TinyLogic ULP-A Dual Inverter with Schmitt-Trigger Input

NC7WV14

The NC7WV14 is a dual inverter with Schmitt−trigger input in tiny footprint packages. The device is designed to operate for V_{CC} = 0.9 V to 3.6 V.

MARKING DIAGRAMS

SIP6 1.45X1.0 MicroPak CASE 127EB

CCKK
XYZ

Pin 1

CC	= Specific Device Code
KK	= 2−Digit Lot Run Traceability Code
XY	= 2−Digit Date Code
Z	= Assembly Plant Code

Features

- Designed for 0.9 V to 3.6 V V_{CC} Operation
- 2.2 ns t_{PD} at 3.3 V (Typ)
- Inputs/Outputs Over−Voltage Tolerant up to 3.6 V
- I_{OFF} Supports Partial Power Down Protection
- Source/Sink 24 mA at 3.3 V
- Available in SC−88 and MicroPak™ Packages
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant
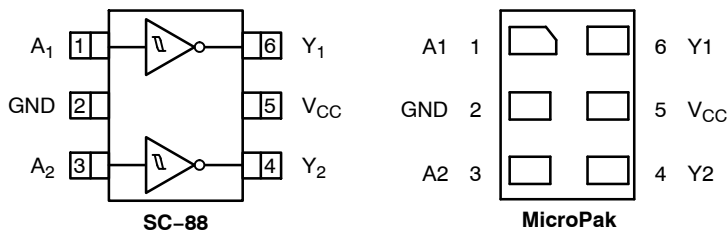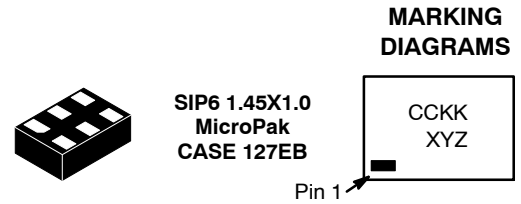

SC−88 DF SUFFIX CASE 419AD

XXXM■

XXX	= Specific Devic Code
M	= Date Code
■	= Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 7 of this data sheet.

Figure 1. Pinout Diagrams (Top Views)

Figure 2. Logic Symbol

PIN ASSIGNMENT

Pin	Function
1	A1
2	GND
3	A2
4	Y2
5	V_{CC}
6	Y1

FUNCTION TABLE

Input	Output
L	H
H	L

NC7WV14

MAXIMUM RATINGS

Symbol	Characteristics		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +4.3	V
V_{IN}	DC Input Voltage		−0.5 to +4.3	V
V_{OUT}	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	−0.5 to V_{CC} + 0.5 −0.5 to +4.3 −0.5 to +4.3	V
I_{IK}	DC Input Diode Current	V_{IN} < GND	−50	mA
I_{OK}	DC Output Diode Current	V_{OUT} < GND	−50	mA
I_{OUT}	DC Output Source/Sink Current		±50	mA
I_{CC} or I_{GND}	DC Supply Current per Supply Pin or Ground Pin		±50	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		+150	°C
θ_{JA}	Thermal Resistance (Note 2)	SC−88 MicroPak	377 154	°C/W
P_D	Power Dissipation in Still Air	SC−88 MicroPak	332 812	mW
MSL	Moisture Sensitivity		Level 1	−
F_R	Flammability Rating	Oxygen Index: 28 to 34	UL 94 V−0 @ 0.125 in	−
V_{ESD}	ESD Withstand Voltage (Note 3)	Human Body Mode Charged Device Mode	2000 1000	V
$I_{Latchup}$	Latchup Performance (Note 4)		±100	mA

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.
1. Applicable to devices with outputs that may be tri−stated.
2. Measured with minimum pad spacing on an FR4 board, using 10 mm−by−1 inch, 2 ounce copper trace no air flow per JESD51−7.
3. HBM tested to EIA / JESD22−A114−A. CDM tested to JESD22−C101−A. JEDEC recommends that ESD qualification to EIA/JESD22−A115A (Machine Model) be discontinued.
4. Tested to EIA/JESD78 Class II.

NC7WV14

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Positive DC Supply Voltage		0.9	3.6	V
V_{IN}	DC Input Voltage		0	3.6	V
V_{OUT}	DC Output Voltage	Active−Mode (High or Low State) Tri−State Mode (Note 1) Power−Down Mode (V_{CC} = 0 V)	0 0 0	V_{CC} 3.6 3.6	
T_A	Operating Temperature Range		−40	+85	°C
t_r , t_f	Input Transition Rise and Fall Time		0	No Limit	ns/V

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.

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			T_A = −40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
V_P	Positive Threshold Voltage		0.9	–	0.62	–	–	–	V
			1.1	–	–	1.0	–	1.0	
			1.4	–	–	1.25	–	1.25	
			1.65	–	–	1.5	–	1.5	
			2.3	–	–	1.8	–	1.8	
			2.7	–	–	2.2	–	2.2	
V_N	Negative Threshold Voltage		0.9	–	0.34	–	–	–	V
			1.1	0.15	–	–	0.15	–	
			1.4	0.2	–	–	0.2	–	
			1.65	0.25	–	–	0.25	–	
			2.3	0.4	–	–	0.4	–	
			2.7	0.6	–	–	0.6	–	
V_H	Hysteresis Voltage		0.9	–	0.29	–	–	–	V
			1.1	0.08	–	0.6	0.08	0.6	
			1.4	0.09	–	0.8	0.09	0.8	
			1.65	0.15	–	1.0	0.15	1.0	
			2.3	0.25	–	1.1	0.25	1.1	
			2.7	0.6	–	1.2	0.6	1.2	

DC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$ Min	Typ	Max	$T_A = -40°C$ to $+85°C$ Min	Max	Unit
V_{OH}	High–Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL}							V
		$I_{OH} = -100$ μA	0.9	–	$V_{CC} - 0.1$	–	–	–	
			1.1 to 1.3	$V_{CC} - 0.1$	–	–	$V_{CC} - 0.1$	–	
			1.4 to 1.6	$V_{CC} - 0.1$	–	–	$V_{CC} - 0.1$	–	
			1.65 to 1.95	$V_{CC} - 0.2$	–	–	$V_{CC} - 0.2$	–	
			2.3 to <2.7	$V_{CC} - 0.2$	–	–	$V_{CC} - 0.2$	–	
			2.7 to 3.6	$V_{CC} - 0.2$	–	–	$V_{CC} - 0.2$	–	
		$I_{OH} = -2$ mA	1.1 o 1.3	0.75 x V_{CC}	–	–	0.75 x V_{CC}	–	
		$I_{OH} = -4$ mA	1.4 to 1.6	0.75 x V_{CC}	–	–	0.75 x V_{CC}	–	
		$I_{OH} = -6$ mA	1.65 to 1.95	1.25	–	–	1.25	–	
			2.3 to <2.7	2.0	–	–	2.0	–	
		$I_{OH} = -12$ mA	2.3 to <2.7	1.8	–	–	1.8	–	
			2.7 to 3.6	2.2	–	–	2.2	–	
		$I_{OH} = -18$ mA	2.3 to <2.7	1.7	–	–	1.7	–	
			2.7 to 3.6	2.4	–	–	2.4	–	
		$I_{OH} = -24$ mA	2.7 to 3.6	2.2	–	–	2.2	–	
V_{OL}	Low–Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL}							V
		$I_{OL} = 100$ μA	0.9	–	0.1	–	–	–	
			1.1 to 1.3	–	–	0.1	–	0.1	
			1.4 to 1.6	–	–	0.1	–	0.1	
			1.65 to 1.95	–	–	0.2	–	0.2	
			2.3 to < 2.7	–	–	0.2	–	0.2	
			2.7 to 3.6	–	–	0.2	–	0.2	
		$I_{OL} = 2$ mA	1.1 o 1.3	–	–	0.25 x V_{CC}	–	0.25 x V_{CC}	
		$I_{OL} = 4$ mA	1.4 to 1.6	–	–	0.25 x V_{CC}	–	0.25 x V_{CC}	
		$I_{OL} = 6$ mA	1.65 to 1.95	–	–	0.3	–	0.3	
		$I_{OL} = 12$ mA	2.3 to <2.7	–	–	0.4	–	0.4	
			2.7 to 3.6	–	–	0.4	–	0.4	
		$I_{OL} = 18$ mA	2.3 to <2.7	–	–	0.6	–	0.6	
			2.7 to 3.6	–	–	0.4	–	0.4	
		$I_{OL} = 24$ mA	2.7 to 3.6	–	–	0.55	–	0.55	
I_{IN}	Input Leakage Current	$V_{IN} = 0$ V to 3.6 V	0.9 to 3.6	–	–	±0.1	–	±0.5	μA
I_{OFF}	Power Off Leakage Current	$V_{IN} = 0$ V to 3.6 V or $V_{OUT} = 0$ V to 3.6 V	0	–	–	0.5	–	0.5	μA
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND	0.9 to 3.6	–	–	0.9	–	0.9	μA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

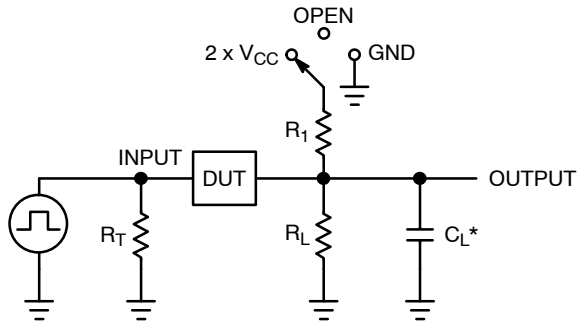# NC7WV14

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	$T_A = 25°C$			$T_A = -40°C$ to $+85°C$		Unit
				Min	Typ	Max	Min	Max	
t_{PLH}, t_{PHL}	Propagation Delay, A to Y (Figures 3 and 4)	$R_L = 1\ M\Omega$, $C_L = 15\ pF$	0.9	–	18.1	–	–	–	ns
		$R_L = 2\ k\Omega$, $C_L = 15\ pF$	1.1 to 1.3	–	6.0	12.2	–	15.6	
			1.4 to 1.6	–	3.8	6.3	–	7.0	
		$R_L = 500\ \Omega$, $C_L = 30\ pF$	1.65 to 1.95	–	3.2	5.2	–	6.2	
			2.3 to 2.7	–	2.6	3.7	–	4.4	
			2.7 to 3.6	–	2.2	3.3	–	3.8	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition	Typical ($T_A = 25°C$)	Unit
C_{IN}	Input Capacitance	$V_{CC} = 0\ V$	2.0	pF
C_{PD}	Power Dissipation Capacitance (Note 5)	f = 10 MHz, $V_{CC} = 0.9$ to 3.6 V, $V_{IN} = 0$ V or V_{CC}	14.0	pF

5. 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 $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption: $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.

Figure 3. Test Circuit

Test	Switch Position
t_{PLH} / t_{PHL}	Open
t_{PLZ} / t_{PZL}	2 x V_{CC}
t_{PHZ} / t_{PZH}	GND

C_L includes probe and jig capacitance
R_T is Z_{OUT} of pulse generator (typically 50 Ω)
f = 1 MHz
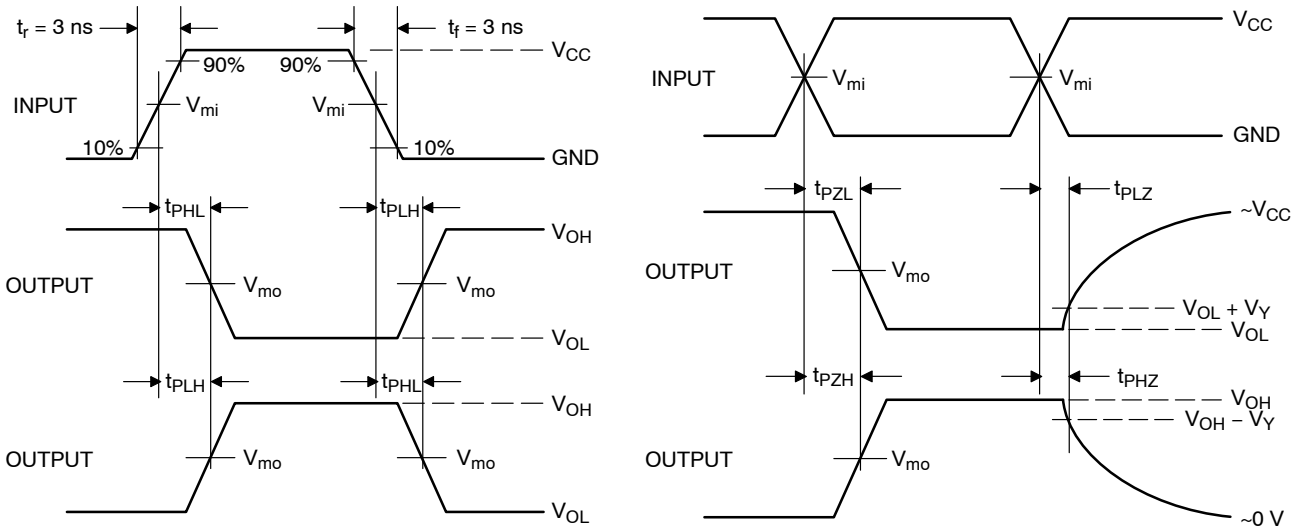
V_{CC}, V	V_{mi}, V	V_{mo}, V	V_Y, V
0.9	V_{CC} / 2	V_{CC} / 2	0.1
1.1 to 1.3	V_{CC} / 2	V_{CC} / 2	0.1
1.4 to 1.6	V_{CC} / 2	V_{CC} / 2	0.1
1.65 to 1.95	V_{CC} / 2	V_{CC} / 2	0.15
2.3 to 2.7	V_{CC} / 2	V_{CC} / 2	0.15
3.0 to 3.6	1.5	1.5	0.3

Figure 4. Switching Waveforms

NC7WV14

ORDERING INFORMATION

Device	Package	Marking	Pin 1 Orientation (See below)	Shipping†
NC7WV14P6X	SC−88	V14	Q4	3000 / Tape & Reel
NC7WV14L6X	MicroPak	BD	Q4	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.

Pin 1 Orientation in Tape and Reel

Direction of Feed
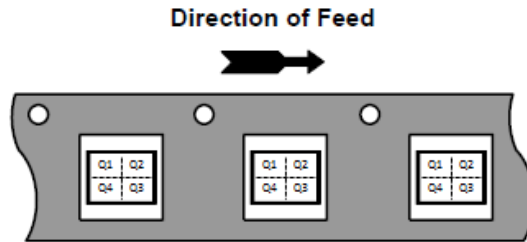
MicroPak is a trademark of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries.

SIP6 1.45X1.0
CASE 127EB
ISSUE O

DATE 31 AUG 2016

2X

| △ | 0.05 | C |

1.45

B

2X

| △ | 0.05 | C |

(0.254)

1.00

A

PIN 1 IDENTIFIER

⑤

TOP VIEW

(1)

(0.49)
5X

(0.75)

(0.52)
1X

(0.30)
6X

PIN 1

0.50±0.05

0.05
0.00

| △ | 0.05 | C |

C

RECOMMENED
LAND PATTERN

0.35±0.05

1.45±0.05

DETAIL A

1.0

0.20±0.05 6X

| ⊕ | 0.10 Ⓜ | C | B | A |
| | 0.05 Ⓜ | C | | |

0.30±0.05 5X

1.00±0.05

0.35±0.05 5X

0.40±0.05

(0.050)
6X

0.5

(0.125)
4X

0.075 X 45°
CHAMFER

DETAIL A
PIN 1 TERMINAL

BOTTOM VIEW

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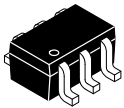
SC−88 (SC−70 6 Lead), 1.25x2
CASE 419AD
ISSUE A

DATE 07 JUL 2010

1
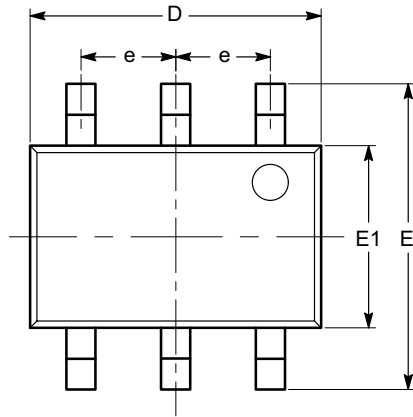
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A	0.80		1.10
A1	0.00		0.10
A2	0.80		1.00
b	0.15		0.30
c	0.10		0.18
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e		0.65 BSC	
L	0.26	0.36	0.46
L1		0.42 REF	
L2		0.15 BSC	
θ	0º		8º
θ1	4º		10º

TOP VIEW
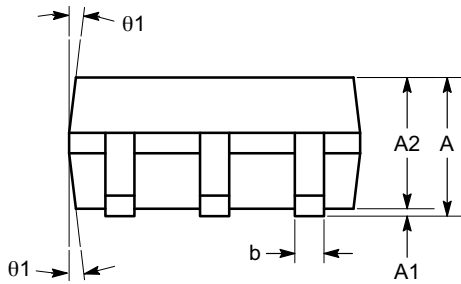
SIDE VIEW
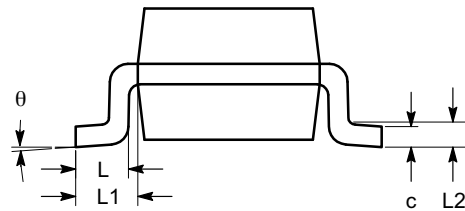
END VIEW

Notes:

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

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DESCRIPTION:	SC−88 (SC−70 6 LEAD), 1.25X2		PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

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