

TC74HC374AP, TC74HC374AF, TC74HC374AFW

Octal D-Type Flip-Flop with 3-State Output

The TC74HC374A is a high speed CMOS OCTAL FLIP-FLOP with 3-STATE OUTPUT fabricated with silicon gate C²MOS technology.

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

These 8-bit D-type flip-flops are controlled by a clock input (CK) and a output enable input (\overline{OE}).

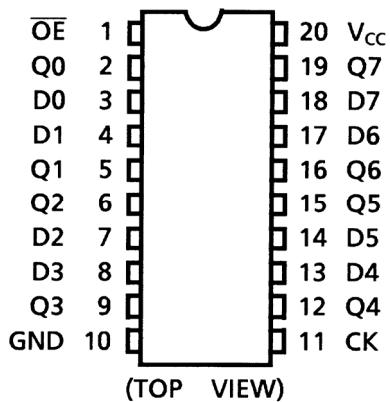
When the OE input is high, the eight outputs are in a high impedance state.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

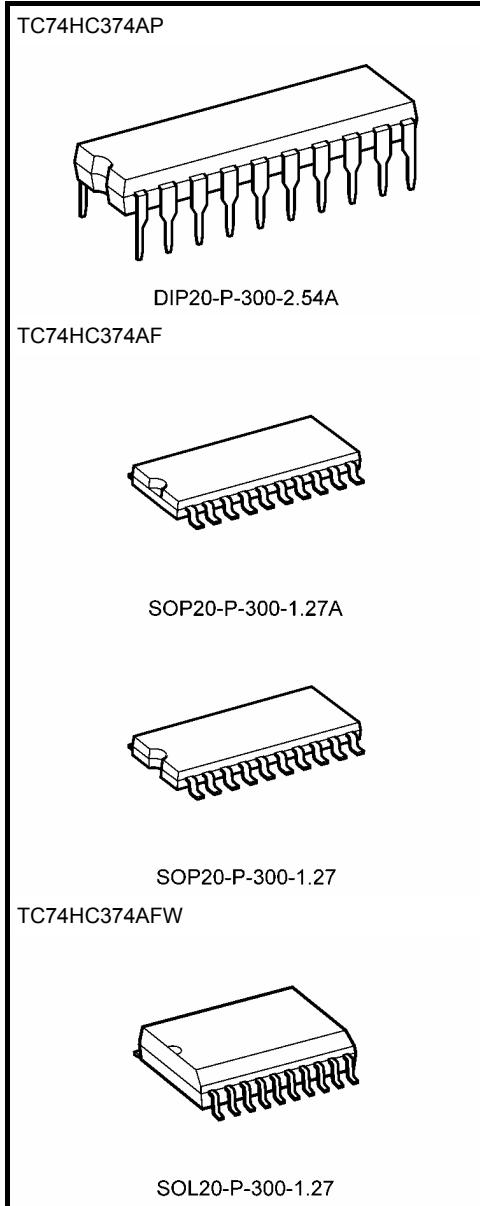
Features

- High speed: $f_{max} = 77$ MHz (typ.) at $V_{CC} = 5$ V
- Low power dissipation: $I_{CC} = 4$ μ A (max) at $T_a = 25^\circ C$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\%$ V_{CC} (min)
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 6$ mA (min)
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 6 V
- Pin and function compatible with 74LS374

Pin Assignment

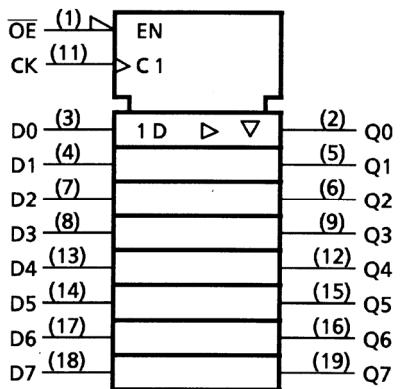


Note: xxxFW (JEDEC SOP) is not available in Japan.



Weight

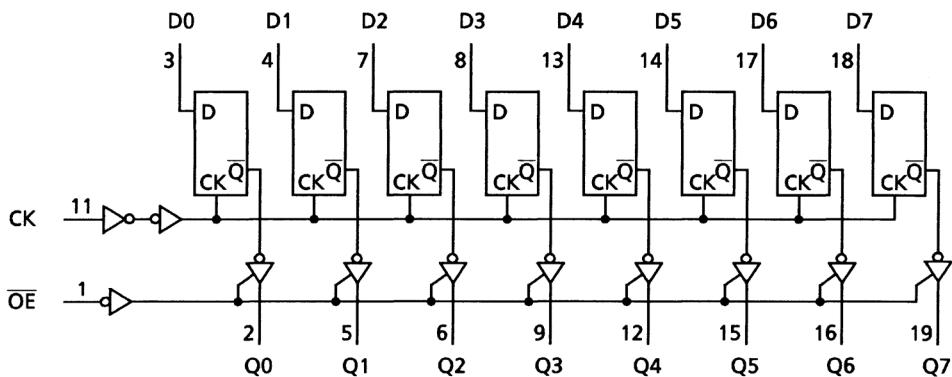
DIP20-P-300-2.54A	: 1.30 g (typ.)
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)

IEC Logic Symbol**Truth Table**

Inputs			Outputs
\overline{OE}	CK	D	Q
H	X	X	Z
L	↓	X	Q_n
L	↑	L	L
L	↑	H	H

X: Don't care

Z: High impedance

 Q_n : No change**System Diagram**

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	–0.5 to 7	V
DC input voltage	V_{IN}	–0.5 to $V_{CC} + 0.5$	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}	± 35	mA
DC V_{CC} /ground current	I_{CC}	± 75	mA
Power dissipation	P_D	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T_{STG}	–65 to 150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: 500 mW in the range of $T_a = -40$ to 65°C . From $T_a = 65$ to 85°C a derating factor of $-10 \text{ mW/}^\circ\text{C}$ shall be applied until 300 mW.

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{OPR}	–40 to 85	°C
Input rise and fall time	t_r, t_f	0 to 1000 ($V_{CC} = 2.0 \text{ V}$) 0 to 500 ($V_{CC} = 4.5 \text{ V}$) 0 to 400 ($V_{CC} = 6.0 \text{ V}$)	ns

Note: The recommended operating conditions are required 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
				4.5	3.15	—	—	3.15	—	
				6.0	4.20	—	—	4.20	—	
Low-level input voltage	V _{IL}	—		2.0	—	—	0.50	—	0.50	V
				4.5	—	—	1.35	—	1.35	
				6.0	—	—	1.80	—	1.80	
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 µA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 µA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		2.0	—	—	—	—	—	µA
				4.5	—	—	—	—	—	
				6.0	—	—	—	—	—	
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		2.0	—	—	—	—	—	µA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		2.0	—	—	—	—	—	µA

Timing Requirements (input: t_r = t_f = 6 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = -40 to 85°C		Unit
				V _{CC} (V)	Typ.	Limit	Limit	
Minimum pulse width (CK)	t _W (H) t _W (L)	—		2.0	—	75	95	ns
				4.5	—	15	19	
				6.0	—	13	16	
Minimum set-up time (D _n)	t _s	—		2.0	—	75	95	ns
				4.5	—	15	19	
				6.0	—	13	16	
Minimum hold time (D _n)	t _h	—		2.0	—	0	0	ns
				4.5	—	0	0	
				6.0	—	0	0	
Clock frequency	f	—		2.0	—	6	5	MHz
				4.5	—	31	25	
				6.0	—	36	29	

AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40 to 85°C		Unit		
		CL (pF)	V _{CC} (V)	Min	Typ.	Max	Min	Max				
Output transition time	t_{TLH} t_{THL}	—	50	2.0	—	20	60	—	75	ns		
				4.5	—	6	12	—	15			
				6.0	—	5	10	—	13			
Propagation delay time (CK-Q)	t_{pLH}	—	50	2.0	—	45	140	—	175	ns		
				4.5	—	15	28	—	35			
				6.0	—	13	24	—	30			
	t_{pHL}		150	2.0	—	60	190	—	240			
				4.5	—	20	38	—	48			
				6.0	—	17	32	—	41			
Output enable time	t_{pZL}	$R_L = 1\text{ k}\Omega$	50	2.0	—	39	135	—	170	ns		
				4.5	—	13	27	—	34			
				6.0	—	11	23	—	29			
	t_{pZH}		150	2.0	—	54	185	—	230			
				4.5	—	18	37	—	46			
				6.0	—	15	31	—	39			
Output enable time	t_{pLZ} t_{pHZ}		$R_L = 1\text{ k}\Omega$	50	2.0	—	30	135	—	170	ns	
					4.5	—	13	27	—	34		
					6.0	—	12	23	—	29		
Maximum clock frequency	f_{max}	—	50	2.0	6	18	—	5	—	MHz		
Input capacitance	C_{IN}	—	—	—	5	10	—	10	pF			
Output capacitance	C_{OUT}	—	—	—	10	—	—	—	pF			
Power dissipation capacitance	C_{PD} (Note)	—	—	—	47	—	—	—	pF			

Note: 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:

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

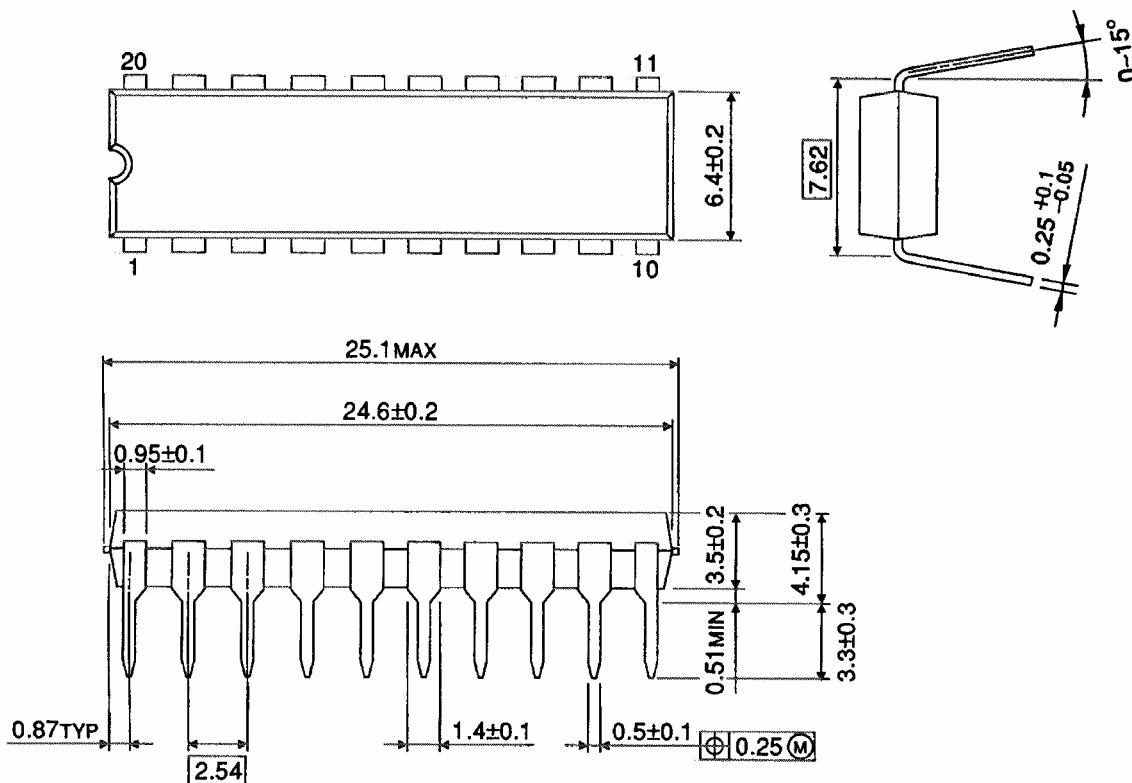
And the total C_{PD} when n pcs. of F/F operate can be gained by the following equation:

$$C_{PD}(\text{total}) = 30 + 17 \cdot n$$

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

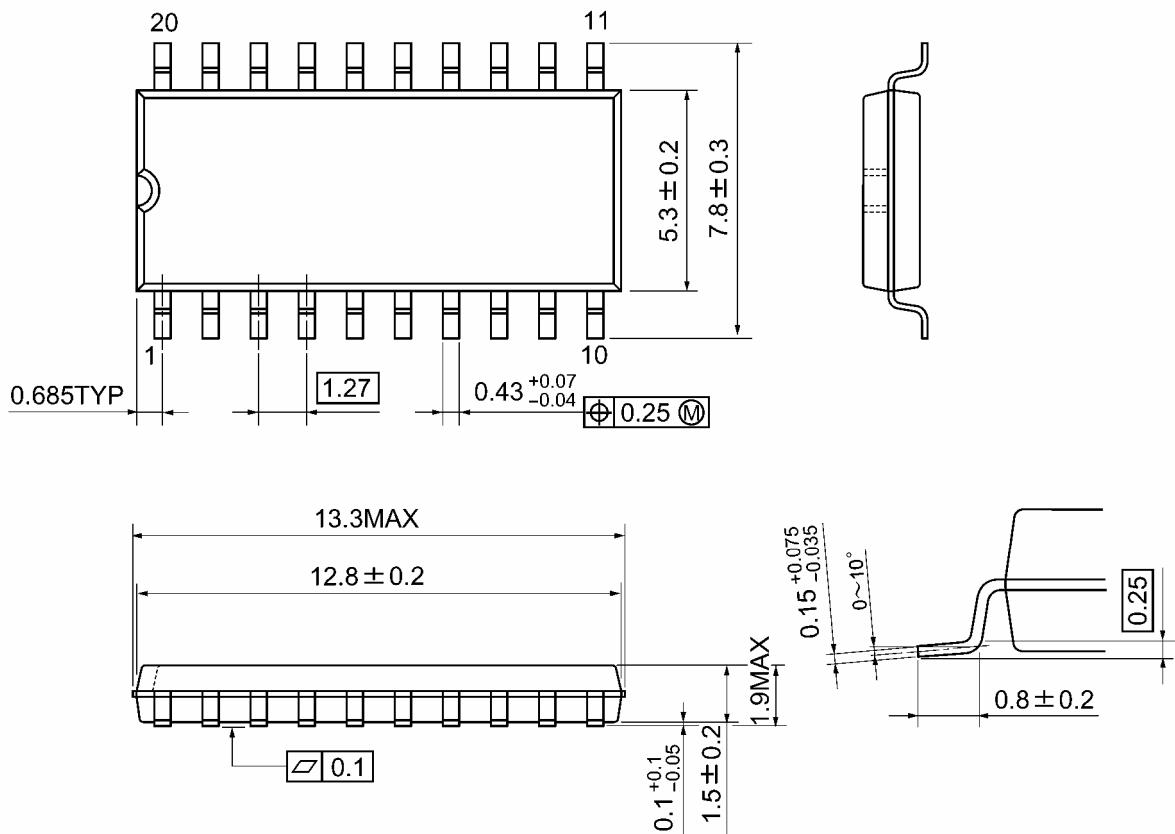


Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A

Unit: mm

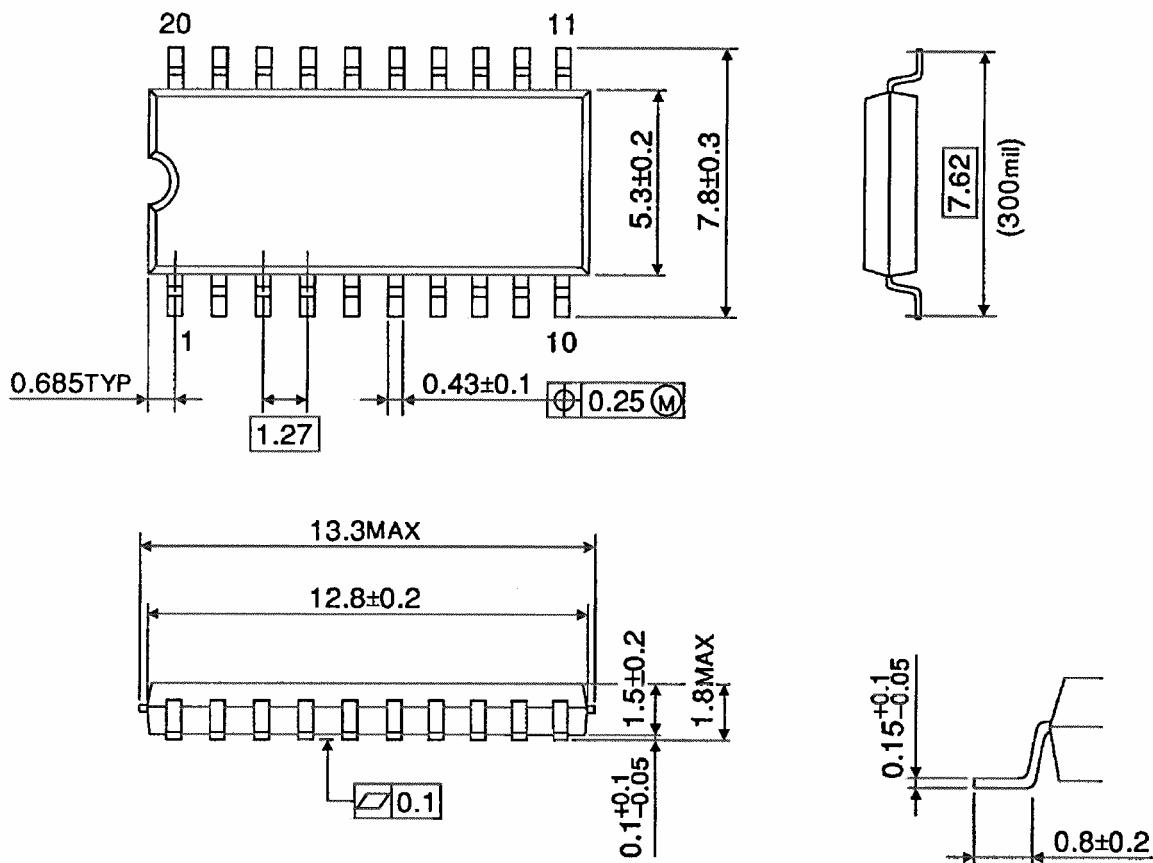


Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm

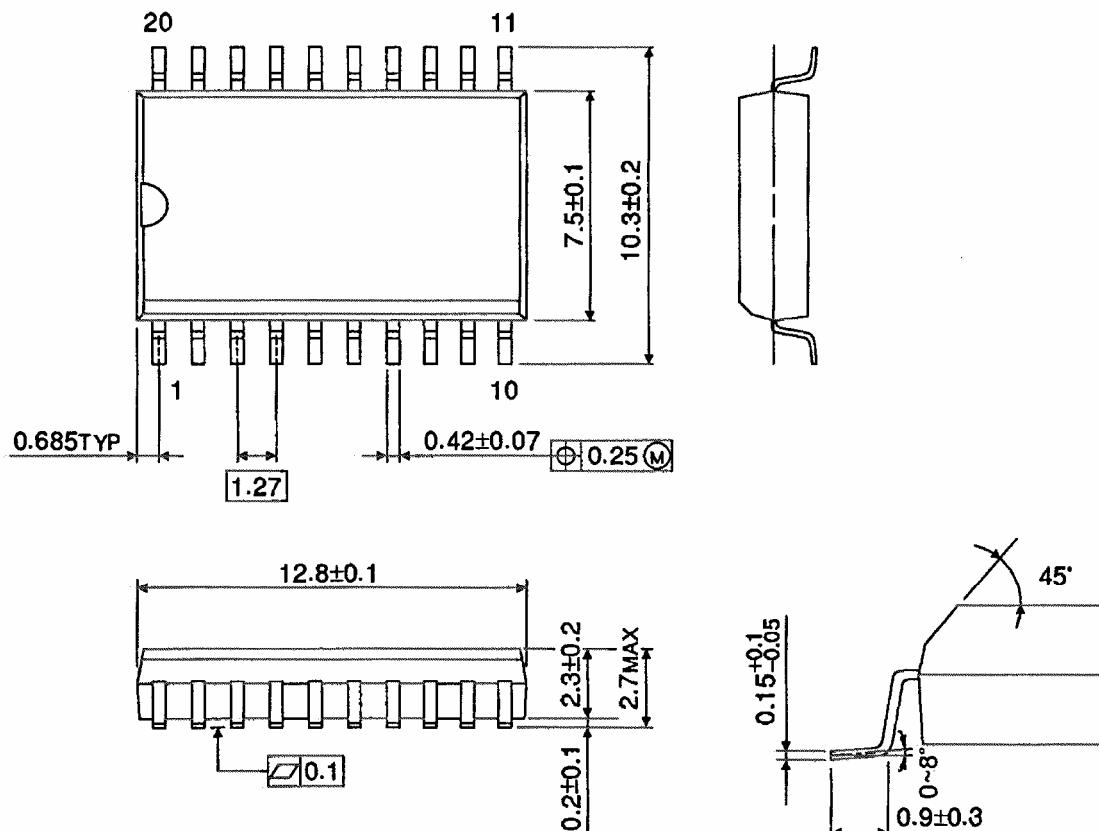


Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Note: Lead (Pb)-Free Packages
DIP20-P-300-2.54A SOP20-P-300-1.27A

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