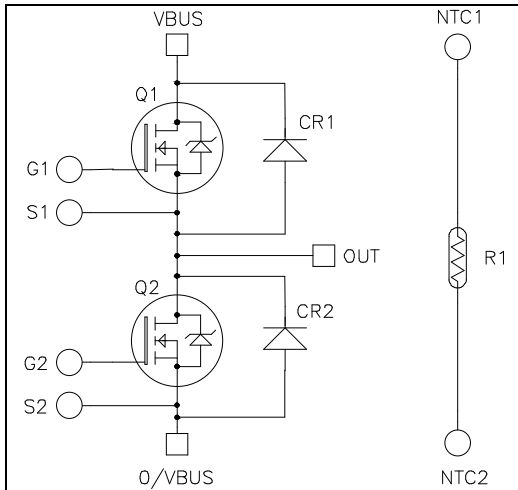


**Very low stray inductance
Phase leg SiC Power Module**

$V_{DSS} = 700V$

$R_{DS(on)} = 2.5m\Omega$ typ @ $T_j = 25^\circ C$

$I_D = 689*A$ @ $T_c = 25^\circ C$

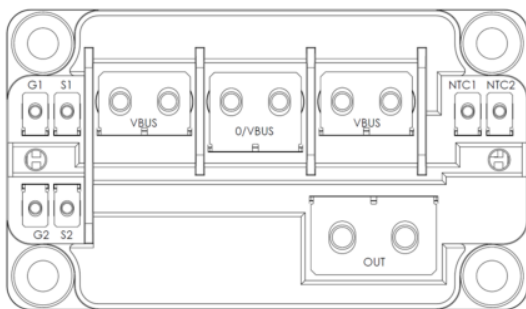


Application

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

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 @ $T_j = 25^\circ C$ 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	$T_c = 25^\circ C$	689*
		$T_c = 80^\circ C$	548*
I_{DM}	Pulsed Drain current	1380	A
V_{GS}	Gate - Source Voltage	-10/25	V
$R_{DS(on)}$	Drain - Source ON Resistance	3.2	m Ω
P_D	Power Dissipation	$T_c = 25^\circ C$	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	$V_{GS} = 20V$ $I_D = 240A$			2.5	3.2	m Ω
					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	$V_{GS} = 20V$, $V_{DS} = 0V$			600	nA	

Dynamic Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$		27		nF
C_{oss}	Output Capacitance	$V_{DS} = 700V$		3		
C_{rss}	Reverse Transfer Capacitance	$f = 1MHz$		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	$V_{GS} = -5/+20V$ $V_{Bus} = 400V$ $I_D = 480A$; $T_J = 150^\circ C$ $R_{GON} = TBD \Omega$; $R_{GOFF} = TBD \Omega$		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	$V_{GS} = -5/+20V$ $V_{Bus} = 400V$ $I_D = 480A$		TBD		μJ
E_{off}	Turn off Energy	$R_{GON} = TBD \Omega$ $R_{GOFF} = TBD \Omega$		TBD		μJ
R_{Gint}	Internal gate resistance			1.25		Ω
R_{thJC}	Junction to Case Thermal Resistance				0.08	$^\circ C/W$

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	$I_{SD} = 240A$; $V_{GS} = -5V$ $V_R = 400V$; $di_F/dt = 6000A/\mu s$		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			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
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B	T _C = 100°C		4		%

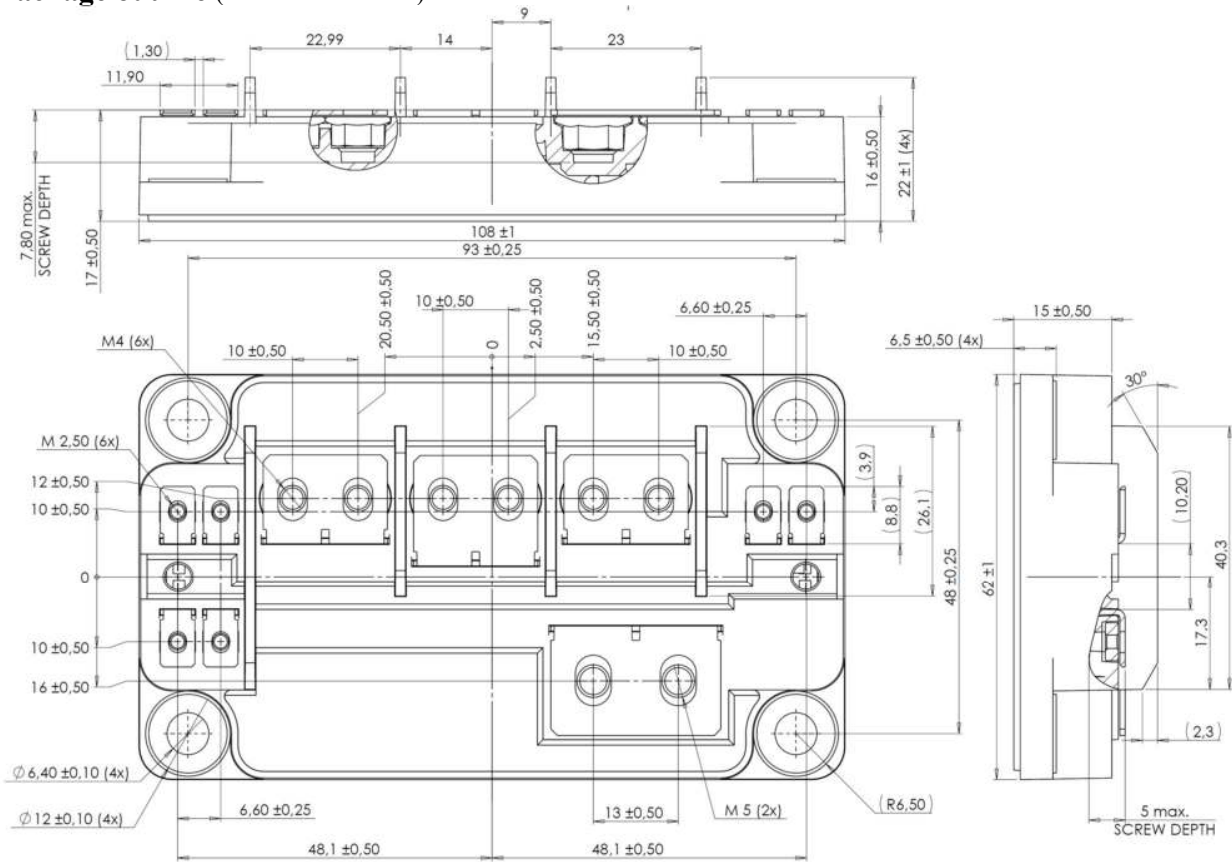
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

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 _{Jmax} - 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	
		To heatsink	M5	2	3.5	
			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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