

Nine-Output 3.3V Buffer

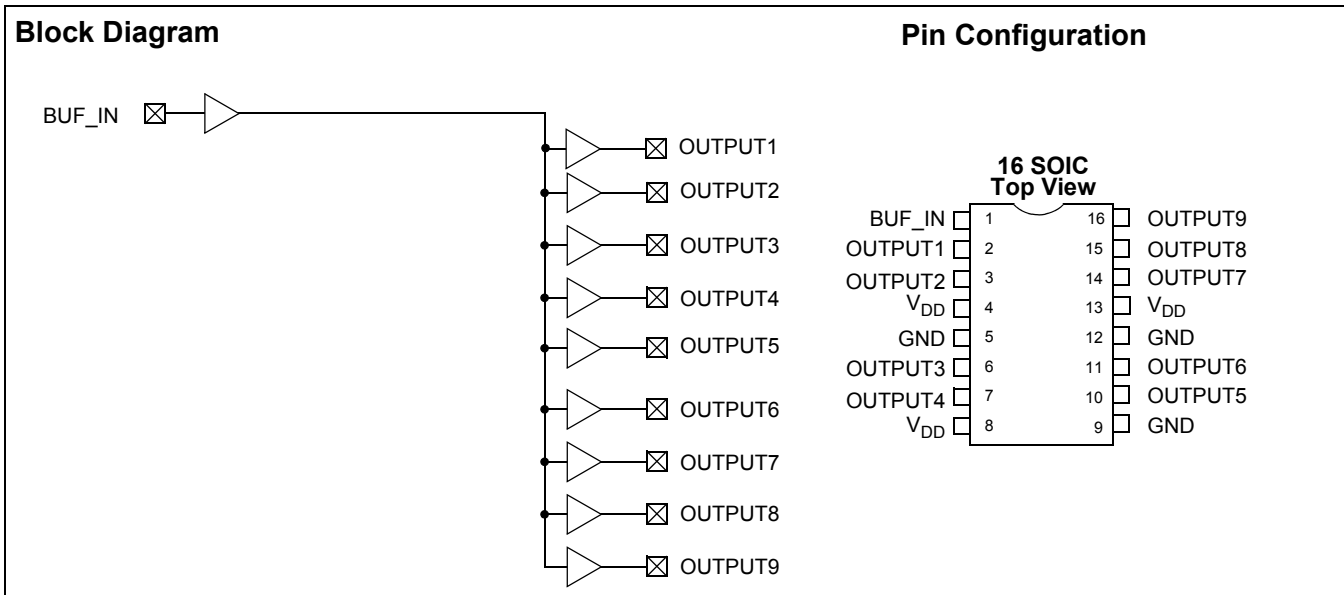
Features

- 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.



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

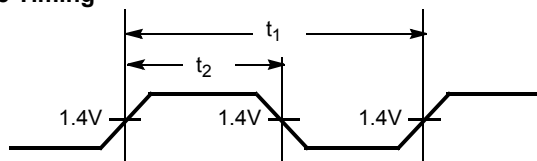
| Parameter | Description | Min. | Max. | Unit |
|---------------------|---|------|--------|------|
| V_{DD} | Supply Voltage | 3.0 | 3.6 | V |
| T_A | (Ambient Operating Temperature) Commercial | 0 | 70 | °C |
| | (Ambient Operating Temperature) Industrial | -40 | 85 | °C |
| C_L | Load Capacitance, $F_{out} < 100$ MHz | | 30 | pF |
| | Load Capacitance, 100 MHz $< F_{out} < 133.33$ 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

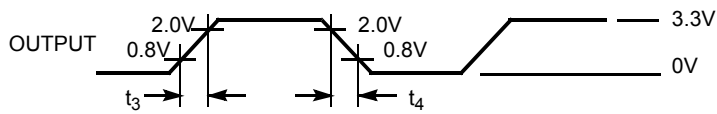
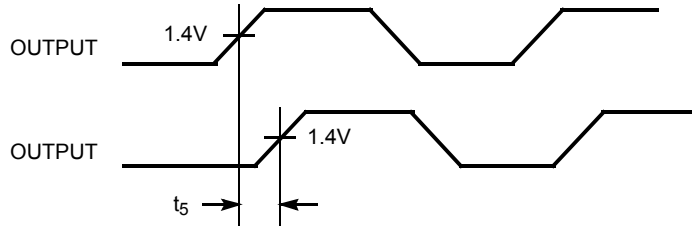
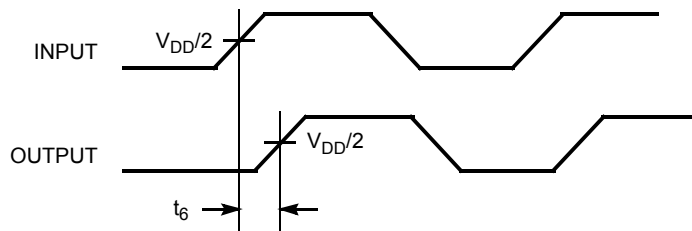
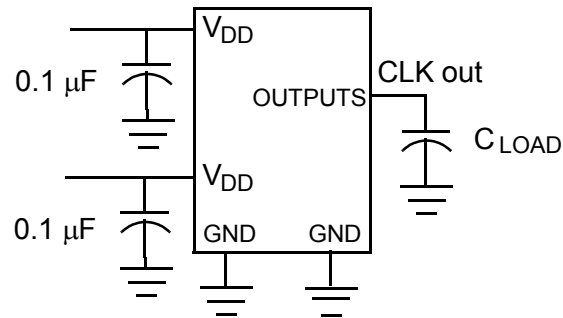
| Parameter | Description | Test Conditions | Min. | Max. | Unit |
|-----------|------------------------------------|-------------------------------|------|-------|------|
| V_{IL} | Input LOW Voltage ^[1] | | | 0.8 | V |
| V_{IH} | Input HIGH Voltage ^[1] | | 2.0 | | V |
| I_{IL} | Input LOW Current | $V_{IN} = 0V$ | | 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]

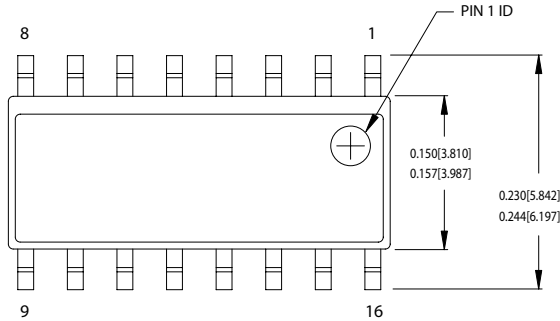
| Parameter | Name | Description | Min. | Typ. | Max. | Unit |
|-----------|--|--------------------------------|------|------|------|------|
| | Duty Cycle ^[2] = $t_2 \div t_1$ | Measured at 1.4V | 40.0 | 50.0 | 60.0 | % |
| t_3 | Rise Time ^[2] | Measured between 0.8V and 2.0V | | | 1.50 | ns |
| t_4 | 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.

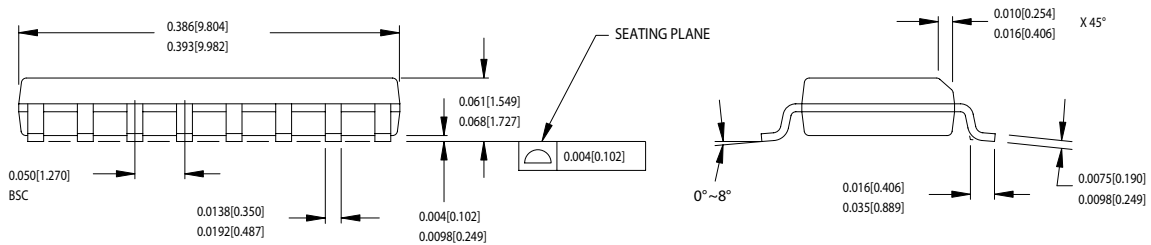
Switching Waveforms (continued)
All Outputs Rise/Fall Time

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


DIMENSIONS IN INCHES[MM] MIN. MAX.
 REFERENCE JEDEC MS-012
 PACKAGE WEIGHT 0.15gms

| PART # | |
|---------|----------------|
| S16.15 | STANDARD PKG. |
| SZ16.15 | LEAD FREE PKG. |



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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 |