MSC240HF170T2NHD

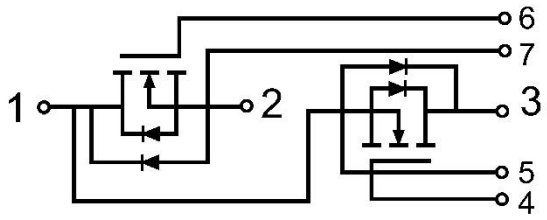
SiC MOSFET Module

Preliminary Datasheet

Features:

- SiC Power MOSFET
- Low $R_{DS(on)}$
- Low Inductance Case Avoid Oscillations
- Isolated Heatsink Using DBC Technology

Circuit Diagram



Applications:

- Main and Auxiliary AC Drives of Electric Vehicles
- DC Servo and Robot Drives
- Battery Vehicles
- UPS Equipment
- Plasma Cutting

SiC MOSFET

Absolute Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Description		Values	Units
V_{DSS}	Drain-Source Blocking Voltage		1700	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum Values	-10/+23	V
V_{GSop}		Recommended Operational Values	-5/+18	V
I_D	Continuous Drain Current	V_{GS}=18V, T_C=25℃	240	A
		V_{GS}=18V, T_C=100℃	168	A
$I_{D(pulse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{Jmax}	600	A
P_D	Power Dissipation	T_C=25℃, T_J=175℃	1419	W

Electrical Characteristics of MOSFET (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=400μA		1700			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=67mA, T_J=25℃		1.9		4.0	V
		V_{DS}=V_{GS}, I_D=67mA, T_J=175℃			2.0		
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1700V, V_{GS}=0V, T_J=25℃				1	mA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=23V, V_{DS}=0V				400	nA
		V_{GS}=-10V, V_{DS}=0V				-400	nA
$R_{DS(on)}$	On State Resistance	V_{GS}=18V, I_{DS}=160A, T_J=25℃			10.0	14.0	mΩ
		V_{GS}=18V, I_{DS}=160A, T_J=175℃			21.3		
g_{fs}	Transconductance	V_{DS}=20V, I_{DS}=160A, T_J=25℃			106.8		S
		V_{DS}=20V, I_{DS}=160A, T_J=175℃			92		S
C_{iss}	Input Capacitance	V_{DS}=1000V, f=1MHz, V_{GS}=0V, V_{AC}=25mV			11.36		nF
C_{oss}	Output Capacitance				0.41		
C_{rss}	Reverse Transfer Capacitance				0.03		
E_{oss}	C_{oss} Stored Energy				201.6		μJ
Q_G	Total Gate Charge	V_{DS}=800V, V_{GS}=-5V/+18V, I_D=160A			568		nC
Q_{GS}	Gate-Source Charge				152		nC
Q_{GD}	Gate-Drain Charge				224		nC
$t_{d(on)}$	Turn-on Delay Time	V_{DS}=800V, V_{GS}=-5V/+18V, I_D=160A, R_G=0.6Ω	T_J=25℃		19		ns
t_r	Rise Time		T_J=25℃		31		ns
$t_{d(off)}$	Turn-off Delay Time		T_J=25℃		52		ns
t_f	Fall Time		T_J=25℃		14		ns
E_{on}	Turn-on Switching Energy		T_J=25℃		2.48		mJ
E_{off}	Turn-off Switching Energy		T_J=25℃		2.80		mJ
$R_{G(int)}$	Internal Gate Resistance				2.2		Ω
$R_{θJC}$	Thermal Resistance Junction-to-Case (per SiC MOSFET)					0.106	℃/W

Reverse SiC Diode

Absolute Maximum Ratings (T_C=25℃ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage		1700	V
I_F	Continuous Forward Current	T_C=175℃	200	A
I_{FSM}	Non-repetitive Peak Forward Surge Current, Half Sine Wave	T_C=25℃, t_p=8.3ms	2000	A
I^2t	I^2t - value	T_C=25℃, t_p=8.3ms	20000	A^2s

Electrical Characteristics of Diode (T_C=25℃ unless otherwise specified)

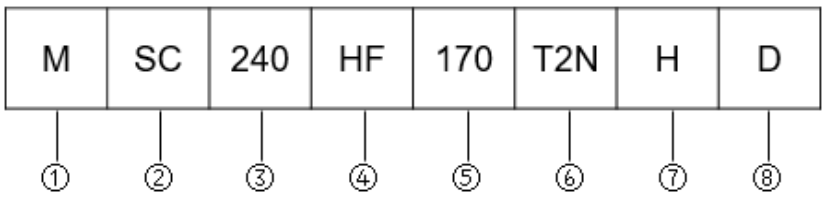
Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	I_F=200A	T_J=25℃		1.45	1.70	V
			T_J=175℃		2.15		V
I_R	Reverse Current	V_R=1700V, T_J=25℃				1	mA
		V_R=1700V, T_J=175℃				10	mA
Q_C	Total Capacitive Charge	V_R=800V, I_F=200A, T_J=25℃			1280		nC
C	Total Capacitance	f=1MHz, T_J=25℃	V_R=0.1V		34.4		nF
			V_R=1000V		0.68		nF
			V_R=1700V		0.63		nF
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per SiC Diode)					0.069	℃/W

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage (All Terminals Shorted)	f=50Hz, t=1min		6800		V
Internal Isolation				AlN		
d_{creep}	Creepage Distance: Terminal to Baseplate			40		mm
	Creepage Distance: Terminal to Terminal			30		mm
d_{clear}	Clearance Distance: Terminal to Baseplate			30		mm
	Clearance Distance: Terminal to Terminal			9		mm
L_{SCE}	Stray Inductance Module				14	nH
T_J	Maximum Junction Temperature				175	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+175	℃
T_{stg}	Storage Temperature		-40		+125	℃
CTI	Comparative Tracking Index			200		
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.03	℃/W
M	Power Terminals Screw:M6		3.0		5.0	N·m
M	Mounting Screw:M6		3.0		6.0	N·m
G	Weight			300		g

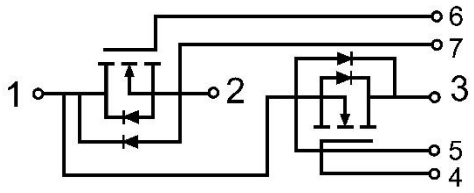
Ordering Information Table

Device code

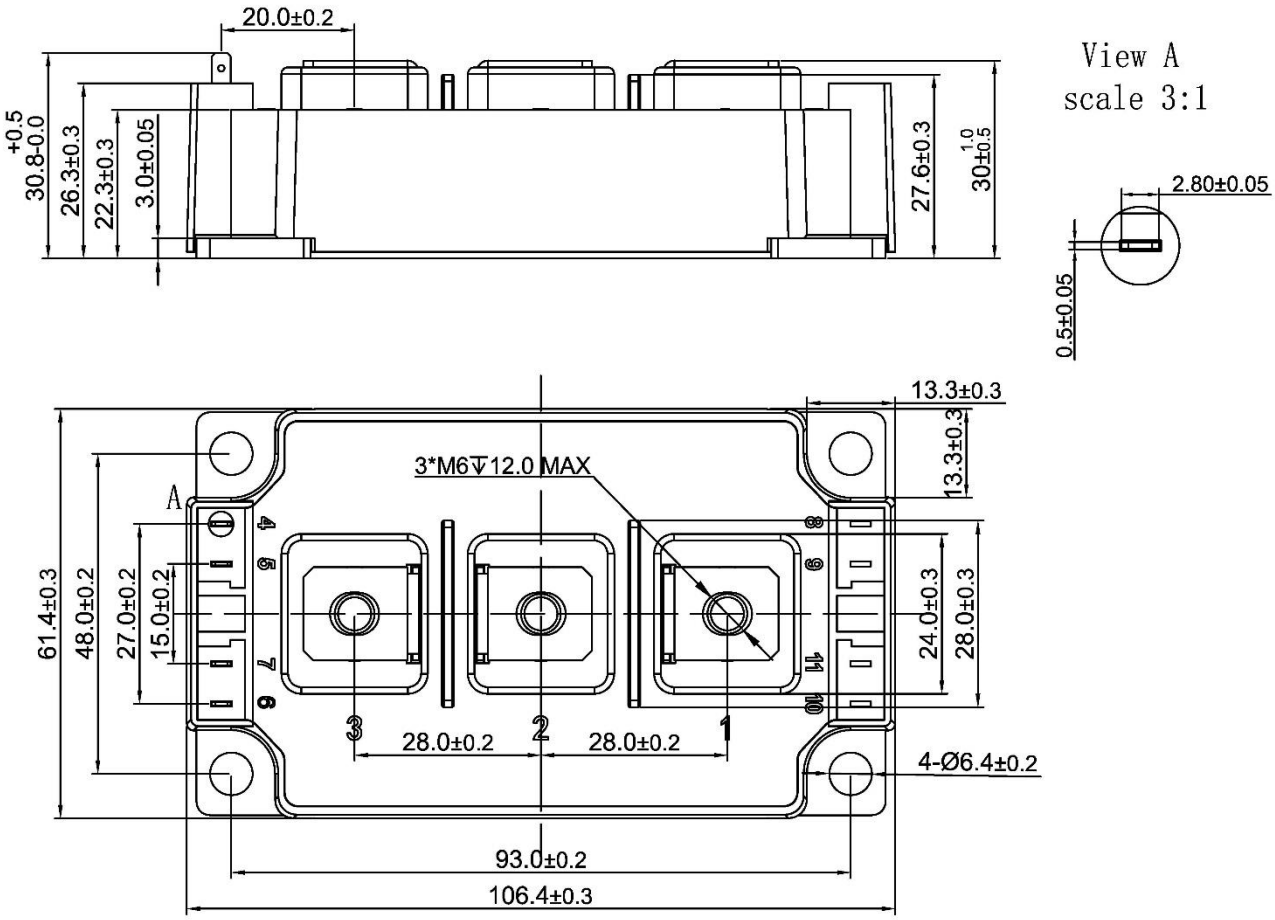


① - MOSFET Module
② - SiC MOSFET
③ - Rated Current (240=240A)
④ - Circuit Configuration (Half Bridge)
⑤ - Rated Voltage (170=1700V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
⑧ - Internal Code

Internal Circuit:



Package Outline (Unit: mm):



Revision	Notes
01	Initial Release

Announcement

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The released datasheet would be issued with “REV.” + “alphabet characters”.