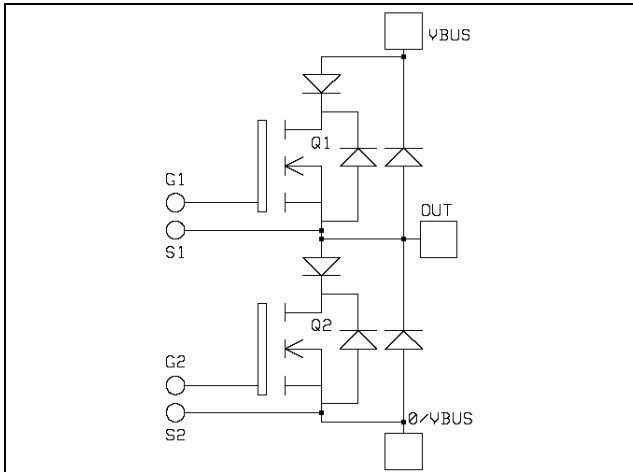


*Phase leg  
Series & SiC parallel diodes  
Super Junction  
MOSFET Power Module*

**$V_{DSS} = 600V$   
 $R_{DSon} = 18m\Omega$  max @  $T_j = 25^\circ C$   
 $I_D = 143A$  @  $T_c = 25^\circ C$**

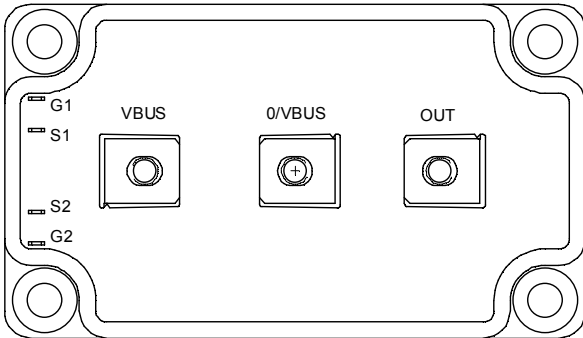


**Application**

- 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	600	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	143
		$T_c = 80^\circ C$	107
$I_{DM}$	Pulsed Drain current	572	
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	18	m $\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	833
$I_{AR}$	Avalanche current (repetitive and non repetitive)	20	A
$E_{AR}$	Repetitive Avalanche Energy	1	mJ
$E_{AS}$	Single Pulse Avalanche Energy	1800	

**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	$V_{GS} = 0V, I_D = 1000\mu A$	600			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 600V, T_j = 25^\circ\text{C}$			100	$\mu A$
		$V_{GS} = 0V, V_{DS} = 600V, T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 71.5A$			18	$m\Omega$
$V_{GS(th)}$	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	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		28		nF
$C_{oss}$	Output Capacitance			10.2		
$C_{rss}$	Reverse Transfer Capacitance			0.85		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 143A$		1036		nC
$Q_{gs}$	Gate - Source Charge			116		
$Q_{gd}$	Gate - Drain Charge			444		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 143A$ $R_G = 1.2\Omega$		21		ns
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
$T_f$	Fall Time			84		
$E_{on}$	Turn-on Switching Energy				1608	
$E_{off}$	Turn-off Switching Energy ❶	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		3920		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 400V$ $I_D = 143A, R_G = 1.2\Omega$		2630		$\mu J$
$E_{off}$	Turn-off Switching Energy ❶				4824	

❶ In accordance with JEDEC standard JESD24-1.

## Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle, $T_c = 85^\circ\text{C}$		120		A
$V_F$	Diode Forward Voltage	$I_F = 120A$		1.1	1.15	V
		$I_F = 240A$		1.4		
		$I_F = 120A, T_j = 125^\circ\text{C}$		0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 120A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		31		ns
		$T_j = 125^\circ\text{C}$		60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 120A, V_R = 133V, di/dt = 400A/\mu s, T_j = 25^\circ\text{C}$		120		nC
		$T_j = 125^\circ\text{C}$		500		

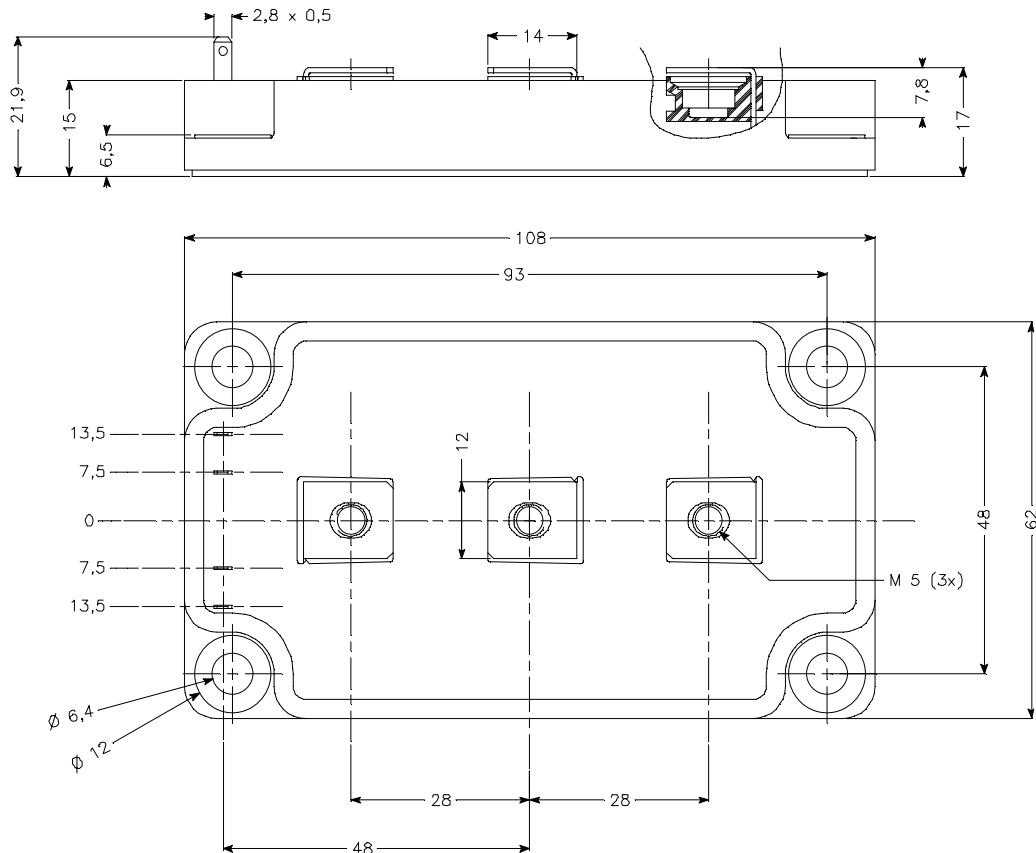
## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	$T_c = 125^\circ\text{C}$		80		A
$V_F$	Diode Forward Voltage	$I_F = 80\text{A}$	$T_j = 25^\circ\text{C}$		1.6	1.8	V
			$T_j = 175^\circ\text{C}$		2.0	2.4	
$Q_C$	Total Capacitive Charge	$I_F = 80\text{A}, V_R = 300\text{V}$ $di/dt = 2000\text{A}/\mu\text{s}$			112		nC
Q	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$			520		pF
		$f = 1\text{MHz}, V_R = 400\text{V}$			400		

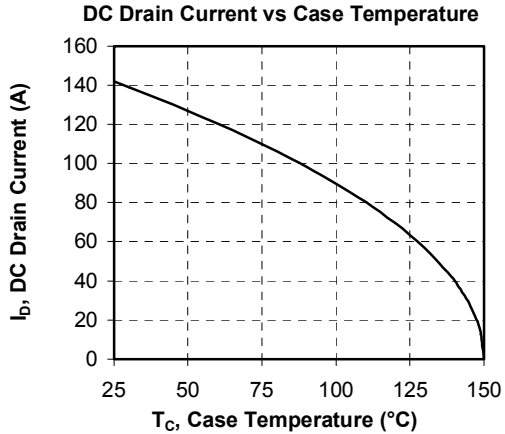
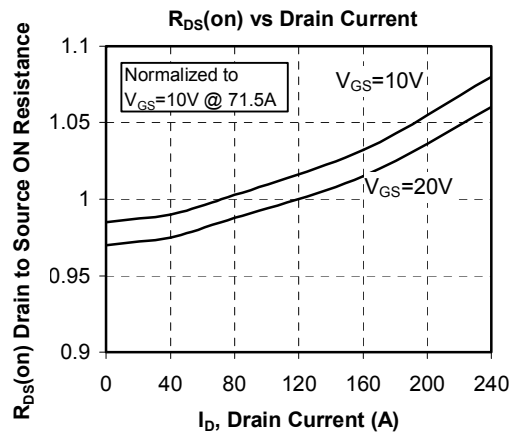
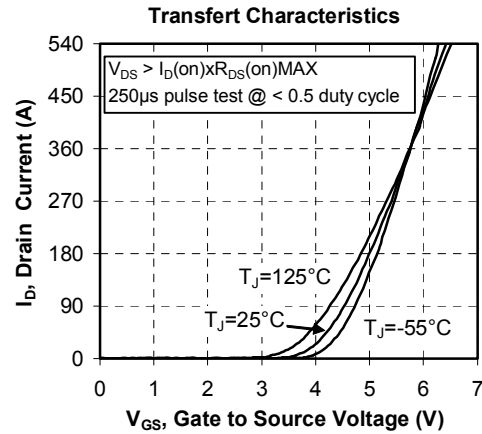
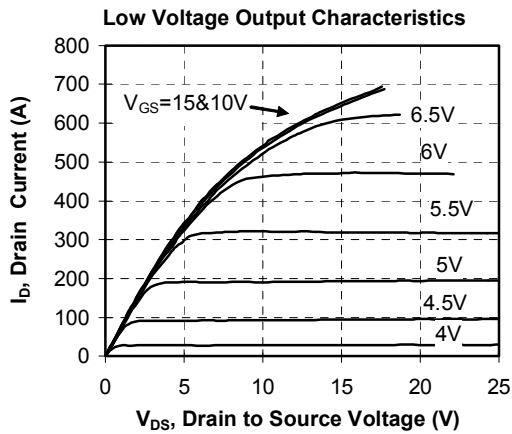
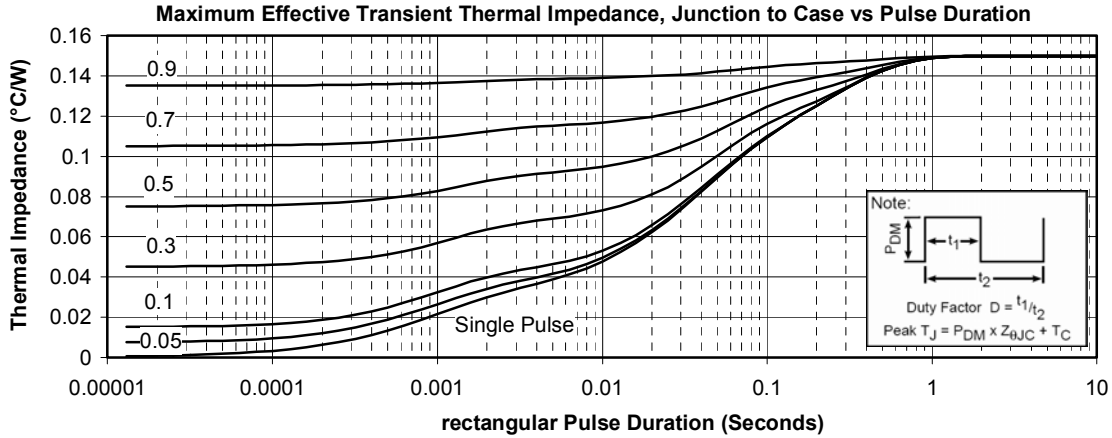
## Thermal and package characteristics

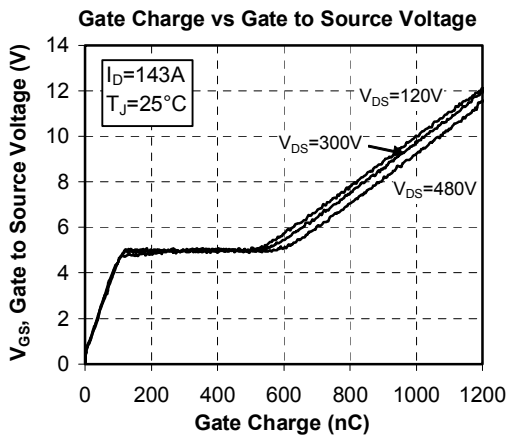
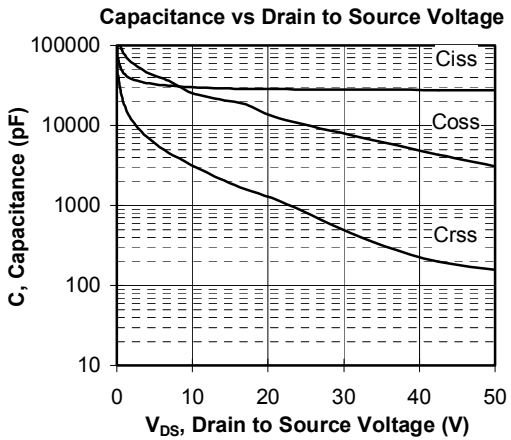
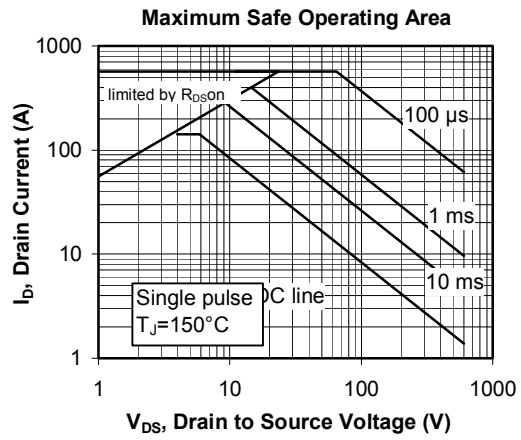
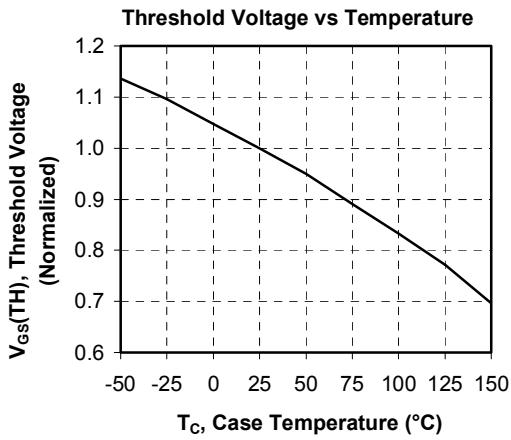
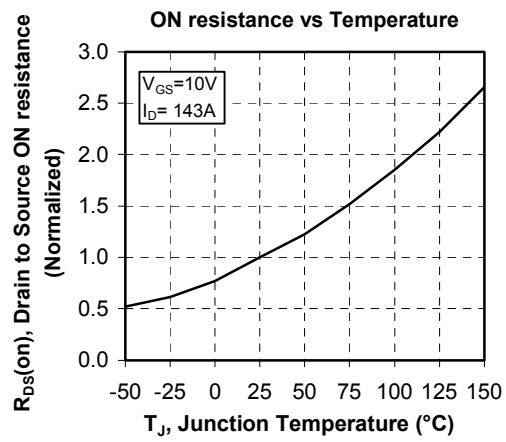
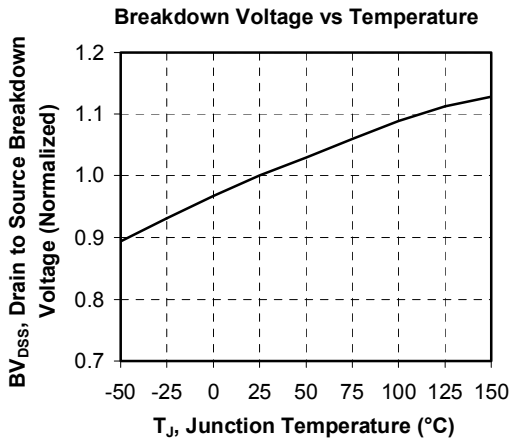
Symbol	Characteristic			Min	Typ	Max	Unit
$R_{thJC}$	Junction to Case	Transistor				0.15	$^\circ\text{C}/\text{W}$
		Series diode				0.46	
		Parallel diode				0.35	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t = 1 \text{ min}, I_{isol} < 1\text{mA}, 50/60\text{Hz}$			2500			V
$T_J$	Operating 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

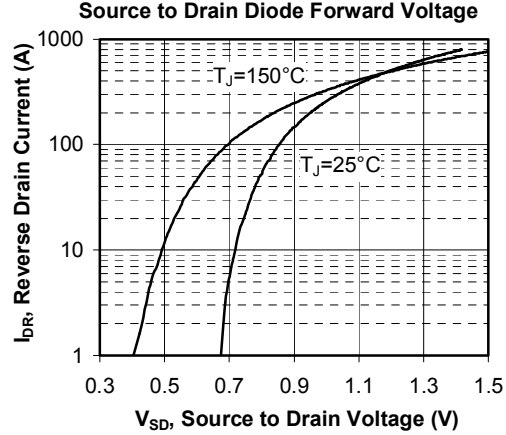
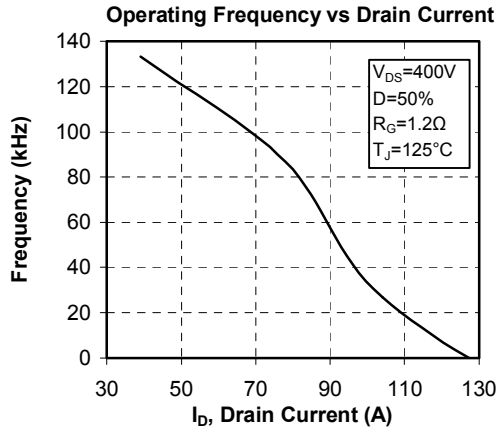
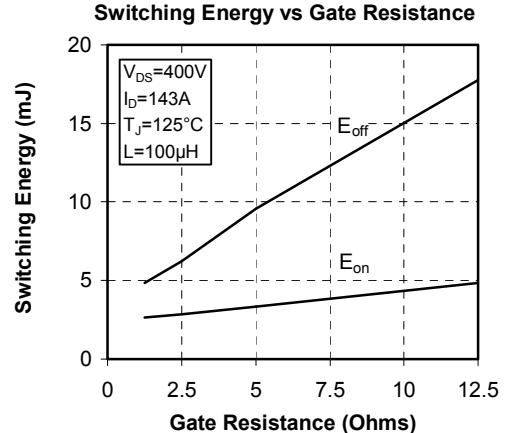
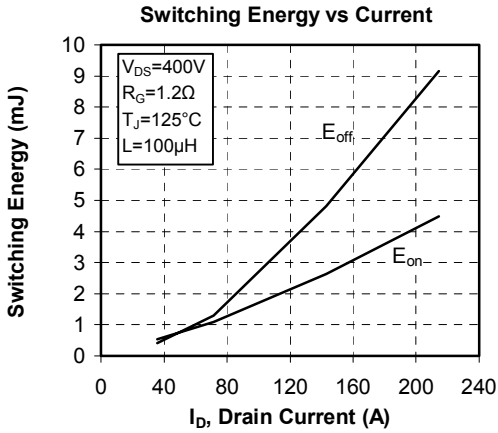
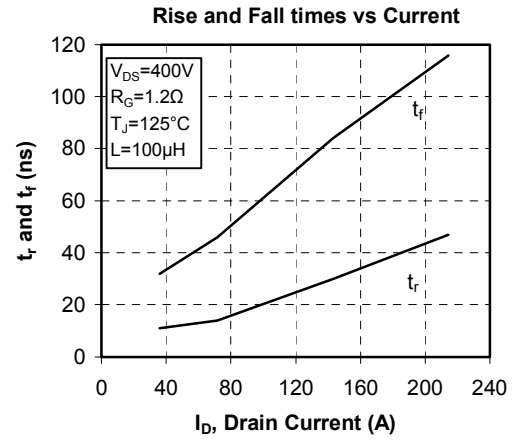
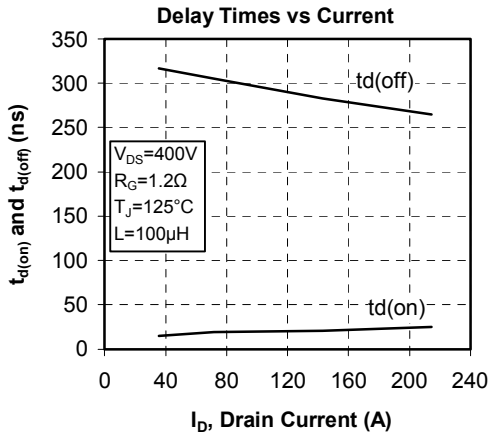
## Package outline



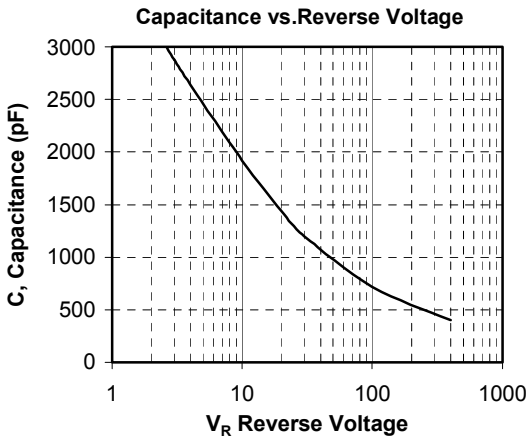
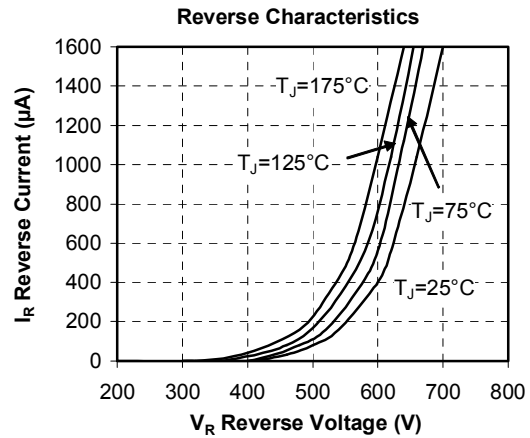
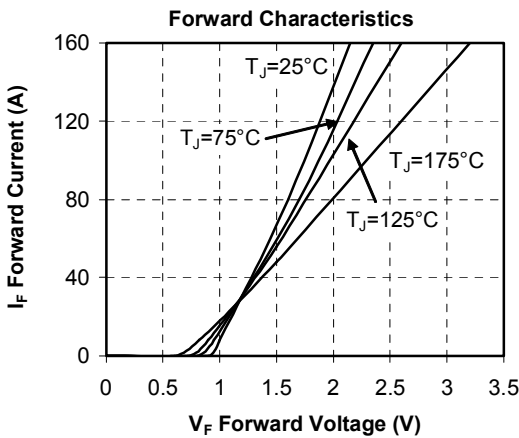
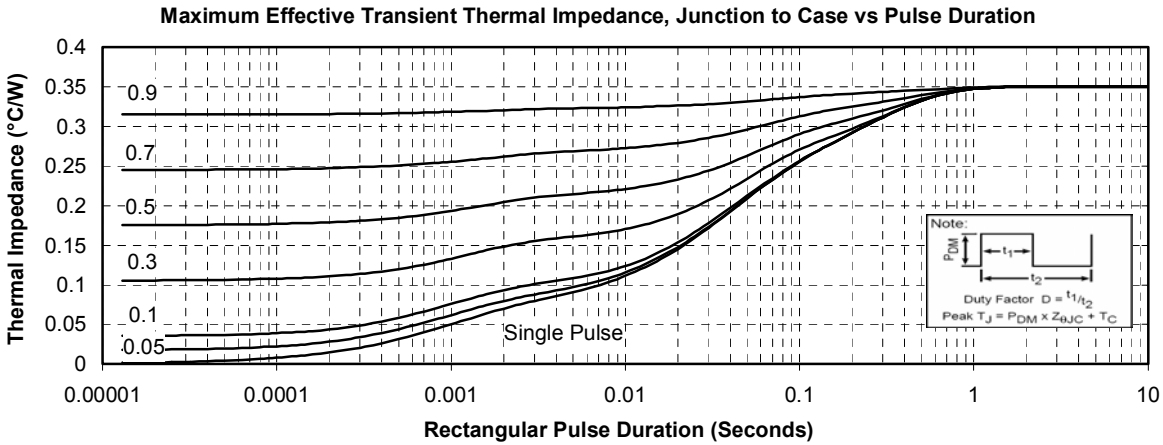
**Typical CoolMOS Performance Curve**







**Typical SiC Diode Performance Curve**



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