

STARPOWER

SEMICONDUCTOR

MOSFET

MD50HFC120B3S

1200V/50A 2 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

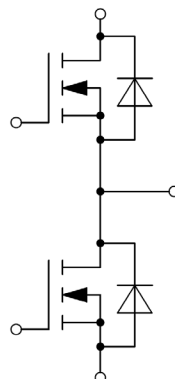
- SiC power MOSFET
- Low $R_{DS(on)}$
- Optimized intrinsic reverse diode
- Avalanche ruggedness
- Low inductance case
- AlN substrate for low thermal resistance
- Isolated copper baseplate using DBC technology



Typical Applications

- Electric vehicle
- 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	-10/+25	V
I_D	Drain Current @ $T_C=25^{\circ}\text{C}$ @ $T_C=80^{\circ}\text{C}$	50	A
		37	A
I_{DM}	Pulsed Drain Current	100	A
P_D	Maximum Power Dissipation @ $T_j=150^{\circ}\text{C}$	251	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current	50	A
I_{SM}	Pulsed Source Current	100	A

Module

Symbol	Description	Value	Unit
T_{jmax}	Maximum Junction Temperature	150	$^{\circ}\text{C}$
T_{jop}	Operating Junction Temperature	-40 to +150	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-40 to +150	$^{\circ}\text{C}$
V_{ISO}	Isolation Voltage RMS, $f=50\text{Hz}$, $t=1\text{min}$	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	$I_D=40\text{A}, V_{GS}=20\text{V}, T_j=25^\circ\text{C}$		40.0	49.0	m Ω
		$I_D=40\text{A}, V_{GS}=20\text{V}, T_j=150^\circ\text{C}$		75.0	104	
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=2.0\text{mA}, V_{DS}=10\text{V}, T_j=25^\circ\text{C}$	1.7	2.2		V
g_{fs}	Forward Transconductance	$V_{DS}=20\text{V}, I_D=40\text{A}, T_j=25^\circ\text{C}$		18.6		S
		$V_{DS}=20\text{V}, I_D=40\text{A}, T_j=150^\circ\text{C}$		17.0		
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_j=25^\circ\text{C}$			200	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}, T_j=25^\circ\text{C}$			1.0	μA
R_{Gint}	Internal Gate Resistance			3.55		Ω
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=1000\text{V}, f=1.0\text{MHz}$		1900		pF
C_{oss}	Output Capacitance			160		pF
C_{rss}	Reverse Transfer Capacitance			13		pF
Q_g	Total Gate Charge	$I_D=40\text{A}, V_{DS}=800\text{V}, V_{GS}=0/20\text{V}$		98.4		nC
Q_{gs}	Gate-Source Charge			21.6		nC
Q_{gd}	Gate-Drain ("Miller") Charge			36.0		nC
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=800\text{V}, I_D=80\text{A}, R_G=0\Omega, V_{GS}=0/20\text{V}, T_j=25^\circ\text{C}$		12		ns
t_r	Rise Time			18		ns
$t_{d(off)}$	Turn-Off Delay Time			23		ns
t_f	Fall Time			14		ns

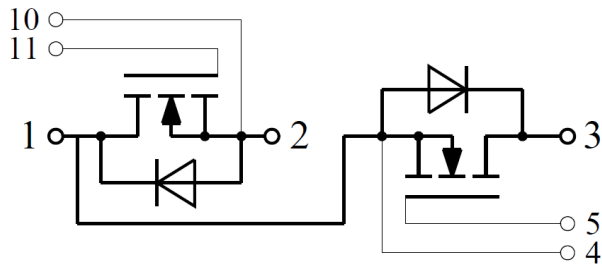
Body Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	$I_S=20\text{A}, V_{GS}=-5\text{V}, T_j=25^\circ\text{C}$		3.30	3.75	V
t_{rr}	Diode Reverse Recovery Time	$V_R=800\text{V}, I_S=40\text{A}, di/dt=700\text{A}/\mu\text{s}, V_{GS}=-5\text{V}, T_j=25^\circ\text{C}$		40		ns
Q_r	Diode Reverse Recovery Charge			330		nC
I_{RM}	Peak Reverse Recovery Current			12.8		A

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

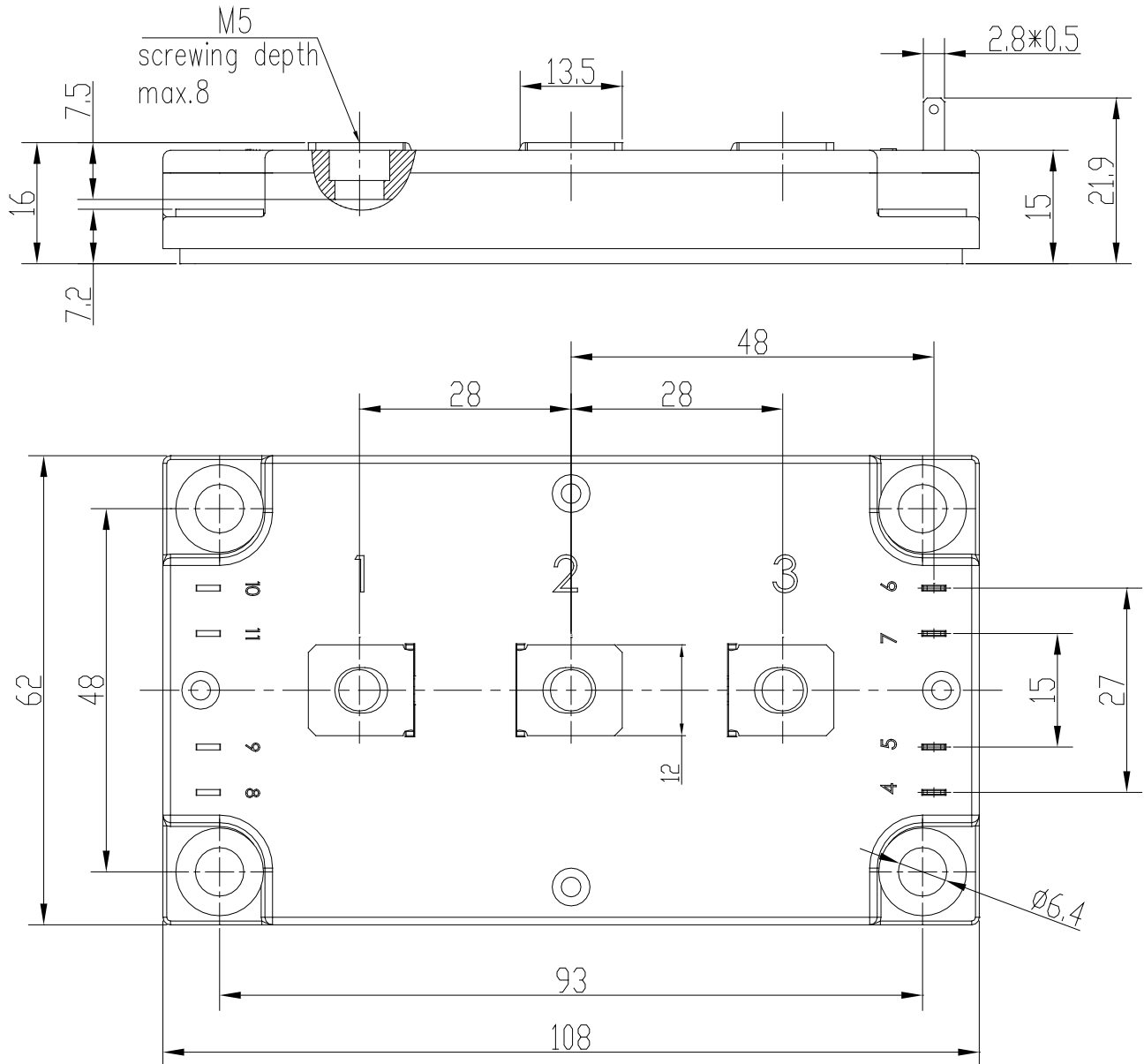
Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per MOSFET)			0.497	K/W
R_{thCH}	Case-to-Heatsink (per MOSFET)		0.070		K/W
	Case-to-Heatsink (per module)		0.035		
M	Terminal Connection Torque, Screw M5	2.5		5.0	N.m
	Mounting Torque, Screw M6	3.0		5.0	
G	Weight of Module		300		g

Circuit Schematic



Package Dimensions

Dimensions in Millimeters



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