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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	-40°C ~ 85°C (TA)
Package / Case	484-BGA
Supplier Device Package	484-FPBGA (23x23)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/ax1000-fgg484i

The maximum power dissipation allowed for Military temperature and Mil-Std 883B devices is specified as a function of θ_{jc}.

Table 2-6 • **Package Thermal Characteristics**

Package Type	Pin Count	θ_{jc}	θ_{ja} Still Air	θ_{ja} 1.0m/s	θ_{ja} 2.5m/s	Units
Chip Scale Package (CSP)	180	N/A	57.8	51.0	50	°C/W
Plastic Quad Flat Pack (PQFP)	208	8.0	26	23.5	20.9	°C/W
Plastic Ball Grid Array (PBGA)	729	2.2	13.7	10.6	9.6	°C/W
Fine Pitch Ball Grid Array (FBGA)	256	3.0	26.6	22.8	21.5	°C/W
Fine Pitch Ball Grid Array (FBGA)	324	3.0	25.8	22.1	20.9	°C/W
Fine Pitch Ball Grid Array (FBGA)	484	3.2	20.5	17.0	15.9	°C/W
Fine Pitch Ball Grid Array (FBGA)	676	3.2	16.4	13.0	12.0	°C/W
Fine Pitch Ball Grid Array (FBGA)	896	2.4	13.6	10.4	9.4	°C/W
Fine Pitch Ball Grid Array (FBGA)	1152	1.8	12.0	8.9	7.9	°C/W
Ceramic Quad Flat Pack (CQFP)[1]	208	2.0	22	19.8	18.0	°C/W
Ceramic Quad Flat Pack (CQFP)[1]	352	2.0	17.9	16.1	14.7	°C/W
Ceramic Column Grid Array (CCGA)[2]	624	6.5	8.9	8.5	8	°C/W

Notes:

1. *θ_{jc} for the 208-pin and 352-pin CQFP refers to the thermal resistance between the junction and the bottom of the package.*
2. *θ_{jc} for the 624-pin CCGA refers to the thermal resistance between the junction and the top surface of the package. Thermal resistance from junction to board (θ_{jb}) for CCGA 624 package is 3.4°C/W.*

Timing Characteristics

Axcelerator devices are manufactured in a CMOS process, therefore, device performance varies according to temperature, voltage, and process variations. Minimum timing parameters reflect maximum operating voltage, minimum operating temperature, and best-case processing. Maximum timing parameters reflect minimum operating voltage, maximum operating temperature, and worst-case processing. The derating factors shown in Table 2-7 should be applied to all timing data contained within this datasheet.

Table 2-7 • **Temperature and Voltage Timing Derating Factors (Normalized to Worst-Case Commercial, T_J = 70°C, VCCA = 1.425V)**

	Junction Temperature						
VCCA	–55°C	–40°C	0°C	25°C	70°C	85°C	125°C
1.4 V	0.83	0.86	0.91	0.96	1.02	1.05	1.15
1.425 V	0.82	0.84	0.90	0.94	1.00	1.04	1.13
1.5 V	0.78	0.80	0.85	0.89	0.95	0.98	1.07
1.575 V	0.74	0.76	0.81	0.85	0.90	0.94	1.02
1.6 V	0.73	0.75	0.80	0.84	0.89	0.92	1.01

Notes:

1. *The user can set the junction temperature in Designer software to be any integer value in the range of –55°C to 175°C.*
2. *The user can set the core voltage in Designer software to be any value between 1.4V and 1.6V.*

All timing numbers listed in this datasheet represent sample timing characteristics of Axcelerator devices. Actual timing delay values are design-specific and can be derived from the Timer tool in Microsemi's Designer software after place-and-route.

1.8 V LVCMOS

Low-Voltage Complementary Metal-Oxide Semiconductor for 1.8 V is an extension of the LVCMOS standard (JESD8-5) used for general-purpose 1.8 V applications. It uses a 3.3 V tolerant CMOS input buffer and a push-pull output buffer.

***Table 2-26* • 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	0.2 VCCI	0.7 VCCI	3.6	0.2	VCCI – 0.2	8 mA	–8 mA

AC Loadings

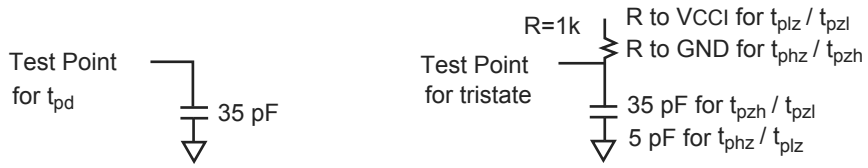


***Figure 2-17* • AC Test Loads**

***Table 2-27* • AC Waveforms, Measuring Points, and Capacitive Loads**

Input Low (V)	Input High (V)	Measuring Point* (V)	VREF (typ) (V)	C_{load} (pF)
0	1.8	0.5 VCCI	N/A	35

*Note: * Measuring Point = VTRIP*

Class II

Table 2-47 • 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 – 0.2	VREF + 0.2	3.6	VREF – 0.8	VREF + 0.8	15.2	-15.2

AC Loadings

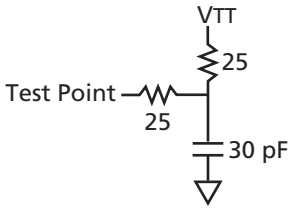


Figure 2-22 • AC Test Loads

Table 2-48 • AC Waveforms, Measuring Points, and Capacitive Loads

Input Low (V)	Input High (V)	Measuring Point* (V)	VREF (typ) (V)	C_{load} (pF)
VREF – 0.75	VREF + 0.75	VREF	1.25	30

*Note: * Measuring Point = V_{trip}*

Timing Characteristics

Table 2-49 • 2.5 V SSTL2 Class II I/O Module
Worst-Case Commercial Conditions VCCA = 1.425 V, VCCI = 2.3 V, T_J = 70°C

		–2 Speed		–1 Speed		Std Speed		
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	Units
2.5 V SSTL2 Class II I/O Module Timing								
t_{DP}	Input Buffer		1.89		2.16		2.53	ns
t_{PY}	Output Buffer		2.39		2.72		3.20	ns
t_{ICLKQ}	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

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).

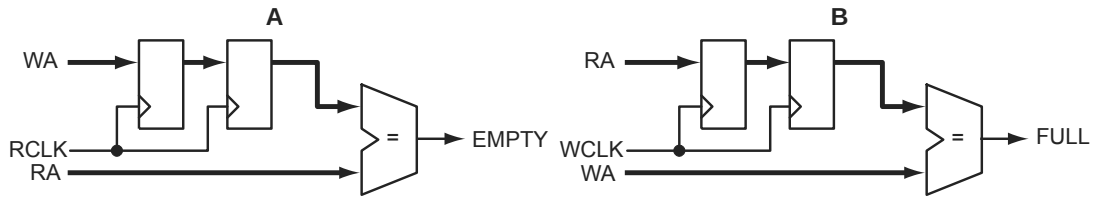


Figure 2-64 • **Overflow and Underflow Control**

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.

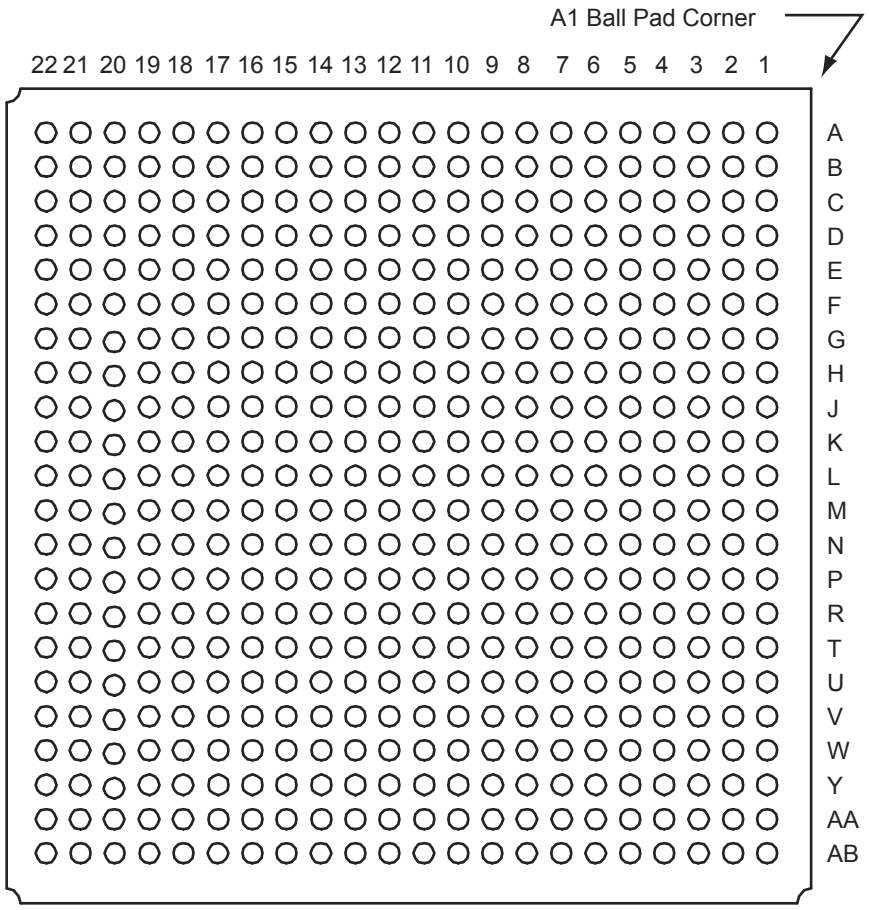
Interface

Figure 2-65 on page 2-99 shows a logic block diagram of the Axcelerator 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.

FG484



Note

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FG484	
AX250 Function	**Pin Number**
Bank 0	
IO00NB0F0	D7
IO00PB0F0	D6
IO01NB0F0	E7
IO01PB0F0	E6
IO02NB0F0	C5
IO02PB0F0	C4
IO03NB0F0	C7
IO03PB0F0	C6
IO04NB0F0	E9
IO04PB0F0	E8
IO05NB0F0	D9
IO05PB0F0	D8
IO06NB0F0	B7
IO06PB0F0	B6
IO07NB0F0	C9
IO07PB0F0	C8
IO08NB0F0	A7
IO08PB0F0	A6
IO09NB0F0	B9
IO09PB0F0	B8
IO10NB0F0	A9
IO10PB0F0	A8
IO11NB0F0	B10
IO11PB0F0	A10
IO12NB0F0/HCLKAN	E11
IO12PB0F0/HCLKAP	E10
IO13NB0F0/HCLKBN	D12
IO13PB0F0/HCLKBP	D11
Bank 1	
IO14NB1F1/HCLKCN	F13
IO14PB1F1/HCLKCP	F12
IO15NB1F1/HCLKDN	E14
IO15PB1F1/HCLKDP	E13
IO16NB1F1	C13
IO16PB1F1	C12

FG484	
AX250 Function	**Pin Number**
IO17NB1F1	B14
IO17PB1F1	B13
IO18NB1F1	A14
IO18PB1F1	A13
IO19NB1F1	A16
IO19PB1F1	A15
IO20NB1F1	B16
IO20PB1F1	B15
IO21NB1F1	C17
IO21PB1F1	C16
IO22NB1F1	F15
IO22PB1F1	F14
IO23NB1F1	D16
IO23PB1F1	D15
IO24NB1F1	E16
IO24PB1F1	E15
IO25NB1F1	F18
IO25PB1F1	F17
IO26NB1F1	D18
IO26PB1F1	E17
IO27NB1F1	G16
IO27PB1F1	G15
Bank 2	
IO28NB2F2	F19
IO28PB2F2	E19
IO29NB2F2	J16
IO29PB2F2	H16
IO30NB2F2	E20
IO30PB2F2	D20
IO31NB2F2	J17
IO31PB2F2	H17
IO32NB2F2	G20
IO32PB2F2	F20
IO33NB2F2	H19
IO33PB2F2	G19
IO34NB2F2	E22

FG484	
AX250 Function	**Pin Number**
IO34PB2F2	D22
IO35NB2F2	J18
IO35PB2F2	H18
IO36NB2F2	G21
IO36PB2F2	F21
IO37NB2F2	K19
IO37PB2F2	J19
IO38NB2F2	J20
IO38PB2F2	H20
IO39NB2F2	L16
IO39PB2F2	K16
IO40NB2F2	J21
IO40PB2F2	H21
IO41NB2F2	L17
IO41PB2F2	K17
IO42NB2F2	J22
IO42PB2F2	H22
IO43NB2F2	L18
IO43PB2F2	K18
IO44NB2F2	L20
IO44PB2F2	K20
Bank 3	
IO45NB3F3	M19
IO45PB3F3	L19
IO46NB3F3	M21
IO46PB3F3	L21
IO47NB3F3	N17
IO47PB3F3	M17
IO48NB3F3	N18
IO48PB3F3	N19
IO49NB3F3	N16
IO49PB3F3	M16
IO50NB3F3	N20
IO50PB3F3	M20
IO51NB3F3	P21
IO51PB3F3	N21

FG484	
AX1000 Function	Pin Number
Bank 0	
IO01NB0F0	E3
IO01PB0F0	D3
IO02NB0F0	E7
IO02PB0F0	E6
IO05NB0F0	D2
IO05PB0F0	E2
IO06NB0F0	C5
IO06PB0F0	C4
IO12NB0F1	D7
IO12PB0F1	D6
IO13NB0F1	B5
IO13PB0F1	B4
IO14NB0F1	E9
IO14PB0F1	E8
IO15NB0F1	C7
IO15PB0F1	C6
IO16NB0F1	A5
IO16PB0F1	A4
IO17NB0F1	B7
IO17PB0F1	B6
IO18NB0F1	A7
IO18PB0F1	A6
IO19NB0F1	C9
IO19PB0F1	C8
IO20NB0F1	D9
IO20PB0F1	D8
IO21NB0F1	B9
IO21PB0F1	B8
IO22NB0F2	A9
IO22PB0F2	A8
IO23NB0F2	B10
IO23PB0F2	A10
IO26NB0F2	A14
IO26PB0F2	A13

FG484	
AX1000 Function	Pin Number
IO29NB0F2	B12
IO29PB0F2	B11
IO30NB0F2/HCLKAN	E11
IO30PB0F2/HCLKAP	E10
IO31NB0F2/HCLKBN	D12
IO31PB0F2/HCLKBP	D11
Bank 1	
IO32NB1F3/HCLKCN	F13
IO32PB1F3/HCLKCP	F12
IO33NB1F3/HCLKDN	E14
IO33PB1F3/HCLKDP	E13
IO34NB1F3	C13
IO34PB1F3	C12
IO37NB1F3	B14
IO37PB1F3	B13
IO38NB1F3	A16
IO38PB1F3	A15
IO40NB1F3	C15
IO42NB1F4	A18
IO42PB1F4	A17
IO43NB1F4	B16
IO43PB1F4	B15
IO44NB1F4	B18
IO44PB1F4	B17
IO45NB1F4	B19
IO45PB1F4	A19
IO46NB1F4	C19
IO46PB1F4	C18
IO48NB1F4	F15
IO48PB1F4	F14
IO49NB1F4	D16
IO49PB1F4	D15
IO50NB1F4	C17
IO50PB1F4	C16
IO51NB1F4	E22

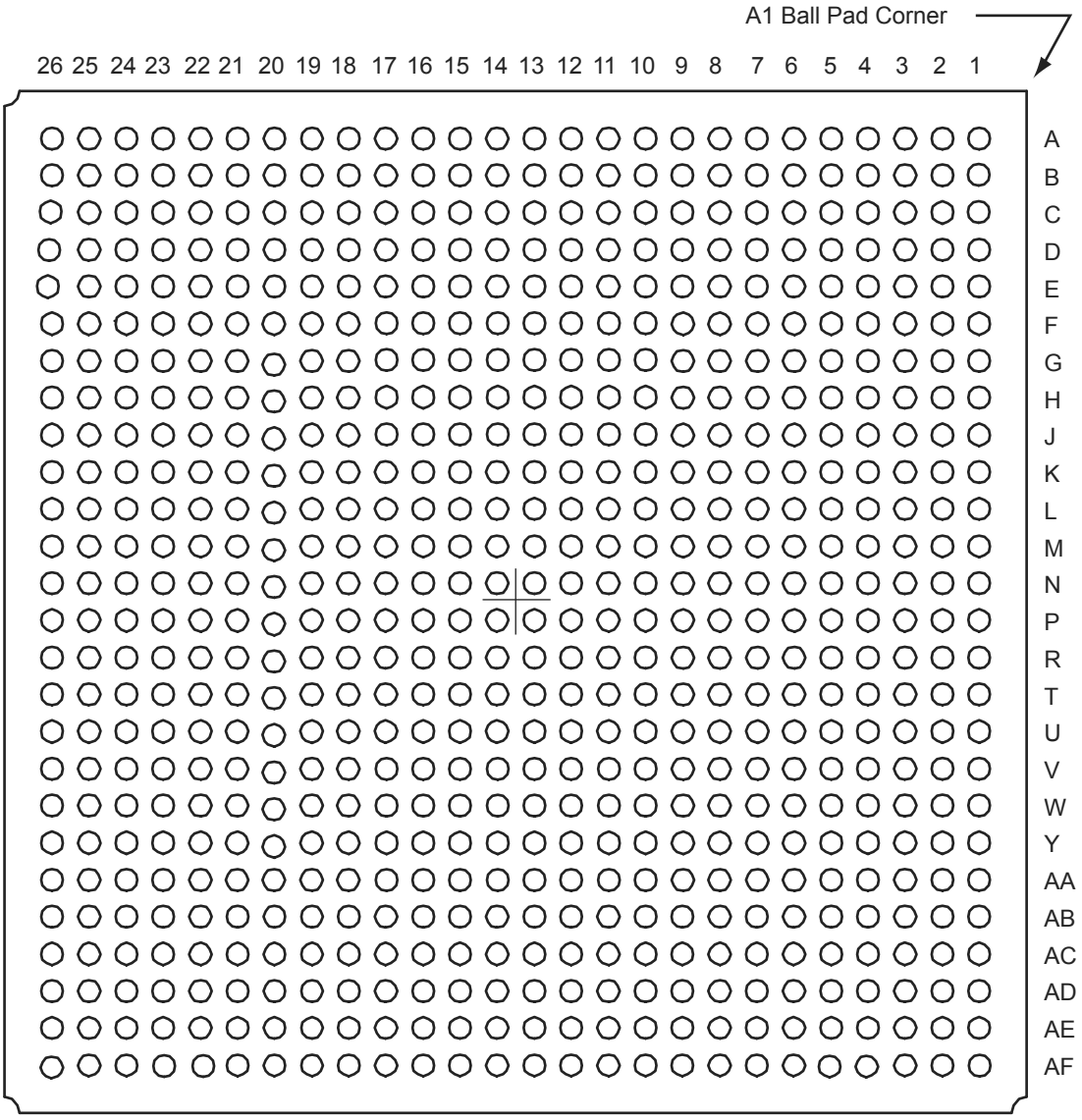
FG484	
AX1000 Function	Pin Number
IO51PB1F4	D22
IO52NB1F4	E16
IO52PB1F4	E15
IO57NB1F5	E21
IO57PB1F5	D21
IO60NB1F5	G16
IO60PB1F5	G15
IO61NB1F5	D18
IO61PB1F5	E17
IO63NB1F5	E20
IO63PB1F5	D20
Bank 2	
IO64NB2F6	F18
IO64PB2F6	F17
IO67NB2F6	F19
IO67PB2F6	E19
IO68NB2F6	J16
IO68PB2F6	H16
IO70NB2F6	J17
IO70PB2F6	H17
IO74NB2F7	J18
IO74PB2F7	H18
IO75NB2F7	G20
IO75PB2F7	F20
IO79NB2F7	H19
IO79PB2F7	G19
IO80NB2F7	L16
IO80PB2F7	K16
IO84NB2F7	L17
IO84PB2F7	K17
IO85NB2F8	G21
IO85PB2F8	F21
IO86NB2F8	G22
IO86PB2F8	F22
IO87NB2F8	J20

FG484	
AX1000 Function	**Pin Number**
IO87PB2F8	H20
IO88NB2F8	L18
IO88PB2F8	K18
IO89NB2F8	K19
IO89PB2F8	J19
IO90NB2F8	J21
IO90PB2F8	H21
IO91NB2F8	J22
IO91PB2F8	H22
IO93NB2F8	K21
IO93PB2F8	K22
IO94NB2F8	L20
IO94PB2F8	K20
IO95NB2F8	M21
IO95PB2F8	L21
Bank 3	
IO96NB3F9	N16
IO96PB3F9	M16
IO97NB3F9	M19
IO97PB3F9	L19
IO98NB3F9	P22
IO98PB3F9	N22
IO99NB3F9	N20
IO99PB3F9	M20
IO100NB3F9	N17
IO100PB3F9	M17
IO101NB3F9	P21
IO101PB3F9	N21
IO103NB3F9	R20
IO103PB3F9	P20
IO104NB3F9	N18
IO104PB3F9	N19
IO105NB3F9	T22
IO105PB3F9	R22
IO106NB3F9	R17

FG484	
AX1000 Function	**Pin Number**
IO106PB3F9	P17
IO107NB3F10	T21
IO107PB3F10	R21
IO110NB3F10	V22
IO110PB3F10	U22
IO113NB3F10	V21
IO113PB3F10	U21
IO114NB3F10	P18
IO114PB3F10	P19
IO116PB3F10	R19
IO117NB3F10	U20
IO117PB3F10	T20
IO118NB3F11	T18
IO118PB3F11	R18
IO121NB3F11	U19
IO121PB3F11	T19
IO124NB3F11	R16
IO124PB3F11	P16
IO127NB3F11	W21
IO127PB3F11	W22
Bank 4	
IO129PB4F12	AB17
IO132NB4F12	Y19
IO132PB4F12	W18
IO133NB4F12	W17
IO133PB4F12	V17
IO135NB4F12	T15
IO135PB4F12	T16
IO138NB4F12	Y17
IO138PB4F12	Y18
IO139NB4F13	V15
IO139PB4F13	V16
IO140NB4F13	U18
IO140PB4F13	V19
IO142NB4F13	W20

FG484	
AX1000 Function	**Pin Number**
IO142PB4F13	V20
IO143NB4F13	W15
IO143PB4F13	W16
IO144NB4F13	AA18
IO144PB4F13	AA19
IO145NB4F13	U14
IO145PB4F13	U15
IO146NB4F13	Y15
IO146PB4F13	Y16
IO147NB4F13	AB18
IO147PB4F13	AB19
IO149NB4F13	Y14
IO149PB4F13	W14
IO150NB4F13	AA16
IO150PB4F13	AA17
IO152NB4F14	AA14
IO152PB4F14	AA15
IO154NB4F14	AB14
IO154PB4F14	AB15
IO155NB4F14	AA13
IO155PB4F14	AB13
IO158NB4F14	Y12
IO158PB4F14	Y13
IO159NB4F14/CLKEN	V12
IO159PB4F14/CLKEP	V13
IO160NB4F14/CLKFN	W11
IO160PB4F14/CLKFP	W12
Bank 5	
IO161NB5F15/CLKGN	U10
IO161PB5F15/CLKGP	U11
IO162NB5F15/CLKHN	V9
IO162PB5F15/CLKHP	V10
IO163NB5F15	Y10
IO163PB5F15	Y11
IO167NB5F15	AA11

FG676



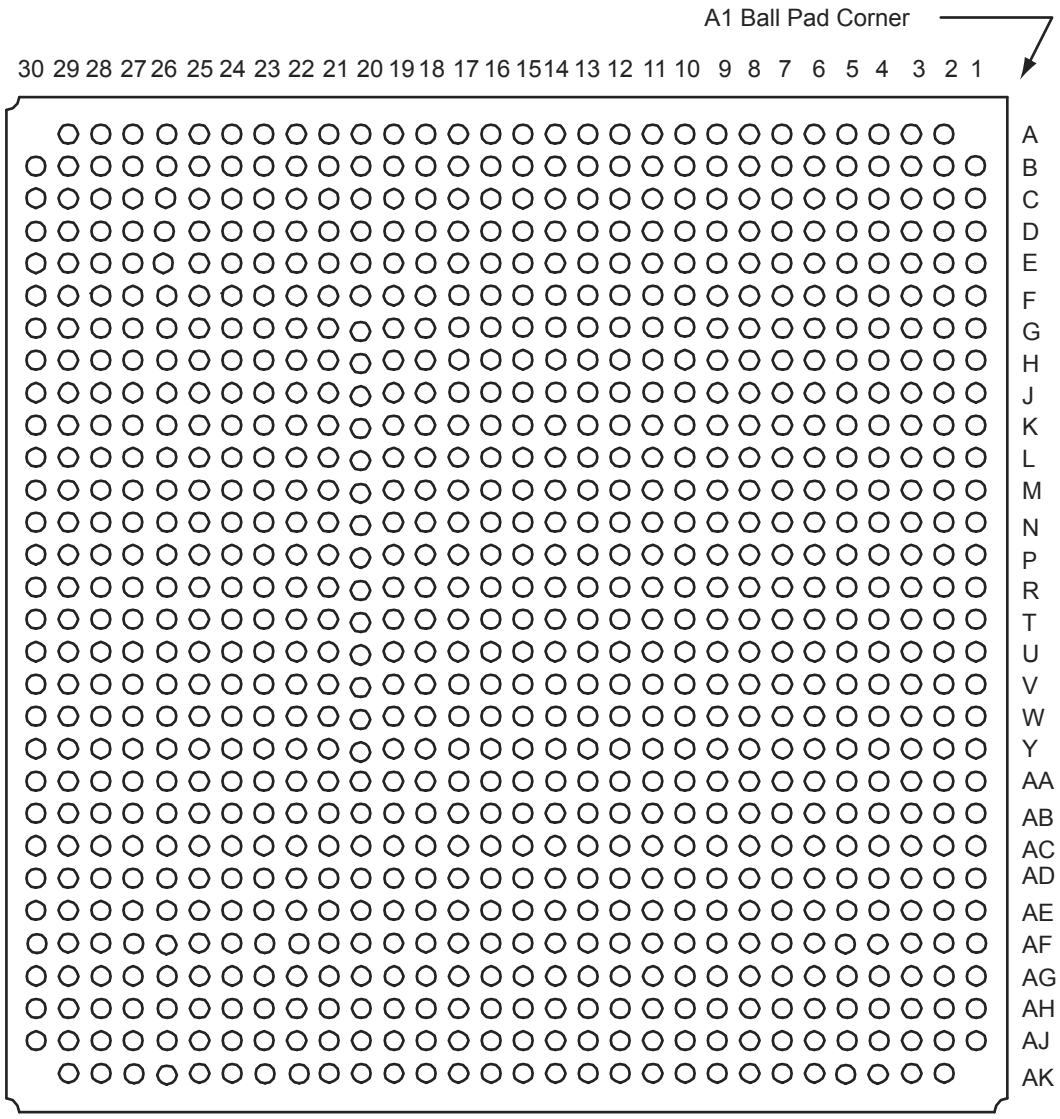
Note

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

FG676	
AX500 Function	**Pin Number**
VCCIB3	T19
VCCIB3	U19
VCCIB3	U20
VCCIB3	V19
VCCIB3	V20
VCCIB3	W20
VCCIB4	W14
VCCIB4	W15
VCCIB4	W16
VCCIB4	W17
VCCIB4	W18
VCCIB4	Y17
VCCIB4	Y18
VCCIB4	Y19
VCCIB5	W10
VCCIB5	W11
VCCIB5	W12
VCCIB5	W13
VCCIB5	W9
VCCIB5	Y10
VCCIB5	Y8
VCCIB5	Y9
VCCIB6	P8
VCCIB6	R8
VCCIB6	T8
VCCIB6	U7
VCCIB6	U8
VCCIB6	V7
VCCIB6	V8
VCCIB6	W7
VCCIB7	H7
VCCIB7	J7
VCCIB7	J8
VCCIB7	K7
VCCIB7	K8

FG676	
AX500 Function	**Pin Number**
VCCIB7	L8
VCCIB7	M8
VCCIB7	N8
VCCPLA	E12
VCCPLB	F13
VCCPLC	E15
VCCPLD	G14
VCCPLE	AF15
VCCPLF	AA14
VCCPLG	AF12
VCCPLH	AB13
VCOMPLA	D12
VCOMPLB	G13
VCOMPLC	D15
VCOMPLD	F14
VCOMPLE	AD15
VCOMPLF	AB14
VCOMPLG	AD12
VCOMPLH	Y13
VPUMP	E22

FG896



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
Bank 0	
IO00NB0F0	D6
IO00PB0F0	E6
IO01NB0F0	A5
IO01PB0F0	B5
IO02NB0F0	G9
IO02PB0F0	G8
IO03NB0F0	F8
IO03PB0F0	F7
IO04NB0F0	D7
IO04PB0F0	E7
IO05NB0F0	C7
IO05PB0F0	C6
IO06NB0F0	H9
IO06PB0F0	H8
IO07NB0F0	D8
IO07PB0F0	E8
IO08NB0F0	E9
IO08PB0F0	F9
IO09NB0F0	A7
IO09PB0F0	B7
IO10NB0F0	H10
IO10PB0F0	G10
IO11NB0F0	C9
IO11PB0F0	C8
IO12NB0F1	E10
IO12PB0F1	F10
IO13NB0F1	D10
IO13PB0F1	D9
IO14NB0F1	F11
IO14PB0F1	G11
IO15NB0F1	A10
IO15PB0F1	A9
IO16NB0F1	H12
IO16PB0F1	H11

FG896	
AX1000 Function	Pin Number
IO17NB0F1	B11
IO17PB0F1	B10
IO18NB0F1	D11
IO18PB0F1	E11
IO19NB0F1	C12
IO19PB0F1	C11
IO20NB0F1	F12
IO20PB0F1	G12
IO21NB0F1	D12
IO21PB0F1	E12
IO22NB0F2	H13
IO22PB0F2	J13
IO23NB0F2	A12
IO23PB0F2	A11
IO24NB0F2	F13
IO24PB0F2	G13
IO25NB0F2	B13
IO25PB0F2	B12
IO26NB0F2	E14
IO26PB0F2	E13
IO27NB0F2	B14
IO27PB0F2	A14
IO28NB0F2	H14
IO28PB0F2	J14
IO29NB0F2	B15
IO29PB0F2	A15
IO30NB0F2/HCLKAN	C14
IO30PB0F2/HCLKAP	D14
IO31NB0F2/HCLKBN	E15
IO31PB0F2/HCLKBP	D15
Bank 1	
IO32NB1F3/HCLKCN	E17
IO32PB1F3/HCLKCP	E16
IO33NB1F3/HCLKDN	C17
IO33PB1F3/HCLKDP	D17

FG896	
AX1000 Function	Pin Number
IO34NB1F3	A17
IO34PB1F3	B17
IO35NB1F3	D18
IO35PB1F3	C18
IO36NB1F3	H17
IO36PB1F3	J17
IO37NB1F3	B19
IO37PB1F3	A19
IO38NB1F3	H18
IO38PB1F3	J18
IO39NB1F3	B20
IO39PB1F3	A20
IO40NB1F3	C20
IO40PB1F3	C19
IO41NB1F4	E20
IO41PB1F4	E19
IO42NB1F4	F18
IO42PB1F4	G18
IO43NB1F4	A22
IO43PB1F4	A21
IO44NB1F4	F20
IO44PB1F4	F19
IO45NB1F4	D21
IO45PB1F4	D20
IO46NB1F4	D22
IO46PB1F4	C22
IO47NB1F4	A25
IO47PB1F4	A24
IO48NB1F4	H19
IO48PB1F4	G19
IO49NB1F4	C24
IO49PB1F4	C23
IO50NB1F4	G20
IO50PB1F4	H20
IO51NB1F4	F21

FG1152	
AX2000 Function	Pin Number
GND	AK12
GND	AK17
GND	AK18
GND	AK23
GND	AK30
GND	AK5
GND	AL1
GND	AL11
GND	AL2
GND	AL24
GND	AL3
GND	AL31
GND	AL32
GND	AL33
GND	AL34
GND	AL4
GND	AM1
GND	AM10
GND	AM15
GND	AM2
GND	AM20
GND	AM25
GND	AM3
GND	AM31
GND	AM32
GND	AM33
GND	AM34
GND	AM4
GND	AN1
GND	AN2
GND	AN26
GND	AN3
GND	AN31
GND	AN32
GND	AN33

FG1152	
AX2000 Function	Pin Number
GND	AN34
GND	AN4
GND	AN9
GND	AP13
GND	AP2
GND	AP22
GND	AP27
GND	AP3
GND	AP31
GND	AP32
GND	AP33
GND	AP4
GND	AP8
GND	B1
GND	B2
GND	B26
GND	B3
GND	B31
GND	B32
GND	B33
GND	B34
GND	B4
GND	B9
GND	C1
GND	C10
GND	C15
GND	C2
GND	C20
GND	C25
GND	C3
GND	C31
GND	C32
GND	C33
GND	C34
GND	C4

FG1152	
AX2000 Function	Pin Number
GND	D1
GND	D11
GND	D2
GND	D24
GND	D3
GND	D31
GND	D32
GND	D33
GND	D34
GND	D4
GND	E12
GND	E17
GND	E18
GND	E23
GND	E30
GND	E5
GND	F29
GND	F30
GND	F6
GND	G28
GND	G7
GND	H1
GND	H34
GND	J2
GND	J33
GND	K3
GND	K32
GND	L11
GND	L24
GND	L31
GND	L4
GND	M12
GND	M23
GND	M30
GND	M5

CQ208	
AX500 Function	Pin Number
Bank 0	
IO03NB0F0	198
IO03PB0F0	199
IO04NB0F0	197
IO19NB0F1/HCLKAN	191
IO19PB0F1/HCLKAP	192
IO20NB0F1/HCLKBN	185
IO20PB0F1/HCLKBP	186
Bank 1	
IO21NB1F2/HCLKCN	180
IO21PB1F2/HCLKCP	181
IO22NB1F2/HCLKDN	174
IO22PB1F2/HCLKDP	175
IO23NB1F2	170
IO23PB1F2	171
IO37NB1F3	165
IO37PB1F3	166
IO39NB1F3	161
IO39PB1F3	162
IO41NB1F3	159
IO41PB1F3	160
Bank 2	
IO43NB2F4	151
IO43PB2F4	153
IO44NB2F4	152
IO44PB2F4	154
IO45PB2F4	148
IO46NB2F4	146
IO46PB2F4	147
IO48NB2F4	144
IO48PB2F4	145
IO57NB2F5	139
IO57PB2F5	140
IO58PB2F5	141
IO59NB2F5	137
IO59PB2F5	138
IO61NB2F5	132

CQ208	
AX500 Function	Pin Number
IO61PB2F5	134
IO62NB2F5	131
IO62PB2F5	133
Bank 3	
IO63NB3F6	127
IO63PB3F6	129
IO64NB3F6	126
IO64PB3F6	128
IO66NB3F6	122
IO66PB3F6	123
IO68NB3F6	120
IO68PB3F6	121
IO77NB3F7	116
IO77PB3F7	117
IO79NB3F7	114
IO79PB3F7	115
IO81NB3F7	110
IO81PB3F7	111
IO82NB3F7	108
IO82PB3F7	109
IO83NB3F7	106
IO83PB3F7	107
Bank 4	
IO84PB4F8	103
IO85NB4F8	100
IO86NB4F8	101
IO86PB4F8	102
IO87NB4F8	96
IO87PB4F8	97
IO101NB4F9	91
IO101PB4F9	92
IO103NB4F9/CLKEN	87
IO103PB4F9/CLKEP	88
IO104NB4F9/CLKFN	81
IO104PB4F9/CLKFP	82
Bank 5	
IO105NB5F10/CLKGN	76

CQ208	
AX500 Function	Pin Number
IO105PB5F10/CLKGP	77
IO106NB5F10/CLKHN	70
IO106PB5F10/CLKHP	71
IO107NB5F10	66
IO107PB5F10	67
IO119NB5F11	62
IO121NB5F11	60
IO121PB5F11	61
IO123NB5F11	56
IO123PB5F11	57
IO125NB5F11	54
IO125PB5F11	55
Bank 6	
IO127NB6F12	47
IO127PB6F12	49
IO128NB6F12	48
IO128PB6F12	50
IO129NB6F12	42
IO129PB6F12	43
IO130PB6F12	44
IO132NB6F12	40
IO132PB6F12	41
IO141NB6F13	35
IO141PB6F13	36
IO142PB6F13	37
IO143NB6F13	33
IO143PB6F13	34
IO145NB6F13	28
IO145PB6F13	30
IO146NB6F13	27
IO146PB6F13	29
Bank 7	
IO147NB7F14	23
IO147PB7F14	25
IO148NB7F14	22
IO148PB7F14	24
IO150NB7F14	18

CQ256	
AX2000 Function	**Pin Number**
VCCA	4
VCCA	22
VCCA	42
VCCA	61
VCCA	63
VCCA	84
VCCA	108
VCCA	127
VCCA	131
VCCA	150
VCCA	170
VCCA	189
VCCA	191
VCCA	212
VCCA	238
VCCDA	2
VCCDA	32
VCCDA	66
VCCDA	67
VCCDA	86
VCCDA	87
VCCDA	94
VCCDA	95
VCCDA	96
VCCDA	106
VCCDA	107
VCCDA	126
VCCDA	130
VCCDA	160
VCCDA	194
VCCDA	196
VCCDA	214
VCCDA	215
VCCDA	222
VCCDA	223

CQ256	
AX2000 Function	**Pin Number**
VCCDA	224
VCCDA	236
VCCDA	237
VCCDA	251
VCCIB0	230
VCCIB0	244
VCCIB1	200
VCCIB1	206
VCCIB1	218
VCCIB2	164
VCCIB2	176
VCCIB2	182
VCCIB3	138
VCCIB3	144
VCCIB3	156
VCCIB4	102
VCCIB4	114
VCCIB4	120
VCCIB5	72
VCCIB5	78
VCCIB5	90
VCCIB6	36
VCCIB6	48
VCCIB6	54
VCCIB7	10
VCCIB7	16
VCCIB7	28
VPUMP	195

CQ352	
AX250 Function	Pin Number
IO64PB4F4	167
IO65NB4F4	170
IO65PB4F4	171
IO66NB4F4	164
IO66PB4F4	165
IO67NB4F4	160
IO67PB4F4	161
IO68NB4F4	158
IO68PB4F4	159
IO70NB4F4	154
IO70PB4F4	155
IO72NB4F4	152
IO72PB4F4	153
IO73NB4F4	146
IO73PB4F4	147
IO74NB4F4/CLKEN	142
IO74PB4F4/CLKEP	143
IO75NB4F4/CLKFN	136
IO75PB4F4/CLKFP	137
Bank 5	
IO76NB5F5/CLKGN	128
IO76PB5F5/CLKGP	129
IO77NB5F5/CLKHN	122
IO77PB5F5/CLKHP	123
IO78NB5F5	112
IO78PB5F5	113
IO79NB5F5	118
IO79PB5F5	119
IO80NB5F5	110
IO80PB5F5	111
IO82NB5F5	106
IO82PB5F5	107
IO84NB5F5	100
IO84PB5F5	101
IO85NB5F5	104

CQ352	
AX250 Function	Pin Number
IO85PB5F5	105
IO86NB5F5	98
IO86PB5F5	99
IO87NB5F5	94
IO87PB5F5	95
IO89NB5F5	92
IO89PB5F5	93
Bank 6	
IO90PB6F6	86
IO91NB6F6	84
IO91PB6F6	85
IO92NB6F6	78
IO92PB6F6	79
IO93NB6F6	82
IO93PB6F6	83
IO95NB6F6	76
IO95PB6F6	77
IO96NB6F6	72
IO96PB6F6	73
IO97NB6F6	70
IO97PB6F6	71
IO98NB6F6	66
IO98PB6F6	67
IO99NB6F6	64
IO99PB6F6	65
IO100NB6F6	60
IO100PB6F6	61
IO101NB6F6	58
IO101PB6F6	59
IO103NB6F6	54
IO103PB6F6	55
IO104NB6F6	52
IO104PB6F6	53
IO105NB6F6	48
IO105PB6F6	49

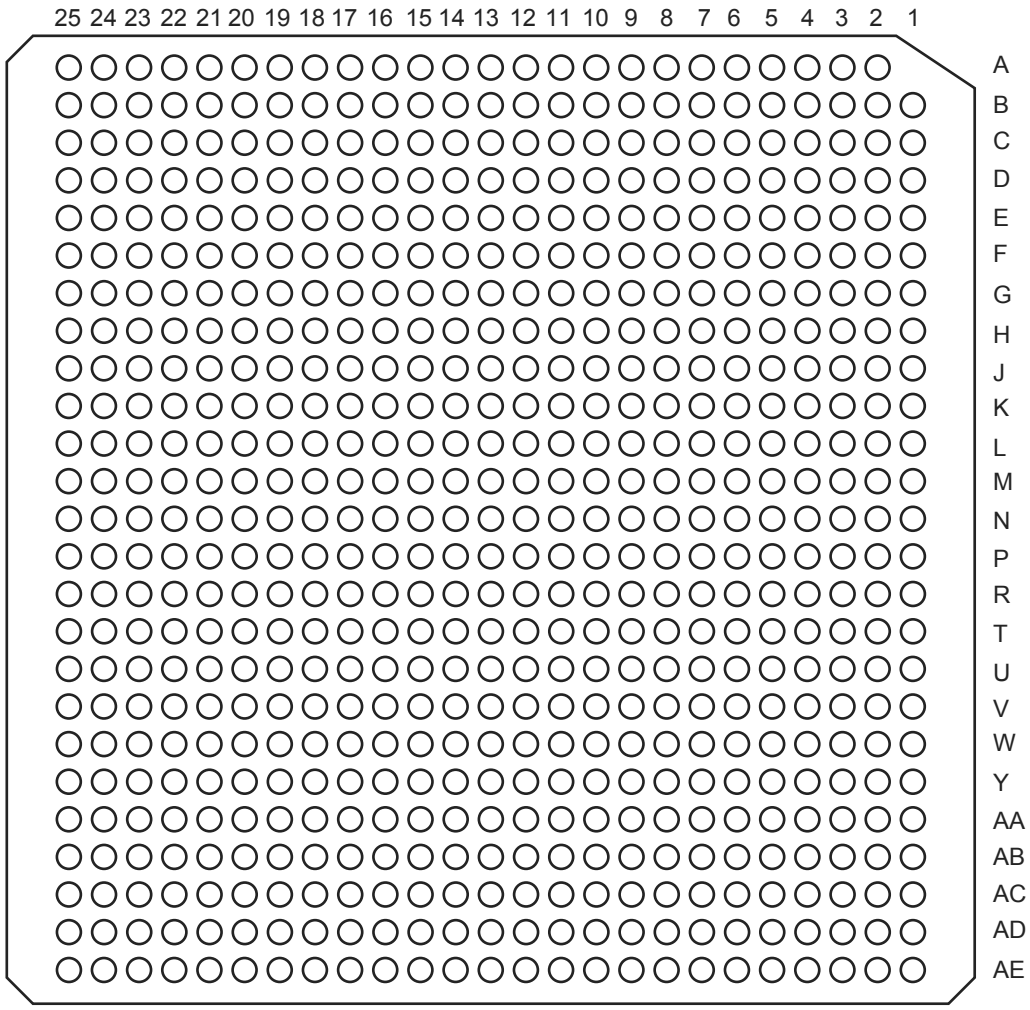
CQ352	
AX250 Function	Pin Number
IO106NB6F6	46
IO106PB6F6	47
Bank 7	
IO107NB7F7	40
IO107PB7F7	41
IO108NB7F7	42
IO108PB7F7	43
IO109NB7F7	36
IO109PB7F7	37
IO110NB7F7	34
IO110PB7F7	35
IO111NB7F7	30
IO111PB7F7	31
IO113NB7F7	28
IO113PB7F7	29
IO114NB7F7	24
IO114PB7F7	25
IO115NB7F7	22
IO115PB7F7	23
IO116NB7F7	18
IO116PB7F7	19
IO117NB7F7	16
IO117PB7F7	17
IO118NB7F7	12
IO118PB7F7	13
IO119NB7F7	10
IO119PB7F7	11
IO121NB7F7	6
IO121PB7F7	7
IO123NB7F7	4
IO123PB7F7	5
Dedicated I/O	
GND	1
GND	9
GND	15

CQ352	
AX1000 Function	Pin Number
GND	21
GND	27
GND	33
GND	39
GND	45
GND	51
GND	57
GND	63
GND	69
GND	75
GND	81
GND	88
GND	89
GND	97
GND	103
GND	109
GND	115
GND	121
GND	133
GND	145
GND	151
GND	157
GND	163
GND	169
GND	176
GND	177
GND	186
GND	192
GND	198
GND	204
GND	210
GND	216
GND	222
GND	228
GND	234

CQ352	
AX1000 Function	Pin Number
GND	240
GND	246
GND	252
GND	258
GND	264
GND	265
GND	274
GND	280
GND	286
GND	292
GND	298
GND	310
GND	322
GND	330
GND	334
GND	340
GND	345
GND	352
NC	91
NC	130
NC	131
NC	174
NC	268
NC	307
NC	308
PRA	312
PRB	311
PRC	135
PRD	134
TCK	349
TDI	348
TDO	347
TMS	350
TRST	351
VCCA	3

CQ352	
AX1000 Function	Pin Number
VCCA	14
VCCA	32
VCCA	56
VCCA	74
VCCA	87
VCCA	102
VCCA	114
VCCA	150
VCCA	162
VCCA	175
VCCA	191
VCCA	209
VCCA	233
VCCA	251
VCCA	263
VCCA	279
VCCA	291
VCCA	329
VCCA	339
VCCDA	2
VCCDA	44
VCCDA	90
VCCDA	116
VCCDA	117
VCCDA	132
VCCDA	148
VCCDA	149
VCCDA	178
VCCDA	221
VCCDA	266
VCCDA	293
VCCDA	294
VCCDA	309
VCCDA	327
VCCDA	328

CG624



Note

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

CG624	
AX1000 Function	**Pin Number**
IO194NB6F18	Y3
IO194PB6F18	AA3
IO195NB6F18	V6
IO195PB6F18	W4
IO197NB6F18	R5
IO197PB6F18	U3
IO198NB6F18	P6
IO199NB6F18	Y5
IO199PB6F18	W5
IO200NB6F18	V3
IO200PB6F18	W3
IO201NB6F18	T7
IO201PB6F18	U7
IO202NB6F18	V2
IO203NB6F19	W2
IO203PB6F19	Y2
IO204NB6F19	AA1
IO204PB6F19	AB1
IO205NB6F19	R6
IO205PB6F19	T6
IO206NB6F19	W1
IO206PB6F19	Y1
IO207NB6F19	T2
IO207PB6F19	U2
IO208NB6F19	T1
IO208PB6F19	U1
IO209NB6F19	AA2
IO209PB6F19	AB2
IO210NB6F19	P5
IO211NB6F19	M1
IO211PB6F19	N1
IO212NB6F19	P1
IO212PB6F19	R1
IO213NB6F19	R8
IO213PB6F19	T8
IO215NB6F20	U4

CG624	
AX1000 Function	**Pin Number**
IO215PB6F20	V4
IO216NB6F20	P8
IO216PB6F20	R3
IO217NB6F20	P7
IO217PB6F20	R7
IO219NB6F20	R4
IO219PB6F20	T4
IO220NB6F20	P2
IO220PB6F20	R2
IO221NB6F20	N4
IO221PB6F20	P4
IO223NB6F20	M2
IO223PB6F20	N2
IO224NB6F20	N3
IO224PB6F20	P3
Bank 7	
IO225NB7F21	J2
IO225PB7F21	J1
IO226PB7F21	G2
IO227NB7F21	H3
IO227PB7F21	H2
IO229NB7F21	K2
IO229PB7F21	L2
IO230NB7F21	K1
IO230PB7F21	L1
IO231NB7F21	E2
IO231PB7F21	F2
IO232NB7F21	F1
IO232PB7F21	G1
IO233NB7F21	L3
IO233PB7F21	M3
IO234NB7F21	D1
IO234PB7F21	E1
IO235NB7F21	K4
IO235PB7F21	L4
IO236NB7F22	M6

CG624	
AX1000 Function	**Pin Number**
IO237NB7F22	N8
IO237PB7F22	N7
IO238NB7F22	M5
IO239NB7F22	L6
IO239PB7F22	L5
IO240NB7F22	M4
IO241NB7F22	L7
IO241PB7F22	M7
IO242NB7F22	J3
IO243NB7F22	M9
IO243PB7F22	M8
IO244NB7F22	P9
IO244PB7F22	N6
IO245NB7F22	K8
IO245PB7F22	L8
IO246NB7F22	F3
IO246PB7F22	E3
IO247NB7F23	K7
IO247PB7F23	K6
IO248NB7F23	D2
IO249NB7F23	G4
IO249PB7F23	G3
IO251NB7F23	N10
IO251PB7F23	N9
IO253NB7F23	H4
IO253PB7F23	J4
IO255NB7F23	J6
IO255PB7F23	J5
IO257NB7F23	H5
IO257PB7F23	H6
Dedicated I/O	
GND	K5
GND	A18
GND	A2
GND	A24
GND	A25

Revision	Changes	Page
Revision 12 (v2.4)	Revised ordering information and timing data to reflect phase out of –3 speed grade options.	
	Table 2-3 was updated.	2
Revision 11 (v2.3)	The "Packaging Data" section is new.	iv
	Table 2-2 was updated.	2-1
	"VCCDA Supply Voltage" was updated.	2-9
	"PRA/B/C/D Probe A, B, C and D" was updated.	2-10
	The "User I/Os" was updated.	2-11
Revision 10 (v2.2)	Figure 1-3 was updated.	1-2
	Table 2-2 was updated.	2-1
	The "Power-Up/Down Sequence" section was updated.	2-1
	Table 2-4 was updated.	2-3
	Table 2-5 was updated.	2-4
	The "Timing Characteristics" section was added.	2-7
	Table 2-7 was updated.	2-7
	Figure 2-1 was updated.	2-8
	The External Setup and Clock-to-Out (Pad-to-Pad) equations in the "Hardwired Clock – Using LVTTL 24 mA High Slew Clock I/O" section were updated.	2-8
	The External Setup and Clock-to-Out (Pad-to-Pad) in the "Routed Clock – Using LVTTL 24 mA High Slew Clock I/O" section were updated.	2-8
	The "Global Pins" section was updated.	2-10
	The "User I/Os" section was updated.	2-11
	Table 2-17 was updated.	2-19
	Figure 2-8 was updated.	2-20
	Figure 2-13 and Figure 2-14 were updated.	2-24
	The following timing parameters were renamed in I/O timing characteristic tables from Table 2-22 to Table 2-60: $t_{IOCLKQ} > t_{ICLKQ}$ $t_{IOCLKY} > t_{OCLKQ}$	2-26 to 2-52
	Timing numbers were updated from Table 2-22 to Table 2-78.	2-26 to 2-69
	The "R-Cell" section was updated.	2-58
	Figure 2-59 was updated.	2-89
	Figure 2-60 was updated.	2-89
	Figure 2-67 was updated.	2-100
	Figure 2-68 was updated.	2-101
	Table 2-89 to Table 2-93 were updated.	2-90 to 2-94
	Table 2-98 to Table 2-102 were updated.	2-102 to 2-106