



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 $Y = A \bullet B$ 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.

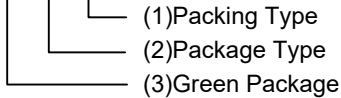
This device has power-down protective circuit, preventing device destruction when it is powered down.

FEATURES

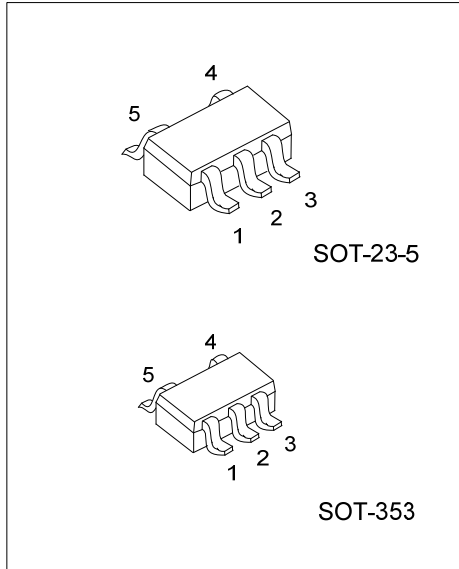
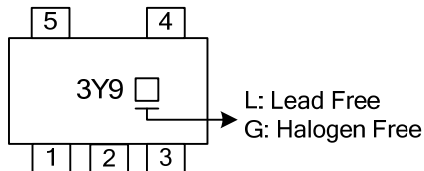
- * Operate from 1.65V to 5.5V
- * Inputs accept voltages to 5.5V
- * I_{off} supports partial-power-down mode
- * $\pm 24mA$ output drive ($V_{CC}=3.3V$)
- * Low power dissipation
- * High noise immunity

ORDERING INFORMATION

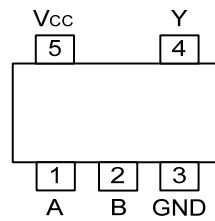
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G09L-AE5-R	U74LVC1G09G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G09L-AL5-R	U74LVC1G09G-AL5-R	SOT-353	Tape Reel

U74LVC1G09G-AE5-R 	(1) R: Tape Reel (2) AE5: SOT-23-5, AL5: SOT-353 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



■ PIN CONFIGURATION

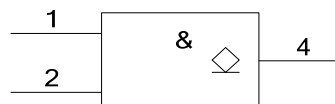
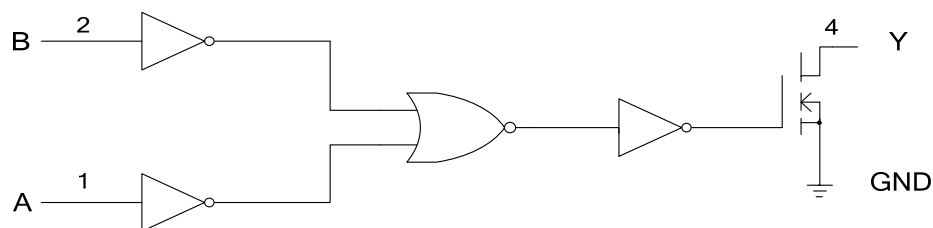


■ FUNCTION TABLE

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

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

■ LOGIC DIAGRAM (positive logic)



IEC logic symbol

■ **ABSOLUTE MAXIMUM RATING** (Unless otherwise specified)

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
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** (Unless otherwise specified)

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	$\Delta t/\Delta V$	$V_{CC}=1.8V\pm0.15V, 2.5V\pm0.2V$			20	ns/V
		$V_{CC}=3.3V\pm0.3V$			10	ns/V
		$V_{CC}=5V\pm0.5V$			5	ns/V
Operating Temperature	T_A		-40		+125	°C

■ ELECTRICAL CHARACTERISTICS (Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
High-level Input Voltage	V_{IH}	$V_{CC}=1.65V\sim1.95V$	$0.65\times V_{CC}$			V
		$V_{CC}=2.3V\sim2.7V$	1.7			V
		$V_{CC}=3.0V\sim3.6V$	2			V
		$V_{CC}=4.5V\sim5.5V$	$0.7\times V_{CC}$			V
Low-level Input Voltage	V_{IL}	$V_{CC}=1.65V\sim1.95V$			$0.35\times V_{CC}$	V
		$V_{CC}=2.3V\sim2.7V$			0.7	V
		$V_{CC}=3.0V\sim3.6V$			0.8	V
		$V_{CC}=4.5V\sim5.5V$			$0.3\times V_{CC}$	V
Low-Level Output Voltage	V_{OL}	$V_{CC}=1.65\sim5.5V, I_{OL}=100\mu A$			0.1	V
		$V_{CC}=1.65V, I_{OL}=4mA$			0.45	V
		$V_{CC}=2.3V, I_{OL}=8mA$			0.3	V
		$V_{CC}=3.0V, I_{OL}=16mA$			0.4	V
		$V_{CC}=3.0V, I_{OL}=24mA$			0.55	V
		$V_{CC}=4.5V, I_{OL}=32mA$			0.55	V
Input Leakage Current	$I_{I(LEAK)}$	$V_{IN}=5.5V$ or GND, $V_{CC}=0\sim5.5V$			± 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, $I_{OUT}=0$ $V_{CC}=1.65\sim5.5V$			10	μA
Additional Quiescent Supply Current Per Input Pin	ΔI_{CC}	$V_{CC}=3\sim5.5V$, 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

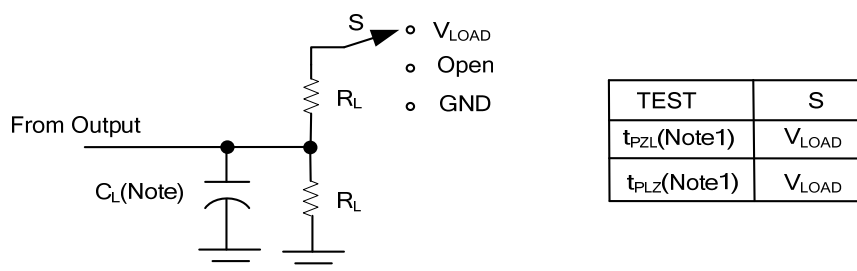
■ SWITCHING CHARACTERISTICS (Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation delay from input (A or B) to output(Y)	t_{PZL} / t_{PLZ}	$V_{CC}=1.8\pm0.15V, R_L=1K\Omega$	$C_L=30pF$ or $50pF$	2.8	14.5	ns
		$V_{CC}=2.5\pm0.2V, R_L=500\Omega$		0.5	8.5	ns
		$V_{CC}=3.3\pm0.3V, R_L=500\Omega$		0.5	7.5	ns
		$V_{CC}=5\pm0.5V, R_L=500\Omega$		0.3	6.0	ns

■ OPERATING CHARACTERISTICS (Unless otherwise specified)

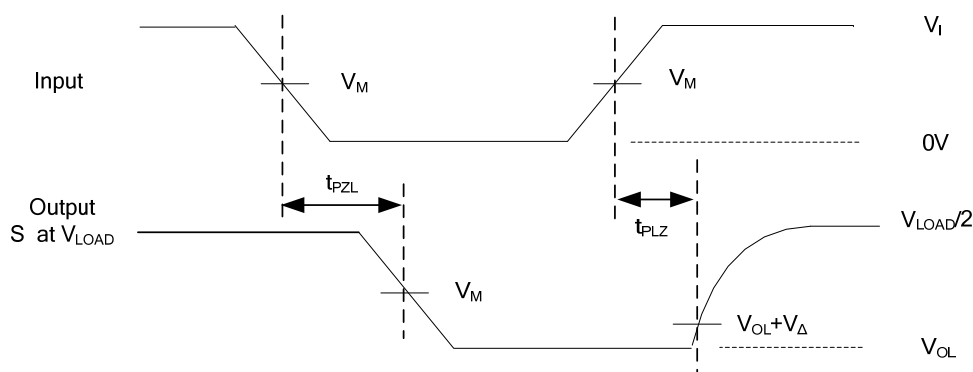
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C_{PD}	$V_{CC}=1.8V, f=10MHz$		3		pF
		$V_{CC}=2.5V, f=10MHz$		3		pF
		$V_{CC}=3.3V, f=10MHz$		4		pF
		$V_{CC}=5V, f=10MHz$		6		pF

■ 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}	$\leq 2ns$	$V_{CC}/2$	$2 * V_{CC}$	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: 1. C_L includes probe and jig capacitance.
 2. All input pulses are supplied by generators having the following characteristics: PRR $\leq 10\text{MHz}$, $Z_O = 50\Omega$.
 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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