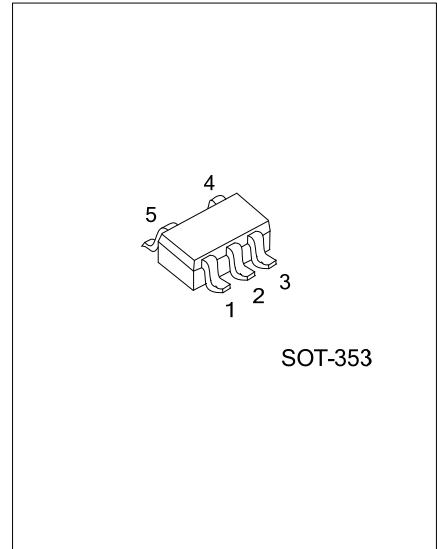




## U74LV1T08

CMOS IC

### SINGLE POWER SUPPLY 2-INPUT POSITIVE AND GATE CMOS LOGIC LEVEL SHIFTER



#### DESCRIPTION

**U74LV1T08** is a low voltage CMOS gate logic that operates at a wider voltage range for industrial, portable, telecom, and automotive applications. The output level is referenced to the supply voltage and is able to support 1.8V, 2.5V, 3.3V, 5V CMOS levels.

The input is designed with a lower threshold circuit to match 1.8V input logic at  $V_{CC}=3.3V$  and can be used in 1.8V to 3.3V level up translation. In addition, the 5V tolerant input pins enable down translation (e.g. 3.3V to 2.5V output at  $V_{CC}=2.5V$ ). The wide  $V_{CC}$  range of 1.8V to 5.5V allows generation of desired output levels to connect to controllers or processors.

#### FEATURES

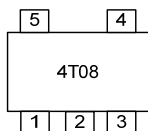
- \* Operation Voltage Range: 1.8V ~ 5.5V
- \* Low Power Current:  $I_{CC}=10\mu A$  (Max.)
- \*  $\pm 8mA$  Output Drive ( $V_{CC}=5.0V$ )

#### ORDERING INFORMATION

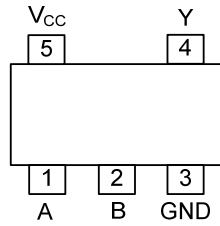
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74LVC1T08L-AL5-R	U74LV1T08G-AL5-R	SOT-353	Tape Reel

<p>U74LV1T08G-AL5-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) AL5: SOT-353 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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#### MARKING



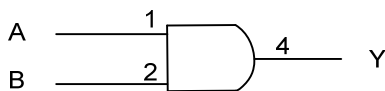
■ PIN CONFIGURATION



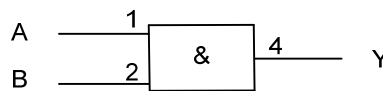
■ FUNCTION TABLE (each gate)

INPUT (Lower Level Input)		OUTPUT (V <sub>CC</sub> CMOS)
A	B	Y
H	H	H
L	X	L
X	L	L

■ LOGIC DIAGRAM (positive logic)

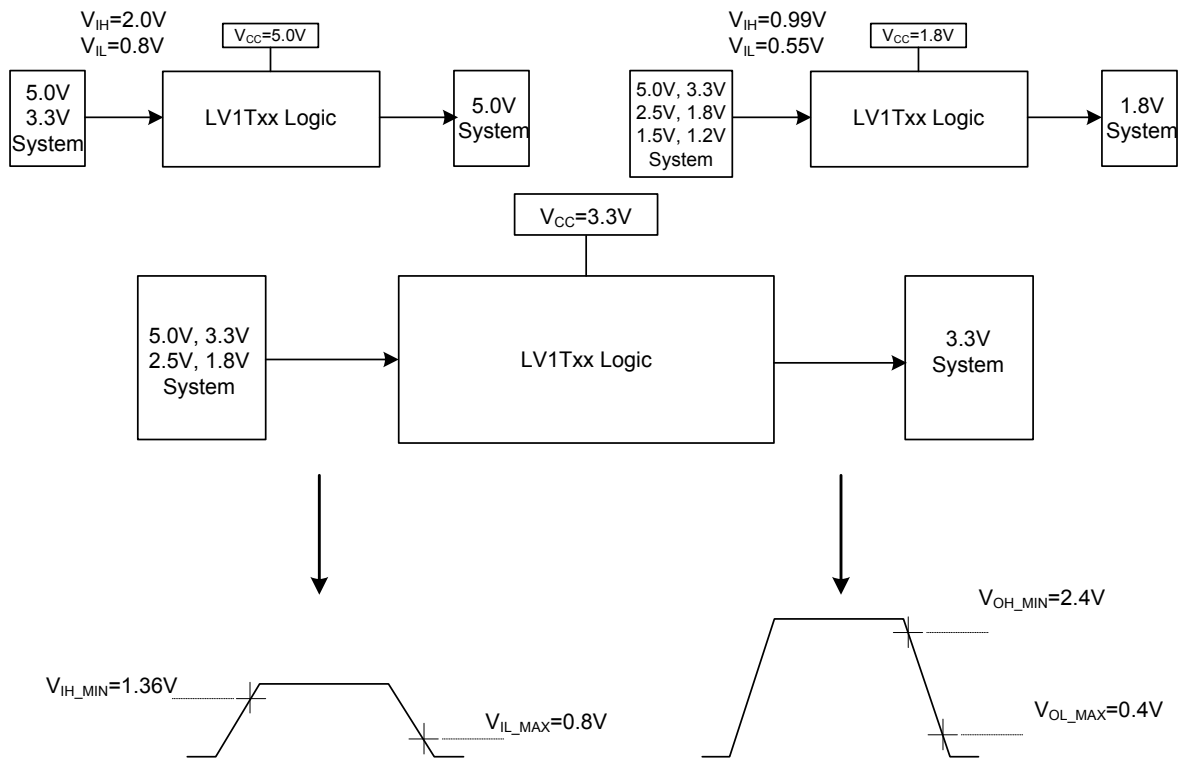


Logic symbol



IEC logic symbol

■ TYPICAL DESIGN EXAMPLES



Switching Thresholds for 1.8V~3.3V Translation

■ ABSOLUTE MAXIMUM RATING (T<sub>A</sub>=25°C, unless otherwise specified) (Note 2)

PARAMETER	SYMBOL	TEST CONDITIONS	RATINGS	UNIT
Supply Voltage	V <sub>CC</sub>		-0.5 ~ 7	V
Input Voltage (Note 2)	V <sub>IN</sub>		-0.5 ~ 7	V
Output Voltage (Note 2)	V <sub>OUT</sub>	Output in the high or low state	-0.5 ~ V <sub>CC</sub> +0.5	V
Continuous Output Current			±25	mA
Continuous current through V <sub>CC</sub> or GND			±50	mA
Input Clamp Current	I <sub>IK</sub>	V <sub>IN</sub> <0	-20	mA
Output Clamp Current	I <sub>OK</sub>	V <sub>OUT</sub> <0 or V <sub>OUT</sub> >V <sub>CC</sub>	±20	mA
Storage Temperature Range	T <sub>STG</sub>		-65 ~ +150	°C

Notes: 1. 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.

2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V <sub>CC</sub>	Operating	1.65		5.5	V
Input Voltage	V <sub>IN</sub>		0		5.5	V
Output Voltage	V <sub>OUT</sub>		0		V <sub>CC</sub>	V
Input Transition Rise or Fall Rate	Δt/Δv	V <sub>CC</sub> =1.8V			20	ns/V
		V <sub>CC</sub> =3.3V or 2.5V			20	ns/V
		V <sub>CC</sub> =5V			20	ns/V
Operating Temperature	T <sub>A</sub>		-40		125	°C

■ STATIC 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~1.8V	0.94			V
		V <sub>CC</sub> = 2.0V	1.02			V
		V <sub>CC</sub> = 2.25V~2.5V	1.135			V
		V <sub>CC</sub> = 2.75V	1.21			V
		V <sub>CC</sub> = 3.0V~3.3V	1.35			V
		V <sub>CC</sub> = 3.6V	1.47			V
		V <sub>CC</sub> = 4.5V~5.5V	2.02			V
		V <sub>CC</sub> = 5.5V	2.1			V
Low-Level Input Voltage	V <sub>IL</sub>	V <sub>CC</sub> = 1.65V~2V			0.58	V
		V <sub>CC</sub> = 2.25V~2.75V			0.75	V
		V <sub>CC</sub> = 3V~3.6V			0.8	V
		V <sub>CC</sub> = 4.5V~5.5V			0.8	V
High-Level Output Voltage	V <sub>OH</sub>	V <sub>CC</sub> = 1.65V ~ 5.5V, I <sub>OH</sub> = -20μA	V <sub>CC</sub> -0.1			V
		V <sub>CC</sub> = 1.65V	I <sub>OH</sub> = -2mA	1.28		V
		V <sub>CC</sub> = 1.8V		1.5		V
		V <sub>CC</sub> = 2.3V	I <sub>OH</sub> = -2.3mA	2		V
				I <sub>OH</sub> = -3mA	2	
		V <sub>CC</sub> = 2.5V, I <sub>OH</sub> = -3mA	2.25		V	
		V <sub>CC</sub> = 3V	I <sub>OH</sub> = -3mA	2.78		V
				I <sub>OH</sub> = -5.5mA	2.6	
		V <sub>CC</sub> = 3.3V, I <sub>OH</sub> = -5.5mA	2.9		V	
		V <sub>CC</sub> = 4.5V	I <sub>OH</sub> = -4mA	4.2		V
I <sub>OH</sub> = -8mA	4.1				V	
V <sub>CC</sub> = 5V, I <sub>OH</sub> = -8mA	4.6		V			

## ■ STATIC CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Low-Level Output Voltage	$V_{OL}$	$V_{CC}=1.65V \sim 5.5V, I_{OL}=20\mu A$			0.1	V	
		$V_{CC}=1.65V, I_{OL}=1.9mA$			0.2	V	
		$V_{CC}=2.3V$	$I_{OL}=2.3mA$			0.1	V
			$I_{OL}=3mA$			0.15	V
		$V_{CC}=3V$	$I_{OL}=3mA$			0.1	V
			$I_{OL}=5.5mA$			0.2	V
$V_{CC}=4.5V$	$I_{OL}=4mA$			0.15	V		
	$I_{OL}=8mA$			0.3	V		
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=0V, 1.8V, 2.5V, 3.3V, 5.5V, V_{IN}=0V$ or $V_{CC}$			0.12	$\mu A$	
Quiescent Supply Current	$I_Q$	$V_{CC}=1.8V, 2.5V, 3.3V, 5V, V_{IN}=0V$ or $V_{CC}, I_o=0$ ; Open on loading			1	$\mu A$	
Additional Quiescent Supply Current	$\Delta I_Q$	$V_{CC}=5.5V$ , One input at 0.3V or 3.4V, other inputs at 0 or $V_{CC}, I_o=0$			1.35	mA	
		$V_{CC}=1.8V$ , One input at 0.3V or 1.1V, other inputs at 0 or $V_{CC}, I_o=0$			10	$\mu A$	
Input Capacitance	$C_{IN}$	$V_{CC}=3.3V, V_{IN}=V_{CC}$ or GND		2		pF	
Output Capacitance	$C_{OUT}$	$V_{CC}=3.3V, V_{OUT}=V_{CC}$ or GND		2.5		pF	

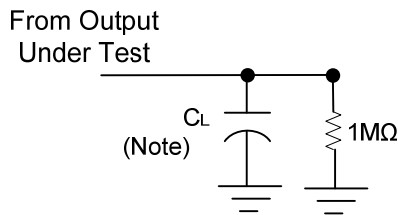
## ■ DYNAMIC CHARACTERISTICS ( $T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Propagation delay from input (Any In) to output(Y)	$t_{PLH}/t_{PHL}$	$C_L=15pF$	$V_{CC}=1.8V$		10.5	11	ns
			$V_{CC}=2.5V$		6	6.5	ns
			$V_{CC}=3.3V$		4.8	5	ns
			$V_{CC}=5V$		4	5	ns
		$C_L=30pF$	$V_{CC}=1.8V$		12	13	ns
			$V_{CC}=2.5V$		6.5	7.5	ns
			$V_{CC}=3.3V$		5	5.5	ns
			$V_{CC}=5V$		5.5	7	ns

## ■ OPERATING CHARACTERISTICS ( $f=1MHz$ & $10MHz, T_A=25^\circ C$ , unless otherwise specified)

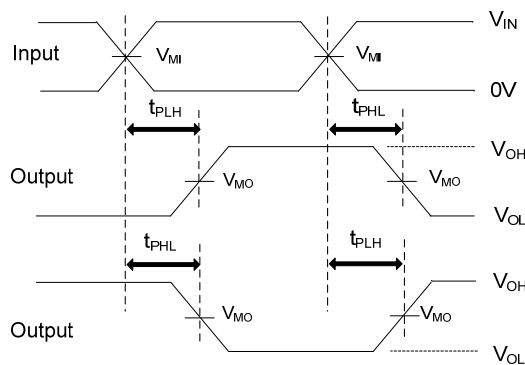
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	$C_{PD}$	$V_{CC}=1.8V \pm 0.15V$		10		pF
		$V_{CC}=2.5V \pm 0.2V$		10		pF
		$V_{CC}=3.3V \pm 0.3V$		10		pF
		$V_{CC}=5V \pm 0.5V$		10		pF

■ TEST CIRCUIT AND WAVEFORMS



Note:  $C_L$  includes probe and jig capacitance.

$V_{CC}$	$V_{MI}$	$V_{MO}$	$C_L$
$2.5V \pm 0.2V$	$V_I/2$	$V_{CC}/2$	5, 10, 15, 30pF
$3.3V \pm 0.3V$	$V_I/2$	$V_{CC}/2$	5, 10, 15, 30pF



PROPAGATION DELAY TIMES

- Notes: 1. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10MHz,  $Z_o=50\Omega$ , slew rate  $\geq$  1V/ns.  
 2. The outputs are measured one at a time, with one transition per measurement.

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