NLX1G11

3-Input AND Gate

The NLX1G11 is an advanced high−speed 3−input CMOS AND gate in ultra−small footprint.

The NLX1G11 input structures provide protection when voltages up to 7.0 V are applied, regardless of the supply voltage.

Features

- High Speed: t_{PD} = 2.4 ns (Typ) @ V_{CC} = 5.0 V
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Low Power Dissipation: I_{CC} = 1 μA (Max) at T_A = 25°C
- 24 mA Balanced Output Source and Sink Capability
- Balanced Propagation Delays
- Overvoltage Tolerant (OVT) Input Pins
- Ultra−Small Packages
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These are Pb−Free Devices

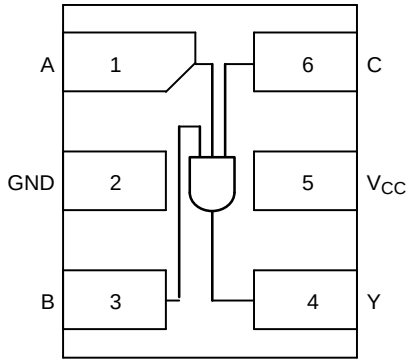

Figure 1. Pinout (Top View)

Figure 2. Logic Symbol

PIN ASSIGNMENT

Pin	Function
1	A
2	GND
3	B
4	Y
5	V_{CC}
6	C

FUNCTION TABLE

Input			Output
A	**B**	**C**	**Y**
L	X	X	L
X	L	X	L
X	X	L	L
H	H	H	H

H − HIGH Logic Level
L − LOW Logic Level
X = Either LOW or HIGH Logic Level

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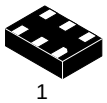
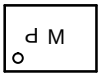
MARKING DIAGRAMS

UDFN6
1.0 x 1.0
CASE 517BX

UDFN6
1.2 x 1.0
CASE 517AA



UDFN6
1.45 x 1.0
CASE 517AQ



X = Device Marking
M = Date Code
▪ = Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
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	−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−50	mA
I_O	DC Output Source/Sink Current		±50	mA
I_{CC}	DC Supply Current per Supply Pin		±100	mA
I_{GND}	DC Ground Current per Ground Pin		±100	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
θ_{JA}	Thermal Resistance (Note 1)		496	°C/W
P_D	Power Dissipation in Still Air @ 85°C		252	mW
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating Oxygen	Index: 28 to 34	UL 94 V−0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	>2000 >200 N/A	V
$I_{LATCHUP}$	Latchup Performance Above V_{CC} and Below GND at 125 °C (Note 5)		±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/JESD22−A114−A.
3. Tested to EIA/JESD22−A115−A.
4. Tested to JESD22−C101−A.
5. Tested to EIA / JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage	Operating Data Retention Only	1.65 1.5	5.5 5.5	V
V_{IN}	Digital Input Voltage (Note 6)		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} = 1.8 V ± 0.15 V V_{CC} = 2.5 V ± 0.2 V V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 V	0 0 0 0	20 20 10 5	ns/V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

6. Unused inputs may not be left open. All inputs must be tied to a high or low−logic input voltage level.

DC ELECTRICAL CHARACTERISTICS

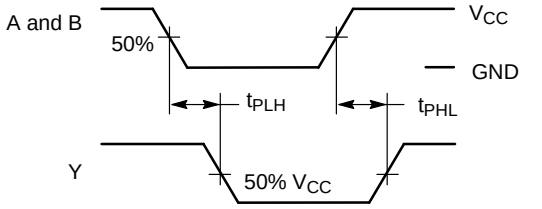
Symbol	Parameter	Conditions	V_{CC} (V)	T_A = 25 °C			T_A = −55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	Low−Level Input Voltage		1.65	0.75 x V_{CC}			0.75 x V_{CC}		V
			2.3 to 5.5	0.70 x V_{CC}			0.70 x V_{CC}		
V_{IL}	Low−Level Input Voltage		1.65			0.25 x V_{CC}		0.25 x V_{CC}	V
			2.3 − 5.5			0.30 x V_{CC}		0.30 x V_{CC}	
V_{OH}	High−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OH} = −100 μA	1.65 − 5.5	V_{CC}−0.1	V_{CC}		V_{CC}−0.1		V
		V_{IN} = V_{IH} or V_{IL} I_{OH} = −4 mA I_{OH} = −8 mA I_{OH} = −12 mA I_{OH} = −16 mA I_{OH} = −24 mA I_{OH} = −32 mA	1.65 2.3 2.7 3.0 3.0 4.5	1.29 1.9 2.2 2.4 2.3 3.8	1.52 2.15 2.4 2.8 2.68 4.2		1.29 1.9 2.2 2.4 2.3 3.8		
V_{OL}	Low−Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_{OL} = 100 μA	1.65 − 5.5			0.1		0.1	V
		V_{IN} = V_{IH} or V_{IL} I_{OH} = 4 mA I_{OH} = 8 mA I_{OH} = 12 mA I_{OH} = 16 mA I_{OH} = 24 mA I_{OH} = 32 mA	1.65 2.3 2.7 3.0 3.0 4.5		0.08 0.1 0.12 0.15 0.22 0.22	0.24 0.3 0.4 0.4 0.55 0.55		0.24 0.3 0.4 0.4 0.55 0.55	
I_{IN}	Input Leakage Current	0 ≤ V_{IN} ≤ 5.5V	0 to 5.5			±0.1		±1.0	μA
I_{OFF}	Power−Off Output Leakage Current	V_{IN} or V_{OUT} = 5.5 V	0			1.0		10	μA
I_{CC}	Quiescent Supply Current	0 ≤ V_{IN} ≤ V_{CC}	5.5			1.0		10	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 2.5 nS)

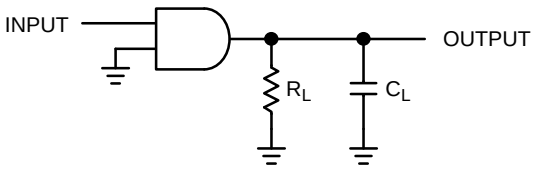
Symbol	Parameter	V_{CC} (V)	Test Condition	T_A = 25 °C			T_A = −55°C to +125°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, Input to Output	1.65−1.95	R_L = 1 MΩ, C_L = 15 pF	2.0	5.5	18.5	2.0	19	ns
		2.3−2.7	R_L = 1 MΩ, C_L = 15 pF	0.8	3.0	11	0.8	11.5	
		3.0−3.6	R_L = 1 MΩ, C_L = 15 pF	0.5	2.6	7.5	0.5	8.0	
			R_L = 500 Ω, C_L = 50 pF	1.5	3.0	8.5	1.5	9.0	
		4.5−5.5	R_L = 1 MΩ, C_L = 15 pF	0.5	2.2	5.5	0.5	6.0	
			R_L = 500 Ω, C_L = 50 pF	0.8	2.4	7.0	0.8	7.5	
C_{IN}	Input Capacitance	5.5	V_{IN} = 0 V or V_{CC}		4.0				pF
C_{PD}	Power Dissipation Capacitance (Note 7)	3.3 5.5	10 MHz V_{IN} = 0 V or V_{CC}		20 26				pF

7. 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}.



$t_R = t_F$ = 2.5 ns, 10% to 90%, f = 1 MHz, t_W = 500 ns

Figure 3. Switching Waveforms



A 1 MHz square input wave is recommended for propagation delay tests

Figure 4. Test Circuit

ORDERING INFORMATION

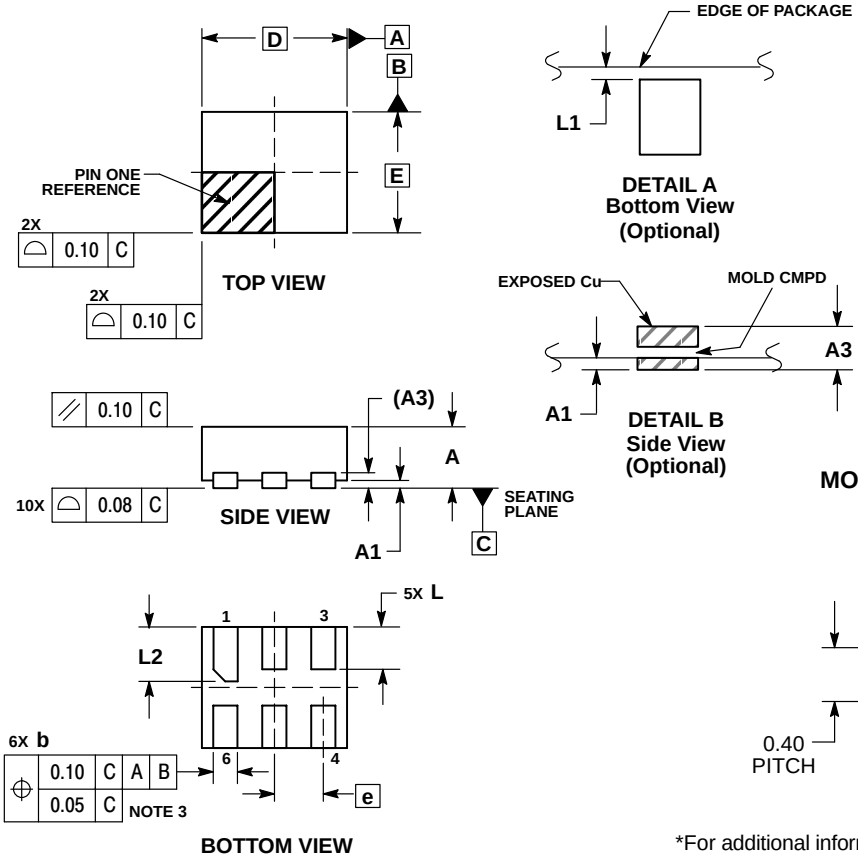
Device	Package	Shipping†
NLX1G11MUTCG (In Development)	UDFN6, 1.2 x 1.0, 0.4P (Pb−Free)	3000 / Tape & Reel
NLX1G11AMUTCG	UDFN6, 1.45 x 1.0, 0.5P (Pb−Free)	3000 / Tape & Reel
NLVX1G11AMUTCG*	UDFN6, 1.45 x 1.0, 0.5P (Pb−Free)	3000 / Tape & Reel
NLX1G11CMUTCG	UDFN6, 1.0 x 1.0, 0.35P (Pb−Free)	3000 / Tape & 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−Q101 Qualified and PPAP Capable.

PACKAGE DIMENSIONS

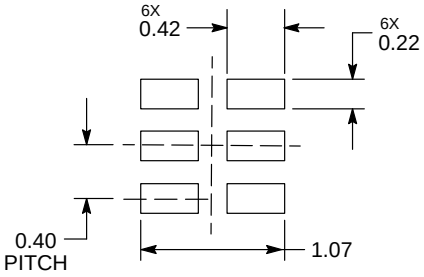
UDFN6 1.2x1.0, 0.4P
CASE 517AA
ISSUE D



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 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.20 BSC	
E	1.00 BSC	
e	0.40 BSC	
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

MOUNTING FOOTPRINT*

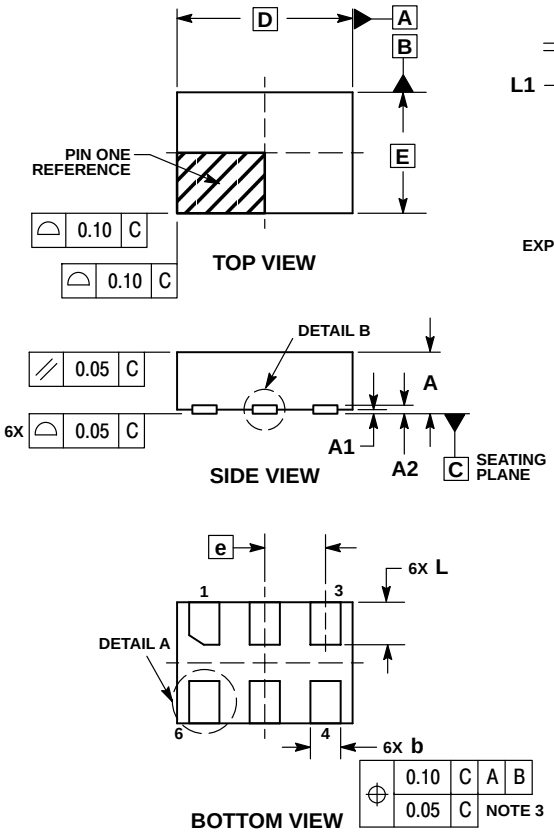


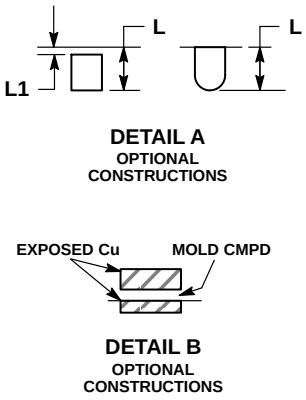
DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

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

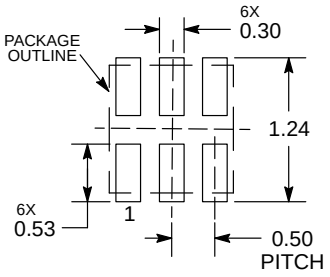




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 mm FROM THE TERMINAL TIP.

	MILLIMETERS	
DIM	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

MOUNTING FOOTPRINT

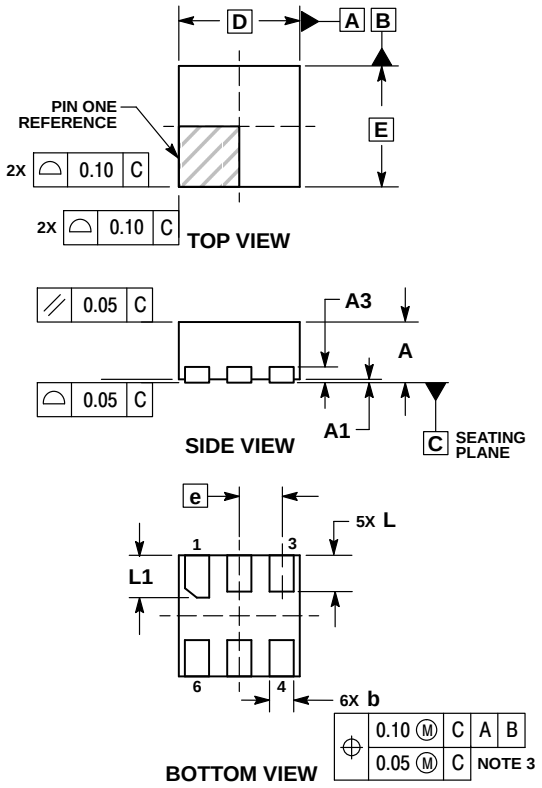


DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

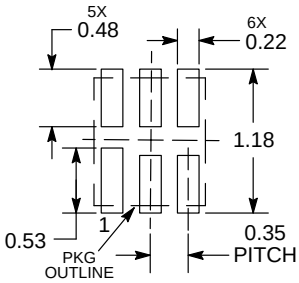
UDFN6 1.0x1.0, 0.35P
CASE 517BX
ISSUE O



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 0.20 MM FROM TERMINAL TIP.
4. PACKAGE DIMENSIONS EXCLUSIVE OF BURRS AND MOLD FLASH.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.13 REF	
b	0.12	0.22
D	1.00 BSC	
E	1.00 BSC	
e	0.35 BSC	
L	0.25	0.35
L1	0.30	0.40

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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