Dual 2-Input Exclusive-OR Gate

NL27WZ86

The NL27WZ86 is a high performance dual 2−input Exclusive−OR Gate operating from a 1.65 V to 5.5 V supply.

Features

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- 2.9 ns t_{PD} at V_{CC} = 5 V (typ)
- Inputs/Outputs Overvoltage Tolerant up to 5.5 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.0 V
- Available in US8, UDFN8 and UQFN8 Packages
- Chip Complexity < 100 FETs
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
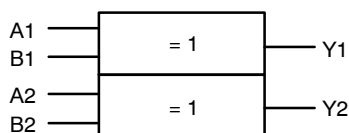- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant
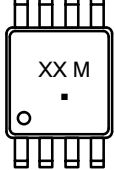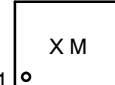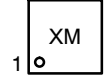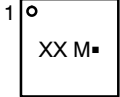
Figure 1. Logic Symbol

ON Semiconductor®

MARKING DIAGRAMS

US8 US SUFFIX CASE 493	XXXX ALYW	Commercial
	XX M	NLV Prefix
UDFN8, 1.45x1.0 MU3 SUFFIX CASE 517BZ	X M	1
UDFN8, 1.95x1.0 MU1 SUFFIX CASE 517CA	X M	1
UQFN8, 1.4x1.2 MQ2 SUFFIX CASE 523AS	XM	1
UQFN8, 1.6x1.6 MQ1 SUFFIX CASE 523AN	XX M	1 8

X, XX, XXXX	= Specific Device Code	
A	= Assembly Location	
L	= Lot Code	
Y	= Year Code	
W	= Week Code	
M	= Date Code	
▪	= Pb−Free Package	

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

NL27WZ86
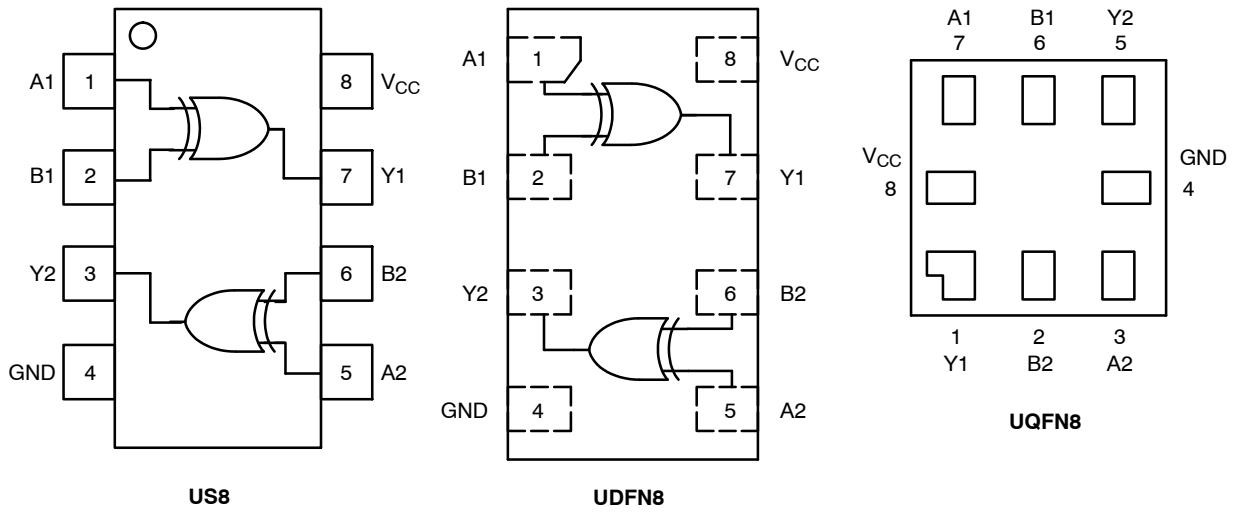
Figure 2. Pinout

PIN ASSIGNMENT (US8 / UDFN8)

Pin	Function
1	A1
2	B1
3	Y2
4	GND
5	A2
6	B2
7	Y1
8	V$_{CC}$

PIN ASSIGNMENT (UQFN8)

Pin	Function
1	Y1
2	B2
3	A2
4	GND
5	Y2
6	B1
7	A1
8	V$_{CC}$

FUNCTION TABLE

Inputs		Output
A	**B**	**Y**
L	L	L
L	H	H
H	L	H
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

MAXIMUM RATINGS

Symbol	Characteristics		Value	Unit
V_{CC}	DC Supply Voltage	NLV	−0.5 to +7.0 −0.5 to +6.5	V
V_{IN}	DC Input Voltage	NLV	−0.5 to +7.0 −0.5 to +6.5	V
V_{OUT}	DC Output Voltage (NLV)	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +7.0 −0.5 to +7.0	V
	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +6.5 −0.5 to +6.5	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−50	mA
I_{OUT}	DC Output Source/Sink Current		±50	mA
I_{CC} or I_{GND}	DC Supply Current per Supply Pin or Ground Pin		±100	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 secs		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 2)	US8 UQFN8 UDFN8	250 210 231	°C/W
P_D	Power Dissipation in Still Air	US8 UQFN8 UDFN8	500 595 541	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 (Note 3)	Human Body Model Charged Device Model	2000 1000	V
$I_{Latchup}$	Latchup Performance (Note 4)		±100	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. Applicable to devices with outputs that may be tri−stated.
2. Measured with minimum pad spacing on an FR4 board, using 10mm−by−1inch, 2 ounce copper trace no air flow per JESD51−7.
3. HBM tested to ANSI/ESDA/JEDEC JS−001−2017. CDM tested to EIA/JESD22−C101−F. JEDEC recommends that ESD qualification to EIA/JESD22−A115−A (Machine Model) be discontinued per JEDEC/JEP172A.
4. Tested to EIA/JESD78 Class II.

RECOMMENDED OPERATING CONDITIONS

Symbol	Characteristics		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		1.65	5.5	V
V_{IN}	DC Input Voltage		0	5.5	V
V_{OUT}	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	0 0 0	V_{CC} 5.5 5.5	
T_A	Operating Temperature Range		−55	+125	°C
t_r , t_f	Input Rise and Fall Time	V_{CC} = 1.65 V to 1.95 V V_{CC} = 2.3 V to 2.7 V V_{CC} = 3.0 V to 3.6 V V_{CC} = 4.5 V to 5.5 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.

NL27WZ86

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$ Min	Typ	Max	$-55°C \leq T_A \leq 125°C$ Min	Max	Units
V_{IH}	High−Level Input Voltage		1.65 to 1.95	0.65 V_{CC}	–	–	0.65 V_{CC}	–	V
			2.3 to 5.5	0.70 V_{CC}	–	–	0.70 V_{CC}	–	
V_{IL}	Low−Level Input Voltage		1.65 to 1.95	–	–	0.35 V_{CC}	–	0.35 V_{CC}	V
			2.3 to 5.5	–	–	0.30 V_{CC}	–	0.30 V_{CC}	
V_{OH}	High−Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -100\,\mu A$ $I_{OH} = -4$ mA $I_{OH} = -8$ mA $I_{OH} = -12$ mA $I_{OH} = -16$ mA $I_{OH} = -24$ mA $I_{OH} = -32$ mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	$V_{CC} - 0.1$ 1.29 1.9 2.2 2.4 2.3 3.8	V_{CC} 1.4 2.1 2.4 2.7 2.5 4.0	– – – – – – –	$V_{CC} - 0.1$ 1.29 1.9 2.2 2.4 2.3 3.8	– – – – – – –	V
V_{OL}	Low−Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 100\,\mu A$ $I_{OL} = 4$ mA $I_{OL} = 8$ mA $I_{OL} = 12$ mA $I_{OL} = 16$ mA $I_{OL} = 24$ mA $I_{OL} = 32$ mA	1.65 to 5.5 1.65 2.3 2.7 3.0 3.0 4.5	– – – – – – –	– 0.08 0.2 0.22 0.28 0.38 0.42	0.1 0.24 0.3 0.4 0.4 0.55 0.55	– – – – – – –	0.1 0.24 0.3 0.4 0.4 0.55 0.55	V
I_{IN}	Input Leakage Current	$V_{IN} = 5.5$ V or GND	1.65 to 5.5	–	–	±0.1	–	±1.0	µA
I_{OFF}	Power Off Leakage Current	$V_{IN} = 5.5$ V or $V_{OUT} = 5.5$ V	0	–	–	1.0	–	10	µA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	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

Symbol	Parameter	V_{CC} (V)	Test Conditions	$T_A = 25°C$ Min	Typ	Max	$T_A = -55$ to $125°C$ Min	Max	Units
t_{PLH}, t_{PHL}	Propagation Delay, (A or B) to Y	1.65 to 1.95	$C_L = 15$ pF $R_L = 1\,M\Omega$ R_1 = Open	–	7.9	9.0	–	10.5	ns
		2.3 to 2.7		–	4.1	7.0	–	7.5	
		3.0 to 3.6		–	3.0	4.8	–	5.2	
		4.5 to 5.5		–	2.2	3.5	–	3.8	
		3.0 to 3.6	$C_L = 50$ pF, $R_L = 500\,\Omega$, R_1 = Open	–	3.8	5.4	–	5.9	
		4.5 to 5.5		–	2.9	4.2	–	4.6	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = 5.5$ V, $V_{IN} = 0$ V or V_{CC}	2.5	pF
C_{OUT}	Output Capacitance	$V_{CC} = 5.5$ V, $V_{IN} = 0$ V or V_{CC}	2.5	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	10 MHz, $V_{CC} = 3.3$ V, $V_{IN} = 0$ V or V_{CC} 10 MHz, $V_{CC} = 5.5$ V, $V_{IN} = 0$ V or V_{CC}	9 11	pF

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$. C_{PD} is used to determine the no−load dynamic power consumption; $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$.

NL27WZ86
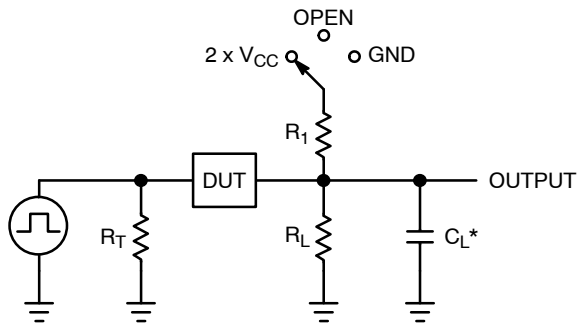
C_L includes probe and jig capacitance
R_T is Z_OUT of pulse generator (typically 50 Ω)
f = 1 MHz

Figure 3. Test Circuit

Test	Switch Position	C_L, pF	R_L, Ω	R_1, Ω
t_{PLH} / t_{PHL}	Open	See AC Characteristics Table		
t_{PLZ} / t_{PZL}	2 x V_{CC}	50	500	500
t_{PHZ} / t_{PZH}	GND	50	500	500

X = Don't Care
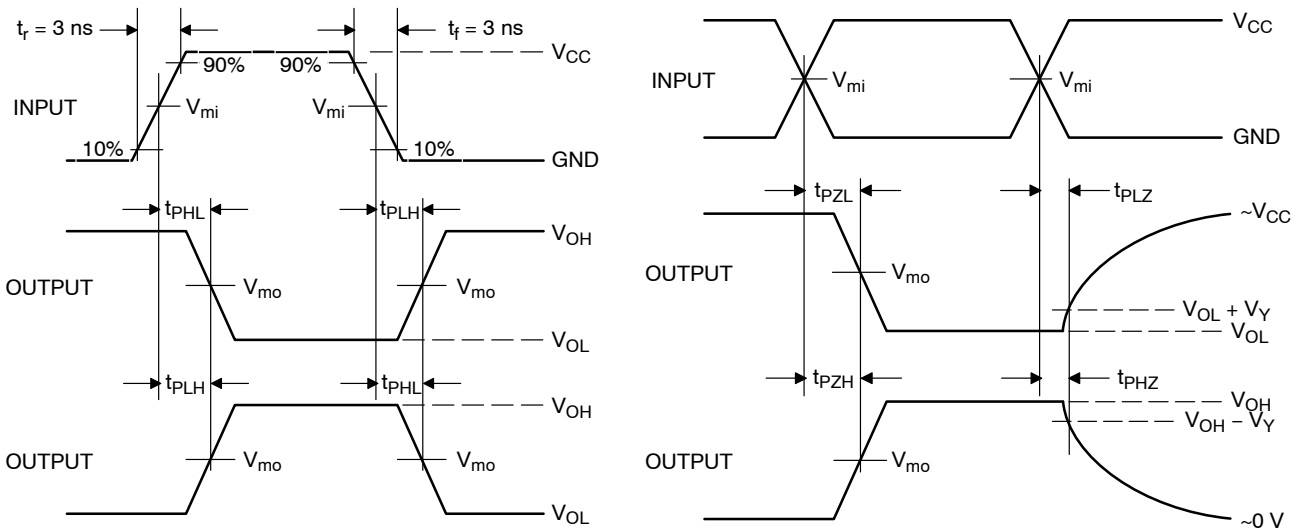
Figure 4. Switching Waveforms

V_{CC}, V	V_{mi}, V	V_{mo}, V		V_Y, V
		t_{PLH}, t_{PHL}	t_{PZL}, t_{PLZ}, t_{PZH}, t_{PHZ}	
1.65 to 1.95	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
2.3 to 2.7	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.15
3.0 to 3.6	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3
4.5 to 5.5	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	0.3

NL27WZ86

Device	Packages	Specific Device Code	Pin 1 Orientation (See below)	Shipping†
NL27WZ86USG	US8	L8	Q4	3000 / Tape & Reel
NLV27WZ86USG*	US8	L8	Q4	3000 / Tape & Reel
NL27WZ86MQ1TCG	UQFN8, 1.6 x 1.6, 0.5P	AC	Q1	3000 / Tape & Reel
NL27WZ86MU1TCG (In Development)	UDFN8, 1.95 x 1.0, 0.5P	TBD	TBD	3000 / Tape & Reel
NL27WZ86MU3TCG (In Development)	UDFN8, 1.45 x 1.0, 0.35P	TBD	TBD	3000 / Tape & Reel
NL27WZ86MQT2CG (In Development)	UQFN8, 1.4 x 1.2, 0.4P	TBD	TBD	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.

Pin 1 Orientation in Tape and Reel
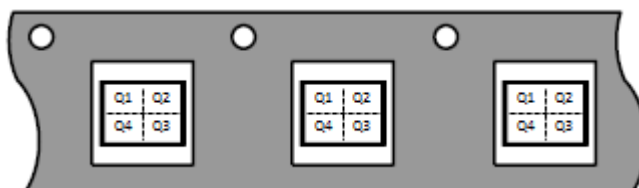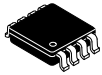
US8
CASE 493
ISSUE F

DATE 01 SEP 2021

SCALE 4 :1
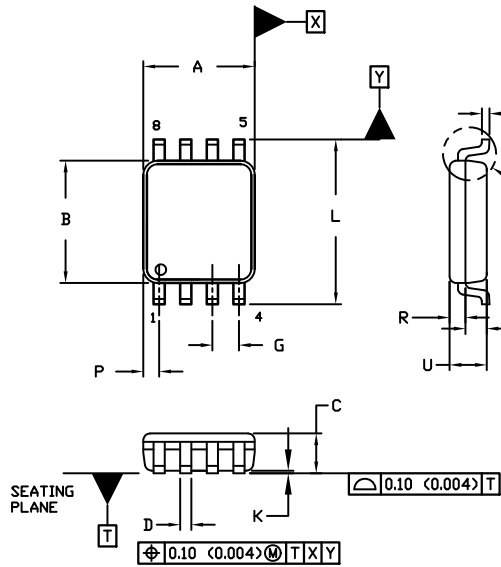
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSION, OR GATE BURR. MOLD FLASH, PROTRUSION, OR GATE BURR SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH AND PROTRUSION SHALL NOT EXCEED 0.14 (0.0055") PER SIDE.
5. LEAD FINISH IS SOLDER PLATING WITH THICKNESS OF 0.0076-0.0203 MM (0.003-0.008").
6. ALL TOLERANCE UNLESS OTHERWISE SPECIFIED ±0.0508 MM (0.002").

DETAIL E
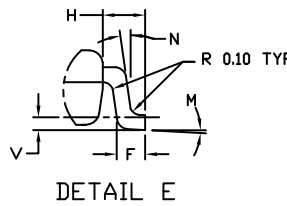
DIM	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.90	2.10	0.075	0.083
B	2.20	2.40	0.087	0.094
C	0.60	0.90	0.024	0.035
D	0.17	0.25	0.007	0.010
F	0.20	0.35	0.008	0.014
G	0.50 BSC		0.020 BSC	
H	0.40 REF		0.016 REF	
J	0.10	0.18	0.004	0.007
K	0.00	0.10	0.000	0.004
L	3.00	3.25	0.118	0.128
M	0°	6°	0°	6°
N	0°	10°	0°	10°
P	0.23	0.34	0.010	0.013
R	0.23	0.33	0.009	0.013
S	0.37	0.47	0.015	0.019
U	0.60	0.80	0.024	0.031
V	0.12 BSC		0.005 BSC	
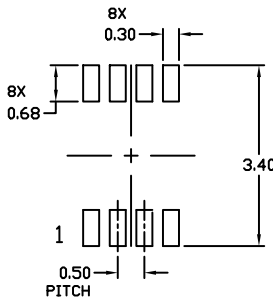
RECOMMENDED ✻ MOUNTING FOOTPRINT

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

GENERIC MARKING DIAGRAM*

XX M■
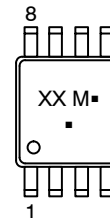
XX   = Specific Device Code
M   = Date Code
■   = Pb-Free Package

(Note: Microdot may be in either location)

*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. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	98AON04475D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	US8		PAGE 1 OF 1

UQFN8, 1.6x1.6, 0.5P
CASE 523AN–01
ISSUE O

DATE 26 NOV 2008

SCALE 4:1

TOP VIEW

PIN ONE REFERENCE

2X ⌒ 0.10 C

2X ⌒ 0.10 C

D A B E

SIDE VIEW

DETAIL B (A3) A

⫽ 0.05 C

⌒ 0.05 C

A1 C SEATING PLANE

BOTTOM VIEW

8X L3
8X L
3 5
1 7
8
DETAIL A
e
8X b
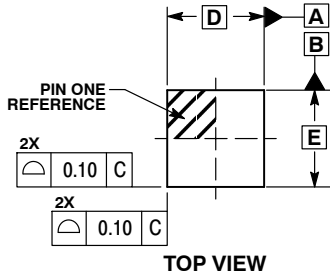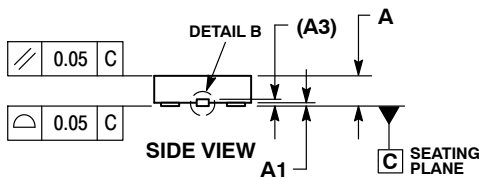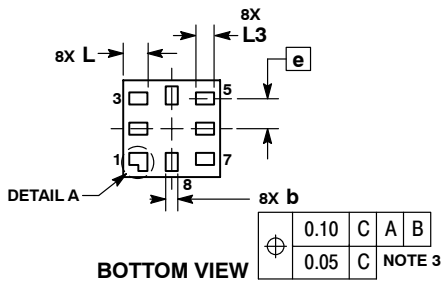
⊕ 0.10 C A B
0.05 C NOTE 3
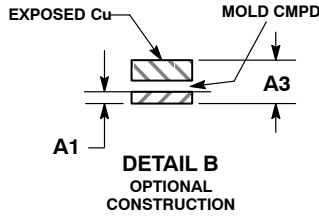
DETAIL B
OPTIONAL CONSTRUCTION

EXPOSED Cu   MOLD CMPD
A3
A1
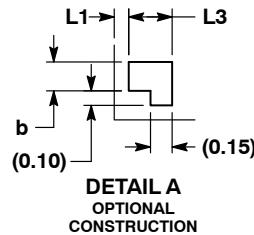
DETAIL A
OPTIONAL CONSTRUCTION

L1 L3
b
(0.10) (0.15)

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	0.60
A1	0.00	0.05
A3	0.13 REF	
b	0.15	0.25
D	1.60 BSC	
E	1.60 BSC	
e	0.50 BSC	
L	0.35	0.45
L1	---	0.15
L3	0.25	0.35

GENERIC MARKING DIAGRAM*

1 o
XX M▪
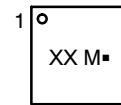
XX = Specific Device Code
M = Date Code
▪ = Pb–Free Package

*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.

SOLDERING FOOTPRINT*

1.70
0.50 PITCH
1
0.35
1.70
7X 0.25
8X 0.53
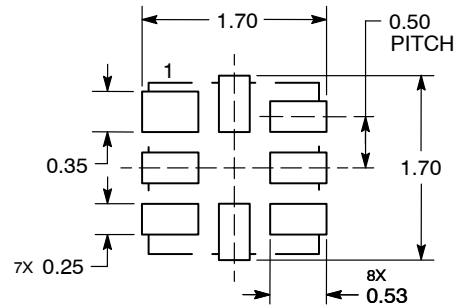
DIMENSIONS: MILLIMETERS

*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:	98AON36348E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.	
DESCRIPTION:	8 PIN UQFN, 1.6X1.6, 0.5P		PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

◊

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Click to view products by ON Semiconductor *manufacturer:*

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NLX1G11AMUTCG NLX1G97MUTCG 74LS38 74LVC32ADTR2G MC74HCT20ADTR2G NLV17SZ00DFT2G NLV17SZ02DFT2G
NLV74HC02ADR2G 74HC32S14-13 74LS133 74LVC1G32Z-7 M38510/30402BDA 74LVC1G86Z-7 74LVC2G08RA3-7
NLV74HC08ADTR2G NLV74HC14ADR2G NLV74HC20ADR2G NLX2G86MUTCG 5962-8973601DA 74LVC2G02HD4-7
NLU1G00AMUTCG 74LVC2G32RA3-7 74LVC2G00HD4-7 NL17SG02P5T5G 74LVC2G00HK3-7 74LVC2G86HK3-7
NLX1G99DMUTWG NLVVHC1G00DFT2G NLVHC1G08DFT2G NLV7SZ57DFT2G NLV74VHC04DTR2G NLV27WZ86USG
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NLV74HC02ADTR2G NLX1G332CMUTCG NL17SG86P5T5G NL17SZ05P5T5G