

STARPOWER

SEMICONDUCTOR

MOSFET

MD680FFN100B7S

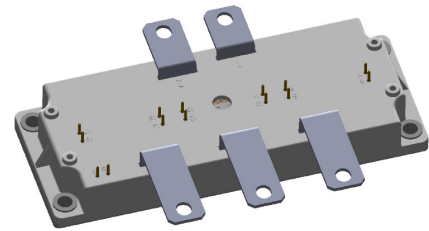
100V/680A 6 in one-package

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

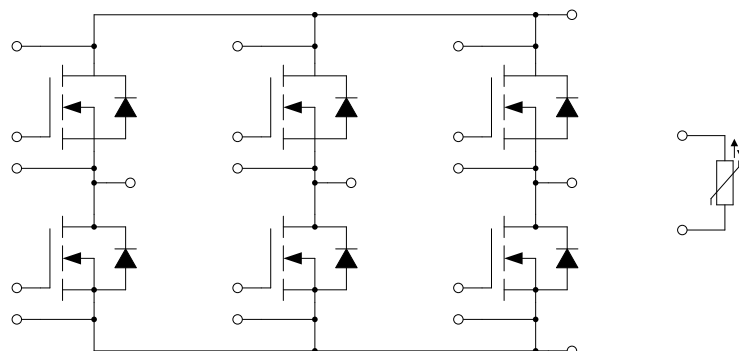
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Low inductance case avoid oscillations
- Kelvin source terminals for easy drive
- Isolated copper baseplate using DBC technology



Typical Applications

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

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	100	V
V_{GSS}	Gate-Source Voltage	± 30	V
I_D	Drain Current	680	A
I_{DM}	Pulsed Drain Current	2680	A
P_D	Maximum Power Dissipation @ $T_j=175^{\circ}\text{C}$	1546	W

Inverse Diode

Symbol	Description	Value	Unit
I_S	Source Current	680	A
I_{SM}	Pulsed Source Current	2680	A

Module

Symbol	Description	Value	Unit
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
M	Terminal Connection Torque, Screw M5 Mounting Torque, Screw M5	2.5 to 5.0 3.0 to 5.0	N.m

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=400\text{A}, V_{GS}=10\text{V}, T_j=25^\circ\text{C}$			2.25	m Ω
$V_{GS(th)}$	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
g_{fs}	Forward Transconductance	$V_{DS}=50\text{V}, I_D=400\text{A}$	208			S
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
R_{Gint}	Internal Gate Resistance			0.68		Ω
C_{iss}	Input Capacitance			27.2		nF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}, V_{DS}=25\text{V}, f=1.0\text{MHz}$		9.88		nF
C_{rss}	Reverse Transfer Capacitance			3.96		nF
Q_g	Total Gate Charge			1040		nC
Q_{gs}	Gate-Source Charge	$I_D=400\text{A}, V_{DS}=80\text{V}, V_{GS}=10\text{V}$		196		nC
Q_{gd}	Gate-Drain ("Miller") Charge			640		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=50\text{V}, I_D=400\text{A}, R_G=0.26\Omega, V_{GS}=10\text{V}, T_j=25^\circ\text{C}$		25		ns
t_r	Rise Time			270		ns
$t_{d(off)}$	Turn-Off Delay Time			45		ns
t_f	Fall Time			140		ns

Inverse Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

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

NTC Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		k Ω
$\Delta R/R$	Deviation of R_{100}	$T_C=100^\circ\text{C}, R_{100}=493.3\Omega$	-5		5	%
P_{25}	Power Dissipation				20.0	mW
$B_{25/50}$	B-value	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3375		K

Module Characteristics $T_c=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
$R_{\theta JC}$	Junction-to-Case(Mosfet)			0.097	K/W
$R_{\theta CS}$	Case-to-Sink(Mosfet)		0.048		K/W
$R_{\theta CS}$	Case-to-Sink		0.008		K/W
G	Weight of Module		360		g

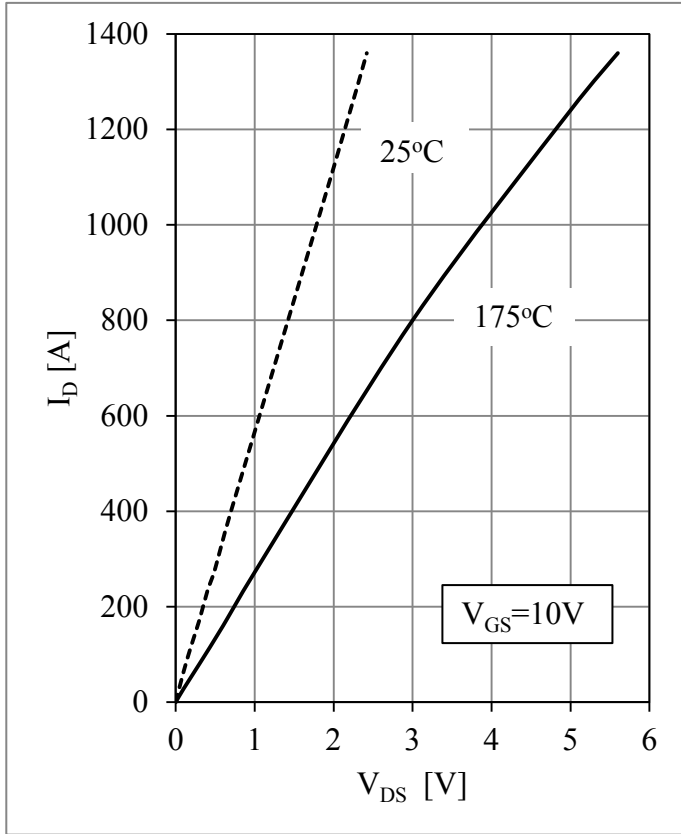


Fig 1. Mosfet Output Characteristics

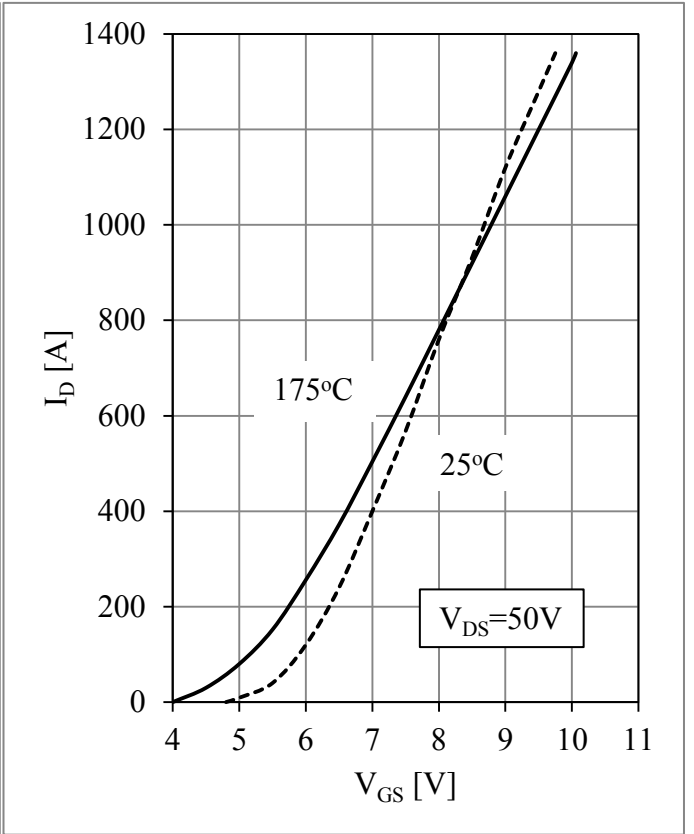


Fig 2. Mosfet Transfer Characteristics

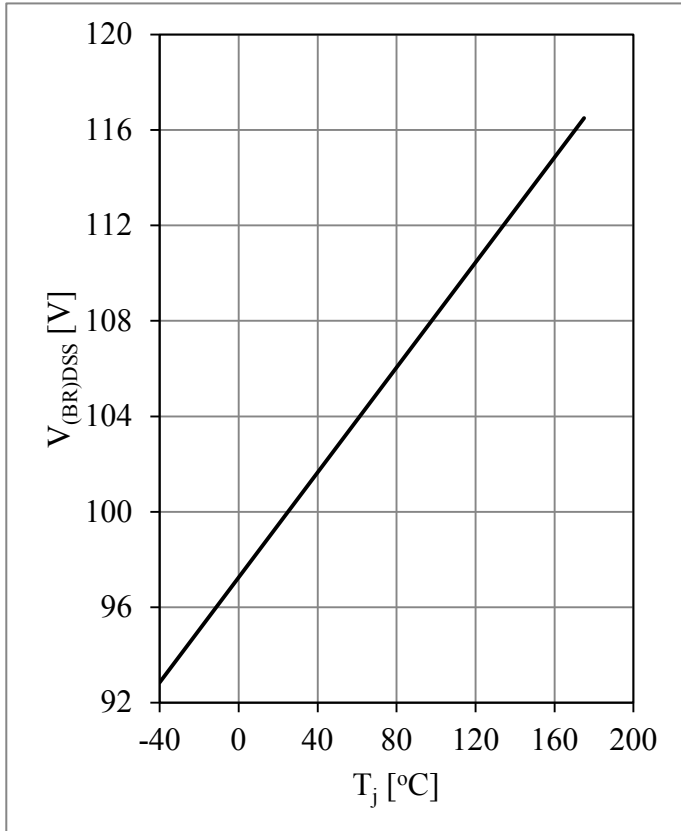


Fig 3. Brakedown Voltage vs. Temperature

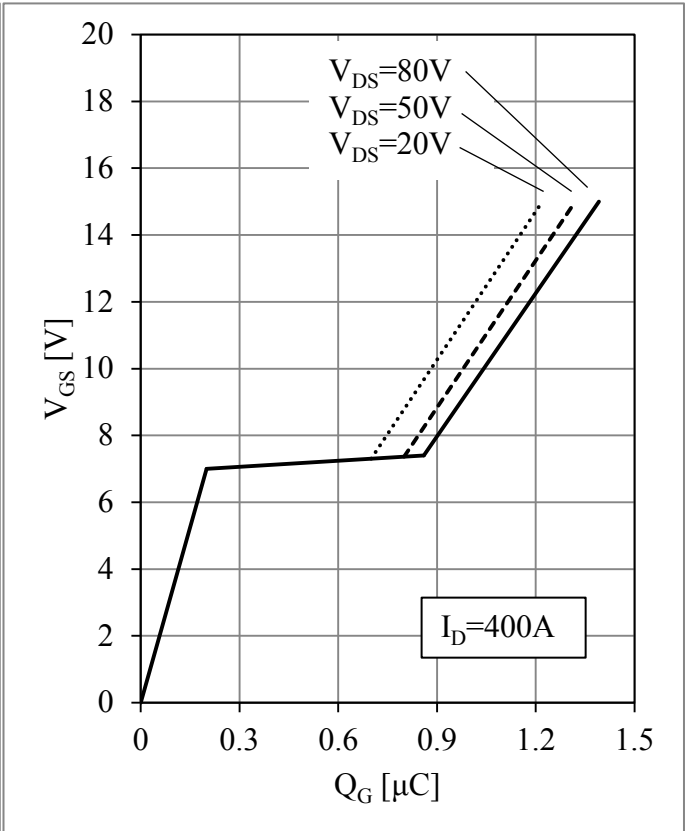


Fig 4. Gate Charge Characteristics

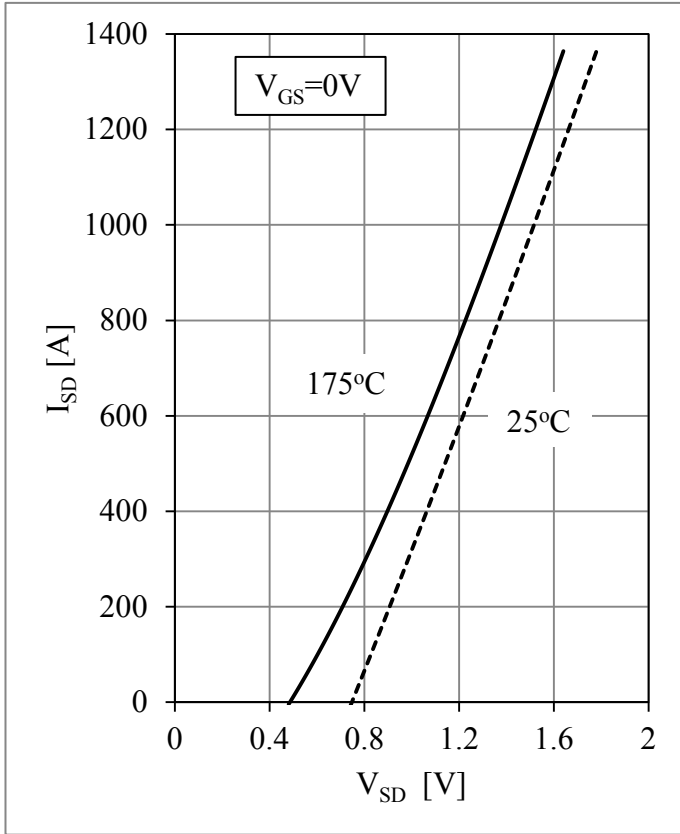


Fig 5. Inverse Diode Output Characteristics

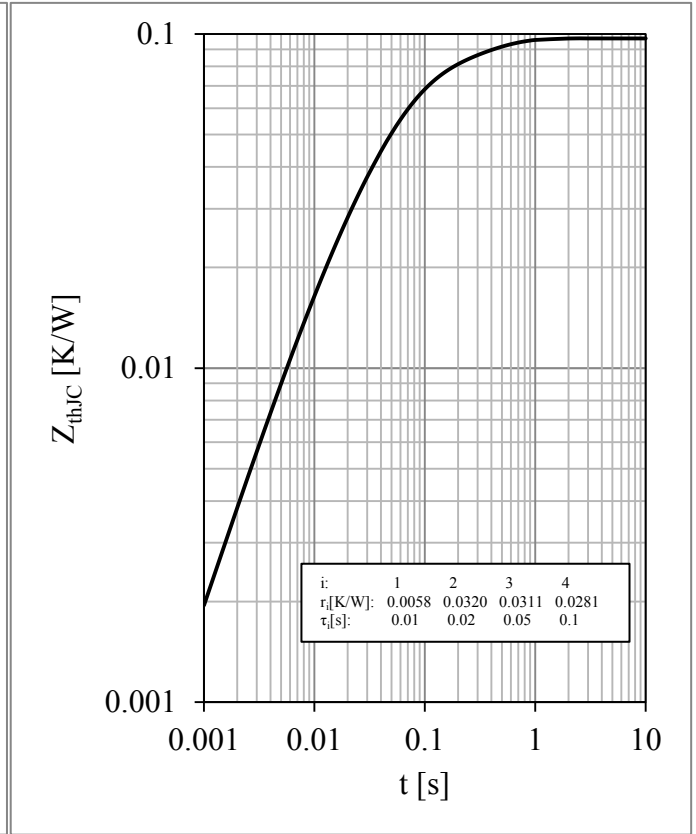


Fig 6. Transient Thermal Impedance

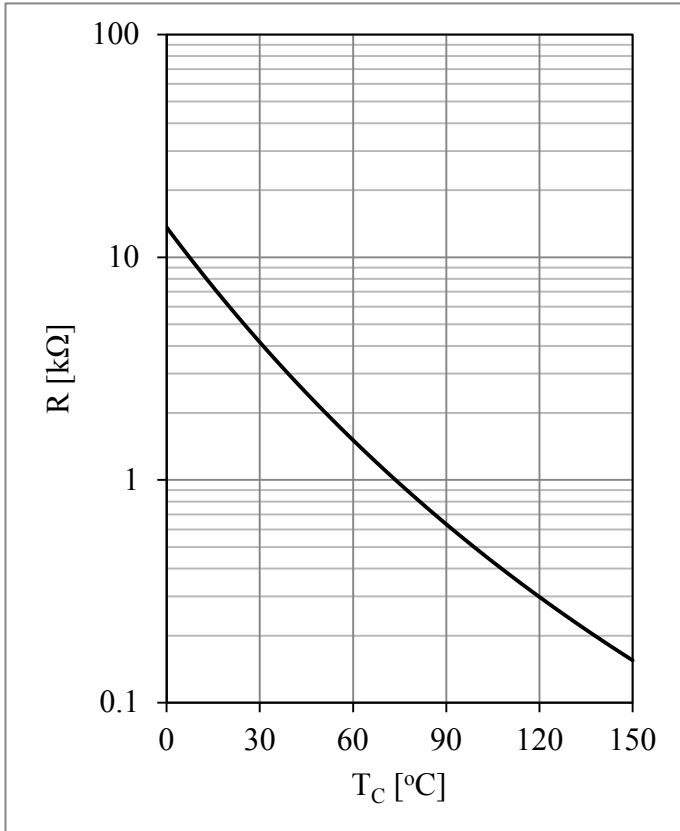
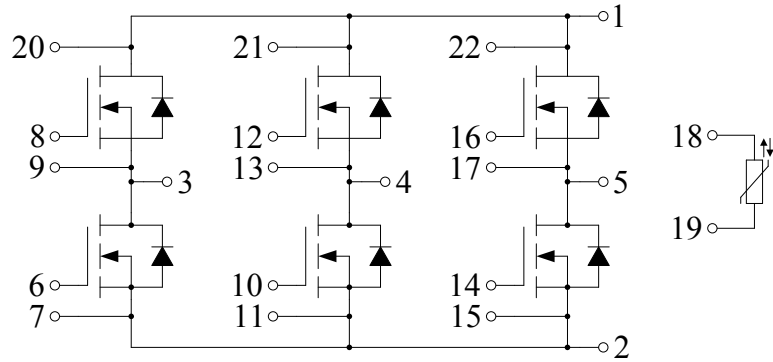


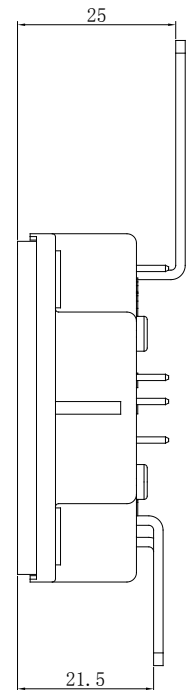
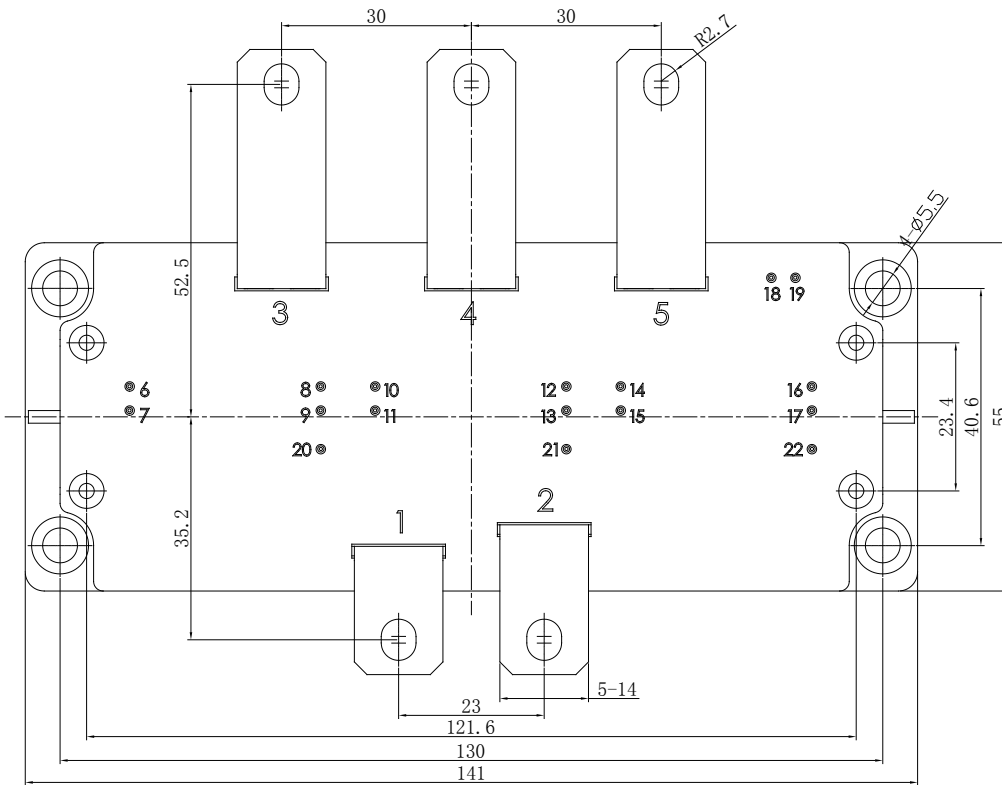
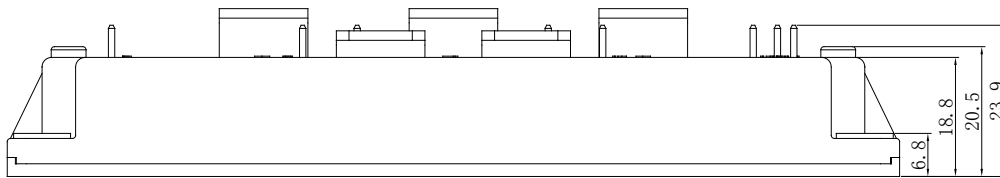
Fig 7. NTC Temperature Characteristic

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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