

NLSV1T34

1-Bit Dual-Supply Non-Inverting Level Translator

The NLSV1T34 is a 1-bit configurable dual-supply voltage level translator. The input A_n and output B_n ports are designed to track two different power supply rails, V_{CCA} and V_{CCB} respectively. Both supply rails are configurable from 0.9 V to 4.5 V allowing universal low-voltage translation from the input A_n to the output B_n port.

Features

- Wide V_{CCA} and V_{CCB} Operating Range: 0.9 V to 4.5 V
- High-Speed w/ Balanced Propagation Delay
- Inputs and Outputs have OVT Protection to 4.5 V
- Non-preferential V_{CCA} and V_{CCB} Sequencing
- Power-Off Protection
- Ultra-Small Packaging: 1.45 mm x 1.0 mm ULLGA6
- This is a Pb-Free Device

Typical Applications

- Mobile Phones, PDAs, Other Portable Devices

Important Information

- ESD Protection for All Pins:
HBM (Human Body Model) > 3000 V

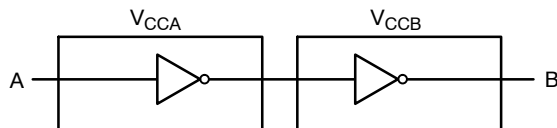


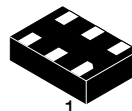
Figure 1. Logic Diagram



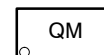
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MARKING DIAGRAM

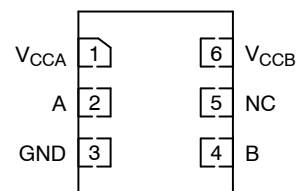


ULLGA6
MU SUFFIX
CASE 613AF



Q = Specific Device Code
M = Date Code

PIN ASSIGNMENT



(Top View)

ORDERING INFORMATION

Device	Package	Shipping†
NLSV1T34AMX1TCG	ULLGA6 (Pb-Free)	3000/Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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PIN ASSIGNMENT

PIN	FUNCTION
V _{CCA}	Input Port DC Power Supply
V _{CCB}	Output Port DC Power Supply
GND	Ground
A	Input Port
B	Output Port

TRUTH TABLE

INPUTS	OUTPUTS
A	B
L	L
H	H

MAXIMUM RATINGS

Symbol	Rating	Value	Condition	Unit
V _{CCA} , V _{CCB}	DC Supply Voltage	-0.5 to +5.5		V
V _I	DC Input Voltage	-0.5 to +5.5	A	V
V _O	DC Output Voltage (Power Down)	-0.5 to +5.5	B V _{CCA} = V _{CCB} = 0	V
	(Active Mode)	-0.5 to +5.5	B	V
I _{IK}	DC Input Diode Current	-20	V _I < GND	mA
I _{OK}	DC Output Diode Current	-50	V _O < GND	mA
I _O	DC Output Source/Sink Current	±50		mA
I _{CCA} , I _{CCB}	DC Supply Current Per Supply Pin	±100		mA
I _{GND}	DC Ground Current per Ground Pin	±100		mA
T _{STG}	Storage Temperature	-65 to +150		°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CCA} , V _{CCB}	Positive DC Supply Voltage	0.9	4.5	V
V _I	Bus Input Voltage	GND	4.5	V
V _{IO}	Bus Output Voltage (Power Down Mode)	GND	4.5	V
	(Active Mode)	GND	V _{CCB}	V
T _A	Operating Temperature Range	-40	+85	°C
Δt / ΔV	Input Transition Rise or Rate V _I , from 30% to 70% of V _{CC} ; V _{CC} = 3.3 V ±0.3 V	0	10	nS

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DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	V _{CCA} (V)	V _{CCB} (V)	-40°C to +85°C		Unit
					Min	Max	
V _{IH}	Input HIGH Voltage		3.6 – 4.5	0.9 – 4.5	2.2	–	V
			2.7 – 3.6		2.0	–	
			2.3 – 2.7		1.6	–	
			1.4 – 2.3		0.65 * V _{CCA}	–	
			0.9 – 1.4		0.9 * V _{CCA}	–	
V _{IL}	Input LOW Voltage		3.6 – 4.5	0.9 – 4.5	–	0.8	V
			2.7 – 3.6		–	0.8	
			2.3 – 2.7		–	0.7	
			1.4 – 2.3		–	0.35 * V _{CCA}	
			0.9 – 1.4		–	0.1 * V _{CCA}	
V _{OH}	Output HIGH Voltage	I _{OH} = -100 μA; V _I = V _{IH}	0.9 – 4.5	0.9 – 4.5	V _{CCB} - 0.2	–	V
		I _{OH} = -0.5 mA; V _I = V _{IH}	0.9	0.9	0.75 * V _{CCB}	–	
		I _{OH} = -2 mA; V _I = V _{IH}	1.4	1.4	1.05	–	
		I _{OH} = -6 mA; V _I = V _{IH}	1.65	1.65	1.25	–	
			2.3	2.3	2.0	–	
		I _{OH} = -12 mA; V _I = V _{IH}	2.3	2.3	1.8	–	
			2.7	2.7	2.2	–	
		I _{OH} = -18 mA; V _I = V _{IH}	2.3	2.3	1.7	–	
			3.0	3.0	2.4	–	
V _{OL}	Output LOW Voltage	I _{OL} = 100 μA; V _I = V _{IL}	0.9 – 4.5	0.9 – 4.5	–	0.2	V
		I _{OL} = 0.5 mA; V _I = V _{IH}	– 1.1	– 1.1	–	0.3	
		I _{OL} = 2 mA; V _I = V _{IH}	1.4	1.4	–	0.35	
		I _{OL} = 6 mA; V _I = V _{IL}	1.65	1.65	–	0.3	
			2.3	2.3	–	0.4	
		I _{OL} = 12 mA; V _I = V _{IL}	2.7	2.7	–	0.4	
			2.3	2.3	–	0.6	
		I _{OL} = 18 mA; V _I = V _{IL}	3.0	3.0	–	0.4	
I _{OL} = 24 mA; V _I = V _{IL}	3.0	3.0	–	0.55			
I _I	Input Leakage Current	V _I = V _{CCA} or GND	0.9 – 4.5	0.9 – 4.5	-1.0	1.0	μA
I _{CCA}	Quiescent Supply Current	V _I = V _{CCA} or GND; I _O = 0, V _{CCA} = V _{CCB}	0.9 – 4.5	0.9 – 4.5	–	2.0	μA
I _{CCB}	Quiescent Supply Current	V _I = V _{CCA} or GND; I _O = 0, V _{CCA} = V _{CCB}	0.9 – 4.5	0.9 – 4.5	–	2.0	μA
I _{CCA} + I _{CCB}	Quiescent Supply Current	V _I = V _{CCA} or GND; I _O = 0, V _{CCA} = V _{CCB}	0.9 – 4.5	0.9 – 4.5	–	4.0	μA
I _{OFF}	Power OFF Leakage Current	V _I = 4.5 V	0	0	–	5.0	μA

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TOTAL STATIC POWER CONSUMPTION ($I_{CCA} + I_{CCB}$)

V_{CCA} (V)	-40°C to +85°C										Unit
	V_{CCB} (V)										
	4.5		3.3		2.8		1.8		0.9		
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
4.5		2		2		2		2		< 1.5	μ A
3.3		2		2		2		2		< 1.5	μ A
2.8		< 2		< 1		< 1		< 0.5		< 0.5	μ A
1.8		< 1		< 1		< 0.5		< 0.5		< 0.5	μ A
0.9		< 0.5		< 0.5		< 0.5		< 0.5		< 0.5	μ A

NOTE: Connect ground before applying supply voltage V_{CCA} or V_{CCB} . This device is designed with the feature that the power-up sequence of V_{CCA} and V_{CCB} will not damage the IC.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V_{CCA} (V)	-40°C to +85°C										Unit
			V_{CCB} (V)										
			4.5		3.3		2.8		1.8		1.2		
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t_{PLH} , t_{PHL} (Note 1)	Propagation Delay, A to B	4.5		1.6		1.8		2.0		2.1		2.3	nS
		3.3		1.7		1.9		2.1		2.3		2.6	
		2.8		1.9		2.1		2.3		2.5		2.8	
		1.8		2.1		2.4		2.5		2.7		3.0	
		1.2		2.4		2.7		2.8		3.0		3.3	

1. Propagation delays defined per Figure 2.

CAPACITANCE

Symbol	Parameter	Test Conditions	Typ (Note 2)	Unit
$C_{I/O}$	I/O Pin Input Capacitance	$V_{CCA} = V_{CCB} = 3.3$ V, $V_I = 0$ V or $V_{CCA/B}$	5.0	pF
C_{PD}	Power Dissipation Capacitance	$V_{CCA} = V_{CCB} = 3.3$ V, $V_I = 0$ V or V_{CCA} , $f = 10$ MHz	5.0	pF

2. Typical values are at $T_A = +25^\circ\text{C}$.

3. C_{PD} is defined as the value of the IC's equivalent capacitance from which the operating current can be calculated from:
 $I_{CC(\text{operating})} \cong C_{PD} \times V_{CC} \times f_{IN}$ where $I_{CC} = I_{CCA} + I_{CCB}$.

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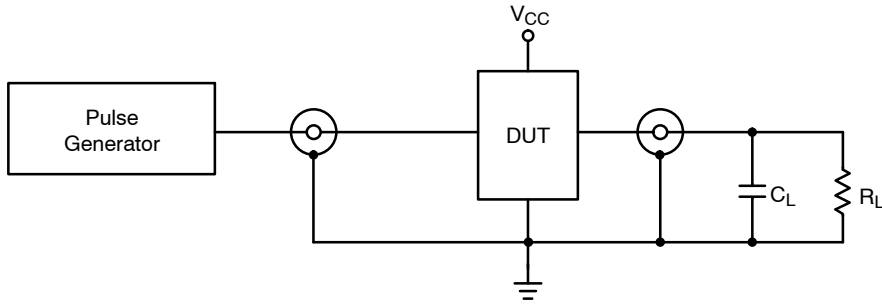
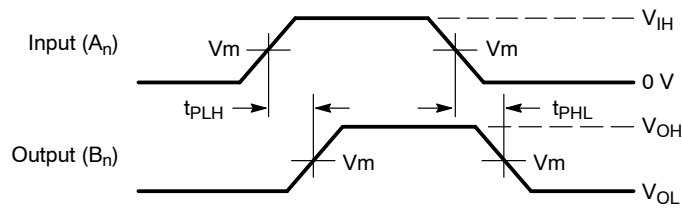


Figure 2. AC (Propagation Delay) Test Circuit

Test	Switch
$C_L = 15 \text{ pF}$ or equivalent (includes probe and jig capacitance) $R_L = 2 \text{ k}\Omega$ or equivalent Z_{OUT} of pulse generator = $50 \text{ }\Omega$	



Waveform 1 - Propagation Delays
 $t_R = t_F = 2.0 \text{ ns}$, 10% to 90%; $f = 1 \text{ MHz}$; $t_W = 500 \text{ ns}$

Figure 3. AC (Propagation Delay) Test Circuit Waveforms

Symbol	V _{CC}
	0.9 V – 4.5 V
V _{mA}	V _{CCA} /2
V _{mB}	V _{CCB} /2

