



STE180N10

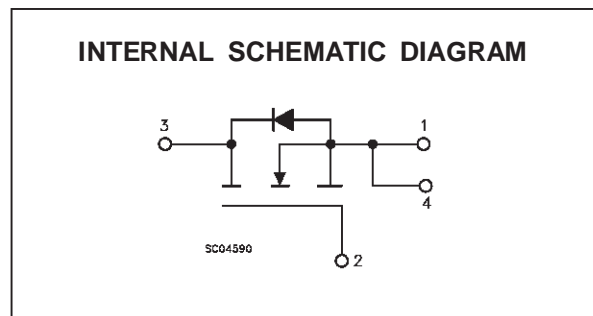
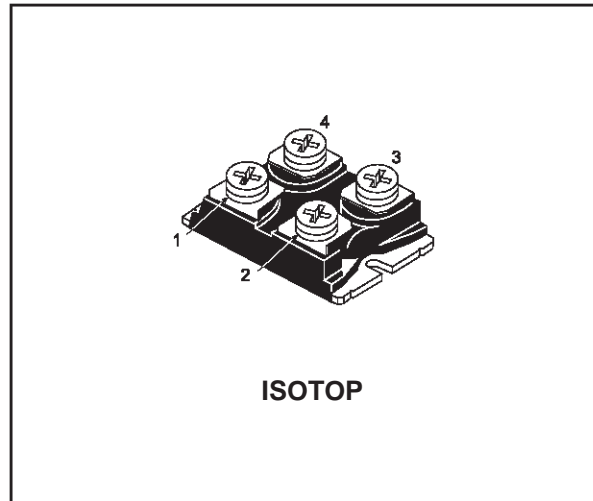
N - CHANNEL 100V - 5.5 mΩ - 180A - ISOTOP POWER MOSFET

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STE180N10 | 100 V | < 7 mΩ | 180 A |

- TYPICAL R_{DS(on)} = 5.5 mΩ
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

INDUSTRIAL APPLICATIONS:

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



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 (continuous) at T _c = 25 °C | 180 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 119 | A |
| I _{DM} (•) | Drain Current (pulsed) | 540 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 450 | W |
| | Derating Factor | 3.6 | W/°C |
| V _{ISO} | Insulation Withstand Voltage (AC-RMS) | 2500 | V |
| T _{stg} | Storage Temperature | -55 to 150 | °C |
| T _j | Max. Operating Junction Temperature | 150 | °C |

(•) Pulse width limited by safe operating area

(1) I_{SD} ≤ 180 A, di/dt ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STE180N10

THERMAL DATA

| | | | | |
|----------------|---|-----|------|-----------------------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | Max | 0.27 | $^{\circ}\text{C}/\text{W}$ |
| R_{thc-h} | Thermal Resistance Case-heatsink With conductive Grease Applied | Max | 0.05 | $^{\circ}\text{C}/\text{W}$ |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|----------|--|-----------|------|
| I_{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max) | 60 | A |
| E_{AS} | Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 25\text{ V}$) | 720 | mJ |

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

OFF

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

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|---|------|------|------|------------------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 250\ \mu\text{A}$ | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10\text{ V}$ $I_D = 90\text{ A}$ | | 5.5 | 7 | $\text{m}\Omega$ |
| $I_{D(on)}$ | On State Drain Current | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$ | 180 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|---|------|------|------|------|
| g_{fs} (*) | Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 90\text{ A}$ | 70 | | | S |
| C_{iss} | Input Capacitance | $V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$ | | 18 | | nF |
| C_{oss} | Output Capacitance | | | 4 | | nF |
| C_{rss} | Reverse Transfer Capacitance | | | 0.5 | | nF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD} = 50\text{ V}$ $I_D = 90\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3) | | 65 | | ns |
| t_r | Rise Time | | | 230 | | ns |
| Q_g | Total Gate Charge | $V_{DD} = 80\text{ V}$ $I_D = 180\text{ A}$ $V_{GS} = 10\text{ V}$ | | 485 | 680 | nC |
| Q_{gs} | Gate-Source Charge | | | 90 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 210 | | nC |

SWITCHING OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{d(off)}$ | Turn-off Delay Time | $V_{DD} = 50\text{ V}$ $I_D = 90\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3) | | 280 | | ns |
| t_f | Fall Time | | | 100 | | ns |
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 80\text{ V}$ $I_D = 180\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Inductive Load, see fig. 5) | | 100 | | ns |
| t_f | Fall Time | | | 170 | | ns |
| t_c | Cross-over Time | | | 260 | | ns |

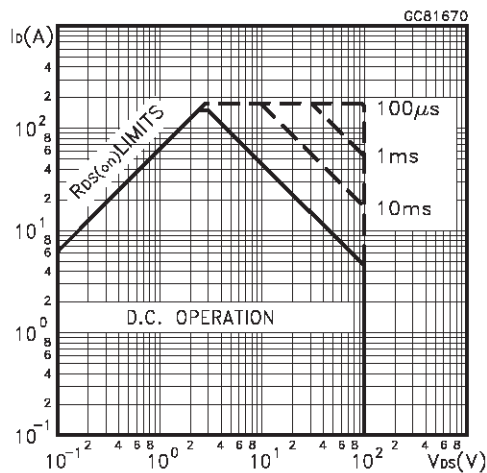
SOURCE DRAIN DIODE

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|--|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 180 | A |
| $I_{SDM}(\bullet)$ | Source-drain Current (pulsed) | | | | 540 | A |
| $V_{SD}(\ast)$ | Forward On Voltage | $I_{SD} = 180\text{ A}$ $V_{GS} = 0$ | | | 1.5 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 180\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5) | | 250 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 1875 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 15 | | A |

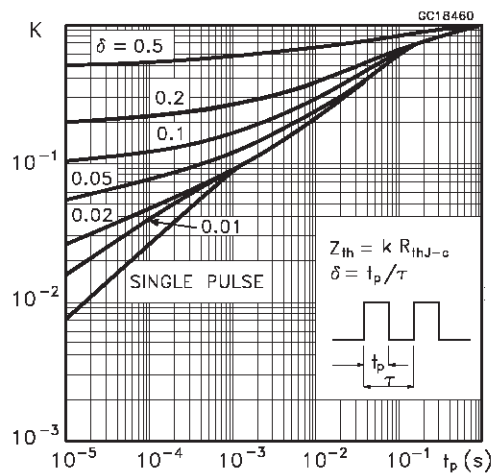
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

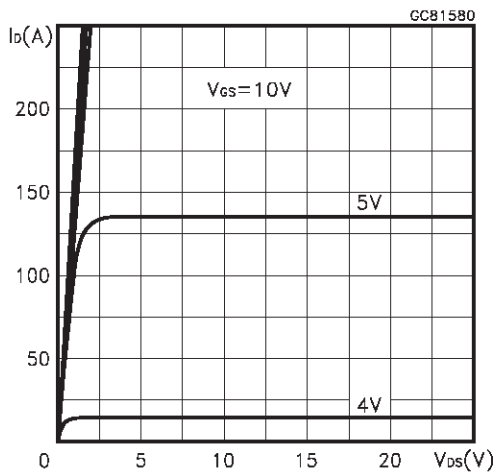
Safe Operating Area



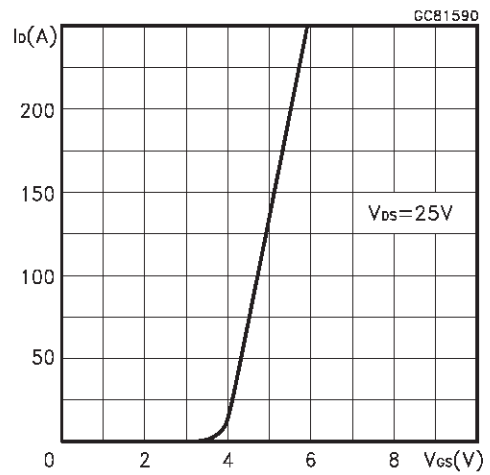
Thermal Impedance



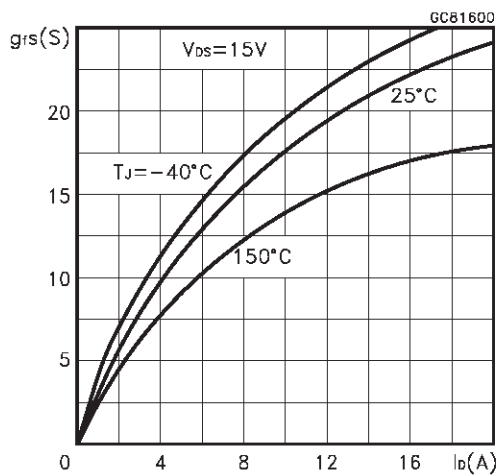
Output Characteristics



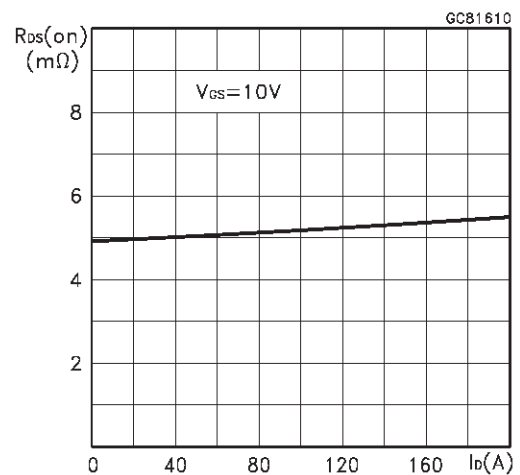
Transfer Characteristics



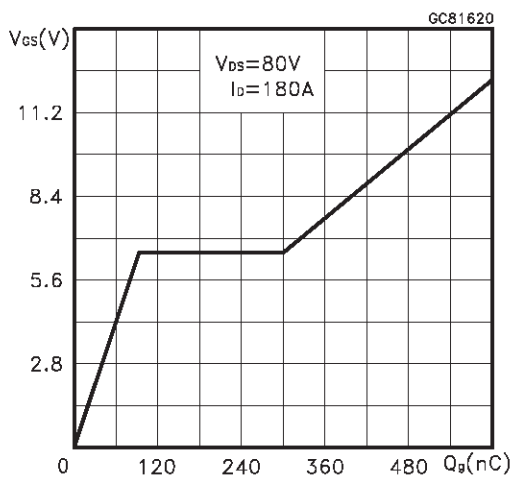
Transconductance



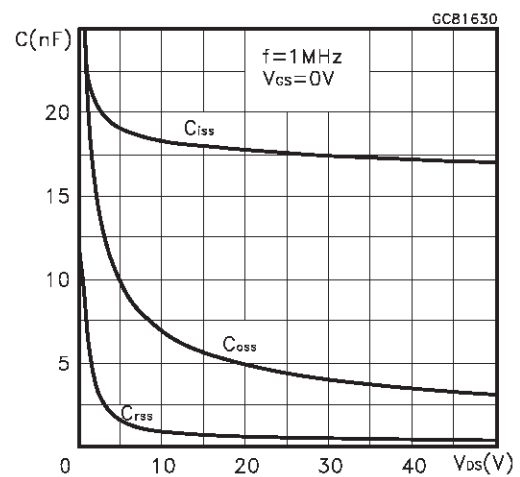
Static Drain-source On Resistance



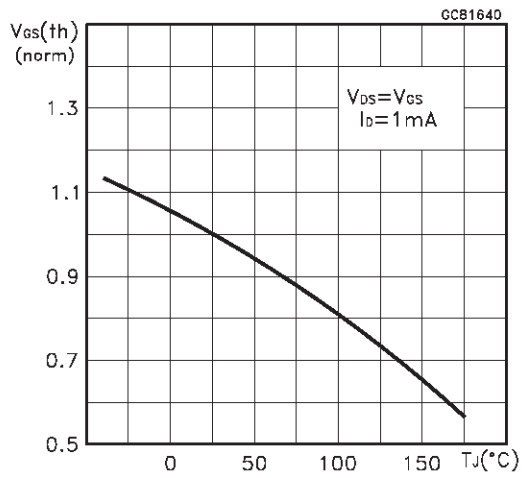
Gate Charge vs Gate-source Voltage



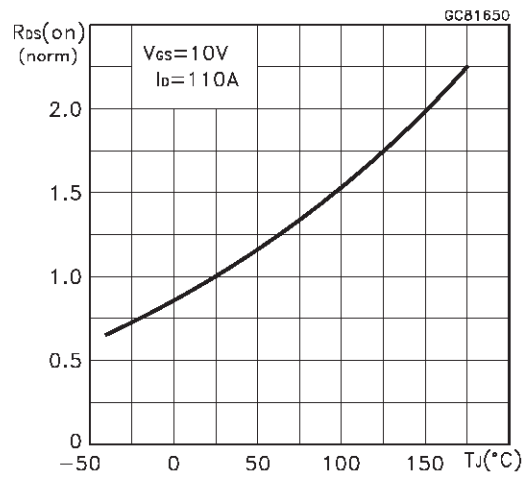
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

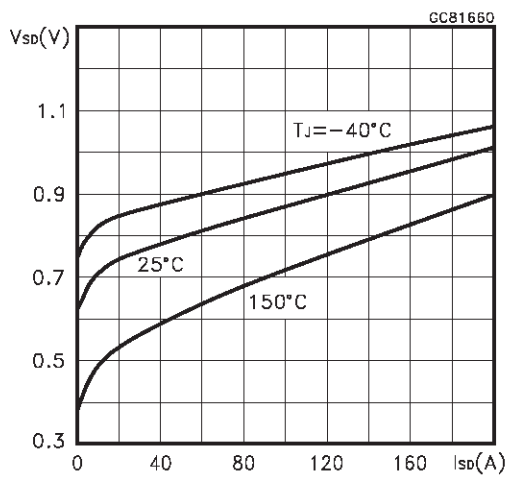


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

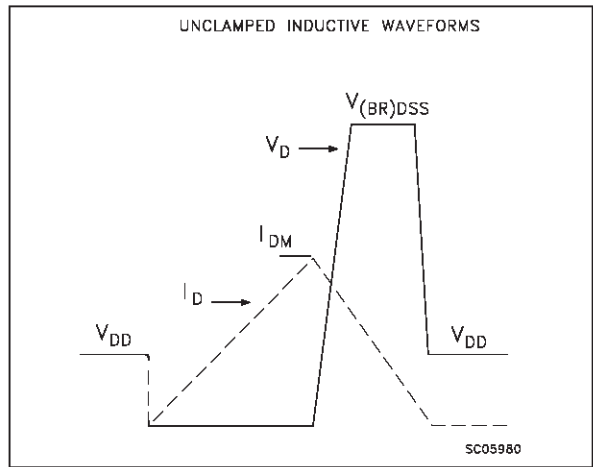


Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

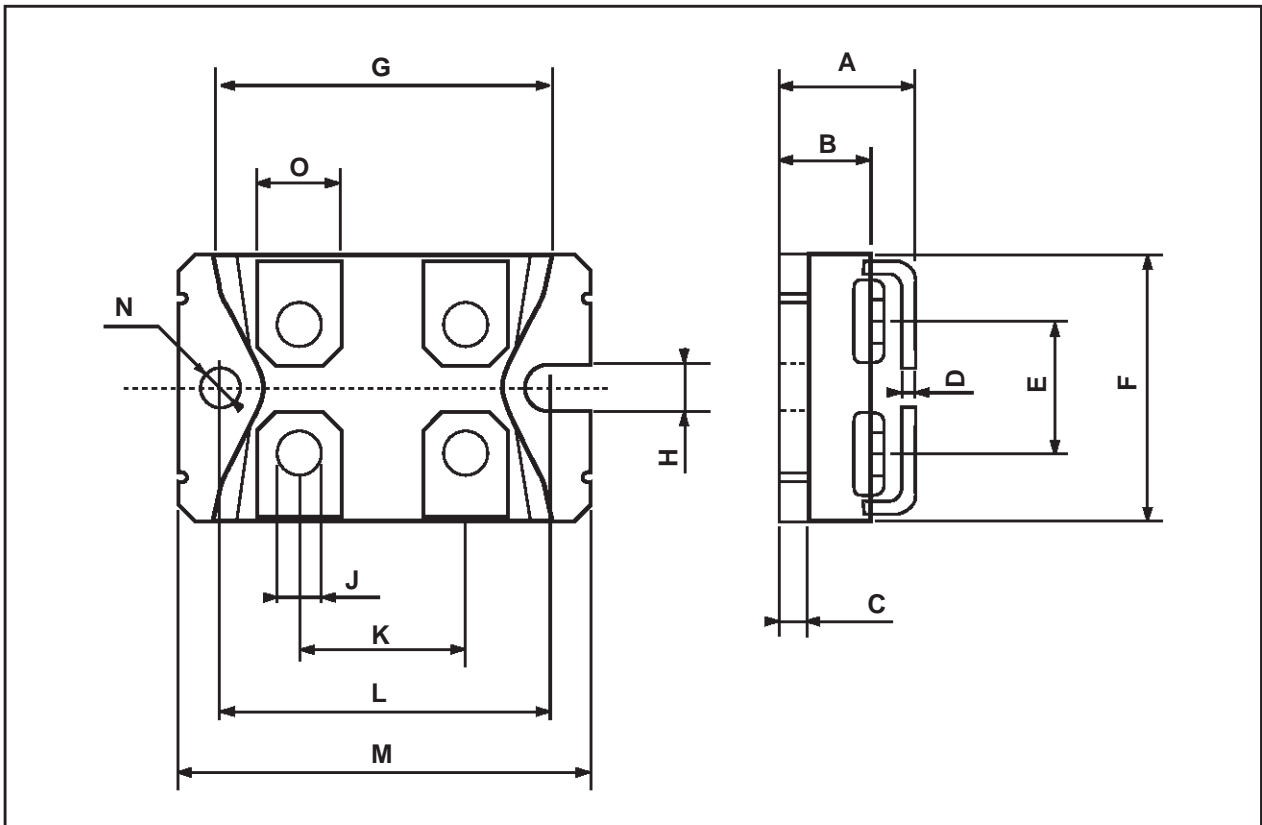


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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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