

STARPOWER

SEMICONDUCTOR

MOSFET

MD680SGN100C2S

Molding Type Module

100V/680A 1 in one-package

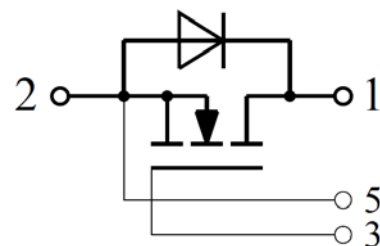
General Description

STARPOWER MOSFET Power Module provides very low $R_{DS(on)}$ as well as optimized intrinsic diode. It's designed for the applications such SMPS and DC drives.



Features

- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Low inductance case avoid oscillations
- Kelvin source terminals for easy drive
- Isolated copper baseplate using DBC technology



Equivalent Circuit Schematic

Typical Applications

- Main and auxiliary AC drives of electric vehicles
- DC servo and robot drives
- Battery vehicles
- UPS equipment
- Plasma cutting

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol | Description | MD680SGN100C2S | Units |
|-----------------|--|----------------|------------------|
| V_{DSS} | Drain-Source Voltage | 100 | V |
| V_{GSS} | Gate-Source Voltage | ± 30 | V |
| I_D | Drain Current @ $T_C=25^\circ\text{C}$ | 680 | A |
| | @ $T_C=80^\circ\text{C}$ | 480 | |
| I_F | Diode Forward Current | 680 | A |
| P_D | Maximum Power Dissipation @ $T_j=175^\circ\text{C}$ | 1630 | W |
| T_{jmax} | Maximum Junction Temperature | 175 | $^\circ\text{C}$ |
| T_{jop} | Operating Junction Temperature | -40 to +150 | $^\circ\text{C}$ |
| T_{STG} | Storage Temperature Range | -40 to +125 | $^\circ\text{C}$ |
| V_{ISO} | Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$ | 2500 | V |
| Mounting Torque | Power Terminal Screw:M4 | 1.1 to 2.0 | N.m |
| | Power Terminal Screw:M6 | 2.5 to 5.0 | |
| | Mounting Screw:M6 | 3.0 to 5.0 | |

Electrical Characteristics of MOSFET $T_C=25^\circ\text{C}$ unless otherwise noted**Off Characteristics**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---------------|--------------------------------|---|------|------|------|---------------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $T_j=25^\circ\text{C}$ | 100 | | | V |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=V_{DSS}$, $V_{GS}=0\text{V}$, $T_j=25^\circ\text{C}$ | | | 100 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=V_{GSS}$, $V_{DS}=0\text{V}$, $T_j=25^\circ\text{C}$ | | | 400 | nA |

On Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|--------------|-----------------------------------|---|------|------|------|------------------|
| $V_{GS(th)}$ | Gate-Source Threshold Voltage | $I_D=1.0\text{mA}$, $V_{DS}=V_{GS}$, $T_j=25^\circ\text{C}$ | 3.0 | | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $I_D=400\text{A}$, $V_{GS}=10\text{V}$, $T_j=25^\circ\text{C}$ | | | 2.25 | $\text{m}\Omega$ |
| g_{fs} | Forward Transconductance | $V_{DS}=50\text{V}$, $I_D=400\text{A}$ | 208 | | | S |

Switching Characteristics

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|---------------|--|--|------|------|------|------------|
| R_{Gint} | Internal Gate Resistance | | | 0.68 | | Ω |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}=50V, I_D=400A,$ $R_G=0.26\Omega, V_{GS}=\pm 10V,$ $T_j=25^\circ C$ | | 25 | | ns |
| t_r | Rise Time | | | 270 | | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 45 | | ns |
| t_f | Fall Time | | | 140 | | ns |
| Q_g | Total Gate Charge | $I_D=400A, V_{DS}=80V,$ $V_{GS}=10V$ | | 1040 | | nC |
| Q_{gs} | Gate-Source Charge | | | 196 | | nC |
| Q_{gd} | Gate-Drain ("Miller") Charge | | | 640 | | nC |
| C_{iss} | Input Capacitance | $V_{GS}=0V, V_{DS}=25V,$ $f=1.0MHz$ | | 27.2 | | nF |
| C_{oss} | Output Capacitance | | | 9.88 | | nF |
| C_{rss} | Reverse Transfer Capacitance | | | 3.96 | | nF |
| L_{CE} | Stray Inductance | | | | 20 | nH |
| $R_{CC'+EE'}$ | Module Lead Resistance, Terminal to Chip | $T_C=25^\circ C$ | | 0.35 | | m Ω |

Electrical Characteristics of Inverse Diode $T_C=25^\circ C$ unless otherwise

noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Units |
|----------|-------------------------------|--|------|------|------|-------|
| V_{SD} | Diode Forward Voltage | $I_F=400A, V_{GS}=0V, T_j=25^\circ C$ | | | 1.30 | V |
| t_{rr} | Diode Reverse Recovery Time | $V_R=50V, I_F=400A,$ $di/dt=400A/\mu s, T_j=25^\circ C$ | | 220 | | ns |
| Q_{rr} | Diode Reverse Recovery Charge | | | | 6.56 | |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------|--|-------|-------|-------|
| $R_{\theta JC}$ | Junction-to-Case (per MOSFET) | | 0.092 | K/W |
| $R_{\theta CS}$ | Case-to-Sink (Conductive grease applied) | 0.035 | | K/W |
| Weight | Weight of Module | 300 | | g |

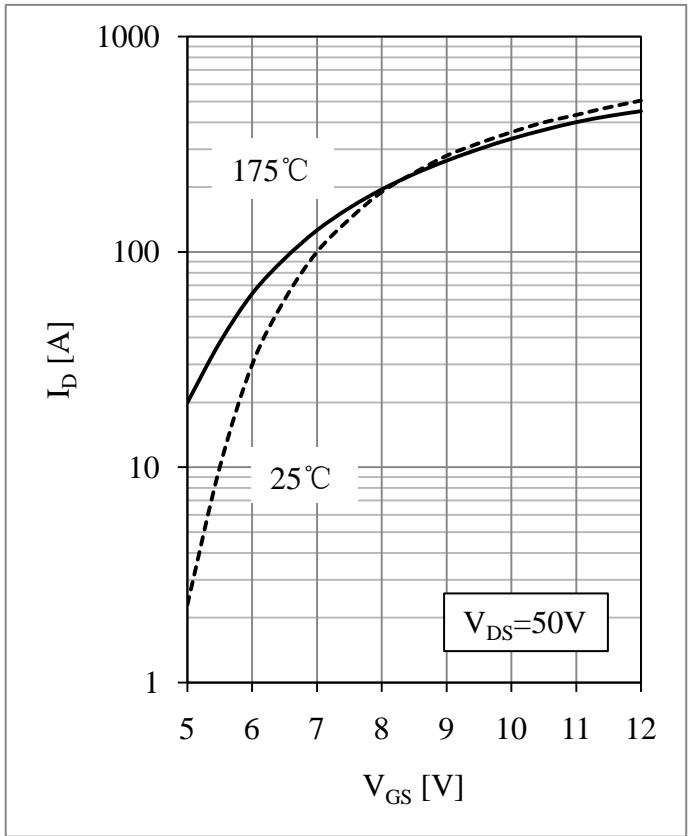
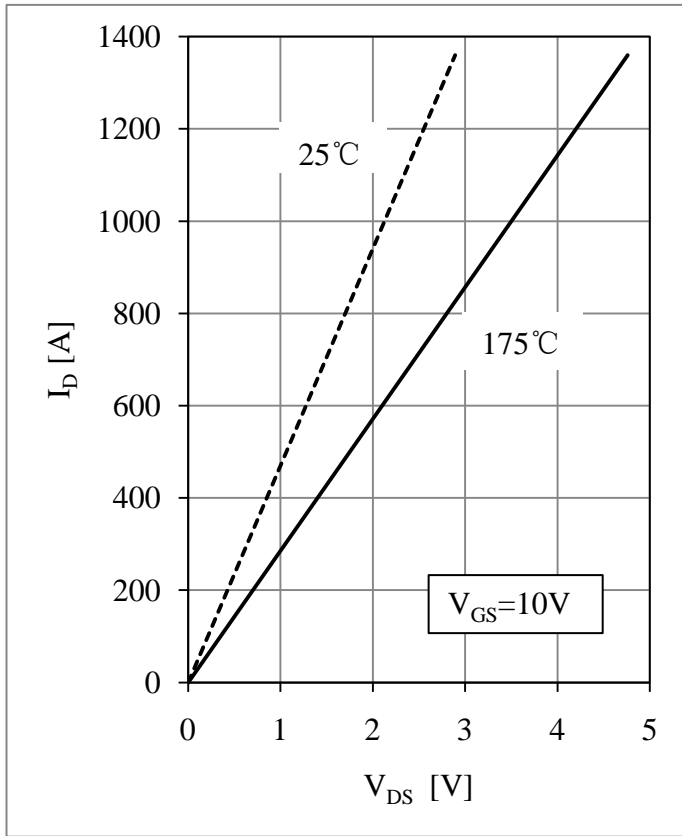


Fig 1. Mosfet Output Characteristic

Fig 2. Mosfet Transfer Characteristic

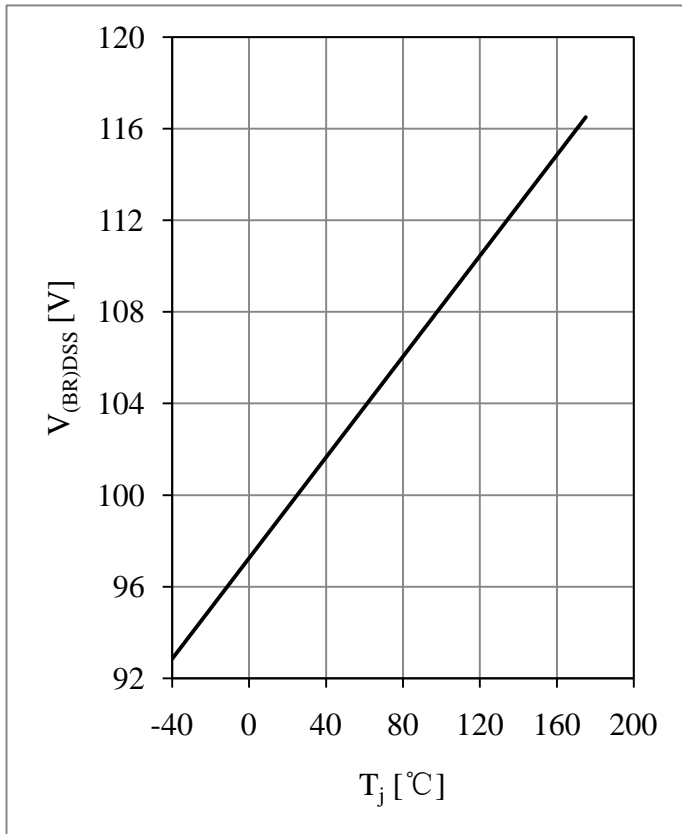


Fig 3. Brakedown Voltage vs. Temperature

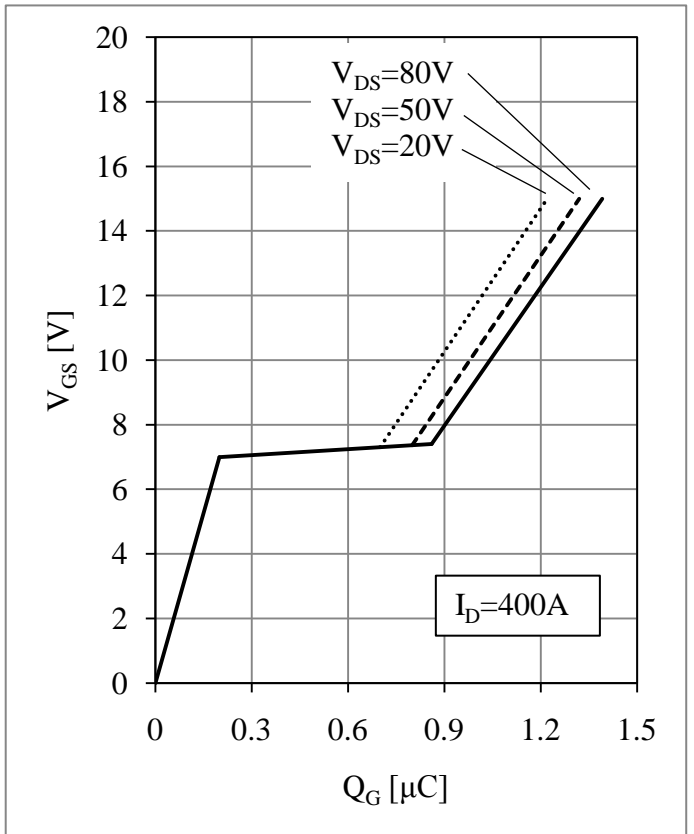


Fig 4. Gate Charge Characteristic

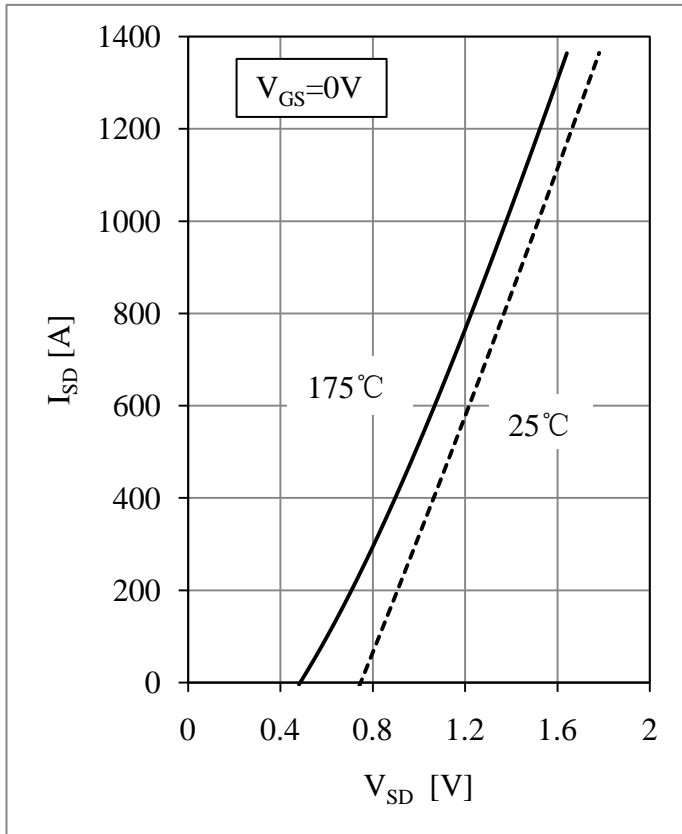


Fig 5. Inverse Diode Output Characteristic

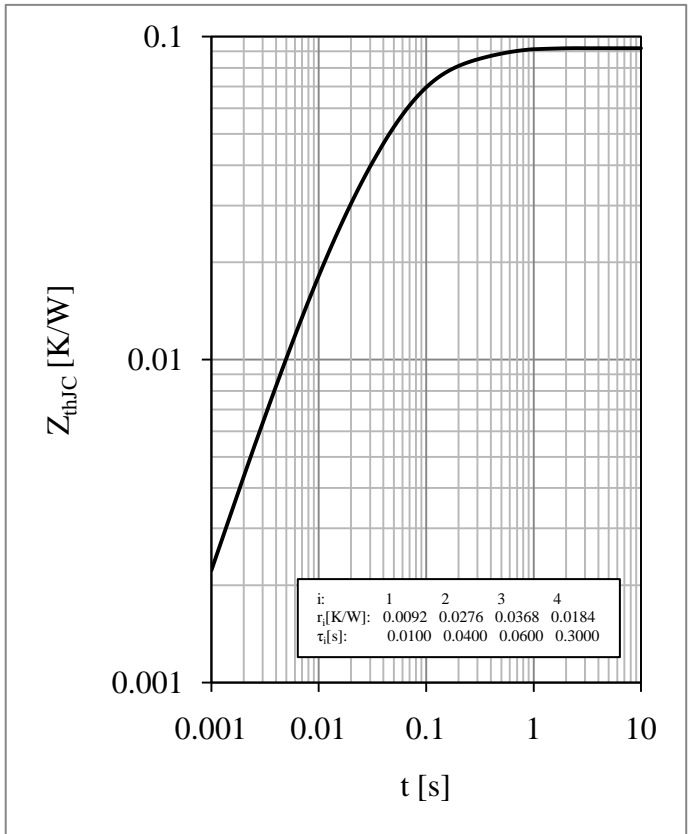
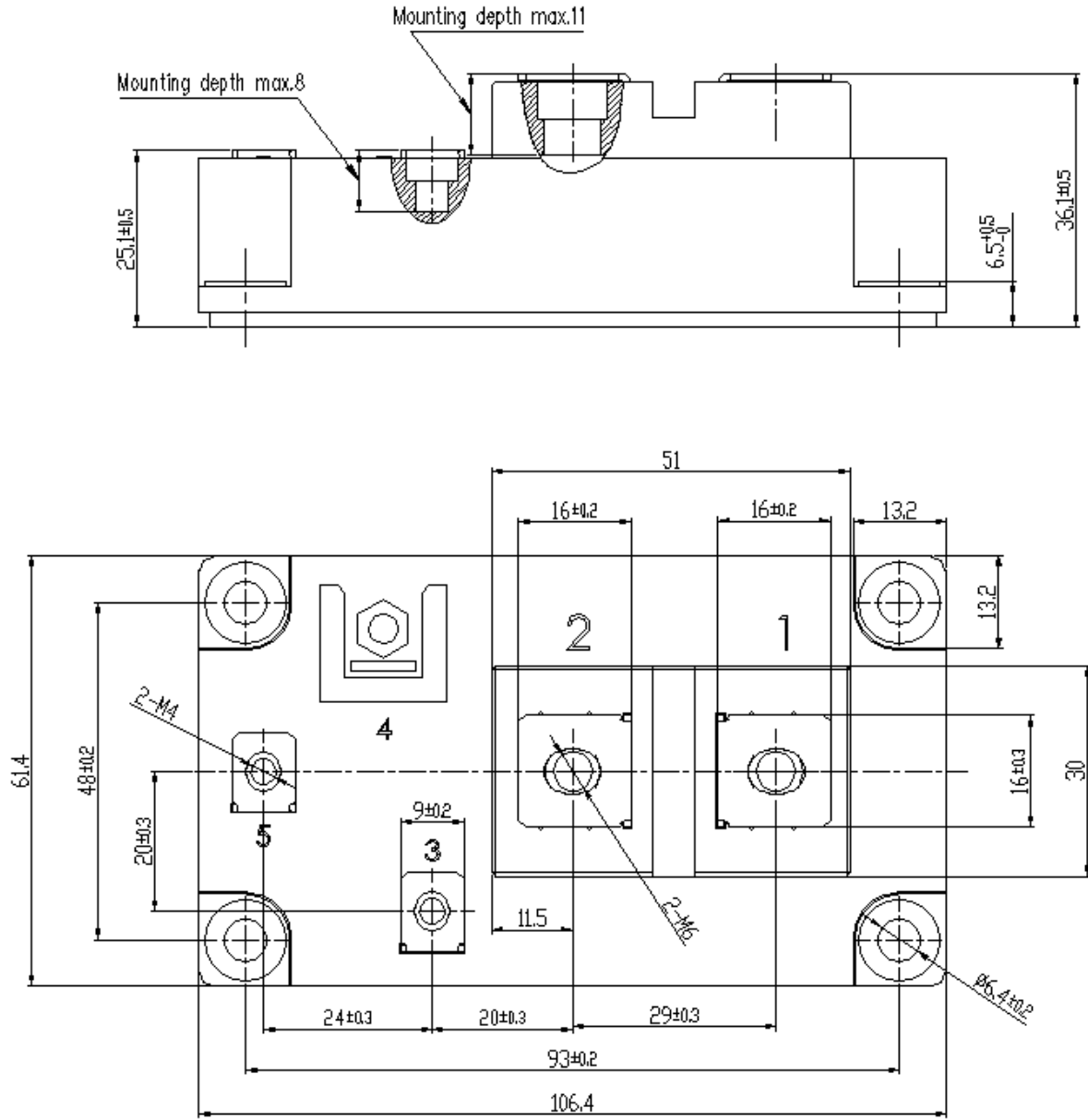


Fig 6. Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



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