TinyLogic UHS Dual 2-Input NOR Gate

NC7WZ02

Description

The NC7WZ02 is a dual 2–Input NOR Gate from ON Semicoductor's Ultra High Speed Series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} range. The inputs and output are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 6.5 V independent of V_{CC} operating voltage.

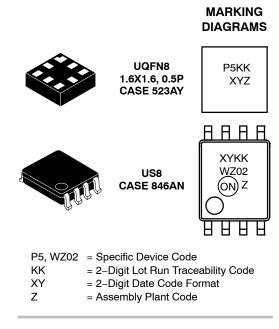
Features

- Space Saving US8 Surface Mount Package
- MicroPak[™] Pb-Free Leadless Package
- Ultra High Speed: $t_{PD} = 2.4$ ns Typ. into 50 pF at 5 V V_{CC}
- High Output Drive: ±24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Matches the Performance of LCX when Operated at 3.3 V V_{CC}
- Power Down High Impedance Inputs / Output
- Overvoltage Tolerant Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry Implemented
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



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ORDERING INFORMATION

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

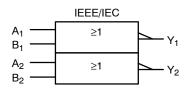


Figure 1. Logic Symbol

Connection Diagrams

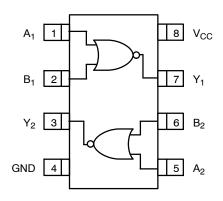
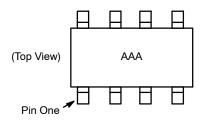


Figure 2. Pin Assignment for US8 (Top View)



AAA represents Product Code Top Mark - see ordering code

NOTE: Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Figure 3. US8 Pin One Orientation Diagram

PIN DESCRIPTION

Pin Names	Description
A _n , B _n	Inputs
Y _n	Output

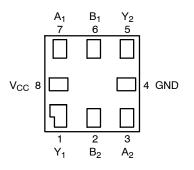


Figure 4. Pad Assignments for MicroPak (Top Through View)

Inp	Output	
А	В	Y
L	L	Н
L	Н	L
Н	L	L
Н	Н	L

H = HIGH Logic Level L = LOW Logic Level

ABSOLUTE MAXIMUM RATINGS

Symbol	Paran	Min	Мах	Unit	
V _{CC}	Supply Voltage	-0.5	6.5	V	
V _{IN}	DC Input Voltage		-0.5	6.5	V
V _{OUT}	DC Output Voltage		-0.5	6.5	V
Ι _{ΙΚ}	DC Input Diode Current	V _{IN} < 0 V	-	-50	mA
I _{OK}	DC Output Diode Current	V _{OUT} < 0 V	-	-50	mA
I _{OUT}	DC Output Current	-	±50	mA	
I_{CC} / I_{GND}	DC V _{CC} / GND Current	-	±100	mA	
T _{STG}	Storage Temperature		-65	+150	°C
TJ	Junction Temperature under Bias	;	-	150	°C
ΤL	Junction Lead Temperature (Soldering, 10 Seconds)		-	260	°C
PD	Power Dissipation in Still Air US8		-	500	mW
		MicroPak-8	-	539	

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.

RECOMMENDED OPERATING CONDITIONS

Symbol		Parameter	Min	Max	Unit
V _{CC}	Supply Voltage Operating		1.65	5.5	V
	Supply Voltage Data Rete	ntion	1.5	5.5	
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage		0	V _{CC}	V
T _A	Operating Temperature		-40	+85	°C
t _r , t _f	Input Rise and Fall Time	V_{CC} @ 1.8 V ±0.15 V, 2.5 V ±0.2 V	0	20	ns/V
		V _{CC} @ 3.3 V ±0.3 V	0	10	
	V _{CC} @ 5.0 V ±0.5 V		0	5	
θ_{JA}	Thermal Resistance	US8	-	250	°C/W
		MicroPak-8	-	232	

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. 1. Unused inputs must be held HIGH or LOW. They may not float.

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DC ELECTICAL CHARACTERISTICS

				T _A = +25°C			T _A = -40	to +85°C	
Symbol	Parameter	Conditions	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit
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}	-	
VIL	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	$V_{IN} = V_{IH} \text{ or } V_{IL},$	1.65	1.55	1.65	-	1.55	-	V
		I _{OH} = -100 μA	2.3	2.2	2.3	-	2.2	-	
			3.0	2.9	3.0	-	2.9	-	
			4.5	4.4	4.5	-	4.4	-	
		I _{OH} = -4 mA	1.65	1.29	1.52	-	1.29	-	
		I _{OH} = -8 mA	2.3	1.9	2.15	-	1.9	-	1
		I _{OH} = -16 mA	3.0	2.4	2.80	-	2.4	-	
		I _{OH} = -24 mA	3.0	2.3	2.68	-	2.3	-	
	I _{OH} = -32 mA	4.5	3.8	4.20	-	3.8	-		
V _{OL}	LOW Level Output Voltage	$V_{IN} = V_{IH} \text{ or } V_{IL},$	1.65	-	0.0	0.1	-	0.1	V
		I _{OL} = 100 μA	2.3	-	0.0	0.1	-	0.1	
			3.0	-	0.0	0.1	-	0.1	
			4.5	-	0.0	0.1	-	0.1	
		I _{OL} = 4 mA	1.65	-	0.08	0.24	-	0.24	-
		I _{OL} = 8 mA	2.3	-	0.10	0.3	_	0.3	
		I _{OL} = 16 mA	3.0	-	0.15	0.4	-	0.4	1
		I _{OL} = 24 mA	3.0	-	0.22	0.55	-	0.55	
		I _{OL} = 32 mA	4.5	-	0.22	0.55	-	0.55	
I _{IN}	Input Leakage Current	V _{IN} = 5.5 V, GND	1.65 to 5.5	-	_	±0.1	-	±1.0	μA
I _{OFF}	Power Off Leakage Current	V _{IN} or V _{OUT} = 5.5 V	0.0	-	-	1	_	10	μA
I _{CC}	Quiescent Supply Current	V _{IN} = 5.5 V, GND	1.65 to 5.5	-	-	1	-	10	μA

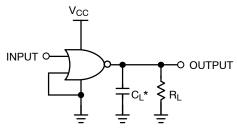
NC7WZ02

AC ELECTRICAL CHARACTERISTICS

								T _A = +25°C		T _A = -40	to +85°C	
Symbol	Parameter	Conditions	V _{CC} (V)	Min	Тур	Max	Min	Max	Unit			
t _{PLH} , t _{PHL}	Propagation Delay	$R_L = 1 M\Omega$,	1.8 ±0.15	-	5.4	9.8	-	10	ns			
	(Figure 5, 7)	C _L = 15 pF	2.5 ±0.2	-	3.3	5.4	-	5.8				
			3.3 ±0.3	-	2.5	3.8	-	4.1				
			5.0 ±0.5	-	2.0	3.0	-	3.3				
		$R_L = 500 \Omega$,	3.3 ±0.3	-	3.1	4.6	-	5.0				
		C _L = 50 pF	5.0 ±0.5	-	2.4	3.7	-	4.0				
C _{IN}	Input Capacitance		0	-	2.5	-	-	-	pF			
C _{PD} Power Dissipation Capacitance (Figure 6)	Power Dissipation Capacitance	(Note 2)	3.3	-	13.5	-	-	-	pF			
		5.0	-	17.5	-	-	-					

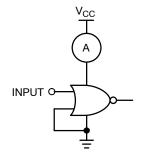
2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. (see Figure 6) C_{PD} is related to I_{CCD} dynamic operating current by the expression: $C_{PD} = I_{CCD} / (V_{CC})$ (F).

AC Loading and Waveforms



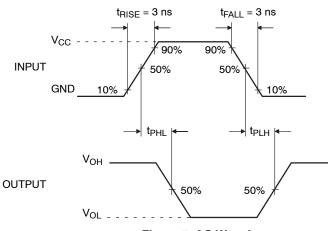
* C_L includes load and stray capacitance Input PRR = 1.0 MHz, t_W = 500 ns

Figure 5. AC Test Circuit



Input = AC Waveform; $t_r = t_f = 1.8$ ns; PRR = 10 MHz; Duty Cycle = 50%.

Figure 6. I_{CCD} Test Circuit





NC7WZ02

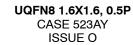
ORDERING INFORMATION

Order Number	Top Mark	Package	Shipping [†]
NC7WZ02K8X	WZ02	8-Lead US8, JEDEC MO-187, Variation CA 3.1 mm Wide	3000 / Tape & Reel
NC7WZ02L8X	P5	8-Lead MicroPak, 1.6 mm Wide	5000 / Tape & Reel

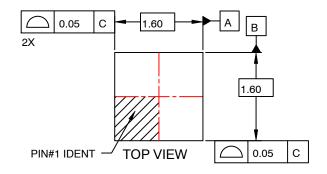
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
3. Pb-Free package per JEDEC J-STD-020B.

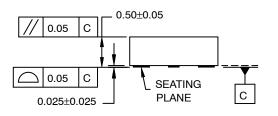
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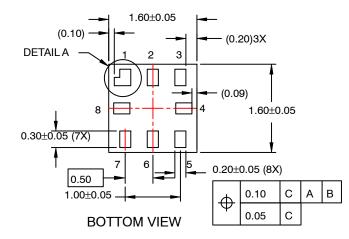


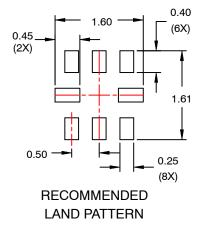
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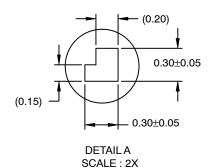
SIDE VIEW





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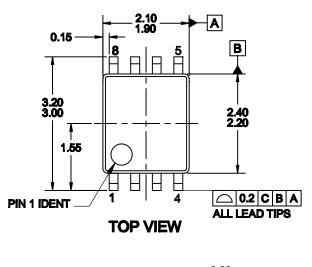
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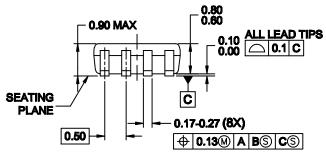
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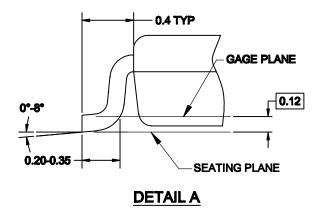
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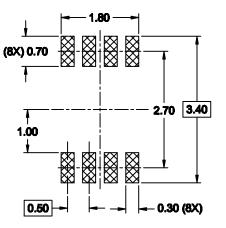
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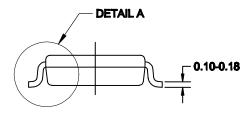




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