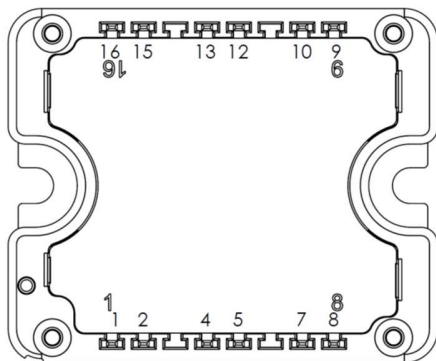
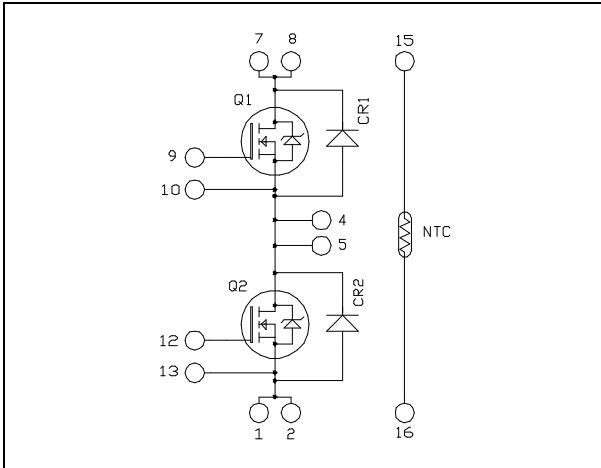


**Phase leg**  
**SiC MOSFET Power Module**

**$V_{DSS} = 1700V$**   
 **$R_{DS(on)} = 17.5m\Omega$  typ @  $T_j = 25^\circ C$**   
 **$I_D = 124A^*$  @  $T_c = 25^\circ C$**



Pins 1/2 ; 4/5 ; 7/8 must be shorted together

### Application

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

### Features

- **SiC Power MOSFET**
  - High speed switching
  - Low  $R_{DS(on)}$
  - Ultra low loss
- **SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF

- Very low stray inductance
- Kelvin source for easy drive
- Internal thermistor for temperature monitoring
- 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
- Solderable terminals both for power and signal for easy PCB mounting
- 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	1700	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	124*
		$T_c = 80^\circ C$	98*
$I_{DM}$	Pulsed Drain current	240	
$V_{GS}$	Gate - Source Voltage	-10/23	V
$R_{DS(on)}$	Drain - Source ON Resistance	22.5	$m\Omega$
$P_D$	Power Dissipation	$T_c = 25^\circ C$ 602	W

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

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



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## Preliminary data

### Electrical Characteristics (Per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V$ ; $V_{DS} = 1700V$		20	200	$\mu A$
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 20V$ $I_D = 60A$	$T_j = 25^\circ C$ $T_j = 175^\circ C$	17.5 31	22.5	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$ ; $I_D = 5mA$	1.8	3.2		V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = 20V$ ; $V_{DS} = 0V$			200	nA

### Dynamic Characteristics (Per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		6600		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 1000V$		300		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		20		
$Q_g$	Total gate Charge	$V_{GS} = -5/20V$		356		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 850V$		98		
$Q_{gd}$	Gate – Drain Charge	$I_D = 60A$		54		
$T_{d(on)}$	Turn-on Delay Time	$V_{GS} = -5/+20V$ ; $T_j = 150^\circ C$		24		ns
$T_r$	Rise Time	$V_{Bus} = 900V$		17		
$T_{d(off)}$	Turn-off Delay Time	$I_D = 100A$		35		
$T_f$	Fall Time	$R_{Gon} = 2.4\Omega$ ; $R_{Goff} = 1.4\Omega$		19		
$E_{on}$	Turn on Energy	$V_{GS} = -5/+20V$ $V_{Bus} = 900V$ $I_D = 100A$	$T_j = 150^\circ C$	2.2		mJ
$E_{off}$	Turn off Energy	$R_{Gon} = 2.4\Omega$ $R_{Goff} = 1.4\Omega$	$T_j = 150^\circ C$	0.33		mJ
$R_{Gint}$	Internal gate resistance			2.93		$\Omega$
$R_{thJC}$	Junction to Case Thermal Resistance				0.25	$^\circ C/W$

### Body diode ratings and characteristics (Per SiC MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0V$ ; $I_{SD} = 60A$ $V_{GS} = -5V$ ; $I_{SD} = 60A$		3.7 3.9		V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 60A$ ; $V_{GS} = -5V$		27		ns
$Q_{rr}$	Reverse Recovery Charge	$V_R = 900V$ ; $di_F/dt = 2000A/\mu s$		1300		nC
$I_{rr}$	Reverse Recovery Current			92		A



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## Preliminary data

### SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Peak Repetitive Reverse Voltage				1700	V
I <sub>RRM</sub>	Reverse Leakage Current	V <sub>R</sub> =1700V		20 300	400	μA
I <sub>F</sub>	DC Forward Current			60		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 60A		1.5 2.3	1.8	V
Q <sub>C</sub>	Total Capacitive Charge	V <sub>R</sub> = 900V		460		nC
C	Total Capacitance	f = 1MHz, V <sub>R</sub> = 600V		334		pF
		f = 1MHz, V <sub>R</sub> = 900V		276		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.276	°C/W

### Temperature sensor NTC (see application note APT0406).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B	T <sub>C</sub> =100°C		4		%

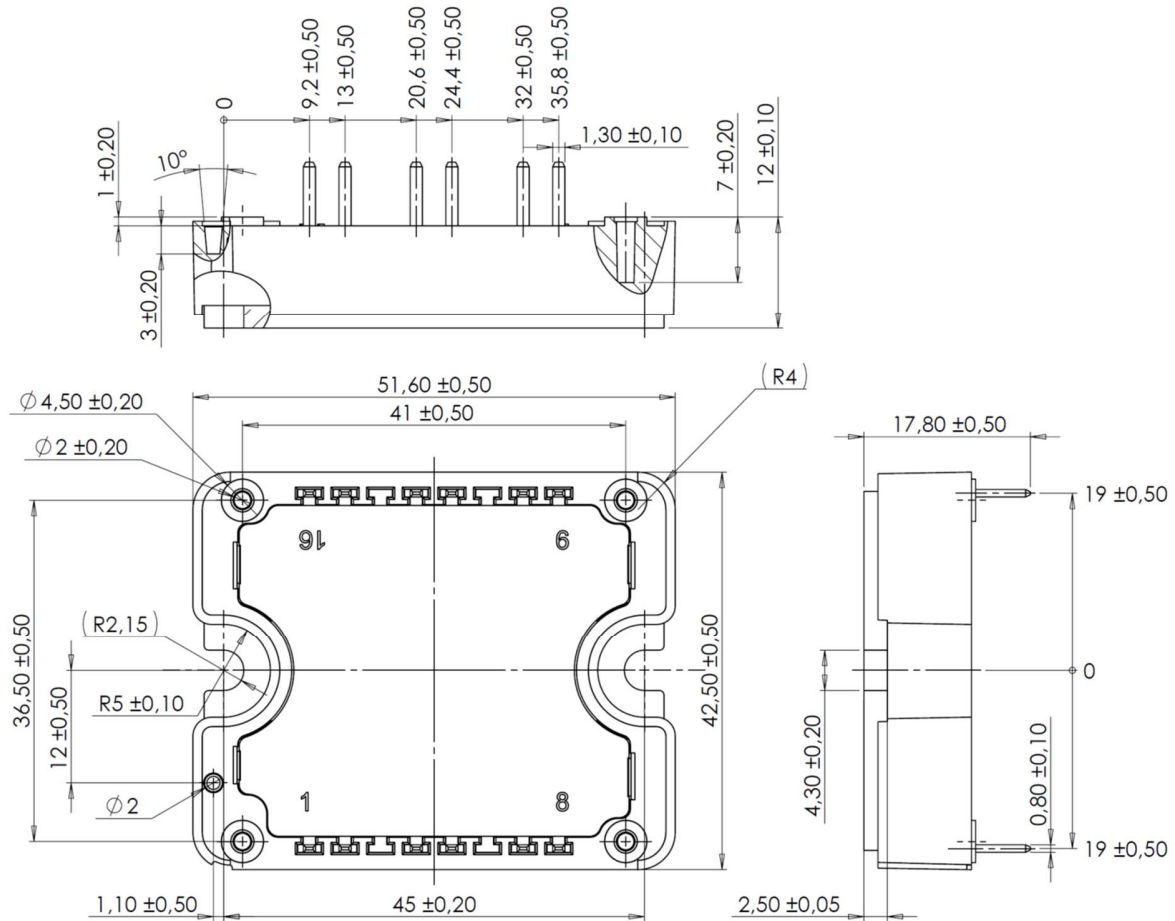
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

### Thermal and package characteristics

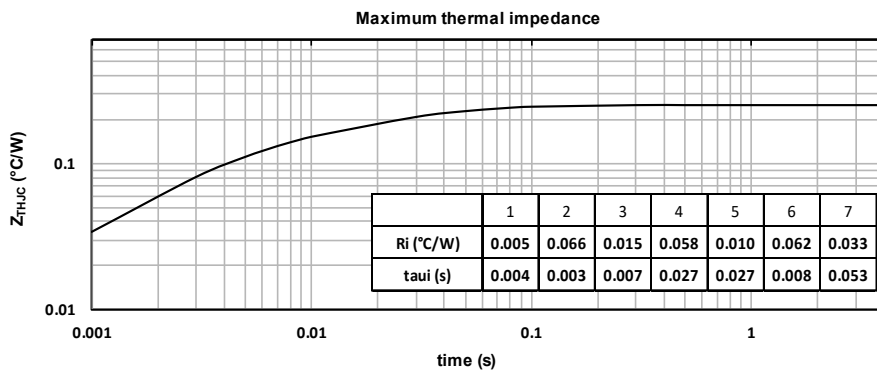
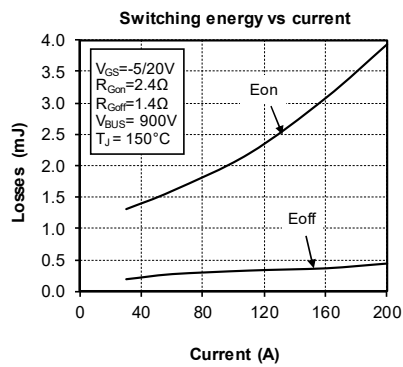
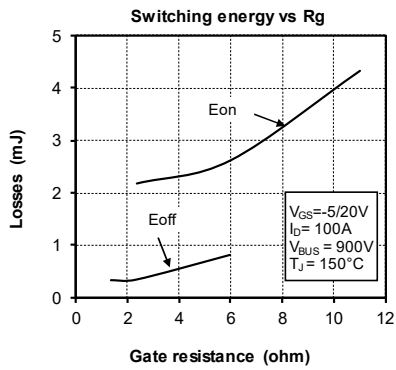
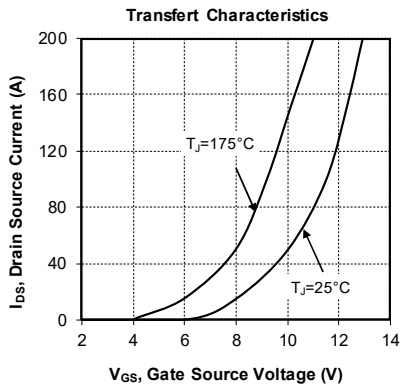
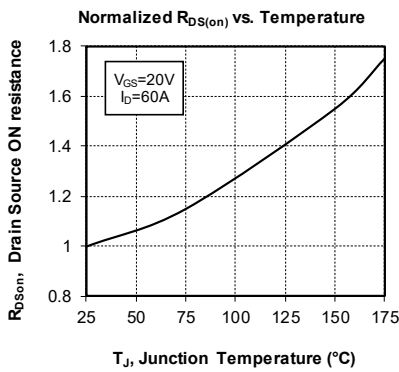
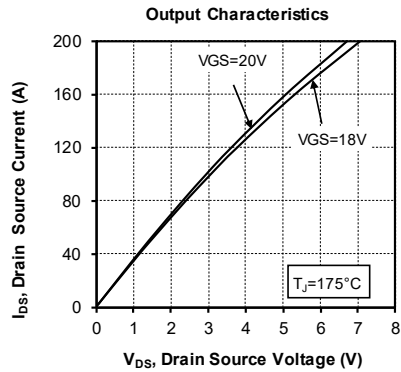
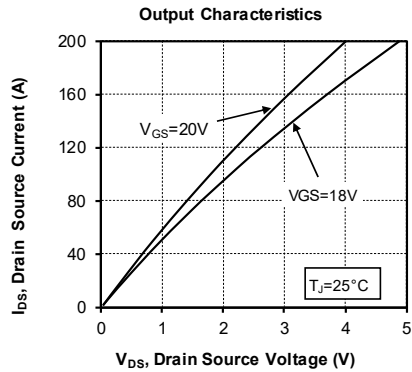
Symbol	Characteristic	Min	Max	Unit		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T <sub>J</sub>	Operating junction temperature range	-40	175	°C		
T <sub>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
T <sub>STG</sub>	Storage Temperature Range	-40	125			
T <sub>C</sub>	Operating Case Temperature	-40	125			
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				80	g

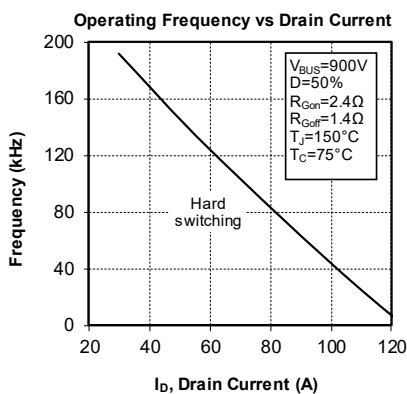
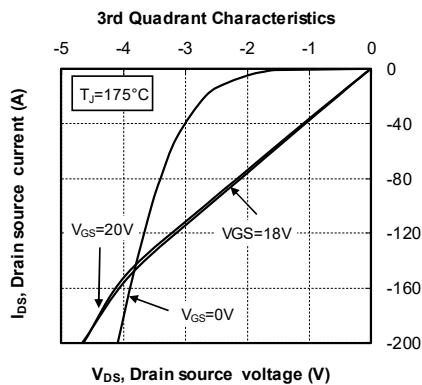
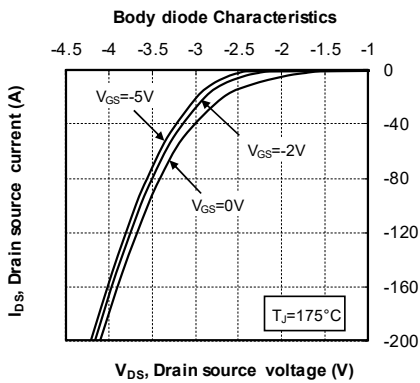
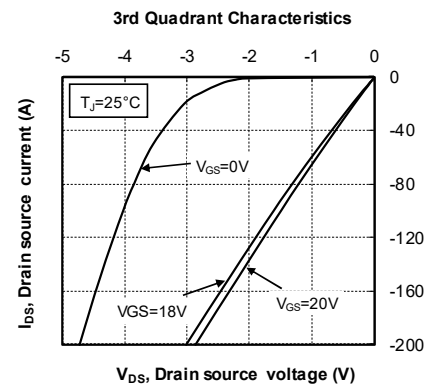
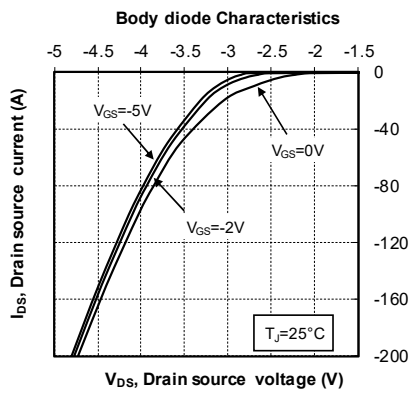
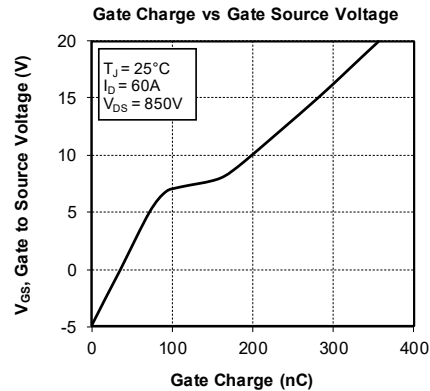
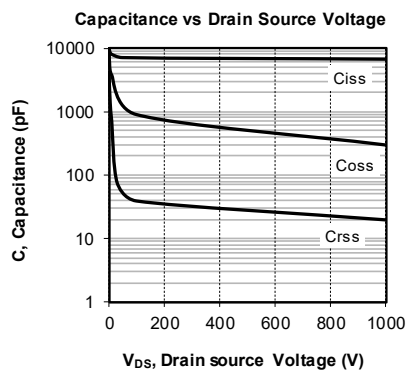
### Package outline (dimensions in mm)



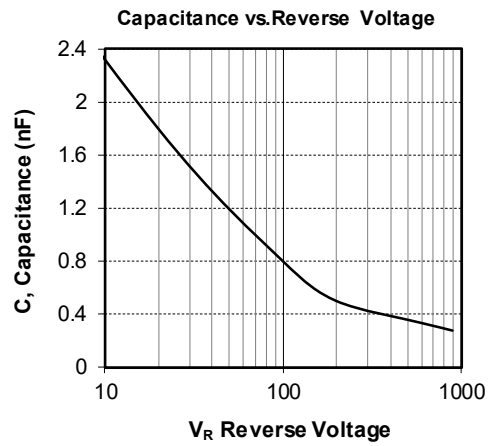
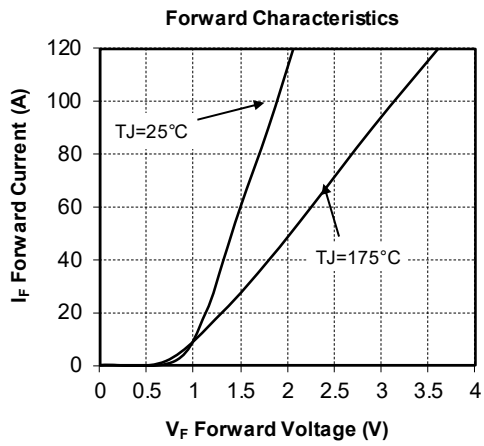
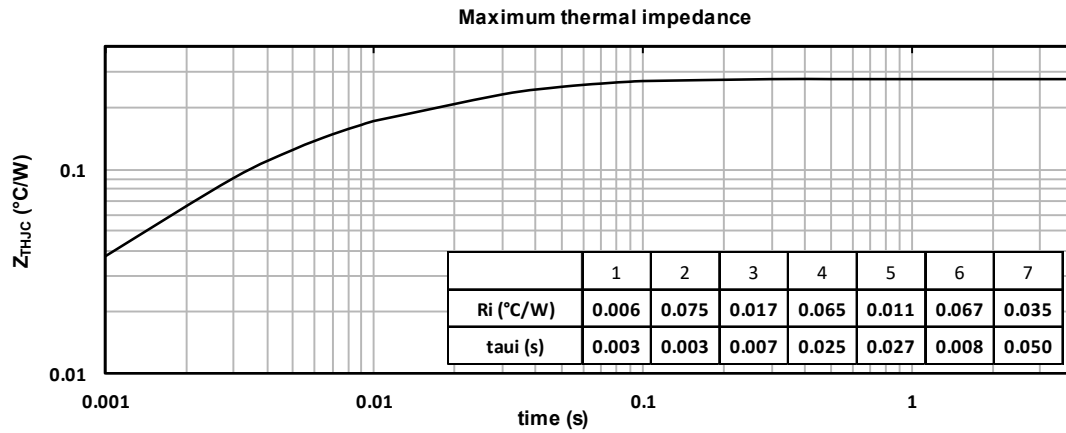
See application note - AN3500A - Mounting instructions for SP1F and SP3F power modules

### Typical SiC MOSFET Performance Curve





### Typical SiC diode Performance Curve





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## Preliminary data

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