

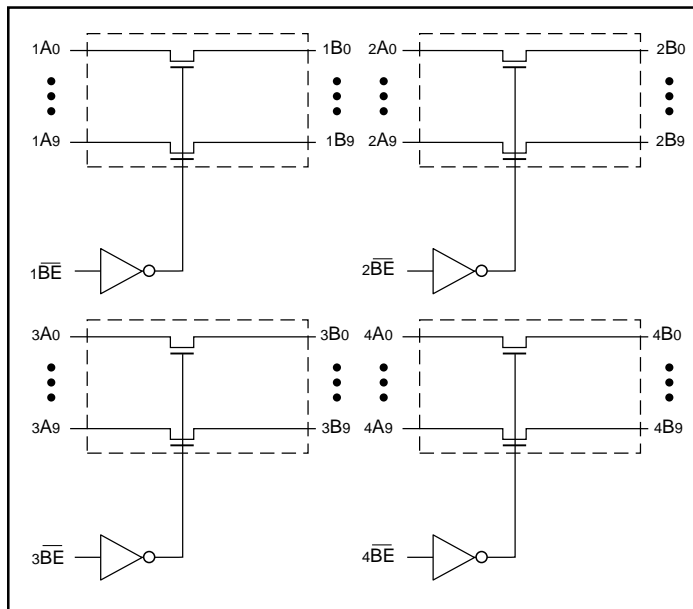
**3.3V, High Bandwidth, Hot Insertion,  
40-Bit, 2-Port, BusSwitch**
**Product Features**

- Near zero propagation delay
- 5Ω switches connect inputs to outputs
- High Bandwidth (>200 MHz)
- Permits Hot Insertion
- Rail-to-Rail, 3.3V Switching
- 5V I/O Tolerant
- Package available:  
–96-pin LFBGA (NB)

**Product Description**

Pericom Semiconductor's PI3C series of logic circuits are produced using the Company's advanced submicron CMOS technology, achieving industry leading performance.

The PI3C34X461 is a 40-bit, 2-port bus switch designed with a low ON resistance (5Ω) allowing inputs to be connected directly to outputs. The bus switch creates no additional propagational delay or additional ground bounce noise. The switches are turned ON by the Bus Enable ( $\overline{BE}$ ) input signal.

**Logic Block Diagram**

**Product Pin Description**

| Pin Name         | Description                  |
|------------------|------------------------------|
| NA0 - NA9        | Bus A                        |
| NB0 - NB9        | Bus B                        |
| $\overline{NBE}$ | Bus Enable Pins (Active LOW) |
| NGND             | Ground                       |
| NV <sub>CC</sub> | Power                        |

**Note:**

N = 1 through 4 for each set of 10-Bit Buses.

**Truth Table<sup>(1)</sup>**

| Function   | $\overline{NBE}$ | A0-9 |
|------------|------------------|------|
| Disconnect | H                | Hi-Z |
| Connect    | L                | B0-9 |

**Note 1:**

H = High Voltage Level

L = Low Voltage Level

Hi-Z = High Impedance



**Product Pinout by Name**

| Name             | Ball Pad | Name             | Ball Pad | Name             | Ball Pad | Name             | Ball Pad |
|------------------|----------|------------------|----------|------------------|----------|------------------|----------|
| 1A0              | A3       | 2A0              | E3       | 3A0              | J3       | 4A0              | N3       |
| 1B0              | A5       | 2B0              | E5       | 3B0              | J5       | 4B0              | N5       |
| 1A1              | A2       | 2A1              | E2       | 3A1              | J2       | 4A1              | N2       |
| 1B1              | A6       | 2B1              | E6       | 3B1              | J6       | 4B1              | N6       |
| 1A2              | A1       | 2A2              | E1       | 3A2              | J1       | 4A2              | N1       |
| 1B2              | B5       | 2B2              | F5       | 3B2              | K5       | 4B2              | P5       |
| 1A3              | B2       | 2A3              | F2       | 3A3              | K2       | 4A3              | P2       |
| 1B3              | B6       | 2B3              | F6       | 3B3              | K6       | 4B3              | P6       |
| 1A4              | B1       | 2A4              | F1       | 3A4              | K1       | 4A4              | P1       |
| 1B4              | C5       | 2B4              | G5       | 3B4              | L5       | 4B4              | R5       |
| 1A5              | C2       | 2A5              | G2       | 3A5              | L2       | 4A5              | R2       |
| 1B5              | C6       | 2B5              | G6       | 3B5              | L6       | 4B5              | R6       |
| 1A6              | C1       | 2A6              | G1       | 3A6              | L1       | 4A6              | R1       |
| 1B6              | D5       | 2B6              | H5       | 3B6              | M5       | 4B6              | T5       |
| 1A7              | D2       | 2A7              | H2       | 3A7              | M2       | 4A7              | T2       |
| 1B7              | D6       | 2B7              | H6       | 3B7              | M6       | 4B7              | T6       |
| 1A8              | D1       | 2A8              | H1       | 3A8              | MI       | 4A8              | T1       |
| 1B8              | D4       | 2B8              | H4       | 3B8              | M4       | 4B8              | T4       |
| 1A9              | D3       | 2A9              | H3       | 3A9              | M3       | 4A9              | T3       |
| 1B9              | C4       | 2B9              | G4       | 3B9              | L4       | 4B9              | R4       |
| NC               | B3       | NC               | F3       | NC               | K3       | NC               | P3       |
| $\overline{1BE}$ | A4       | $\overline{2BE}$ | E4       | $\overline{3BE}$ | J4       | $\overline{4BE}$ | N4       |
| 1VCC             | B4       | 2VCC             | F4       | 3VCC             | K4       | 4VCC             | P4       |
| 1GND             | C3       | 2GND             | G3       | 3GND             | L3       | 4GND             | R3       |

**Product Pinout [LFBGA(N96) Package]**

|          | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b>                 | <b>5</b> | <b>6</b> |
|----------|----------|----------|----------|--------------------------|----------|----------|
| <b>A</b> | 1A2      | 1A1      | 1A0      | 1 $\overline{\text{BE}}$ | 1B0      | 1B1      |
| <b>B</b> | 1A4      | 1A3      | NC       | 1VCC                     | 1B2      | 1B3      |
| <b>C</b> | 1A6      | 1A5      | 1GND     | 1B9                      | 1B4      | 1B5      |
| <b>D</b> | 1A8      | 1A7      | 1A9      | 1B8                      | 1B6      | 1B7      |
| <b>E</b> | 2A2      | 2A1      | 2A0      | 2 $\overline{\text{BE}}$ | 2B0      | 2B1      |
| <b>F</b> | 2A4      | 2A3      | NC       | 2VCC                     | 2B2      | 2B3      |
| <b>G</b> | 2A6      | 2A5      | 2GND     | 2B9                      | 2B4      | 2B5      |
| <b>H</b> | 2A8      | 2A7      | 2A9      | 2B8                      | 2B6      | 2B7      |
| <b>J</b> | 3A2      | 3A1      | 3A0      | 3 $\overline{\text{BE}}$ | 3B0      | 3B1      |
| <b>K</b> | 3A4      | 3A3      | NC       | 3VCC                     | 3B2      | 3B3      |
| <b>L</b> | 3A6      | 3A5      | 3GND     | 3B9                      | 3B4      | 3B5      |
| <b>M</b> | 3A8      | 3A7      | 3A9      | 3B8                      | 3B6      | 3B7      |
| <b>N</b> | 4A2      | 4A1      | 4A0      | 4 $\overline{\text{BE}}$ | 4B0      | 4B1      |
| <b>P</b> | 4A4      | 4A3      | NC       | 4VCC                     | 4B2      | 4B3      |
| <b>R</b> | 4A6      | 4A5      | 4GND     | 4B9                      | 4B4      | 4B5      |
| <b>T</b> | 4A8      | 4A7      | 4A9      | 4B8                      | 4B6      | 4B7      |

**Product Pin Assignment (Top View)**

### Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

|   |                 |
|---|-----------------|
| Storage Temperature .....   | -65°C to +150°C |
| Ambient Temperature with Power Applied .....                            | -40°C to +85°C  |
| Supply Voltage to Ground Potential (Inputs & V <sub>CC</sub> Only) .... | -0.5V to +4.6V  |
| Supply Voltage to Ground Potential (Outputs & D/O Only) .               | -0.5V to +4.6V  |
| DC Input Voltage .....  | -0.5V to +4.6V  |
| DC Output Current .....   | 120mA           |
| Power Dissipation .....   | 0.5W            |

**Note:**

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### DC Electrical Characteristics (Over the Operating Range, T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 3.3V ±10%)

| Parameters       | Description                         | Test Conditions <sup>(1)</sup>   | Min. | Typ <sup>(2)</sup> | Max.    | Units |
|------------------|-------------------------------------|--|------|--------------------|---------|-------|
| V <sub>IH</sub>  | Input HIGH Voltage                  | Guaranteed Logic HIGH Level  | 2.0  |                    |         | V     |
| V <sub>IL</sub>  | Input LOW Voltage                   | Guaranteed Logic LOW Level   | -0.5 |                    | 0.8     |       |
| I <sub>IH</sub>  | Input HIGH Current                  | V <sub>CC</sub> = Max., V <sub>IN</sub> = V <sub>CC</sub>  |      |                    | ±1      | μA    |
| I <sub>IL</sub>  | Input LOW Current                   | V <sub>CC</sub> = Max., V <sub>IN</sub> = GND  |      |                    | ±1      |       |
| I <sub>OZH</sub> | High Impedance Output Current       | 0 ≤ A, B ≤ V <sub>CC</sub>   |      |                    | ±1      |       |
| V <sub>IK</sub>  | Clamp Diode Voltage                 | V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA  |      | -0.73              | -1.2    | V     |
| R <sub>ON</sub>  | Switch On Resistance <sup>(4)</sup> | V <sub>CC</sub> = Min., V <sub>IN</sub> = 0.0V, I <sub>ON</sub> = 48mA<br>V <sub>CC</sub> = Min., V <sub>IN</sub> = 2.4V, I <sub>ON</sub> = 15mA |      | 5<br>10            | 7<br>15 | Ω     |

### Capacitance (T<sub>A</sub> = 25°C, f = 1 MHz)

| Parameters <sup>(5)</sup> | Description                 | Test Conditions      | Typ. | Units |
|---------------------------|-----------------------------|----------------------|------|-------|
| C <sub>IN</sub>           | Input Capacitance           | V <sub>IN</sub> = 0V | 3.5  | pF    |
| C <sub>OFF</sub>          | A/B Capacitance, Switch Off | V <sub>IN</sub> = 0V | 5.0  |       |
| C <sub>ON</sub>           | A/B Capacitance, Switch On  | V <sub>IN</sub> = 0V | 10.0 |       |

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 3.3V, T<sub>A</sub> = 25°C ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- Measured by the voltage drop between A and B pin at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (A,B) pins.
- This parameter is determined by device characterization but is not production tested.

### Power Supply Characteristics

| Parameters       | Description                         | Test Conditions <sup>(1)</sup> |  | Min. | Typ <sup>(2)</sup> | Max. | Units |
|------------------|-------------------------------------|--------------------------------|--|------|--------------------|------|-------|
| I <sub>CC</sub>  | Quiescent Power Supply Current      | V <sub>CC</sub> = Max.         | V <sub>IN</sub> = GND or V <sub>CC</sub> |      | 260                | 500  | μA    |
| ΔI <sub>CC</sub> | Supply Current per Input @ TTL HIGH | V <sub>CC</sub> = Max.         | V <sub>IN</sub> = 3.0V <sup>(3)</sup>    |      |                    | 750  |       |

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient.
3. Per TTL driven input (control input only); A and B pins do not contribute to I<sub>CC</sub>.
4. This current applies to the control inputs only and represent the current required to switch internal capacitance at the specified frequency. The A and B inputs generate no significant AC or DC currents as they transition. This parameter is not tested, but is guaranteed by design.

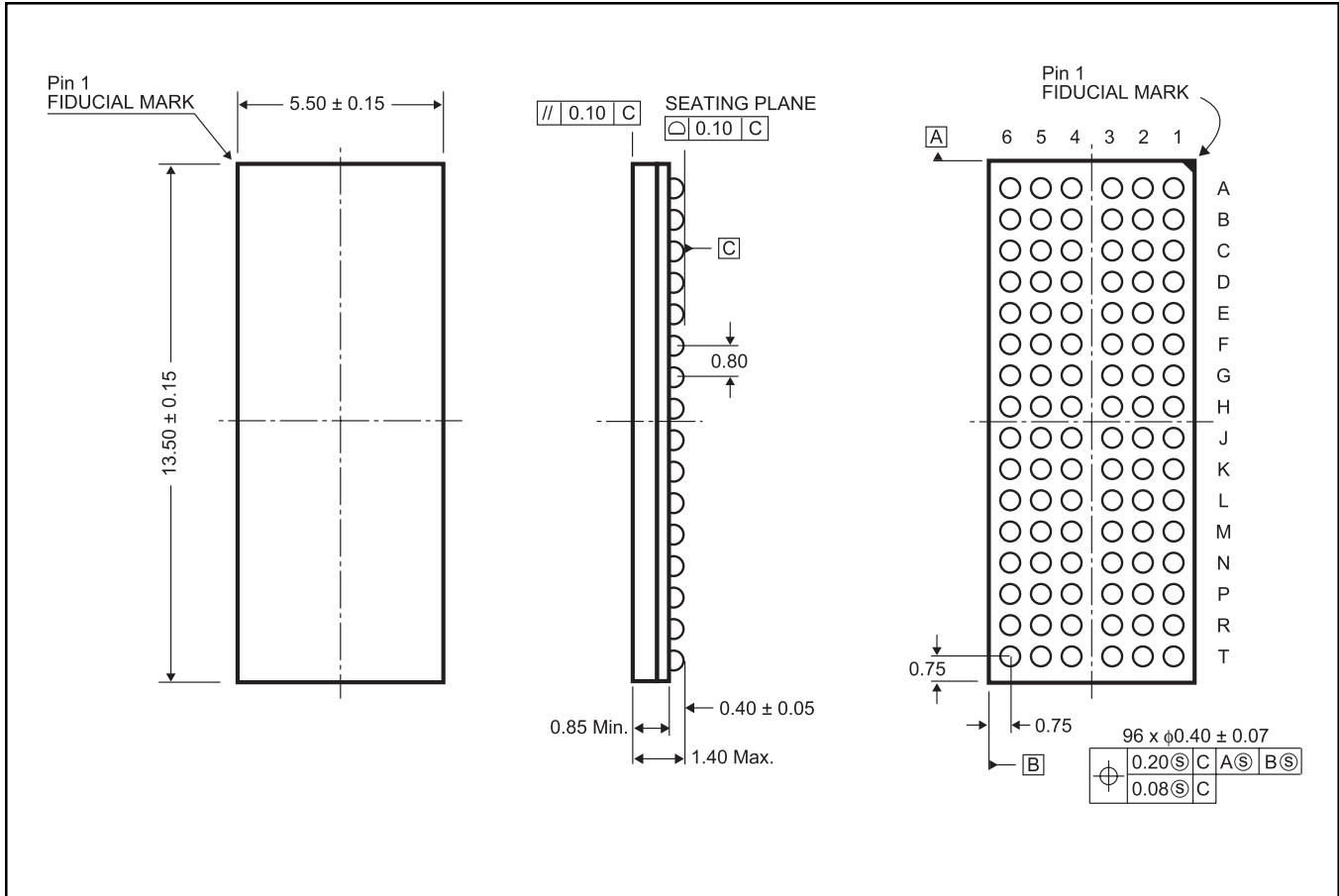
### Switching Characteristics over Operating Range

|                                      |  |  | PI3C34X461 |      |       |
|--------------------------------------|--|--|------------|------|-------|
|                                      |  |  | Com.       |      |       |
| Parameters                           | Description  | Conditions                                   | Min.       | Max. | Units |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay <sup>(2,3)</sup><br>Ax to Bx, Bx to Ax | C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω |            | 0.25 | ns    |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Bus Enable Time<br>BE to Ax or Bx                        |  | 1.5        | 6.5  |       |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Bus Disable Time<br>BE to Ax or Bx                       |  | 1.5        | 5.5  |       |

**Notes:**

1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagational delay other than the RC delay of the ON resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 50pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

**96-Pin LFBGA (NB) Package**



**Ordering Information**

| Part         | Pin - Package   | Dimensions     | Ball Pitch |
|--------------|-----------------|----------------|------------|
| PI5C34X461NB | 96 - LFBGA (NB) | 5.5mm x 13.5mm | 0.8mm      |

**Applications Information**

**Logic Inputs**

The logic control inputs can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply, the output enables or select pins may be driven LOW to 0V and HIGH to 3.6V. Driving IN Rail-to-Rail<sup>®</sup> minimizes power consumption.

**Power Supply Sequencing**

Proper power-supply sequencing is advised for all CMOS devices. It is recommended to always apply  $V_{CC}$  before applying signals to the input/output or control pins.