



U74LVC02A

CMOS IC

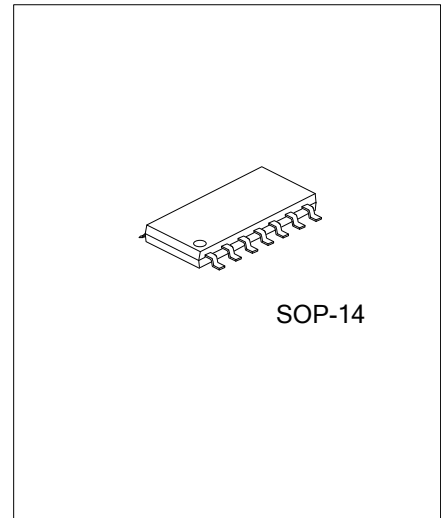
QUAD 2-INPUT POSITIVE-NOR GATE

DESCRIPTION

The **U74LVC02A** is a quad 2-input positive-NOR gate which performs the function $Y=A+B$ or $Y=\overline{A \times B}$. 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, $I_{CC}=10\mu A$ (Max.)
- * ± 24 mA output driver at 3V
- * Typical V_{OLP} (Output Ground Bounce) $< 0.8V$, $V_{CC}=3.3V$, $T_A=25^\circ C$
- * Typical V_{OHV} (Output V_{OH} undershoot) $> 2V$, $V_{CC}=3.3V$, $T_A=25^\circ C$



ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC02AL-S14-R	U74LVC02AG-S14-R	SOP-14	Tape Reel

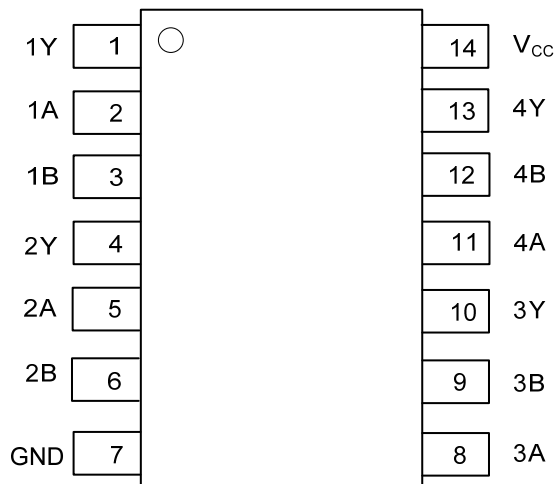
U74LVC02AL-S14-R	(1) Packing Type (2) Package Type (3) Lead Plating	(1) R: Tape Reel (2) S14: SOP-14 (3) L: Lead Free, G: Halogen Free
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■ PIN CONFIGURATION



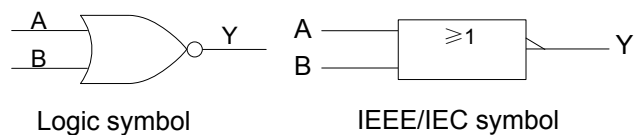
■ PIN DESCRIPTION

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)



■ 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	θ_{JA}	127	°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 $1.95V$	$0.65 \times V_{CC}$		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 $1.95V$		$0.35 \times V_{CC}$	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 ($T_A = 25^\circ\text{C}$, unless otherwise specified)

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

Note: All typical values are at $V_{CC} = 3.3\text{V}$, $T_A = 25^\circ\text{C}$.

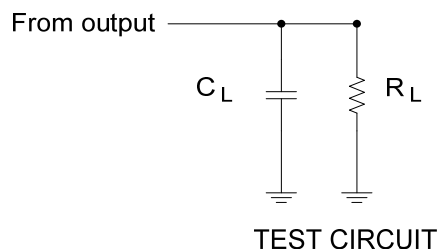
■ SWITCHING CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise specified

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

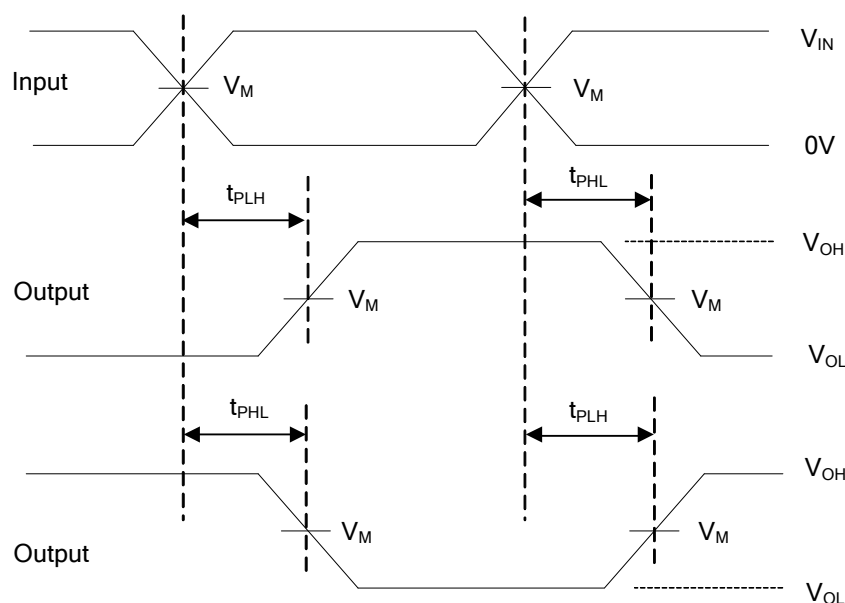
■ OPERATING CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise specified

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

■ TEST CIRCUIT AND WAVEFORMS



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



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 $\leq 10MHz$, $Z_O = 50\Omega$.

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