CY2309NZ

Nine-Output 3.3 V Buffer

Features

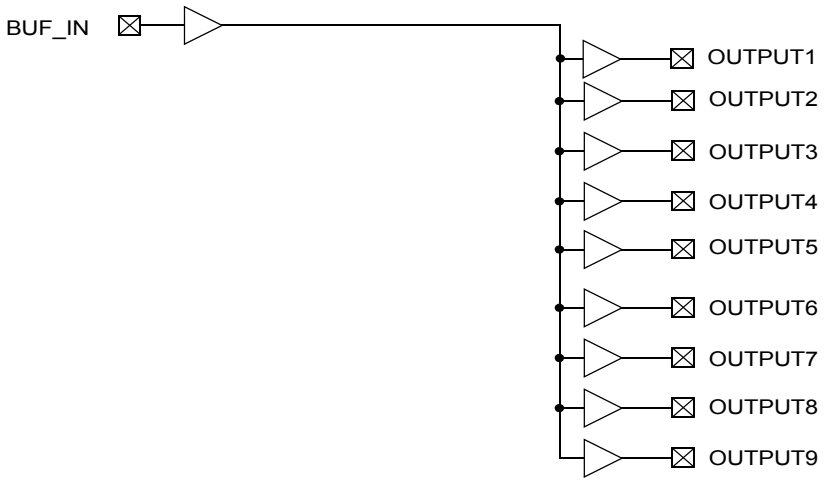
- One-input to nine-output buffer/driver
- Supports two DIMMs or four SO-DIMMs with one additional output for feedback to an external or chipset phase-locked loop (PLL)
- Low power consumption for mobile applications
  - Less than 32 mA at 66.6 MHz with unloaded outputs
- 1-ns Input-output delay
- Buffers all frequencies from DC to 133.33 MHz
- Output-output skew less than 250 ps
- Multiple V_{DD} and V_{SS} pins for noise and electromagnetic interference (EMI) reduction
- Space-saving 16-pin 150-mil small-outline integrated circuit (SOIC) package
- 3.3 V operation
- Industrial temperature available

Functional Description

The CY2309NZ is a low-cost buffer designed to distribute high-speed clocks in mobile PC systems and desktop PC systems with SDRAM support. The part has nine outputs, eight of which can be used to drive two DIMMs or four SO-DIMMs, and the remaining can be used for external feedback to a PLL. The device operates at 3.3V and outputs can run up to 133.33 MHz.

The CY2309NZ is designed for low EMI and power optimization. It has multiple V_{SS} and V_{DD} pins for noise optimization and consumes less than 32 mA at 66.6 MHz, making it ideal for the low-power requirements of mobile systems. It is available in an ultra-compact 150-mil 16-pin SOIC package.

Logic Block Diagram



Contents

Pinouts

Figure 1. CY2309NZ - 16 SOIC-Top View

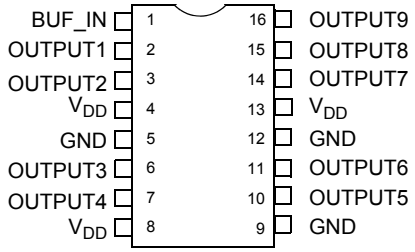


Table 1. Pin Description for CY2309NZ

Pin	Signal	Description
4, 8, 13	V_{DD}	3.3 V Digital voltage supply
5, 9, 12	GND	Ground
1	BUF_IN	Input clock
2, 3, 6, 7, 10, 11, 14, 15, 16	OUTPUT [1:9]	Outputs

Maximum Ratings

Supply voltage to ground potential .....–0.5 V to +7.0 V
DC input voltage .....–0.5 V to 7.0 V
Storage temperature .....–65 °C to +150 °C
Junction temperature..... 150 °C
Static discharge voltage
(per MIL-STD-883, Method 3015) .....>2,000 V

Operating Conditions for Commercial and Industrial Temperature Devices

Parameter	Description	Min	Max	Unit
V_{DD}	Supply voltage	3.0	3.6	V
T_A	(Ambient operating temperature) commercial	0	70	°C
	(Ambient operating temperature) industrial	–40	85	°C
C_L	Load capacitance, Fout < 100 MHz	–	30	pF
	Load capacitance,100 MHz < Fout < 133.33 MHz	–	15	pF
C_{IN}	Input capacitance	–	7	pF
BUF_IN, OUTPUT [1:9]	Operating frequency	DC	133.33	MHz
t_{PU}	Power-up time for all VDDs to reach minimum specified voltage (power ramps must be monotonic)	0.05	50	ms

Electrical Characteristics for Commercial and Industrial Temperature Devices

Parameter	Description	Test Conditions	Min	Max	Unit
V_{IL}	Input LOW voltage[1]		–	0.8	V
V_{IH}	Input HIGH voltage[1]		2.0	–	V
I_{IL}	Input LOW current	V_{IN} = 0 V	–	50.0	µA
I_{IH}	Input HIGH current	V_{IN} = V_{DD}	–	100.0	µA
V_{OL}	Output LOW voltage[2]	I_{OL} = 8 mA	–	0.4	V
V_{OH}	Output HIGH voltage[2]	I_{OH} = –8 mA	2.4	–	V
I_{DD}	Supply current	Unloaded outputs at 66.66 MHz	–	32	mA

Switching Characteristics for Commercial and Industrial Temperature Devices[3]

Parameter	Name	Description	Min	Typ	Max	Unit
	Duty cycle[2] = $t_2 \div t_1$	Measured at 1.4 V	40.0	50.0	60.0	%
t_3	Rise time[2]	Measured between 0.8 V and 2.0 V	–	–	1.50	ns
t_4	Fall time[2]	Measured between 0.8 V and 2.0 V	–	–	1.50	ns
t_5	Output to output skew[2]	All outputs equally loaded	–	–	250	ps
t_6	Propagation delay, BUF_IN Rising edge to Output Rising edge[2]	Measured at V_{DD}/2	1	5	9.2	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

Figure 2. Duty Cycle Timing

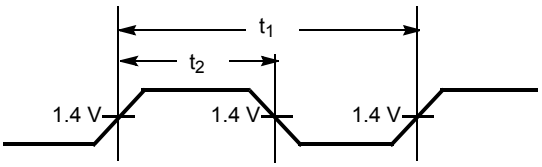


Figure 3. All Outputs Rise/Fall Time

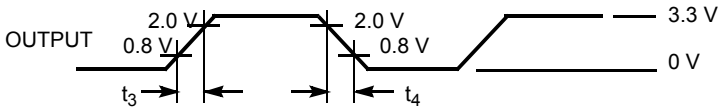


Figure 4. Output-Output Skew

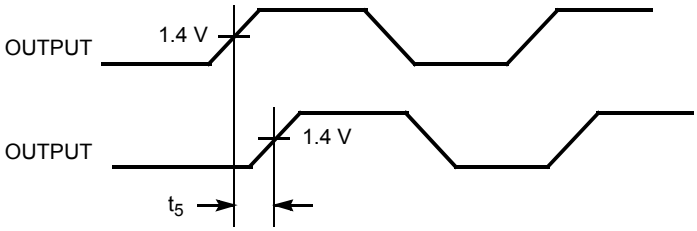
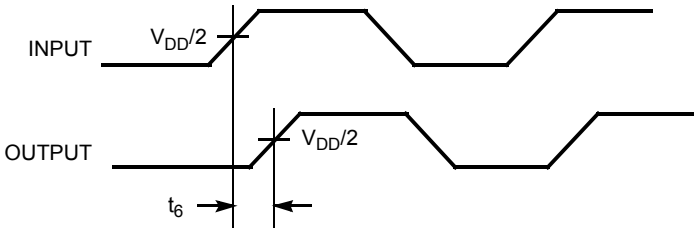
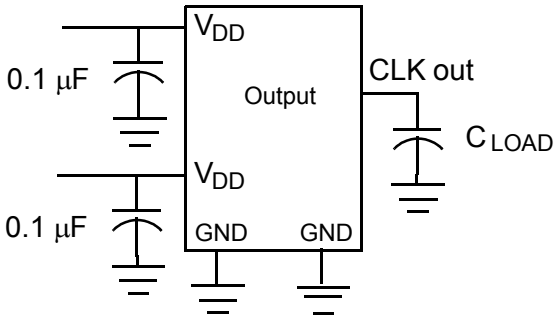


Figure 5. Input-Output Propagation Delay



Test Circuits

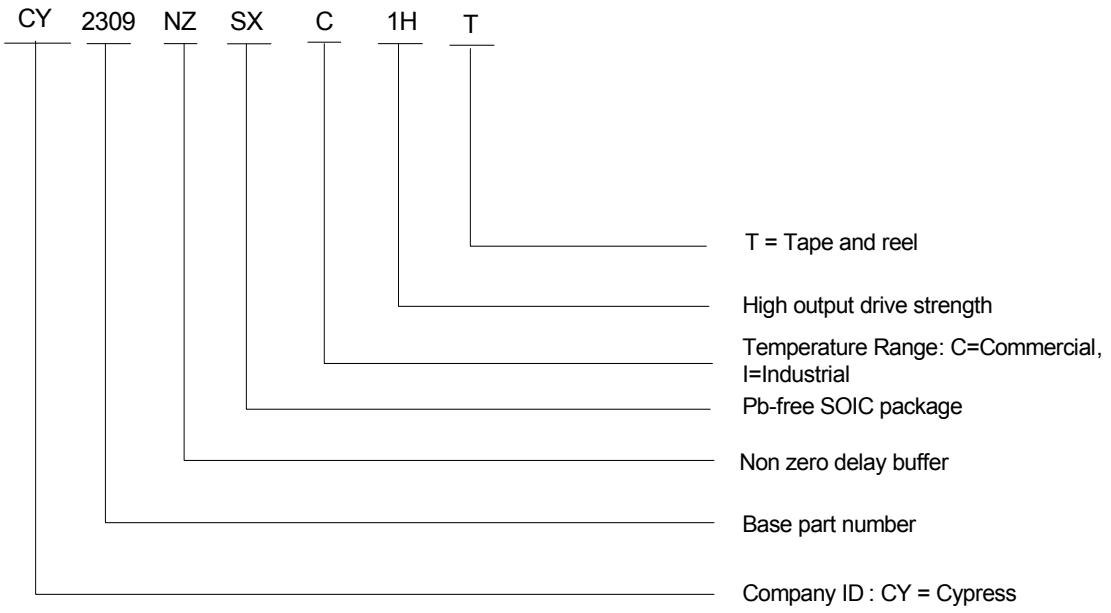


Note
4. Not recommended for new designs.

Ordering Information

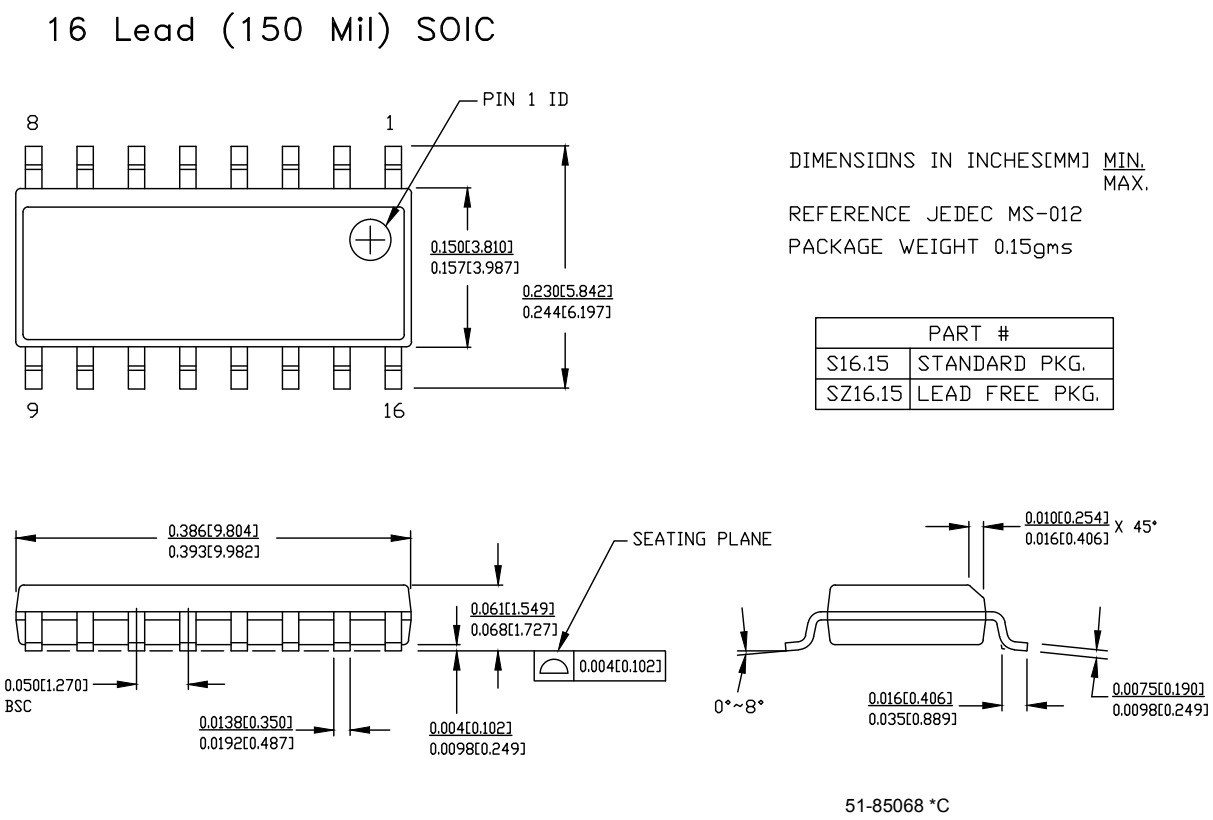
Ordering Code	Package Type	Operating Range
Pb-free		
CY2309NZSXC-1H	16-pin 150-mil SOIC	Commercial
CY2309NZSXC-1HT	16-pin 150-mil SOIC – Tape and reel	Commercial
CY2309NZSXI-1H	16-pin 150-mil SOIC	Industrial
CY2309NZSXI-1HT	16-pin 150-mil SOIC – Tape and reel	Industrial

Ordering Code Definition



Package Diagram

Figure 6. 16-Pin (150-Mil) SOIC S16



Acronyms

Acronym	Description
PLL	phase-locked loop
SOIC	small-outline integrated circuit
EMI	Electromagnetic interference

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degrees Celsius
mA	milliampere
µA	microamperes
MHz	megahertz
ms	milliseconds
mV	millivolts
ns	nanoseconds
pF	picofarads
V	volts

Document History Page

Document Title: CY2309NZ Nine-Output 3.3 V Buffer Document Number: 38-07182				
REV.	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	111858	DSG	12/09/01	Change from Spec number: 38-00709 to 38-07182
*A	121834	RBI	12/14/02	Power-up requirements added to Operating Conditions Information
*B	130563	SDR	10/23/03	Added industrial operating temperature to operating conditions
*C	212991	RGL/GGK	03/30/04	Updated the propagation delay T_6 spec to 9.2 ns in the Switching Characteristics table
*D	270149	RGL	10/04/04	Added Lead-free devices Replaced 8.7ns Input/Output Delay to 1ns Input/Output Delaying the features section
*E	2568533	AESA	09/23/08	Updated template. Added Note “Not recommended for new designs.” Changed "SDRAM [1:9]" to "OUTPUT [1:9]" in Operating Conditions table. Removed part number CY2309NZSI–1H and CY2309NZSI–1HT.
*F	2904715	CXQ	04/05/10	Removed parts CY2309NZSC-1H,CY2309NZSC-1HT from Ordering Information. Updated Package Diagram
*G	3082147	CXQ	11/10/2010	Maximum Rating section on page 2, change the following from: "DC Input Voltage (Except REF) ..... –0.5 V to VDD + 0.5 V" "DC Input Voltage REF .....–0.5 V to 7.0 V" to: "DC Input Voltage .....–0.5 V to 7.0 V" Updated datasheet as per new template Updated footnotes Added Acronyms and Units of Measure table Added Ordering Code Definition

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