



MSC300HF170T2NHD

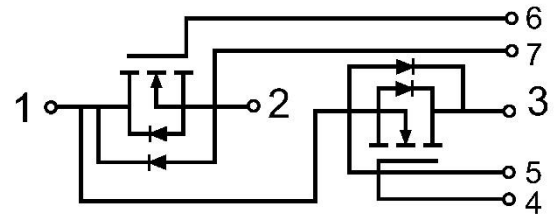
SiC MOSFET Module

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 ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description		Values	Units
V_{DS}	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	$V_{GS}=18\text{V}, T_C=25^{\circ}\text{C}$	360	A
		$V_{GS}=18\text{V}, T_C=100^{\circ}\text{C}$	252	A
$I_{D(pulse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{Jmax}	900	A
P_D	Power Dissipation	$T_C=25^{\circ}\text{C}, T_J=175^{\circ}\text{C}$	2129	W



Electrical Characteristics of MOSFET ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=600\mu A$	1700			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=100mA, T_J=25^{\circ}\text{C}$	2.0	3.0	4.0	V
		$V_{DS}=V_{GS}, I_D=100mA, T_J=175^{\circ}\text{C}$		2.0		
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=1700V, V_{GS}=0V, T_J=25^{\circ}\text{C}$			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	$V_{GS}=18V, I_{DS}=240A, T_J=25^{\circ}\text{C}$		6.7	8.4	m Ω
		$V_{GS}=18V, I_{DS}=240A, T_J=175^{\circ}\text{C}$		14.2		
g_{fs}	Transconductance	$V_{DS}=20V, I_{DS}=240A, T_J=25^{\circ}\text{C}$		160		S
		$V_{DS}=20V, I_{DS}=240A, T_J=175^{\circ}\text{C}$		138		S
C_{iss}	Input Capacitance	$V_{DS}=1000V, f=1MHz,$ $V_{GS}=0V, V_{AC}=25mV$		17.04		nF
C_{oss}	Output Capacitance			0.61		
C_{rss}	Reverse Transfer Capacitance			0.05		
E_{oss}	C_{oss} Stored Energy			302.4		μJ
Q_G	Total Gate Charge	$V_{DS}=800V,$ $V_{GS}=-5V/+18V,$ $I_D=240A$		852		nC
Q_{GS}	Gate-Source Charge			228		nC
Q_{GD}	Gate-Drain Charge			336		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=800V,$ $V_{GS}=-5V/+18V,$ $I_D=240A, R_G=0.5\Omega$	$T_J=25^{\circ}\text{C}$	25		ns
t_r	Rise Time		$T_J=25^{\circ}\text{C}$	36		ns
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}\text{C}$	58		ns
t_f	Fall Time		$T_J=25^{\circ}\text{C}$	23		ns
E_{on}	Turn-on Switching Energy		$T_J=25^{\circ}\text{C}$	3.72		mJ
E_{off}	Turn-off Switching Energy		$T_J=25^{\circ}\text{C}$	4.20		mJ
$R_{G(int)}$	Internal Gate Resistance			2.0		Ω
$R_{\theta JC}$	Thermal Resistance Junction-to-Case (per SiC MOSFET)				0.070	$^{\circ}\text{C/W}$



Reverse SiC Diode

Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage		1700	V
I_F	Continuous Forward Current	$T_C=175^{\circ}\text{C}$	300	A
I_{FSM}	Non-repetitive Peak Forward Surge Current, Half Sine Wave	$T_C=25^{\circ}\text{C}$, $t_p=8.3\text{ms}$	3000	A
I^2t	I^2t - value	$T_C=25^{\circ}\text{C}$, $t_p=8.3\text{ms}$	45000	A^2s

Electrical Characteristics of Diode ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =300A	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 =300A, T _J =25℃			1920		nC
C	Total Capacitance	f=1MHz, T _J =25℃	V _R =0.1V		51.6		nF
			V _R =1000V		1.03		nF
			V _R =1700V		0.94		nF
R _{θJC}	Thermal Resistance: Junction-to-Case (per SiC Diode)					0.046	℃/W



Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted) f=50Hz, t=1min	6800			V
Internal Isolation		AIN			
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	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+175	°C
T _{stg}	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)			0.03	°C/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	M	SC	300	HF	170	T2N	H	D
	①	②	③	④	⑤	⑥	⑦	⑧

- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (300=300A)
- 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



Revision	Notes
01	Initial Release

Announcement

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

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