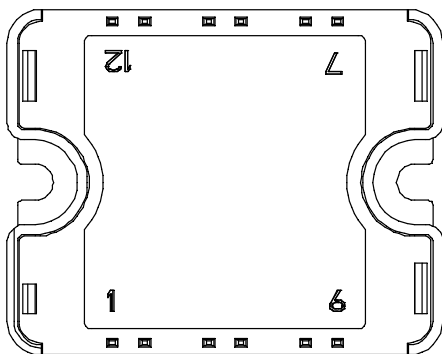
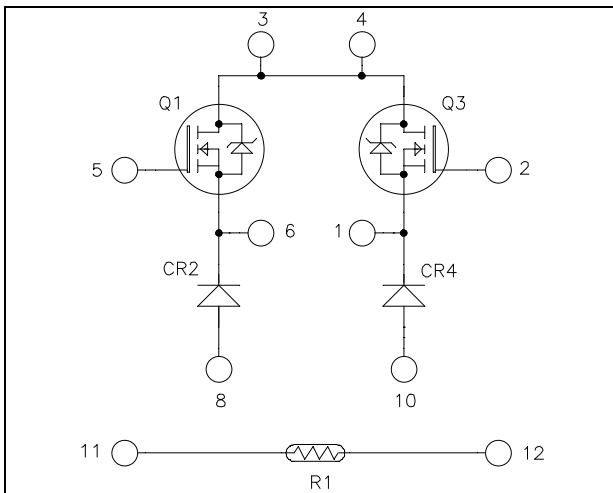


## Dual Buck chopper Super Junction MOSFET Power Module

$$V_{DSS} = 600V$$

$$R_{DSon} = 45m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 49A \text{ @ } T_c = 25^\circ C$$



Pins 3/4 must be shorted together

### Application

- AC and DC motor control
- Switched Mode Power Supplies

### Features



- 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
- Each leg can be easily paralleled to achieve a single buck of twice the current capability
- 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	$T_c = 25^\circ C$	49
		$T_c = 80^\circ C$	38
$I_{DM}$	Pulsed Drain current	130	
$V_{GS}$	Gate - Source Voltage	$\pm 20$	V
$R_{DSon}$	Drain - Source ON Resistance	45	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	250
$I_{AR}$	Avalanche current (repetitive and non repetitive)	15	A
$E_{AR}$	Repetitive Avalanche Energy	3	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1900	

**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 <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 600V   T <sub>j</sub> = 25°C			250	μA
		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 600V   T <sub>j</sub> = 125°C			500	
R <sub>DS(on)</sub>	Drain – Source on Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 24.5A		40	45	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 3mA	2.1	3	3.9	V
I <sub>GSS</sub>	Gate – Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0V			100	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V ; V <sub>DS</sub> = 25V f = 1MHz		7.2		nF	
C <sub>oss</sub>	Output Capacitance				8.5		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = 10V V <sub>Bus</sub> = 300V I <sub>D</sub> = 49A		150		nC	
Q <sub>gs</sub>	Gate – Source Charge				34		
Q <sub>gd</sub>	Gate – Drain Charge				51		
T <sub>d(on)</sub>	Turn-on Delay Time	<b>Inductive Switching (125°C)</b> V <sub>GS</sub> = 10V V <sub>Bus</sub> = 400V I <sub>D</sub> = 49A R <sub>G</sub> = 5Ω		21		ns	
T <sub>r</sub>	Rise Time				30		
T <sub>d(off)</sub>	Turn-off Delay Time				100		
T <sub>f</sub>	Fall Time				45		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> V <sub>GS</sub> = 10V ; V <sub>Bus</sub> = 400V I <sub>D</sub> = 49A ; R <sub>G</sub> = 5Ω		675		μJ	
E <sub>off</sub>	Turn-off Switching Energy				520		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> V <sub>GS</sub> = 10V ; V <sub>Bus</sub> = 400V I <sub>D</sub> = 49A ; R <sub>G</sub> = 5Ω		1100		μJ	
E <sub>off</sub>	Turn-off Switching Energy				635		

**Chopper diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage		600			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> = 600V	T <sub>j</sub> = 25°C		25	μA
			T <sub>j</sub> = 125°C		500	
I <sub>F</sub>	DC Forward Current			60		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 60A		1.7	2.3	V
		I <sub>F</sub> = 120A		2		
		I <sub>F</sub> = 60A   T <sub>j</sub> = 125°C		1.4		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 60A V <sub>R</sub> = 400V	T <sub>j</sub> = 25°C		70	ns
			T <sub>j</sub> = 125°C		140	
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt = 200A/μs	T <sub>j</sub> = 25°C		100	nC
			T <sub>j</sub> = 125°C		690	

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	CoolMOS		0.5	°C/W	
		Diode		0.85		
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		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	3	N.m
Wt	Package Weight				80	g

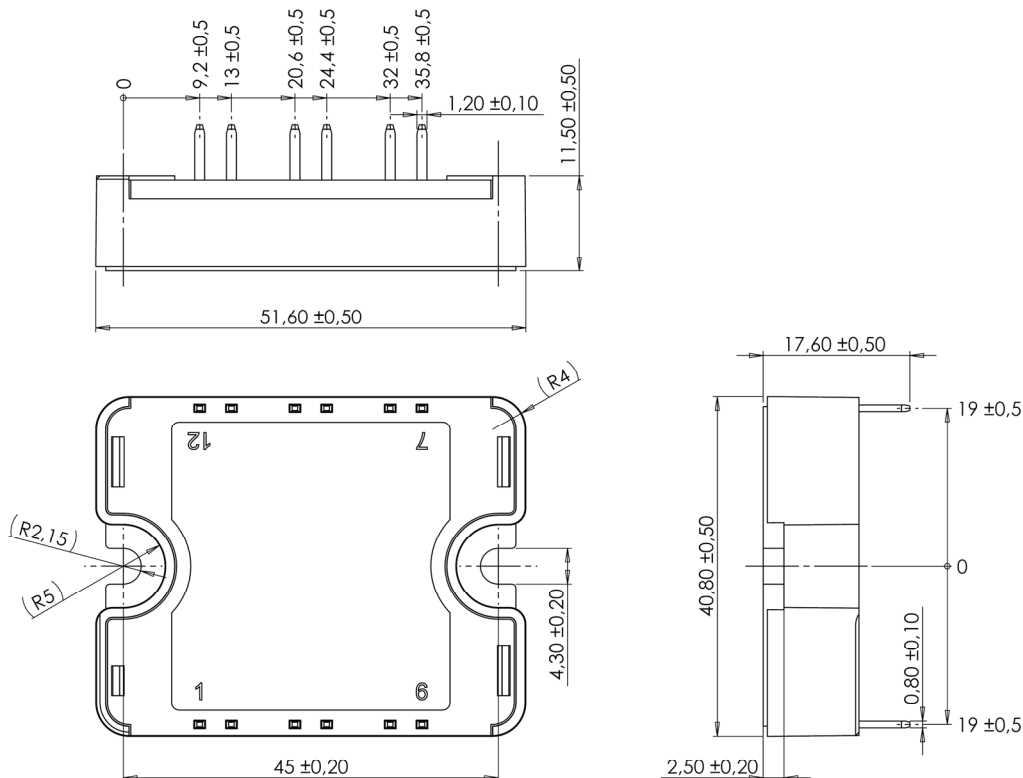
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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		%

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

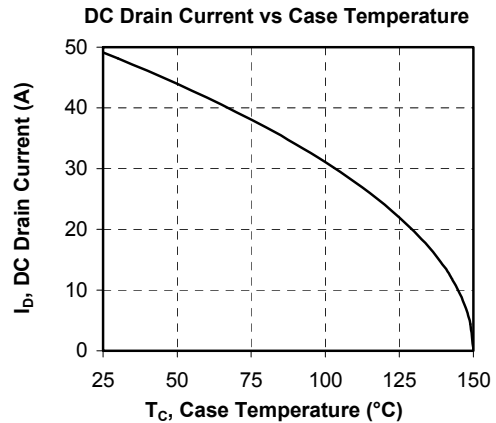
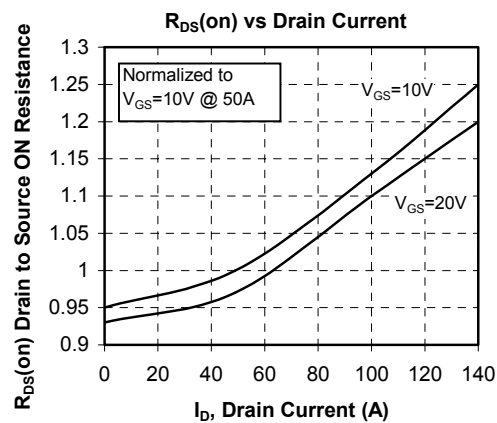
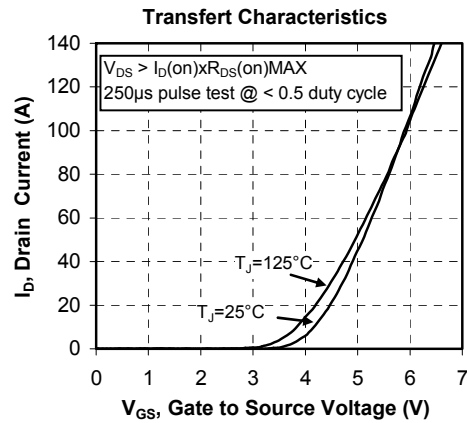
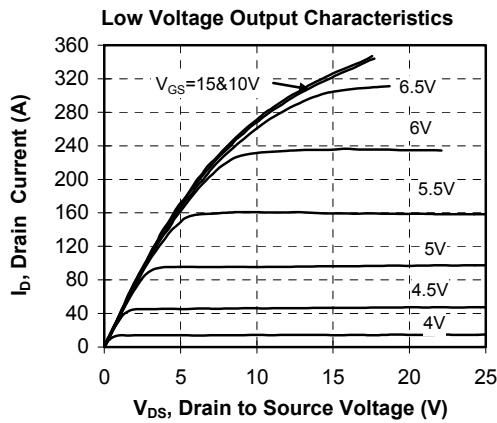
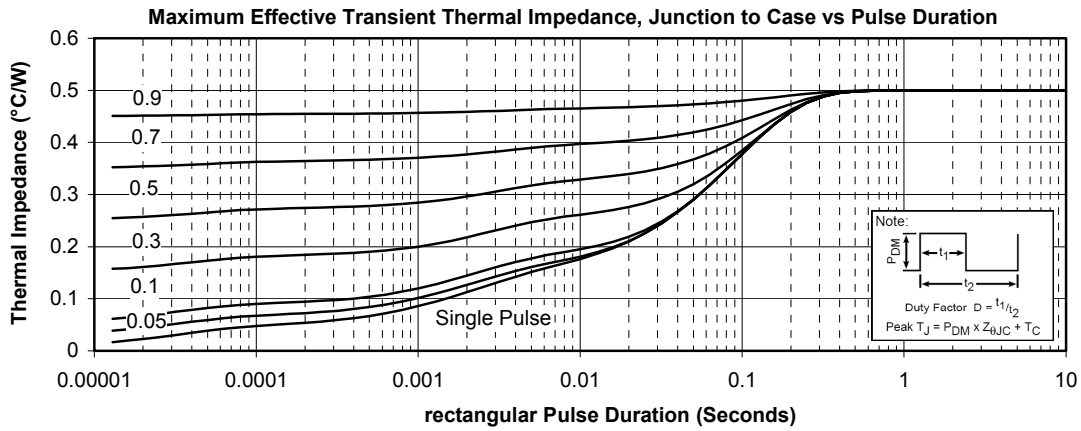
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

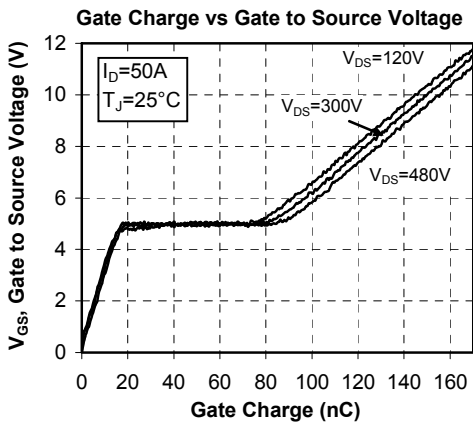
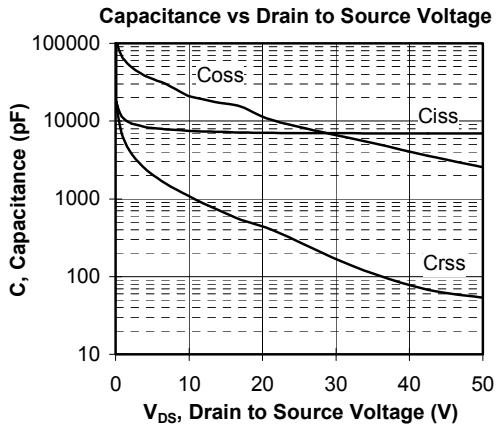
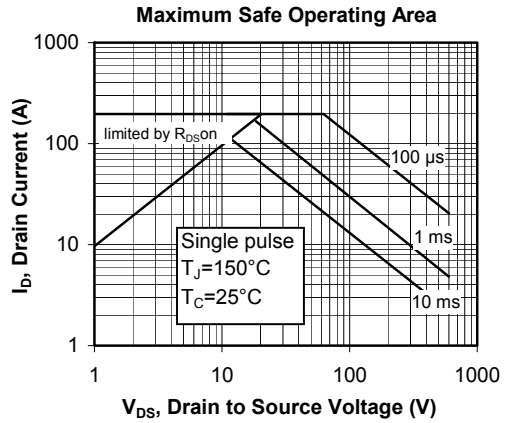
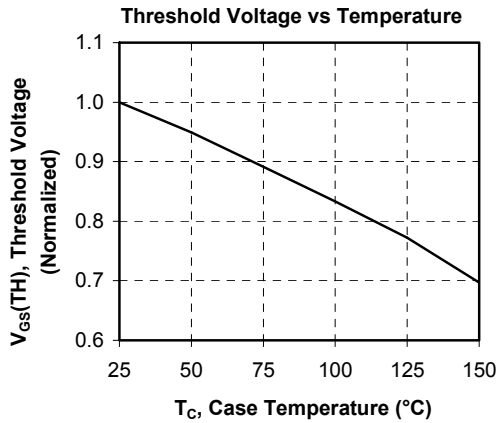
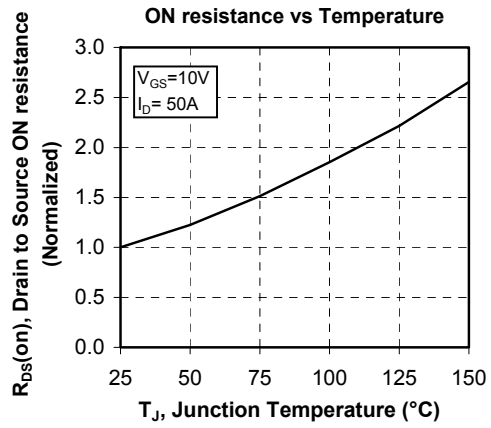
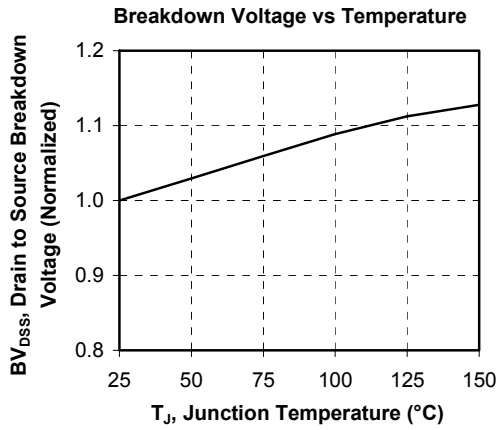
## SP1 Package outline (dimensions in mm)

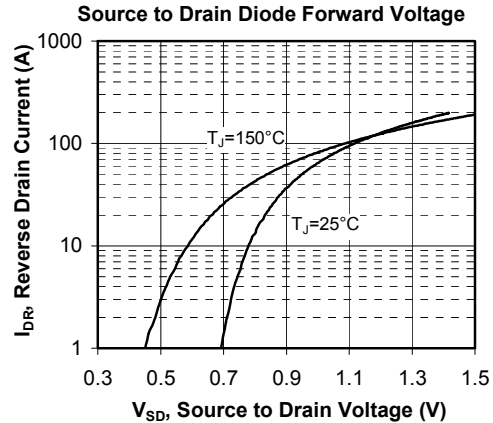
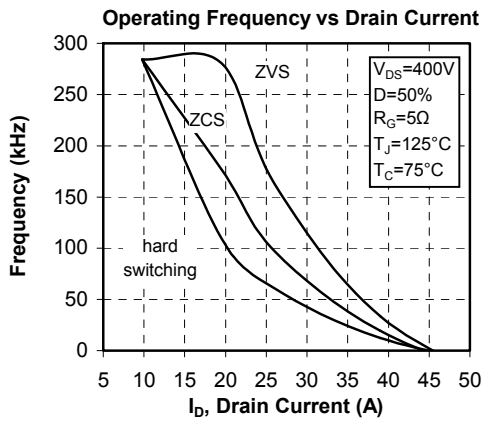
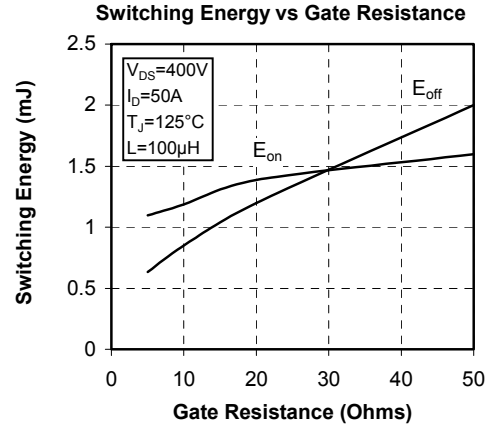
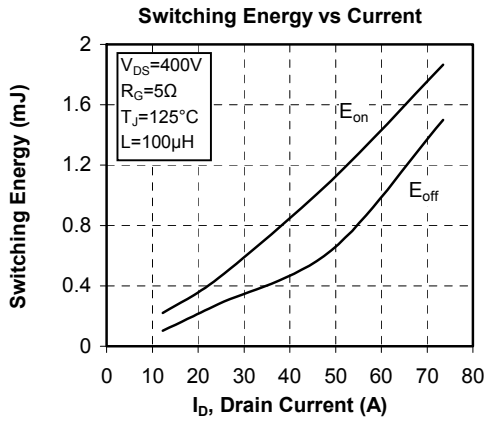
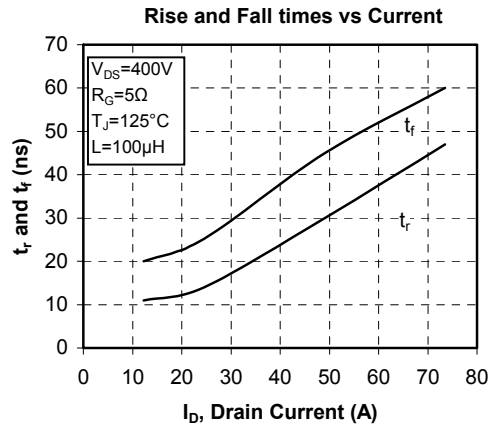
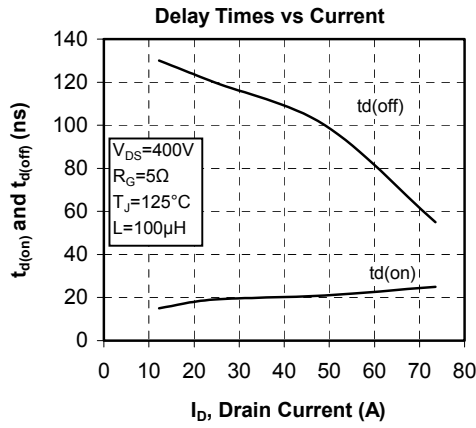


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

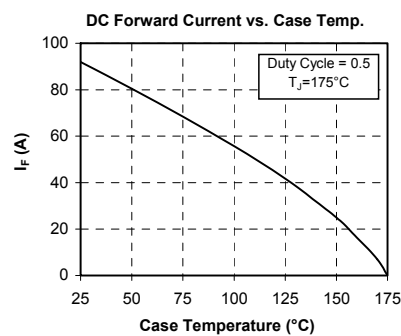
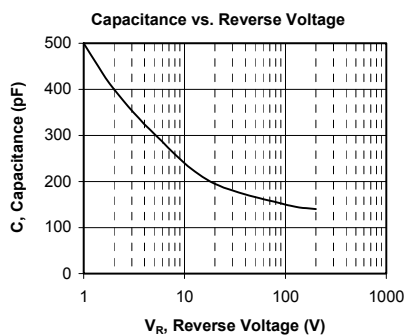
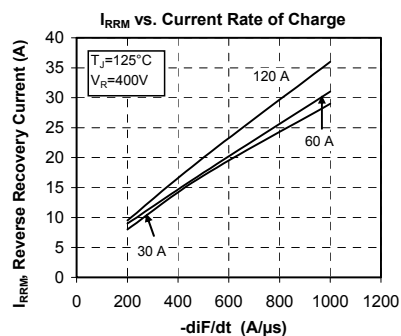
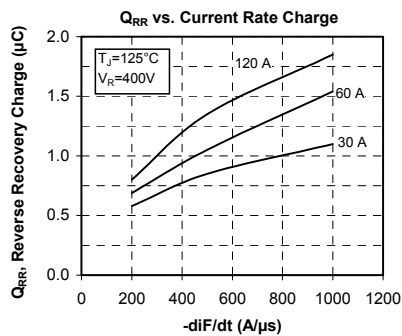
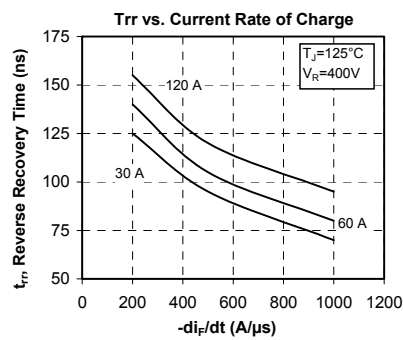
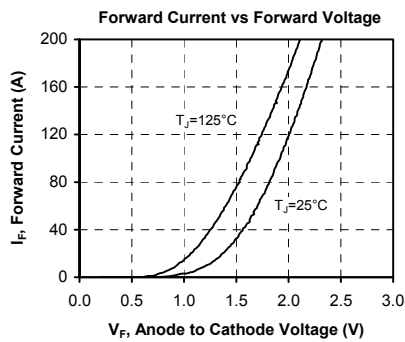
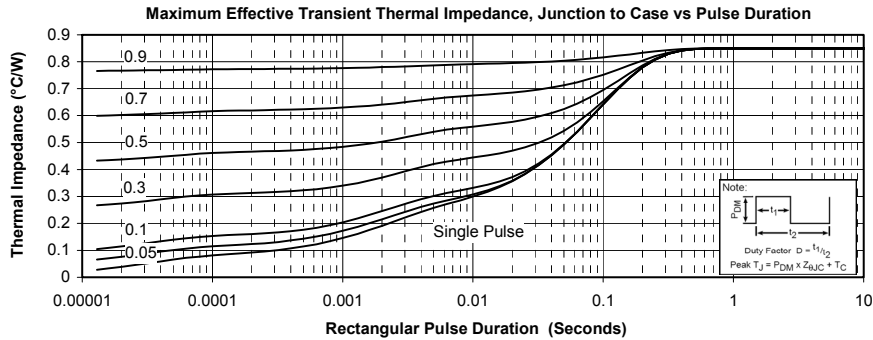
## Typical CoolMOS Performance Curve







## Typical chopper diode Performance Curve



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