

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
- 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 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 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



Pinouts

Figure 1. CY2309NZ - 16 SOIC-Top View



Table 1. 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 | Storage Temperature | -65°C to +150°C |
| DC Input Voltage (Except REF) | -0.5V to V _{DD} + 0.5V | Junction Temperature..... | 150°C |
| DC Input Voltage REF | -0.5V to 7V | 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, 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} = 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 |

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.

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

Figure 2. Duty Cycle Timing



Figure 3. All Outputs Rise/Fall Time



Figure 4. Output-Output Skew

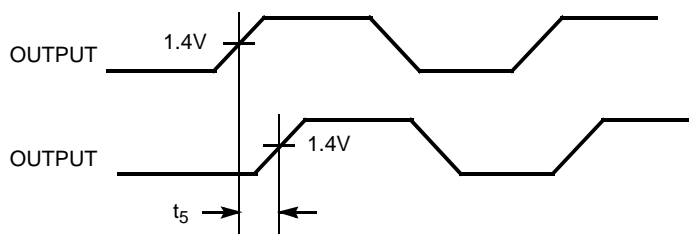


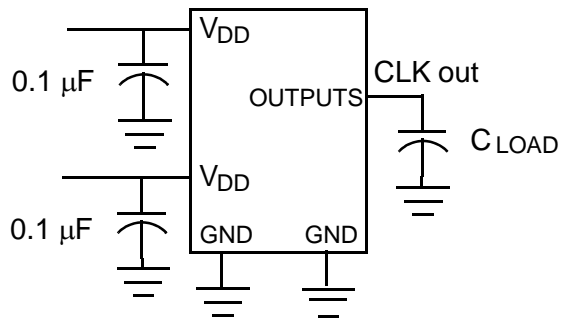
Figure 5. Input-Output Propagation Delay



Note

3. All parameters specified with loaded outputs.

Test Circuits



Ordering Information

| Ordering Code | Package Type | Operating Range |
|-------------------------------|-------------------------------------|-----------------|
| CY2309NZSC-1H ^[4] | 16-pin 150-mil SOIC | Commercial |
| CY2309NZSC-1HT ^[4] | 16-pin 150-mil SOIC – Tape and Reel | Commercial |
| 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 |

Package Diagram

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



Note
4. Not recommended for new designs.

Document History Page

| Document Title: CY2309NZ Nine-Output 3.3V 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 Delay in 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. |

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