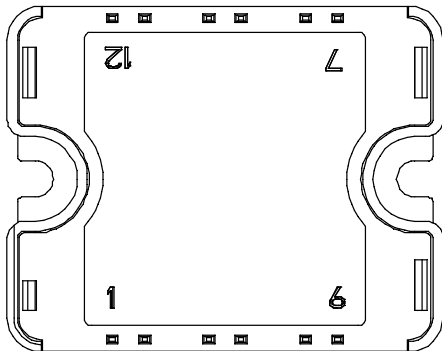
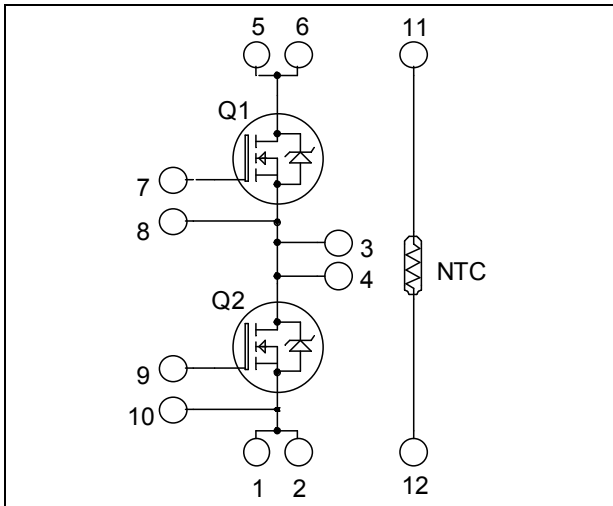


Phase leg Super Junction MOSFET Power Module

$V_{DSS} = 800V$
 $R_{DSon} = 150m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 28A \text{ @ } T_c = 25^\circ C$



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	800	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	28
		$T_c = 80^\circ C$	21
I_{DM}	Pulsed Drain current	110	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	150	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	277
I_{AR}	Avalanche current (repetitive and non repetitive)	17	A
E_{AR}	Repetitive Avalanche Energy	0.5	mJ
E_{AS}	Single Pulse Avalanche Energy	670	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on 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} = 800V			50	μA
		T _j = 25°C				
		V _{GS} = 0V, V _{DS} = 800V			375	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 14A			150	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 2mA	2.1	3	3.9	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0V			±150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V		4507		pF
C _{oss}	Output Capacitance	V _{DS} = 25V		2092		
C _{rss}	Reverse Transfer Capacitance	f = 1MHz		108		
Q _g	Total gate Charge	V _{GS} = 10V V _{Bus} = 400V I _D = 28A		180		nC
Q _{gs}	Gate – Source Charge			22		
Q _{gd}	Gate – Drain Charge			90		
T _{d(on)}	Turn-on Delay Time	Inductive switching @125°C V _{GS} = 15V V _{Bus} = 533V I _D = 28A R _G = 2.5Ω		10		ns
T _r	Rise Time			13		
T _{d(off)}	Turn-off Delay Time			83		
T _f	Fall Time			35		
E _{on}	Turn-on Switching Energy	Inductive switching @ 25°C V _{GS} = 15V, V _{Bus} = 533V I _D = 28A, R _G = 2.5Ω		486		μJ
E _{off}	Turn-off Switching Energy			278		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C V _{GS} = 15V, V _{Bus} = 533V I _D = 28A, R _G = 2.5Ω		850		μJ
E _{off}	Turn-off Switching Energy			342		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I _S	Continuous Source current (Body diode)		T _c = 25°C		28	A
			T _c = 80°C		21	
V _{SD}	Diode Forward Voltage	V _{GS} = 0V, I _S = - 28A			1.2	V
dv/dt	Peak Diode Recovery ❶				6	V/ns
t _{rr}	Reverse Recovery Time	I _S = - 28A V _R = 400V di _S /dt = 200A/μs	T _j = 25°C		550	ns
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		30	μC

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

$$I_S \leq -28A \quad di/dt \leq 200A/\mu s \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

Thermal and package characteristics

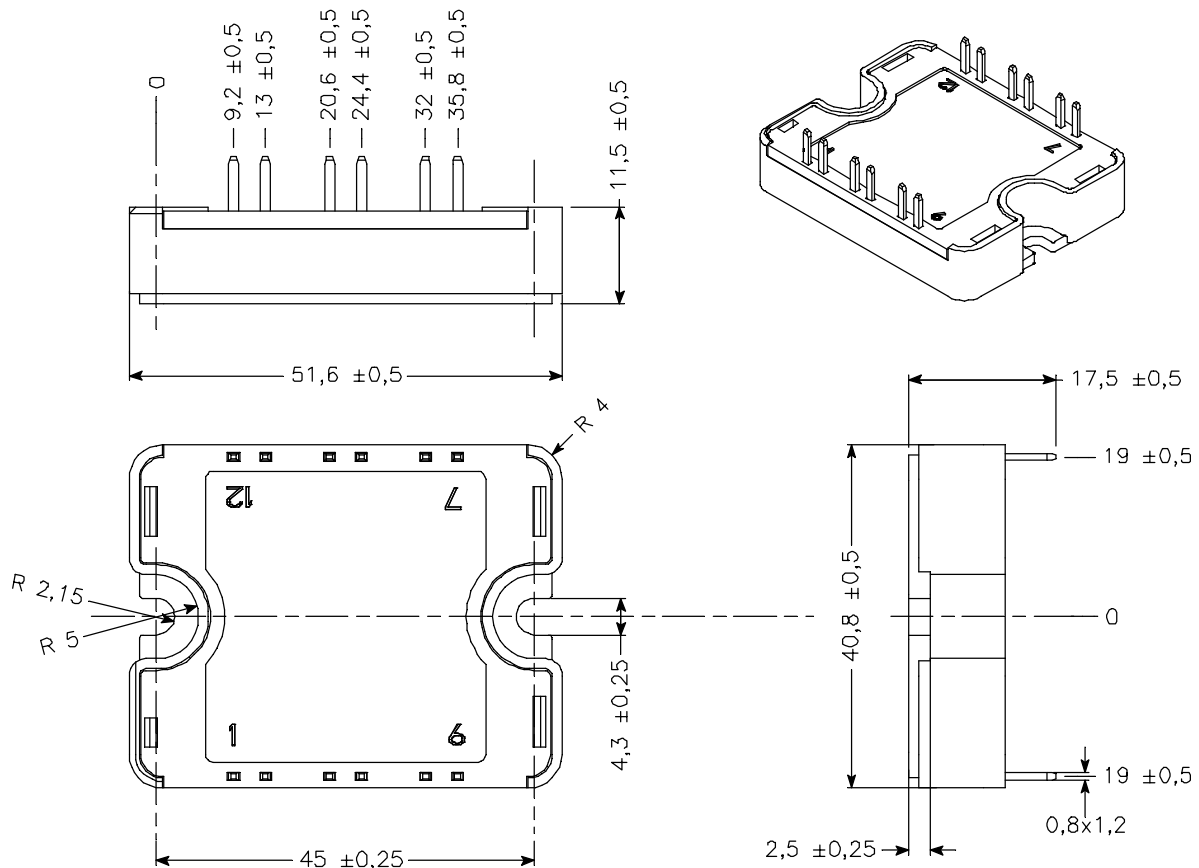
Symbol	Characteristic	Min	Typ	Max	Unit	
R _{thJC}	Junction to Case Thermal Resistance			0.45	°C/W	
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz	2500			V	
T _J	Operating junction temperature range	-40		150	°C	
T _{STG}	Storage Temperature Range	-40		125		
T _C	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 ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

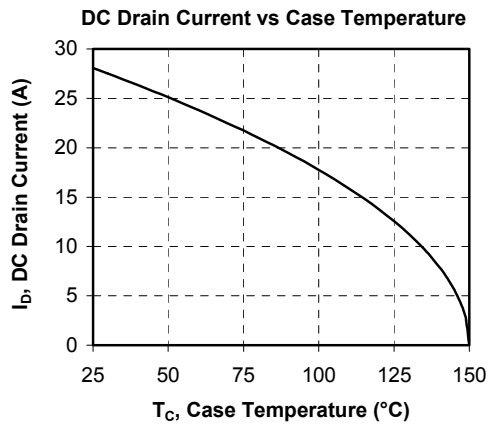
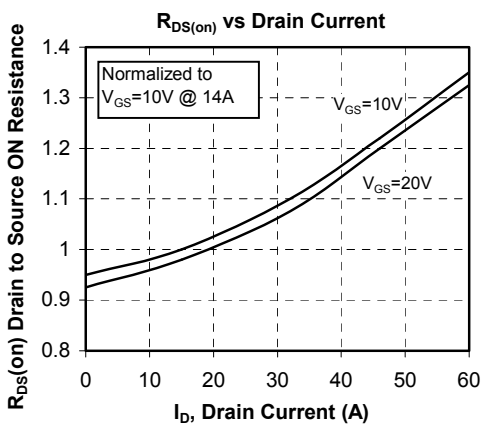
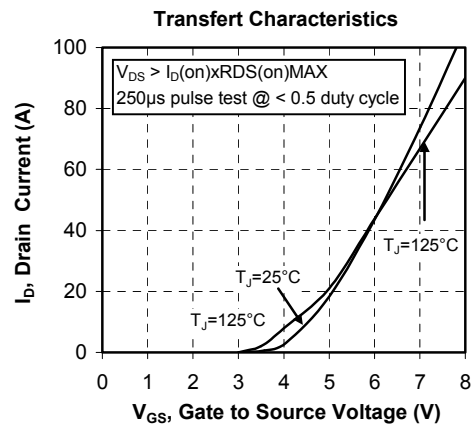
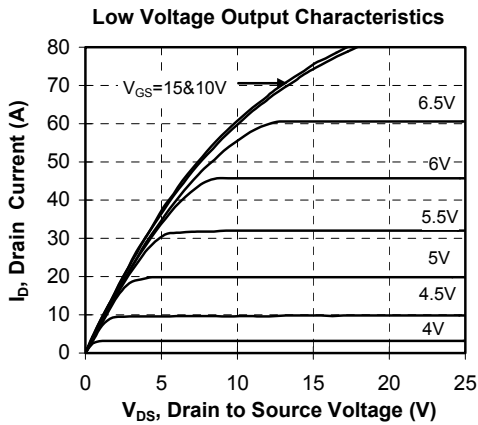
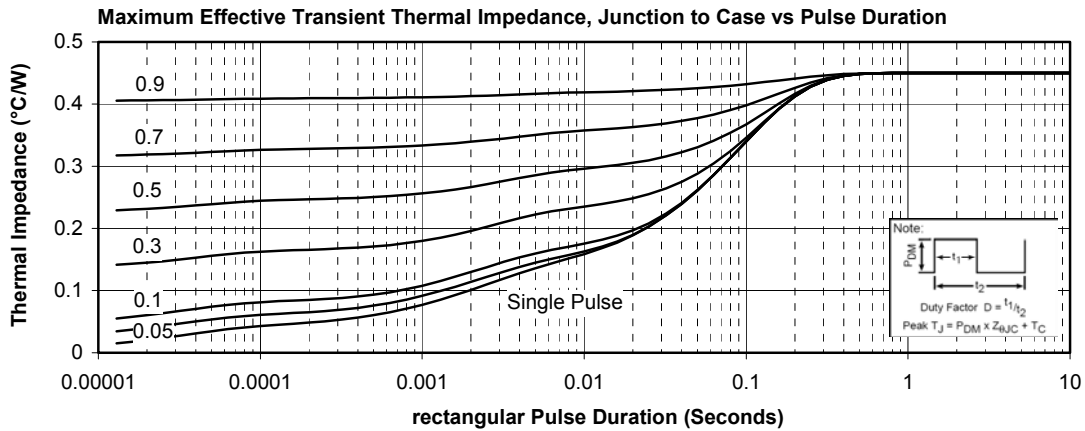
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

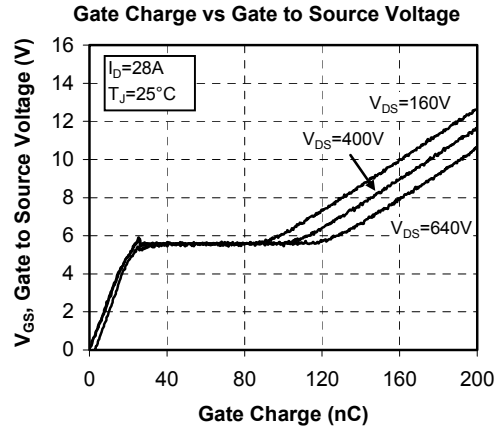
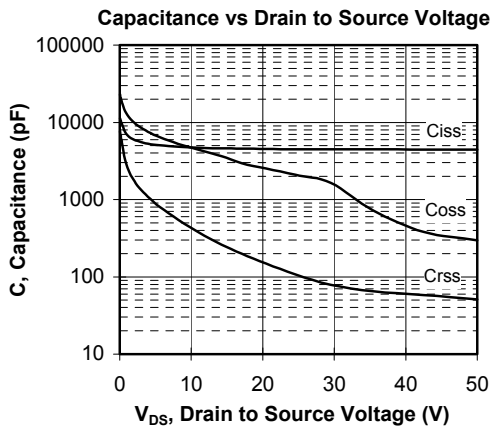
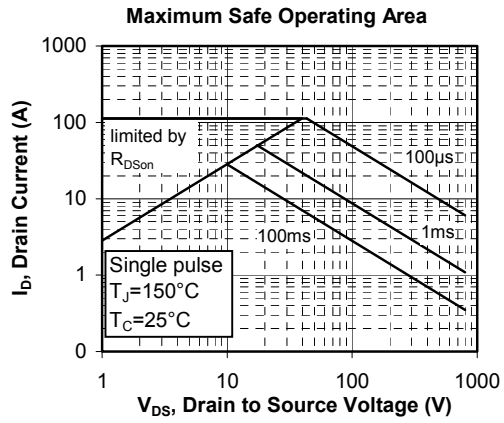
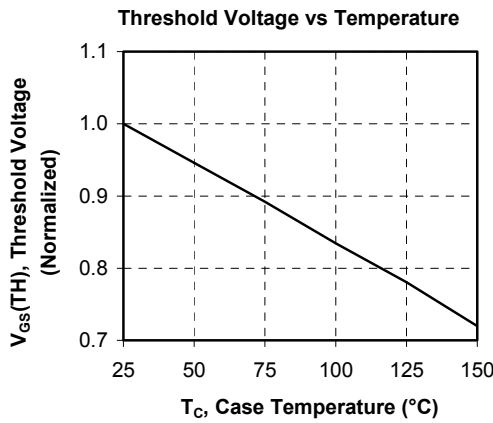
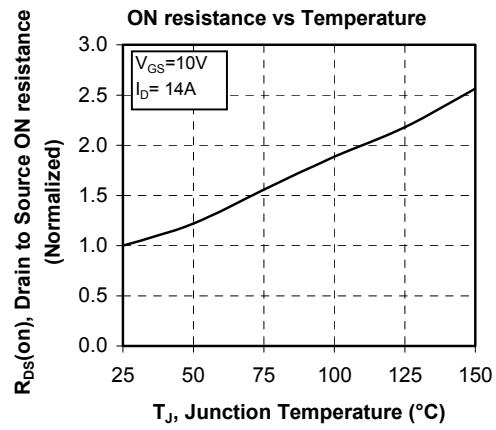
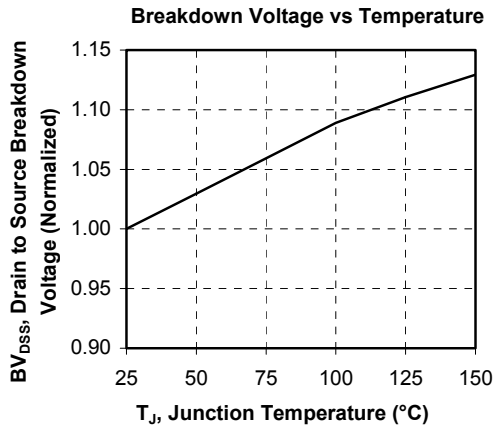
T: Thermistor temperature
 R_T: Thermistor value at T

SP1 Package outline (dimensions in mm)


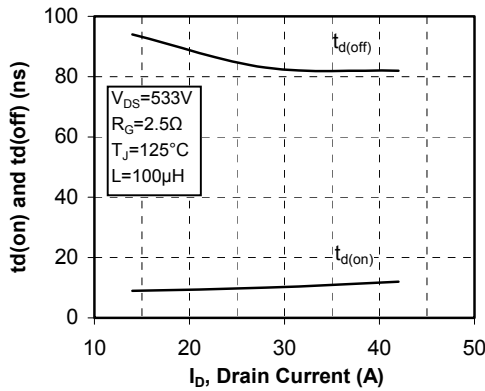
See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical Performance Curve

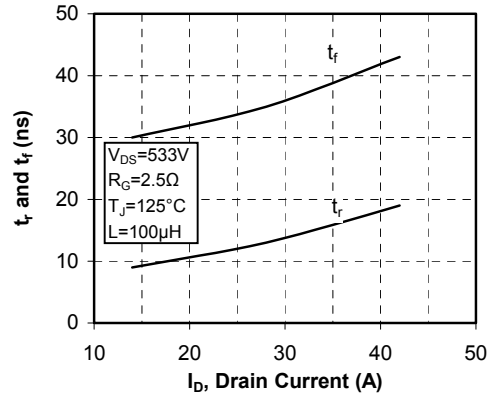




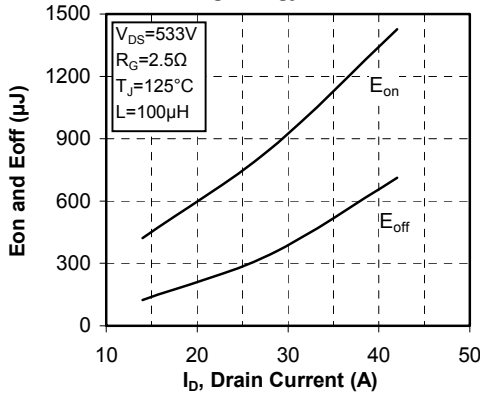
Delay Times vs Current



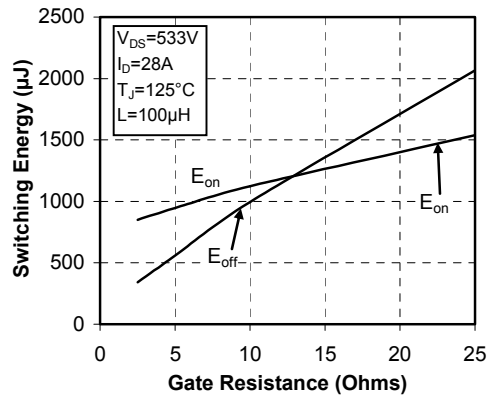
Rise and Fall times vs Current



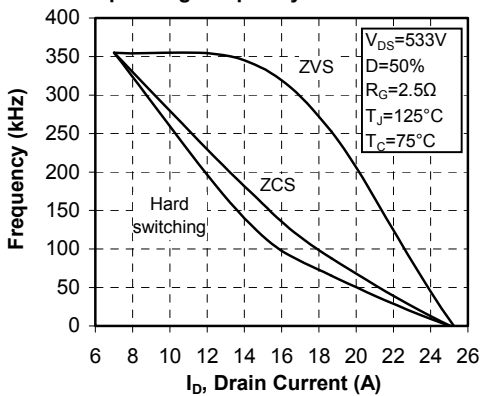
Switching Energy vs Current



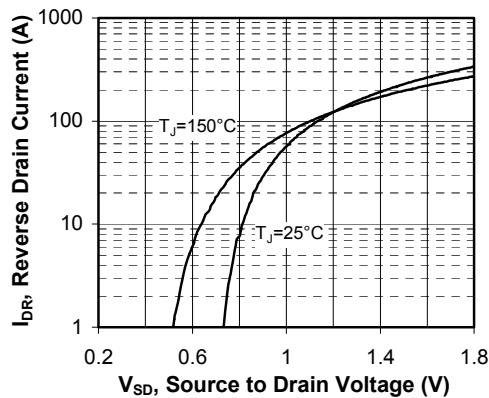
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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