

## 20-Bit, Hot Insertion, BusSwitch with Precharged Outputs & Undershoot Protection

### Product Features

- Undershoot protection up to  $-1.5V$ , 25ns width
- Near zero propagation delay
- 5 Ohm switches connect between two ports
- Fast switching speed: 4.5ns max.
- Permits hot insertion
- Isolation during power-off conditions
- B-Port outputs are precharged by bias voltage to minimize signal distortion during live insertion.
- Package options include:
  - 48-pin 150-mil wide plastic BQSOP (B)
  - 48-pin 240-mil wide plastic TSSOP (A)

### Product Description

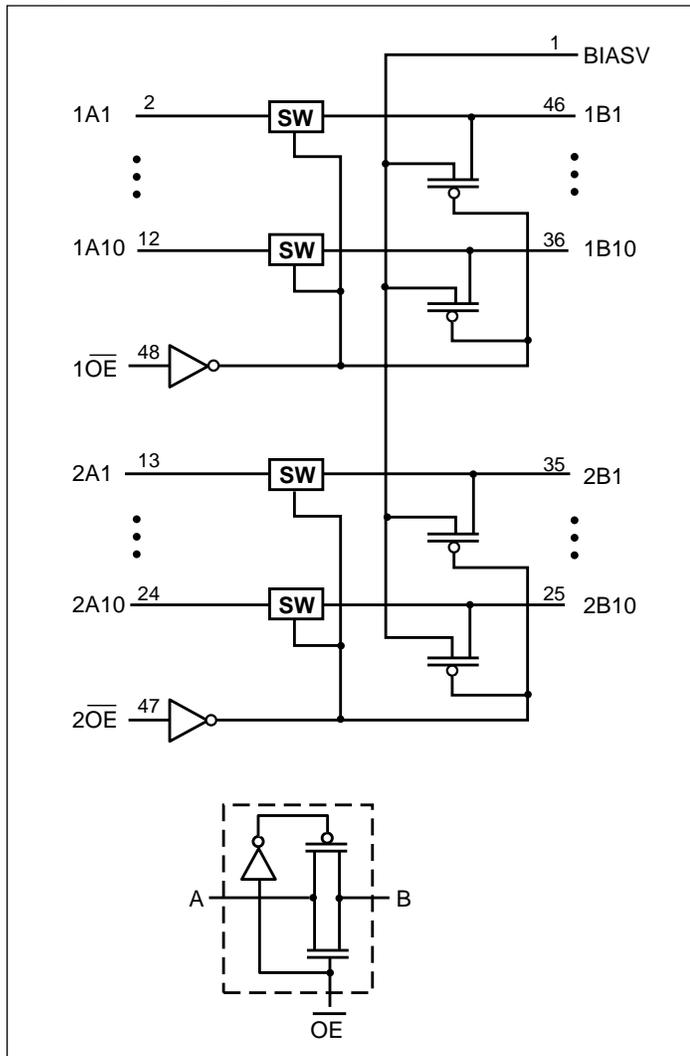
Pericom Semiconductor's PI5C series of logic circuits are produced using the company's advanced submicron CMOS technology.

The PI5C16215C provides 20-bits of high-speed bus switching. The low on-state resistance of the switch allows connections to be made with minimal propagation delay. The device also precharges the B-port to a user-selectable bias voltage (BIASV) to minimize live-insertion noise. The device incorporates an internal charge pump to handle input undershoot of up to  $-1.5V$  and 25ns width.

The device is organized as dual 10-bit bus switches with individual output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the corresponding 10-bit bus switch is on and port A is connected to port B. When  $\overline{OE}$  is high, the switch is open, a high-impedance state exists between the two ports, and port B is precharged to BIASV through the equivalent of a 10-k ohm resistor.

To ensure the high-impedance state on power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver connected to  $\overline{OE}$ .

### Logic Block Diagram



### Product Pin Configuration

|          |    |    |                  |
|----------|----|----|------------------|
| BIASV    | 1  | 48 | $\overline{1OE}$ |
| 1A1      | 2  | 47 | $2OE$            |
| 1A2      | 3  | 46 | 1B1              |
| 1A3      | 4  | 45 | 1B2              |
| 1A4      | 5  | 44 | 1B3              |
| 1A5      | 6  | 43 | 1B4              |
| 1A6      | 7  | 42 | 1B5              |
| GND      | 8  | 41 | GND              |
| 1A7      | 9  | 40 | 1B6              |
| 1A8      | 10 | 39 | 1B7              |
| 1A9      | 11 | 38 | 1B8              |
| 1A10     | 12 | 37 | 1B9              |
| 2A1      | 13 | 36 | 1B10             |
| 2A2      | 14 | 35 | 2B1              |
| $V_{CC}$ | 15 | 34 | 2B2              |
| 2A3      | 16 | 33 | 2B3              |
| GND      | 17 | 32 | GND              |
| 2A4      | 18 | 31 | 2B4              |
| 2A5      | 19 | 30 | 2B5              |
| 2A6      | 20 | 29 | 2B6              |
| 2A7      | 21 | 28 | 2B7              |
| 2A8      | 22 | 27 | 2B8              |
| 2A9      | 23 | 26 | 2B9              |
| 2A10     | 24 | 25 | 2B10             |

**Absolute Maximum Ratings Over Free-Air Temperature Range**

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

|   |                 |
|---|-----------------|
| Storage Temperature .....                                       | -65°C to +150°C |
| Supply Voltage Range .....                                      | -0.5V to +7V    |
| DC Input Voltage <sup>(1)</sup> .....                           | -0.5V to +7V    |
| Input Clamp Current, I <sub>IK</sub> (V <sub>I</sub> < 0) ..... | -50mA           |
| DC Output Current .....   | 120mA           |
| Power Dissipation <sup>(2)</sup> .....                          | 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.

**Notes:**

1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

**Recommended Operating Conditions** (Over Recommended Operating Free-air Temperature Range)

| Parameter       | Description                    | Min. | Max.            | Units |
|-----------------|--------------------------------|------|-----------------|-------|
| V <sub>CC</sub> | Supply voltage                 | 4    | 5.5             | V     |
| BIASV           | Supply voltage                 | 1.3  | V <sub>CC</sub> |       |
| V <sub>IH</sub> | High-Level input voltage       | 2    |                 |       |
| V <sub>IL</sub> | Low-level input voltage        |      | 0.8             |       |
| T <sub>A</sub>  | Operating free-air temperature | -40  | 85              | °C    |

**Electrical Characteristics** (Over Recommended Operating Free-air Temperature Range)

| Parameter                                  | Test Conditions                        |   | Min. | Typ <sup>†</sup> | Max. | Units |
|--|--|---|------|------------------|------|-------|
| V <sub>IK</sub>                            | V <sub>CC</sub> = 4.5V                 | I <sub>I</sub> = -18mA  |      |                  | -1.8 | V     |
| I <sub>I</sub>                             | V <sub>CC</sub> = 5.5V                 | V <sub>I</sub> = 5.5V or GND                                  |      |                  | ±5   | μA    |
| I <sub>O</sub>                             | V <sub>CC</sub> = 4.5V                 | BIASV = 2.4V    V <sub>O</sub> = 0                            | 0.25 |                  |      | mA    |
| I <sub>CC</sub>                            | V <sub>CC</sub> = 5.5V                 | I <sub>O</sub> = 0    V <sub>I</sub> = V <sub>CC</sub> or GND |      |                  | 100  | μA    |
| ΔI <sub>CC</sub> <sup>‡</sup> Control pins | V <sub>CC</sub> = 5.5V                 | One input at 3.4V, Other at V <sub>CC</sub> or GND            |      |                  | 2.5  | mA    |
| C <sub>I</sub> Control pins                | V <sub>I</sub> = 3V or 0               |   |      | 3.5              |      | pF    |
| C <sub>O</sub> (OFF)                       | V <sub>O</sub> = 3V or 0    Switch Off |   |      | 4.5              |      |       |
| r <sub>ON</sub> <sup>*</sup>               | V <sub>CC</sub> = 4V                   | V <sub>I</sub> = 2.4V    I <sub>I</sub> = 15mA                |      | 9                | 20   | ohm   |
|  | V <sub>CC</sub> = 4.5V                 | V <sub>I</sub> = 0,    I <sub>I</sub> = 64mA                  |      | 5.5              | 8    |       |
|  |  | V <sub>I</sub> = 0,    I <sub>I</sub> = 30mA                  |      | 5                | 8    |       |
|  |  | V <sub>I</sub> = 2.4V    I <sub>I</sub> = 15mA                |      | 9                | 15   |       |

**Notes:**

- \* Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.
- ‡ This is the increase in supply current for each input that is at the specified TTL voltage level rather the V<sub>CC</sub> or GND.
- † All typical values are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

### Truth Table

| $\overline{OE}$ | Function                   |
|-----------------|----------------------------|
| L               | A port = B port            |
| H               | A port = Z, B Port = BIASV |

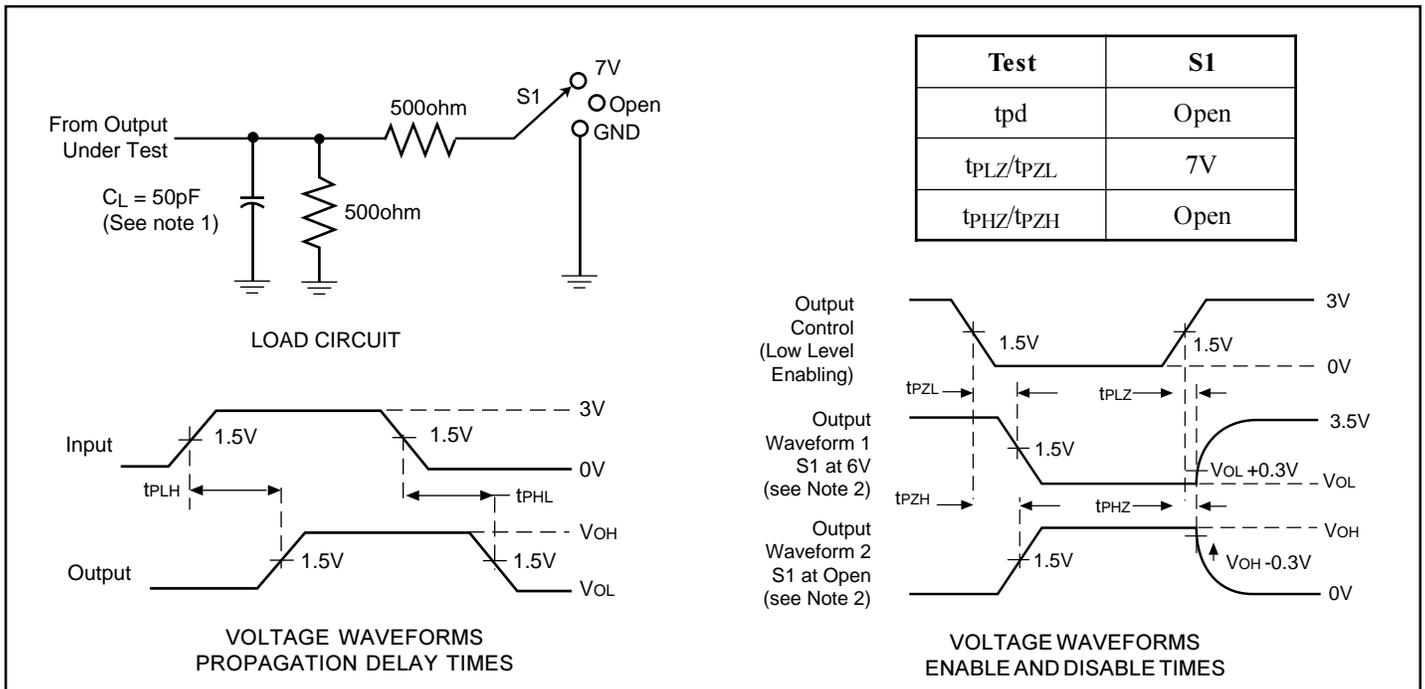
### Switching Characteristics (Over Recommended Operating Free-air Temperature Range, $C_L = 50\text{pF}$ )

| Parameter | Test Conditions | From (Input) | To (Output) | $V_{CC} = 5V \pm 0.5V$ |      | $V_{CC} = 4V$ |      | Units |
|-----------|-----------------|--------------|-------------|------------------------|------|---------------|------|-------|
|           |                 |              |             | Min.                   | Max. | Min.          | Max. |       |
| $t_{PD}$  |                 | A or B       | B or A      |                        | 0.25 |               | 0.25 | ns    |
| $t_{PZH}$ | BIASV = GND     | ON           | A or B      | 3.1                    | 5    |               | 6    |       |
| $t_{PZL}$ | BIASV = 3V      |              |             | 3.0                    | 5    |               | 6    |       |
| $t_{PHZ}$ | BIASV = GND     | ON           | A or B      | 2.0                    | 5    |               | 5.5  |       |
| $t_{PLZ}$ | BIASV = 3V      |              |             | 3                      | 5    |               | 5.5  |       |

#### Notes:

- This parameter is warranted but not production tested. The propagation delay is based on the RC time constant of the typical on-state resistance of the switch and a load capacitance of 50pF, when driven by an ideal voltage source (zero output impedance).

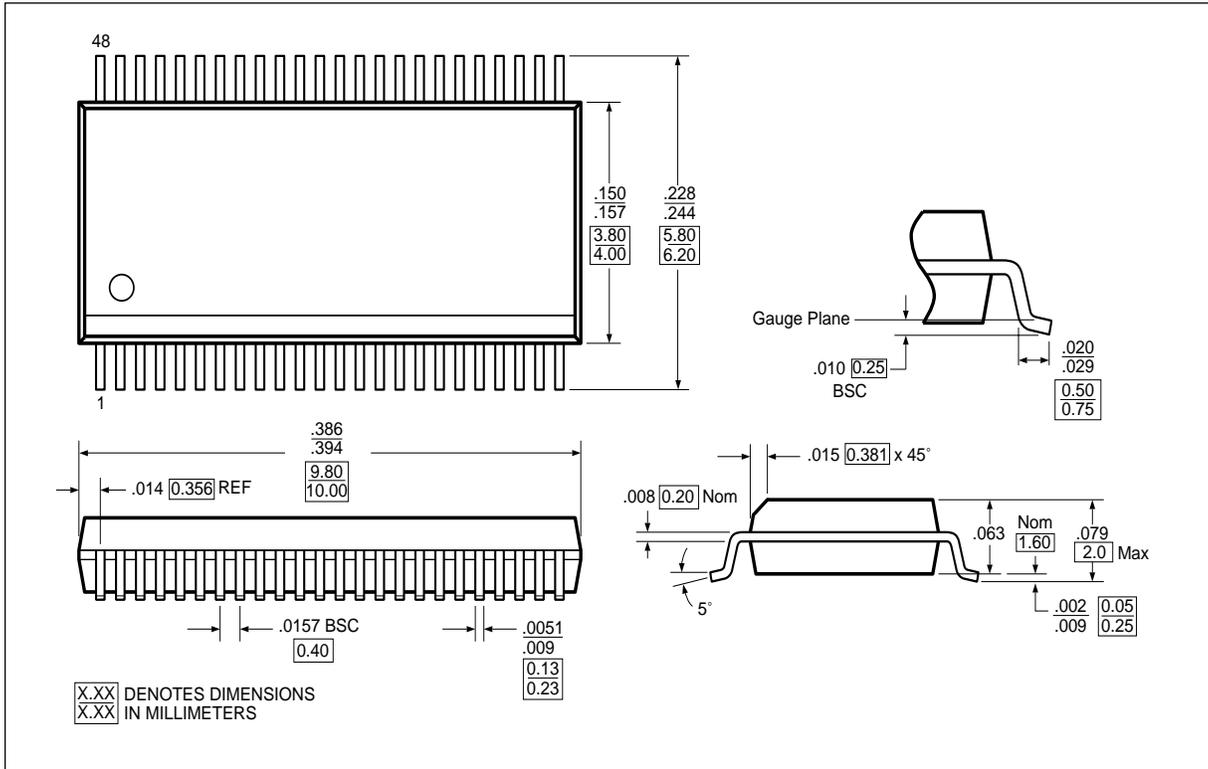
### Parameter Measurements



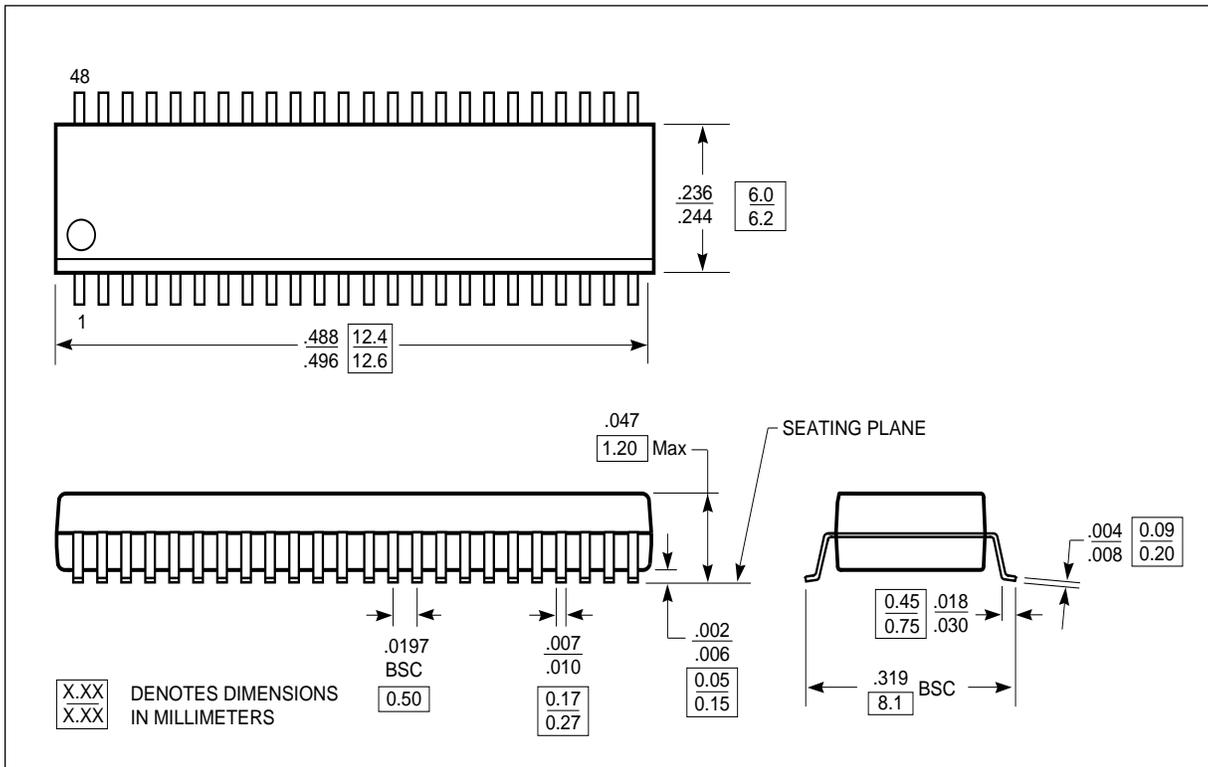
#### Notes:

- $C_L$  includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
- All input pulses are supplied by generators having the following characteristics:  $PRR < 10\text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_r \leq 2.5\text{ns}$ ,  $t_f \leq 2.5\text{ns}$ .
- The outputs are measured one at a time with one transition per measurement.
- $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

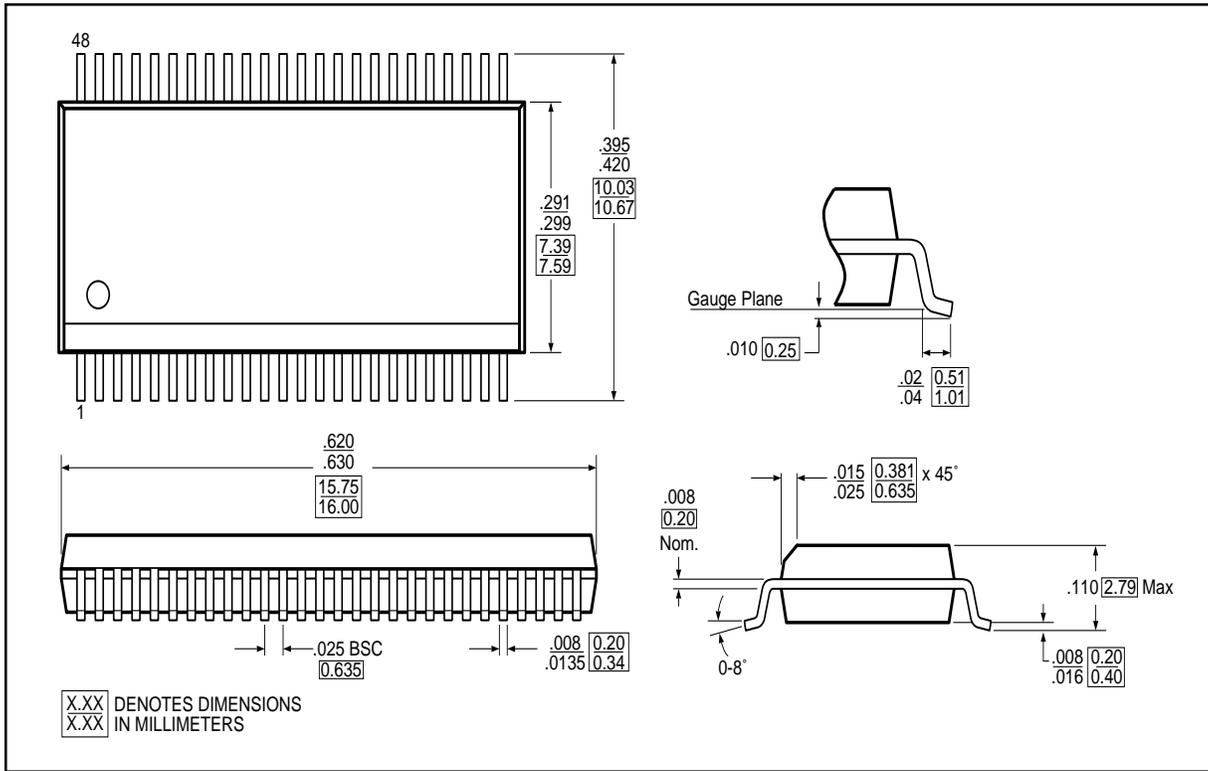
**48-pin BQSOP (B)**



**48-pin TSSOP (A)**



**48-pin SSOP (V)**



**Ordering Information**

| Part        | Pin - Package    | Width   |
|-------------|------------------|---------|
| PI5C16215CB | 48 - BQSOP (B48) | 150-mil |
| PI5C16215CA | 48 - TSSOP (A48) | 240-mil |

**Applications Information**

**Logic Inputs**

The logic control inputs can be driven up to +5.5V regardless of the supply voltage. For example, given a +5.0V supply, IN may be driven low to 0V and high to 5.5V. Driving IN Rail-to-Rail® minimizes power consumption.

**Power-Supply Sequencing**

Proper power-supply sequencing is recommended for all CMOS devices. Always apply V<sub>CC</sub> before applying signals to the bias voltage pin and the input/output or control pins.

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