

STARPOWER

SEMICONDUCTOR

MOSFET

MD15FSR120L2SF

1200V/15A 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 solar power.

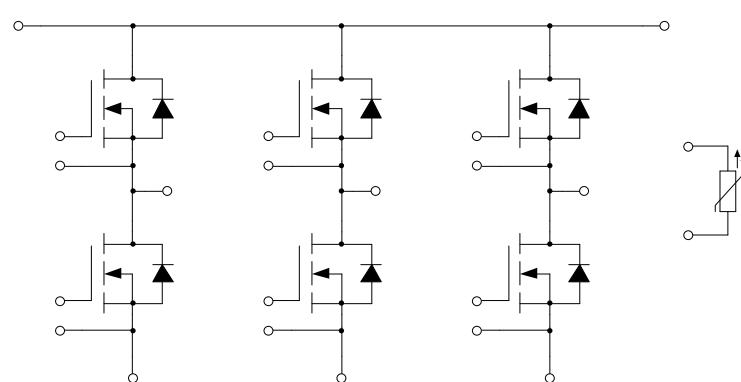
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Avalanche ruggedness
- Low inductance case
- substrate for low thermal resistance
- Isolated heatsink using DBC technology

Typical Applications

- Uninterruptible power supply
- Solar Power
- Switching mode power supply

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	1200	V
V_{GSS}	Gate-Source Voltage	-4/+22	V
I_D	Drain Current @ $T_C=25^\circ\text{C}$ @ $T_C=100^\circ\text{C}$	23 16	A
I_{DM}	Pulsed Drain Current	52	A
P_D	Maximum Power Dissipation @ $T_j=175^\circ\text{C}$	98	W

Inverse Diode

Symbol	Description	Value	Unit
I_S	Source Current @ $T_C=100^\circ\text{C}$	TBD	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	175	°C
T_{jop}	Operating Junction Temperature	-40 to +150	°C
T_{STG}	Storage Temperature Range	-40 to +125	°C
V_{ISO}	Isolation Voltage RMS,f=50Hz,t=1min	2500	V

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	$I_D=12\text{A}, V_{GS}=18\text{V}, T_j=25^\circ\text{C}$		62	78	$\text{m}\Omega$
		$I_D=12\text{A}, V_{GS}=18\text{V}, T_j=150^\circ\text{C}$		124		
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=6.45\text{mA}, V_{DS}=10\text{V}, T_j=25^\circ\text{C}$	2.8		4.8	V
g_{fs}	Forward Transconductance	$V_{DS}=10\text{V}, I_D=12\text{A}, T_j=25^\circ\text{C}$		8.3		S
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$			80	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}, T_j=25^\circ\text{C}$			100	nA
R_{Gint}	Internal Gate Resistance			4.0		Ω
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=800\text{V}, f=1.0\text{MHz}$		1498		pF
C_{oss}	Output Capacitance			45		pF
C_{rss}	Reverse Transfer Capacitance			3		pF
Q_g	Total Gate Charge	$I_D=12\text{A}, V_{DS}=800\text{V}, V_{GS}=18\text{V}$		64		nC
Q_{gs}	Gate-Source Charge			14		nC
Q_{gd}	Gate-Drain ("Miller") Charge			17		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=800\text{V}, I_D=12\text{A}, R_G=0\Omega, V_{GS}=0/18\text{V}, T_j=25^\circ\text{C}$		4.4		ns
t_r	Rise Time			11		ns
$t_{d(off)}$	Turn-Off Delay Time			22		ns
t_f	Fall Time			10		ns
E_{on}	Turn-On Switching Loss	$V_{DS}=800\text{V}, I_D=12\text{A}, R_G=0\Omega, V_{GS}=0/18\text{V}, T_j=25^\circ\text{C}$		0.13		mJ
E_{off}	Turn-Off Switching Loss			0.01		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	$I_S=12\text{A}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$		3.3		V
t_{rr}	Diode Reverse Recovery Time	$V_R=800\text{V}, I_S=12\text{A}, \text{di}/\text{dt}=3800\text{A}/\mu\text{s}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$		8.1		ns
Q_r	Diode Reverse Recovery Charge			105		nC
I_{rm}	Peak Reverse Recovery Current			26		A

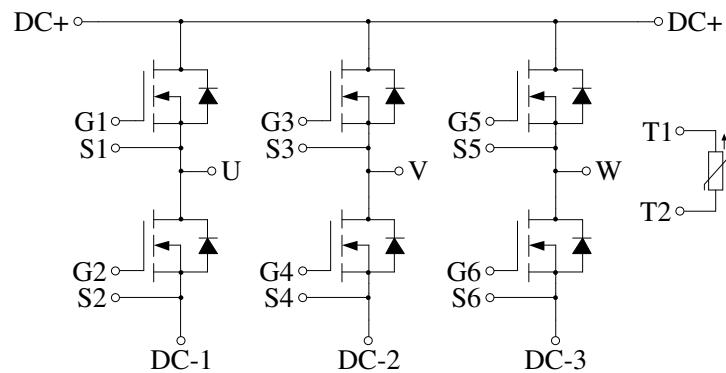
NTC Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{25}	Rated Resistance			5.0		$\text{k}\Omega$
$\Delta R/R$	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
$B_{25/80}$	B-value	$R_2=R_{25}\exp[B_{25/80}(1/T_2 - 1/(298.15\text{K}))]$		3411		K
$B_{25/100}$	B-value	$R_2=R_{25}\exp[B_{25/100}(1/T_2 - 1/(298.15\text{K}))]$		3433		K

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

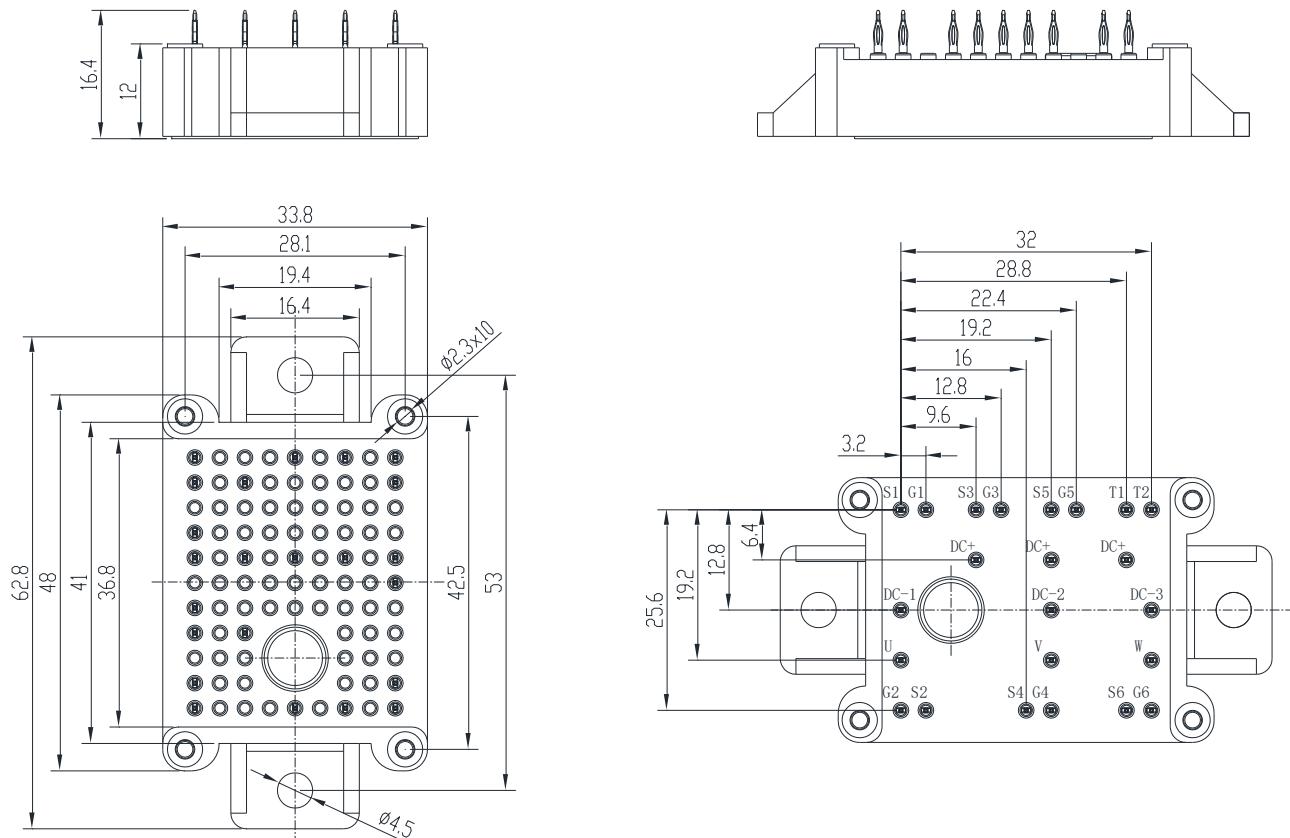
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per MOSFET)		1.384	1.522	K/W
R_{thCH}	Case-to-Heatsink (per MOSFET)		0.348		
	Case-to-Heatsink (per Module)		0.058		K/W
F	Mounting Force Per Clamp	20		50	N.m
G	Weight of Module		24		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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