# 3.3V, 24-Bit Bus-Exchange Switch

## Product Features

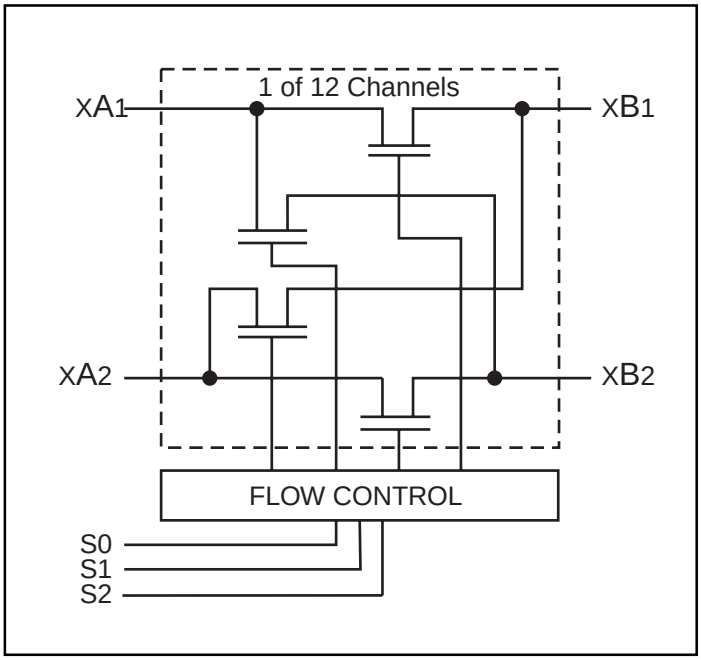
- Near-zero propagation delay
- 5Ω switches connect inputs to outputs
- Direct bus connection when switches are ON
- Fast Switching Speed - 5.5ns max.
- Operating Vcc Range: 3.0V to 3.6V
- Industrial operating temperature: –40°C to +85°C
- Packages available:
  – 56-pin 240-mil wide thin plastic TSSOP (A)
  – 56-pin 300-mil wide plastic SSOP (V)

## Product Description

Pericom Semiconductor's PI3B series of logic circuits are produced in the Company's advanced 0.35 micron CMOS technology.

The PI3B16213 is a 3.3 volt, 24-bit bus-exchange switch designed with a low ON resistance allowing connections to be made with minimal propagation delay. This device operates as a 24-bit or as a 12-bit bus switch, providing data exchange between the four signal ports via the data-select (S0-S2) terminals.

## Logic Block Diagram



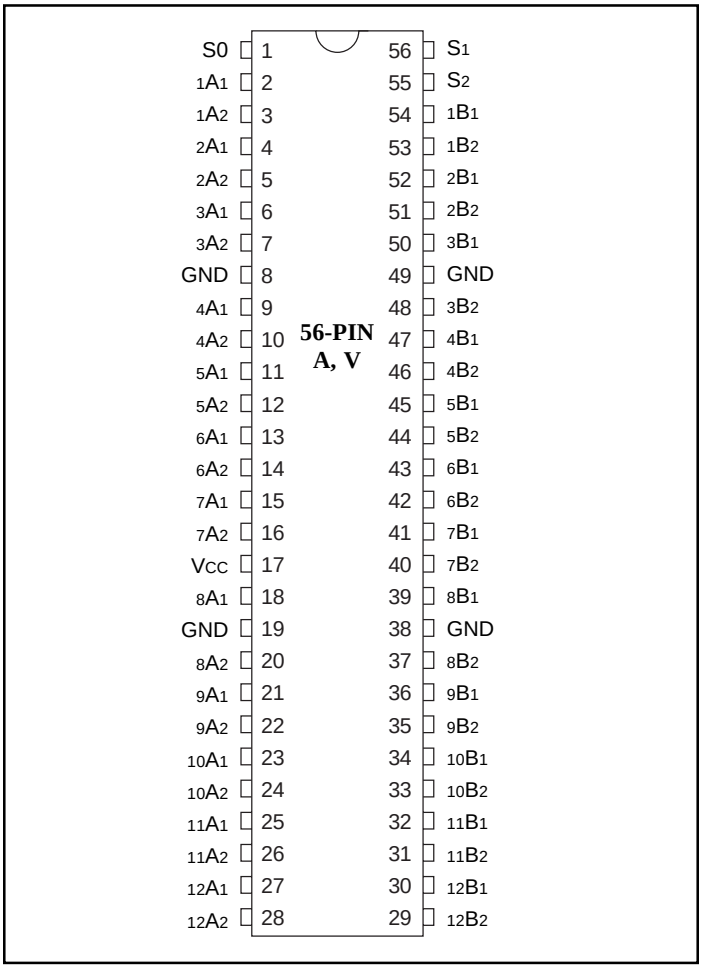

## Truth Table

| Function | S2 | S1 | S0 | A1 | A2 |
|---|---|---|---|---|---|
| Disconnect | L | L | L | Z | Z |
| A1 to B1 | L | L | H | B1 | Z |
| A1 to B2 | L | H | L | B2 | Z |
| A2 to B1 | L | H | H | Z | B1 |
| A2 to B2 | H | L | L | Z | B2 |
| A1 to A2 and B2 | H | L | H | A2/B2 | A1/B2 |
| A1 to B1, A2 to B2 | H | H | L | B1 | B2 |
| A1 to B2, A2 to B1 | H | H | H | B2 | B1 |

**Note:**

1. H = High Voltage Level
   L = Low Voltage Level
   Z = High Impedance

## Product Pin Configuration




## Product Pin Description

| Pin Name | I/O | Description |
|---|---|---|
| S0-S2 | I | Select Inputs |
| xAx | I/O | Bus A |
| xBx | I/O | Bus B |

## 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 Range | –0.5V to +4.60V |
| DC Input Voltage | –0.5V to +4.60V |
| DC Output Current | 120 mA |
| Power Dissipation | 1 W |

**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.

## Electrical Characteristics (Over the Operating Range, $T_A$ = –40°C to +85°C, $V_{CC}$ = 3.0V to 3.6V)

| Parameters | Description | | Test Conditions | | | Min. | Typ(1) | Max. | Units |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IK}$ | Input HIGH Voltage | | $V_{CC}$ = Min. | II = -18mA | | | | -1.2 | V |
| II | Input Current | | $V_{CC}$ = 0 | VI = Max. | | | | 10 | µA |
| | | | $V_{CC}$ = Max. | VI = Max. or GND | | | | ±1 | |
| $I_{CC}$ | Quiescent Power Supply Current | | $V_{CC}$ = Max. IO = 0 | VI =$V_{CC}$ or GND | | | | 10 | |
| $C_{IN}$(2) | Input Capacitance | | Vin = 0V | | | | | 3 | pF |
| $C_{OFF}$(2) | Switch Off, A/B Capacitance | | Vin = 0V; S0,S1,S2 = GND | | | | | 14 | |
| $R_{ON}$(3) | A to B | Vcc = Min. | $V_{CC}$ = Min | VI = 0 | II = 30mA, | | 5 | 8 | Ω |
| | | | | | II = 64mA | | 5 | 8 | |
| | | | | VI = 2.4 V | II = 15mA | | 10 | 15 | |
| | A1 to A2 | Vcc = Min. | $V_{CC}$ = Min | VI = 0 | II = 30mA, | | 10 | 14 | |
| | | | | | II = 64mA | | 10 | 14 | |
| | | | | VI = 2.4 V | II = 15mA | | 20 | 30 | |

**Notes:**
1. Typical values are at Vcc = 3.3V, $T_A$ = 25°C ambient and maximum loading.
2. This parameter is determined by device characterization but is not production tested.
3. 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.

## Recommended Operating Conditions

| Parameters | Description | Min. | Typ(1) | Max. | Units |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | 3.0 | — | 3.6 | V |
| $V_{IH}$ | High-level input voltage | 2 | — | — | |
| $V_{IL}$ | Low-level input voltage | — | — | 0.8 | |
| $T_A$ | Operating free-air temperature | -40 | — | 85 | °C |

**Notes:**
1. Typical values are at Vcc = 3.3V, +25°C ambient.

## PI3B16213 Switching Characteristics over Operating Range

| Parameters | From (INPUT) | To (OUTPUT) | $V_{CC}$ = 3.0 V to 3.6V | | Units |
|---|---|---|---|---|---|
| | | | Min | Max | |
| $t_{PD}$(1,2) | A or B | B or A | | 0.25 | ns |
| | A1 | A2 | | 0.5 | |
| $t_{EN}$(2) | S | A or B | 1 | 4.5 | |
| $t_{DIS}$(2) | S | A or B | 1 | 5.5 | |
| $t_{EN}$(2) | S0 | A1 and A2 | 1 | 4.5 | |
| $t_{DIS}$(2) | S0 | A1 and A2 | 1 | 5.5 | |

**Note:**
1. This parameter is guaranteed but not tested on Propagation Delays. 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.
2. See test circuit and waveforms.