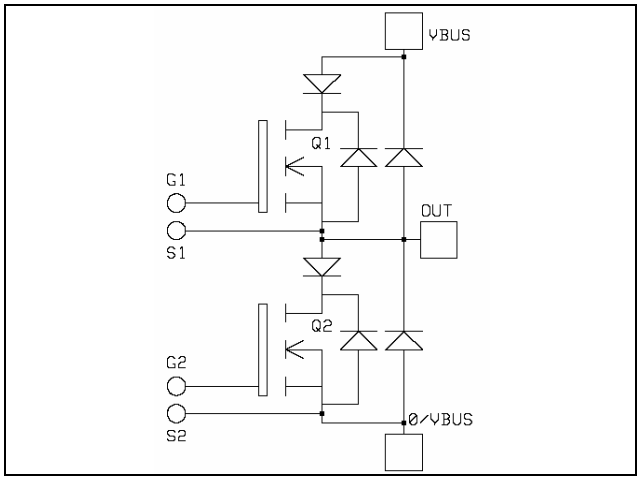
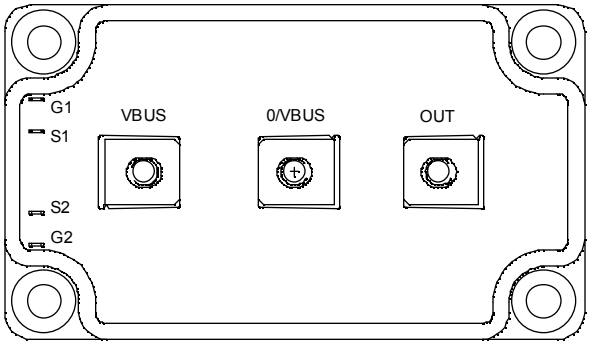
APTM100A13SC

Phase leg
Series & SiC parallel diodes
MOSFET Power Module

V_{DSS} = 1000V
R_{DSon} = 130mΩ max @ Tj = 25°C
I_D = 65A @ Tc = 25°C





Application

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

Features

- ***Power MOS 7® MOSFETs***
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- ***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		1000	V
I_D	Continuous Drain Current	T_c = 25°C	65	A
		T_c = 80°C	49	
I_{DM}	Pulsed Drain current		240	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		130	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	1250	W
I_{AR}	Avalanche current (repetitive and non repetitive)		24	A
E_{AR}	Repetitive Avalanche Energy		30	mJ
E_{AS}	Single Pulse Avalanche Energy		1300	

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 = 1.5mA		1000			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS}= 1000V	T_j = 25°C			600	µA
		V_{GS} = 0V, V_{DS}= 800V	T_j = 125°C			2	mA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 32.5A				130	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 6mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±450	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		15.2		nF
C_{oss}	Output Capacitance			2.6		
C_{rss}	Reverse Transfer Capacitance			0.42		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 500V I_D = 65A		562		nC
Q_{gs}	Gate – Source Charge			75		
Q_{gd}	Gate – Drain Charge			363		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @125°C** V_{GS} = 15V V_{Bus} = 667V I_D = 65A R_G = 0.5Ω		9		ns
T_r	Rise Time			9		
$T_{d(off)}$	Turn-off Delay Time			50		
T_f	Fall Time			24		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 667V I_D = 65A, R_G = 0.5Ω		1278		µJ
E_{off}	Turn-off Switching Energy ❶			462		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 667V I_D = 65A, R_G = 0.5Ω		2671		µJ
E_{off}	Turn-off Switching Energy ❶			570		

❶ In accordance with JEDEC standard JESD24-1.

SiC Parallel diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RRM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C		400	1600	µA
			T_j = 125°C		800	8000	
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	Tc = 125°C		40		A
V_F	Diode Forward Voltage	I_F = 40A	T_j = 25°C		1.6	1.8	V
			T_j = 175°C		2.6	3.0	
Q_C	Total Capacitive Charge	I_F = 40A, V_R = 600V di/dt =2000A/µs			112		nC
Q	Total Capacitance	f = 1MHz, V_R = 200V			360		pF
		f = 1MHz, V_R = 400V			264		

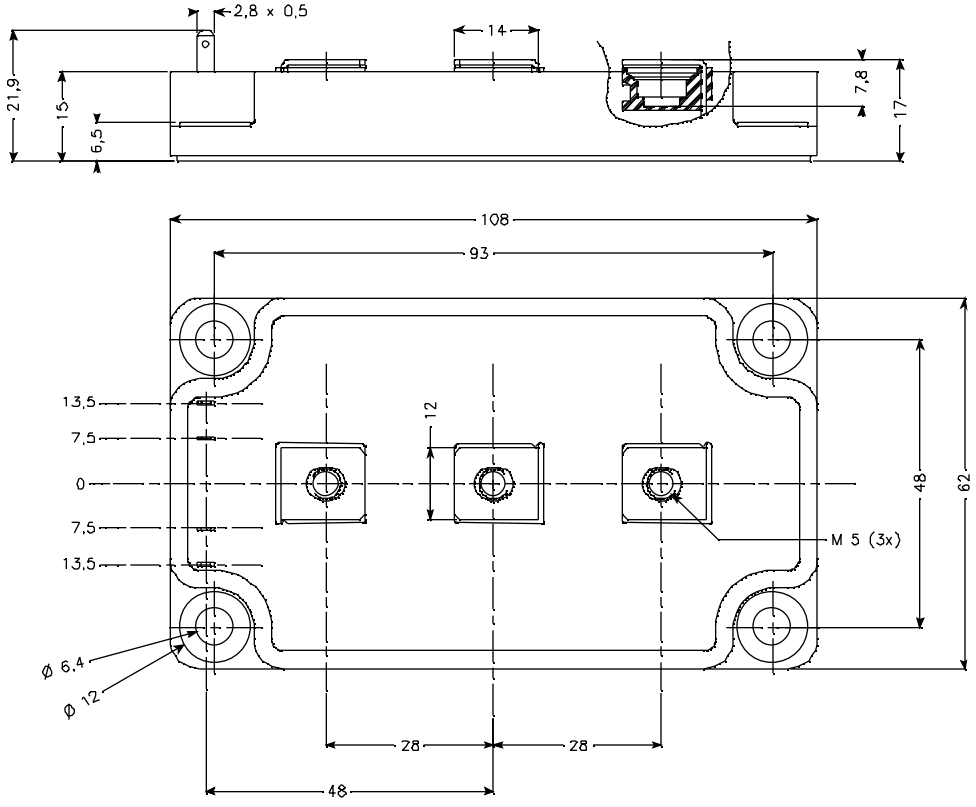
Series diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	T_c = 85°C		60		A
V_F	Diode Forward Voltage	I_F = 60A			1.1	1.15	V
		I_F = 120A			1.4		
		I_F = 60A	T_j = 125°C		0.9		
t_{rr}	Reverse Recovery Time	I_F = 60A V_R = 133V di/dt = 400A/µs	T_j = 25°C		24		ns
			T_j = 125°C		48		
Q_{rr}	Reverse Recovery Charge	I_F = 60A V_R = 133V di/dt = 400A/µs	T_j = 25°C		66		nC
			T_j = 125°C		300		

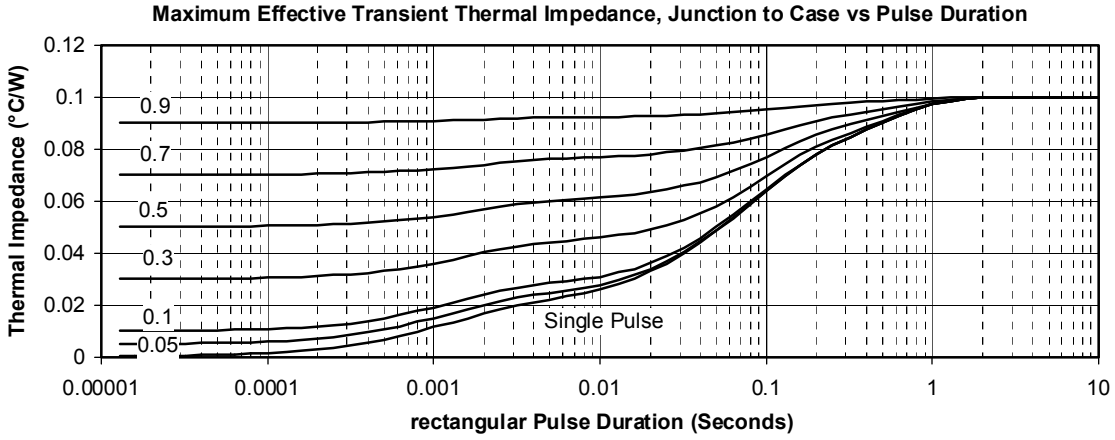
Thermal and package characteristics

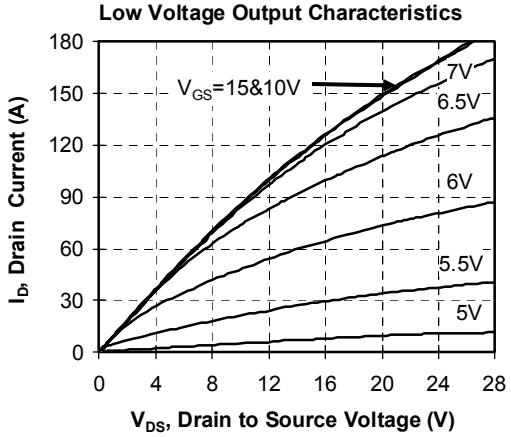
Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case	Transistor				0.10	°C/W
		Series diode				0.65	
		Parallel diode				0.35	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage 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

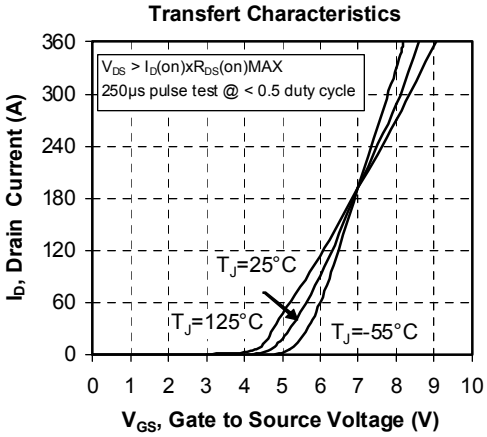
Package outline

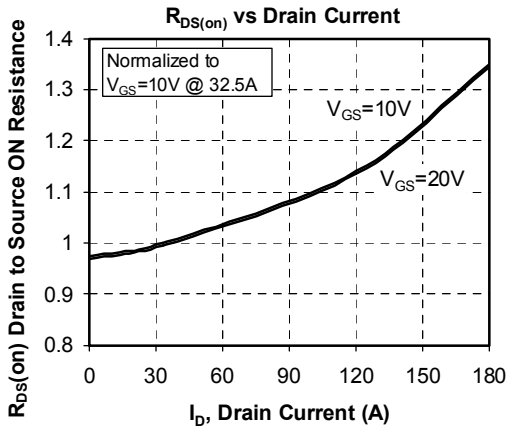


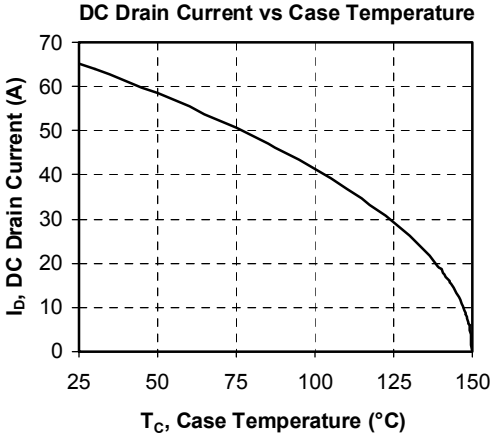
Typical MOSFET Performance Curve



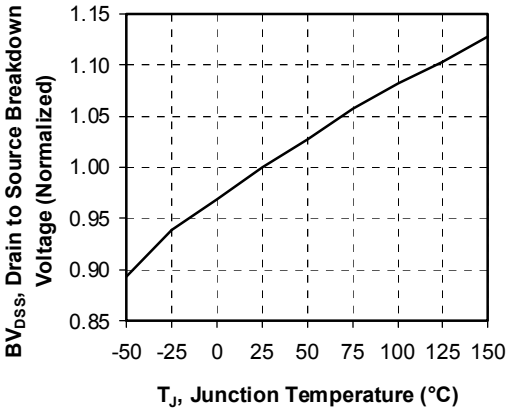




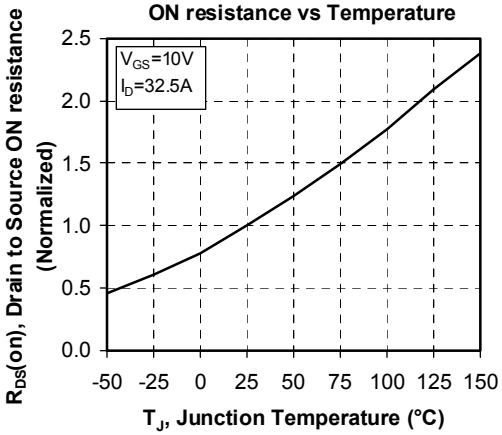




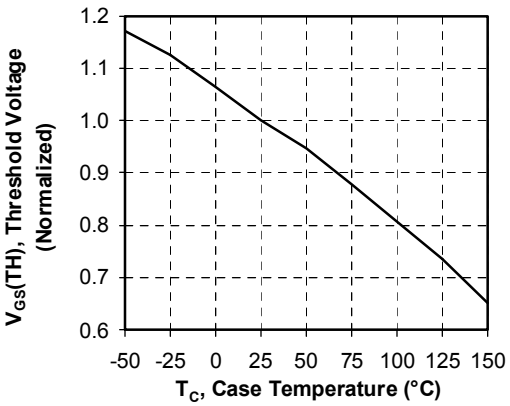
Breakdown Voltage vs Temperature



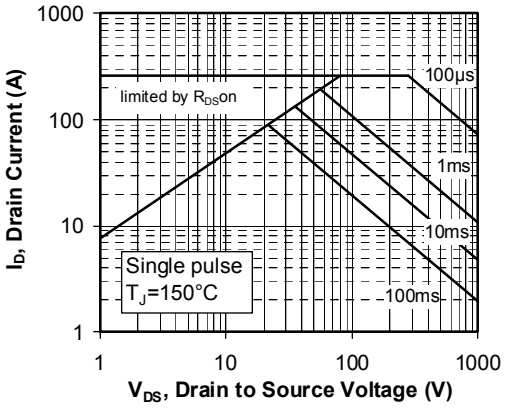
ON resistance vs Temperature



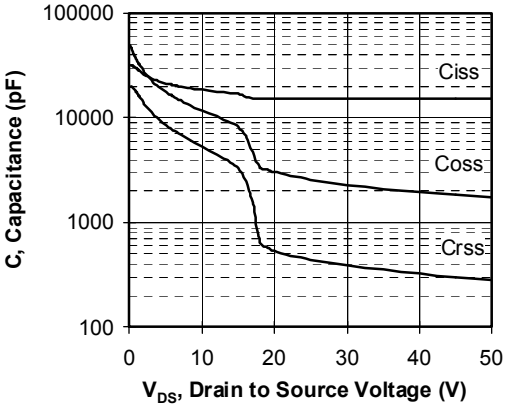
Threshold Voltage vs Temperature



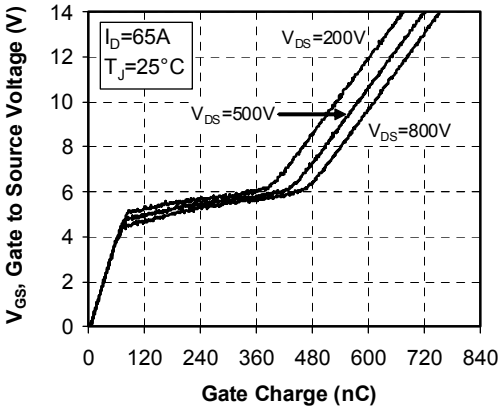
Maximum Safe Operating Area



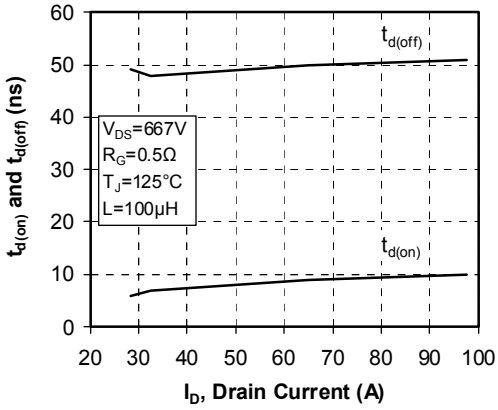
Capacitance vs Drain to Source Voltage



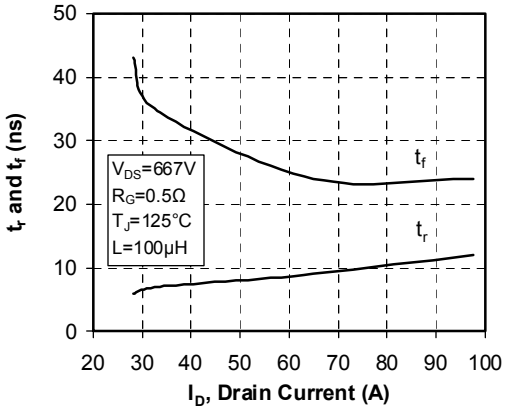
Gate Charge vs Gate to Source Voltage



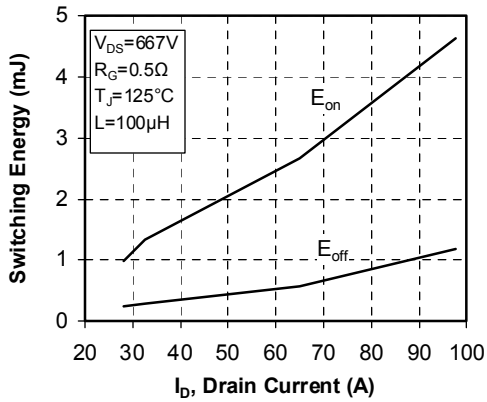
Delay Times vs Current



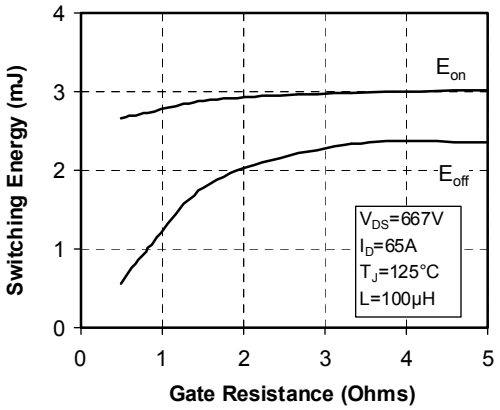
Rise and Fall times vs Current



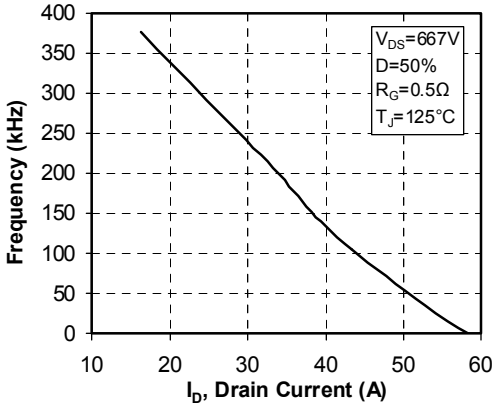
Switching Energy vs Current



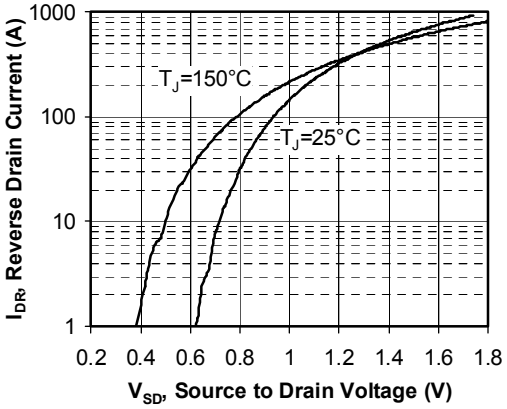
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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