5-Bit, 4-Port Bus Exchange Switch

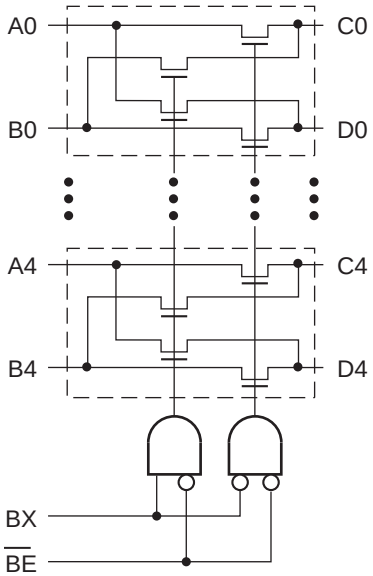
Features

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- Direct bus connection when switches are ON
- Ultra-low quiescent power (0.2µA typical)
  – Ideally suited for notebook applications
- Packaging (Pb-free & Green Available):
  – 24-pin 150-mil wide plastic QSOP (Q)

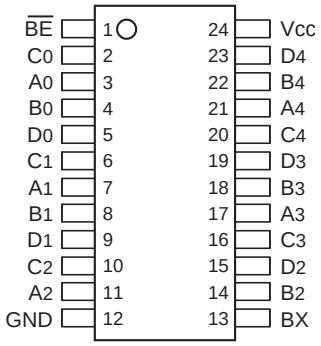
Description

The PI5C3383 is a 5-bit, 4-port bus switch with exchange designed with a low On-Resistance allowing inputs to be connected directly to outputs. The switch creates no additional propagational delay or additional ground bounce noise. The switch is turned ON by the Bus Enable ($\overline{BE}$) input signal, and the Bus Exchange (BX) input signal offers nibble swapping of the AB and CD pairs of signals. This exchange configuration allows byte swapping of buses in systems. It can also be used as a quad 2-to-1 multiplexer and to create low delay barrel shifters, etc.

Block Diagram



Pin Configuration



Truth Table[1]

Function	$\overline{BE}$	BX	A0-A4	B0-B4
Disconnect	H	X	Hi-Z	Hi-Z
Connect	L	L	C0-C4	D0-D4
Exchange	L	H	D0-D4	C0-C4

Note:

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

Pin Description

Pin Name	Description
$\overline{BE}$	Bus Enable Input (Active LOW)
B_X	Bus Exchange Input
A_X	Bus A
B_X	Bus B
C_X	Bus C
D_X	Bus D
GND	Ground
V_{CC}	Power

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)	–0.5V 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} = 5V ±5%)

Parameters	Description	Test Condidtions[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	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND			±1	
I_{OZ}	High Impedance Output Current	0 ≤ A B, CD ≤ V_{CC}			±1	
V_{IK}	Clamp Diode Voltage	V_{CC} =Min., I_{IN} = –18mA			–0.7	–1.2
I_{OS}	Short Circut Current[3]	AB (CD) = 0V, CD (AB) = V_{CC}	100			mA
V_H	Input Hysteresis at Control Pins			150		mV
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		10	15	

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. 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 AB and CD pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (A or B, C or D) pins.

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[1]	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	6	pF
C_{OFF}	AB/CD Capacitance, Switch OFF		8	
C_{ON}	AB/CD Capacitance, Switch ON		14	

Notes:
1. 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	3.0	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. $\overline{AB}$ and CD pins Open $\overline{BE}$ = GND 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, B, C, and D 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, B, C, and D 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	Condidtions	Com			Units
			Min.	Typ.	Max	
t_{PLH} t_{PHL}	Propagation Delay[1,2] Ax to Cx, Bx to Dx	C_L = 50pF R_L = 500Ω		0.25		ns
t_{PZH} t_{PZL}	Bus Enable Time $\overline{BE}$ to Cx or Dx		1.5		6.5	
t_{PHZ} t_{PLZ}	Bus Disable Time $\overline{BE}$ to Cx or Dx		1.5		5.5	
t_{BX}	Bus Exchange Time BX to Cx or Dx		1.5		6.5	

Notes:
1. This parameter is guaranteed but not tested on Propagation Delays.
2. 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.

Applications

Logic Inputs

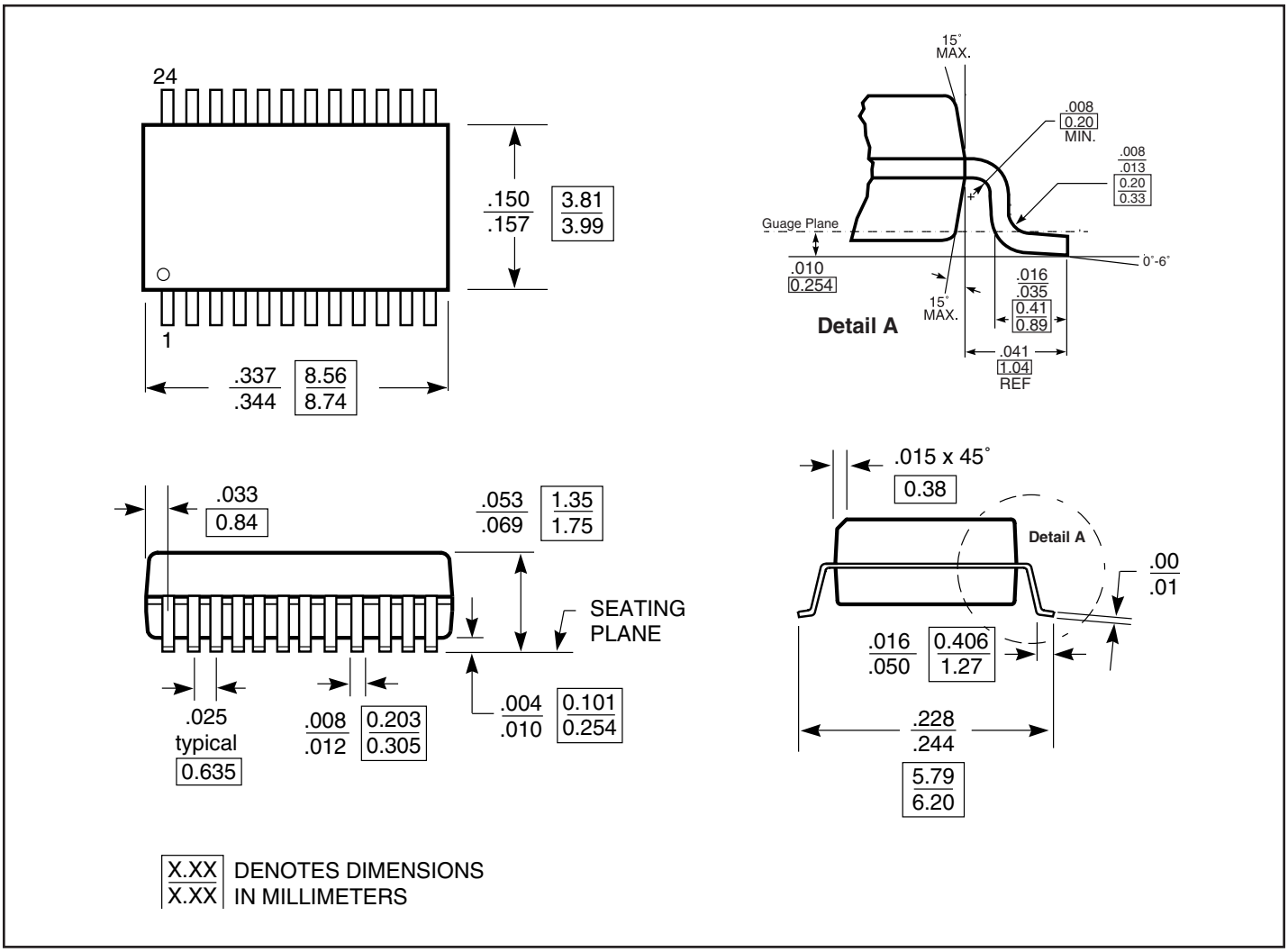
The logic control inputs can be driven up to +5.5V regardless of the supply voltage. For example, given a 5.0V supply, the control or select pins may be driven low to 0V and high to 5.5V. Driving the control or select pins Rail-to-Rail® minimizes power consumption.

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.

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

Packaging Mechanical: 24-Pin QSOP (Q)



Ordering Information

Ordering Code	Packaging Code	Package Description
PI5C3383Q	Q	24-pin 150-mil wide plastic QSOP
PI5C3383QE	Q	Pb-free & Green, 24-pin 150-mil wide plastic QSOP

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel