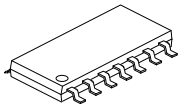
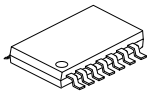
U74LVC02A

CMOS IC

QUAD 2-INPUT POSITIVE-NOR GATE



SOP-14



TSSOP-14

■ DESCRIPTION

The **U74LVC02A** is a quad 2-input positive-NOR gate which performs the function $Y=\overline{A+B}$ or $Y=\overline{A}\times\overline{B}$. It is designed for 1.65V to 3.6V operation.

■ FEATURES

* Wide supply voltage range from 1.65V to 3.6V
* Max t_{pd} of 4.4ns at 3.3V
* Up to 5.5V inputs accept voltages
* Low power consumption, I_{CC}=10μA (Max.)
* ±24 mA output driver at 3V
* Typical V_{OLP} (Output Ground Bounce) < 0.8V, V_{CC}=3.3V, T_A=25°C
* Typical V_{OHV} (Output V_{OH} undershoot) > 2V, V_{CC}=3.3V, T_A=25°C

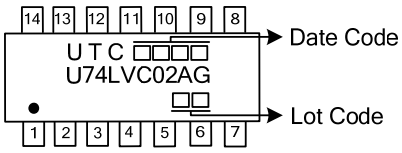
■ ORDERING INFORMATION

Ordering Number	Package	Packing
U74LVC02AG-S14-R	SOP-14	Tape Reel
U74LVC02AG-P14-R	TSSOP-14	Tape Reel

U74LVC02AG-S14-R
(1) Packing Type
(2) Package Type
(3) Green Package

(1) R: Tape Reel
(2) S14: SOP-14, P14: TSSOP-14
(3) G: Halogen Free and Lead Free

■ MARKING



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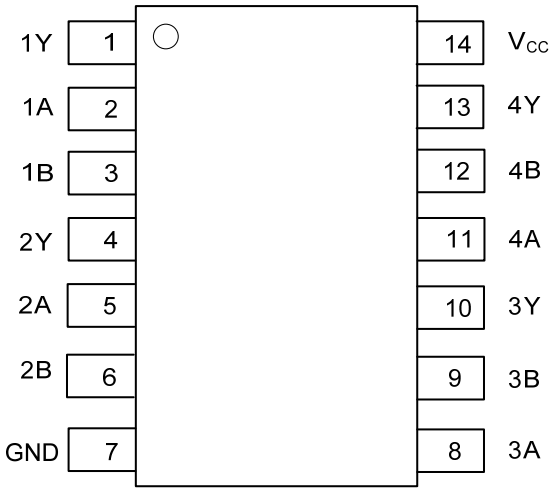
■ PIN CONFIGURATION



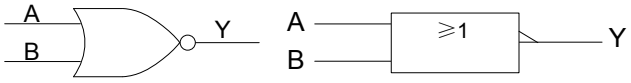
■ PIN DESCRIPTION

PIN	SYMBOL	FUNCTION
2, 5, 8, 11	1A-4A	Data inputs
3, 6, 9, 12	1B-4B	Data inputs
1, 4, 10, 13	1Y-4Y	Data outputs
7	GND	Ground (0V)
14	V_{CC}	Positive supply voltage

■ FUNCTION TABLE (each gate)

INPUTS		OUTPUT
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

■ LOGIC SYMBOL (one gate)



Logic symbol IEEE/IEC symbol

■ ABSOLUTE MAXIMUM RATING (unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	-0.5~6.5	V
Input Voltage	V_{IN}	-0.5~6.5	V
Output Voltage (any output in the high or low state)	V_{OUT}	-0.5~V_{CC}+0.5	V
Input Clamp Current	I_{IK}	-50	mA
Output Clamp Current	I_{OK}	-50	mA
Output Current	I_{OUT}	±50	mA
V_{CC} or GND Current	I_{CC}	±100	mA
Storage Temperature	T_{STG}	-65 ~ +150	°C

Note: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-14	θ_{JA}	86	°C/W
	TSSOP-14		113	°C/W

■ RECOMMENDED OPERATING COMDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNIT
Supply Voltage	V_{CC}	Operating	1.65	3.6	V
		Data retention only	1.5		
High-Level Input Voltage	V_{IH}	V_{CC} = 1.65V to 1.95V	0.65×V_{CC}		V
		V_{CC} = 2.3V to 2.7V	1.7		
		V_{CC} = 2.7V to 3.6V	2		
Low-Level Input Voltage	V_{IL}	V_{CC} = 1.65V to 1.95V		0.35×V_{CC}	V
		V_{CC} = 2.3V to 2.7V		0.7	
		V_{CC} = 2.7V to 3.6V		0.8	
Input Voltage	V_{IN}		0	5.5	V
Output Voltage	V_{OUT}		0	V_{CC}	V
High-level Output Current	I_{OH}	V_{CC}=1.65V		-4	mA
		V_{CC}=2.3V		-8	
		V_{CC}=2.7V		-12	
		V_{CC}=3V		-24	
Low-level Output Current	I_{OL}	V_{CC}=1.65V		4	mA
		V_{CC}=2.3V		8	
		V_{CC}=2.7V		12	
		V_{CC}=3V		24	
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	V_{CC}=1.2 to 2.7V		20	ns/V
		V_{CC}=2.7 to 3.6V		10	
Operating Temperature	T_A		-40	85	°C

■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Output Voltage	V_{OH}	I_{OH}=-100 μA, V_{CC}=1.65V~3.6V	V_{CC} -0.2			V
		I_{OH}=-4 mA, V_{CC}=1.65V	1.2			
		I_{OH}=-8 mA, V_{CC}=2.3V	1.7			
		I_{OH}=-12 mA, V_{CC}=2.7V	2.2			
		I_{OH}=-12 mA, V_{CC}=3V	2.4			
		I_{OH}=-24 mA, V_{CC}=3V	2.2			
Low-Level Output Voltage	V_{OL}	I_{OL}=100 μA, V_{CC}=1.65V~3.6V			0.2	V
		I_{OL}=4 mA, V_{CC}=1.65V			0.45	
		I_{OL}=8 mA, V_{CC}=2.3V			0.7	
		I_{OL}=12 mA, V_{CC}=2.7V			0.4	
		I_{OL}=24 mA, V_{CC}=3V			0.55	
Input Leakage Current	$I_{I(LEAK)}$	V_{IN}=5.5V or GND, V_{CC}=0~3.6V			±5	μA
Quiescent Supply Current	I_{CC}	V_{IN}= V_{CC} or GND, I_{OUT} = 0			10	μA
Additional quiescent Supply Current	Δ I_{CC}	One input at V_{CC}-0.6V; other inputs at V_{CC} or GND			500	μA
Input Capacitance (Note)	C_{IN}	V_{IN} = V_{CC} or GND, V_{CC}=3.3V		5		pF

Note: All typical values are at V_{CC} = 3.3 V, T_A = 25 °C.

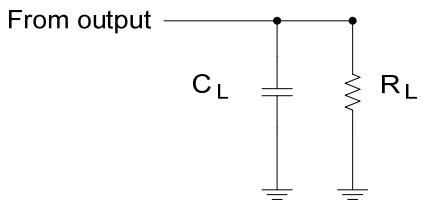
■ SWITCHING CHARACTERISTICS T_A =25°C , unless otherwise specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A or B) to output (Y)	t_{PLH}/t_{PHL}	V_{CC}=1.8V, C_L=30pF, R_L=1KΩ		13.4		ns
		V_{CC}=2.5±0.2V, C_L=30pF, R_L=500Ω	1		7.4	
		V_{CC}=2.7V, C_L=50pF, R_L=500Ω			5.4	
		V_{CC}=3.3±0.3V, C_L=50pF, R_L=500Ω	1		4.4	
Skew between any two outputs of the same package switching in the same direction	$t_{sk(o)}$	V_{CC}=3.3±0.3V, C_L=50pF, R_L=500Ω			1	ns

■ OPERATING CHARACTERISTICS T_A =25°C , unless otherwise specified

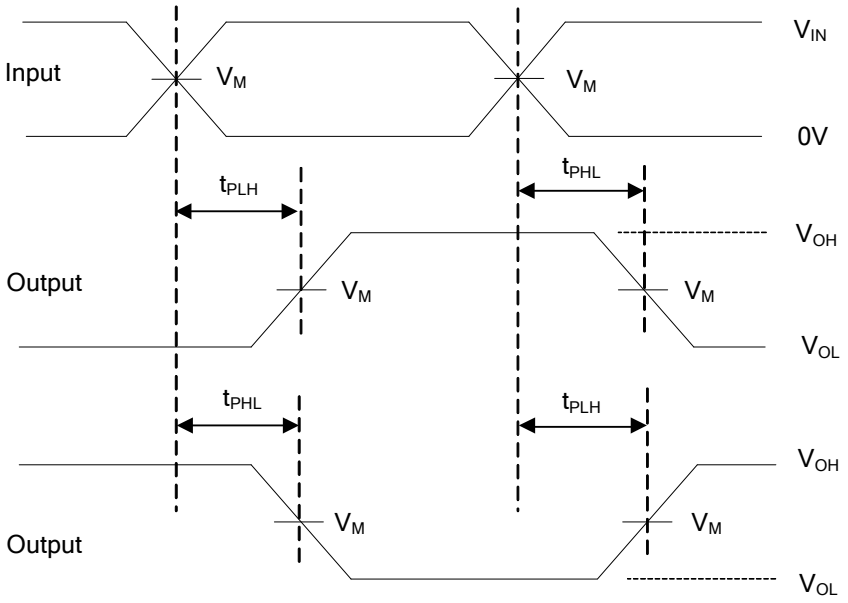
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Power dissipation capacitance per gate	C_{PD}	f=10MHz	V_{CC}=1.8V		7.5		pF
			V_{CC}=2.5V		8.5		
			V_{CC}=3.3V		9.5		

■ TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT

V_{CC}	Inputs		V_M	C_L	R_L
	V_{IN}	t_r, t_f			
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	1KΩ
2.5V±0.2V	V_{CC}	≤2ns	$V_{CC}/2$	30pF	500Ω
2.7V	V_{CC}	≤2.5ns	1.5V	50pF	500Ω
3.3V±0.3V	V_{CC}	≤2.5ns	1.5V	50pF	500Ω



Propagation delay times
Inverting and noninverting outputs

Notes: 1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Z_O = 50Ω.

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