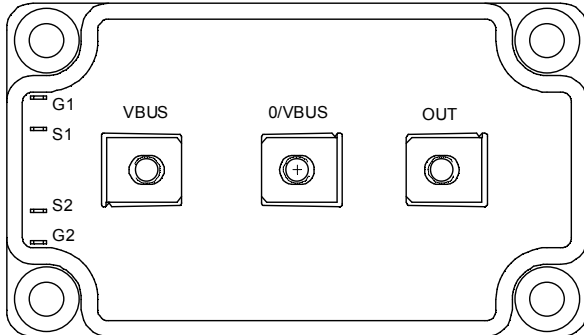
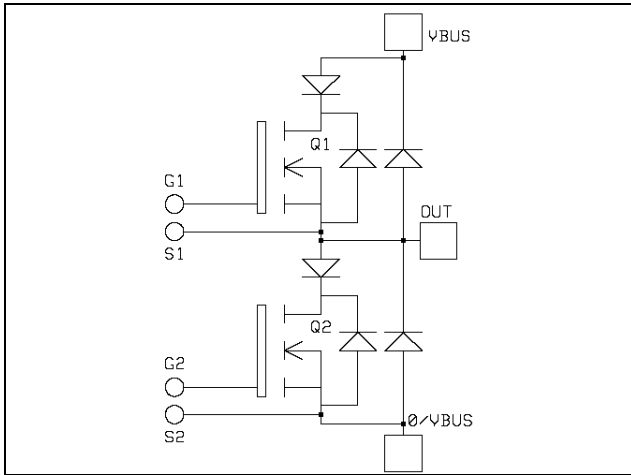


*Phase leg  
Series & SiC parallel diodes  
Super Junction  
MOSFET Power Module*

$V_{DSS} = 800V$   
 $R_{DSon} = 75m\Omega \text{ max @ } T_j = 25^\circ C$   
 $I_D = 56A \text{ @ } T_c = 25^\circ C$



**Application**

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

**Features**

- **COOLMOS** Power Semiconductors
  - 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
  - M5 power connectors
- High level of integration

**Benefits**

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile

**Absolute maximum ratings**

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	800	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	56
		$T_c = 80^\circ C$	43
$I_{DM}$	Pulsed Drain current	232	
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	75	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	568
$I_{AR}$	Avalanche current (repetitive and non repetitive)	24	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.

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

## Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$BV_{DSS}$	Drain - Source Breakdown Voltage	$V_{GS} = 0V, I_D = 1000\mu A$	800			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 800V, T_j = 25^\circ\text{C}$			100	$\mu A$
		$V_{GS} = 0V, V_{DS} = 800V, T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 28A$			75	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 4mA$	2.1	3	3.9	V
$I_{GSS}$	Gate - Source Leakage Current	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 200$	nA

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		9015		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		4183		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1MHz$		215		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		364		nC
$Q_{gs}$	Gate - Source Charge	$V_{Bus} = 400V$		48		
$Q_{gd}$	Gate - Drain Charge	$I_D = 56A$		184		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V$ $V_{Bus} = 553V$ $I_D = 56A$ $R_G = 1.2\Omega$		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	<b>Inductive switching @ 25°C</b> $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		583		$\mu J$
$E_{off}$	Turn-off Switching Energy ①			556		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b> $V_{GS} = 15V, V_{Bus} = 533V$ $I_D = 56A, R_G = 1.2\Omega$		1020		$\mu J$
$E_{off}$	Turn-off Switching Energy ①			684		

## Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle, $T_c = 85^\circ\text{C}$		60		A
$V_F$	Diode Forward Voltage	$I_F = 60A$		1.1	1.15	V
		$I_F = 120A$		1.4		
		$I_F = 60A, T_j = 125^\circ\text{C}$		0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		24		ns
		$T_j = 125^\circ\text{C}$		48		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 60A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		66		nC
		$T_j = 125^\circ\text{C}$		300		

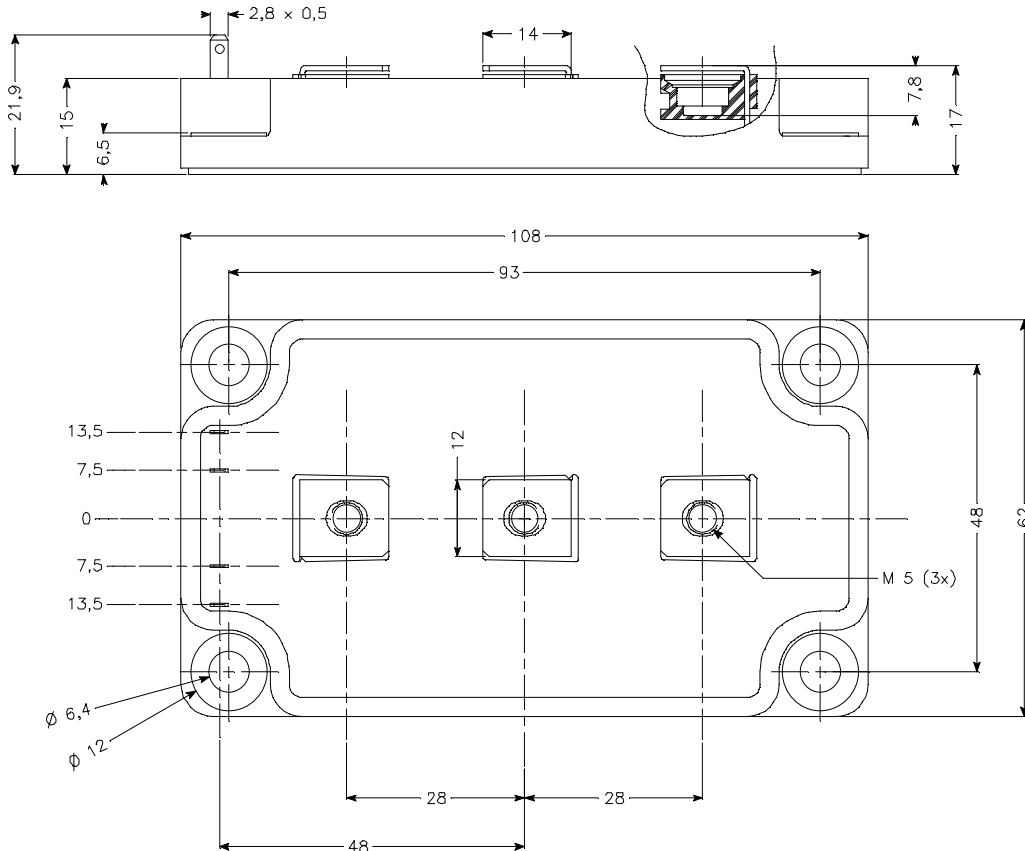
**Parallel diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle $T_c = 125^\circ\text{C}$		30		A
$V_F$	Diode Forward Voltage	$I_F = 30\text{A}$	$T_j = 25^\circ\text{C}$	1.6	1.8	V
			$T_j = 175^\circ\text{C}$	2.6	3.0	
$Q_C$	Total Capacitive Charge	$I_F = 30\text{A}, V_R = 600\text{V}$ $di/dt = 1600\text{A}/\mu\text{s}$		84		nC
Q	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$		270		pF
		$f = 1\text{MHz}, V_R = 400\text{V}$		198		

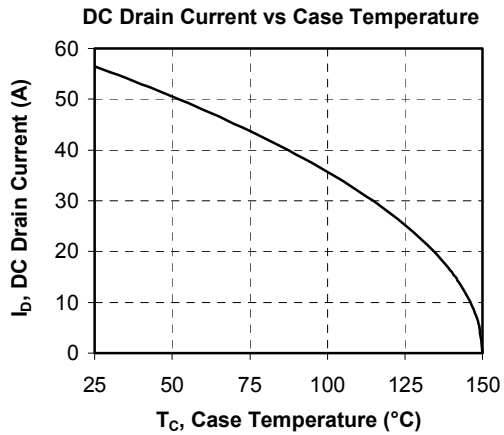
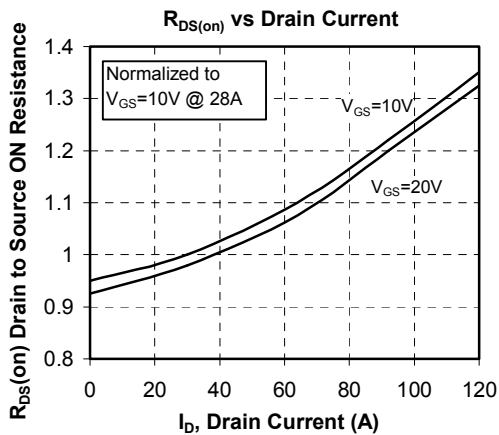
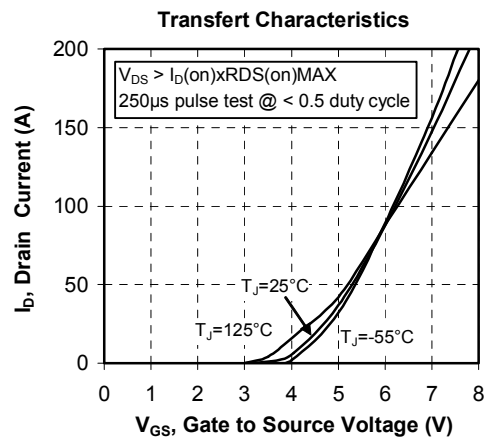
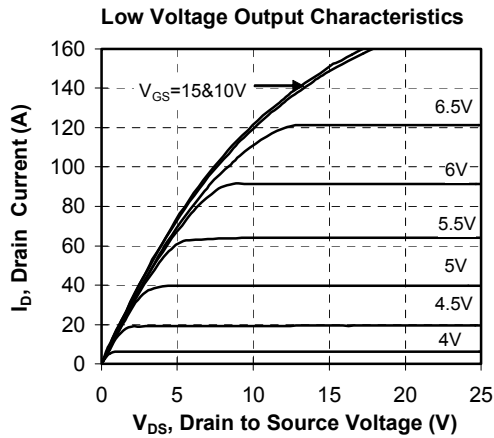
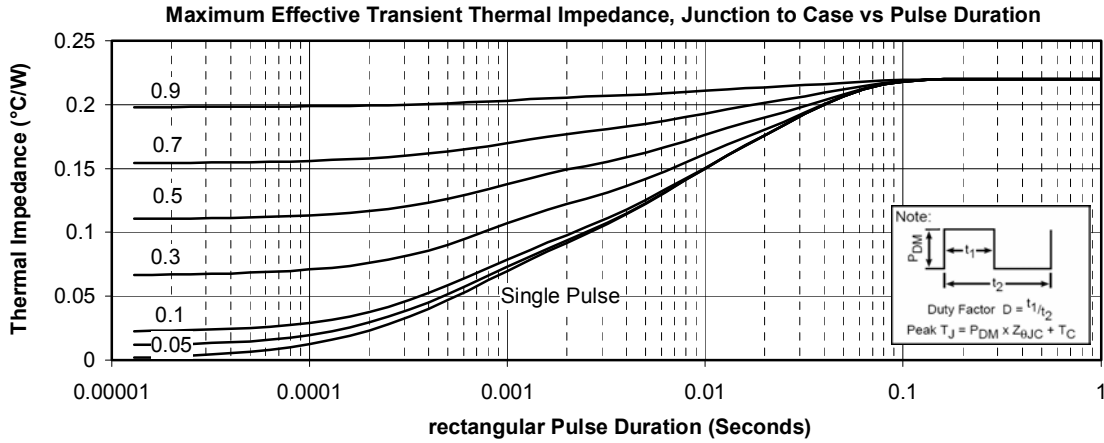
**Thermal and package characteristics**

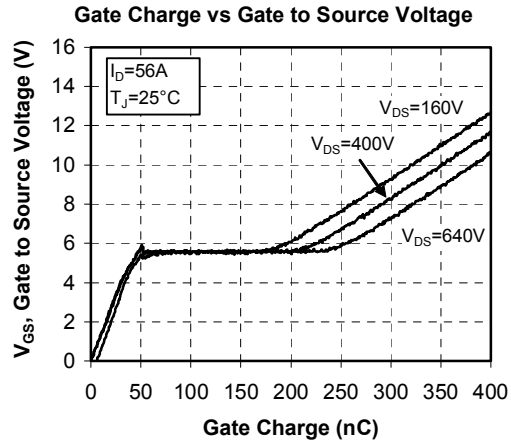
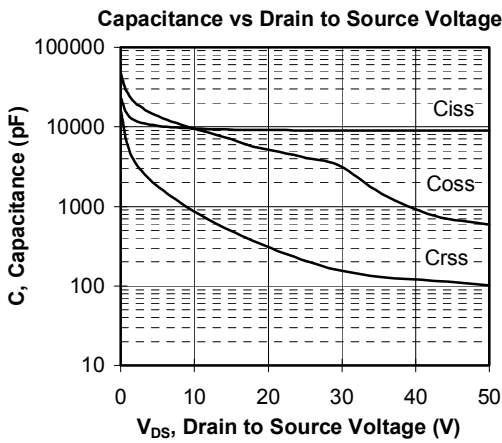
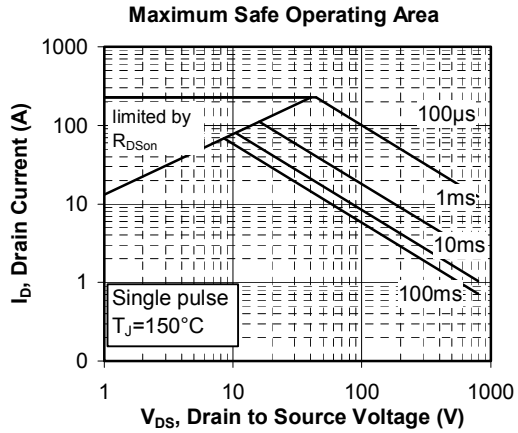
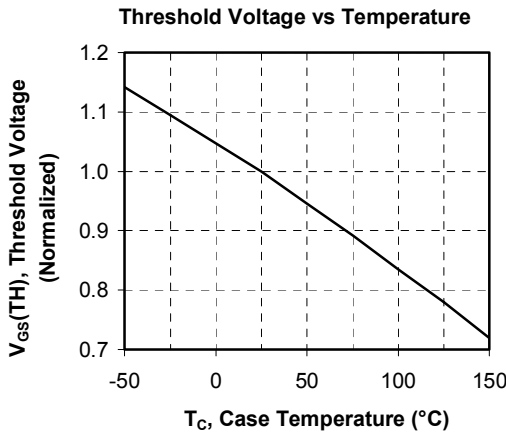
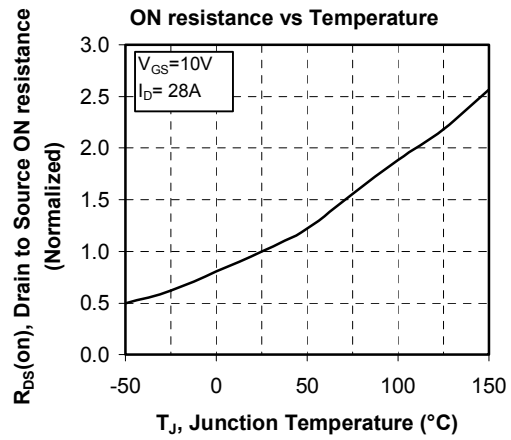
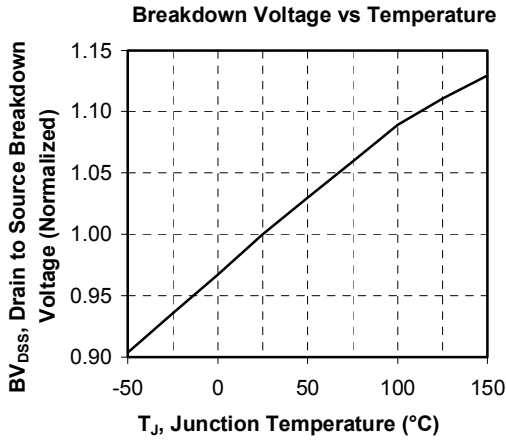
Symbol	Characteristic	Min	Typ	Max	Unit	
$R_{thJC}$	Junction to Case	Transistor			0.22	$^\circ\text{C}/\text{W}$
		Series diode			0.65	
		Parallel diode			0.45	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t = 1\text{ min}, I_{isol} < 1\text{mA}, 50/60\text{Hz}$	2500			V	
$T_J$	Operating junction temperature range	-40		150	$^\circ\text{C}$	
$T_{STG}$	Storage Temperature Range	-40		125		
$T_C$	Operating Case Temperature	-40		100		
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight			280	g	

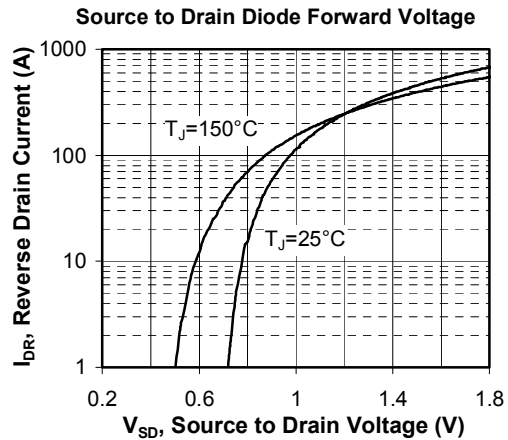
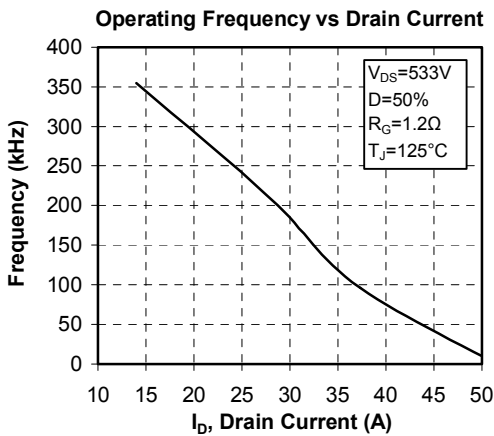
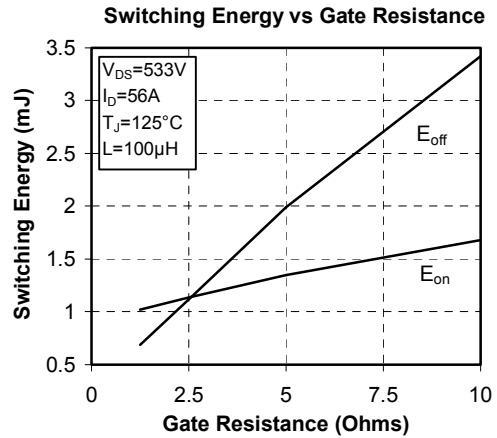
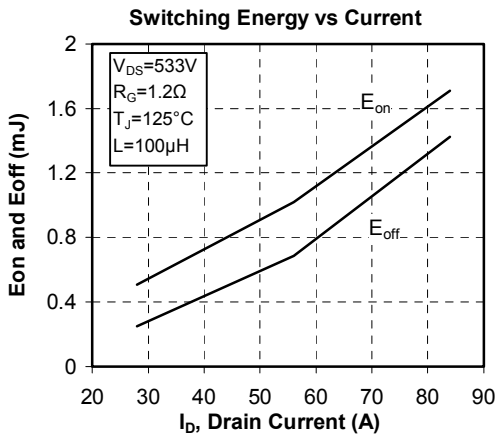
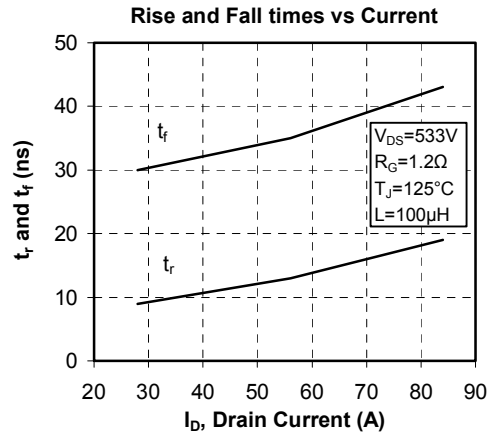
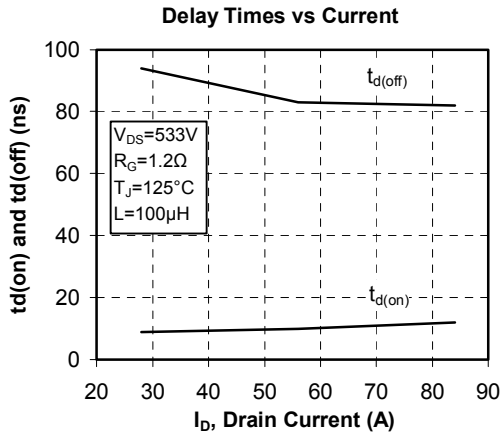
**Package outline**



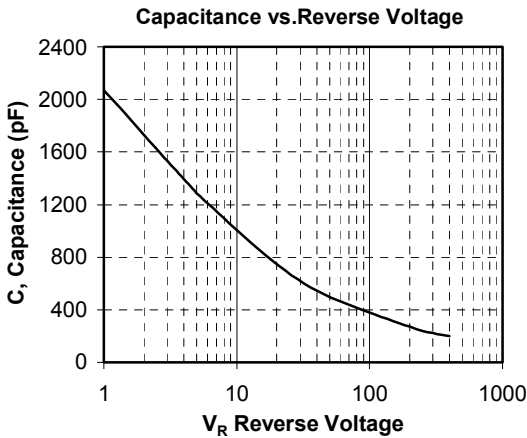
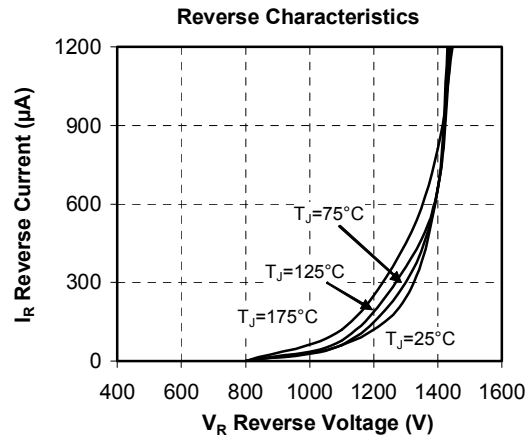
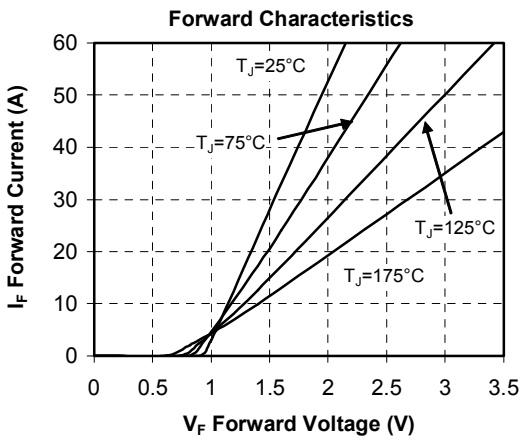
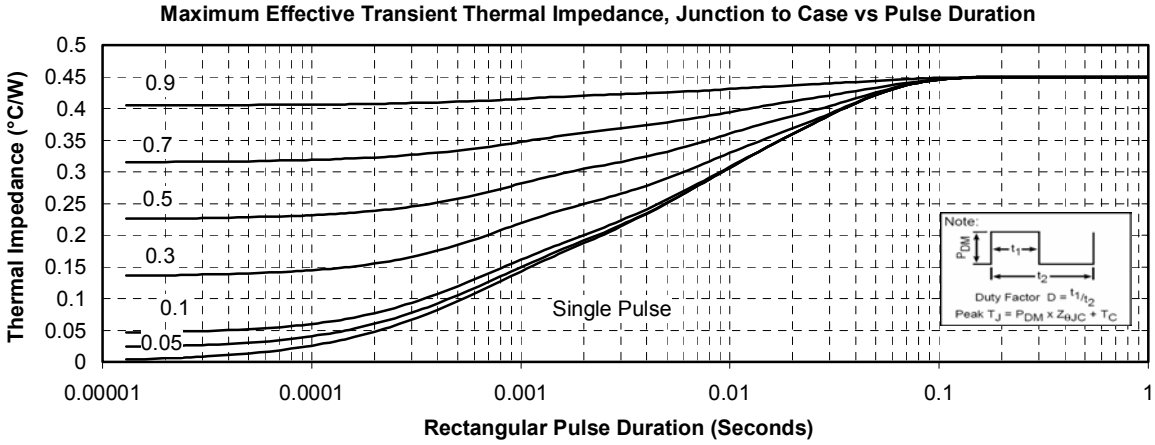
**Typical CoolMOS Performance Curve**







**Typical SiC Diode Performance Curve**



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APT's products are covered by one or more of U.S patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S and Foreign patents pending. All Rights Reserved.