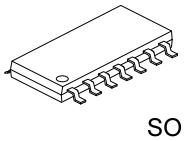
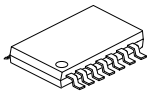
U74LVC86A

CMOS IC

QUAD 2-INPUT EXCLUSIVE OR GATE



SOP-14U



TSSOP-14U

■ 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

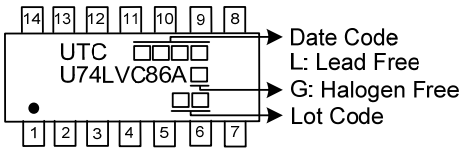
* Wide supply voltage range from 1.2V to 3.6V
* Max t_{pd} of 4.6ns at C_L=50pF, V_{CC}=3.3V
* Up to 5.5V inputs accept voltages
* Low power consumption, I_{CC} = 1 μA (Max.)
* Compatible with TTL families

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC86AL-UEA-R	U74LVC86AG-UEA-R	SOP-14U	Tape Reel
U74LVC86AL-UEB-R	U74LVC86AG-UEB-R	TSSOP-14U	Tape Reel

U74LVC86AG-UEA-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) UEA: SOP-14U, UEB: TSSOP-14U (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



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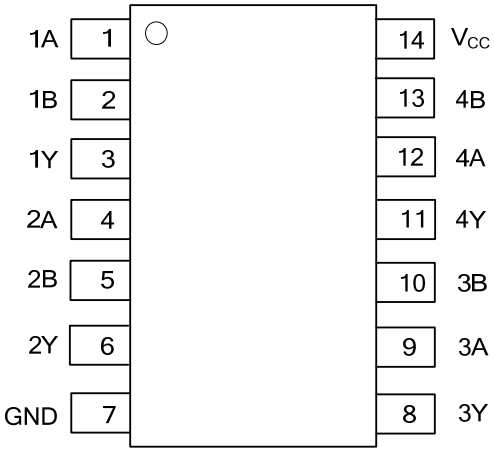
■ PIN CONFIGURATION



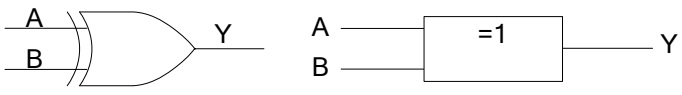
■ F PIN DESCRIPTION

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_{CC}	Positive supply voltage

■ FUNCTION TABLE (EACH GATE)

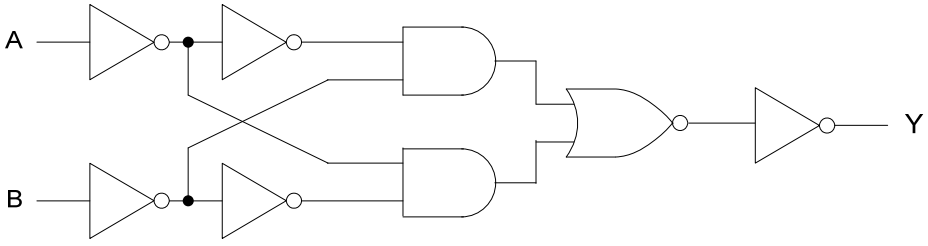
INPUTS		OUTPUT
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

■ LOGIC SYMBOL (ONE GATE)



Logic symbol IEEE/IEC symbol

■ LOGIC DIAGRAM (ONE GATE)



■ ABSOLUTE MAXIMUM RATING (T_A=25°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}	±50	mA
V_{CC} or GND Current		I_{CC}	±100	mA
Power Dissipation	T_A=-40°C to +125°C	P_D	500	mW
Storage Temperature		T_{STG}	-65 ~ +150	°C

Notes: 1. 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.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-14U	θ_{JA}	125	°C/W
	TSSOP-14U		150	°C/W

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN		MAX	UNIT
Supply Voltage	V_{CC}	Operating	1.65		3.6	V
		Data retention only	1.5			V
Input Voltage	V_{IN}		0		5.5	V
Output Voltage	V_{OUT}		0		V_{CC}	V
Input Transition Rise or Fall Rate	Δt/Δv	V_{CC}=1.65~2.7V			20	ns/V
		V_{CC}=2.7~3.6V			10	ns/V
Operating Temperature	T_A		-40		+125	°C

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-Level Input Voltage	V_{IH}	V_{CC}=1.65V~1.95V	0.65× V_{CC}			V
		V_{CC}=2.3V~2.7V	1.7			V
		V_{CC}=2.7V~3.6V	2.0			V
Low-Level Input Voltage	V_{IL}	V_{CC}=1.65V~1.95V			0.35× V_{CC}	V
		V_{CC}=2.3V~2.7V			0.7	V
		V_{CC}=2.7V~3.6V			0.8	V
High-Level Output Voltage	V_{OH}	I_{OH}=-100μA, V_{CC}=1.65V~3.6V V_I=V_{IH} or V_{IL}	V_{CC} - 0.2			V
		I_{OH}=-4mA, V_{CC}=1.65V V_I=V_{IH} or V_{IL}	1.29			V
		I_{OH}=-8mA, V_{CC}=2.3V V_I=V_{IH} or V_{IL}	1.9			V
		I_{OH}=-12mA, V_{CC}=2.7V V_I=V_{IH} or V_{IL}	2.2	V_{CC}		V
		I_{OH}=-18mA, V_{CC}=3.0V V_I=V_{IH} or V_{IL}	2.4			V
		I_{OH}=-24mA, V_{CC}=3.0V V_I=V_{IH} or V_{IL}	2.3			V

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Low-Level Output Voltage	V_{OL}	I_{OL}=100μA, V_{CC}=1.65V~3.6V V_I=V_{IH} or V_{IL}			0.1	V
		I_{OL}=4mA, V_{CC}=1.65V, V_I=V_{IH} or V_{IL}			0.24	V
		I_{OL}=8mA, V_{CC}=2.3V, V_I=V_{IH} or V_{IL}			0.3	V
		I_{OL}=12mA, V_{CC}=2.7V, V_I=V_{IH} or V_{IL}			0.4	V
		I_{OL}=24mA, V_{CC}=3.0V, V_I=V_{IH} or V_{IL}			0.55	V
Input Leakage Current	$I_{I(LEAK)}$	V_{IN}=5.5V or GND, V_{CC}=3.6V		±0.1	±1	μA
Quiescent Supply Current	I_{CC}	V_{IN}=V_{CC} or GND, I_{OUT}=0, V_{CC}=3.6V		0.1	1	μA
Additional quiescent Supply Current	ΔI_{CC}	One inputat V_{CC}–0.6V, Other inputsat V_{CC} or GND, I_{OUT}=0, V_{CC}=2.7V~3.6V		5	500	μA
Input Capacitance	C_{IN}	V_{IN}=V_{CC} or GND, V_{CC}=3.3V		5.0		pF

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

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

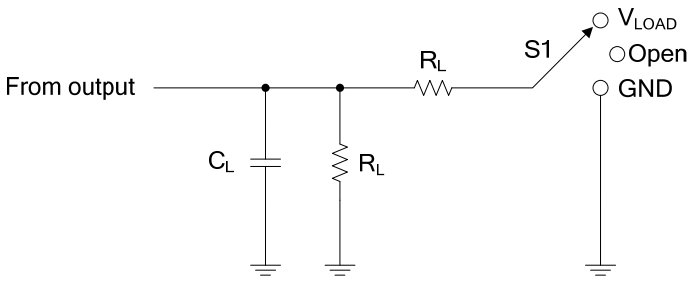
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A or B) to output (Y)	t_{PLH}/t_{PHL}	V_{CC} = 1.8V ±0.15V, C_L = 30 pF, R_L = 1KΩ	1	4.1	9.4	ns
		V_{CC} = 2.5V ±0.2V, C_L = 50 pF, R_L = 500Ω	1	2.9	7.1	ns
		V_{CC} = 2.7V, C_L = 50 pF, R_L= 500Ω	1	2.8	5.4	ns
		V_{CC} = 3.3 ±0.3V, C_L = 30pF, R_L= 500Ω	1	2.5	4.4	ns
Output Skew Time	$t_{SK(O)}$	V_{CC}=3.3±0.3V			1.5	ns

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

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

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

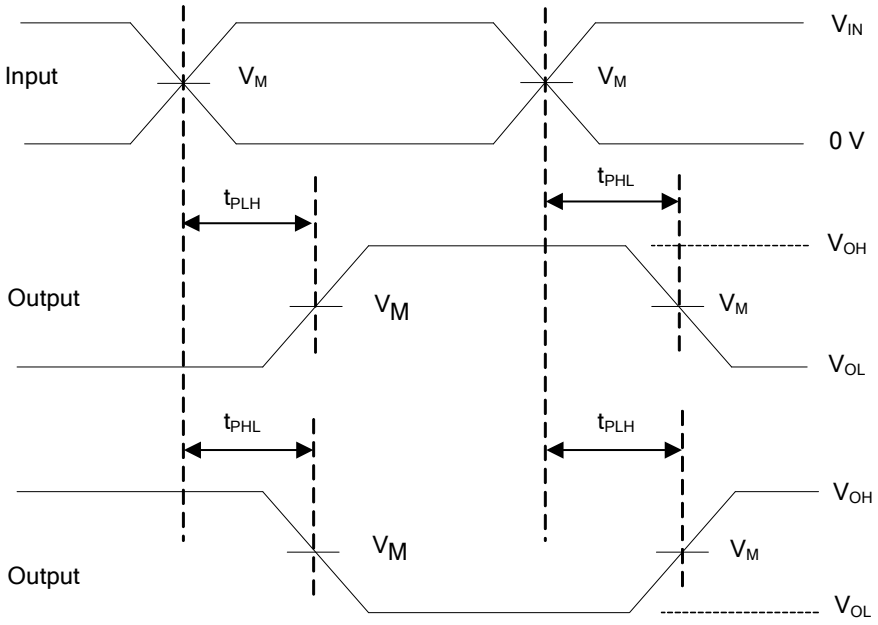
■ TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT

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}	≤2ns	$V_{CC}/2$	2 × V_{CC}	30pF	1KΩ
2.5V	V_{CC}	≤2ns	$V_{CC}/2$	2 × V_{CC}	50pF	500Ω
2.7V	2.7V	≤2.5ns	1.5V	6V	50pF	500Ω
3.3V	3.3V	≤2.5ns	1.5V	6V	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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