CY2300

Phase-Aligned Clock Multiplier

Features

- 10 MHz to 166.67 MHz output operating range
- Four-multiplier configuration
- Single PLL architecture
- Phase aligned outputs
- Low jitter, high accuracy outputs
- Output enable pin
- 3.3 V operation
- 5 V tolerant input
- Internal loop filter
- 8-pin 150-mil small-outline integrated circuit (SOIC) package
- Commercial temperature

Functional Description

The CY2300 is a four output 3.3 V phase-aligned system clock designed to distribute high-speed clocks in PC, workstation, datacom, telecom, and other high-performance applications.

The part allows the user to obtain 1/2x, 1x, $\overline{1x}$ and 2x REFIN output frequencies on respective output pins.

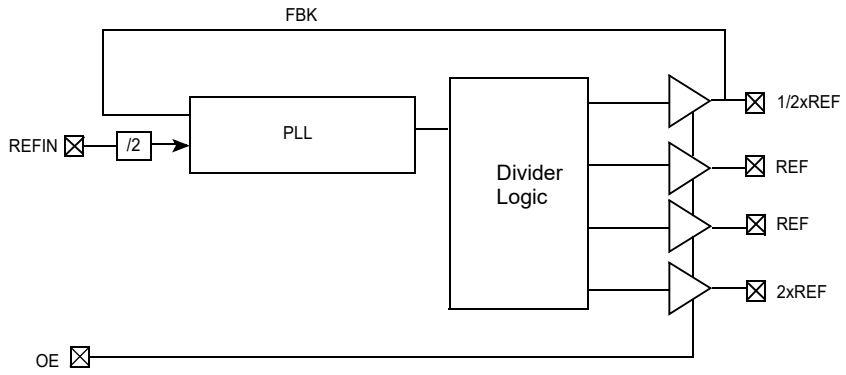
The part has an on-chip PLL which locks to an input clock presented on the REFIN pin. The input-to-output skew is guaranteed to be less than ±200 ps, and output-to-output skew is guaranteed to be less than 200 ps.

Multiple CY2300 devices can accept the same input clock and distribute it in a system. In this case, the skew between the outputs of two devices is guaranteed to be less than 400 ps.

The CY2300 is available in commercial temperature range.

For a complete list of related documentation, click here.

Logic Block Diagram



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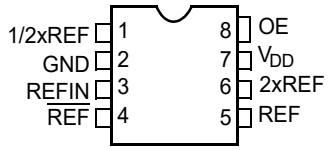
Pinouts

Figure 1. 8-pin SOIC pinout (Top View)



Pin Definitions

Pin	Signal [1]	Description
1	1/2xREF	Clock output, 1/2x reference
2	GND	Ground
3	REFIN	Input reference frequency, 5 V tolerant input
4	$\overline{\text{REF}}$	Clock output $\overline{\text{reference}}$
5	REF	Clock output reference
6	2xREF	Clock output, 2x reference
7	V_{DD}	3.3 V Supply
8	OE	Output enable (weak pull-up)

Note
1. Weak pull-down on all outputs.

Maximum Ratings

Supply voltage to ground potential .....–0.5 V to +7.0 V
DC input voltage (except ref) .....–0.5 V to V_{DD} + 0.5 V
DC input voltage REF .....–0.5 V to 7 V

Storage temperature .....–65 °C to +150 °C
Junction temperature ..... 150 °C
Static discharge voltage
(per MIL-STD-883, method 3015) .....> 2000 V

Operating Conditions

Parameter	Description	Min	Max	Unit
V_{DD}	Supply voltage	3.0	3.6	V
T_A	Operating temperature (ambient temperature)	0	70	°C
C_L	Load capacitance, 10 MHz < F_{OUT} < 133.33 MHz	–	18	pF
	Load capacitance,133.33 MHz < F_{OUT} < 166.67 MHz	–	12	pF
C_{IN}	Input capacitance	–	7	pF
t_{PU}	Power-up time for all V_{DD}'s to reach minimum specified voltage (power ramps must be monotonic)	0.05	50	ms

Electrical Characteristics

Parameter	Description	Test Conditions	Min	Max	Unit
V_{IL}	Input LOW voltage		–	0.8	V
V_{IH}	Input HIGH voltage		2.0	–	V
I_{IL}	Input LOW current	V_{IN} = 0 V	–	100	µA
I_{IH}	Input HIGH current	V_{IN} = V_{DD}	–	50	µA
V_{OL}	Output LOW voltage [2]	I_{OL} = 8 mA	–	0.4	V
V_{OH}	Output HIGH voltage [2]	I_{OH} = –8 mA	2.4	–	V
I_{DD}	Supply current	Unloaded outputs, REFIN = 66 MHz	–	45	mA
		Unloaded outputs, REFIN = 33 MHz	–	32	mA
		Unloaded outputs, REFIN = 20 MHz	–	18	mA

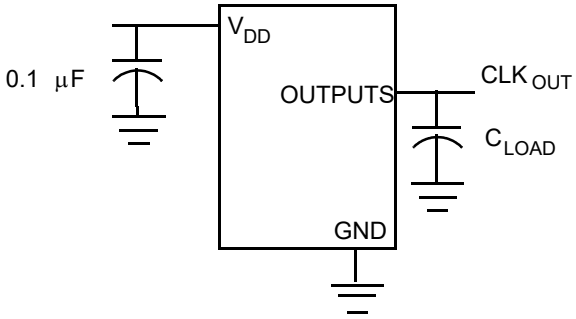
Thermal Resistance

Parameter [3]	Description	Test Conditions	8-pin SOIC	Unit
θ_{JA}	Thermal resistance (junction to ambient)	Test conditions follow standard test methods and procedures for measuring thermal impedance, in accordance with EIA/JESD51.	140	°C/W
θ_{JC}	Thermal resistance (junction to case)		54	°C/W

Notes
2. Parameter is guaranteed by design and characterization. It is not 100% tested in production.
3. These parameters are guaranteed by design and are not tested.

Test Circuits

Figure 2. Test Circuit #1



Switching Characteristics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
$1/t_1$	Output frequency	18 pF load	10	–	133.33	MHz
		12 pF load	–	–	166.67	MHz
	Duty cycle[4] = $t_2 \div t_1$	Measured at $V_{DD}/2$	40	50	60	%
t_3	Rise time[4]	Measured between 0.8 V and 2.0 V	–	–	1.20	ns
t_4	Fall time[4]	Measured between 0.8 V and 2.0 V	–	–	1.20	ns
t_5	Output to output skew on rising edges[4]	All outputs equally loaded Measured at $V_{DD}/2$	–	–	200	ps
t_6	Delay, REFIN rising edge to output rising edge[4]	Measured at $V_{DD}/2$ from REFIN to any output	–	–	±200	ps
t_7	Device to device skew[4]	Measured at $V_{DD}/2$ on the 1/2xREF pin of devices (pin 1)	–	–	400	ps
t_J	Period jitter[4]	Measured at Fout = 133.33 MHz, loaded outputs, 18 pF load	–	–	±175	ps
t_{LOCK}	PLL lock time[4]	Stable power supply, valid clocks presented on REFIN	–	–	1.0	ms

Note
4. All parameters are specified with equally loaded outputs.

Switching Waveforms

Figure 3. Duty Cycle Timing

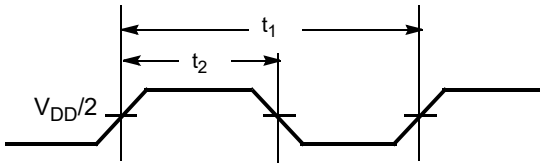


Figure 4. All Outputs Rise/Fall Time

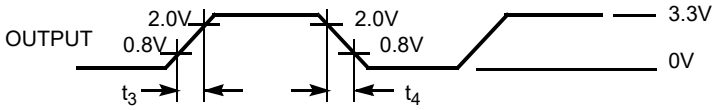


Figure 5. Output to Output Skew

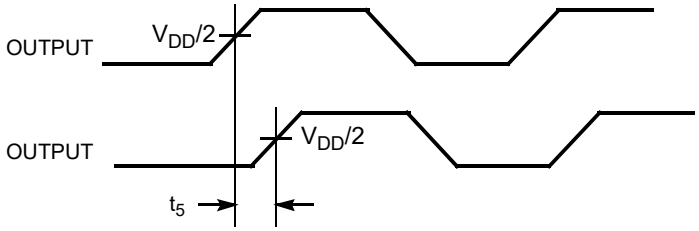


Figure 6. Input to Output Propagation Delay

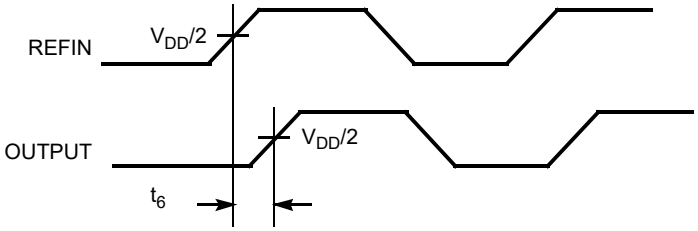
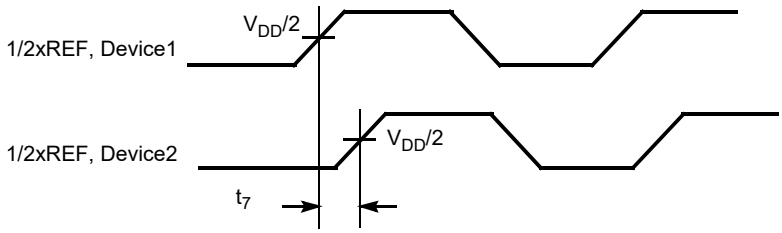


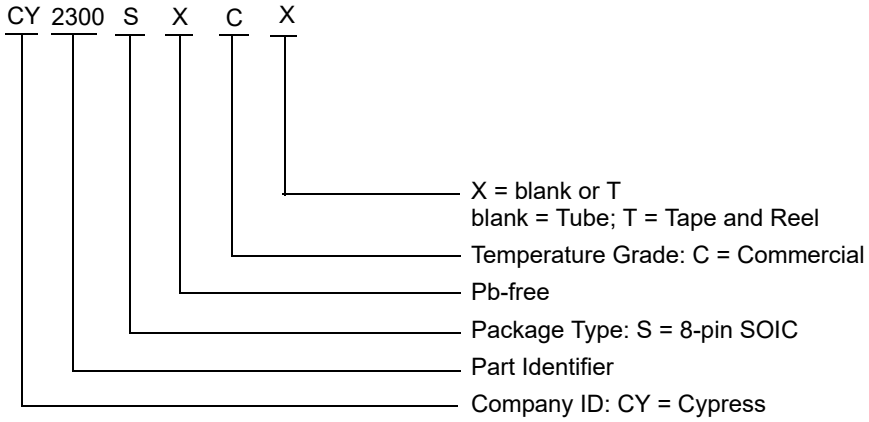
Figure 7. Device to Device Skew



Ordering Information

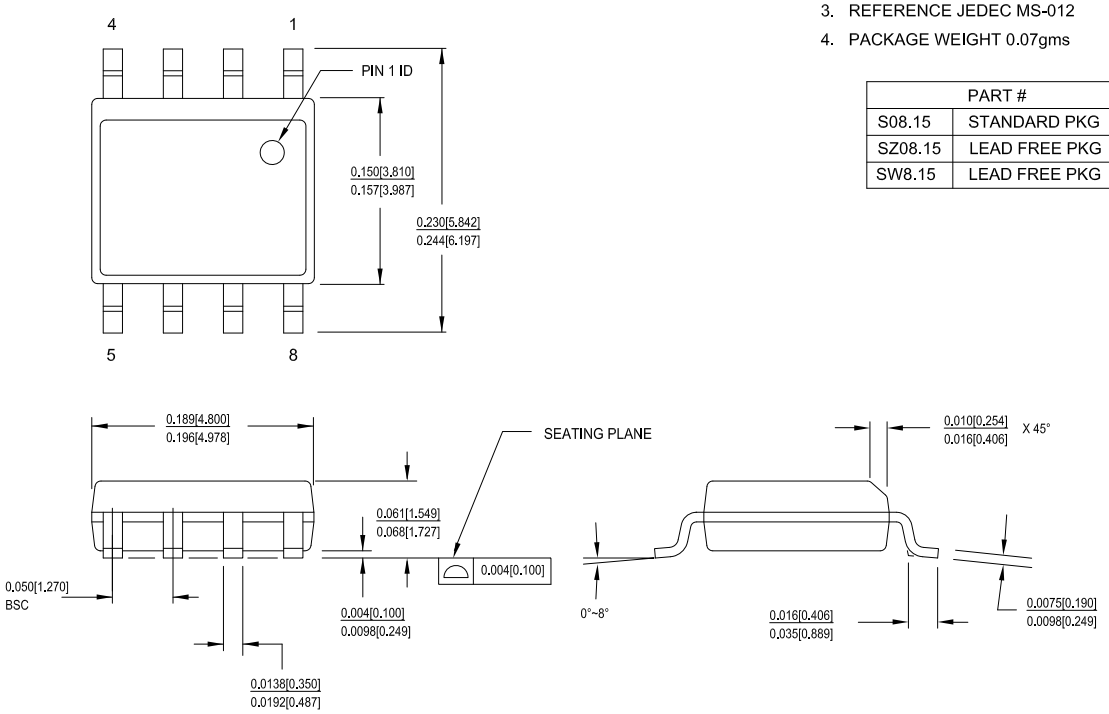
Ordering Code	Package Type	Operating Range
Pb-free		
CY2300SXC	8-pin SOIC	Commercial (0 °C to 70 °C)
CY2300SXCT	8-pin SOIC - Tape and Reel	Commercial (0 °C to 70 °C)

Ordering Code Definitions



Package Drawing and Dimensions

Figure 8. 8-pin SOIC (150 Mils) Package Outline, 51-85066



1. DIMENSIONS IN INCHES[MM] MIN.
   MAX.
2. PIN 1 ID IS OPTIONAL,
   ROUND ON SINGLE LEADFRAME
   RECTANGULAR ON MATRIX LEADFRAME
3. REFERENCE JEDEC MS-012
4. PACKAGE WEIGHT 0.07gms

PART #	
S08.15	STANDARD PKG
SZ08.15	LEAD FREE PKG
SW8.15	LEAD FREE PKG

51-85066 *I

Reference Documents

Reference documents are available through your local Cypress sales representative. You can also direct your requests to tsbusdev@cypress.com.

Document Number	Document Title	Description
NA	NA	NA

Acronyms

Acronym	Description
FBK	Feedback
OE	Output Enable
PLL	Phase Locked Loop
REFIN	Reference Input

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
Hz	hertz
kHz	kilohertz
MHz	megahertz
µA	microampere
µF	microfarad
µs	microsecond
µV	microvolt
mA	milliampere
mm	millimeter
ms	millisecond
mV	millivolt
ns	nanosecond
pA	picoampere
pF	picofarad
ps	picosecond
V	volt

Errata

This section describes the errors, workaround solution and silicon design fixes for Cypress zero delay clock buffers belonging to the families CY2300. Details include errata trigger conditions, scope of impact, available workaround and silicon revision applicability.

Contact your local Cypress Sales Representative if you have questions.

Part Numbers Affected

Part Number	Device Characteristics
CY2300SXC	All Variants
CY2300SXCT	All Variants

CY2300 Errata Summary

Items	Part Number	Fix Status
Start up lock time issue [CY2300]	All	Silicon fixed. New silicon available from WW 10 of 2013

CY2300 Qualification Status of fixed silicon

Product Status: In production

Qualification report last updated on 11/27/2012

http://www.cypress.com/?rID=72595

1. Start up lock time issue

■ **Problem Definition**

Output of CY2300 fails to locks within 1 ms upon power up (as per datasheet spec).

■ **Parameters Affected**

PLL lock time (t_{LOCK})

■ **Trigger Condition(S)**

Start up

■ **Scope of Impact**

It can impact the performance of system and its throughput.

■ **Workaround**

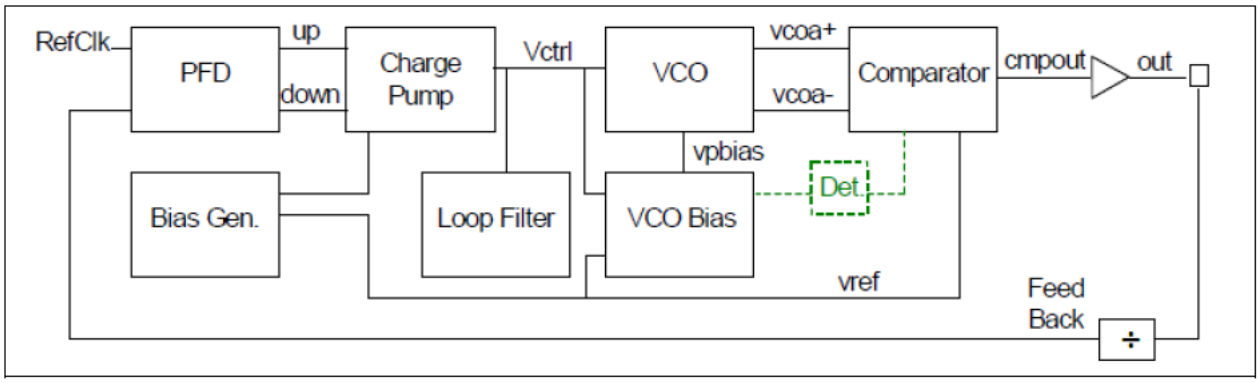
Apply reference input (RefClk) before power up (VDD). If RefClk is applied after power up, noise gets coupled on the output and propagates back to the PLL causing it to take higher time to acquire lock. If reference input is present during power up, noise will not propagate to the PLL and device will start up normally without problems.

■ **Fix Status**

This issue is due to design marginality. Two minor design modifications have been made to address this problem.

a. Addition of VCO bias detector block as shown in the following figure keeps comparator power down till VCO bias is present and thereby eliminating the propagation of noise to feedback.

b. Bias generator enhancement for successful initialization.


RefClk
PFD
up
down
Charge Pump
Vctrl
VCO
vcoa+
vcoa-
Comparator
cmpout
out
vpbias
Det
Bias Gen.
Loop Filter
VCO Bias
vref
Feed Back
÷

Document History Page

Document Title: CY2300, Phase-Aligned Clock Multiplier Document Number: 38-07252				
Rev.	**ECN**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	110517	SZV	01/07/2002	Changed from spec number 38-01039 to spec number 38-07252.
*A	121854	RBI	12/14/2002	Updated Operating Conditions: Added t_{PU} parameter and its details.
*B	246829	RGL	08/02/2004	Updated Ordering Information: Updated part numbers (Added Lead Free Devices).
*C	2568533	AESA	09/23/2008	Removed Selector Guide. Removed Operating Conditions (for CY2300SI Industrial Temperature Devices). Removed Electrical Characteristics (for CY2300SI Industrial Temperature Devices). Removed Switching Characteristics (for CY2300SI Industrial Temperature Devices). Updated Ordering Information: Updated part numbers (Removed part numbers CY2300SC, CY2300SC, CY2300SI, CY2300SI, CY2300SXI and CY2300SXIT). Updated to new template.
*D	3026183	BASH	09/01/2010	Removed Benefits. Updated Operating Conditions: Updated details in “Description” column corresponding to C_L parameter (Added lower limit of 10 MHz for 18pF load capacitance). Updated Ordering Information: No change in part numbers. Added Ordering Code Definitions. Added Reference Documents, Acronyms and Units of Measure.
*E	4126294	CINM	11/25/2013	Updated Package Drawing and Dimensions: spec 51-85066 – Changed revision from *D to *F. Added Errata. Updated to new template. Completing Sunset Review.
*F	4325140	CINM	03/28/2014	Updated Errata.
*G	4578443	TAVA	11/25/2014	Updated Functional Description: Added “For a complete list of related documentation, click here.” at the end.
*H	5240894	PSR	04/25/2016	Updated Features: Added “10 MHz to 166.67 MHz output operating range”. Added Thermal Resistance. Updated Package Drawing and Dimensions: spec 51-85066 – Changed revision from *F to *H. Updated to new template.
*I	5542709	TAVA	12/05/2016	Updated to new template. Completing Sunset Review.
*J	6010798	PAWK	01/02/2018	Updated Package Drawing and Dimensions: spec 51-85066 – Changed revision from *H to *I. Updated to new template.

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