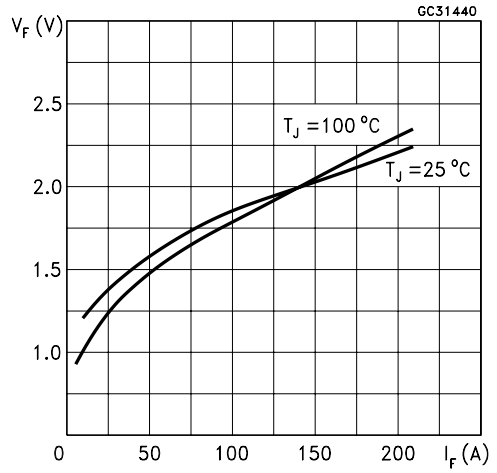
Switching Times Inductive Load Versus Temperature



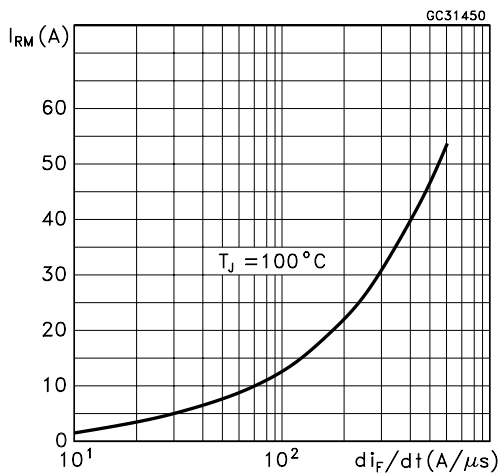
Dc Current Gain



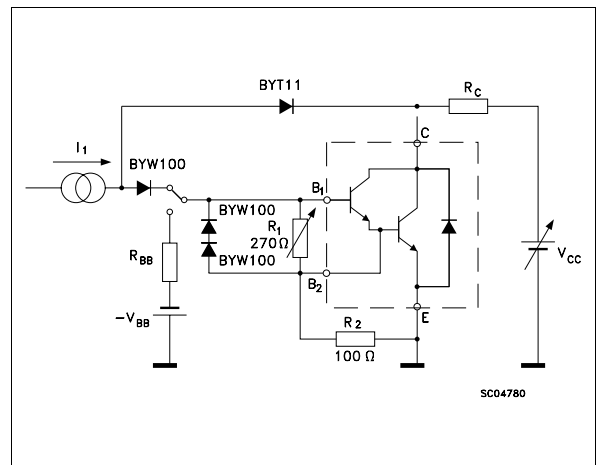
Typical V_F Versus I_F



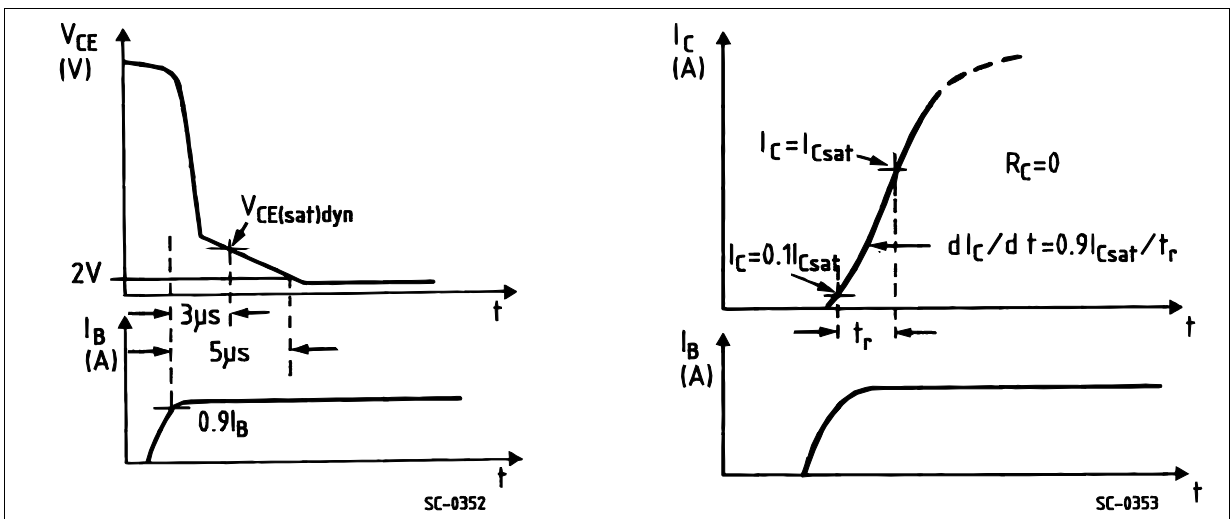
Peak Reverse Current Versus di_F/dt



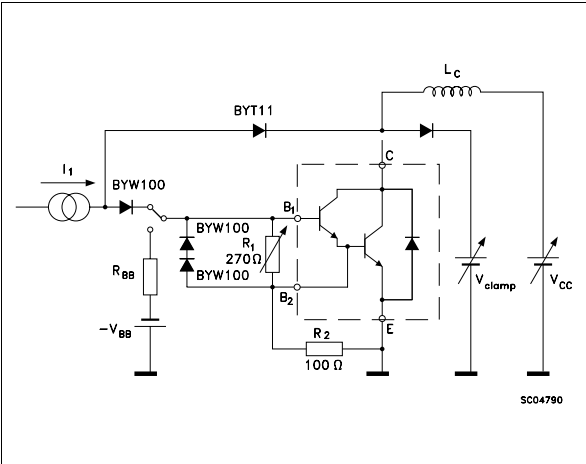
Turn-on Switching Test Circuit



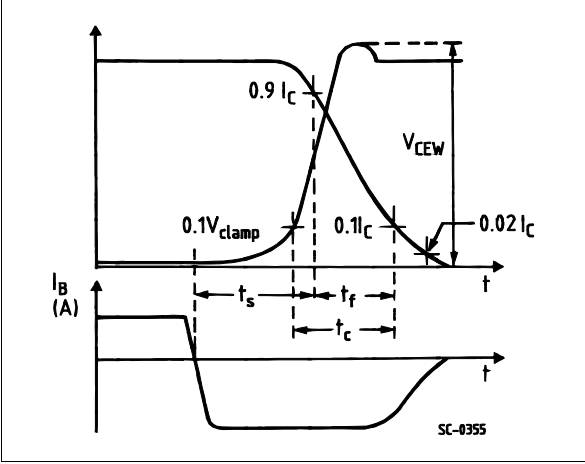
Turn-on Switching Waveforms



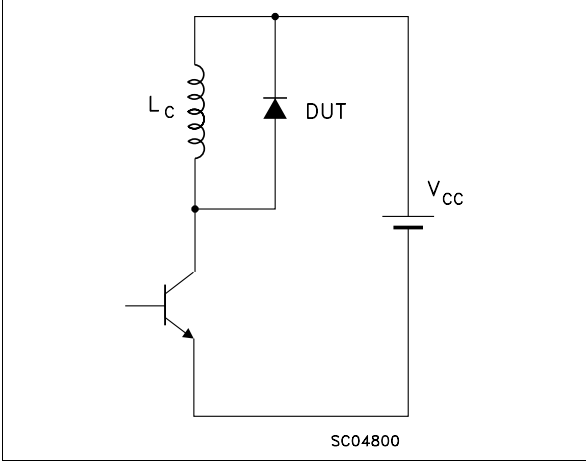
Turn-on Switching Test Circuit



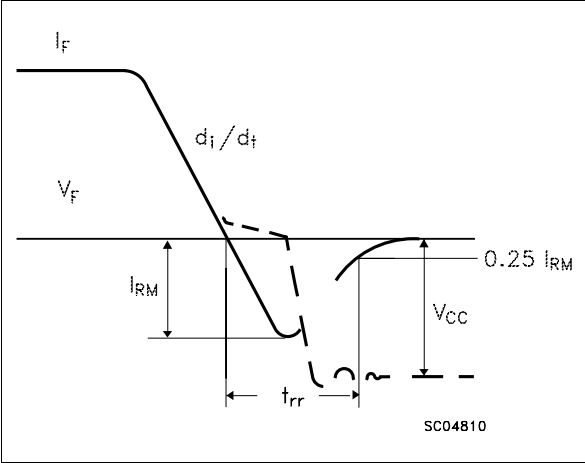
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

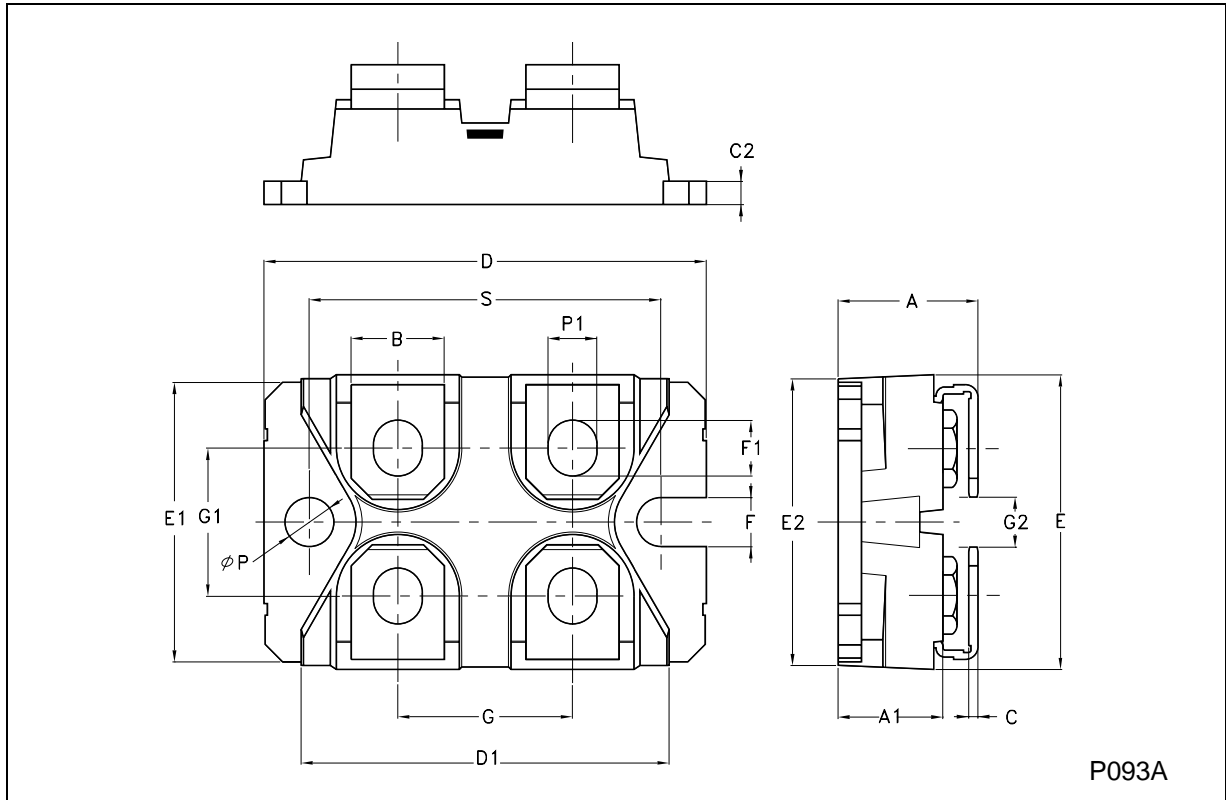


Turn-off Switching Waveform of Diode



ISOTOP MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.8 | | 12.2 | 0.465 | | 0.480 |
| A1 | 8.9 | | 9.1 | 0.350 | | 0.358 |
| B | 7.8 | | 8.2 | 0.307 | | 0.322 |
| C | 0.75 | | 0.85 | 0.029 | | 0.033 |
| C2 | 1.95 | | 2.05 | 0.076 | | 0.080 |
| D | 37.8 | | 38.2 | 1.488 | | 1.503 |
| D1 | 31.5 | | 31.7 | 1.240 | | 1.248 |
| E | 25.15 | | 25.5 | 0.990 | | 1.003 |
| E1 | 23.85 | | 24.15 | 0.938 | | 0.950 |
| E2 | | 24.8 | | | 0.976 | |
| G | 14.9 | | 15.1 | 0.586 | | 0.594 |
| G1 | 12.6 | | 12.8 | 0.496 | | 0.503 |
| G2 | 3.5 | | 4.3 | 0.137 | | 1.169 |
| F | 4.1 | | 4.3 | 0.161 | | 0.169 |
| F1 | 4.6 | | 5 | 0.181 | | 0.196 |
| P | 4 | | 4.3 | 0.157 | | 0.169 |
| P1 | 4 | | 4.4 | 0.157 | | 0.173 |
| S | 30.1 | | 30.3 | 1.185 | | 1.193 |



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