

200 MHz Field Programmable Zero Delay Buffer

Features

- Fully field-programmable
 - Input and output dividers
 - Inverting/noninverting outputs
 - Phase-locked loop (PLL) or fanout buffer configuration
- 10 MHz to 200 MHz operating range
- Split 2.5 V or 3.3 V outputs
- Two LVCMOS reference inputs
- Twelve low skew outputs
 - 35 ps typical output-to-output skew (same frequency)
- 110 ps typical cycle-cycle jitter (same frequency)
- Three-stateable outputs
- Less than 50 μ A shutdown current
- Spread aware
- 28-pin SSOP
- 3.3 V operation
- Industrial temperature available

Functional Description

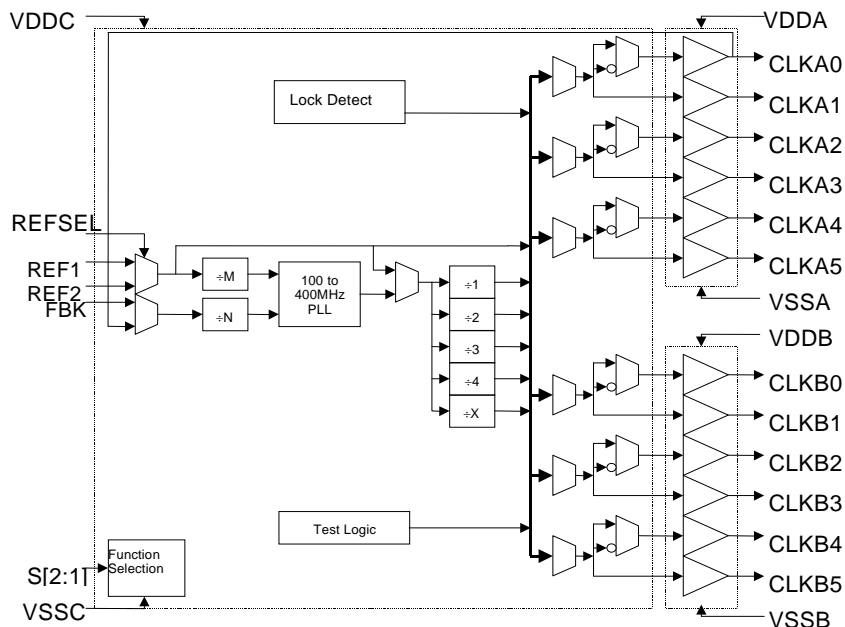
The CY23FP12 is a high performance fully field-programmable 200 MHz zero delay buffer designed for high speed clock distribution. The integrated PLL is designed for low jitter and optimized for noise rejection. These parameters are critical for reference clock distribution in systems using high performance ASICs and microprocessors.

The CY23FP12 is fully programmable through volume or prototype programmers, enabling the user to define an application-specific Zero Delay Buffer with customized input and output dividers, feedback topology (internal/external), output inversions, and output drive strengths. For additional flexibility, the user can mix and match multiple functions listed in [Table 2](#), and assign a particular function set to any one of the four possible S1-S2 control bit combinations. This feature enables the implementation of four distinct personalities, selectable with S1-S2 bits, on a single programmed silicon. The CY23FP12 also features a proprietary auto power down circuit that shuts down the device in case of a REF failure, resulting in less than 50 μ A of current draw.

The CY23FP12 provides 12 outputs grouped in two banks with separate power supply pins which can be connected independently to either a 2.5 V or a 3.3 V rail.

Selectable reference input is a fault tolerance feature which enables glitch-free switch over to a secondary clock source when REFSEL is asserted/deasserted.

Logic Block Diagram



www.DataSheet4U.com

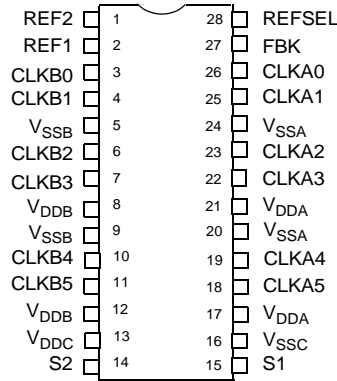
Contents

Pin Configuration	3	Package Drawing and Dimension	12
Pin Description	3	Acronyms	13
Field Programming the CY23FP12	6	Document Conventions	13
CyberClocks™ Software	6	Units of Measure	13
CY3672-USB Development Kit	6	Document History Page	14
CY23FP12 Frequency Calculation	6	Sales, Solutions, and Legal Information	15
Absolute Maximum Conditions	7	Worldwide Sales and Design Support	15
Operating Conditions	7	Products	15
DC Electrical Specifications	7	PSoC Solutions	15
Switching Characteristics	8		
Switching Waveforms	9		
Test Circuits	10		
Ordering Information	11		
Ordering Code Definition	11		

Pin Configuration

Figure 1. 28-Pin SSOP

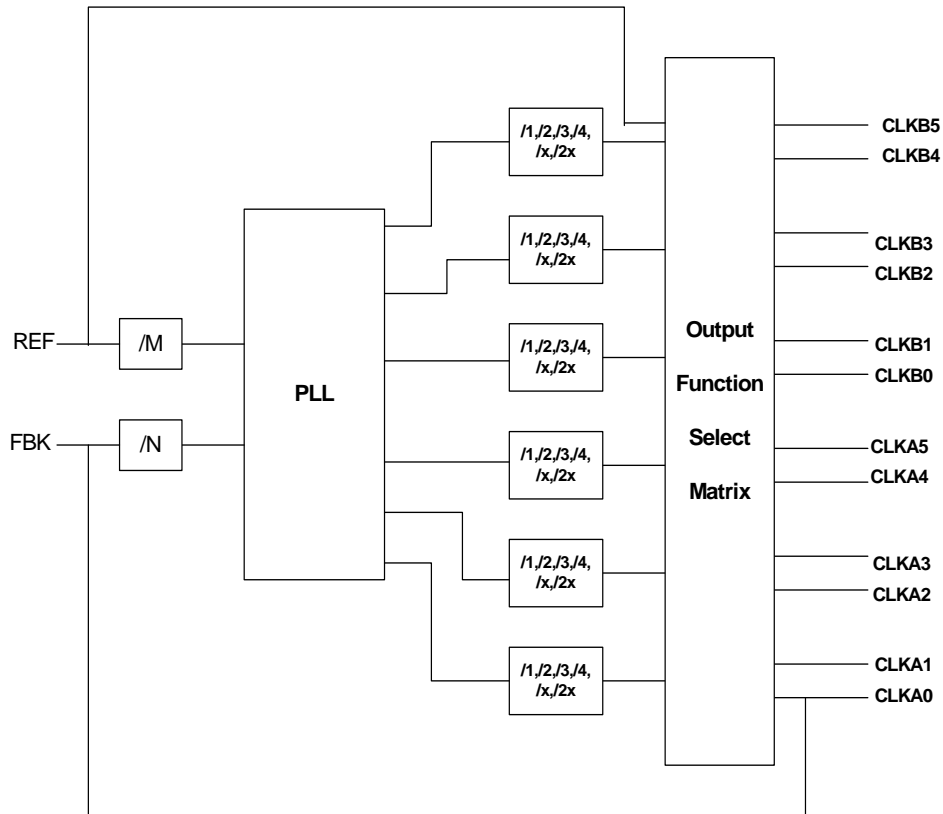
Top View



Pin Description

Pin No.	Name	I/O	Type	Description
1	REF2	I	LVTTTL/LVCMOS	Input reference frequency, 5 V-tolerant input.
2	REF1	I	LVTTTL/LVCMOS	Input reference frequency, 5 V-tolerant input.
3	CLKB0	O	LVTTTL	Clock output, Bank B.
4	CLKB1	O	LVTTTL	Clock output, Bank B.
5	VSSB	PWR	POWER	Ground for Bank B.
6	CLKB2	O	LVTTTL	Clock output, Bank B.
7	CLKB3	O	LVTTTL	Clock output, Bank B.
8	VDDB	PWR	POWER	2.5 V or 3.3 V supply, Bank B.
9	VSSB	PWR	POWER	Ground for Bank B.
10	CLKB4	O	LVTTTL	Clock output, Bank B.
11	CLKB5	O	LVTTTL	Clock output, Bank B.
12	VDDB	PWR	POWER	2.5 V or 3.3 V supply, Bank B.
13	VDDC	PWR	POWER	3.3 V core supply.
14	S2	I	LVTTTL	Select input.
15	S1	I	LVTTTL	Select input.
16	VSSC	PWR	POWER	Ground for core.
17	VDDA	PWR	POWER	2.5 V or 3.3 V supply, Bank A.
18	CLKA5	O	LVTTTL	Clock output, Bank A.
19	CLKA4	O	LVTTTL	Clock output, Bank A.
20	VSSA	PWR	POWER	Ground for Bank A.
21	VDDA	PWR	POWER	2.5 V or 3.3 V supply Bank A.
22	CLKA3	O	LVTTTL	Clock output, Bank A.
23	CLKA2	O	LVTTTL	Clock output, Bank A.
24	VSSA	PWR	POWER	Ground for Bank A.
25	CLKA1	O	LVTTTL	Clock output, Bank A.
26	CLKA0	O	LVTTTL	Clock output, Bank A.
27	FBK	I	LVTTTL	PLL feedback input.
28	REFSEL	I	LVTTTL	Reference select input. When REFSEL = 0, REF1 is selected. When REFSEL = 1, REF2 is selected.

Figure 2. Basic PLL Block Diagram



The following table lists independent functions that can be programmed with a volume or prototype programmer on the “default” silicon.

Table 1. Programmable Functions

Configuration	Description	Default
DC Drive Bank A	Programs the drive strength of Bank A outputs. The user can select one out of two possible drive strength settings that produce output DC currents in the range of ±16 mA to ±20 mA.	±16 mA
DC Drive Bank B	Programs the drive strength of Bank B outputs. The user can select one out of two possible drive strength settings that produce output DC currents in the range of ±16 mA to ±20 mA.	±16 mA
Output Enable for Bank B clocks	Enables/Disables CLKB[5:0] outputs. Each of the six outputs can be disabled <i>individually</i> if not used, to minimize electromagnetic interference (EMI) and switching noise.	Enable
Output Enable for Bank A clocks	Enables/Disables CLKA[5:0] outputs. Each of the six outputs can be disabled <i>individually</i> if not used, to minimize EMI and switching noise.	Enable
Inv CLKA0	Generates an inverted clock on the CLKA0 output. When this option is programmed, CLKA0 and CLKA1 will become complimentary pairs.	Non-invert
Inv CLKA2	Generates an inverted clock on the CLKA2 output. When this option is programmed, CLKA2 and CLKA3 will become complimentary pairs.	Non-invert
Inv CLKA4	Generates an inverted clock on the CLKA4 output. When this option is programmed, CLKA4 and CLKA5 will become complimentary pairs.	Non-invert
Inv CLKB0	Generates an inverted clock on the CLKB0 output. When this option is programmed, CLKB0 and CLKB1 will become complimentary pairs.	Non-invert
Inv CLKB2	Generates an inverted clock on the CLKB2 output. When this option is programmed, CLKB2 and CLKB3 will become complimentary pairs.	Non-invert
Inv CLKB4	Generates an inverted clock on the CLKB4 output. When this option is programmed, CLKB4 and CLKB5 will become complimentary pairs.	Non-invert

Table 1. Programmable Functions

Configuration	Description	Default
Pull-down Enable	Enables/Disables internal pulldowns on all outputs	Enable
Fbk Pull-down Enable	Enables/Disables internal pulldowns on the feedback path (applicable to both internal and external feedback topologies)	Enable
Fbk Sel	Selects between the internal and the external feedback topologies	External

Table 2 lists independent functions that can be assigned to each of the four S1 and S2 combinations. When a particular S1 and S2 combination is selected, the device assumes the configuration (which is essentially a set of functions given in Table 2) that has been preassigned to that particular combination.

Table 2. Programmable Functions for S1/S2 Combinations

Function	Description	Default
Output Enable CLKB[5:4]	Enables/Disables CLKB[5:4] output pair	See Table 4 on page 6
Output Enable CLKB[3:2]	Enables/Disables CLKB[3:2] output pair	See Table 4 on page 6
Output Enable CLKB[1:0]	Enables/Disables CLKB[1:0] output pair	See Table 4 on page 6
Output Enable CLKA[5:4]	Enables/Disables CLKA[5:4] output pair	See Table 4 on page 6
Output Enable CLKA[3:2]	Enables/Disables CLKA[3:2] output pair	See Table 4 on page 6
Output Enable CLKA[1:0]	Enables/Disables CLKA[1:0] output pair	See Table 4 on page 6
Auto Power-down Enable	Enables/Disables the auto power down circuit, which monitors the reference clock rising edges and shuts down the device in case of a reference “failure.” This failure is triggered by a drift in reference frequency below a set limit. This auto power down circuit is disabled internally when one or more of the outputs are configured to be driven directly from the reference clock.	Enable
PLL Power-down	Shuts down the PLL when the device is configured as a non-PLL fanout buffer.	PLL Enabled
M[7:0]	Assigns an eight-bit value to reference divider –M. The divider can be any integer value from 1 to 256; however, the PLL input frequency cannot be lower than 10 MHz.	2
N[7:0]	Assigns an eight-bit value to feedback divider –N. The divider can be any integer value from 1 to 256; however, the PLL input frequency cannot be lower than 10 MHz.	2
X[6:0]	Assigns a seven-bit value to output divider –X. The divider can be any integer value from 5 to 130. Divide by 1,2,3, and 4 are preprogrammed on the device and can be activated by the appropriate output mux setting.	1
Divider Source	Selects between the PLL output and the reference clock as the source clock for the output dividers.	See Table 4 on page 6
CLKA54 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKA5 and CLKA4 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2
CLKA32 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKA3 and CLKA2 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2
CLKA10 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKA1 and CLKA0 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2
CLKB54 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKB5 and CLKB4 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2
CLKB32 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKB3 and CLKB2 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2
CLKB10 Source	Independently selects one out of the eight possible output dividers that will connect to the CLKB1 and CLKB0 pair. Please refer to Table 3 on page 6 for a list of divider values.	Divide by 2

Table 3 is a list of output dividers that are independently selected to connect to each output pair.

In the default (unprogrammed) state of the device, S1 and S2 pins will function as indicated in Table 4.

Table 3. Output Dividers

CLKA/B Source	Output Connects To
0 [000]	REF
1 [001]	Divide by 1
2 [010]	Divide by 2
3 [011]	Divide by 3
4 [100]	Divide by 4
5 [101]	Divide by X
6 [110]	Divide by 2X ^[1]
7 [111]	TEST mode [LOCK signal] ^[2]

Table 4. S1/S2 Default Functionality

S2	S1	CLKA[5:0]	CLKB[5:0]	Divider Source
0	0	Three-state	Three-state	PLL
0	1	Driven	Three-state	PLL
1	0	Driven	Driven	Reference
1	1	Driven	Driven	PLL

Field Programming the CY23FP12

The CY23FP12 must be programmed in a device programmer prior to being installed in a circuit. The CY23FP12 is based on flash technology, so it can be reprogrammed up to 100 times. This enables fast and easy design changes and product updates, and eliminates any issues with old and out-of-date inventory.

Samples and small prototype quantities can be programmed on the CY3672-USB programmer. Cypress’s value-added distribution partners and third-party programming systems from BP Microsystems, HiLo Systems, and others are available for large production quantities.

CyberClocks™ Software

CyberClocks is an easy-to-use software application that allows the user to custom-configure the CY23FP12. Users can specify the REF frequency, PLL frequency, output frequencies and/or post-dividers, and different functional options. CyberClocks outputs an industry standard JEDEC file used for programming the CY23FP12.

CyberClocks can be downloaded free of charge from the Cypress website at www.cypress.com.

CY3672-USB Development Kit

The Cypress CY3672-USB Development Kit, in combination with the CY3692 Socket Adapter, is used to program samples and small prototype quantities of the CY23FP12. This portable programmer connects to a PC via a USB interface.

CY23FP12 Frequency Calculation

The CY23FP12 is an extremely flexible clock buffer with up to twelve individual outputs, generated from an integrated PLL. Four variables are used to determine the final output frequency. These are the input Reference Frequency, the M and N dividers, and the post divider.

The basic PLL block diagram is shown in Figure 2 on page 4. Each of the six clock output pairs has many post divider options available to it. There are six post divider options: /1, /2, /3, /4, /X, and /2X. X is a programmable value between 5 and 130, and 2X is twice that value. The post divider options can be applied to the calculated PLL frequency or to the REF directly. The feedback is connected either internally to CLKA0 or externally to any output.

A programmable divider, M, is inserted between the reference input, REF, and the phase detector. The divider M can be any integer 1 to 256. The PLL input frequency cannot be lower than 10 MHz or higher than 200 MHz.

A programmable divider, N, is inserted between the feedback input, FBK, and the phase detector. The divider N can be any integer 1 to 256. The PLL input frequency cannot be lower than 10 MHz or higher than 200 MHz.

The output can be calculated as follows:

$$F_{REF} / M = F_{FBK} / N.$$

$$F_{PLL} = (F_{REF} * N * \text{post divider}) / M.$$

$$F_{OUT} = F_{PLL} / \text{post divider}.$$

In addition to above divider options, the following option bypasses the PLL and passes the REF directly to the output.

$$F_{OUT} = F_{REF}$$

Notes

1. Outputs will be rising edge aligned only to those outputs using this same device setting.
2. When the source of an output pair is set to [111], the output pair becomes lock indicator signal. For example, if the source of an output pair (CLKA0, CLKA1) is set to [111], the CLKA0 and CLKA1, becomes lock indicator signals. In non-invert mode, CLKA0 and CLKA1 signals will be high when the PLL is in lock mode. If CLKA0 is in an invert mode, the CLKA0 will be low and the CLKA1 will be high when the PLL is in lock mode.

Absolute Maximum Conditions

Exceeding maximum ratings may shorten the useful life of the device. User guidelines are not tested.

Parameter	Description	Condition	Min	Max	Unit
V _{DD}	Supply voltage	Non-functional	-0.5	7	VDC
V _{IN}	Input voltage REF	Relative to V _{CC}	-0.5	V _{DD} + 0.5	VDC
V _{IN}	Input voltage except REF	Relative to V _{CC}	-0.5	V _{DD} + 0.5	VDC
LU _I	Latch-up immunity	Functional	300		mA
T _S	Temperature, storage	Non-functional	-65	125	°C
T _J	Junction temperature		-	125	°C
∅ _{Jc}	Dissipation, Junction to case	Functional	34		°C/W
∅ _{Ja}	Dissipation, Junction to ambient	Functional	86		°C/W
ESD _h	ESD protection (Human body model)		2000		V
M _{SL}	Moisture sensitivity level		MSL - 1		class
G _{ATES}	Total functional gate count	Assembled Die	21375		each
UL-94	Flammability rating	At 1/8 in.	V-0		class
FIT	Failure in time	Manufacturing test	10		ppm

Operating Conditions

Parameter	Description	Test Conditions	Min	Max	Unit
V _{DDC}	Core supply voltage		3.135	3.465	V
V _{DDA} , V _{DDB}	Bank A, Bank B supply voltage		3.135	3.465	V
			2.375	2.625	V
T _A	Temperature, operating ambient	Commercial temperature	0	70	°C
		Industrial temperature	-40	85	
t _{PU}	Power-up time for all V _{DDs} to reach minimum specified voltage (power ramps must be monotonic)		0.05	500	ms

DC Electrical Specifications

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
V _{IL}	Input LOW voltage ^[3]		-	-	0.3 × V _{DD}	V
V _{IH}	Input HIGH voltage ^[3]		0.7 × V _{DD}	-	-	V
I _{IL}	Input LOW current ^[3]	V _{IN} = 0 V	-	-	50	μA
I _{IH}	Input HIGH current ^[3]	V _{IN} = V _{DD}	-	-	50	μA
V _{OL}	Output LOW voltage ^[4]	V _{DDA} /V _{DDB} = 3.3 V, I _{OL} = 16 mA (standard drive) V _{DDA} /V _{DDB} = 3.3 V, I _{OL} = 20 mA (high drive) V _{DDA} /V _{DDB} = 2.5 V, I _{OL} = 16 mA (high drive)	-	-	0.5	V
V _{OH}	Output HIGH voltage ^[4]	V _{DDA} /V _{DDB} = 3.3 V, I _{OH} = -16 mA (standard drive) V _{DDA} /V _{DDB} = 3.3 V, I _{OH} = -20 mA (high drive) V _{DDA} /V _{DDB} = 2.5 V, I _{OH} = -16 mA (high drive)	V _{DD} - 0.5	-	-	V
I _{DDS}	Power-down supply current	REF = 0 MHz	-	12	50	μA

Notes

- Applies to both REF Clock and FBK.
- Parameter is guaranteed by design and characterization. Not 100% tested in production.

DC Electrical Specifications

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
I _{DD}	Supply current	V _{DDA} = V _{DDDB} = 2.5 V, Unloaded outputs at 166 MHz	–	40	65	mA
		V _{DDA} = V _{DDDB} = 2.5 V, Loaded outputs at 166 MHz, C _L = 15 pF	–	65	100	
		V _{DDA} = V _{DDDB} = 3.3 V, Unloaded outputs at 166 MHz	–	50	80	
		V _{DDA} = V _{DDDB} = 3.3 V, Loaded outputs at 166 MHz, C _L = 15 pF	–	100	120	

Switching Characteristics ^[5]

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
f _{REF}	Reference frequency ^[6]	Commercial temperature	10	–	200	MHz
		Industrial temperature	10	–	166.7	
ER _{REF}	Reference edge rate		1	–	–	V/ns
DC _{REF}	Reference duty cycle		25	–	75	%
f _{OUT}	Output frequency ^[7]	C _L = 15 pF, Commercial temperature	10	–	200	MHz
		C _L = 15 pF, Industrial temperature	10	–	166.7	
		C _L = 30 pF, Commercial temperature	10	–	100	
		C _L = 30 pF, Industrial temperature	10	–	83.3	
DC _{OUT}	Output duty cycle ^[5]	V _{DDA/B} = 3.3 V, measured at V _{DD} /2	45	50	55	%
		V _{DDA/B} = 2.5 V, measured at V _{DD} /2	40	50	60	
t ₃	Rise time ^[5]	V _{DDA/B} = 3.3 V, 0.8 V to 2.0 V, C _L = 30 pF (standard drive and high drive)	–	–	1.6	ns
		V _{DDA/B} = 3.3 V, 0.8 V, 10 V to 2.0 V, C _L = 15 pF (standard drive and high drive)	–	–	0.8	
		V _{DDA/B} = 2.5 V, 0.6 V to 1.8 V, C _L = 30 pF (high drive only)	–	–	2.0	
		V _{DDA/B} = 2.5 V, 0.6 V to 1.8 V, C _L = 15 pF (high drive only)	–	–	1.0	
t ₄	Fall time ^[5]	V _{DDA/B} = 3.3 V, 0.8 V to 2.0 V, C _L = 30 pF (standard drive and high drive)	–	–	1.6	ns
		V _{DDA/B} = 3.3 V, 0.8 V to 2.0 V, C _L = 15 pF (standard drive and high drive)	–	–	0.8	
		V _{DDA/B} = 2.5 V, 0.6 V to 1.8 V, C _L = 30 pF (high drive only)	–	–	1.6	
		V _{DDA/B} = 2.5 V, 0.6 V to 1.8 V, C _L = 15 pF (high drive only)	–	–	0.8	

Notes

- All parameters are specified with loaded outputs.
- When the device is configured as a non-PLL fanout buffer (PLL Power-down enabled), the reference frequency can be lower than 10MHz. With auto power-down disabled and PLL power-down enabled, the reference frequency can be as low as DC level.
- When the device is configured as a non-PLL fanout buffer (PLL Power-down enabled), the output frequency can be lower than 10MHz. With auto power-down disabled and PLL power-down enabled, the output frequency can be as low as DC level.

Switching Characteristics ^[5]

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
TTB	Total timing budget, ^[8,9] Bank A and B same frequency	Outputs at 200 MHz, tracking skew not included	–	–	650	ps
	Total timing budget, Bank A and B different frequency		–	–	850	
t ₅	Output to output skew ^[5]	All outputs equally loaded	–	35 ^[10]	200	ps
	Bank to bank skew	Same frequency	–	–	200	
	Bank to bank skew	Different frequency	–	–	400	
	Bank to bank skew	Different voltage, same frequency	–	–	400	
t ₆	Input to output skew (static phase offset) ^[5]	Measured at V _{DD} /2, REF to FBK	–	0	250	ps
t ₇	Device-to-device skew ^[5]	Measured at V _{DD} /2	–	0	500	ps
t _J	Cycle-to-cycle jitter ^[5] (Peak)	Banks A and B at same frequency	–	110 ^[11]	200	ps
	Cycle-to-cycle jitter ^[5] (Peak)	Banks A and B at different frequencies	–	–	400	
t _{TSK}	Tracking skew	Input reference clock at < 50-KHz modulation with ±3.75% spread	–	–	200	ps
t _{LOCK}	PLL lock time ^[5]	Stable power supply, valid clock at REF	–	–	1.0	ms
t _{LD}	Inserted loop delay	Max loop delay for PLL Lock (stable frequency)	–	–	7	ns
		Max loop delay to meet Tracking Skew Spec	–	–	4	ns

Switching Waveforms

Figure 3. Duty Cycle Timing

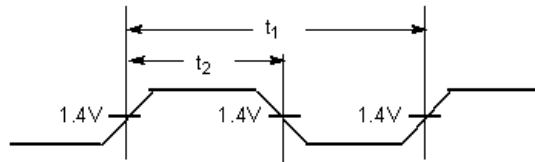
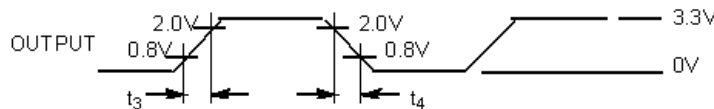


Figure 4. All Outputs Rise/Fall Time



Notes

- 8. Guaranteed by statistical correlation. Tested initially and after any design or process changes that may affect these parameters.
- 9. TTB is the window between the earliest and the latest output clocks with respect to the input reference clock across variations in output frequency, supply voltage, operating temperature, input clock edge rate, and process. The measurements are taken with the AC test load specified and include output-output skew, cycle-cycle jitter, and dynamic phase error. TTB will be equal to or smaller than the maximum specified value at a given frequency.
- 10. Same frequency, 15pF load, high drive.
- 11. Same frequency, 15pF load, low drive.

Figure 5. Output-Output Skew

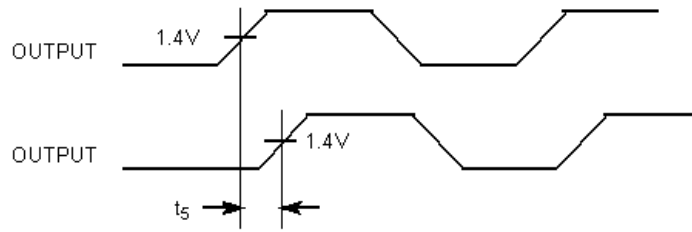


Figure 6. Input-Output Propagation Delay

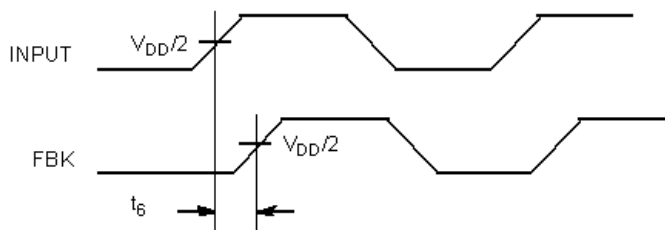
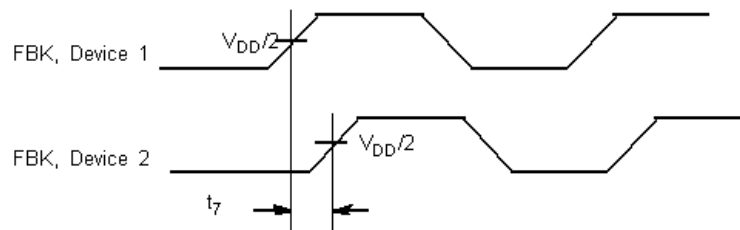
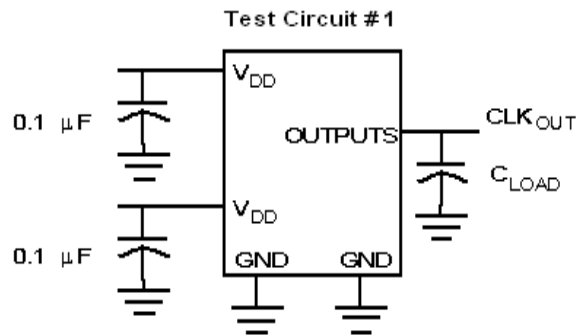


Figure 7. Device-Device Skew



Test Circuits

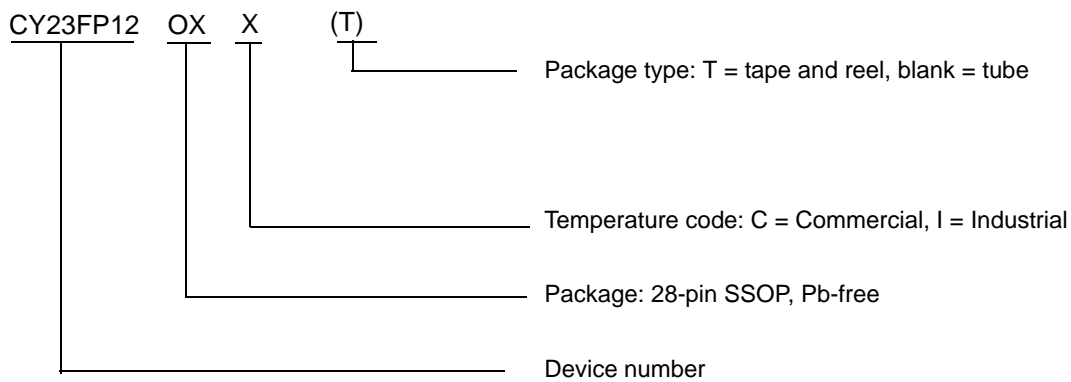


Test Circuit for all parameters

Ordering Information

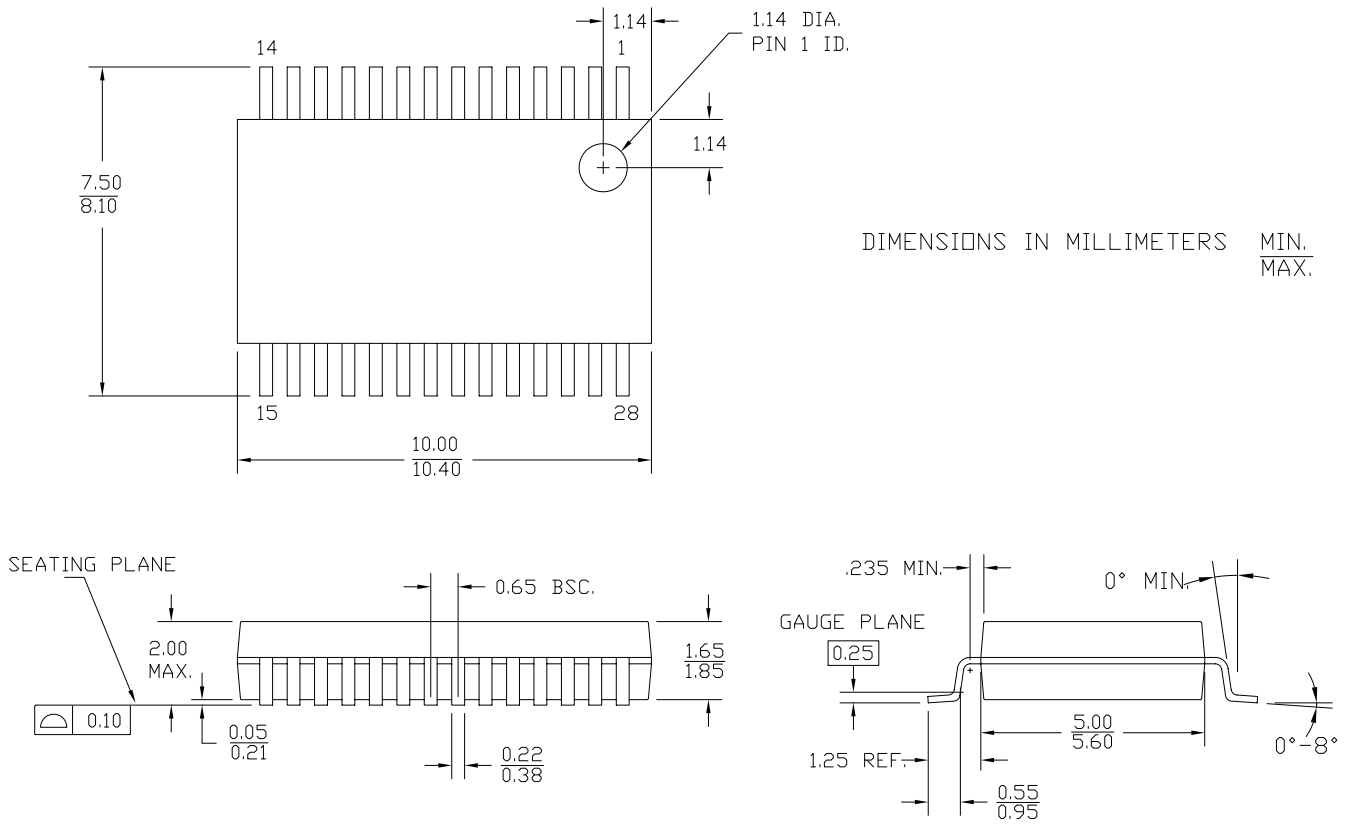
Ordering Code	Package Type	Operating Range
Pb-free		
CY23FP12OXC	28-pin SSOP	Commercial, 0 °C to 70 °C
CY23FP12OXCT	28-pin SSOP – Tape and Reel	Commercial, 0 °C to 70 °C
CY23FP12OXI	28-pin SSOP	Industrial, –40 °C to 85 °C
CY23FP12OXIT	28-pin SSOP – Tape and Reel	Industrial, –40 °C to 85 °C
Programmer		
CY3672-USB	Programmer with USB Interface	
CY3692	CY23FP12 Socket Adapter for CY3672-USB Programmer (Labeled CY3672 ADP006)	

Ordering Code Definition



Package Drawing and Dimension

Figure 8. 28-Pin (5.3 mm) Shrunk Small Outline Package



51-85079 *D

Acronyms

Acronym	Description
DCXO	digitally controlled crystal oscillator
ESD	electrostatic discharge
PLL	phase locked loop
RMS	root mean square
SSOP	shrunk small outline package
XTAL	crystal

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
μA	micro amperes
mA	milli amperes
ms	milli seconds
MHz	Mega Hertz
ns	nano seconds
pF	pico Farad
ps	pico seconds
V	Volts

Document History Page

Document Title: CY23FP12 200 MHz Field Programmable Zero Delay Buffer				
Document Number: 38-07246				
Revision	ECN	Submission Date	Orig. of Change	Description of Change
**	115158	07/03/02	HWT	New datasheet
*A	121880	12/14/02	RBI	Power-up requirements added to Absolute Maximum Ratings information
*B	124523	03/19/03	RGL	Final data sheet Changed title to "200 MHz Field Programmable Zero Delay Buffer"
*C	126938	06/16/03	RGL	Interchanged REF2 in the Pin Configuration diagram Replaced all divide by 2 default value to divide by 2 in Table 2 Fixed the formula in the Frequency Calculation section
*D	129364	09/10/03	RGL	Changed the CyClocksRT trademark to CyberClocks Added Note 2 in the TEST mode in Table 3 Added T _{LD} specifications in the Switching Characteristics table
*E	299718	See ECN	RGL	Added lead-free devices Added typical values
*F	2865396	01/25/2010	KVM	Updated template. Added captions to tables 1-4. Added Operating Conditions table. Various edits to text. Removed "FTG" from text about the CY3672 programmer. Specified separate commercial and industrial max values for f _{REF} Removed part numbers CY23FP12OC, CY23FP12OCT, CY23FP12OI and CY23FP12OIT. Changed part number CY3672 to CY3672-USB. Updated package drawing.
*G	3146083	01/18/11	BASH	Modified V _{IN} max vau from 7 to V _{DD} + 0.5 in "Absolute Maximum Conditions" on page 8. Added Acronyms , Document Conventions , and Ordering Code Definition .

Sales, Solutions, and Legal Information

Worldwide Sales and Design Support

Cypress maintains a worldwide network of offices, solution centers, manufacturer's representatives, and distributors. To find the office closest to you, visit us at [Cypress Locations](#).

Products

Automotive	cypress.com/go/automotive
Clocks & Buffers	cypress.com/go/clocks
Interface	cypress.com/go/interface
Lighting & Power Control	cypress.com/go/powerpsoc cypress.com/go/plc
Memory	cypress.com/go/memory
Optical & Image Sensing	cypress.com/go/image
PSoC	cypress.com/go/psoc
Touch Sensing	cypress.com/go/touch
USB Controllers	cypress.com/go/USB
Wireless/RF	cypress.com/go/wireless

PSoC Solutions

psoc.cypress.com/solutions
PSoC 1 | PSoC 3 | PSoC 5

© Cypress Semiconductor Corporation, 2002-2011. The information contained herein is subject to change without notice. Cypress Semiconductor Corporation assumes no responsibility for the use of any circuitry other than circuitry embodied in a Cypress product. Nor does it convey or imply any license under patent or other rights. Cypress products are not warranted nor intended to be used for medical, life support, life saving, critical control or safety applications, unless pursuant to an express written agreement with Cypress. Furthermore, Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress products in life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Any Source Code (software and/or firmware) is owned by Cypress Semiconductor Corporation (Cypress) and is protected by and subject to worldwide patent protection (United States and foreign), United States copyright laws and international treaty provisions. Cypress hereby grants to licensee a personal, non-exclusive, non-transferable license to copy, use, modify, create derivative works of, and compile the Cypress Source Code and derivative works for the sole purpose of creating custom software and or firmware in support of licensee product to be used only in conjunction with a Cypress integrated circuit as specified in the applicable agreement. Any reproduction, modification, translation, compilation, or representation of this Source Code except as specified above is prohibited without the express written permission of Cypress.

Disclaimer: CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Cypress reserves the right to make changes without further notice to the materials described herein. Cypress does not assume any liability arising out of the application or use of any product or circuit described herein. Cypress does not authorize its products for use as critical components in life-support systems where a malfunction or failure may reasonably be expected to result in significant injury to the user. The inclusion of Cypress' product in a life-support systems application implies that the manufacturer assumes all risk of such use and in doing so indemnifies Cypress against all charges.

Use may be limited by and subject to the applicable Cypress software license agreement.