

STARPOWER

SEMICONDUCTOR

SiC MOSFET

MD40HTS120P8HT

1200V/4.03mΩ 6 in one-package

General Description

STARPOWER SiC MOSFET Power Module provides very low $R_{DS(on)}$ as well as high blocking voltage.

It's designed for the applications such as hybrid and electric vehicle.

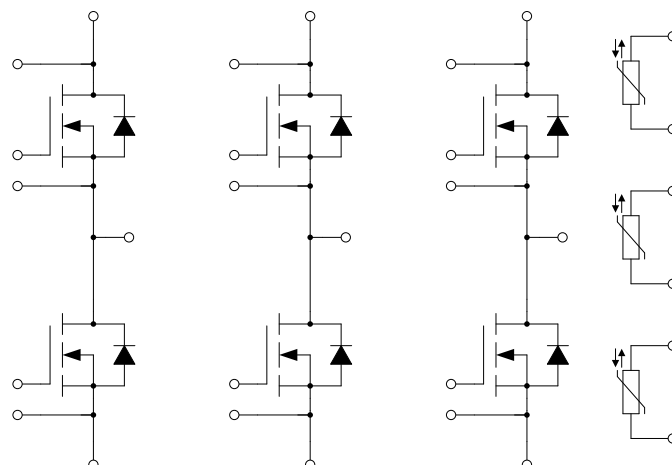
Features

- SiC power MOSFET
- High blocking voltage with low $R_{DS(on)}$
- Easy to parallel and simple to drive
- Low inductance case avoid oscillations
- Isolated copper pinfin baseplate using Si_3N_4 AMB technology

Typical Applications

- Automotive application
- Hybrid and electric vehicle
- Inverter for motor drive

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	1200	V
V_{GSSmax}	Gate-Source Voltage	-8/+19	V
V_{GSSop}	Gate-Source Voltage	-4/+15	V
I_D	Drain Current $T_{vj}=175^{\circ}\text{C}$	265	A
I_{DRM}	Repetitive Peak Drain Current tp limited by T_{vjop}	530	A
P_D	Maximum Power Dissipation @ $T_F=65^{\circ}\text{C}$ $T_{vj}=175^{\circ}\text{C}$	416	W

Body Diode

Symbol	Description	Value	Unit
I_S	Source Current $T_{vj}=175^{\circ}\text{C}$	TBD	A

Module

Symbol	Description	Value	Unit
T_{vjmax}	Maximum Junction Temperature	175	$^{\circ}\text{C}$
T_{vjop}	Operating Junction Temperature	-40 to +175	$^{\circ}\text{C}$
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

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=53\text{A}, V_{GS}=15\text{V}, T_{vj}=25^\circ\text{C}$		4.03		$\text{m}\Omega$
		$I_D=53\text{A}, V_{GS}=15\text{V}, T_{vj}=175^\circ\text{C}$		7.07		
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=66\text{mA}, V_{DS}=V_{GS}, T_{vj}=25^\circ\text{C}$	1.8	2.5	3.2	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_{vj}=25^\circ\text{C}$			500	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=15\text{V}, V_{DS}=0\text{V}, T_{vj}=25^\circ\text{C}$			400	nA
R_{Gint}	Internal Gate Resistance			1.33		Ω
C_{iss}	Input Capacitance			18.6		nF
C_{oss}	Output Capacitance	$V_{GS}=0\text{V}, V_{DS}=1000\text{V}, f=100\text{kHz}$		0.66		nF
C_{rss}	Reverse Transfer Capacitance			0.04		nF
Q_g	Total Gate Charge	$I_D=218\text{A}, V_{DS}=800\text{V}, V_{GS}=-4/+15\text{V}$		0.75		μC
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ
$t_{d(on)}$	Turn-On Delay Time	TBD		TBD		ns
t_r	Rise Time			TBD		ns
$t_{d(off)}$	Turn-Off Delay Time			TBD		ns
t_f	Fall Time			TBD		ns
E_{on}	Turn-On Switching Loss			TBD		mJ
E_{off}	Turn-Off Switching Loss			TBD		mJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	$I_{SD}=26\text{A}, V_{GS}=-4\text{V}, T_{vj}=25^\circ\text{C}$		4.20		V
		$I_{SD}=26\text{A}, V_{GS}=-4\text{V}, T_{vj}=175^\circ\text{C}$		TBD		
Q_r	Diode Reverse Recovery Charge	TBD		TBD		μC
I_{rrm}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Diode Reverse Recovery Charge	TBD		TBD		μC
I_{rrm}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ
Q_r	Diode Reverse Recovery Charge	TBD		TBD		μC
I_{rrm}	Peak Reverse Recovery Current			TBD		A
E_{rec}	Reverse Recovery Energy			TBD		mJ

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
L_{CE}	Stray Inductance		TBD		nH
$R_{CC'+EE'}$	Module Lead Resistance, Terminal to Chip		TBD		$\text{m}\Omega$
R_{thJF}	Junction-to-Cooling Fluid (per MOSFET) $\Delta V/\Delta t=8.0\text{dm}^3/\text{min}, T_F=65^\circ\text{C}$		0.240	0.264	K/W
G	Weight of Module		TBD		g

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.