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
- Power−Off High Impedance Inputs and Outputs
- Ultra−Small Packaging: 1.45 mm x 1.0 mm ULLGA6
  2.0 mm x 2.1 mm SC−88A
- These are Pb−Free Devices

Typical Applications

- Mobile Phones, PDAs, Other Portable Devices

Important Information

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

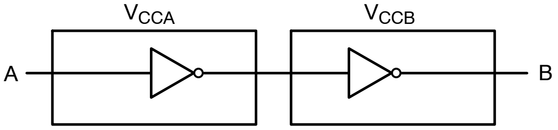

Figure 1. Logic Diagram

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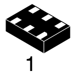
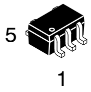
http://onsemi.com

MARKING DIAGRAMS

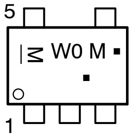


ULLGA6
MU SUFFIX
CASE 613AF

Q = Specific Device Code
M = Date Code

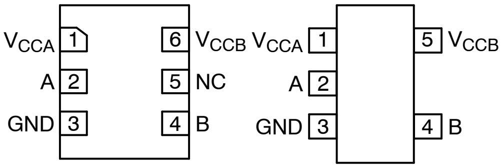


SC−88A
(SOT−353/SC−70)
DF SUFFIX
CASE 419A



W0 = Device Code
M = Date Code*
▪ = Pb−Free Package
(Note: Microdot may be in either location)
*Date Code orientation and/or position may vary depending upon manufacturing location.

PIN ASSIGNMENT



ULLGA6
(Top View)

SC−88A
(Top View)

ORDERING INFORMATION

Device	Package	Shipping†
NLSV1T34AMX1TCG	ULLGA6 (Pb−Free)	3000/Tape & Reel
NLSV1T34DFT2G	SC−88A (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.

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 A	−0.5 to +5.5		V
V_O	DC Output Voltage (Power Down) B	−0.5 to +5.5	$V_{CCA} = V_{CCB} = 0$	V
	(Active Mode) B	−0.5 to +5.5		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) B	GND	4.5	V
	(Active Mode) B	GND	V_{CCB}	V
T_A	Operating Temperature Range	−40	+85	°C
$\Delta t / \Delta V$	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

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	$I_{OH} = -100\ \mu A$; $V_I = V_{IH}$	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	–	
		$I_{OH} = -24$ mA; $V_I = V_{IH}$	3.0	3.0	2.2	–	
V_{OL}	Output LOW Voltage	$I_{OL} = 100\ \mu A$; $V_I = V_{IL}$	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	
		$I_{OL} = 12$ mA; $V_I = V_{IL}$	2.3	2.3	–	0.4	
			2.7	2.7	–	0.4	
		$I_{OL} = 18$ mA; $V_I = V_{IL}$	2.3	2.3	–	0.6	
			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

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

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

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

			−40°C to +85°C										
			V_{CCB} (V)										
			4.5		3.3		2.8		1.8		1.2		
Symbol	Parameter	V_{CCA} (V)	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Unit
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 $T_A = +25°C$.
3. C_{PD} is defined as the value of the IC’s equivalent capacitance from which the operating current can be calculated from: $I_{CC(operating)} \cong C_{PD} \times V_{CC} \times f_{IN}$ where $I_{CC} = I_{CCA} + I_{CCB}$.

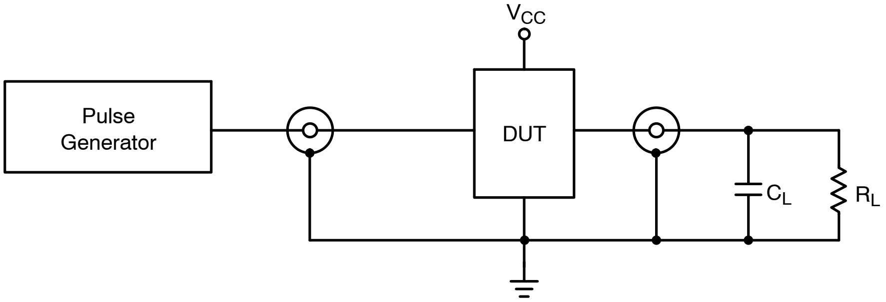
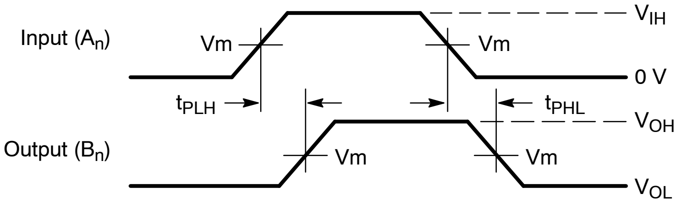


Figure 2. AC (Propagation Delay) Test Circuit

Test	Switch
C_L = 15 pF or equivalent (includes probe and jig capacitance) R_L = 2 kΩ or equivalent Z_{OUT} of pulse generator = 50 Ω	



Waveform 1 – Propagation Delays

$t_R = t_F$ = 2.0 ns, 10% to 90%; f = 1 MHz; t_W = 500 ns

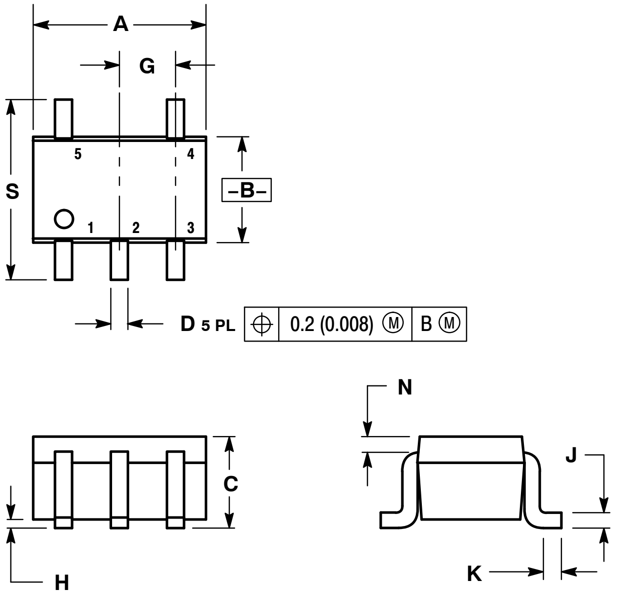
Figure 3. AC (Propagation Delay) Test Circuit Waveforms

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

PACKAGE DIMENSIONS

SC−88A, SOT−353, SC−70

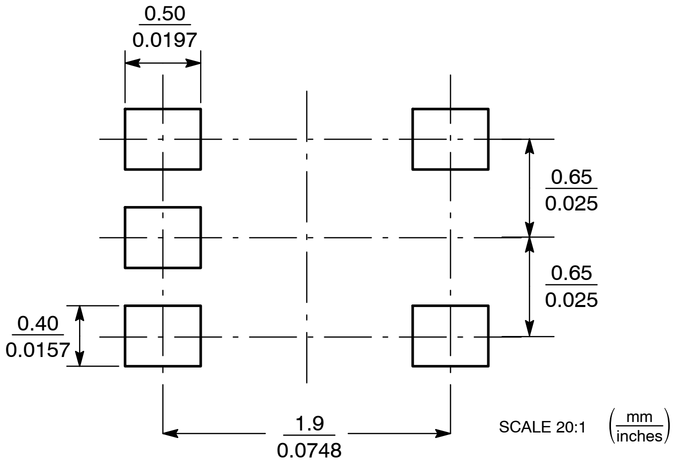
CASE 419A−02
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

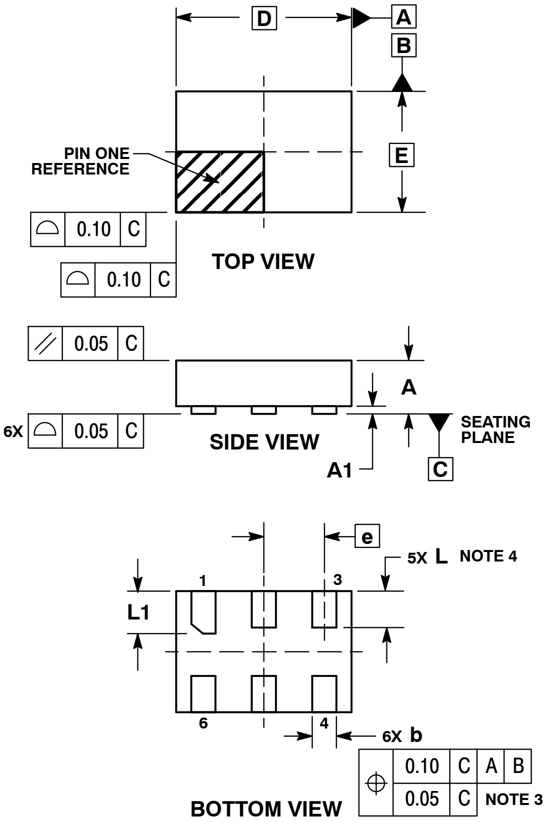
SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

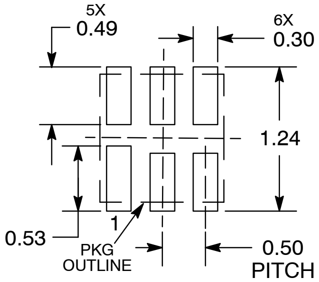
ULLGA6 1.45x1.0, 0.5P
CASE 613AF−01
ISSUE A



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.
4. A MAXIMUM OF 0.05 PULL BACK OF THE PLATED TERMINAL FROM THE EDGE OF THE PACKAGE IS ALLOWED.

	MILLIMETERS	
DIM	**MIN**	**MAX**
A	– – –	0.40
A1	0.00	0.05
b	0.15	0.25
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.25	0.35
L1	0.30	0.40

MOUNTING FOOTPRINT SOLDERMASK DEFINED*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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