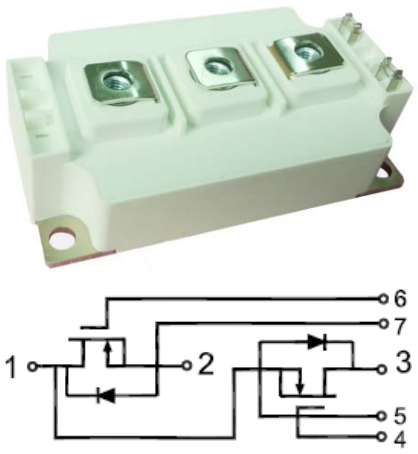
MSC120HF120T2NH

SiC MOSFET Module

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：

- Induction Heating
- DC/DC Converters
- Solar and Wind Inverters
- Line Regen Drives
- Battery Chrage

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

Symbol	Description		Value	Units
V_{DSmax}	Drain-Source Voltage		1200	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℃	193	A
		V_{GS}=20V,T_C=90℃	138	A
$I_{D(pluse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{jmax}	480	A
P_D	Power Dissipation	T_c=25℃， T_j=150℃	925	W

SILVERMICRO

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=300uA	1.2			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = 10 V, I_D =6 mA	1.8	2.6		V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1.2 kV, V_{GS} = 0V		80	300	μA
		V_{DS} = 1.2 kV, V_{GS} = 0V, T_J = 150 ˚C		400	1500	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V		1	100	nA
$R_{DS(on)}$	On State Resistance	V_{GS} = 20 V, I_{DS} = 120 A		13	16	mΩ
		V_{GS} = 20 V, I_{DS} = 120 A, T_J = 150 ˚C		23	30	mΩ
g_{fs}	Transconductance	V_{DS}= 20 V, I_{DS} = 120 A		53.8		S
		V_{DS}= 20 V, I_{DS} = 120 A, Tj=150℃		48.5		S
C_{iss}	Input Capacitance	V_{DS} = 1KV, f = 200 kHz, V_{AC} = 25 mV		6.3		nF
C_{OSS}	Output Capacitance			0.88		nF
C_{rss}	Reverse Transfer Capacitance			0.037		nF
E_{on}	Turn-On Switching Energy	V_{DD} = 600 V, V_{GS} = -5V/+20V I_D = 120 A, $R_{G(ext)}$ = 2.5 Ω		1.7		mJ
E_{off}	Turn-Off Switching Energy			0.4		mJ
$R_{G(int)}$	Internal Gate Resistance	f = 200 kHz, V_{AC} = 25 mV		1.8		Ω
Q_{GS}	Gate-Source Charge	V_{DD}= 800 V, V_{GS} = -5V/+20V, I_D= 120 A,		97		nC
Q_{GD}	Gate-Drain Chrage			118		nC
Q_G	Total Gate Chrage			378		nC
$t_{d(on)}$	Turn-off delay time	V_{DD} = 600V, V_{GS} = -5/+20V, I_D = 120 A, $R_{G(ext)}$ = 2.5 Ω,		38		ns
t_r	Rise Time			34		ns
$t_{d(off)}$	Turn-off delay time			70		ns
t_f	Fall Time			22		ns
t_{SC}	Short Time	V_{DD}=700V,V_{GS}=15V, T_J=100℃	5			μs
$R_{\theta JCM}$	MOSFET Thermal Resistance: Junction-To-Case			0.125	0.135	℃/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	I_F = 120 A, V_{GS} = 0		1.5	1.8	V
		I_F = 120 A, V_{GS} = 0 T_j=150℃		1.9	2.4	
Q_C	Total Capacitive Charge	I_{SD} = 120A, V_{DS} = 600 V, T_J = 25°C, di_{SD}/d_t = 3 kA/μs, V_{GS} = -5 V		1.1		μC
$R_{\theta JCD}$	Diode Thermal Resistance: Junction-To-Case			0.108	0.115	℃/W
I_F	Continuous Diode Forward Current	V_{GS}= -5V， T_C=25℃			305	A
		V_{GS}= 5V， T_C=25℃			195	A

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	5.0			KV
L_{Stray}	Stray Inductance	Measured between terminals 2 and 3			15	nH
G	Weight			300		g
M	Mounting Torque	To heatsink and terminal			5	N·m
	Clearance Distance	Terminal to terminal			12	mm
	Creepage Distance	Terminal to terminal			30	mm
		Terminal to baseplate			40	mm

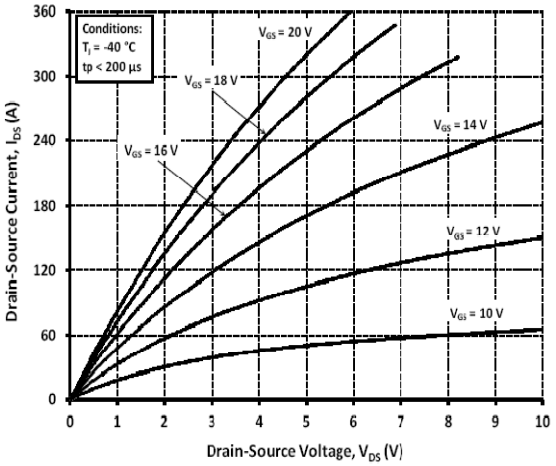


Fig.1 Output Characteristic Tj=-40℃

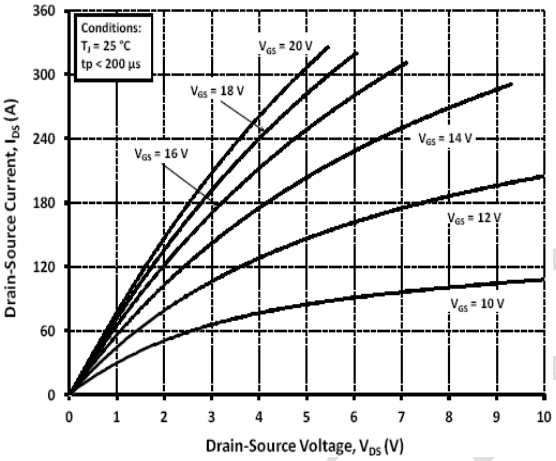


Fig.2 Output Characteristics Tj=25℃

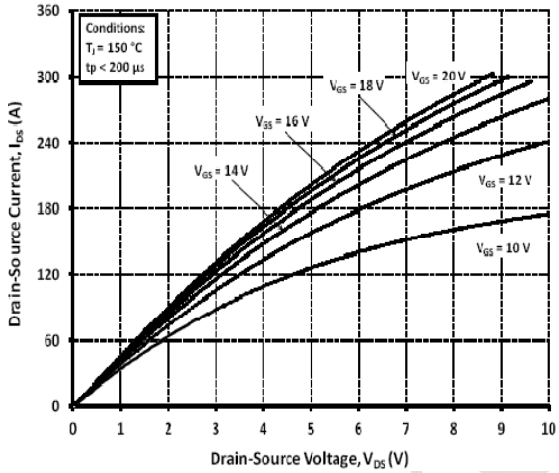


Fig.3 Output Characteristic Tj=150℃

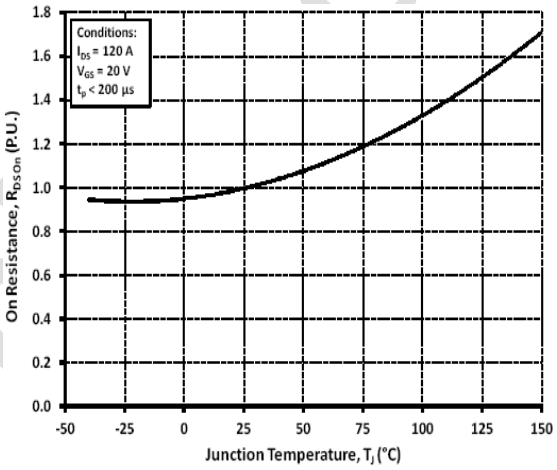


Fig.4 Normalized On-Resistant VS Temperature

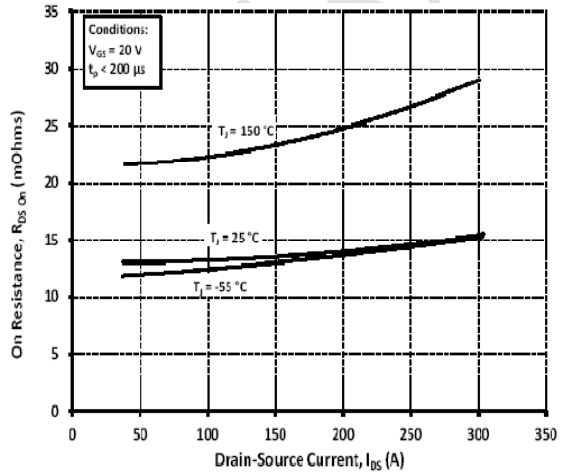


Fig.5 On-Resistant VS Drain Current For Various Temperatures

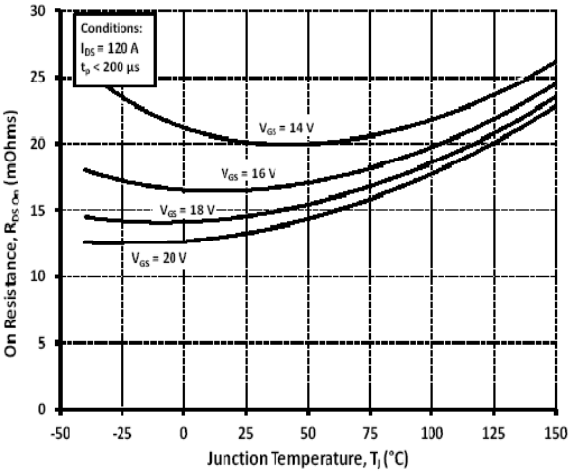


Fig.6 On-Resistant vs Temperatures For Various Gate-Source voltage

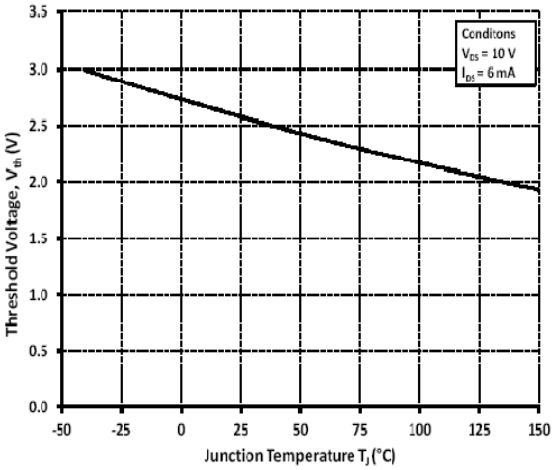


Fig.7 Threshold Voltage VS Temperature

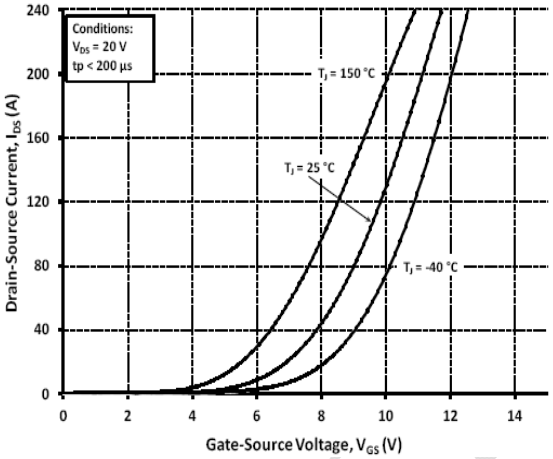


Fig.8 Transfer Characteristic for Various Junction Temperature

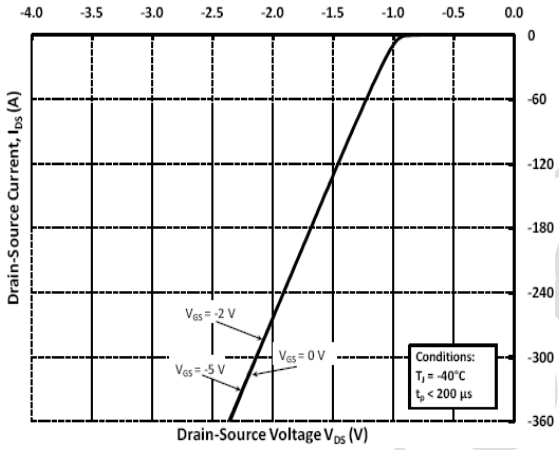


Fig.9 Diode Characteristic at -40℃

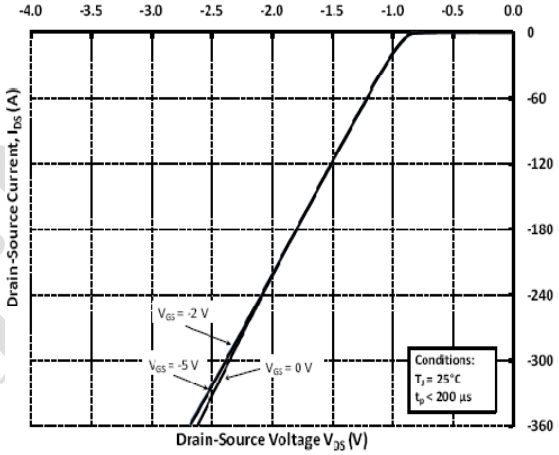


Fig.10 Diode Characteristic at 25℃

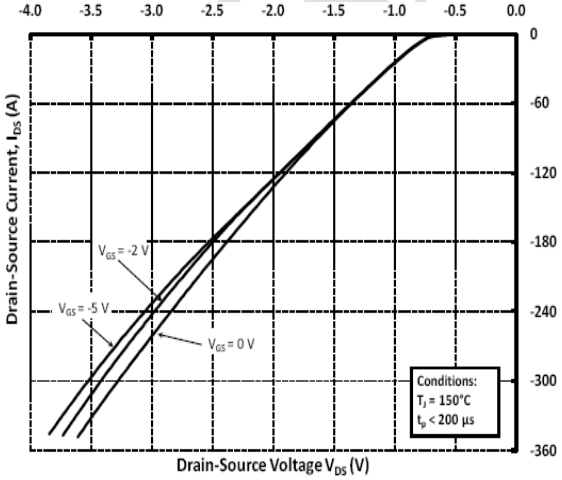


Fig.11 Diode Characteristic at 150℃

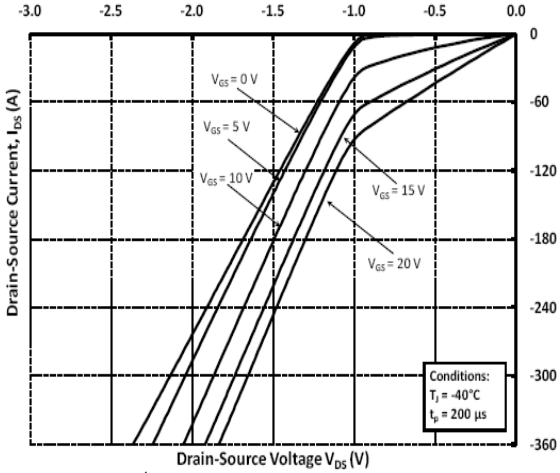


Fig.12 3rd Quadrant Characteristic at -40℃

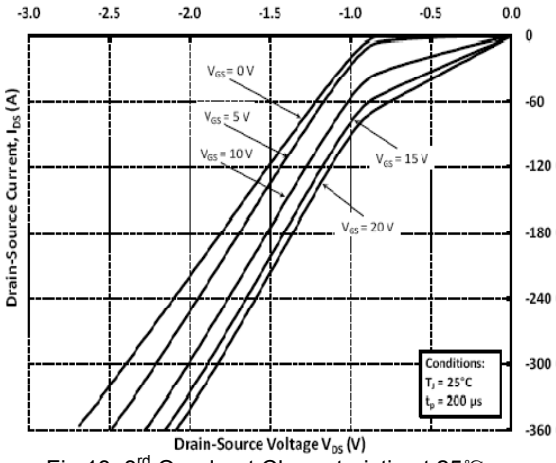


Fig.13 3rd Quadrant Characteristic at 25℃

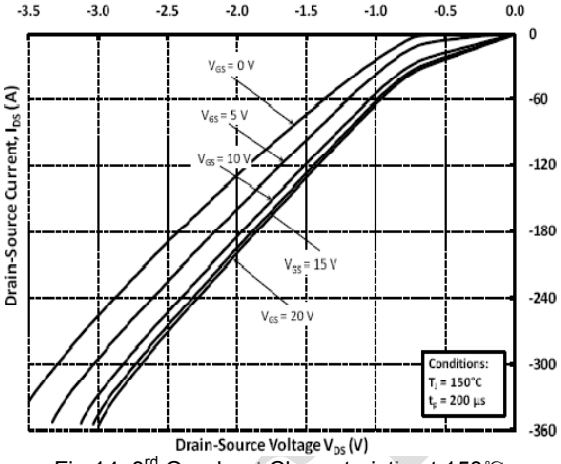


Fig.14 3rd Quadrant Characteristic at 150℃

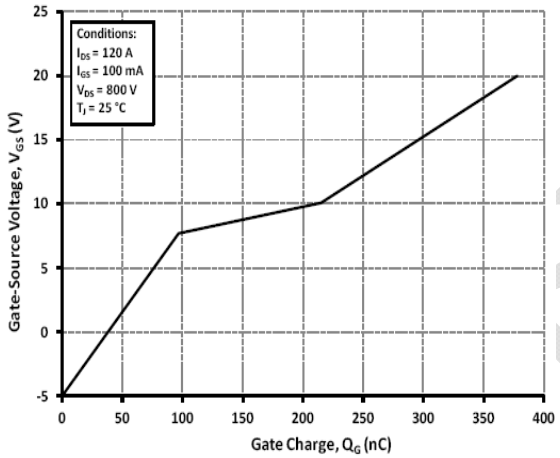


Fig.15 Typical Gate Charge Characteristic

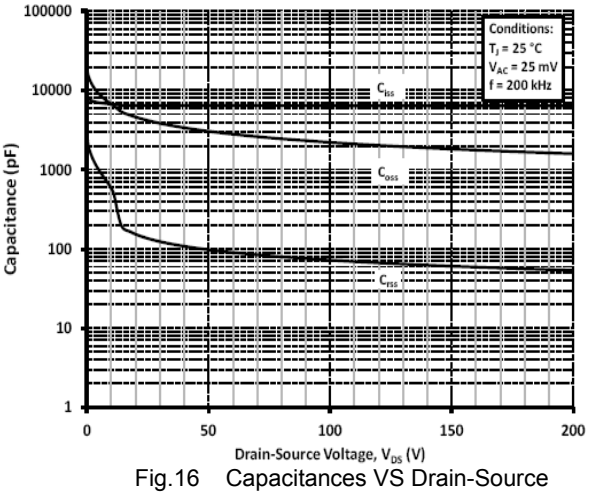


Fig.16 Capacitances VS Drain-Source Voltage (0-200V)

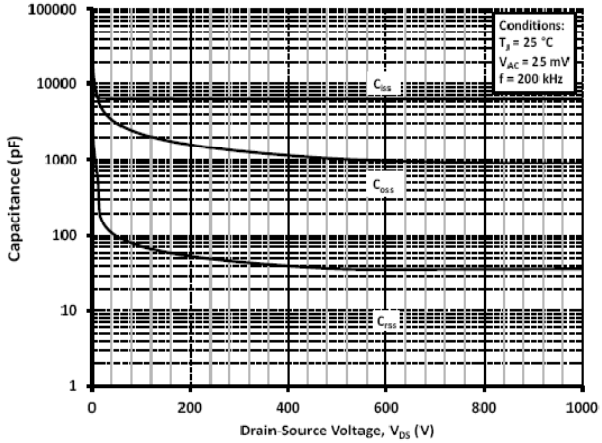


Fig.17 Typical Capacitances VS Drain-Source Voltage (0-1KV)

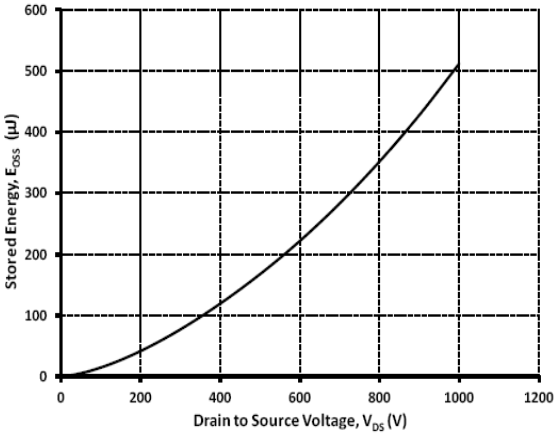


Fig.18 Typical Output Capacitor Stored Energy

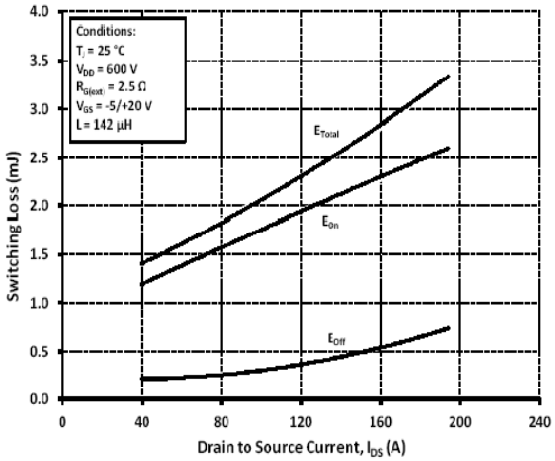


Fig.19 Inductive Switching Energy VS Drain Current For V_{DS}=600A,R_G=2.5 Ω

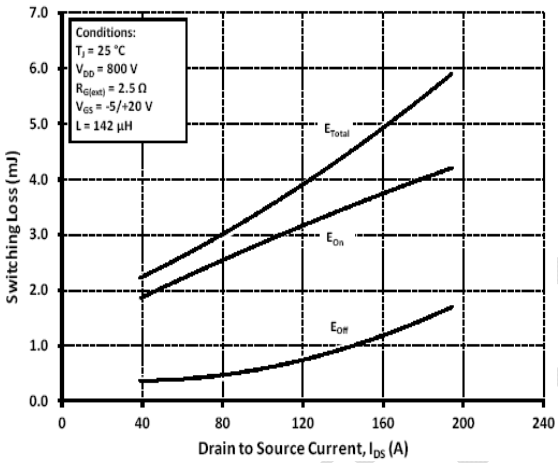


Fig.20 Inductive Switching Energy VS Drain Current For V_{DS}=800A,R_G=2.5 Ω

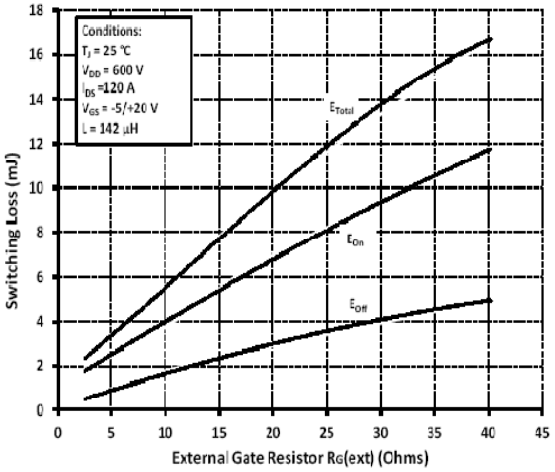


Fig.21 Inductive Switching Energy VS $R_{G(ext)}$

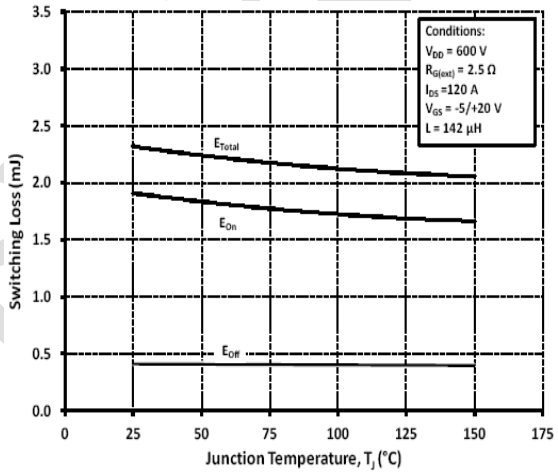


Fig.22 Inductive Switching Energy VS Temperature

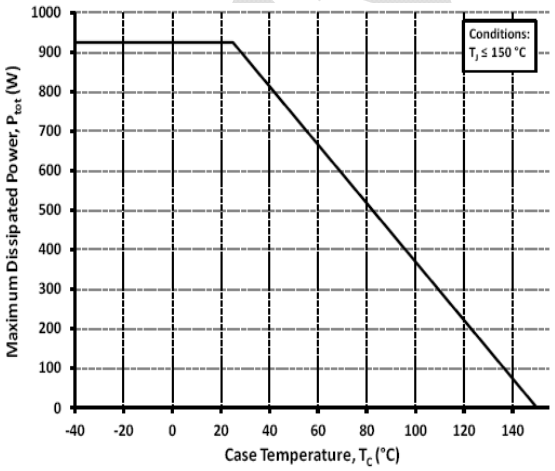


Fig.23 Maximum Power Dissipation (MOSFET) Derating VS Case Temperature

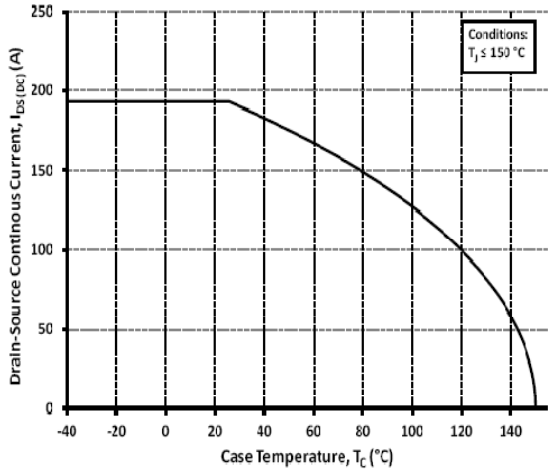


Fig.24 Continous Drain Current Derating VS Case Temperature

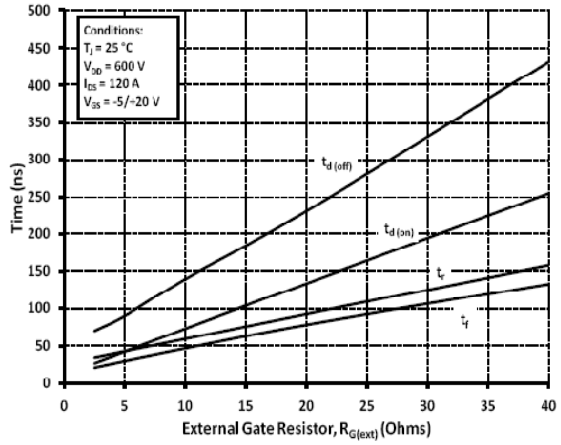


Fig.25 Timing VS $R_{G(ext)}$

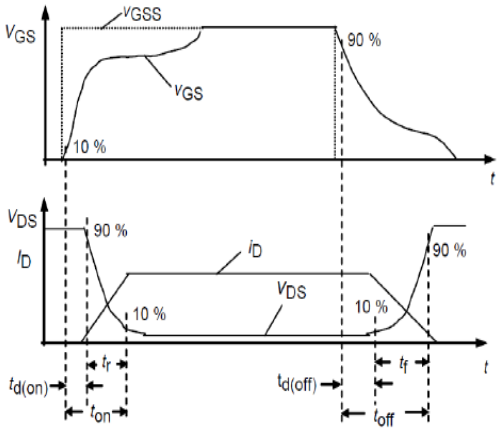


Fig.26 Resistive Switching Time Description

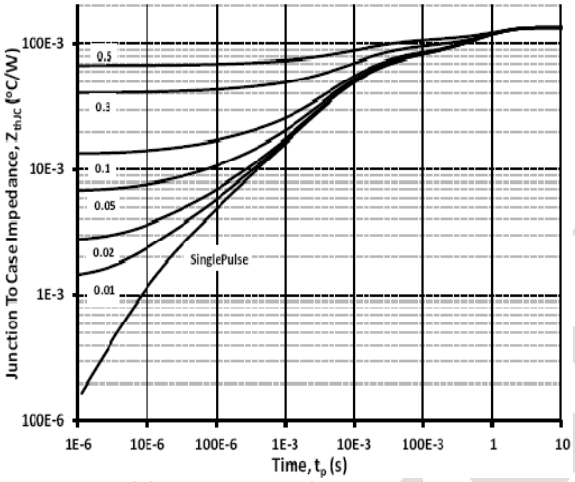


Fig.27 MOSFET Junction Case Thermal Impedance

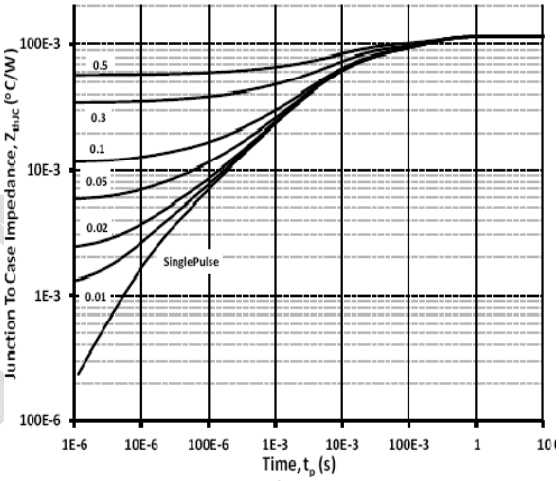


Fig.28 Diode Junction to Case Thermal Impendence

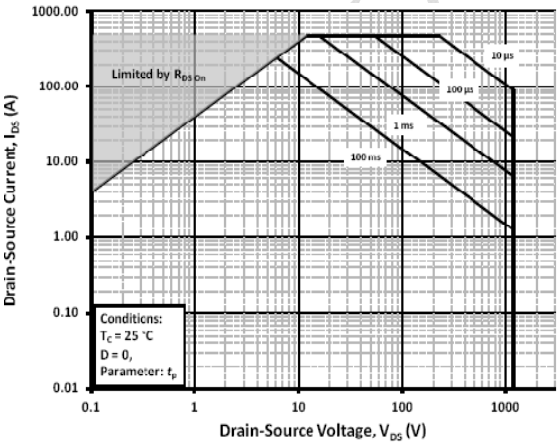
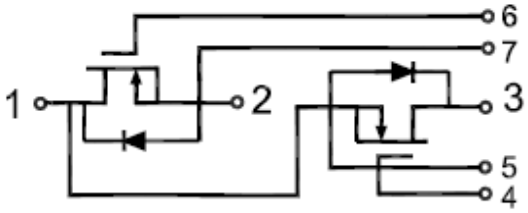
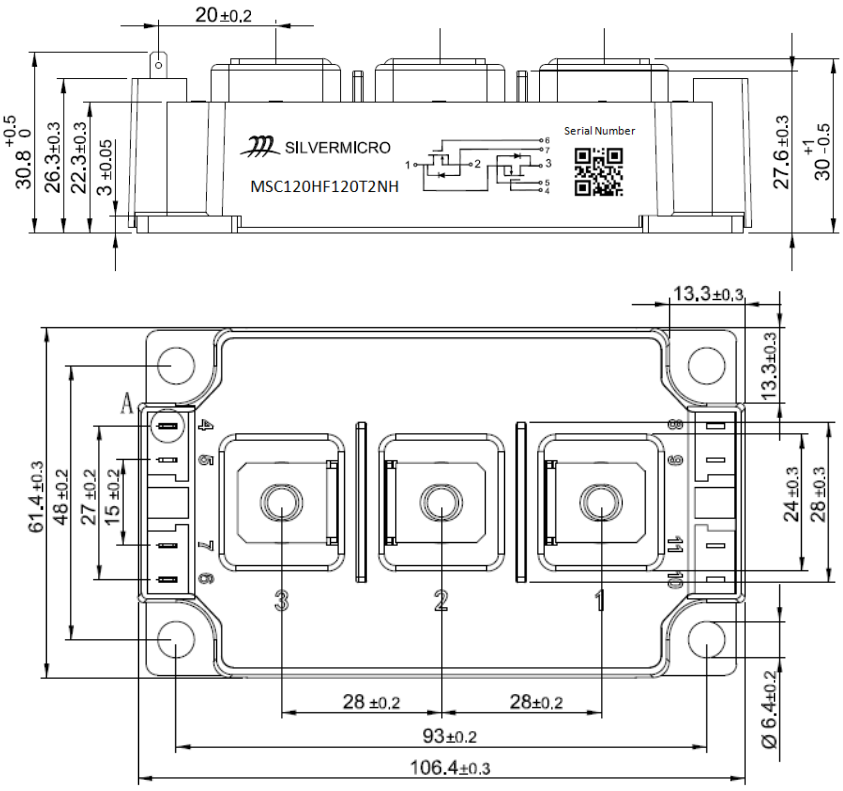


Fig.29 Maximum Power Dissipation (MOSFET) Derating Vs. Case Temperature

Internal Circuit



Package Outline (Unit: mm):



Date	Revision	Notes
09/15/2015	01	Initial Release
01/24/2019	02	Add t_{SC}

Announcement

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