

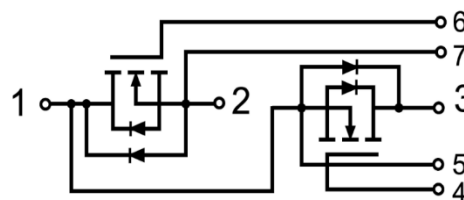
MSC600HF170T2NHD

SiC MOSFET Module

Circuit Diagram

Features:

- $V_{DS}=1200V$ $I_D=600A$ N-Channel SiC MOSFET Module
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- 100% RBSOA Tested($2 \times I_C$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- Induction Heating
- Railway Traction
- New Energy Systems
- UPS and SMPS Systems
- Fully Electric Combat Vehicles & Aviation Power Distribution



Type	Package	Marking
MSC600HF170T2NHD	T2N	MSC600HF170T2NHD

MOSFET

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

V_{DS}	Drain-Source Voltage		1700	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}	$T_C=100^\circ C$	600	A
		$T_C=25^\circ C$	1200	A
I_{DRM}	Repetitive peak drain current	T_p limited by T_{Jmax}	1200	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	4000	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
$V_{GS(th)}$	Gate threshold voltage	$I_D=100\text{mA}$, $V_{DS}=V_{GS}$	2.0	2.6	4.0	V
$R_{DS(on)}$	Drain-source on-resistance	$I_D=600\text{A}$,	$V_{GS}=18\text{V}$ $T_J=25^{\circ}\text{C}$	3.10	3.75	$\text{m}\Omega$
			$V_{GS}=18\text{V}$ $T_J=125^{\circ}\text{C}$	5.42		$\text{m}\Omega$
			$V_{GS}=18\text{V}$ $T_J=175^{\circ}\text{C}$	7.10		$\text{m}\Omega$
I_{DSS}	Drain-source leakage current	$V_{GS}=0\text{V}$, $V_{DS}=1700\text{V}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GSS}	Gate-source leakage current	$V_{GS}=20\text{V}$, $V_{DS}=0\text{V}$, $T_J=25^{\circ}\text{C}$			600	nA
C_{iss}	Input Capacitance	$V_{CE}=1000\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		43.75		nF
C_{oss}	Output Capacitance			2.18		nF
C_{rss}	Reverse Transfer Capacitance			0.11		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=900V, I_D=600A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ Inductive Load	$T_J=25^{\circ}C$		324		ns	
			$T_J=125^{\circ}C$		272			
			$T_J=175^{\circ}C$		264			
t_r	Rise Time		$T_J=25^{\circ}C$		142		ns	
			$T_J=125^{\circ}C$		138			
			$T_J=175^{\circ}C$		124			
$t_{d(off)}$	Turn-off Delay Time		$V_{DD}=900V, I_D=600A,$ $R_{Goff}=2.2\Omega, V_{GS}=-3/18V,$ Inductive Load	$T_J=25^{\circ}C$		738		ns
				$T_J=125^{\circ}C$		828		
				$T_J=175^{\circ}C$		866		
t_f	Fall Time	$T_J=25^{\circ}C$			84		ns	
		$T_J=125^{\circ}C$			88			
		$T_J=175^{\circ}C$			92			
E_{on}	Turn-on Switching Loss	$V_{DD}=900V, I_D=600A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ $di/dt=7600A/\mu s(T_J=175^{\circ}C)$ Inductive Load		$T_J=25^{\circ}C$		76		mJ
		$T_J=125^{\circ}C$			80			
		$T_J=175^{\circ}C$			86			



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E _{off}	Turn-off Switching Loss	V _{DD} =900V, I _D =600A, R _{Goff} =2.2Ω, V _{GS} =-3/18V, du/dt=5500V/μs(T _J =175°C) Inductive Load	T _J =25°C		52		mJ
			T _J =125°C		56		
			T _J =175°C		58		
Q _g	Total Gate Charge	V _{GE} =+18V...-3V	T _J =25°C		2.05		μC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		2.4		Ω
R _{θJC}	MOSFET Thermal Resistance: Junction-to-Case (per MOSFET)					0.043	°C/W
R _{θCS}	MOSFET Thermal Resistance: Case-to-Sink (per MOSFET) (per MOSFET, λ _{grease} = 1 W/(m • K))				0.059		°C/W

Diode,SBD

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1700	V
I _{SD}	Body Diode Continuous Forward Current		600	A
I _{SDM}	Body Diode Maximum Forward Current	t _p =1ms	1200	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{SD}	Forward Voltage	I _{SD} =600A, V _{GS} =-3V	T _J =25°C		1.98	2.40	V
			T _J =125°C		2.93		
			T _J =175°C		3.25		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per diode)					0.046	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per diode) (per Diode, λ _{grease} = 1 W/(m • K))				0.063		°C/W



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Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	4000			V
Internal Isolation		AlN			
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	-40		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		5	N·m
M	Mounting Screw:M6	3		6	N·m
G	Weight		300		g

Ordering Information Table

Device code	M	SC	600	HF	170	T2N	H	D
	①	②	③	④	⑤	⑥	⑦	⑧

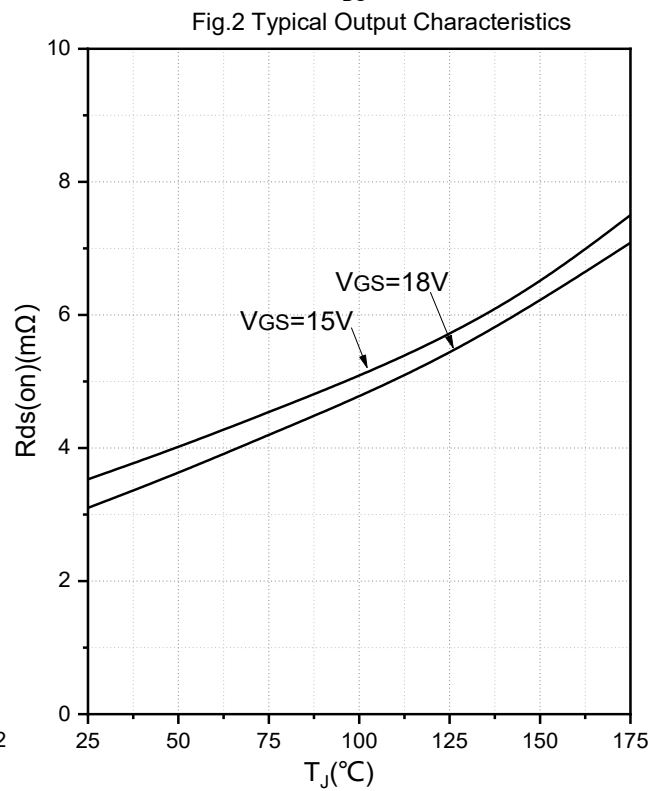
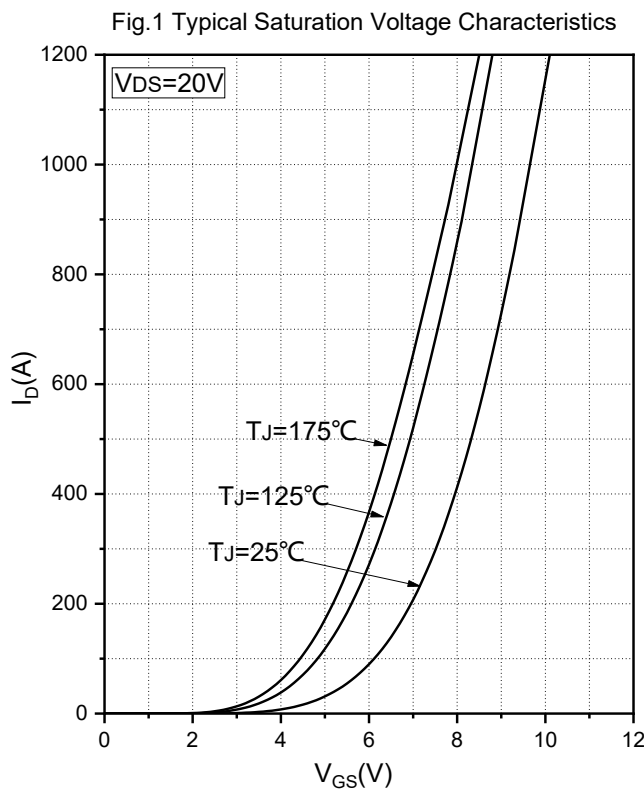
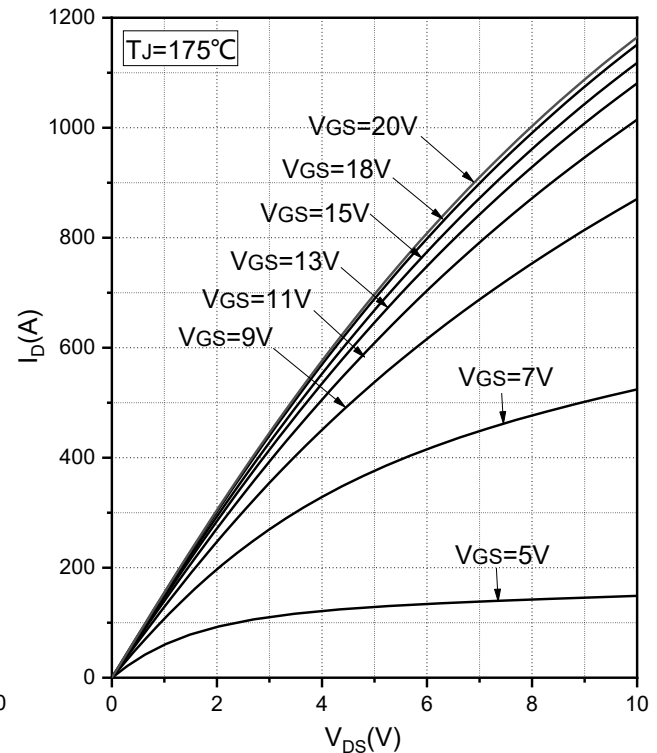
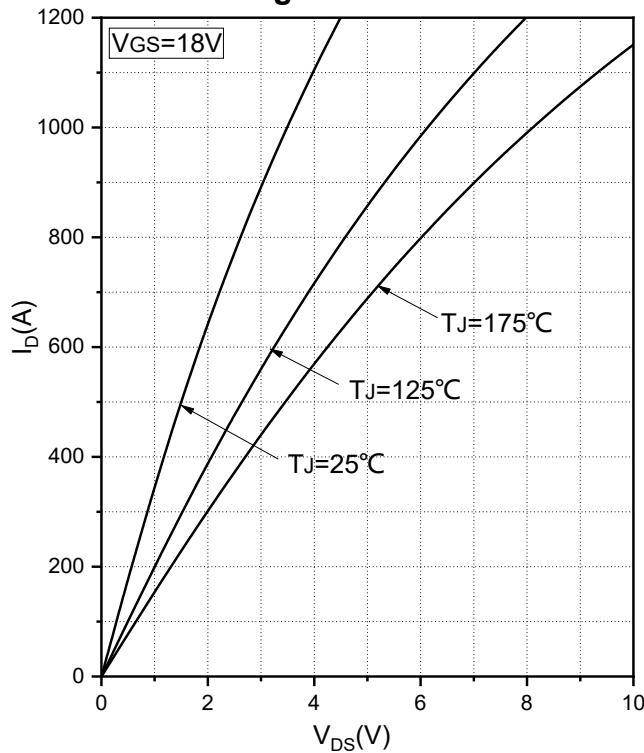
- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (600=600A)
- ④ - Circuit Configuration:HF (Half Bridge)
- ⑤ - Rated Voltage (170=1700V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Code



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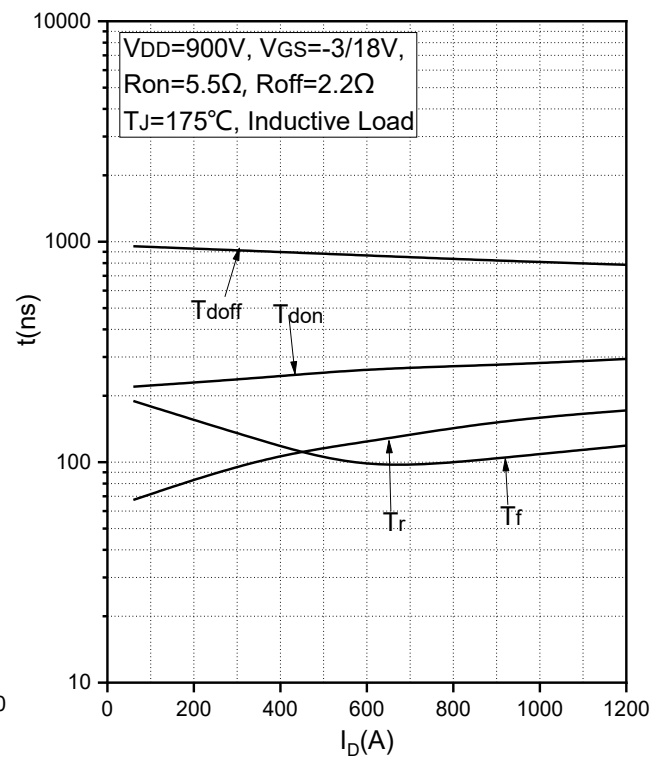
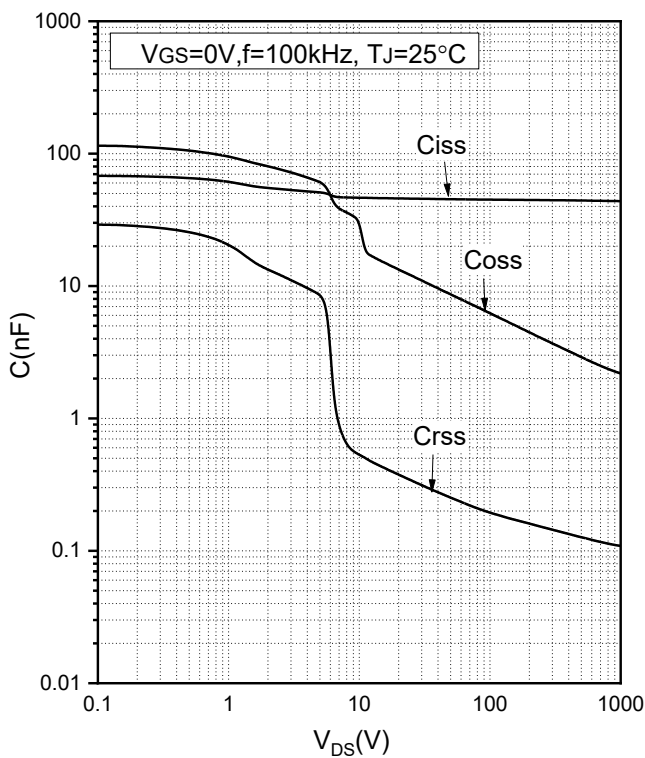
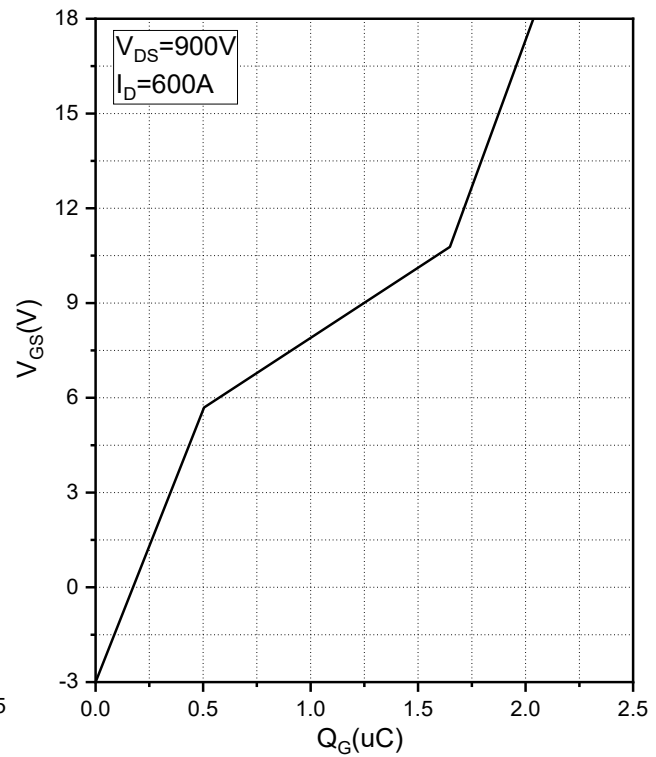
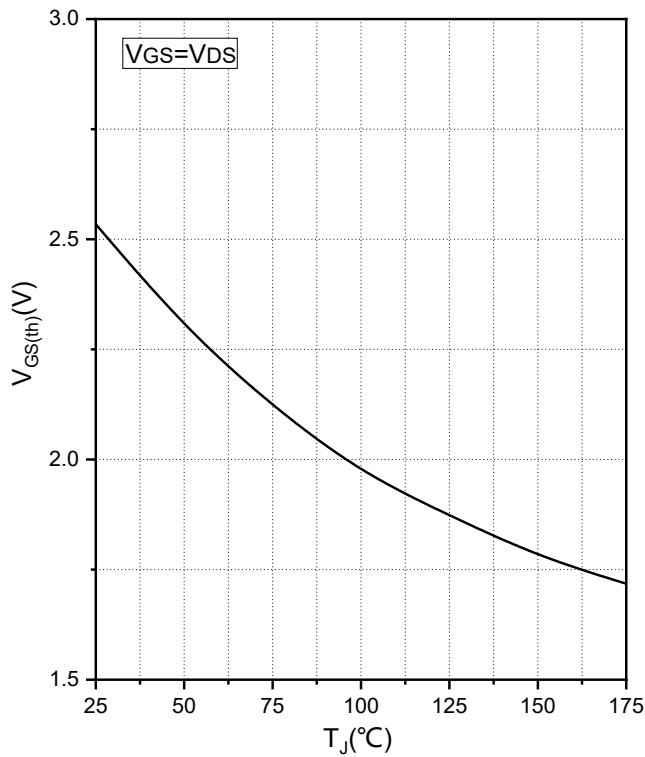
Characteristic diagram





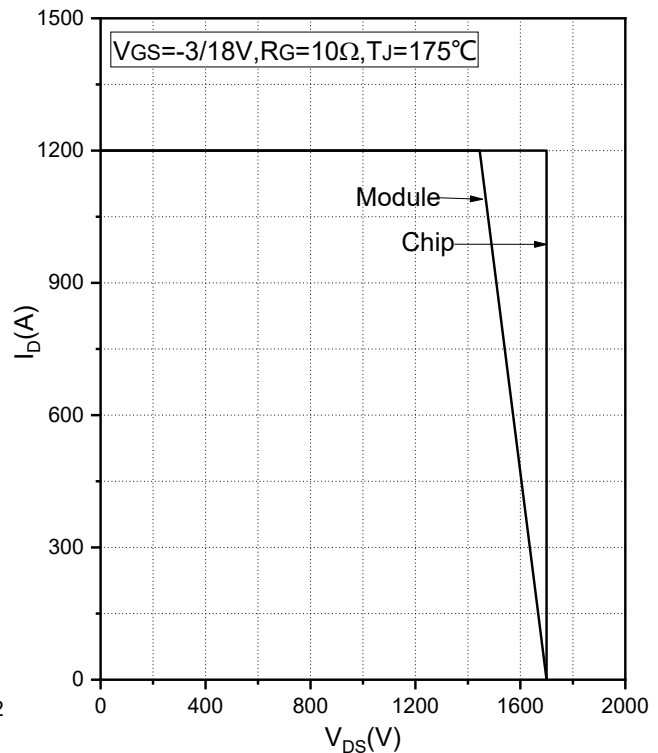
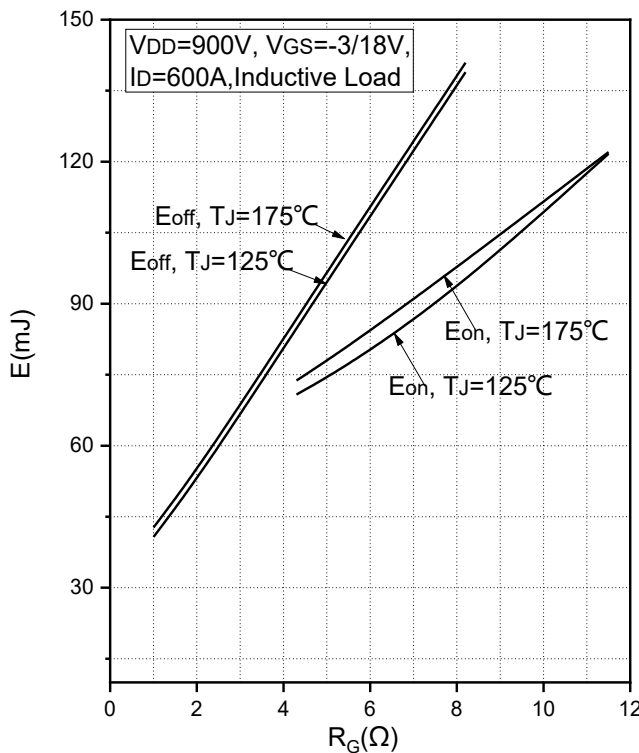
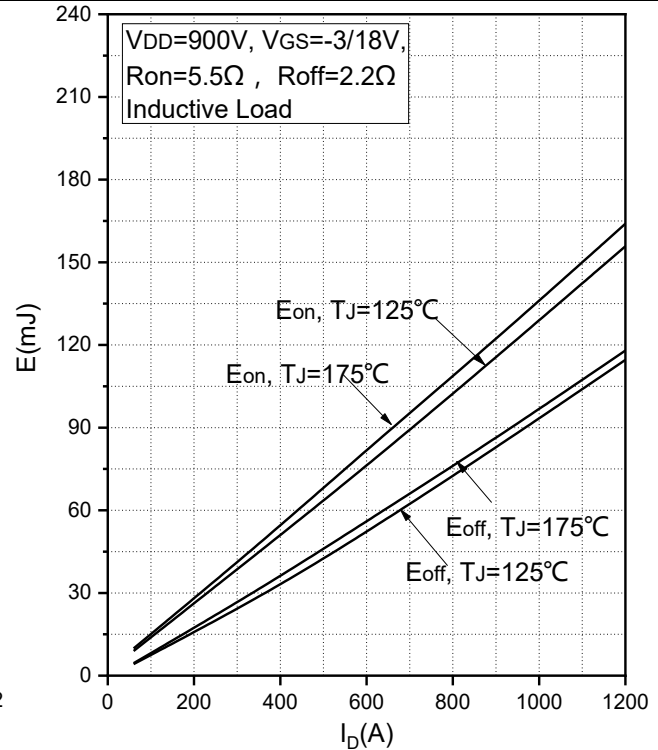
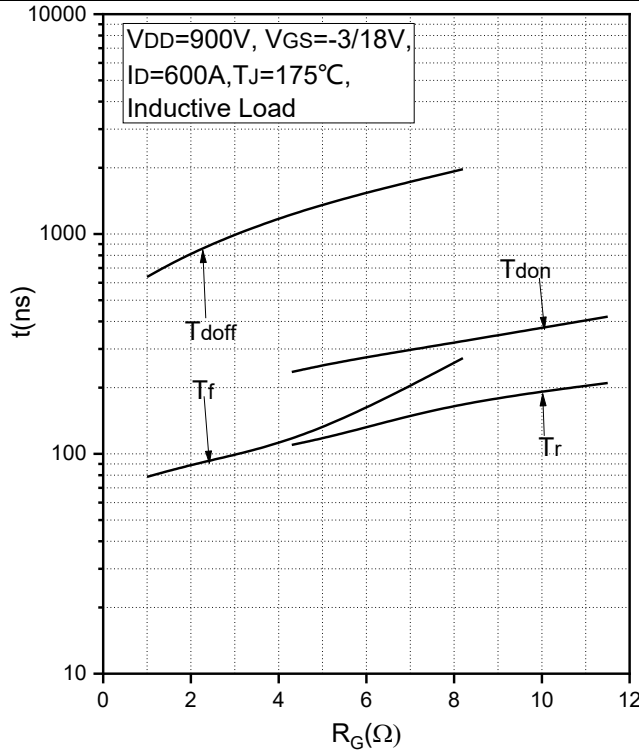
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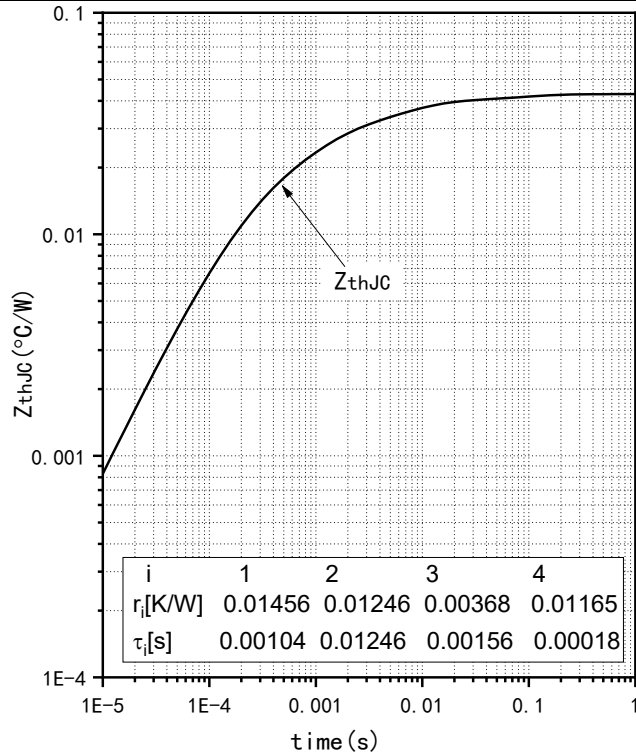


Fig.13 Transient Thermal Impedance (MOSFET)

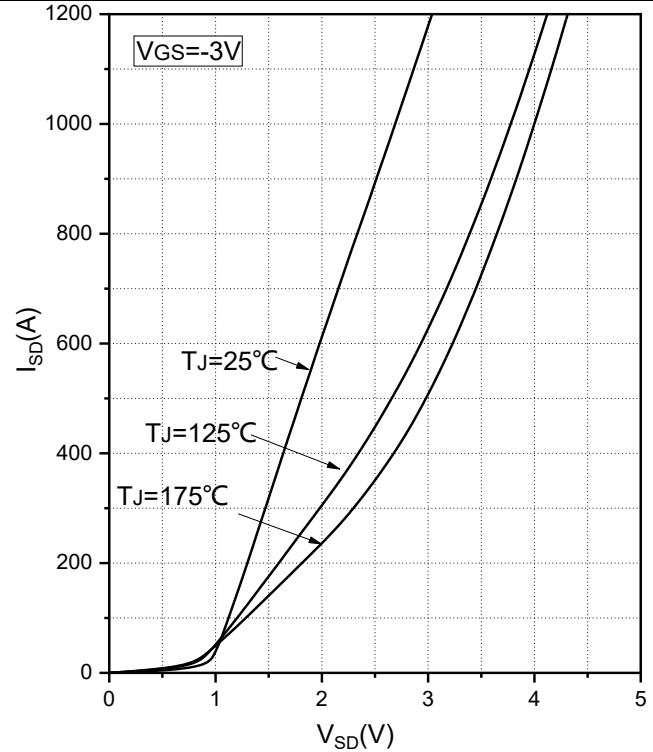


Fig.14 Typical Forward characteristic of SBD

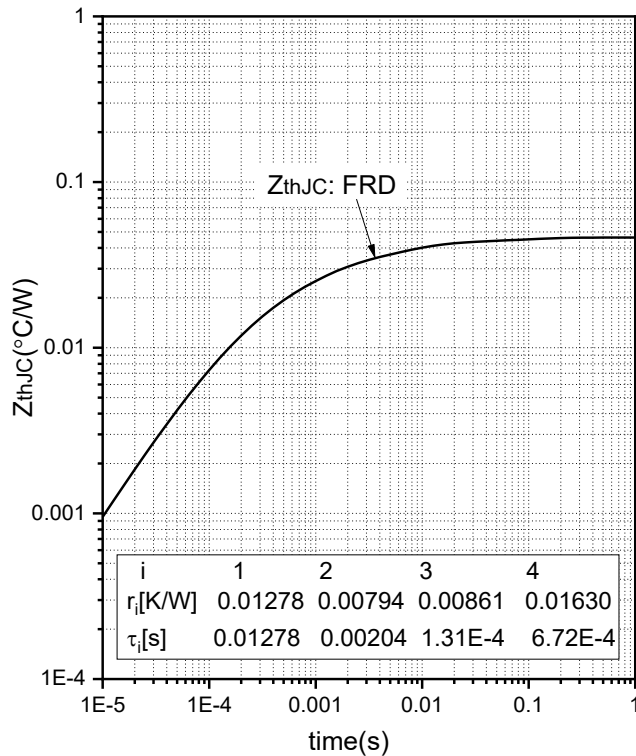
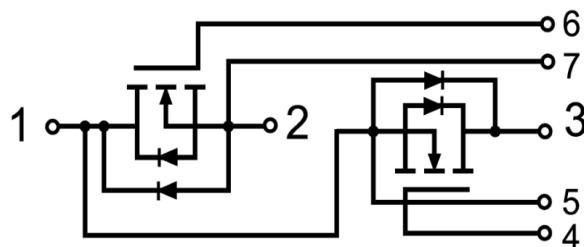


Fig.13 Transient Thermal Impedance (SBD)



Internal Circuit:

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Revision	Notes
02	Engineering Sample Datasheet

Announcement

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