

# NC7WZ04

## TinyLogic UHS Dual Inverter

### Description

The NC7WZ04 is a dual inverter 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 broad  $V_{CC}$  operating range. The device is specified to operate 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 tolerate voltages up to 5.5 V independent of  $V_{CC}$  operating voltage.

### Features

- Ultra-High Speed:  $t_{PD}$  2.3 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
- 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 6-Lead Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

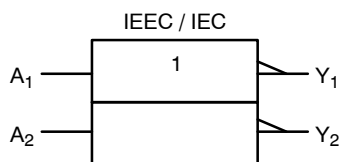


Figure 1. Logic Symbol



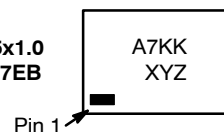
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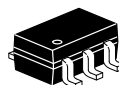
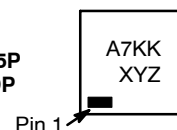
### MARKING DIAGRAMS



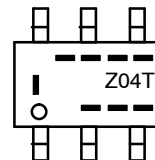
SIP6 1.45x1.0  
CASE 127EB



UDFN6  
1.0x1.0, 0.35P  
CASE 517DP



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



A7, Z04 = 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

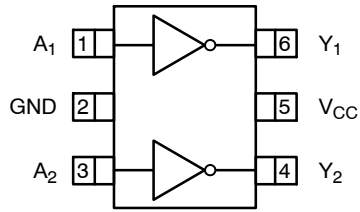


Figure 2. SC70 (Top View)

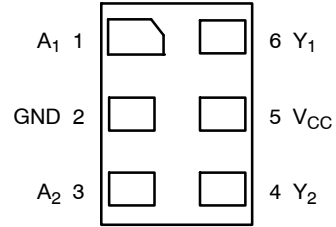
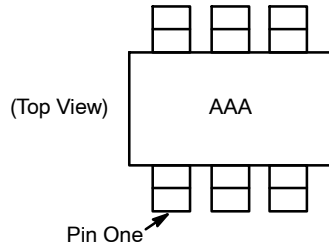


Figure 3. MicroPak (Top Through View)



### NOTES:

1. AAA represents product code top mark (see *Ordering Information*).
2. Orientation of top mark determines pin one location.
3. Reading 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	Input
2	2	GND	Ground
3	3	A	Input
4	4	Y	Output
5	5	V <sub>CC</sub>	Supply Voltage
6	6	Y	Output

## 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 <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 Source / Sink Current		-	±50	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current		-	±100	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	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 <sub>CC</sub>	Supply Voltage Operating		1.65	5.50	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>r</sub> , t <sub>f</sub>	Input Rise and Fall Times	V <sub>CC</sub> at 1.8 V, 2.5 V ±0.2 V	0	20	ns/V
		V <sub>CC</sub> at 3.3 V ±0.3 V	0	10	
		V <sub>CC</sub> at 5.0 V ±0.5 V	0	5	
T <sub>A</sub>	Operating Temperature		-40	+85	°C
θ <sub>JA</sub>	Thermal Resistance	SC70-6	-	659	°C/W
		MicroPak-6	-	382	
		MicroPak2-6	-	382	°C/W

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.

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

# NC7WZ04

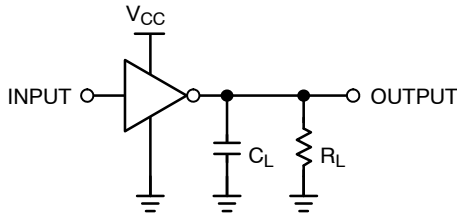
## DC ELECTRICAL CHARACTERISTICS

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>IH</sub>	HIGH Level Input Voltage	1.65 to 1.95		0.65 V <sub>CC</sub>	–	–	0.65 V <sub>CC</sub>	–	V
		2.30 to 5.50		0.70 V <sub>CC</sub>	–	–	0.70 V <sub>CC</sub>	–	
V <sub>IL</sub>	LOW Level Input Voltage	1.65 to 1.95		–	–	0.35 V <sub>CC</sub>	–	0.35 V <sub>CC</sub>	V
		2.30 to 5.50		–	–	0.30 V <sub>CC</sub>	–	0.30 V <sub>CC</sub>	
V <sub>OH</sub>	HIGH Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>IL</sub> , I <sub>OH</sub> = –100 µA	1.55	1.65	–	1.55	–	V
		1.80		1.70	1.80	–	1.70	–	
		2.30		2.20	2.30	–	2.20	–	
		3.00		2.90	3.00	–	2.90	–	
		4.50		4.40	4.50	–	4.40	–	
		1.65	I <sub>OH</sub> = –4 mA	1.29	1.52	–	1.29	–	
		2.30	I <sub>OH</sub> = –8 mA	1.90	2.14	–	1.90	–	
		3.00	I <sub>OH</sub> = –16 mA	2.40	2.75	–	2.40	–	
		3.00	I <sub>OH</sub> = –24 mA	2.30	2.62	–	2.30	–	
		4.50	I <sub>OH</sub> = –32 mA	3.80	4.13	–	3.80	–	
V <sub>OL</sub>	LOW Level Output Voltage	1.65	V <sub>IN</sub> = V <sub>IH</sub> , I <sub>OL</sub> = 100 µA	–	0.10	0.10	–	0.10	V
		1.80		–	0.00	0.10	–	0.10	
		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	–	0.80	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	–	0.16	0.40	–	0.40	
		3.00	I <sub>OL</sub> = 24 mA	–	0.24	0.55	–	0.55	
		4.50	I <sub>OL</sub> = 32 mA	–	0.25	0.55	–	0.55	
I <sub>IN</sub>	Input Leakage Current	1.65 to 5.5	0 ≤ V <sub>IN</sub> ≤ 5.5 V	–	–	±1	–	±1.0	µA
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	–	10	µA

# 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)	1.65	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 1 MΩ	–	5.3	9.2	–	11.0	ns
		1.80		–	4.4	7.6	–	8.4	
		2.50 ±0.20		–	3.0	5.1	–	5.6	
		3.30 ±0.30		–	2.2	3.4	–	3.8	
		5.00 ±0.50		–	1.8	2.8	–	3.1	
		3.30 ±0.30	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	–	2.9	4.5	–	5.0	
		5.00 ±0.50		–	2.3	3.6	–	4.0	
C <sub>IN</sub>	Input Capacitance	0.00		–	2.5	–	–	–	pF
C <sub>PD</sub>	Power Dissipation Capacitance (Note 5) (Figure 7)	3.30		–	9	–	–	–	pF
		5.00		–	11	–	–	–	

5. 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:

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

Figure 5. AC Test Circuit

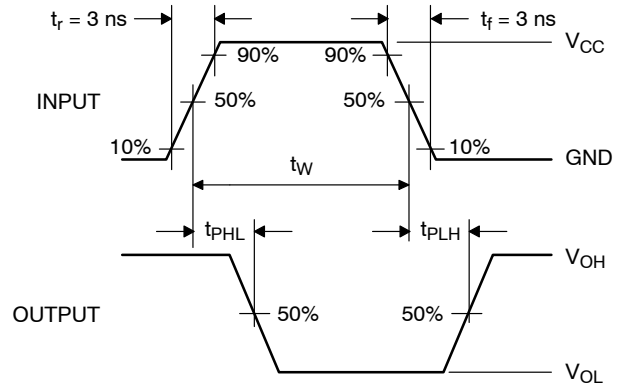
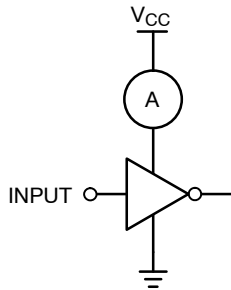


Figure 6. AC Waveforms



NOTE:

8. Input = AC Waveform; t<sub>r</sub> = t<sub>f</sub> = 1.8 ns.  
9. PRR = Variable; Duty Cycle = 50%.

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

## NC7WZ04

### DEVICE ORDERING INFORMATION

Device	Top Mark	Packages	Shipping <sup>†</sup>
NC7WZ04P6X	Z04	6-Lead SC70, EIAJ SC-88, 1.25 mm Wide	3000 / Tape & Reel
NC7WZ04L6X	A7	6-Lead MicroPak, 1.00 mm Wide	5000 / Tape & Reel
NC7WZ04FHX	A7	6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch	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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**SIP6 1.45X1.0**  
CASE 127EB  
ISSUE O


DATE 31 AUG 2016



**NOTES:**

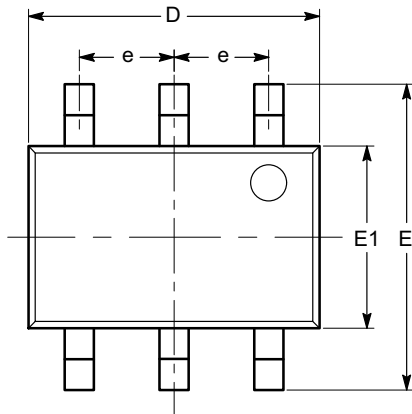
1. CONFORMS TO JEDEC STANDARD MO-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-2009
4. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

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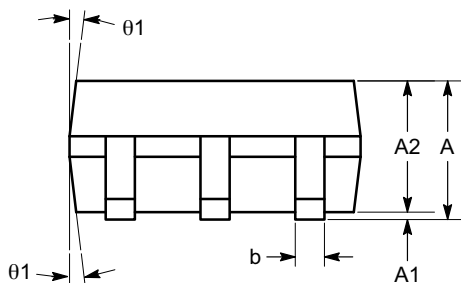
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**SC-88 (SC-70 6 Lead), 1.25x2**  
CASE 419AD-01  
ISSUE A

DATE 07 JUL 2010

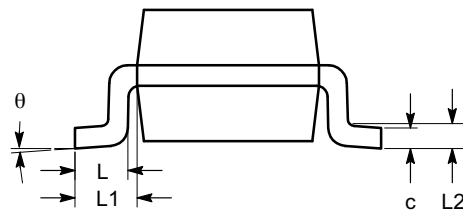


**TOP VIEW**



**SIDE 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°




**END VIEW**

**Notes:**

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

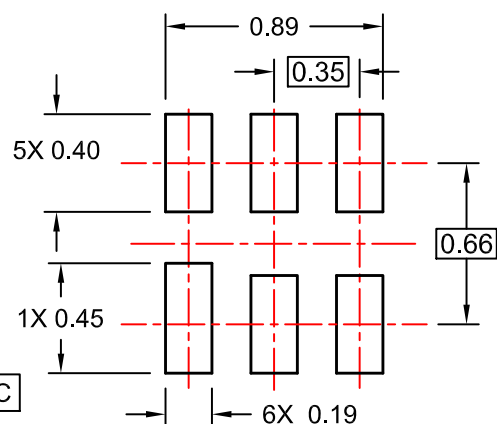
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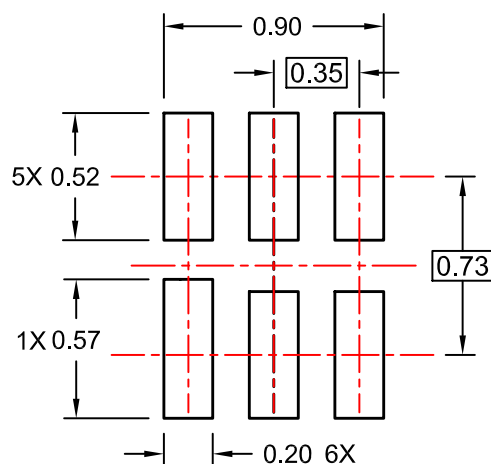


**ON**

## DATE 31 AUG 2016



SIDE VIEW



(0.08) 4X  
DETAIL A

1 2 3

6X  $0.14 \pm 0.05$

5X  $0.30 \pm 0.05$

6 5 4

0.35 0.60

(0.08) 4X

BOTTOM VIEW

Figure 1: Detail A of a pin. The drawing shows a cross-section of a pin with a rectangular body and a chamfered top edge. Dimension lines indicate a width of  $(0.05) 6X$  and a height of  $0.35 \pm 0.050$ . A chamfer is specified as  $0.075X45^\circ$ . A callout box contains the letters C, B, and A. The text "DETAIL A" and "PIN 1 LEAD SCALE: 2X" are also present.

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