



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

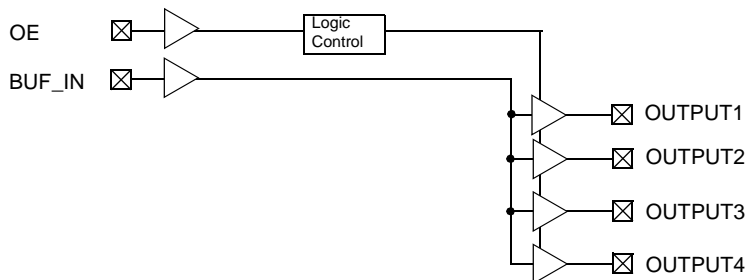
### Functional Description

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.

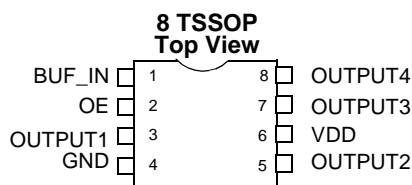
**Table 1. Function Table.**

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

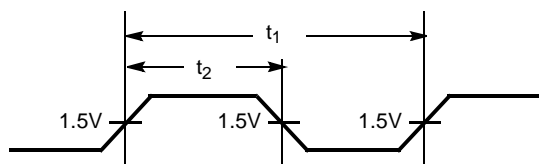
Parameter	Name	Description	Min.	Typ.	Max.	Unit
	Duty Cycle <sup>[2]</sup> = $t_2 \div t_1$	Measured at 1.5V	40.0	50.0	60.0	%
$t_3$	Rise Time <sup>[2]</sup>	Measured between 0.8V and 2.0V			1.50	ns
$t_4$	Fall Time <sup>[2]</sup>	Measured between 0.8V and 2.0V			1.50	ns
$t_5$	Output to Output Skew <sup>[2]</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:

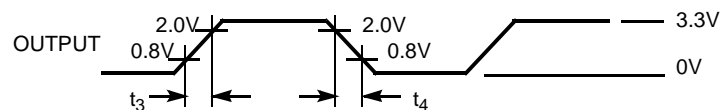
1. BUF\_IN input has a threshold voltage of  $V_{DD}/2$ .
2. Parameter is guaranteed by design and characterization. It is not 100% tested in production.
3. All parameters specified with loaded outputs.

## Switching Waveforms

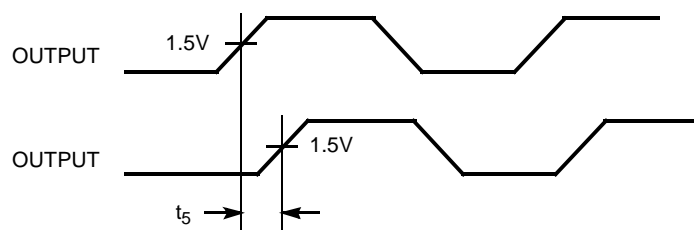
### Duty Cycle Timing



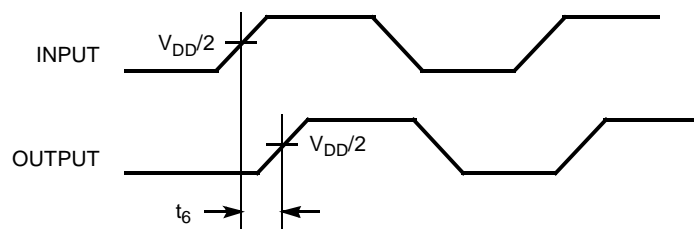
### All Outputs Rise/Fall Time



### Output-Output Skew



### Input-Output Propagation Delay

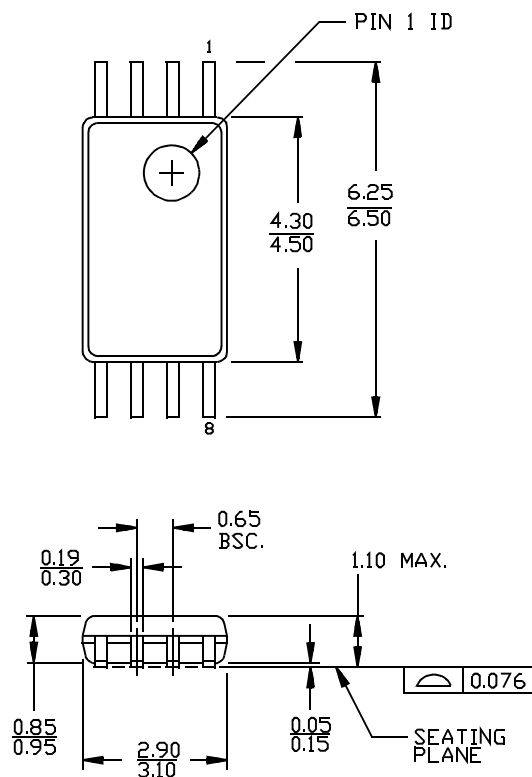


## Ordering Information

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

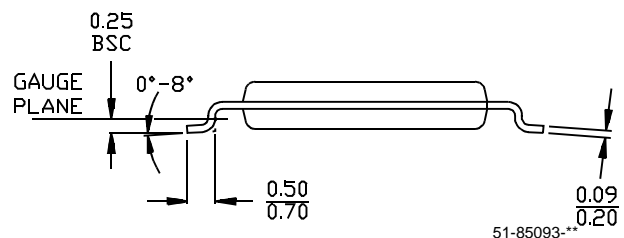
## Package Diagram

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



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**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	Added Industrial Temperature Range in the Ordering Information
*B	121820	12/14/02	RBI	Power up requirements added to Operating Conditions Information