

**DUAL N-CHANNEL ENHANCEMENT MODE MOSFET**

**Product Summary**

$V_{(BR)DSS}$	$R_{DS(ON)}$ max	$I_D$ max $T_A = +25^\circ C$
20V	45mΩ @ $V_{GS} = 4.5V$	4.5A
	55mΩ @ $V_{GS} = 2.5V$	4.1A

**Features and Benefits**

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Description**

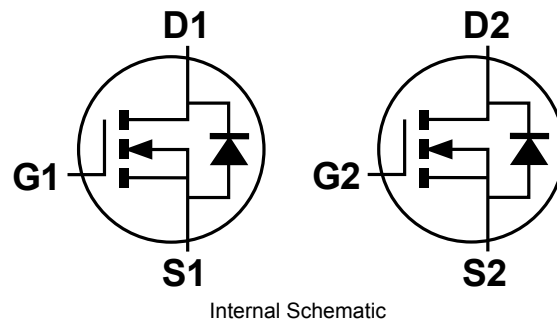
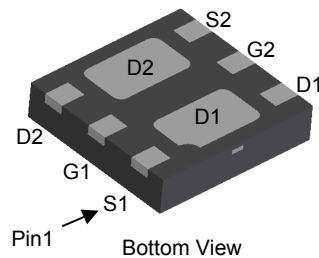
This MOSFET has been designed to minimize the on-state resistance ( $R_{DS(on)}$ ) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

**Applications**

- Battery Charging
- Power Management Functions
- DC-DC Converters
- Portable Power Adaptors

**Mechanical Data**

- Case: U-DFN2020-6 Type B
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.0065 grams (approximate)

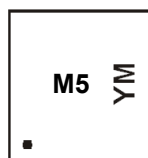


**Ordering Information (Note 4)**

Part Number	Case	Packaging
DMN2050LFDB -7	DFN2020-6 Type B	3,000/Tape & Reel
DMN2050LFDB -13	DFN2020-6 Type B	10,000/Tape & Reel

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 <http://www.diodes.com/products/packages.html>

**Marking Information**



M5 = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: A = 2013)  
 M = Month (ex: 9 = September)

Date Code Key

Year	2009	2010	2011	2012	2013	2014	2015					
Code	W	X	Y	Z	A	B	C					
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<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic			Symbol	Value	Units
Drain-Source Voltage			V <sub>DSS</sub>	20	V
Gate-Source Voltage			V <sub>GSS</sub>	±12	V
Continuous Drain Current (Note 5) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	3.3	A
		T <sub>A</sub> = +70°C		2.6	
Continuous Drain Current (Note 6) V <sub>GS</sub> = 4.5V	Steady State	T <sub>A</sub> = +25°C	I <sub>D</sub>	4.5	A
		T <sub>A</sub> = +70°C		3.6	
Maximum Continuous Body Diode Forward Current (Note 6)			I <sub>S</sub>	1	A
Pulsed Drain Current (10μs pulse, duty cycle = 1%)			I <sub>DM</sub>	25	A
Avalanche Current (Note 7) L = 0.1mH			I <sub>AR</sub>	9	A
Repetitive Avalanche Energy (Note 7) L = 0.1mH			E <sub>AR</sub>	4.5	mJ

**Thermal Characteristics**

Characteristic		Symbol	Value	Units
Total Power Dissipation (Note 5)	T <sub>A</sub> = +25°C	P <sub>D</sub>	0.73	W
	T <sub>A</sub> = +70°C		0.46	
Thermal Resistance, Junction to Ambient (Note 5)	Steady state	R <sub>θJA</sub>	173	°C/W
	t < 10s		110	
Total Power Dissipation (Note 6)	T <sub>A</sub> = +25°C	P <sub>D</sub>	1.42	W
	T <sub>A</sub> = +70°C		0.90	
Thermal Resistance, Junction to Ambient (Note 6)	Steady state	R <sub>θJA</sub>	89	°C/W
	t < 10s		57	
Thermal Resistance, Junction to Case (Note 6)		R <sub>θJC</sub>	18	
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS (Note 8)</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	20	–	–	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
Zero Gate Voltage Drain Current T <sub>J</sub> = +25°C	I <sub>DSS</sub>	–	–	1.0	μA	V <sub>DS</sub> = 16V, V <sub>GS</sub> = 0V
Gate-Source Leakage	I <sub>GSS</sub>	–	–	±100	nA	V <sub>GS</sub> = ±12V, V <sub>DS</sub> = 0V
<b>ON CHARACTERISTICS (Note 8)</b>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	0.4	–	1.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	–	28	45	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 5.0A
		–	36	55		V <sub>GS</sub> = 2.5V, I <sub>D</sub> = 4.2A
Forward Transfer Admittance	Y <sub>fs</sub>	–	9	–	S	V <sub>DS</sub> = 5V, I <sub>D</sub> = 5A
Diode Forward Voltage	V <sub>SD</sub>	–	0.75	1.0	V	V <sub>GS</sub> = 0V, I <sub>S</sub> = 1A
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	C <sub>iSS</sub>	–	389	–	pF	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 0V, f = 1.0MHz
Output Capacitance	C <sub>oss</sub>	–	72	–	pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>	–	63	–	pF	
Gate Resistance	R <sub>g</sub>	–	2.1	–	Ω	V <sub>DS</sub> = 0V, V <sub>GS</sub> = 0V, f = 1MHz
Total Gate Charge (V <sub>GS</sub> = 4.5V)	Q <sub>g</sub>	–	5.7	–	nC	V <sub>DS</sub> = 15V, I <sub>D</sub> = 5.8A
Total Gate Charge (V <sub>GS</sub> = 10V)	Q <sub>g</sub>	–	12	–	nC	
Gate-Source Charge	Q <sub>gs</sub>	–	0.7	–	nC	
Gate-Drain Charge	Q <sub>gd</sub>	–	1.5	–	nC	
Turn-On Delay Time	t <sub>D(on)</sub>	–	5	–	ns	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 4.5V, R <sub>G</sub> = 6Ω, I <sub>DS</sub> = 1A
Turn-On Rise Time	t <sub>r</sub>	–	8	–	ns	
Turn-Off Delay Time	t <sub>D(off)</sub>	–	25	–	ns	
Turn-Off Fall Time	t <sub>f</sub>	–	8	–	ns	
Reverse Recovery Time	t <sub>rr</sub>	–	8.5	–	ns	I <sub>F</sub> = 5A, di/dt = 100A/μs
Reverse Recovery Charge	Q <sub>rr</sub>	–	2.1	–	nC	

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
  - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
  - I<sub>AR</sub> and E<sub>AR</sub> rating are based on low frequency and duty cycles to keep T<sub>J</sub> = +25°C
  - Short duration pulse test used to minimize self-heating effect.
  - Guaranteed by design. Not subject to product testing.

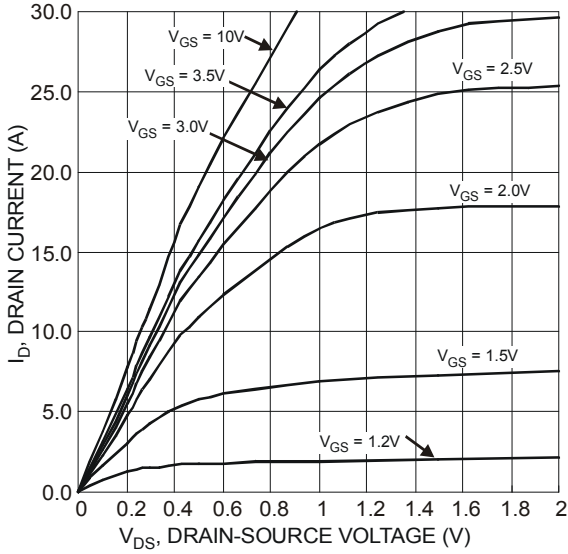


Figure 1 Typical Output Characteristics

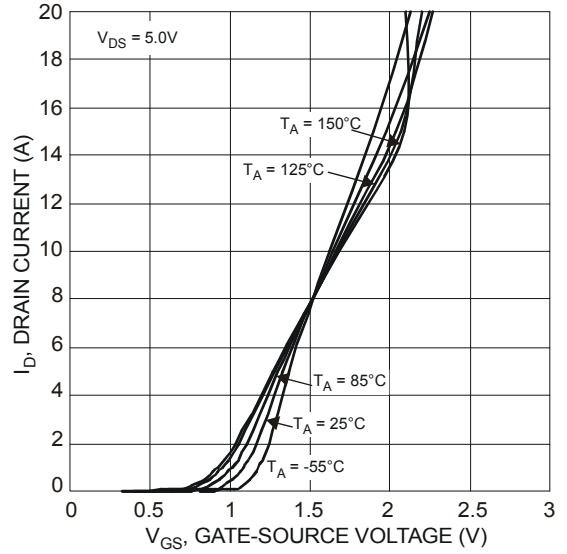


Figure 2 Typical Transfer Characteristics

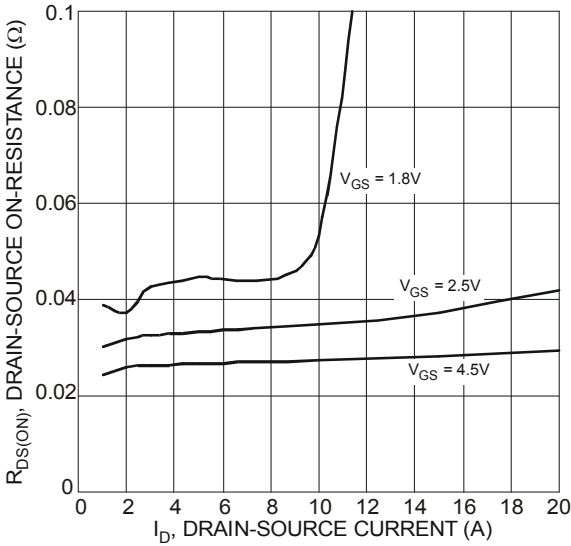


Figure 3 Typical On-Resistance vs. Drain Current and Gate Voltage

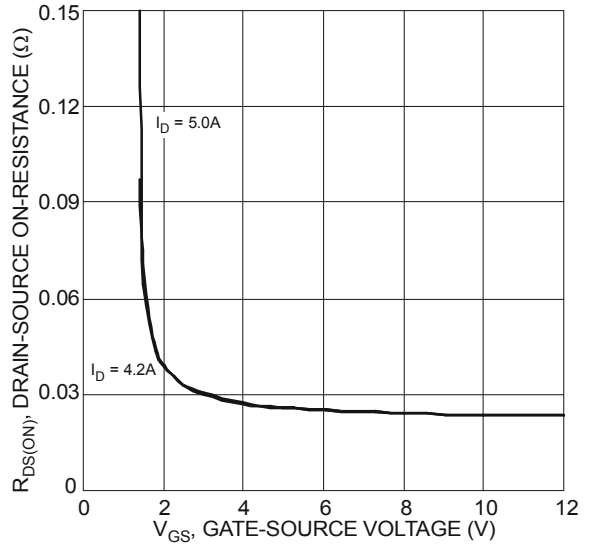


Figure 4 Typical Transfer Characteristics

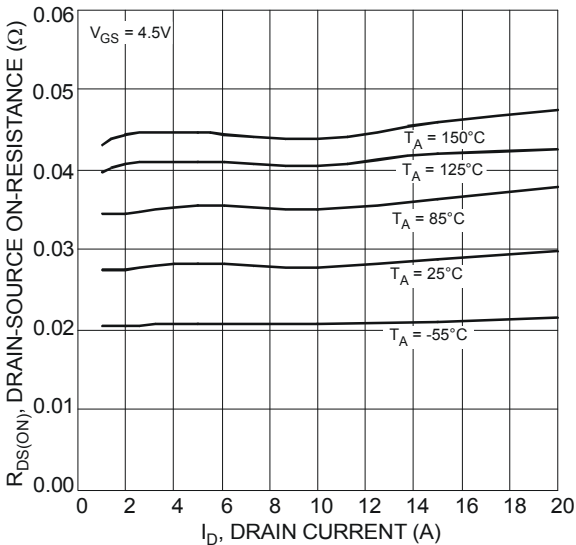


Figure 5 Typical On-Resistance vs. Drain Current and Temperature

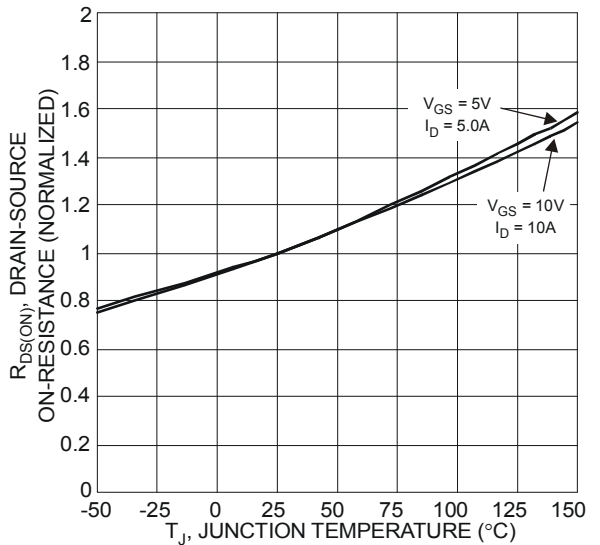


Figure 6 On-Resistance Variation with Temperature

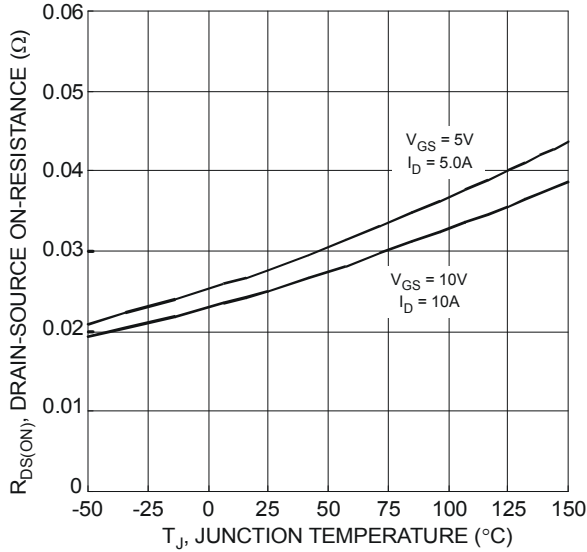


Figure 7 On-Resistance Variation with Temperature

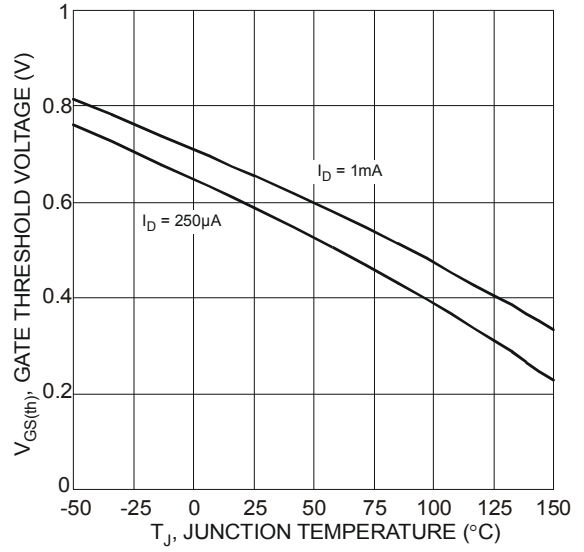


Figure 8 Gate Threshold Variation vs. Ambient Temperature

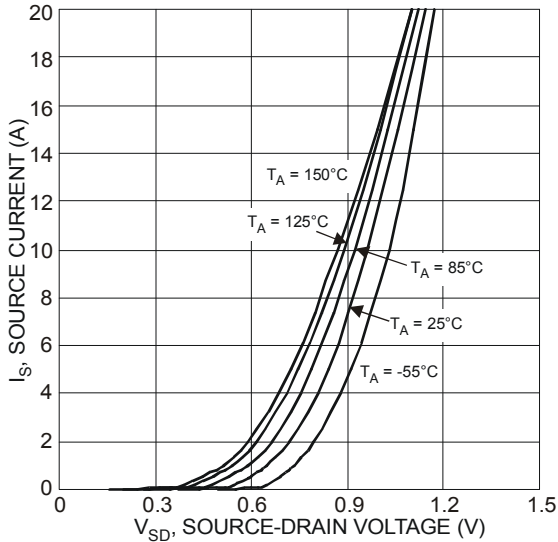


Figure 9 Diode Forward Voltage vs. Current

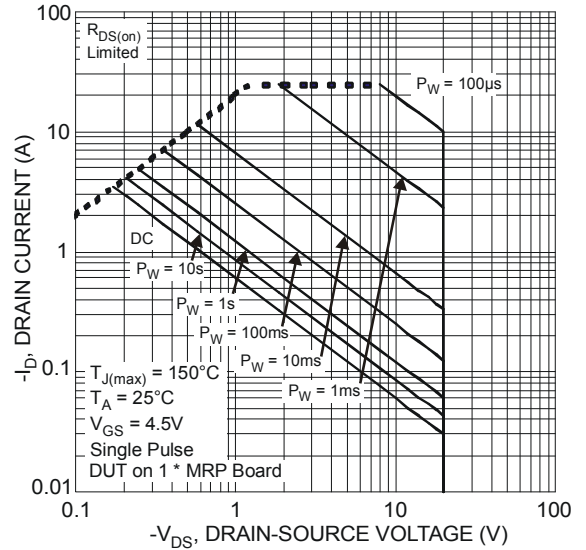


Figure 10 SOA, Safe Operation Area

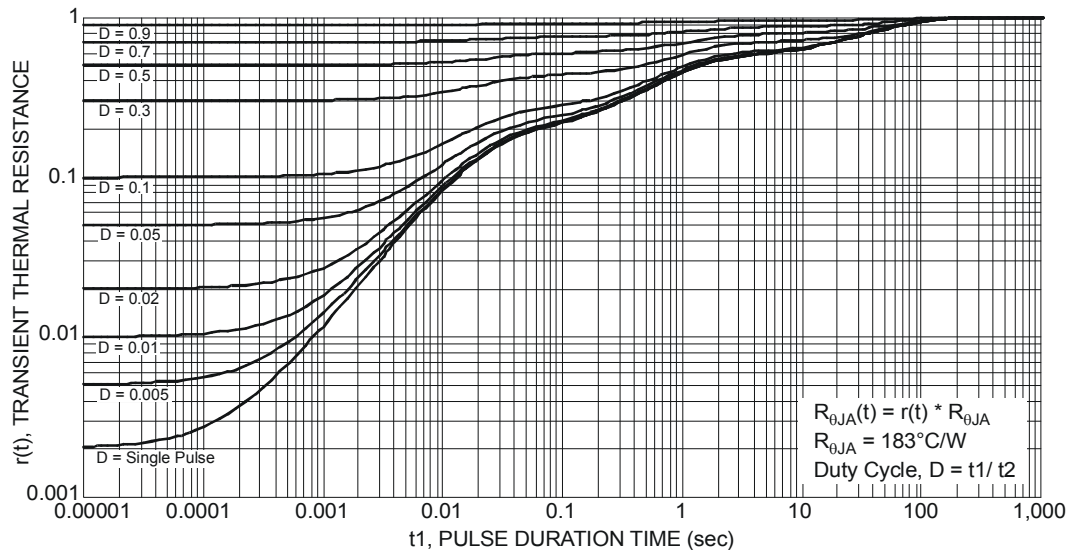
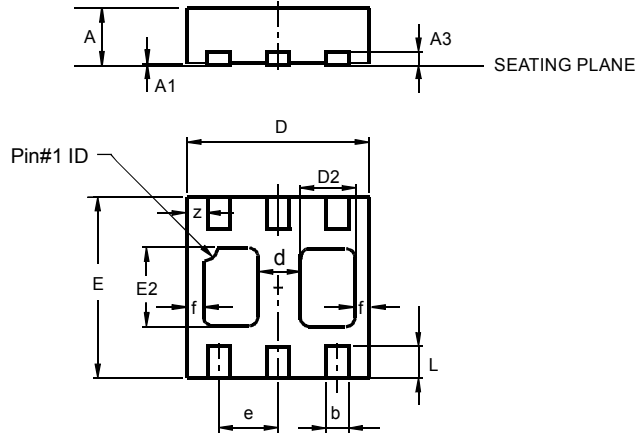


Figure 11 Transient Thermal Resistance

$R_{\theta JA}(t) = r(t) * R_{\theta JA}$   
 $R_{\theta JA} = 183^{\circ}\text{C/W}$   
 Duty Cycle,  $D = t1 / t2$

**Package Outline Dimensions**

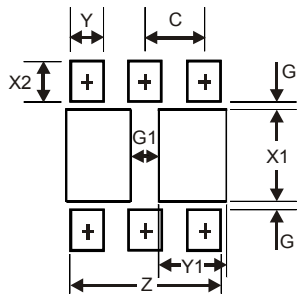
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



DFN2020-6 Type B			
Dim	Min	Max	Typ
A	0.545	0.605	0.575
A1	0	0.05	0.02
A3	—	—	0.13
b	0.20	0.30	0.25
D	1.95	2.075	2.00
d	—	—	0.45
D2	0.50	0.70	0.60
e	—	—	0.65
E	1.95	2.075	2.00
E2	0.90	1.10	1.00
f	—	—	0.15
L	0.25	0.35	0.30
z	—	—	0.225
All Dimensions in mm			

**Suggested Pad Layout**

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



Dimensions	Value (in mm)
Z	1.67
G	0.20
G1	0.40
X1	1.0
X2	0.45
Y	0.37
Y1	0.70
C	0.65

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