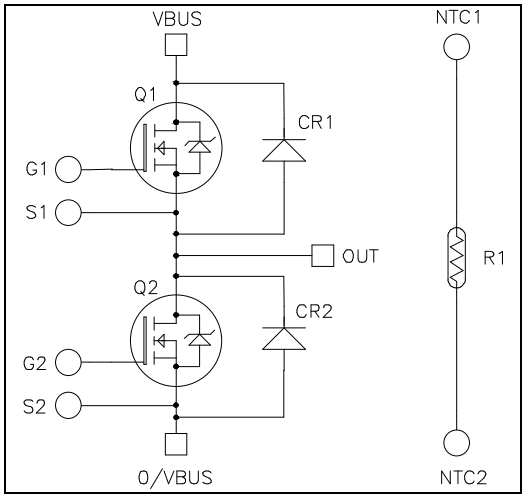
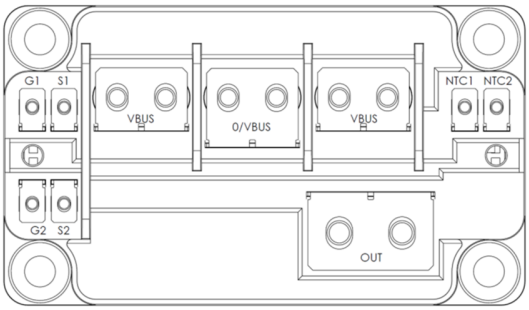
MSCSM70AM025CT6LIAG
Preliminary data

Very low stray inductance
Phase leg SiC Power Module

V_{DSS} = 700V
R_{DSon} = 2.5mΩ typ @ Tj = 25°C
I_D = 689*A @ Tc = 25°C





Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- EV motor and traction drive
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Features

- ***SiC Power MOSFET***
  - Low $R_{DS(on)}$
  - High temperature performance
- ***SiC Schottky Diode***
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Very low stray inductance
- Internal thermistor for temperature monitoring
- M4 & M5 power connectors
- M2.5 signals connectors
- AlN substrate for improved thermal performance

Benefits

- High efficiency converter
- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (per SiC MOSFET)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		700	V
I_D	Continuous Drain Current	T_c = 25°C	689*	A
		T_c = 80°C	548*	
I_{DM}	Pulsed Drain current		1380	
V_{GS}	Gate - Source Voltage		-10/25	V
R_{DSon}	Drain - Source ON Resistance		3.2	mΩ
P_D	Power Dissipation	T_c = 25°C	1882	W

*Specification of SiC MOSFET device but output current must be limited due to size of power connectors.

These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Electrical Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V ; V_{DS} = 700V				600	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 20V I_D = 240A	T_j = 25°C		2.5	3.2	mΩ
			T_j = 175°C		3.2		
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 24mA		1.9	2.4		V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V				600	nA

Dynamic Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 700V f = 1MHz			27		nF
C_{oss}	Output Capacitance				3		
C_{rss}	Reverse Transfer Capacitance				0.17		
Q_g	Total gate Charge	V_{GS}= -5/20V V_{Bus} = 470V I_D = 240A			1290		nC
Q_{gs}	Gate – Source Charge				348		
Q_{gd}	Gate – Drain Charge				210		
$T_{d(on)}$	Turn-on Delay Time	V_{GS} = -5/+20V V_{Bus} = 400V I_D = 480A ; T_J = 150°C R_{GON} = TBD Ω ; R_{GOFF} = TBD Ω			40		ns
T_r	Rise Time				35		
$T_{d(off)}$	Turn-off Delay Time				50		
T_f	Fall Time				20		
E_{on}	Turn on Energy	V_{GS} = -5/+20V V_{Bus} = 400V I_D = 480A R_{GON} = TBD Ω R_{GOFF} = TBD Ω	T_J = 150°C		TBD		µJ
E_{off}	Turn off Energy		T_J = 150°C		TBD		µJ
R_{Gint}	Internal gate resistance				1.25		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.08	°C/W

Body diode ratings and characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	V_{GS} = 0V ; I_{SD} = 240A		3.4		V
		V_{GS} = -5V ; I_{SD} = 240A		3.8		
t_{rr}	Reverse Recovery Time	I_{SD} = 240A ; V_{GS} = -5V V_R = 400V ; di_F/dt = 6000A/µs		38		ns
Q_{rr}	Reverse Recovery Charge			1.9		µC
I_{rr}	Reverse Recovery Current			89		A

SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					700	V
I_{RRM}	Reverse Leakage Current	V_R=700V	T_j = 25°C		90	1200	µA
			T_j = 175°C		1500		
I_F	DC Forward Current		Tc = 65°C		300		A
V_F	Diode Forward Voltage	I_F = 300A	T_j = 25°C		1.5	1.8	V
			T_j = 175°C		1.9		
Q_C	Total Capacitive Charge	V_R = 400V			798		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			1488		pF
		f = 1MHz, V_R = 400V			1296		
R_{thJC}	Junction to Case Thermal Resistance					0.167	°C/W

Temperature sensor NTC (see application note APT0406).

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

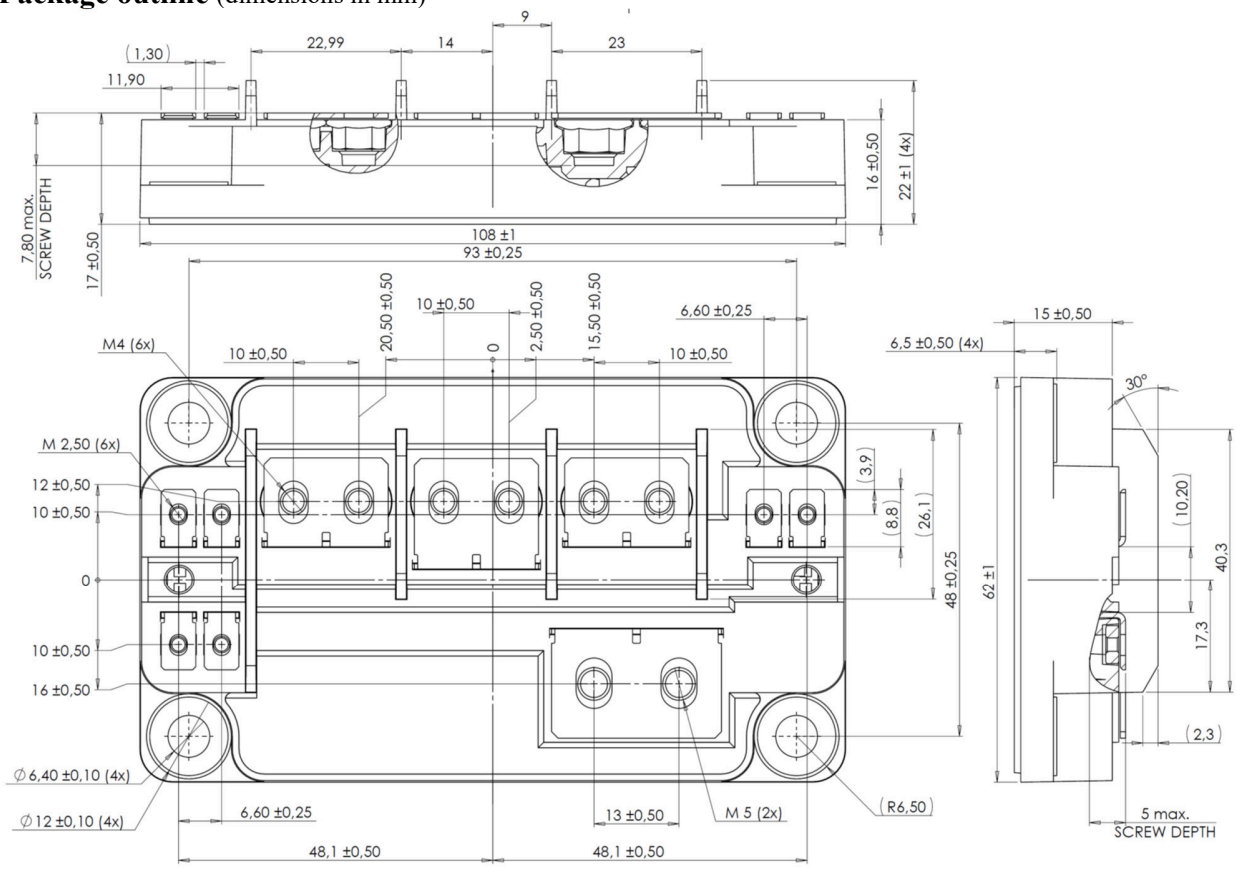
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and Package characteristics

Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	175	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	For terminals	M2.5	0.4	0.6	N.m
			M4	2	3	
			M5	2	3.5	
		To heatsink	M6	3	5	
L_{DC}	Module stray inductance between VBUS & 0/VBUS				3	nH
Wt	Package Weight				320	g

Package outline (dimensions in mm)



See application note AN1911 - Mounting instructions for SP6 Low inductance Power Module on www.microsemi.com

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