



CYPRESS

CY2304NZ

# Four Output PCI-X and General Purpose Buffer

## Features

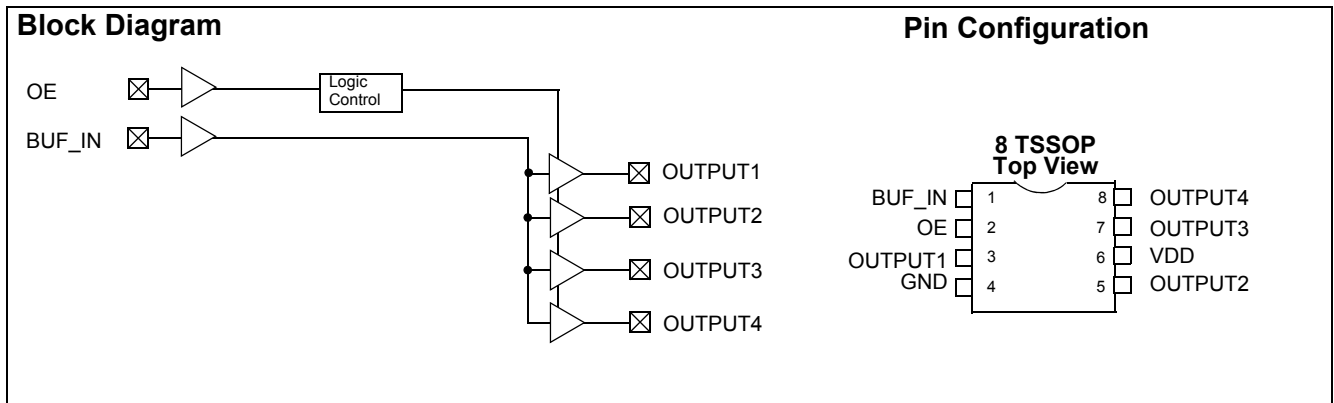
- One input to four output buffer/driver
- General-purpose or PCI-X clock buffer
- Buffers all frequencies from DC to 140 MHz
- Output-to-output skew less than 100 ps
- Space-saving 8-pin TSSOP package
- 3.3V operation
- 60 ps typical output-output skew

## 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 3.3V 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



## 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**

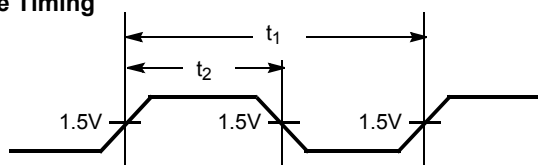
Parameter	Description	Min.	Max.	Unit
$V_{DD}$	Supply Voltage	3.0	3.6	V
$T_A$	Operating Temperature (Ambient Temperature)	-40	85	°C
$C_L$	Load Capacitance	-	25	pF
$C_{IN}$	Input Capacitance	-	7	pF
BUF_IN, OUTPUT [1:4]	Operating Frequency	DC	140	MHz
$t_{PU}$	Power-up time for all $V_{DD}$ 's to reach minimum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

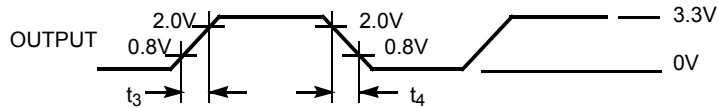
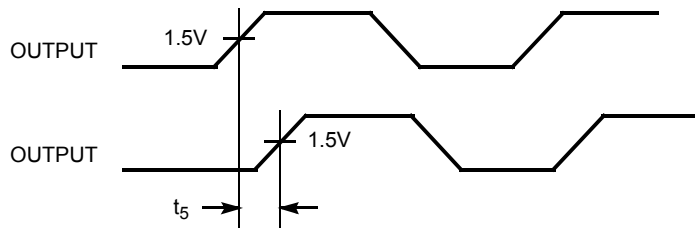
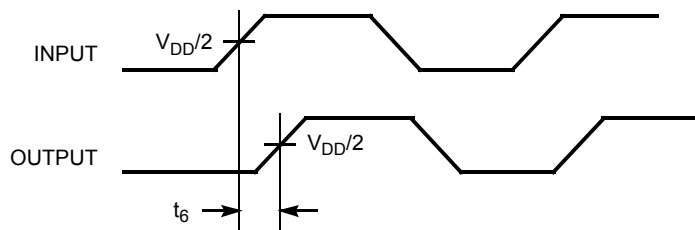
**Switching Characteristics<sup>[3]</sup> for Commercial and Industrial Temperature Devices**

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	-	60	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

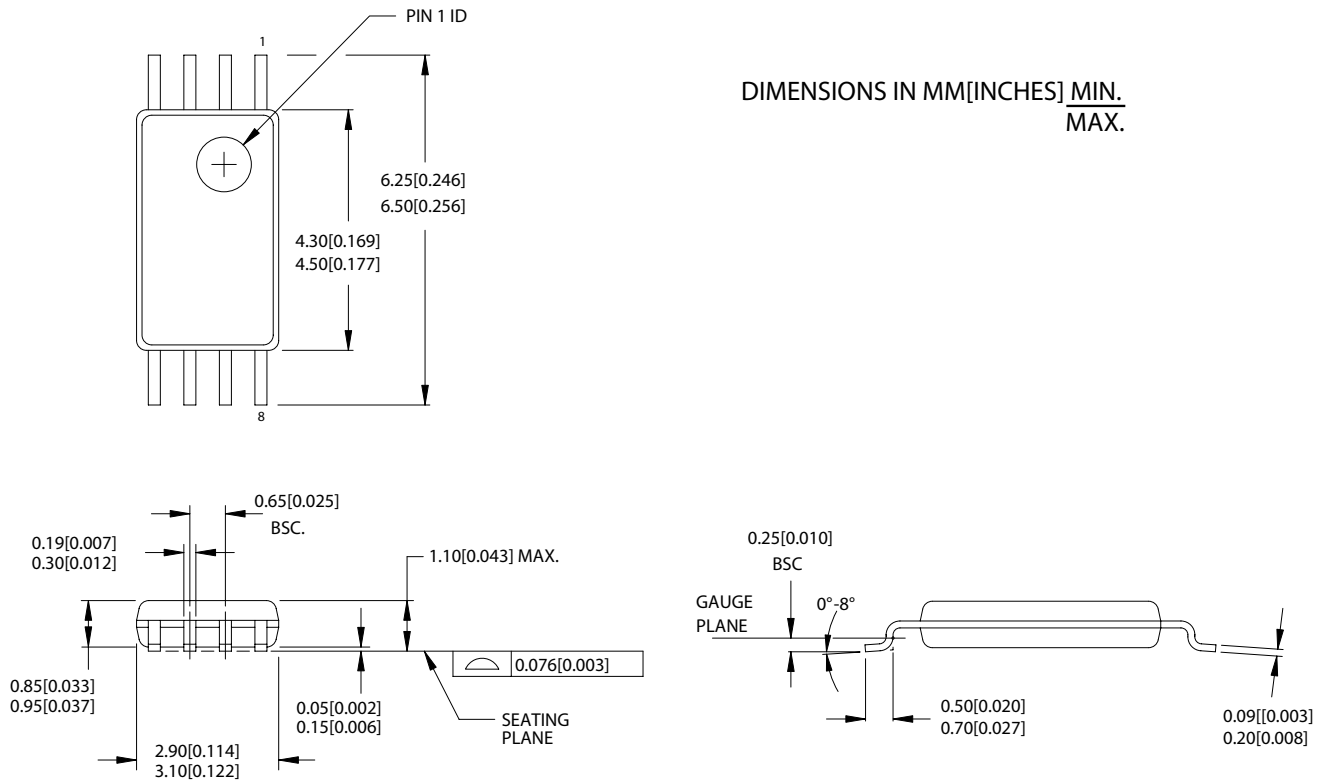
**Switching Waveforms**
**Duty Cycle Timing**

**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** (continued)

**All Outputs Rise/Fall Time**

**Output-Output Skew**

**Input-Output Propagation Delay**

**Ordering Information**

Ordering Code	Package Type	Operating Range
<b>Standard</b>		
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
<b>Lead-free</b>		
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

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


51-85093-\*A

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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
*C	291098	See ECN	RGL	Added Lead-free Devices Specified typical value for output-output skew