



Welcome to [E-XFL.COM](https://www.e-xfl.com)

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	418
Number of Gates	1000000
Voltage - Supply	1.425V ~ 1.575V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 70°C (TA)
Package / Case	676-BGA
Supplier Device Package	676-FBGA (27x27)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/ax1000-fg676

Calculating Power Dissipation

Table 2-3 • Standby Current

Device	Temperature	ICCA	ICCD A	ICCBANK		ICCP LL	ICCCP ¹		IIH, IIL, IOZ ²	Units
		Standby Current (Core)	Standby Current, Differential I/O	Standby Current per I/O Bank		Standby Current per PLL	Standby Current, Charge Pump			
				2.5 V VCCI	3.3 V VCCI		Active	Bypassed Mode		
AX125	Typical at 25°C	1.5	1.5	0.2	0.3	0.2	0.3	0.01	±0.01	mA
	70°C	15	6	0.5	0.75	1	0.4	0.01	±0.01	mA
	85°C	25	6	0.6	0.8	1	0.4	0.2	±0.01	mA
	125°C	50	8	1	1.5	2	0.4	0.5	±0.01	mA
AX250	Typical at 25°C	1.5	1.4	0.25	0.4	0.2	0.3	0.01	±0.01	mA
	70°C	30	7	0.8	0.9	1	0.4	0.01	±0.01	mA
	85°C	40	7	0.8	1	1	0.4	0.2	±0.01	mA
	125°C	70	9	1.3	1.8	2	0.4	0.5	±0.01	mA
AX500	Typical at 25°C	5	1.4	0.4	0.75	0.2	0.3	0.01	±0.01	mA
	70°C	60	7	1	1.5	1	0.4	0.01	±0.01	mA
	85°C	80	7	1	1.9	1	0.4	0.2	±0.01	mA
	125°C	180	9	1.75	2.5	1.5	0.4	0.5	±0.01	mA
AX1000	Typical at 25°C	7.5	1.5	0.5	1.25	0.2	0.3	0.01	±0.01	mA
	70°C	80	8	1.5	3	1	0.4	0.01	±0.01	mA
	85°C	120	8	1.5	3.4	1	0.4	0.2	±0.01	mA
	125°C	200	10	3	4	1.5	0.4	0.5	±0.01	mA
AX2000	Typical at 25°C	20	1.6	0.7	1.5	0.2	0.3	0.01	±0.01	mA
	70°C	160	10	2	7	1	0.4	0.01	±0.01	mA
	85°C	200	10	3	8	1	0.4	0.2	±0.01	mA
	125°C	500	15	4	10	1.5	0.4	0.5	±0.01	mA

Notes:

1. ICCCP Active is the ICCDA or the Internal Charge Pump current. ICCCP Bypassed mode is the External Charge Pump current IIH (VPUMP pin).
2. IIH, IIL, or IOZ values are measured with inputs at the same level as VCCI for IIH and GND for IIL and IOZ.

User I/O Naming Conventions

Due to the complex and flexible nature of the Axcelerator family's user I/Os, a naming scheme is used to show the details of the I/O. The naming scheme explains to which bank an I/O belongs, as well as the pairing and pin polarity for differential I/Os (Figure 2-7).

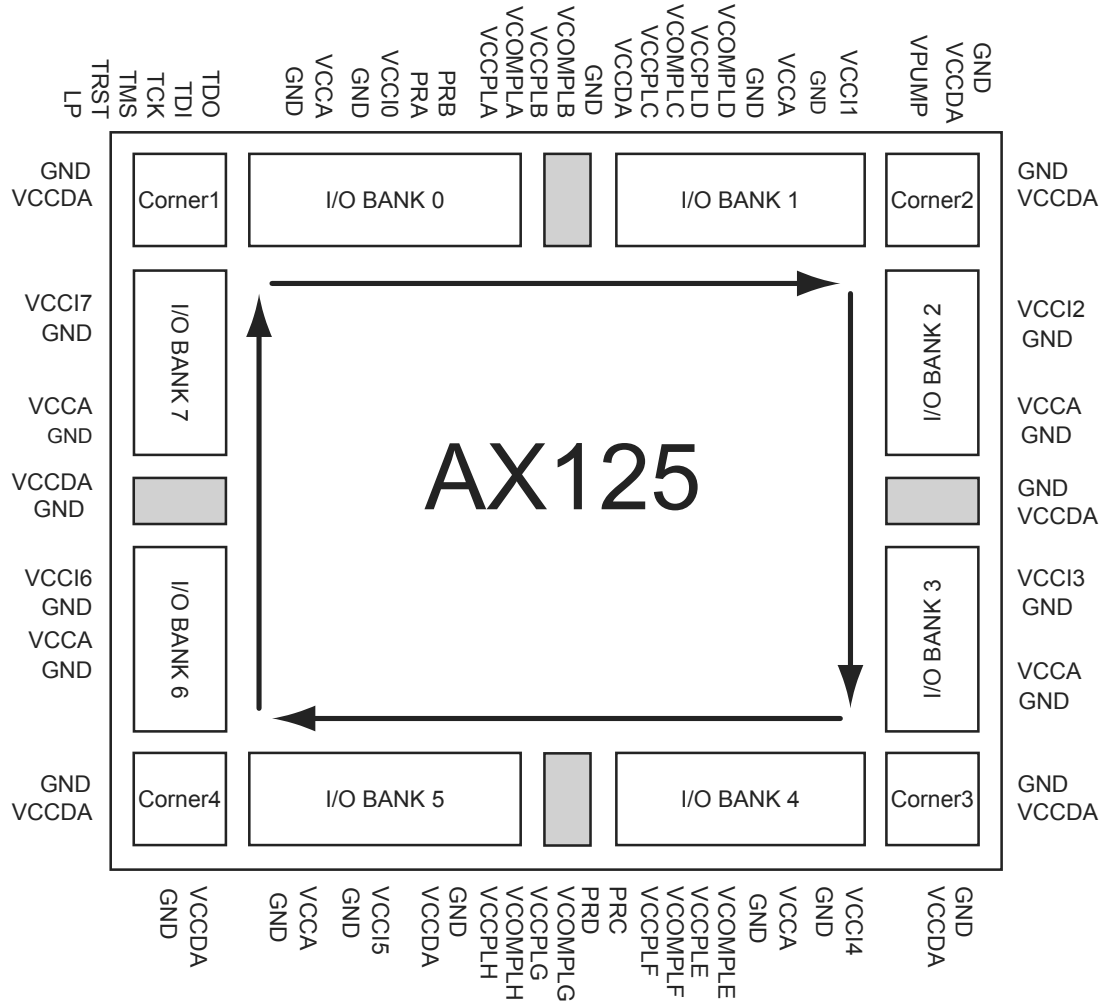
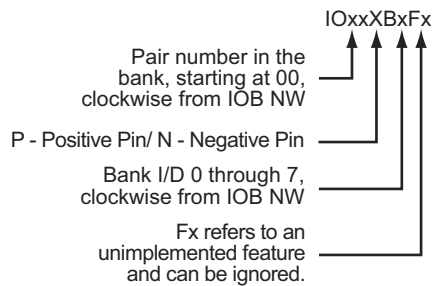


Figure 2-7 • I/O Bank and Dedicated Pin Layout



Examples:

IO12PB1F1 is the positive pin of the thirteenth pair of the first I/O bank (IOB NE). IO12PB1 combined with IO12NB1 form a differential pair.

For those I/Os that can be employed either as a user I/O or as a special function, the following nomenclature is used:

IOxxXBxFx/special_function_name

IOxxPB1Fx/xCLKx this pin can be configured as a clock input or as a user I/O.

Figure 2-8 • General Naming Schemes

I/O Module Timing Characteristics

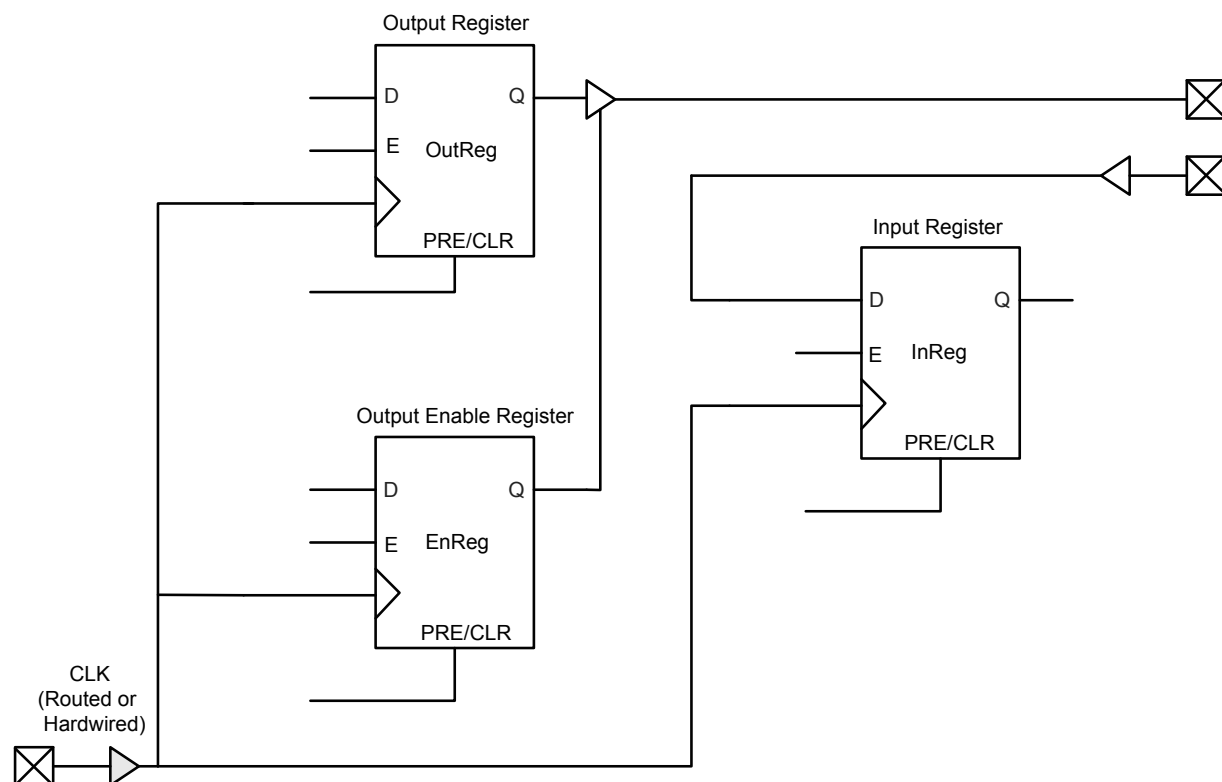


Figure 2-11 • Timing Model

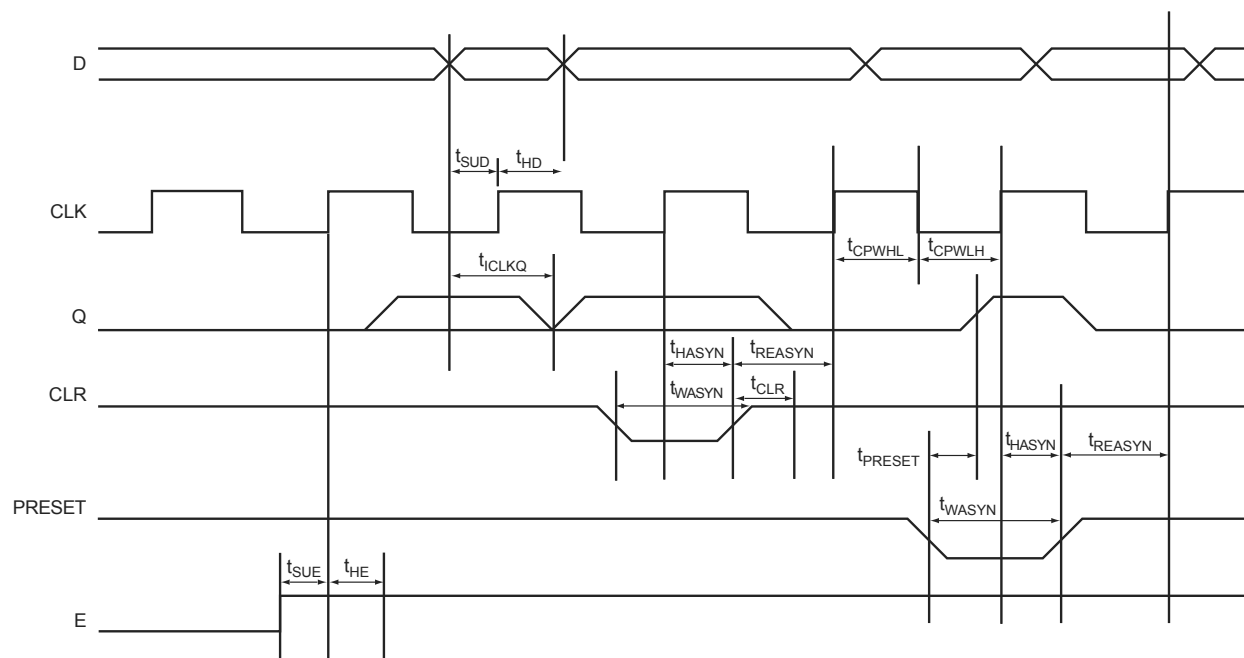


Figure 2-12 • Input Register Timing Characteristics

3.3 V PCI, 3.3 V PCI-X

Peripheral Component Interface for 3.3 V standard specifies support for both 33 MHz and 66 MHz PCI bus applications. It uses an LVTTTL input buffer and a push-pull output buffer. The input and output buffers are 5 V tolerant with the aid of external components. Axcelerator 3.3 V PCI and 3.3 V PCI-X buffers are compliant with the PCI Local Bus Specification Rev. 2.1.

The PCI Compliance Specification requires the clamp diodes to be able to withstand for 11 ns, -3.5 V in undershoot, and 7.1 V in overshoot.

Table 2-33 • 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
PCI	-0.3	0.3 VCCI	0.5 VCCI	VCCI + 0.5	(per PCI specification)			
PCI-X	-0.5	0.35 VCCI	0.5 VCCI	VCCI + 0.5	(per PCI specification)			

AC Loadings

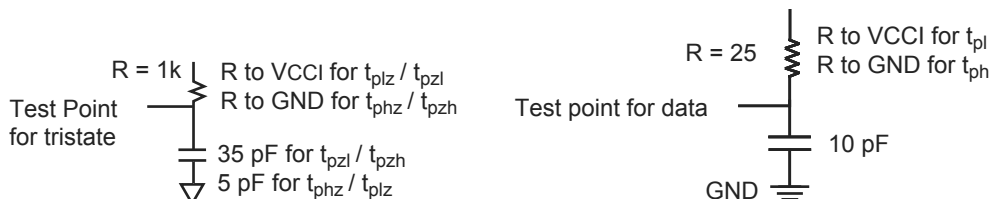


Figure 2-18 • AC Test Loads

Table 2-34 • AC Waveforms, Measuring Points, and Capacitive Loads

Input Low (V)	Input High (V)	Measuring Point* (V)	VREF (typ) (V)	C _{load} (pF)
(Per PCI Spec and PCI-X Spec)			N/A	10

Note: * Measuring Point = VTRIP

Timing Model and Waveforms

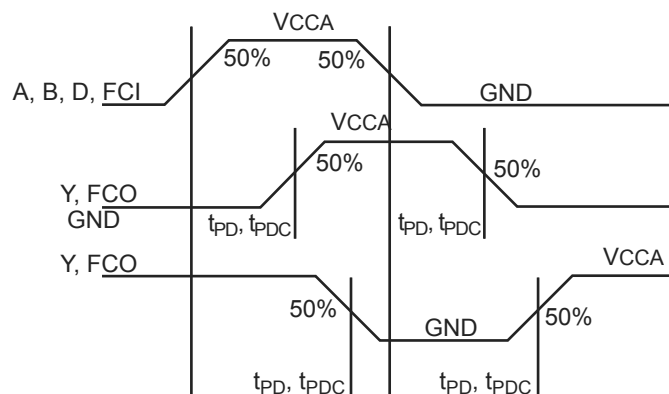


Figure 2-28 • C-Cell Timing Model and Waveforms

Timing Characteristics

Table 2-62 • C-Cell

Worst-Case Commercial Conditions $V_{CCA} = 1.425\text{ V}$, $V_{CCI} = 3.0\text{ V}$, $T_J = 70^\circ\text{C}$

		–2 Speed		–1 Speed		Std Speed		Units
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	
C-Cell Propagation Delays								
t _{PD}	Any input to output Y	0.74		0.84		0.99		ns
t _{PDC}	Any input to carry chain output (FCO)	0.57		0.64		0.76		ns
t _{PDB}	Any input through DB when one input is used	0.95		1.09		1.28		ns
t _{CCY}	Input to carry chain (FCI) to Y	0.61		0.69		0.82		ns
t _{CC}	Input to carry chain (FCI) to carry chain output (FCO)	0.08		0.09		0.11		ns

Timing Models and Waveforms

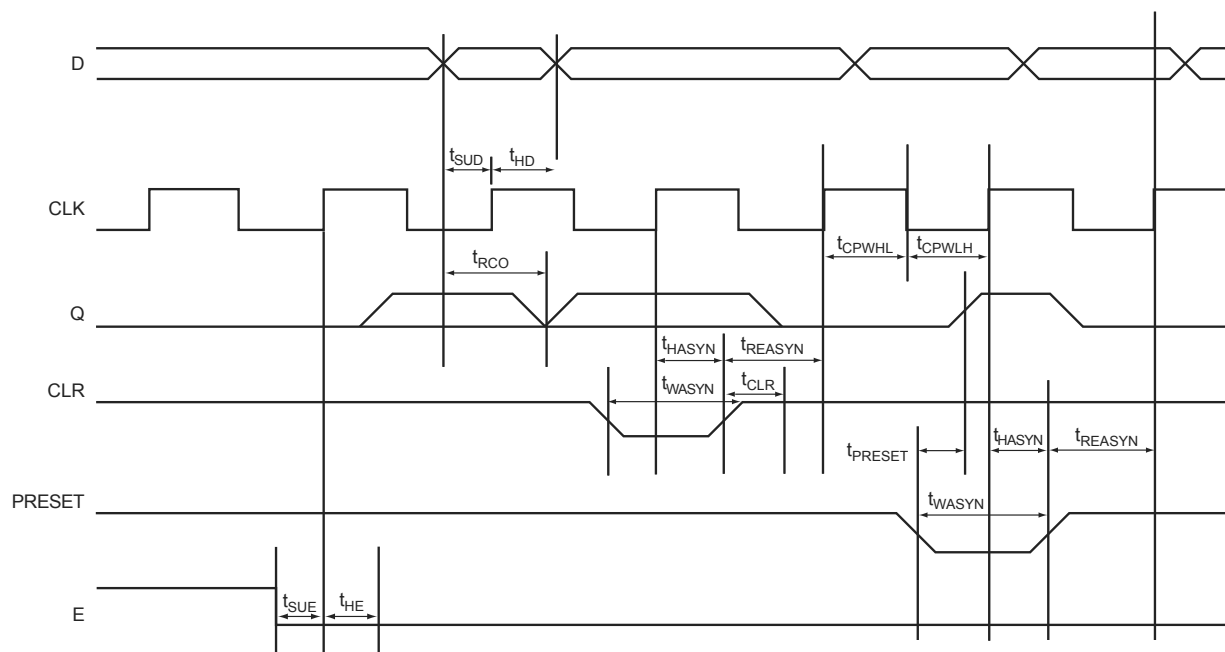


Figure 2-32 • R-Cell Delays

Timing Characteristics

Table 2-63 • R-Cell

Worst-Case Commercial Conditions $V_{CCA} = 1.425\text{ V}$, $V_{CCI} = 3.0\text{ V}$, $T_J = 70^\circ\text{C}$

		–2 Speed		–1 Speed		Std Speed		Units
Parameter	Description	Min.	Max.	Min.	Max.	Min.	Max.	
R-Cell Propagation Delays								
t _{RCO}	Sequential Clock-to-Q		0.67		0.77		0.90	ns
t _{CLR}	Asynchronous Clear-to-Q		0.67		0.77		0.90	ns
t _{PRESET}	Asynchronous Preset-to-Q		0.36		0.36		0.36	ns
t _{SUD}	Flip-Flop Data Input Set-Up		0.34		0.34		0.34	ns
t _{SUE}	Flip-Flop Enable Input Set-Up		0.00		0.00		0.00	ns
t _{HD}	Flip-Flop Data Input Hold		0.67		0.77		0.90	ns
t _{HE}	Flip-Flop Enable Input Hold		0.67		0.77		0.90	ns
t _{WASYN}	Asynchronous Pulse Width	0.48		0.48		0.48		ns
t _{REASYN}	Asynchronous Recovery Time		0.23		0.27		0.31	ns
t _{HASYN}	Asynchronous Removal Time		0.36		0.36		0.36	ns
t _{CPWHL}	Clock Pulse Width High to Low	0.36		0.36		0.36		ns
t _{CPWLH}	Clock Pulse Width Low to High	0.36		0.36		0.36		ns

Sample Implementations

Frequency Synthesis

Figure 2-53 illustrates an example where the PLL is used to multiply a 155.5 MHz external clock up to 622 MHz. Note that the same PLL schematic could use an external 350 MHz clock, which is divided down to 155 MHz by the FPGA internal logic.

Figure 2-54 illustrates the PLL using both dividers to synthesize a 133 MHz output clock from a 155 MHz input reference clock. The input frequency of 155 MHz is multiplied by 6 and divided by 7, giving a CLK1 output frequency of 132.86 MHz. When dividers are used, a given ratio can be generated in multiple ways, allowing the user to stay within the operating frequency ranges of the PLL.

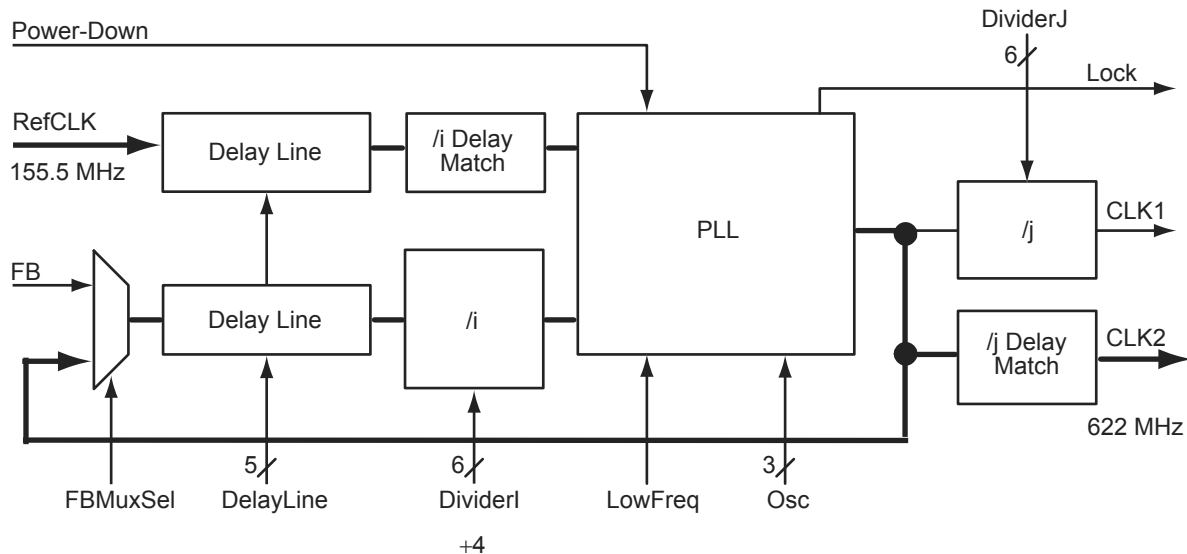


Figure 2-53 • Using the PLL 155.5 MHz In, 622 MHz Out

Adjustable Clock Delay

Figure 2-55 illustrates using the PLL to delay the reference clock by employing one of the adjustable delay lines. In this case, the output clock is delayed relative to the reference clock. Delaying the reference clock relative to the output clock is accomplished by using the delay line in the feedback path.

Table 2-100 • Four 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		14.60		16.63		19.55	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		2.51		2.51		2.51	ns
t _{WCKP}	Minimum WCLK Period	3.26		3.26		3.26		ns
t _{RSU}	Read Setup		15.27		17.39		20.44	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		2.96		2.96		2.96	ns
t _{RCKP}	Minimum RCLK period	3.69		3.69		3.69		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)		2.36		2.69		3.16	ns
t _{RCK2RD2}	RCLK-To-OUT (Nonpipelined)		2.83		3.23		3.79	ns

Note: Timing data for these four cascaded FIFO blocks uses a depth of 16,384. For all other combinations, use Microsemi's timing software.

Programming

Device programming is supported through the Silicon Sculptor II, a single-site, robust and compact device programmer for the PC. Up to four Silicon Sculptor IIs can be daisy-chained and controlled from a single PC host. With standalone software for the PC, Silicon Sculptor II is designed to allow concurrent programming of multiple units from the same PC when daisy-chained.

Silicon Sculptor II programs devices independently to achieve the fastest programming times possible. Each fuse is verified by Silicon Sculptor II to ensure correct programming. Furthermore, at the end of programming, there are integrity tests that are run to ensure that programming was completed properly. Not only does it test programmed and nonprogrammed fuses, Silicon Sculptor II also provides a self-test to test its own hardware extensively.

Programming an Axcelerator device using Silicon Sculptor II is similar to programming any other antifuse device. The procedure is as follows:

1. Load the *.AFM file.
2. Select the device to be programmed.
3. Begin programming.

When the design is ready to go to production, Microsemi offers device volume-programming services either through distribution partners or via our In-House Programming Center.

In addition, BP Microsystems offers multi-site programmers that provide qualified support for Axcelerator devices.

For more details on programming the Axcelerator devices, please refer to the *Silicon Sculptor II User's Guide*.

BG729		BG729		BG729	
AX1000 Function	Pin Number	AX1000 Function	Pin Number	AX1000 Function	Pin Number
IO163PB5F15	AA14	IO182NB5F17	AF7	IO200NB6F18	AA4
IO164NB5F15	AE13	IO182PB5F17	AG7	IO200PB6F18	AA5
IO164PB5F15	AF13	IO183NB5F17	AD7	IO201NB6F18	W5
IO165NB5F15	AF12	IO183PB5F17	AE7	IO201PB6F18	W6
IO165PB5F15	AG12	IO184NB5F17	AC7	IO202NB6F18	AB1
IO166NB5F15	AD12	IO184PB5F17	AC8	IO202PB6F18	AC1
IO166PB5F15	AE12	IO185NB5F17	AF6	IO203NB6F19	Y3
IO167NB5F15	Y13	IO185PB5F17	AG6	IO203PB6F19	AA3
IO167PB5F15	AA13	IO186NB5F17	AB7	IO204NB6F19	AA2
IO168NB5F15	AD11	IO186PB5F17	AB8	IO204PB6F19	AB2
IO168PB5F15	AE11	IO187NB5F17	Y9	IO205NB6F19	U8
IO169NB5F15	AG11	IO187PB5F17	AA9	IO205PB6F19	V8
IO169PB5F15	AF11	IO188NB5F17	AD6	IO206NB6F19	V5
IO170NB5F15	AB11	IO188PB5F17	AE6	IO206PB6F19	V6
IO170PB5F15	AC11	IO189NB5F17	AB6	IO207NB6F19	Y1
IO171NB5F16	AF10	IO189PB5F17	AC6	IO207PB6F19	AA1
IO171PB5F16	AG10	IO190NB5F17	AF5	IO208NB6F19	W4
IO172NB5F16	AD10	IO190PB5F17	AG5	IO208PB6F19	Y4
IO172PB5F16	AE10	IO191NB5F17	AA6	IO209NB6F19	T7
IO173NB5F16	Y12	IO191PB5F17	AA7	IO209PB6F19	U7
IO173PB5F16	AA12	IO192NB5F17	Y8	IO210NB6F19	W2
IO174NB5F16	AB10	IO192PB5F17	AA8	IO210PB6F19	Y2
IO174PB5F16	AC10	Bank 6		IO211NB6F19	U5
IO175NB5F16	AF9	IO193NB6F18	W8	IO211PB6F19	U6
IO175PB5F16	AG9	IO193PB6F18	Y7	IO212NB6F19	V3
IO176NB5F16	AD9	IO194NB6F18	AB5	IO212PB6F19	W3
IO176PB5F16	AE9	IO194PB6F18	AC5	IO213NB6F19	R9
IO177NB5F16	Y11	IO195NB6F18	AC2	IO213PB6F19	T8
IO177PB5F16	AA11	IO195PB6F18	AC3	IO214NB6F20	U4
IO178NB5F16	AF8	IO196NB6F18	AC4	IO214PB6F20	V4
IO178PB5F16	AG8	IO196PB6F18	AD4	IO215NB6F20	T5
IO179NB5F16	AD8	IO197NB6F18	Y5	IO215PB6F20	T6
IO179PB5F16	AE8	IO197PB6F18	Y6	IO216NB6F20	V1
IO180NB5F16	AB9	IO198NB6F18	AB3	IO216PB6F20	W1
IO180PB5F16	AC9	IO198PB6F18	AB4	IO217NB6F20	R7
IO181NB5F17	Y10	IO199NB6F18	V7	IO217PB6F20	R8
IO181PB5F17	AA10	IO199PB6F18	W7	IO218NB6F20	U2

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		FG256	
AX250 Function	Pin Number	AX250 Function	Pin Number
VCCA	L9	VCCIB4	M11
VCCA	N3	VCCIB4	M9
VCCA	P14	VCCIB5	M6
VCCPLA	C7	VCCIB5	M7
VCCPLB	D6	VCCIB5	M8
VCCPLC	A10	VCCIB6	J5
VCCPLD	D10	VCCIB6	K5
VCCPLE	P10	VCCIB6	L5
VCCPLF	N11	VCCIB7	F5
VCCPLG	T7	VCCIB7	G5
VCCPLH	N7	VCCIB7	H5
VCCDA	A11	VCOMPLA	A7
VCCDA	A2	VCOMPLB	D7
VCCDA	C13	VCOMPLC	B9
VCCDA	D9	VCOMPLD	D11
VCCDA	H1	VCOMPLE	T10
VCCDA	J15	VCOMPLF	N10
VCCDA	N14	VCOMPLG	R8
VCCDA	N8	VCOMPLH	N6
VCCDA	P4	VPUMP	A14
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		

FG484	
AX500 Function	Pin Number
IO54PB2F5	H22
IO55NB2F5	L17
IO55PB2F5	K17
IO56NB2F5	K21
IO56PB2F5	K22
IO58NB2F5	L20
IO58PB2F5	K20
IO59NB2F5	L18
IO59PB2F5	K18
IO60NB2F5	M21
IO60PB2F5	L21
IO61NB2F5	L16
IO61PB2F5	K16
IO62NB2F5	M19
IO62PB2F5	L19
Bank 3	
IO63NB3F6	N16
IO63PB3F6	M16
IO64NB3F6	P22
IO64PB3F6	N22
IO65NB3F6	N20
IO65PB3F6	M20
IO66NB3F6	P21
IO66PB3F6	N21
IO67NB3F6	N18
IO67PB3F6	N19
IO68NB3F6	T22
IO68PB3F6	R22
IO69NB3F6	N17
IO69PB3F6	M17
IO70NB3F6	T21
IO70PB3F6	R21
IO71NB3F6	P18
IO71PB3F6	P19
IO72NB3F6	R20

FG484	
AX500 Function	Pin Number
IO72PB3F6	P20
IO73PB3F6	R19
IO74NB3F7	V21
IO74PB3F7	U21
IO75NB3F7	V22
IO75PB3F7	U22
IO76NB3F7	U20
IO76PB3F7	T20
IO77NB3F7	R17
IO77PB3F7	P17
IO78NB3F7	W21
IO78PB3F7	W22
IO79NB3F7	T18
IO79PB3F7	R18
IO80NB3F7	W20
IO80PB3F7	V20
IO81NB3F7	U19
IO81PB3F7	T19
IO82NB3F7	U18
IO82PB3F7	V19
IO83NB3F7	R16
IO83PB3F7	P16
Bank 4	
IO84NB4F8	AB18
IO84PB4F8	AB19
IO85NB4F8	T15
IO85PB4F8	T16
IO86NB4F8	AA18
IO86PB4F8	AA19
IO87NB4F8	W17
IO87PB4F8	V17
IO88NB4F8	Y19
IO88PB4F8	W18
IO89NB4F8	U14
IO89PB4F8	U15

FG484	
AX500 Function	Pin Number
IO90NB4F8	Y17
IO90PB4F8	Y18
IO91NB4F8	V15
IO91PB4F8	V16
IO92PB4F8	AB17
IO93NB4F8	Y15
IO93PB4F8	Y16
IO94NB4F9	AA16
IO94PB4F9	AA17
IO95NB4F9	AB14
IO95PB4F9	AB15
IO96NB4F9	W15
IO96PB4F9	W16
IO97NB4F9	AA13
IO97PB4F9	AB13
IO98NB4F9	AA14
IO98PB4F9	AA15
IO100NB4F9	Y14
IO100PB4F9	W14
IO101NB4F9	Y12
IO101PB4F9	Y13
IO102NB4F9	AA11
IO102PB4F9	AA12
IO103NB4F9/CLKEN	V12
IO103PB4F9/CLKEP	V13
IO104NB4F9/CLKFN	W11
IO104PB4F9/CLKFP	W12
Bank 5	
IO105NB5F10/CLKGN	U10
IO105PB5F10/CLKGP	U11
IO106NB5F10/CLKHN	V9
IO106PB5F10/CLKHP	V10
IO107NB5F10	Y10
IO107PB5F10	Y11
IO108NB5F10	AA9

FG896	
AX2000 Function	Pin Number
IO303PB7F28	R1
IO304NB7F28	R7
IO304PB7F28	R6
IO306NB7F28	N2
IO306PB7F28	P2
IO307NB7F28	N3
IO307PB7F28	P3
IO308NB7F28	P9
IO308PB7F28	P8
IO309NB7F28	P4
IO309PB7F28	P5
IO310NB7F29	P7
IO310PB7F29	P6
IO311NB7F29	L1
IO311PB7F29	M1
IO312NB7F29	M5
IO312PB7F29	N5
IO313NB7F29	M4
IO313PB7F29	N4
IO315NB7F29	L2
IO315PB7F29	M2
IO316NB7F29	N7
IO316PB7F29	N6
IO317NB7F29	L3
IO317PB7F29	M3
IO318NB7F29	N8
IO318PB7F29	N9
IO320NB7F29	L6
IO320PB7F29	M6
IO321NB7F30	K4
IO321PB7F30	L4
IO322NB7F30	M8
IO322PB7F30	M7
IO323NB7F30	J1
IO323PB7F30	K1

FG896	
AX2000 Function	Pin Number
IO324NB7F30	K5
IO324PB7F30	L5
IO326NB7F30	G1*
IO326PB7F30	K2*
IO327NB7F30	J4
IO327PB7F30	J3
IO328NB7F30	L8
IO328PB7F30	L7
IO329NB7F30	G2
IO329PB7F30	H2
IO330NB7F30	G3
IO330PB7F30	H3
IO331NB7F30	K8
IO331PB7F30	K7
IO332NB7F31	J6
IO332PB7F31	K6
IO333NB7F31	D1
IO333PB7F31	D2
IO334NB7F31	G4
IO334PB7F31	H4
IO335NB7F31	F2
IO335PB7F31	F1
IO336NB7F31	H5
IO336PB7F31	J5
IO337NB7F31	E2
IO337PB7F31	E1
IO338NB7F31	H7
IO338PB7F31	J7
IO339NB7F31	F4
IO339PB7F31	F3
IO340NB7F31	F5
IO340PB7F31	G5
IO341NB7F31	G6
IO341PB7F31	H6
Dedicated I/O	

FG896	
AX2000 Function	Pin Number
GND	A13
GND	A18
GND	A2
GND	A23
GND	A29
GND	A8
GND	AA10
GND	AA21
GND	AA28
GND	AA3
GND	AB2
GND	AB22
GND	AB29
GND	AB9
GND	AC1
GND	AC30
GND	AE25
GND	AE6
GND	AF26
GND	AF5
GND	AG27
GND	AG4
GND	AH10
GND	AH15
GND	AH16
GND	AH21
GND	AH28
GND	AH3
GND	AJ1
GND	AJ2
GND	AJ22
GND	AJ29
GND	AJ30
GND	AJ9
GND	AK13

FG1152		FG1152		FG1152	
AX2000 Function	Pin Number	AX2000 Function	Pin Number	AX2000 Function	Pin Number
IO155PB3F14	AC29	IO172PB4F16	AH27	IO190NB4F17	AH22
IO156NB3F14	AE30	IO173NB4F16	AJ27	IO190PB4F17	AH23
IO156PB3F14	AD30	IO173PB4F16	AJ28	IO191NB4F17	AJ23
IO157NB3F14	AC26	IO174NB4F16	AL27	IO191PB4F17	AJ24
IO157PB3F14	AB26	IO174PB4F16	AL28	IO192NB4F17	AG21
IO158NB3F14	AH33	IO175NB4F16	AM28	IO192PB4F17	AG22
IO158PB3F14	AG33	IO175PB4F16	AM29	IO193NB4F18	AP23
IO159NB3F14	AD27	IO176NB4F16	AG25	IO193PB4F18	AP24
IO159PB3F14	AC27	IO176PB4F16	AG26	IO194NB4F18	AN22
IO160NB3F14	AG32	IO177NB4F16	AK26	IO194PB4F18	AN23
IO160PB3F14	AF32	IO177PB4F16	AK27	IO195NB4F18	AM23
IO161NB3F15	AG31	IO178NB4F16	AF25	IO195PB4F18	AL23
IO161PB3F15	AF31	IO178PB4F16	AE25	IO196NB4F18	AF21
IO162NB3F15	AF29	IO179NB4F16	AP28	IO196PB4F18	AF22
IO162PB3F15	AE29	IO179PB4F16	AN28	IO197NB4F18	AL22
IO163NB3F15	AE28	IO180NB4F16	AJ25	IO197PB4F18	AM22
IO163PB3F15	AD28	IO180PB4F16	AJ26	IO198NB4F18	AE21
IO164NB3F15	AG30	IO181NB4F17	AM26	IO198PB4F18	AE22
IO164PB3F15	AF30	IO181PB4F17	AM27	IO199NB4F18	AJ21
IO165NB3F15	AE26	IO182NB4F17	AF24	IO199PB4F18	AJ22
IO165PB3F15	AD26	IO182PB4F17	AE24	IO200NB4F18	AK21
IO166NB3F15	AJ30	IO183NB4F17	AH24	IO200PB4F18	AK22
IO166PB3F15	AH30	IO183PB4F17	AH25	IO201NB4F18	AM21
IO167NB3F15	AG28	IO184NB4F17	AG23	IO201PB4F18	AL21
IO167PB3F15	AF28	IO184PB4F17	AG24	IO202NB4F18	AE20
IO168NB3F15	AF27	IO185NB4F17	AL25	IO202PB4F18	AD20
IO168PB3F15	AE27	IO185PB4F17	AL26	IO203NB4F19	AN21
IO169NB3F15	AH29	IO186NB4F17	AP25	IO203PB4F19	AP21
IO169PB3F15	AG29	IO186PB4F17	AP26	IO204NB4F19	AP20
IO170NB3F15	AD25	IO187NB4F17	AK24	IO204PB4F19	AN20
IO170PB3F15	AC25	IO187PB4F17	AK25	IO205NB4F19	AN19
Bank 4		IO188NB4F17	AF23	IO205PB4F19	AP19
IO171NB4F16	AP29	IO188PB4F17	AE23	IO206NB4F19	AG20
IO171PB4F16	AN29	IO189NB4F17	AN24	IO206PB4F19	AF20
IO172NB4F16	AH26	IO189PB4F17	AM24	IO207NB4F19	AL19

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
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	
AX500 Function	Pin Number	AX500 Function	Pin Number	AX500 Function	Pin Number
IO87PB4F8	171	IO119PB5F11	101	IO146NB6F13	46
IO89NB4F8	166	IO121NB5F11	98	IO146PB6F13	47
IO89PB4F8	167	IO121PB5F11	99	Bank 7	
IO94NB4F9	164	IO123NB5F11	94	IO147NB7F14	40
IO94PB4F9	165	IO123PB5F11	95	IO147PB7F14	41
IO95NB4F9	160	IO125NB5F11	92	IO148NB7F14	42
IO95PB4F9	161	IO125PB5F11	93	IO148PB7F14	43
IO97NB4F9	158	Bank 6		IO149NB7F14	36
IO97PB4F9	159	IO126PB6F12	86	IO149PB7F14	37
IO99NB4F9	154	IO127NB6F12	84	IO151NB7F14	30
IO99PB4F9	155	IO127PB6F12	85	IO151PB7F14	31
IO100NB4F9	146	IO129NB6F12	82	IO152NB7F14	34
IO100PB4F9	147	IO129PB6F12	83	IO152PB7F14	35
IO101NB4F9	152	IO131NB6F12	78	IO153NB7F14	28
IO101PB4F9	153	IO131PB6F12	79	IO153PB7F14	29
IO103NB4F9/CLKEN	142	IO133NB6F12	76	IO155NB7F14	24
IO103PB4F9/CLKEP	143	IO133PB6F12	77	IO155PB7F14	25
IO104NB4F9/CLKFN	136	IO134NB6F12	72	IO157NB7F14	22
IO104PB4F9/CLKFP	137	IO134PB6F12	73	IO157PB7F14	23
Bank 5		IO135NB6F12	70	IO159NB7F15	16
IO105NB5F10/CLKGN	128	IO135PB6F12	71	IO159PB7F15	17
IO105PB5F10/CLKGP	129	IO137NB6F13	66	IO160NB7F15	18
IO106NB5F10/CLKHN	122	IO137PB6F13	67	IO160PB7F15	19
IO106PB5F10/CLKHP	123	IO138NB6F13	64	IO161NB7F15	12
IO107NB5F10	118	IO138PB6F13	65	IO161PB7F15	13
IO107PB5F10	119	IO139NB6F13	60	IO163NB7F15	10
IO114NB5F11	112	IO139PB6F13	61	IO163PB7F15	11
IO114PB5F11	113	IO141NB6F13	54	IO165NB7F15	6
IO115NB5F11	110	IO141PB6F13	55	IO165PB7F15	7
IO115PB5F11	111	IO142NB6F13	58	IO167NB7F15	4
IO116NB5F11	106	IO142PB6F13	59	IO167PB7F15	5
IO116PB5F11	107	IO143NB6F13	52	Dedicated I/O	
IO117NB5F11	104	IO143PB6F13	53	GND	1
IO117PB5F11	105	IO145NB6F13	48	GND	9
IO119NB5F11	100	IO145PB6F13	49	GND	15

CQ352		CQ352		CQ352	
AX500 Function	Pin Number	AX500 Function	Pin Number	AX500 Function	Pin Number
GND	21	GND	240	TDI	348
GND	27	GND	246	TDO	347
GND	33	GND	252	TMS	350
GND	39	GND	258	TRST	351
GND	45	GND	264	VCCA	3
GND	51	GND	265	VCCA	14
GND	57	GND	274	VCCA	32
GND	63	GND	280	VCCA	56
GND	69	GND	286	VCCA	74
GND	75	GND	292	VCCA	87
GND	81	GND	298	VCCA	102
GND	88	GND	310	VCCA	114
GND	89	GND	322	VCCA	150
GND	97	GND	330	VCCA	162
GND	103	GND	334	VCCA	175
GND	109	GND	340	VCCA	191
GND	115	GND	345	VCCA	209
GND	121	GND/LP	352	VCCA	233
GND	133	NC	91	VCCA	251
GND	145	NC	117	VCCA	263
GND	151	NC	130	VCCA	279
GND	157	NC	131	VCCA	291
GND	163	NC	148	VCCA	329
GND	169	NC	174	VCCA	339
GND	176	NC	268	VCCDA	2
GND	177	NC	294	VCCDA	44
GND	186	NC	307	VCCDA	90
GND	192	NC	308	VCCDA	116
GND	198	NC	327	VCCDA	132
GND	204	NC	328	VCCDA	149
GND	210	PRA	312	VCCDA	178
GND	216	PRB	311	VCCDA	221
GND	222	PRC	135	VCCDA	266
GND	228	PRD	134	VCCDA	293
GND	234	TCK	349	VCCDA	309

CG624	
AX2000 Function	Pin Number
VCCIB2	D23
VCCIB2	E22
VCCIB2	K17
VCCIB2	L17
VCCIB2	M16
VCCIB3	AA22
VCCIB3	AB23
VCCIB3	AC24
VCCIB3	AC25
VCCIB3	P16
VCCIB3	R17
VCCIB3	T17
VCCIB4	AB21
VCCIB4	AC22
VCCIB4	AD23
VCCIB4	AE23
VCCIB4	T14
VCCIB4	U15
VCCIB4	U16
VCCIB5	AB5
VCCIB5	AC4
VCCIB5	AD3
VCCIB5	AE3
VCCIB5	T12
VCCIB5	U10
VCCIB5	U11
VCCIB6	AA4
VCCIB6	AB3
VCCIB6	AC1
VCCIB6	AC2
VCCIB6	P10
VCCIB6	R9

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
VCCIB6	T9
VCCIB7	C1
VCCIB7	C2
VCCIB7	D3
VCCIB7	E4
VCCIB7	K9
VCCIB7	L9
VCCIB7	M10
VCCPLA	E12
VCCPLB	J12
VCCPLC	E14
VCCPLD	H14
VCCPLE	Y14
VCCPLF	U14
VCCPLG	Y12
VCCPLH	U12
VCOMPLA	F12
VCOMPLB	H12
VCOMPLC	F14
VCOMPLD	J14
VCOMPLE	AA14
VCOMPLF	V14
VCOMPLG	AA12
VCOMPLH	V12
VPUMP	E20

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.*