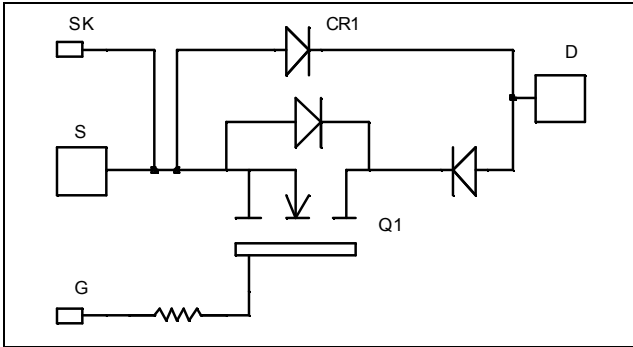


**Single switch  
Series & parallel diodes  
MOSFET Power Module**

**$V_{DSS} = 200V$   
 $R_{DSon} = 4m\Omega$  max @  $T_j = 25^\circ C$   
 $I_D = 417A$  @  $T_c = 25^\circ C$**

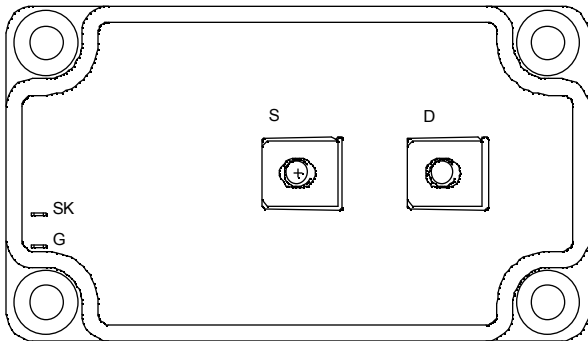


**Application**

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

**Features**

- Power MOS 7<sup>®</sup> MOSFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration
- AlN substrate for improved thermal performance



**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	200	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	417
		$T_c = 80^\circ C$	310
$I_{DM}$	Pulsed Drain current	1670	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	4	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	1560
$I_{AR}$	Avalanche current (repetitive and non repetitive)	100	A
$E_{AR}$	Repetitive Avalanche Energy	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy	3000	

**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	$V_{GS} = 0V, I_D = 500\mu A$	200			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 200V, T_j = 25^\circ\text{C}$			500	$\mu A$
		$V_{GS} = 0V, V_{DS} = 160V, T_j = 125^\circ\text{C}$			2000	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 208.5A$			4	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10mA$	3		5	V
$I_{GSS}$	Gate - Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 200$	nA

## Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		28.8		nF
$C_{oss}$	Output Capacitance			9.32		
$C_{rss}$	Reverse Transfer Capacitance			0.58		
$Q_g$	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 100V$ $I_D = 417A$		560		nC
$Q_{gs}$	Gate - Source Charge			212		
$Q_{gd}$	Gate - Drain Charge			268		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V$ $V_{Bus} = 133V$ $I_D = 417A$ $R_G = 1.2\Omega$		32		ns
$T_r$	Rise Time			64		
$T_{d(off)}$	Turn-off Delay Time			88		
$T_f$	Fall Time			116		
$E_{on}$	Turn-on Switching Energy ❶	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 417A, R_G = 1.2\Omega$		3396		$\mu J$
$E_{off}$	Turn-off Switching Energy ❷			3716		
$E_{on}$	Turn-on Switching Energy ❶	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 417A, R_G = 1.2\Omega$		3744		$\mu J$
$E_{off}$	Turn-off Switching Energy ❷			3944		

❶  $E_{on}$  includes diode reverse recovery.

❷ 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 $T_c = 85^\circ\text{C}$		360		A
$V_F$	Diode Forward Voltage	$I_F = 360A$		1.1	1.15	V
		$I_F = 720A$		1.4		
		$I_F = 360A, T_j = 125^\circ\text{C}$		0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 360A, V_R = 133V, di/dt = 1000A/\mu s, T_j = 25^\circ\text{C}$		31		ns
		$I_F = 360A, V_R = 133V, di/dt = 1000A/\mu s, T_j = 125^\circ\text{C}$		60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 360A, V_R = 133V, di/dt = 1000A/\mu s, T_j = 25^\circ\text{C}$		360		nC
		$I_F = 360A, V_R = 133V, di/dt = 1000A/\mu s, T_j = 125^\circ\text{C}$		1500		

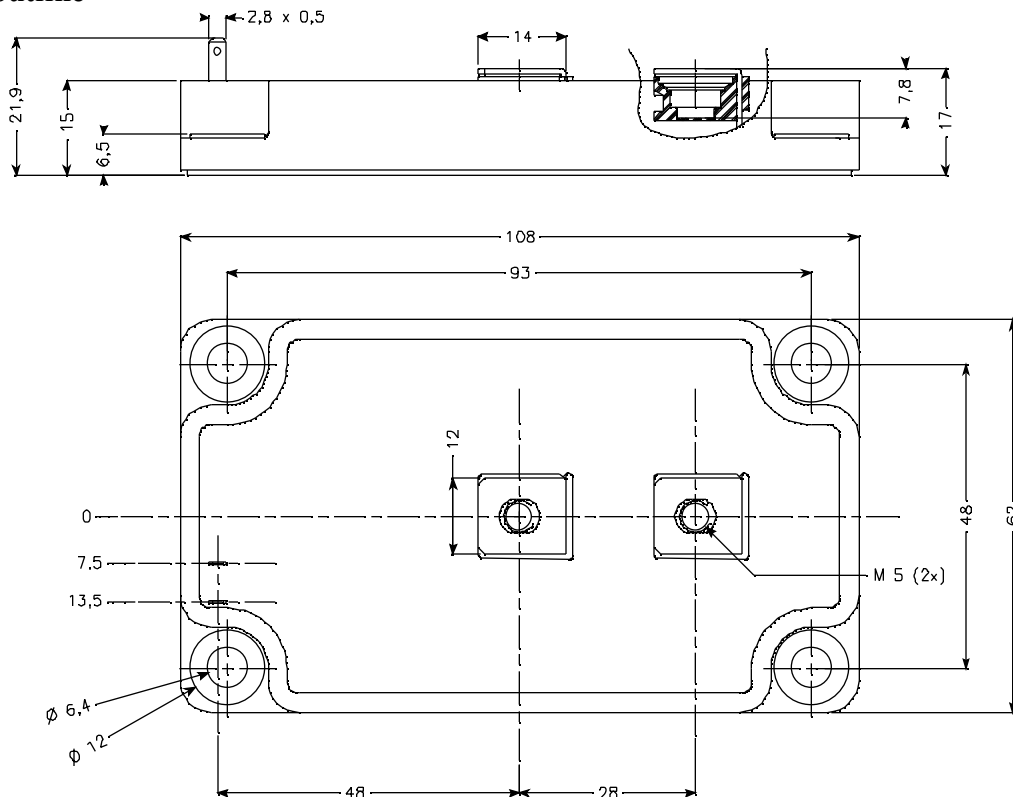
**Parallel diode ratings and characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	$T_c = 85^\circ\text{C}$		360		A
$V_F$	Diode Forward Voltage	$I_F = 360\text{A}$			1.1	1.15	V
		$I_F = 720\text{A}$			1.4		
		$I_F = 360\text{A}$	$T_j = 125^\circ\text{C}$		0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 360\text{A}$ $V_R = 133\text{V}$ $di/dt = 1000\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		31		ns
			$T_j = 125^\circ\text{C}$		60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 360\text{A}$ $V_R = 133\text{V}$ $di/dt = 1000\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		360		nC
			$T_j = 125^\circ\text{C}$		1500		

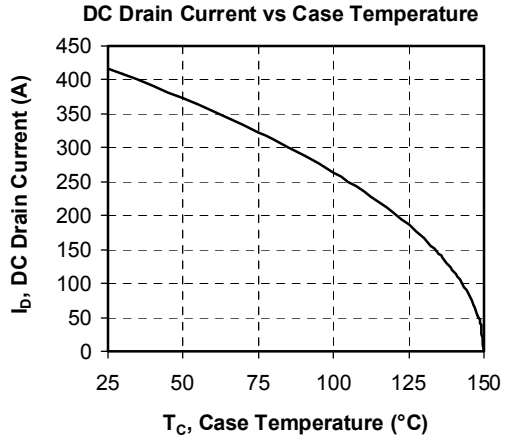
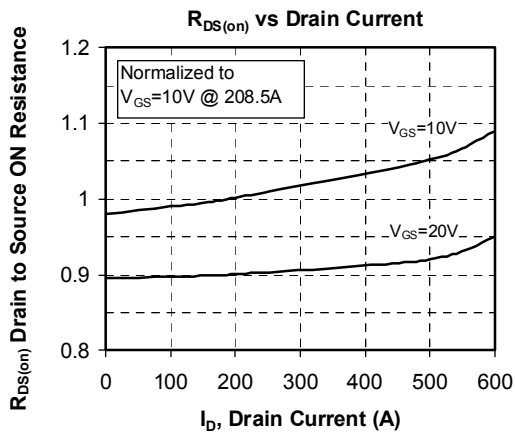
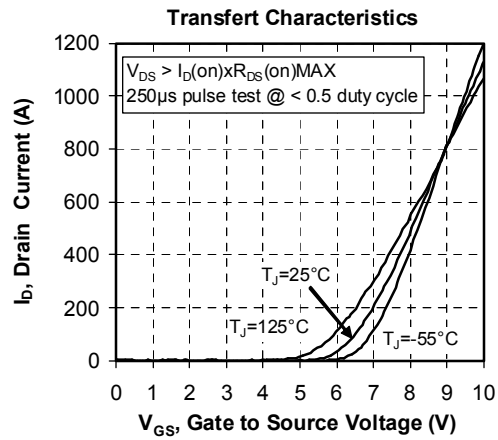
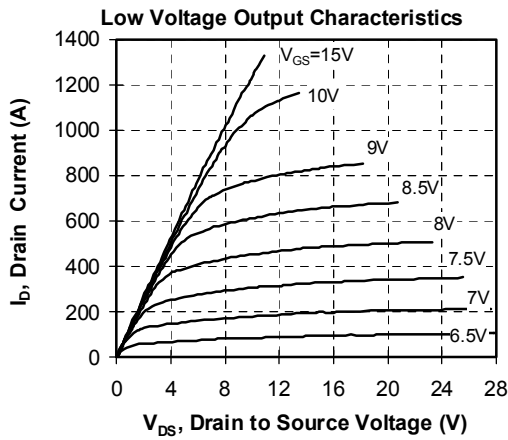
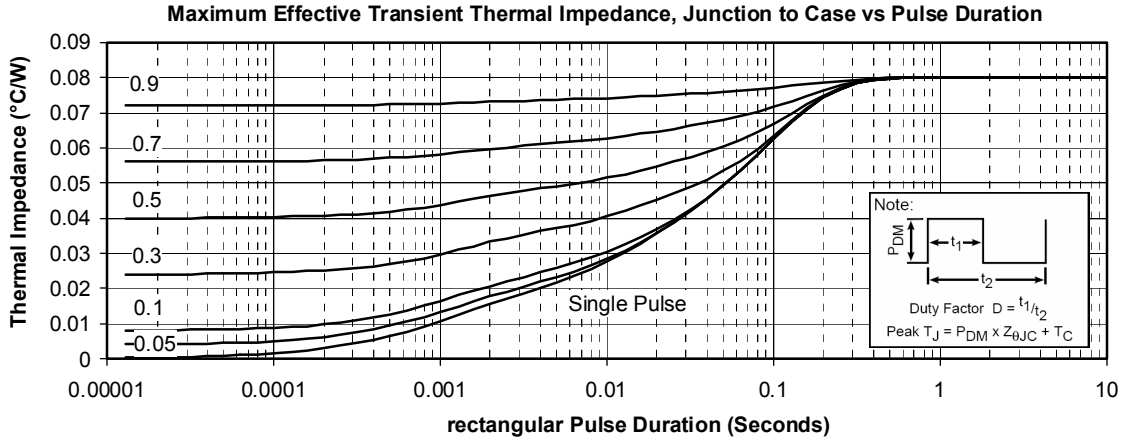
**Thermal and package characteristics**

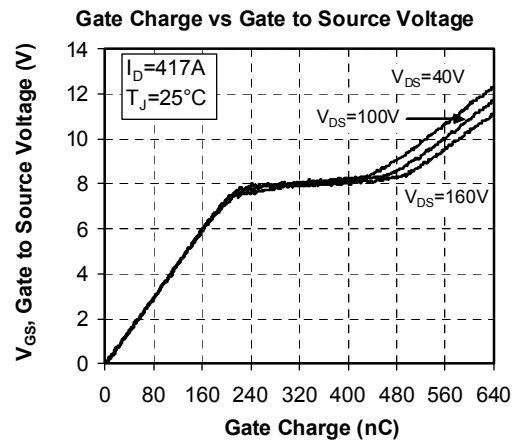
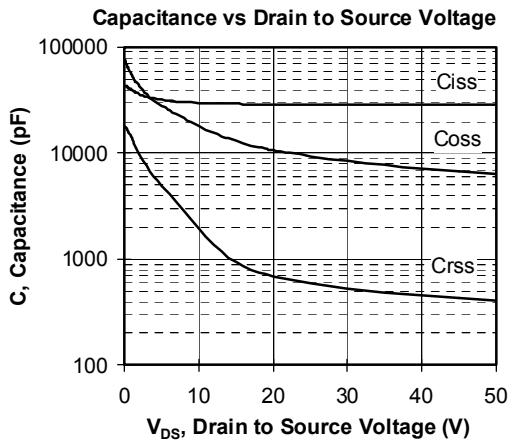
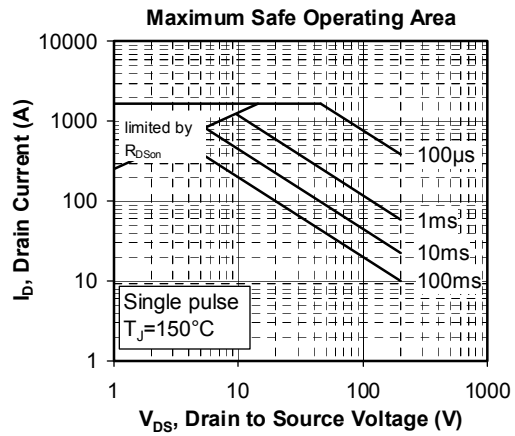
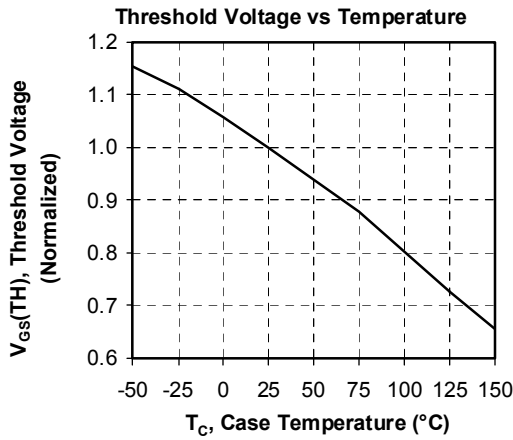
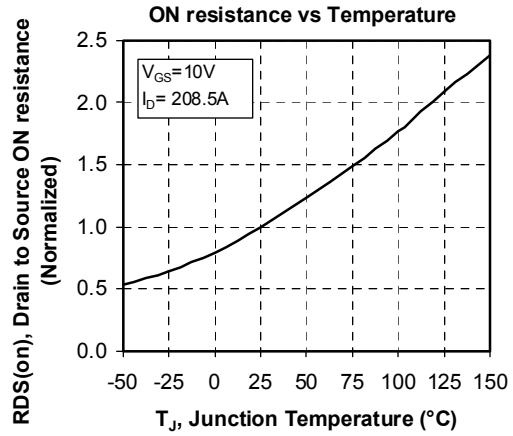
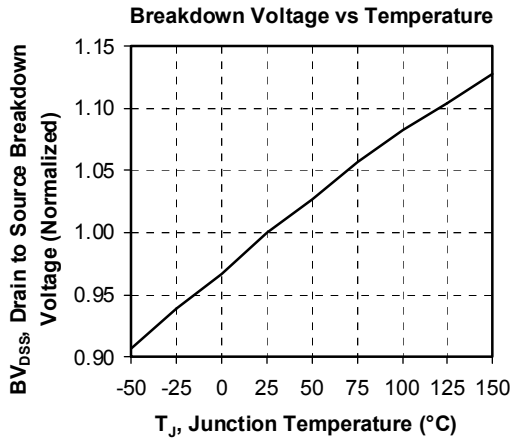
Symbol	Characteristic	Min	Typ	Max	Unit	
$R_{thJC}$	Junction to Case	Transistor			0.08	$^\circ\text{C}/\text{W}$
		Series Diode			0.12	
		Parallel Diode			0.12	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1\text{ min}$ , $I_{sol}<1\text{mA}$ , 50/60Hz	2500			V	
$T_J$	Operating junction temperature 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**

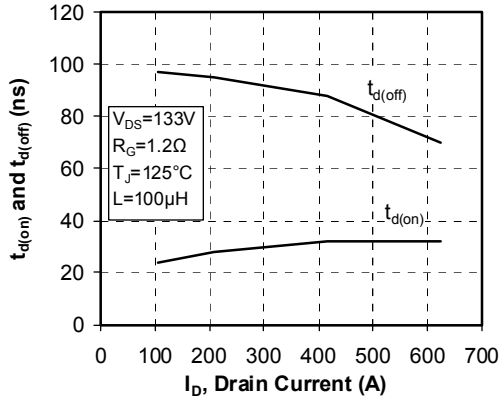


**Typical Performance Curve**

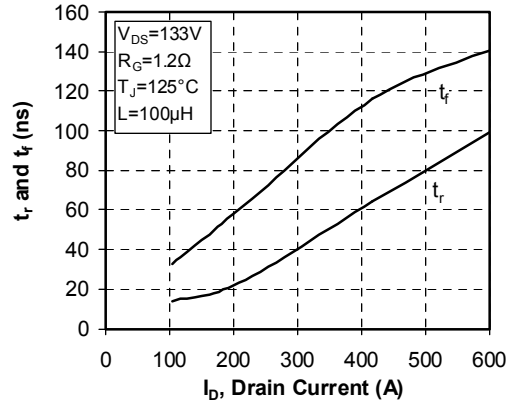




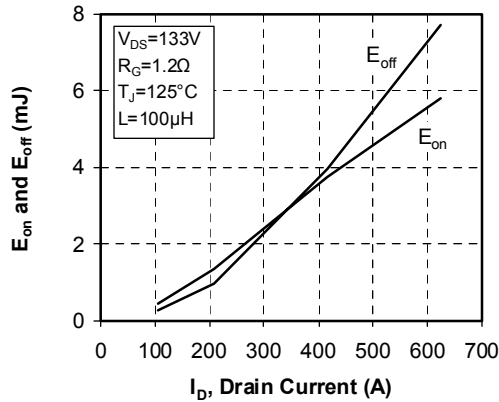
**Delay Times vs Current**



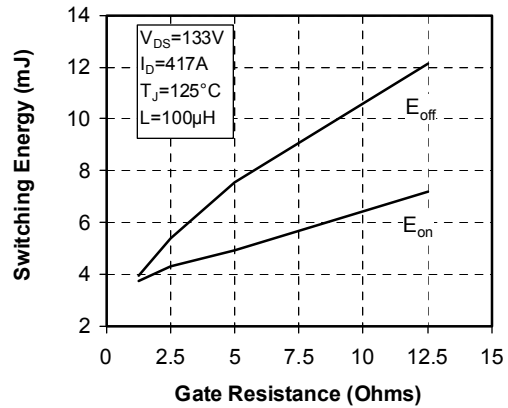
**Rise and Fall times vs Current**



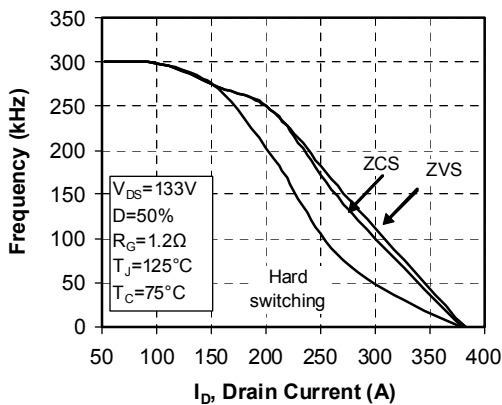
**Switching Energy vs Current**



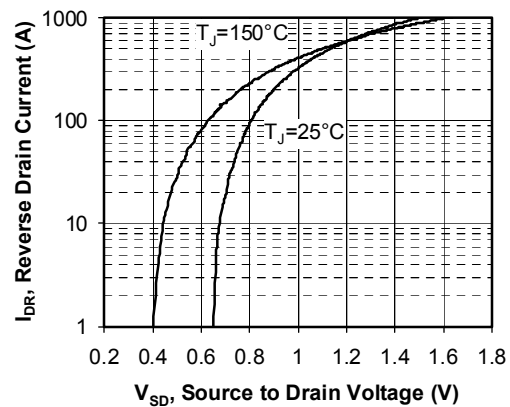
**Switching Energy vs Gate Resistance**



**Operating Frequency vs Drain Current**



**Source to Drain Diode Forward Voltage**



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.