NLSF302

Quad 2-Input NOR Gate

The NLSF302 is an advanced high speed CMOS 2−input NOR gate fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining CMOS low power dissipation.

The internal circuit is composed of three stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

Features

- High Speed: t_{PD} = 3.6 ns (Typ) at V_{CC} = 5.0 V
- Low Power Dissipation: I_{CC} = 2.0 μA (Max) at T_A = 25°C
- High Noise Immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC}
- Power Down Protection Provided on Inputs
- Balanced Propagation Delays
- Designed for 2.0 V to 5.5 V Operating Range
- Low Noise: V_{OLP} = 0.8 V (Max)
- Function Compatible with Other Standard Logic Families
- QFN−16 Package
- Latchup Performance Exceeds 300 mA
- ESD Performance: Human Body Model; > 2000 V, Machine Model > 200 V
- Chip Complexity: 40 FETs or 10 Equivalent Gates
- Pb−Free Package is Available*

FUNCTION TABLE

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

*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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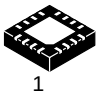
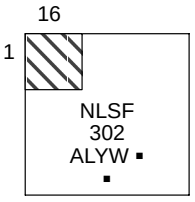


QFN−16
MN SUFFIX
CASE 485G

MARKING DIAGRAM



NLSF302 = Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NLSF302MNR2	QFN−16	3000/Tape & Reel
NLSF302MNR2G	QFN−16 (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.

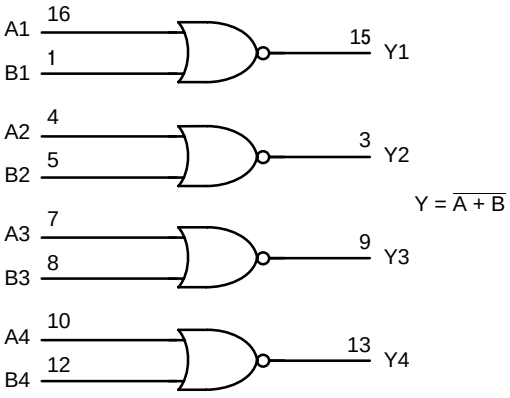


Figure 1. LOGIC DIAGRAM

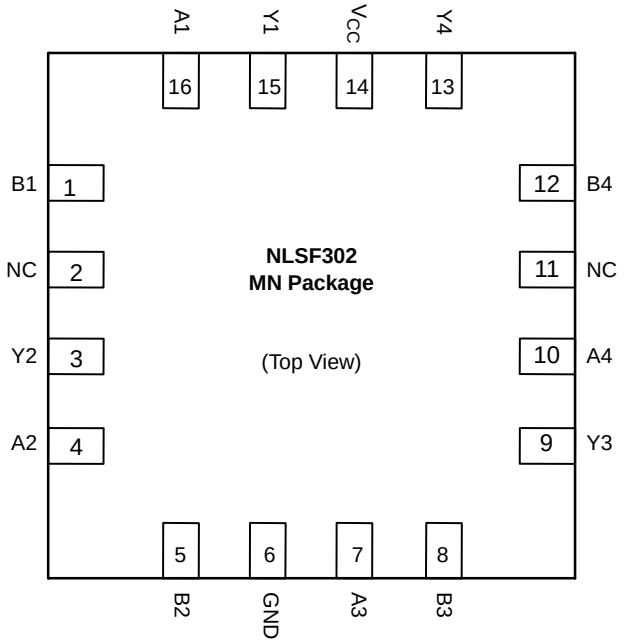


Figure 2. PIN ASSIGNMENT (QFN−16)

MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
DC Supply Voltage	V_{CC}	– 0.5 to + 7.0	V
DC Input Voltage	V_{in}	– 0.5 to + 7.0	V
DC Output Voltage	V_{out}	– 0.5 to V_{CC} + 0.5	V
Input Diode Current	I_{IK}	− 20	mA
Output Diode Current	I_{OK}	± 20	mA
DC Output Current, per Pin	I_{out}	± 25	mA
DC Supply Current, V_{CC} and GND Pins	I_{CC}	± 50	mA
Power Dissipation in Still Air	P_D	450	mW
Storage Temperature	T_{stg}	– 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.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high−impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range GND ≤ (V_{in} or V_{out}) ≤ V_{CC}.

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either GND or V_{CC}). Unused outputs must be left open.

RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	Min	Max	Unit
DC Supply Voltage		V_{CC}	2.0	5.5	V
DC Input Voltage		V_{in}	0	5.5	V
DC Output Voltage		V_{out}	0	V_{CC}	V
Operating Temperature		T_A	−40	+85	°C
Input Rise and Fall Time	V_{CC} = 3.3 V ± 0.3 V V_{CC} =5.0 V ± 0.5 V	t_r, t_f	0 0	100 20	ns/V

DC ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	Symbol	V_{CC} V	T_A = 25°C			T_A = − 40 to 85°C		Unit
				Min	Typ	Max	Min	Max	
Minimum High−Level Input Voltage		V_{IH}	2.0 3.0 to 5.5	1.50 V_{CC} x 0.7			1.50 V_{CC} x 0.7		V
Maximum Low−Level Input Voltage		V_{IL}	2.0 3.0 to 5.5			0.50 V_{CC} x 0.3		0.50 V_{CC} x 0.3	V
Minimum High−Level Output Voltage	V_{in} = V_{IH} or V_{IL} I_{OH} = −50 μA	V_{OH}	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5		1.9 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		
Maximum Low−Level Output Voltage	V_{in} = V_{IH} or V_{IL} I_{OL} = 50 μA	V_{OL}	2.0 3.0 4.5		0.0 0.0 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	
Maximum Input Leakage Current	V_{in} = 5.5 V or GND	I_{in}	0 to 5.5			± 0.1		± 1.0	μA
Maximum Quiescent Supply Current	V_{in} = V_{CC} or GND	I_{CC}	5.5			2.0		20.0	μA

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0ns)

Parameter	Test Conditions	Symbol	T_A = 25°C			T_A = − 40 to 85°C		Unit
			Min	Typ	Max	Min	Max	
Maximum Propagation Delay, Input A or B to Output Y	V_{CC} = 3.3 ± 0.3 V C_L = 15 pF C_L = 50 pF	t_{PLH}, t_{PHL}		5.6 8.1	7.9 11.4	1.0 1.0	9.5 13.0	ns
	V_{CC} = 5.0 ± 0.5 V C_L = 15 pF C_L = 50 pF			3.6 5.1	5.5 7.5	1.0 1.0	6.5 8.5	
Maximum Input Capacitance		C_{in}		4	10		10	pF
			Typical @ 25°C, V_{CC} = 5.0 V					
Power Dissipation Capacitance (Note 1)		C_{PD}		15				pF

1. 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} • V_{CC} • f_{in} + I_{CC}/4 (per gate). 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}.

NOISE CHARACTERISTICS (Input t_r = t_f = 3.0 ns, C_L = 50 pF, V_{CC} = 5.0V)

Characteristic	Symbol	T_A = 25°C		Unit
		Typ	Max	
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	0.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	− 0.3	− 0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}		3.5	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}		1.5	V

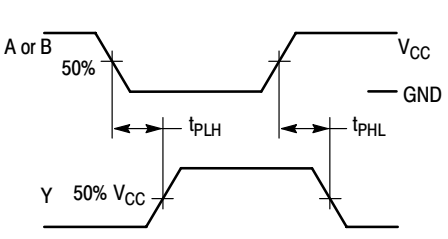
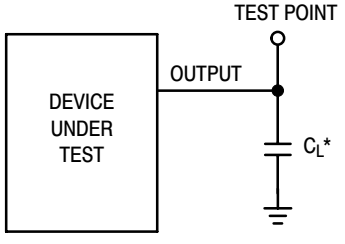


Figure 3. Switching Waveforms



*Includes all probe and jig capacitance

Figure 4. Test Circuit

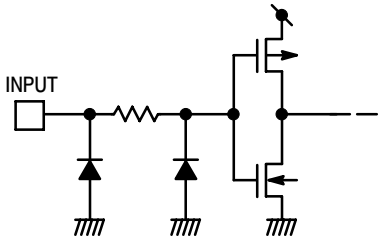


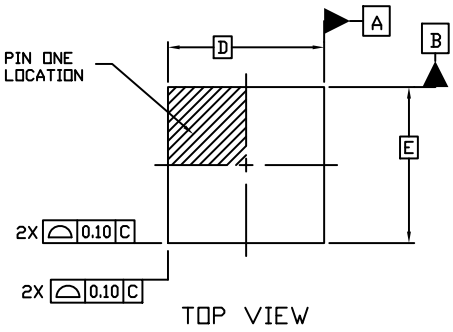
Figure 5. Input Equivalent Circuit

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

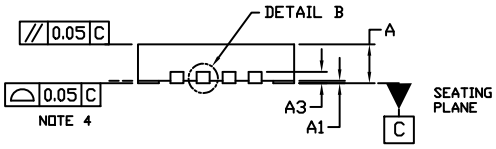
QFN16 3x3, 0.5P
CASE 485G
ISSUE G

DATE 08 OCT 2021

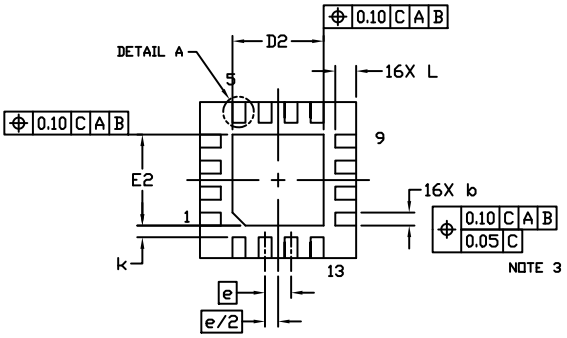
SCALE 2:1



TOP VIEW

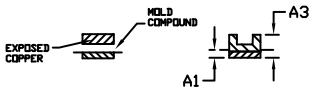


SIDE VIEW

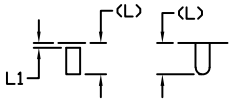


BOTTOM VIEW

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. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.



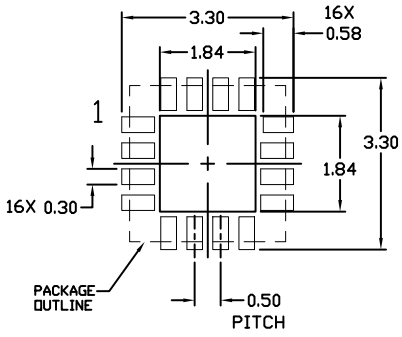
DETAIL B
ALTERNATE CONSTRUCTIONS



DETAIL A
ALTERNATE TERMINAL CONSTRUCTIONS

	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	0.80	0.90	1.00
A1	0.00	0.03	0.05
A3		0.20 REF	
b	0.18	0.24	0.30
D		3.00 BSC	
D2	1.65	1.75	1.85
E		3.00 BSC	
E2	1.65	1.75	1.85
e		0.50 BSC	
k		0.18 TYP	
L	0.30	0.40	0.50
L1	0.00	0.08	0.15

MOUNTING FOOTPRINT



GENERIC MARKING DIAGRAM*

XXXXX = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = 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.

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