

CL74LV1T86 Single Power Supply 2-Input Exclusive-OR Gate CMOS Logic Level Shifter

General Description

The CL74LV1T86 is a single 2-input exclusive OR gate with reduced input thresholds to support voltage translation applications.

Ordering Information

Part Number	Package	
CL74LV1T86	SOT-23-5 SOT-353	

Features

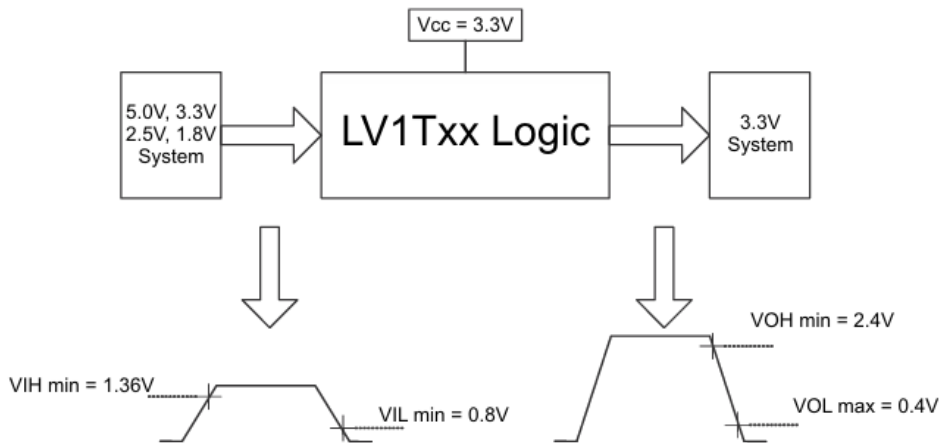
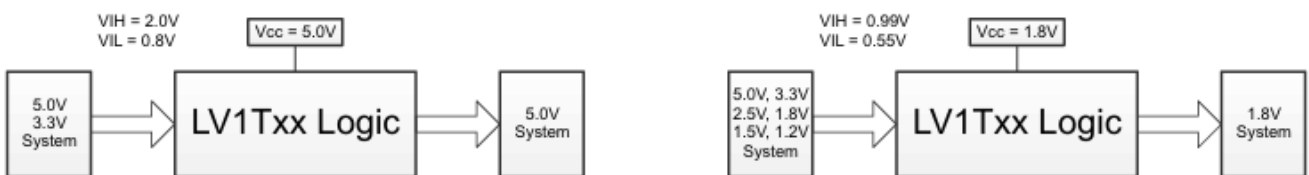
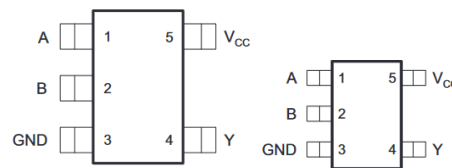
- Single-supply voltage translator at 5.0V, 3.3V, 2.5V, and 1.8V V_{CC}
- Operating range of 1.8V to 5.5V
- Up translation:
 - 1.2V to 1.8V at 1.8V V_{CC}
 - 1.5V to 2.5V at 2.5V V_{CC}
 - 1.8V to 3.3V at 3.3V V_{CC}
 - 3.3V to 5.0V at 5.0V V_{CC}
- Down translation:
 - 3.3V to 1.8V at 1.8V V_{CC}
 - 3.3V to 2.5V at 2.5V V_{CC}
 - 5.0V to 3.3V at 3.3V V_{CC}

- Output drive:
 - 8mA output drive at 5V
 - 7mA output drive at 3.3V
 - 3mA output drive at 1.8V
- Characterized up to 50MHz at 3.3V V_{CC}
- 5V tolerance on input pins
- –40°C to +125°C operating temperature range
- Supports standard logic pinouts

Applications

- Telecom
- Portable applications
- Servers
- PC and notebooks

Pin Configuration



Switching Thresholds for 1.8-V to 3.3-V Translation



Pin Assignment

CL74LV1T86

Pin Name	Pin No.	Pin Function
A	1	Input
B	2	Input
GND	3	Ground
Y	4	Output
V _{CC}	5	Power pin

Absolute Maximum Ratings (Note1)

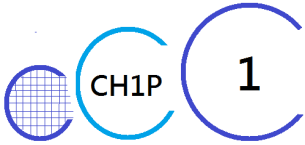
- V_{CC} ----- -0.5V to +7.0V
- V_I----- -0.5V to +7.0V
- V_O(Voltage range applied to any output in the high-impedance or power-off state)----- -0.5V to +4.6V
- V_O(Voltage range applied to any output in the high or slow state)----- -0.5V to V_{CC}+0.5V
- Input clamp current ----- -20mA
- Output clamp current ----- ±20mA
- Continuous output current ----- ±25mA
- Storage Temperature ----- -65°C to 150°C

Recommended Operating Conditions

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply voltage	V _{CC}	Operating	1.6		5.5	V
Input voltage	V _I		0		5.5	V
Output voltage	V _O		0		V _{CC}	V
High- level output current	I _{OH}	V _{CC} = 1.8V			-3	mA
		V _{CC} = 2.5V			-5	
		V _{CC} = 3.3V			-7	
		V _{CC} = 5.0V			-8	
Low- level output current	I _{OL}	V _{CC} = 1.8V			3	mA
		V _{CC} = 2.5V			5	
		V _{CC} = 3.3V			7	
		V _{CC} = 5.0V			8	
Input transition rise or fall rate	ΔT/ΔV	V _{CC} = 1.8V			20	ns/V
		V _{CC} = 3.3V or 2.5V			20	
		V _{CC} = 5V			20	
Operating temperature	T _A		-40		125	°C

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
High- level input voltage	V_{IH}	$V_{CC} = 1.65 \sim 1.8V$	0.94			V
		$V_{CC} = 2.0V$	1.02			
		$V_{CC} = 2.25 \sim 2.5V$	1.135			
		$V_{CC} = 2.75V$	1.21			
		$V_{CC} = 3 \sim 3.3V$	1.35			
		$V_{CC} = 3.6V$	1.47			
		$V_{CC} = 4.5V \sim 5.0V$	2.02			
		$V_{CC} = 5.5V$	2.1			
Low- level input voltage	V_{IL}	$V_{CC} = 1.65 \sim 2.0V$			0.58	V
		$V_{CC} = 2.25 \sim 2.75V$			0.75	
		$V_{CC} = 3 \sim 3.6V$			0.8	
		$V_{CC} = 4.5V \sim 5.5V$			0.8	
High- level output voltage	V_{OH}	$V_{CC} = 1.65 \sim 5.5V, I_{OH} = -20\mu A$	$V_{CC} - 0.1$			V
		$V_{CC} = 1.65V, I_{OH} = -2mA$	1.28			
		$V_{CC} = 1.8V, I_{OH} = -2mA$	1.5			
		$V_{CC} = 2.3V, I_{OH} = -2.3mA$	2.0			
		$V_{CC} = 2.3V, I_{OH} = -3mA$	2.0			
		$V_{CC} = 2.5V, I_{OH} = -3mA$	2.25			
		$V_{CC} = 3.0V, I_{OH} = -3mA$	2.78			
		$V_{CC} = 3.0V, I_{OH} = -5.5mA$	2.6			
		$V_{CC} = 3.3V, I_{OH} = -5.5mA$	2.9			
		$V_{CC} = 4.5V, I_{OH} = -4mA$	4.2			
		$V_{CC} = 4.5V, I_{OH} = -8mA$	4.1			
		$V_{CC} = 5.0V, I_{OH} = -8mA$	4.6			
Low- level output voltage	V_{OL}	$V_{CC} = 1.65 \sim 5.5V, I_{OL} = 20\mu A$			0.1	V
		$V_{CC} = 1.65V, I_{OL} = 1.9mA$			0.2	
		$V_{CC} = 2.3V, I_{OL} = 2.3mA$			0.1	
		$V_{CC} = 2.3V, I_{OL} = 3mA$			0.15	
		$V_{CC} = 3V, I_{OL} = 3mA$			0.1	
		$V_{CC} = 3V, I_{OL} = 5.5mA$			0.2	
		$V_{CC} = 4.5V, I_{OL} = 4mA$			0.15	
		$V_{CC} = 4.5V, I_{OL} = 8mA$			0.3	
Input leakage current	I_I	$V_{IN} = V_{CC}$ or GND, $V_{CC} = 0 \sim 5.5V$			0.1	μA
Supply current	I_{CC}	$V_{IN} = V_{CC}$ or GND, $I_{OUT} = 0, V_{CC} = 1.8 \sim 5.0V$			1	μA
Additional supply current per input pin	ΔI_{CC}	$V_{CC} = 5.5V$, one input at 0.3V or 3.4V, other input at V_{CC} or GND, $I_{OUT} = 0$			1.35	μA
		$V_{CC} = 1.8V$, one input at 0.3V or 1.1V, other input at V_{CC} or GND, $I_{OUT} = 0$			10	

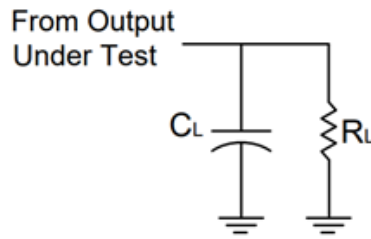


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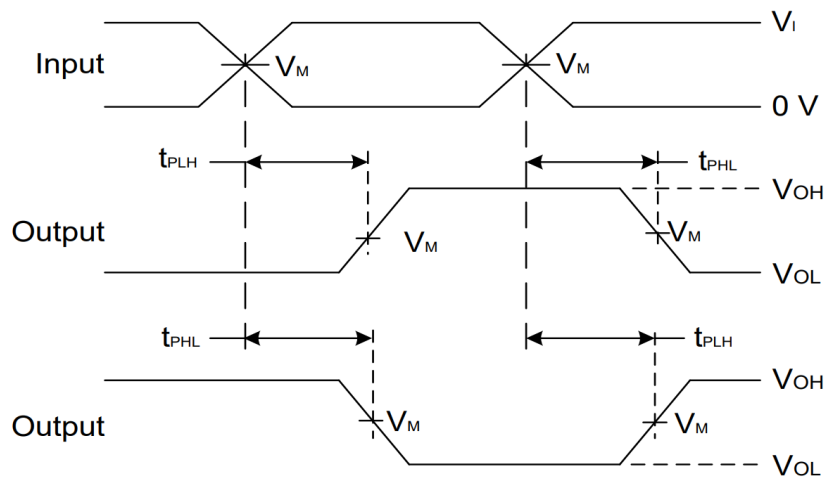
Switching Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Propagation delay from input(A) to output(Y)	T_{PD}	$V_{CC} = 5.0V$		4	5	ns
		$V_{CC} = 3.3V$	$C_L = 15pF$	4.8	5	
		$V_{CC} = 2.5V$	$R_L = 1M\Omega$	6	6.5	
		$V_{CC} = 1.8V$		10.5	11	

Parameter Measurement Information



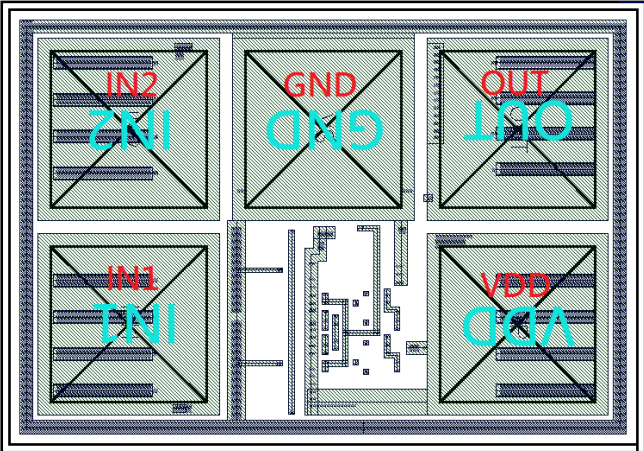
VCC	INPUTS		V _M	C _L	R _L
	V _I	t _r /t _f			
1.8V ± 0.15V	V _{CC}	≤ 2ns	V _{CC} /2	15pF	1MΩ
2.5V ± 0.2V	V _{CC}	≤ 2ns	V _{CC} /2	15pF	1MΩ
3.3V ± 0.3V	3V	≤ 2.5ns	1.5V	15pF	1MΩ
5V ± 0.5V	V _{CC}	≤ 2.5ns	V _{CC} /2	15pF	1MΩ



**Voltage Waveform Propagation Delay Times
Inverting and Non Inverting Outputs**

- Notes:
- A. C_L includes probe and jig capacitance
 - B. All pulses and supplied at pulse repetition rate ≤ 10MHz
 - C. t_{PLH} and t_{PHL} are the same as t_{PD}

PAD Location and Coordinates

PHYSICAL CHARACTERISTICS		UNIT	CHIP DRAWING
Wafer Size	200	mm	
Die Size (with S/L)	0.308 * 0.233	mm ²	
Scribe line width	60	um	
TOP Metal thickness	3	um	
Top Metallization	Al-Cu		
Wafer Thickness	726	um	
CUP (circuit under PAD) or not	YES		
Bonding Wire Diameter	20	um	

PAD NAME	PAD SIZE (μm ²)	Coordinate
IN 1	60*60	(49,49)
IN 2	60*60	(49,124)
GND	60*60	(124,124)
OUT (Y)	60*60	(199,124)
VDD	60*60	(199,49)

Bonding Diagram Example

