FAIRCHILD
SEMICONDUCTOR®

February 2011

# NC7SZ34
# TinyLogic® UHS Buffer

## Features

- Ultra-High Speed: $t_{PD}$ 2.4ns (Typical) into 50pF at 5V $V_{CC}$
- High Output Drive: ±24mA at 3V $V_{CC}$
- Broad $V_{CC}$ Operating Range: 1.65V to 5.5V
- Matches Performance of LCX Operated at 3.3V $V_{CC}$
- Power-Down High-Impedance Inputs / Outputs
- Proprietary Noise / EMI Reduction Circuitry
- WLCSP Package

## Description

The NC7SZ34 is a single buffer from Fairchild'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 of 1.65V to 5.5V $V_{CC}$. The inputs and output are high-impedance when $V_{CC}$ is 0V. Inputs tolerate voltages up to 7V, independent of $V_{CC}$ operating voltage.

## Related Resources

- *AN-5055 — Portability and Ultra Low Power TinyLogic®*
- *MS-503 — Family Characteristics TinyLogic® HS/HST and UHS Series*

## Ordering Information

| Part Number | Top Mark | Package | Packing Method |
|---|---|---|---|
| NC7SZ34UCX | KJ | 4-Lead, Wafer-Level Chip Scale 0.76x0.76x0.5mm Wafer-Level Chip-Scale Package (WLCSP) | 3000 Units on Tape & Reel |

## Pin Configurations

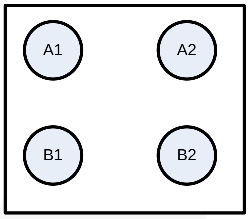


**Figure 1. WLCSP (Top View)**

## Pin Definitions

| WLCSP | Name | Description |
|---|---|---|
| A1 | A | Input |
| A2 | VCC | Power Supply |
| B1 | GND | Ground |
| B2 | Y | Output |

## Function Table

Y= A

| Inputs | Output |
|---|---|
| **A** | **Y** |
| LOW Logic Level | LOW Logic Level |
| HIGH Logic Level | HIGH Logic Level |

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

| Symbol | Parameter | | Min. | Max. | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | | -0.5 | 7.0 | V |
| $V_{IN}$ | DC Input Voltage | | -0.5 | 7.0 | V |
| $V_{OUT}$ | DC Output Voltage | | -0.5 | 7.0 | V |
| $I_{IK}$ | DC Input Diode Current | $V_{IN}$ < -0.5V | | -50 | mA |
| $I_{OK}$ | DC Output Diode Current | $V_{OUT}$ < -0.5V | | -50 | mA |
| $I_{OUT}$ | DC Output Current | | | ±50 | 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 at +85°C | | | 200 | mW |
| ESD | Human Body Model, JEDEC:JESD22-A114 | | | 4000 | V |
| | Charge Device Model, JEDEC:JESD22-C101 | | | 2000 | |

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

| 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 | | -40 | +85 | °C |
| $t_r$, $t_f$ | Input Rise and Fall Times | $V_{CC}$ at 1.8V, 2.5V ±0.2V | 0 | 20 | ns/V |
| | | $V_{CC}$ at 3.3V ±0.3V | 0 | 10 | |
| | | $V_{CC}$ at 5.0V ±0.5V | 0 | 5 | |
| $\theta_{JA}$ | Thermal Resistance | | | 80 | °C/W |

**Note:**

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

## DC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ | Conditions | $T_A$=25°C |  |  | $T_A$=-40 to 85°C |  | Unit |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Min. | Typ. | Max. | Min. | Max. |  |
| $V_{IH}$ | HIGH Level Input Voltage | 1.65 to 1.95 |  | $0.65V_{CC}$ |  |  | $0.65V_{CC}$ |  | V |
|  |  | 2.30 to 5.50 |  | $0.70V_{CC}$ |  |  | $0.70V_{CC}$ |  |  |
| $V_{IL}$ | LOW Level Input Voltage | 1.65 to 1.95 |  |  |  | $0.35V_{CC}$ |  | $0.35V_{CC}$ | V |
|  |  | 2.30 to 5.50 |  |  |  | $0.30V_{CC}$ |  | $0.30V_{CC}$ |  |
| $V_{OH}$ | HIGH Level Output Voltage | 1.65 | $V_{IN}=V_{IH}$, $I_{OH}=$ -100µA | 1.55 | 1.65 |  |  |  | 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 | $I_{OH}$=-4mA | 1.29 | 1.52 |  | 1.29 |  |  |
|  |  | 2.30 | $I_{OH}$=-8mA | 1.90 | 2.15 |  | 1.90 |  |  |
|  |  | 3.00 | $I_{OH}$=-16mA | 2.40 | 2.80 |  | 2.40 |  |  |
|  |  | 3.00 | $I_{OH}$=-24mA | 2.30 | 2.68 |  | 2.30 |  |  |
|  |  | 4.50 | $I_{OH}$=-32mA | 3.80 | 4.20 |  | 3.80 |  |  |
| $V_{OL}$ | LOW Level Output Voltage | 1.65 | $V_{IN}=V_{IL}$, $I_{OL}$=100µA |  | 0.00 | 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 | $I_{OL}$=4mA |  | 0.08 | 0.24 |  | 0.24 |  |
|  |  | 2.30 | $I_{OL}$=8mA |  | 0.10 | 0.30 |  | 0.30 |  |
|  |  | 3.00 | $I_{OL}$=16mA |  | 0.15 | 0.40 |  | 0.40 |  |
|  |  | 3.00 | $I_{OL}$=24mA |  | 0.22 | 0.55 |  | 0.55 |  |
|  |  | 4.50 | $I_{OL}$=32mA |  | 0.22 | 0.55 |  | 0.55 |  |
| $I_{IN}$ | Input Leakage Current | 0 to 5.5 | $0 \leq V_{IN} \leq 5.5V$ |  |  | ±1 |  | ±10 | µA |
| $I_{OFF}$ | Power Off Leakage Current | 0 | $V_{IN}$ or $V_{OUT}$=5.5V |  |  | 1 |  | 10 | µA |
| $I_{CC}$ | Quiescent Supply Current | 1.65 to 5.50 | $V_{IN}$=5.5V, GND |  |  | 1.0 |  | 10 | µA |

## AC Electrical Characteristics

| Symbol | Parameter | $V_{CC}$ | Conditions | $T_A$=25°C |  |  | $T_A$=-40 to 85°C |  | Units | Figure |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  | Min. | Typ. | Max. | Min. | Max. |  |  |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay | 1.65 | $C_L$=15pF, $R_L$=1MΩ | 2.0 | 5.3 | 11.4 | 2.0 | 12.0 | ns | Figure 2<br>Figure 3 |
|  |  | 1.80 |  | 2.0 | 4.4 | 9.5 | 2.0 | 10.0 |  |  |
|  |  | 2.5 ±0.2 |  | 0.8 | 2.9 | 6.5 | 0.8 | 7.0 |  |  |
|  |  | 3.3 ±0.3 |  | 0.5 | 2.1 | 4.5 | 0.5 | 4.7 |  |  |
|  |  | 5.0 ±0.5 |  | 0.5 | 1.8 | 3.9 | 0.5 | 4.1 |  |  |
|  |  | 3.3 ±0.3 | $C_L$=50pF, $R_L$=500Ω | 1.5 | 2.9 | 5.0 | 1.5 | 5.2 |  |  |
|  |  | 5.0 ±0.5 |  | 0.8 | 2.4 | 4.3 | 0.8 | 4.5 |  |  |
| $C_{IN}$ | Input Capacitance | 0.00 |  |  | 2.0 |  |  |  | pF |  |
| $C_{PD}$ | Power Dissipation Capacitance[2] | 3.30 |  |  | 12.9 |  |  |  | pF | Figure 4 |
|  |  | 5.00 |  |  | 15.6 |  |  |  |  |  |

**Note:**

2. $C_{PD}$ is defined as the value of the internal equivalent capacitance derived from dynamic operating current consumption ($I_{CCD}$) at no output lading and operating at 50% duty cycle. $C_{PD}$ is related to $I_{CCD}$ dynamic operating current by the expression: $I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}\text{static})$.

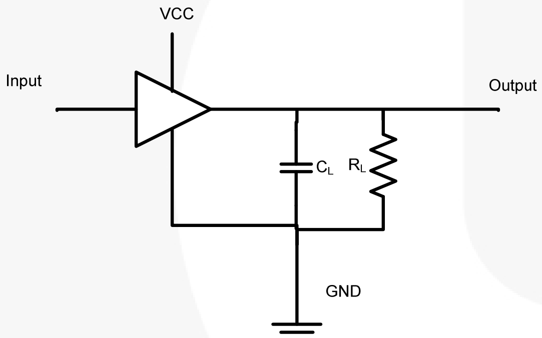


Figure 2. AC Test Circuit

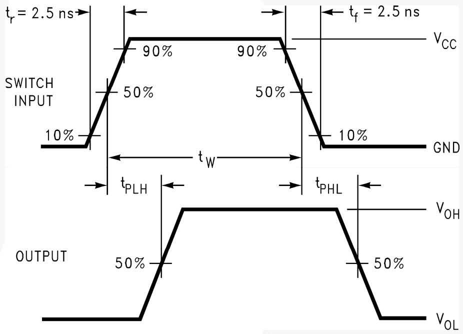


Figure 3. AC Waveforms

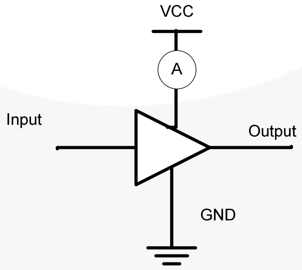
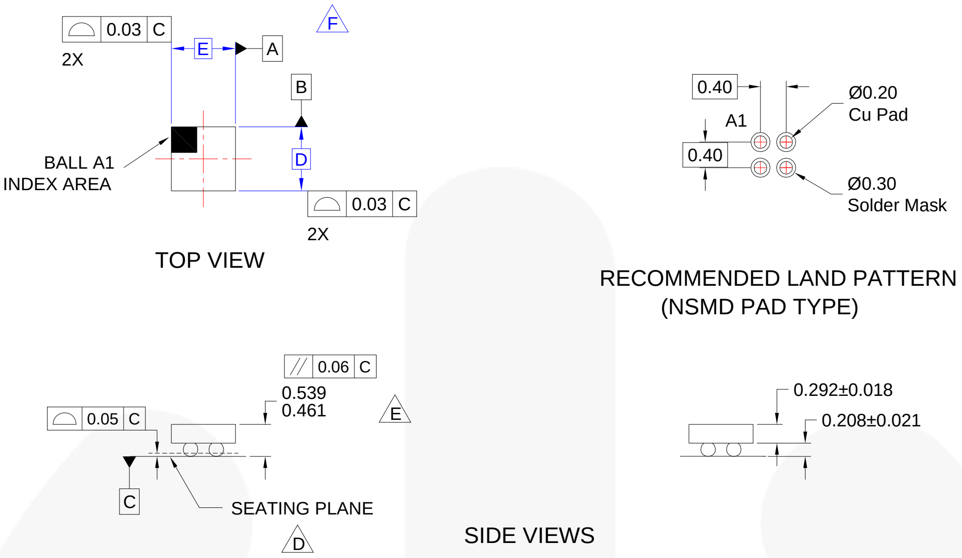


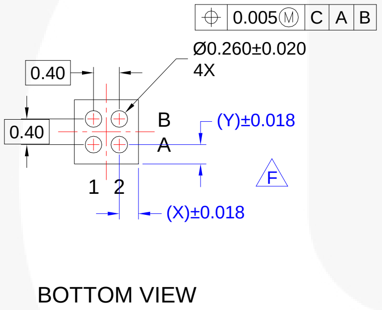
Figure 4. $I_{CCD}$ Test Circuit

**Note:**

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

## Physical Dimensions





NOTES:

A. NO JEDEC REGISTRATION APPLIES.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCE PER ASME Y14.5M, 1994.

D. DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.

E. PACKAGE NOMINAL HEIGHT IS 500 MICRONS ±39 MICRONS (461-539 MICRONS).

F. FOR DIMENSIONS D, E, X, AND Y SEE PRODUCT DATASHEET.

G. DRAWING FILNAME: MKT-UC004AFrev1.

**Figure 5. 4-Lead, Wafer-Level Chip Scale 0.76x0.76x0.5mm Wafer-Level Chip-Scale Package (WLCSP)**

| Product | D | E | X | Y |
|---|---|---|---|---|
| NC7SZ34UCX | 0.76 +/-0.030 | 0.76 +/-0.030 | 0.18 | 0.18 |

*Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.*

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## Tape and Reel Specifications

*Please visit Fairchild Semiconductor's online packaging area for the most recent tape and reel specifications: http://www.fairchildsemi.com/packaging/SOT23-5L_tr.pdf.*

| Package Designator | Tape Section | Cavity Number | Cavity Status | Cover Type Status |
|---|---|---|---|---|
| UCX | Leader (Start End) | 125 (Typical) | Empty | Sealed |
| | Carrier | 3000 | Filled | Sealed |
| | Trailer (Hub End) | 75 (Typical) | Empty | Sealed |

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