PI5C34X483
PI5C34X2483(25ohm)

40-Bit, 4-Port Bus Exchange Switch

Product Features

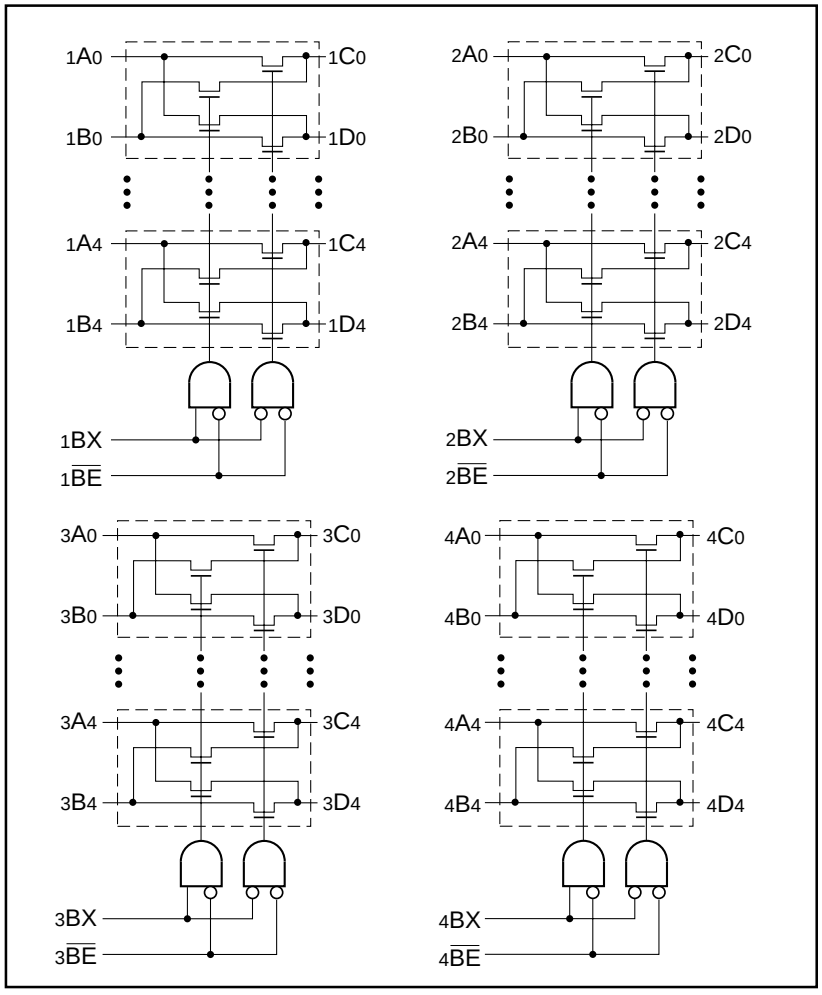
- Near-zero propagation delay
- Low noise, 25ohm version (PI5C34X2483)
- 5ohm switches connect inputs to outputs (PI5C34X483)
- Direct bus connection when switches are ON
- Ultra-low quiescent power (0.2 µA typical) – Ideally suited for notebook applications
- Package available:
  – 96-pin LFBGA (N96)

Product Description

Pericom Semiconductor's PI5C series of logic circuits are produced using the Company's advanced 0.8 micron CMOS technology, achieving industry leading performance.

The PI5C34X483 and PI5C34X2483 are 40-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 four Bus Enable ($_N\overline{BE}$) input signals, and four Bus Exchange (BX) input signals offer nibble swapping of the AB and CD pairs of signals. This exchange configuration allows byte swapping of buses in systems. The PI5C34X2483 is designed with an internal 25ohm resistor reducing noise reflection in high-speed applications.

Logic Block Diagram



Truth Table[1]

Function	$_N\overline{BE}$	$_N$BX	$_N$A0-$_N$A4	$_N$B0-$_N$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

Product Pin Description

Pin Name	Description
$_N$A0 - $_N$A9	Bus A
$_N$B0 - $_N$B9	Bus B
$_N\overline{BE}$	Bus Enable Pins (Active LOW)
$_N$GND	Ground
$_N$V$_{CC}$	Power

Note: N = 1 through 4 for each set of 10-bit buses

Product Pinout by Name

Name	Ball Pad	Name	Ball Pad	Name	Ball Pad	Name	Ball Pad
$_1A_0$	A6	$_2A_0$	E6	$_3A_0$	J6	$_4A_0$	N6
$_1B_0$	A5	$_2B_0$	E5	$_3B_0$	J5	$_4B_0$	N5
$_1C_0$	B5	$_2C_0$	F5	$_3C_0$	K5	$_4C_0$	P5
$_1D_0$	B4	$_2D_0$	F4	$_3D_0$	K4	$_4D_0$	P4
$_1A_1$	A4	$_2A_1$	E4	$_3A_1$	J4	$_4A_1$	N4
$_1B_1$	A3	$_2B_1$	E3	$_3B_1$	J3	$_4B_1$	N3
$_1C_1$	B3	$_2C_1$	F3	$_3C_1$	K3	$_4C_1$	P3
$_1D_1$	A2	$_2D_1$	E2	$_3D_1$	J2	$_4D_1$	N2
$_1A_2$	B2	$_2A_2$	F2	$_3A_2$	K2	$_4A_2$	P2
$_1B_2$	C5	$_2B_2$	G5	$_3B_2$	L5	$_4B_2$	R5
$_1C_2$	A1	$_2C_2$	E1	$_3C_2$	J1	$_4C_2$	N1
$_1D_2$	D1	$_2D_2$	H1	$_3D_2$	M1	$_4D_2$	T1
$_1A_3$	D3	$_2A_3$	H3	$_3A_3$	M3	$_4A_3$	T3
$_1B_3$	D4	$_2B_3$	H4	$_3B_3$	M4	$_4B_3$	T4
$_1C_3$	D2	$_2C_3$	H2	$_3C_3$	M2	$_4C_3$	T2
$_1D_3$	C3	$_2D_3$	G3	$_3D_3$	L3	$_4D_3$	R3
$_1A_4$	D5	$_2A_8$	H5	$_3A_4$	M5	$_4A_4$	T5
$_1B_4$	D6	$_2B_8$	H6	$_3B_4$	M6	$_4B_4$	T6
$_1C_4$	C4	$_2C_4$	G4	$_3C_4$	L4	$_4C_4$	R4
$_1D_4$	C2	$_2D_4$	G2	$_3D_4$	L2	$_4D_4$	R2
$_1\overline{BE}$	B6	$_2\overline{BE}$	F6	$_3\overline{BE}$	K6	$_4\overline{BE}$	P6
$_1BX$	C1	$_2BX$	G1	$_3BX$	L1	$_4BX$	R1
$_1V_{CC}$	C6	$_2V_{CC}$	G6	$_3V_{CC}$	L6	$_4V_{CC}$	R6
$_1GND$	B1	$_2GND$	F1	$_3GND$	K1	$_4GND$	P1

Product Pinout [LFBGA(N96) Package]

	1	2	3	4	5	6
A	1C8	1D1	1B1	1A1	1B0	1A0
B	1GND	1A2	1C1	1D0	1C0	$1\overline{BE}$
C	1BX	$1\overline{D4}$	1D3	1C4	1B2	1VCC
D	1D2	1C3	1A3	1B3	1A4	1B4
E	2C2	2D1	2B1	2A1	2B0	2A0
F	2GND	2A2	2C1	2D0	2C0	$2\overline{BE}$
G	2BX	$2\overline{D4}$	2D3	2C4	2B2	2VCC
H	2D2	2C3	2A3	2B3	2A4	2B4
J	3C2	3D1	3B1	3A1	3B0	3A0
K	3GND	3A2	3C1	3D0	3C0	$3\overline{BE}$
L	3BX	$3\overline{D4}$	3D3	3C4	3B2	3VCC
M	3D2	3C3	3A3	3B3	3A4	3B4
N	4C2	4D1	4B1	4A1	4B0	4A0
P	4GND	4A2	4C1	4D0	4C0	$4\overline{BE}$
R	4BX	$4\overline{D4}$	4D3	4C4	4B2	4VCC
T	4D2	4C3	4A3	4B3	4A4	4B4

Product Pin Assignment (Top View)

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} = 5V ±5%)

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}		—	—	±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND		—	—	±1	
I_{OZH}	High Impedance Output Current	0 ≤ AB, CD ≤ V_{CC}		—	—	±1	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
I_{OS}	Short Circuit 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	PI5C34X483 PI5C34X2483	— 18	5 28	7 40	ohm
		V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA	PI5C34X483 PI5C34X2483	— 18	10 35	15 48	

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters[5]	Description	Test Conditions	Typ	Max.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	3.5		pF
C_{OFF}	AB/CD Capacitance, Switch Off	V_{IN} = 0V	5		
C_{ON}	AB/CD Capacitance, Switch On	V_{IN} = 0V	10		

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 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.
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	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., 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.

PI5C34X483 Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	PI5C34X483 Com Min.	PI5C34X483 Com Typ	PI5C34X483 Com Max.	Units
t_{PLH} t_{PHL}	Propagation Delay[2,3] Ax to Cx, Bx to Dx	C_L = 50 pF R_L = 500ohm	—	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. 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.

PI5C34X2483 Switching Characteristics over Operating Range

Parameters	Description	Conditions[1]	PI5C34X2483 Com Min.	PI5C34X2483 Com Typ	PI5C34X2483 Com Max.	Units
t_{PLH} t_{PHL}	Propagation Delay[2,3] Ax to Cx, Bx to Dx	C_L = 50 pF R_L = 500ohm	—	1.25	—	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. 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.

Ordering Information

Part	Pin - Package	Dimensions
PI5C34X483N	96 - LFBGA (N96)	5.5mm x 13.5mm
PI5C34X2483N	96 - LFBGA (N96)	5.5mm x 13.5mm