CYPRESS

CY2309NZ

Nine Output, 3.3V SDRAM Buffer for 2 DIMMs or 4 SO-DIMMs

Features

- **One input to nine output buffer/driver**
- **Supports two SDRAM 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 25 mA at 66.6 MHz with unloaded outputs**
- **8.7-ns Input-Output delay**
- **Buffers all frequencies from DC to 100 MHz**
- **Output-output skew less than 250 ps**
- **Multiple V_{DD} and V_{SS} pins for noise and EMI reduction**
- **Space-saving 16-pin 150-mil SOIC package**
- **3.3V operation**

Functional Description

The CY2309NZ is a low-cost SDRAM 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 100 MHz, making it compatible with Pentium II® processors and 100-MHz chipsets. The CY2309NZ can be used in conjunction with the CY2281, CY2282, CY2283, CY2284 or similar clock synthesizers for a full Pentium II motherboard solution.

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 25 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
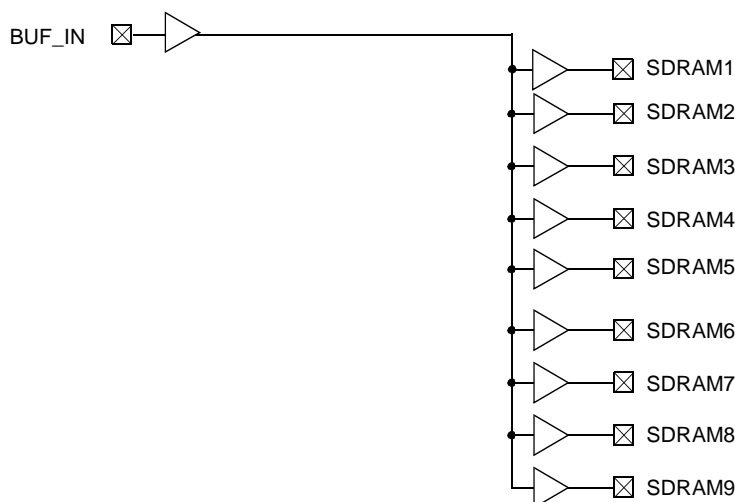
Pin Configuration

16 SOIC Top View
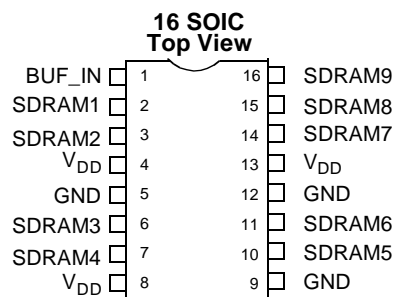
Pin Description for CY2309NZ

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

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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

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)	0	70	°C
C_L	Load Capacitance		30	pF
C_{IN}	Input Capacitance		7	pF
BUF_IN, SDRAM [1:9]	Operating Frequency	DC	100	MHz

Electrical Characteristics

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, SEL inputs at V_{DD} or GND		35	mA

## Switching Characteristics [3] Over the Operating Range

| 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 SDRAM Rising Edge[2]	Measured at V_{DD}/2	1	5	8.7	ns

Notes:
1. BUF_IN input has a threshold voltage of V_{DD}/2.
2. Parameter is guaranteed by design and characterization. Not 100% tested in production.
3. All parameters specified with loaded outputs.
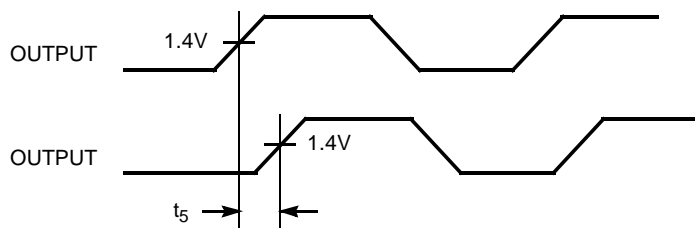
Switching Waveforms
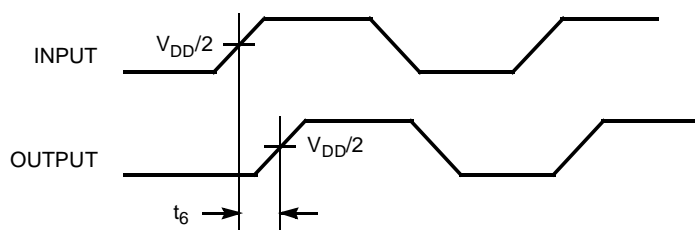
Duty Cycle Timing
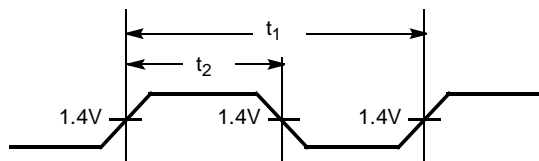
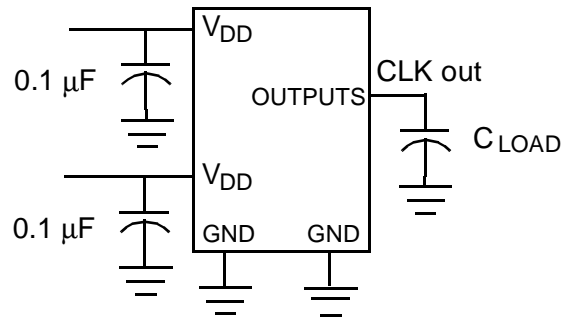### All Outputs Rise/Fall Time
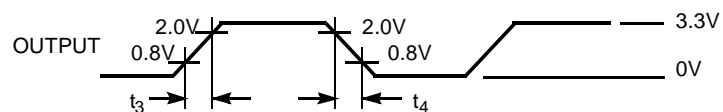
Output-Output Skew

Input-Output Propagation Delay

Test Circuits

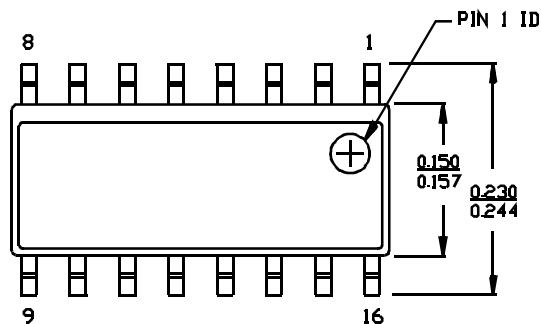## Ordering Information

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

Document #: 38–00709–C

Package Diagram

16-Lead (150-Mil) Molded SOIC S16

51-85068-A