

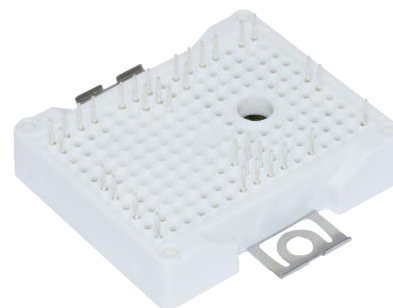
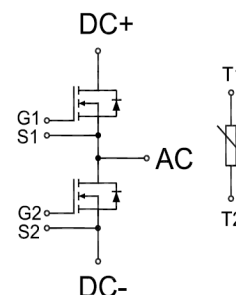
MSC450HF120B9H

SiC MOSFET Module

Circuit Diagram

Features:

- $V_{DS}=1200V$ $I_D=450A$ 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:

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

Type	Package	Marking
MSC450HF120B9H	B9	MSC450HF120B9H

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}	$T_C=100^\circ C$	450	A
		$T_C=25^\circ C$	900	A
I_{DRM}	Repetitive peak drain current	T_p limited by T_{Jmax}	900	A
P_D	Maximum Power Dissipation	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	2000	W



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

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate threshold voltage	$I_D=134\text{mA}$, $V_{DS}=V_{GS}$	3.0	3.8	5.0	V
$R_{DS(on)}$	Drain-source on-resistance	$I_D=450\text{A}$, $V_{GS}=18\text{V}$ $T_J=25^\circ\text{C}$		4.55	5.46	$\text{m}\Omega$
				6.04		$\text{m}\Omega$
				7.40		$\text{m}\Omega$
I_{DSS}	Drain-source leakage current	$V_{GS}=0\text{V}$, $V_{DS}=1200\text{V}$, $T_J=25^\circ\text{C}$			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	$V_{CE}=1000\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		16.53		nF
C_{oss}	Output Capacitance			0.61		nF
C_{rss}	Reverse Transfer Capacitance			0.06		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=600V, I_D=450A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ Inductive Load	$T_J=25^{\circ}C$		193		ns	
			$T_J=125^{\circ}C$		163			
			$T_J=175^{\circ}C$		159			
t_r	Rise Time		$T_J=25^{\circ}C$		85		ns	
			$T_J=125^{\circ}C$		82			
			$T_J=175^{\circ}C$		74			
$t_{d(off)}$	Turn-off Delay Time		$V_{DD}=600V, I_D=450A,$ $R_{Goff}=2.2\Omega, V_{GS}=-3/18V,$ Inductive Load	$T_J=25^{\circ}C$		369		ns
				$T_J=125^{\circ}C$		414		
				$T_J=175^{\circ}C$		433		
t_f	Fall Time	$T_J=25^{\circ}C$			48		ns	
		$T_J=125^{\circ}C$			52			
		$T_J=175^{\circ}C$			55			
E_{on}	Turn-on Switching Loss	$V_{DD}=600V, I_D=450A,$ $R_{Gon}=5.5\Omega, V_{GS}=-3/18V,$ $di/dt=5900A/\mu s(T_J=175^{\circ}C)$ Inductive Load		$T_J=25^{\circ}C$		34		mJ
		$T_J=125^{\circ}C$			35			
		$T_J=175^{\circ}C$			38			



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E _{off}	Turn-off Switching Loss	V _{DD} =600V, I _D =450A, R _{Goff} =2.2Ω, V _{GS} =-3/18V, du/dt=8100V/μs(T _J =175°C) Inductive Load	T _J =25°C		23		mJ
			T _J =125°C		25		
			T _J =175°C		26		
Q _g	Total Gate Charge	V _{GE} =+18V...-3V	T _J =25°C		824		nC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		1.6		Ω
R _{θJC}	MOSFET Thermal Resistance: Junction-to-Case (per MOSFET)					0.074	°C/W
R _{θCS}	MOSFET Thermal Resistance: Case-to-Sink (per MOSFET) (per MOSFET, λ _{grease} = 1 W/(m · K))				0.018		°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		450	A
I _{SDM}	Body Diode Maximum Forward Current	t _p =1ms	900	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} =450A, V _{GS} =-3V	T _J =25°C	5.52	6.60	V
			T _J =125°C	5.42		
			T _J =175°C	5.20		

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units.
R ₂₅	T _C =25°C		5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω	-5		+5	%
P ₂₅	T _C =25°C			10	mW
B _{25/50}	R ₂ =R ₂₅ exp[B _{25/50} (1/T ₂ -1/(298.15K))]		3380		K
B _{25/80}	R ₂ =R ₂₅ exp[B _{25/80} (1/T ₂ -1/(298.15K))]		3440		K
B _{25/100}	R ₂ =R ₂₅ exp[B _{25/100} (1/T ₂ -1/(298.15K))]		3545		K



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Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s	2500			V
Internal Isolation			Si ₃ N ₄			
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	Mounting Screw:M4		1.0		1.2	N·m
G	Weight			40		g

Ordering Information Table

Device code	M	SC	450	HF	120	B9	H
	①	②	③	④	⑤	⑥	⑦

- ① - MOSFET Module
- ② - SiC MOSFET
- ③ - Rated Current (450=450A)
- ④ - Circuit Configuration:HF (Half Bridge)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Characteristic diagram

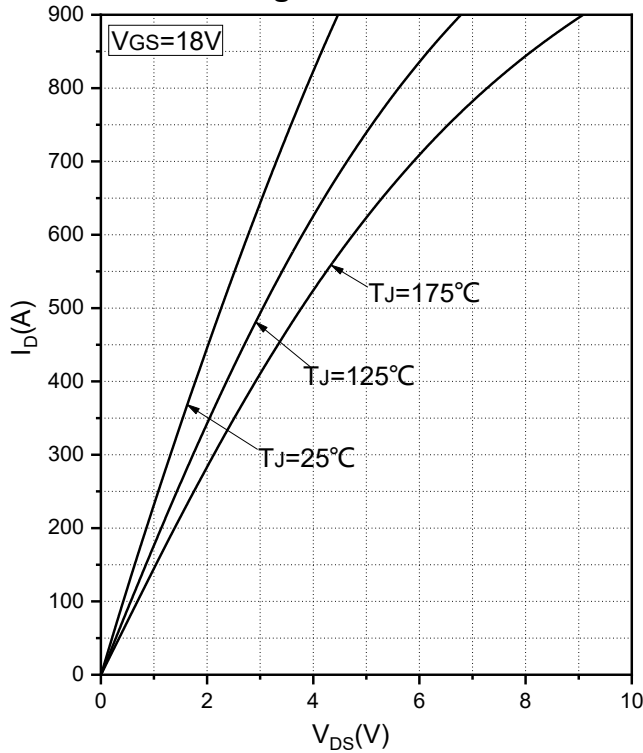


Fig.1 Typical Saturation Voltage Characteristics

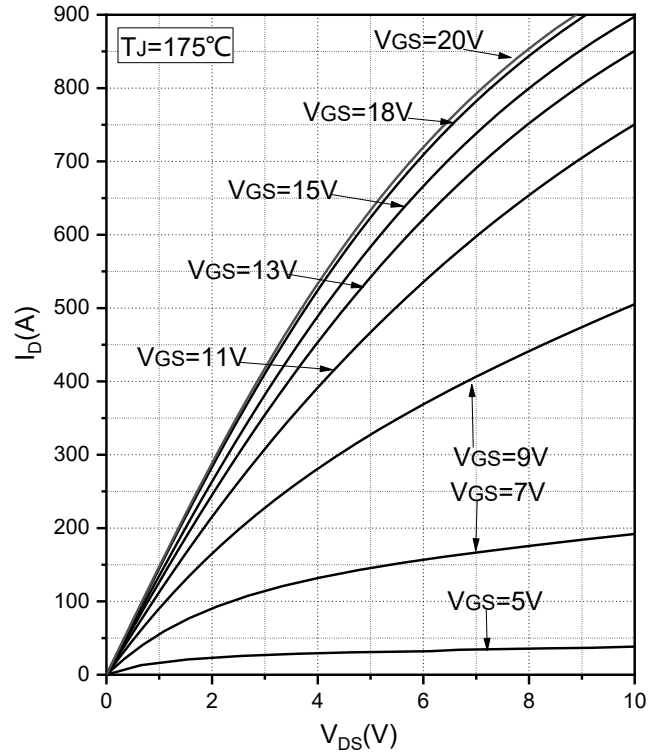


Fig.2 Typical Output Characteristics

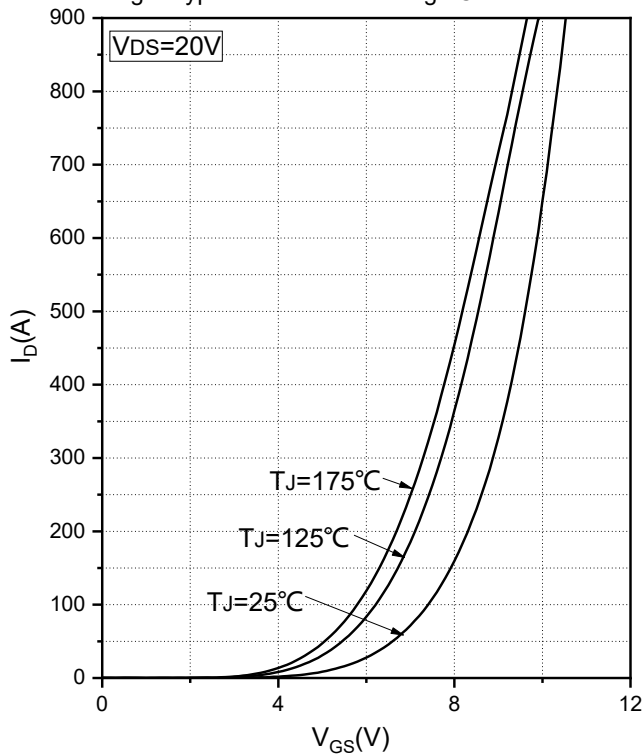


Fig.3 Transfer Characteristic

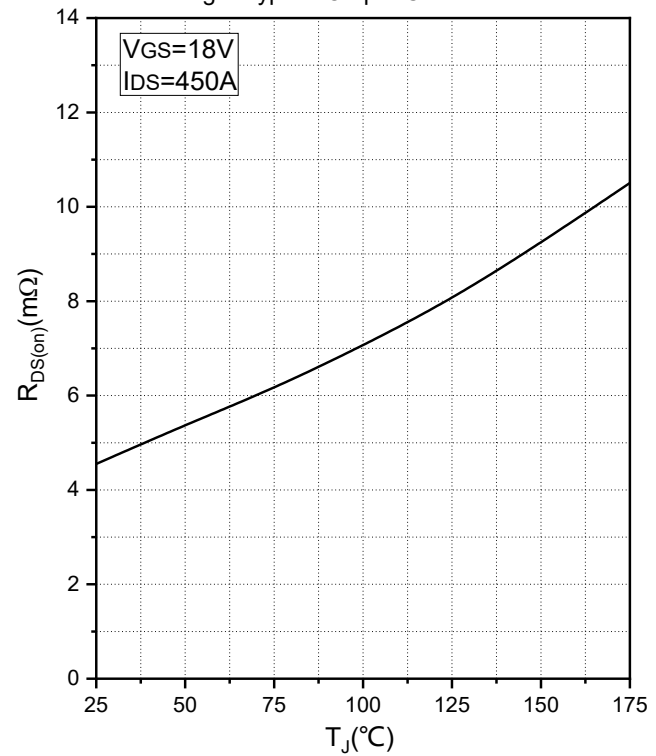


Fig.4 Drain source on-resistance

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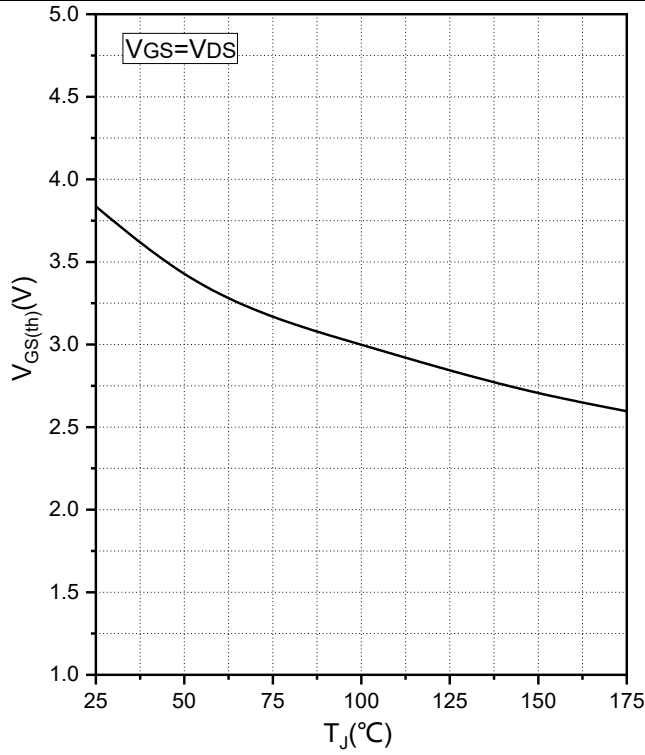


Fig.5 Gate-source threshold voltage

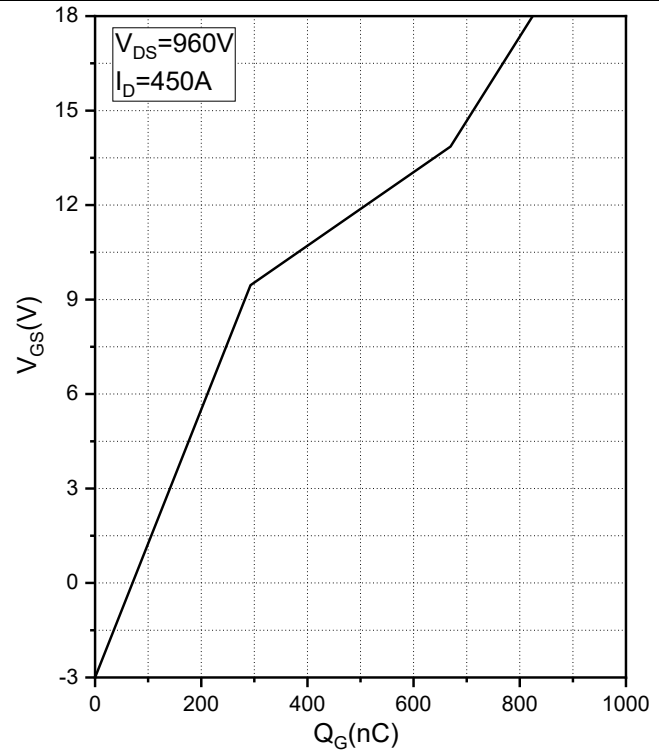


Fig.6 Gate charge characteristic

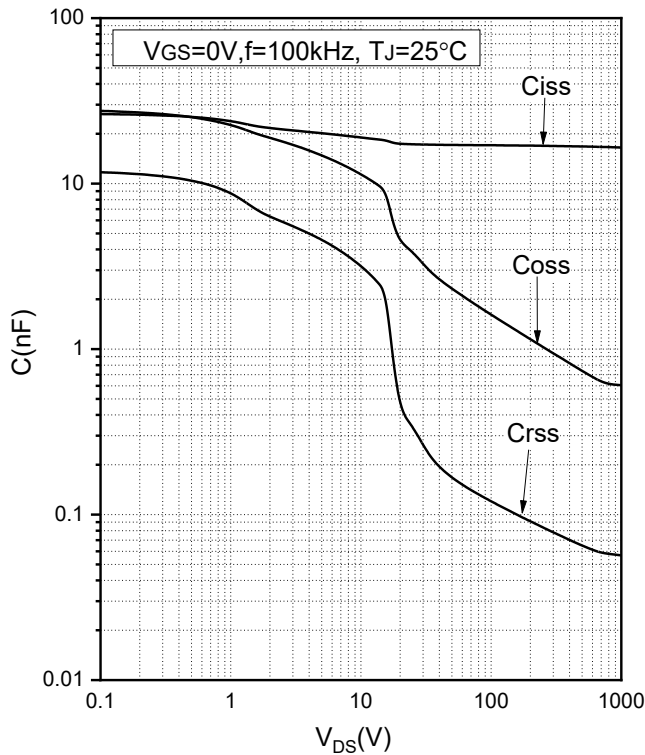


Fig.7 Capacity characteristic

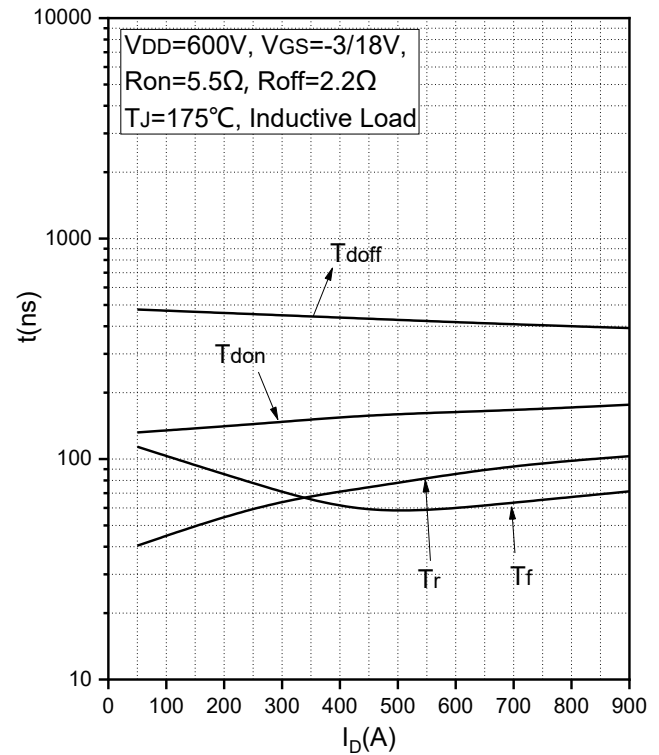
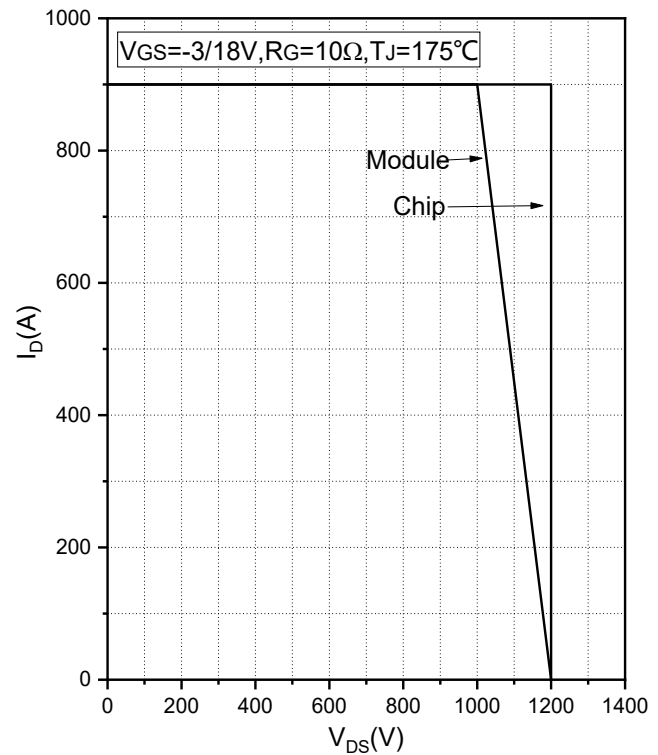
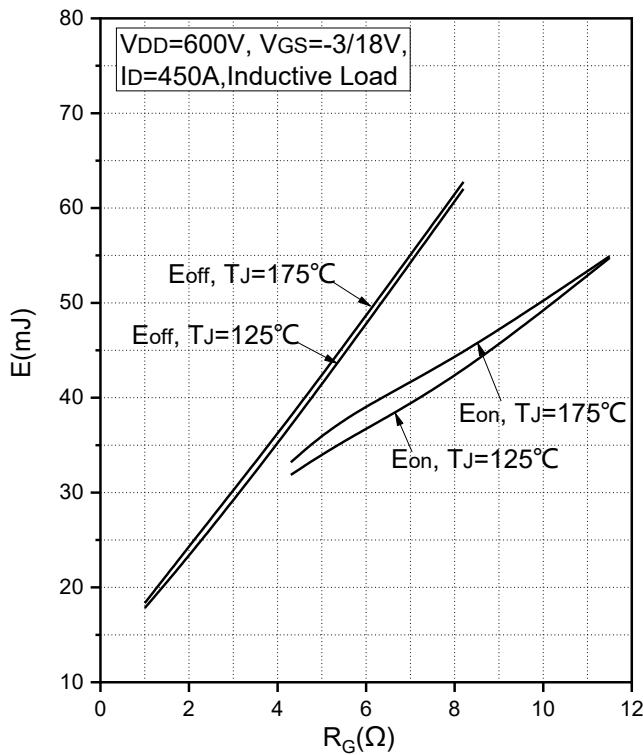
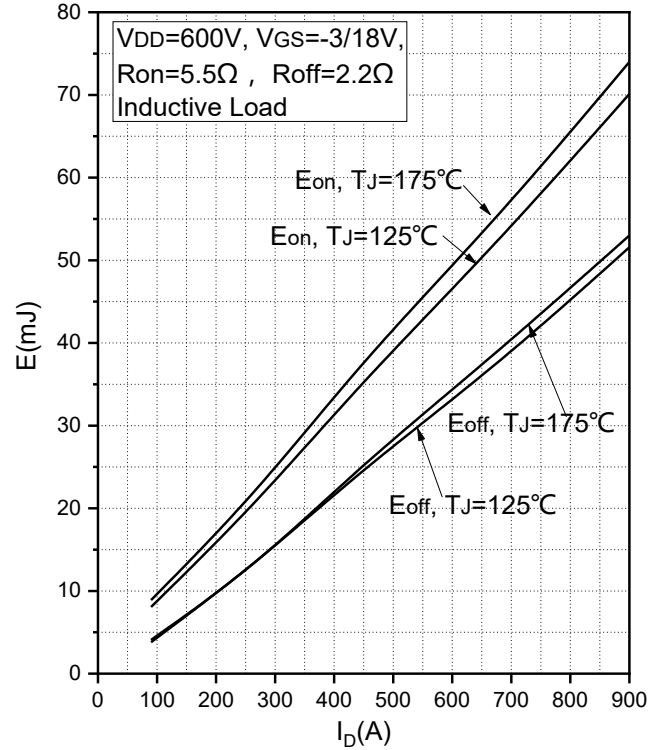
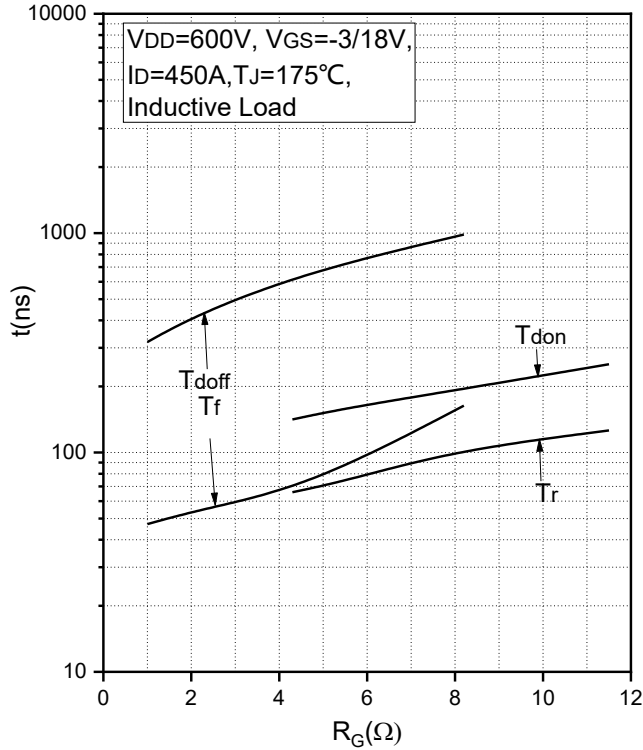


Fig.8 Typical Switching times vs Drain Current

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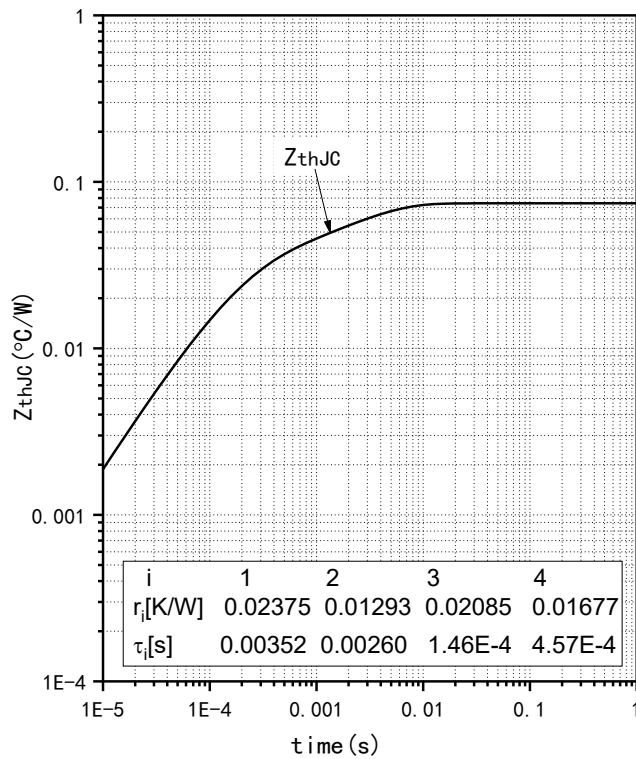


Fig.13 Transient Thermal Impedance (IGBT)

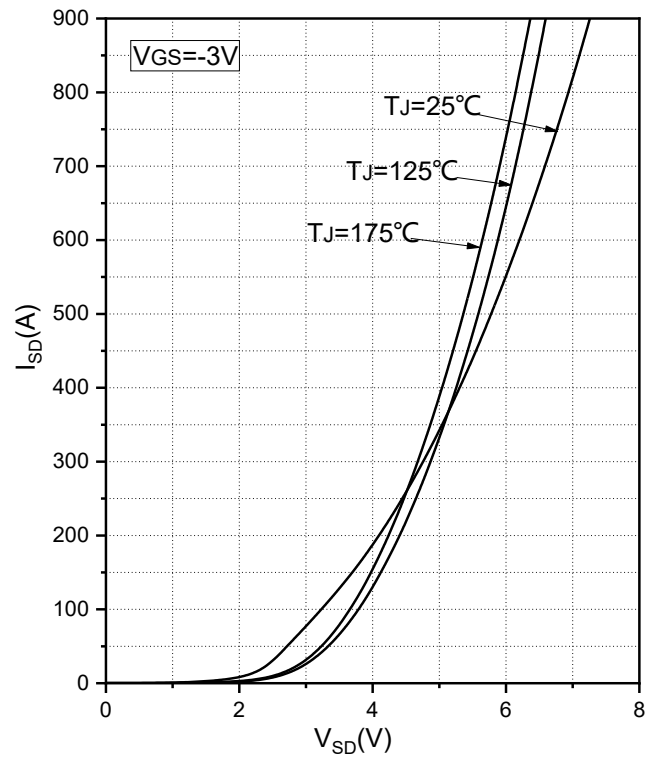


Fig.14 Typical Forward characteristic body diode

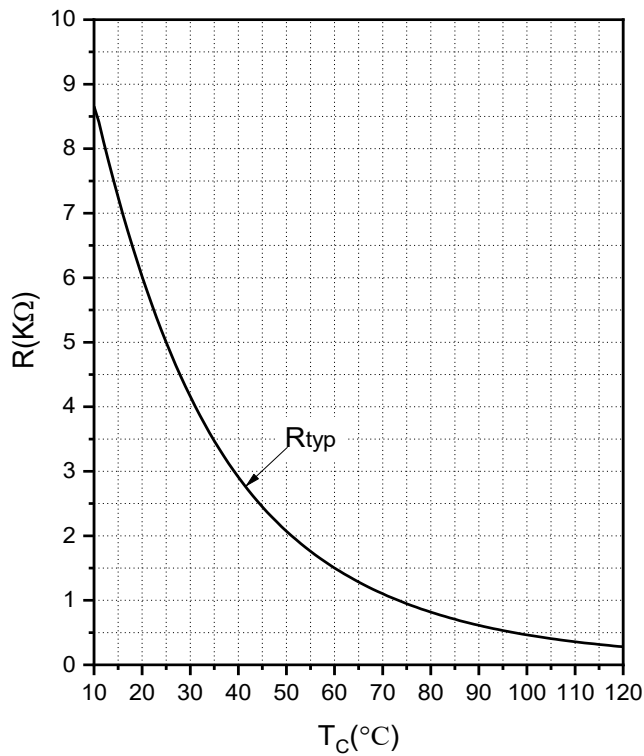


Fig.15 NTC Temperature Characteristics



Technical drawings of the PCB assembly showing dimensions in mm:

- Top View:**
 - Overall width: 62.8 ± 0.3
 - Overall height: 53.0 ± 0.2
 - Internal width segments: 48.0 ± 0.3 and 42.5 ± 0.2
 - Bottom mounting holes: $\varnothing 4.5 \pm 0.1$
 - Bottom mounting hole spacing: 12.5 ± 0.3
 - Bottom mounting hole diameter: $\varnothing 2.3 \times 8.5^{+0.3}_{-0.0}$
 - Bottom mounting hole depth: 51.0 ± 0.2
 - Bottom mounting hole width: 56.7 ± 0.3
- Bottom View:**
 - Overall width: 62.8 ± 0.3
 - Overall height: 53.0 ± 0.2
 - Internal width segments: 48.0 ± 0.3 and 42.5 ± 0.2
 - Bottom mounting holes: $\varnothing 4.5 \pm 0.1$
 - Bottom mounting hole spacing: 12.5 ± 0.3
 - Bottom mounting hole diameter: $\varnothing 2.3 \times 8.5^{+0.3}_{-0.0}$
 - Bottom mounting hole depth: 51.0 ± 0.2
 - Bottom mounting hole width: 56.7 ± 0.3
- Side View:**
 - Overall height: 15.0 ± 0.5
 - Internal height segments: 12.0 ± 0.3 and 3.4 ± 0.2

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Revision	Notes
02	Engineering Sample Datasheet

Announcement

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