

Four Output PCI-X and General Purpose Buffer

Features

- One input to four output buffer/driver
- General-purpose or PCI-X clock buffer
- Buffers all frequencies from DC to 140 MHz
- Output-to-output skew less than 100 ps
- Space-saving 8-pin TSSOP package
- 3.3 V operation
- 60 ps typical output-output skew

Functional Description

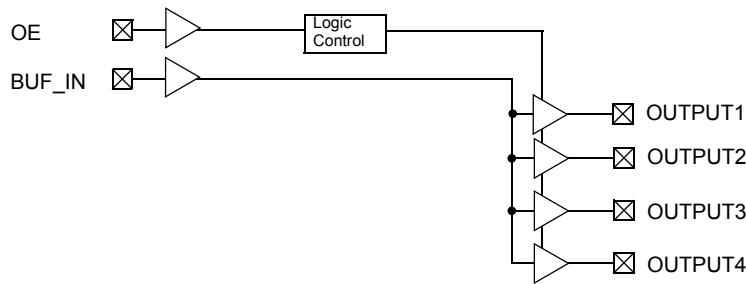
The CY2304NZ is a low-cost buffer designed to distribute high-speed clocks for PCI-X and other applications. The device operates at 3.3 V and outputs can run up to 140 MHz.

For a complete list of related documentation, click [here](#).

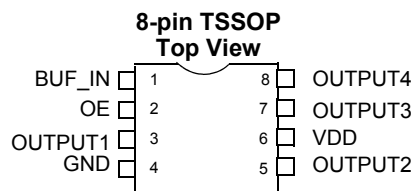
Function Table

| Inputs | | Outputs |
|--------|----|--------------|
| BUF_IN | OE | Output [1:4] |
| L | L | L |
| H | L | L |
| L | H | L |
| H | H | H |

Block Diagram



Pin Configuration



Pin Description

For CY2304NZ

| Signal | Pin | Description |
|-----------------|------------|---|
| V _{DD} | 6 | 3.3 V voltage supply |
| GND | 4 | Ground |
| BUF_IN | 1 | Input clock |
| OUTPUT [1:4] | 3, 5, 7, 8 | Outputs |
| OE | 2 | Input pin for output enable, active HIGH. |

Maximum Ratings

Supply Voltage to Ground Potential -0.5 V to $V_{DD} + 0.5$ V
 DC Input Voltage -0.5 V to $V_{DD} + 0.5$ V

Storage Temperature -65 °C to +150 °C
 Max. Soldering Temperature (10 sec.) 260 °C
 Junction Temperature 150 °C

Operating Conditions

| Parameter | Description | Min | Max | Unit |
|----------------------|--|------|-----|------|
| V_{DD} | Supply Voltage | 3.0 | 3.6 | V |
| T_A | Operating Temperature (Ambient Temperature) | -40 | 85 | °C |
| C_L | Load Capacitance | - | 25 | pF |
| C_{IN} | Input Capacitance | - | 7 | pF |
| BUF_IN, OUTPUT [1:4] | Operating Frequency | DC | 140 | MHz |
| $t_{PU}^{[1]}$ | Power-up time for all VDD's to reach minimum specified voltage (power ramps must be monotonic) | 0.05 | 50 | ms |

Electrical Characteristics

| Parameter | Description | Test Conditions | Min | Max | Unit |
|-----------|------------------------------------|-------------------------------|-----|------|------|
| V_{IL} | Input LOW Voltage ^[2] | | - | 0.8 | V |
| V_{IH} | Input HIGH Voltage ^[2] | | 2.0 | - | V |
| I_{IL} | Input LOW Current | $V_{IN} = 0$ V | -5 | 5 | μA |
| I_{IH} | Input HIGH Current | $V_{IN} = V_{DD}$ | -5 | 5 | μA |
| V_{OL} | Output LOW Voltage ^[3] | $I_{OL} = 24$ mA | - | 0.8 | V |
| | | $I_{OL} = 12$ mA | - | 0.55 | V |
| V_{OH} | Output HIGH Voltage ^[3] | $I_{OH} = -24$ mA | 2.0 | - | V |
| | | $I_{OH} = -12$ mA | 2.4 | - | V |
| I_{DD} | Supply Current | Unloaded outputs at 66.66 MHz | - | 25 | mA |

Switching Characteristics

For Commercial and Industrial Temperature Devices

| Parameter ^[4] | Name | Description | Min | Typ | Max | Unit |
|--------------------------|--|----------------------------------|------|------|------|------|
| | Duty Cycle ^[3] = $t_2 \div t_1$ | Measured at 1.5 V | 40.0 | 50.0 | 60.0 | % |
| t_3 | Rise Time ^[3] | Measured between 0.8 V and 2.0 V | - | - | 1.50 | ns |
| t_4 | Fall Time ^[3] | Measured between 0.8 V and 2.0 V | - | - | 1.50 | ns |
| t_5 | Output to Output Skew ^[3] | All outputs equally loaded | - | 60 | 100 | ps |
| t_6 | Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge ^[3] | Measured at $V_{DD}/2$ | 2.5 | 3.5 | 5 | ns |

Notes

1. This operating condition guarantees skew and propagation delay.
2. BUF_IN input has a threshold voltage of $V_{DD}/2$.
3. Parameter is guaranteed by design and characterization. It is not 100% tested in production.
4. All parameters specified with loaded outputs.

Switching Waveforms

Figure 1. Duty Cycle Timing

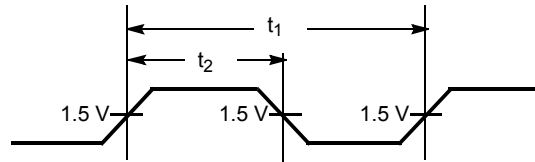


Figure 2. All Outputs Rise/Fall Time

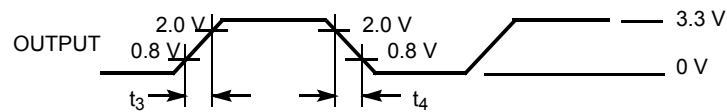


Figure 3. Output-Output Skew

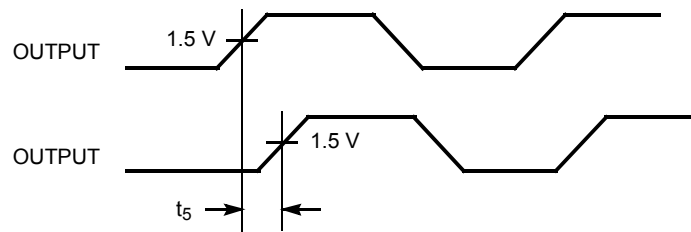
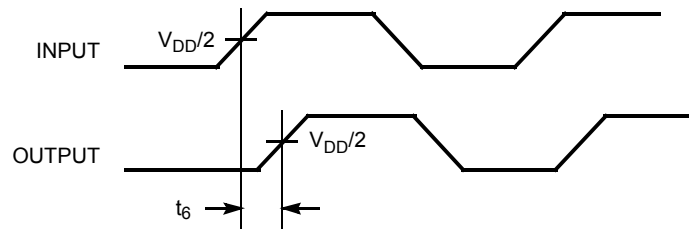


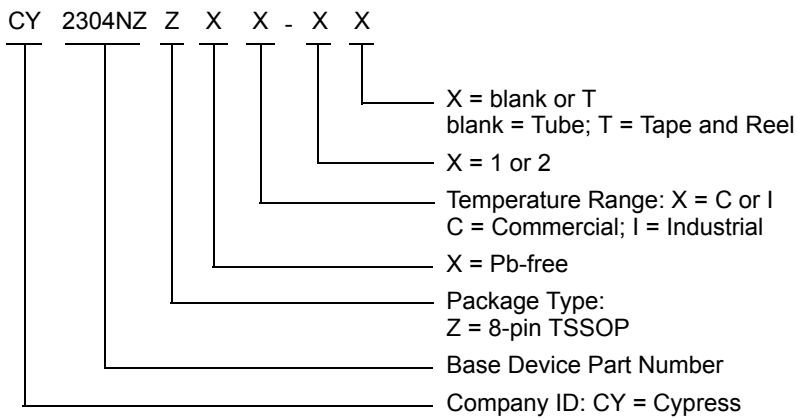
Figure 4. Input-Output Propagation Delay



Ordering Information

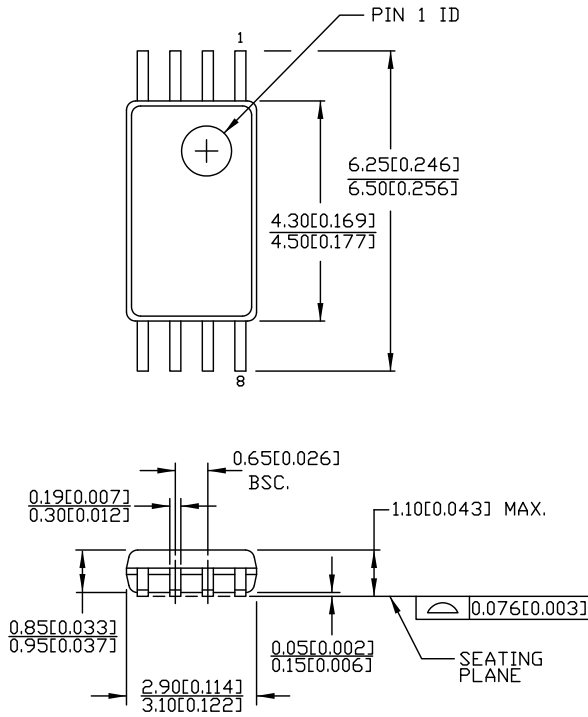
| Ordering Code | Package Type | Operating Range |
|-----------------|-----------------------------|-----------------------------|
| Standard | | |
| CY2304NZZI-1 | 8-pin TSSOP | Industrial, -40 °C to 85 °C |
| CY2304NZZI-1T | 8-pin TSSOP – Tape and Reel | Industrial, -40 °C to 85 °C |
| Pb-free | | |
| CY2304NZZXC-1 | 8-pin TSSOP | Commercial, 0 °C to 70 °C |
| CY2304NZZXC-1T | 8-pin TSSOP – Tape and Reel | Commercial, 0 °C to 70 °C |
| CY2304NZZXI-1 | 8-pin TSSOP | Industrial, -40 °C to 85 °C |
| CY2304NZZXI-1T | 8-pin TSSOP – Tape and Reel | Industrial, -40 °C to 85 °C |

Ordering Code Definitions



Package Diagram

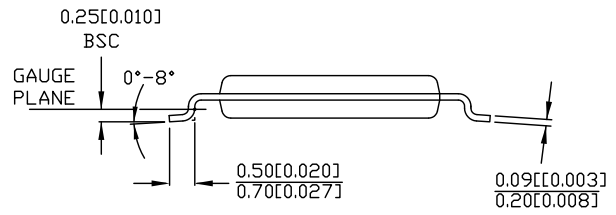
Figure 5. 8-pin TSSOP (4.40 mm Body) Z08.173/ZZ08.173 Package Outline, 51-85093



DIMENSIONS IN MM [INCHES] MIN. MAX.

REFERENCE JEDEC MO-153

| PART # | |
|----------|----------------|
| Z08.173 | STANDARD PKG. |
| ZZ08.173 | LEAD FREE PKG. |



51-85093 *E

Acronyms

| Acronym | Description |
|---------|-----------------------------------|
| PCI | Peripheral Component Interconnect |
| TSSOP | Thin-Shrink Small Outline Package |

Document Conventions

Units of Measure

| Symbol | Unit of Measure |
|--------|-----------------|
| °C | degree Celsius |
| Hz | hertz |
| MHz | megahertz |
| μA | microampere |
| mA | milliampere |
| ms | millisecond |
| mV | millivolt |
| ns | nanosecond |
| Ω | ohm |
| % | percent |
| pF | picofarad |
| ps | picosecond |
| V | volt |
| W | watt |

Document History Page

| Document Title: CY2304NZ, Four Output PCI-X and General Purpose Buffer | | | | |
|--|---------|------------|-----------------|---|
| Document Number: 38-07099 | | | | |
| Rev. | ECN No. | Issue Date | Orig. of Change | Description of Change |
| ** | 111420 | 02/12/02 | IKA | New data sheet. |
| *A | 118610 | 09/25/02 | HWT | Updated Ordering Information : Added Industrial Temperature Range in the Ordering Information. |
| *B | 121820 | 12/14/02 | RBI | Updated Operating Conditions : Added t _{PJ} parameter and its details. |
| *C | 291098 | See ECN | RGL | Updated Switching Characteristics : Specified typical value for "Output to Output Skew" parameter. Updated Ordering Information : Added Lead-free Devices. |
| *D | 2904623 | 04/05/10 | CXQ | Updated Ordering Information (Removed inactive parts). Updated Package Diagram . |
| *E | 3163624 | 02/05/2011 | CXQ | Updated Maximum Ratings (Removed reference to "Except REF" and "REF" for DC Input Voltage spec). Added Ordering Code Definitions . Updated Package Diagram . Added Acronyms and Units of Measure . Updated in new template. |
| *F | 3931498 | 04/08/2013 | PURU | Updated Maximum Ratings : Removed "Static Discharge Voltage" and its related information. Updated Package Diagram : spec 51-85093 – Changed revision from *C to *D. |
| *G | 4103402 | 08/23/2013 | MNSB | Updated Operating Conditions : Added Note 1 and referred the same note in t _{PJ} parameter. Updated in new template. |
| *H | 4312848 | 03/18/2014 | CINM | No technical updates. Completing Sunset Review. |
| *I | 4578443 | 11/25/2014 | AJU | Added related documentation hyperlink in page 1. Updated package diagram. |

Sales, Solutions, and Legal Information

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

Products

| | |
|--|--|
| Automotive | cypress.com/go/automotive |
| Clocks & Buffers | cypress.com/go/clocks |
| Interface | cypress.com/go/interface |
| Lighting & Power Control | cypress.com/go/powerpsoc cypress.com/go/plc |
| Memory | cypress.com/go/memory |
| PSoC | cypress.com/go/psoc |
| Touch Sensing | cypress.com/go/touch |
| USB Controllers | cypress.com/go/USB |
| Wireless/RF | cypress.com/go/wireless |

PSoC[®] Solutions

[psoc.cypress.com/solutions](#)
[PSoC 1](#) | [PSoC 3](#) | [PSoC 4](#) | [PSoC 5LP](#)

Cypress Developer Community

[Community](#) | [Forums](#) | [Blogs](#) | [Video](#) | [Training](#)

Technical Support

[cypress.com/go/support](#)

© Cypress Semiconductor Corporation, 2002-2014. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Any Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress) and is protected by and subject to worldwide patent protection (United States and foreign), United States copyright laws and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer: CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.