



## U74LVC1G86

CMOS IC

### SINGLE 2-INPUT EXCLUSIVE-OR GATE

#### DESCRIPTION

The **U74LVC1G86** is a single 2-input EXCLUSIVE-OR gate which provides the Function  $Y = A \oplus B$  or  $Y = \overline{A}B + A\overline{B}$  in positive logic. Inputs can be driven from either 3.3V or 5V devices. These features allow the use of these devices in a mixed 3.3V and 5V environment.

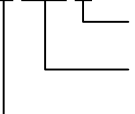
This device is fully specified for partial Power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

#### FEATURES

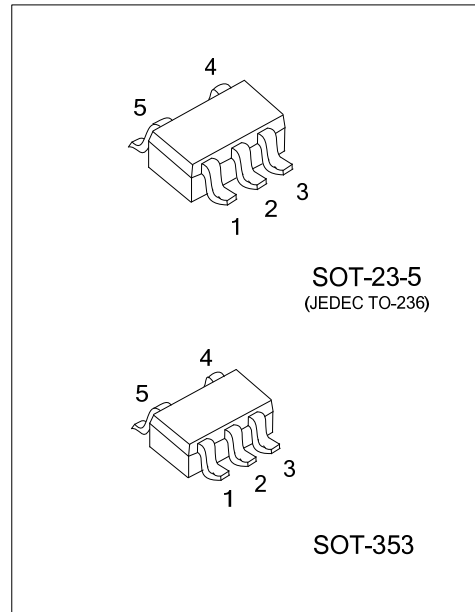
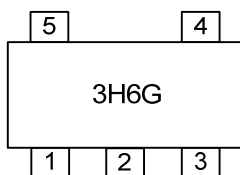
- \* Operate from 1.65V to 5.5V
- \* Inputs accept voltages to 5.5V
- \*  $I_{OFF}$  supports partial-power-down mode
- \* Low power dissipation
- \* Max  $t_{PD}$  of 4 ns at 3.3V

#### ORDERING INFORMATION

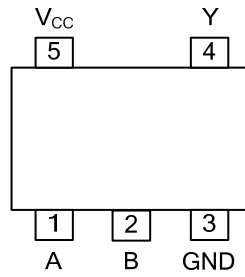
Ordering Number	Package	Packing
U74LVC1G86G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G86G-AL5-R	SOT-353	Tape Reel

<p>U74LVC1G86G-AE5-R</p>  <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) AE5: SOT-23-5, AL5: SOT-353</li> <li>(3) G: Halogen Free and Lead Free</li> </ul>
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#### MARKING



■ PIN CONFIGURATION

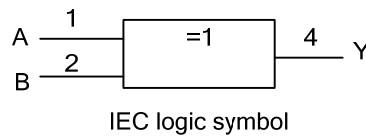
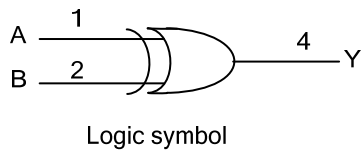


■ FUNCTION TABLE

INPUT(A)	INPUT(B)	OUTPUT(Y)
L	L	L
H	L	H
L	H	H
H	H	L

Note: H: HIGH voltage level; L: LOW voltage level;

■ LOGIC DIAGRAM (positive logic)



## ■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		$V_{CC}$	-0.5 ~ +6.5	V
Input Voltage		$V_{IN}$	-0.5 ~ +6.5	V
Output Voltage	Output in the high or low state	$V_{OUT}$	-0.5 ~ $V_{CC}+0.5$	V
	Output in the high-impedance or power-off state		-0.5 ~ +6.5	V
Continuous $V_{CC}$ or GND Current		$I_{CC}$	±100	mA
Continuous Output Current ( $V_{OUT}=0$ to $V_{CC}$ )		$I_{OUT}$	±50	mA
Input Clamp Current ( $V_{IN}<0$ )		$I_{IK}$	-50	mA
Output Clamp Current ( $V_{OUT}<0$ )		$I_{OK}$	-50	mA
Storage Temperature Range		$T_{STG}$	-65 ~ +150	°C

Note: 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.

## ■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	$V_{CC}$	Operating	1.65		5.5	V
		Data retention only	1.5			V
Input Voltage	$V_{IN}$		0		5.5	V
Output Voltage	$V_{OUT}$	High or low state	0		$V_{CC}$	V
High-level Output Current	$I_{OH}$	$V_{CC}=1.65V$			-4	mA
		$V_{CC}=2.3V$			-8	mA
		$V_{CC}=3V$			-16	mA
		$V_{CC}=3V$			-24	mA
		$V_{CC}=4.5V$			-32	mA
Low-level Output Current	$I_{OL}$	$V_{CC}=1.65V$			4	mA
		$V_{CC}=2.3V$			8	mA
		$V_{CC}=3V$			16	mA
		$V_{CC}=3V$			24	mA
		$V_{CC}=4.5V$			32	mA
Operating Temperature	$T_A$		-40		85	°C
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC}=1.8V\pm 0.15V, 2.5V\pm 0.2V$			20	ns/V
		$V_{CC}=3.3V\pm 0.3V$			10	ns/V
		$V_{CC}=5V\pm 0.5V$			5	ns/V

■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
High-level Input Voltage	V <sub>IH</sub>	V <sub>CC</sub> =1.65V to 1.95V	0.65×V <sub>CC</sub>			V	
		V <sub>CC</sub> =2.3V to 2.7V	1.7			V	
		V <sub>CC</sub> =3V to 3.6V	2			V	
		V <sub>CC</sub> =4.5V to 5.5V	0.7×V <sub>CC</sub>			V	
Low-level Input Voltage	V <sub>IL</sub>	V <sub>CC</sub> =1.65V to 1.95V			0.35×V <sub>CC</sub>	V	
		V <sub>CC</sub> =2.3V to 2.7V			0.7	V	
		V <sub>CC</sub> =3V to 3.6V			0.8	V	
		V <sub>CC</sub> =4.5V to 5.5V			0.3×V <sub>CC</sub>	V	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>CC</sub> =1.65 ~ 5.5V, I <sub>OH</sub> =-100μA	V <sub>CC</sub> -0.1			V	
		V <sub>CC</sub> =1.65V, I <sub>OH</sub> =-4mA	1.2			V	
		V <sub>CC</sub> =2.3V, I <sub>OH</sub> =-8mA	1.9			V	
		V <sub>CC</sub> =3.0V	I <sub>OL</sub> =16mA	2.4			V
			I <sub>OL</sub> =24mA	2.3			V
V <sub>CC</sub> =4.5V, I <sub>OH</sub> =-32mA	3.8			V			
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> =1.65 ~ 5.5V, I <sub>OL</sub> =100μA			0.1	V	
		V <sub>CC</sub> =1.65V, I <sub>OL</sub> =4mA			0.45	V	
		V <sub>CC</sub> =2.3V, I <sub>OL</sub> =8mA			0.3	V	
		V <sub>CC</sub> =3.0V	I <sub>OL</sub> =16mA			0.4	V
			I <sub>OL</sub> =24mA			0.55	V
V <sub>CC</sub> =4.5V, I <sub>OL</sub> =32mA				0.55	V		
Input Leakage Current	I <sub>I(LEAK)</sub>	V <sub>CC</sub> =0 ~ 5.5V, V <sub>IN</sub> =5.5V or GND			±5	μA	
Power OFF Leakage Current	I <sub>off</sub>	V <sub>CC</sub> =0V, V <sub>IN</sub> or V <sub>OUT</sub> =5.5V			±10	μA	
Quiescent Supply Current	I <sub>CC</sub>	V <sub>CC</sub> =1.65 ~ 5.5V, V <sub>IN</sub> =V <sub>CC</sub> or GND, I <sub>OUT</sub> =0			10	μA	
Additional Quiescent Supply Current Per Input Pin	ΔI <sub>CC</sub>	V <sub>CC</sub> =3 ~ 5.5V, One input at V <sub>CC</sub> -0.6V, Other inputs at V <sub>CC</sub> or GND			500	μA	
Input Capacitance	C <sub>I</sub>	V <sub>CC</sub> =3.3V, V <sub>IN</sub> =V <sub>CC</sub> or GND		6		pF	

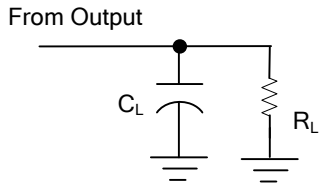
■ SWITCHING CHARACTERISTICS (T<sub>A</sub> =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input to output	t <sub>PLH</sub> t <sub>PHL</sub>	V <sub>CC</sub> =1.8±0.15V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	2.1		9.1	ns
		V <sub>CC</sub> =2.5±0.2V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	1		4.5	ns
		V <sub>CC</sub> =3.3±0.3V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	0.6		4	ns
		V <sub>CC</sub> =5±0.5V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	0.8		3.3	ns
Propagation delay from input to output	t <sub>PLH</sub> t <sub>PHL</sub>	V <sub>CC</sub> =1.8±0.15V, C <sub>L</sub> =30pF, R <sub>L</sub> =1KΩ	3.5		9.9	ns
		V <sub>CC</sub> =2.5±0.2V, C <sub>L</sub> =30pF, R <sub>L</sub> =500Ω	1.8		5.5	ns
		V <sub>CC</sub> =3.3±0.3V, C <sub>L</sub> =50pF, R <sub>L</sub> =500Ω	1.3		5	ns
		V <sub>CC</sub> =5±0.5V, C <sub>L</sub> =50pF, R <sub>L</sub> =500Ω	1		4	ns

■ OPERATING CHARACTERISTICS (f=10MHz, T<sub>A</sub> =25°C , unless otherwise specified)

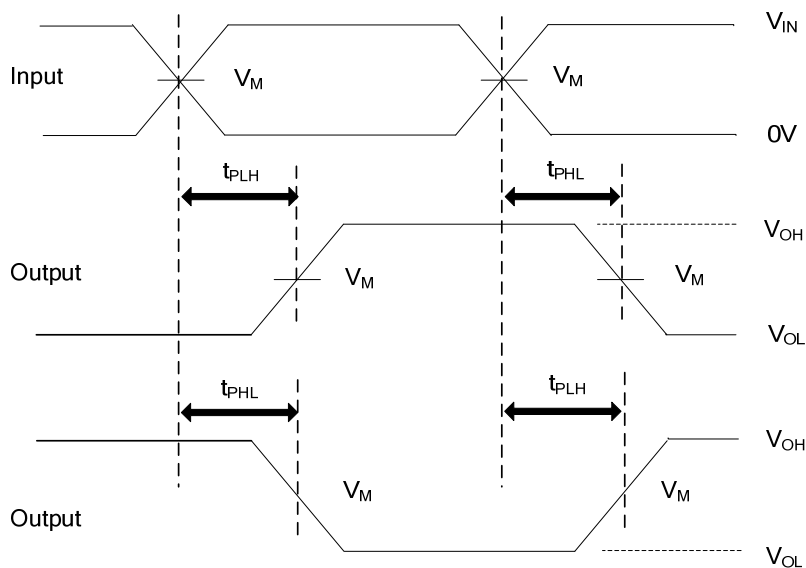
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C <sub>PD</sub>	V <sub>CC</sub> =1.8V		22		pF
		V <sub>CC</sub> =2.5V		22		pF
		V <sub>CC</sub> =3.3V		22		pF
		V <sub>CC</sub> =5V		24		pF

■ TEST CIRCUIT AND WAVEFORMS



TEST CIRCUIT

V <sub>CC</sub>	Inputs		V <sub>M</sub>	C <sub>L</sub>	R <sub>L</sub>
	V <sub>IN</sub>	t <sub>R</sub> , t <sub>F</sub>			
1.8V±0.15V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	15pF	1MΩ
				30pF	1KΩ
2.5V±0.2V	V <sub>CC</sub>	≤2ns	V <sub>CC</sub> /2	15pF	1MΩ
				30pF	500Ω
3.3V±0.3V	3V	≤2.5ns	1.5V	15pF	1MΩ
				50pF	500Ω
5V±0.5V	V <sub>CC</sub>	≤2.5ns	V <sub>CC</sub> /2	15pF	1MΩ
				50pF	500Ω



PROPAGATION DELAY TIMES

- Notes: 1. C<sub>L</sub> includes probe and jig capacitance.  
 2. All input pulses are supplied by generators having the following characteristics: PRR ≤10MHz, Z<sub>O</sub> = 50Ω.

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