

TC74VHC373F,TC74VHC373FT,TC74VHC373FK**Octal D-Type Latch with 3-State Output**

The TC74VHC373 is an advanced high speed CMOS OCTAL LATCH with 3-STATE OUTPUT fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

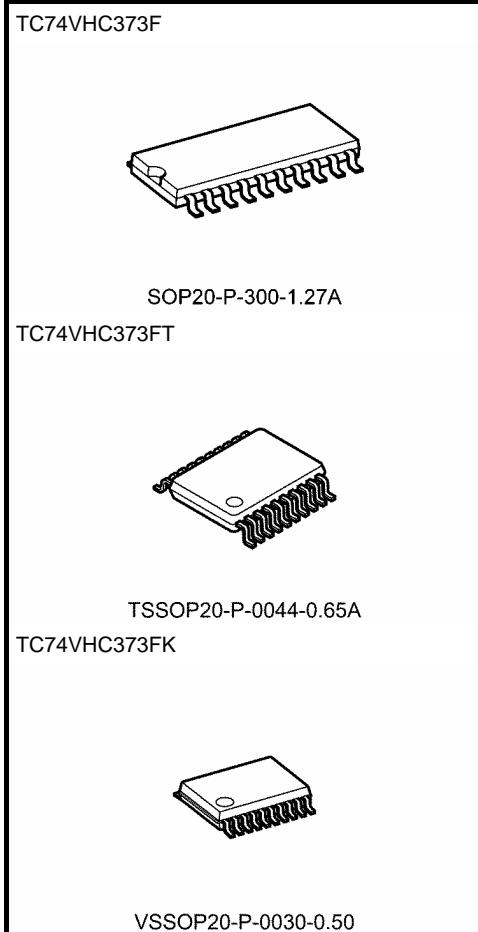
This 8-bit D-type latch is controlled by a latch enable input (LE) and an output enable input (\overline{OE}).

When the \overline{OE} input is high, the eight outputs are in a high impedance state.

An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

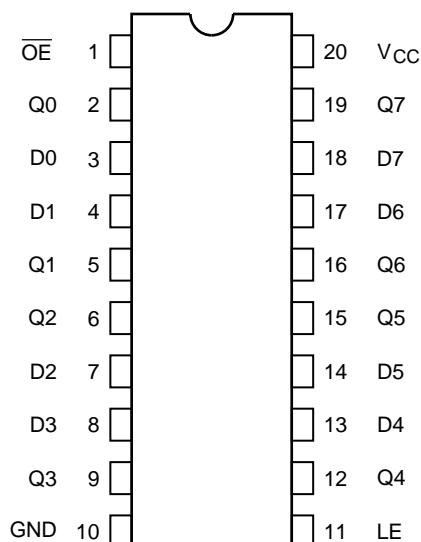
Features

- High speed: $t_{pd} = 5.0$ ns (typ.) at $V_{CC} = 5$ V
- Low power dissipation: $I_{CC} = 4 \mu A$ (max) at $T_a = 25^\circ C$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 5.5 V
- Low noise: $V_{OLP} = 0.8$ V (max)
- Pin and function compatible with 74ALS373

**Weight**

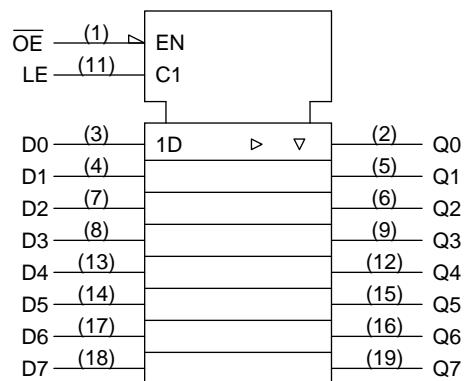
SOP20-P-300-1.27A	: 0.22 g (typ.)
TSSOP20-P-0044-0.65A	: 0.08 g (typ.)
VSSOP20-P-0030-0.50	: 0.03 g (typ.)

Pin Assignment



(top view)

IEC Logic Symbol



Truth Table

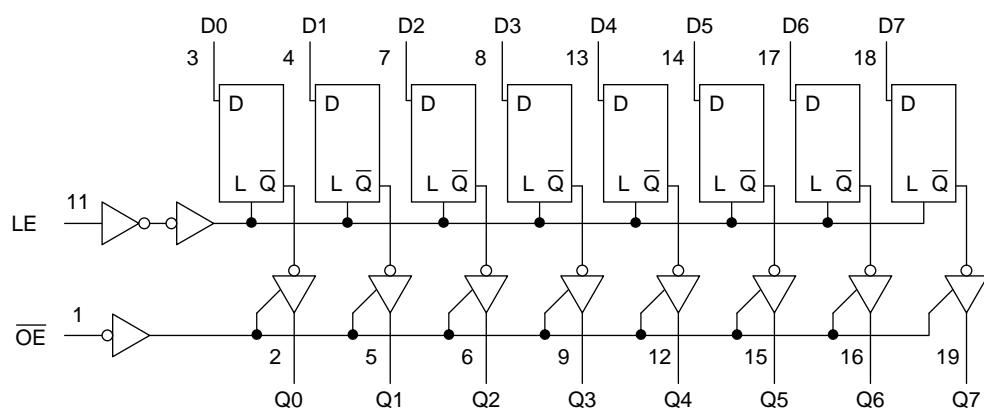
Inputs			Output
OE	LE	D	
H	X	X	Z
L	L	X	Q _n
L	H	L	L
L	H	H	H

X: Don't care

Z: High impedance

Q_n: Q outputs are latched at the time when the LE input is taken to a low logic level.

System Diagram



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to 7.0	V
DC output voltage	V_{OUT}	-0.5 to $V_{CC} + 0.5$	V
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	± 20	mA
DC output current	I_{OUT}	± 25	mA
DC V_{CC} /ground current	I_{CC}	± 75	mA
Power dissipation	P_D	180	mW
Storage temperature	T_{stg}	-65 to 150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V)	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit
				V _{CC} (V)	Min	Typ.	Max	Min	
High-level input voltage	V _{IH}	—	2.0	1.50	—	—	—	1.50	V
			3.0 to 5.5	V _{CC} × 0.7	—	—	—	V _{CC} × 0.7	
Low-level input voltage	V _{IL}	—	2.0	—	—	0.50	—	0.50	V
			3.0 to 5.5	V _{CC} × 0.3	—	—	—	V _{CC} × 0.3	
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 µA	2.0	1.9	2.0	—	1.9	V
				3.0	2.9	3.0	—	2.9	
I _{OH} = -4 mA	4.5		4.4	4.5	—	4.4			
				3.0	2.58	—	—	2.48	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 µA	4.5	3.94	—	—	3.80	V
				2.0	—	0.0	0.1	—	
I _{OL} = 4 mA	3.0		—	0.0	0.1	—			
				4.5	—	0.0	0.1	—	
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND	5.5	—	—	±0.25	—	±2.50	µA
				—	—	—	—	—	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND	0 to 5.5	—	—	±0.1	—	±1.0	µA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND	5.5	—	—	4.0	—	40.0	µA

Timing Requirements (input: t_r = t_f = 3 ns)

Characteristics	Symbol	Test Condition			Ta = 25°C		Ta = -40 to 85°C		Unit
				V _{CC} (V)	Typ.	Limit	Limit	Limit	
Minimum pulse width (LE)	t _w (H)	—	3.3 ± 0.3	—	5.0	5.0	ns	ns	ns
			5.0 ± 0.5	—	5.0	5.0			
Minimum set-up time	t _s	—	3.3 ± 0.3	—	4.0	4.0	ns	ns	ns
			5.0 ± 0.5	—	4.0	4.0			
Minimum hold time	t _h	—	3.3 ± 0.3	—	1.0	1.0	ns	ns	ns
			5.0 ± 0.5	—	1.0	1.0			

AC Electrical Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40 to 85°C		Unit	
			V _{CC} (V)	C _L (pF)	Min	Typ.	Max	Min	Max		
Propagation delay time (LE-Q)	t _{pLH}	—	3.3 ± 0.3	15	—	7.0	11.0	1.0	13.0	ns	
				50	—	9.5	14.5	1.0	16.5		
	t _{pHL}		5.0 ± 0.5	15	—	4.9	7.2	1.0	8.5		
				50	—	6.4	9.2	1.0	10.5		
Propagation delay time (D-Q)	t _{pLH}	—	3.3 ± 0.3	15	—	7.3	11.4	1.0	13.5	ns	
				50	—	9.8	14.9	1.0	17.0		
	t _{pHL}		5.0 ± 0.5	15	—	5.0	7.2	1.0	8.5		
				50	—	6.5	9.2	1.0	10.5		
3-state output enable time	t _{pZL}	R _L = 1 kΩ	3.3 ± 0.3	15	—	7.3	11.4	1.0	13.5	ns	
				50	—	9.8	14.9	1.0	17.0		
	t _{pZH}		5.0 ± 0.5	15	—	5.5	8.1	1.0	9.5		
				50	—	7.0	10.1	1.0	11.5		
3-state output disable time	t _{pLZ}	R _L = 1 kΩ	3.3 ± 0.3	50	—	9.5	13.2	1.0	15.0	ns	
			5.0 ± 0.5	50	—	6.5	9.2	1.0	10.5		
Output to output skew	t _{osLH}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns	
			5.0 ± 0.5	50	—	—	1.0	—	1.0		
Input capacitance	C _{IN}	—	—	—	4	10	—	10	pF		
Output capacitance	C _{OUT}	—	—	—	6	—	—	—	pF		
Power dissipation capacitance	C _{PD}	(Note 2)	—	27	—	—	—	—	pF		

Note 1: Parameter guaranteed by design.

$$t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|$$

Note 2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per latch)}$$

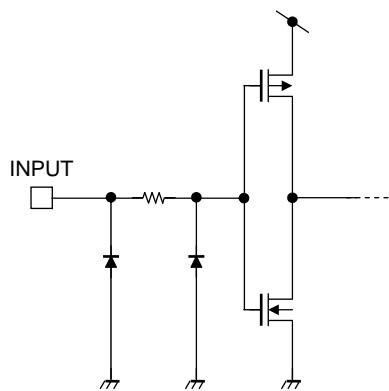
And the total C_{PD} when n pcs. of Latch operate can be gained by the following equation:

$$C_{PD}(\text{total}) = 14 + 13 \cdot n$$

Noise Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Unit
			V _{CC} (V)	Typ.	Max	
Quiet output maximum dynamic V _{OL}	V _{OLP}	C _L = 50 pF	5.0	0.5	0.8	V
Quiet output minimum dynamic V _{OL}	V _{OLV}	C _L = 50 pF	5.0	-0.5	-0.8	V
Minimum high level dynamic input voltage	V _{IHD}	C _L = 50 pF	5.0	—	3.5	V
Maximum low level dynamic input voltage	V _{ILD}	C _L = 50 pF	5.0	—	1.5	V

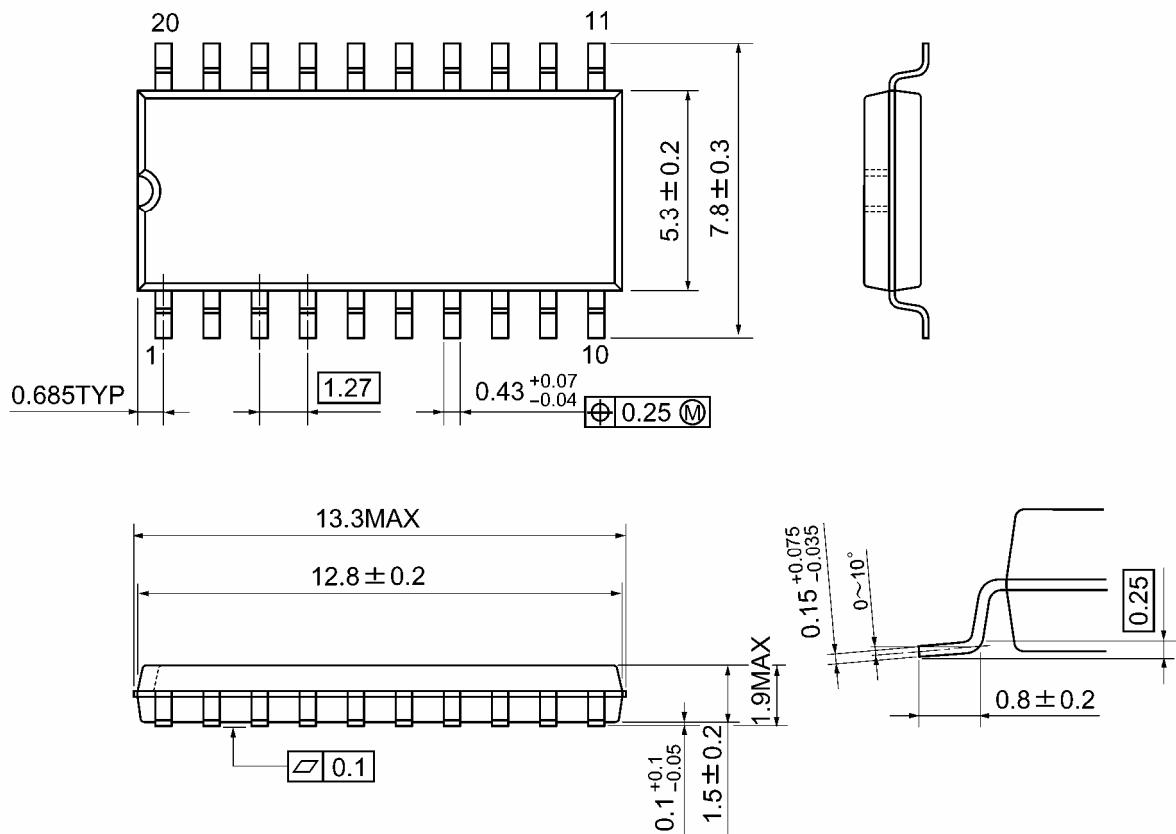
Input Equivalent Circuit



Package Dimensions

SOP20-P-300-1.27A

Unit: mm

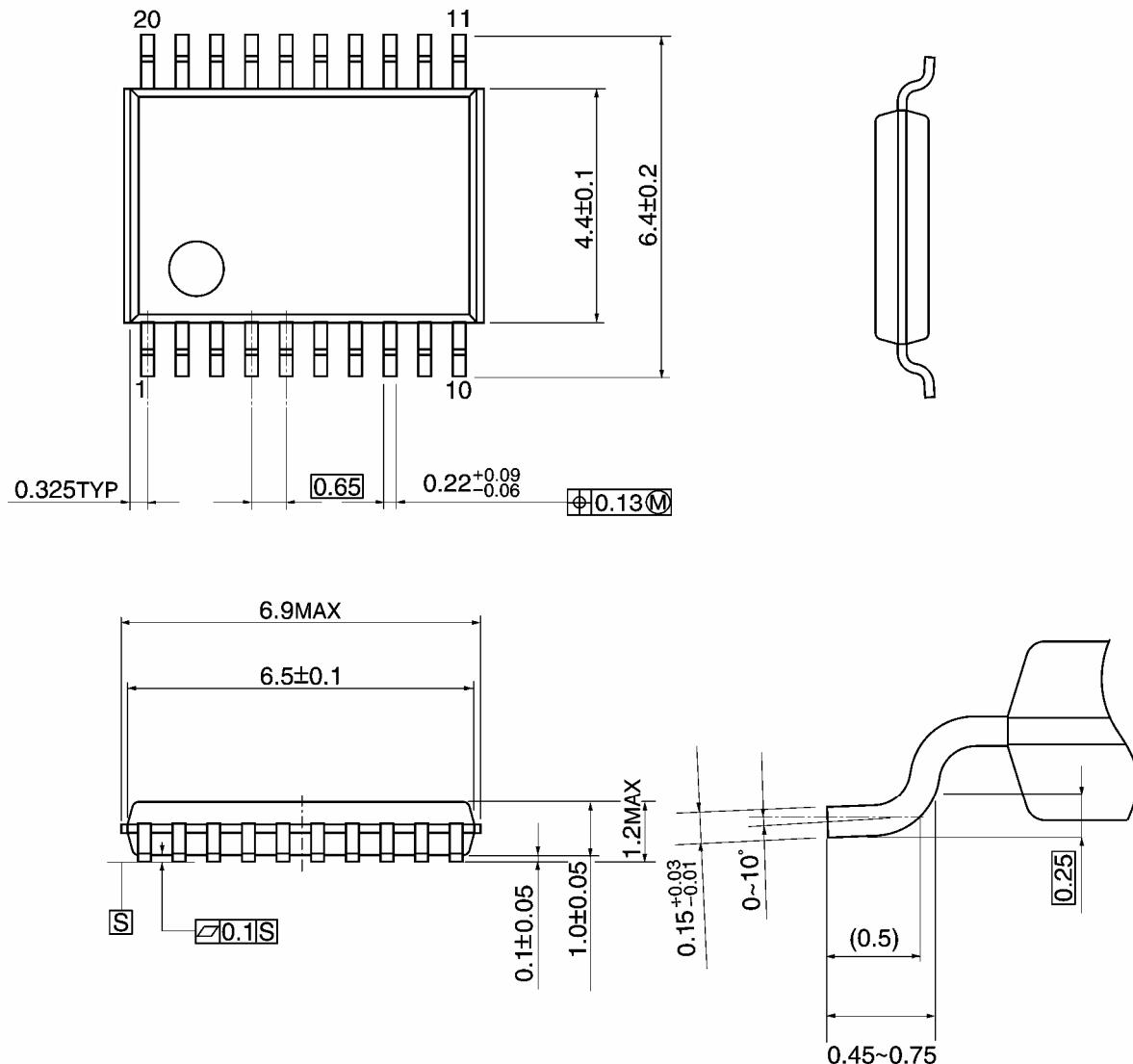


Weight: 0.22 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm

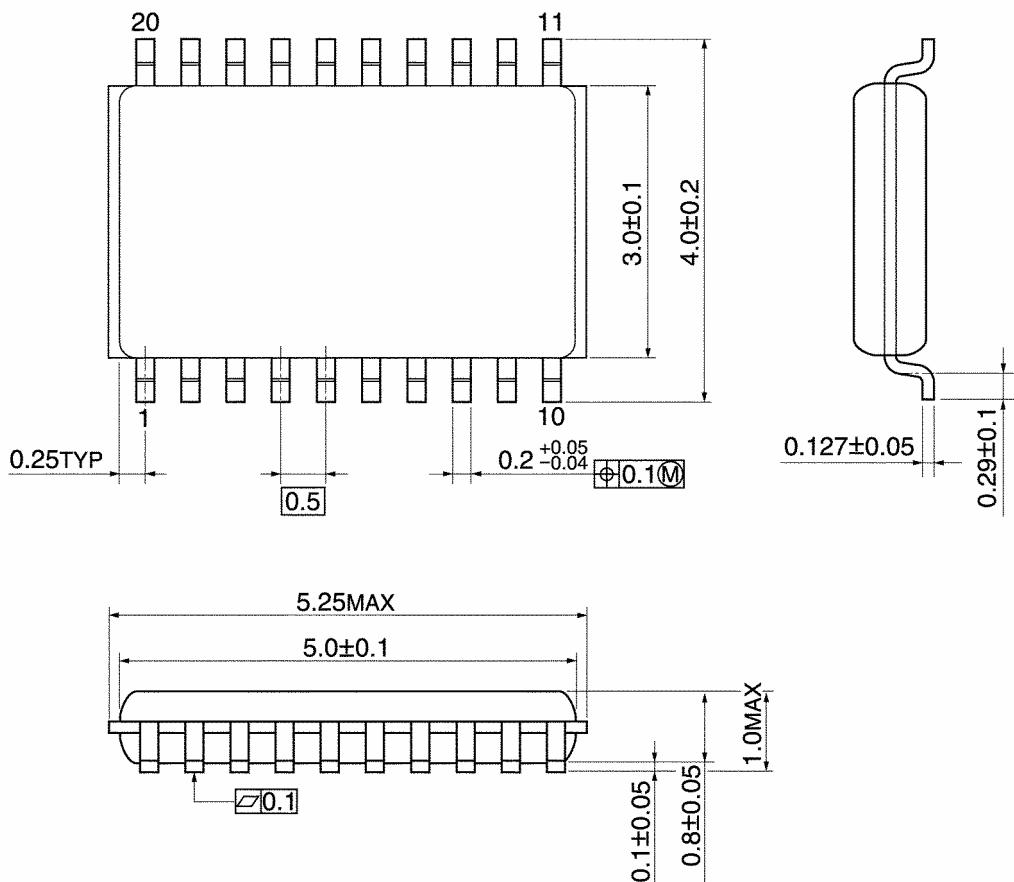


Weight: 0.08 g (typ.)

Package Dimensions

VSSOP20-P-0030-0.50

Unit: mm



Weight: 0.03 g (typ.)

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