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
- 3.3 V operation
- 60 ps typical output-output skew

Functional Description

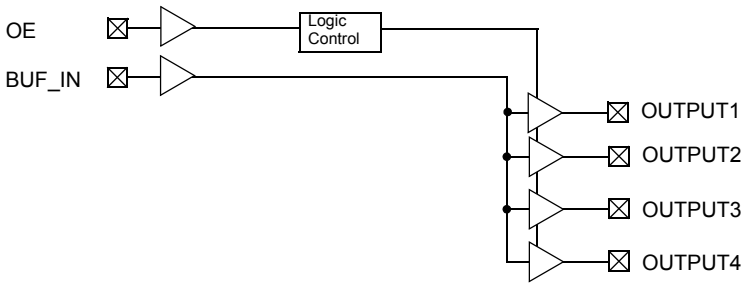
The CY2304NZ is a low-cost buffer designed to distribute high-speed clocks for PCI-X and other applications. The device operates at 3.3 V and outputs can run up to 140 MHz.

For a complete list of related documentation, click here.

Function Table

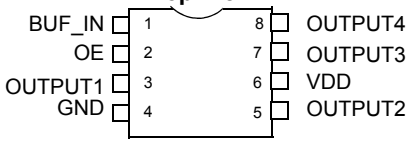
Inputs		Outputs
BUF_IN	OE	Output [1:4]
L	L	L
H	L	L
L	H	L
H	H	H

Block Diagram



Pin Configuration

8-pin TSSOP
Top View



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

Thermal Resistance

Parameter [4]	Description	Test Conditions	8-pin TSSOP	Unit
θ_{JA}	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, in accordance with EIA/JESD51.	165	°C/W
θ_{JC}	Thermal resistance (junction to case)		33	°C/W

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. These parameters are guaranteed by design and are not tested.

Switching Characteristics

For Commercial and Industrial Temperature Devices which are characterized over the frequency range of 1 MHz to 140 MHz.

Parameter [5]	Name	Description	Min	Typ	Max	Unit
	Duty Cycle [6] = $t_2 \div t_1$	Measured at 1.5 V	40.0	50.0	60.0	%
t_3	Rise Time [6]	Measured between 0.8 V and 2.0 V	–	–	1.50	ns
t_4	Fall Time [6]	Measured between 0.8 V and 2.0 V	–	–	1.50	ns
t_5	Output to Output Skew [6]	All outputs equally loaded	–	60	100	ps
t_6	Propagation Delay, BUF_IN Rising Edge to OUTPUT Rising Edge [6]	Measured at $V_{DD}/2$	2.5	3.5	5	ns

Switching Waveforms

Figure 1. Duty Cycle Timing

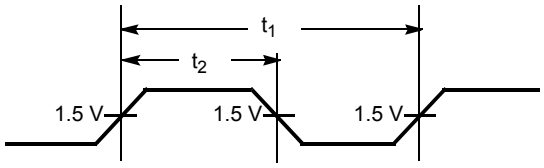


Figure 2. All Outputs Rise/Fall Time

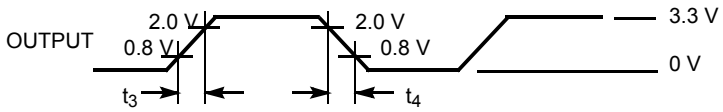


Figure 3. Output-Output Skew

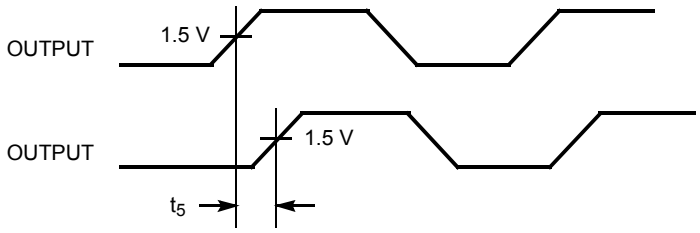
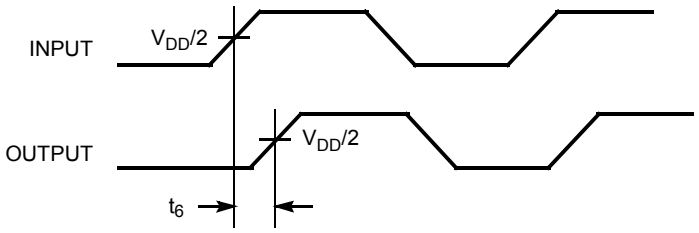


Figure 4. Input-Output Propagation Delay

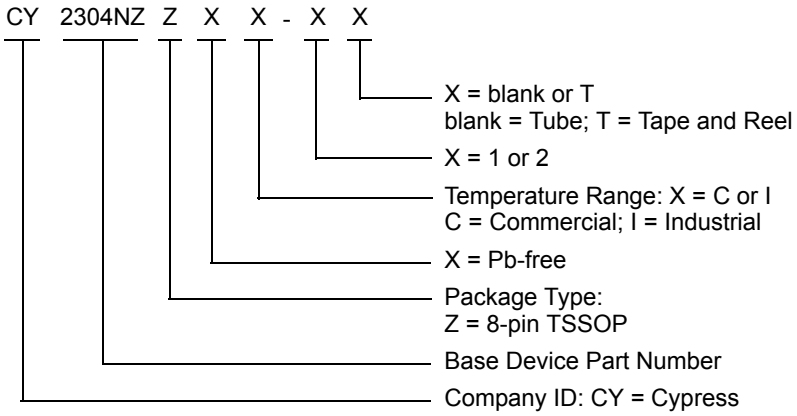


Notes
5. All parameters specified with loaded outputs.
6. Parameter is guaranteed by design and characterization. It is not 100% tested in production.

Ordering Information

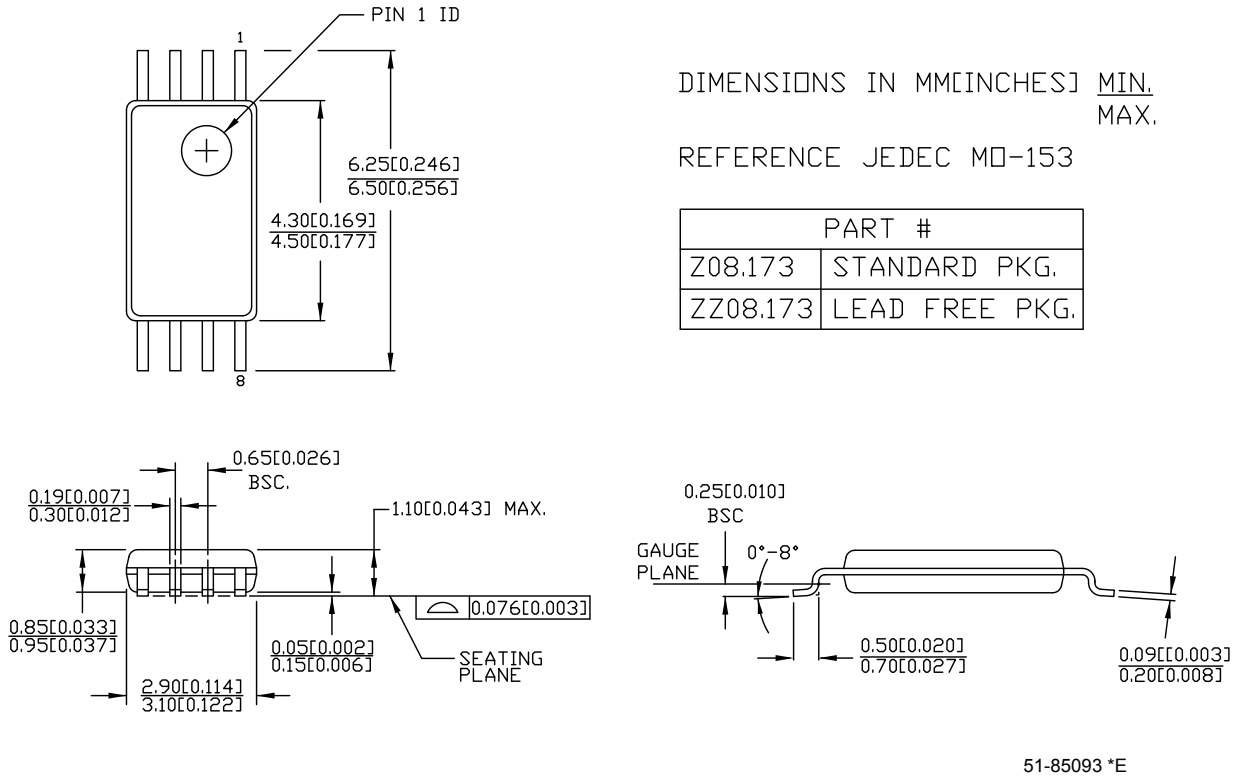
Ordering Code	Package Type	Operating Range
Standard		
CY2304NZZI-1	8-pin TSSOP	Industrial, –40 °C to 85 °C
CY2304NZZI-1T	8-pin TSSOP – Tape and Reel	Industrial, –40 °C to 85 °C
Pb-free		
CY2304NZZXC-1	8-pin TSSOP	Commercial, 0 °C to 70 °C
CY2304NZZXC-1T	8-pin TSSOP – Tape and Reel	Commercial, 0 °C to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



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_{PU} 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 to 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_{PU} parameter. Updated to new template.
*H	4312848	03/18/2014	CINM	No technical updates. Completing Sunset Review.
*I	4578443	11/25/2014	AJU	Updated Functional Description: Added “For a complete list of related documentation, click here.” at the end. Updated Package Diagram: spec 51-85093 – Changed revision from *D to *E.
*J	4756553	05/06/2015	TAVA	Updated Switching Characteristics: Replaced “For Commercial and Industrial Temperature Devices” with “For Commercial and Industrial Temperature Devices which are characterized over the frequency range of 1 MHz to 140 MHz.” for characterization.
*K	5258800	05/04/2016	PSR	Added Thermal Resistance. Updated to new template.

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