

NC7WZ14

TinyLogic UHS Dual Inverter with Schmitt Trigger Inputs

Description

The NC7WZ14 is a dual 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. Schmitt trigger inputs achieve typically 1 V hysteresis between the positive-and-negative-going input threshold voltage at 5 V.

Features

- Ultra High-Speed: t_{PD} 3.2 ns (Typical) into 50 pF at 5 V
- High Output Drive: ± 24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Matches Performance of LCX when Operated at 3.3 V V_{CC}
- 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 SC70 Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

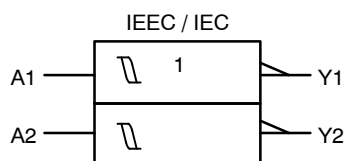


Figure 1. Logic Symbol



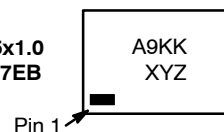
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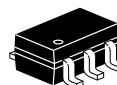
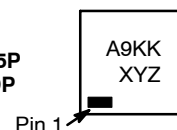
MARKING DIAGRAMS



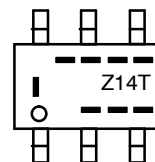
SIP6 1.45x1.0
CASE 127EB



UDFN6
1.0x1.0, 0.35P
CASE 517DP



SC-88
(SC-70 6 Lead)
1.25x2
CASE 419AD-01



A9, Z14 = Specific Device Code
KK = 2-Digit Lot Run Traceability Code
XY = 2-Digit Date Code Format
Z = Assembly Plant Code
---- = Year Coding Scheme
I-- = Plant Code Identifier
T = Die Run Code
--- = Eight-Week Datacoding Scheme

ORDERING INFORMATION

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

Pin Configurations

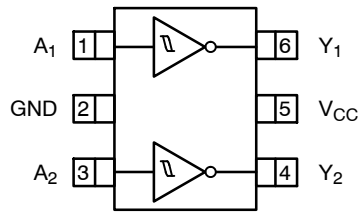


Figure 2. SC70 (Top View)

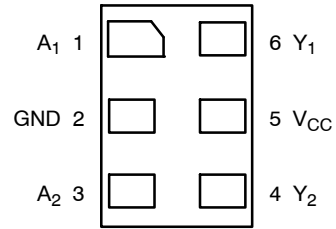
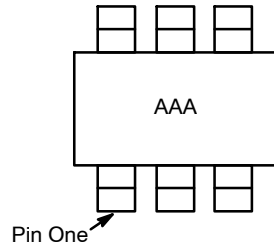


Figure 3. MicroPak (Top Through View)



NOTES:

1. AAA represents Product Code Top Mark (see *Ordering Information*).
2. Orientation of Top Mark determines Pin One location. Read the top mark left to right, pin one is the lower left pin.

Figure 4. SC70 Pin 1 Orientation

PIN DEFINITIONS

Pin # SC70	Pin # MicroPak	Name	Description
1	1	A ₁	Input
2	2	GND	Ground
3	3	A ₂	Input
4	4	Y ₂	Output
5	5	V _{CC}	Supply Voltage
6	6	Y ₁	Input

FUNCTION TABLE (Y = /A)

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level
L = LOW Logic Level

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	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
I _{IK}	DC Input Diode Current	V _{IN} < -0.5 V	-	-50	mA
I _{OK}	DC Output Diode Current	V _{OUT} < -0.5 V	-	-50	mA
I _{OUT}	DC Output Current		-	±100	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current		-	±50	mA
T _{STG}	Storage Temperature Range		-65	+150	°C
T _J	Junction Temperature Under Bias		-	+150	°C
T _L	Junction Lead Temperature (Soldering, 10 Seconds)		-	+260	°C
P _D	Power Dissipation	SC70-6	-	190	mW
		MicroPak-6	-	327	
		MicroPak2™-6	-	327	
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 _{CC}	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.5	5.5	
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage		0	V _{CC}	V
T _A	Operating Temperature	SC70-6	-40	+125	°C
		MicroPak-6	-40	+85	
		MicroPak2-6	-40	+85	
θ _{JA}	Thermal Resistance	SC70-6	-	659	°C/W
		MicroPak-6	-	382	
		MicroPak2-6	-	382	

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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40 to +85°C		T _A = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _P	Positive Threshold Voltage	1.65		-	-	1.40	-	1.40	-	1.40	V
		1.80		-	-	1.50	-	1.50	-	1.50	
		2.30		-	-	1.80	-	1.80	-	1.80	
		3.00		-	-	2.20	-	2.20	-	2.20	
		4.50		-	-	3.10	-	3.10	-	3.20	
		5.50		-	-	3.60	-	3.60	-	3.70	

NC7WZ14

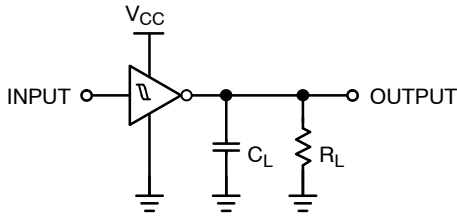
DC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40 to +85°C		T _A = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
V _N	Negative Threshold Voltage	1.65		0.20	0.50	–	0.20	–	0.30	–	V
		1.80		0.25	0.56	–	0.25	–	0.35	–	
		2.30		0.40	0.75	–	0.40	–	0.50	–	
		3.00		0.60	0.98	–	0.60	–	0.70	–	
		4.50		1.00	1.42	–	1.00	–	1.10	–	
		5.50		1.20	1.68	–	1.20	–	1.40	–	
V _H	Hysteresis Voltage	1.65		0.10	0.48	0.90	0.10	0.90	0.10	0.90	V
		1.80		0.15	0.51	1.00	0.15	1.00	0.15	1.00	
		2.30		0.25	0.62	1.10	0.25	1.10	0.25	1.10	
		3.00		0.40	0.76	1.20	0.40	1.20	0.40	1.20	
		4.50		0.60	1.01	1.50	0.60	1.50	0.60	1.50	
		5.50		0.70	1.20	1.70	0.70	1.70	0.70	1.70	
V _{OH}	HIGH Level Output Voltage	1.65	V _{IN} = V _{IL} , I _{OH} = –100 µA	1.55	1.65	–	1.55	–	1.55	–	V
		1.80		1.70	1.80	–	1.70	–	1.70	–	
		2.30		2.20	2.30	–	2.20	–	2.20	–	
		3.00		2.90	3.00	–	2.90	–	2.90	–	
		4.50		4.40	4.50	–	4.40	–	4.40	–	
		1.65	I _{OH} = –4 mA	1.29	1.52	–	1.29	–	1.26	–	
		2.30	I _{OH} = –8 mA	1.90	2.14	–	1.90	–	1.80	–	
		3.00	I _{OH} = –16 mA	2.40	2.75	–	2.40	–	2.30	–	
		3.00	I _{OH} = –24 mA	2.30	2.62	–	2.30	–	2.20	–	
		4.50	I _{OH} = –32 mA	3.80	4.13	–	3.80	–	3.70	–	
V _{OL}	LOW Level Output Voltage	1.65	V _{IN} = V _{IH} , I _{OL} = 100 µA	–	0.00	0.10	–	0.10	–	0.10	V
		1.80		–	0.00	0.10	–	0.10	–	0.10	
		2.30		–	0.00	0.10	–	0.10	–	0.10	
		3.00		–	0.00	0.10	–	0.10	–	0.10	
		4.50		–	0.00	0.10	–	0.10	–	0.10	
		1.65	I _{OL} = 4 mA	–	0.08	0.24	–	0.24	–	0.26	
		2.30	I _{OL} = 8 mA	–	0.10	0.30	–	0.30	–	0.32	
		3.00	I _{OL} = 16 mA	–	0.16	0.40	–	0.40	–	0.43	
		3.00	I _{OL} = 24 mA	–	0.24	0.55	–	0.55	–	0.60	
		4.50	I _{OL} = 32 mA	–	0.25	0.55	–	0.55	–	0.60	
I _{IN}	Input Leakage Current	1.65 to 5.5	V _{IN} = 5.5 V, GND	–	–	±0.1	–	±1.0	–	±2.0	µA
I _{OFF}	Power Off Leakage Current	0	V _{IN} or V _{OUT} = 5.5 V	–	–	1	–	10	–	20	µA
I _{CC}	Quiescent Supply Current	1.65 to 5.5	V _{IN} = 5.5 V, GND	–	–	1.0	–	10	–	20	µA

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40 to +85°C		T _A = -40 to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay (Figure 5, 6)	1.65	C _L = 15 pF, R _L = 1 MΩ,	-	7.6	13.1	-	14.5	-	14.7	ns
		1.80		-	6.3	10.9	-	12.0	-	12.3	
		2.50 ±0.20		-	4.3	7.4	-	8.1	-	8.4	
		3.30 ±0.30		-	3.3	5.0	-	5.5	-	5.8	
		5.00 ±0.50		-	2.7	4.1	-	4.5	-	4.8	
		3.30 ±0.30	C _L = 50 pF, R _L = 500 Ω,	-	4.0	6.0	-	6.6	-	6.9	
		5.00 ±0.50		-	3.2	4.9	-	5.4	-	5.7	
C _{IN}	Input Capacitance	0.00		-	2.5	-	-	-	-	-	pF
C _{PD}	Power Dissipation Capacitance (Note 4) (Figure 7)	3.30		-	11.0	-	-	-	-	-	pF
		5.00		-	12.5	-	-	-	-	-	

4. 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. C_{PD} is related to I_{CCD} dynamic operating current by the expression:
I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic}).



NOTE:

5. C_L includes load and stray capacitance;
Inputs PRR = 1.0 MHz, t_W = 500 ns.

Figure 5. AC Test Circuit

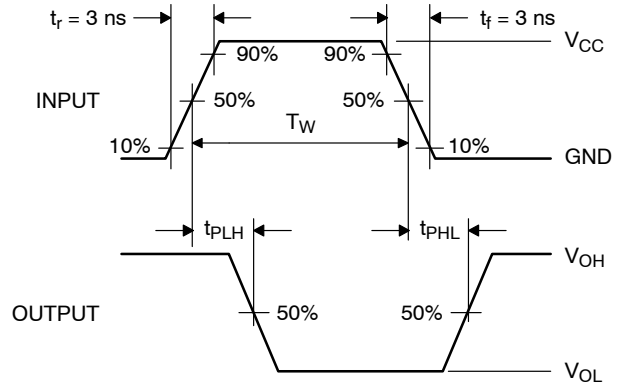
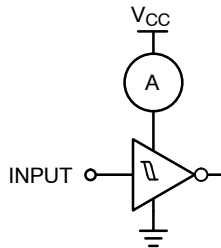


Figure 6. AC Waveforms



NOTE:

6. Input = AC Waveform; t_r = t_f = 1.8 ns; PRR = variable;
Duty Cycle = 50%.

Figure 7. I_{CCD} Test Circuit

NC7WZ14

ORDERING INFORMATION

Device	Operating Temperature	Top Mark	Packages	Shipping [†]
NC7WZ14P6X	–40 to +85°C	Z14	6-Lead SC70, EIAJ SC–88a, 1.25 mm Wide	3000 / Tape & Reel
NC7WZ14EP6X	–40 to +125°C	Z14	6-Lead SC70, EIAJ SC–88a, 1.25 mm Wide	3000 / Tape & Reel
NC7WZ14L6X	–40 to +85°C	A9	6-Lead MicroPak, 1.00 mm Wide	5000 / Tape & Reel
NC7WZ14FHX	–40 to +85°C	A9	6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch	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.

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NOTES:

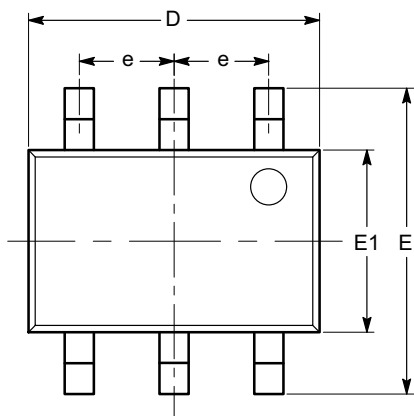
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2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

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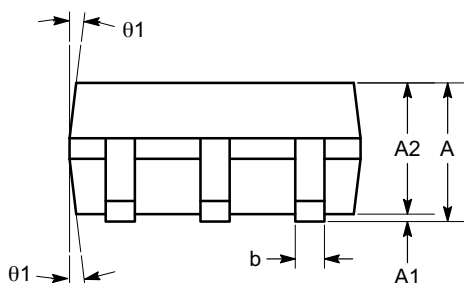
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SC-88 (SC-70 6 Lead), 1.25x2
CASE 419AD-01
ISSUE A

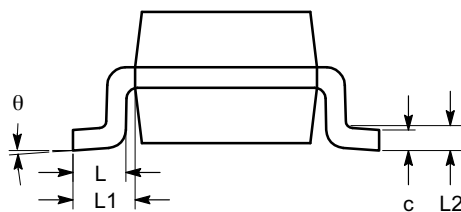
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TOP VIEW



SIDE VIEW



END VIEW

SYMBOL	MIN	NOM	MAX
A	0.80		1.10
A1	0.00		0.10
A2	0.80		1.00
b	0.15		0.30
c	0.10		0.18
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.26	0.36	0.46
L1	0.42 REF		
L2	0.15 BSC		
θ	0°		8°
θ1	4°		10°

Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

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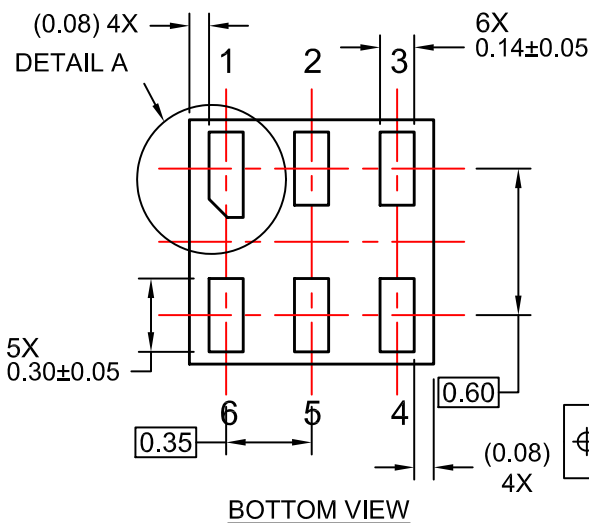
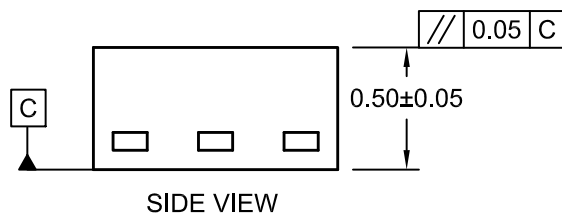
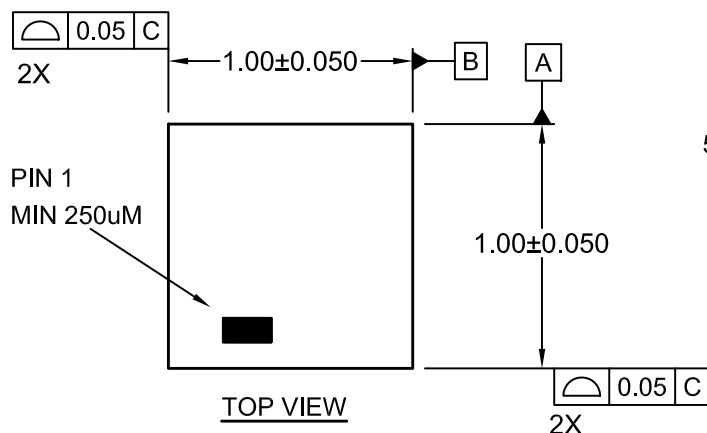
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CASE 517DP

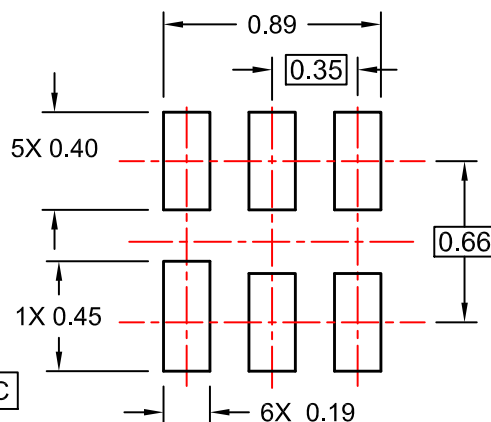
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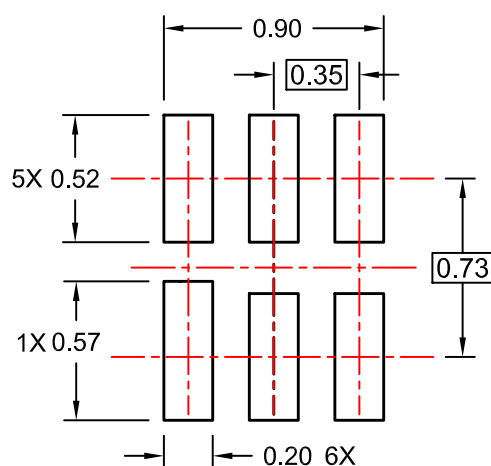


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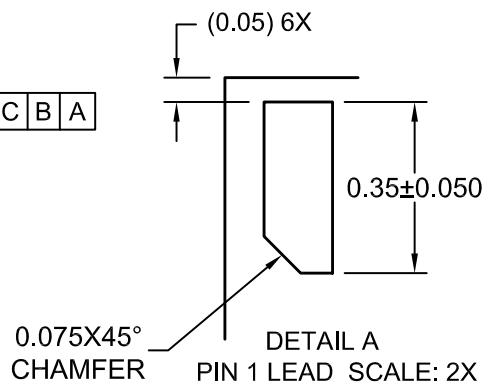
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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009



RECOMMENDED LAND PATTERN FOR SPACE CONSTRAINED PCB



ALTERNATIVE LAND PATTERN FOR UNIVERSAL APPLICATION



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