CY2309NZ

Nine-Output 3.3V Buffer

Features

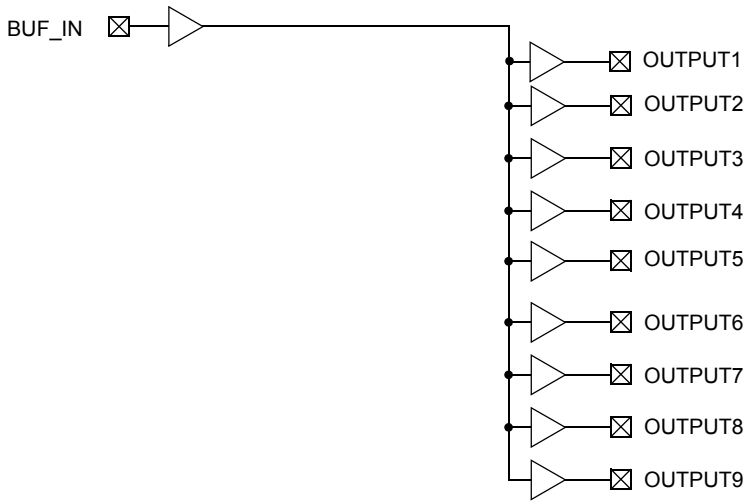
- **One-input to nine-output buffer/driver**
- **Supports two DIMMs or four SO-DIMMs with one additional output for feedback to an external or chipset PLL**
- **Low power consumption for mobile applications**
  - **— Less than 32 mA at 66.6 MHz with unloaded outputs**
- **8.7-ns Input-Output delay**
- **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 SOIC package**
- **3.3V operation**
- **Industrial temperature available**

Functional Description

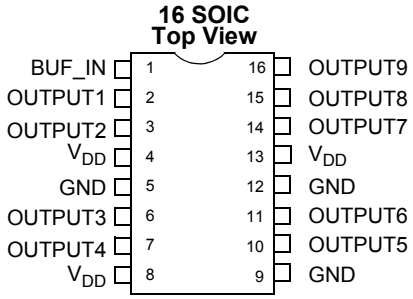
The CY2309NZ is a low-cost buffer designed to distribute high-speed clocks in mobile PC systems and desktop PC systems with SDRAM support. The part has nine outputs, eight of which can be used to drive 2 DIMMs or 4 SO-DIMMs, and the remaining can be used for external feedback to a PLL. The device operates 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.

Block Diagram



Pin Configuration



Pin Description for CY2309NZ

Pin	Signal	Description
4, 8, 13	V_{DD}	3.3V 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 ..... –0.5V to +7.0V
DC Input Voltage (Except REF) .....–0.5V to V_{DD} + 0.5V
DC Input Voltage REF..... –0.5V to 7V
Storage Temperature .....–65°C to +150°C
Junction Temperature..... 150°C
Static Discharge Voltage
(per MIL-STD-883, Method 3015) .....>2,000V

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, SDRAM [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

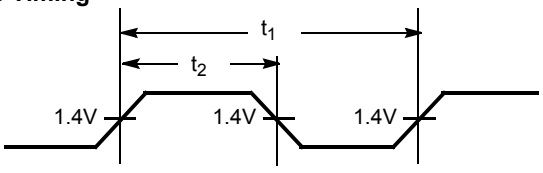
Parameter	Description	Test Conditions	Min.	Max.	Unit
V_{IL}	Input LOW Voltage[1]			0.8	V
V_{IH}	Input HIGH Voltage[1]		2.0		V
I_{IL}	Input LOW Current	V_{IN} = 0V		50.0	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}		100.0	µA
V_{OL}	Output LOW Voltage[2]	I_{OL} = 8 mA		0.4	V
V_{OH}	Output HIGH Voltage[2]	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 1.4V	40.0	50.0	60.0	%
t_3	Rise Time[2]	Measured between 0.8V and 2.0V			1.50	ns
t_4	Fall Time[2]	Measured between 0.8V and 2.0V			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

Switching Waveforms

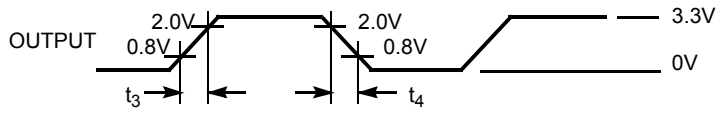
Duty Cycle Timing



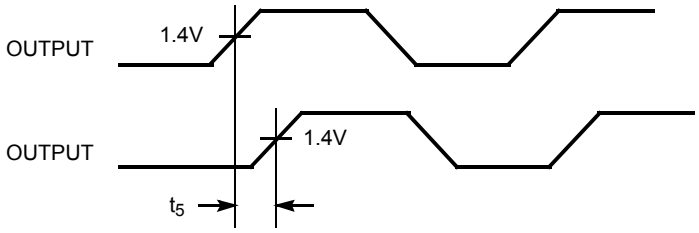
Notes:
1. BUF_IN input has a threshold voltage of V_{DD}/2.
2. Parameter is guaranteed by design and characterization. It is not 100% tested in production.
3. All parameters specified with loaded outputs.

Switching Waveforms (continued)

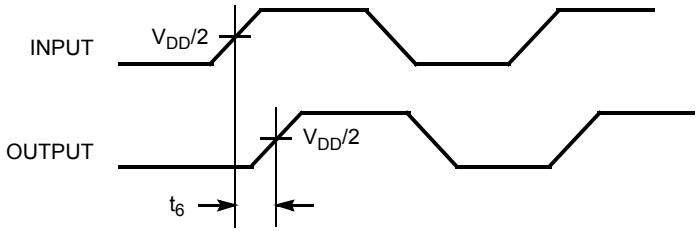
All Outputs Rise/Fall Time



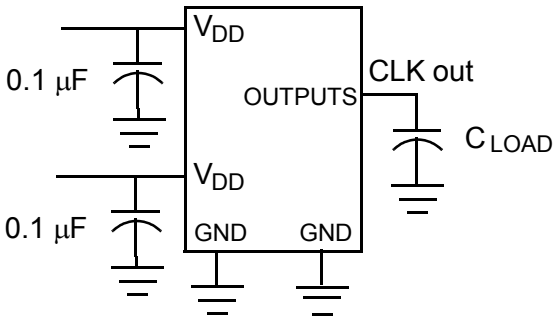
Output-Output Skew



Input-Output Propagation Delay



Test Circuits

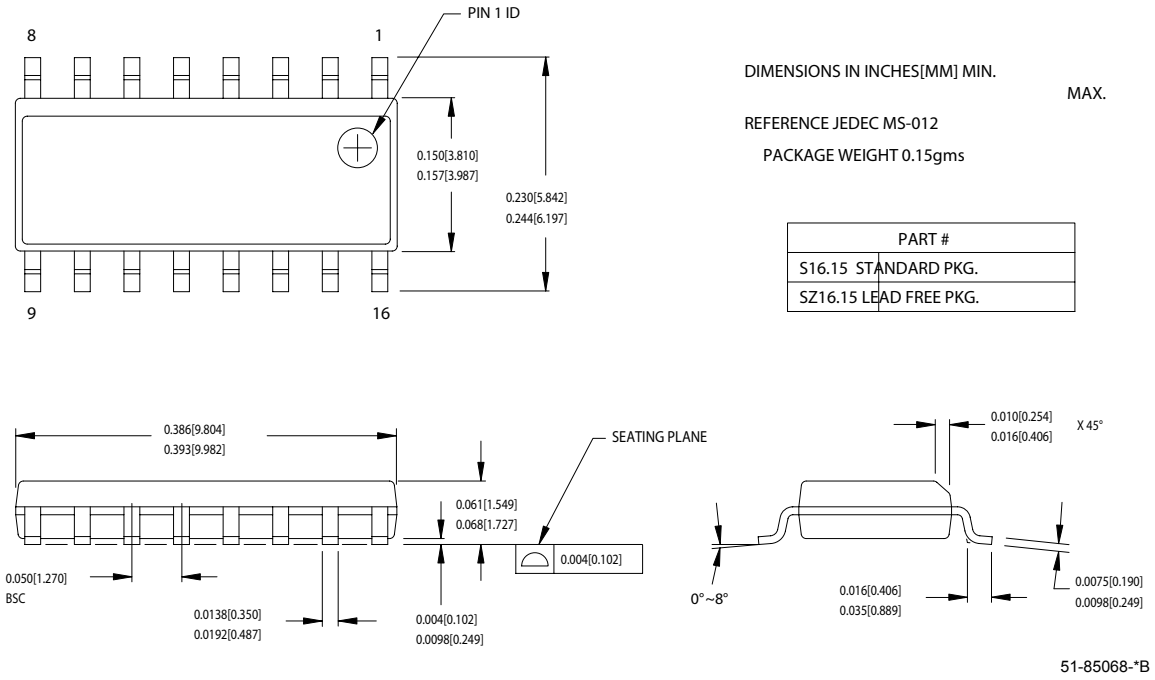


Ordering Information

Ordering Code	Package Name	Package Type	Operating Range
CY2309NZSC–1H	S16	16-pin 150-mil SOIC	Commercial
CY2309NZSI-1H	S16	16-pin 150-mil SOIC	Industrial

Package Diagram

16-Lead (150-Mil) SOIC S16



Document History Page

Document Title: CY2309NZ Nine-Output 3.3V Buffer Document Number: 38-07182				
REV.	**ECN NO.**	**Issue Date**	**Orig. of Change**	**Description of Change**
**	111858	12/09/01	DSG	Change from Spec number: 38-00709 to 38-07182
*A	121834	12/14/02	RBI	Power-up requirements added to Operating Conditions Information
*B	130563	10/23/03	SDR	Added industrial operating temperature to operating conditions
*C	212991	See ECN	RGL/GGK	Updated the propagation delay T_6 spec to 9.2 ns in the Switching Characteristics table