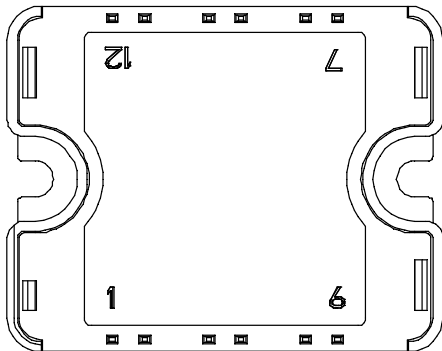
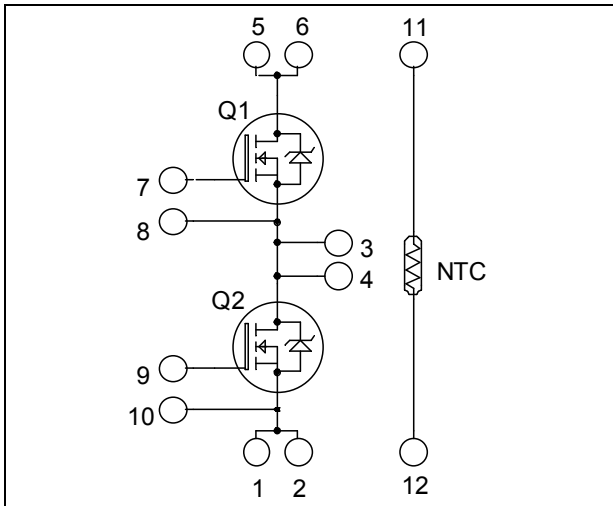


## Phase leg Super Junction MOSFET Power Module

$$V_{DSS} = 600V$$

$$R_{DSon} = 35m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 72A \text{ @ } T_c = 25^\circ C$$



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

### Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

### Features

- **COOLMOS**  
Power Semiconductors
  - Ultra low  $R_{DSon}$
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
  - Very rugged
- Very low stray inductance
  - Symmetrical design
- 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	600	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	72
		$T_c = 80^\circ C$	54
$I_{DM}$	Pulsed Drain current	200	A
$V_{GS}$	Gate - Source Voltage	$\pm 20$	V
$R_{DSon}$	Drain - Source ON Resistance	35	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	416
$I_{AR}$	Avalanche current (repetitive and non repetitive)	20	A
$E_{AR}$	Repetitive Avalanche Energy	1	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1800	

**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	$V_{GS} = 0V, V_{DS} = 600V$			40	$\mu\text{A}$
		$T_j = 25^\circ\text{C}$				
		$V_{GS} = 0V, V_{DS} = 600V$			375	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 72A$			35	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5.4\text{mA}$	2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 150$	$\text{nA}$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		14		$\text{nF}$
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		5.13		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.42		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		518		$\text{nC}$
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 300V$		58		
$Q_{gd}$	Gate – Drain Charge	$I_D = 72A$		222		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive Switching @ 125°C</b> $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 72A$ $R_G = 2.5\Omega$		21		$\text{ns}$
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
$T_f$	Fall Time			84		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 72A, R_G = 2.5\Omega$		1340		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			1960		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 72A, R_G = 2.5\Omega$		2192		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			2412		

**Source - Drain diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$		72		A
		$T_c = 80^\circ\text{C}$		54		
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0V, I_S = -72A$			1.2	V
$dv/dt$	Peak Diode Recovery ①				6	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -72A$ $V_R = 350V$		580		$\text{ns}$
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 200A/\mu\text{s}$		46		$\mu\text{C}$

①  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

$$I_S \leq -72A \quad di/dt \leq 200A/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance			0.3	°C/W	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			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	

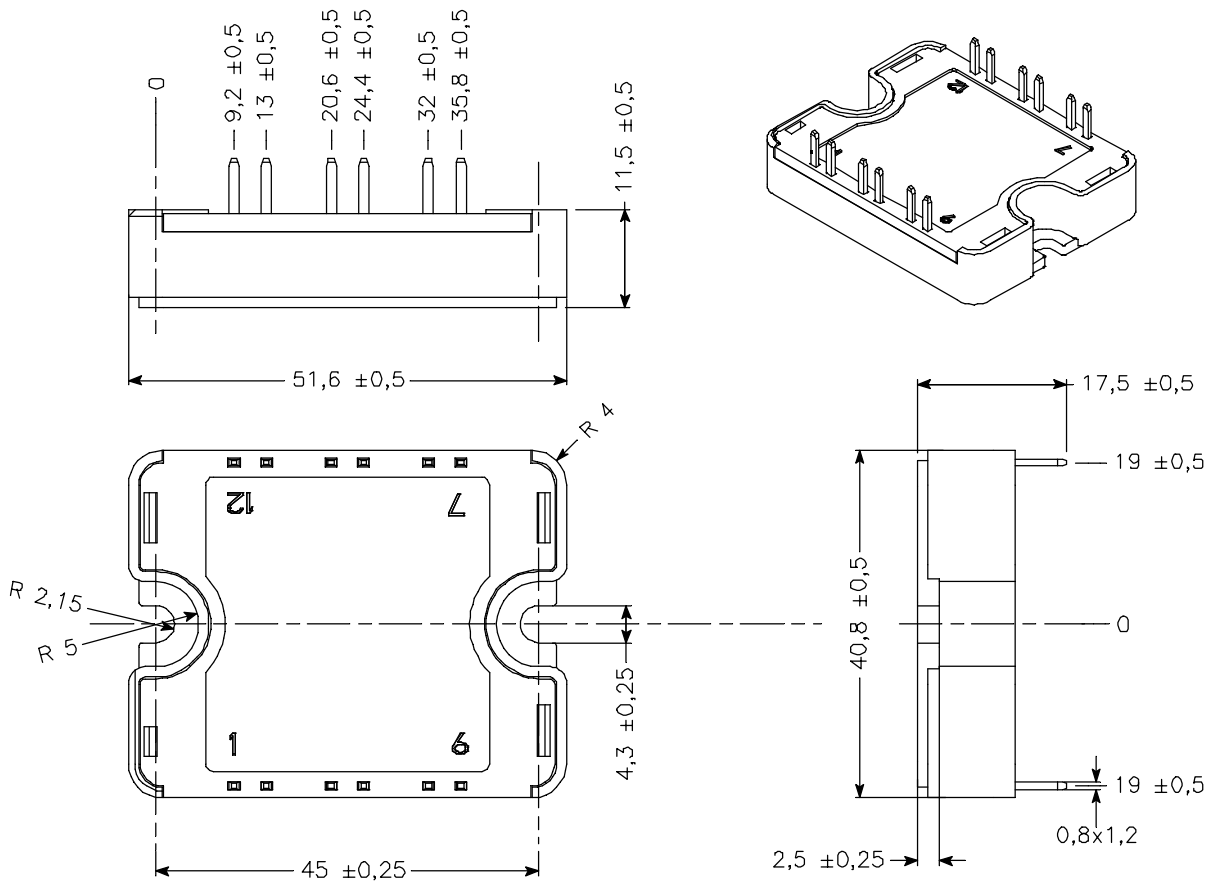
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

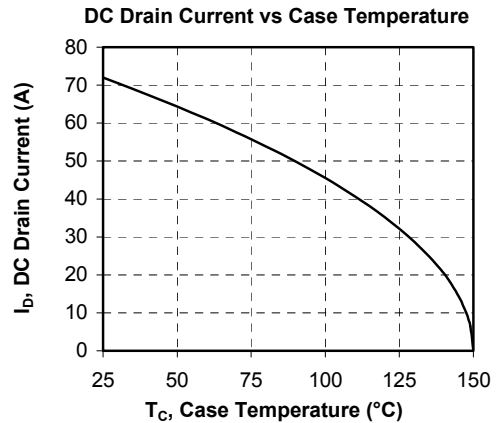
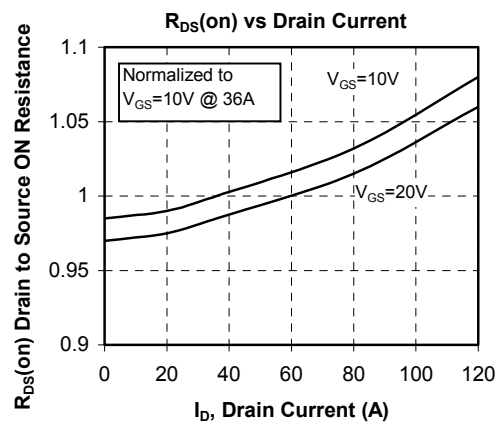
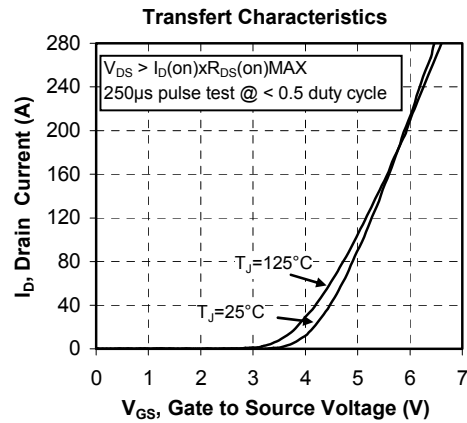
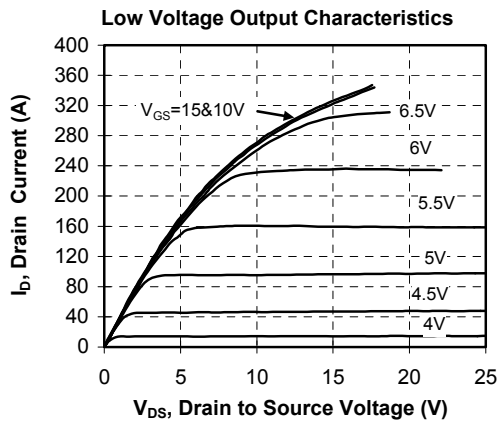
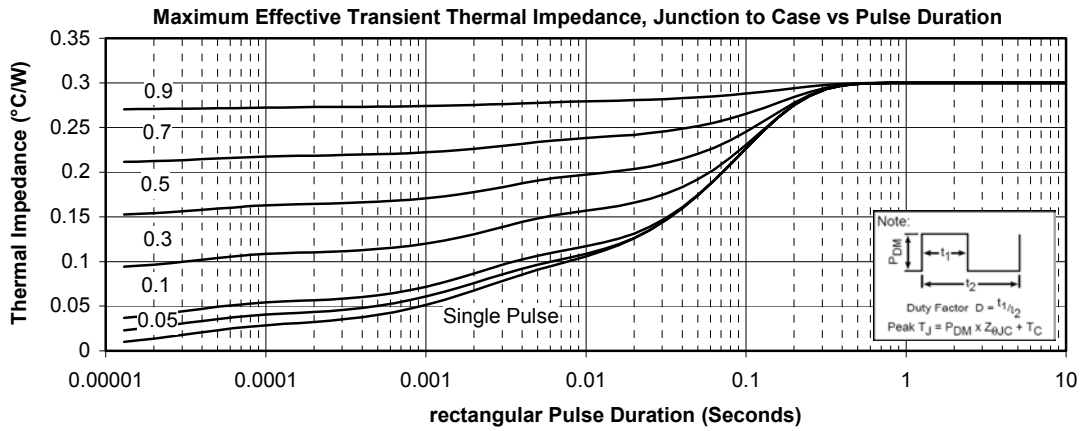
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T} - \frac{1}{T_{25}} \right) \right]}$$

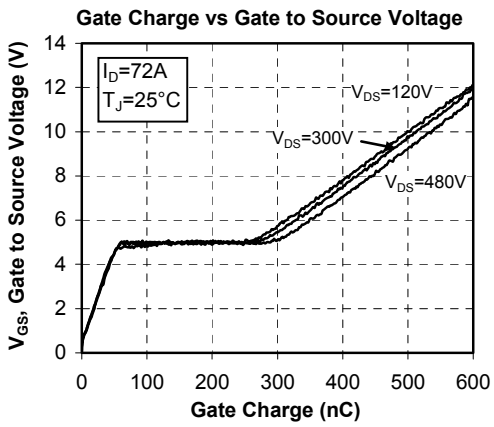
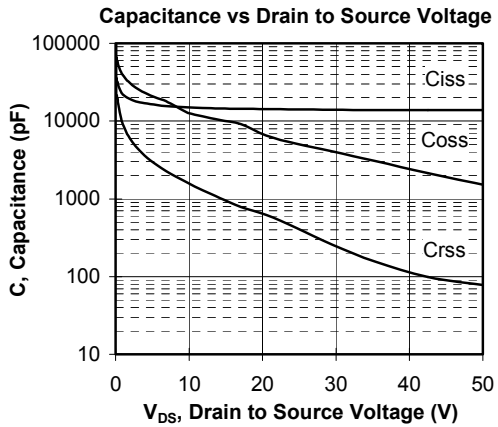
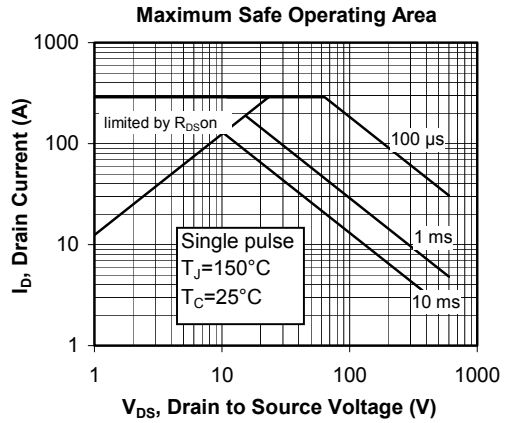
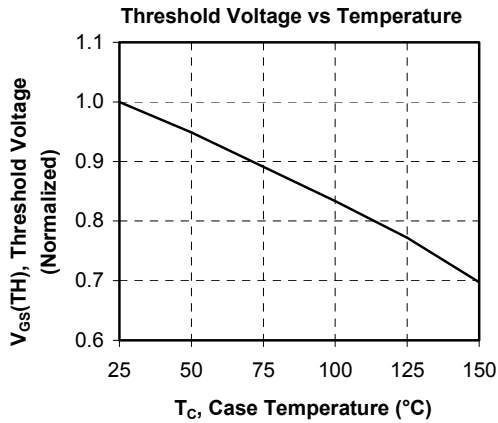
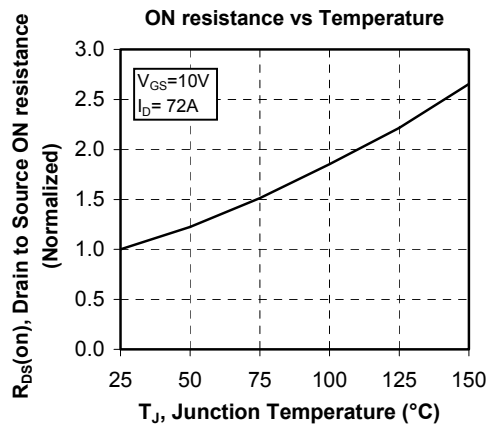
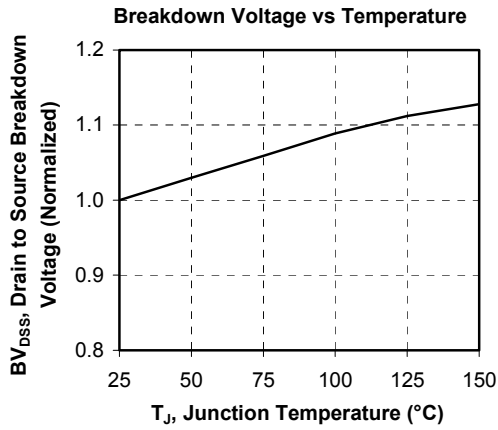
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

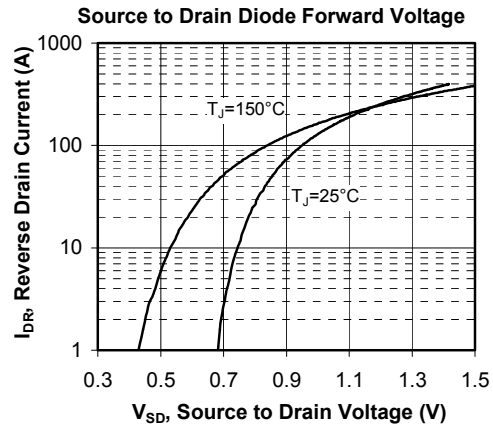
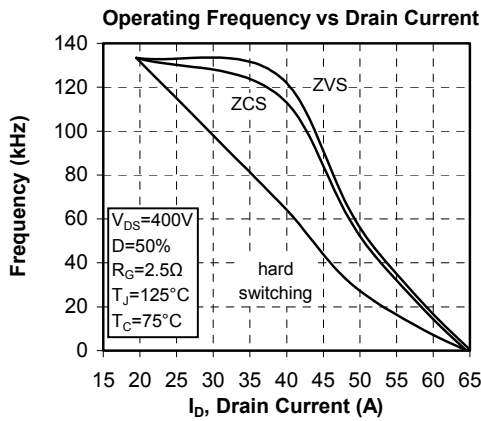
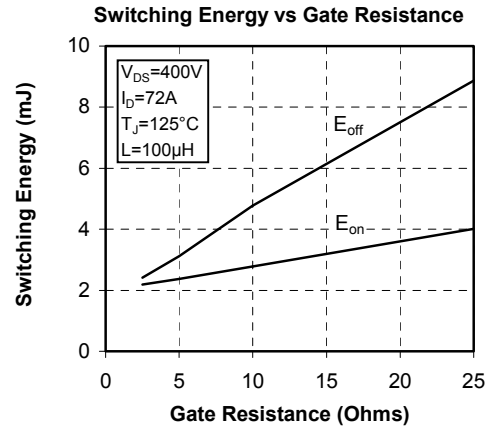
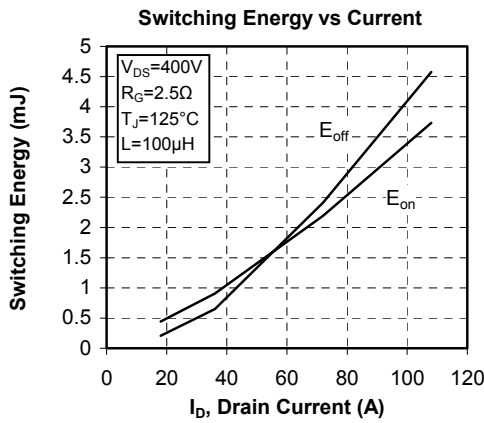
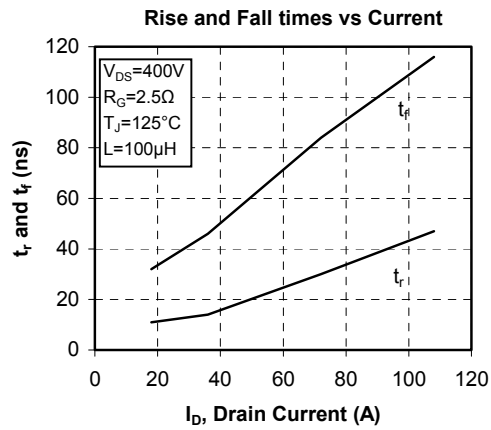
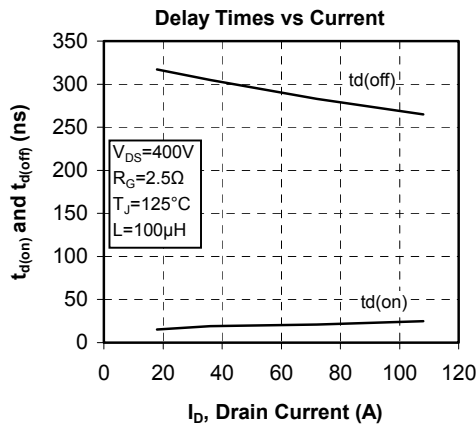
## SP1 Package outline (dimensions in mm)



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

**Typical Performance Curve**






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