3.3V, High Bandwidth, Hot Insertion 40-Bit, 2-Port, Bus Switch

Product Features

- Near-zero propagation delay
- 5-ohm switches connect inputs to outputs
- High Bandwidth (>200 MHz)
- Permits Hot Insertion.
- Rail-to-Rail, 3.3V Switching
- 5V I/O Tolerant
- Packages available:
  – 96-pin Low Profile Fine Pitch Ball Grid Array (NB96)

Applications

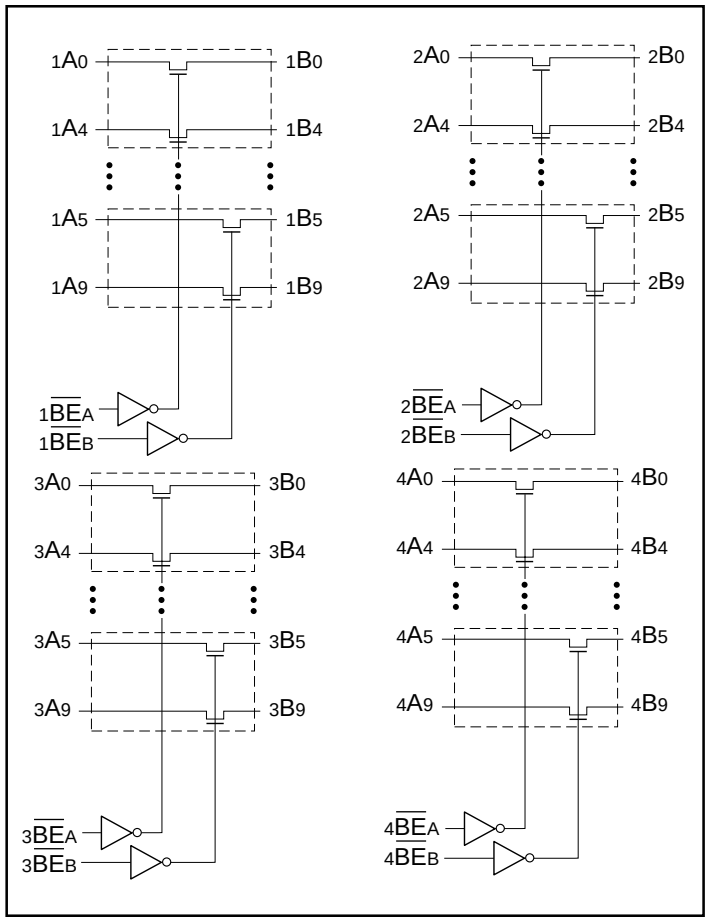
- High Bandwidth Data switching
- Hot Docking

Product Description

Pericom Semiconductor's PI3C series of logic circuits are produced using the Company's advanced submicron CMOS technology, achieving industry leading performance.

The PI3C34X484 is a 3.3 Volt, high-bandwidth 40-bit, 2-port bus switch 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. Eight bus enable signals are provided, one for each of the upper and lower five bits of the four 10-bit buses.

Logic Block Diagram



Product Pin Description

Pin Name	Description
NA0 - NA9	Bus A
NB0 - NB9	Bus B
N$\overline{BE}$A, N$\overline{BE}$B	Bus Enable Pins (Active LOW)
NGND	Ground
NVCC	Power

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

Truth Table(1)

Function	N$\overline{BE}$A	N$\overline{BE}$B	B0– B4	B5– B9
Disconnect	H	H	Hi-Z	Hi-Z
Connect	L	H	A0–A4	Hi-Z
Connect	H	L	Hi-Z	A5–A9
Connect	L	L	A0–A4	A5–A9

Note:

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

Product Pinout by Name

Name	Ball Pad	Name	Ball Pad	Name	Ball Pad	Name	Ball Pad
$1A_0$	A2	$2A_0$	E2	$3A_0$	J2	$4A_0$	N2
$1B_0$	A3	$2B_0$	E3	$3B_0$	J3	$4B_0$	N3
$1A_1$	A1	$2A_1$	E1	$3A_1$	J1	$4A_1$	N1
$1B_1$	B2	$2B_1$	F2	$3B_1$	K2	$4B_1$	P2
$1A_2$	C2	$2A_2$	G2	$3A_2$	L2	$4A_2$	R2
$1B_2$	B1	$2B_2$	F1	$3B_2$	K1	$4B_2$	P1
$1A_3$	C1	$2A_3$	G1	$3A_3$	L1	$4A_3$	R1
$1B_3$	D2	$2B_3$	H2	$3B_3$	M2	$4B_3$	T2
$1A_4$	D3	$2A_4$	H3	$3A_4$	M3	$4A_4$	T3
$1B_4$	D1	$2B_4$	H1	$3B_4$	M1	$4B_4$	T1
$1A_5$	D4	$2A_5$	H4	$3A_5$	M4	$4A_5$	T4
$1B_5$	D6	$2B_5$	H6	$3B_5$	M6	$4B_5$	T6
$1A_6$	C6	$2A_6$	G6	$3A_6$	L6	$4A_6$	R6
$1B_6$	D5	$2B_6$	H5	$3B_6$	M5	$4B_6$	T5
$1A_7$	C5	$2A_7$	G5	$3A_7$	L5	$4A_7$	R5
$1B_7$	B6	$2B_7$	F6	$3B_7$	K6	$4B_7$	P6
$1A_8$	A6	$2A_8$	E6	$3A_8$	J6	$4A_8$	N6
$1B_8$	B5	$2B_8$	F5	$3B_8$	K5	$4B_8$	P5
$1A_9$	A5	$2A_9$	E5	$3A_9$	J5	$4A_9$	N5
$1B_9$	A4	$2B_9$	E4	$3B_9$	J4	$4B_9$	N4
$1\overline{BE}_A$	B3	$2\overline{BE}_A$	F3	$3\overline{BE}_A$	K3	$4\overline{BE}_A$	P3
$1\overline{BE}_B$	C4	$2\overline{BE}_B$	G4	$3\overline{BE}_B$	L4	$4\overline{BE}_B$	R4
$1V_{CC}$	B4	$2V_{CC}$	F4	$3V_{CC}$	K4	$4V_{CC}$	P4
1GND	C3	2GND	G3	3GND	L3	4GND	R3

Product Pinout: 96-Pin LFBGA (NB) Package

	1	2	3	4	5	6
A	$_1A_1$	$_1A_0$	$_1B_0$	$_1B_9$	$_1A_9$	$_1A_8$
B	$_1B_2$	$_1B_1$	$_1\overline{BE}_A$	$_1V_{CC}$	$_1B_8$	$_1B_7$
C	$_1A_3$	$_1A_2$	$_1GND$	$_1\overline{BE}_B$	$_1A_7$	$_1A_6$
D	$_1B_4$	$_1B_3$	$_1A_4$	$_1A_5$	$_1B_6$	$_1B_5$
E	$_2A_1$	$_2A_0$	$_2B_0$	$_2B_9$	$_2A_9$	$_2A_8$
F	$_2B_2$	$_2B_1$	$_2\overline{BE}_A$	$_2V_{CC}$	$_2B_8$	$_2B_7$
G	$_2A_3$	$_2A_2$	$_2GND$	$_2\overline{BE}_B$	$_2A_7$	$_2A_6$
H	$_2B_4$	$_2B_3$	$_2A_4$	$_2A_5$	$_2B_6$	$_2B_5$
J	$_3A_1$	$_3A_0$	$_3B_0$	$_3B_9$	$_3A_9$	$_3A_8$
K	$_3B_2$	$_3B_1$	$_3\overline{BE}_A$	$_3V_{CC}$	$_3B_8$	$_3B_7$
L	$_3A_3$	$_3A_2$	$_3GND$	$_3\overline{BE}_B$	$_3A_7$	$_3A_6$
M	$_3B_4$	$_3B_3$	$_3A_4$	$_3A_5$	$_3B_6$	$_3B_5$
N	$_4A_1$	$_4A_0$	$_4B_0$	$_4B_9$	$_4A_9$	$_4A_8$
P	$_4B_2$	$_4B_1$	$_4\overline{BE}_A$	$_4V_{CC}$	$_4B_8$	$_4B_7$
R	$_4A_3$	$_4A_2$	$_4GND$	$_4\overline{BE}_B$	$_4A_7$	$_4A_6$
T	$_4B_4$	$_4B_3$	$_4A_4$	$_4A_5$	$_4B_6$	$_4B_5$

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°C to +85°C, V_{CC} = 3.3V ±10%)

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-Impedence Output Current	0 ≤A, B ≤V_{CC}		—	—	±1	
V_{IK}	Clamp diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.73	–1.2	V
R_{ON}	Switch On Resistance[4]	V_{CC} = Min.,V_{IN} = 0.0V I_{ON} = 48mA or 64mA	PI3C34X484	—	5	7	Ω
		V_{CC} = Min.,V_{IN} = 2.4V I_{ON} = 15mA	PI3C34X484	—	8	15	

Capacitance (T_A = 25°C f = 1 MHz)

Parameters[5]	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	3.5	pF
C_{OFF}	A/B Capacitance, Switch Off		5.0	
C_{ON}	A/B Capacitance, Switch On		10.0	

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} = 3.3V, 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}	PI3C34X484	—	1.0	2	mA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max., V_{IN} = 3.0V[3]		—	—	750	µA

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} = 3.3V, +25°C ambient.
3. Per TTL driven input (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.

PI3C34X484 Switching Characteristics over 3.3V Operating Range

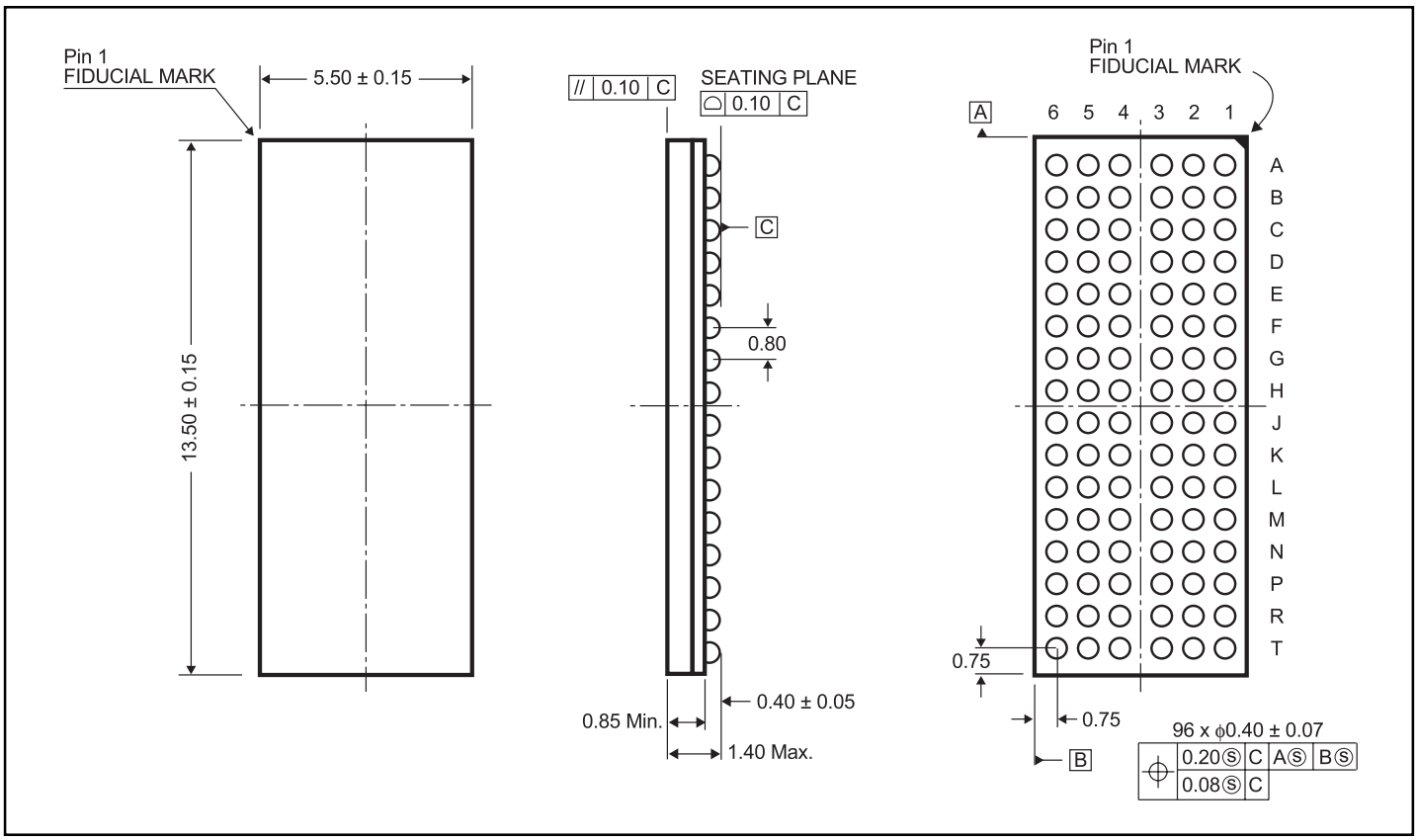
Parameters	Description	Conditions[1]	PI3C34X484		Units
			Com.		
			Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay[2,3] Ax to Bx, Bx to Ax	C_L = 50pF R_L = 500Ω	—	0.25	ns
t_{PZH} t_{PZL}	Bus Enable Time $\overline{BE}$x to Ax or Bx	C_L = 50pF R_L = 500Ω R = 500Ω	1.5	6.5	
t_{PHZ} t_{PLZ}	Bus Disable Time $\overline{BE}$x to Ax or Bx		1.5	5.5	

PI3C34X484 Switching Characteristics over 2.5V Operating Range

Parameters	Description	Conditions[1]	PI3C34X484		Units
			Com.		
			Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay[2,3] Ax to Bx, Bx to Ax	C_L = 50pF R_L = 500Ω	—	0.25	ns
t_{PZH} t_{PZL}	Bus Enable Time $\overline{BE}$x to Ax or Bx	C_L = 50pF R_L = 500Ω R = 500Ω	1.5	9.8	
t_{PHZ} t_{PLZ}	Bus Disable Time $\overline{BE}$x to Ax or Bx		1.5	8.3	

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.

96-Pin LFBGA (NB) Package



Applications Information

Logic Inputs

Logic control inputs can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply, the output enables or select pins may be driven LOW to 0V and HIGH to 3.6V. Driving IN Rail-to-Rail® minimizes power consumption.

Power Supply Sequencing

Proper power-supply sequencing is advised for all CMOS devices. It is recommended to always apply V_{CC} before applying signals to the input/output or control pins.

Ordering Information

Part	Pin - Package	Dimensions
PI3C34X484NB	96 - LFBGA (NB96)	5.5mm x 13.5mm