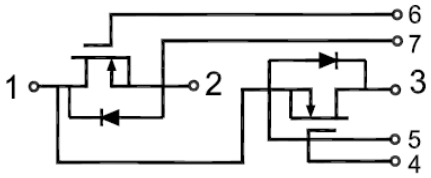
MM300HF170T2NH

SiC MOSFET Module

Preliminary Data

Features：

- Ultra Low Loss
- High-Frequency Operation
- Zero Reverse Recovery Current from Diode
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-safe Device Operation
- Easy of Paralleling
- Copper Baseplate and Aluminum Nitride Insulator



Applications：

- HF Resonant Converters/Inverters
- Motor Drivers
- Solar and Wind Inverters
- UPS and SMPS
- Traction

Absolute Maximum Ratings (T_C=25℃unless otherwise specified)

Symbol	Description		Value	Units
V_{DSmax}	Drain-Source Voltage		1700	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum values	-10/+25	V
V_{GSop}	Gate-Source Voltage	Recommended Operational Values	-5/20	V
I_D	Continuous Drain Current	V_{GS}=20V,T_C=25℃	325	A
		V_{GS}=20V,T_C=90℃	225	A
$I_{D(pluse)}$	Pulsed Drain Current	Pulse width t_p=200us Repetition rate limited by T_{jmax},T_c=25℃	900	A
P_D	Power Dissipation	T_c=25℃， T_j=150℃	1760	W

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Electrical Characteristics of MOSFET (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain - Source Breakdown Voltage	V_{GS}=0V,I_D=1mA	1.7			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = 10 V, I_D = 15 mA	1.8	2.3		V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1.7 kV, V_{GS} = 0V		500	1000	μA
		V_{DS} = 1.7 kV, V_{GS} = 0V, T_J = 150 ˚C		1500	3000	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V		1	600	nA
$R_{DS(on)}$	On State Resistance	V_{GS} = 20 V, I_{DS} = 225A		8.0	10.0	mΩ
		V_{GS} = 20 V, I_{DS} = 225 A, T_J = 150 ˚C		16.2	20	mΩ
g_{fs}	Transconductance	V_{DS}= 20 V, I_{DS} = 225 A		95		S
		V_{DS}= 20 V, I_{DS} = 225 A, Tj=150℃		82		S
C_{iss}	Input Capacitance	V_{DS} = 1k V, f = 200 kHz, V_{AC} = 25 mV		20		nF
C_{OSS}	Output Capacitance			2.5		nF
C_{rss}	Reverse Transfer Capacitance			0.08		nF
E_{on}	Turn-On Switching Energy	V_{DD} = 900 V, V_{GS} = -5V/+20V I_D = 300 A, $R_{G(ext)}$ = 2.5 Ω		13.0		mJ
E_{off}	Turn-Off Switching Energy			10.0		mJ
$R_{G(int)}$	Internal Gate Resistance	f = 200 kHz, V_{AC} = 25 mV		3.7		Ω
Q_{GS}	Gate-Source Charge	V_{DD}= 900 V, V_{GS} = -5V/+20V, I_D= 300 A, $R_{G(ext)}$ = 2.5 Ω		273		nC
Q_{GD}	Gate-Drain Chrage			324		nC
Q_G	Total Gate Chrage			1076		nC
$t_{d(on)}$	Turn-off delay time	V_{DD} = 900V, V_{GS} = -5/+20V, I_D = 300 A, $R_{G(ext)}$ = 2.5 Ω,		105		ns
t_r	Rise Time			72		ns
$t_{d(off)}$	Turn-off delay time			211		ns
t_f	Fall Time			56		ns
$R_{\theta JCM}$	Thermal Resistance Junction-To-Case for MOSFET	T_C=90℃， P_D=150W		0.067	0.071	℃/W

Free-Wheeling SiC Schottky Diode Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	IF = 300 A, VGS = 0		1.7	2.0	V
		IF = 300 A, VGS = 0 Tj=150℃		2.2	2.5	
Q_C	Total Capacitive Charge			4.4		μC
$R_{\theta JCD}$	Thermal Resistance Junction-To-Case for Diode	T_C=90℃，P_D=130W		0.060	0.065	℃/W

Module

Symbol	Description	Conditions	Min	Typ	Max	Unit
T_{Jmax}	Junction Temperature		-40		150	℃
Tc,T_{STG}	Case and Storage Temperature Range		-40		125	℃
Visol	Case Isolation Voltage	AC,50 HZ， 1 min	4.5			KV
L_{Stray}	Stray Inductance	Measured between terminals 2 and 3			14	nH
G	Weight			300		g
M	Mounting Torque	To heatsink and terminal			5	N·m
	Clearance Distance	Terminal to terminal			9	mm
	Creepage Distance	Terminal to terminal			30	mm
		Terminal to baseplate			40	mm

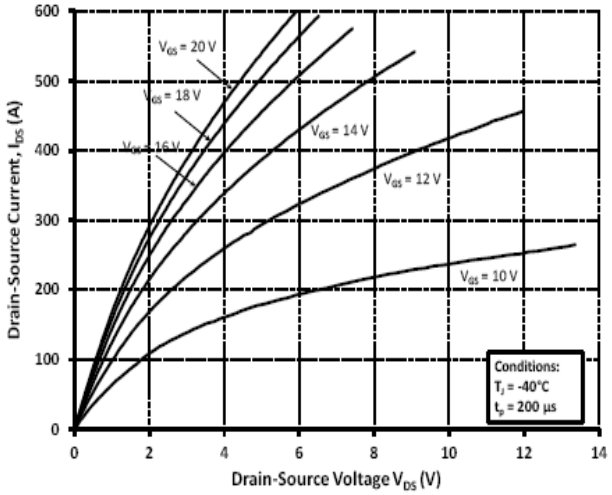


Fig.1 Typical Output Characteristic Tj=-40℃

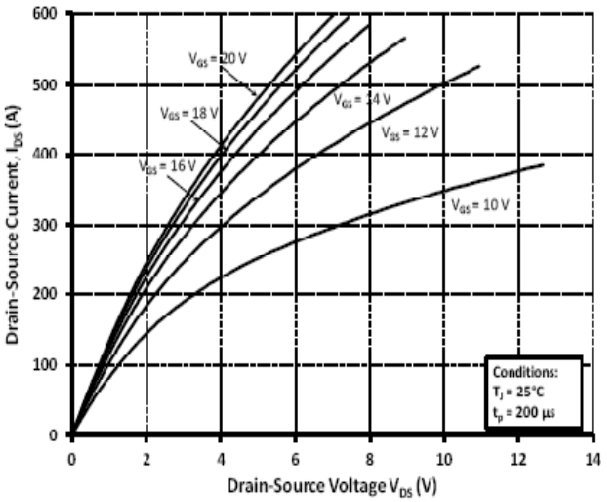


Fig.2 Typical Output Characteristics Tj=25℃

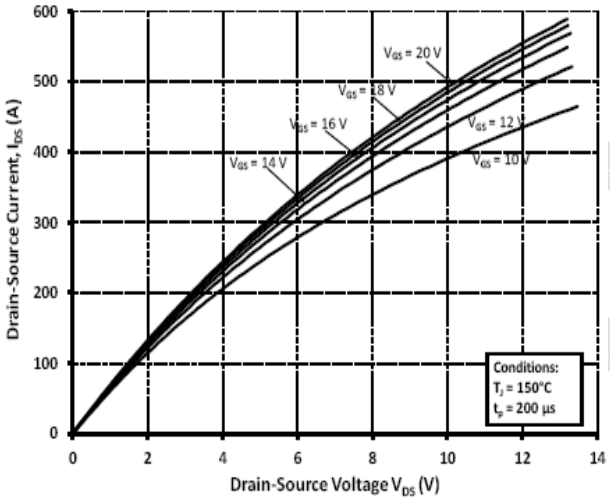


Fig.3 Typical Output Characteristic Tj=150℃

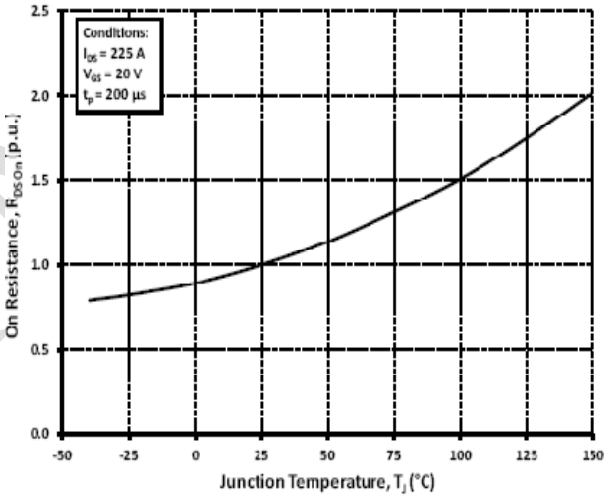


Fig.4 Normalized On-Resistant VS Temperature

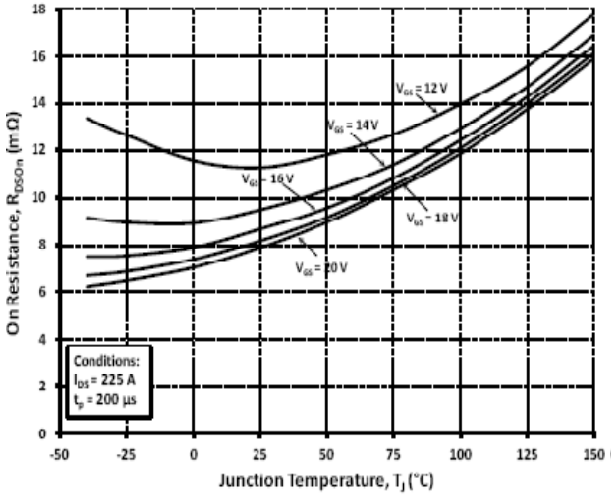


Fig.5 Typical On-Resistant VS Temperature for Various Gate-Source Voltage

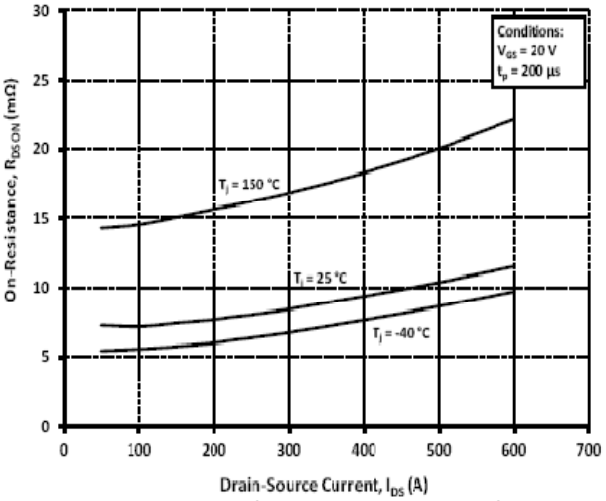


Fig.6 Typical On-Resistant vs. Drain Current For Various Temperature

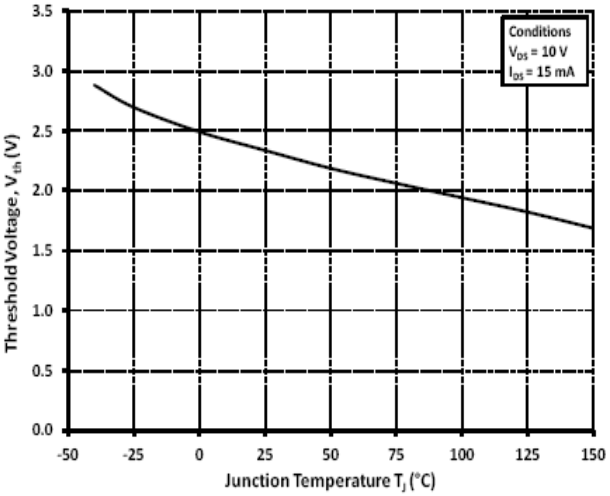


Fig.7 Threshold Voltage VS Temperature

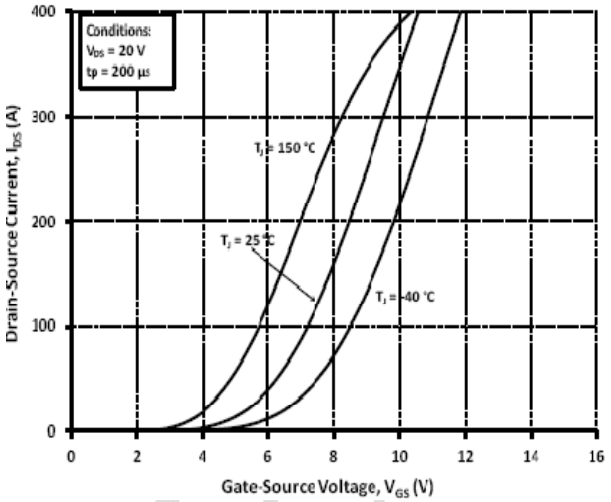


Fig.8 Transfer Characteristic for Various Junction Temperature

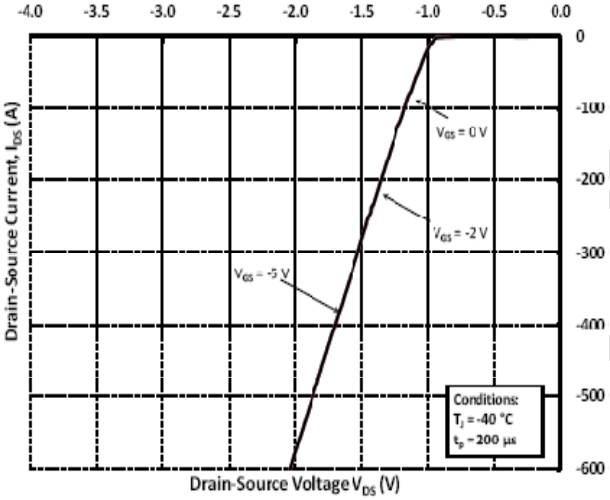


Fig.9 Diode Characteristic at -40℃

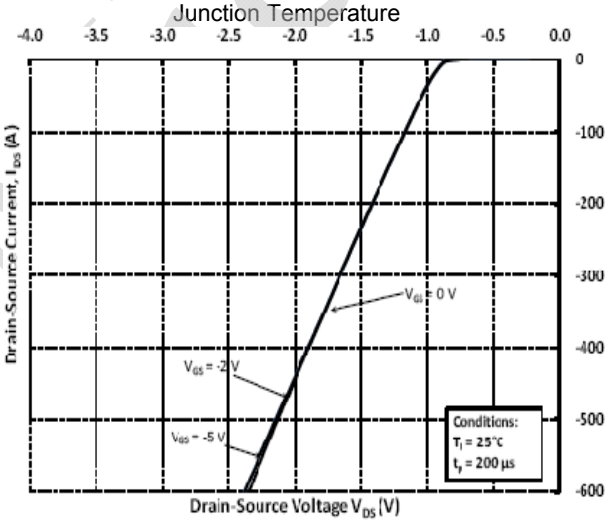


Fig.10 Diode Characteristic at 25℃

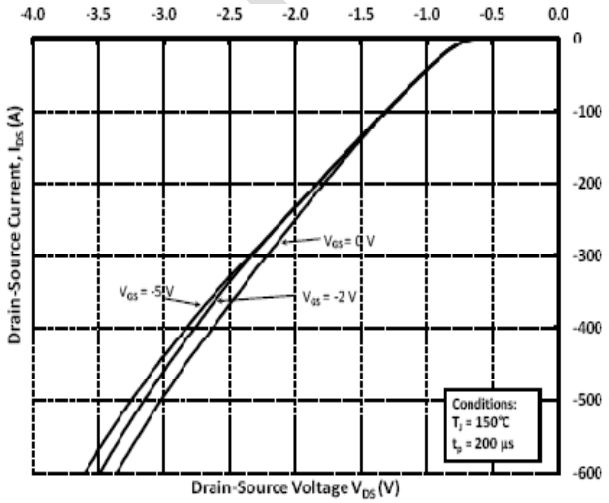


Fig.11 Diode Characteristic at 150℃

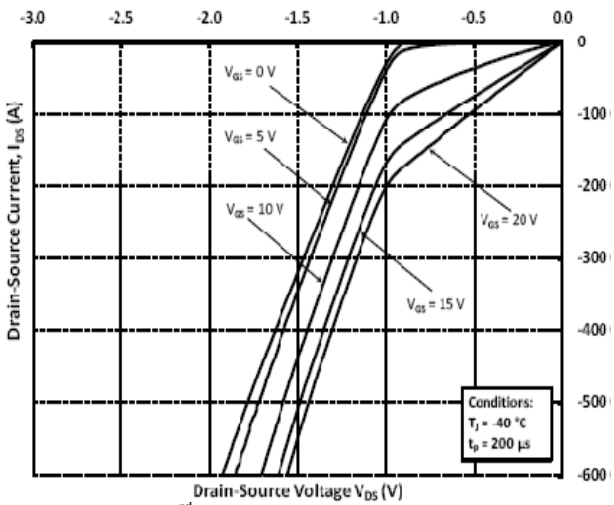


Fig.12 3rd Quadrant Characteristic at -40℃

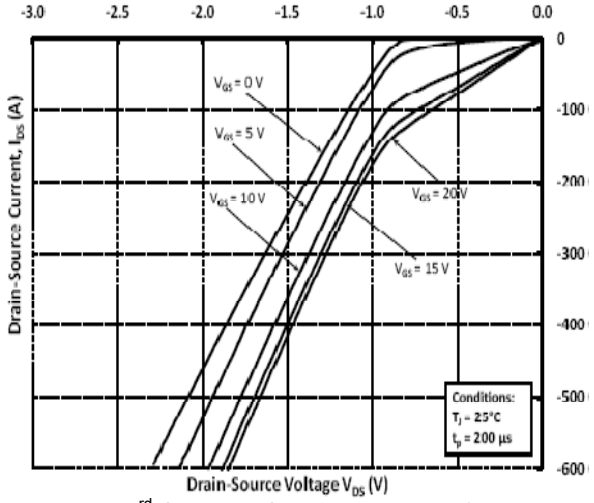


Fig.13 3rd Quadrant Characteristic at 25℃

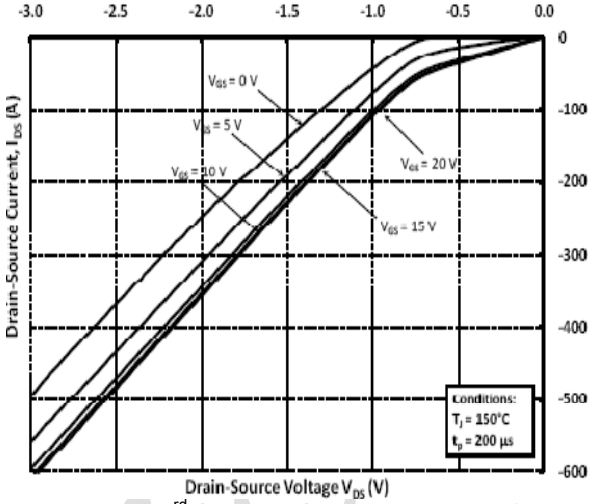


Fig.14 3rd Quadrant Characteristic at 150℃

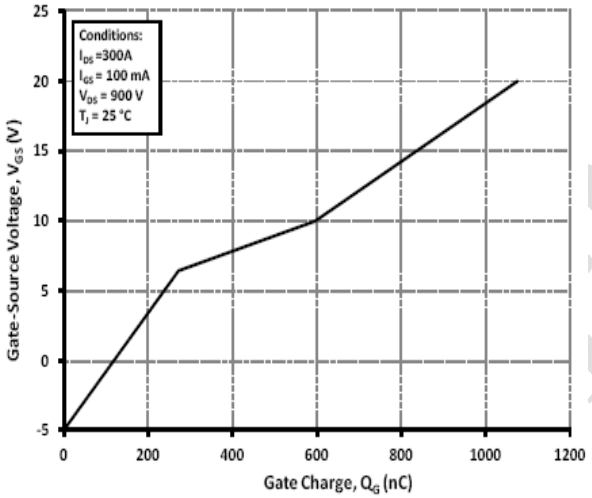


Fig.15 Typical Gate Charge Characteristic

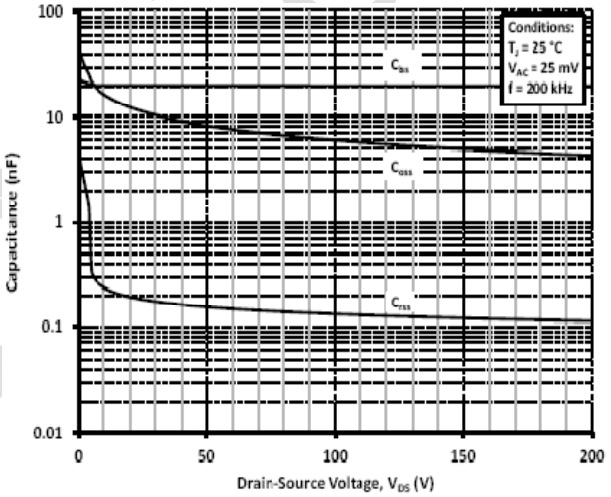


Fig.16 Typical Capacitances VS Drain-Source Voltage (0-200V)

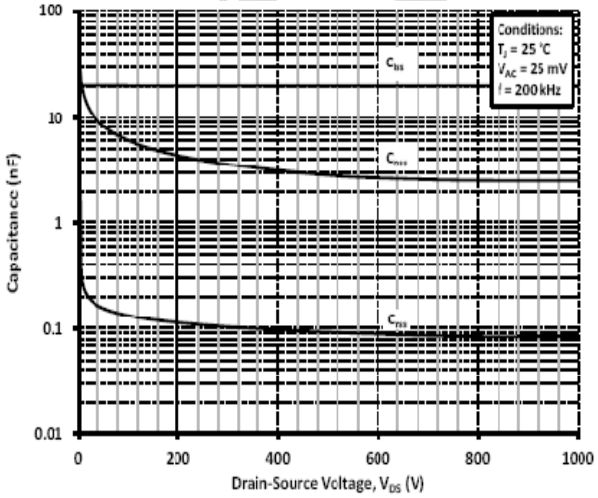


Fig.17 Typical Capacitances VS Drain-Source Voltage (0-1KV)

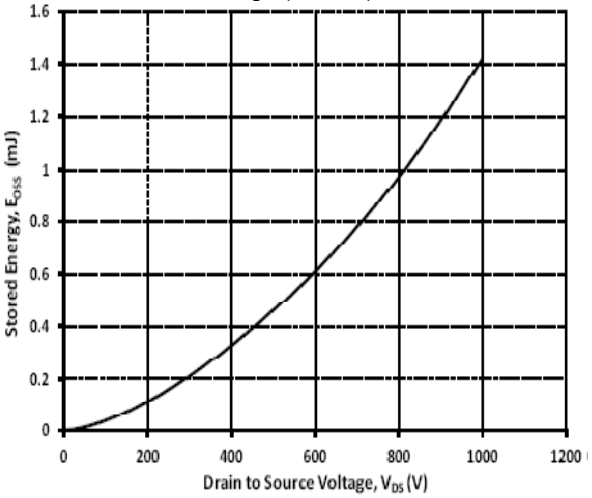


Fig.18 Typical Output Capacitor Stored Energy

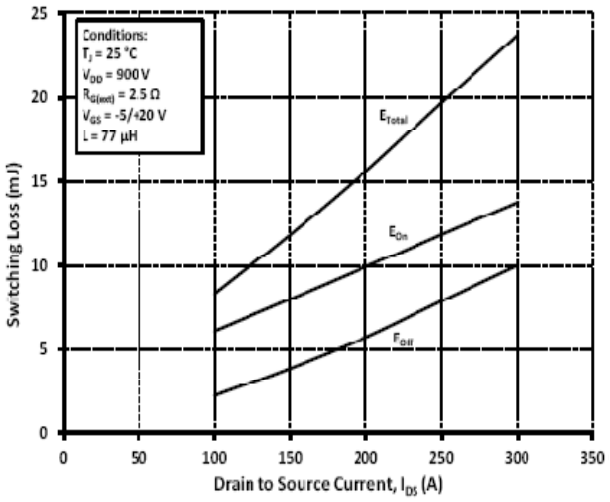


Fig.19 Inductive Switching Energy VS Drain Current For V_{DS}=900V,R_G=2.5 Ω

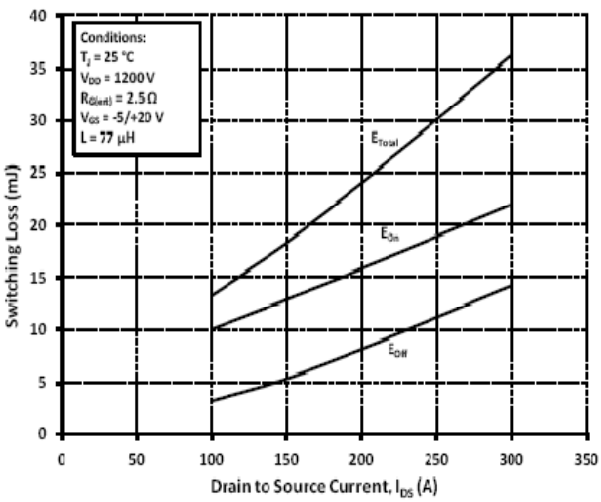


Fig.20 Inductive Switching Energy VS Drain Current For V_{DS}=1200V,R_G=2.5 Ω

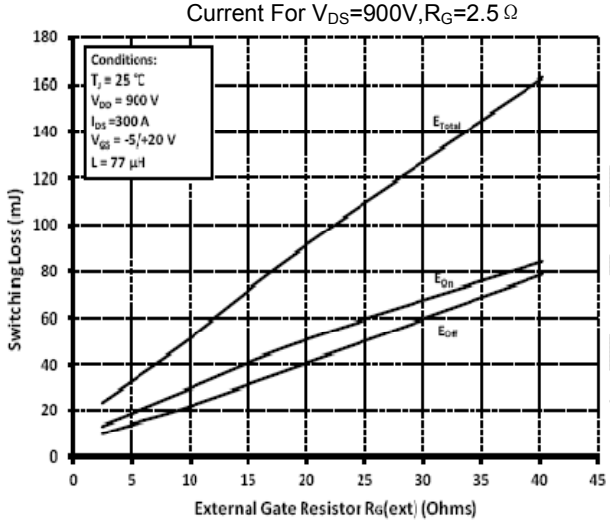


Fig.21 Inductive Switching Energy VS $R_{G(ext)}$

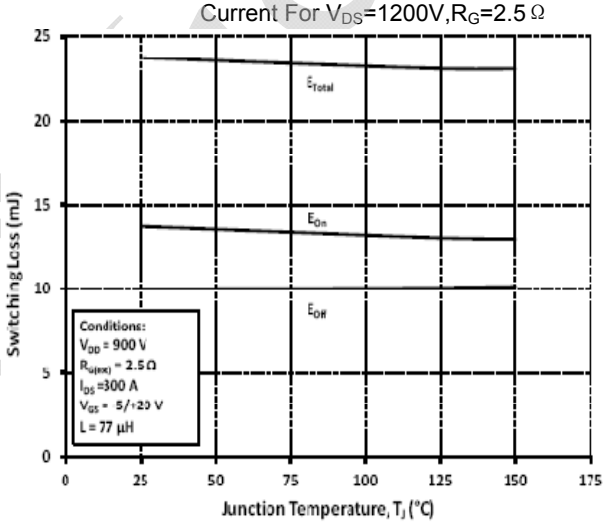


Fig.22 Inductive Switching Energy VS Temperature

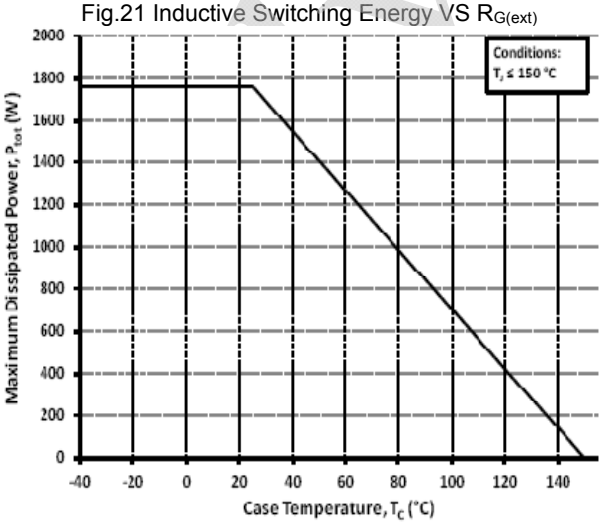


Fig.23 Maximum Power Dissipation (MOSFET) Derating VS Case Temperature

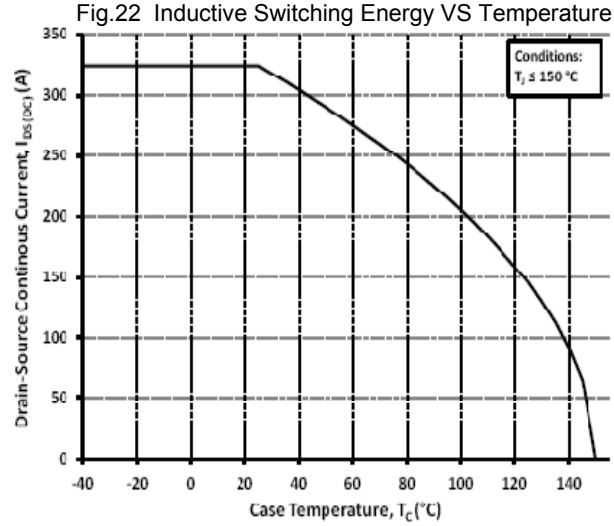


Fig.24 Continous Drain Current Derating VS Case Temperature

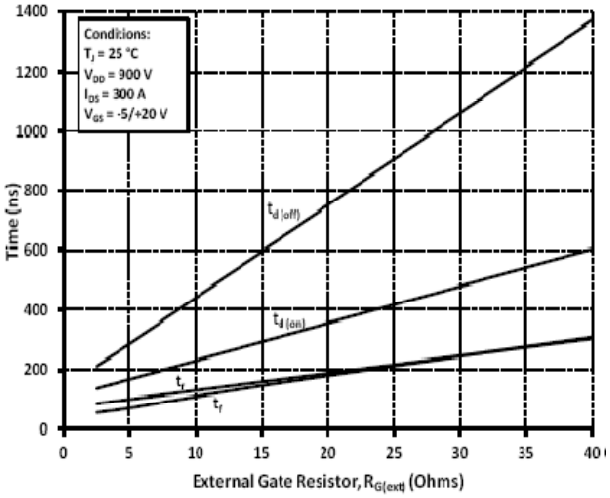


Fig.25 Timing VS $R_{G(ext)}$

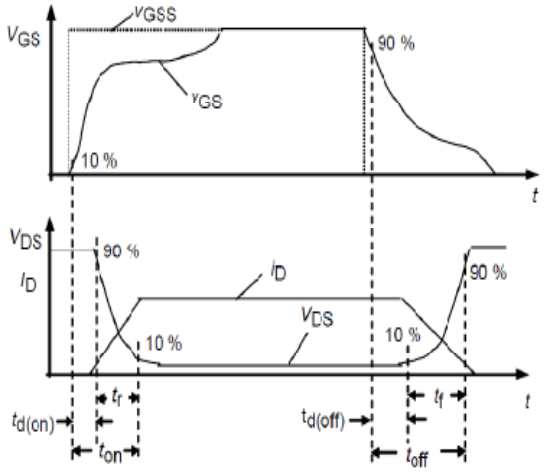


Fig.26 Resistive Switching Time Description

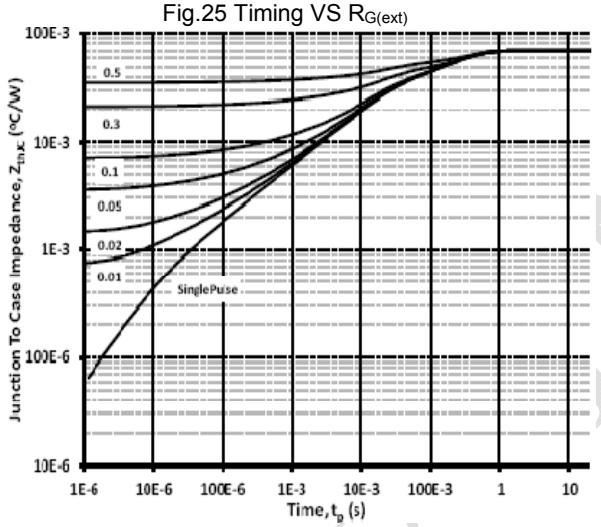


Fig.27 MOSFET Junction Case Thermal Impedance

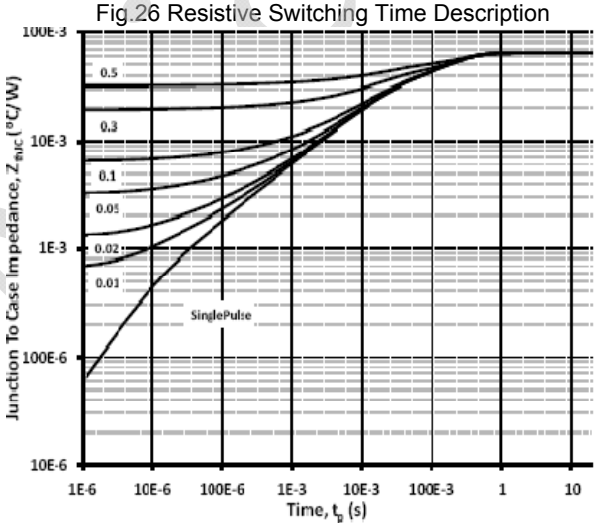


Fig.28 Diode Junction to Case Thermal Impendence

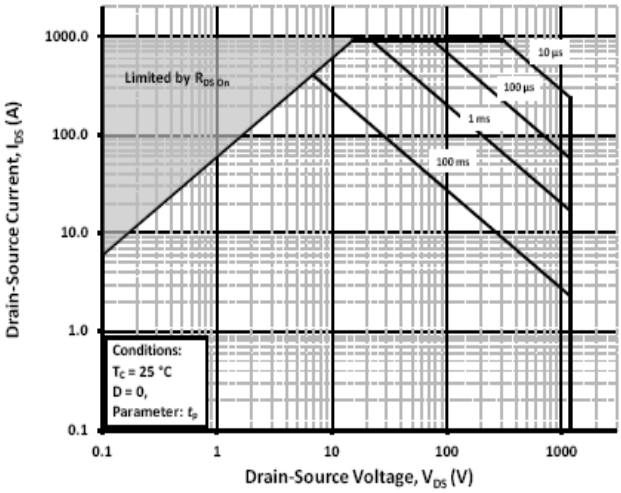
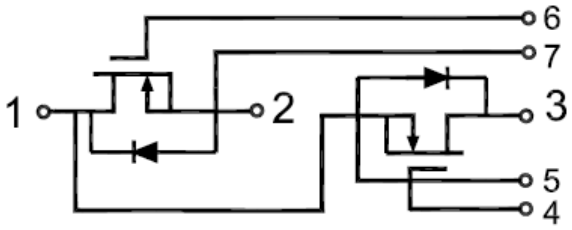
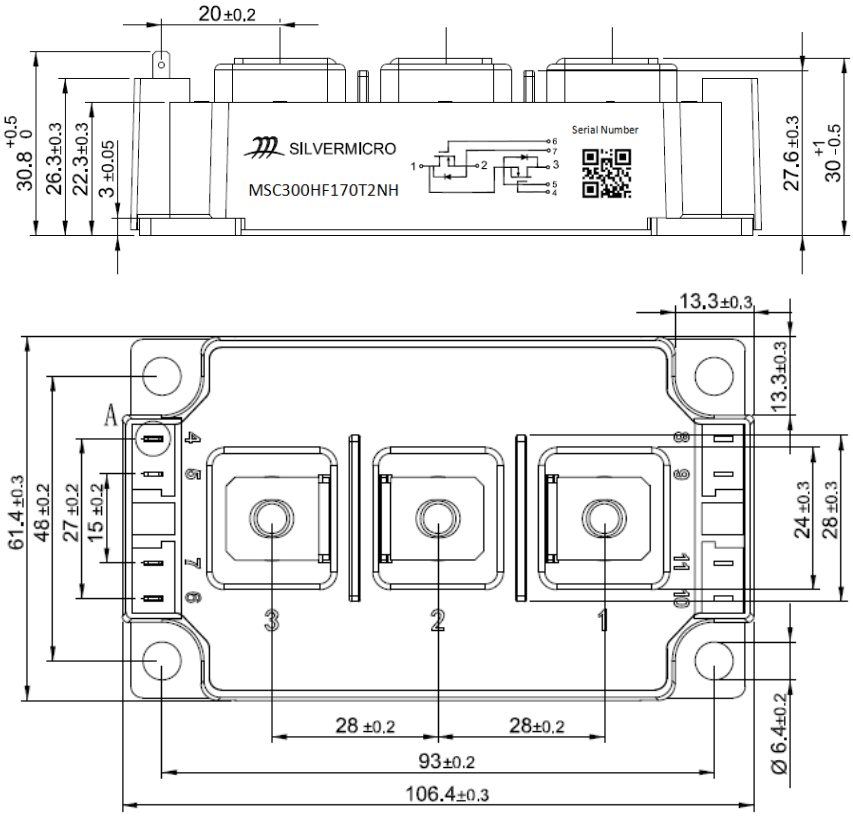


Fig. 29 Maximum Power Dispassion （MOSFET）
Derating vs Case Temperature

Internal Circuit



Package Outline (Unit: mm):



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