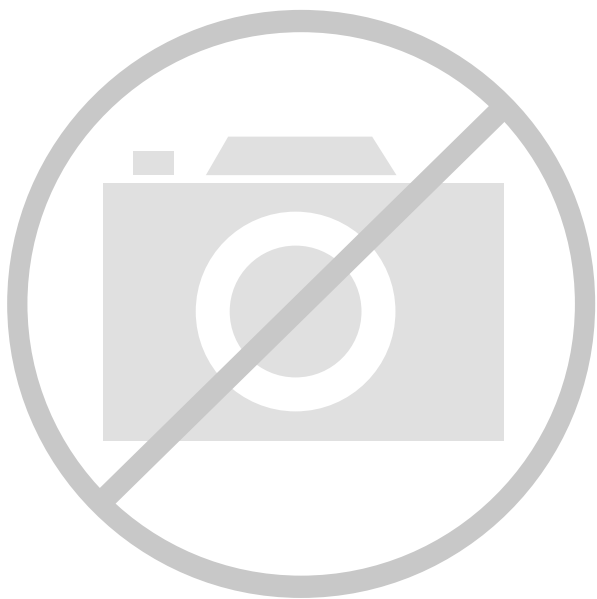




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Understanding [Embedded - FPGAs \(Field Programmable Gate Array\)](#)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

Details

Product Status	Active
Number of LABs/CLBs	18144
Number of Logic Elements/Cells	-
Total RAM Bits	165888
Number of I/O	317
Number of Gates	1000000
Voltage - Supply	1.425V ~ 1.575V
Mounting Type	Surface Mount
Operating Temperature	-55°C ~ 125°C (TA)
Package / Case	484-BGA
Supplier Device Package	484-FPBGA (23x23)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/ax1000-1fgg484m

HSTL Class I

High-Speed Transceiver Logic is a general-purpose high-speed 1.5 V bus standard (EIA/JESD8-6). The Axcelerator devices support Class I. This requires a differential amplifier input buffer and a push-pull output buffer.

Table 2-41 • DC Input and Output Levels

VIL		VIH		VOL	VOH	IOL	IOH
Min., V	Max., V	Min., V	Max., V	Max., V	Min., V	mA	mA
-0.3	VREF – 0.1	VREF + 0.1	3.6	0.4	VCC – 0.4	8	-8

AC Loadings

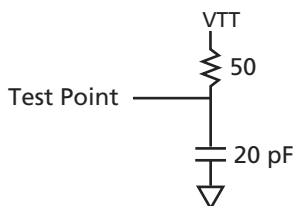


Figure 2-20 • AC Test Loads

Table 2-42 • AC Waveforms, Measuring Points, and Capacitive Loads

Input Low (V)	Input High (V)	Measuring Point* (V)	VREF (typ) (V)	C _{load} (pF)
VREF – 0.5	VREF + 0.5	VREF	0.75	20

Note: * Measuring Point = VTRIP

Timing Characteristics

Table 2-43 • 1.5 V HSTL Class I I/O Module

Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 1.425 V, T_J = 70°C

		–2 Speed		–1 Speed		Std Speed		Units
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	
1.5 V HSTL Class I I/O Module Timing								
t _{DP}	Input Buffer		1.80		2.05		2.41	ns
t _{PY}	Output Buffer		4.90		5.58		6.56	ns
t _{CLKQ}	Clock-to-Q for the I/O input register		0.67		0.77		0.90	ns
t _{OCLKQ}	Clock-to-Q for the I/O output register and the I/O enable register		0.67		0.77		0.90	ns
t _{SUD}	Data Input Set-Up		0.23		0.27		0.31	ns
t _{SUE}	Enable Input Set-Up		0.26		0.30		0.35	ns
t _{HD}	Data Input Hold		0.00		0.00		0.00	ns
t _{HE}	Enable Input Hold		0.00		0.00		0.00	ns
t _{CPWHL}	Clock Pulse Width High to Low	0.39		0.39		0.39		ns
t _{CPWLH}	Clock Pulse Width Low to High	0.39		0.39		0.39		ns
t _{WASYN}	Asynchronous Pulse Width	0.37		0.37		0.37		ns
t _{REASYN}	Asynchronous Recovery Time		0.13		0.15		0.17	ns
t _{HASYN}	Asynchronous Removal Time		0.00		0.00		0.00	ns
t _{CLR}	Asynchronous Clear-to-Q		0.23		0.27		0.31	ns
t _{PRESET}	Asynchronous Preset-to-Q		0.23		0.27		0.31	ns

Module Specifications

C-Cell

Introduction

The C-cell is one of the two logic module types in the AX architecture. It is the combinatorial logic resource in the Axcelerator device. The AX architecture implements a new combinatorial cell that is an extension of the C-cell implemented in the SX-A family. The main enhancement of the new C-cell is the addition of carry-chain logic.

The C-cell can be used in a carry-chain mode to construct arithmetic functions. If carry-chain logic is not required, it can be disabled.

The C-cell features the following (Figure 2-27):

- Eight-input MUX (data: D0-D3, select: A0, A1, B0, B1). User signals can be routed to any one of these inputs. Any of the C-cell inputs (D0-D3, A0, A1, B0, B1) can be tied to one of the four routed clocks (CLKE/F/G/H).
- Inverter (DB input) can be used to drive a complement signal of any of the inputs to the C-cell.
- A carry input and a carry output. The carry input signal of the C-cell is the carry output from the C-cell directly to the north.
- Carry connect for carry-chain logic with a signal propagation time of less than 0.1 ns.
- A hardwired connection (direct connect) to the adjacent R-cell (Register Cell) for all C-cells on the east side of a SuperCluster with a signal propagation time of less than 0.1 ns.

This layout of the C-cell (and the C-cell Cluster) enables the implementation of over 4,000 functions of up to five bits. For example, two C-cells can be used together to implement a four-input XOR function in a single cell delay.

The carry-chain configuration is handled automatically for the user with Microsemi's extensive macro library (please see the *Antifuse Macro Library Guide* for a complete listing of available Axcelerator macros).

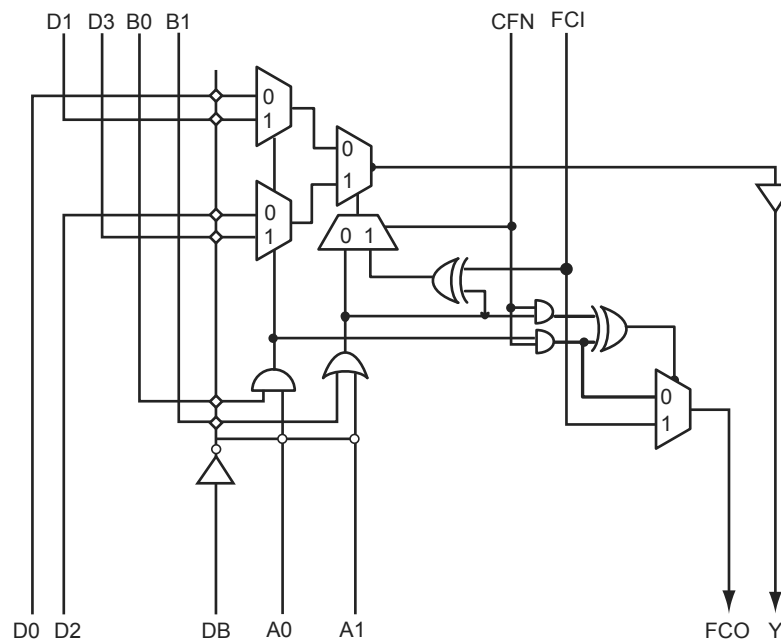
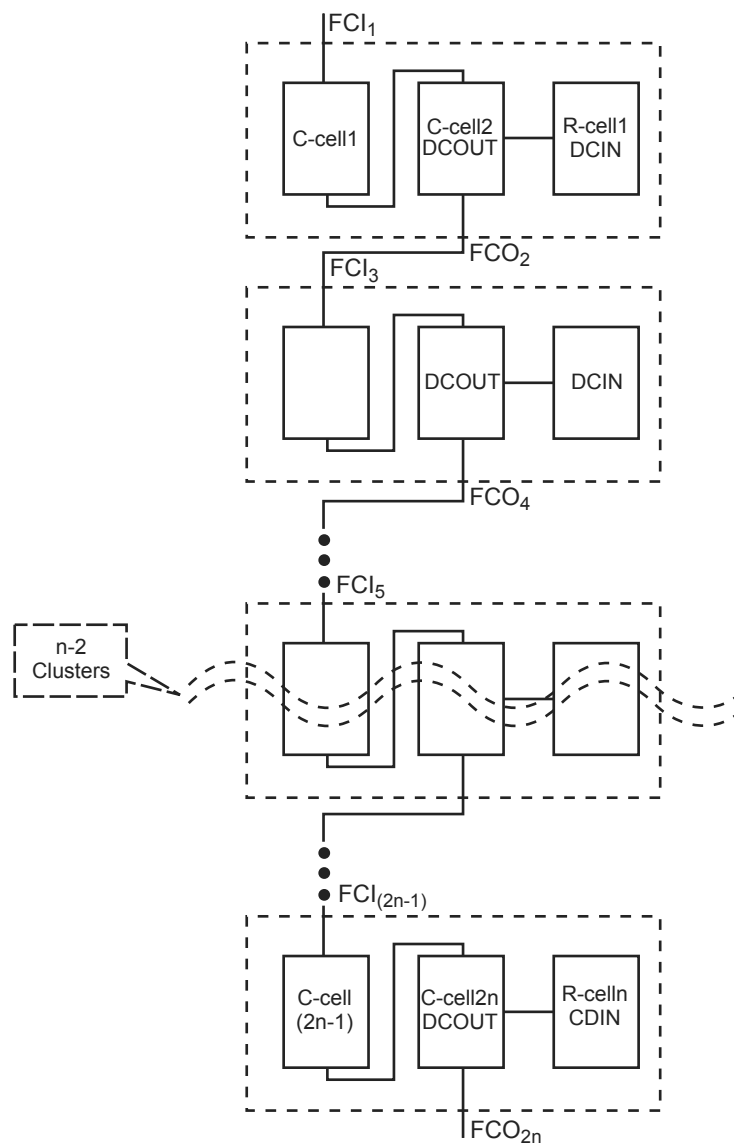


Figure 2-27 • C-Cell



Note: The carry-chain sequence can end on either C-cell.

Figure 2-30 • Carry-Chain Sequencing of C-Cells

Timing Characteristics

Refer to Table 2-62 on page 2-55 for more information on carry-chain timing.

Table 2-93 • Sixteen RAM Blocks Cascaded
Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 3.0 V, T_J = 70°C

		–2 Speed		–1 Speed		Std Speed		
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	Units
Write Mode								
t _{WDASU}	Write Data Setup vs. WCLK		16.54		18.84		22.15	ns
t _{WDAHD}	Write Data Hold vs. WCLK		0.00		0.00		0.00	ns
t _{WADSU}	Write Address Setup vs. WCLK		16.54		18.84		22.15	ns
t _{WADHD}	Write Address Hold vs. WCLK		0.00		0.00		0.00	ns
t _{WENSU}	Write Enable Setup vs. WCLK		16.54		18.84		22.15	ns
t _{WENHD}	Write Enable Hold vs. WCLK		0.00		0.00		0.00	ns
t _{WCKH}	WCLK Minimum High Pulse Width	0.75		0.75		0.75		ns
t _{WCLK}	WCLK Minimum Low Pulse Width	13.40		13.40		13.40		ns
t _{WCKP}	WCLK Minimum Period	14.15		14.15		14.15		ns
Read Mode								
t _{RADSU}	Read Address Setup vs. RCLK		18.13		20.65		24.27	ns
t _{RADHD}	Read Address Hold vs. RCLK		0.00		0.00		0.00	ns
t _{RENSU}	Read Enable Setup vs. RCLK		18.13		20.65		24.27	ns
t _{RENHD}	Read Enable Hold vs. RCLK		0.00		0.00		0.00	ns
t _{RCK2RD1}	RCLK-To-OUT (Pipelined)		12.08		13.76		16.17	ns
t _{RCK2RD2}	RCLK-To-OUT (Non-Pipelined)		12.83		14.62		17.18	ns
t _{RCLKH}	RCLK Minimum High Pulse Width	0.73		0.73		0.73		ns
t _{RCLKL}	RCLK Minimum Low Pulse Width	14.41		14.41		14.41		ns
t _{RCKP}	RCLK Minimum Period	15.14		15.14		15.14		ns

Note: Timing data for these sixteen cascaded RAM blocks uses a depth of 65,536. For all other combinations, use Microsemi's timing software.

Glitch Elimination

An analog filter is added to each FIFO controller to guarantee glitch-free FIFO-flag logic.

Overflow and Underflow Control

The counter MSB keeps track of the difference between the read address (RA) and the write address (WA). The EMPTY flag is set when the read and write addresses are equal. To prevent underflow, the write address is double-sampled by the read clock prior to comparison with the read address (part A in Figure 2-64). To prevent overflow, the read address is double-sampled by the write clock prior to comparison to the write address (part B in Figure 2-64).

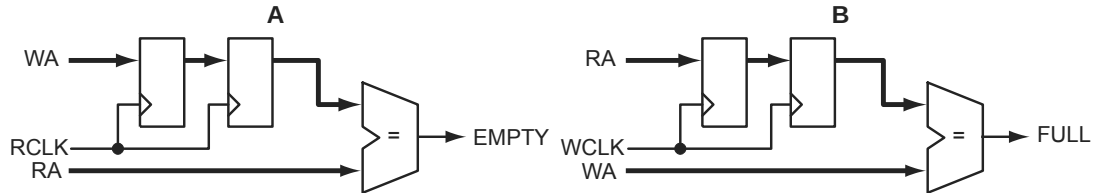


Figure 2-64 • Overflow and Underflow Control

FIFO Configurations

Unlike the RAM, the FIFO's write width and read width cannot be specified independently. For the FIFO, the write and read widths must be the same. The WIDTH pins are used to specify one of six allowable word widths, as shown in Table 2-96.

Table 2-96 • FIFO Width Configurations

WIDTH(2:0)	W x D
000	1 x 4k
001	2 x 2k
010	4 x 1k
011	9 x 512
100	18 x 256
101	36 x 128
11x	reserved

The DEPTH pins allow RAM cells to be cascaded to create larger FIFOs. The four pins allow depths of 2, 4, 8, and 16 to be specified. Table 2-86 on page 2-87 describes the FIFO depth options for various data width and memory blocks.

Interface

Figure 2-65 on page 2-99 shows a logic block diagram of the Accelerator FIFO module.

Cascading FIFO Blocks

FIFO blocks can be cascaded to create deeper FIFO functions. When building larger FIFO blocks, if the word width can be fractured in a multi-bit FIFO, the fractured word configuration is recommended over a cascaded configuration. For example, 256x36 can be configured as two blocks of 256x18. This should be taken into account when building the FIFO blocks manually. However, when using SmartGen, the user only needs to specify the depth and width of the necessary FIFO blocks. SmartGen automatically configures these blocks to optimize performance.

Table 2-101 • Eight FIFO Blocks Cascaded
Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 3.0 V, T_J = 70°C

		–2 Speed		–1 Speed		Std Speed		Units
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	
FIFO Module Timing								
t _{WSU}	Write Setup		15.46		17.61		20.70	ns
t _{WHD}	Write Hold		0.00		0.00		0.00	ns
t _{WCKH}	WCLK High		0.75		0.75		0.75	ns
t _{WCKL}	WCLK Low		5.13		5.13		5.13	ns
t _{WCKP}	Minimum WCLK Period	5.88		5.88		5.88		ns
t _{RSU}	Read Setup		16.22		18.47		21.72	ns
t _{RHD}	Read Hold		0.00		0.00		0.00	ns
t _{RCKH}	RCLK High		0.73		0.73		0.73	ns
t _{RCKL}	RCLK Low		5.77		5.77		5.77	ns
t _{RCKP}	Minimum RCLK period	6.50		6.50		6.50		ns
t _{CLRHF}	Clear High		0.00		0.00		0.00	ns
t _{CLR2FF}	Clear-to-flag (EMPTY/FULL)		1.92		2.18		2.57	ns
t _{CLR2AF}	Clear-to-flag (AEMPTY/AFULL)		4.39		5.00		5.88	ns
t _{CK2FF}	Clock-to-flag (EMPTY/FULL)		2.13		2.42		2.85	ns
t _{CK2AF}	Clock-to-flag (AEMPTY/AFULL)		5.04		5.75		6.75	ns
t _{RCK2RD1}	RCLK-To-OUT (Pipelined)		3.39		3.86		4.54	ns
t _{RCK2RD2}	RCLK-To-OUT (Nonpipelined)		4.93		5.62		6.61	ns

Note: Timing data for these eight cascaded FIFO blocks uses a depth of 32,768. For all other combinations, use Microsemi's timing software.

FG256-Pin FBGA		FG256-Pin FBGA		FG256-Pin FBGA	
AX125 Function	Pin Number	AX125 Function	Pin Number	AX125 Function	Pin Number
Bank 6		IO81NB7F7	C2	GND	M12
IO60NB6F6	L4	IO81PB7F7	B1	GND	M5
IO60PB6F6	M4	IO82NB7F7	D2	GND	P13
IO61NB6F6	L3	IO82PB7F7	D3	GND	P3
IO61PB6F6	M3	IO83NB7F7	E3	GND	R15
IO63NB6F6	P2	IO83PB7F7	F3	GND	R2
IO63PB6F6	N2	Dedicated I/O		GND	T1
IO64NB6F6	J4	VCCDA	E4	GND	T16
IO64PB6F6	K4	GND	A1	GND/LP	D4
IO65NB6F6	N1	GND	A16	NC	A11
IO65PB6F6	P1	GND	B15	NC	R11
IO67NB6F6	L2	GND	B2	NC	R5
IO67PB6F6	M2	GND	D15	PRA	D8
IO69NB6F6	L1	GND	E12	PRB	C8
IO69PB6F6	M1	GND	E5	PRC	N9
IO70NB6F6	J3	GND	F11	PRD	P9
IO70PB6F6	K3	GND	F6	TCK	D5
IO71NB6F6	J2	GND	G10	TDI	C6
IO71PB6F6	K2	GND	G7	TDO	C4
Bank 7		GND	G8	TMS	C3
IO72NB7F7	J1	GND	G9	TRST	C5
IO72PB7F7	K1	GND	H10	VCCA	D14
IO73NB7F7	G2	GND	H7	VCCA	F10
IO73PB7F7	H2	GND	H8	VCCA	F4
IO74NB7F7	G3	GND	H9	VCCA	F7
IO74PB7F7	H3	GND	J10	VCCA	F8
IO75NB7F7	E1	GND	J7	VCCA	F9
IO75PB7F7	F1	GND	J8	VCCA	G11
IO76NB7F7	G1	GND	J9	VCCA	G6
IO77NB7F7	E2	GND	K10	VCCA	H11
IO77PB7F7	F2	GND	K7	VCCA	H6
IO78NB7F7	G4	GND	K8	VCCA	J11
IO78PB7F7	H4	GND	K9	VCCA	J6
IO79NB7F7	C1	GND	L11	VCCA	K11
IO79PB7F7	D1	GND	L6	VCCA	K6

FG256	
AX250 Function	Pin Number
VCCA	L9
VCCA	N3
VCCA	P14
VCCPLA	C7
VCCPLB	D6
VCCPLC	A10
VCCPLD	D10
VCCPLE	P10
VCCPLF	N11
VCCPLG	T7
VCCPLH	N7
VCCDA	A11
VCCDA	A2
VCCDA	C13
VCCDA	D9
VCCDA	H1
VCCDA	J15
VCCDA	N14
VCCDA	N8
VCCDA	P4
VCCDA	R11
VCCDA	R5
VCCIB0	E6
VCCIB0	E7
VCCIB0	E8
VCCIB1	E10
VCCIB1	E11
VCCIB1	E9
VCCIB2	F12
VCCIB2	G12
VCCIB2	H12
VCCIB3	J12
VCCIB3	K12
VCCIB3	L12
VCCIB4	M10

FG256	
AX250 Function	Pin Number
VCCIB4	M11
VCCIB4	M9
VCCIB5	M6
VCCIB5	M7
VCCIB5	M8
VCCIB6	J5
VCCIB6	K5
VCCIB6	L5
VCCIB7	F5
VCCIB7	G5
VCCIB7	H5
VCOMPLA	A7
VCOMPLB	D7
VCOMPLC	B9
VCOMPLD	D11
VCOMPLE	T10
VCOMPLF	N10
VCOMPLG	R8
VCOMPLH	N6
VPUMP	A14

FG324		FG324		FG324	
AX125 Function	Pin Number	AX125 Function	Pin Number	AX125 Function	Pin Number
GND	R4	NC	N4	VCCA	M8
GND	T16	NC	N5	VCCA	M9
GND	T3	NC	R12	VCCA	P4
GND	U17	NC	R13	VCCA	R15
GND	U2	NC	R6	VCCPLA	D8
GND	V1	NC	R7	VCCPLB	E7
GND	V18	NC	T12	VCCPLC	B11
GND/LP	E5	NC	T6	VCCPLD	E11
NC	A10	NC	U16	VCCPLE	R11
NC	A11	NC	V17	VCCPLF	P12
NC	A12	PRA	E9	VCCPLG	U8
NC	A13	PRB	D9	VCCPLH	P8
NC	A8	PRC	P10	VCCDA	B3
NC	A9	PRD	R10	VCCDA	D14
NC	B12	TCK	E6	VCCDA	E10
NC	F15	TDI	D7	VCCDA	J2
NC	F4	TDO	D5	VCCDA	K16
NC	G15	TMS	D4	VCCDA	P15
NC	G4	TRST	D6	VCCDA	P9
NC	H14	VCCA	E15	VCCDA	R5
NC	H15	VCCA	G10	VCCIB0	F7
NC	H5	VCCA	G11	VCCIB0	F8
NC	J1	VCCA	G5	VCCIB0	F9
NC	J14	VCCA	G8	VCCIB1	F10
NC	J15	VCCA	G9	VCCIB1	F11
NC	J5	VCCA	H12	VCCIB1	F12
NC	K14	VCCA	H7	VCCIB2	G13
NC	K15	VCCA	J12	VCCIB2	H13
NC	K5	VCCA	J7	VCCIB2	J13
NC	L14	VCCA	K12	VCCIB3	K13
NC	L15	VCCA	K7	VCCIB3	L13
NC	L5	VCCA	L12	VCCIB3	M13
NC	M4	VCCA	L7	VCCIB4	N10
NC	M5	VCCA	M10	VCCIB4	N11
NC	N17	VCCA	M11	VCCIB4	N12

FG484	
AX1000 Function	Pin Number
IO167PB5F15	AA12
IO169NB5F15	AA9
IO169PB5F15	AA10
IO170NB5F15	AB9
IO170PB5F15	AB10
IO171NB5F16	W8
IO171PB5F16	W9
IO172NB5F16	Y8
IO172PB5F16	Y9
IO173NB5F16	U8
IO173PB5F16	U9
IO174NB5F16	AA7
IO174PB5F16	AA8
IO175NB5F16	AB5
IO175PB5F16	AB6
IO176NB5F16	AA5
IO176PB5F16	AA6
IO177NB5F16	AA4
IO177PB5F16	AB4
IO178NB5F16	Y6
IO178PB5F16	Y7
IO179NB5F16	T7
IO179PB5F16	T8
IO180NB5F16	W6
IO180PB5F16	W7
IO181NB5F17	Y4
IO181PB5F17	Y5
IO184NB5F17	AB7
IO187NB5F17	V3
IO187PB5F17	W3
IO188NB5F17	V4
IO188PB5F17	W5
IO192NB5F17	V6
IO192PB5F17	V7
Bank 6	

FG484	
AX1000 Function	Pin Number
IO194NB6F18	V2
IO194PB6F18	W2
IO195NB6F18	U5
IO195PB6F18	T5
IO200NB6F18	T4
IO200PB6F18	U4
IO201NB6F18	P6
IO201PB6F18	R6
IO203NB6F19	U2
IO204NB6F19	T3
IO204PB6F19	U3
IO205NB6F19	P5
IO205PB6F19	R5
IO208NB6F19	V1
IO208PB6F19	W1
IO209NB6F19	P7
IO209PB6F19	R7
IO212NB6F19	P4
IO212PB6F19	R4
IO214NB6F20	P3
IO214PB6F20	R3
IO215NB6F20	M6
IO215PB6F20	N6
IO216NB6F20	R2
IO216PB6F20	T2
IO217NB6F20	T1
IO217PB6F20	U1
IO219NB6F20	M5
IO219PB6F20	N5
IO220NB6F20	P1
IO220PB6F20	R1
IO221NB6F20	N2
IO221PB6F20	P2
IO222NB6F20	M3
IO222PB6F20	N3

FG484	
AX1000 Function	Pin Number
IO223NB6F20	M7
IO223PB6F20	N7
IO224NB6F20	M4
IO224PB6F20	N4
Bank 7	
IO225NB7F21	M2
IO225PB7F21	N1
IO226NB7F21	K2
IO226PB7F21	K1
IO228NB7F21	L3
IO228PB7F21	L2
IO229NB7F21	K5
IO229PB7F21	L5
IO230NB7F21	H1
IO230PB7F21	J1
IO231NB7F21	H2
IO231PB7F21	J2
IO232NB7F21	K4
IO232PB7F21	K3
IO233NB7F21	K6
IO233PB7F21	L6
IO234NB7F21	F1
IO234PB7F21	G1
IO235NB7F21	F2
IO235PB7F21	G2
IO236NB7F22	H3
IO236PB7F22	J3
IO237NB7F22	K7
IO237PB7F22	L7
IO241NB7F22	H6
IO241PB7F22	J6
IO242NB7F22	H4
IO242PB7F22	J4
IO243NB7F22	H5
IO243PB7F22	J5

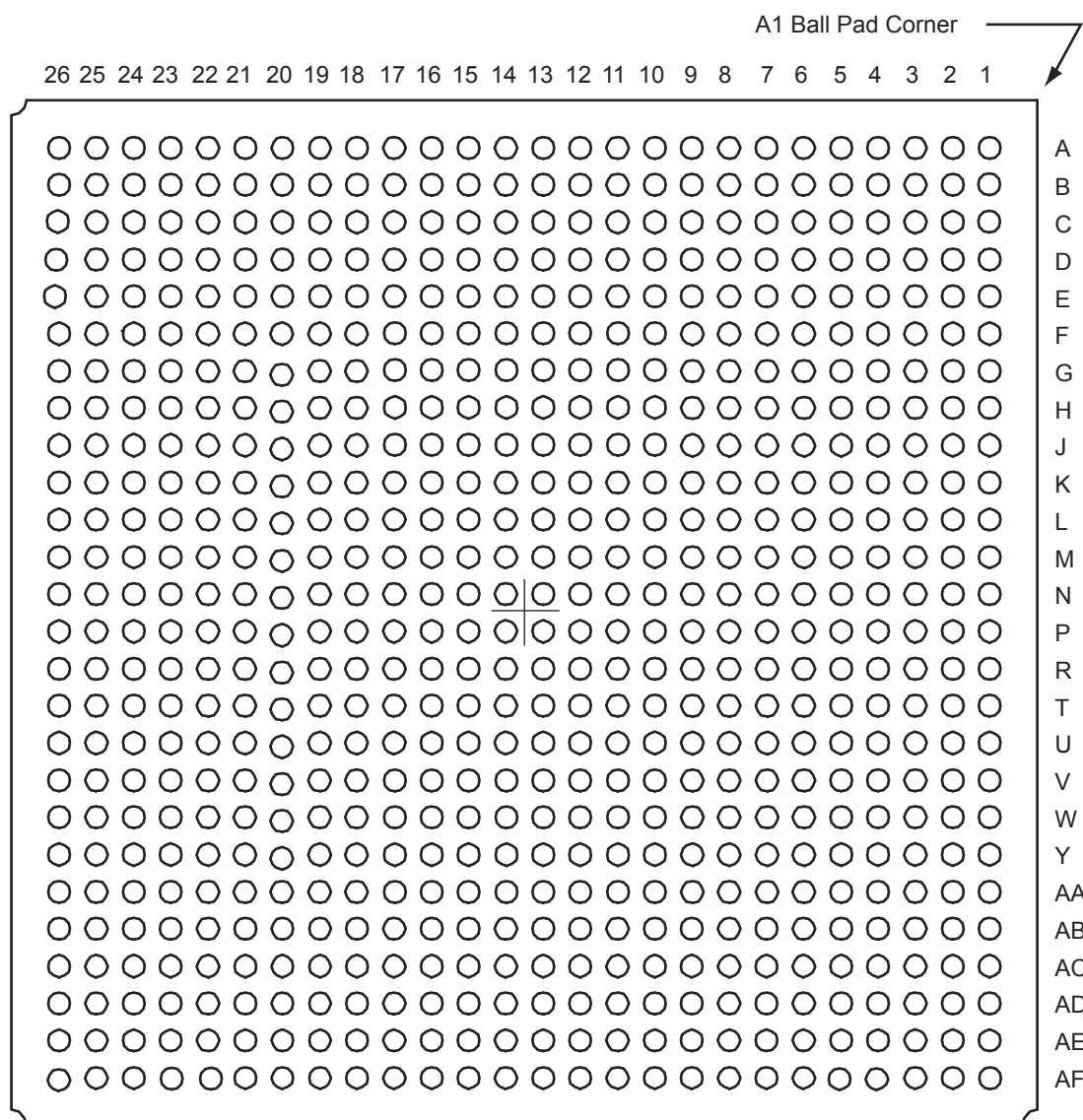
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AX1000 Function	Pin Number	AX1000 Function	Pin Number	AX1000 Function	Pin Number
IO246NB7F22	F3	GND	D4	GND	V5
IO246PB7F22	G3	GND	E18	GND	W19
IO250NB7F23	F4	GND	E5	GND	W4
IO250PB7F23	G4	GND	G18	GND	Y20
IO253NB7F23	G5	GND	H15	GND	Y3
IO253PB7F23	G6	GND	H8	GND/LP	G7
IO254NB7F23	D1	GND	J14	PRA	G11
IO254PB7F23	E1	GND	J9	PRB	F11
IO257NB7F23	F5	GND	K10	PRC	T12
IO257PB7F23	E4	GND	K11	PRD	U12
Dedicated I/O		GND	K12	TCK	G8
VCCDA	H7	GND	K13	TDI	F9
GND	A1	GND	L1	TDO	F7
GND	A11	GND	L10	TMS	F6
GND	A12	GND	L11	TRST	F8
GND	A2	GND	L12	VCCA	G17
GND	A21	GND	L13	VCCA	J10
GND	A22	GND	L22	VCCA	J11
GND	AA1	GND	M1	VCCA	J12
GND	AA2	GND	M10	VCCA	J13
GND	AA21	GND	M11	VCCA	J7
GND	AA22	GND	M12	VCCA	K14
GND	AB1	GND	M13	VCCA	K9
GND	AB11	GND	M22	VCCA	L14
GND	AB12	GND	N10	VCCA	L9
GND	AB2	GND	N11	VCCA	M14
GND	AB21	GND	N12	VCCA	M9
GND	AB22	GND	N13	VCCA	N14
GND	B1	GND	P14	VCCA	N9
GND	B2	GND	P9	VCCA	P10
GND	B21	GND	R15	VCCA	P11
GND	B22	GND	R8	VCCA	P12
GND	C20	GND	U16	VCCA	P13
GND	C3	GND	U6	VCCA	T6
GND	D19	GND	V18	VCCA	U17

FG484	
AX1000 Function	Pin Number
VCCPLA	F10
VCCPLB	G9
VCCPLC	D13
VCCPLD	G13
VCCPLE	U13
VCCPLF	T14
VCCPLG	W10
VCCPLH	T10
VCCDA	AB16
VCCDA	AB8
VCCDA	C10
VCCDA	C11
VCCDA	C14
VCCDA	D14
VCCDA	D5
VCCDA	F16
VCCDA	G12
VCCDA	L4
VCCDA	M18
VCCDA	T11
VCCDA	T17
VCCDA	U7
VCCDA	V14
VCCDA	V8
VCCIB0	A3
VCCIB0	B3
VCCIB0	H10
VCCIB0	H11
VCCIB0	H9
VCCIB1	A20
VCCIB1	B20
VCCIB1	H12
VCCIB1	H13
VCCIB1	H14
VCCIB2	C21

FG484	
AX1000 Function	Pin Number
VCCIB2	C22
VCCIB2	J15
VCCIB2	K15
VCCIB2	L15
VCCIB3	M15
VCCIB3	N15
VCCIB3	P15
VCCIB3	Y21
VCCIB3	Y22
VCCIB4	AA20
VCCIB4	AB20
VCCIB4	R12
VCCIB4	R13
VCCIB4	R14
VCCIB5	AA3
VCCIB5	AB3
VCCIB5	R10
VCCIB5	R11
VCCIB5	R9
VCCIB6	M8
VCCIB6	N8
VCCIB6	P8
VCCIB6	Y1
VCCIB6	Y2
VCCIB7	C1
VCCIB7	C2
VCCIB7	J8
VCCIB7	K8
VCCIB7	L8
VCOMPLA	D10
VCOMPLB	G10
VCOMPLC	E12
VCOMPLD	G14
VCOMPLE	W13
VCOMPLF	T13

FG484	
AX1000 Function	Pin Number
VCOMPLG	V11
VCOMPLH	T9
VPUMP	D17

FG676



Note

For Package Manufacturing and Environmental information, visit Resource center at <http://www.microsemi.com/soc/products/rescenter/package/index.html>.

FG896	
AX1000 Function	Pin Number
IO155NB4F14	AC17
IO155PB4F14	AB17
IO156NB4F14	AK19
IO156PB4F14	AJ19
IO157NB4F14	AE17
IO157PB4F14	AD17
IO158NB4F14	AJ17
IO158PB4F14	AJ18
IO159NB4F14/CLKEN	AG18
IO159PB4F14/CLKEP	AH18
IO160NB4F14/CLKFN	AG16
IO160PB4F14/CLKFP	AG17
Bank 5	
IO161NB5F15/CLKGN	AG14
IO161PB5F15/CLKGP	AG15
IO162NB5F15/CLKHN	AG13
IO162PB5F15/CLKHP	AH13
IO163NB5F15	AE14
IO163PB5F15	AD14
IO164NB5F15	AJ12
IO164PB5F15	AJ13
IO165NB5F15	AB14
IO165PB5F15	AC15
IO166NB5F15	AK11
IO166PB5F15	AK12
IO167NB5F15	AB13
IO167PB5F15	AC14
IO168NB5F15	AH11
IO168PB5F15	AH12
IO169NB5F15	AD13
IO169PB5F15	AC13
IO170NB5F15	AJ10
IO170PB5F15	AJ11
IO171NB5F16	AG11
IO171PB5F16	AG12

FG896	
AX1000 Function	Pin Number
IO172NB5F16	AK9
IO172PB5F16	AK10
IO173NB5F16	AE12
IO173PB5F16	AE13
IO174NB5F16	AG9
IO174PB5F16	AG10
IO175NB5F16	AE11
IO175PB5F16	AF11
IO176NB5F16	AH8
IO176PB5F16	AH9
IO177NB5F16	AC12
IO177PB5F16	AD12
IO178NB5F16	AJ7
IO178PB5F16	AJ8
IO179NB5F16	AF9
IO179PB5F16	AF10
IO180NB5F16	AE9
IO180PB5F16	AE10
IO181NB5F17	AC11
IO181PB5F17	AD11
IO182NB5F17	AK6
IO182PB5F17	AK7
IO183NB5F17	AF8
IO183PB5F17	AG8
IO184NB5F17	AG7
IO184PB5F17	AH7
IO185NB5F17	AC10
IO185PB5F17	AD10
IO186NB5F17	AJ5
IO186PB5F17	AJ6
IO187NB5F17	AE7
IO187PB5F17	AE8
IO188NB5F17	AF6
IO188PB5F17	AF7
IO189NB5F17	AD8

FG896	
AX1000 Function	Pin Number
IO189PB5F17	AD9
IO190NB5F17	AH6
IO190PB5F17	AG6
IO191NB5F17	AG5
IO191PB5F17	AH5
IO192NB5F17	AC8
IO192PB5F17	AC9
Bank 6	
IO193NB6F18	AB7
IO193PB6F18	AC7
IO194NB6F18	AD5
IO194PB6F18	AE5
IO195NB6F18	AB6
IO195PB6F18	AC6
IO196NB6F18	AE4
IO196PB6F18	AF4
IO197NB6F18	AA8
IO197PB6F18	AB8
IO198NB6F18	AF3
IO198PB6F18	AG3
IO199NB6F18	AC4
IO199PB6F18	AD4
IO200NB6F18	AB5
IO200PB6F18	AC5
IO201NB6F18	Y7
IO201PB6F18	AA7
IO202NB6F18	AD3
IO202PB6F18	AE3
IO203NB6F19	Y6
IO203PB6F19	AA6
IO204NB6F19	Y5
IO204PB6F19	AA5
IO205NB6F19	W8
IO205PB6F19	Y8
IO206NB6F19	AA4

FG1152		FG1152		FG1152	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
IO207PB4F19	AL20	IO224PB5F21	AP14	IO242NB5F22	AG11
IO208NB4F19	AG19	IO225NB5F21	AK13	IO242PB5F22	AG12
IO208PB4F19	AF19	IO225PB5F21	AK14	IO243NB5F22	AL9
IO209NB4F19	AN18	IO226NB5F21	AE15	IO243PB5F22	AL10
IO209PB4F19	AP18	IO226PB5F21	AF15	IO244NB5F22	AM8
IO210NB4F19	AE19	IO227NB5F21	AG14	IO244PB5F22	AM9
IO210PB4F19	AD19	IO227PB5F21	AG15	IO245NB5F23	AH10
IO211NB4F19	AL18	IO228NB5F21	AJ13	IO245PB5F23	AJ10
IO211PB4F19	AM18	IO228PB5F21	AJ14	IO246NB5F23	AF10
IO212NB4F19/CLKEN	AJ20	IO229NB5F21	AM13	IO246PB5F23	AF11
IO212PB4F19/CLKEP	AK20	IO229PB5F21	AM14	IO247NB5F23	AJ9
IO213NB4F19/CLKFN	AJ18	IO230NB5F21	AE14	IO247PB5F23	AK9
IO213PB4F19/CLKFP	AJ19	IO230PB5F21	AF14	IO248NB5F23	AN7
Bank 5		IO231NB5F21	AN12	IO248PB5F23	AP7
IO214NB5F20/CLKGN	AJ16	IO231PB5F21	AP12	IO249NB5F23	AL7
IO214PB5F20/CLKGP	AJ17	IO232NB5F21	AG13	IO249PB5F23	AL8
IO215NB5F20/CLKHN	AJ15	IO232PB5F21	AH13	IO250NB5F23	AE10
IO215PB5F20/CLKHP	AK15	IO233NB5F21	AL12	IO250PB5F23	AE11
IO216NB5F20	AD16	IO233PB5F21	AL13	IO251NB5F23	AK8
IO216PB5F20	AE17	IO234NB5F21	AE13	IO251PB5F23	AJ8
IO217NB5F20	AM17	IO234PB5F21	AF13	IO252NB5F23	AH8
IO217PB5F20	AL17	IO235NB5F22	AN11	IO252PB5F23	AH9
IO218NB5F20	AG16	IO235PB5F22	AP11	IO253NB5F23	AN6
IO218PB5F20	AF16	IO236NB5F22	AM11	IO253PB5F23	AP6
IO219NB5F20	AM16	IO236PB5F22	AM12	IO254NB5F23	AG9
IO219PB5F20	AL16	IO237NB5F22	AJ11	IO254PB5F23	AG10
IO220NB5F20	AP16	IO237PB5F22	AJ12	IO255NB5F23	AJ7
IO220PB5F20	AN16	IO238NB5F22	AH11	IO255PB5F23	AK7
IO221NB5F20	AN15	IO238PB5F22	AH12	IO256NB5F23	AL6
IO221PB5F20	AP15	IO239NB5F22	AK10	IO256PB5F23	AM6
IO222NB5F20	AD15	IO239PB5F22	AK11	Bank 6	
IO222PB5F20	AE16	IO240NB5F22	AE12	IO257NB6F24	AG6
IO223NB5F21	AL14	IO240PB5F22	AF12	IO257PB6F24	AH6
IO223PB5F21	AL15	IO241NB5F22	AN10	IO258NB6F24	AD9
IO224NB5F21	AN14	IO241PB5F22	AP10	IO258PB6F24	AE9

FG1152		FG1152		FG1152	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
IO311NB7F29	N3	IO328PB7F30	N9	GND	A33
IO311PB7F29	P3	IO329NB7F30	J4	GND	A4
IO312NB7F29	P7	IO329PB7F30	K4	GND	A8
IO312PB7F29	R7	IO330NB7F30	J5	GND	AA14
IO313NB7F29	P6	IO330PB7F30	K5	GND	AA15
IO313PB7F29	R6	IO331NB7F30	M10	GND	AA16
IO314NB7F29	M2	IO331PB7F30	M9	GND	AA17
IO314PB7F29	N2	IO332NB7F31	L8	GND	AA18
IO315NB7F29	N4	IO332PB7F31	M8	GND	AA19
IO315PB7F29	P4	IO333NB7F31	F2	GND	AA20
IO316NB7F29	R9	IO333PB7F31	F1	GND	AA21
IO316PB7F29	R8	IO334NB7F31	J6	GND	AB1
IO317NB7F29	N5	IO334PB7F31	K6	GND	AB13
IO317PB7F29	P5	IO335NB7F31	H4	GND	AB22
IO318NB7F29	R10	IO335PB7F31	H3	GND	AB34
IO318PB7F29	R11	IO336NB7F31	K7	GND	AC12
IO319NB7F29	L2	IO336PB7F31	L7	GND	AC23
IO319PB7F29	L1	IO337NB7F31	G4	GND	AC30
IO320NB7F29	N8	IO337PB7F31	G3	GND	AC5
IO320PB7F29	P8	IO338NB7F31	K9	GND	AD11
IO321NB7F30	M6	IO338PB7F31	L9	GND	AD24
IO321PB7F30	N6	IO339NB7F31	H6	GND	AD31
IO322NB7F30	P10	IO339PB7F31	H5	GND	AD4
IO322PB7F30	P9	IO340NB7F31	H7	GND	AE3
IO323NB7F30	L3	IO340PB7F31	J7	GND	AE32
IO323PB7F30	M3	IO341NB7F31	J8	GND	AF2
IO324NB7F30	M7	IO341PB7F31	K8	GND	AF33
IO324PB7F30	N7	Dedicated I/O		GND	AG1
IO325NB7F30	K2	GND	A13	GND	AG27
IO325PB7F30	K1	GND	A2	GND	AG34
IO326NB7F30	G2	GND	A22	GND	AG8
IO326PB7F30	H2	GND	A27	GND	AH28
IO327NB7F30	L6	GND	A3	GND	AH7
IO327PB7F30	L5	GND	A31	GND	AJ29
IO328NB7F30	N10	GND	A32	GND	AJ6

FG1152		FG1152		FG1152	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
GND	AK12	GND	AN34	GND	D1
GND	AK17	GND	AN4	GND	D11
GND	AK18	GND	AN9	GND	D2
GND	AK23	GND	AP13	GND	D24
GND	AK30	GND	AP2	GND	D3
GND	AK5	GND	AP22	GND	D31
GND	AL1	GND	AP27	GND	D32
GND	AL11	GND	AP3	GND	D33
GND	AL2	GND	AP31	GND	D34
GND	AL24	GND	AP32	GND	D4
GND	AL3	GND	AP33	GND	E12
GND	AL31	GND	AP4	GND	E17
GND	AL32	GND	AP8	GND	E18
GND	AL33	GND	B1	GND	E23
GND	AL34	GND	B2	GND	E30
GND	AL4	GND	B26	GND	E5
GND	AM1	GND	B3	GND	F29
GND	AM10	GND	B31	GND	F30
GND	AM15	GND	B32	GND	F6
GND	AM2	GND	B33	GND	G28
GND	AM20	GND	B34	GND	G7
GND	AM25	GND	B4	GND	H1
GND	AM3	GND	B9	GND	H34
GND	AM31	GND	C1	GND	J2
GND	AM32	GND	C10	GND	J33
GND	AM33	GND	C15	GND	K3
GND	AM34	GND	C2	GND	K32
GND	AM4	GND	C20	GND	L11
GND	AN1	GND	C25	GND	L24
GND	AN2	GND	C3	GND	L31
GND	AN26	GND	C31	GND	L4
GND	AN3	GND	C32	GND	M12
GND	AN31	GND	C33	GND	M23
GND	AN32	GND	C34	GND	M30
GND	AN33	GND	C4	GND	M5

FG1152		FG1152		FG1152	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
VCCIB0	C5	VCCIB3	AA24	VCCIB6	AA11
VCCIB0	D5	VCCIB3	AB23	VCCIB6	AA12
VCCIB0	L12	VCCIB3	AB24	VCCIB6	AB11
VCCIB0	L13	VCCIB3	AC24	VCCIB6	AB12
VCCIB0	L14	VCCIB3	AK31	VCCIB6	AC11
VCCIB0	M13	VCCIB3	AK32	VCCIB6	AK1
VCCIB0	M14	VCCIB3	AK33	VCCIB6	AK2
VCCIB0	M15	VCCIB3	AK34	VCCIB6	AK3
VCCIB0	M16	VCCIB3	V23	VCCIB6	AK4
VCCIB0	M17	VCCIB3	W23	VCCIB6	V12
VCCIB1	A30	VCCIB3	Y23	VCCIB6	W12
VCCIB1	B30	VCCIB4	AC18	VCCIB6	Y12
VCCIB1	C30	VCCIB4	AC19	VCCIB7	E1
VCCIB1	D30	VCCIB4	AC20	VCCIB7	E2
VCCIB1	L21	VCCIB4	AC21	VCCIB7	E3
VCCIB1	L22	VCCIB4	AC22	VCCIB7	E4
VCCIB1	L23	VCCIB4	AD21	VCCIB7	M11
VCCIB1	M18	VCCIB4	AD22	VCCIB7	N11
VCCIB1	M19	VCCIB4	AD23	VCCIB7	N12
VCCIB1	M20	VCCIB4	AL30	VCCIB7	P11
VCCIB1	M21	VCCIB4	AM30	VCCIB7	P12
VCCIB1	M22	VCCIB4	AN30	VCCIB7	R12
VCCIB2	E31	VCCIB4	AP30	VCCIB7	T12
VCCIB2	E32	VCCIB5	AC13	VCCIB7	U12
VCCIB2	E33	VCCIB5	AC14	VCCPLA	J16
VCCIB2	E34	VCCIB5	AC15	VCCPLB	K17
VCCIB2	M24	VCCIB5	AC16	VCCPLC	J19
VCCIB2	N23	VCCIB5	AC17	VCCPLD	L18
VCCIB2	N24	VCCIB5	AD12	VCCPLE	AK19
VCCIB2	P23	VCCIB5	AD13	VCCPLF	AE18
VCCIB2	P24	VCCIB5	AD14	VCCPLG	AK16
VCCIB2	R23	VCCIB5	AL5	VCCPLH	AF17
VCCIB2	T23	VCCIB5	AM5	VCOMPLA	H16
VCCIB2	U23	VCCIB5	AN5	VCOMPLB	L17
VCCIB3	AA23	VCCIB5	AP5	VCOMPLC	H19

CQ352		CQ352		CQ352	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
Bank 0				Bank 3	
IO01NB0F0	341	IO71NB1F6	277	IO129NB3F12	219
IO01PB0F0	342	IO71PB1F6	278	IO129PB3F12	220
IO02PB0F0	343	IO73NB1F6	269	IO132NB3F12	217
IO04NB0F0	337	IO73PB1F6	270	IO132PB3F12	218
IO04PB0F0	338	IO74NB1F6	271	IO137NB3F12	213
IO05NB0F0	335	IO74PB1F6	272	IO137PB3F12	214
IO05PB0F0	336	Bank 2		IO139NB3F13	211
IO08NB0F0	331	IO87NB2F8	261	IO139PB3F13	212
IO08PB0F0	332	IO87PB2F8	262	IO141NB3F13	205
IO37NB0F3	325	IO88NB2F8	255	IO141PB3F13	206
IO37PB0F3	326	IO88PB2F8	256	IO142NB3F13	207
IO38NB0F3	323	IO89NB2F8	259	IO142PB3F13	208
IO38PB0F3	324	IO89PB2F8	260	IO145NB3F13	199
IO41NB0F3/HCLKAN	319	IO91NB2F8	253	IO145PB3F13	200
IO41PB0F3/HCLKAP	320	IO91PB2F8	254	IO146NB3F13	201
IO42NB0F3/HCLKBN	313	IO99NB2F9	249	IO146PB3F13	202
IO42PB0F3/HCLKBP	314	IO99PB2F9	250	IO147NB3F13	193
Bank 1		IO100NB2F9	247	IO147PB3F13	194
IO43NB1F4/HCLKCN	305	IO100PB2F9	248	IO148NB3F13	195
IO43PB1F4/HCLKCP	306	IO107NB2F10	243	IO148PB3F13	196
IO44NB1F4/HCLKDN	299	IO107PB2F10	244	IO149NB3F13	189
IO44PB1F4/HCLKDP	300	IO110NB2F10	241	IO149PB3F13	190
IO48NB1F4	295	IO110PB2F10	242	IO161NB3F15	183
IO48PB1F4	296	IO111NB2F10	237	IO161PB3F15	184
IO65NB1F6	283	IO111PB2F10	238	IO163NB3F15	187
IO65PB1F6	284	IO112NB2F10	235	IO163PB3F15	188
IO66NB1F6	289	IO112PB2F10	236	IO165NB3F15	181
IO66PB1F6	290	IO113NB2F10	231	IO165PB3F15	182
IO68NB1F6	287	IO113PB2F10	232	IO167NB3F15	179
IO68PB1F6	288	IO114NB2F10	229	IO167PB3F15	180
IO69NB1F6	275	IO114PB2F10	230	Bank 4	
IO69PB1F6	276	IO115NB2F10	225	IO181NB4F17	172
IO70NB1F6	281	IO115PB2F10	226	IO181PB4F17	173
IO70PB1F6	282	IO117NB2F10	223	IO182NB4F17	170
		IO117PB2F10	224		

CG624	
AX2000 Function	Pin Number
Bank 0	
IO00NB0F0	D7*
IO00PB0F0	E7*
IO01NB0F0	G7
IO01PB0F0	G6
IO02NB0F0	B5
IO02PB0F0	B4
IO04PB0F0	C7
IO05NB0F0	F8
IO05PB0F0	F7
IO06NB0F0	H8
IO06PB0F0	H7
IO11NB0F0	J8
IO11PB0F0	J7
IO12PB0F1	B6
IO13NB0F1	E9*
IO13PB0F1	D8*
IO15NB0F1	C9
IO15PB0F1	C8
IO16NB0F1	A5
IO16PB0F1	A4
IO17NB0F1	D10
IO17PB0F1	D9
IO18NB0F1	A7
IO18PB0F1	A6
IO19NB0F1	G9
IO19PB0F1	G8
IO20PB0F1	B7
IO23NB0F2	F10
IO23PB0F2	F9
IO26NB0F2	C11*
IO26PB0F2	B8*

Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.

CG624	
AX2000 Function	Pin Number
IO27NB0F2	H10
IO27PB0F2	H9
IO28NB0F2	A9
IO28PB0F2	B9
IO30NB0F2	B11
IO30PB0F2	B10
IO31NB0F2	E11
IO31PB0F2	F11
IO33NB0F2	D12
IO33PB0F2	D11
IO34NB0F3	A11
IO34PB0F3	A10
IO37NB0F3	J13
IO37PB0F3	K13
IO38NB0F3	H11
IO38PB0F3	G11
IO40PB0F3	B12
IO41NB0F3/HCLKAN	G13
IO41PB0F3/HCLKAP	G12
IO42NB0F3/HCLKBN	C13
IO42PB0F3/HCLKBP	C12
Bank 1	
IO43NB1F4/HCLKCN	G15
IO43PB1F4/HCLKCP	G14
IO44NB1F4/HCLKDN	B14
IO44PB1F4/HCLKDP	B13
IO45NB1F4	H13
IO47NB1F4	D14
IO47PB1F4	C14
IO48NB1F4	A16
IO48PB1F4	A15
IO49PB1F4	H15

Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.

CG624	
AX2000 Function	Pin Number
IO51NB1F4	E15
IO51PB1F4	F15
IO52NB1F4	A17
IO55NB1F5	G16
IO55PB1F5	H16
IO56NB1F5	A20
IO56PB1F5	A19
IO57NB1F5	D16
IO57PB1F5	D15
IO58NB1F5	A22
IO58PB1F5	A21
IO59NB1F5	F16
IO61NB1F5	G17
IO61PB1F5	H17
IO62NB1F5	B17
IO62PB1F5	B16
IO63NB1F5	H18
IO65NB1F6	C17
IO66PB1F6	B18
IO67NB1F6	J18
IO67PB1F6	J19
IO68NB1F6	B20
IO68PB1F6	B19
IO69NB1F6	E17
IO69PB1F6	F17
IO70NB1F6	B22
IO70PB1F6	B21
IO71PB1F6	G18
IO73NB1F6	G19
IO74NB1F6	C19
IO74PB1F6	C18
IO75NB1F6	D18

Note: *Not routed on the same package layer and to adjacent LGA pads as its differential pair complement. Recommended to be used as a single-ended I/O.