

NC7WZU04

TinyLogic UHS Dual Unbuffered Inverter

Description

The NC7WZU04 is a dual unbuffered inverter from ON Semiconductor's Ultra High Speed Series of TinyLogic in the space saving SC-88 6-lead package. The special purpose unbuffered circuit design is intended for crystal oscillator or analog applications. The internal circuit consists of only one-stage, the output, to allow for this part to be used in these oscillator or analog applications. 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 are high impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 5.5 V independent of V_{CC} operating voltage.

Features

- Space-Saving SC-88 6-Lead Package
- Ultra-Small MicroPak™ Leadless Packages
- Unbuffered for Crystal Oscillator and Analog Applications
- Balanced Output Drive: ± 8 mA at 4.5 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Low Quiescent Power: $I_{CC} < 1 \mu A$ at 5 V V_{CC} , $T_A = 25^\circ C$
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

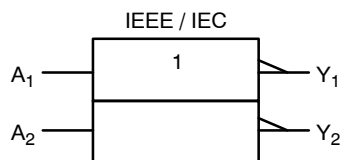


Figure 1. Logic Symbol



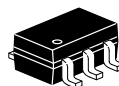
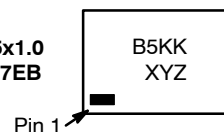
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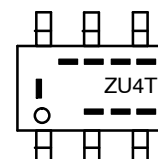
MARKING DIAGRAMS



SIP6 1.45x1.0
CASE 127EB



SC-88
CASE 419AD-01



B5, ZU4 = Specific Device Code
KK = 2-Digit Lot Run Traceability Code
XY = 2-Digit Date Code Format
Z = Assembly Plant Code
T = Die Run Code
---- = Year Coding Scheme
|- - = Plant Code Identifier
- - - = 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

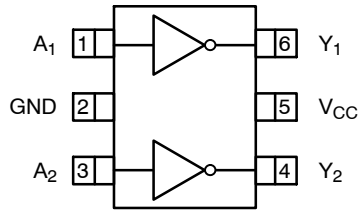


Figure 2. SC-88 (Top View)

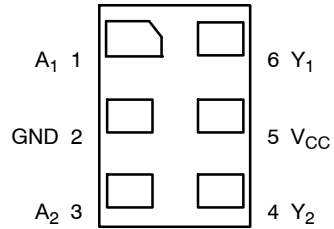
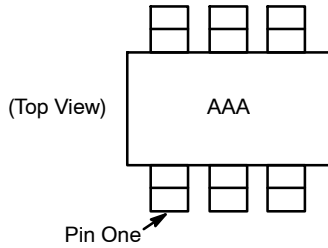


Figure 3. MicroPak (Top Through View)



AAA represents Product Code Top Mark – see ordering code
 NOTE: Orientation of Top Mark determines Pin One location.
 Reading the top product code mark left to right, Pin One is the lower left pin (see diagram).

Figure 4. SC-88 Pin 1 Orientation

PIN DEFINITIONS

| Pin Name | Description |
|---------------------------------|-------------|
| A ₁ , A ₂ | Data Inputs |
| Y ₁ , Y ₂ | Outputs |

FUNCTION TABLE (Y = \bar{A})

| Input | Output |
|-------|--------|
| A | Y |
| L | H |
| H | L |

H = HIGH Logic Level
 L = LOW Logic Level

NC7WZU04

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 |
| | | V _{OUT} > 0.5 V, V _{CC} = GND | - | +50 | mA |
| I _{OUT} | DC Output Current | | - | ±50 | mA |
| I _{CC} or I _{GND} | DC V _{CC} / GND Current | | - | ±100 | mA |
| T _{STG} | Storage Temperature | | -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 in Still Air | SC-88-6 | - | 190 | mW |
| | | MicroPak-6 | - | 327 | |

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 | | 1.8 | 5.5 | 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 | | -40 | +85 | °C |
| θ _{JA} | Thermal Resistance | SC-88-6 | - | 659 | °C/W |
| | | MicroPak-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.

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

NC7WZU04

DC ELECTRICAL CHARACTERISTICS

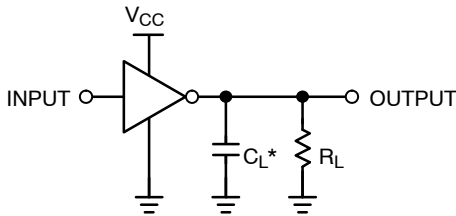
| Symbol | Parameter | V _{CC} (V) | Conditions | | T _A = +25°C | | | T _A = -40 to +85°C | | Unit | |
|---------------------|---|---------------------|--|---------------------------|-------------------------|------|----------------------|-------------------------------|----------------------|------|------|
| | | | | | Min | Typ | Max | Min | Max | | |
| V _{IH} | HIGH Level Input Voltage | 1.8 to 2.7 | | | 0.85 V _{CC} | - | - | 0.85 V _{CC} | - | V | |
| | | 3.0 to 5.5 | | | 0.8 V _{CC} | - | - | 0.8 V _{CC} | - | | |
| V _{IL} | LOW Level Input Voltage | 1.8 to 2.7 | | | - | - | 0.15 V _{CC} | - | 0.15 V _{CC} | V | |
| | | 3.0 to 5.5 | | | - | - | 0.2 V _{CC} | - | 0.2 V _{CC} | | |
| V _{OH} | HIGH Level Output Voltage | 1.65 | V _{IN} = V _{IL} | I _{OH} = -100 μA | 1.55 | 1.65 | - | 1.55 | - | V | |
| | | 1.8 | | | 1.6 | 1.79 | - | 1.6 | - | | |
| | | 2.3 | | | 2.1 | 2.29 | - | 2.1 | - | | |
| | | 3.0 | | | 2.7 | 2.99 | - | 2.7 | - | | |
| | | 4.5 | | | 4.0 | 4.48 | - | 4.0 | - | | |
| | | 1.65 | V _{IN} = GND | I _{OH} = -2 mA | 1.29 | 1.52 | - | 1.29 | - | V | |
| | | 2.3 | | | 1.9 | 2.19 | - | 1.9 | - | | |
| | | 3.0 | | | 2.4 | 2.82 | - | 2.4 | - | | |
| | | 3.0 | | | I _{OH} = -4 mA | 2.3 | 2.73 | - | 2.3 | | - |
| | | 4.5 | | | I _{OH} = -8 mA | 3.8 | 4.24 | - | 3.8 | | - |
| VOL | LOW Level Output Voltage | 1.65 | V _{IN} = V _{IH} | I _{OL} = 100 μA | - | 0.01 | 0.2 | - | 0.2 | V | |
| | | 1.8 | | | - | 0.01 | 0.2 | - | 0.2 | | |
| | | 2.3 | | | - | 0.01 | 0.2 | - | 0.2 | | |
| | | 3.0 | | | - | 0.01 | 0.3 | - | 0.3 | | |
| | | 4.5 | | | - | 0.01 | 0.5 | - | 0.5 | | |
| | | 1.65 | V _{IN} = V _{CC} | I _{OL} = 2 mA | - | 0.10 | 0.24 | - | 0.24 | V | |
| | | 2.3 | | | I _{OL} = 2 mA | - | 0.12 | 0.3 | - | | 0.3 |
| | | 3.0 | | | I _{OL} = 4 mA | - | 0.19 | 0.4 | - | | 0.4 |
| | | 3.0 | | | I _{OL} = 6 mA | - | 0.29 | 0.55 | - | | 0.55 |
| | | 4.5 | | | I _{OL} = 8 mA | - | 0.29 | 0.55 | - | | 0.55 |
| I _{IN} | Input Leakage Current | 1.65 to 5.5 | V _{IN} = 5.5 V, GND | | - | - | ±0.1 | - | ±1.0 | μA | |
| I _{CC} | Quiescent Supply Current | 1.65 to 5.5 | V _{IN} = 5.5 V, GND | | - | - | 1.0 | - | 10 | μA | |
| I _{CCPEAK} | Peak Supply Current in Analog Operation | 1.8 | V _{OUT} = Open V _{IN} = Adjust for Peak I _{CC} Current | | - | 0.2 | - | - | - | mA | |
| | | 2.5 | | | - | 2 | - | - | - | | |
| | | 3.3 | | | - | 5 | - | - | - | | |
| | | 5.0 | | | - | 15 | - | - | - | | |

AC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | V _{CC} (V) | Conditions | T _A = +25°C | | | T _A = -40 to +85°C | | Unit |
|-------------------------------------|---|---------------------|--|---|-----|-----|-------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PLH} , t _{PHL} | Propagation Delay (Figure 5, 6) | 1.65 | C _L = 15 pF, R _L = 1 MΩ | - | 5.5 | 9.8 | - | 11.0 | ns |
| | | 1.8 | | - | 4.6 | 8.1 | - | 8.9 | |
| | | 2.5 ± 0.2 | | - | 3.3 | 5.7 | - | 6.3 | |
| | | 3.3 ± 0.3 | | - | 2.7 | 4.1 | - | 4.5 | |
| | | 5.0 ± 0.5 | | - | 2.2 | 3.3 | - | 3.6 | |
| | | 3.3 ± 0.3 | | C _L = 50 pF, R _L = 500 Ω | - | 4.0 | 6.4 | - | |
| | | 5.0 ± 0.5 | - | | 3.4 | 5.6 | - | 6.2 | |
| C _{IN} | Input Capacitance | 0 | | - | 3 | - | - | - | pF |
| C _{PD} | Power Dissipation Capacitance (Figure 7) | 3.3 | (Note 2) | - | 3.5 | - | - | - | pF |
| | | 5.0 | | - | 5.5 | - | - | - | |

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

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

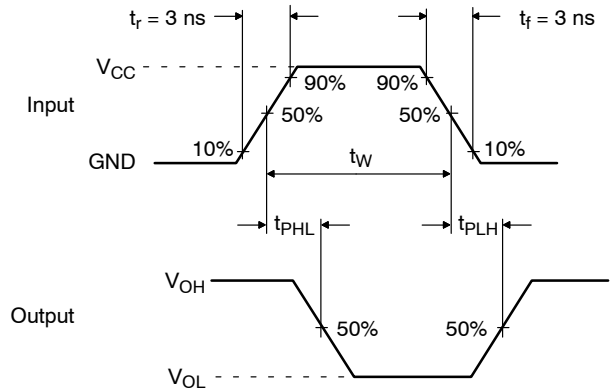
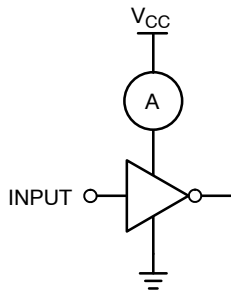


Figure 6. AC Waveforms



Application Note: When operating the NC7WZU04's unbuffered output stage in its linear range, as in oscillator applications, care must be taken to observe maximum power rating for the device and package. The high drive nature of the design of the output stage will result in substantial simultaneous conduction currents when the stage is in the linear region. See the I_{CCPEAK} specification on page 4.

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

Figure 7. I_{CCD} Test Circuit

NC7WZU04

DEVICE ORDERING INFORMATION

| Device | Top Mark | Packages | Shipping [†] |
|-------------|----------|----------|-----------------------|
| NC7WZU04P6X | ZU4 | SC-88 | 3000 / Tape & Reel |
| NC7WZU04L6X | B5 | MicroPak | 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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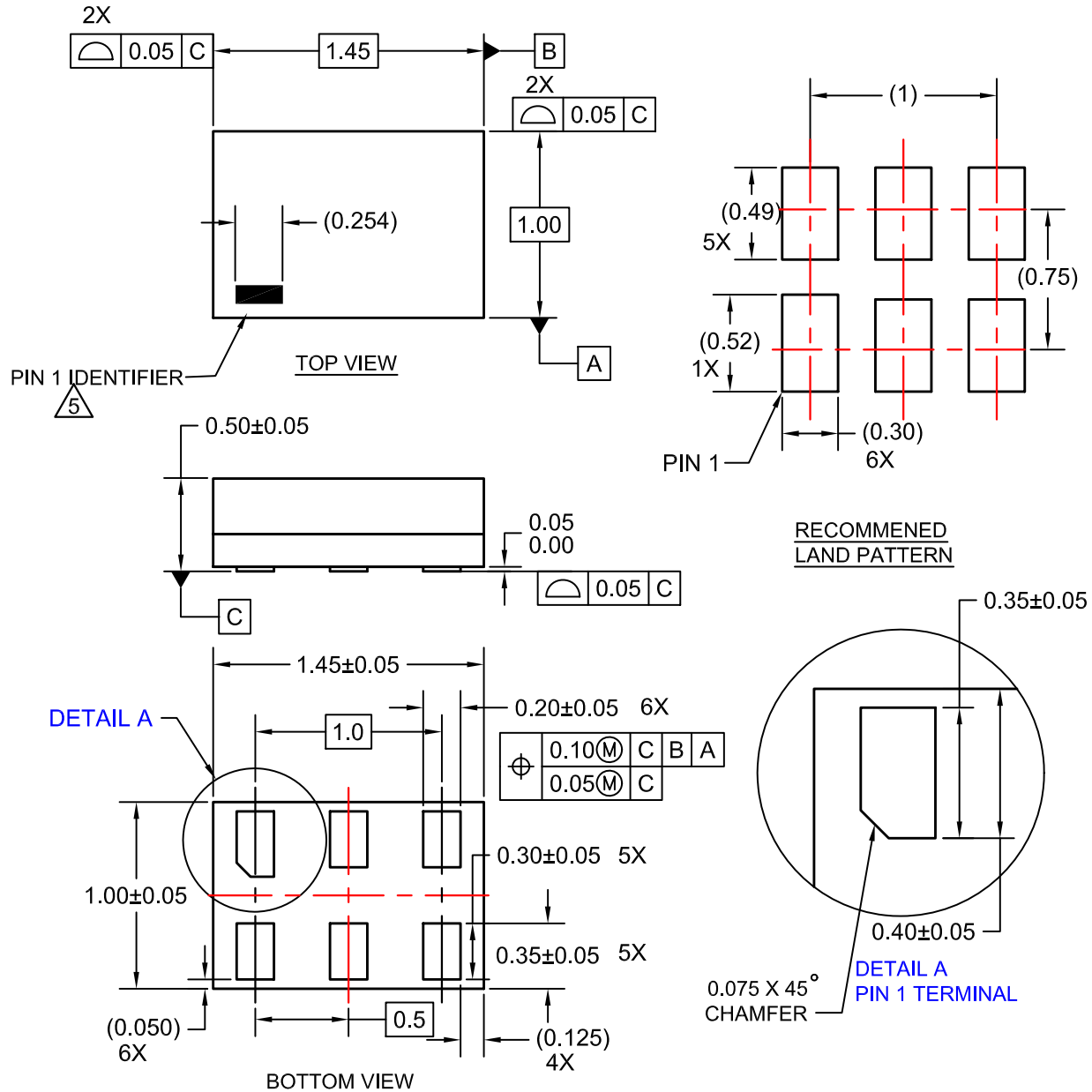
PACKAGE DIMENSIONS

ON Semiconductor®



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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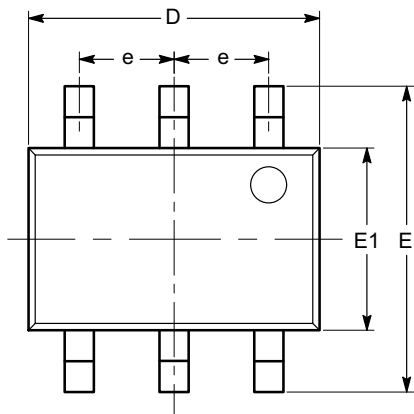
PACKAGE DIMENSIONS

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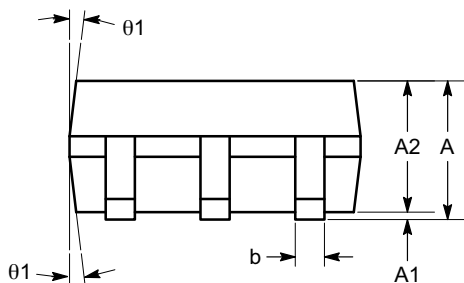
SC-88 (SC-70 6 Lead), 1.25x2
CASE 419AD-01
ISSUE A

DATE 07 JUL 2010

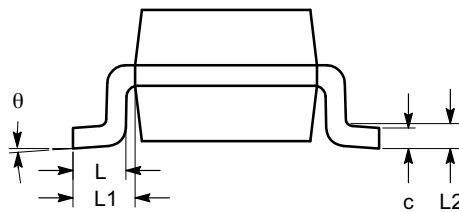


TOP VIEW

| 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° |
| θ_1 | 4° | | 10° |



SIDE VIEW



END VIEW

Notes:

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

| | | |
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