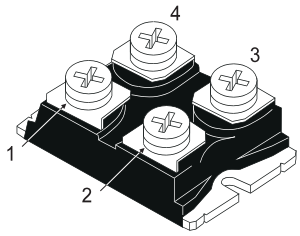
# STE250NS10

## N-CHANNEL 100V - 0.0045 Ω - 220A ISOTOP
## STripFET™ POWER MOSFET

| TYPE | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STE250NS10 | 100 V | <0.0055 Ω | 220A |

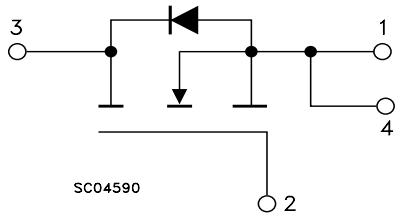
- TYPICAL $R_{DS}(on)$ = 0.0045Ω
- STANDARD THRESHOLD DRIVE
- 100% AVALANCHE TESTED




**ISOTOP**

### APPLICATIONS
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS

### INTERNAL SCHEMATIC DIAGRAM




### ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0) | 100 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 100 | V |
| $V_{GS}$ | Gate- source Voltage | ± 20 | V |
| $I_D$ | Drain Current (continuos) at $T_C$ = 25°C | 220 | A |
| $I_D$ | Drain Current (continuos) at $T_C$ = 100°C | 156 | A |
| $I_{DM}$(•) | Drain Current (pulsed) | 880 | A |
| $P_{tot}$ | Total Dissipation at $T_C$ = 25°C | 500 | W |
| | Derating Factor | 4 | W/°C |
| dv/dt (1) | Peak Diode Recovery voltage slope | 3.5 | V/ns |
| $V_{ISO}$ | Insulation Withstand Voltage (AC-RMS) | 2500 | V |
| $T_{stg}$ | Storage Temperature | -55 to 150 | °C |
| $T_j$ | Operating Junction Temperature | 150 | °C |

(•) Pulse width limited by safe operating area.

(1 ) $I_{SD}$ ≤220A, di/dt ≤200A/µs, $V_{DD} \le V_{(BR)DSS}$, $T_j \le T_{JMAX}$.

## THERMAL DATA

| | | | | |
|---|---|---|---|---|
| Rthj-case<br>Rthj-amb | Thermal Resistance Junction-case<br>Thermal Resistance Junction-ambient | Max<br>Max | 0.25<br>50 | °C/W<br>°C/W |

## AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|---|---|---|---|
| $I_{AR}$ | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_j$ max) | 220 | A |
| $E_{AS}$ | Single Pulse Avalanche Energy (starting $T_j$ = 25 °C, $I_D$ = $I_{AR}$, $V_{DD}$ = 64 V) | 800 | mJ |

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

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D$ = 1 mA $V_{GS}$ = 0 | 100 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_C$ = 125°C | | | 50<br>500 | µA<br>µA |
| $I_{GSS}$ | Gate-body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ± 20V | | | ±400 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ $I_D$ = 250 µA | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS}$ = 10 V $I_D$ = 125 A | | 0.0045 | 0.0055 | Ω |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ | Forward Transconductance | $V_{DS}$ = 20 V $I_D$ = 70 A | | 60 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 25V, f = 1 MHz, $V_{GS}$ = 0 | | 31<br>4.3<br>1.2 | | nF<br>nF<br>nF |

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD}$ = 50 V $I_D$ = 125 A<br>$R_G$ = 4.7 Ω $V_{GS}$ = 10 V<br>(Resistive Load, Figure 3) | | 110<br>380 | | ns<br>ns |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$= 50V $I_D$= 220A $V_{GS}$ = 10V | | 900<br>160<br>330 | | nC<br>nC<br>nC |

SWITCHING OFF

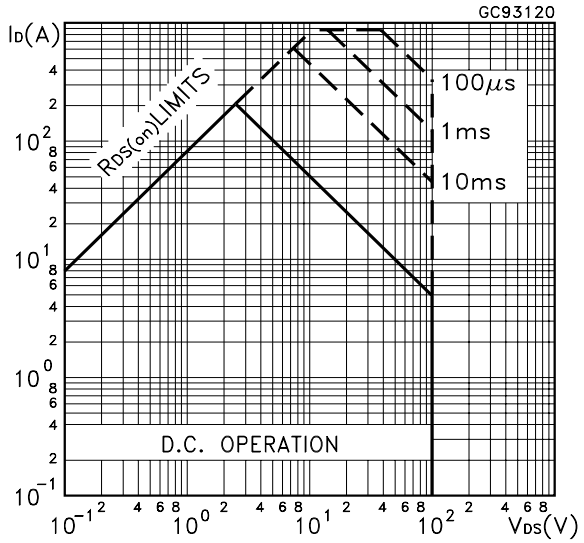
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(off)}$<br>$t_f$ | Turn-off Delay Time<br>Fall Time | $V_{DD}$ = 50 V $I_D$ = 125 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 10 V<br>(Resistive Load, Figure 3) | | 1100<br>330 | | ns<br>ns |
| $t_{r(Voff)}$<br>$t_f$<br>$t_c$ | Off-voltage Rise Time<br>Fall Time<br>Cross-over Time | $V_{clamp}$ = 80 V $I_D$ = 220 A<br>$R_G$ = 4.7Ω, $V_{GS}$ = 10 V<br>(Inductive Load, Figure 5) | | 950<br>330<br>600 | | ns<br>ns<br>ns |

SOURCE DRAIN DIODE

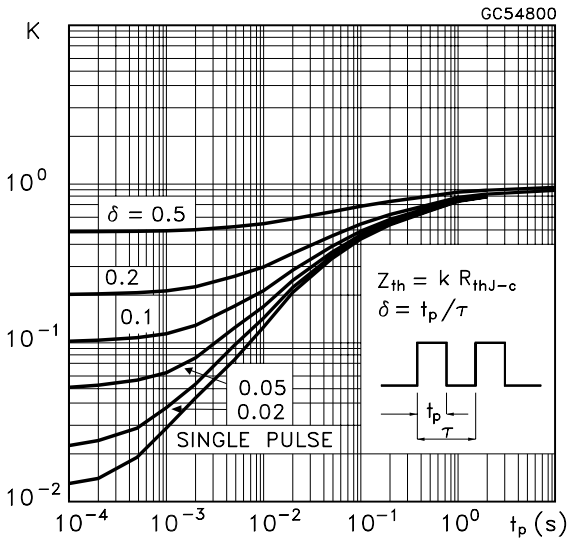
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ (•) | Source-drain Current<br>Source-drain Current (pulsed) | | | | 220<br>880 | A<br>A |
| $V_{SD}$ (*) | Forward On Voltage | $I_{SD}$ = 220 A $V_{GS}$ = 0 | | | 1.5 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD}$ = 220 A di/dt = 100A/µs<br>$V_{DD}$ = 30 V $T_j$ = 150°C<br>(see test circuit, Figure 5) | | 200<br>1.35<br>13.5 | | ns<br>µC<br>A |

(*)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
(•)Pulse width limited by safe operating area.

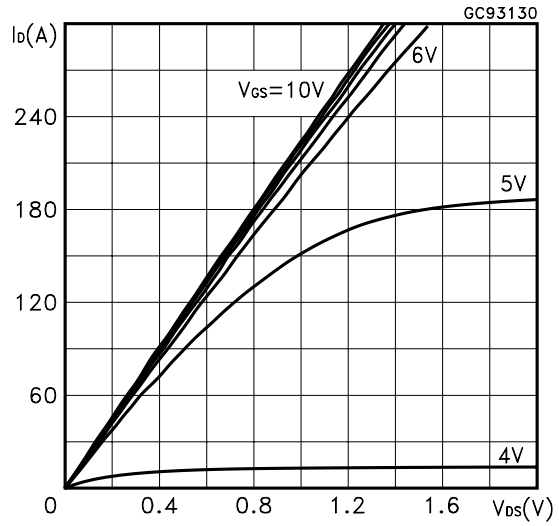
Safe Operating Area



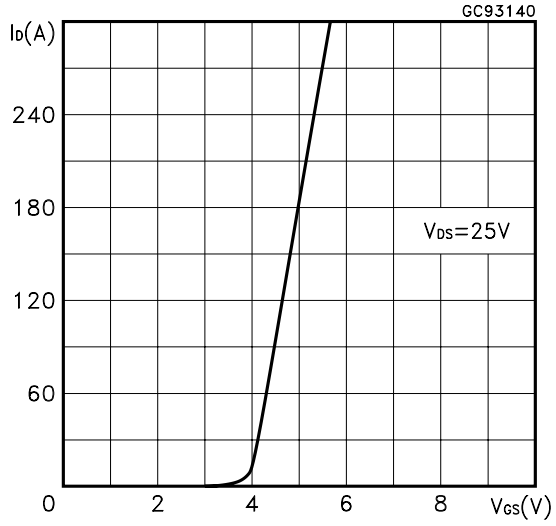

Thermal Impedance



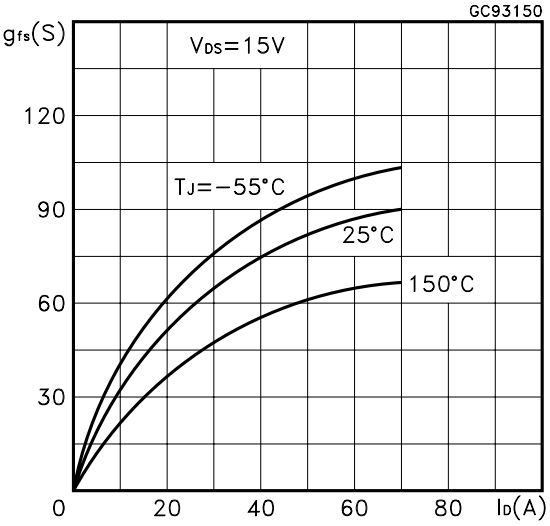
Output Characteristics



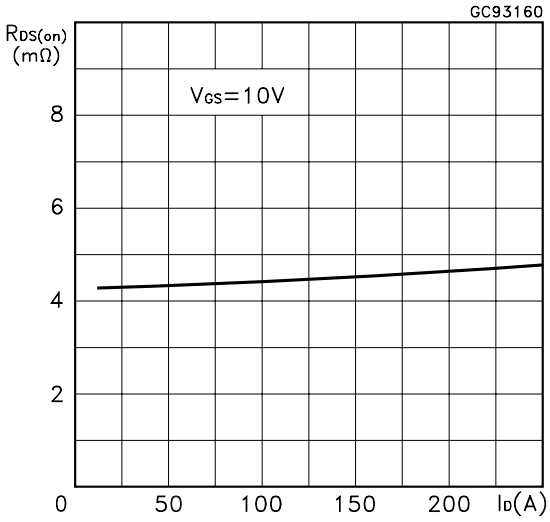

Transfer Characteristics



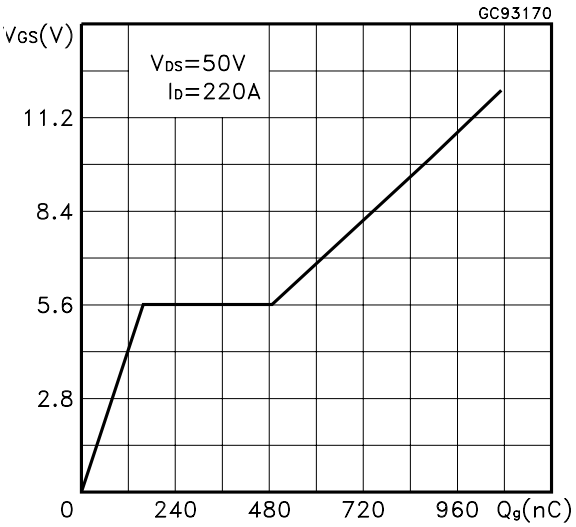

Transconductance



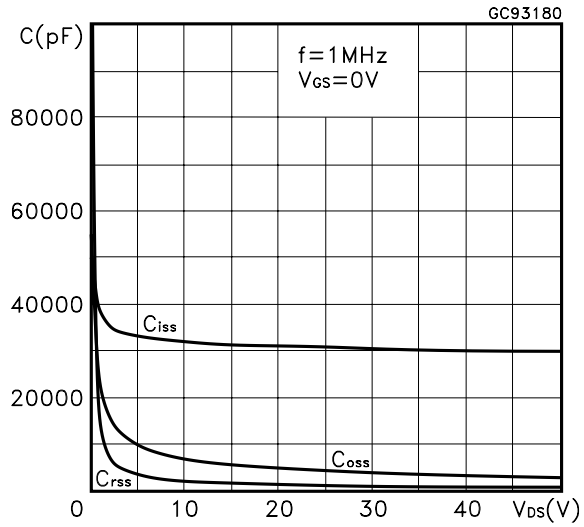

Static Drain-source On Resistance



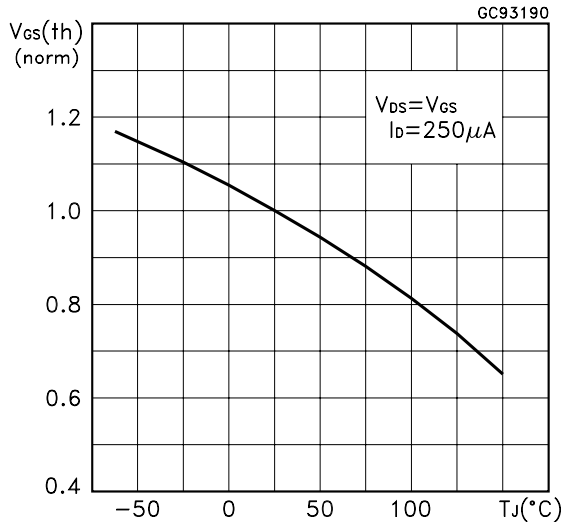

Gate Charge vs Gate-source Voltage



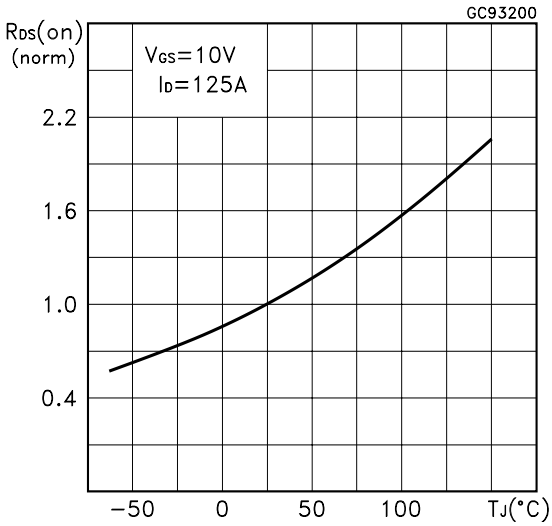

Capacitance Variations



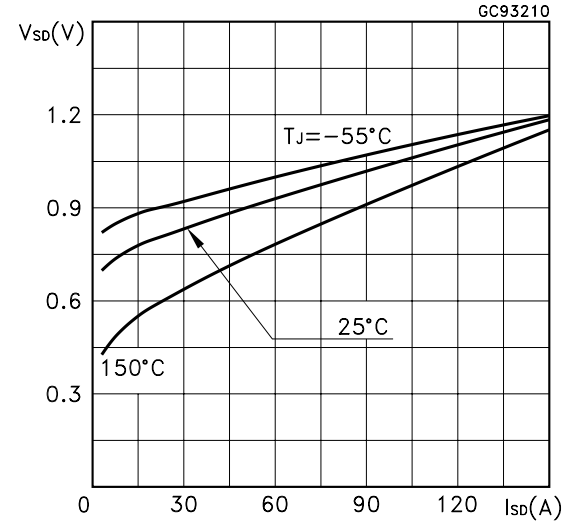
Normalized Gate Threshold Voltage vs Temperature




Normalized on Resistance vs Temperature




Source-drain Diode Forward Characteristics




Normalized Breakdown Voltage vs Temperature.

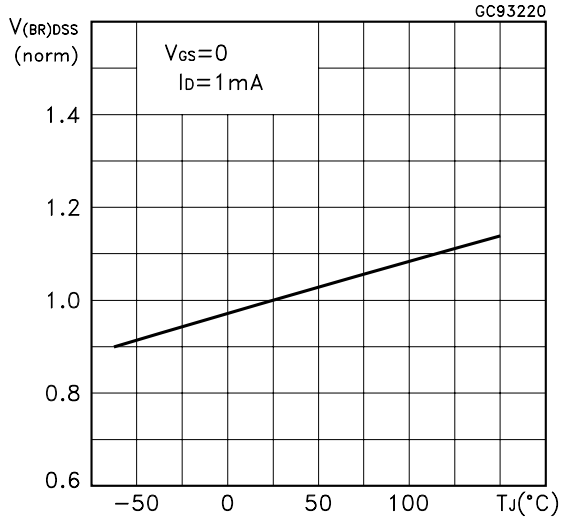



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**Fig. 1:** Unclamped Inductive Load Test Circuit

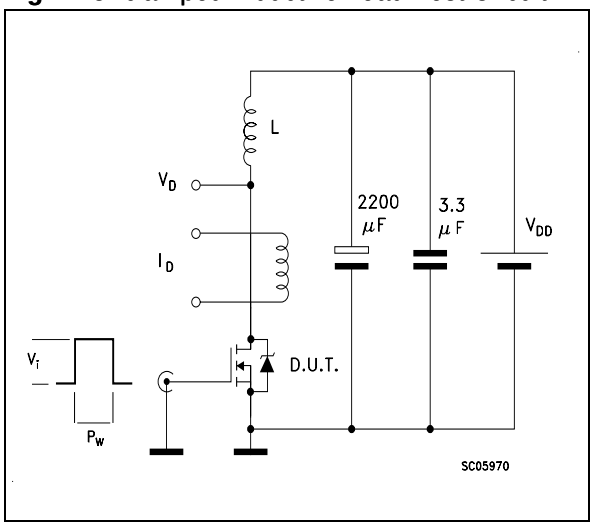



**Fig. 2:** Unclamped Inductive Waveform

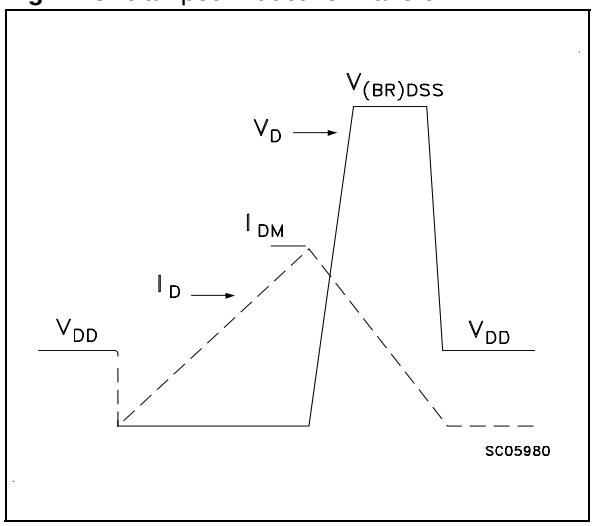



**Fig. 3:** Switching Times Test Circuits For Resistive Load

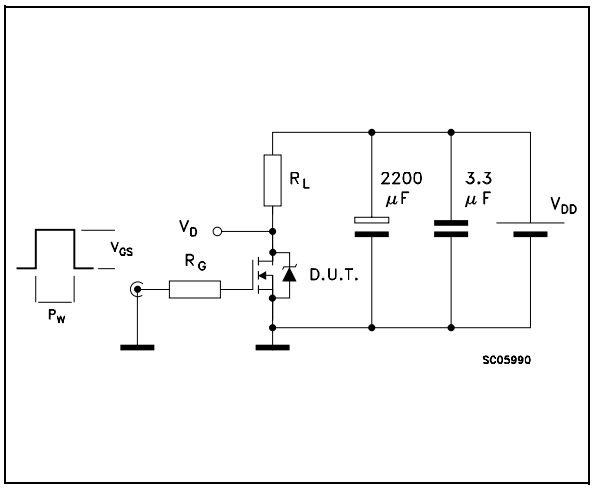



**Fig. 4:** Gate Charge test Circuit

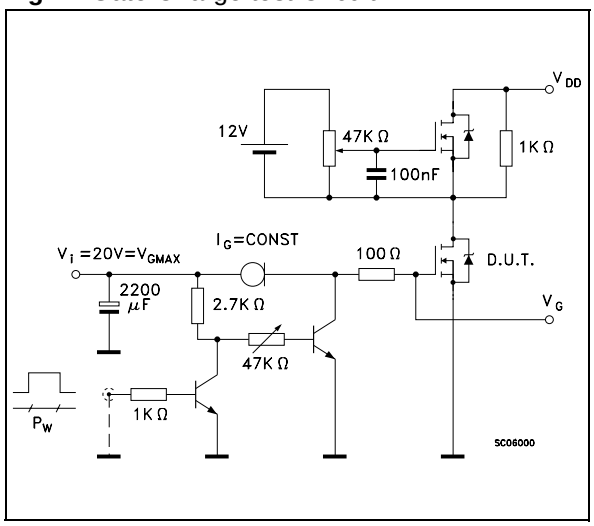
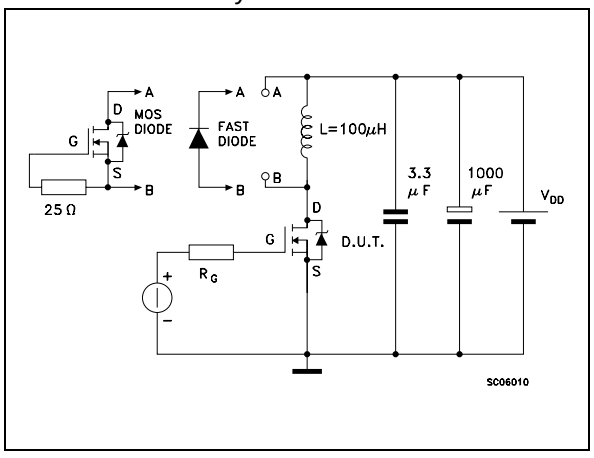
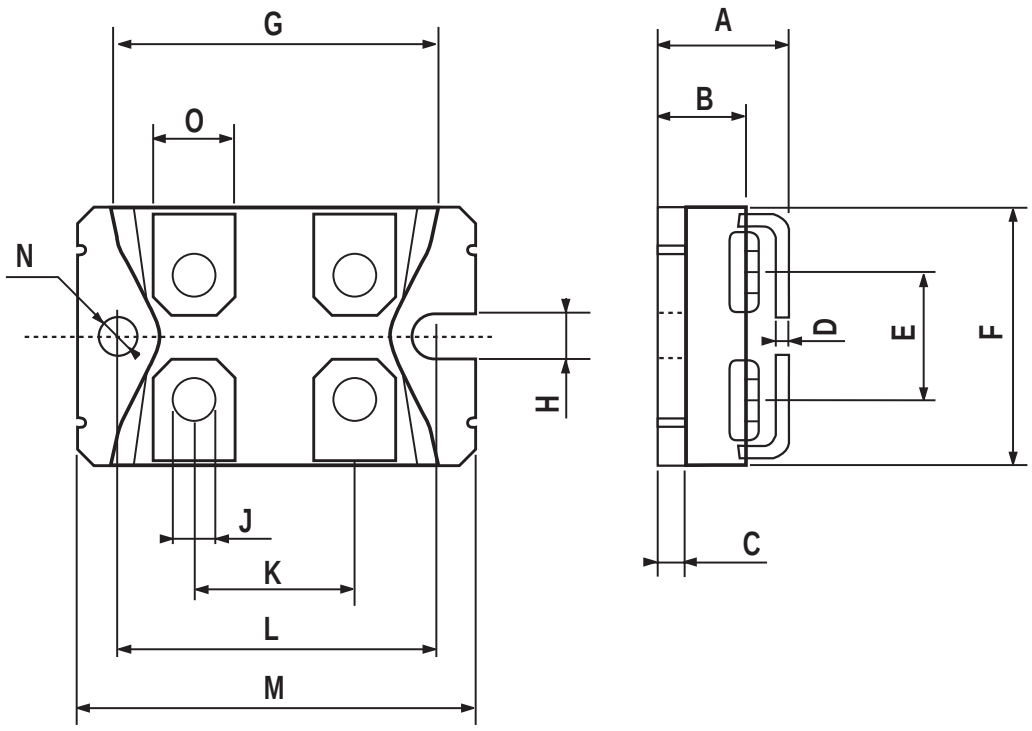



**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Recovery Times



## 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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