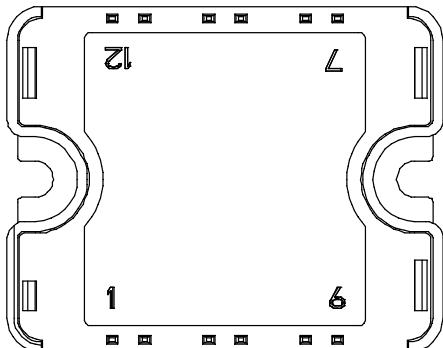
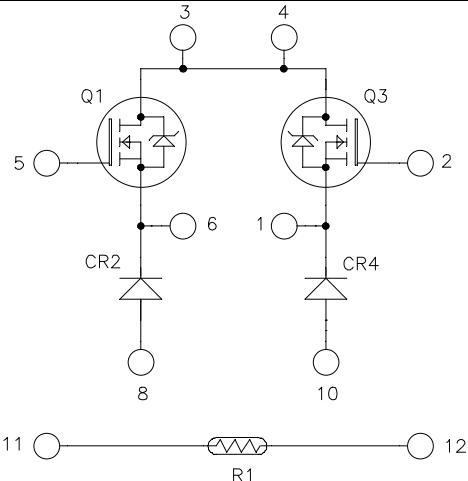


**Dual Buck chopper  
Super Junction MOSFET  
Power Module**

**$V_{DSS} = 600V$**   
 **$R_{DSon} = 45m\Omega$  max @  $T_j = 25^\circ C$**   
 **$I_D = 49A$  @  $T_c = 25^\circ C$**



Pins 3/4 must be shorted together

**Application**

- AC and DC motor control
- Switched Mode Power Supplies

**Features**
**• COOLMOS<sup>®</sup>  
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
- 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	49	A
	$T_c = 25^\circ C$	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	250	W
$I_{AR}$	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
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	$T_j = 25^\circ\text{C}$			250
		$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$	$T_j = 125^\circ\text{C}$			500
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 24.5\text{A}$		40	45	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 3\text{mA}$	2.1	3	3.9	$\text{V}$
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{V}$			100	$\text{nA}$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V} ; V_{DS} = 25\text{V}$ $f = 1\text{MHz}$		7.2		$\text{nF}$
$C_{oss}$	Output Capacitance			8.5		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$ $V_{Bus} = 300\text{V}$ $I_D = 49\text{A}$		150		$\text{nC}$
$Q_{gs}$	Gate – Source Charge			34		
$Q_{gd}$	Gate – Drain Charge			51		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive Switching (125°C)</b> $V_{GS} = 10\text{V}$ $V_{Bus} = 400\text{V}$ $I_D = 49\text{A}$		21		$\text{ns}$
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			100		
$T_f$	Fall Time			45		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b> $V_{GS} = 10\text{V} ; V_{Bus} = 400\text{V}$ $I_D = 49\text{A} ; R_G = 5\Omega$		675		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			520		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> $V_{GS} = 10\text{V} ; V_{Bus} = 400\text{V}$ $I_D = 49\text{A} ; R_G = 5\Omega$		1100		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			635		

**Chopper diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			$\text{V}$
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		25	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		500	
$I_F$	DC Forward Current		$T_c = 80^\circ\text{C}$	60		$\text{A}$
$V_F$	Diode Forward Voltage		$I_F = 60\text{A}$		1.7	2.3
			$I_F = 120\text{A}$		2	
			$I_F = 60\text{A}$	$T_j = 125^\circ\text{C}$	1.4	
$t_{rr}$	Reverse Recovery Time	$I_F = 60\text{A}$ $V_R = 400\text{V}$ $di/dt = 200\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		70	$\text{ns}$
			$T_j = 125^\circ\text{C}$		140	
$Q_{rr}$	Reverse Recovery Charge		$T_j = 25^\circ\text{C}$		100	$\text{nC}$
			$T_j = 125^\circ\text{C}$		690	

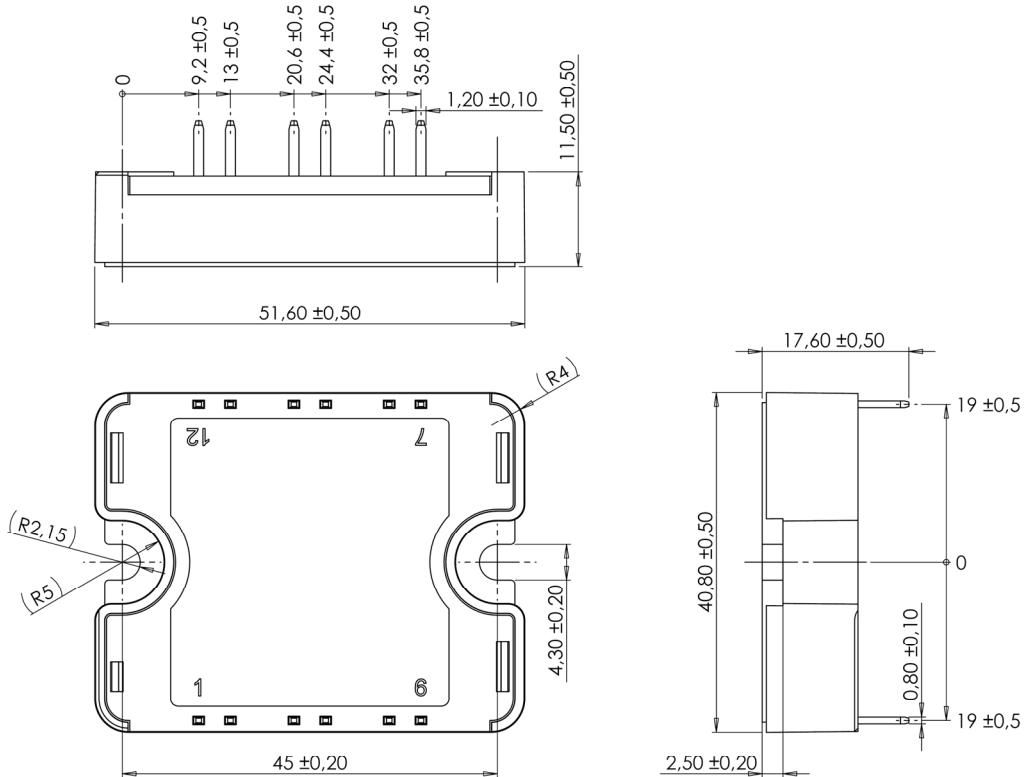
**Thermal and package characteristics**

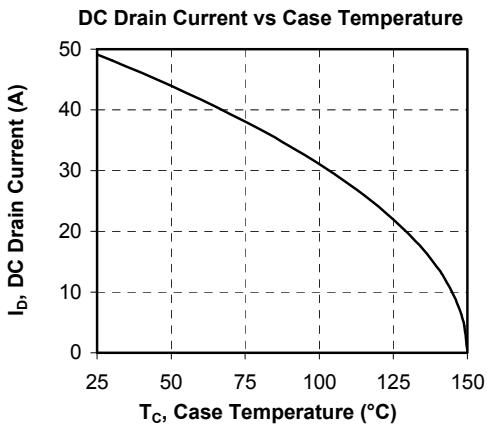
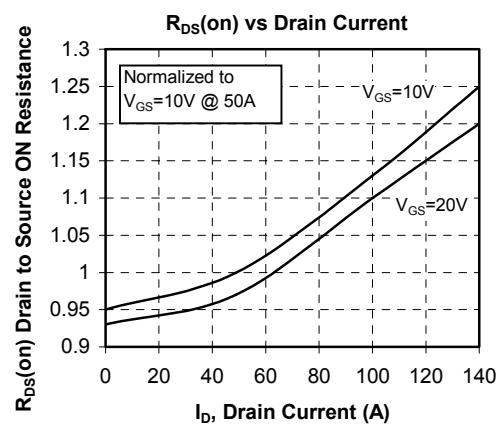
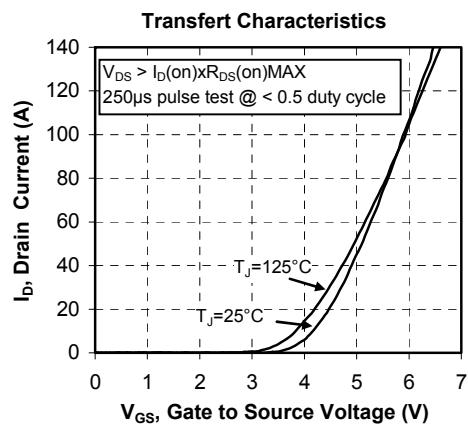
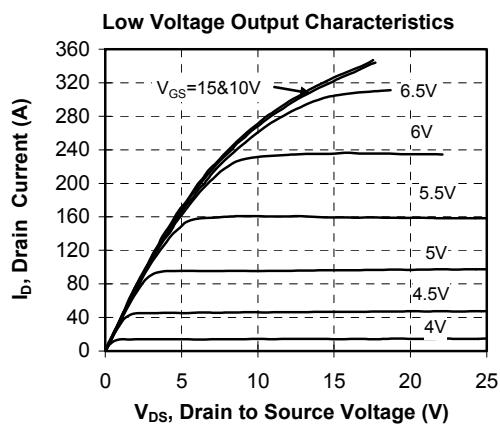
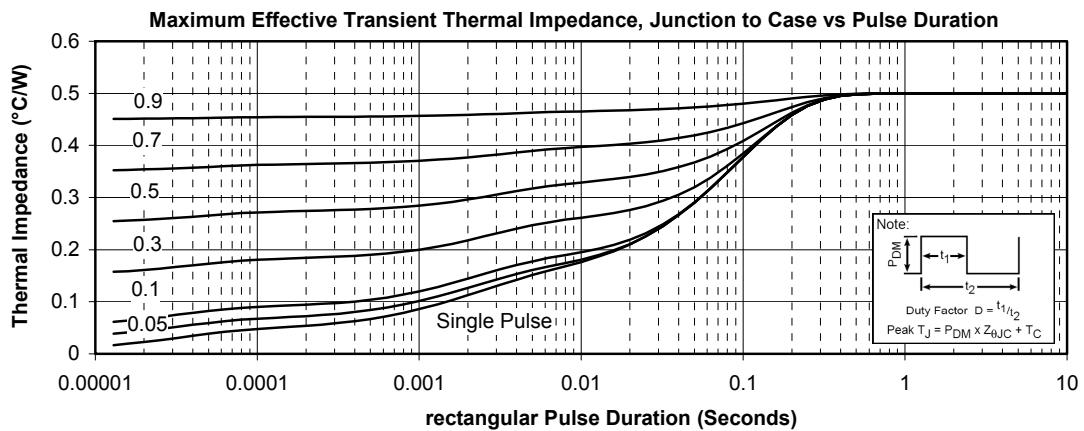
Symbol	Characteristic		Min	Typ	Max	Unit
R <sub>thJC</sub>	Junction to Case Thermal Resistance	CoolMOS			0.5	°C/W
		Diode			0.85	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz		4000			V
T <sub>J</sub>	Operating junction temperature range		-40		150	°C
T <sub>STG</sub>	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

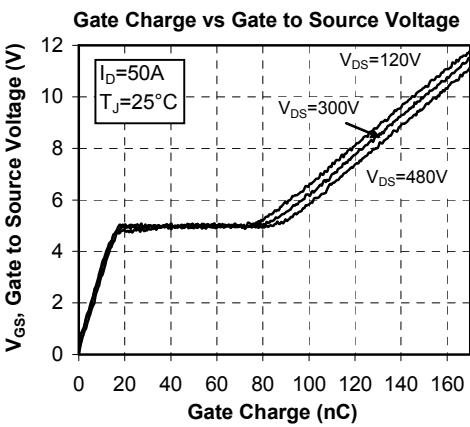
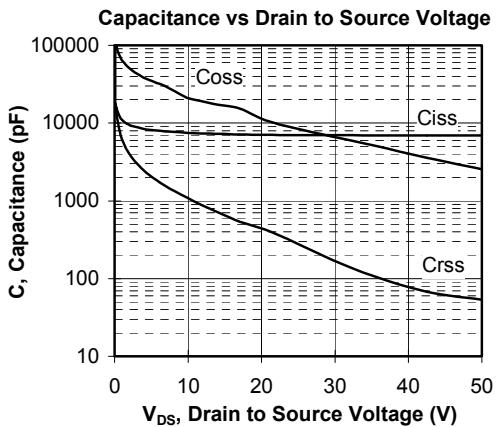
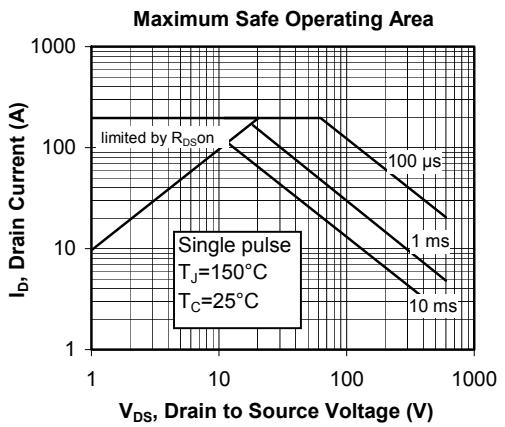
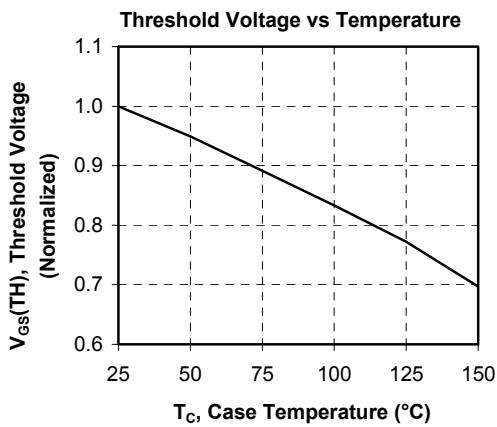
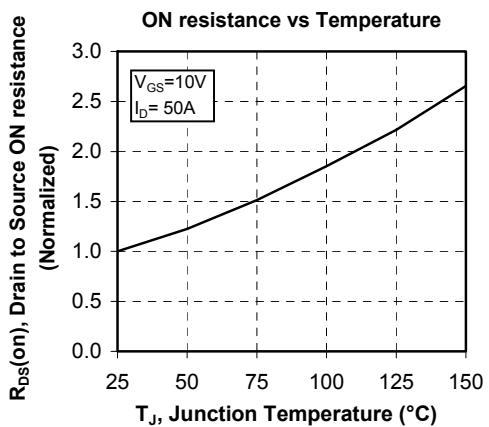
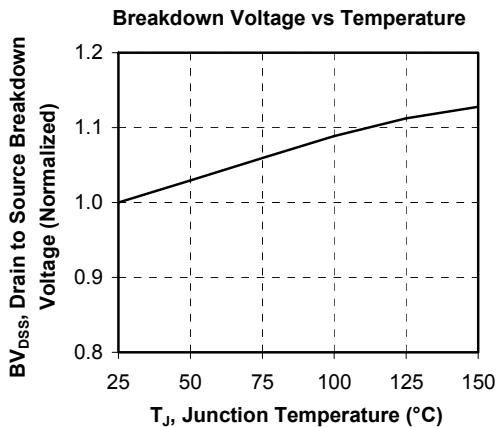
**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com) for more information).

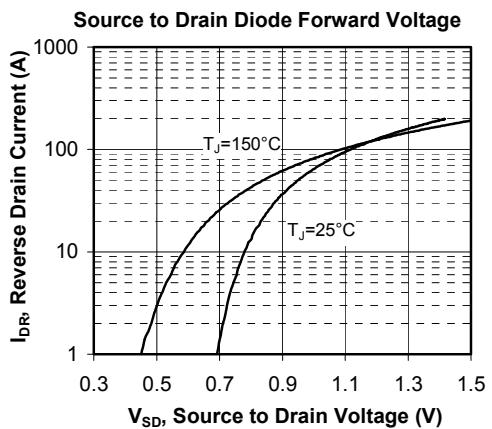
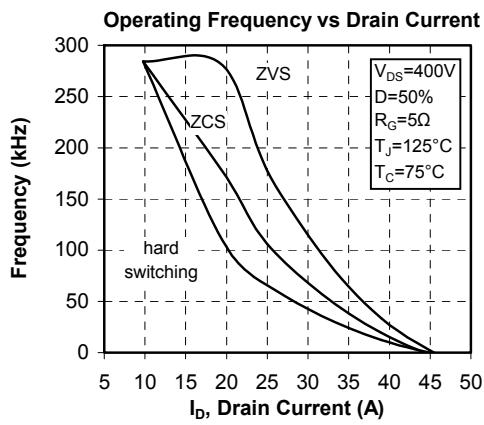
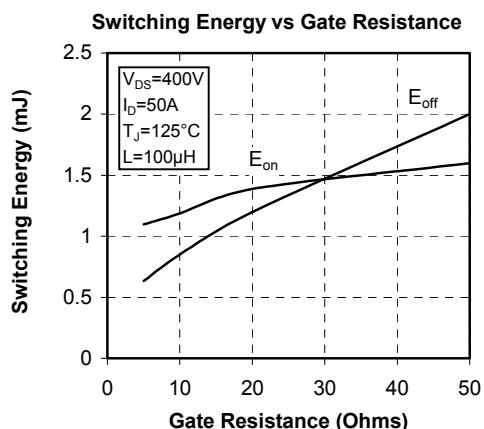
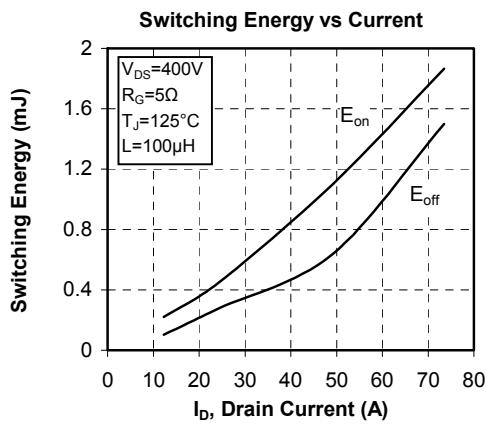
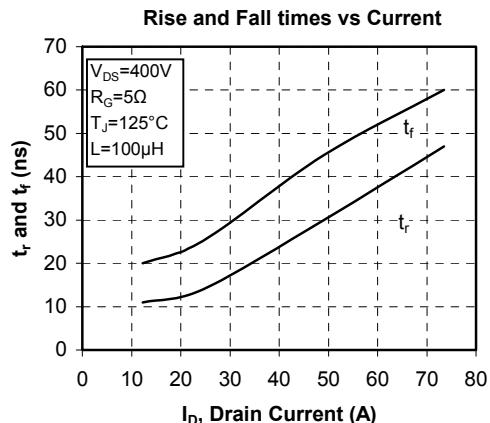
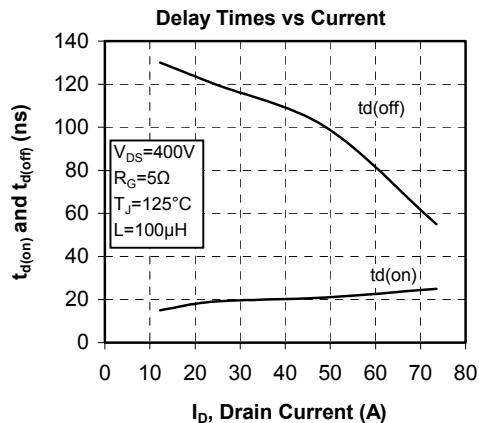
Symbol	Characteristic		Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C			50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>				5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K			3952		K
ΔB/B		T <sub>C</sub> =100°C		4		%

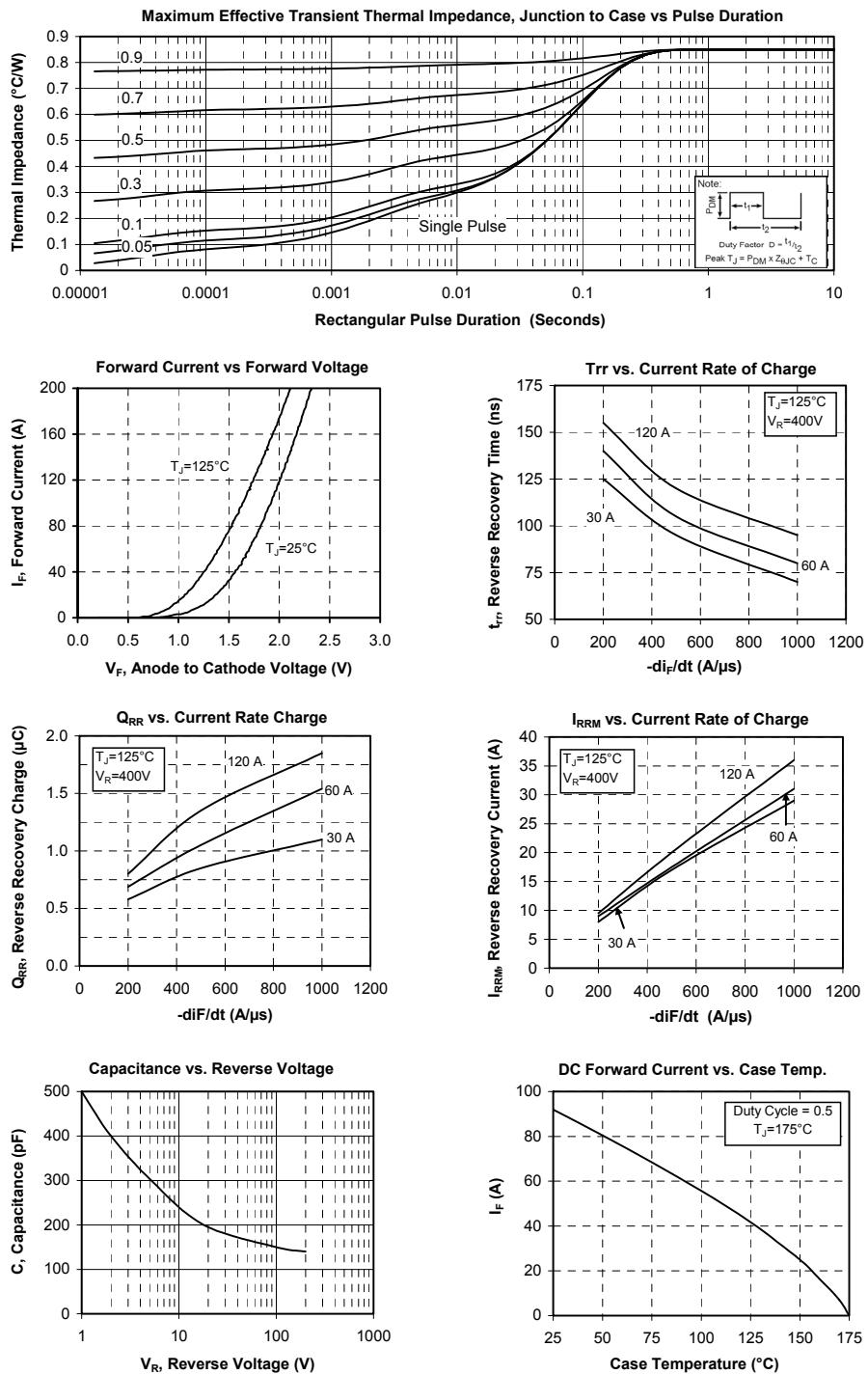
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]} \quad \begin{array}{l} T: \text{Thermistor temperature} \\ R_T: \text{Thermistor value at } T \end{array}$$

**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 chopper diode Performance Curve**


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