



## U74LVC1G09

Advance

CMOS IC

### SINGLE 2-INPUT POSITIVE-AND GATE WITH OPEN-DRAIN OUTPUT

#### DESCRIPTION

The **U74LVC1G09** is a single 2-input AND gate with open-drain output . It performs the Boolean function  $Y = A \cdot B$  or  $Y = \overline{A+B}$  in positive logic . For digital operation this device must have a external pull-up resistor to establish a logic HIGH-level.

This device has power-down protective circuit, preventing device destruction when it is powered down.

#### FEATURES

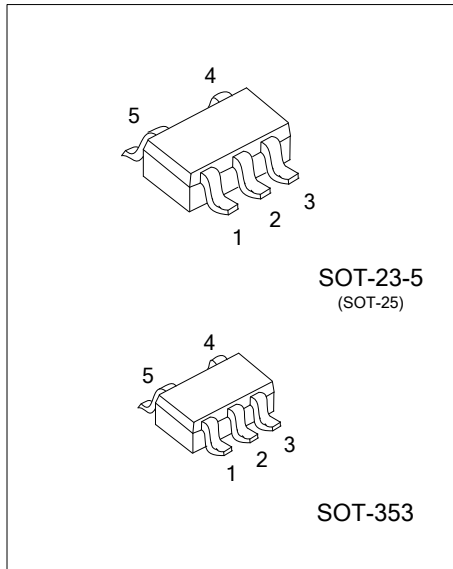
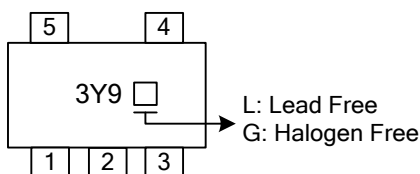
- \* Operate from 1.65V to 5.5V
- \* Inputs accept voltages to 5.5V
- \*  $I_{off}$  supports partial-power-down mode
- \*  $\pm 24mA$  output drive ( $V_{CC}=3.3V$ )
- \* Low power dissipation
- \* High noise immunity

#### ORDERING INFORMATION

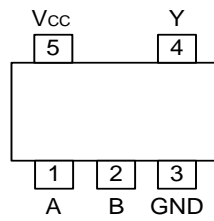
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G09L-AE5-R	U74LVC1G09G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G09L-AL5-R	U74LVC1G09G-AL5-R	SOT-353	Tape Reel

<p>U74LVC1G09G-AE5-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AE5: SOT-23-5, AL5: SOT-353 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
---	---

#### MARKING



## ■ PIN CONFIGURATION

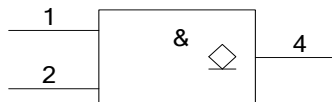
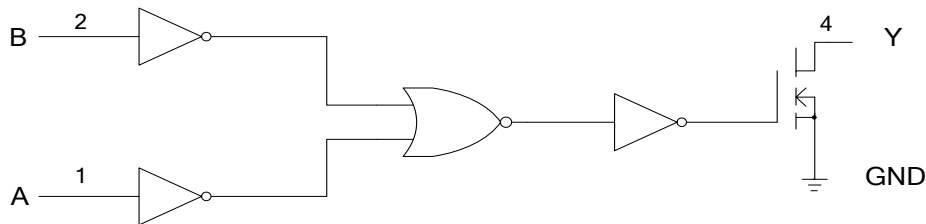


## ■ FUNCTION TABLE

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

Note: H: HIGH voltage level, L: LOW voltage level.

## ■ LOGIC DIAGRAM (positive logic)



IEC logic symbol

FLYING 汎翔國際有限公司  
[www.flying1688.com](http://www.flying1688.com)

### ■ 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	$V_{OUT}$	-0.5 ~ +6.5	V
$V_{CC}$ 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
Operating Temperature	$T_{OPR}$	-40 ~ +85	°C
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	$V_{OUT}$		0		5.5	V
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
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~1.95V	0.65×V <sub>CC</sub>			V
		V <sub>CC</sub> =2.3V~2.7V	1.7			V
		V <sub>CC</sub> =3.0V~3.6V	2			V
		V <sub>CC</sub> =4.5V~5.5V	0.7×V <sub>CC</sub>			V
Low-level Input Voltage	V <sub>IL</sub>	V <sub>CC</sub> =1.65V~1.95V			0.35×V <sub>CC</sub>	V
		V <sub>CC</sub> =2.3V~2.7V			0.7	V
		V <sub>CC</sub> =3.0V~3.6V			0.8	V
		V <sub>CC</sub> =4.5V~5.5V			0.3×V <sub>CC</sub>	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
		V <sub>CC</sub> =3.0V, 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>IN</sub> =5.5V or GND, V <sub>CC</sub> =0 ~ 5.5V			±1	μA
Power OFF Leakage Current	I <sub>off</sub>	V <sub>IN</sub> or V <sub>OUT</sub> =5.5V, V <sub>CC</sub> =0V			±10	μA
Quiescent Supply Current	I <sub>CC</sub>	V <sub>IN</sub> =5.5V or GND, I <sub>OUT</sub> =0 V <sub>CC</sub> =1.65~5.5V			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		3.5		pF
Output Capacitance	C <sub>OUT</sub>	V <sub>CC</sub> =3.3V, V <sub>IN</sub> =V <sub>CC</sub> or GND		4.5		pF

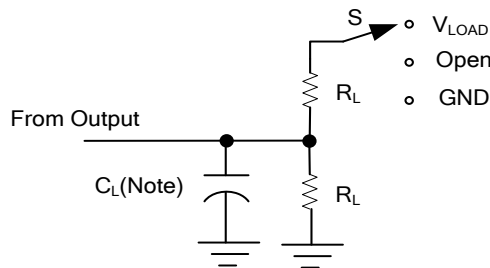
### ■ SWITCHING CHARACTERISTICS (T<sub>A</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Propagation delay from input (A or B) to output(Y)	t <sub>PZL</sub> / t <sub>PLZ</sub>	V <sub>CC</sub> =1.8±0.15V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	2.9		7.4	ns	
		V <sub>CC</sub> =2.5±0.2V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	1.7		3.8	ns	
		V <sub>CC</sub> =3.3±0.3V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	1.5		4.9	ns	
		V <sub>CC</sub> =5±0.5V, C <sub>L</sub> =15pF, R <sub>L</sub> =1MΩ	0.9		2.4	ns	
		V <sub>CC</sub> =1.8±0.15V, R <sub>L</sub> =1KΩ	C <sub>L</sub> =30pF or 50pF	2.8		10	ns
		V <sub>CC</sub> =2.5±0.2V, R <sub>L</sub> =500Ω		1.6		6.0	ns
		V <sub>CC</sub> =3.3±0.3V, R <sub>L</sub> =500Ω		1.4		4.5	ns
		V <sub>CC</sub> =5±0.5V, R <sub>L</sub> =500Ω		1.0		3.9	ns

### ■ OPERATING CHARACTERISTICS (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, f=10MHz		3		pF
		V <sub>CC</sub> =2.5V, f=10MHz		3		pF
		V <sub>CC</sub> =3.3V, f=10MHz		4		pF
		V <sub>CC</sub> =5V, f=10MHz		6		pF

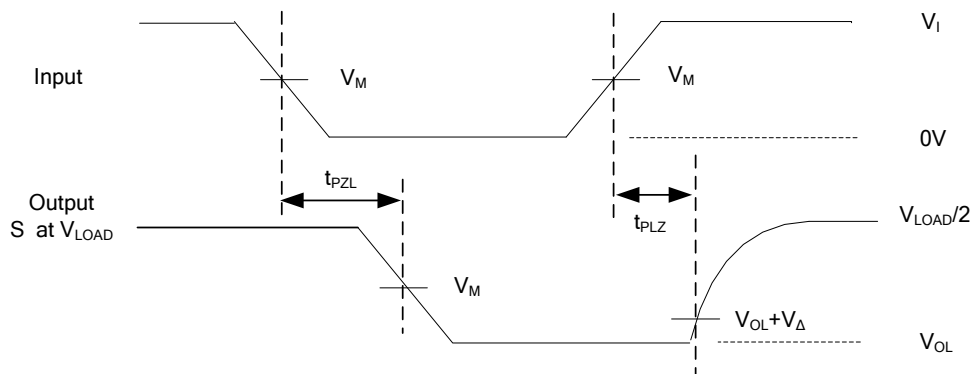
### ■ TEST CIRCUIT AND WAVEFORMS



TEST	S
$t_{PZL}(\text{Note1})$	$V_{LOAD}$
$t_{PLZ}(\text{Note1})$	$V_{LOAD}$

Note: Since this device has open drain outputs, the  $t_{PLZ}$  and  $t_{PZL}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

$V_{CC}$	$V_{IN}$	$t_R/t_F$	$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M $\Omega$	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	15pF	1M $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M $\Omega$	0.3V
$1.8V \pm 0.15V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	30pF	1K $\Omega$	0.15V
$2.5V \pm 0.2V$	$V_{CC}$	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	30pF	500 $\Omega$	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	50pF	500 $\Omega$	0.3V
$5V \pm 0.5V$	$V_{CC}$	$\leq 2.5ns$	$V_{CC}/2$	$2 * V_{CC}$	50pF	500 $\Omega$	0.3V



Note:  $C_L$  includes probe and jig capacitance.

All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10MHz$ ,  $Z_0 = 50\Omega$ .

Since this device has open drain outputs, the  $t_{PLZ}$  and  $t_{PZL}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. UTC reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.