# PERICOM

## PI3B32160

## 3.3V, Low Capacitance 16-Bit to 32-Bit, Demux PCI Hot Plug Bus Switch with Precharged Outputs for Live Insertion

## Product Features

- $R_{ON}$ is 5Ω typical
- Pullup on B1 and B2 ports
- Low Power: 50μW typical
- Industrial Operation Temperature: –40ºC to +85ºC
- Near Zero propagation delay
- Switching speed: 4.5ns max.
- Channel on capacitance: 14pF max.
- $V_{CC}$ Operating Range: 3V to +3.6V
- Package available: 56-pin TSSOP (A)

## Logic Block Diagram
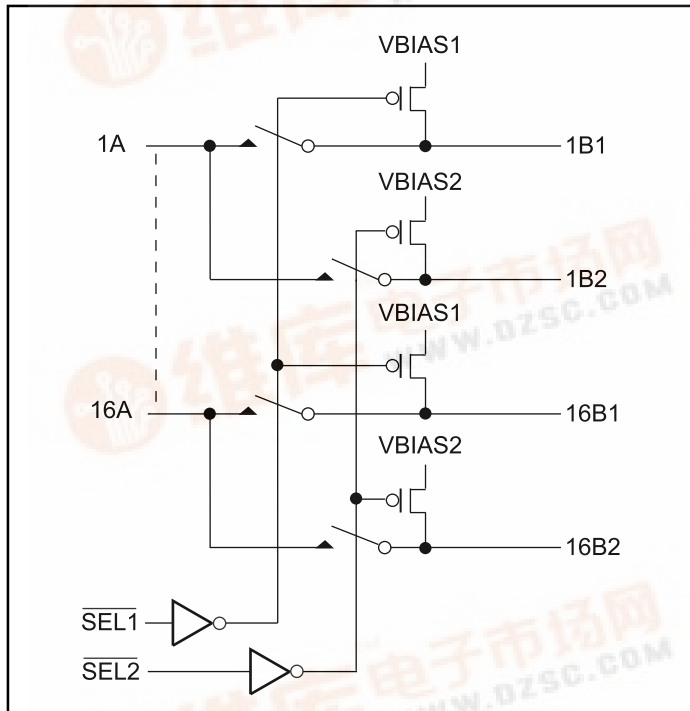


| Function | $\overline{SEL1}$ | $\overline{SEL2}$ |
|---|---|---|
| nA to nB1 | L | H |
| nA to nB2 | H | L |
| nA to nB1 and nB2 | L | L |
| nB1, nB2 = VBIAS | H | H |

## Product Description

Pericom Semiconductor's PI3B series of logic circuits are produced using the Company's advanced submicron CMOS technology, achieving industry leading performance.

The PI3B32160 is a 16-bit to 32-bit demultiplexer bus switch. Industry leading advantages include a propagation delay of 250ps, resulting from 5Ω channel resistance and low I/O capacitance. A port demultiplexes to either 1B and 2B or to both. The switch is bidirectional.

## Application

Provides PCI Hot Plugging

## Logic Inputs

The logic cotrol inputs can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply. IN may be driven low to 0V and high to 3.6V. Driving IN Rail-to-Rail minimizes power consumption.

## Power-Supply Sequencing and Overvoltage Protection

**Caution:** Do not exceed the absolute maximum ratings because stresses beyond the listed ratings may cause permanent damage to the device.

Proper power-supply sequencing is recommended for all CMOS devices. Always apply $V_{CC}$ before applying $V_{BIAS}$ and signals to the input/output pins.

## Pin Description

## 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 & $V_{CC}$ Only) ... −0.3V 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, $T_A$ = −40°C to +85°C, $V_{CC}$ = 3.3V ±10%, VBIAS = 1.3V to $V_{CC}$)

| Parameters | Description | Test Conditions[1] | Min. | Typ.[2] | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{IH}$ | Input HIGH Voltage | Guaranteed Logic HIGH Level | 2.0 | — | — | V |
| $V_{IL}$ | Input LOW Voltage | Guaranteed Logic LOW Level | −0.5 | — | 0.8 | |
| $I_{IH}$ | Input HIGH Current | $V_{CC}$ = Max., $V_{IN}$ = $V_{CC}$ | — | — | ±1 | |
| $I_{IL}$ | Input LOW Current | $V_{CC}$ = Max., $V_{IN}$ = GND | — | — | ±1 | μA |
| $I_{OZH}$ | High Impedance Output Current | A = 0V or $V_{CC}$ max., VBIAS1 = VBIAS2 = $V_{CC}$ max. | — | — | +1 | |
| $V_{IK}$ | Clamp Diode Voltage | $V_{CC}$ = Min., $I_{IN}$ = −18mA | — | −0.9 | −1.8 | V |
| $R_{ON}$ | Switch On Resistance[4] | $V_{CC}$ = Min., $V_{IN}$ = 0.0V, $I_{ON}$ = 48mA | — | 5 | 7 | Ω |
| | | $V_{CC}$ = Min., $V_{IN}$ = 2.4V, $I_{ON}$ = 15mA | — | 9 | 15 | |

## Capacitance ($T_A$ = 25°C, f = 1 MHz)

| Parameters[5] | Description | Test Conditions | Typ. | Max. | Units |
|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{IN}$ = 0V | 2.6 | 3.2 | |
| $C_{OFF}$ | A Capacitance, Switch Off | $V_{IN}$ = 0V | 8.0 | 9.5 | pF |
| $C_{OFF}$ | B Capacitance, Switch Off | $V_{IN}$ = 0V | 4.2 | 4.7 | |
| $C_{ON}$ | A/B Capacitance, Switch On | $V_{IN}$ = 0V | 11 | 14 | |

**Notes:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC}$ = 3.3V, $T_A$ = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time.  Duration of the test should not exceed one second.
4. Measured by the voltage drop between A and B pins at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (A & B) pins.
5. This parameter is determined by device characterization but is not production tested.

## Power Supply Characteristics

| Parameters | Description | Test Conditions[1] | | Min. | Typ.[2] | Max. | Units |
|---|---|---|---|---|---|---|---|
| $I_{CC}$ | Quiescent Power Supply Current | $V_{CC}$ = Max. | $V_{IN}$ = GND or $V_{CC}$ | — | — | 20 | µA |
| $\Delta I_{CC}$ | Supply Current per Input @TTL HIGH | $V_{CC}$ = Max. | $V_{IN}$ = 3.0V[3] other pin = $V_{CC}$ or GND | — | — | 2.5 | mA |
| $I_{CCD}$ | Supply Current per Input per MHz | $V_{CC}$ = Max., A and B Pins Open Control Input Toggling 50% Duty Cycle | | — | — | 0.25 | mA/ MHz |

**Notes:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at $V_{CC}$ = 3.3V, +25°C ambient.
3. Per TTL driven input ($V_{IN}$ = 3.0V, control inputs only); A and B pins do not contribute to $I_{CC}$.
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.
5. Values for these conditions are examples of the $I_{CC}$ formula. These limits are guaranteed but not tested.

## Switching Characteristics over Operating Range

| Parameters | Description | Conditions[1] | PI3B32160 Com. | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay[2,3] A to B | $C_L$=50pF $R_L$= 500Ω | — | 0.25 | — | |
| $t_{PZH}$ $t_{PZL}$ | Bus Enable Time SEL to A,B | | 1.3 | — | 4.5 | ns |
| $t_{PHZ}$ $t_{PLZ}$ | Bus Disable Time SEL to A,B | | 1.3 | — | 4.5 | |

**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.

## 56-Pin TSSOP (A) Package
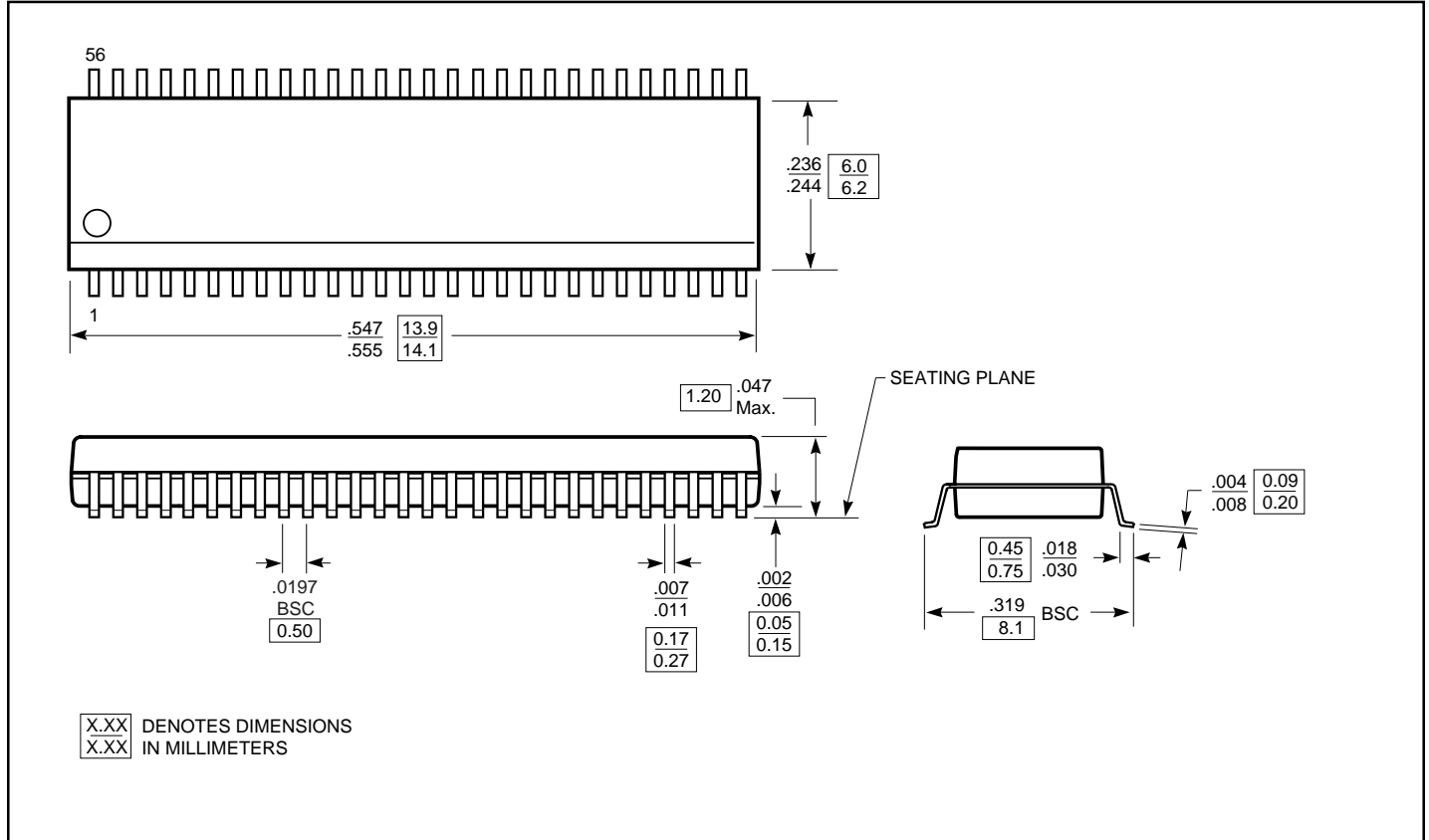


## Ordering Information

| Part | Pin - Package | Width | Temperature |
|------|---------------|-------|-------------|
| PI3B32160A | 56-TSSOP (A56) | 240-mil | −40ºC to +85ºC |

## 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, IN may be driven low to 0V and high to 3.6V. Driving IN Rail-to-Rail® minimizes power consumption.

### Power-Supply Sequencing

Proper power-supply sequencing is recommended for all CMOS devices. Always apply $V_{CC}$ before applying signals to the BIAS voltage pin and the input/output or control pins.

*Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd*