

### 3.3V, 5-Bit, 4-Port Bus Exchange NanoSwitch™

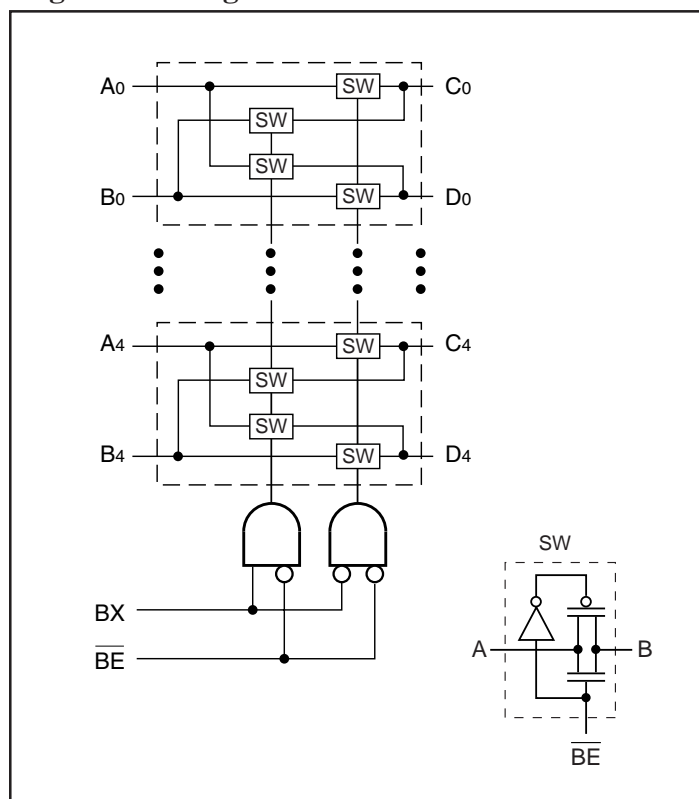
#### Product Features

- Near-zero propagation delay
- 5-ohm switches connect inputs to outputs
- Direct bus connection when switches are ON
- Ultra-low quiescent power (0.1µA typical)
  - Ideally suited for notebook applications
- Packages (Pb Free & Green Available)
  - 24-pin 173-mil wide plastic TSSOP (L)
  - 24-pin 150-mil wide plastic QSOP (Q)

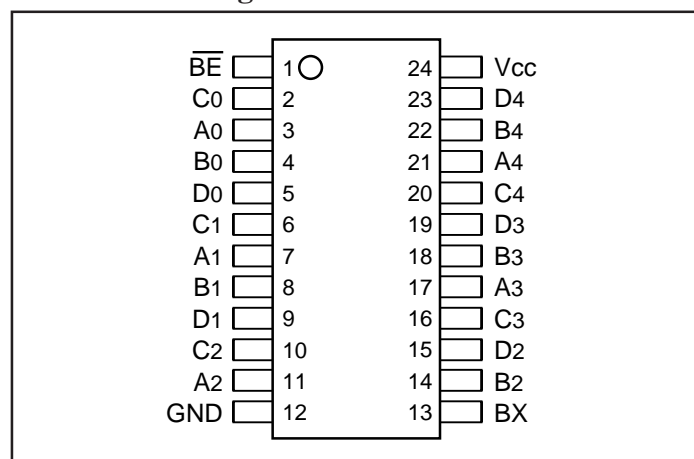
#### Product Description

The PI3B3383 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 bus switch creates no additional propagational delay or additional ground bounce noise. The switches are 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.

#### Logic Block Diagram



#### Product Pin Configuration



#### Product Pin Description

Pin Name	Description
$\overline{BE}$	Bus Enable Input (Active LOW)
BX	Bus Exchange Input
Ax	Bus A
Bx	Bus B
Cx	Bus C
Dx	Bus D
GND	Ground
V <sub>CC</sub>	Power

#### Truth Table<sup>(1)</sup>

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

### 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 .....	-0.5V to +4.6V
DC Input Voltage .....	-0.5V to +4.6V
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, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ , $V_{CC} = 3.3\text{V} \pm 10\%$ )

Parameters	Description	Test Conditions <sup>(1)</sup>	Min.	Typ <sup>(2)</sup>	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	$V_{CC} = \text{Max.}, V_{IN} = V_{CC}$			$\pm 1$	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND}$			$\pm 1$	
$I_{OZH}$	High Impedance Output Current	$0 < \text{AB}, \text{CD} < V_{CC}$			$\pm 1$	
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = M_{IN.}, I_{IN} = -18\text{mA}$		-0.7	-1.2	V
$R_{ON}$	Switch On Resistance <sup>(3)</sup>	$V_{CC} = M_{IN.}, V_{IN} = 0.0\text{V}, I_{ON} = 48\text{mA}$ $V_{CC} = M_{IN.}, V_{IN} = 2.4\text{V}, I_{ON} = 15\text{mA}$		5 10	7 15	$\Omega$

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $T_A = 25^\circ\text{C}$  ambient and maximum loading.
- 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 ( $T_A = 25^\circ\text{C}$ , $f = 1\text{MHz}$ )

Parameters <sup>(1)</sup>	Description	Test Conditions	Typ.	Units
$C_{IN}$	Input Capacitance	$V_{IN} = 0\text{V}$	3.0	pF
$C_{OFF}$	AB/CD Capacitance, Switch Off		12.0	
$C_{ON}$	AB/CD Capacitance, Switch On		24.0	

**Notes:**

- This parameter is determined by device characterization but is not production tested.

### Power Supply Characteristics

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ <sup>(2)</sup>	Max.	Units
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max.	V <sub>IN</sub> = GND or V <sub>CC</sub>		0.1	10	μA
ΔI <sub>CC</sub>	Supply Current per Input@ LVTTL HIGH	V <sub>CC</sub> = Max.	V <sub>IN</sub> = 3.0V <sup>(3)</sup>			750	

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V<sub>CC</sub> = 3.0V, +25°C ambient.
3. Per LVTTL driven input (V<sub>IN</sub> = 2.4V, control inputs only); A, B, C, and D pins do not contribute to I<sub>CC</sub>.

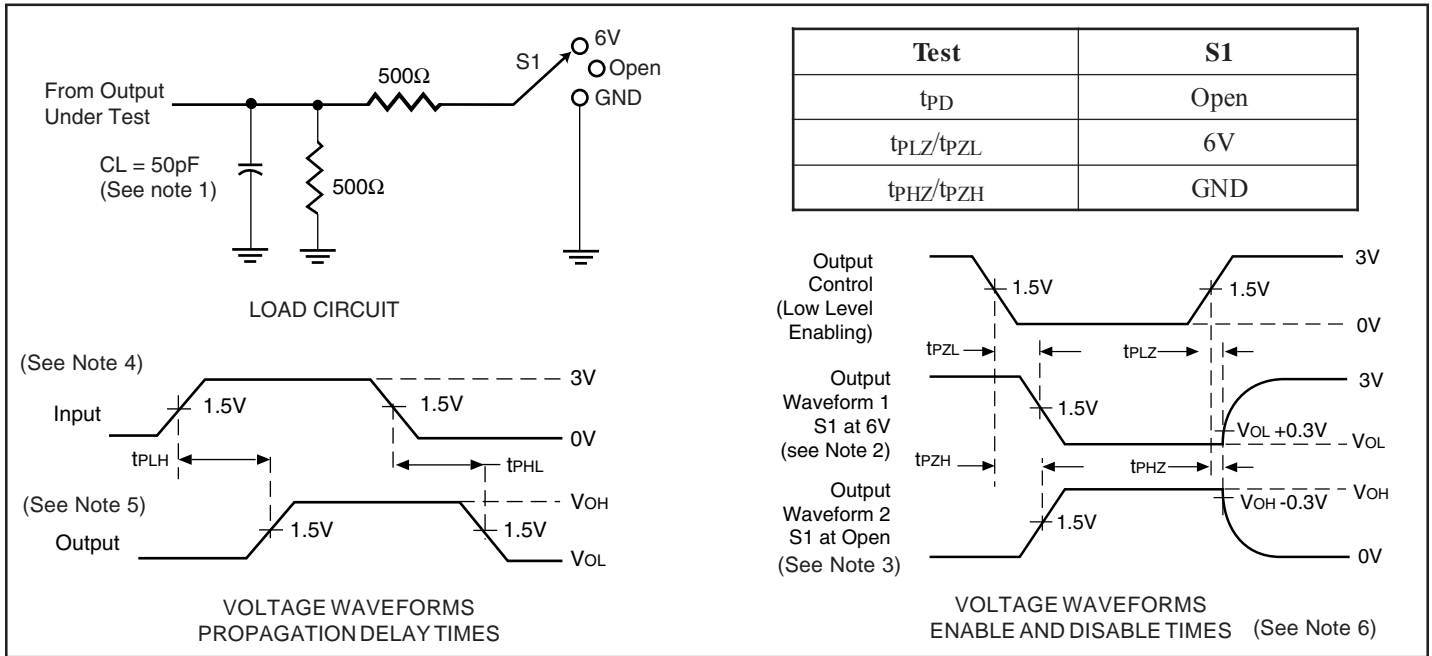
### PI3B3383 Switching Characteristics over Operating Range

Parameters	Description	Conditions <sup>(1)</sup>	Com			Units
			Min.	Typ.	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay <sup>(2,3)</sup> Ax to Cx, Bx to Dx	C <sub>I</sub> = 50pF R <sub>I</sub> = 500Ω		0.25		ns
t <sub>PZH</sub> t <sub>PZL</sub>	Bus Enable Time BE to Cx or Dx		1		4.5	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Bus Disable Time BE to Cx or Dx		1		4.5	
t <sub>BX</sub>	Bus Exchange Time, BX to Cx or Dx		1		4.8	

**Notes:**

1. See test circuit and waveforms.
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 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.

**Parameter Measurements**



**Notes:**

1.  $C_L$  includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
3. Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
4. All input pulses are supplied by generators having the following characteristics: PRR < 10 MHz,  $Z_O = 50\Omega$ ,  $t_r \leq 2.5ns$ ,  $t_f \leq 2.5ns$ .
5. The outputs are measured one at a time with one transition per measurement.
6.  $t_{pLZ}$  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  $t_{pd}$ .

**Packaging Mechanical: 24-Pin TSSOP (L) Package**

