GSM10MT12EP3

SiC MOSFET Half-Bridge Module

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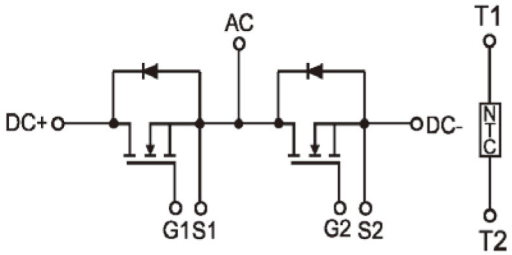
Features:

- High Frequency Switching
- Low Capacitances and Low Gate Charge
- Fast and Reliable Body Diode
- Compatible with Commercial Gate Drivers
- Low Conduction Losses at High Temperatures
- Reduced Ringing
- Fast and More Efficient Switching
- Lesser Switching Spikes and Lower Losses
- Better Power Density and System Efficiency
- Ease of Paralleling without Thermal Runaway
- Higher System Reliability
- Simple to Drive
- NTC Temperature Sensor Inside
- Press Fit Terminal

V_{DS}	1200V
$R_{DS(ON)}$ (Typ.)	10mΩ
I_{DS}	160A



Applications:

- EV Chargers
- Solar
- High-Efficiency Converters / Inverters
- Motor & Traction Drives
- Smart-Grid / Grid-Tied Distributed Generation

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

Symbol	Description		Values	Units
V_{DSS}	Drain-Source Blocking Voltage		1200	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum Values	-10/+20	V
V_{GSop}		Recommended Operational Values	-5/+15	V
I_D	Continuous Drain Current	V_{GS}=-5/+15V, T_C=25℃	226	A
		V_{GS}=-5/+15V, T_C=100℃	160	A
		V_{GS}=-5/+15V, T_C=135℃	116	A
$I_{D(pluse)}$	Pulsed Drain Current	t_p≤3μs, D≤1%, V_{GS}=15V	600	A
E_{AS}	Non-Repetitive Avalanche Energy	L=0.85mH, I_{AS}=60A	1500	mJ
P_D	Power Dissipation	T_C=25℃,T_J=175℃	493	W

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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V,I_D=200μA	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=70mA, T_J=25℃		2.30		V
		V_{DS}=V_{GS}, I_D=70mA, T_J=125℃		1.60		V
		V_{DS}=V_{GS}, I_D=70mA, T_J=150℃		1.50		V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V			1	mA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=20V, V_{DS}=0V			100	nA
		V_{GS}=-10V, V_{DS}=0V			-100	nA
$R_{DS(on)}$	On State Resistance	V_{GS}=15V, I_{DS}=160A, T_J=25℃		10.5		mΩ
		V_{GS}=15V, I_{DS}=160A, T_J=125℃		12.6		
		V_{GS}=15V, I_{DS}=160A, T_J=150℃		13.3		
g_{fs}	Transconductance	V_{DS}=20V, I_D=160A, T_J=25℃		118		S
		V_{DS}=20V, I_D=160A, T_J=150℃		105		
C_{iss}	Input Capacitance	V_{DS}=800V, f=1MHz, V_{GS} =0V, V_{AC}=25mV		11628		pF
C_{oss}	Output Capacitance			352		pF

C_{rss}	Reverse Transfer Capacitance	V_{DS}=800V, f=1MHz, V_{GS} =0V, V_{AC}=25mV			28.4		pF
E_{oss}	C_{oss} Stored Energy	V_{DS}=800V, f=1MHz, V_{GS}=0V, V_{AC}=25mV			136		μJ
Q_{oss}	C_{oss} Stored Charge				512		nC
Q_G	Total Gate Charge	V_{DS}=800V, V_{GS}=-5V to +15V, I_D=120A			360		nC
Q_{GS}	Gate-Source Charge				100		
Q_{GD}	Gate-Drain Charge				140		
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=600V, V_{GS}=-5V to +15V, I_D=120A, R_G(ext)=4.7Ω	T_J=25℃		85		ns
			T_J=125℃		82		
			T_J=150℃		79		
t_r	Rise Time		T_J=25℃		72		ns
			T_J=125℃		68		
			T_J=150℃		67		
$t_{d(off)}$	Turn-off Delay Time		T_J=25℃		164		ns
			T_J=125℃		190		
			T_J=150℃		430		
t_f	Fall Time		T_J=25℃		75		ns
			T_J=125℃		77		
			T_J=150℃		79		
E_{on}	Turn-on Switching Energy		T_J=25℃		2.0		mJ
			T_J=125℃		1.4		
			T_J=150℃		1.4		
E_{off}	Turn-off Switching Energy		T_J=25℃		1.7		mJ
			T_J=125℃		1.9		
			T_J=150℃		1.8		
$R_{G(int)-C}$	Internal Gate Resistance(chip)				0.65		Ω
$R_{\theta JC}$	Thermal Resistance Junction-to-Case for SiC MOSFET(per leg)					0.305	℃/W

Built-in SiC Body Diode
Electrical Characteristics of Diode (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
I_S	Inverse Diode Continuous, Forward Current	V_{GS}=-5V, T_C=100℃		94			A
$I_{S(pluse)}$	Inverse Diode Direct Current, Pulsed	V_{GS}=-5V			376		A
V_{SD}	Diode Forward Voltage	I_{SD}=160A, V_{GS}=-5V, T_J=25℃			5.50		V
		I_{SD}=160A, V_{GS}=-5V, T_J=125℃			5.10		V
		I_{SD}=160A, V_{GS}=-5V, T_J=150℃			5.05		V
t_{rr}	Reverse Recovery Time	I_{SD}=120A, V_{GS}=-5V to +15V, V_R=600V, -di/dt=2306A/μs (T_J=150℃)	T_J=25℃		50		ns
			T_J=125℃		61		
			T_J=150℃		63		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		1.01		uC
			T_J=125℃		2.14		
			T_J=150℃		2.26		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		32.8		A
			T_J=125℃		56.3		
			T_J=150℃		59.4		

Internal NTC-Thermistor Characteristics

R_{25}	T_C=25℃	5		kΩ
△R/R	T_C=100℃, R_{100}=481Ω		±5	%
P_{25}	T_C=25℃	50		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

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 1minute		3000		V
Internal Isolation				AL2O3 Ceramic		
	Clearance Distance: Terminal to Terminal			5.0		mm
	Clearance Distance: Terminal to Heatsink			10.0		
	Creepage Distance: Terminal to Terminal			6.3		
	Creepage Distance: Terminal to Heatsink			11.5		
L_{SCE}	Stray Inductance Module	Between Terminals DC+ and DC-		11.4		nH
T_J	Maximum Junction Temperature				175	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+125	℃
CTI	Comparative Tracking Index		200			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.08	℃/W
M	Mounting Screw:M4		1.0		1.5	N·m
G	Weight			21		g

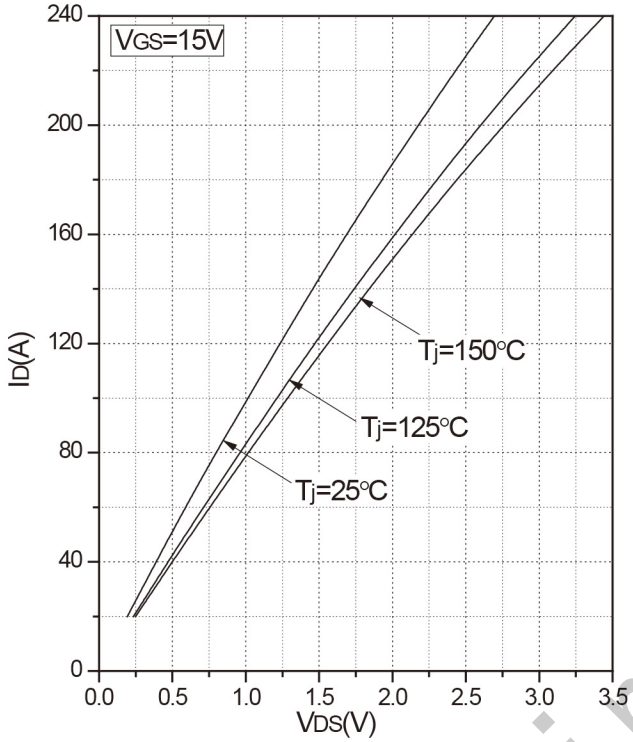


Fig.1 Transfer Characteristics

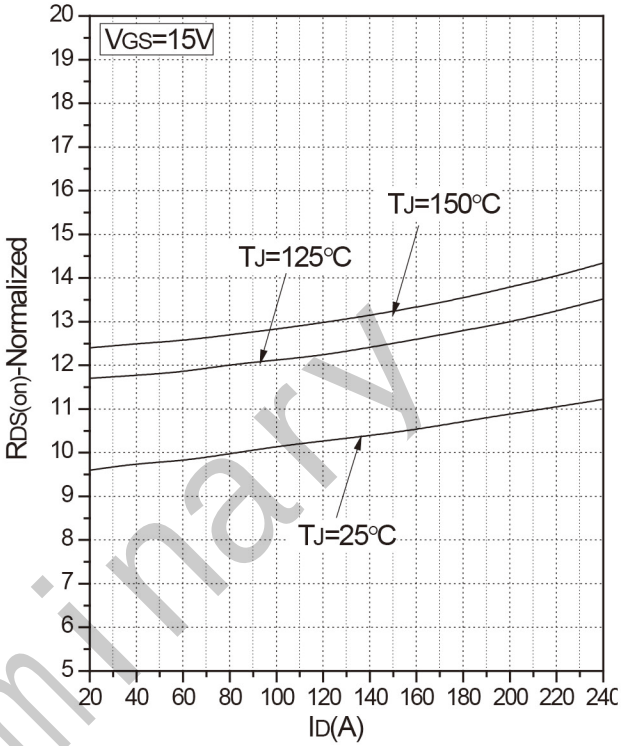


Fig.2 Normalized On-Resistance vs. Drain Current

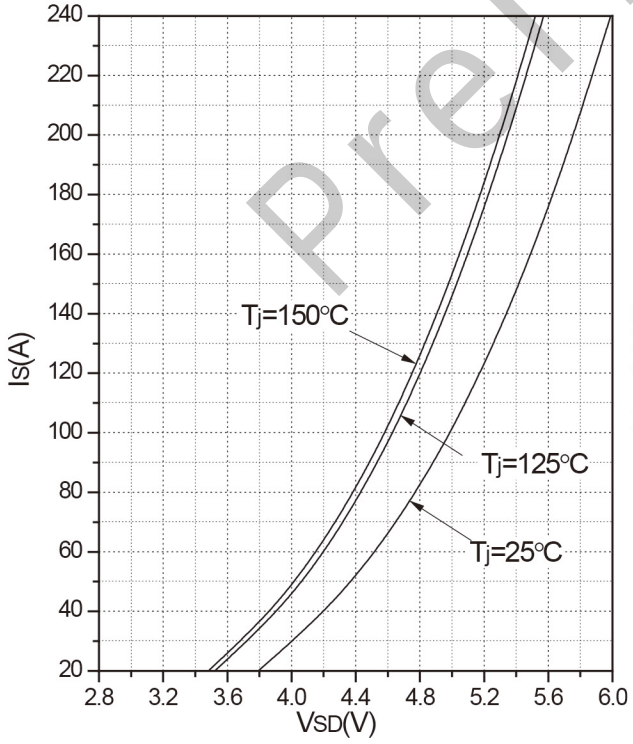


Fig.3 Forward Characteristics

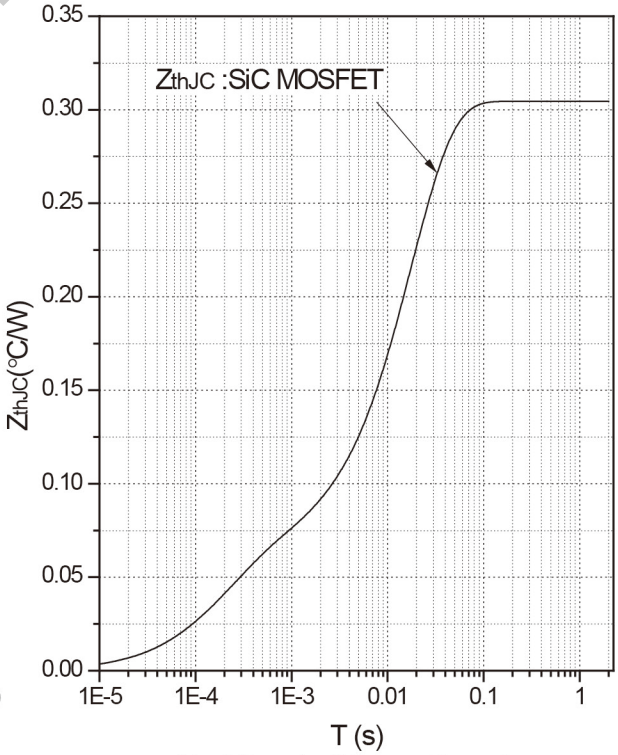


Fig.4 Transient Thermal Impedance

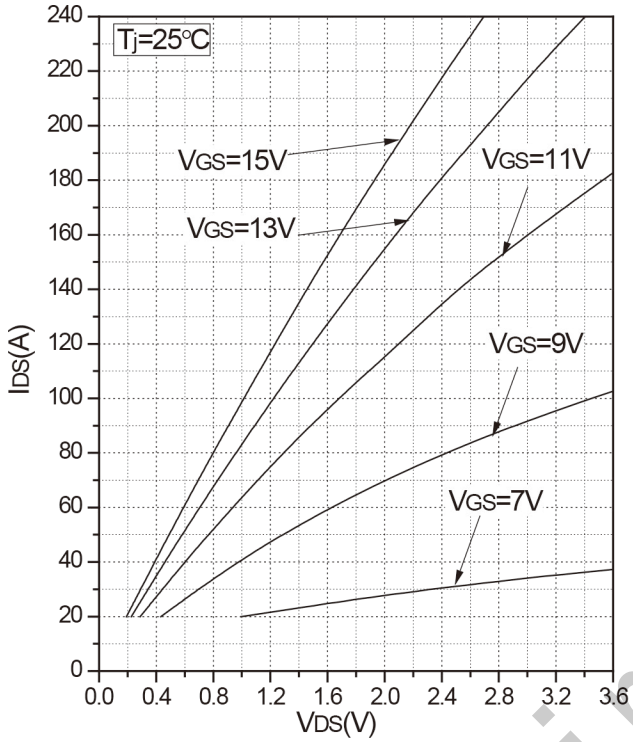


Fig.5 Typical Output Characteristics

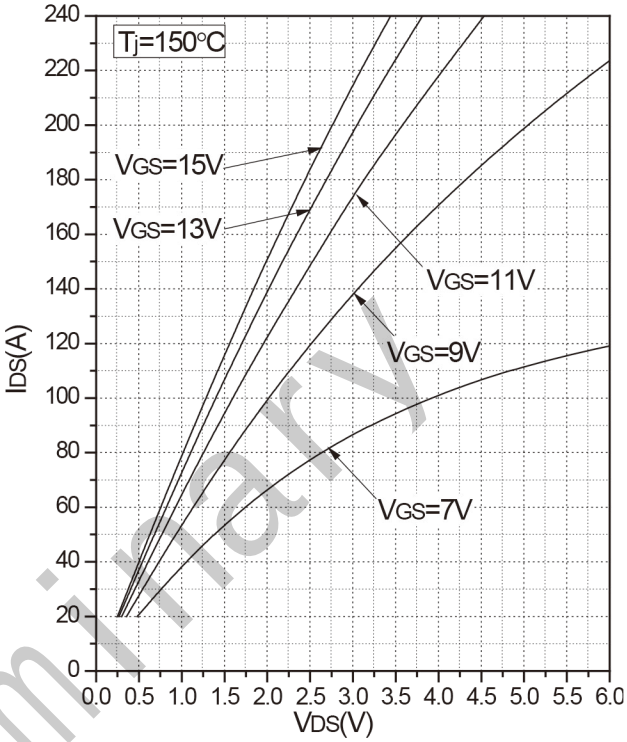


Fig.6 Typical Output Characteristics

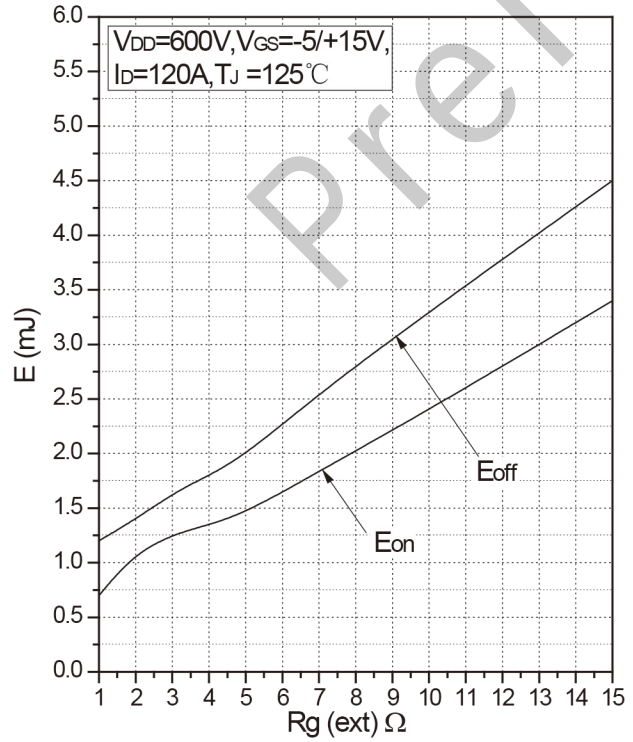


Fig.7 Inductive Switching Energy vs. R_G(ext)

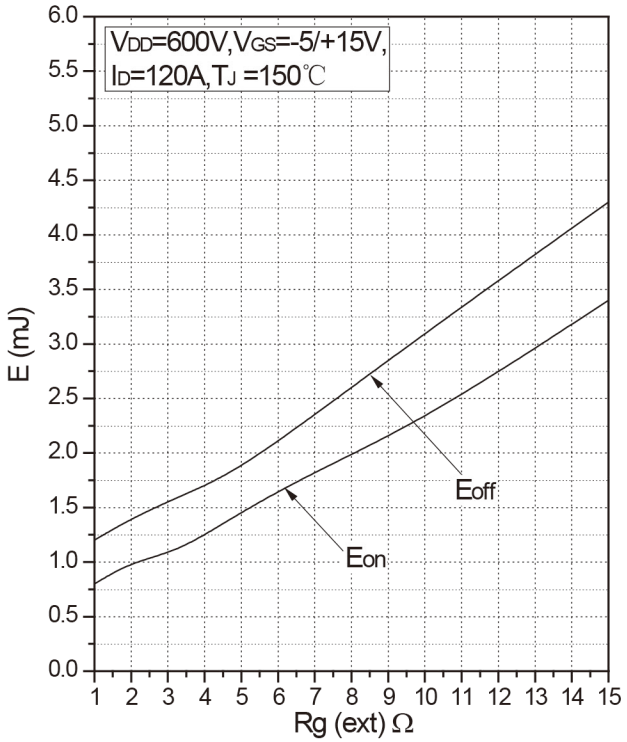
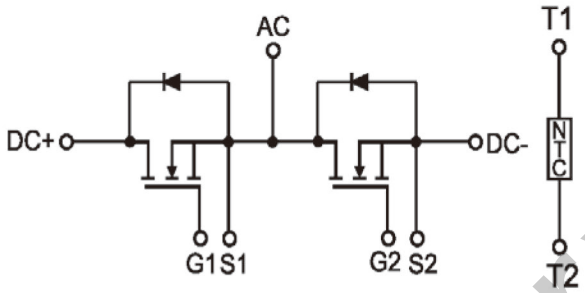
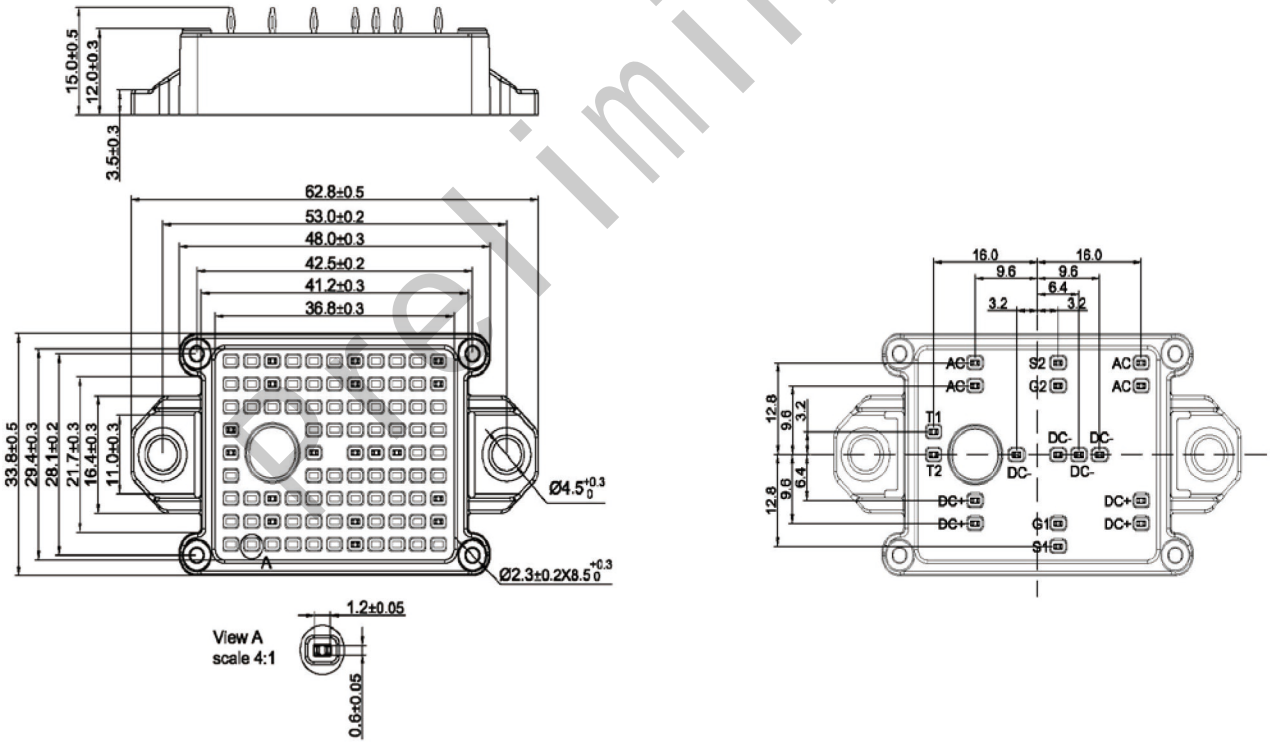


Fig.8 Inductive Switching Energy vs. R_G(ext)

Internal Circuit



Package Outline (Unit: mm):



Date	Revision	Notes
01/19/2023	01	Initial Release

Announcement

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The released datasheet would be issued with “REV.” + “alphabet characters”.

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