

# 100 MHz LVDS Clock Generator

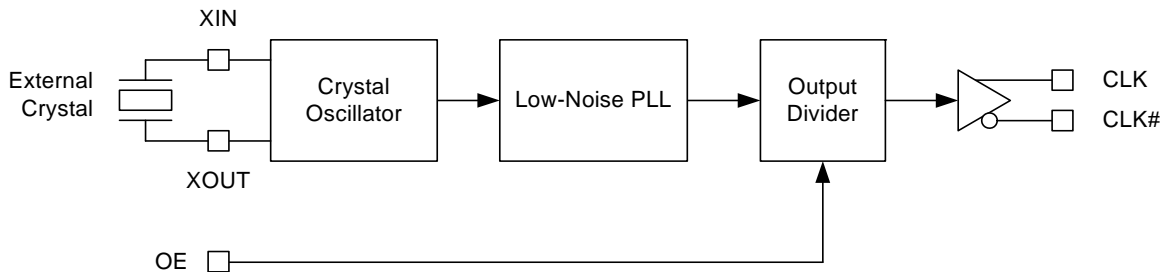
## Features

- One low-voltage differential signaling (LVDS) output pair
- Output frequency: 100 MHz
- External crystal frequency: 25 MHz
- Low RMS phase jitter at 100 MHz, using 25 MHz crystal (637 kHz to 10 MHz): 0.53 ps (typical)
- Pb-free 8-Pin TSSOP package
- Supply voltage: 3.3 V or 2.5 V
- Commercial temperature range

## Functional Description

The CY2XL11 is a PLL based high performance clock generator with a crystal oscillator interface and one LVDS output pair. It is optimized to generate PCI Express, FC, and other high-performance clock frequencies. It also produces an output frequency that is four times the crystal frequency. It uses Cypress's low-noise VCO technology to achieve less than 1 ps typical RMS phase jitter, that meets high-performance systems' jitter requirements.

## Logic Block Diagram



## Pinouts

Figure 1. Pin Diagram - 8-Pin TSSOP



Table 1. Pin Definition – 8-Pin TSSOP

Pin Number	Pin Name	I/O Type	Description
1, 8	VDD	Power	3.3 V or 2.5 V power supply. All supply current flows through pin 1
2	VSS	Power	Ground
3, 4	XOUT, XIN	XTAL output and input	Parallel resonant crystal interface
5	OE	CMOS input	Output enable. When HIGH, the output is enabled. When LOW, the output is high-impedance
6,7	CLK#, CLK	LVDS output	Differential clock output

## Frequency Table

Input Crystal Frequency (MHz)	PLL Multiplier Value	Output Frequency (MHz)
25	4	100

## Absolute Maximum Conditions

Parameter	Description	Condition	Min	Max	Unit
V <sub>DD</sub>	Supply voltage	–	–0.5	4.4	V
V <sub>IN</sub> <sup>[1]</sup>	Input voltage, DC	Relative to V <sub>SS</sub>	–0.5	V <sub>DD</sub> + 0.5	V
T <sub>S</sub>	Temperature, storage	Non operating	–65	150	°C
T <sub>J</sub>	Temperature, junction	–	–	135	°C
ESD <sub>HBM</sub>	ESD protection (human body model)	JEDEC STD 22-A114-B	2000	–	V
UL–94	Flammability rating	At 1/8 inch	V–0		
Θ <sub>JA</sub> <sup>[2]</sup>	Thermal resistance, junction to ambient	0 m/s airflow	100		°C/W
		1 m/s airflow	91		
		2.5 m/s airflow	87		

## Operating Conditions

Parameter	Description	Min	Max	Unit
V <sub>DD</sub>	3.3 V supply voltage	3.135	3.465	V
	2.5 V supply voltage	2.375	2.625	V
T <sub>A</sub>	Ambient temperature	–5	70	°C
T <sub>PU</sub>	Power up time for all V <sub>DD</sub> to reach minimum specified voltage (ensure power ramps is monotonic)	0.05	500	ms

## DC Electrical Characteristics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
I <sub>DD</sub> <sup>[4]</sup>	Power supply current with output terminated	V <sub>DD</sub> = 3.465 V, OE = V <sub>DD</sub> , output terminated	–	–	120	mA
		V <sub>DD</sub> = 2.625 V, OE = V <sub>DD</sub> , output terminated	–	–	115	mA
V <sub>OD</sub> <sup>[6]</sup>	LVDS differential output voltage	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 100 Ω between CLK and CLK#	247	–	454	mV
ΔV <sub>OD</sub> <sup>[6]</sup>	Change in V <sub>OD</sub> between complementary output states	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 100 Ω between CLK and CLK#	–	–	50	mV
V <sub>OS</sub> <sup>[7]</sup>	LVDS offset output voltage	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 100 Ω between CLK and CLK#	1.125	–	1.375	V
ΔV <sub>OS</sub>	Change in V <sub>OS</sub> between complementary output states	V <sub>DD</sub> = 3.3 V or 2.5 V, R <sub>TERM</sub> = 100 Ω between CLK and CLK#	–	–	50	mV
I <sub>OZ</sub>	Output leakage current	Three-state output, unterminated, measured on one pin while floating the other pin, OE = V <sub>SS</sub>	–35	–	35	μA

### Notes

1. The voltage on any input or IO pin cannot exceed the power pin during power up.
2. Simulated using Apache Sentinel TI software. The board is derived from the JEDEC multilayer standard. It measures 76 x 114 x 1.6 mm and has 4-layers of copper (2/1/1/2 oz.). The internal layers are 100% copper planes, while the top and bottom layers have 50% metalization. No vias are included in the model.
3. Outputs are terminated with 100Ω between CLK and CLK#. Refer to [Figure 8 on page 5](#).
4. I<sub>DD</sub> includes –4 mA of current that is dissipated externally in the output termination resistor.
5. Not 100% tested, guaranteed by design and characterization.
6. Refer to [Figure 2 on page 4](#).
7. Refer to [Figure 3 on page 4](#).

**DC Electrical Characteristics** (continued)

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
V <sub>IH</sub>	Input high voltage, OE pin	–	0.7 × V <sub>DD</sub>	–	–	V
V <sub>IL</sub>	Input low voltage, OE pin	–	–	–	0.3 × V <sub>DD</sub>	V
I <sub>IH</sub>	Input high current, OE pin	OE = V <sub>DD</sub>	–	–	115	μA
I <sub>IL</sub>	Input low current, OE pin	OE = V <sub>SS</sub>	–50	–	–	μA
C <sub>IN</sub>	Input capacitance, OE pin	–	–	15	–	pF
C <sub>INX</sub>	Pin capacitance, XIN & XOUT	–	–	4.5	–	pF

**AC Electrical Characteristics**<sup>[3]</sup>

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
F <sub>OUT</sub>	Output frequency	–	–	100	–	MHz
T <sub>R</sub> , T <sub>F</sub> <sup>[8]</sup>	Output rise or fall time	20% to 80% of full output swing	–	0.5	1.0	ns
T <sub>Jitter(φ)</sub> <sup>[11]</sup>	RMS phase jitter (random)	F <sub>OUT</sub> = 100 MHz, (637 kHz–10 MHz)	–	0.53	–	ps
T <sub>DC</sub> <sup>[9]</sup>	Duty cycle	Measured at zero crossing point	45	–	55	%
T <sub>OHZ</sub> <sup>[10]</sup>	Output disable time	Time from falling edge on OE to stopped outputs (Asynchronous)	–	–	100	ns
T <sub>OE</sub> <sup>[10]</sup>	Output enable time	Time from rising edge on OE to outputs at a valid frequency (Asynchronous)	–	–	120	ns
T <sub>LOCK</sub>	Startup time	Time for CLK to reach valid frequency measured from the time V <sub>DD</sub> = V <sub>DD(min.)</sub>	–	–	5	ms

**Crystal Characteristics**

Parameter	Description	Min	Max	Unit
	Mode of oscillation	Fundamental		–
F	Frequency	25	25	MHz
ESR	Equivalent series resistance	–	50	Ω
C <sub>S</sub>	Shunt capacitance	–	7	pF

**Notes**

8. Refer to [Figure 4](#) on page 4.
9. Refer to [Figure 5](#) on page 4.
10. Refer to [Figure 6](#) on page 4.
11. Refer to [Figure 7](#) on page 5.

Switching Waveforms

Figure 2. Output Voltage Swing

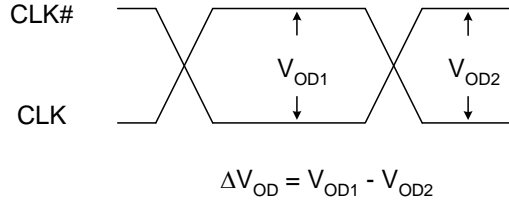


Figure 3. Output Offset Voltage

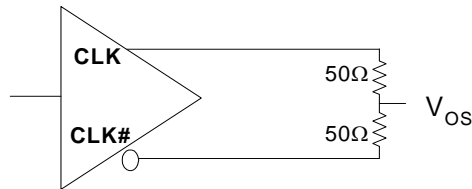


Figure 4. Output Rise or Fall Time

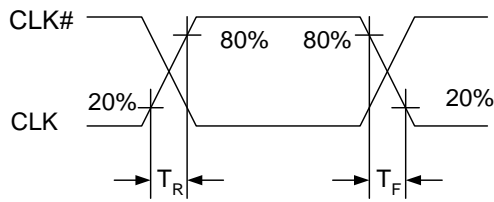


Figure 5. Duty Cycle Timing

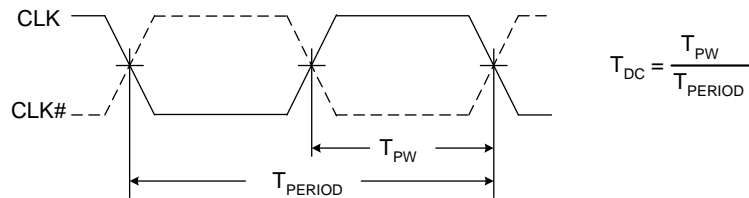


Figure 6. Output Enable and Disable Timing

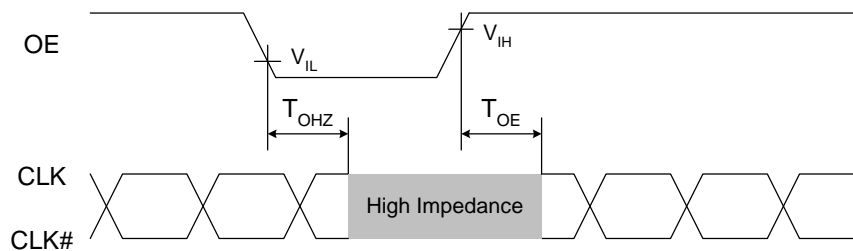
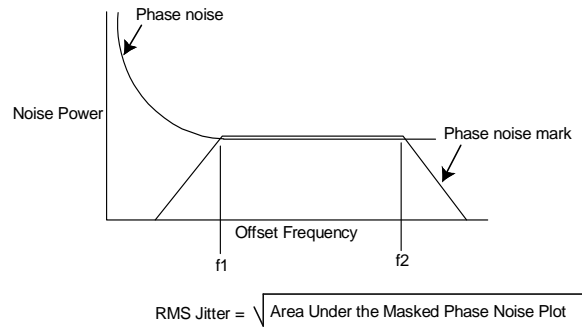
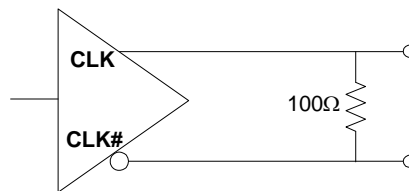


Figure 7. RMS Phase Jitter



## Termination Circuits

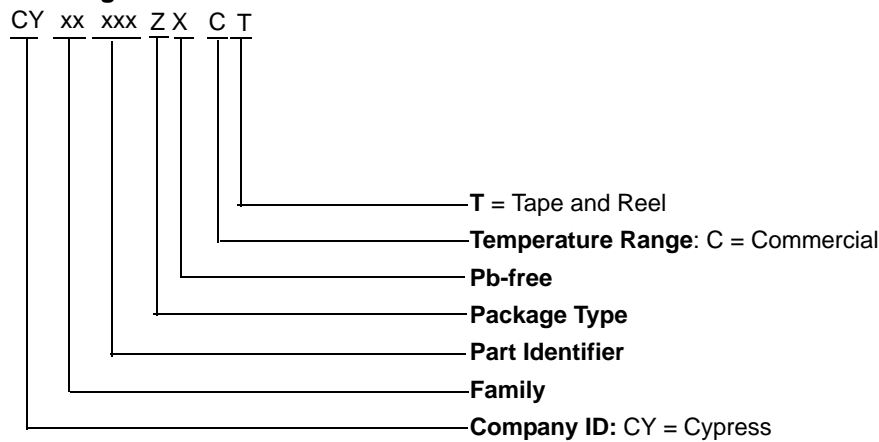
Figure 8. LVDS Termination



### Ordering Information

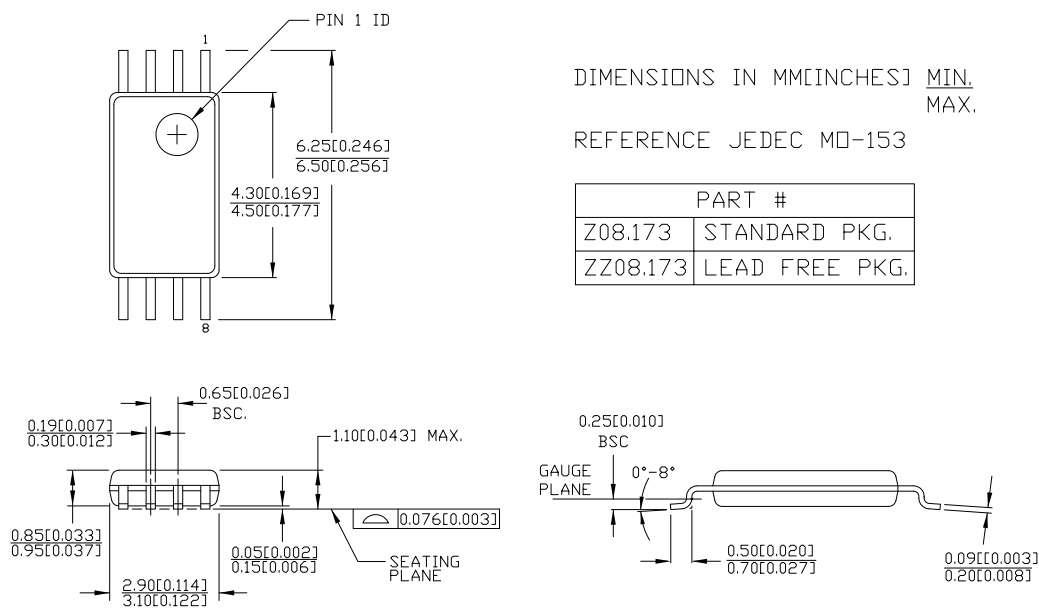
Part Number	Package Description	Product Flow
CY2XL11ZXC	8-pin TSSOP	Commercial, -5°C to 70°C
CY2XL11ZXCT	8-pin TSSOP - Tape and Reel	Commercial, -5°C to 70°C
CY2XL11ZXI	8-pin TSSOP	Industrial
CY2XL11ZXI(T)	8-pin TSSOP - Tape and Reel	Industrial

### Ordering Code Definitions



### Package Drawing and Dimensions

Figure 9. 8-Pin Thin Shrunk Small Outline Package (4.40 MM Body) Z8



51-85093-°C

## Acronyms

Acronym	Description
CLKOUT	Clock output
CMOS	Complementary metal oxide semiconductor
DPM	Die pick map
EPROM	Erasable programmable read only memory
LVDS	Low-voltage differential signaling
NTSC	National television system committee
OE	Output enable
PAL	Phase alternate line
PD	Power down
PLL	Phase locked loop
PPM	Parts per million
TTL	Transistor transistor logic

## Document Conventions

### Units of Measures

Symbol	Unit of Measure
°C	degrees Celsius
kHz	kilohertz
kΩ	kilohms
MHz	megahertz
MΩ	megaohms
μA	microamperes
μs	microseconds
μV	microvolts
μVrms	microvolts root-mean-square
mA	milliamperes
mm	millimeters
ms	milliseconds
mV	millivolts
nA	nanoamperes
ns	nanoseconds
nV	nanovolts
Ω	ohms

Document History Page

Document Title: CY2XL11 100 MHz LVDS Clock Generator Document Number: 001- 42886				
REV.	ECN NO.	Submission Date	Orig. of Change	Description of Change
**	2117527	See ECN	WWZ/KVM /AES A	New data sheet
*A	2669117	03/05/2009	KVM/ AESA	Changed crystal and output frequency Removed MSL spec Changed IIL value from -20 uA to -50 uA Changed IIH value from 20 uA to 115 uA Changed phase jitter value from 1 to 0.53 ps Changed junction temp from 125°C to 135°C Changed IDD from 150 mA to 120 mA Rise / fall time changed to 350 ps to 500ps Changed Data Sheet Status to Final
*B	2700242	04/30/2009	KVM/ PYRS	Typo correction Reformatted AC and DC tables Added IDD spec for 2.5V Added CINX and TLOCK specs Changed CIN from 7pF to 15pF
*C	2718433	06/12/2009	WWZ/HMT	No change. Submit to ECN for product launch.
*D	2764787	09/18/2009	KVM	Add clause to I <sub>OZ</sub> Test Conditions Change V <sub>OD</sub> limits from 250/450 mV to 247/454 mV Add max limit for T <sub>R</sub> , T <sub>F</sub> : 1.0 ns Change T <sub>OE</sub> max from 100 ns to 120 ns Change T <sub>LOCK</sub> max from 10 ms to 5 ms
*E	3067416	10/20/20	BASH	Added the industrial part in Ordering Information table. Updated the package diagram. Added Ordering Code Definition, Acronyms, and Document Conventions.
*F	3199831	03/18/11	CXQ	No change. Sunset review spec.



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