



U74LVC1G09

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 $Y = A \bullet B$ 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

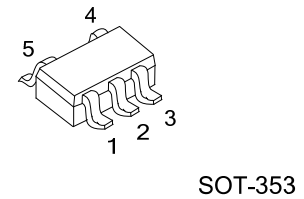
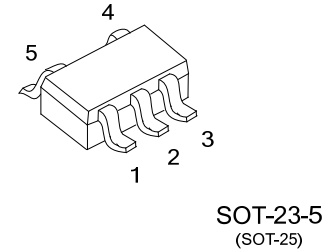
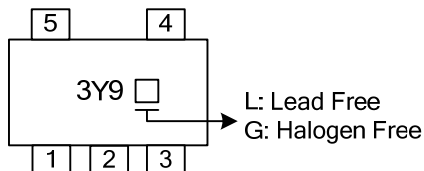
- * Operate from 1.65V to 5.5V
- * Inputs accept voltages to 5.5V
- * I_{off} supports partial-power-down mode
- * $\pm 24mA$ output drive($V_{CC}=3.3V$)
- * Low power dissipation
- * High noise immunity

ORDERING INFORMATION

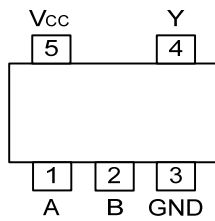
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G09L-AE5-R	U74LVC1G09G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G09L-AL5-R	U74LVC1G09G-AL5-R	SOT-353	Tape Reel

U74LVC1G09L-AE5-R	(1) Packing Type (2) Package Type (3) Lead Free	(1) R: Tape Reel (2) AE5: SOT-23-5, AL5: SOT-353 (3) G: Halogen Free, L: Lead Free
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MARKING



■ PIN CONFIGURATION

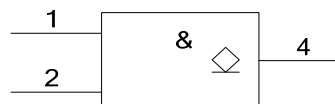
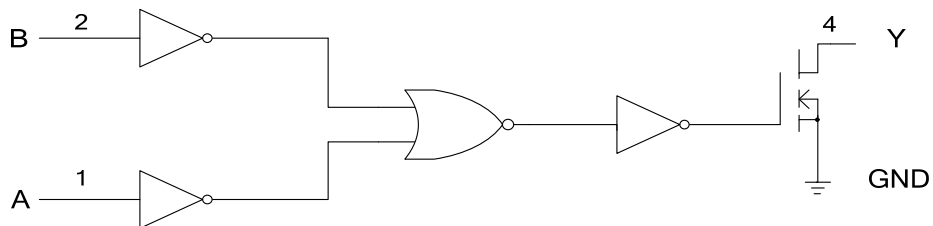


■ FUNCTION TABLE

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

■ 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 ~ +6.5	V
	Output in the high-impedance or power-off state		-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}	active mode	0		V_{CC}	V
		high-impedance mode	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	$\Delta t/\Delta V$	$V_{CC}=1.8V\pm0.15V, 2.5V\pm0.2V$			20	ns/V
		$V_{CC}=3.3V\pm0.3V$			10	ns/V
		$V_{CC}=5V\pm0.5V$			5	ns/V

■ **ELECTRICAL CHARACTERISTICS** ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-level Input Voltage	V_{IH}	$V_{CC}=1.65\text{V}\sim 1.95\text{V}$	$0.65 \cdot V_{CC}$			V
		$V_{CC}=2.3\text{V}\sim 2.7\text{V}$	1.7			V
		$V_{CC}=3.0\text{V}\sim 3.6\text{V}$	2			V
		$V_{CC}=4.5\text{V}\sim 5.5\text{V}$	$0.7 \cdot V_{CC}$			V
Low-level Input Voltage	V_{IL}	$V_{CC}=1.65\text{V}\sim 1.95\text{V}$			$0.35 \cdot V_{CC}$	V
		$V_{CC}=2.3\text{V}\sim 2.7\text{V}$			0.7	V
		$V_{CC}=3.0\text{V}\sim 3.6\text{V}$			0.8	V
		$V_{CC}=4.5\text{V}\sim 5.5\text{V}$			$0.3 \cdot V_{CC}$	V
Low-Level Output Voltage	V_{OL}	$I_{OL}=100\mu\text{A}$, $V_{CC}=1.65\sim 5.5\text{V}$			0.1	V
		$I_{OL}=4\text{mA}$, $V_{CC}=1.65\text{V}$			0.45	V
		$I_{OL}=8\text{mA}$, $V_{CC}=2.3\text{V}$			0.3	V
		$I_{OL}=16\text{mA}$, $V_{CC}=3.0\text{V}$			0.4	V
		$I_{OL}=24\text{mA}$, $V_{CC}=3.0\text{V}$			0.55	V
		$I_{OL}=32\text{mA}$, $V_{CC}=4.5\text{V}$			0.55	V
Input Leakage Current	$I_{I(LEAK)}$	$V_{IN}=5.5\text{V}$ or GND, $V_{CC}=0 \sim 5.5\text{V}$			± 1	μA
Power OFF Leakage Current	I_{off}	V_{IN} or $V_{OUT}=5.5\text{V}$, $V_{CC}=0\text{V}$			± 10	μA
Quiescent Supply Current	I_{CC}	$V_{IN}=5.5\text{V}$ or GND, $I_{OUT}=0$ $V_{CC}=1.65\sim 5.5\text{V}$			10	μA
Additional Quiescent Supply Current Per Input Pin	ΔI_{CC}	$V_{CC}=3\sim 5.5\text{V}$, One input at $V_{CC}-0.6\text{V}$, Other inputs at V_{CC} or GND			500	μA
Input Capacitance	C_I	$V_{CC}=3.3\text{V}$, $V_{IN}=V_{CC}$ or GND		3.5		pF
Output Capacitance	C_{OUT}	$V_{CC}=3.3\text{V}$, $V_{IN}=V_{CC}$ or GND		4.5		pF

■ **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_{PZL} / t_{PLZ}	$V_{CC}=1.8\pm 0.15\text{V}$, $C_L=15\text{pF}$, $R_L=1\text{M}\Omega$	2.9		7.4	ns
		$V_{CC}=2.5\pm 0.2\text{V}$, $C_L=15\text{pF}$, $R_L=1\text{M}\Omega$	1.7		3.8	ns
		$V_{CC}=3.3\pm 0.3\text{V}$, $C_L=15\text{pF}$, $R_L=1\text{M}\Omega$	1.5		4.9	ns
		$V_{CC}=5\pm 0.5\text{V}$, $C_L=15\text{pF}$, $R_L=1\text{M}\Omega$	0.9		2.4	ns
		$V_{CC}=1.8\pm 0.15\text{V}$, $R_L=1\text{K}\Omega$	2.8		10	ns
		$V_{CC}=2.5\pm 0.2\text{V}$, $R_L=500\Omega$	1.6		6.0	ns
		$V_{CC}=3.3\pm 0.3\text{V}$, $R_L=500\Omega$	1.4		4.5	ns
		$V_{CC}=5\pm 0.5\text{V}$, $R_L=500\Omega$	1.0		3.9	ns

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C_{PD}	$V_{CC}=1.8\text{V}$, $f=10\text{MHz}$		3		pF
		$V_{CC}=2.5\text{V}$, $f=10\text{MHz}$		3		pF
		$V_{CC}=3.3\text{V}$, $f=10\text{MHz}$		4		pF
		$V_{CC}=5\text{V}$, $f=10\text{MHz}$		6		pF

From Output

C_L (Note)

R_L

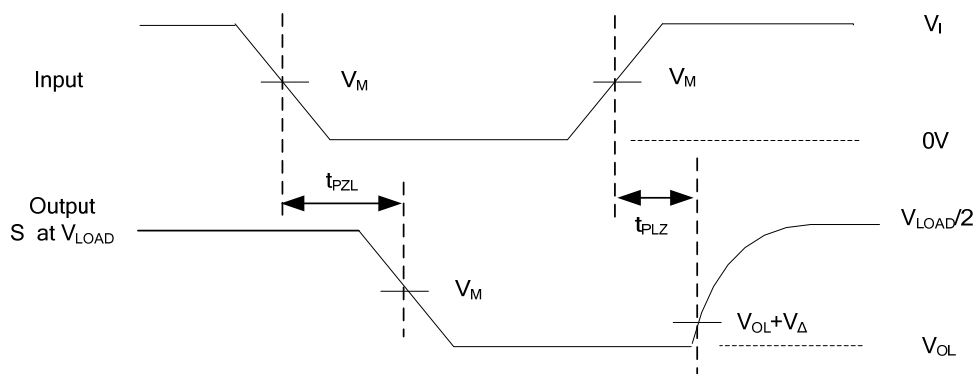
R_L

S

- V_{LOAD}
- Open
- GND

TEST	S
t _{PZL} (Note1)	V _{LOAD}
t _{PLZ} (Note1)	V _{LOAD}

V _{CC}	V _{IN}	t _R /t _F	V _M	V _{LOAD}	C _L	R _L	V _Δ
1.8V±0.15V	V _{CC}	≤2ns	V _{CC} /2	2*V _{CC}	15pF	1MΩ	0.15V
2.5V±0.2V	V _{CC}	≤2ns	V _{CC} /2	2*V _{CC}	15pF	1MΩ	0.15V
3.3V±0.3V	3 V	≤2.5ns	1.5V	6V	15pF	1MΩ	0.3V
5V±0.5V	V _{CC}	≤2.5ns	V _{CC} /2	2*V _{CC}	15pF	1MΩ	0.3V
1.8V±0.15V	V _{CC}	≤2ns	V _{CC} /2	2*V _{CC}	30pF	1KΩ	0.15V
2.5V±0.2V	V _{CC}	≤2ns	V _{CC} /2	2*V _{CC}	30pF	500Ω	0.15V
3.3V±0.3V	3 V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.5V	V _{CC}	≤2.5ns	V _{CC} /2	2*V _{CC}	50pF	500Ω	0.3V



Note: C_L includes probe and jig capacitance.
All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_0 = 50\Omega$.
Since this device has open drain outputs, the t_{PLZ} and t_{PZL} is the same as t_{PLH} and t_{PHL} .

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