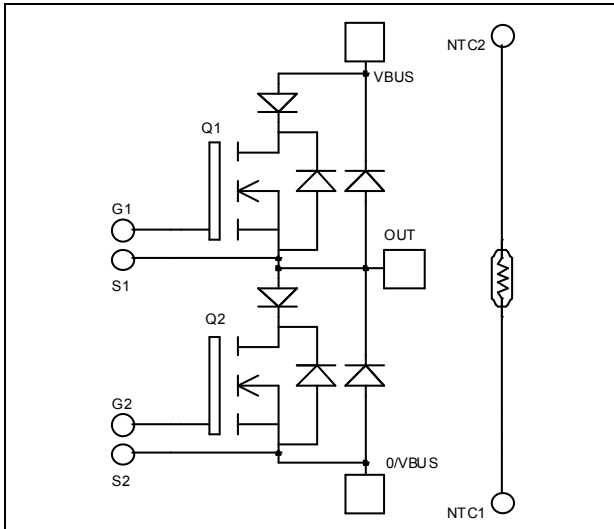


**Phase leg Series & SiC parallel diodes
Super Junction MOSFET Power Module**

$V_{DSS} = 800V$
 $R_{DSon} = 100m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 42A \text{ @ } T_c = 25^\circ C$

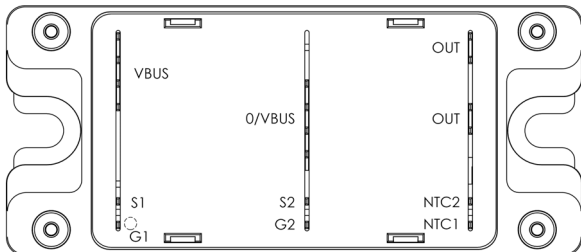


Application

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

Features

- **CoolMOS™**
 - Ultra low R_{DSon}
 - Low Miller capacitance
 - Ultra low gate charge
 - Avalanche energy rated
- **Parallel SiC Schottky Diode**
 - Zero reverse recovery
 - Zero forward recovery
 - Temperature Independent switching behavior
 - Positive temperature coefficient on VF
- Kelvin source for easy drive
- Very low stray inductance
 - Symmetrical design
 - Lead frames for power connections
- 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

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

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	800	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	42
		$T_c = 80^\circ C$	32
I_{DM}	Pulsed Drain current	168	
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	100	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	416
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

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I _{DSS}	Zero Gate Voltage Drain Current	V _{GS} = 0V, V _{DS} = 800V			75	μA
		T _j = 25°C				
		V _{GS} = 0V, V _{DS} = 800V			750	
R _{DS(on)}	Drain – Source on Resistance	V _{GS} = 10V, I _D = 21A			100	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 3mA	2.1	3	3.9	V
I _{GSS}	Gate – Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0V			±300	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C _{iss}	Input Capacitance	V _{GS} = 0V V _{DS} = 25V f = 1MHz		6761		pF
C _{oss}	Output Capacitance			3137		
C _{rss}	Reverse Transfer Capacitance			161		
Q _g	Total gate Charge	V _{GS} = 10V V _{Bus} = 400V I _D = 42A		273		nC
Q _{gs}	Gate – Source Charge			36		
Q _{gd}	Gate – Drain Charge			138		
T _{d(on)}	Turn-on Delay Time	Inductive switching @ 125°C V _{GS} = 15V V _{Bus} = 533V I _D = 42A R _G = 1.8Ω		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 = 42A, R _G = 1.8Ω		437		μJ
E _{off}	Turn-off Switching Energy			417		
E _{on}	Turn-on Switching Energy	Inductive switching @ 125°C V _{GS} = 15V, V _{Bus} = 533V I _D = 42A, R _G = 1.8Ω		765		μJ
E _{off}	Turn-off Switching Energy			513		
R _{thJC}	Junction to Case Thermal Resistance				0.3	°C/W

Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V _{RRM}	Maximum Peak Repetitive Reverse Voltage		1000			V
I _{RM}	Maximum Reverse Leakage Current	V _R = 1000V			200	μA
I _F	DC Forward Current	T _c = 85°C		60		A
V _F	Diode Forward Voltage	I _F = 60A		1.9	2.3	V
		I _F = 120A		2.2		
		I _F = 60A	T _j = 125°C		1.7	
t _{rr}	Reverse Recovery Time	I _F = 630A V _R = 667V di/dt = 400A/μs	T _j = 25°C		290	ns
			T _j = 125°C		390	
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		1340	nC
			T _j = 125°C		4700	
R _{thJC}	Junction to Case Thermal Resistance				0.65	°C/W

Parallel 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		200	800	μA
				400	4000	
I _F	DC Forward Current			20		A
V _F	Diode Forward Voltage	I _F = 20A		1.6	1.8	V
				2.6	3.0	
Q _C	Total Capacitive Charge	I _F = 20A, V _R = 600V di/dt = 1200A/μs		56		nC
Q	Total Capacitance	f = 1MHz, V _R = 200V		180		pF
		f = 1MHz, V _R = 400V		132		
R _{thJC}	Junction to Case Thermal Resistance				0.8	°C/W

Thermal and package characteristics

Symbol	Characteristic	Min	Max	Unit		
V _{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, 50/60Hz	4000		V		
T _J	Operating junction temperature range	-40	150	°C		
T _{JOP}	Recommended junction temperature under switching conditions	-40	T _{Jmax} -25			
T _{STG}	Storage Temperature Range	-40	125			
T _C	Operating Case Temperature	-40	100			
Torque	Mounting torque	To Heatsink	M5	2.5	4.7	N.m
Wt	Package Weight				160	g

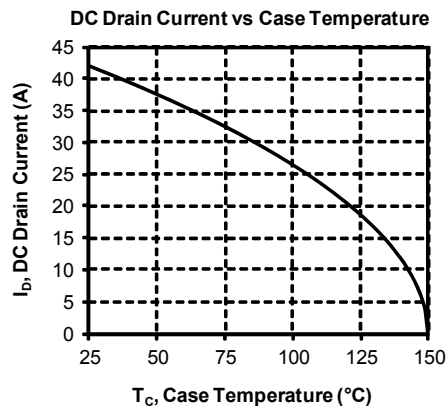
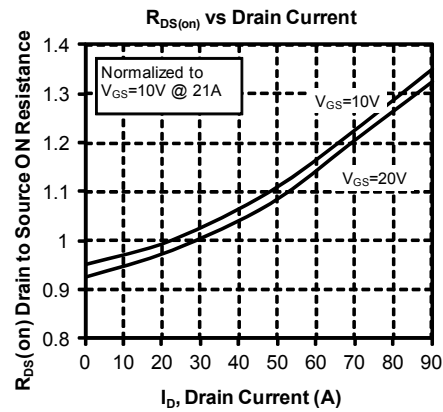
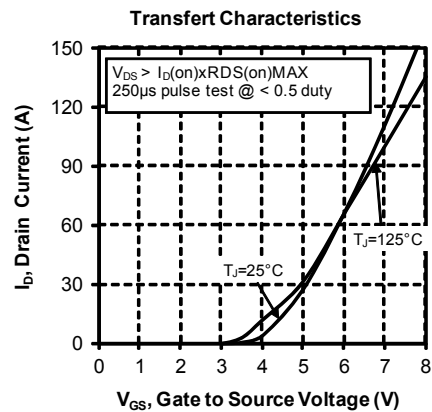
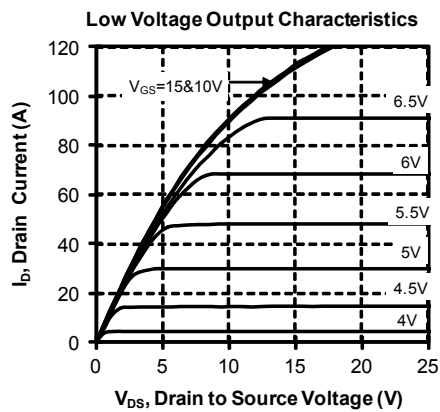
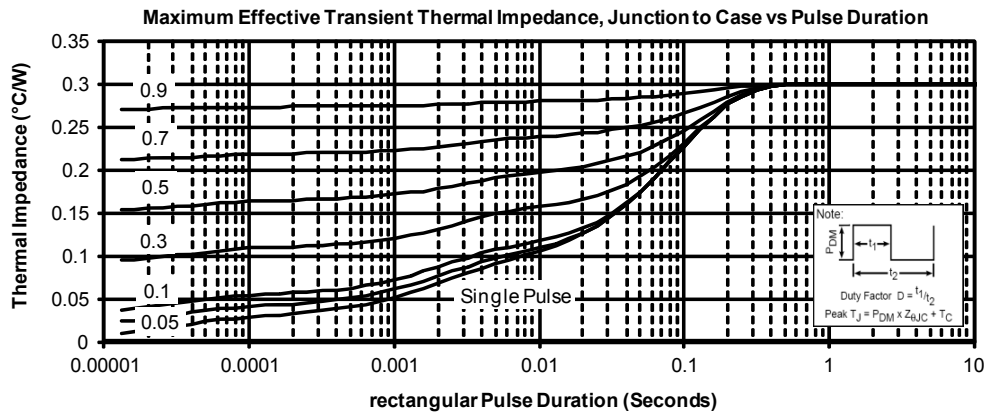
Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

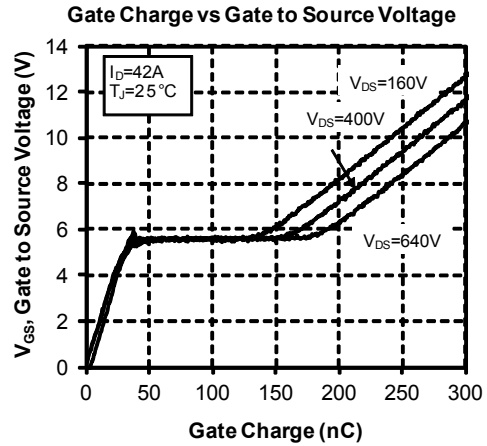
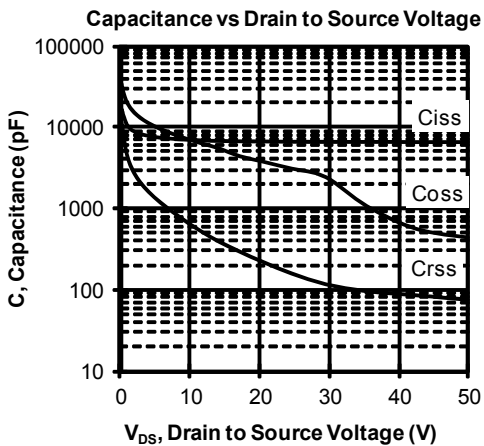
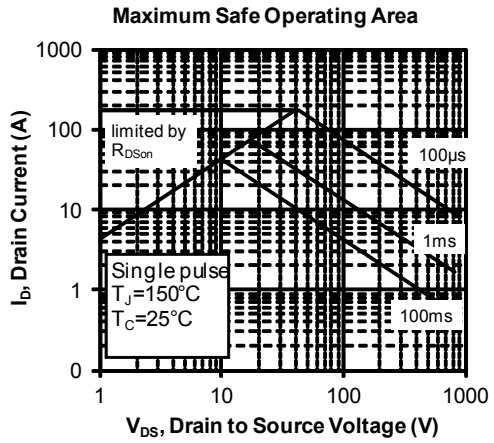
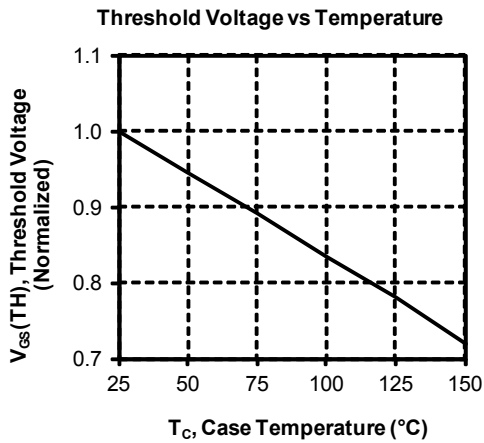
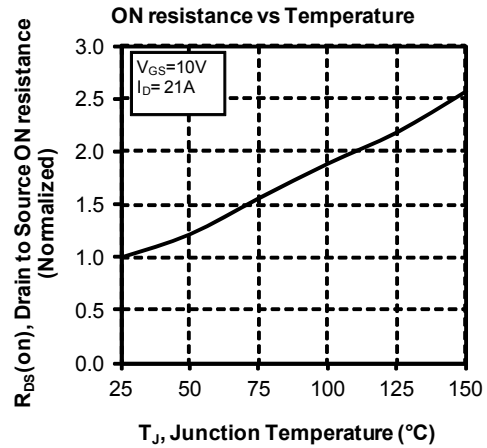
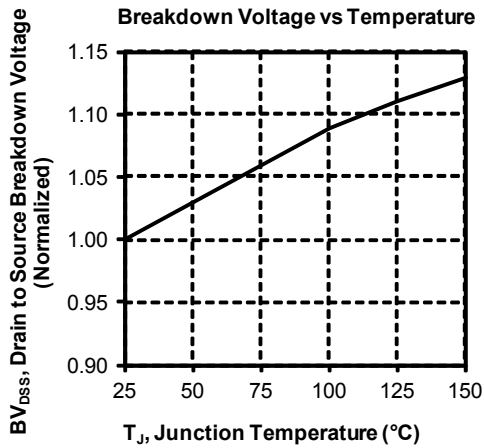
Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
ΔR ₂₅ /R ₂₅			5		%
B _{25/85}	T ₂₅ = 298.15 K		3952		K
ΔB/B		T _C = 100°C	4		%

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

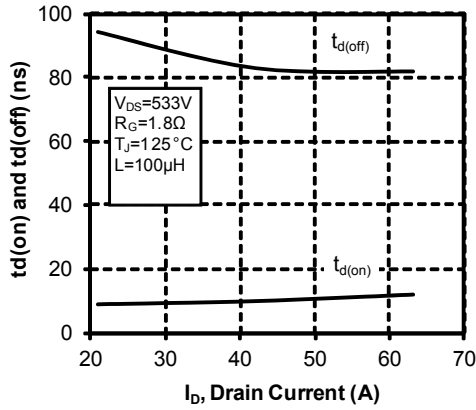
T: Thermistor temperature
 R_T: Thermistor value at T

Typical CoolMOS Performance Curve

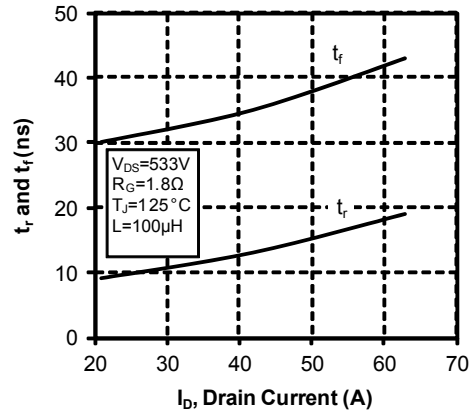




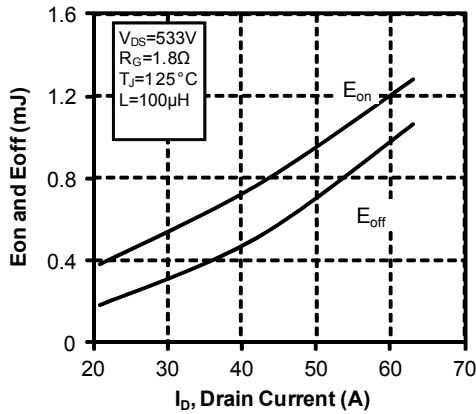
Delay Times vs Current



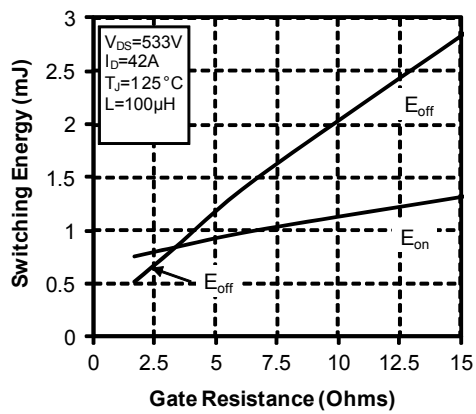
Rise and Fall times vs Current



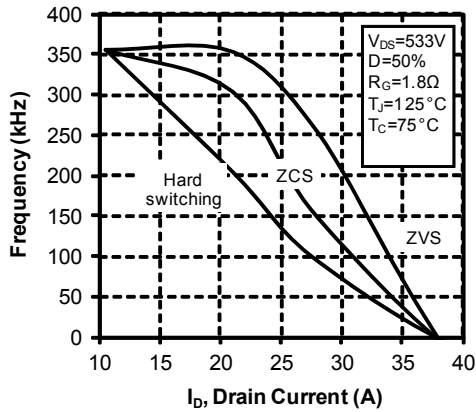
Switching Energy vs Current



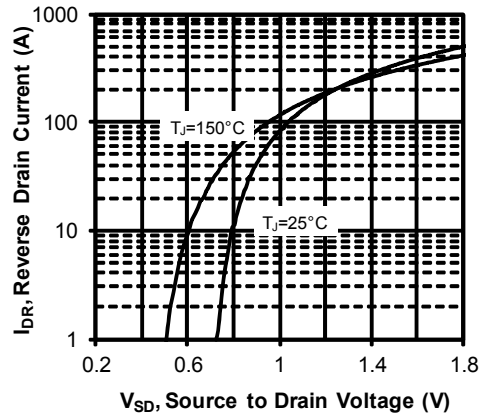
Switching Energy vs Gate Resistance



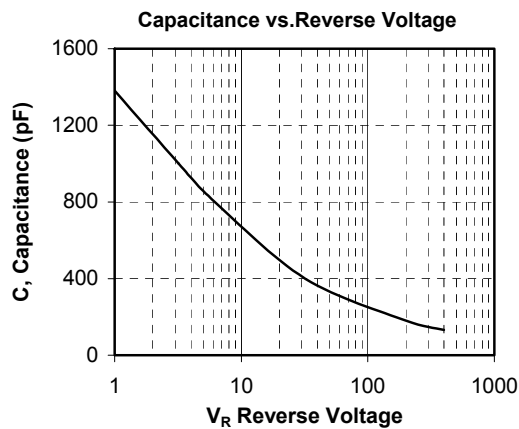
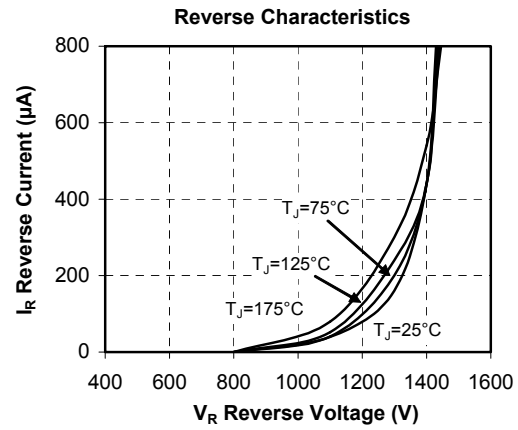
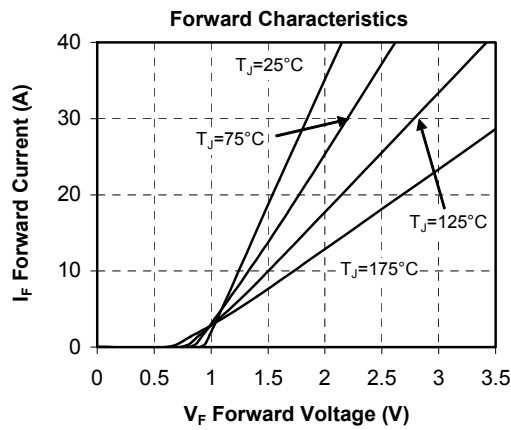
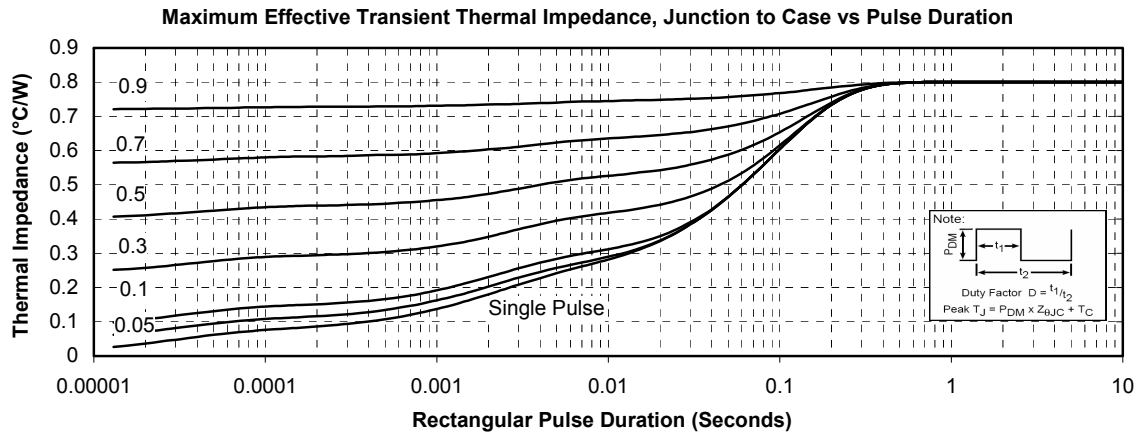
Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



Typical SiC Diode Performance Curve



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