

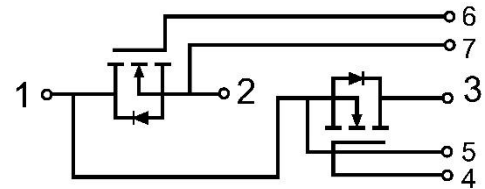
MSC500HF120T2NH

SiC MOSFET Module

Circuit Diagram

Features:

- $V_{DS}=1200V$ $R_{DS(on)}=3.1m\Omega$ SiC MOSFET Module
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Low Inductance Case Avoid Oscillations
- Isolated Heatsink Using DBC Technology



Applications:

- Main and Auxiliary AC Drives of Electric Vehicles
- DC Servo and Robot Drives
- Battery Vehicles
- UPS Equipment
- Plasma Cutting



Type	Package	Marking
MSC500HF120T2NH	T2N	MSC500HF120T2NH

MOSFET

Maximum Rated Values ($T_C=25^{\circ}C$ unless otherwise specified)

V_{DS}	Drain-Source Voltage		1200	V
V_{GSmax}	Gate-Source Voltage(Absolute maximum values)		-10/+23	V
V_{GSop}	Gate-Source Voltage(Recommended operational values)		-5/+18	V
I_{DDC}	Continuous Drain Current Limited by T_{Jmax}	$T_C=90^{\circ}C$	430	A
		$T_C=25^{\circ}C$	579	A
I_{DRM}	Repetitive peak drain current	T_p limited by T_{Jmax}	800	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}C$, $T_{Jmax}=175^{\circ}C$	1948	W



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Electrical Characteristics of MOSFET ($T_C=25^\circ\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	1200			V
$V_{GS(th)}$	Gate threshold voltage	$I_D=180mA, V_{DS}=V_{GS}$	2.0	2.9	4.0	V
$R_{DS(on)}$	Drain-source on-resistance	$I_D=300A,$	$V_{GS}=18V$ $T_J=25^\circ\text{C}$	3.10	4.50	$m\Omega$
			$V_{GS}=18V$ $T_J=125^\circ\text{C}$	4.70		$m\Omega$
			$V_{GS}=18V$ $T_J=175^\circ\text{C}$	5.80		$m\Omega$
I_{DSS}	Drain-source leakage current	$V_{GS}=0V,$ $V_{DS}=1200V, T_J=25^\circ\text{C}$			1	mA
I_{GSS}	Gate-source leakage current	$V_{GS}=23V,$ $V_{DS}=0V, T_J=25^\circ\text{C}$			400	nA
		$V_{GS}=-10V,$ $V_{DS}=0V, T_J=25^\circ\text{C}$			-400	nA
C_{iss}	Input Capacitance	$V_{DS}=1000V, V_{GS}=0V,$ $f=100kHz$		22.40		nF
C_{oss}	Output Capacitance			0.84		nF
C_{rss}	Reverse Transfer Capacitance			0.08		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=800V, I_D=300A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ Inductive Load	$T_J=25^{\circ}C$		129		ns
			$T_J=125^{\circ}C$		109		
			$T_J=175^{\circ}C$		106		
t_r	Rise Time		$T_J=25^{\circ}C$		57		ns
			$T_J=125^{\circ}C$		55		
			$T_J=175^{\circ}C$		49		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		246		ns
			$T_J=125^{\circ}C$		276		
			$T_J=175^{\circ}C$		289		
t_f	Fall Time	$T_J=25^{\circ}C$		32		ns	
		$T_J=125^{\circ}C$		35			
		$T_J=175^{\circ}C$		37			
E_{on}	Turn-on Switching Loss	$V_{DD}=800V, I_D=300A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ $di/dt=6900A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		22		mJ
		$T_J=125^{\circ}C$		24			
		$T_J=175^{\circ}C$		25			



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E _{off}	Turn-off Switching Loss	V _{DD} =800V, I _D =300A, R _{Goff} =2.2Ω, V _{GS} =-3/18V, du/dt=9600V/μs(T _J =175°C) Inductive Load	T _J =25°C		15		mJ
			T _J =125°C		16		
			T _J =175°C		17		
Q _g	Total Gate Charge	V _{DD} =800V, I _D =300A V _{GS} =-3/18V	T _J =25°C		920		nC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		2.6		Ω
R _{θJC}	MOSFET Thermal Resistance: Junction-to-Case (per MOSFET)					0.077	°C/W
R _{θCS}	MOSFET Thermal Resistance: Case-to-Sink (per MOSFET) (per MOSFET, λ _{grease} = 1 W/(m • K))				0.06		°C/W

Body diode(MOSFET)

Maximum Rated Values of Body diode (T_C=25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _{SD}	Body Diode Continuous Forward Current		400	A
I _{SDM}	Body Diode Maximum Forward Current	t _p =1ms	800	A

Electrical Characteristics of Body Diode (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{SD}	Forward Voltage	I _{SD} =300A, V _{GS} =-3V	T _J =25°C		4.75	5.70	V
			T _J =125°C		4.86		
			T _J =175°C		4.68		



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Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted) f=50Hz, t=1min		2500		V
Internal Isolation			AIN		
d _{creep}	Creepage Distance: Terminal to Baseplate		40		mm
	Creepage Distance: Terminal to Terminal		30		mm
d _{clear}	Clearance Distance: Terminal to Baseplate		30		mm
	Clearance Distance: Terminal to Terminal		9		mm
L _{SCE}	Stray Inductance Module			14	nH
T _J	Maximum Junction Temperature			175	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		175	°C
T _{stg}	Storage Temperature	-40		125	°C
CTI	Comparative Tracking Index		200		
M	Power Terminals Screw:M6	3.0		5.0	N·m
M	Mounting Screw:M6	3.0		6.0	N·m
G	Weight		300		g

Ordering Information Table

Device code	M	SC	500	HF	120	T2N	H
	①	②	③	④	⑤	⑥	⑦

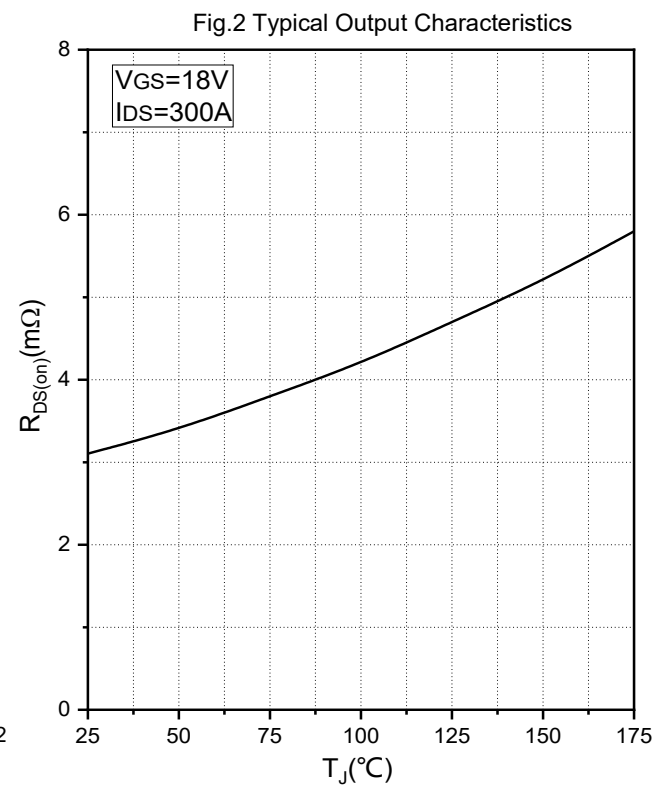
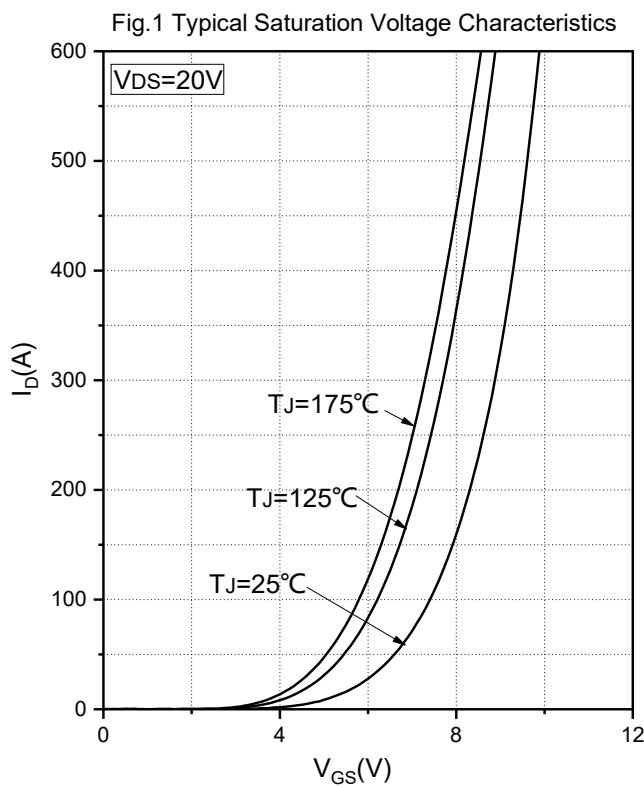
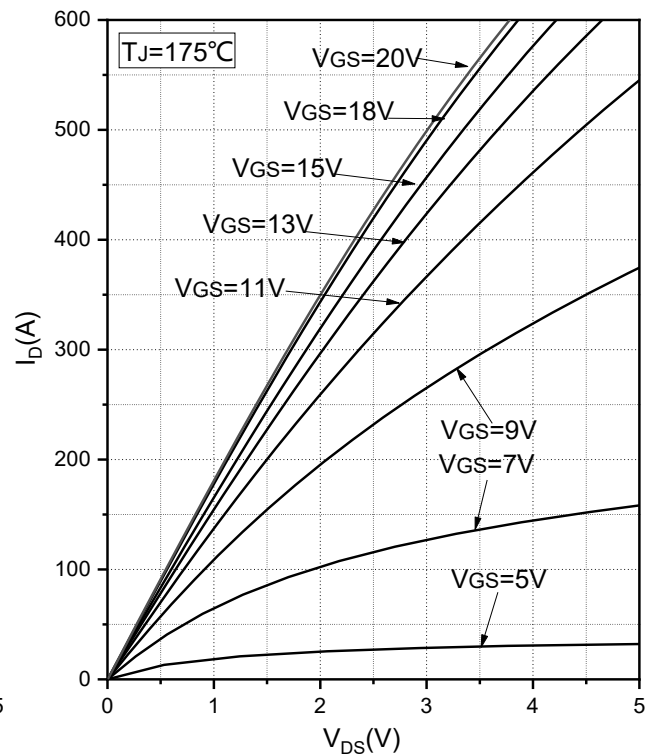
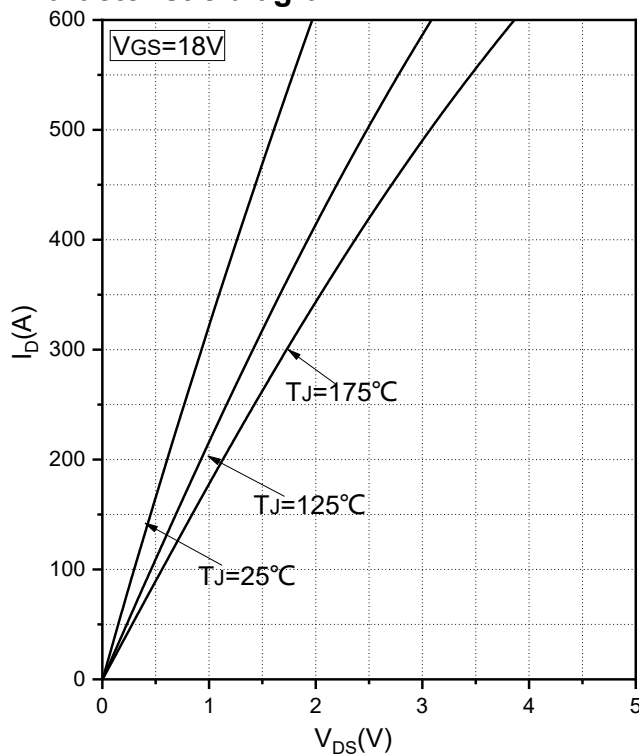
- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (500=500A)
- ④ - Circuit Configuration:HF (Half Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

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Characteristic diagram



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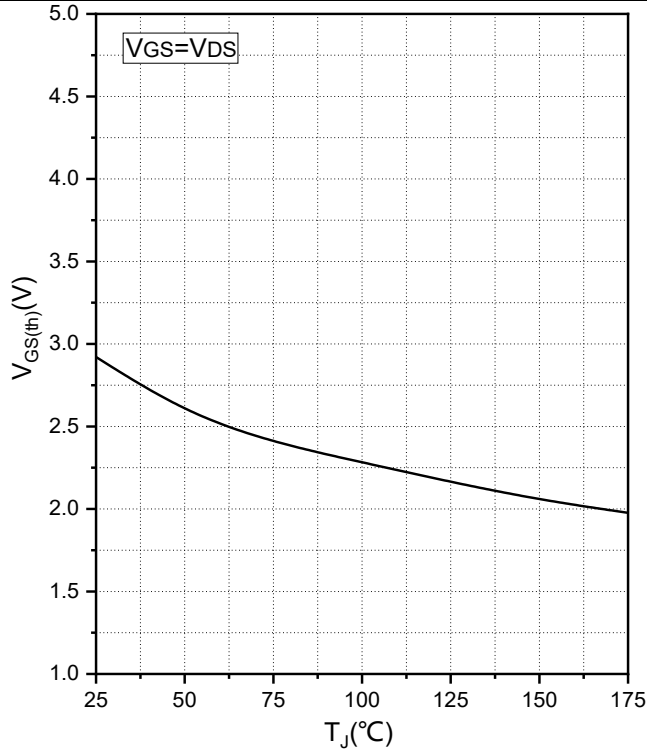


Fig.5 Gate-source threshold voltage

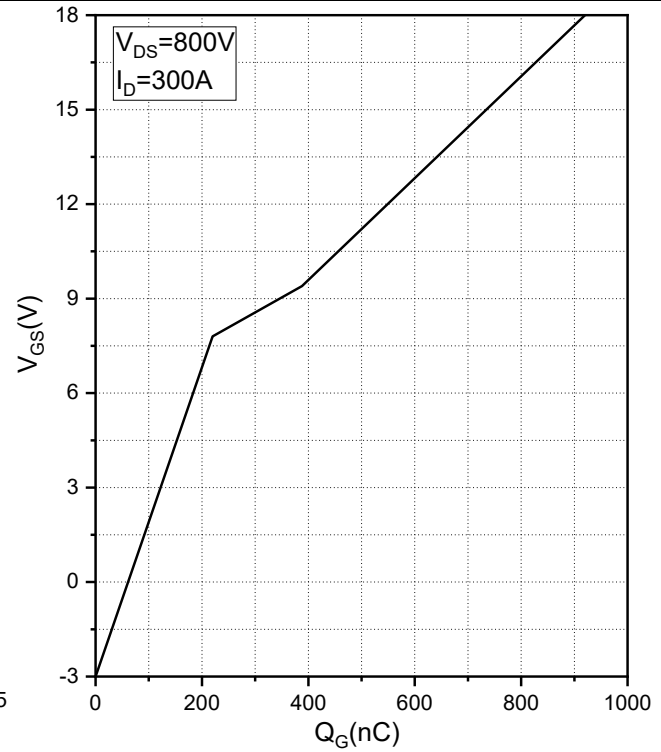


Fig.6 Gate charge characteristic

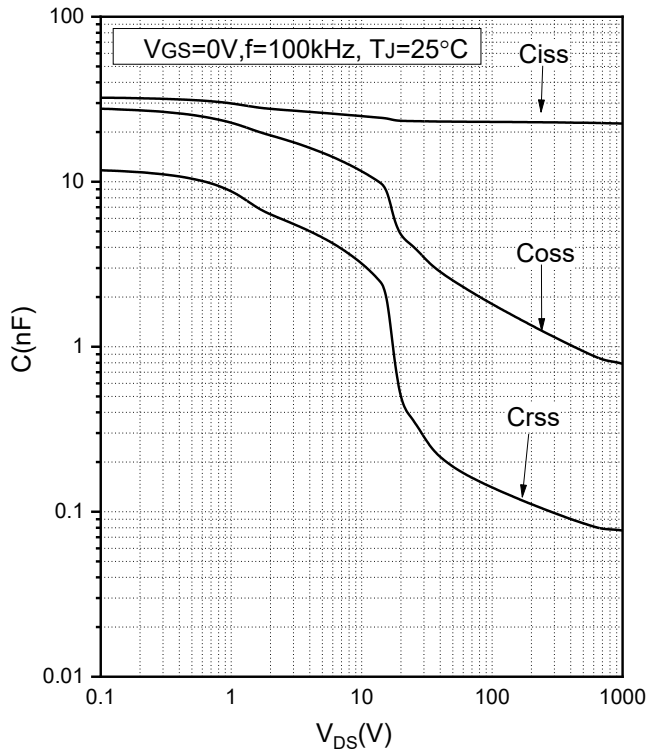


Fig.7 Capacity characteristic

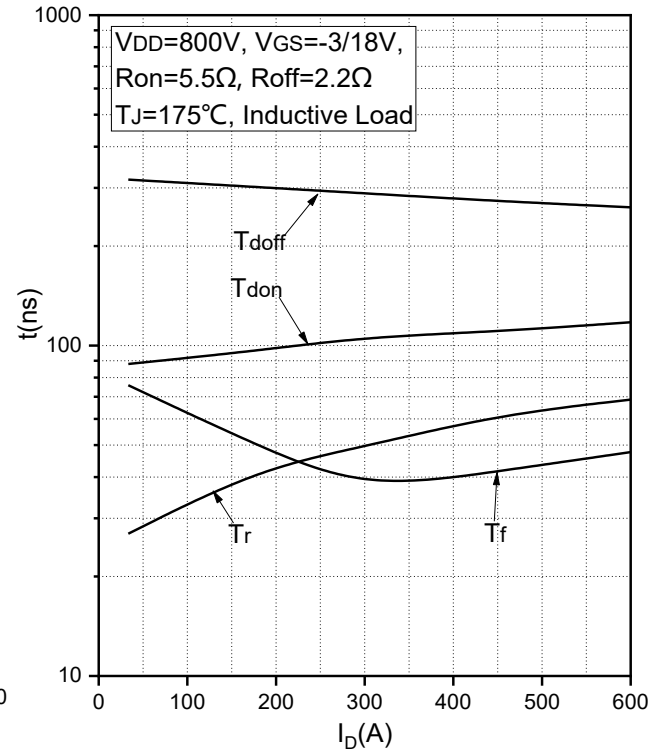
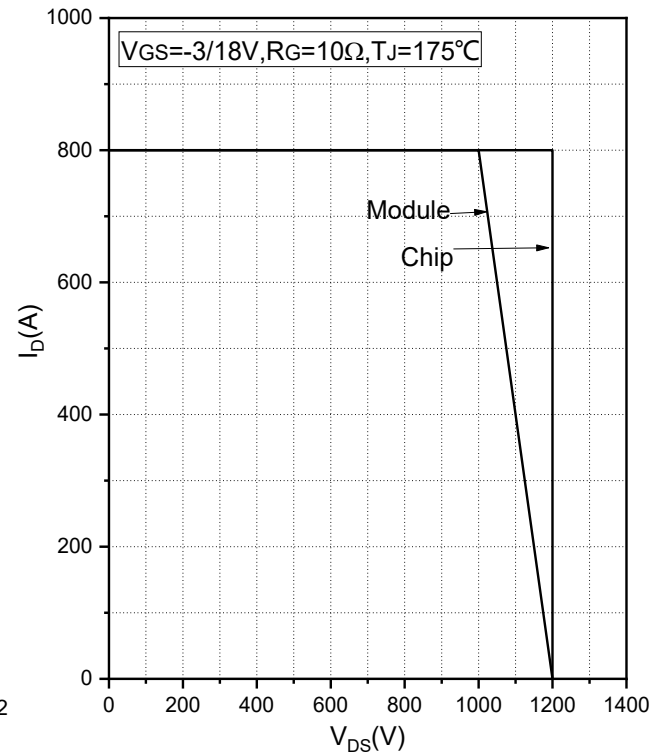
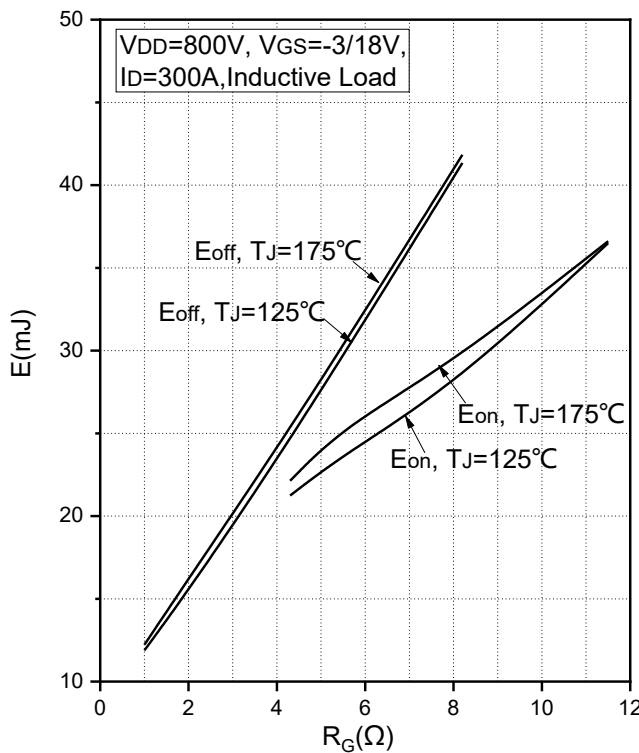
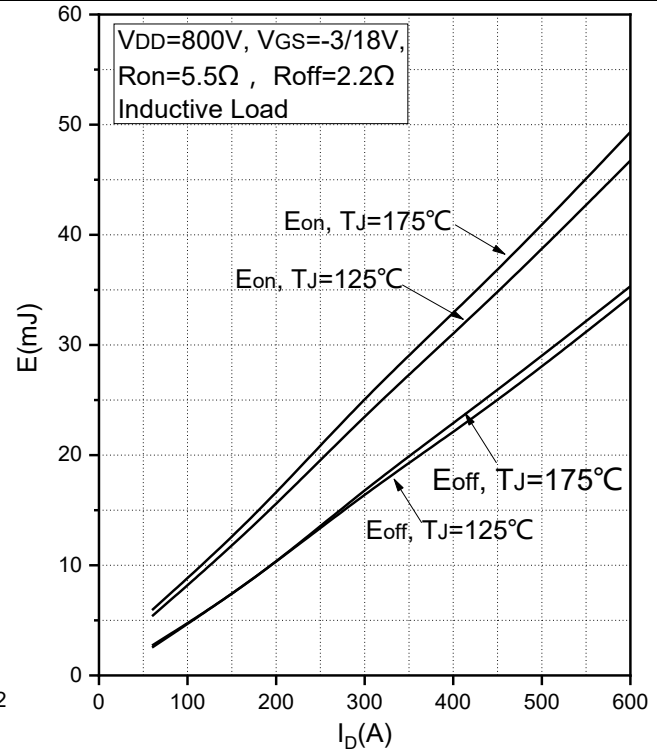
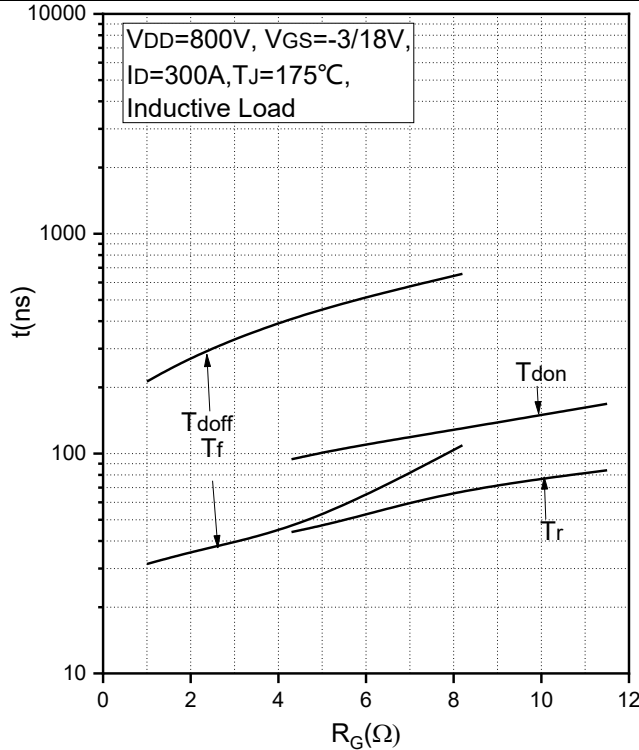


Fig.8 Typical Switching times vs Drain Current

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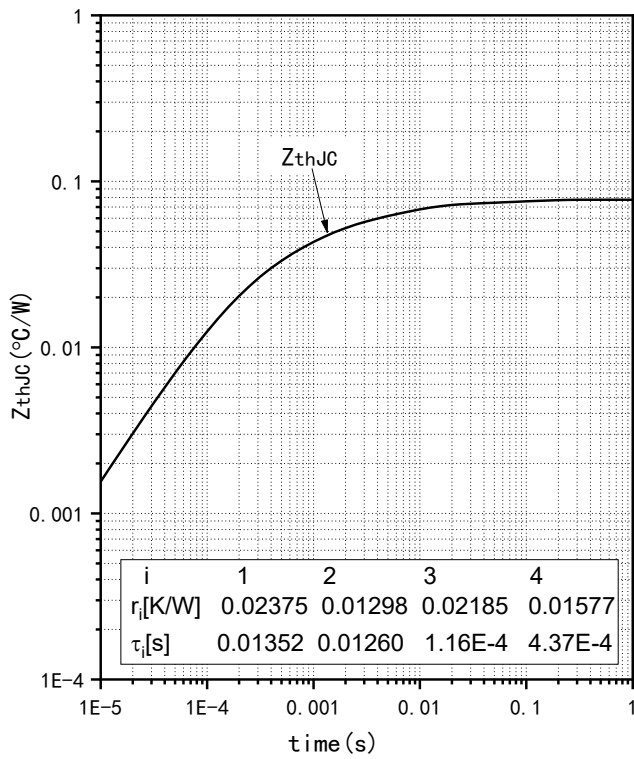


Fig.13 Transient Thermal Impedance (MOSFET)

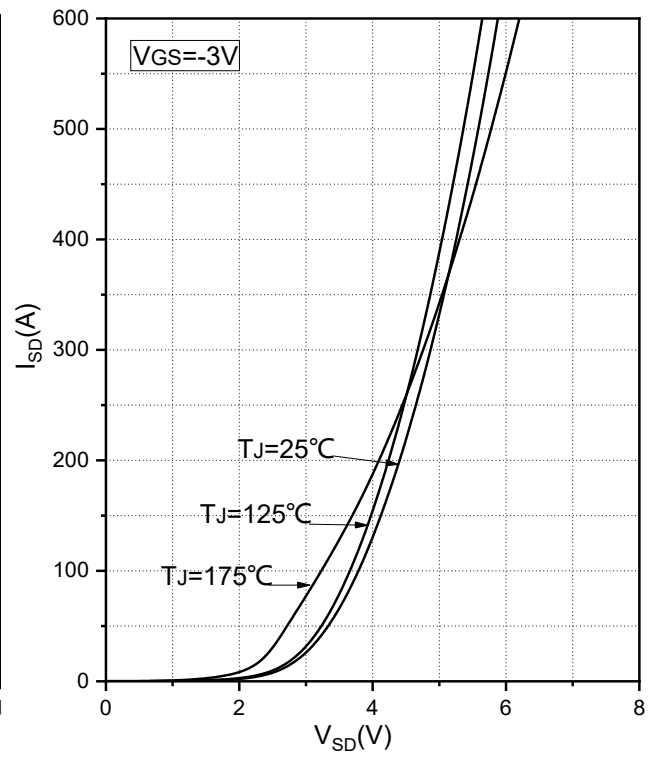


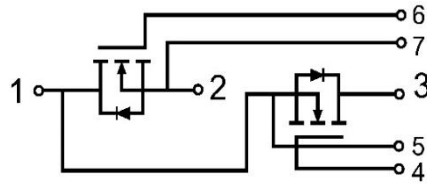
Fig.14 Typical Forward characteristic body diode



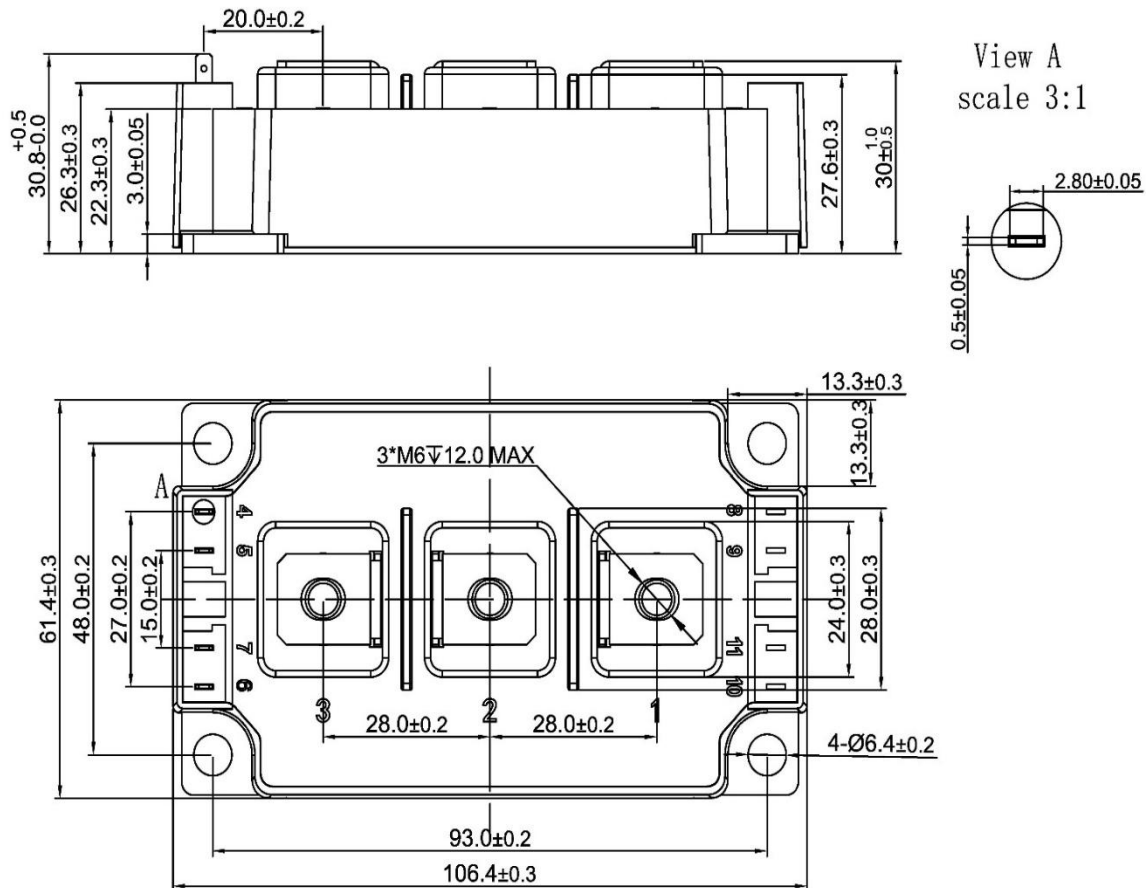
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Internal Circuit:



Package Outline (Unit: mm):





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Revision	Notes
01	Initial Release
02	Engineering Sample Datasheet

Announcement

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