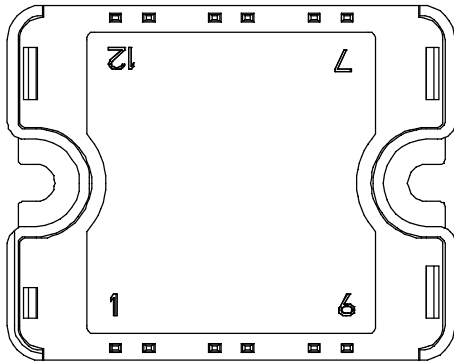
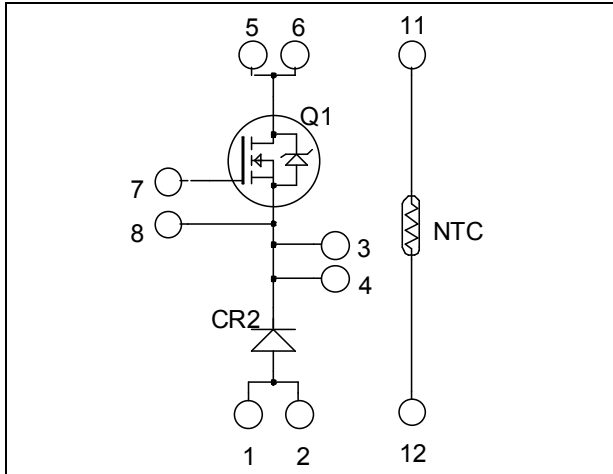


**Buck chopper  
Super Junction MOSFET  
SiC chopper diode**



Pins 1/2 ; 3/4 ; 5/6 must be shorted together

$V_{DSS} = 900V$

$R_{DSon} = 60m\Omega \text{ max @ } T_j = 25^\circ C$

$I_D = 59A \text{ @ } T_c = 25^\circ C$

**Application**

- AC and DC motor control
- Switched Mode Power Supplies

**Features**

• **COOLMOS**  
Power Semiconductors

- Ultra low  $R_{DSon}$
- Low Miller capacitance
- Ultra low gate charge
- Avalanche energy rated
- Very rugged

• **CRI 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
- High level of integration

**Benefits**

- 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

**Absolute maximum ratings**

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	900	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	59
		$T_c = 80^\circ C$	44
$I_{DM}$	Pulsed Drain current	150	
$V_{GS}$	Gate - Source Voltage	$\pm 20$	V
$R_{DSon}$	Drain - Source ON Resistance	60	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	462
$I_{AR}$	Avalanche current (repetitive and non repetitive)	8.8	A
$E_{AR}$	Repetitive Avalanche Energy	2.9	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1940	

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 900V$   $T_j = 25^\circ\text{C}$			200	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 900V$   $T_j = 125^\circ\text{C}$		1000		
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 52A$		50	60	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 6\text{mA}$	2.5	3	3.5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			200	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V; V_{DS} = 100V$ $f = 1\text{MHz}$		13.6		nF
$C_{oss}$	Output Capacitance			0.66		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 400V$ $I_D = 52A$		540		nC
$Q_{gs}$	Gate – Source Charge			64		
$Q_{gd}$	Gate – Drain Charge			230		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive Switching (<math>125^\circ\text{C}</math>)</b> $V_{GS} = 10V$ $V_{Bus} = 600V$ $I_D = 52A$ $R_G = 3.8\Omega$		70		ns
$T_r$	Rise Time			20		
$T_{d(off)}$	Turn-off Delay Time			400		
$T_f$	Fall Time			25		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 10V; V_{Bus} = 600V$ $I_D = 52A; R_G = 3.8\Omega$		1.8		mJ
$E_{off}$	Turn-off Switching Energy			1.5		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 10V; V_{Bus} = 600V$ $I_D = 52A; R_G = 3.8\Omega$		2.52		mJ
$E_{off}$	Turn-off Switching Energy			1.7		

**CR2 SiC diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		1200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 1200V$	$T_j = 25^\circ\text{C}$	96	600	$\mu\text{A}$
			$T_j = 175^\circ\text{C}$	168	3000	
$I_F$	DC Forward Current			30		A
$V_F$	Diode Forward Voltage	$I_F = 30A$	$T_j = 25^\circ\text{C}$	1.6	1.8	V
			$T_j = 175^\circ\text{C}$	2.3	3	
$Q_C$	Total Capacitive Charge	$I_F = 30A, V_R = 600V$ $di/dt = 1000A/\mu\text{s}$		120		nC
C	Total Capacitance	$f = 1\text{MHz}, V_R = 200V$		288		pF
		$f = 1\text{MHz}, V_R = 400V$		207		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	CoolMOS		0.27	°C/W	
		SiC Diode		0.63		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	4000			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M4	2.5	4.7	N.m
Wt	Package Weight				80	g

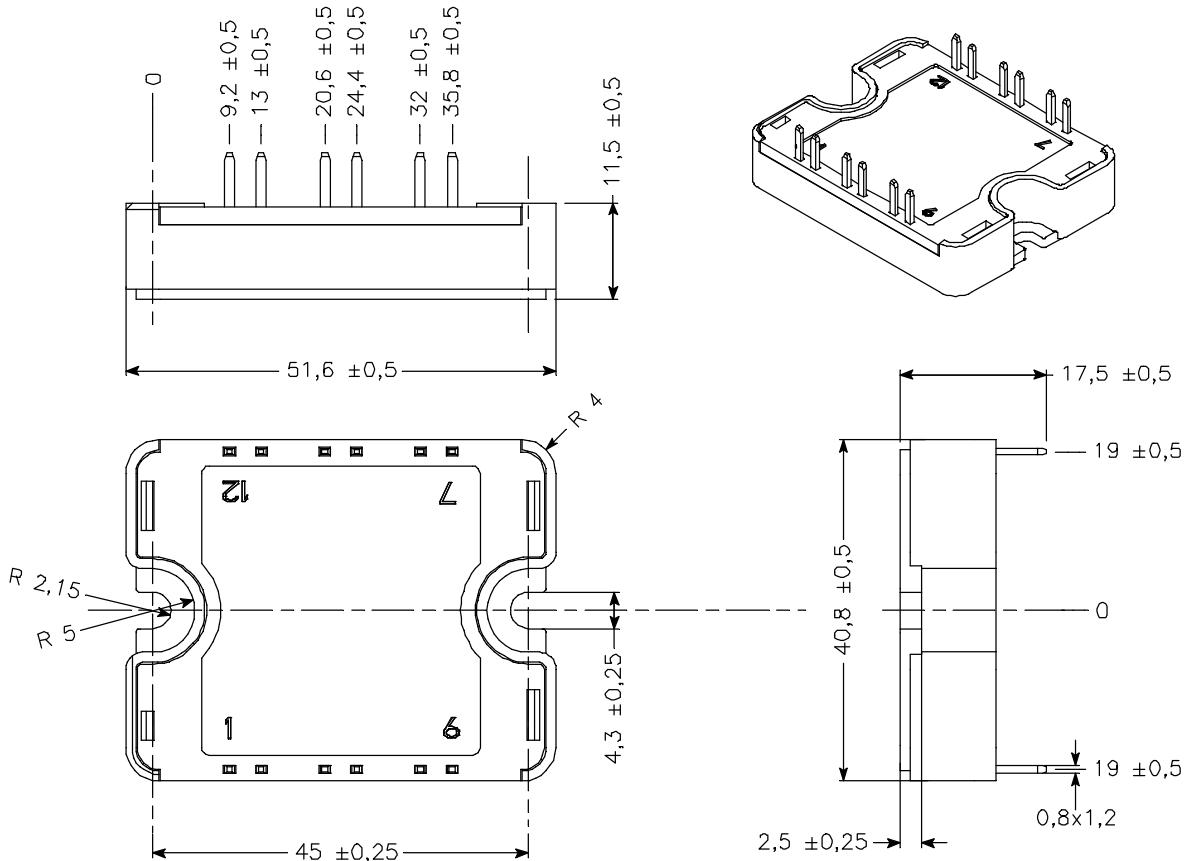
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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		%

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

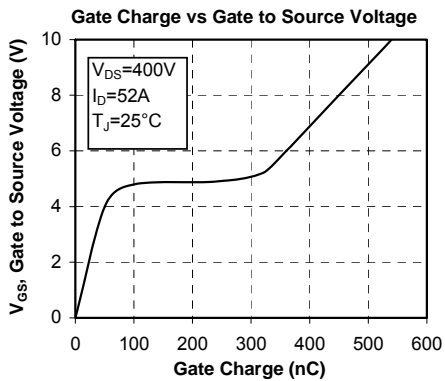
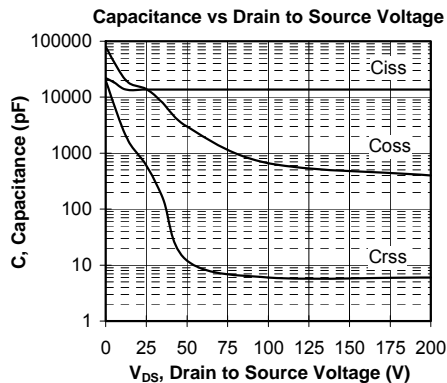
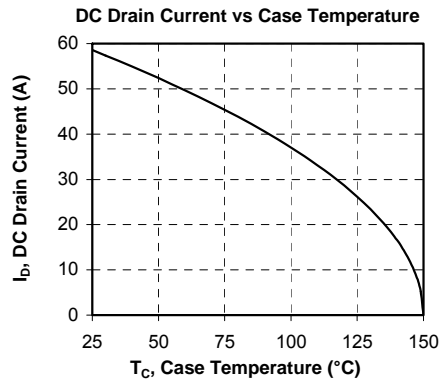
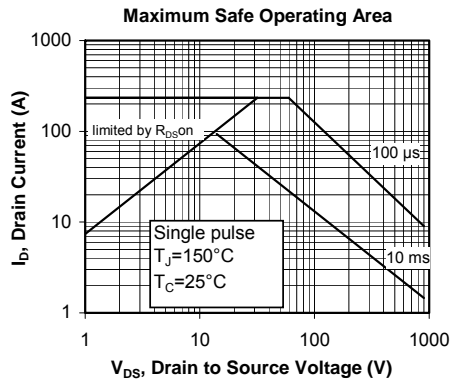
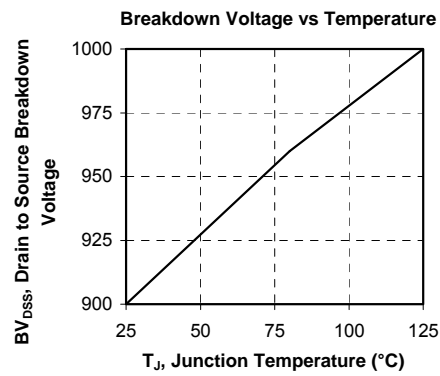
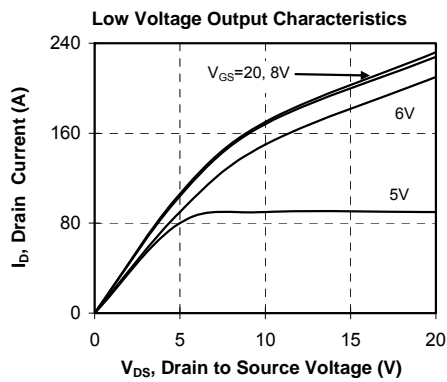
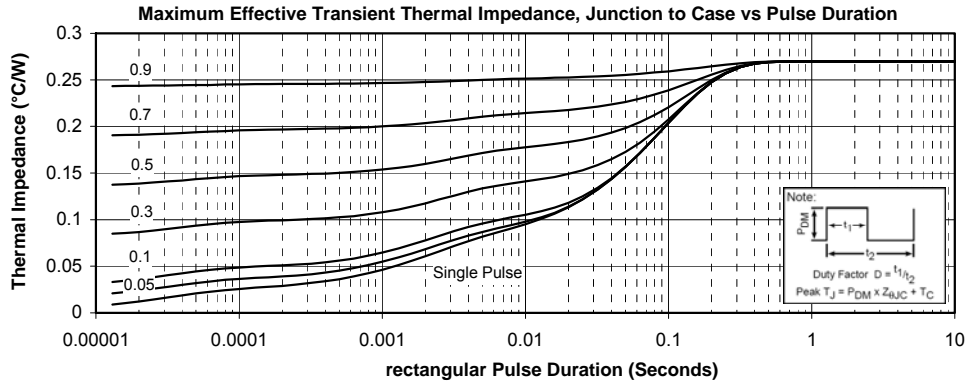
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

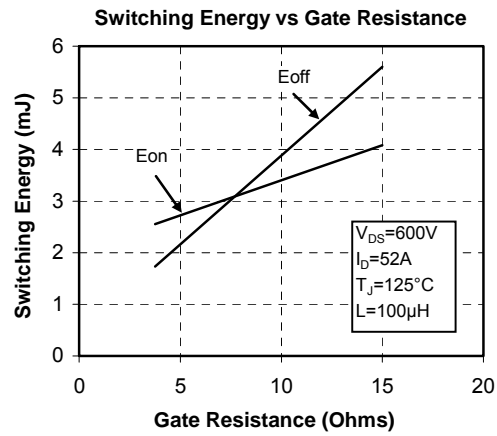
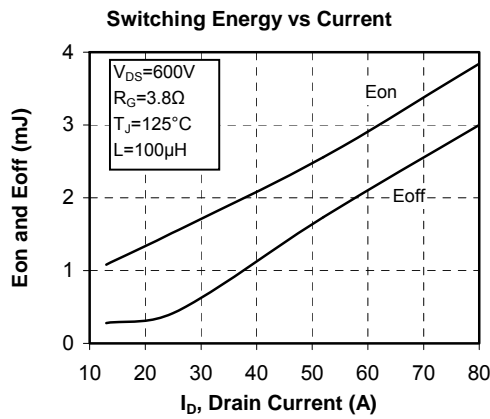
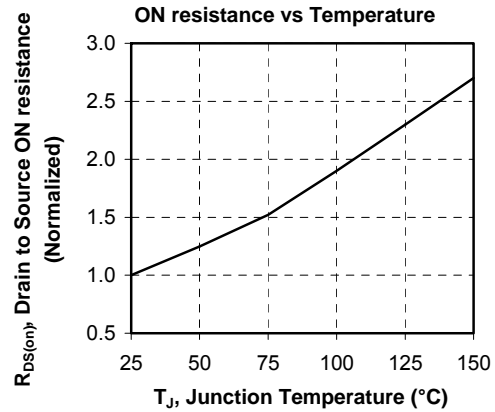
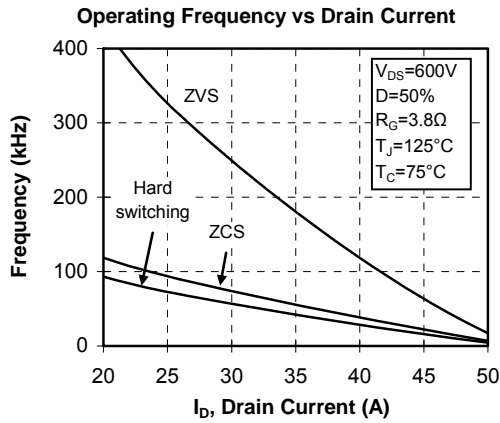
## SP1 Package outline (dimensions in mm)



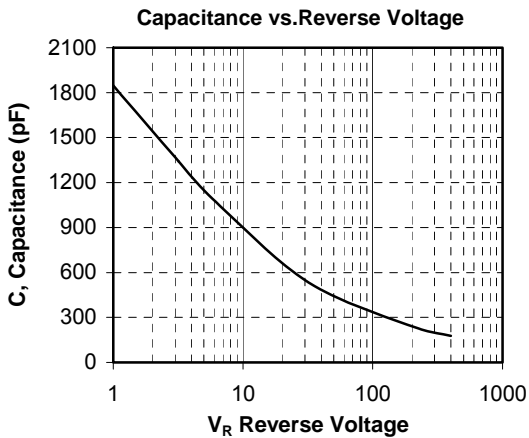
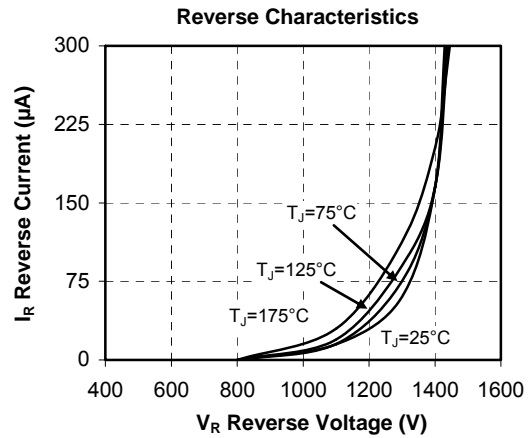
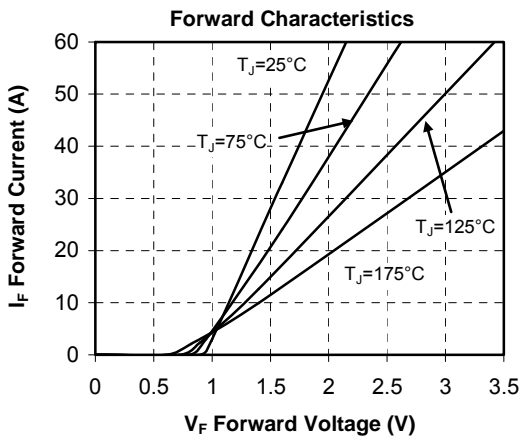
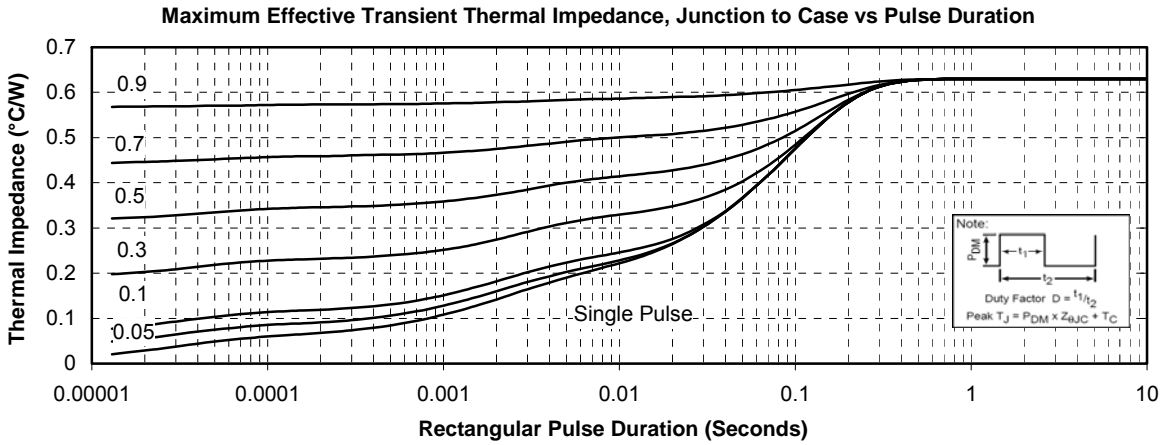
See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical CoolMOS Performance Curve





## Typical CR2 SiC Diode Performance Curve



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