



CYPRESS

CY2304NZ

## 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
- 3.3V operation

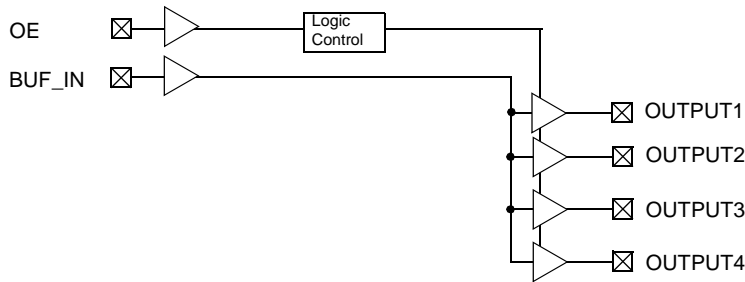
### Functional Description

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

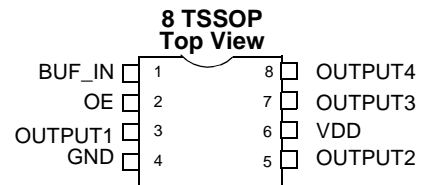
Table 1. Function Table.

| 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 <sub>DD</sub> | 6          | 3.3V 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 ..... -0.5V to  $V_{DD} + 0.5V$   
 DC Input Voltage (Except REF) ..... -0.5V to  $V_{DD} + 0.5V$   
 DC Input Voltage REF ..... -0.5V to  $V_{DD} + 0.5V$

Storage Temperature ..... -65°C to +150°C  
 Max. Soldering Temperature (10 sec.) ..... 260°C  
 Junction Temperature ..... 150°C  
 Static Discharge Voltage  
 (per MIL-STD-883, Method 3015) ..... >2,000V

**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  |
| $t_{PU}$             | 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 <sup>[1]</sup>   |                               |      | 0.8  | V    |
| $V_{IH}$  | Input HIGH Voltage <sup>[1]</sup>  |                               | 2.0  |      | V    |
| $I_{IL}$  | Input LOW Current                  | $V_{IN} = 0V$                 | -5   | 5    | μA   |
| $I_{IH}$  | Input HIGH Current                 | $V_{IN} = V_{DD}$             | -5   | 5    | μA   |
| $V_{OL}$  | Output LOW Voltage <sup>[2]</sup>  | $I_{OL} = 24\text{ mA}$       |      | 0.8  | V    |
|           |                                    | $I_{OL} = 12\text{ mA}$       |      | 0.55 | V    |
| $V_{OH}$  | Output HIGH Voltage <sup>[2]</sup> | $I_{OH} = -24\text{ mA}$      | 2.0  |      | V    |
|           |                                    | $I_{OH} = -12\text{ mA}$      | 2.4  |      | V    |
| $I_{DD}$  | Supply Current                     | Unloaded outputs at 66.66 MHz |      | 25   | mA   |

**Switching Characteristics<sup>[3]</sup> for Commercial and Industrial Temperature Devices**

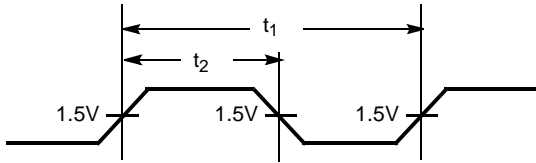
| Parameter | Name   | Description                    | Min. | Typ. | Max. | Unit |
|-----------|--|--------------------------------|------|------|------|------|
|           | Duty Cycle <sup>[2]</sup> = $t_2 \div t_1$                                 | Measured at 1.5V               | 40.0 | 50.0 | 60.0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

**Notes:**

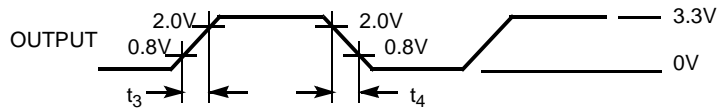
1. BUF\_IN input has a threshold voltage of  $V_{DD}/2$ .
2. Parameter is guaranteed by design and characterization. It is not 100% tested in production.
3. All parameters specified with loaded outputs.

## Switching Waveforms

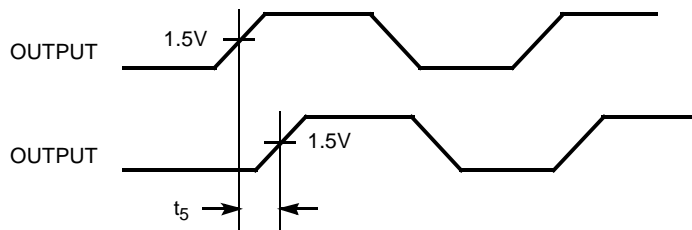
### Duty Cycle Timing



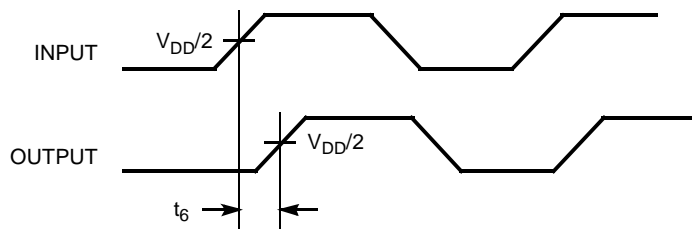
### All Outputs Rise/Fall Time



### Output-Output Skew

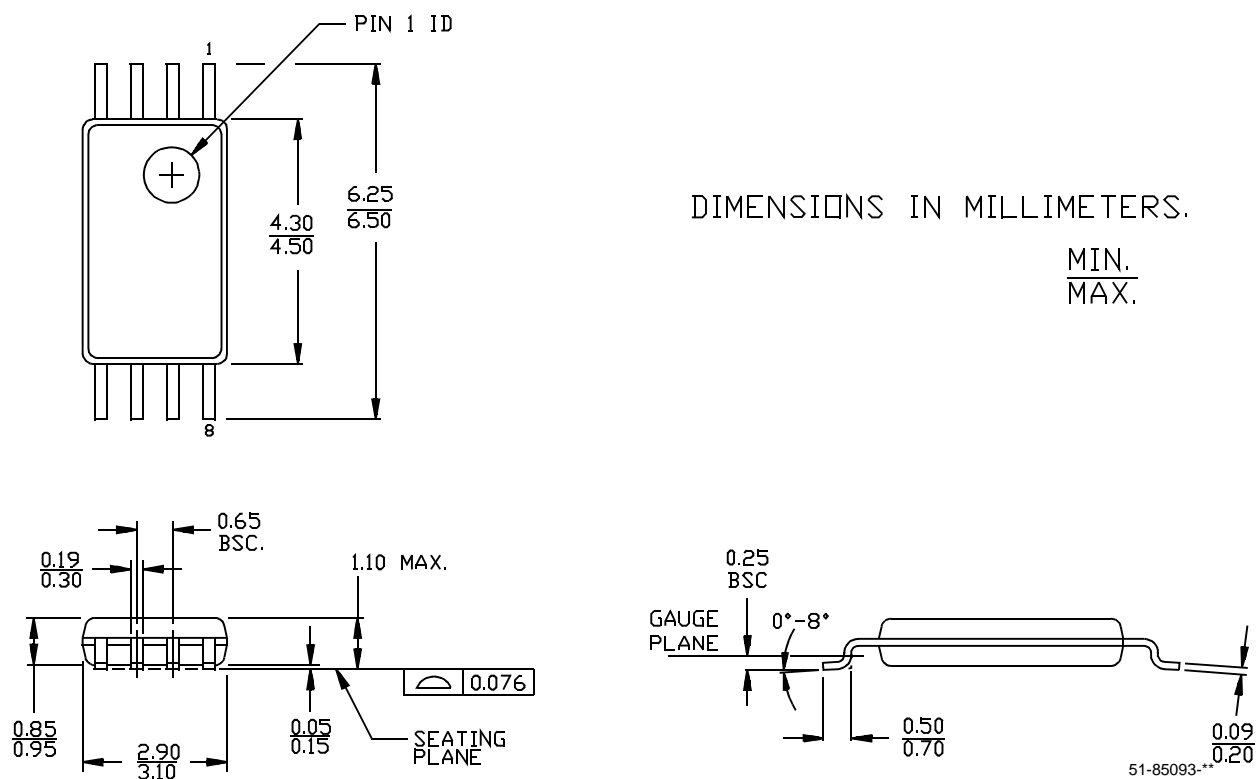


### Input-Output Propagation Delay



**Ordering Information**

| Ordering Code | Package Type                | Operating Range           |
|---------------|-----------------------------|---------------------------|
| CY2304NZZC-1  | 8-pin TSSOP                 | Commercial, 0°C to 70°C   |
| CY2304NZZC-1T | 8-pin TSSOP - Tape and Reel | Commercial, 0°C to 70°C   |
| 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 |

**Package Diagram**
**8-pin Thin Shrunken Small Outline Package (4.40 MM Body) Z8**


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**Document History Page**

| <b>Document Title: CY2304NZ Four Output PCI-X and General Purpose Buffer</b> |                |                   |                        |   |
|--|----------------|-------------------|------------------------|---|
| <b>Document Number: 38-07099</b>   |                |                   |                        |   |
| <b>REV.</b>  | <b>ECN NO.</b> | <b>Issue Date</b> | <b>Orig. of Change</b> | <b>Description of Change</b>                                    |
| **   | 111420         | 02/12/02          | IKA                    | New Data Sheet  |
| *A   | 118610         | 09/25/02          | HWT                    | Added Industrial Temperature Range in the Ordering Information  |
| *B   | 121820         | 12/14/02          | RBI                    | Power up requirements added to Operating Conditions Information |

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