WINSOURCE ELECTRONICS

THE DATASHEET OF

PI5C16210BE

20-Bit, 2-Port Bus Switch

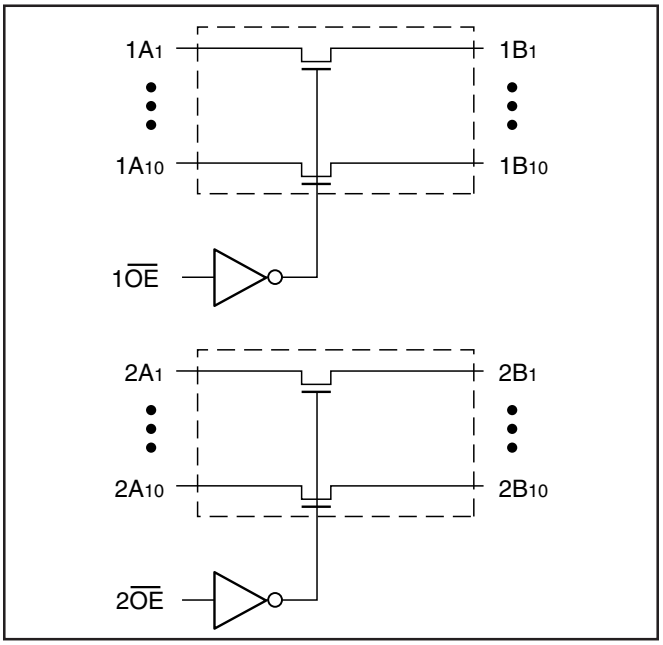
Product Features:

- Near-zero propagation delay
- 5-Ohm switches connect inputs to outputs
- Direct bus connection when switches are ON
- 32X384 function with flow through pinout make board layout easier
- Ultra-low quiescent power (0.5µW typical)
  – ideally suited for notebook applications
- Industrial operating temperature: –40°C to +85°C
- Packaging (Pb-free and Green available):
  – 48-pin 150-mil wide plastic BQSOP (B)
  – 48-pin 173-mil wide plastic TVSOP (K)
  – 48-pin 240-mil wide plastic TSSOP (A)
  – 48-pin 300-mil wide plastic SSOP (V)

Product Description:

The PI5C16210 is configured as 20-bit, 2-port bus switches designed with a low ON resistance (5-Ohm) 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 ($x\overline{OE}$) input signal.

Logic Block Diagram

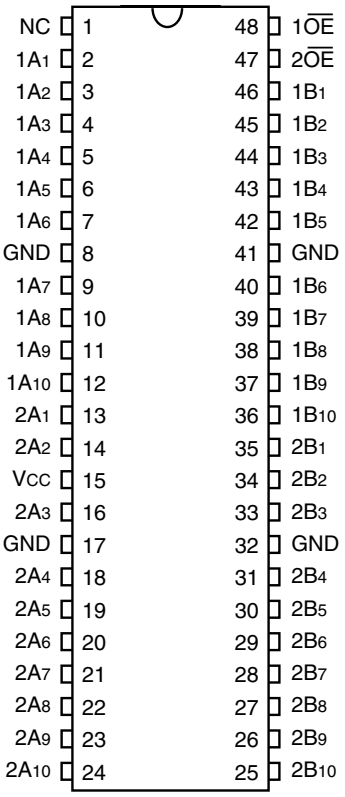


Truth Table[1]

Inputs		Inputs/Outputs	
$1\overline{OE}$	$2\overline{OE}$	1A,1B	2A,2B
L	L	1A = 1B	2A = 2B
L	H	1A = 1B	Z
H	L	Z	2A = 2B
H	H	Z	Z

Note:
1. H = High Voltage Level
   L = Low Voltage Level
   Hi-Z = High Impedance

Product Pin Configuration



Product Pin Description

Pin Name	Description
$1\overline{OE}$, $2\overline{OE}$	Bus Enable Inputs (Active LOW)
1A1-1A10, 2A1-2A10	Bus A
1B1 - 1B10, 2B1 - 2B10	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 to Ground Potential (Inputs & Vcc Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120 mA
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 $+85°C$, $V_{CC} = 4$ to $5.5V$)

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	V
I_I	Input Current	$V_{CC} = 5.5V$., $V_{IN} = 5.5V$ or GND	±1	—	—	µA
		$V_{CC} = 0V$, $V_{IN} = V_{CC}$	—	—	±1	µA
I_{OZH}	High Impedance Output Current	$0 \le A, B \le V_{CC}$	—	—	10	µA
V_{IK}	Clamp Diode Voltage	$V_{CC} = 4.5V$, $I_{IN} = –18$ mA	—	–0.7	–1.2	V
I_{OS}	Short Circuit Current[3]	A (B) = 0V, B (A) = V_{CC}	100	—	—	mA
V_H	Input Hysteresis at Control Pins		—	150	—	mV
R_{ON}	Switch On Resistance[4]	$V_{CC} = 4.5V$, $V_{IN} = 0.0V$, $I_{ON} = 30$ mA, 64 mA	—	5	7	ohm
		$V_{CC} = 4.5V$, $V_{IN} = 2.4V$, $I_{ON} = 15$ mA	—	—	15	ohm
		$V_{CC} = 4$ V, $V_{IN} = 2.4V$, $I_{ON} = 15$ mA	—	14	20	ohm

Capacitance ($T_A = 25°C$, f = 1 MHz)

Parameters[5]	Description	Test Conditions	Typ	Units
C_{IN}	Input Capacitance	$V_{IN} = 0V$ or $3V$	2.4	pF
C_{OFF}	A/B Capacitance, Switch Off	$V_{IN} = 0V$ or $3V$	3.4	pF

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at Vcc = 5.0V, $T_A = 25°C$ 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 pin 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}		0.1	10	µA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.	V_{IN} = 3.4V[3]			2.5	mA
I_{CCD}	Supply Current per Input per MHz[4]	V_{CC} = Max., A and B Pins Open Control Input Toggling 50% Duty Cycle				0.25	mA/ MHz

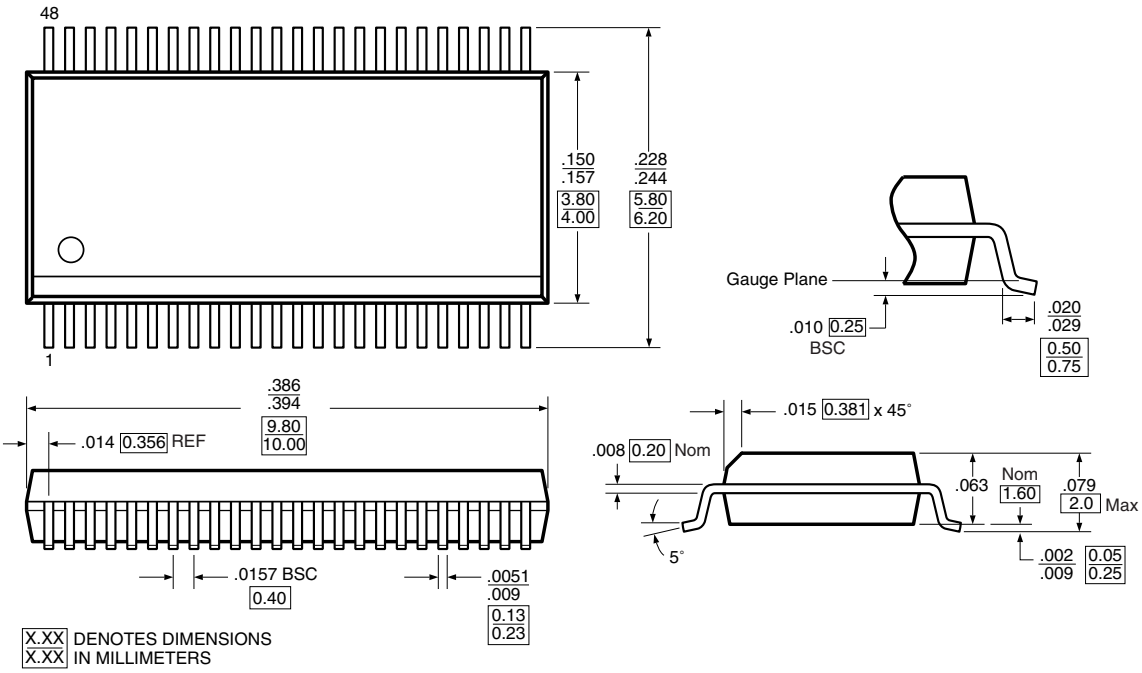
Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V, control inputs only); A and B pins do not contribute to Icc.
4. This current applies 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

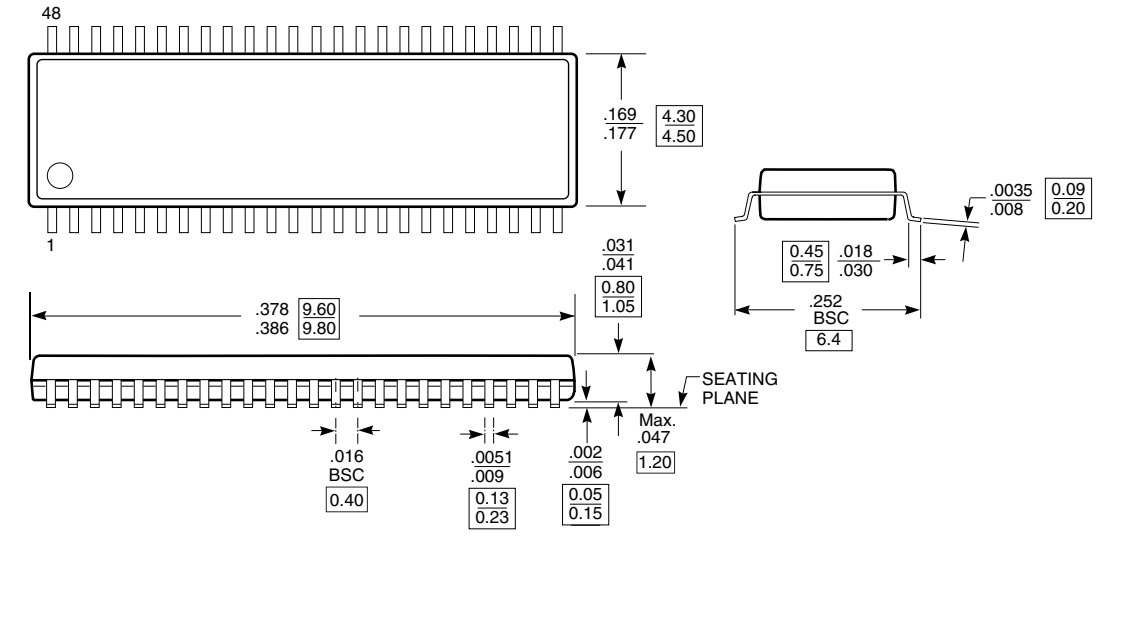
Parameters	Description	Conditions[1]	PI5C16210				Unit
			Vcc = 5V ±0.5V		Vcc = 4V		
			Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay[2,3] Ax to Bx, Bx to Ax	C_L = 50 pF R_L = 500-ohm		0.25		0.25	ns
t_{PZH} t_{PZL}	Bus Enable Time xOE to Ax or Bx		1.5	6.5		6.3	ns
t_{PHZ} t_{PLZ}	Bus Disable Time xOE to Ax or Bx		1.5	5.5		5.5	ns

Notes:
1. See test circuit and wave forms.
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 50 pF 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.

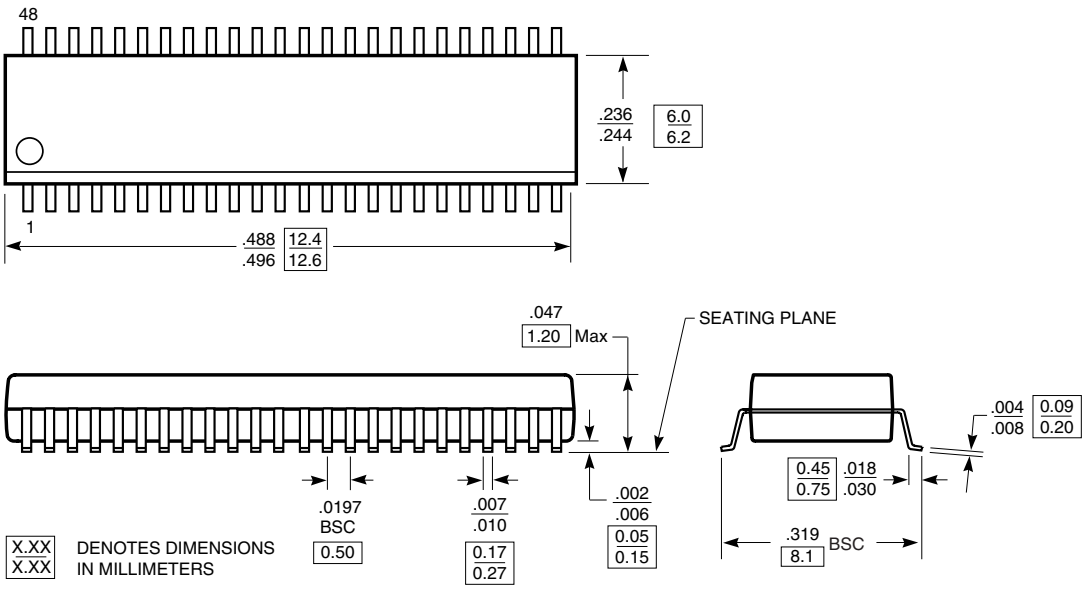
Packaging Mechanical: 48-pin BQSOP (B48)



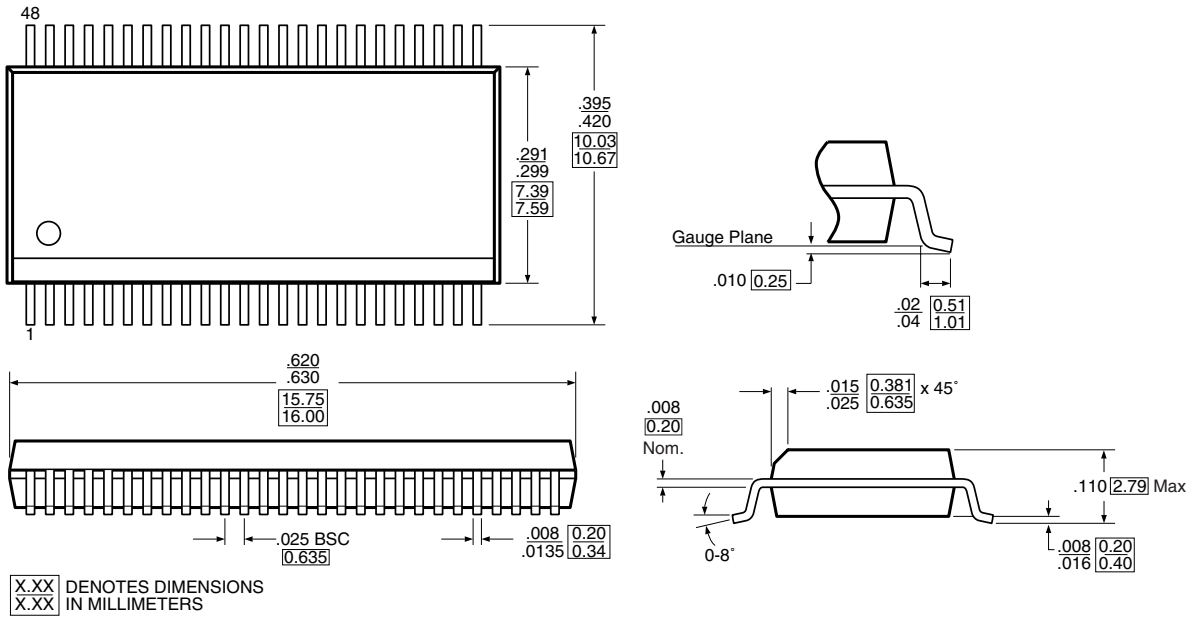
Packaging Mechanical: 48-pin TVSOP (K48)



Packaging Mechanical: 48-pin TSSOP (A48)



Packaging Mechanical: 48-pin SSOP (V48)



Ordering Information

Ordering Code	Package code	Package Type
PI5C16210B	B	48-pin 150-mil wide plastic BQSOP
PI5C16210BE	B	Pb-free and Green, 48-pin 150-mil wide plastic BQSOP
PI5C16210K	K	48-pin 173-mil wide plastic TVSOP
PI5C16210KE	K	Pb-free and Green, 48-pin 173-mil wide plastic TVSOP
PI5C16210A	A	48-pin 240-mil wide plastic TSSOP
PI5C16210AE	A	Pb-free and Green, 48-pin 240-mil wide plastic TSSOP
PI5C16210V	V	48-pin 300-mil wide plastic SSOP
PI5C16210VE	V	Pb-free and Green, 48-pin 300-mil wide plastic SSOP

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