



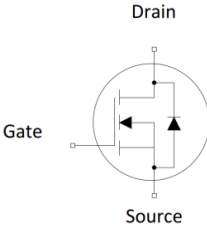


**100V N-Channel Trench MOSFET(Preliminary)**

General Description <ul style="list-style-type: none"> Trench Power Technology Low $R_{DS(ON)}$ Low Gate Charge Optimized for fast-switching Applications Applications <ul style="list-style-type: none"> Synchronous Rectification in DC/DC and AC/DC Converters Isolated DC/DC Converters in Telecom and Industrial 		Product Summary <table> <tr> <td>VDS</td> <td>100V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>60A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 16.5mΩ</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=4.5V$)</td> <td>< 17.5mΩ</td> </tr> <tr> <td>100% UIS Tested</td> <td></td> </tr> </table>		VDS	100V	I_D (at $V_{GS}=10V$)	60A	$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 16.5m Ω	$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 17.5m Ω	100% UIS Tested	
VDS	100V												
I_D (at $V_{GS}=10V$)	60A												
$R_{DS(ON)}$ (at $V_{GS}=10V$)	< 16.5m Ω												
$R_{DS(ON)}$ (at $V_{GS}=4.5V$)	< 17.5m Ω												
100% UIS Tested													
													
Device	Package	Form	Marking										
TTP60N10AT	TO-220	Tube	60N10AT										

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)			
Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ^B	I_D	$T_C = 25^\circ\text{C}$	60
		$T_C = 100^\circ\text{C}$	48
Pulsed Drain Current ^A	I_{DM}	180	A
Avalanche Current ^A	I_{AS}	30	A
Single Pulse Avalanche Energy $L = 0.3\text{mH}$ ^A	E_{AS}	135	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	142
		$T_C = 100^\circ\text{C}$	47.6
Operating Junction and Storage Temperature Range	T_J, T_{SGT}	-55 to 175	$^\circ\text{C}$

Thermal Resistance			
Parameter		Symbol	Maximum
Thermal Resistance, Junction-to-Case	Steady-State	R_{thJC}	1.05
Thermal Resistance, Junction-to-Ambient	Steady-State	R_{thJA}	100



Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted)							
Symbol	Parameter	Conditions	Value			Units	
			Min	Typ	Max		
STATIC PARAMETERS							
BV_{DSS}	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	100	--	--	V	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$	--	--	1	μA
			$T_J = 100^\circ\text{C}$	--	--	25	
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	--	--	± 100	nA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.0	1.5	2.4	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 30\text{A}$	--	12.5	16.5	$\text{m}\Omega$	
		$V_{GS} = 4.5\text{V}, I_D = 30\text{A}$	--	13.5	17.5	$\text{m}\Omega$	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 20\text{A}$	47	--	--	S	
V_{SD}	Diode Forward Voltage	$I_S = 20\text{A}, V_{GS} = 0\text{V}$	--	--	1	V	
I_S	Maximum Body-Diode Continuous Current ^B		--	--	60	A	
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$	--	8491	--	pF	
C_{oss}	Output Capacitance		--	206	--		
C_{rss}	Reverse Transfer Capacitance		--	175	--		
SWITCHING PARAMETERS							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 50\text{V}, I_D = 30\text{A}$	--	150	--	nC	
Q_{gs}	Gate Source Charge		--	20	--		
Q_{gd}	Gate Drain Charge		--	22	--		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 50\text{V}, I_D = 30\text{A}, R_G = 2.5\Omega$	--	17	--	ns	
t_r	Turn-On Rise Time		--	14	--		
$T_{D(off)}$	Turn-Off Delay Time		--	56	--		
t_f	Turn-Off Fall Time		--	18	--		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 30\text{A}, di/dt = 100\text{A}/\mu\text{s}$	--	35	--	ns	
Q_{rr}	Body Diode Reverse Recovery Charge		--	58	--	nC	

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

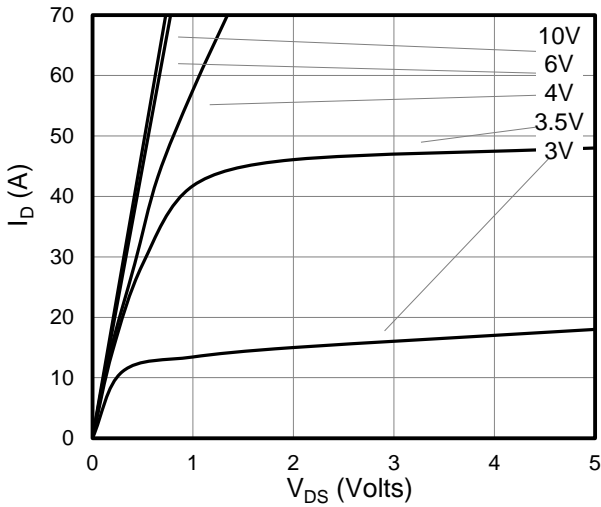


Figure 1: On-Region Characteristics

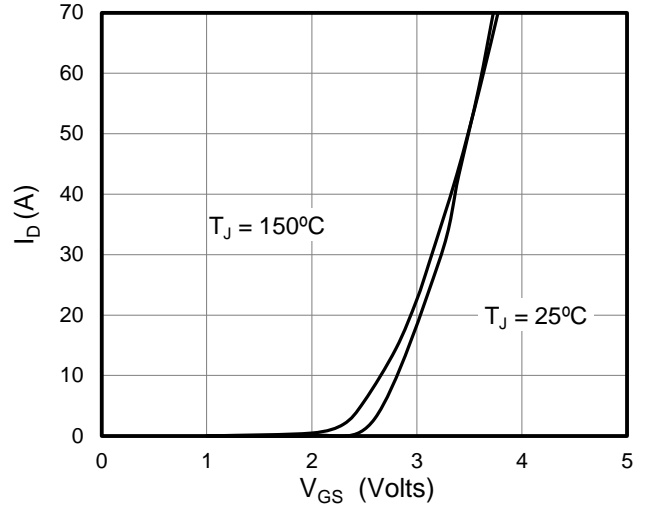


Figure 2: Transfer Characteristics

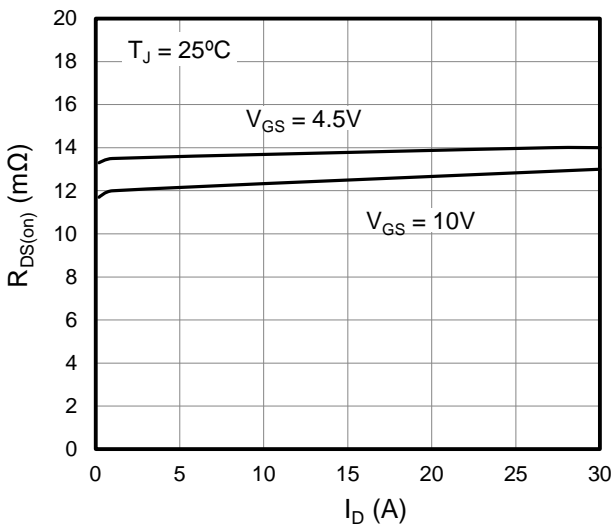


Figure 3: On-Resistance vs. Drain Current

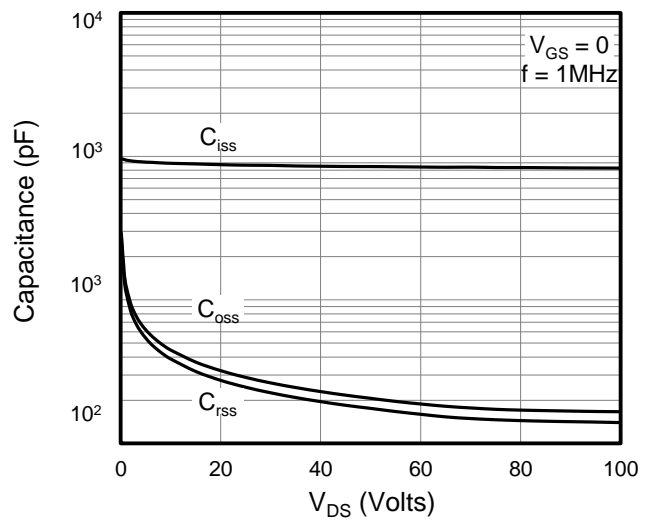


Figure 4: Capacitance Characteristics

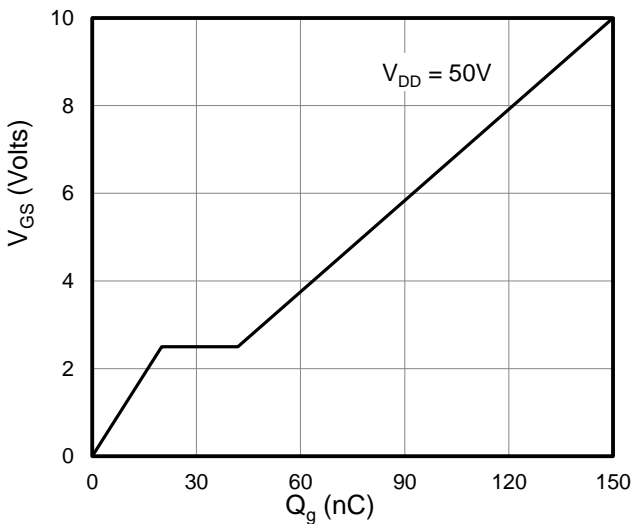


Figure 5: Gate Charge Characteristics

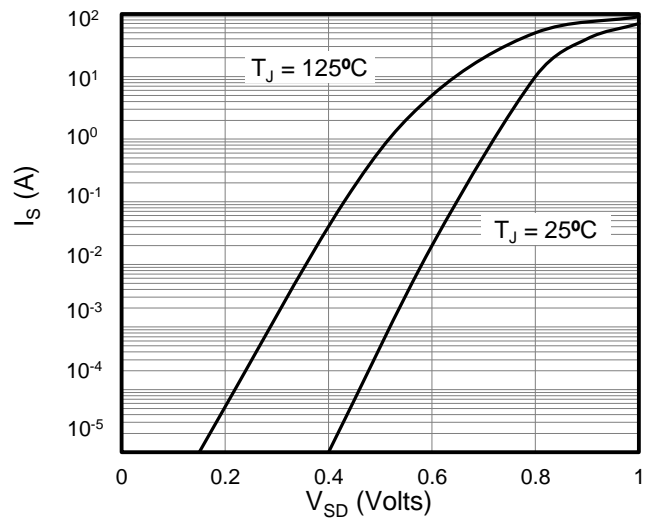


Figure 6: Body Diode Forward Voltage



Typical Characteristics $T_J = 25^{\circ}\text{C}$, unless otherwise noted

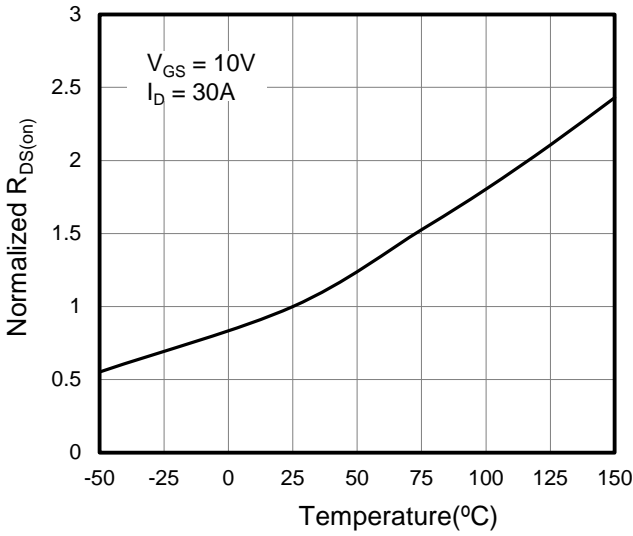


Figure 7: On-Resistance vs. Junction Temperature

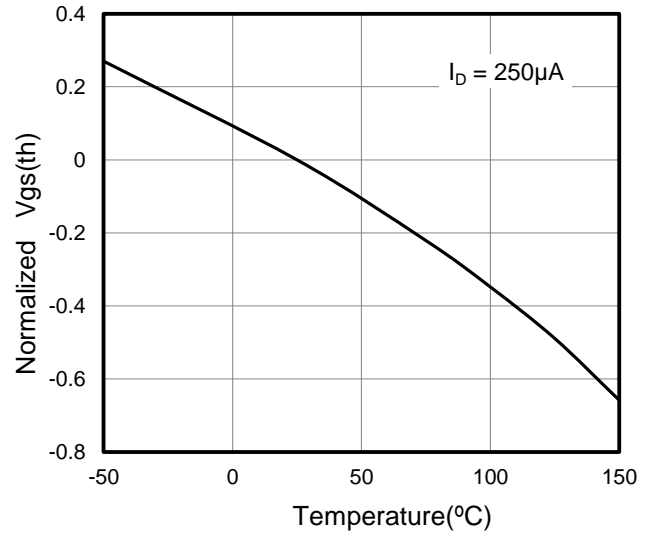


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

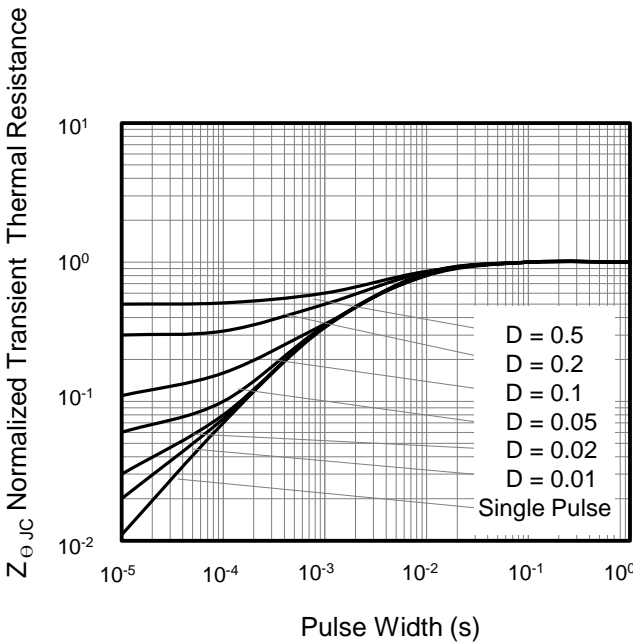


Figure 9: Normalized Transient Thermal Resistance

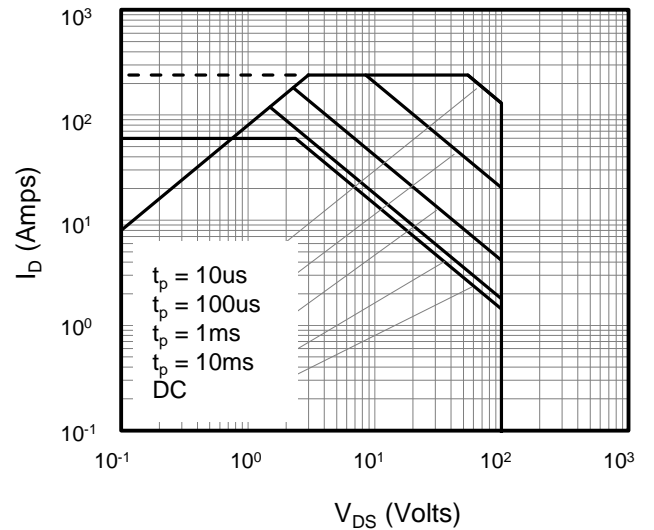


Figure 10: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveform

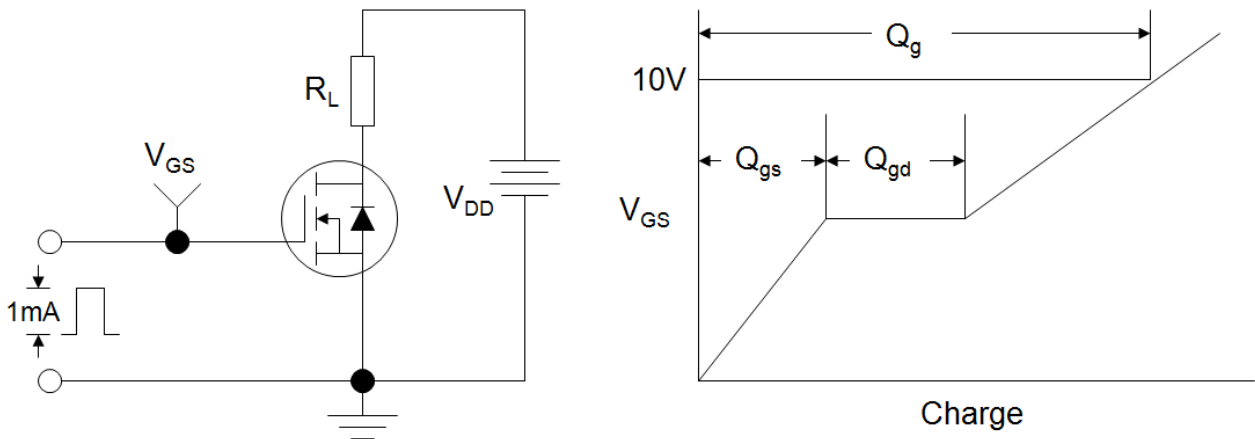
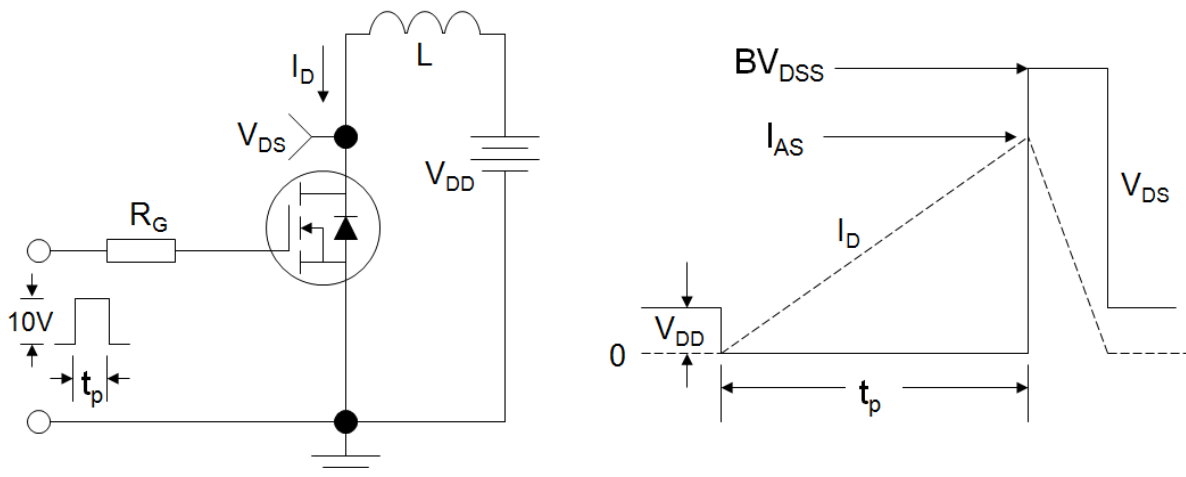


Figure B: Resistive Switching Test Circuit and Waveform

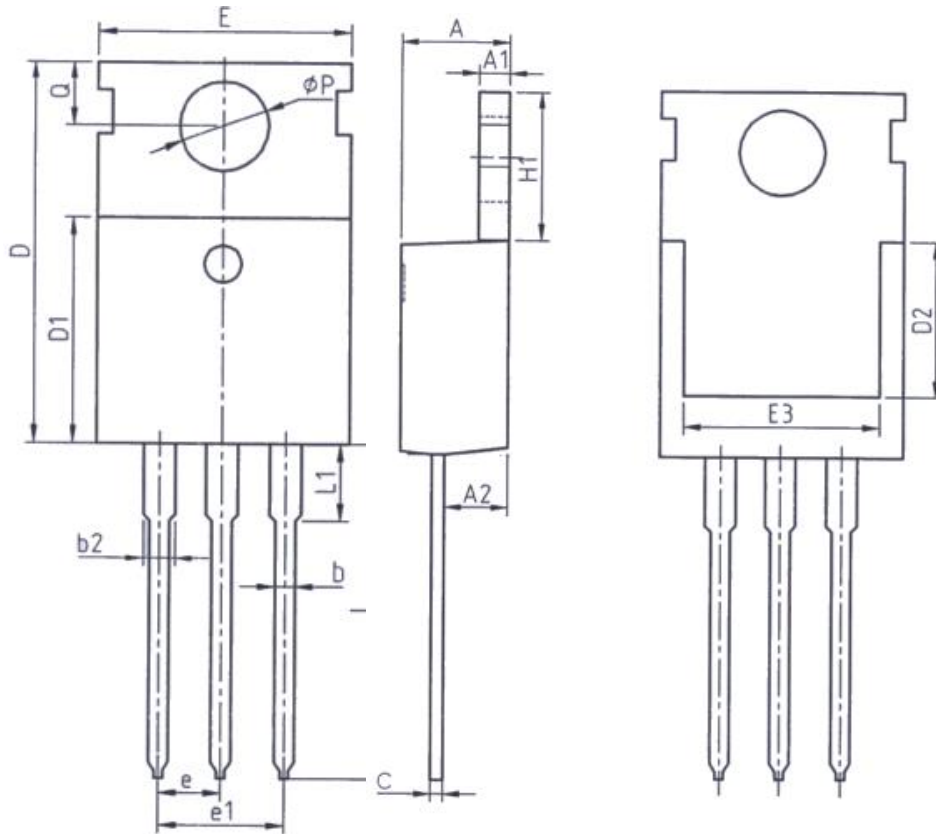


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-220



Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.25	1.45
A2	2.20	2.60
b	0.70	0.95
b2	1.17	1.47
c	0.40	0.65
D	15.10	16.10
D1	8.80	9.40
D2	5.50	-

Unit: mm		
Symbol	Min.	Max.
E	9.70	10.30
E3	7.00	-
e	2.54BSC	
e1	5.08BSC	
H1	6.25	6.85
L	12.75	13.80
L1	-	3.40
P	3.40	3.80
Q	2.60	3.00



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