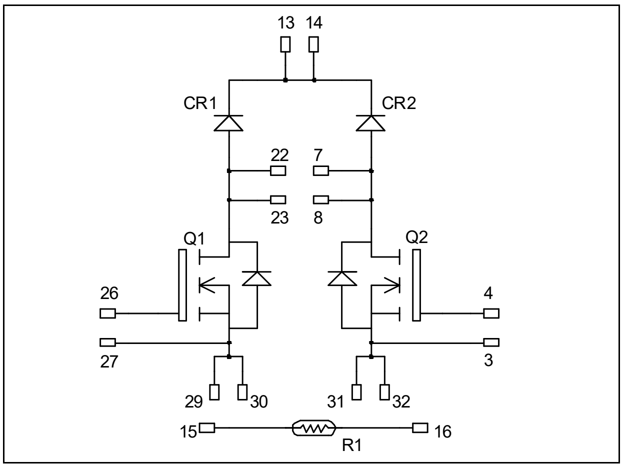
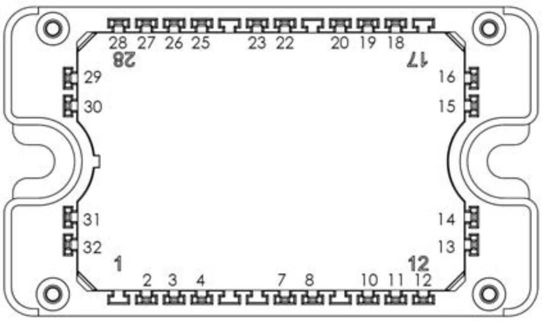
APTC60DDAM24T3G

Dual boost chopper
Super Junction MOSFET
Power Module

V_{DSS} = 600V
R_{DSon} = 24mΩ max @ Tj = 25°C
I_D = 95A @ Tc = 25°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

Application
- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features
- **Super junction MOSFET**
  - Ultra low R_{DSon}
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
- Internal thermistor for temperature monitoring

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
- Low profile
- Each leg can be easily paralleled to achieve a single Boost of twice the current capability
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (per super junction MOSFET)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		600	V
I_D	Continuous Drain Current	T_c = 25°C	95	A
		T_c = 80°C	70	
I_{DM}	Pulsed Drain current		260	
V_{GS}	Gate - Source Voltage		±20	V
R_{DSon}	Drain - Source ON Resistance		24	mΩ
P_D	Power Dissipation	T_c = 25°C	462	W
I_{AR}	Avalanche current (repetitive and non repetitive)		15	A
E_{AR}	Repetitive Avalanche Energy		3	mJ
E_{AS}	Single Pulse Avalanche Energy		1900	

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

Electrical Characteristics (per super junction MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V$, $V_{DS} = 600V$			350	µA
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V$, $I_D = 47.5A$			24	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 5mA$	2.1	3	3.9	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 20$ V, $V_{DS} = 0V$			200	nA

Dynamic Characteristics (per super junction MOSFET)

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$; $V_{DS} = 25V$ f = 1MHz		14.4		nF
C_{oss}	Output Capacitance			17		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 95A$		300		nC
Q_{gs}	Gate – Source Charge			68		
Q_{gd}	Gate – Drain Charge			102		
$T_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)** $V_{GS} = 10V$ $V_{Bus} = 400V$ $I_D = 95A$ $R_G = 2.5\Omega$		21		ns
T_r	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			100		
T_f	Fall Time			45		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** $V_{GS} = 10V$; $V_{Bus} = 400V$ $I_D = 95A$; $R_G = 2.5\Omega$		1350		µJ
E_{off}	Turn-off Switching Energy			1040		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** $V_{GS} = 10V$; $V_{Bus} = 400V$ $I_D = 95A$; $R_G = 2.5\Omega$		2200		µJ
E_{off}	Turn-off Switching Energy			1270		
R_{thJC}	Junction to Case Thermal Resistance				0.27	°C/W

Chopper diode ratings and characteristics (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					600	V
I_{RM}	Reverse Leakage Current	V_R=600V				100	µA
I_F	DC Forward Current		$T_c = 80°C$		100		A
V_F	Diode Forward Voltage	$I_F = 100A$			1.6	2	V
		$I_F = 200A$			2		
		$I_F = 100A$	$T_j = 125°C$		1.3		
t_{rr}	Reverse Recovery Time	$I_F = 100A$ $V_R = 400V$ di/dt=200A/µs	$T_j = 25°C$		160		ns
			$T_j = 125°C$		220		
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		290		nC
			$T_j = 125°C$		1530		
R_{thJC}	Junction to Case Thermal Resistance					0.55	°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	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				110	g

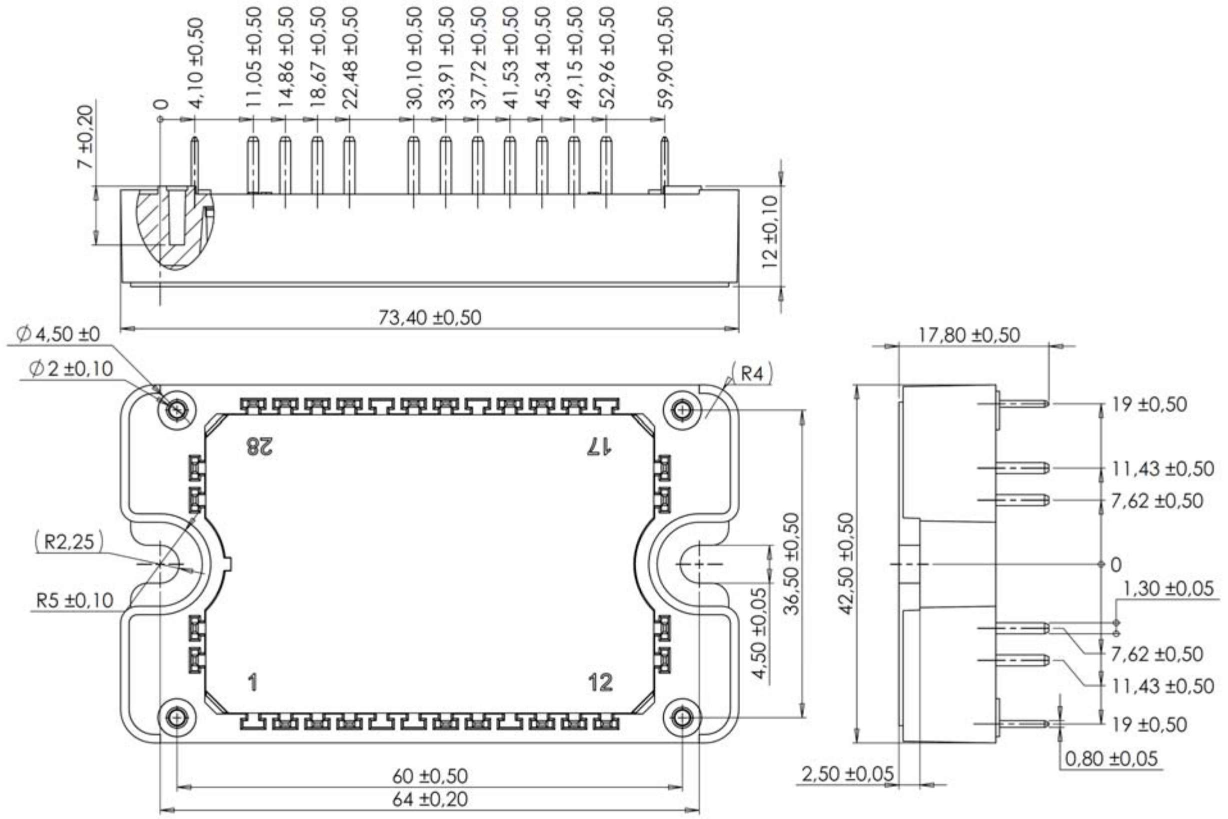
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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		%

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

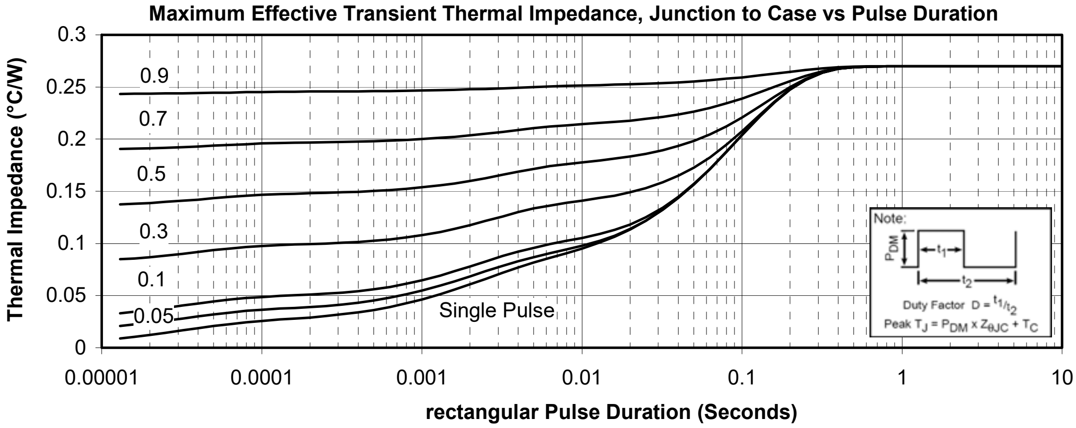
T: Thermistor temperature
R_T: Thermistor value at T

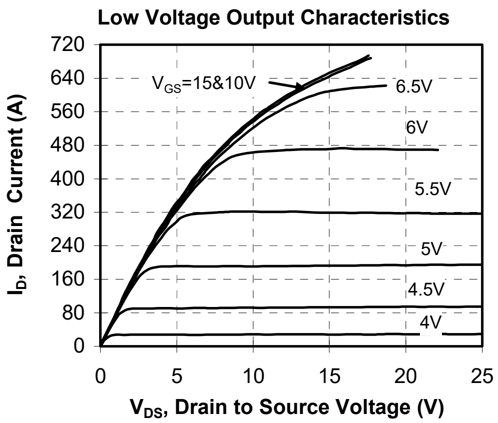
Package outline (dimensions in mm)

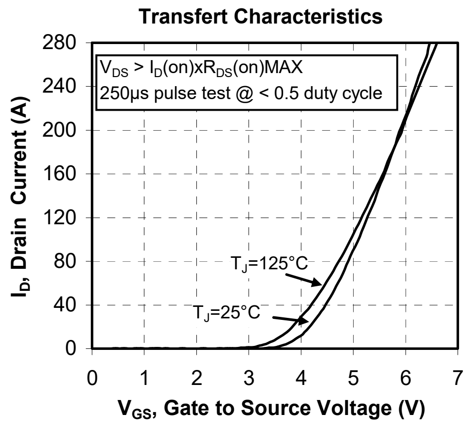


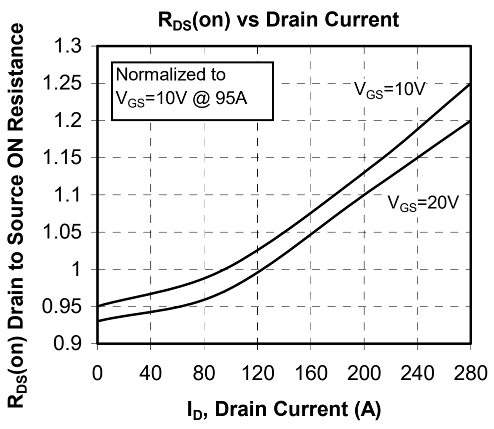
See application note 1906 - Mounting Instructions for SP3F Power Modules on www.microsemi.com

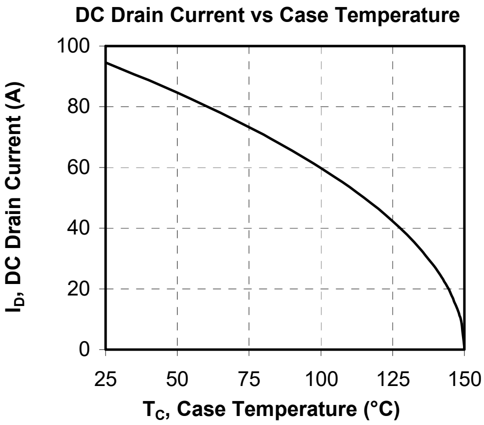
Typical Super junction MOSFET Performance Curve

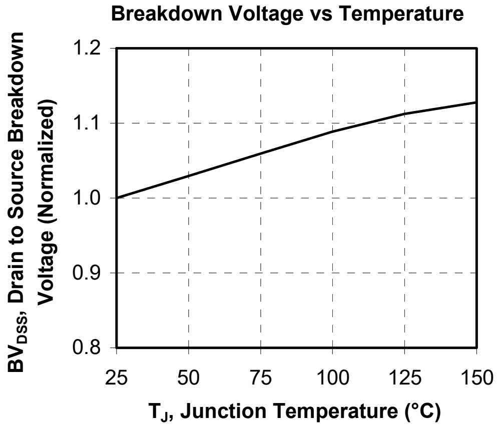


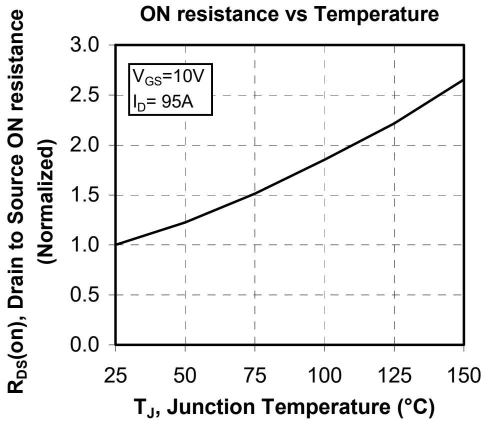


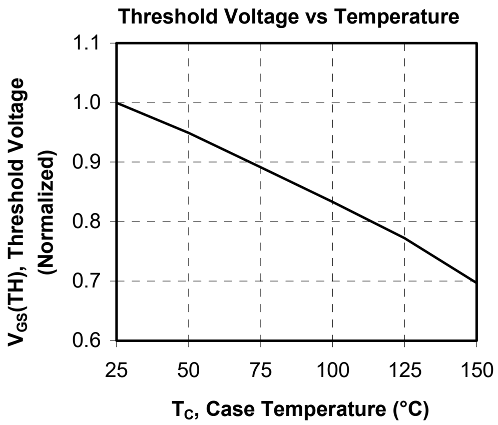


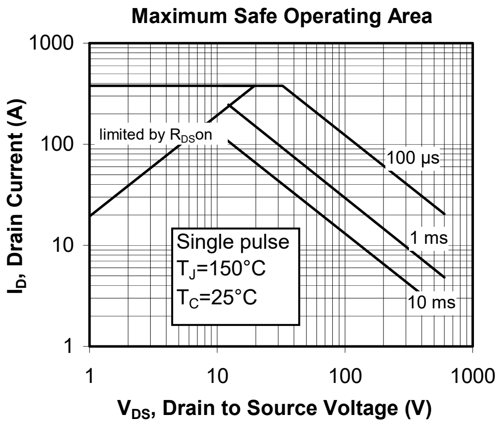


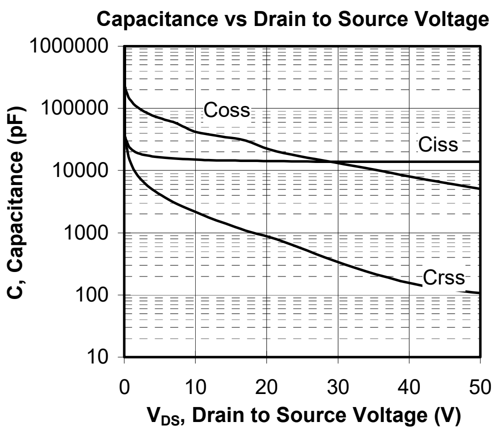


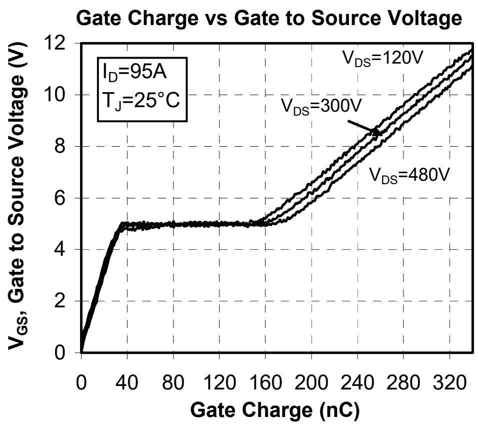

Breakdown Voltage vs Temperature
BVDSS, Drain to Source Breakdown Voltage (Normalized)
TJ, Junction Temperature (°C)

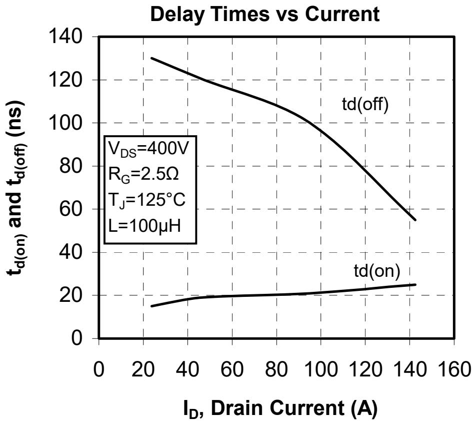

ON resistance vs Temperature
VGS=10V
ID= 95A
RDS(on), Drain to Source ON resistance (Normalized)
TJ, Junction Temperature (°C)

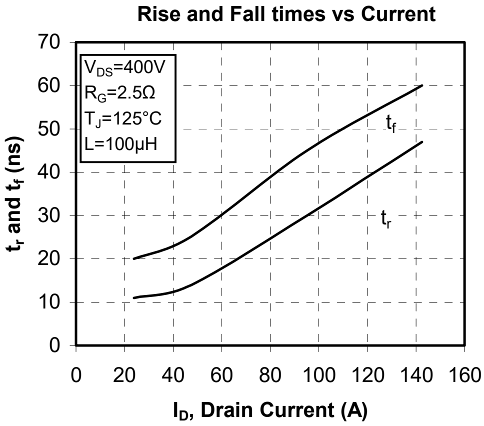

Threshold Voltage vs Temperature
VGS(TH), Threshold Voltage (Normalized)
TC, Case Temperature (°C)

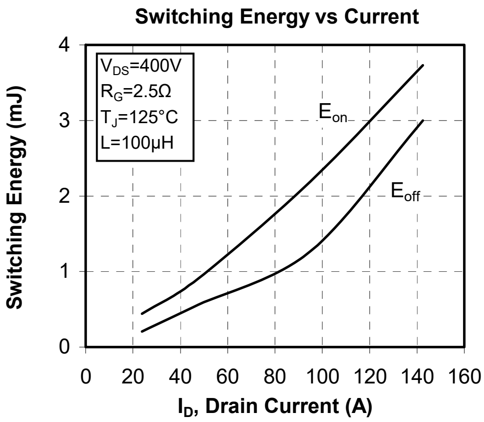

Maximum Safe Operating Area
limited by RDSon
100 µs
1 ms
10 ms
Single pulse
TJ=150°C
TC=25°C
ID, Drain Current (A)
VDS, Drain to Source Voltage (V)

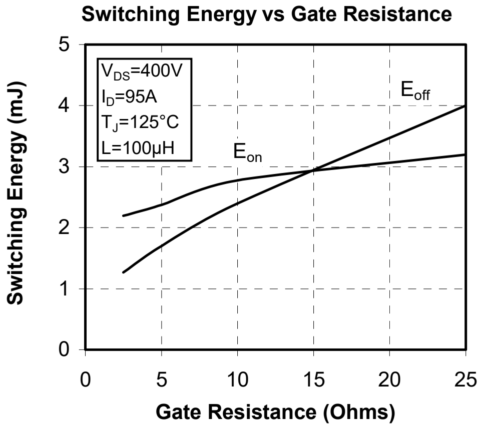

Capacitance vs Drain to Source Voltage
Coss
Ciss
Crss
C, Capacitance (pF)
VDS, Drain to Source Voltage (V)

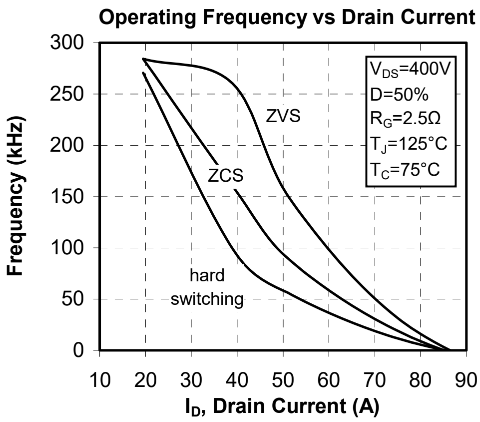

Gate Charge vs Gate to Source Voltage
ID=95A
TJ=25°C
VDS=120V
VDS=300V
VDS=480V
VGS, Gate to Source Voltage (V)
Gate Charge (nC)

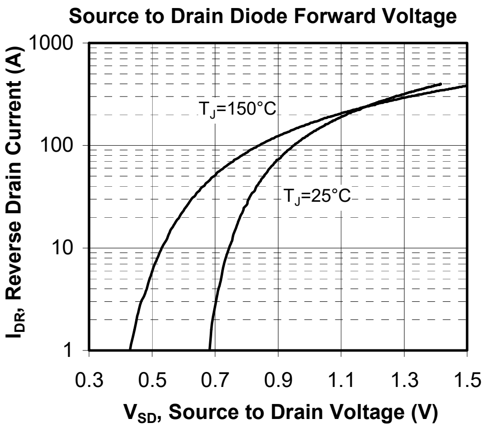

Delay Times vs Current
td(off)
td(on)
VDS=400V
RG=2.5Ω
TJ=125°C
L=100µH
td(on) and td(off) (ns)
ID, Drain Current (A)


Rise and Fall times vs Current
VDS=400V
RG=2.5Ω
TJ=125°C
L=100µH
tf
tr
tr and tf (ns)
ID, Drain Current (A)

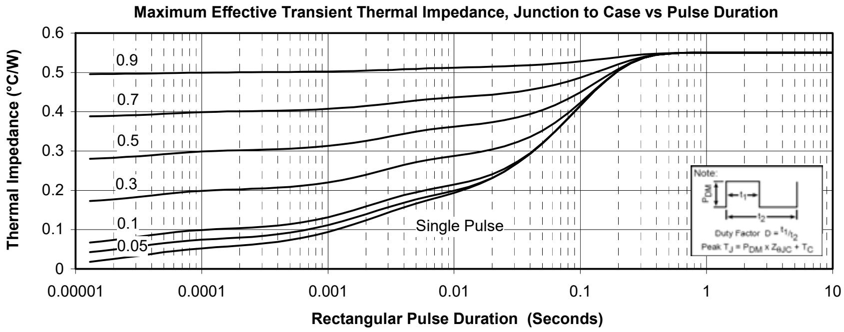

Switching Energy vs Current
VDS=400V
RG=2.5Ω
TJ=125°C
L=100µH
Eon
Eoff
Switching Energy (mJ)
ID, Drain Current (A)

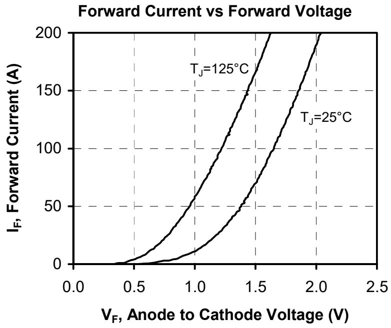

Switching Energy vs Gate Resistance
VDS=400V
ID=95A
TJ=125°C
L=100µH
Eoff
Eon
Switching Energy (mJ)
Gate Resistance (Ohms)

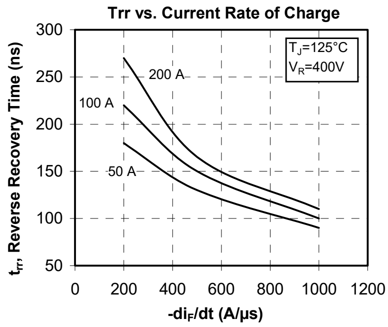

Operating Frequency vs Drain Current
VDS=400V
D=50%
RG=2.5Ω
TJ=125°C
TC=75°C
ZVS
ZCS
hard
switching
Frequency (kHz)
ID, Drain Current (A)

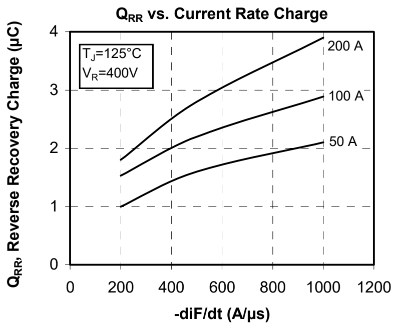

Source to Drain Diode Forward Voltage
TJ=150°C
TJ=25°C
IDR, Reverse Drain Current (A)
VSD, Source to Drain Voltage (V)

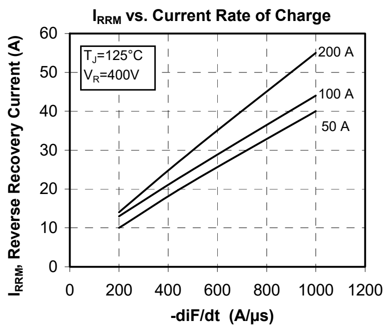
Typical chopper diode performance curve

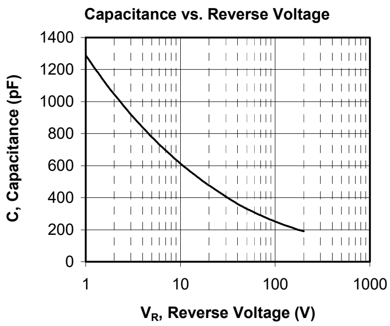


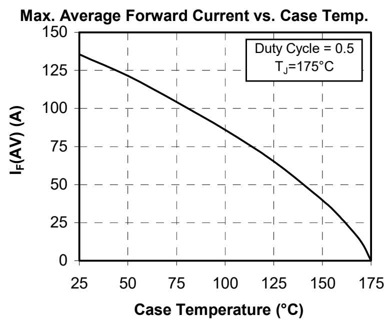












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