

**Boost chopper  
SiC FWD diode  
Super Junction  
MOSFET Power Module**

**$V_{DSS} = 600V$**

**$R_{DSon} = 18m\Omega \text{ max @ } T_j = 25^\circ C$**

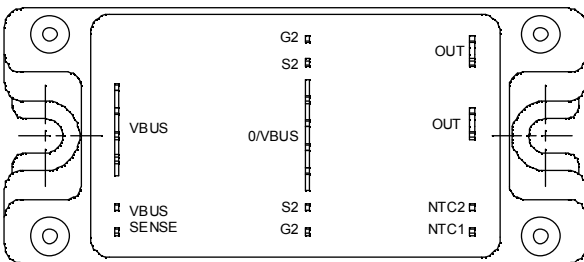
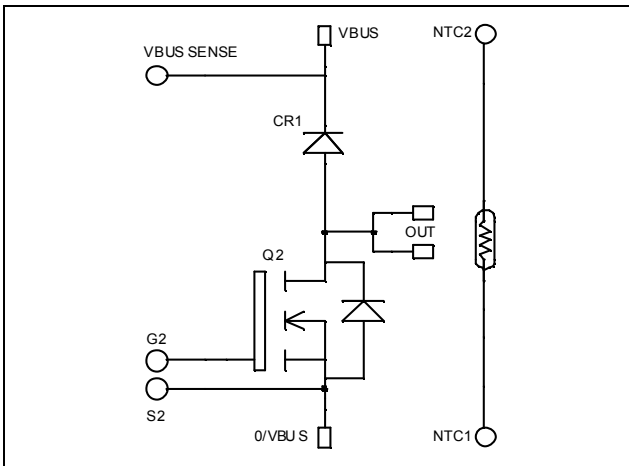
**$I_D = 143A \text{ @ } T_c = 25^\circ C$**

**Application**

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

**Features**

- **COOLMOS**  
Power Semiconductors
  - Ultra low  $R_{DSon}$
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
- **FWD 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

**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
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$			100	$\mu\text{A}$
		$T_j = 25^\circ\text{C}$				
		$V_{GS} = 0\text{V}, V_{DS} = 600\text{V}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 71.5\text{A}$			18	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 4\text{mA}$	2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 200$	$\text{nA}$

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$		28		$\text{nF}$
$C_{oss}$	Output Capacitance	$V_{DS} = 25\text{V}$		10.2		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.85		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$		1036		$\text{nC}$
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 300\text{V}$		116		
$Q_{gd}$	Gate – Drain Charge	$I_D = 143\text{A}$		444		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}$ $V_{Bus} = 400\text{V}$ $I_D = 143\text{A}$ $R_G = 1.2\Omega$		21		$\text{ns}$
$T_r$	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
$T_f$	Fall Time			84		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		1608		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			3920		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 400\text{V}$ $I_D = 143\text{A}, R_G = 1.2\Omega$		2630		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			4824		

## Chopper diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage		600			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R = 600\text{V}$	$T_j = 25^\circ\text{C}$		2	$\text{mA}$
			$T_j = 175^\circ\text{C}$		10	
$I_F$	DC Forward Current			100		A
$V_F$	Diode Forward Voltage	$I_F = 100\text{A}$	$T_j = 25^\circ\text{C}$	1.6	1.8	V
			$T_j = 175^\circ\text{C}$	2.0	2.4	
$Q_C$	Total Capacitive Charge	$I_F = 100\text{A}, V_R = 300\text{V}$ $di/dt = 2400\text{A}/\mu\text{s}$		140		$\text{nC}$
C	Total Capacitance	$f = 1\text{MHz}, V_R = 200\text{V}$		650		$\text{pF}$
		$f = 1\text{MHz}, V_R = 400\text{V}$		500		

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance	Transistor		0.15	°C/W	
		Diode		0.28		
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, I <sub>isol</sub> <1mA, 50/60Hz	2500			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	M5	1.5	4.7	N.m
Wt	Package Weight			160		g

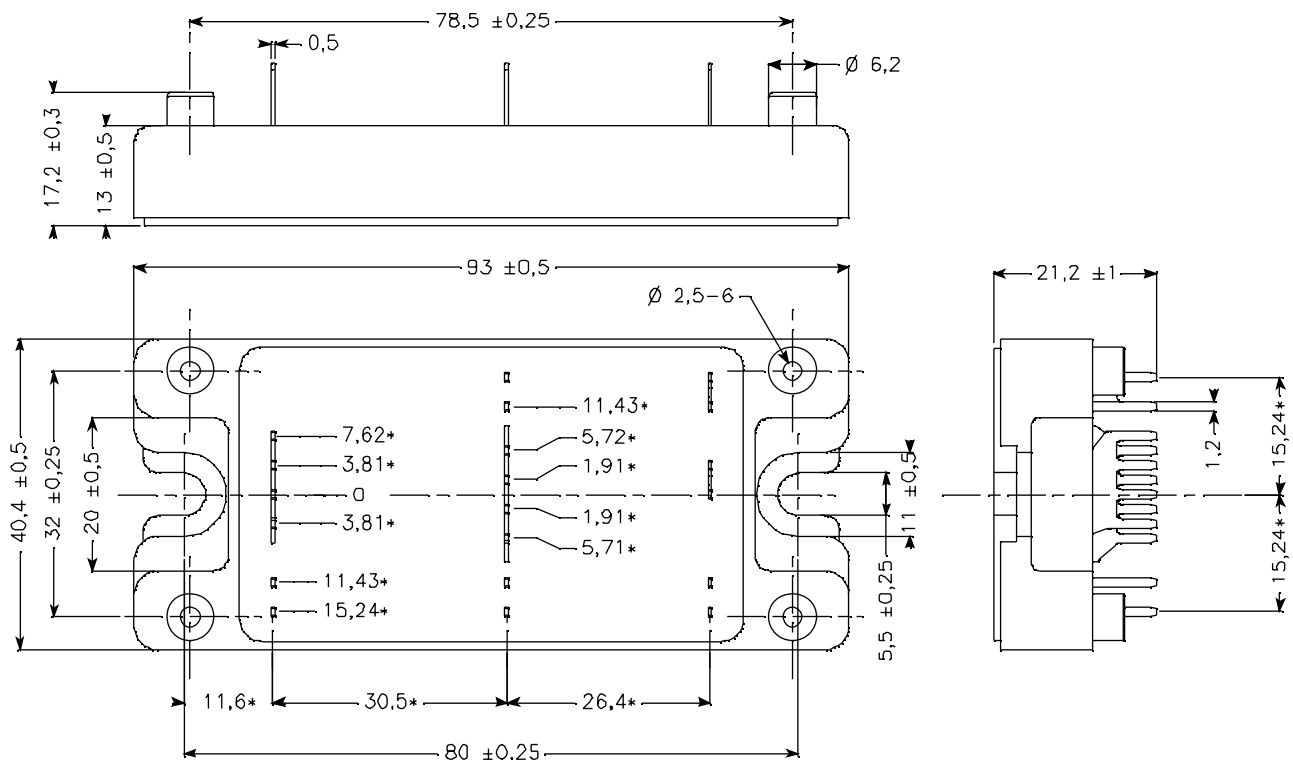
## Temperature sensor NTC (see application note APT0406 on www.advancedpower.com for more information).

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

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

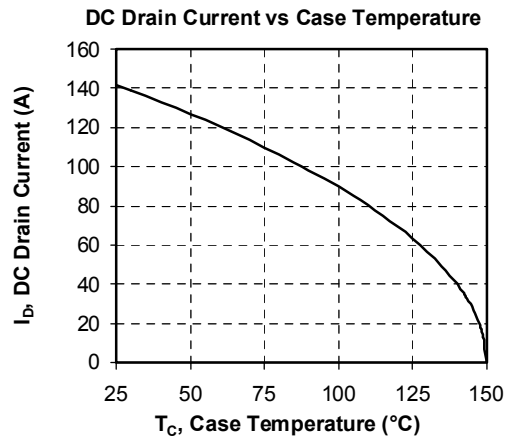
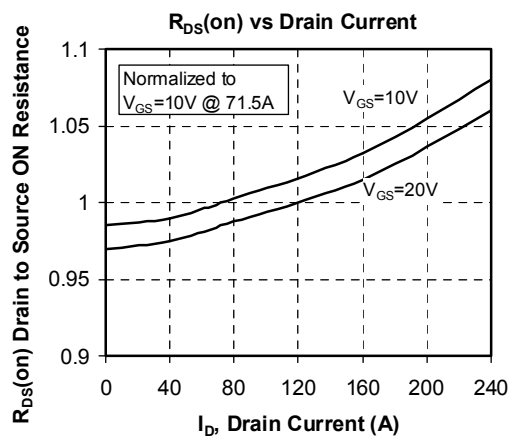
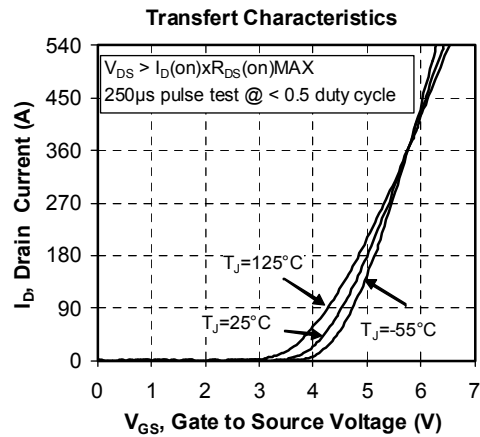
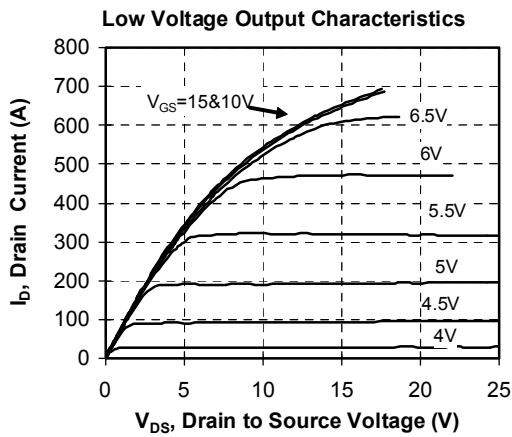
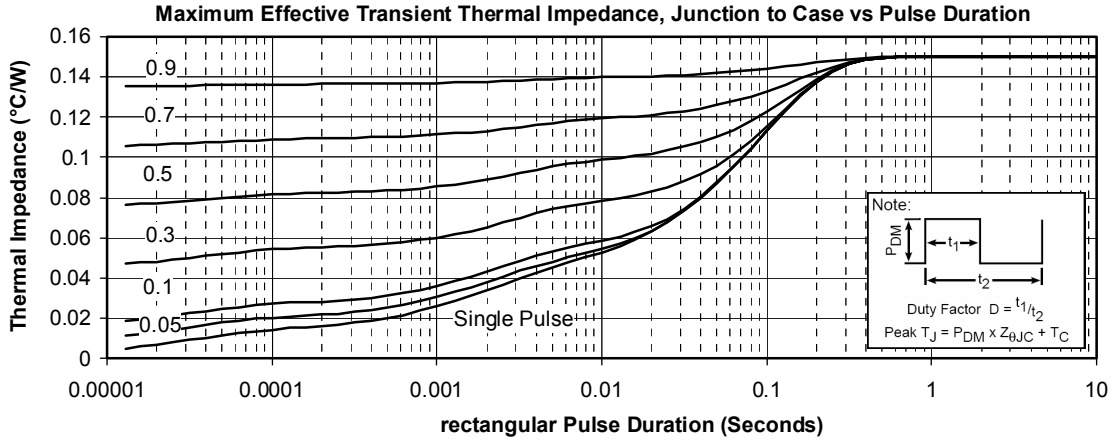
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

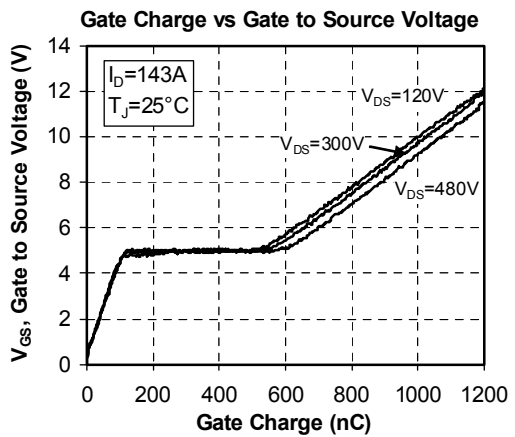
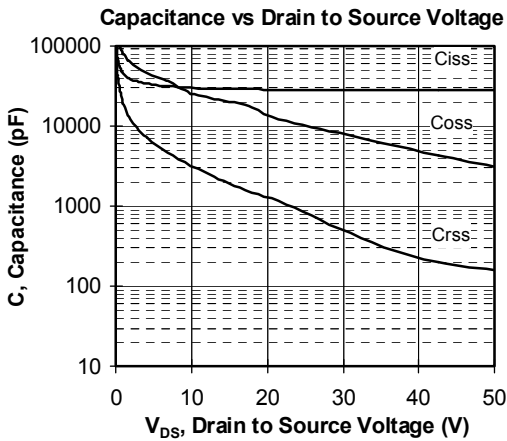
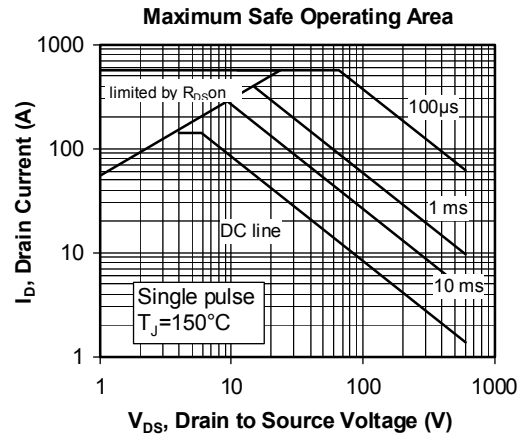
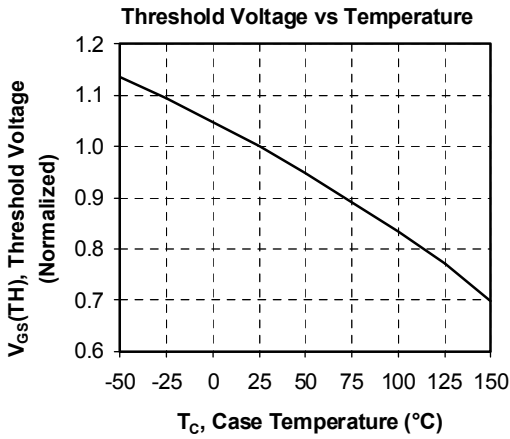
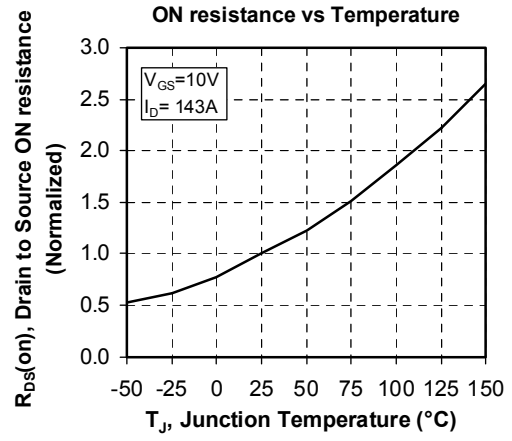
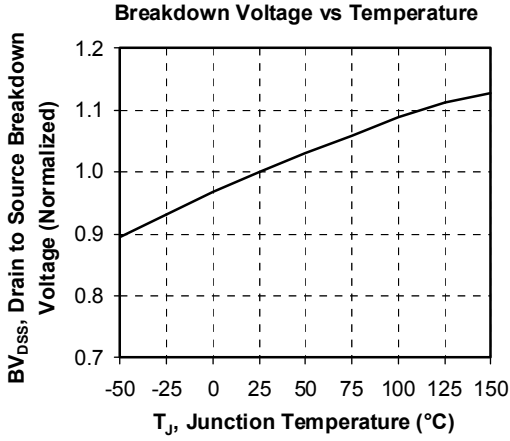
## SP4 Package outline (dimensions in mm)

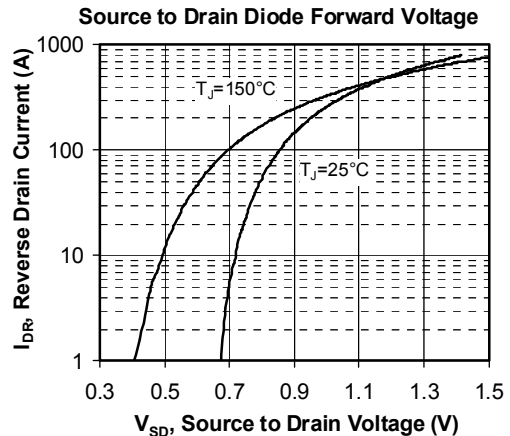
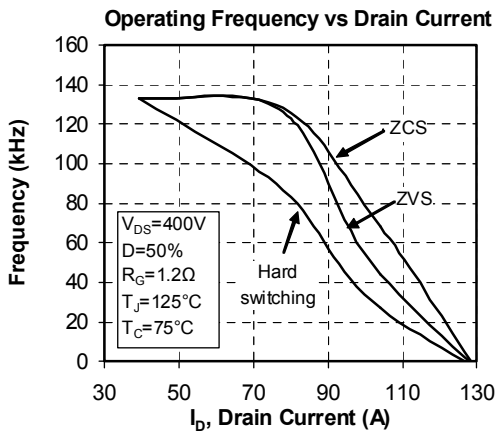
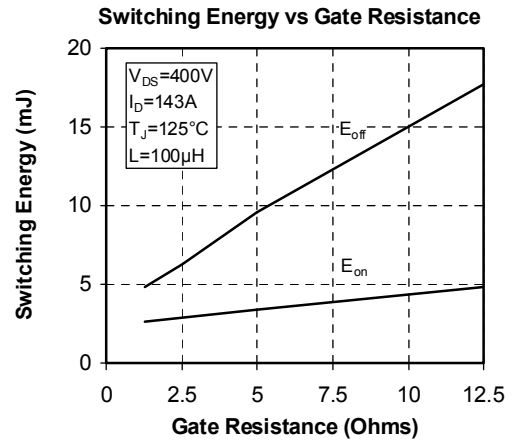
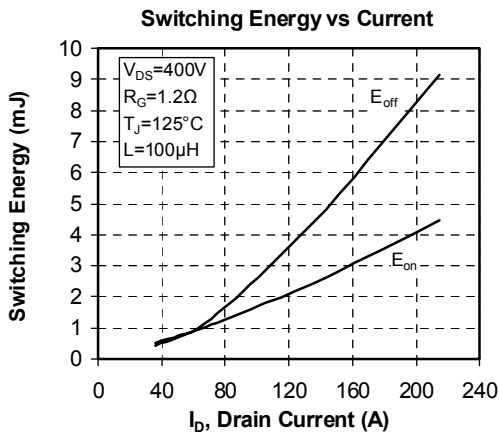
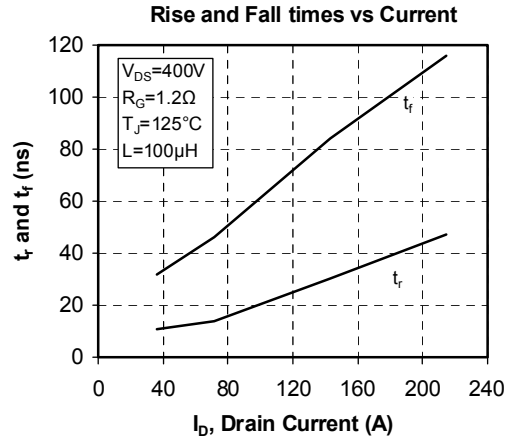
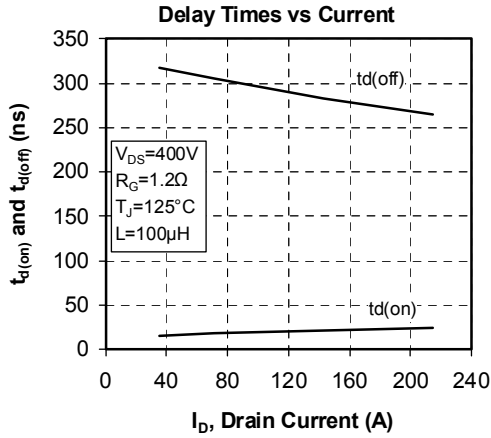


ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\pm 0,1$

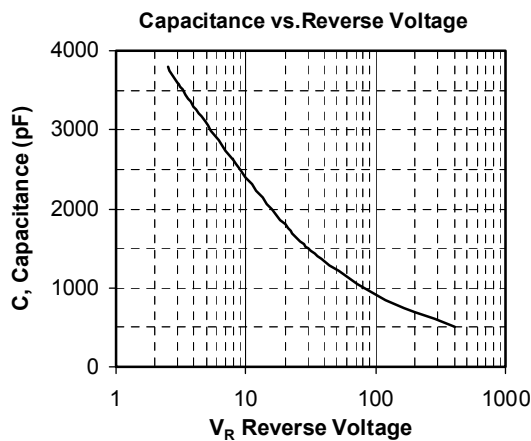
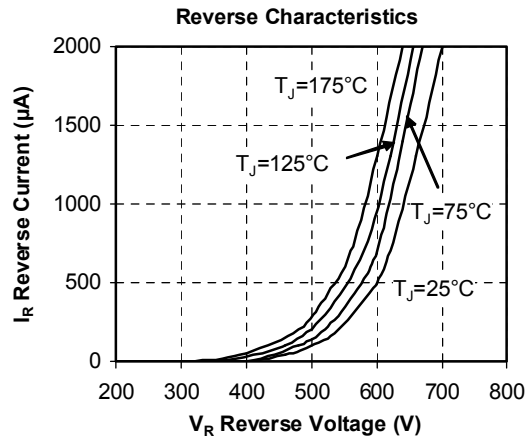
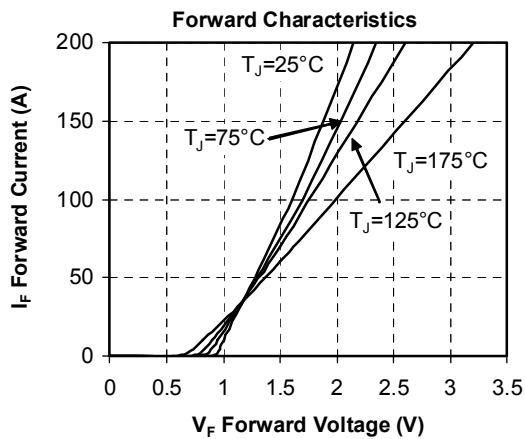
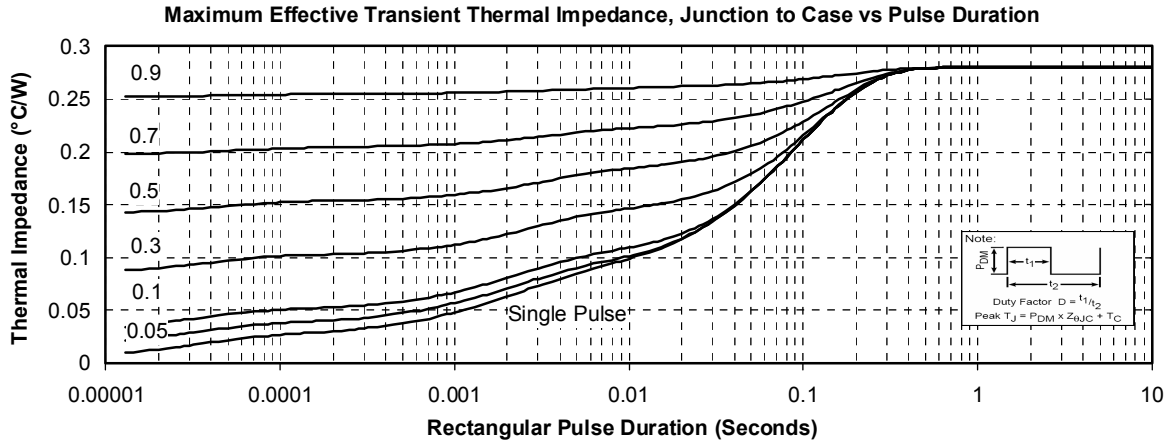
**Typical CoolMOS Performance Curve**







**Typical SiC Diode Performance Curve**



“COOLMOS™” comprise a new family of transistors developed by Infineon Technologies AG. “COOLMOS” is a trademark of Infineon Technologies AG”.

APT reserves the right to change, without notice, the specifications and information contained herein

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.