



MSC45TL65C7H

SiC MOSFET Module

Preliminary Datasheet

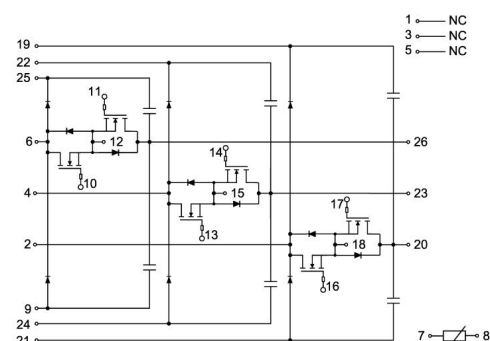
Features:

- High Speed Switching
- Low Switching Losses
- Simple to Drive
- Lead Free, Compliant with RoHS Requirement

Application:

- 3-Level-Applications

Circuit Diagram



Boost Switch, SiC MOSFET

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

Symbol	Description		Values	Units
V_{DSS}	Drain-Source Blocking Voltage		650	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum Values	-8/+19	V
V_{GSop}		Recommended Operational Values	-4/+15	V
I_D	Continuous Drain Current	$V_{GS}=15\text{V}, T_C=25^{\circ}\text{C}$	49	A
		$V_{GS}=15\text{V}, T_C=100^{\circ}\text{C}$	35	A
$I_{D (pluse)}$	Pulsed Drain Current	Pulse width t_P limited by T_{Jmax}	132	A
P_D	Power Dissipation	$T_C=25^{\circ}\text{C}, T_J=175^{\circ}\text{C}$	77	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 =100μA	650			V
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =4.84mA	1.6	2.6	4.0	V
		V _{DS} =V _{GS} , I _D =4.84mA, T _J =175°C		2.2		V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =650V, V _{GS} =0V			1	mA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =15V, V _{DS} =0V			200	nA
R _{DS(on)}	On State Resistance	V _{GS} =15V, I _D =17.6A		45	65	mΩ
		V _{GS} =15V, I _D =17.6A, T _J =175°C		60		mΩ
g _{fs}	Transconductance	V _{DS} =20V, I _{DS} =17.6A		12		S
		V _{DS} =20V, I _{DS} =17.6A, T _J =175°C		11		S
C _{iss}	Input Capacitance	V _{DS} =600V, f=1MHz, V _{GS} =0V		1600		pF
C _{oss}	Output Capacitance			100		pF
C _{rss}	Reverse Transfer Capacitance			8		pF
E _{oss}	C _{oss} Stored Energy			20		μJ
Q _G	Total Gate Charge	V _{DS} =400V, V _{GS} =-4V to +15V, I _D =17.6A		63		nC
Q _{GS}	Gate-Source Charge			21		nC
Q _{GD}	Gate-Drain Charge			18		nC
t _{d(on)}	Turn-on Delay Time	V _{DD} =400V, V _{GS} =-4V to +15V, I _D =17.6A		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 Energy			TBD		mJ
E _{off}	Turn-off Switching Energy			TBD		mJ
R _{G-C}	Internal Gate Resistance(chip)			3		Ω
R _{θJC}	Thermal Resistance Junction-to-Case (per SiC MOSFET)				1.94	°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			49		A
$I_{S(pluse)}$	Inverse Diode Direct Current, Pulsed			132		A
V_{SD}	Diode Forward Voltage	$I_{SD}=8.8\text{A}$, $V_{GS}=-4\text{V}$, $T_J=25^{\circ}\text{C}$		4.8		V
		$I_{SD}=8.8\text{A}$, $V_{GS}=-4\text{V}$, $T_J=175^{\circ}\text{C}$		4.2		V
t_{rr}	Reverse Recovery Time	$I_F=17.6\text{A}$, $di/dt=5200\text{A}/\mu\text{s}$ ($T_J=175^{\circ}\text{C}$), $V_{rr}=400\text{V}$, $V_{GS}=-4\text{V}$		15		ns
Q_{rr}	Reverse Recovery Charge			260		μC
I_{rr}	Peak Reverse Recovery Current			40		A

Boost Diode, SiC Schottky Diode

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

V_{RRM}	Repetitive Peak Reverse Voltage		1200	V
I_F	Diode Continuous Forward Current	$T_J=150^{\circ}\text{C}$	30	A
I_{FSM}	Non-repetitive Peak Forward Surge Current, Half Sine Wave	$T_J=25^{\circ}\text{C}$	300	A
I_{FRM}	Repetitive Peak Forward Surge Current, Half Sine Wave	$T_J=25^{\circ}\text{C}$	150	A
I^2t	I^2t - value	$T_J=25^{\circ}\text{C}$	450	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	$I_F=35\text{A}$	$T_J=25^{\circ}\text{C}$		1.50	1.80	V
			$T_J=175^{\circ}\text{C}$		2.20		
I_R	Reverse Current	$V_R=1200\text{V}$	$T_J=25^{\circ}\text{C}$			1	mA
		$V_R=1200\text{V}$	$T_J=175^{\circ}\text{C}$			10	
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					1.28	$^{\circ}\text{C}/\text{W}$



Internal Capacitance Characteristic

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
C	Capacitance	0V, T _J =25°C		33		nF
T _{OP}	Operation Temperature		-55		125	°C
V _{max}	Maximum DC Voltage			630		V
Tolerance			-5		5	%

Internal NTC- Thermistor Characteristic

Symbol	Conditions	Min.	Typ.	Max.	Units
R ₂₅	T _C =25°C		22		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =1481Ω	-3		+3	%
P ₂₅	T _C =25°C		200		mW
B _{25/50}	$R_2 = R_{25} \exp[B_{25/50}(1/T_2 - 1/(298.15K))]$		3950		K
B _{25/80}	$R_2 = R_{25} \exp[B_{25/80}(1/T_2 - 1/(298.15K))]$		3982		K
B _{25/100}	$R_2 = R_{25} \exp[B_{25/100}(1/T_2 - 1/(298.15K))]$		3998		K

Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f = 50Hz, 60s		2500	V
Internal Isolation		Al ₂ O ₃			
T _J	Maximum Junction Temperature			175	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-55		+150	°C
T _{stg}	Storage Temperature	-55		+125	°C
CTI	Comparative Tracking Index	225			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)			0.05	°C/W
T	Mounting Screw:M4	1.5		2.0	N·m
G	Weight		31		g



Ordering Information Table

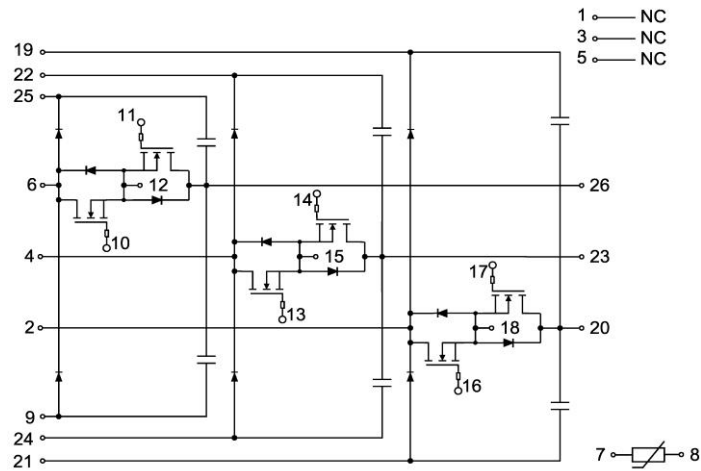
Device code

M	SC	45	TL	65	C7	H
①	②	③	④	⑤	⑥	⑦

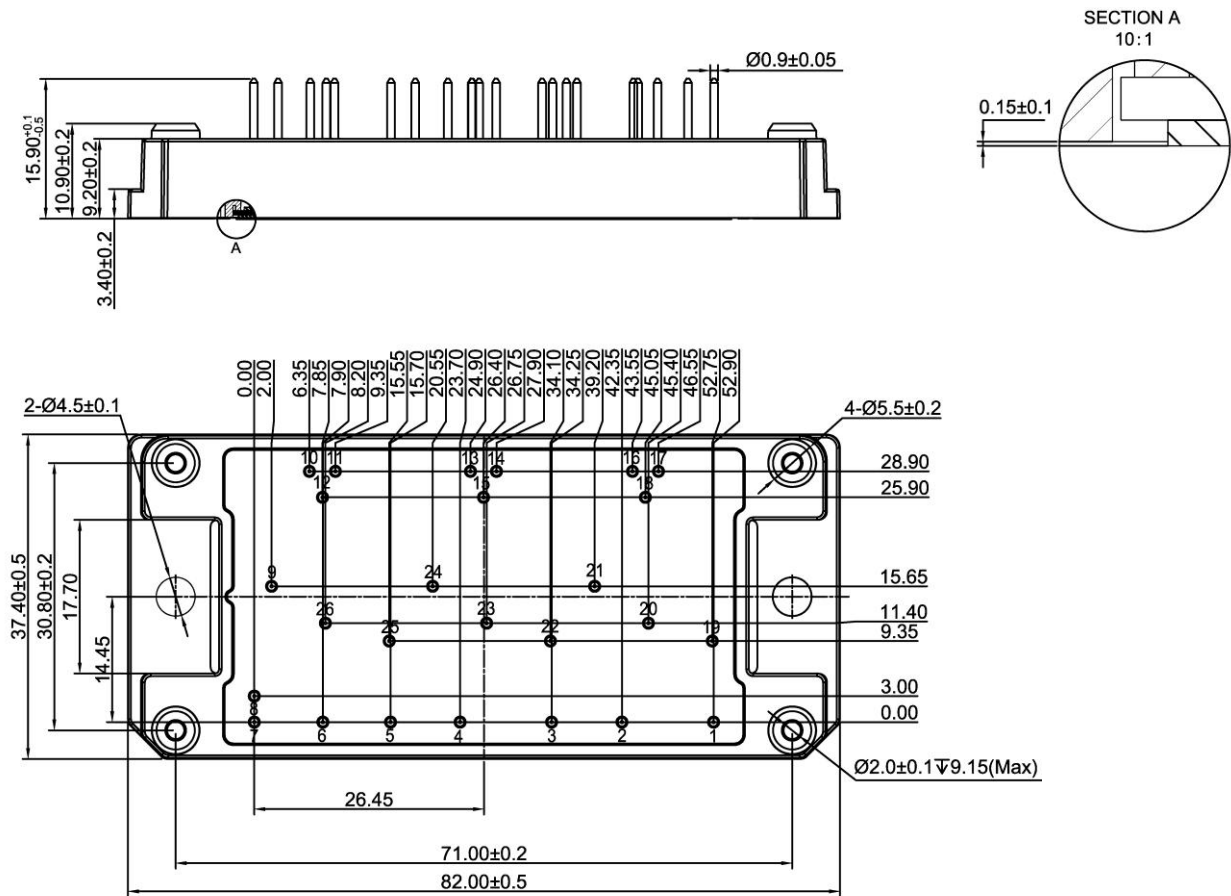
- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (45=45A)
- ④ - Circuit Configuration: (Three Phase Power Factor Correction)
- ⑤ - Rated Voltage (65=650V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcement

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