NLU1GT125

Non-Inverting 3-State Buffer, TTL Level
LSTTL−Compatible Inputs

The NLU1GT125 MiniGate™ is an advanced CMOS high−speed non−inverting buffer in ultra−small footprint.

The NLU1GT125 requires the 3−state control input $\overline{OE}$ to be set High to place the output in the high impedance state.

The device input is compatible with TTL−type input thresholds and the output has a full 5.0 V CMOS level output swing.

The NLU1GT125 input and output structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: t_{PD} = 3.8 ns (Typ) @ V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 1 μA (Max) at T_A = 25°C
- TTL−Compatible Input: V_{IL} = 0.8 V; V_{IH} = 2.0 V
- CMOS−Compatible Output:
  V_{OH} > 0.8 V_{CC}; V_{OL} < 0.1 V_{CC} @ Load
- Power Down Protection Provided on inputs
- Balanced Propagation Delays
- Ultra−Small Packages
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
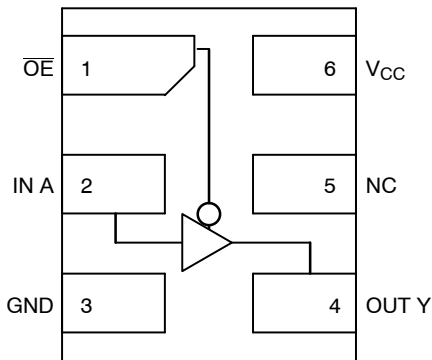- These are Pb−Free Devices

ON Semiconductor®

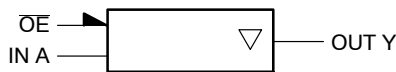### MARKING DIAGRAMS

UDFN6
1.2 x 1.0
CASE 517AA

7M

UDFN6
1.0 x 1.0
CASE 517BX

L M

UDFN6
1.45 x 1.0
CASE 517AQ

D M

7 = Device Marking
M = Date Code

ORDERING INFORMATION
See detailed ordering and shipping information on page 4 of this data sheet.

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol

FUNCTION TABLE

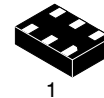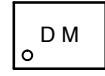| Input		Output
A	**$\overline{OE}$**	**Y**
L	L	L
H	L	H
X	H	Z

PIN ASSIGNMENT

1	$\overline{OE}$
2	IN A
3	GND
4	OUT Y
5	NC
6	V_{CC}

January, 2019 − Rev. 7

NLU1GT125

MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_{IN}	DC Input Voltage		−0.5 to +7.0	V
V_{OUT}	DC Output Voltage		−0.5 to +7.0	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−20	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	±20	mA
I_O	DC Output Source/Sink Current		±12.5	mA
I_{CC}	DC Supply Current Per Supply Pin		±25	mA
I_{GND}	DC Ground Current per Ground Pin		±25	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		150	°C
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125°C (Note 2)		±500	mA

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
1. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA / JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		1.65	5.5	V
V_{IN}	Digital Input Voltage		0	5.5	V
V_{OUT}	Output Voltage		0	5.5	V
T_A	Operating Free−Air Temperature		−55	+125	°C
$\Delta t / \Delta V$	Input Transition Rise or Fall Rate	V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 V	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions	V$_{CC}$ (V)	T$_A$ = 25 °C Min	Typ	Max	T$_A$ = +85°C Min	Max	T$_A$ = −55°C to +125°C Min	Max	Unit
V$_{IH}$	Low−Level Input Voltage		3.0 4.5 to 5.5	1.4 2.0			1.4 2.0		1.4 2.0		V
V$_{IL}$	Low−Level Input Voltage		3.0 4.5 to 5.5			0.53 0.8		0.53 0.8		0.53 0.8	V
V$_{OH}$	High−Level Output Voltage	V$_{IN}$ = V$_{IH}$ or V$_{IL}$ I$_{OH}$ = −50 µA	3.0 4.5	2.9 4.4	3.0 4.5		2.9 4.4		2.9 4.4		V
		V$_{IN}$ = V$_{IH}$ or V$_{IL}$ I$_{OH}$ = −4 mA I$_{OH}$ = −8 mA	3.0 4.5	2.58 3.94			2.48 3.80		2.34 3.66		
V$_{OL}$	Low−Level Output Voltage	V$_{IN}$ = V$_{IH}$ or V$_{IL}$ I$_{OL}$ = 50 µA	3.0 4.5		0 0	0.1 0.1		0.1 0.1		0.1 0.1	V
		V$_{IN}$ = V$_{IH}$ or V$_{IL}$ I$_{OL}$ = 4 mA I$_{OL}$ = 8 mA	3.0 4.5			0.36 0.36		0.44 0.44		0.52 0.52	
I$_{IN}$	Input Leakage Current	0 ≤ V$_{IN}$ ≤ 5.5 V	0 to 5.5			±0.1		±1.0		±1.0	µA
I$_{CC}$	Quiescent Supply Current	0 ≤ V$_{IN}$ ≤ V$_{CC}$	5.5			1.0		20		40	µA
I$_{CCT}$	Quiescent Supply Current	V$_{IN}$ = 3.4 V Other Input: V$_{CC}$ or GND	5.5			1.35		1.50		1.65	mA
I$_{OPD}$	Output Leakage Current	V$_{OUT}$ = 5.5 V	0.0			0.5		5.0		10	µA
I$_{OZ}$	3−State Leakage Current	V$_{IN}$ = V$_{IH}$ or V$_{IL}$ V$_{OUT}$ = V$_{CC}$ or GND	0.0			±0.25		±2.5		±2.5	µA

AC ELECTRICAL CHARACTERISTICS (Input t$_r$ = t$_f$ = 3.0 ns)

Symbol	Parameter	V$_{CC}$ (V)	Test Condition	T$_A$ = 25 °C Min	Typ	Max	T$_A$ = +85°C Min	Max	T$_A$ = −55°C to +125°C Min	Max	Unit
t$_{PLH}$, t$_{PHL}$	Propagation Delay, A to **Y** (Figures 3 and 5)	3.0 to 3.6	C$_L$ = 15 pF C$_L$ = 50 pF		5.6 8.1	8.0 11.5	1.0 1.0	9.5 13.0		12.0 16.0	ns
		4.5 to 5.5	C$_L$ = 15 pF C$_L$ = 50 pF		3.8 5.3	5.5 7.5	1.0 1.0	6.5 8.5		8.5 10.5	
t$_{PZL}$, t$_{PZH}$	Output Enable Time, $\overline{OE}$ to Y (Figures 4 and 6)	3.0 to 3.6	C$_L$ = 15 pF C$_L$ = 50 pF		5.4 7.9	8.0 11.5	1.0 1.0	9.5 13.0		11.5 15.0	ns
		4.5 to 5.5	C$_L$ = 15 pF C$_L$ = 50 pF		3.6 5.1	5.1 7.1	1.0 1.0	6.0 8.0		7.5 9.5	
t$_{PLZ}$, t$_{PHZ}$	Output Disable Time, $\overline{OE}$ to Y (Figures 4 and 6)	3.0 to 3.6	C$_L$ = 15 pF C$_L$ = 50 pF		6.5 8.0	9.7 13.2	1.0 1.0	11.5 15.0		14.5 18.5	ns
		4.5 to 5.5	C$_L$ = 15 pF C$_L$ = 50 pF		4.8 7.0	6.8 8.8	1.0 1.0	8.0 10.0		10.0 12.0	
C$_{IN}$	Input Capacitance				4	10		10		10.0	pF
C$_{OUT}$	3−State Output Capacitance (Output in High Impedance State)				6						pF
C$_{PD}$	Power Dissipation Capacitance (Note 3)	5.0			14						pF

3. C$_{PD}$ is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation I$_{CC(OPR)}$ = C$_{PD}$ • V$_{CC}$ • f$_{in}$ + I$_{CC}$. C$_{PD}$ is used to determine the no−load dynamic power consumption: P$_D$ = C$_{PD}$ • V$_{CC}^2$ • f$_{in}$ + I$_{CC}$ • V$_{CC}$.
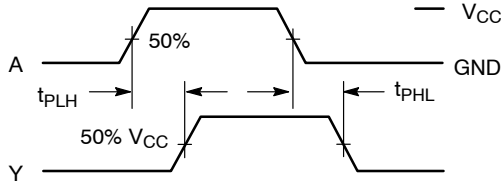
NLU1GT125

SWITCHING WAVEFORMS

Figure 3. Switching Waveforms
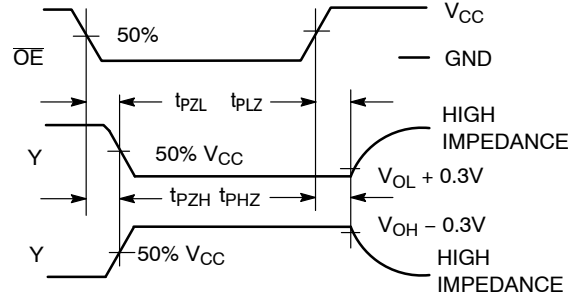
Figure 4.

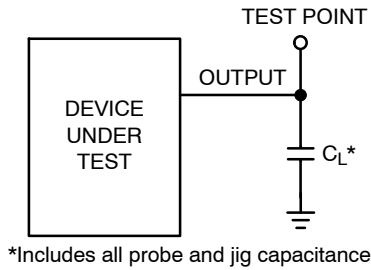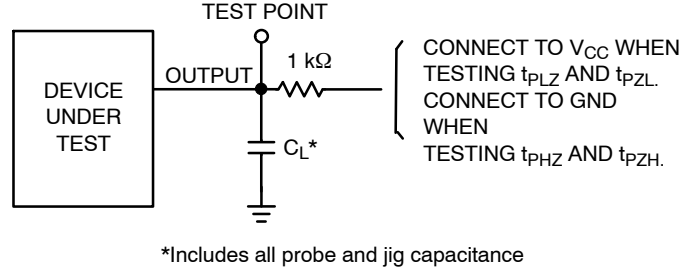MiniGate is a trademark of Semiconductor Components Industries, LLC (SCILLC).

*Includes all probe and jig capacitance

Figure 5. Test Circuit

CONNECT TO V_{CC} WHEN TESTING t_{PLZ} AND t_{PZL}. CONNECT TO GND WHEN TESTING t_{PHZ} AND t_{PZH}.

*Includes all probe and jig capacitance

Figure 6. Test Circuit
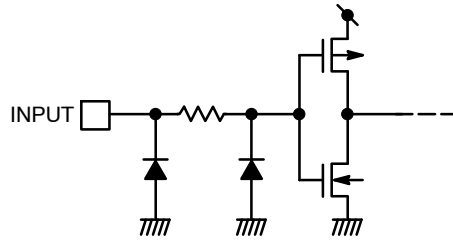
Figure 7. Input Equivalent Circuit

ORDERING INFORMATION

Device	Package	Shipping[†]
NLU1GT125MUTCG	UDFN6, 1.2 x 1.0, 0.4P (Pb−Free)	3000 / Tape & Reel
NLU1GT125AMUTCG, NLVU1GT125AMUTCG*	UDFN6, 1.45 x 1.0, 0.5P (Pb−Free)	3000 / Tape & Reel
NLU1GT125CMUTCG	UDFN6, 1.0 x 1.0, 0.35P (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 Specifications Brochure, BRD8011/D.
*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

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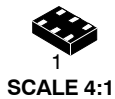
UDFN6, 1.45x1.0, 0.5P
CASE 517AQ–01
ISSUE O

DATE 15 MAY 2008

1
SCALE 4:1

D **A**
B

PIN ONE
REFERENCE

E

| △ | 0.10 | C |

| △ | 0.10 | C |

TOP VIEW

L **L**

L1

DETAIL A
OPTIONAL
CONSTRUCTIONS

| ⫽ | 0.05 | C |

DETAIL B

A

6X | △ | 0.05 | C |

A1

A2 | C | SEATING PLANE

SIDE VIEW

EXPOSED Cu   MOLD CMPD

DETAIL B
OPTIONAL
CONSTRUCTIONS
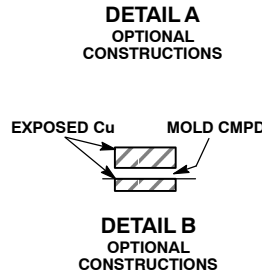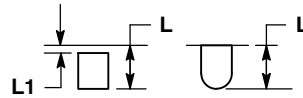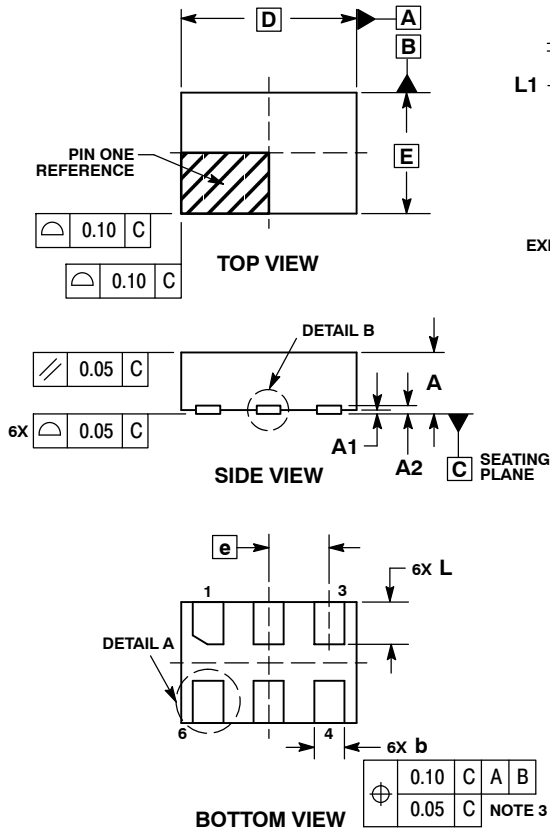
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A2	0.07 REF	
b	0.20	0.30
D	1.45 BSC	
E	1.00 BSC	
e	0.50 BSC	
L	0.30	0.40
L1	---	0.15

**GENERIC
MARKING DIAGRAM***

XM

X = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb–Free indicator, "G" or microdot " ▪", may or may not be present.

e

6X **L**

1   3

DETAIL A

6   4

6X **b**

| ⊕ | 0.10 | C | A | B |
| 0.05 | C | NOTE 3 | | |

BOTTOM VIEW

MOUNTING FOOTPRINT

6X
0.30

PACKAGE
OUTLINE

1.24

6X
0.53

1

0.50
PITCH
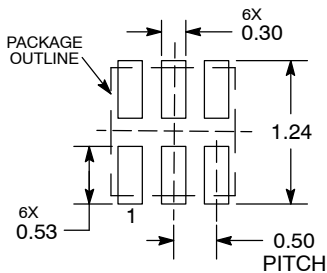
DIMENSIONS: MILLIMETERS

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

DOCUMENT NUMBER:	98AON30313E	
STATUS:	ON SEMICONDUCTOR STANDARD	
NEW STANDARD:		
DESCRIPTION:	UDFN6, 1.45X1.0, 0.5P	PAGE 1 OF 2

ISSUE	REVISION	DATE
O	RELEASED FOR PRODUCTION. REQ. BY K. VAN TYNE.	15 MAY 2008

PUBLICATION ORDERING INFORMATION

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