12V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

BV_{DSS}	$R_{DS(ON)}$ MAX	I_D T_A = +25°C
12V	10mΩ @ V_{GS} = 4.5V	9.3A
	12mΩ @ V_{GS} = 2.5V	8.5A
	14mΩ @ V_{GS} = 1.8V	7.9A
	18mΩ @ V_{GS} = 1.5V	6.9A
	41mΩ @ V_{GS} = 1.2V	4.6A

Description and Applications

This MOSFET is designed to meet the stringent requirements of automotive applications. It is qualified to AEC-Q101, supported by a PPAP, and is ideal for use in:

- Load Switch
- DC-DC Converters
- Power Management Functions

Features

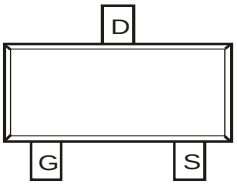
- Low On-Resistance
- ESD Protected Gate
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The DMN1019USNQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

Mechanical Data

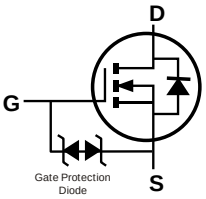
- Case: SC59
- Case Material: Molded Plastic. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Solderable per MIL-STD-202, Method 208 e3
- Terminal Connections: See Diagram
- Weight: 0.014 grams (Approximate)

SC59

Top View



Top View
Pin Configuration



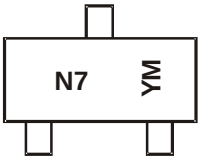
Equivalent Circuit

Ordering Information (Note 4)

Part Number	Case	Packaging
DMN1019USNQ-7	SC59	3,000/Tape & Reel
DMN1019USNQ-13	SC59	10,000/Tape & Reel

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



N7 = Product Type Marking Code
YM = Date Code Marking
Y = Year ex: I = 2021
M = Month ex: 9 = September

Date Code Key

Year	2019	…	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Code	G	…	I	J	K	L	M	N	O	P	R	S

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Unit
Drain-Source Voltage			V_{DSS}	12	V
Gate-Source Voltage			V_{GSS}	±8	V
Continuous Drain Current (Note 6) V_{GS} = 4.5V	Steady State	T_A = +25°C T_A = +70°C	I_D	9.3 7.4	A
	t < 10s	T_A = +25°C T_A = +70°C	I_D	11 8.8	A
Pulsed Drain Current (10µs Pulse, Duty Cycle = 1%)			I_{DM}	70	A
Maximum Body Diode Forward Current (Note 6)			I_S	2	A

Thermal Characteristics

Characteristic		Symbol	Value	Unit
Total Power Dissipation (Note 5)	T_A = +25°C	P_D	0.68	W
Thermal Resistance, Junction to Ambient (Note 5)	Steady State	$R_{\theta JA}$	160	°C/W
Total Power Dissipation (Note 6)	T_A = +25°C	P_D	1.2	W
Thermal Resistance, Junction to Ambient (Note 6)	Steady State	$R_{\theta JA}$	96	°C/W
Thermal Resistance, Junction to Case (Note 6)		$R_{\theta JC}$	18	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS (Note 7)						
Drain-Source Breakdown Voltage	BV_{DSS}	12	—	—	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	—	—	1	µA	V_{DS} = 12V, V_{GS} = 0V
Gate-Body Leakage	I_{GSS}	—	—	±2	µA	V_{GS} = ±8V, V_{DS} = 0V
ON CHARACTERISTICS (Note 7)						
Gate Threshold Voltage	$V_{GS(TH)}$	0.35	0.53	0.8	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance	$R_{DS(ON)}$	—	7	10	mΩ	V_{GS} = 4.5V, I_D = 9.7A
		—	8	12		V_{GS} = 2.5V, I_D = 9A
		—	10	14		V_{GS} = 1.8V, I_D = 8.1A
		—	14	18		V_{GS} = 1.5V, I_D = 4.5A
		—	28	41		V_{GS} = 1.2V, I_D = 2.4A
Diode Forward Voltage	V_{SD}	—	0.8	1.2	V	V_{GS} = 0V, I_S = 10A
DYNAMIC CHARACTERISTICS (Note 8)						
Input Capacitance	C_{iss}	—	2426	—	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz
Output Capacitance	C_{oss}	—	396	—	pF	
Reverse Transfer Capacitance	C_{rss}	—	375	—	pF	
Gate Resistance	R_g	—	1.1	—	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (V_{GS} = 8V)	Q_g	—	50.6	—	nC	V_{DS} = 4V, I_D = 10A
Total Gate Charge (V_{GS} = 4.5V)	Q_g	—	27.3	—		
Gate-Source Charge	Q_{gs}	—	3.4	—		
Gate-Drain Charge	Q_{gd}	—	5.2	—		
Turn-On Delay Time	$t_{D(ON)}$	—	7.6	—	ns	V_{DD} = 4V, V_{GEN} = 5V, I_D = 10A, R_G = 1Ω, R_L = 0.4Ω
Turn-Off Delay Time	$t_{D(OFF)}$	—	22.2	—	ns	
Turn-On Rise Time	t_R	—	57.6	—	ns	
Turn-Off Fall Time	t_F	—	16.8	—	ns	

Notes:
5. Device mounted on FR-4 PCB with minimum recommended pad layout, single sided. The power dissipation P_D is based on t < 10s $R_{\theta JA}$.
6. Device mounted on 1" × 1" FR-4 PCB with high coverage 2 oz. Copper, single sided. The power dissipation P_D is based on t < 10s $R_{\theta JA}$.
7. Short duration pulse test used to minimize self-heating effect.
8. Guaranteed by design. Not subject to production testing.

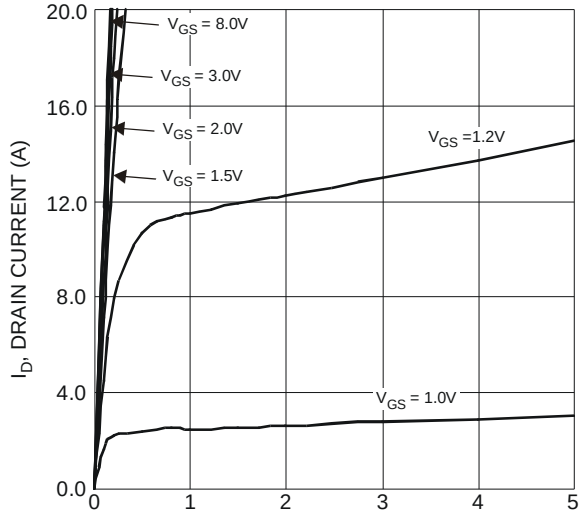


Figure 1 Typical Output Characteristics

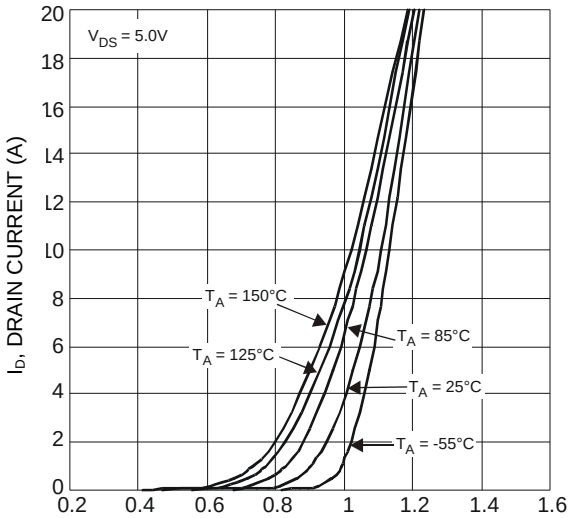


Figure 2 Typical Transfer Characteristics

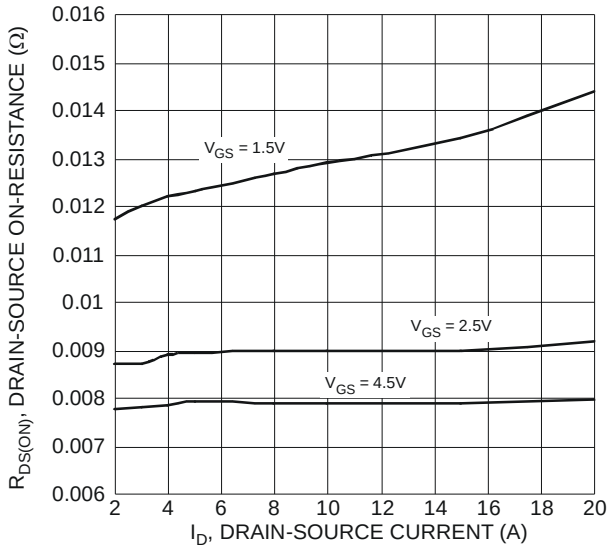


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

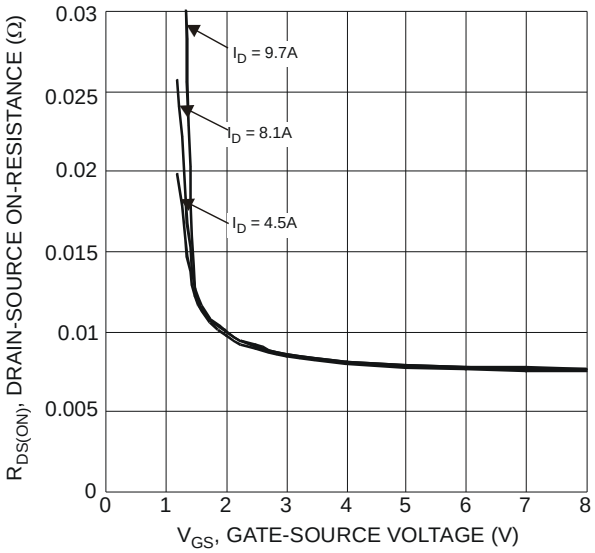


Figure 4 Typical Transfer Characteristics

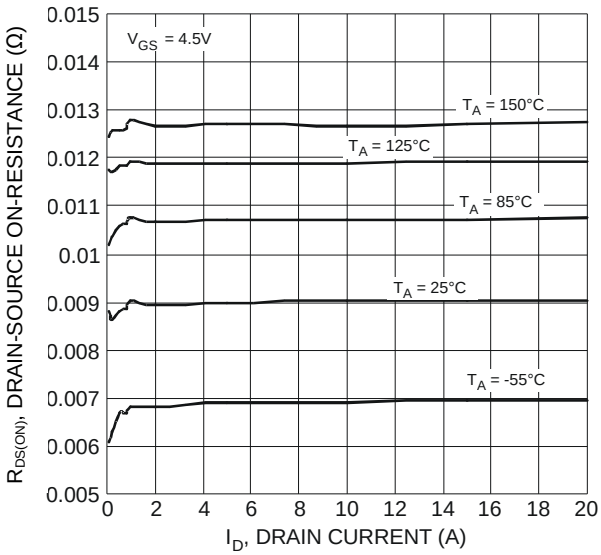


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

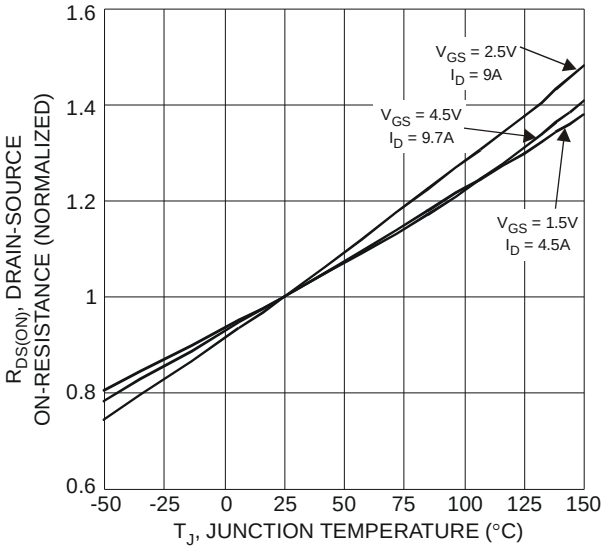


Figure 6 On-Resistance Variation with Temperature

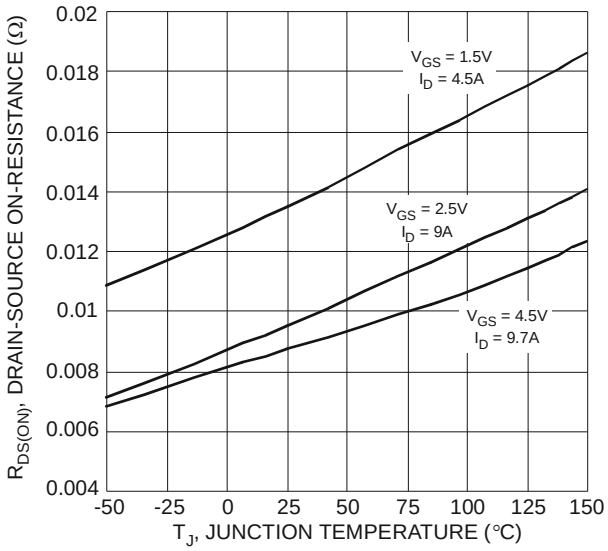


Figure 7 On-Resistance Variation with Temperature

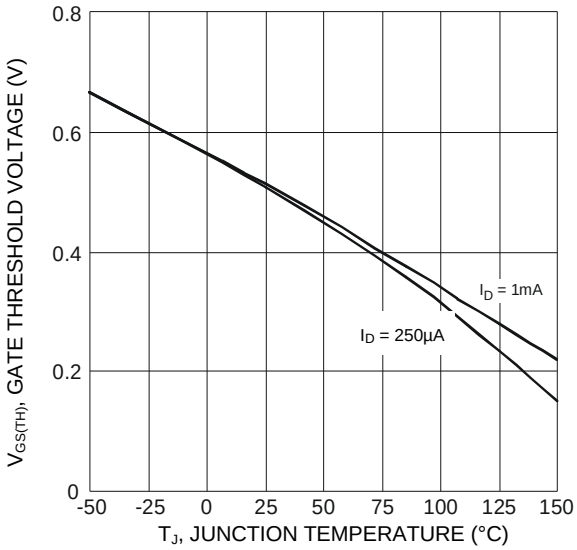


Figure 8 Gate Threshold Variation vs. Junction Temperature

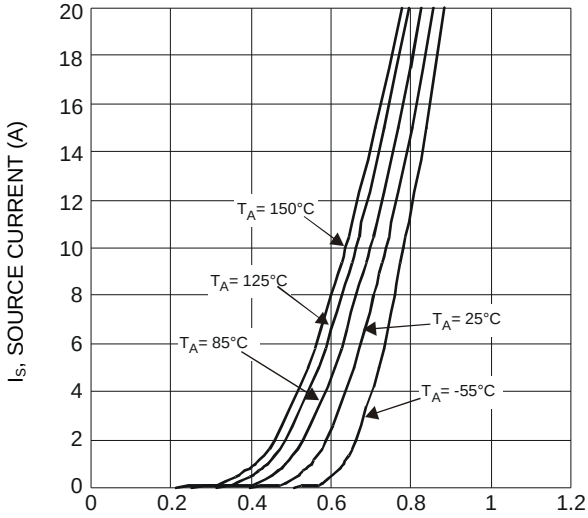


Figure 9 Diode Forward Voltage vs. Current

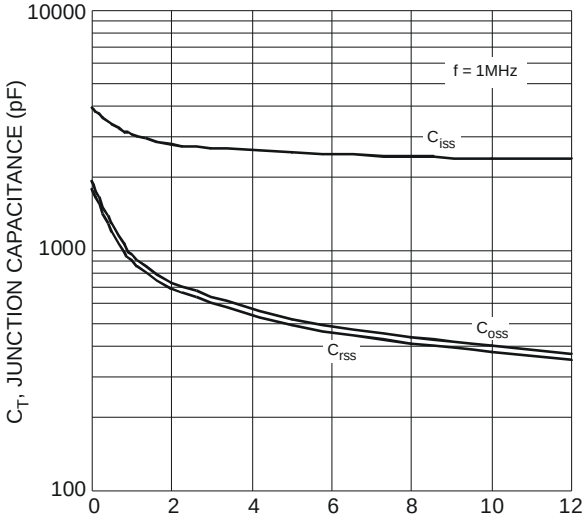


Figure 10 Typical Junction Capacitance

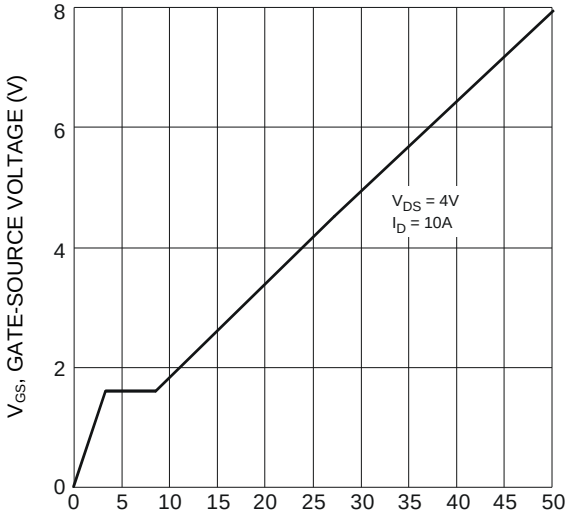


Figure 11 Gate Charge

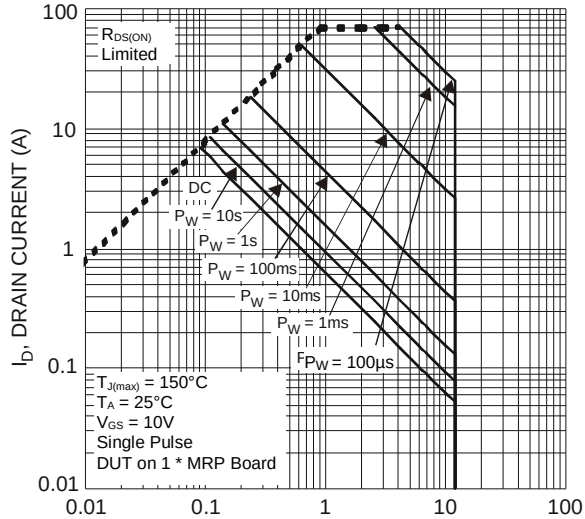


Figure 12 SOA, Safe Operation Area

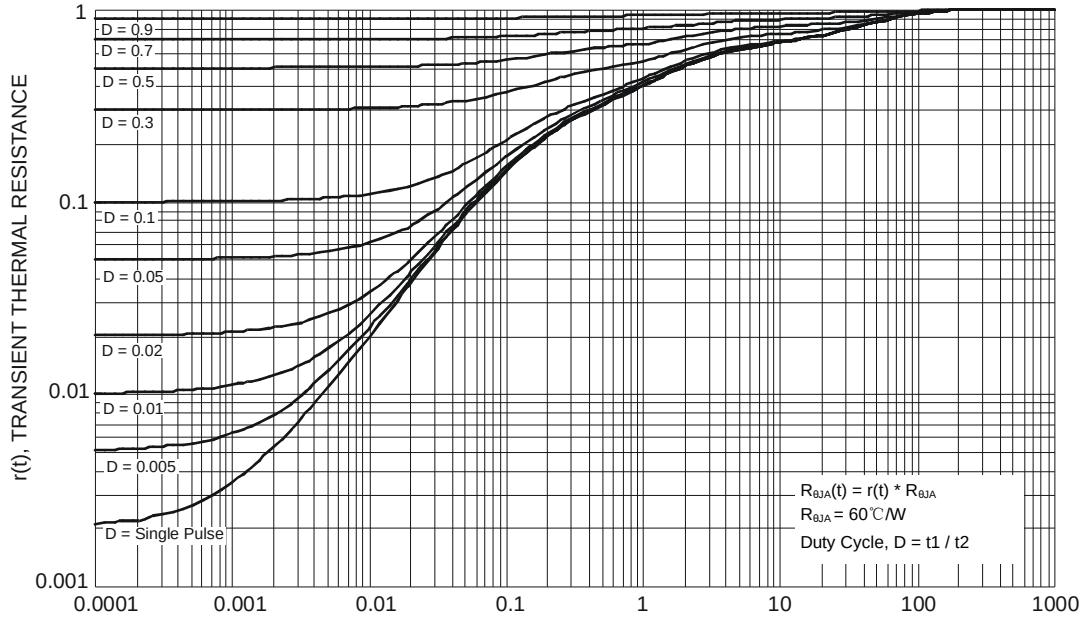


Figure 13 Transient Thermal Resistance

Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

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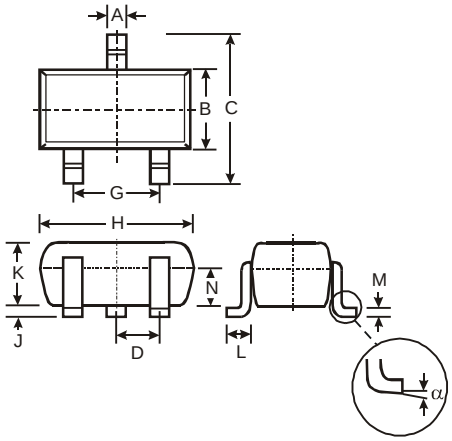
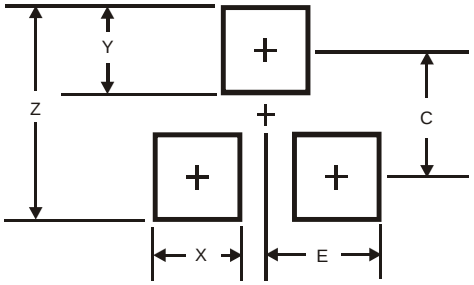


SC59			
Dim	**Min**	**Max**	**Typ**
A	0.35	0.50	0.38
B	1.50	1.70	1.60
C	2.70	3.00	2.80
D	-	-	0.95
G	-	-	1.90
H	2.90	3.10	3.00
J	0.013	0.10	0.05
K	1.00	1.30	1.10
L	0.35	0.55	0.40
M	0.10	0.20	0.15
N	0.70	0.80	0.75
α	0°	8°	-
All Dimensions in mm			

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SC59



Dimensions	Value (in mm)
Z	3.4
X	0.8
Y	1.0
C	2.4
E	1.35

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