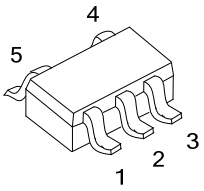
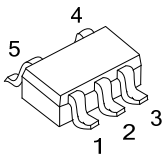
U74LVC1G09

CMOS IC

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



SOT-23-5
(SOT-25)



SOT-353

■ DESCRIPTION

The **U74LVC1G09** is a single 2-input AND gate with open-drain output . It performs the Boolean function $Y = A \bullet B$ or $Y = \overline{\overline{A}+\overline{B}}$ 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

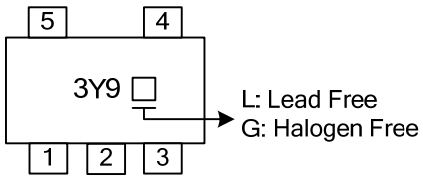
* Operate from 1.65V to 5.5V
* Inputs accept voltages to 5.5V
* I_{off} supports partial-power-down mode
* ±24mA output drive(V_{CC}=3.3V)
* Low power dissipation
* High noise immunity

■ ORDERING INFORMATION

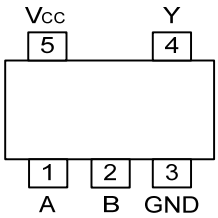
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1G09L-AE5-R	U74LVC1G09G-AE5-R	SOT-23-5	Tape Reel
U74LVC1G09L-AL5-R	U74LVC1G09G-AL5-R	SOT-353	Tape Reel

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

■ MARKING



■ PIN CONFIGURATION

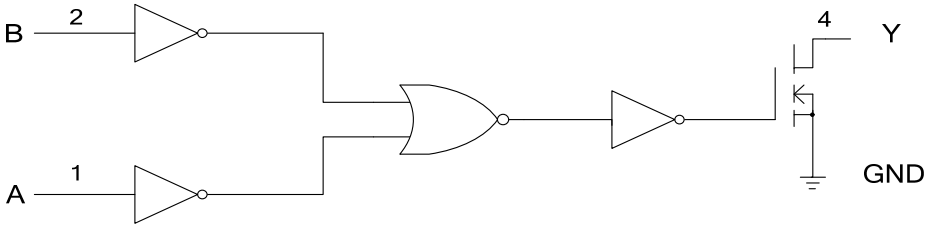


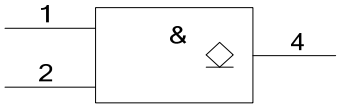
■ FUNCTION TABLE

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	Δt/ΔV	V_{CC}=1.8V±0.15V, 2.5V±0.2V			20	ns/V
		V_{CC}=3.3V±0.3V			10	ns/V
		V_{CC}=5V±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

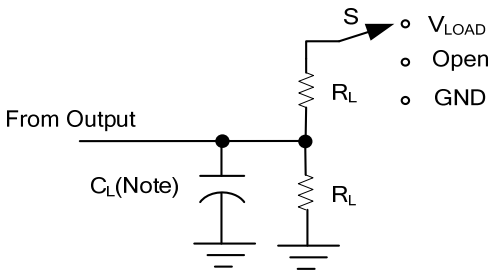
■ SWITCHING CHARACTERISTICS (T_A=25°C, unless otherwise specified)

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

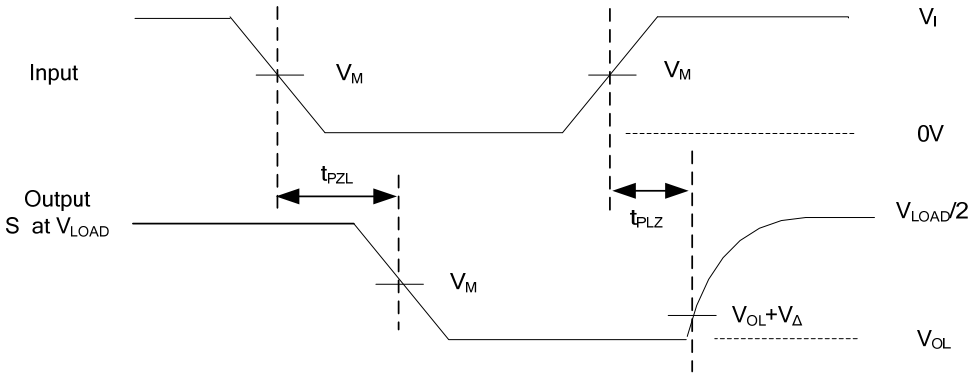
■ TEST CIRCUIT AND WAVEFORMS



TEST	S
t_{PZL}(Note1)	V_{LOAD}
t_{PLZ}(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_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 ≤10MHz, Z_O = 50Ω.
Since this device has open drain outputs, the t_{PLZ} and t_{PZL} is the same as t_{PLH} and t_{PHL}.