



## U74LVC86A

CMOS IC

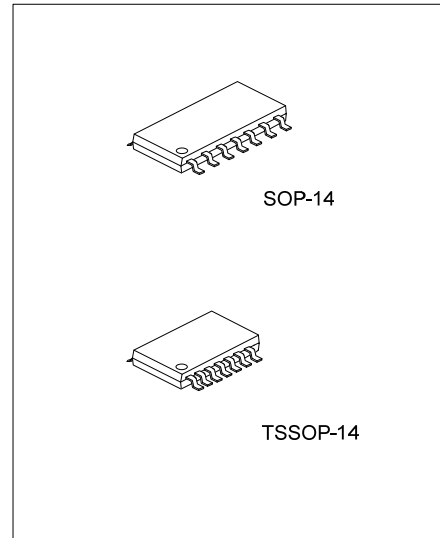
### QUAD 2-INPUT EXCLUSIVE OR GATE

#### DESCRIPTION

The **U74LVC86A** is a quad 2-input exclusive OR gate which performs the function  $Y=A \oplus B$  or  $Y=\overline{A}B + A\overline{B}$ . It is designed for 1.2V to 3.6V operation.

#### FEATURES

- \* Wide supply voltage range from 1.2V to 3.6V
- \* Max  $t_{pd}$  of 4.6ns at  $C_L=50pF$ ,  $V_{CC}=3.3V$
- \* Up to 5.5V inputs accept voltages
- \* Low power consumption,  $I_{CC} = 1 \mu A$  (Max.)
- \* Compatible with TTL families

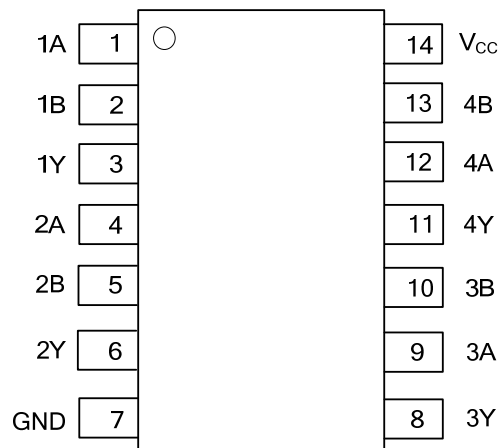


#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC86AL-S14-R	U74LVC86AG-S14-R	SOP-14	Tape Reel
U74LVC86AL-S14-T	U74LVC86AG-S14-T	SOP-14	Tube
U74LVC86AL-P14-R	U74LVC86AG-P14-R	TSSOP-14	Tape Reel
U74LVC86AL-P14-T	U74LVC86AG-P14-T	TSSOP-14	Tube

<p>U74LVC86AL-S14-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Free</p>	<p>(1) R: Tape Reel, T: Tube (2) S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free, L: Lead Free</p>
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■ PIN CONFIGURATION



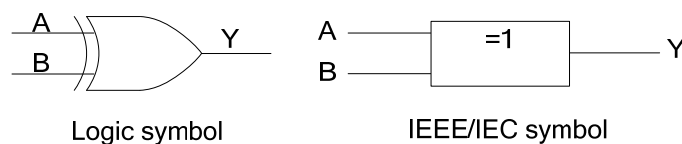
■ F PIN DESCRIPTION

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

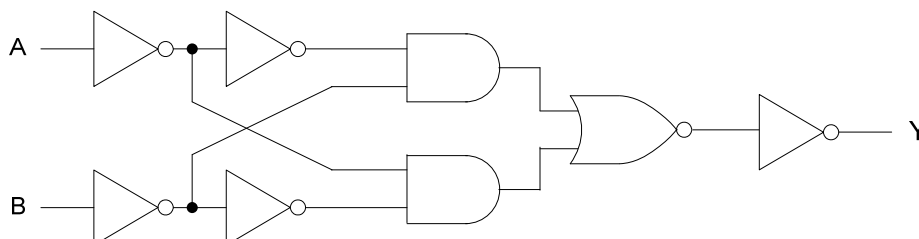
■ FUNCTION TABLE (EACH GATE)

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

■ LOGIC SYMBOL (ONE GATE)



■ LOGIC DIAGRAM (ONE GATE)



■ ABSOLUTE MAXIMUM RATING ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	UNIT
Supply Voltage	$V_{CC}$	-0.5 ~ 6.5	V
Input Voltage	$V_{IN}$	-0.5 ~ 5.5	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	$I_{OUT}$	$\pm 50$	mA
$V_{CC}$ or GND Current	$I_{CC}$	$\pm 100$	mA
Power Dissipation	$P_D$	$T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$ 500	mW
Storage Temperature	$T_{STG}$	-65 ~ +150	$^\circ\text{C}$

Notes: 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	RATING	UNIT
Junction to Ambient	$\theta_{JA}$	115	$^\circ\text{C}/\text{W}$

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
Supply Voltage	$V_{CC}$	Max. speed performance	2.7	3.6	V
		Low-voltage applications	1.2	3.6	
High-Level Input Voltage	$V_{IH}$	$V_{CC} = 1.2\text{V}$	$V_{CC}$		V
		$V_{CC} = 1.65\text{V} \sim 1.95\text{V}$	$0.65 \times V_{CC}$		
		$V_{CC} = 2.3\text{V} \sim 2.7\text{V}$	1.7		
		$V_{CC} = 2.7\text{V} \sim 3.6\text{V}$	2.0		
Low-Level Input Voltage	$V_{IL}$	$V_{CC} = 1.2\text{V}$		GND	V
		$V_{CC} = 1.65\text{V} \sim 1.95\text{V}$		$0.35 \times V_{CC}$	
		$V_{CC} = 2.3\text{V} \sim 2.7\text{V}$		0.7	
		$V_{CC} = 2.7\text{V} \sim 3.6\text{V}$		0.8	
Input Voltage	$V_{IN}$		0	5.5	V
Output Voltage	$V_{OUT}$		0	$V_{CC}$	V
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC} = 1.2 \sim 2.7\text{V}$		20	ns/V
		$V_{CC} = 2.7 \sim 3.6\text{V}$		10	
Operating Temperature	$T_A$		-40	+85	$^\circ\text{C}$

## ■ ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Output Voltage	$V_{OH}$	$I_{OH} = -100\mu A, V_{CC} = 1.65V \sim 3.6V$ $V_I = V_{IH} \text{ or } V_{IL}$	$V_{CC} - 0.2$			V
		$I_{OH} = -4mA, V_{CC} = 1.65V$ $V_I = V_{IH} \text{ or } V_{IL}$	1.29			
		$I_{OH} = -8mA, V_{CC} = 2.3V$ $V_I = V_{IH} \text{ or } V_{IL}$	1.9			
		$I_{OH} = -12mA, V_{CC} = 2.7V$ $V_I = V_{IH} \text{ or } V_{IL}$	2.2	$V_{CC}$		
		$I_{OH} = -18mA, V_{CC} = 3.0V$ $V_I = V_{IH} \text{ or } V_{IL}$	2.4			
		$I_{OH} = -24mA, V_{CC} = 3.0V$ $V_I = V_{IH} \text{ or } V_{IL}$	2.3			
Low-Level Output Voltage	$V_{OL}$	$I_{OH} = 100\mu A, V_{CC} = 1.65V \sim 3.6V$ $V_I = V_{IH} \text{ or } V_{IL}$			0.1	V
		$I_{OH} = 4mA, V_{CC} = 1.65V,$ $V_I = V_{IH} \text{ or } V_{IL}$			0.24	
		$I_{OH} = 8mA, V_{CC} = 2.3V,$ $V_I = V_{IH} \text{ or } V_{IL}$			0.3	
		$I_{OH} = 12mA, V_{CC} = 2.7V,$ $V_I = V_{IH} \text{ or } V_{IL}$			0.4	
		$I_{OH} = 24mA, V_{CC} = 3.0V,$ $V_I = V_{IH} \text{ or } V_{IL}$			0.55	
Input Leakage Current	$I_{I(LEAK)}$	$V_{IN} = 5.5V \text{ or } GND,$ $V_{CC} = 3.6V$		$\pm 0.1$	$\pm 1$	$\mu A$
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC} \text{ or } GND, I_{OUT} = 0,$ $V_{CC} = 3.6V$		0.1	1	$\mu A$
Additional quiescent Supply Current	$\Delta I_{CC}$	One input at $V_{CC} - 0.6V,$ other inputs at $V_{CC} \text{ or } GND,$ $I_{OUT} = 0, V_{CC} = 2.7V \sim 3.6V$		5	500	$\mu A$
Input Capacitance	$C_{IN}$	$V_{IN} = V_{CC} \text{ or } GND, V_{CC} = 3.3V$		5.0		pF

Note: 1. All typical values are at  $V_{CC} = 3.3V, T_A = 25^\circ C$

## ■ SWITCHING CHARACTERISTICS

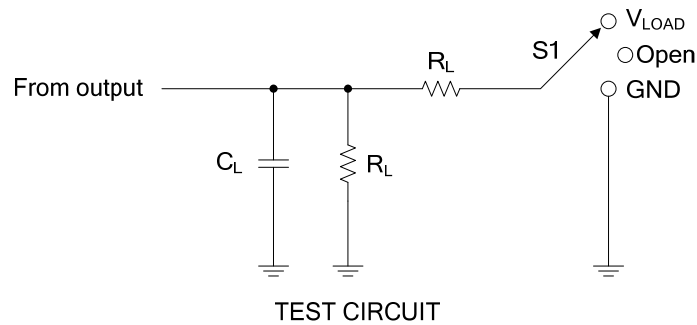
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A or B) to output (Y)	$t_{PLH}/t_{PHL}$	$V_{CC} = 1.2V, C_L = 50pF, R_L = 500\Omega$		11		ns
		$V_{CC} = 1.8V \pm 0.15V, C_L = 30pF, R_L = 1K\Omega$	1	4.1	9.4	
		$V_{CC} = 2.5V \pm 0.2V, C_L = 50pF, R_L = 500\Omega$	1	2.9	7.1	
		$V_{CC} = 2.7V, C_L = 50pF, R_L = 500\Omega$	1	2.8	5.4	
		$V_{CC} = 3.3 \pm 0.3V, C_L = 30pF, R_L = 500\Omega$	1	2.5	4.4	

Note: 1. All typical values are at  $V_{CC} = 3.3V, T_A = 25^\circ C$

## ■ OPERATING CHARACTERISTICS

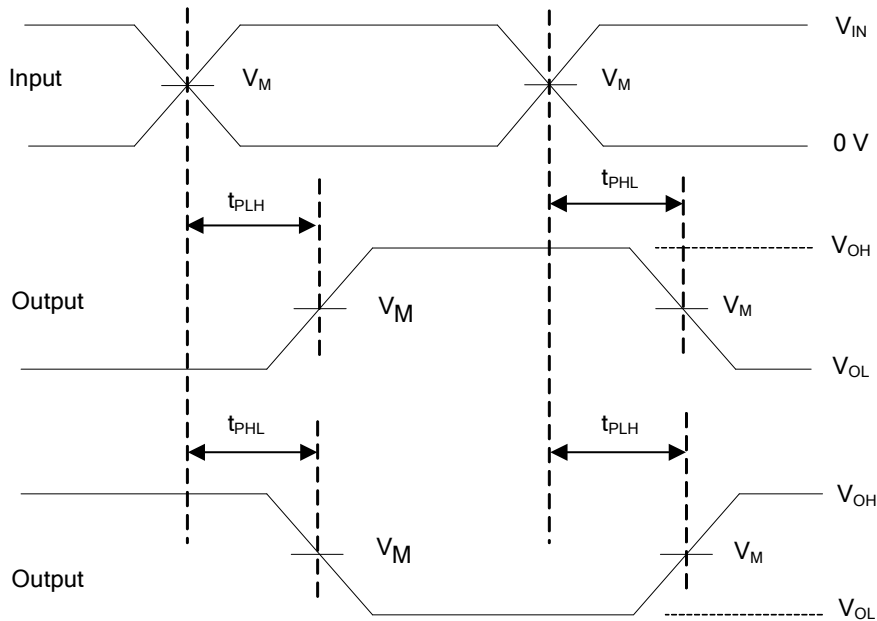
PARAMETER	SYMBOL	TEST CONDITIONS	TYP	UNIT
Power Dissipation Capacitance Per Gate	$C_{pd}$	$V_{CC} = 3.3V$	28	pF

## ■ TEST CIRCUIT AND WAVEFORMS



TEST	S1
$t_{PLH}/t_{PHL}$	Open

$V_{CC}$	Input		$V_M$	$V_{LOAD}$	$C_L$	$R_L$
	$V_{IN}$	$t_R, t_F$				
1.8V	$V_{CC}$	$\leq 2\text{ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1K $\Omega$
2.5V	$V_{CC}$	$\leq 2\text{ns}$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 $\Omega$
2.7V	2.7V	$\leq 2.5\text{ns}$	1.5V	6V	50pF	500 $\Omega$
3.3V	3.3V	$\leq 2.5\text{ns}$	1.5V	6V	50pF	500 $\Omega$



**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  $\leq 10\text{MHz}$ ,  $Z_O = 50\Omega$ .

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