



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 $Y = A \cdot B$ 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

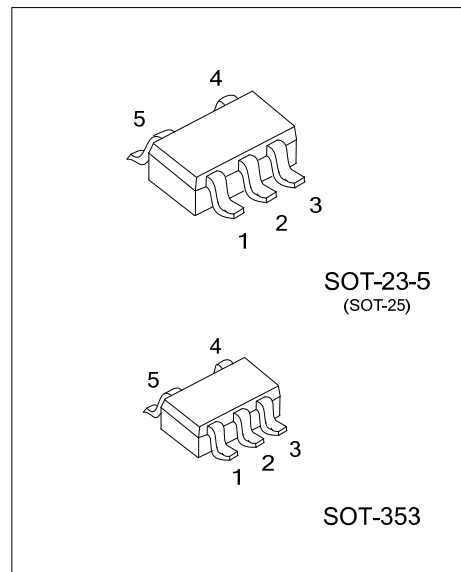
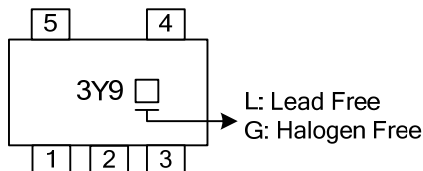
- * Operate from 1.65V to 5.5V
- * Inputs accept voltages to 5.5V
- * I_{off} supports partial-power-down mode
- * $\pm 24mA$ output drive($V_{CC}=3.3V$)
- * Low power dissipation
- * High noise immunity

ORDERING INFORMATION

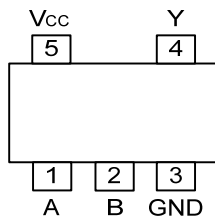
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G09L-AE5-R	U74LVC1G09G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G09L-AL5-R	U74LVC1G09G-AL5-R	SOT-353	Tape Reel

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



■ PIN CONFIGURATION

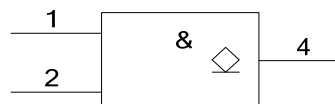
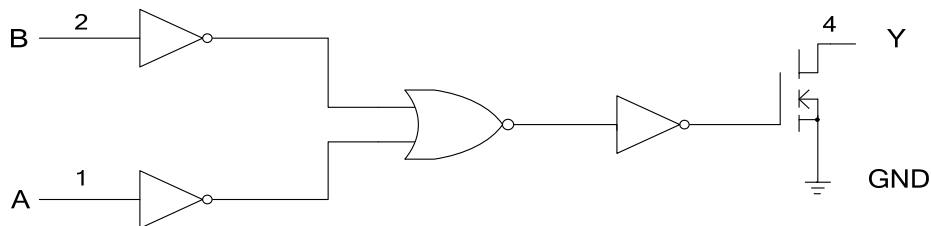


■ FUNCTION TABLE

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	V_{OUT}	Output in the high or low state	-0.5 ~ +6.5
		Output in the high-impedance or power-off state	-0.5 ~ +6.5
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	$\Delta t/\Delta V$	$V_{CC}=1.8V\pm 0.15V, 2.5V\pm 0.2V$			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_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} =3.0V~3.6V	2			V
		V _{CC} =4.5V~5.5V	0.7*V _{CC}			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} =3.0V~3.6V			0.8	V
		V _{CC} =4.5V~5.5V			0.3*V _{CC}	V
Low-Level Output Voltage	V _{OL}	I _{OL} =100μA, V _{CC} =1.65~5.5V			0.1	V
		I _{OL} =4mA, V _{CC} =1.65V			0.45	V
		I _{OL} =8mA, V _{CC} =2.3V			0.3	V
		I _{OL} =16mA, V _{CC} =3.0V			0.4	V
		I _{OL} =24mA, V _{CC} =3.0V			0.55	V
		I _{OL} =32mA, V _{CC} =4.5V			0.55	V
Input Leakage Current	I _{I(LEAK)}	V _{IN} =5.5V or GND, V _{CC} =0 ~ 5.5V			±1	μA
Power OFF Leakage Current	I _{off}	V _{IN} or V _{OUT} =5.5V, V _{CC} =0V			±10	μA
Quiescent Supply Current	I _{CC}	V _{IN} =5.5V or GND, I _{OUT} =0 V _{CC} =1.65~5.5V			10	μA
Additional Quiescent Supply Current Per Input Pin	ΔI _{CC}	V _{CC} =3~5.5V, One input at V _{CC} -0.6V, Other inputs at V _{CC} or GND			500	μA
Input Capacitance	C _I	V _{CC} =3.3V, V _{IN} =V _{CC} or GND		3.5		pF
Output Capacitance	C _{OUT}	V _{CC} =3.3V, V _{IN} =V _{CC} or GND		4.5		pF

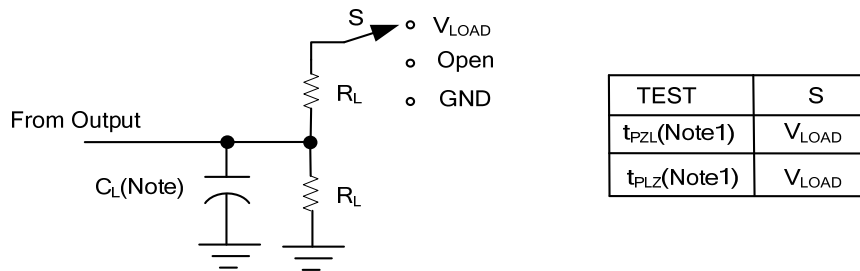
■ SWITCHING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

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

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

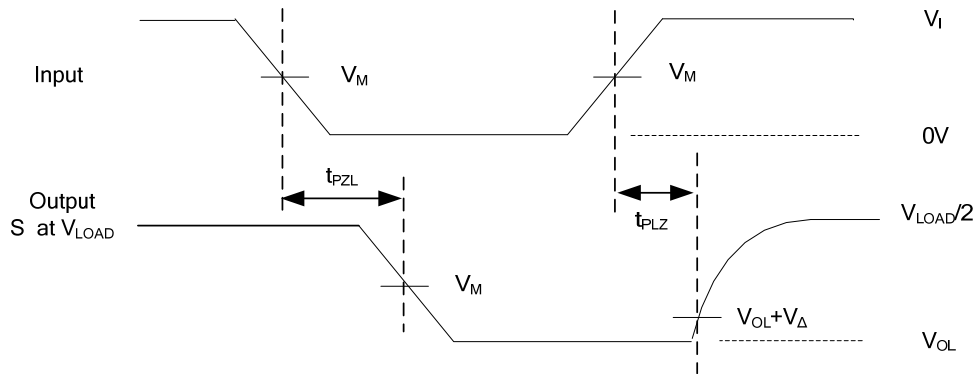
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C _{PD}	V _{CC} =1.8V, f=10MHz		3		pF
		V _{CC} =2.5V, f=10MHz		3		pF
		V _{CC} =3.3V, f=10MHz		4		pF
		V _{CC} =5V, f=10MHz		6		pF

TEST CIRCUIT AND WAVEFORMS



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_{Δ}
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M Ω	0.15V
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M Ω	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	15pF	1M Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 * V_{CC}$	15pF	1M Ω	0.3V
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	30pF	1K Ω	0.15V
$2.5V \pm 0.2V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	30pF	500 Ω	0.15V
$3.3V \pm 0.3V$	3 V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V
$5V \pm 0.5V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 * V_{CC}$	50pF	500 Ω	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} .

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