



MSC300HF170T2NS

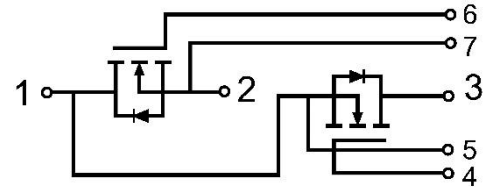
SiC MOSFET Module

Preliminary Data

Features:

- SiC Power MOSFET
- Low $R_{DS(on)}$
- Fast and Reliable Body Diode
- 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_{DSS}	Drain-Source Blocking Voltage	1700	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum Values	-10/+23
V_{GSop}		Recommended Operational Values	-5/+18
I_D	Continuous Drain Current	$V_{GS}=18\text{V}, T_C=25^{\circ}\text{C}$	360
		$V_{GS}=18\text{V}, T_C=100^{\circ}\text{C}$	252
$I_{D(pulse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{Jmax}	900
P_D	Power Dissipation	$T_C=25^{\circ}\text{C}, T_J=175^{\circ}\text{C}$	2129



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)				0.07	$^{\circ}\text{C/W}$



Built-in SiC Body Diode

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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
I_S	Inverse Diode Continuous, Forward Current	$T_C=25^{\circ}\text{C}$			240	A
V_{SD}	Diode Forward Voltage	$I_{SD}=120\text{A}, V_{GS}=-5\text{V}, T_J=25^{\circ}\text{C}$		4.0		V
		$I_{SD}=120\text{A}, V_{GS}=-5\text{V}, T_J=175^{\circ}\text{C}$		3.5		V
t_{rr}	Reverse Recover Time	$V_R=800\text{V}, I_{SD}=240\text{A}$		28		ns
Q_{rr}	Reverse Recovery Charge			768		nC
I_{rrm}	Peak Reverse Recovery Current			70.2		A

Module

Symbol	Description	Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage (All Terminals Shorted) $f=50\text{Hz}, t=1\text{min}$	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	$^{\circ}\text{C}$
T_{JOP}	Maximum Operating Junction Temperature Range	-40		+175	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-40		+125	$^{\circ}\text{C}$
CTI	Comparative Tracking Index	200			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)			0.03	$^{\circ}\text{C}/\text{W}$
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	S
①	②	③	④	⑤	⑥	⑦

- 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 Comprehensive Reliability Test-Automotive Grade/High Reliability Module)



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”.