2-Bit Bus Switch with Dual Side Undershoot Protection

Product Features

- R_{ON} is 5-ohms typical
- Undershoot protection up to –2V (data inputs only)
- Industrial Operation Temperature: –40°C to +85°C
- Near zero propagation delay
- Packages available:
  – 8-pin 173 mil wide plastic TSSOP (L)
  – 8-pin 118 mil wide plastic MSOP (U)

Applications

- PCI Hot Plugging for live insertion
- Memory bank sharing

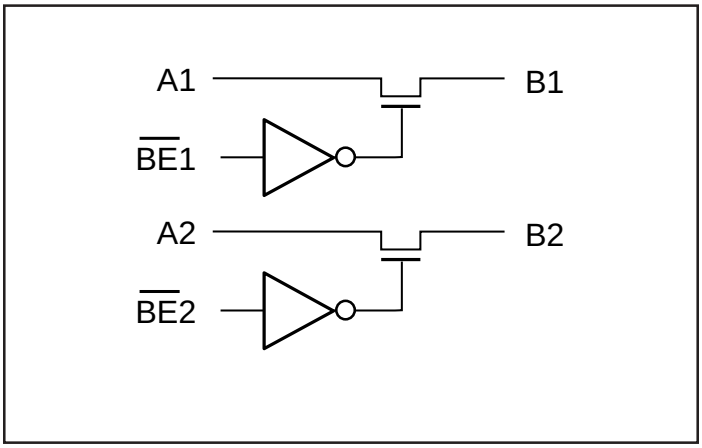
Product Description

Pericom Semiconductor's PI5C series of logic circuits are produced using the Company's advanced submicron CMOS technology, achieving industry leading performance.

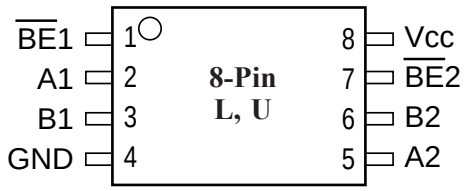
The PI5C3306CD is a 5V, 2-bit Dual Side bus switch. It is intended for PCI Hot-Plug applications. Industry leading advantages include a propagation delay of 250ps that result from its 5-ohm channel resistance and low I/O capacitance. The A-ports switch data to B outputs and are bidirectional. The PI5C3306CD device has active LOW enables.

When the switch is disabled, the A&B ports can handle up to –2V undershoot.

Logic Block Diagram



Product Pin Configuration



Product Pin Description

Pin Name	Description
$\overline{BE}$n	Switch Enable
A2-A1	Bus A
B2-B1	Bus B
V_{CC}	Power
GND	Ground

Truth Table[1]

$\overline{BE}$n	An	Bn	Vcc	Function
X*	Hi-Z	Hi-Z	GND	Disconnect
H	Hi-Z	Hi-Z	VCC	Disconnect
L	Bn	An	VCC	Connect

Notes:

1. H = High Voltage Level
   L = Low Voltage Level
   Hi-Z = High Impedance
   X = Don't Care

* A pull-up resistor should be provided for power-up protection.

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	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} = 4V 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	
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}			±10	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND			±10	
I_{OZH}	High Impedance Output Current	0 ≤ A, B ≤ VCC			±10	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –2mA			–1.8	V
V_{UP}	Undershoot Protection Voltage[4,5]	Max Inputs, Undershoot Pulse Duration <50ns			–2.0	
R_{ON}	Switch On Resistance[3]	V_{CC} = Min., V_{IN} = 0.0V, I_{ON} = 48mA V_{CC} = 4.5V, V_{IN} = 2.4V, I_{ON} = 15mA V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA		5 10 16	7 15 20	ohm

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[4]	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	1.7	pF
C_{OFF}	A/B Capacitance, Switch Off		2.5	
C_{ON}	A/B Capacitance, Switch On		7.7	

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} = 5.0V, T_A = 25°C ambient and maximum loading.
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.
4. This parameter is determined by device characterization but is not production tested.
5. See Parameter Measurements for description of characterization method.

Power Supply Characteristics

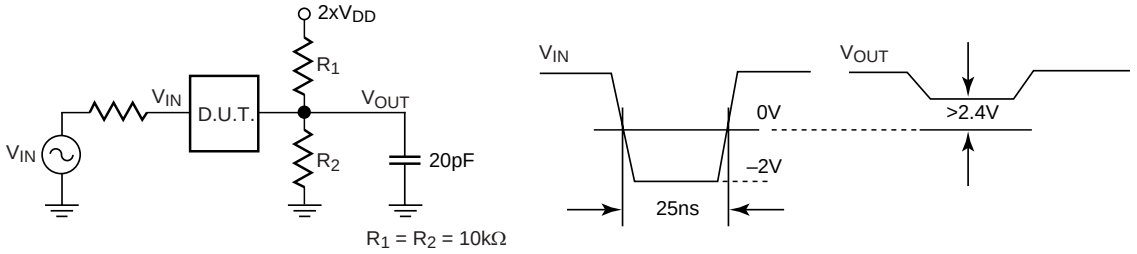
Parameters	Description	Test Conditions(1)		Min.	Typ(2)	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}			75	µA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.	V_{IN} = 3.4V(3)			2.5	mA

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} = 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 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.

PI5C3306CD Switching Characteristics Over Operating Range

Parameters	Description	Conditions	Com		Units
			Min.	Max.	
t_{PLH} / t_{PHL}	Propagation Delay(2,3) A to B, B to A	C_L = 50pF, R_L = 500ohm		0.25	ns
t_{PZH} / t_{PZL}	Bus Enable Time		0.5	6.6	
t_{PHZ} / t_{PLZ}	Bus Disable Time		0.5	6.0	

Parameter Measurements



Undershoot Test Circuit — Undershoot Test Waveforms

Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagation 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 propagation 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.

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, BE, maybe driven LOW to 0V and HIGH to 5.5V. Driving BE Rail-to-Rail® minimizes power consumption.

Power-Supply Sequencing

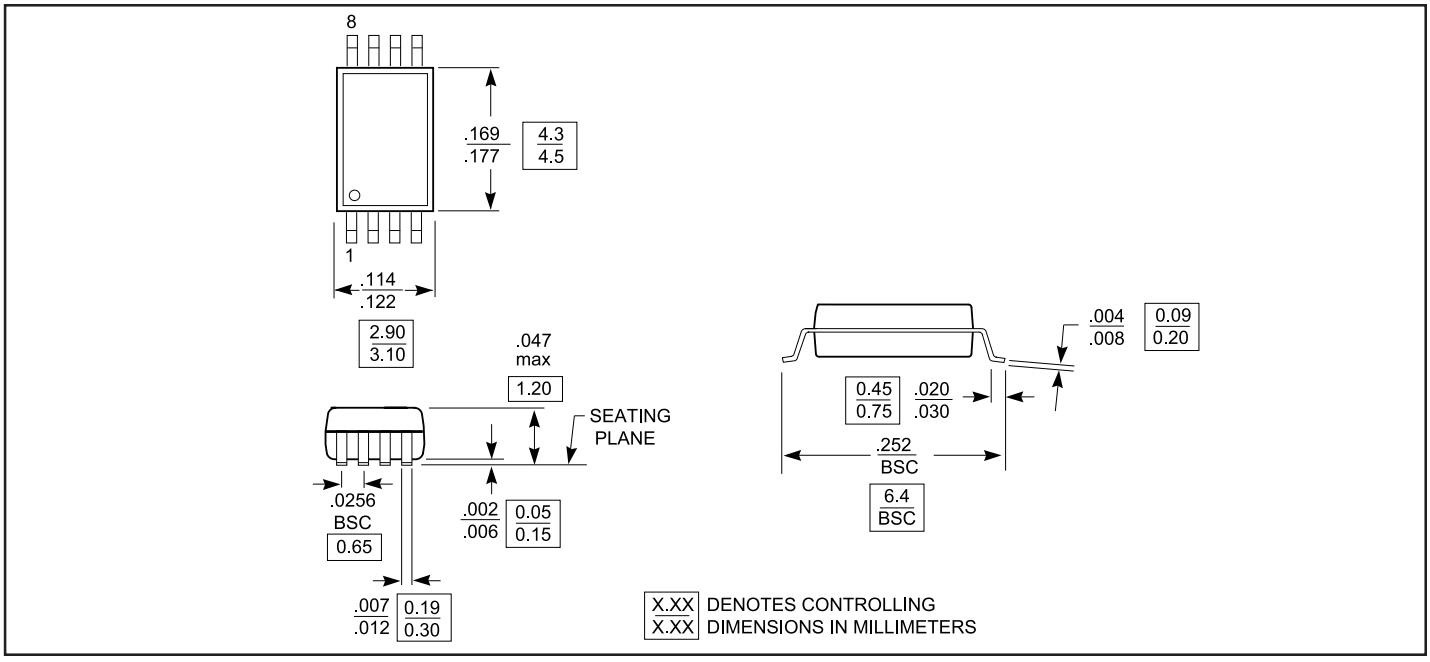
Proper power-supply sequencing is recommended for all CMOS devices. Always apply Vcc before applying signals to the input/output or control pins.

Hot Insertion

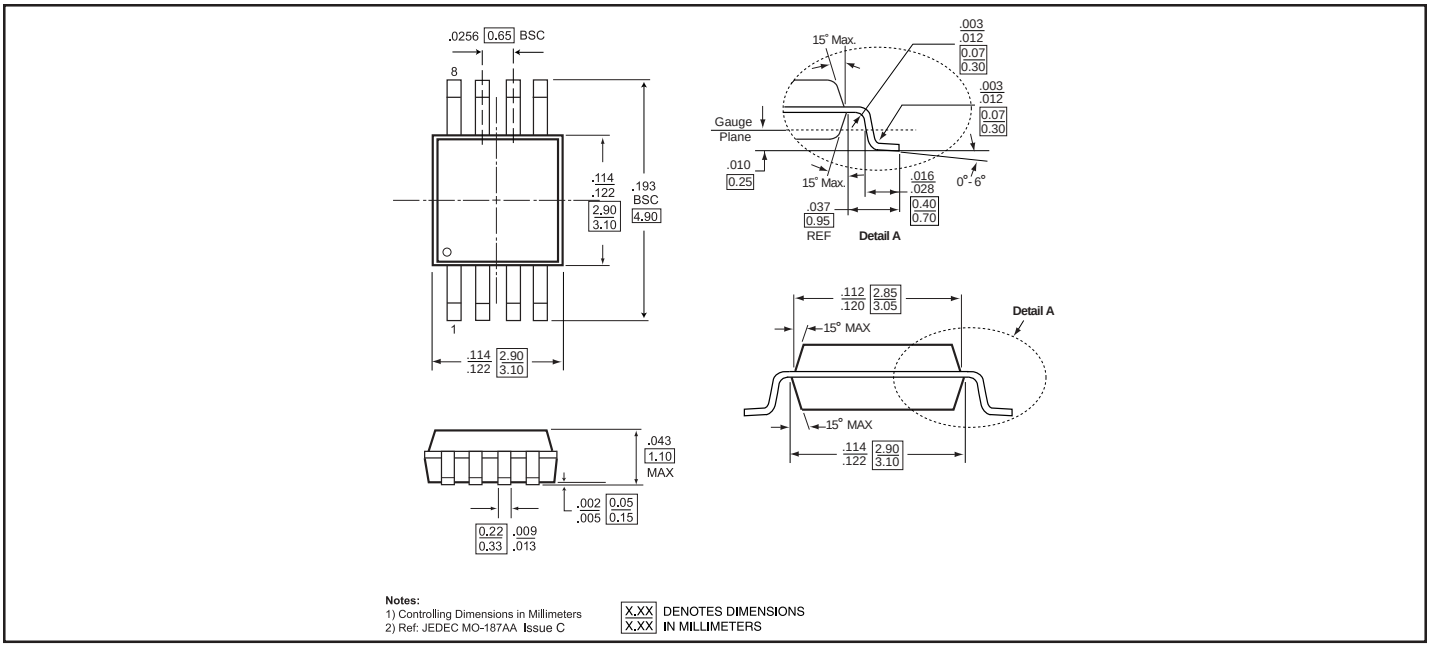
For Datacom and Telecom applications that have ten or more volts passing through the backplane, a high voltage from the power supply may be seen at the device input pins during hot insertion. The PI5Cxxxx devices have maximum limits of 7V and 120mA for 20ns. If the power is higher or applied for a longer time or repeatedly reaches the maximum limits, the device can be damaged.

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

Packaging Mechanical: 8-Pin TSSOP (L)



Packaging Mechanical: 8-Pin MSOP (U)



Thermal Characteristics can be found on the web: http://www.pericom.com/packaging/mechanicals.php

Ordering Information

Part	Pin - Package	Temperature
PI5C3306CDL	8 - TSSOP (L)	–40°C to +85°C
PI5C3306CDU	8 - MSOP (U)	–40°C to +85°C

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