

# LVPECL Voltage Controlled Crystal Oscillator (VCXO)

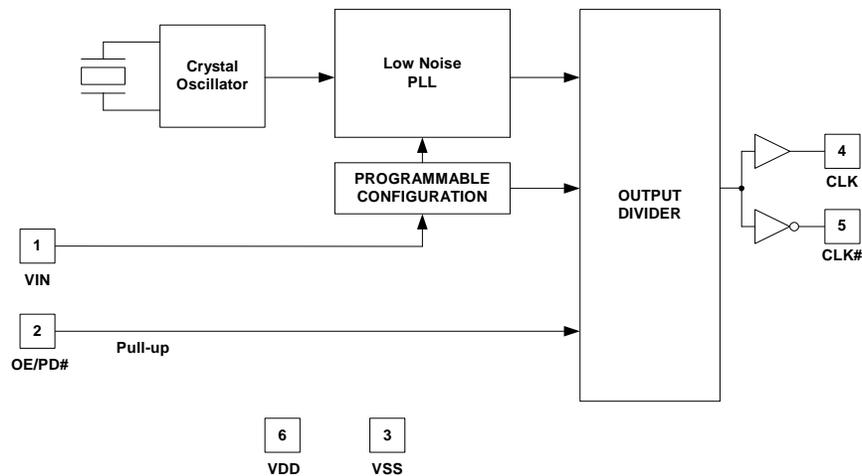
## Features

- High-frequency VCXO with LVPECL output
- Any output frequency from 50 MHz to 690 MHz
- Available either factory configured or field programmable
- Integrated phase-locked loop (PLL)
- 1 ps typical RMS Phase Jitter
- Output Enable or Power-down function
- Supply voltage: 3.3 V or 2.5 V
- Pb-free package: 5.0 × 3.2 mm LCC
- Commercial and industrial temperature ranges

## Benefits

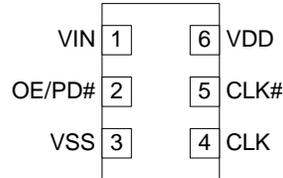
- Eliminates the need for external crystal
- Low-noise internal PLL
- Fast time to market
- Suitable for HDDs, consumer and networking applications
- Small footprint
- Application compatibility in standard and low-power systems
- Field-programmable for reduced inventory

## Logic Block Diagram



## Pinouts

Figure 1. 6-Pin Ceramic LCC



## Pin Definitions

Pin	Name	I/O Type	Description
1	V <sub>IN</sub>	Analog Input	VCXO control voltage. Positive slope.
2	OE/PD#	CMOS Input, internal pull-up	Output Enable pin: Active HIGH. If OE = 1, CLK is enabled. Power-down pin: Active LOW. If PD# = 0, Power-down is enabled. The functionality of this pin is programmable.
3	V <sub>SS</sub>	Power	Power supply ground
4, 5	CLK, CLK#	Output	Clock output. LVPECL outputs. CLK# is the complement of CLK.
6	V <sub>DD</sub>	Power	Positive power supply: 2.5 V or 3.3 V

## Functional Description

The CY2V014 is a high-performance high-frequency voltage-controlled crystal oscillator (VCXO).

The device uses a Cypress proprietary low-noise PLL to synthesize the frequency from an embedded crystal.

The output frequency is user adjustable by means of an analog control voltage applied to the V<sub>IN</sub> pin.

### VCXO Control Voltage (V<sub>IN</sub>, pin 1)

V<sub>IN</sub> is an analog input that is used to adjust the output frequency. The nominal output frequency is defined when V<sub>IN</sub> = V<sub>DD</sub>/2. Increasing the voltage on V<sub>IN</sub> increases the output frequency, while decreasing the voltage on V<sub>IN</sub> decreases the output frequency. Any voltage between V<sub>SS</sub> and V<sub>DD</sub> is allowed on V<sub>IN</sub>. The voltage/frequency slope is very linear over most of the control voltage range.

## Programming Description

### Field-Programmable CY2V014

Field-programmable devices are shipped unprogrammed, and must be programmed before use. Customers can use CyberClocks™ Online Software to specify the device configuration and generate a .JED programming file. Programming of samples and prototype quantities is available using the CY3672 programmer. Third-party vendors manufacture programmers for small to large volume applications. Cypress’s value-added distribution partners also provide programming services. Field-programmable devices are designated with an “F” in the part number, and are intended for quick prototyping and inventory reduction.

## Factory-Configured CY2V014

For customers wanting ready-to-use devices, the CY2V014 is available factory-configured, with no programming required. All requests must be submitted to the local Cypress Field Application Engineer (FAE) or sales representative. Once the request has been processed, you will receive a new part number, samples, and data sheet with the programmed values. This part number will be used for additional sample requests and production orders.

## Programming Variables

### Output Frequency

Any frequency between 50 MHz and 690 MHz may be specified.

### Absolute Pull Range

The absolute pull range (APR) may be specified.

### Pin 2: Output Enable or Power-Down (OE/PD#)

Pin 2 can be programmed as either output enable (OE) or Power-down (PD#). The OE function is used to enable or disable the CLK output very quickly, but it does not reduce core power consumption. The PD# function puts the device into a low-power state, but wake-up takes longer because the PLL must reacquire lock.

## Absolute Maximum Conditions

Parameter	Description	Condition	Min	Max	Unit
V <sub>CC</sub>	Supply Voltage		-0.5	4.4	V
V <sub>IN</sub>	Input Voltage	Relative to V <sub>SS</sub>	-0.5	V <sub>DD</sub> +0.5	VDC
T <sub>S</sub>	Temperature, Storage	Non Functional	-55	150	°C
T <sub>J</sub>	Temperature, Junction		-40	125	°C
ESD <sub>HBM</sub>	ESD Protection (Human Body Model)	MIL-STD-883, Method 3015	2000		V
UL-94	Flammability Rating	At 1/8 in.	V-0		
MSL	Moisture Sensitivity Level		1		

Note: The voltage on any input or I/O pin cannot exceed the power pin during power-up.

## Operating Conditions

Parameter	Description	Min	Typ	Max	Unit
V <sub>DD</sub>	Supply Voltage Range	3.0 2.25	3.3 2.5	3.6 2.75	V
T <sub>PU</sub>	Power-up Time for V <sub>DD</sub> to Reach Minimum Specified Voltage (power ramp must be monotonic)	0.05	-	500	ms
T <sub>A</sub>	Ambient Temperature (Commercial)	0	-	70	°C
T <sub>A</sub>	Ambient Temperature (Industrial)	-40	-	85	°C

## DC Electrical Characteristics

Parameter	Description	Condition	Min	Typ	Max	Unit
V <sub>OH</sub>	LVPECL High Output Voltage	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 50 Ω to V <sub>DD</sub> - 2.0 V	V <sub>DD</sub> - 1.15	-	V <sub>DD</sub> - 0.75	V
V <sub>OL</sub>	LVPECL Low Output Voltage	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 50 Ω to V <sub>DD</sub> - 2.0 V	V <sub>DD</sub> - 2.0	-	V <sub>DD</sub> - 1.625	V
V <sub>OD1</sub>	LVPECL Output Voltage Swing (V <sub>OH</sub> - V <sub>OL</sub> )	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 50 Ω to V <sub>DD</sub> - 2.0 V	600	-	1000	mV
V <sub>OD2</sub>	LVPECL Output Voltage Swing (V <sub>OH</sub> - V <sub>OL</sub> )	V <sub>DD</sub> = 2.5 V, R <sub>TERM</sub> = 50 Ω to V <sub>DD</sub> - 1.4 V	500	-	1000	mV
V <sub>OCM</sub>	LVPECL Output Common Mode Voltage (V <sub>OH</sub> + V <sub>OL</sub> )/2	V <sub>DD</sub> = 2.5 V, R <sub>TERM</sub> = 50 Ω to V <sub>DD</sub> - 1.4 V	1.2	-	-	V
V <sub>IH</sub>	CMOS Input High Voltage		0.7 × V <sub>DD</sub>	-	-	V
V <sub>IL</sub>	CMOS Input Low Voltage		-	-	0.3 × V <sub>DD</sub>	V
R <sub>UP</sub>	Internal Pull-up Resistor		-	100	-	kΩ
I <sub>IH</sub>	CMOS Input High Current	V <sub>IN</sub> = V <sub>DD</sub>	-	-	10	μA
I <sub>IL</sub>	CMOS Input Low Current	V <sub>IN</sub> = V <sub>SS</sub>	-	-	120	μA
V <sub>VIN</sub>	V <sub>IN</sub> Input Voltage		0	-	V <sub>DD</sub>	V
I <sub>IVIN</sub>	V <sub>IN</sub> Input Current	V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>DD</sub>	-	-	10	μA
L <sub>IN</sub>	V <sub>IN</sub> to f <sub>OUT</sub> Linearity	0.2 × V <sub>DD</sub> ≤ V <sub>IN</sub> ≤ 0.8 × V <sub>DD</sub>	-	1	-	%
I <sub>OZ</sub>	Output Leakage Current	Three-state output, PD#/OE = V <sub>SS</sub>	-35	-	35	μA
I <sub>DD</sub>	Operating Supply Current	V <sub>DD</sub> = 3.3 V or 2.5 V, CLK = 150 MHz, C <sub>LOAD</sub> = 0, PD#/OE = V <sub>DD</sub>	-	-	100	mA
I <sub>SB</sub>	Standby Supply Current	PD# = V <sub>SS</sub>	-	-	1	mA

**AC Electrical Characteristics**

Parameter	Description	Condition	Min	Typ	Max	Unit
f <sub>OUT</sub>	Output Frequency		50	–	690	MHz
FS <sub>FACT</sub>	Frequency Stability – factory programmed devices	V <sub>IN</sub> = V <sub>DD</sub> /2 <sup>[1]</sup>	–60	–	60	ppm
FS <sub>FIELD</sub>	Frequency Stability – field programmable devices	V <sub>IN</sub> = V <sub>DD</sub> /2 <sup>[1]</sup>	–100	–	100	ppm
APR	Absolute Pull Range	V <sub>IN</sub> = V <sub>DD</sub> to V <sub>SS</sub> , relative to nominal f <sub>OUT</sub> , across operating temperature and voltage range <sup>[2]</sup>	±100 ±50	– –	– –	ppm
BW	Modulation Bandwidth (V <sub>IN</sub> )	–3 dB	10	–	–	kHz
DC	Output Duty Cycle	Measured at zero crossing	45	50	55	%
T <sub>R</sub> , T <sub>F</sub>	Output Rise and Fall Time	20% and 80% of full output swing	–	350	–	ps
T <sub>OE1</sub>	Output Disable Time	Time from falling edge on OE to stopped outputs (Asynchronous)	–	–	100	ns
T <sub>OE2</sub>	Output Enable Time	Time from rising edge on OE to outputs at a valid frequency (Asynchronous)	–	–	100	ns
T <sub>LOCK</sub>	Start-up Time	Time for CLK to reach valid frequency measured from the time V <sub>DD</sub> = V <sub>DD</sub> (Min) or from PD# rising edge.	–	–	10	ms
T <sub>J1</sub>	RMS Phase Jitter	f <sub>OUT</sub> = 106.25 MHz (12 kHz–20 MHz)	–	1	–	ps
T <sub>J2</sub>	Peak-to-peak Period Jitter	f <sub>OUT</sub> = 106.25 MHz	–	30	–	ps

**Notes**

1. Frequency stability is the maximum variation in frequency from F<sub>0</sub>. It includes initial accuracy, plus variation from temperature, supply voltage, shock, vibration and first year aging.
2. APR is the minimum pull range under all conditions over the device lifetime, including aging for 10 years. APR is relative to F<sub>0</sub>.

Switching Waveforms

Figure 2. Duty Cycle Timing ( $DC = t_{1A}/t_{1B}$ )

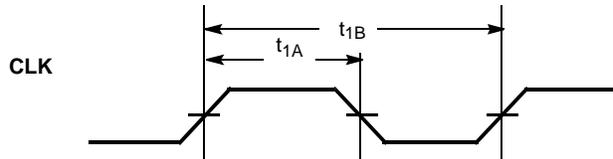


Figure 3. Output Differential Voltage

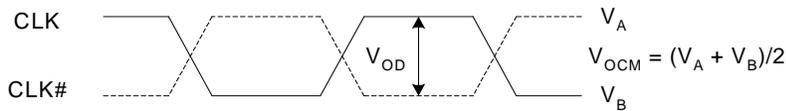


Figure 4. Output Rise/Fall Time

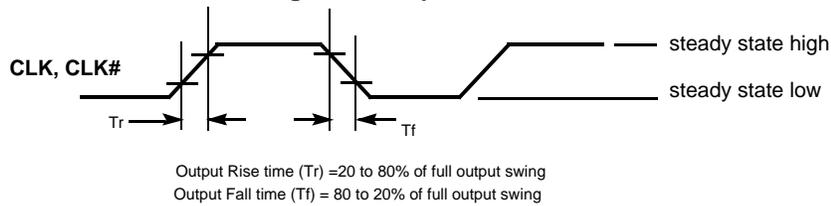
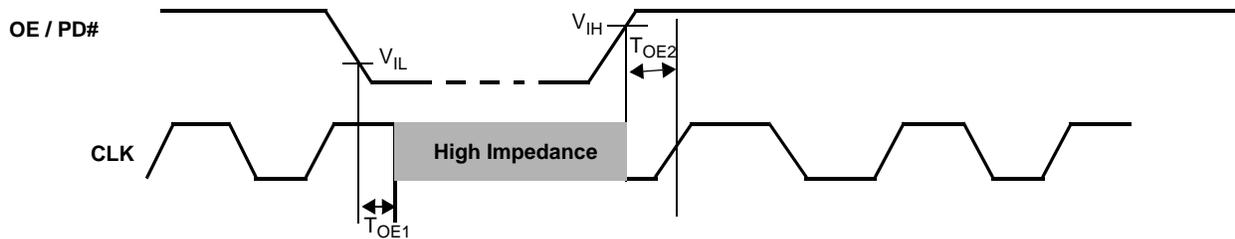
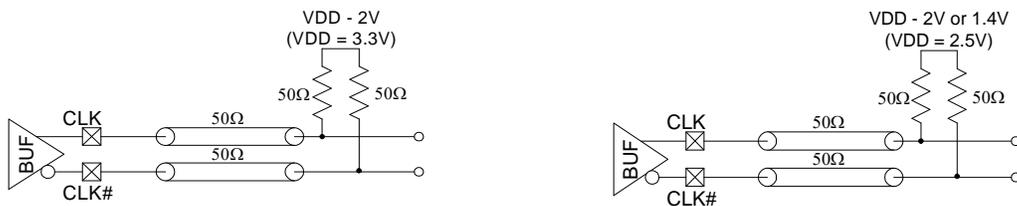


Figure 5. Output Enable/Disable Timing



Termination Circuits

Figure 6. LVPECL Termination



## Ordering Information

Table 1 lists the CY2V014 key package features and ordering codes. The table contains only the parts that are currently available. If you do not see what you are looking for, contact your local sales representative. For more information, visit the Cypress website at [www.cypress.com](http://www.cypress.com) and refer to the product summary page at <http://www.cypress.com/products>.

**Table 1. Key Features and Ordering Information**

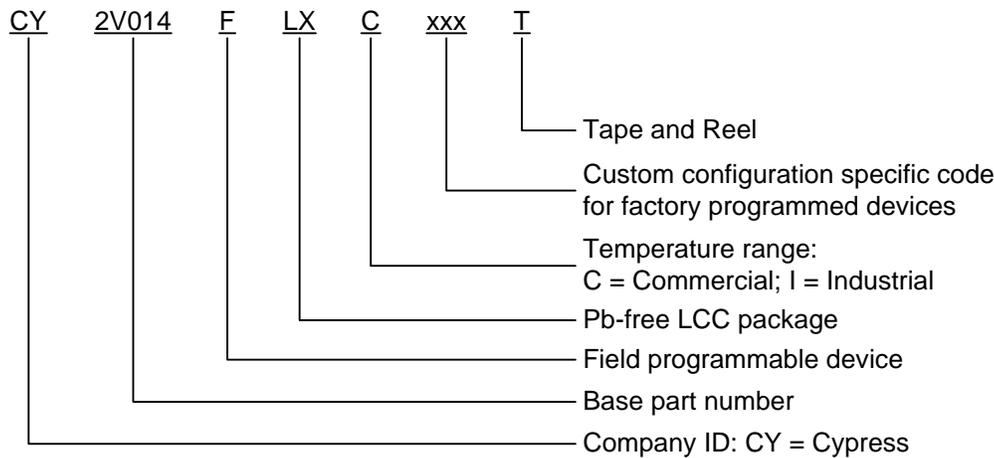
Part Number	Configuration	Package description	Product Flow
<b>Pb-free</b>			
CY2V014FLXCT	Field programmable	6-Pin Ceramic LCC SMD – Tape and Reel	Commercial, 0 °C to 70 °C
CY2V014FLXIT	Field programmable	6-Pin Ceramic LCC SMD – Tape and Reel	Industrial, –40 °C to 85 °C

## Possible Configurations

Some product offerings are factory programmed customer specific devices with customized part numbers. The Possible Configurations table shows the available device types, but not complete part numbers. Contact your local Cypress FAE or Sales Representative for more information.

Part Number <sup>[3]</sup>	Configuration	Package description	Product Flow
<b>Pb-free</b>			
CY2V014LXCxxxT	Factory configured	6-Pin Ceramic LCC SMD – Tape and Reel	Commercial, 0 °C to 70 °C
CY2V014LXIxxxT	Factory configured	6-Pin Ceramic LCC SMD – Tape and Reel	Industrial, –40 °C to 85 °C

## Ordering Code Definitions

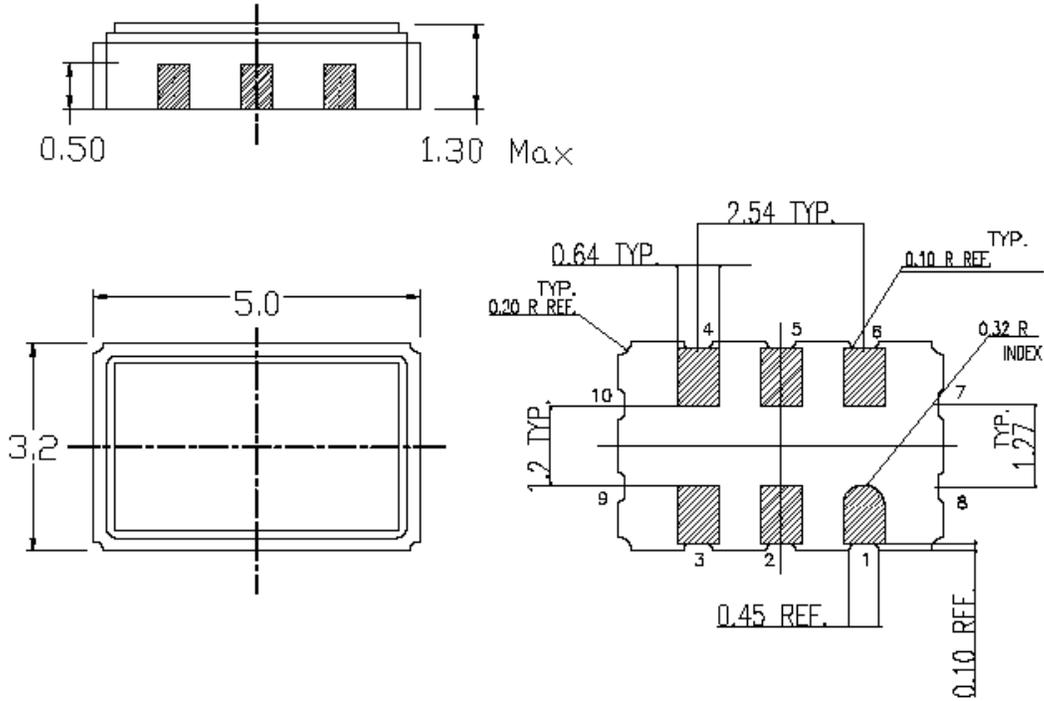


**Note**

3. "xxx" is a factory assigned code that identifies the programming option.

Package Diagram

Figure 7. 6-Pin 3.2 x 5.0 mm Ceramic LCC LZ06A



001-10044 \*A

Acronyms

Table 2. Acronyms Used in this Document

Acronym	Description
CMOS	complementary metal oxide semiconductor
ESD	electro-static discharge
FAE	field applications engineer
HDD	hard disk drive
LCC	leadless chip carrier
PLL	phase-locked loop
RMS	root mean square
SMD	surface mount device
VCXO	voltage-controlled crystal oscillator

Document Conventions

Units of Measure

Table 3. Units of Measure

Symbol	Unit of Measure
°C	degree celcius
KHz	kilo hertz
KΩ	kilo ohm
MHz	mega hertz
μA	micro ampere
mA	milli ampere
ms	milli second
mV	milli volt
ns	nano second
Ω	ohm
ppm	parts per million
%	percent
ps	pico second
V	volt

## Document History Page

Document Title: CY2V014 LVPECL Voltage Controlled Crystal Oscillator (VCXO) Document Number: 001-06458				
Revision	ECN	Orig. of Change	Submission Date	Description of Change
**	504458	RGL	See ECN	New data sheet
*A	2899939	CXQ	03/26/10	Updated ordering information table. Updated package diagram. Updated copyright section.
*B	3099970	CXQ	12/02/10	Updated template and styles. Changed from Preliminary to Final. Added Acronyms, Units of Measure, and Ordering Code Definitions sections. Changed 700 MHz to 690 MHz in second "Features" bullet. Changed from 700 MHz to 690 MHz in "Programming Variables" section Changed fOUT spec in AC specifications table from 700 max to 690 max. Changed FSfact in AC specifications from +/-60 ppm max to -60ppm min and 60 ppm max. Changed FSfield spec to -100 ppm min and 100 ppm max.

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<a href="#">Interface</a>	<a href="http://cypress.com/go/interface">cypress.com/go/interface</a>
<a href="#">Lighting &amp; Power Control</a>	<a href="http://cypress.com/go/powerpsoc">cypress.com/go/powerpsoc</a> <a href="http://cypress.com/go/plc">cypress.com/go/plc</a>
<a href="#">Memory</a>	<a href="http://cypress.com/go/memory">cypress.com/go/memory</a>
<a href="#">Optical &amp; Image Sensing</a>	<a href="http://cypress.com/go/image">cypress.com/go/image</a>
<a href="#">PSoC</a>	<a href="http://cypress.com/go/psoc">cypress.com/go/psoc</a>
<a href="#">Touch Sensing</a>	<a href="http://cypress.com/go/touch">cypress.com/go/touch</a>
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<a href="#">Wireless/RF</a>	<a href="http://cypress.com/go/wireless">cypress.com/go/wireless</a>

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