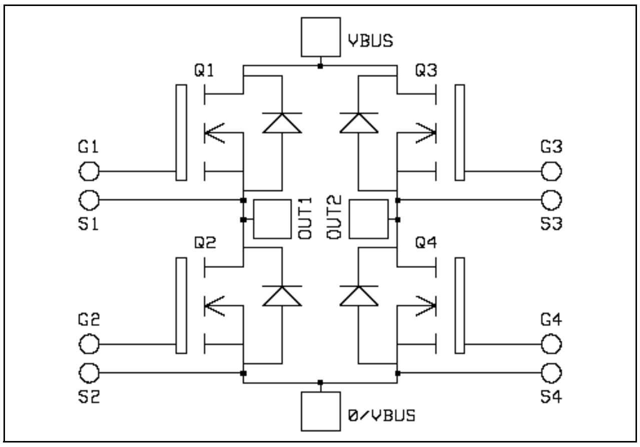
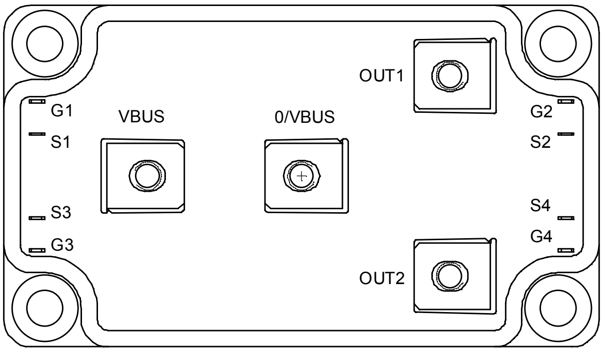
APTM20HM10F

Full - Bridge MOSFET Power Module

V_{DSS} = 200V
R_{DSon} = 10mΩ max @ Tj = 25°C
I_D = 175A @ Tc = 25°C





Application

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

Features

- Power MOS 7® FREDFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- 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		200	V
I_D	Continuous Drain Current	T_c = 25°C	175	A
		T_c = 80°C	131	
I_{DM}	Pulsed Drain current		700	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		10	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	694	W
I_{AR}	Avalanche current (repetitive and non repetitive)		89	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		2500	

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handing Procedures Should Be Followed.

All ratings @ $T_j = 25°C$ unless otherwise specified

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
BV_{DSS}	Drain - Source Breakdown Voltage	$V_{GS} = 0V$, $I_D = 375\mu A$		200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 200V$	$T_j = 25°C$			375	µA
		$V_{GS} = 0V, V_{DS} = 160V$	$T_j = 125°C$			1500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V$, $I_D = 87.5A$				10	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 5mA$		3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30$ V, $V_{DS} = 0V$				±150	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1MHz		13.7		nF
C_{oss}	Output Capacitance			4.36		
C_{rss}	Reverse Transfer Capacitance			0.2		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 100V$ $I_D = 150A$		224		nC
Q_{gs}	Gate – Source Charge			86		
Q_{gd}	Gate – Drain Charge			94		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** $V_{GS} = 15V$ $V_{Bus} = 133V$ $I_D = 150A$ $R_G = 2.5\Omega$		28		ns
T_r	Rise Time			56		
$T_{d(off)}$	Turn-off Delay Time			81		
T_f	Fall Time			99		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 25°C** $V_{GS} = 15V$, $V_{Bus} = 133V$ $I_D = 150A$, $R_G = 2.5\Omega$		926		µJ
E_{off}	Turn-off Switching Energy ❷			910		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 125°C** $V_{GS} = 15V$, $V_{Bus} = 133V$ $I_D = 150A$, $R_G = 2.5\Omega$		1216		µJ
E_{off}	Turn-off Switching Energy ❷			1062		

Source - Drain diode ratings and characteristics

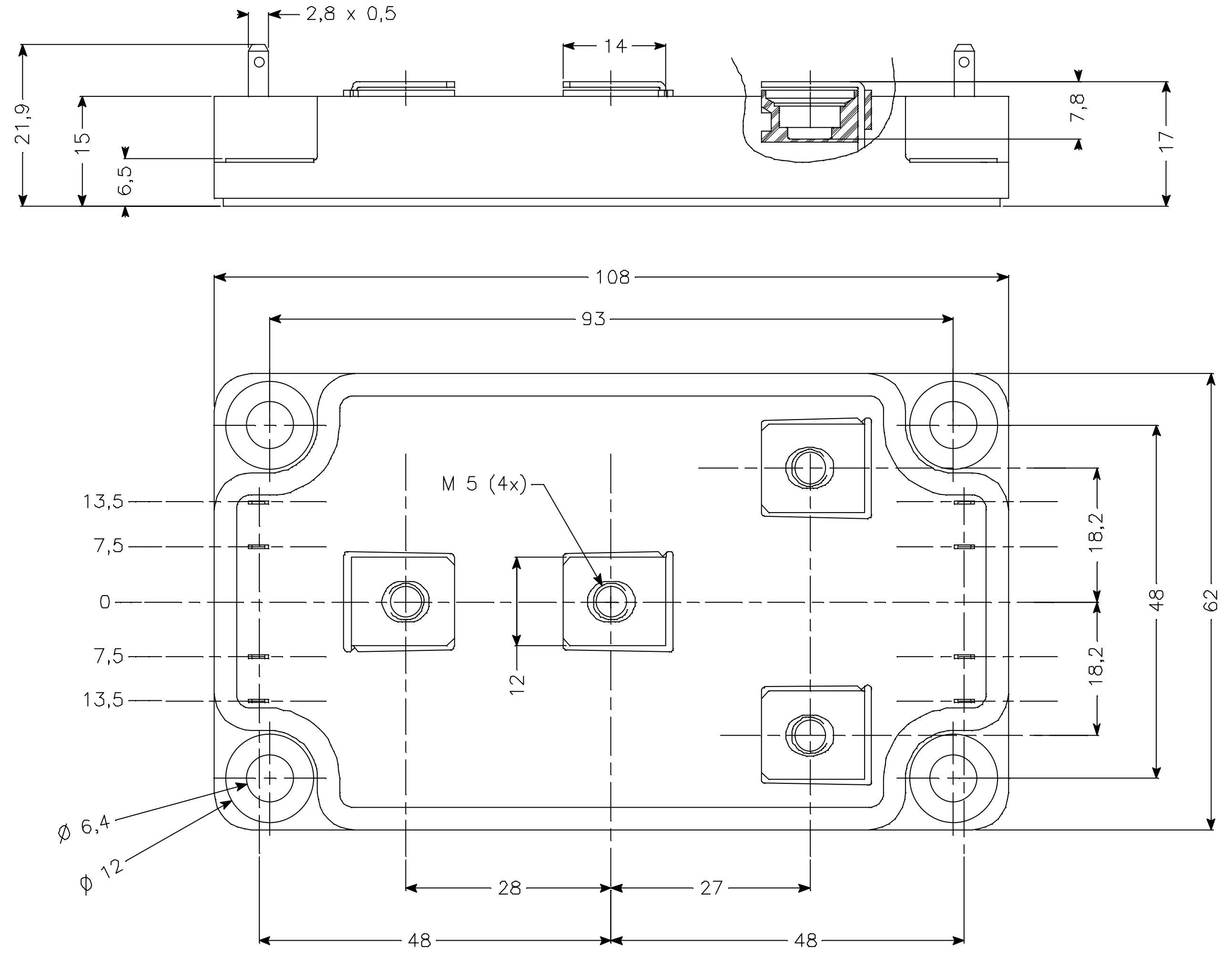
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			175	A
			Tc = 80°C			131	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V$, $I_S = -150A$				1.3	V
dv/dt	Peak Diode Recovery ❸					8	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -150A$ $V_R = 133V$ $di_S/dt = 200A/\mu s$	$T_j = 25°C$			220	ns
			$T_j = 125°C$			420	
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		2.14		µC
			$T_j = 125°C$		5.8		

❶ E_{on} includes diode reverse recovery.
❷ In accordance with JEDEC standard JESD24-1.
❸ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \leq -150A$ di/dt $\leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_j \leq 150°C$

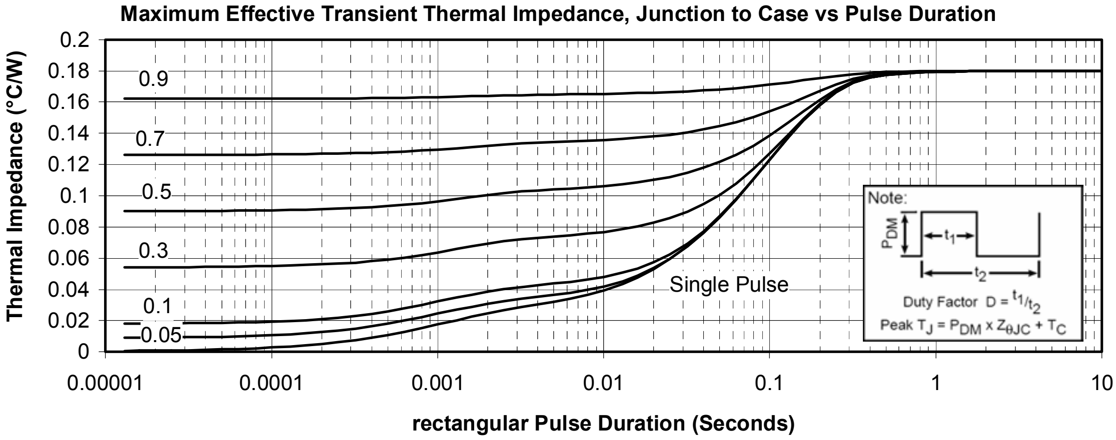
Thermal and package characteristics

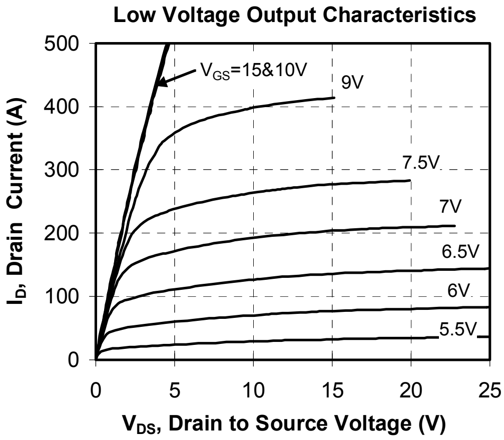
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case					0.18	°C/W
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					280	g

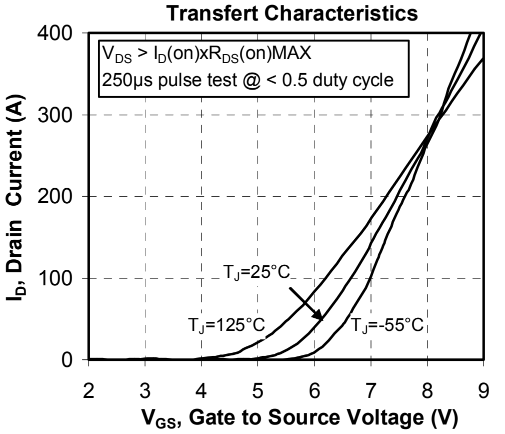
Package outline

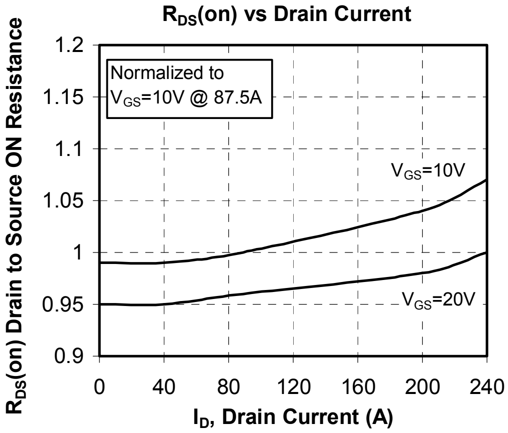


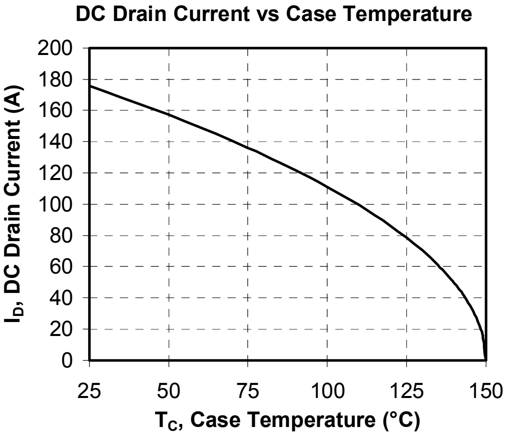
Typical Performance Curve

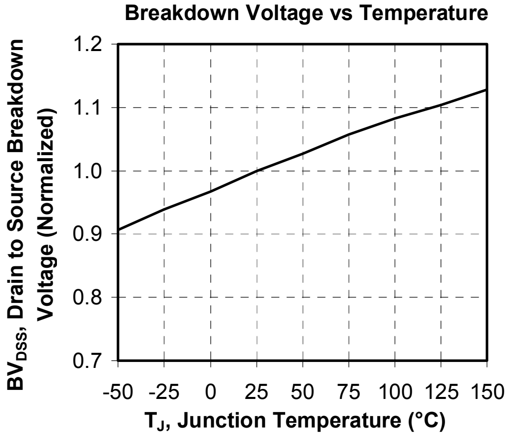

Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

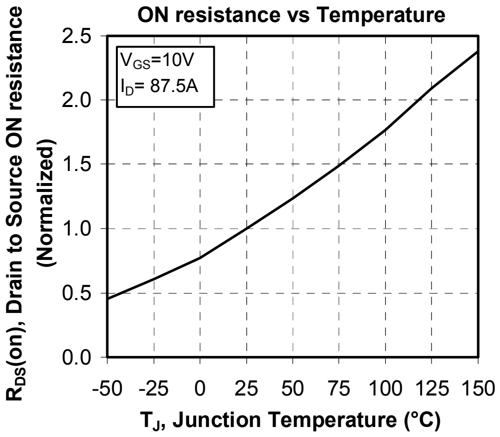

Low Voltage Output Characteristics

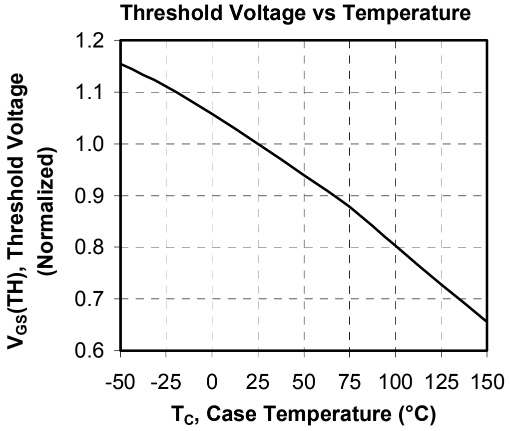

Transfert Characteristics

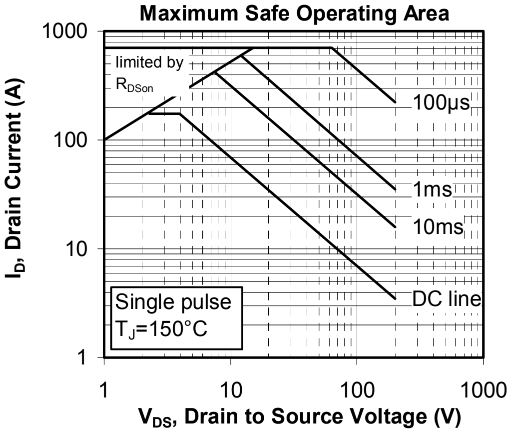

R_{DS}(on) vs Drain Current

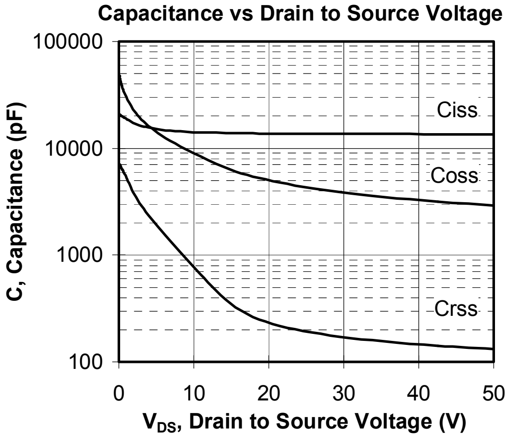

DC Drain Current vs Case Temperature

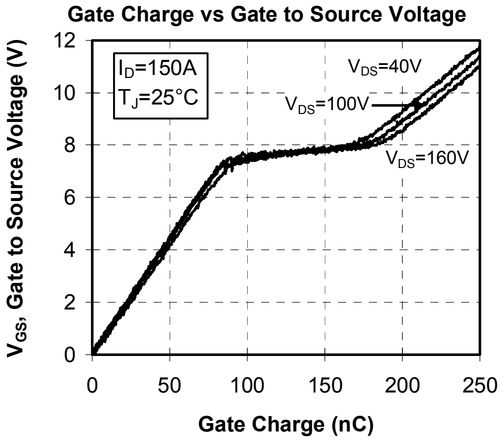

Breakdown Voltage vs Temperature

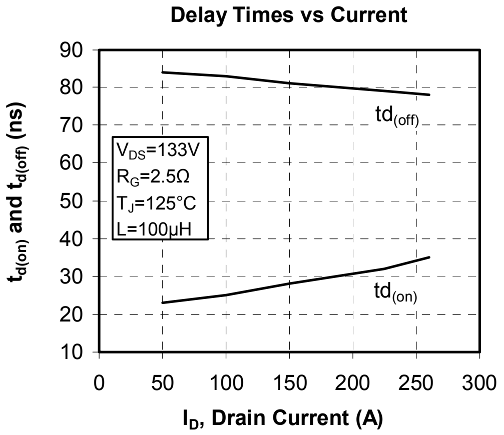

ON resistance vs Temperature

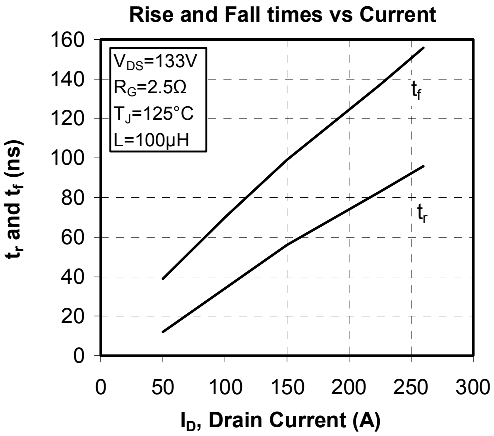

Threshold Voltage vs Temperature

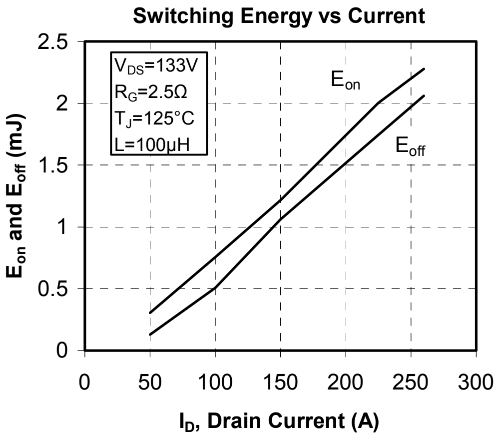

Maximum Safe Operating Area

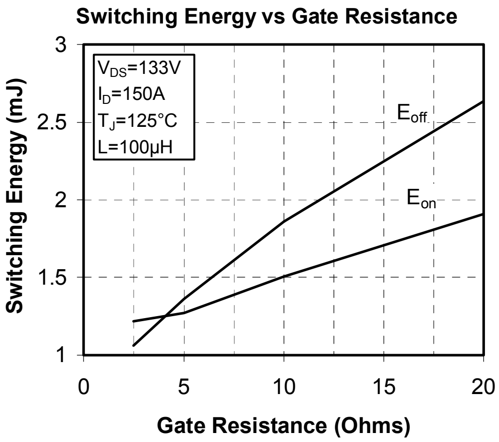

Capacitance vs Drain to Source Voltage

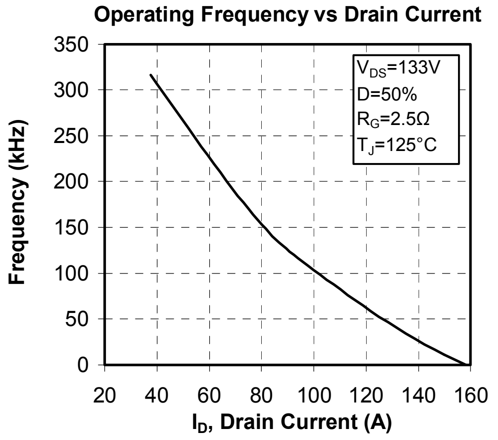

Gate Charge vs Gate to Source Voltage

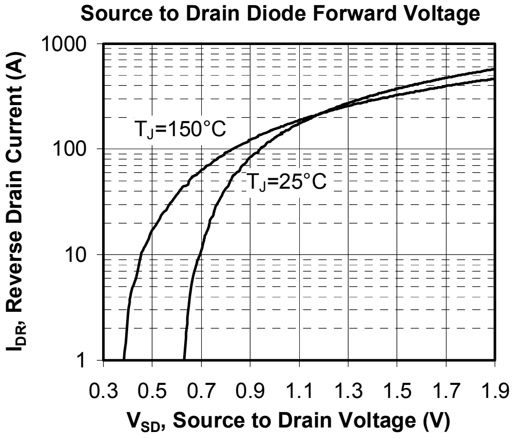

Delay Times vs Current


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