

# TinyLogic UHS Triple Inverter with Schmitt Trigger Input



ON Semiconductor®

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## NC7NZ14

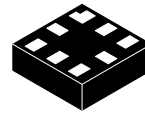
### Description

The NC7NZ14 is a triple inverter with Schmitt trigger input from ON Semiconductor's Ultra-High Speed (UHS) 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 outputs are high-impedance when  $V_{CC}$  is 0 V. Inputs tolerate voltages up to 5.5 V independent of  $V_{CC}$  operating voltage.

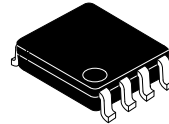
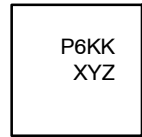
### Features

- Ultra High-Speed:  $t_{PD} = 3.7$  ns (Typical) into 50 pF at 5 V  $V_{CC}$
- High Output Drive:  $\pm 24$  mA at 3 V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range: 1.65 V to 5.5 V
- Power Down High Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving US8 Surface Mount Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

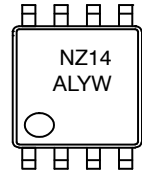
### MARKING DIAGRAMS



UQFN8  
1.6X1.6, 0.5P  
CASE 523AY



US8  
CASE 846AN



P6, NZ14 = Specific Device Code  
 KK = 2-Digit Lot Run Traceability Code  
 XY = 2-Digit Date Code Format  
 Z = Assembly Plant Code  
 A = Assembly Site  
 L = Wafer Lot Number  
 YW = Assembly Start Week

### ORDERING INFORMATION

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

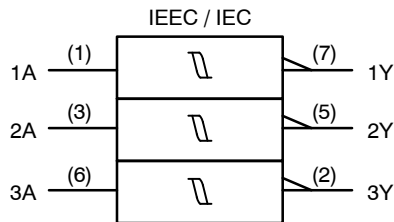


Figure 1. Logic Symbol

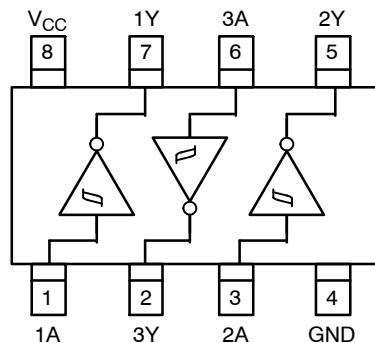
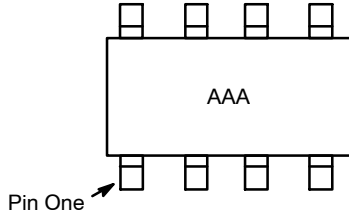


Figure 2. Connection Diagram (Top View)

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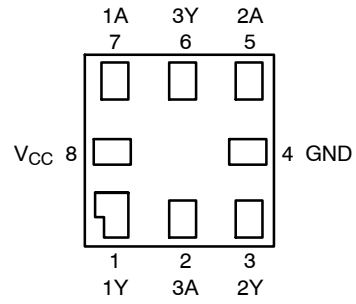
## Pin Configurations



**NOTES:**

1. AAA represents product code top mark (see ordering table).
2. Orientation of top mark determines pin one location. Reading the top product code mark left to right, pin one is the lower left pin.

**Figure 3. US8**



**Figure 4. MicroPak (Top Through View)**

### PIN DEFINITIONS

Pin # US8	Pin # MicroPak	Name	Description
1	7	1A	Input
2	6	3Y	Output
3	5	2A	Input
4	4	GND	Ground
5	3	2Y	Output
6	2	3A	Input
7	1	1Y	Output
8	8	V <sub>CC</sub>	Supply Voltage

### FUNCTION TABLE

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level  
L = LOW Logic Level

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## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	6.5	V
V <sub>IN</sub>	DC Input Voltage		-0.5	6.5	V
V <sub>OUT</sub>	DC Output Voltage		-0.5	6.5	V
I <sub>IK</sub>	DC Input Diode Current	V <sub>IN</sub> < 0 V	-	-50	mA
I <sub>OK</sub>	DC Output Diode Current	V <sub>OUT</sub> < 0 V	-	-50	mA
I <sub>OUT</sub>	DC Output Current		-	±50	mA
I <sub>CC</sub> / I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current		-	±50	mA
T <sub>STG</sub>	Storage Temperature Range		-65	+150	°C
T <sub>J</sub>	Junction Temperature Under Bias		-	+150	°C
T <sub>L</sub>	Junction Lead Temperature (Soldering, 10 Seconds)		-	+260	°C
P <sub>D</sub>	Power Dissipation in Still Air	US8	-	500	mW
		MicroPak-8	-	539	
ESD	Human Body Model, JEDEC: JESD22-A114		-	4000	V
	Charge Device Model, JEDEC: JESD22-C101		-	2000	

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	Conditions	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage Operating		1.65	5.5	V
	Supply Voltage Data Retention		1.5	5.5	
V <sub>IN</sub>	Input Voltage		0	5.5	V
V <sub>OUT</sub>	Output Voltage		0	V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature		-40	+85	°C
θ <sub>JA</sub>	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.

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

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## DC ELECTRICAL CHARACTERISTICS

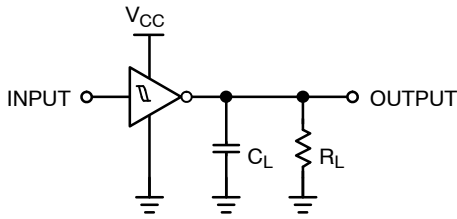
Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit
				Min	Typ	Max	Min	Max	
V <sub>P</sub>	Positive Threshold Voltage	1.65		-	1.10	1.50	-	1.50	V
		2.30		-	1.40	1.80	-	1.80	
		3.00		-	1.75	2.20	-	2.20	
		4.50		-	2.45	3.10	-	3.10	
		5.50		-	2.90	3.60	-	3.60	
V <sub>N</sub>	Negative Threshold Voltage	1.65		0.25	0.55	-	0.25	-	V
		2.30		0.40	0.75	-	0.40	-	
		3.00		0.60	1.00	-	0.60	-	
		4.50		1.00	1.43	-	1.00	-	
		5.50		1.20	1.70	-	1.20	-	
V <sub>H</sub>	Hysteresis Voltage	1.65		0.15	0.54	1.00	0.15	1.00	V
		2.30		0.25	0.65	1.10	0.25	1.10	
		3.00		0.40	0.77	1.20	0.40	1.20	
		4.50		0.60	1.01	1.50	0.60	1.50	
		5.50		0.70	1.18	1.70	0.70	1.70	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>P</sub> or V <sub>N</sub> , I <sub>OH</sub> = -100 μA	1.55	1.65	-	1.55	-	V
		2.30		2.20	2.30	-	2.20	-	
		3.00		2.90	3.00	-	2.90	-	
		4.50		4.40	4.50	-	4.4	-	
		1.65	I <sub>OH</sub> = -4 mA	1.29	1.52	-	1.29	-	
		2.30	I <sub>OH</sub> = -8 mA	1.90	2.15	-	1.90	-	
		3.00	I <sub>OH</sub> = -16 mA	2.40	2.80	-	2.40	-	
		3.00	I <sub>OH</sub> = -24 mA	2.30	2.68	-	2.30	-	
		4.50	I <sub>OH</sub> = -32 mA	3.80	4.20	-	3.80	-	
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>P</sub> or V <sub>N</sub> , I <sub>OL</sub> = 100 μA	-	0.00	0.10	-	0.10	V
		2.30		-	0.00	0.10	-	0.10	
		3.00		-	0.00	0.10	-	0.10	
		4.50		-	0.00	0.10	-	0.10	
		1.65	I <sub>OL</sub> = 4 mA	-	0.08	0.24	-	0.24	
		2.30	I <sub>OL</sub> = 8 mA	-	0.10	0.30	-	0.30	
		3.00	I <sub>OL</sub> = 16 mA	-	0.15	0.40	-	0.40	
		3.00	I <sub>OL</sub> = 24 mA	-	0.22	0.55	-	0.55	
		4.50	I <sub>OL</sub> = 32 mA	-	0.22	0.55	-	0.55	
		I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5	V <sub>IN</sub> = 5.5 V, GND	-	-	±0.1	
I <sub>OFF</sub>	Power Off Leakage Current	0	V <sub>IN</sub> or V <sub>OUT</sub> = 5.5 V	-	-	1	-	10	μA
I <sub>CC</sub>	Quiescent Supply Current	1.65 to 5.50	V <sub>IN</sub> = 5.5 V, GND	-	-	1.0	-	10	μA

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## AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C			T <sub>A</sub> = -40 to +85°C		Unit	
				Min	Typ	Max	Min	Max		
t <sub>PLH</sub> , t <sub>PHL</sub>	Propagation Delay (Figure 5, 6)	1.80 ± 0.15	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ,	-	7.6	12.5	-	13.0	ns	
				-	5.0	9.0	-	9.5		
		-		3.7	6.3	-	6.5			
		-		3.1	5.2	-	5.5			
		3.30 ± 0.30		C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω,	-	4.4	7.2	-		7.5
					-	3.7	5.9	-		6.2
C <sub>IN</sub>	Input Capacitance	0.00		-	2.5	-	-	-	pF	
C <sub>PD</sub>	Power Dissipation Capacitance (Note 4) (Figure 7)	3.30		-	9	-	-	-	pF	
		5.00		-	11	-	-	-		

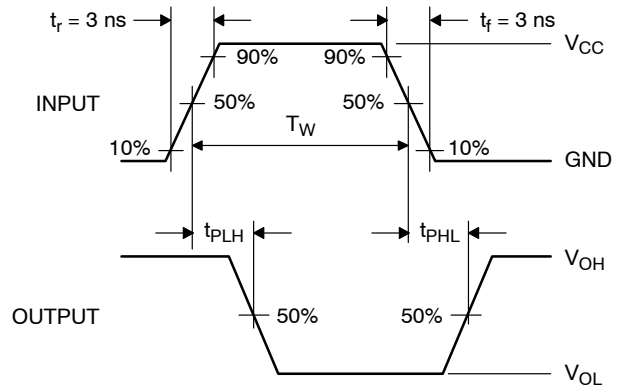
4. C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I<sub>CCD</sub>) at no output loading and operating at 50% duty cycle. C<sub>PD</sub> is related to I<sub>CCD</sub> dynamic operating current by the expression:  
 $I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic})$ .



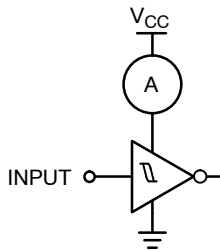
NOTE:

5. C<sub>L</sub> includes load and stray capacitance;  
 Input PRR = 1.0 MHz, t<sub>W</sub> = 500 ns.

**Figure 5. AC Test Circuit**



**Figure 6. AC Waveforms**



NOTE:

6. Input = AC Waveform; t<sub>r</sub> = t<sub>f</sub> = 1.8 ns; PRR = 10 MHz;  
 Duty Cycle = 50%.

**Figure 7. I<sub>CCD</sub> Test Circuit**

# NC7NZ14

## ORDERING INFORMATION

Part Number	Operating Temperature	Top Mark	Package	Shipping <sup>†</sup>
NC7NZ14K8X	-40 to +85°C	NZ14	8-Lead US8, JEDEC MO-187, Variation CA 3.1 mm Wide	3000 / Tape & Reel
NC7NZ14L8X		P6	8-Lead MicroPak, 1.6 mm Wide	5000 / Tape & Reel

<sup>†</sup>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.

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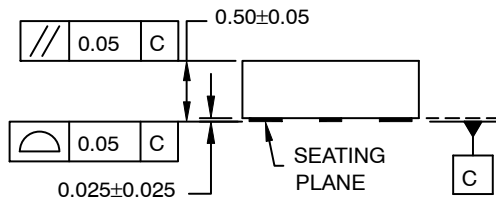


**UQFN8 1.6X1.6, 0.5P**  
CASE 523AY  
ISSUE O

DATE 31 AUG 2016



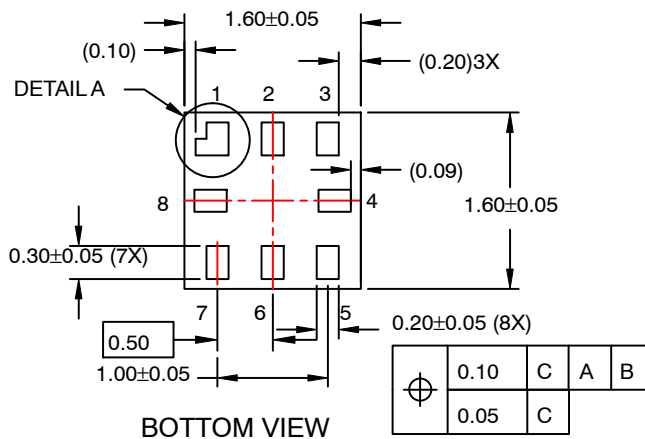
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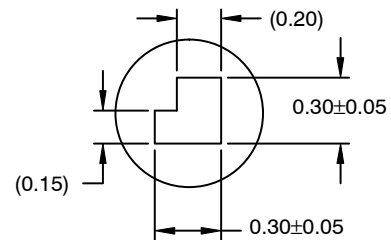
**SIDE VIEW**

**NOTES:**

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**BOTTOM VIEW**



**DETAIL A  
SCALE : 2X**

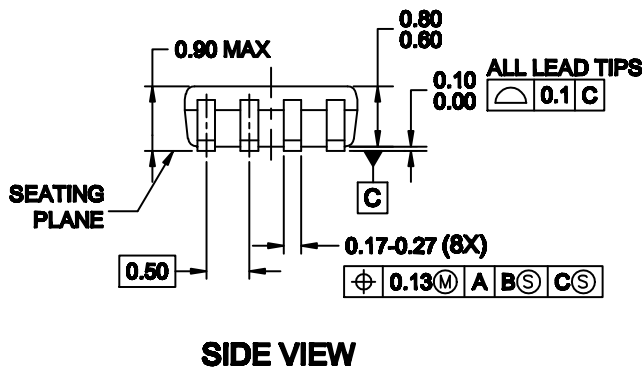
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