



MSC600HF170T9HD

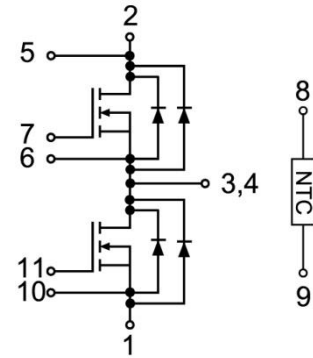
SiC MOSFET Module

Preliminary Datasheet

Features:

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive
- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency
- Low Inductance Case Avoid Oscillations
- Copper Baseplate and Silicon Nitride Insulator

Circuit Diagram



Applications:

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC converters
- Pulsed Power Applications
- Solid-State Transformer

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	$V_{GS}=18\text{V}, T_c=25^\circ\text{C}$	800	A
		$V_{GS}=18\text{V}, T_c=100^\circ\text{C}$	550	A
$I_{D(pulse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{Jmax}	1620	A
P_D	Power Dissipation	$T_c=25^\circ\text{C}, T_J=175^\circ\text{C}$	4054	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	$V_{GS}=0V, I_D=6mA$	1700			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=180mA, T_J=25^{\circ}\text{C}$	2.0	2.8	4.0	V
		$V_{DS}=V_{GS}, I_D=180mA, T_J=175^{\circ}\text{C}$		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	$V_{GS}=18V, I_{DS}=450A, T_J=25^{\circ}\text{C}$		3.3	5.0	m Ω
		$V_{GS}=18V, I_{DS}=450A, T_J=175^{\circ}\text{C}$		5.3		
g_{fs}	Transconductance	$V_{DS}=20V, I_{DS}=450A, T_J=25^{\circ}\text{C}$		272		S
		$V_{DS}=20V, I_{DS}=450A, T_J=175^{\circ}\text{C}$		286		S
C_{iss}	Input Capacitance	$V_{DS}=1000V, f=100kHz,$ $V_{GS}=0V, V_{AC}=25mV$		46.68		nF
C_{oss}	Output Capacitance			1.10		
C_{rss}	Reverse Transfer Capacitance			0.11		
E_{oss}	C_{oss} Stored Energy			570.6		μJ
Q_G	Total Gate Charge	$V_{DS}=1000V,$ $V_{GS}=-5V/+18V,$ $I_D=180A$		2172		nC
Q_{GS}	Gate-Source Charge			468		nC
Q_{GD}	Gate-Drain Charge			300		nC
E_{on}	Turn-on Switching Energy	$V_{DS}=1000V,$ $V_{GS}=-5V/+18V,$ $I_D=180A, R_G=0.4\Omega$	$T_J=25^{\circ}\text{C}$	7.2		mJ
E_{off}	Turn-off Switching Energy		$T_J=25^{\circ}\text{C}$	3.0		mJ
$R_{G(int)}$	Internal Gate Resistance			1.7		Ω
$R_{\theta JC}$	Thermal Resistance Junction-to-Case (per SiC MOSFET)				0.037	$^{\circ}\text{C/W}$



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	$T_C=175^{\circ}\text{C}$	600	A
I_{FSM}	Non-repetitive Peak Forward Surge Current, Half Sine Wave	$T_C=25^{\circ}\text{C}$, $t_p=8.3\text{ms}$	6000	A
I^2t	I^2t - value	$T_C=25^{\circ}\text{C}$, $t_p=8.3\text{ms}$	180000	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 =600A	T _J =25℃		1.45	1.80	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 =600A, T _J =25℃			3840		nC
C	Total Capacitance	f=1MHz, T _J =25℃	V _R =0.1V		103		nF
			V _R =1000V		2.06		nF
			V _R =1700V		1.88		nF
R _{θJC}	Thermal Resistance: Junction-to-Case (per SiC Diode)					0.020	℃/W

NTC Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	$T_C=25^{\circ}\text{C}$		5		k Ω
$\Delta R/R$	$T_C=100^{\circ}\text{C}$, $R_{100}=465\Omega$	-5		+5	%
P_{25}	$T_C=25^{\circ}\text{C}$			10	mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3380		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3440		K
$B_{25/100}$	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3545		K



Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted) f=50Hz, t=1min	3400			V
Internal Isolation		Si3N4			
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	4.0		5.0	N·m
M	Mounting Screw:M5	3.0		6.0	N·m
G	Weight		330		g

Ordering Information Table

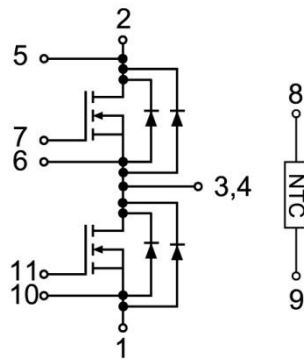
Device code

M	SC	600	HF	170	T9	H	D
①	②	③	④	⑤	⑥	⑦	⑧

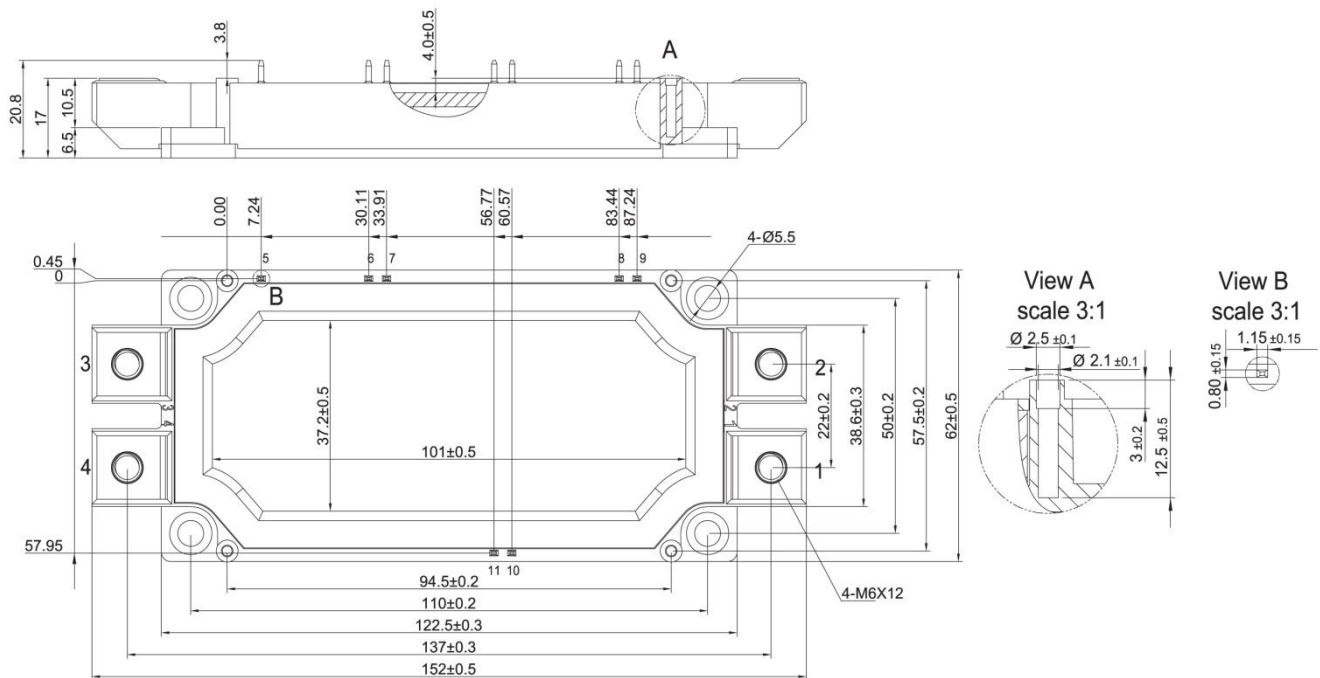
- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (600=600A)
- ④ - Circuit Configuration (Half Bridge)
- ⑤ - Rated Voltage (170=1700V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Code



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”.