

STARPOWER

SEMICONDUCTOR

MOSFET

MD680SGN100B3S

Molding Type Module

100V/680A 1 in one-package

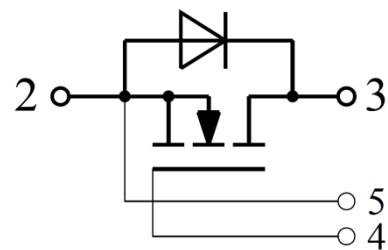
General Description

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	MD680SGN100B3S	Units
V_{DSS}	Drain-Source Voltage	100	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current @ $T_C=25^\circ\text{C}$ @ $T_C=80^\circ\text{C}$	680	A
		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:M5 Mounting Screw:M6	2.5 to 5.0 3.0 to 5.0	N.m

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

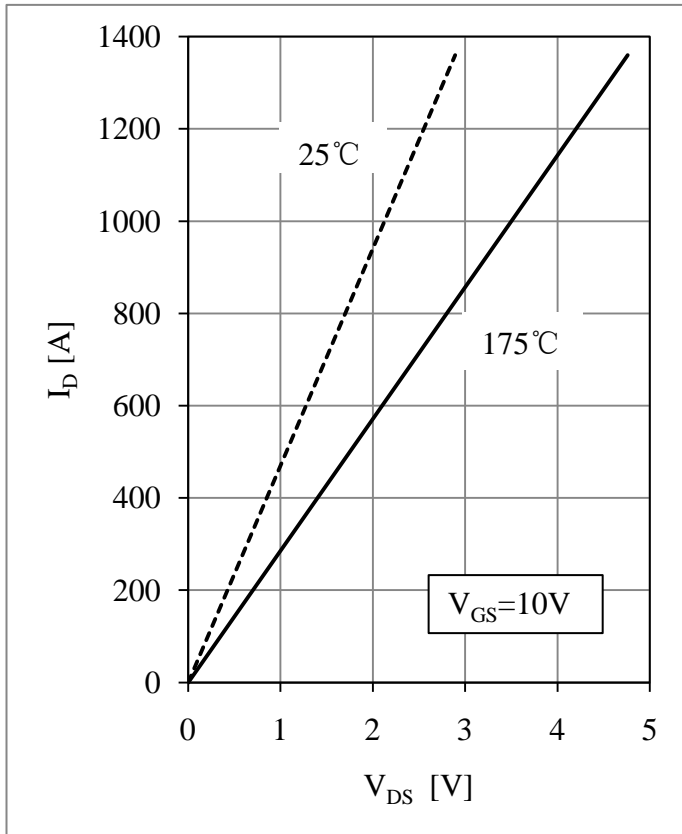


Fig 1. Mosfet Output Characteristic

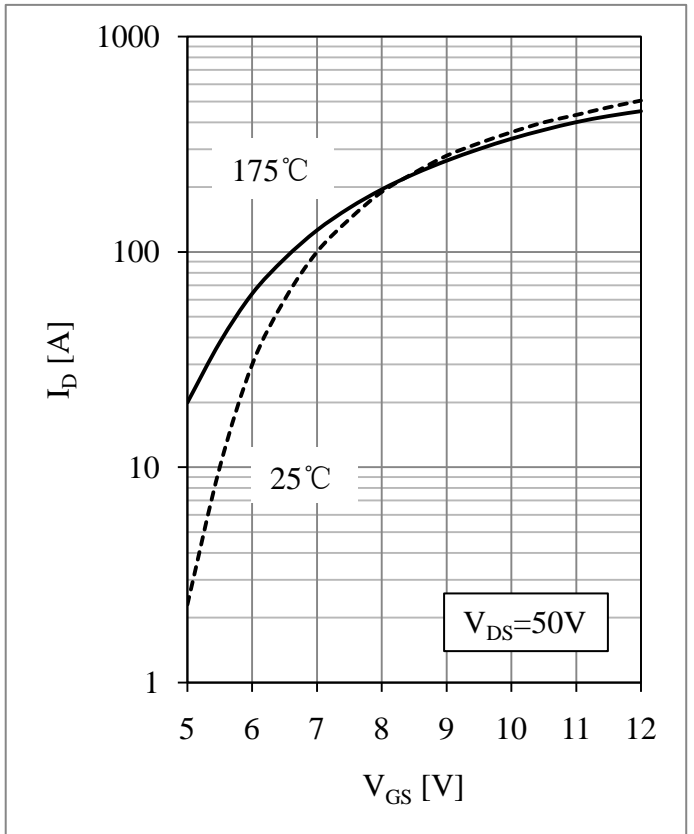


Fig 2. Mosfet Transfer Characteristic

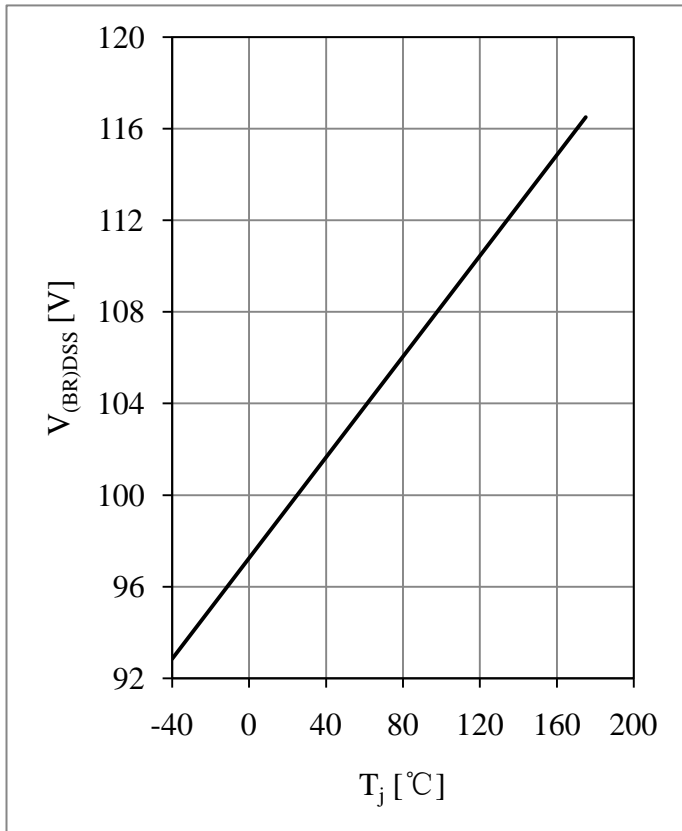


Fig 3. Brakedown Voltage vs. Temperature

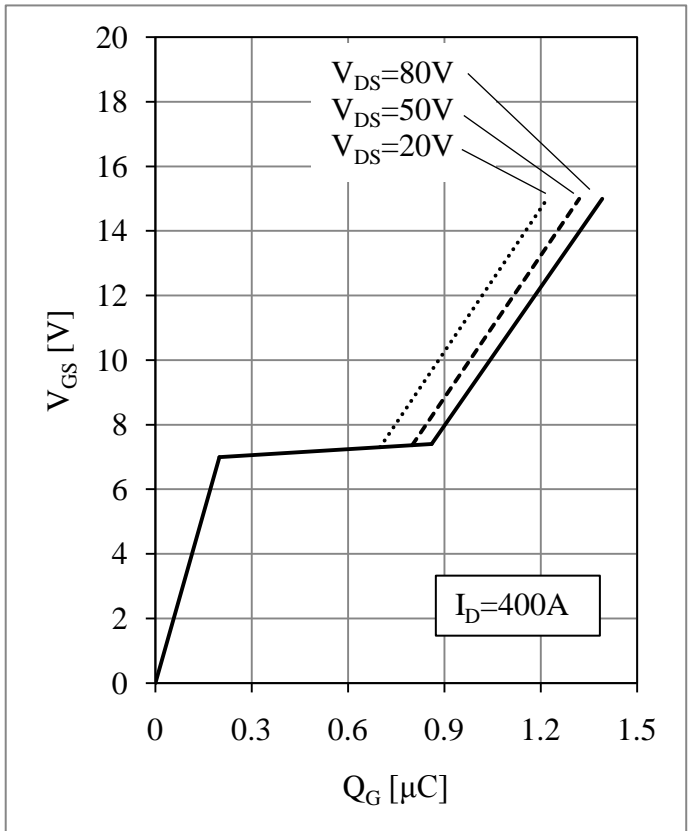


Fig 4. Gate Charge Characteristic

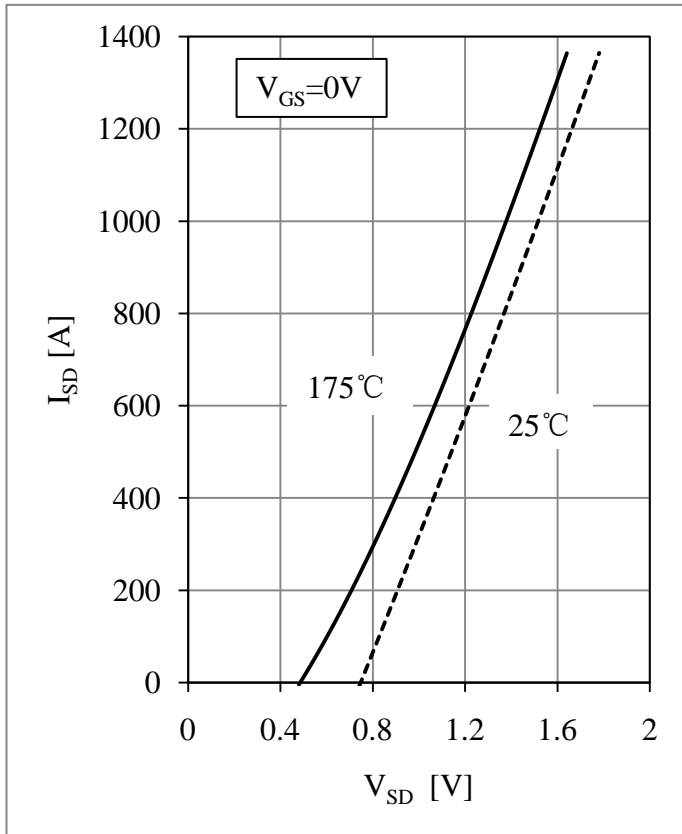


Fig 5. Inverse Diode Output Characteristic

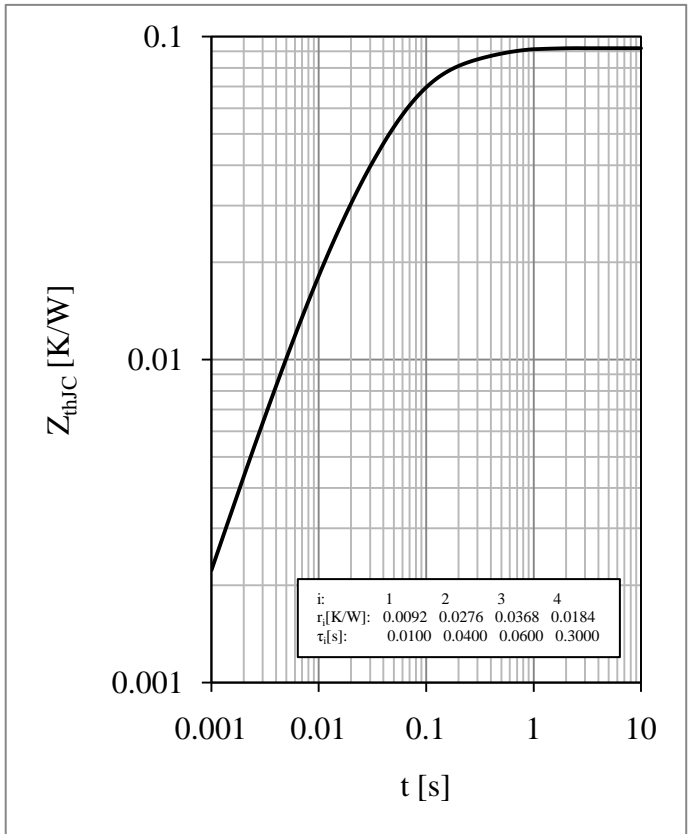
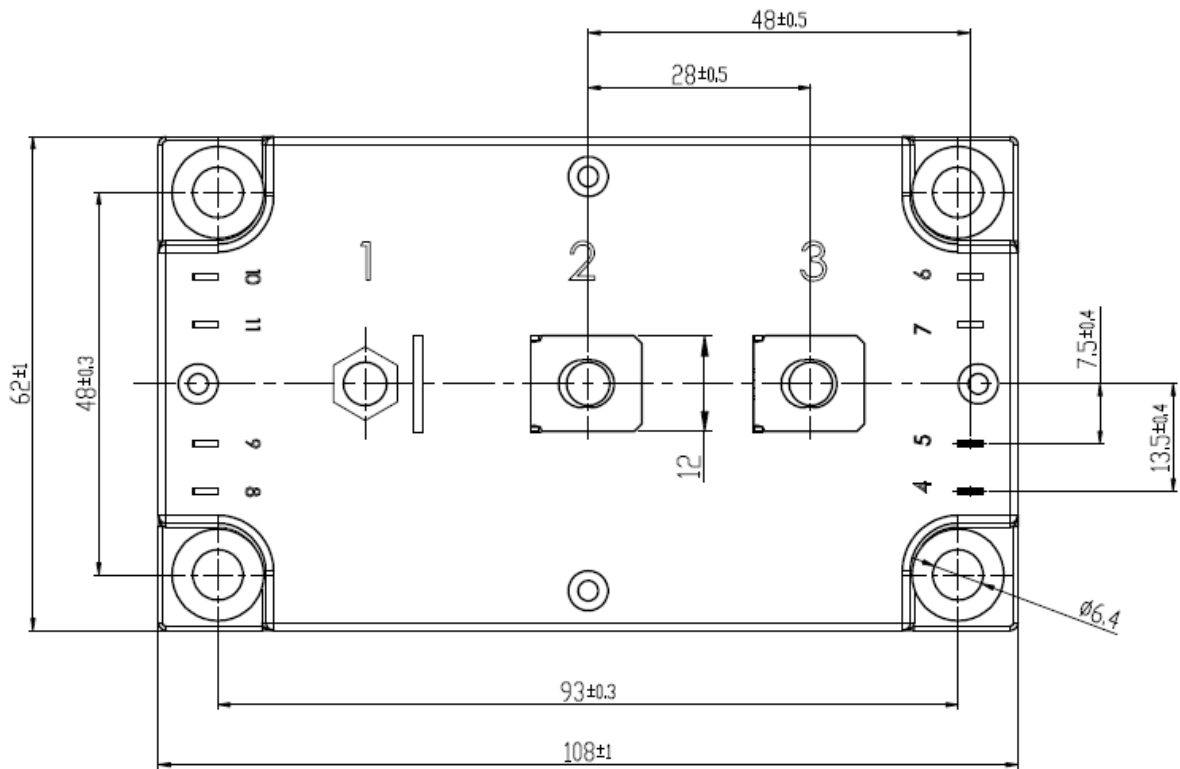
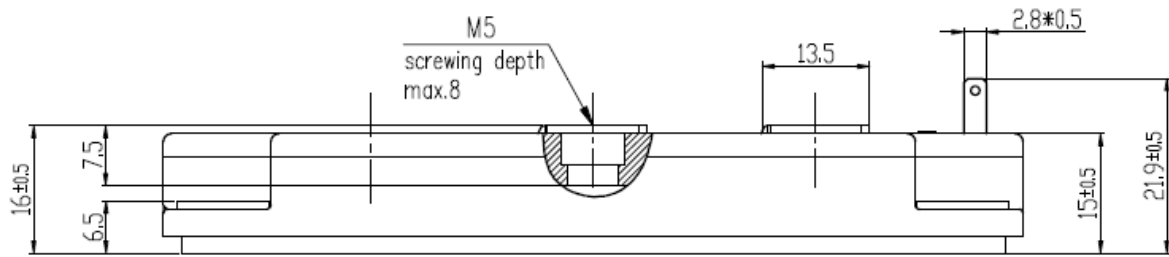


Fig 6. Transient Thermal Impedance

Package Dimensions

Dimensions in Millimeters



Terms and Conditions of Usage

The data contained in this product datasheet is exclusively intended for technically trained staff. you and your technical departments will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to such application.

This product data sheet is describing the characteristics of this product for which a warranty is granted. Any such warranty is granted exclusively pursuant the terms and conditions of the supply agreement. There will be no guarantee of any kind for the product and its characteristics.

Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of our product, please contact the sales office, which is responsible for you (see www.powersemi.cc), For those that are specifically interested we may provide application notes.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the Product in aviation applications, in health or live endangering or life support applications, please notify.

If and to the extent necessary, please forward equivalent notices to your customers.
Changes of this product data sheet are reserved.