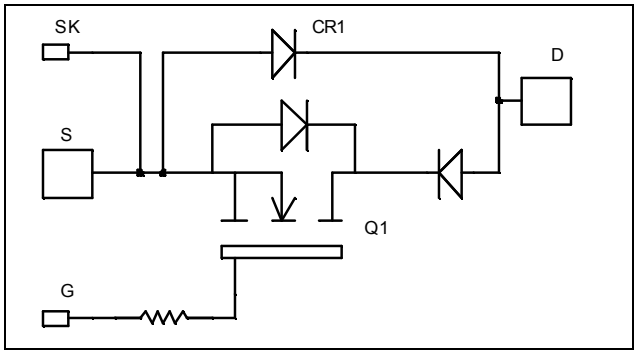
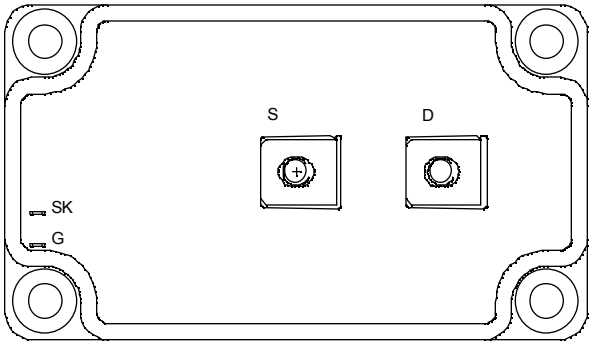
APTM120U10SA

Single switch
Series & parallel diodes
MOSFET Power Module

V_{DSS} = 1200V
R_{DSon} = 100mΩ typ @ Tj = 25°C
I_D = 116A @ Tc = 25°C





Application

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

Features

- Power MOS 7® 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 MOSFET 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		1200	V
I_D	Continuous Drain Current	T_c = 25°C	116	A
		T_c = 80°C	86	
I_{DM}	Pulsed Drain current		464	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		120	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	3290	W
I_{AR}	Avalanche current (repetitive and non repetitive)		24	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		3200	

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*
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 1200V	T_j = 25°C			1	mA
		V_{GS} = 0V, V_{DS} = 1000V	T_j = 125°C			4	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 58A			100	120	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 20mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±400	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		28.9		nF
C_{oss}	Output Capacitance			4.4		
C_{rss}	Reverse Transfer Capacitance			0.8		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 600V I_D = 116A		1100		nC
Q_{gs}	Gate – Source Charge			128		
Q_{gd}	Gate – Drain Charge			716		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 800V I_D = 116A R_G = 1.2Ω		20		ns
T_r	Rise Time			17		
$T_{d(off)}$	Turn-off Delay Time			245		
T_f	Fall Time			62		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 800V I_D = 116A, R_G = 1.2Ω		5		mJ
E_{off}	Turn-off Switching Energy			4.6		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 800V I_D = 116A, R_G = 1.2Ω		9.2		mJ
E_{off}	Turn-off Switching Energy			5.6		

Series diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=200V	T_j = 25°C			350	µA
			T_j = 125°C			600	
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	T_c = 80°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°C		0.9		
t_{rr}	Reverse Recovery Time	I_F = 120A V_R = 133V di/dt = 400A/µs	T_j = 25°C		31		ns
			T_j = 125°C		60		
Q_{rr}	Reverse Recovery Charge	I_F = 120A V_R = 133V di/dt = 400A/µs	T_j = 25°C		120		nC
			T_j = 125°C		500		

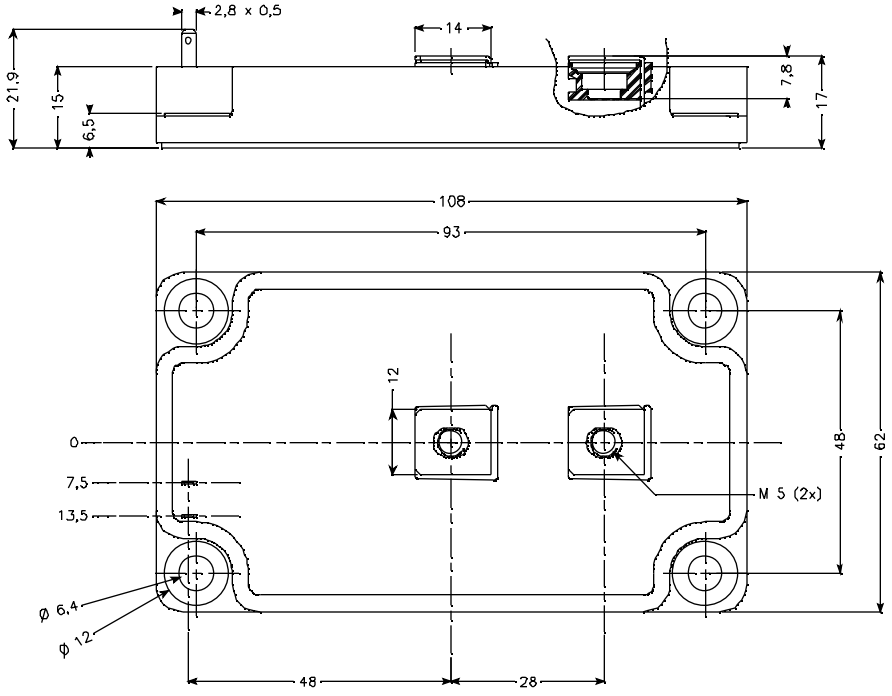
Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C			200	µA
			T_j = 125°C			750	
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	T_c = 80°C		180		A
V_F	Diode Forward Voltage	I_F = 180A			2.5	3	V
		I_F = 360A			3		
		I_F = 180A	T_j = 125°C		1.8		
t_{rr}	Reverse Recovery Time	I_F = 180A V_R = 800V di/dt = 600A/µs	T_j = 25°C		265		ns
			T_j = 125°C		350		
Q_{rr}	Reverse Recovery Charge	I_F = 180A V_R = 800V di/dt = 600A/µs	T_j = 25°C		1.7		µC
			T_j = 125°C		8.7		

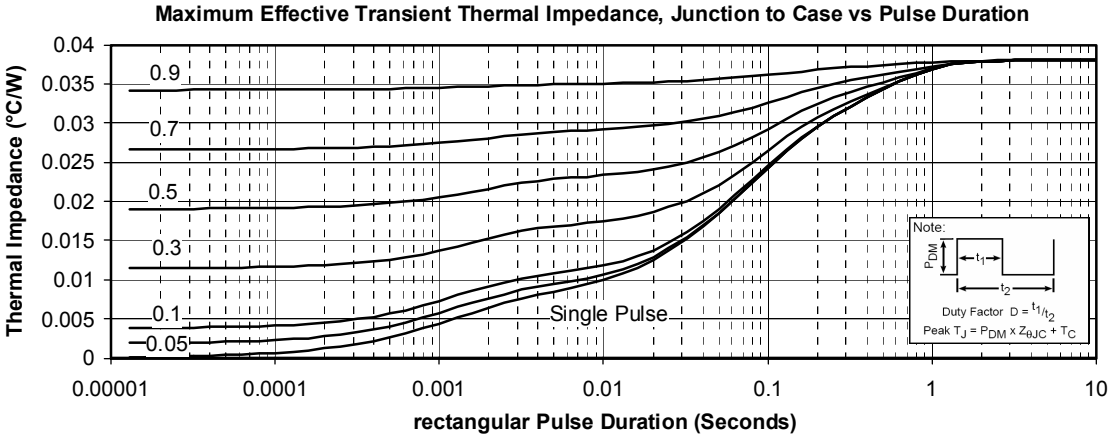
Thermal and package characteristics

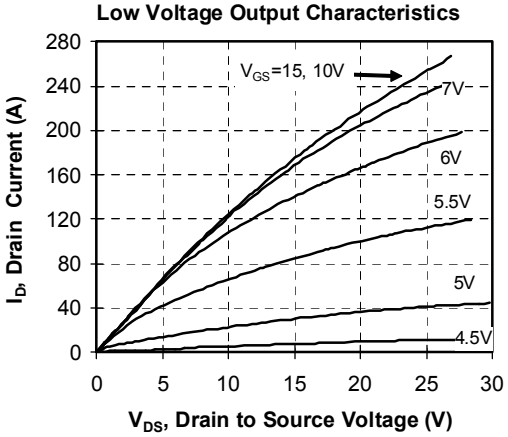
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case	Transistor				0.038	°C/W
		Series diode				0.46	
		Parallel diode				0.32	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage 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

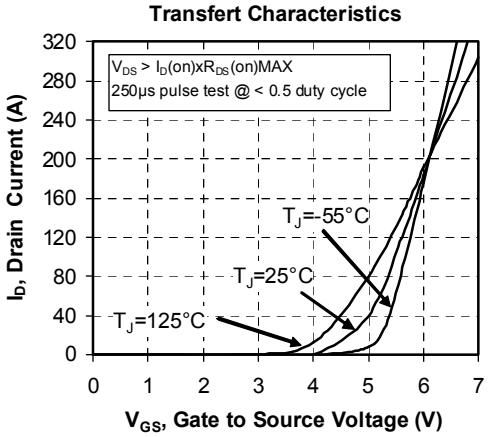
SP6 Package outline (dimensions in mm)

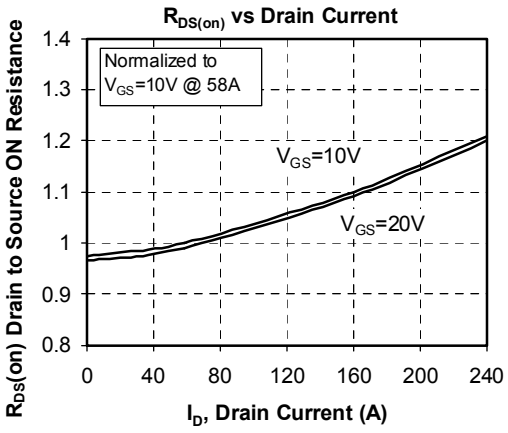


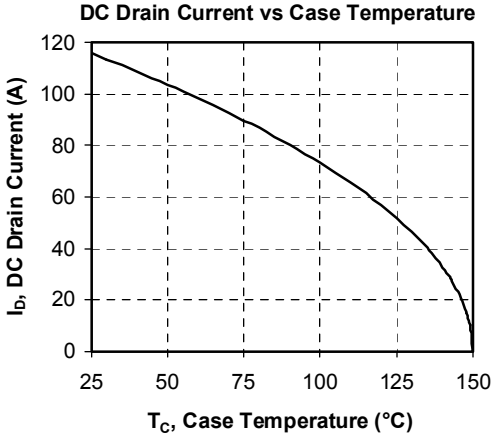
Typical Performance Curve



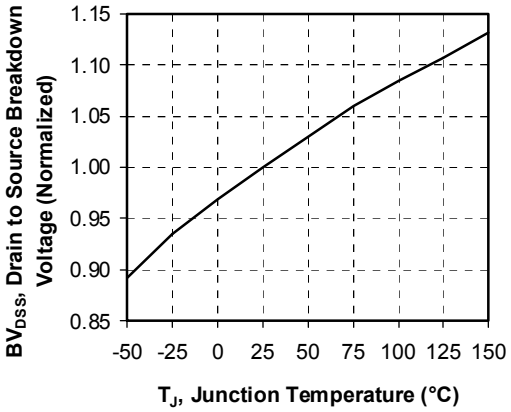




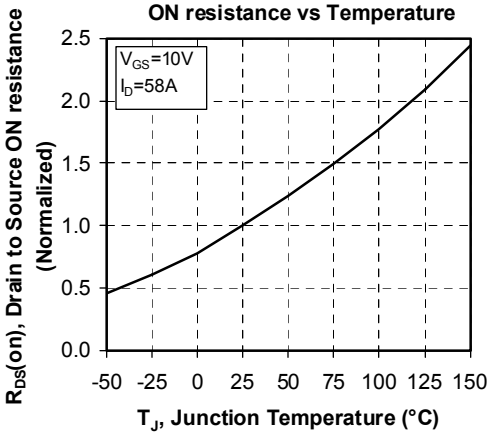




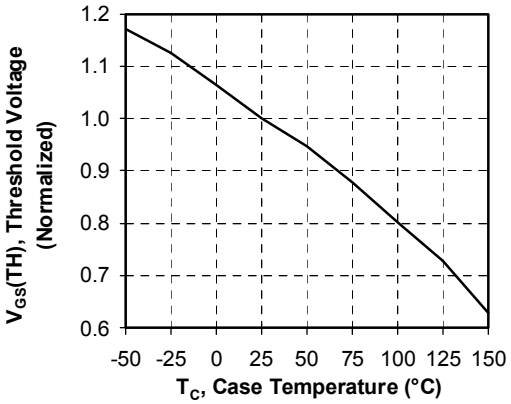
Breakdown Voltage vs Temperature



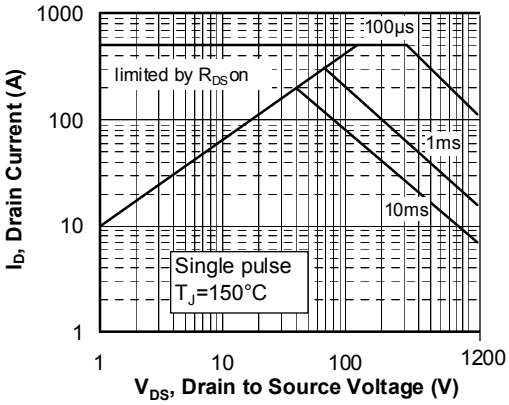
ON resistance vs Temperature



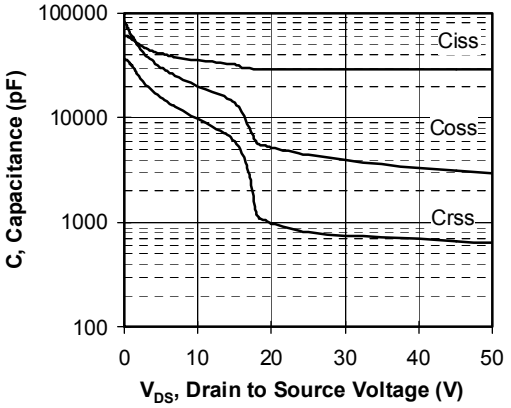
Threshold Voltage vs Temperature



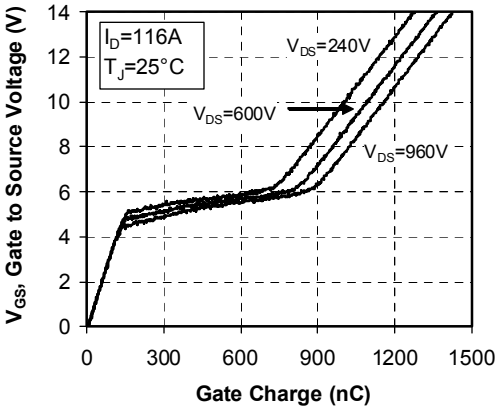
Maximum Safe Operating Area



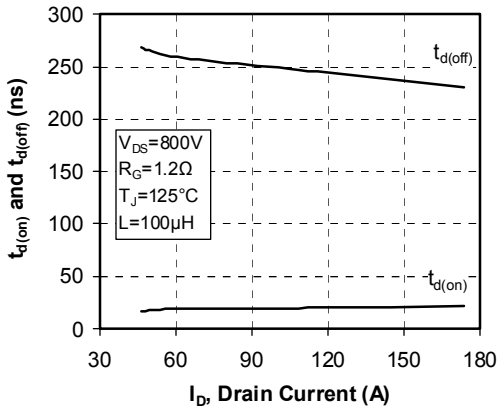
Capacitance vs Drain to Source Voltage



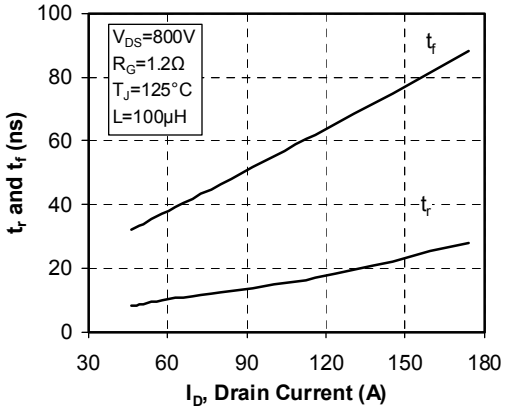
Gate Charge vs Gate to Source Voltage



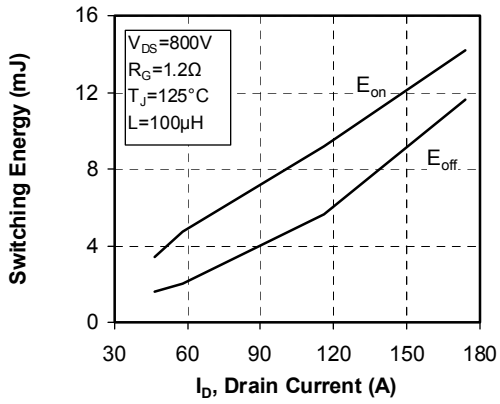
Delay Times vs Current



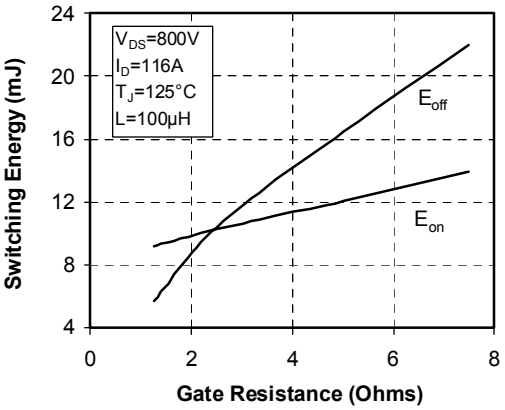
Rise and Fall times vs Current



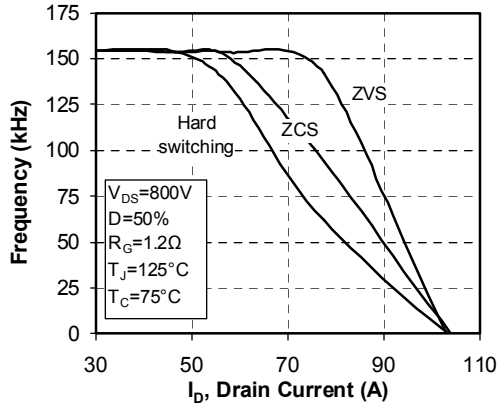
Switching Energy vs Current



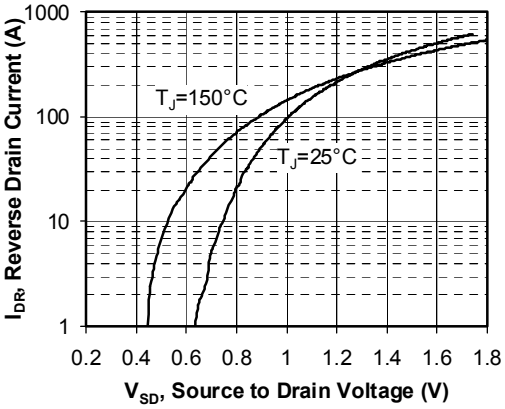
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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