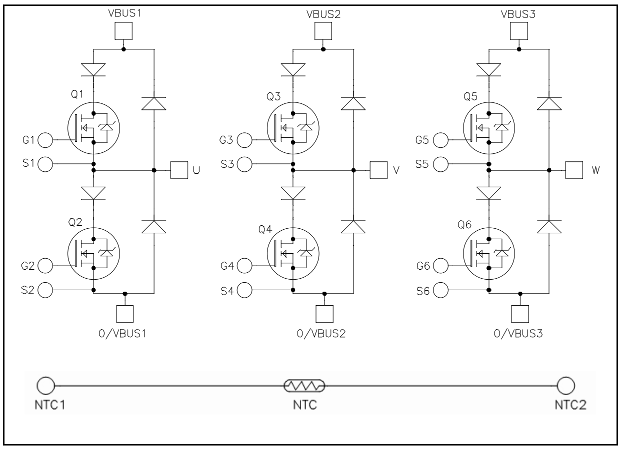
APTM100TA35SCTPG
APTM100TA35SCPG

Microsemi
POWER PRODUCTS GROUP

Triple phase leg MOSFET Power Module

V_{DSS} = 1000V
R_{DSon} = 350mΩ typ @ Tj = 25°C
I_D = 22A @ Tc = 25°C

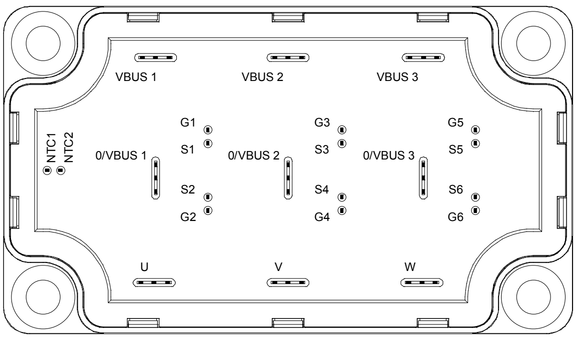


Application

- 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
- ***SiC Parallel 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
- High level of integration
- Internal thermistor for temperature monitoring



Pins NTC1 & NTC2 are only mounted on APTM100TA35SCTPG power module.

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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

Absolute maximum ratings (Per MOSFET)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		1000	V
I_D	Continuous Drain Current	$T_c = 25°C$	22	A
		$T_c = 80°C$	17	
I_{DM}	Pulsed Drain current		88	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		420	mΩ
P_D	Maximum Power Dissipation	$T_c = 25°C$	390	W
I_{AR}	Avalanche current (repetitive and non repetitive)		25	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		3000	

Electrical Characteristics (Per MOSFET)

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 1000V$	$T_j = 25°C$			100	µA
		$V_{GS} = 0V, V_{DS} = 800V$	$T_j = 125°C$			500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 11A$			350	420	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5mA$		3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = ±30V, V_{DS} = 0V$				±100	nA

Dynamic Characteristics (Per MOSFET)

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1MHz		5.2		nF
C_{oss}	Output Capacitance			0.88		
C_{rss}	Reverse Transfer Capacitance			0.16		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 500V$ $I_D = 22A$		186		nC
Q_{gs}	Gate – Source Charge			24		
Q_{gd}	Gate – Drain Charge			122		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** $V_{GS} = 15V$ $V_{Bus} = 670V$ $I_D = 22A$ $R_G = 5Ω$		18		ns
T_r	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			155		
T_f	Fall Time			40		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** $V_{GS} = 15V, V_{Bus} = 670V$ $I_D = 22A, R_G = 5Ω$		540		µJ
E_{off}	Turn-off Switching Energy			623		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** $V_{GS} = 15V, V_{Bus} = 670V$ $I_D = 22A, R_G = 5Ω$		854		µJ
E_{off}	Turn-off Switching Energy			779		
R_{thJC}	Junction to Case Thermal Resistance				0.32	°C/W

Series diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Repetitive Reverse Voltage			1000			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1000V				250	µA
I_F	DC Forward Current		T_c = 80°C		30		A
V_F	Diode Forward Voltage	I_F = 30A			1.9	2.3	V
		I_F = 60A			2.2		
		I_F = 30A	T_j = 125°C		1.7		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 667V di/dt = 200A/µs	T_j = 25°C		290		ns
			T_j = 125°C		390		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		670		nC
			T_j = 125°C		2350		
R_{thJC}	Junction to Case Thermal Resistance					1.2	°C/W

SiC Parallel diode ratings and characteristics (per SiC diode)

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		64	400	µA
			T_j = 175°C		112	2000	
I_F	DC Forward Current		Tc = 125°C		20		A
V_F	Diode Forward Voltage	I_F = 20A	T_j = 25°C		1.6	1.8	V
			T_j = 175°C		2.3	3	
Q_C	Total Capacitive Charge	I_F = 20A, V_R = 600V di/dt =1000A/µs			80		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			192		pF
		f = 1MHz, V_R = 400V			138		
R_{thJC}	Junction to Case Thermal Resistance					1	°C/W

Thermal and package characteristics

Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	150	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	100	
Torque	Mounting torque	To heatsink	M6	3	5	N.m
Wt	Package Weight				250	g

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

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Symbol	*Characteristic*		*Min*	*Typ*	*Max*	*Unit*
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

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

T: Thermistor temperature

R_T: Thermistor value at T

SP6-P Package outline (dimensions in mm)

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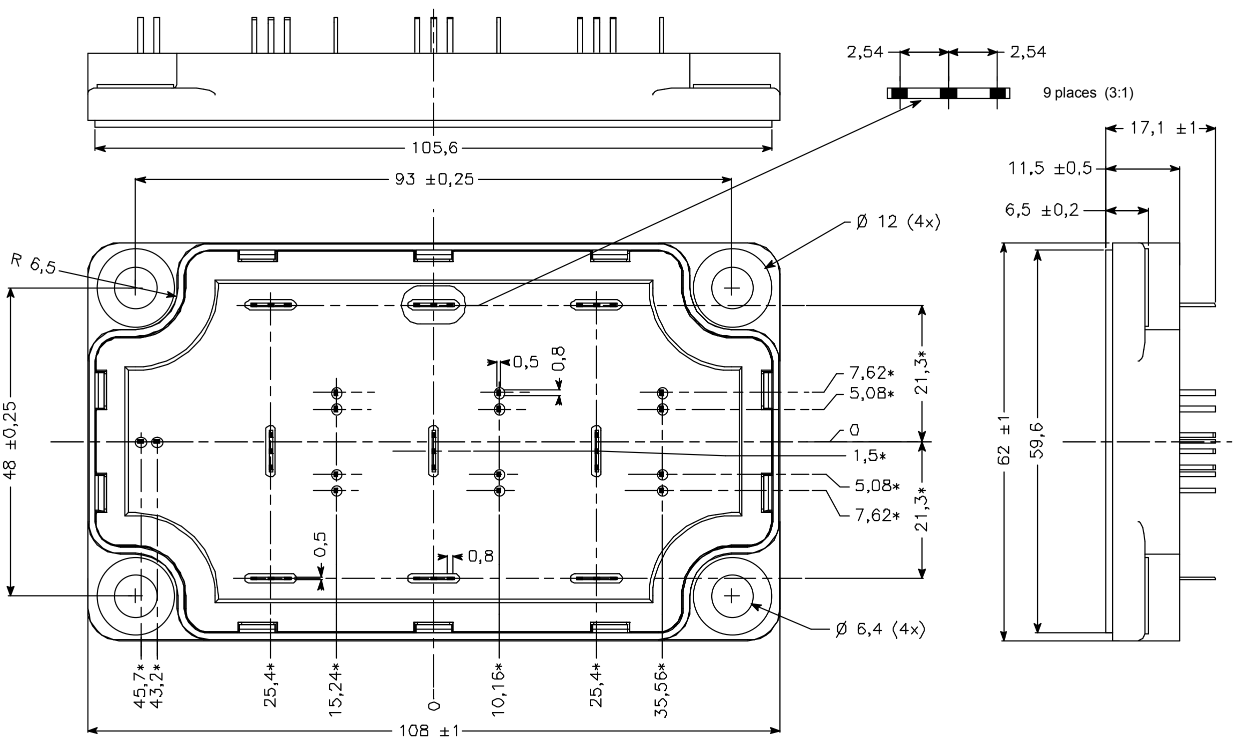
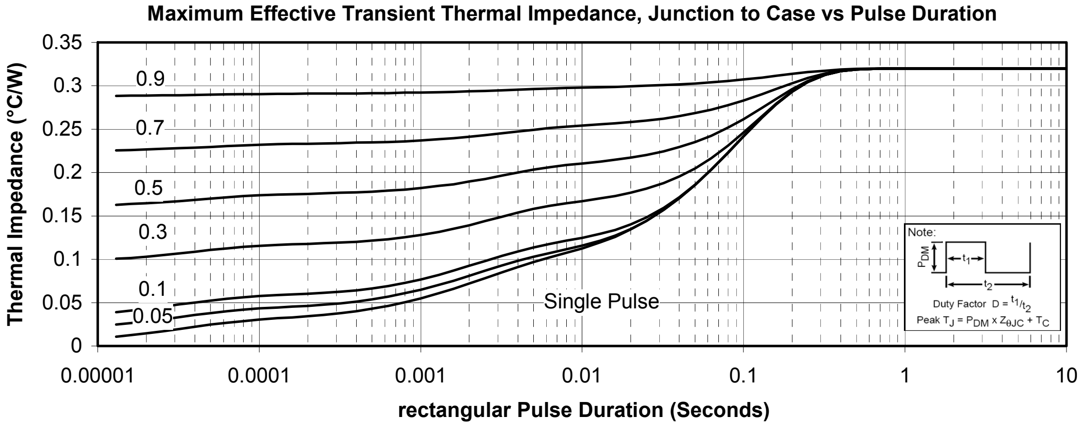
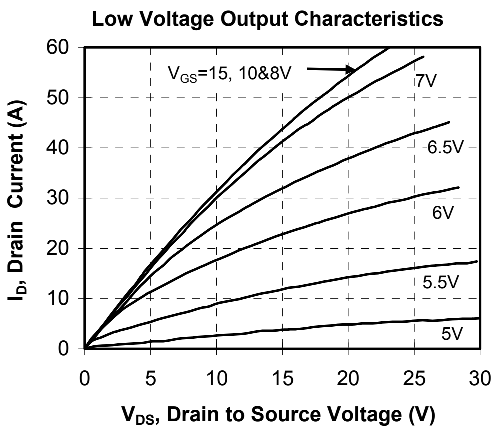


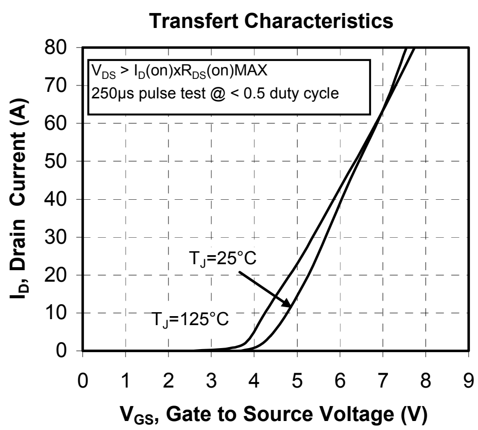
ALL DIMENSIONS MARKED " * " ARE TOLERENCED AS : ⌖ Ø1

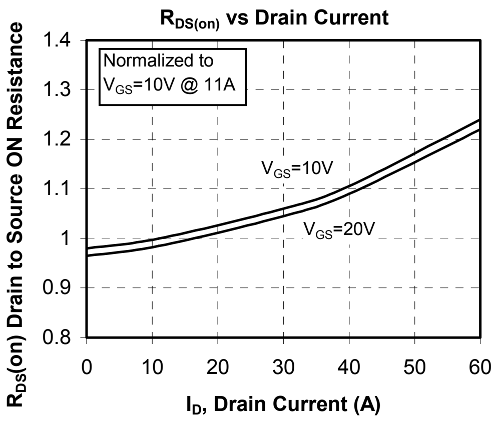
See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on www.microsemi.com

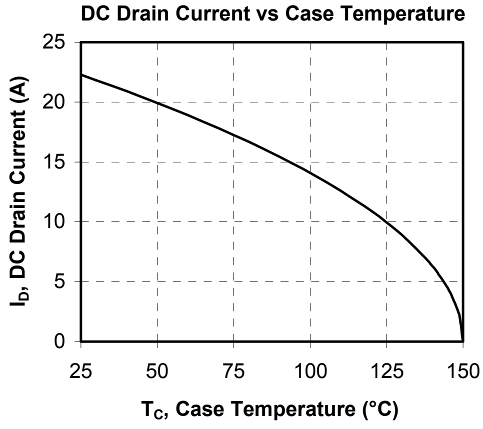
Typical MOSFET Performance Curve

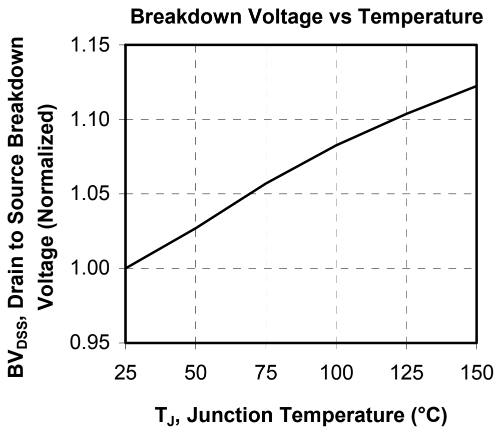


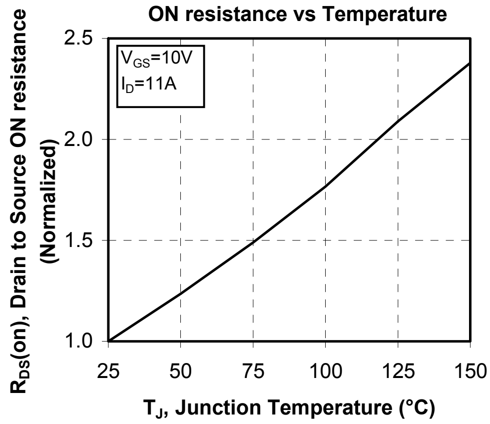


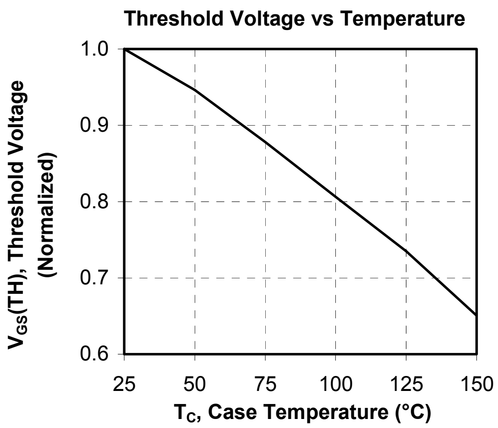


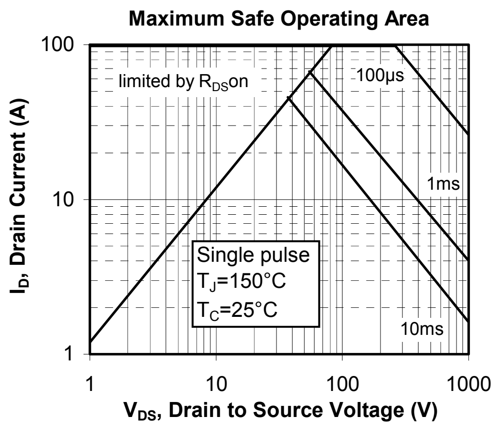


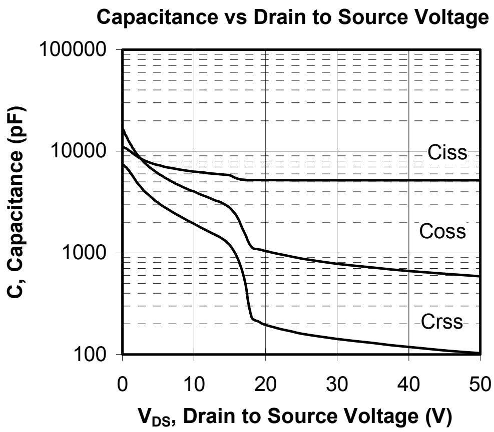


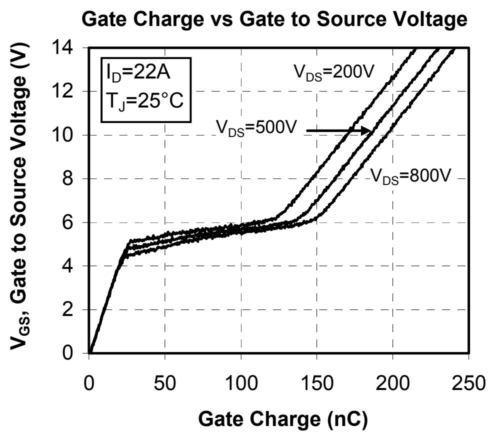

Breakdown Voltage vs Temperature
BVDSS, Drain to Source Breakdown Voltage (Normalized)
1.15
1.10
1.05
1.00
0.95
25 50 75 100 125 150
TJ, Junction Temperature (°C)


ON resistance vs Temperature
VGS=10V
ID=11A
RDS(on), Drain to Source ON resistance (Normalized)
2.5
2.0
1.5
1.0
25 50 75 100 125 150
TJ, Junction Temperature (°C)

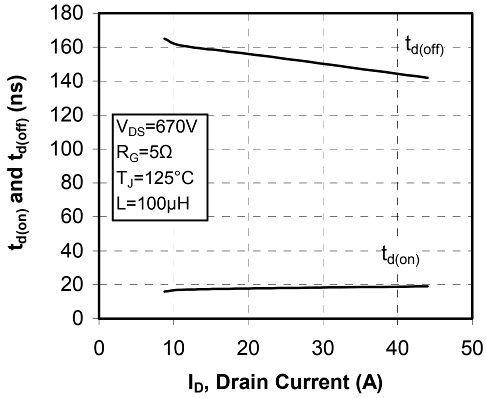

Threshold Voltage vs Temperature
VGS(TH), Threshold Voltage (Normalized)
1.0
0.9
0.8
0.7
0.6
25 50 75 100 125 150
TC, Case Temperature (°C)


Maximum Safe Operating Area
limited by RDSon
100µs
1ms
10ms
Single pulse
TJ=150°C
TC=25°C
ID, Drain Current (A)
100
10
1
1 10 100 1000
VDS, Drain to Source Voltage (V)

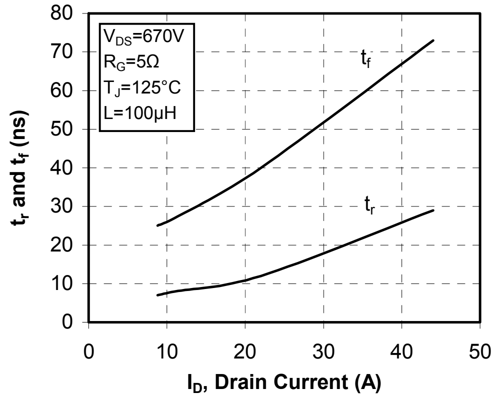

Capacitance vs Drain to Source Voltage
Ciss
Coss
Crss
C, Capacitance (pF)
100000
10000
1000
100
0 10 20 30 40 50
VDS, Drain to Source Voltage (V)


Gate Charge vs Gate to Source Voltage
ID=22A
TJ=25°C
VDS=200V
VDS=500V
VDS=800V
VGS, Gate to Source Voltage (V)
14
12
10
8
6
4
2
0
0 50 100 150 200 250
Gate Charge (nC)

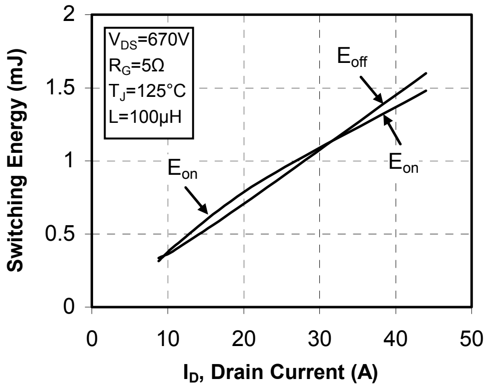
Delay Times vs Current



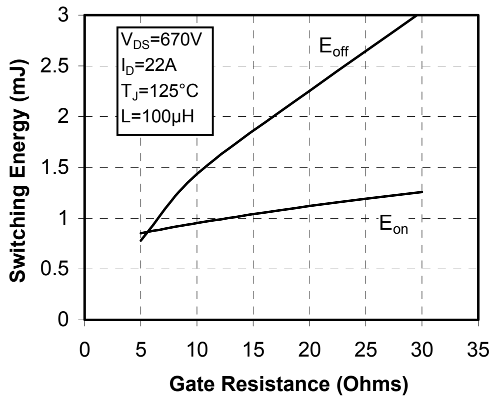
Rise and Fall times vs Current



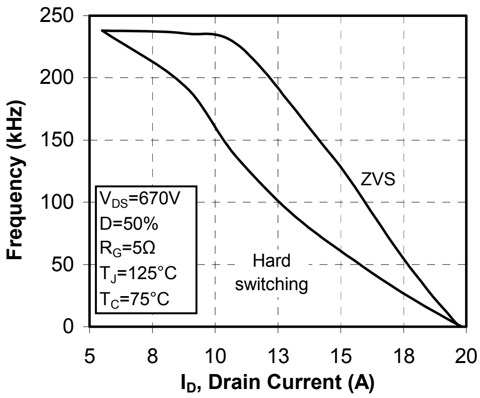
Switching Energy vs Current



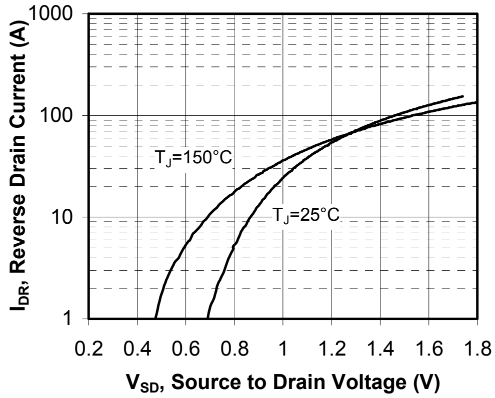
Switching Energy vs Gate Resistance



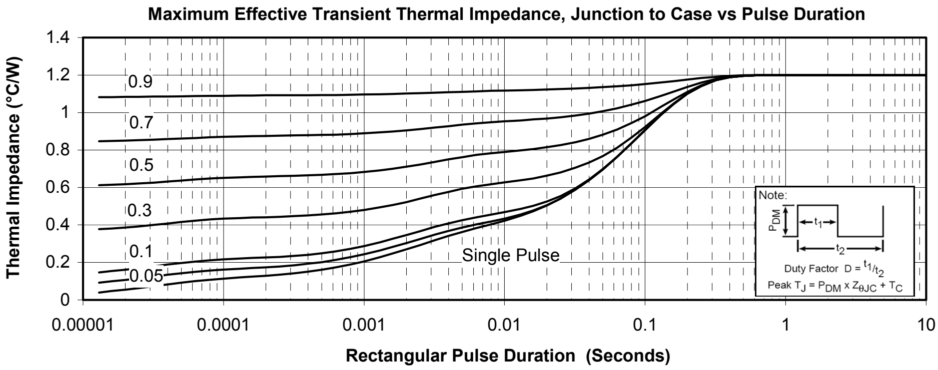
Operating Frequency vs Drain Current

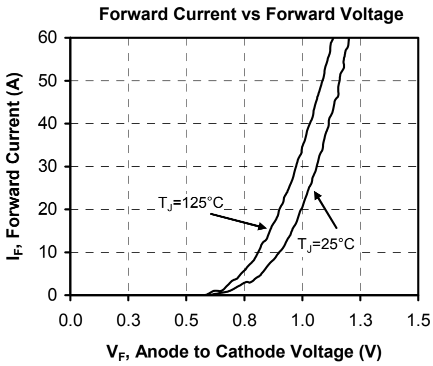


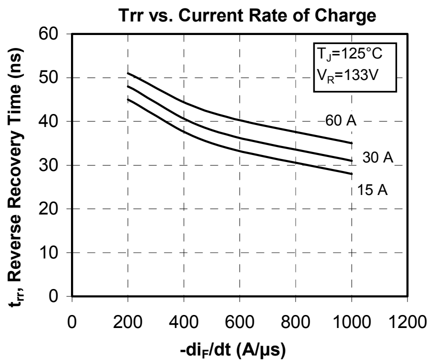
Source to Drain Diode Forward Voltage

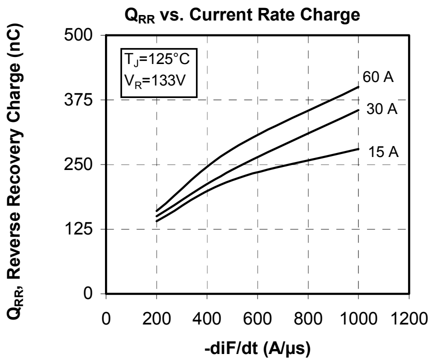


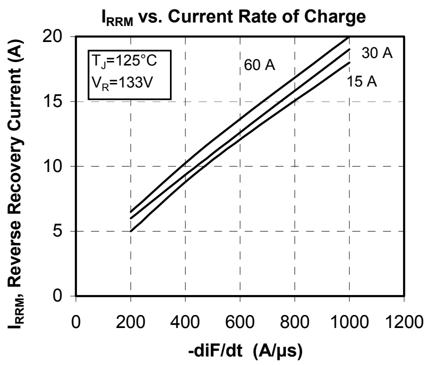
Typical series diode Performance Curve

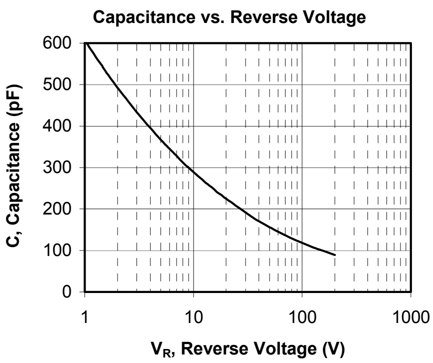




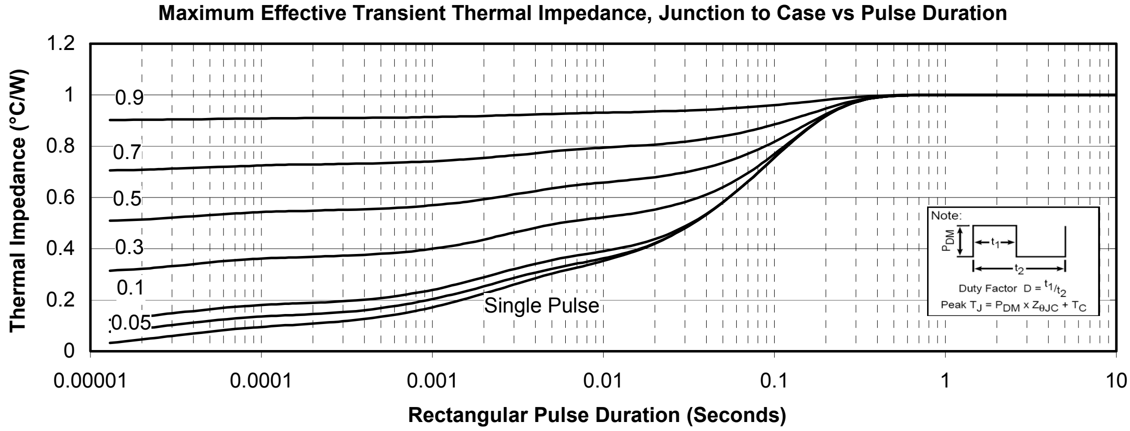


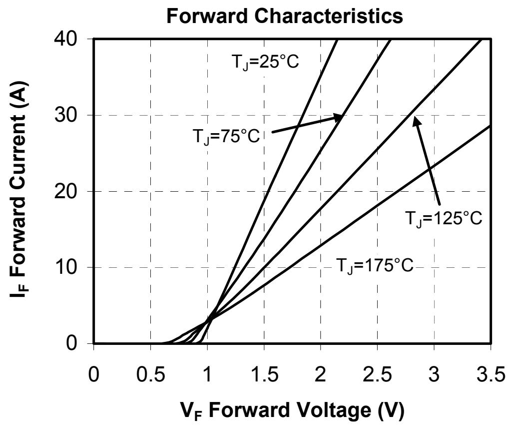


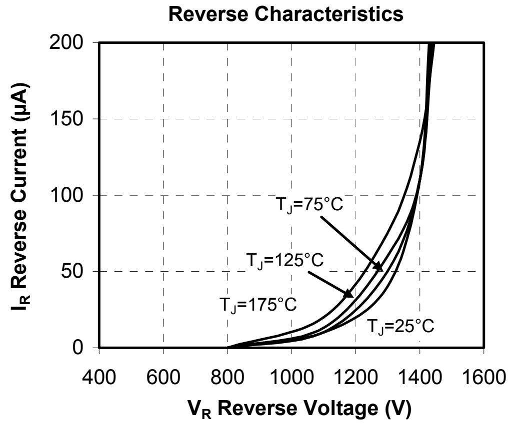


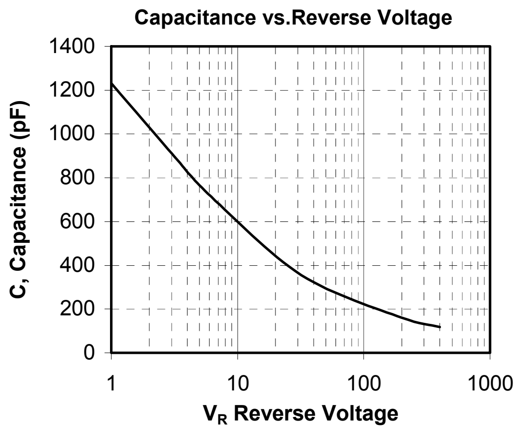


Typical SiC parallel diode Performance Curve









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