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CY2XP311

312.5 MHz LVPECL Clock Generator

Features

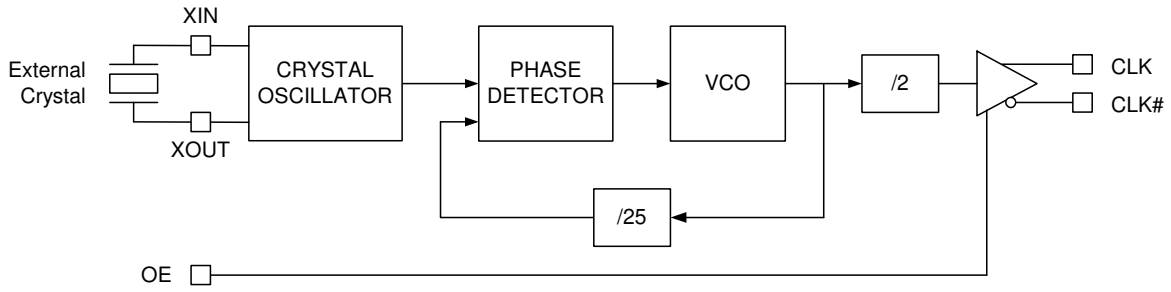
- One LVPECL output pair
- Output frequency: 312.5 MHz
- External crystal frequency: 25 MHz
- Low RMS phase jitter at 312.5 MHz, using 25-MHz crystal (1.875 MHz to 20 MHz): 0.3 ps (typical)
- Pb-free 8-pin TSSOP package
- Supply voltage: 3.3 V or 2.5 V
- Commercial and industrial temperature ranges

Functional Description

The CY2XP311 is a PLL (phase locked loop) based high performance clock generator. It is optimized to generate 10 GB Ethernet, SONET, and other high performance clock frequencies. It also produces an output frequency that is 12.5 times the crystal frequency. It uses Cypress's low noise VCO technology to achieve 0.3 ps typical RMS phase jitter, which meets both 10 GB Ethernet and SONET jitter requirements. The CY2XP311 has a crystal oscillator interface input and one LVPECL output pair.

For a complete list of related documentation, click here.

Logic Block Diagram



Contents

Pinouts

Figure 1. 8-pin TSSOP pinout

Pin Definitions

8-pin TSSOP

Pin Number	Pin Name	I/O Type	Description
1, 8	VDD	Power	3.3 V or 2.5 V power supply.
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	LVPECL output	Differential clock output

Frequency Table

Input		Output Frequency (MHz)
Crystal Frequency (MHz)	PLL Multiplier Value	
25	12.5	312.5

Absolute Maximum Conditions

Parameter	Description	Conditions	Min	Max	Unit
V_{DD}	Supply voltage	–	–0.5	4.4	V
V_{IN}[1]	Input voltage, DC	Relative to V_{SS}	–0.5	V_{DD} + 0.5	V
T_S	Temperature, storage	Non operating	–65	150	°C
T_J	Temperature, junction	–	–	135	°C
ESD_{HBM}	ESD protection, human body model	JEDEC STD 22-A114-B	2000	–	V
UL–94	Flammability rating	At 1/8 in.	V–0		
Θ_{JA}[2]	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_{DD}	3.3 V supply voltage	3.135	3.465	V
	2.5 V supply voltage	2.375	2.625	V
T_A	Ambient temperature, commercial	0	70	°C
	Ambient temperature, industrial	–40	85	°C
T_{PU}	Power up time for all V_{DD} to reach minimum specified voltage (ensure power ramps is monotonic)	0.05	500	ms

Notes
1. The voltage on any input or I/O 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.

DC Electrical Characteristics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
I_{DD}	Operating supply current with output unterminated	V_{DD} = 3.465 V, OE = V_{DD}, output unterminated	–	–	125	mA
		V_{DD} = 2.625 V, OE = V_{DD}, output unterminated	–	–	120	mA
I_{DDT}	Operating supply current with output terminated	V_{DD} = 3.465 V, OE = V_{DD}, output terminated	–	–	150	mA
		V_{DD} = 2.625 V, OE = V_{DD}, output terminated	–	–	145	mA
V_{OH}	LVPECL output high voltage	V_{DD} = 3.3 V or 2.5 V, R_{TERM} = 50 Ω to V_{DD} – 2.0 V	V_{DD} – 1.15	–	V_{DD} – 0.75	V
V_{OL}	LVPECL output low voltage	V_{DD} = 3.3 V or 2.5 V, R_{TERM} = 50 Ω to V_{DD} – 2.0 V	V_{DD} – 2.0	–	V_{DD} – 1.625	V
V_{OD1}	LVPECL peak-to-peak output voltage swing	V_{DD} = 3.3 V or 2.5 V, R_{TERM} = 50 Ω to V_{DD} – 2.0 V	600	–	1000	mV
V_{OD2}	LVPECL output voltage swing (V_{OH} – V_{OL})	V_{DD} = 2.5 V, R_{TERM} = 50 Ω to V_{DD} – 1.5 V	500	–	1000	mV
V_{OCM}	LVPECL output common mode voltage (V_{OH} + V_{OL})/2	V_{DD} = 2.5 V, R_{TERM} = 50 Ω to V_{DD} – 1.5 V	1.2	–	–	V
I_{OZ}	LVPECL output leakage current	Output off, OE = V_{SS}	–35	–	35	µA
V_{IH}	Input high voltage, OE Pin	–	0.7 × V_{DD}	–	V_{DD} + 0.3	V
V_{IL}	Input low voltage, OE Pin	–	–0.3	–	0.3 × V_{DD}	V
I_{IH}	Input high current, OE Pin	OE = V_{DD}	–	–	115	µA
I_{IL}	Input low current, OE Pin	OE = V_{SS}	–50	–	–	µA
C_{IN}[3]	Input capacitance, OE Pin	–	–	15	–	pF
C_{INX}[3]	Pin capacitance, XIN & XOUT	–	–	4.5	–	pF

Notes
3. Not 100% tested, guaranteed by design and characterization.

AC Electrical Characteristics

Parameter [4]	Description	Conditions	Min	Typ	Max	Unit
F_{OUT}	Output frequency		–	312.5	–	MHz
T_R, T_F[5]	Output rise or fall time	20% to 80% of full output swing	–	0.5	1.0	ns
$T_{Jitter(\phi)}$[6]	RMS phase jitter (random)	312.5 MHz, (1.875 to 20 MHz)	–	0.3	–	ps
T_{DC}[7]	Output duty cycle	Measured at zero crossing point	45	–	55	%
T_{OHZ}	Output disable time	Time from falling edge on OE to stopped outputs (Asynchronous)	–	–	100	ns
T_{OE}	Output enable time	Time from rising edge on OE to outputs at a valid frequency (Asynchronous)	–	–	100	ns
T_{LOCK}	Startup time	Time for CLK to reach valid frequency measured from the time $V_{DD} = V_{DD}$(min.)	–	–	5	ms

Recommended Crystal Specifications

Parameter [8]	Description	Min	Max	Unit
Mode	Mode of Oscillation	Fundamental		–
F	Frequency	25	25	MHz
ESR	Equivalent Series Resistance	–	50	Ω
C_S	Shunt Capacitance	–	7	pF

Notes
4. Not 100% tested, guaranteed by design and characterization.
5. Refer to Figure 5 on page 7.
6. Refer to Figure 6 on page 7.
7. Refer to Figure 7 on page 8.
8. Characterized using an 18 pF parallel resonant crystal.

Parameter Measurements

Figure 2. 3.3 V Output Load AC Test Circuit

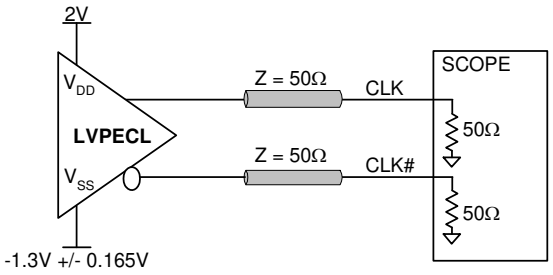


Figure 3. 2.5 V Output Load AC Test Circuit

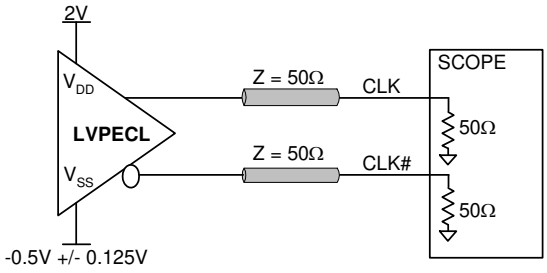


Figure 4. Output DC Parameters

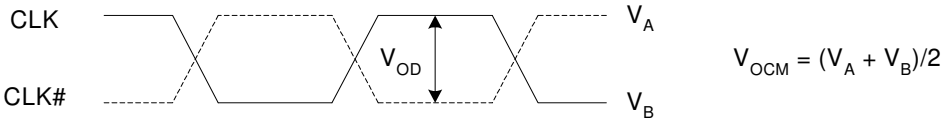


Figure 5. Output Rise and Fall Time

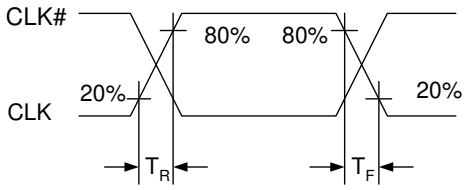


Figure 6. RMS Phase Jitter

Parameter Measurements (continued)

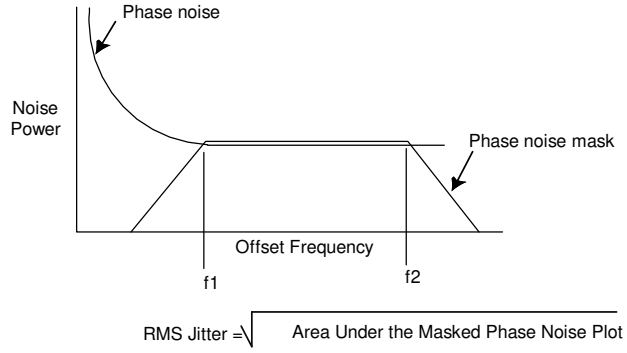


Figure 7. Output Duty Cycle

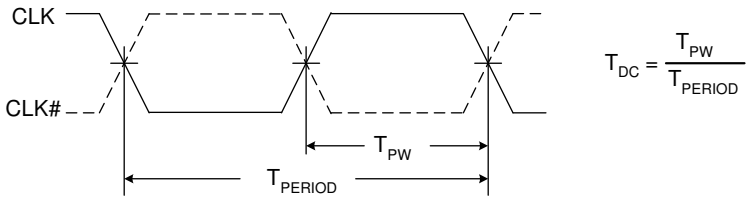
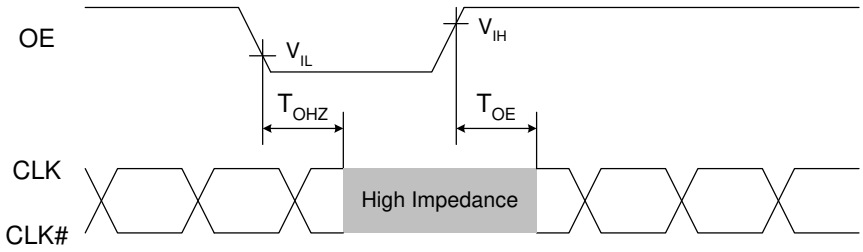


Figure 8. Output Enable Timing



Application Information

Power Supply Filtering Techniques

As in any high speed analog circuitry, noise at the power supply pins can degrade performance. To achieve optimum jitter performance, use good power supply isolation practices. Figure 9 illustrates a typical filtering scheme. 0.01 to 0.1 µF ceramic chip capacitors are located close to the VDD pins to provide a short and low impedance AC path to ground. A 1 to 10 µF ceramic or tantalum capacitor is located in the general vicinity of this device and may be shared with other devices. An acceptable alternative power supply configuration is shown in Figure 10.

Figure 9. Power Supply Filtering

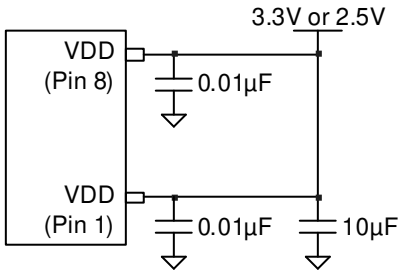
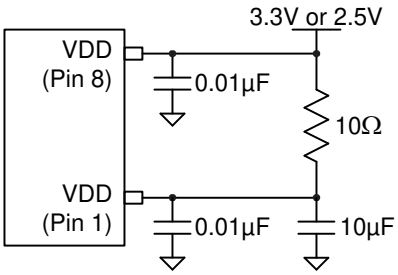


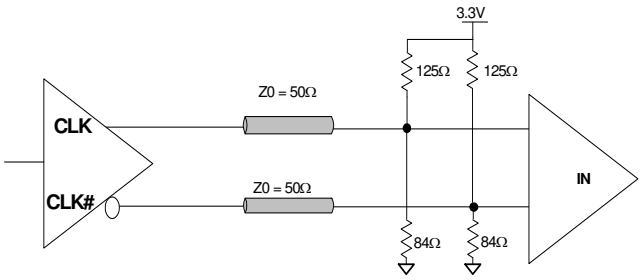
Figure 10. Alternative Power Supply Filtering



Termination for LVPECL Output

The CY2XP311 implements its LVPECL driver with a current steering design. For proper operation, it requires a 50 ohm dc termination on each of the two output signals. For 3.3 V operation, this data sheet specifies output levels for termination to V_{DD}–2.0 V. This same termination voltage can also be used for V_{DD} = 2.5 V operation, or it can be terminated to V_{DD}–1.5 V. Note that it is also possible to terminate with 50 ohms to ground (V_{SS}), but the high and low signal levels differ from the data sheet values. Termination resistors are best located close to the destination device. To avoid reflections, trace characteristic impedance (Z_0) should match the termination impedance. Figure 11 shows a standard termination scheme.

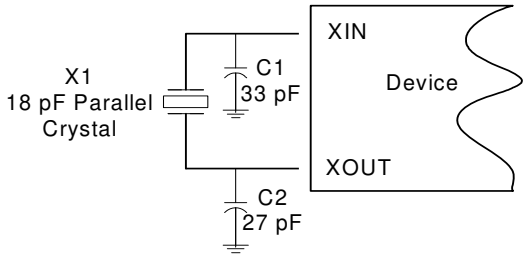
Figure 11. LVPECL Output Termination



Crystal Input Interface

The CY2XP311 is characterized with 18 pF parallel resonant crystals. The capacitor values shown in Figure 12 are determined using a 25 MHz 18 pF parallel resonant crystal and are chosen to minimize the ppm error. Note that the optimal values for C1 and C2 depend on the parasitic trace capacitance and are therefore layout dependent.

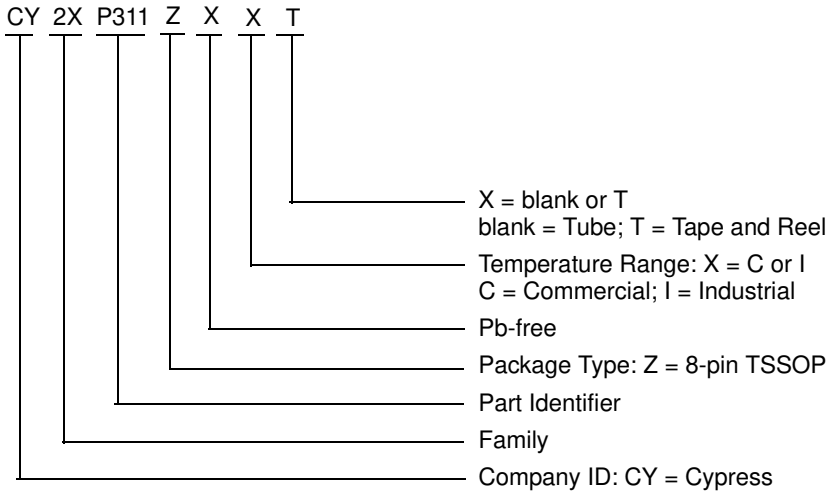
Figure 12. Crystal Input Interface



Ordering Information

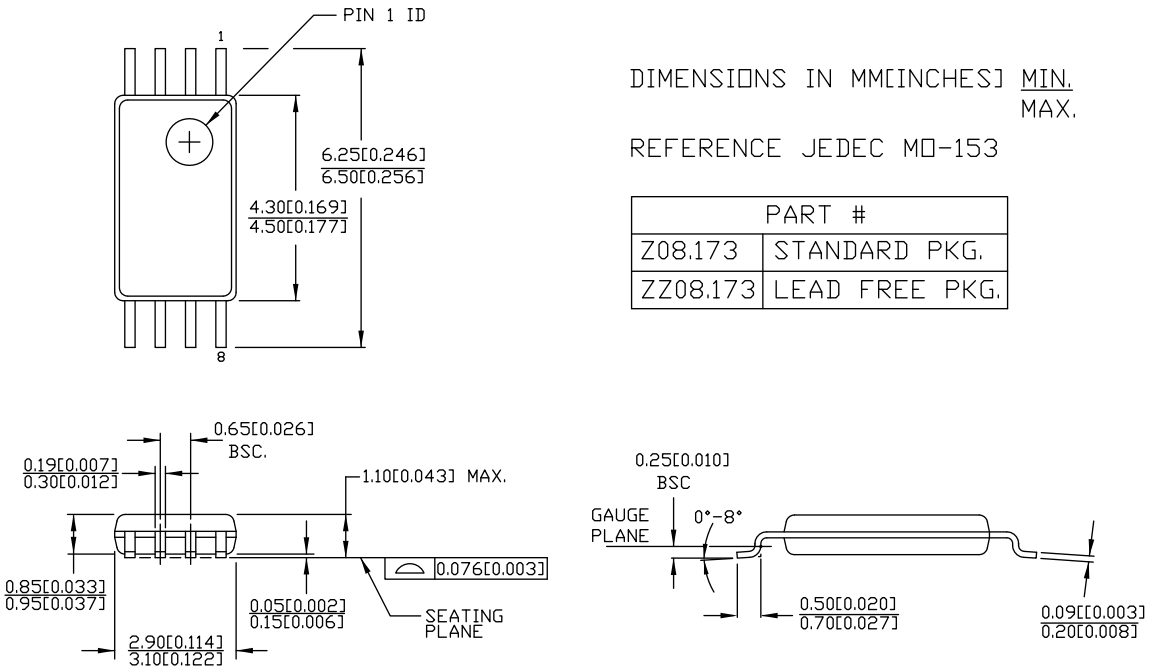
Part Number	Package Type	Product Flow
CY2XP311ZXI	8-pin TSSOP	Industrial, –40 °C to 85 °C
CY2XP311ZXIT	8-pin TSSOP – Tape and Reel	Industrial, –40 °C to 85 °C

Ordering Code Definitions



Package Drawing and Dimensions

Figure 13. 8-pin TSSOP (4.40 mm Body) Package Outline, 51-85093



51-85093 *E

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 Signalling
LVPECL	Low-Voltage Positive Emitter Coupled Logic
NTSC	National Television System Committee
OE	Output Enable
PAL	Phase Alternate Line
PD	Power Down
PLL	Phase Locked Loop
TTL	Transistor-Transistor Logic

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degree Celsius
kHz	kilohertz
kΩ	kilohm
MHz	megahertz
MΩ	megaohm
µA	microampere
µs	microsecond
µV	microvolt
µVrms	microvolts root-mean-square
mA	milliampere
mm	millimeter
ms	millisecond
mV	millivolt
nA	nanoampere
ns	nanosecond
nV	nanovolt
Ω	ohm
ppm	parts per million
V	volt

Document History Page

Document Title: CY2XP311, 312.5 MHz LVPECL Clock Generator Document Number: 001-59931				
Rev.	**ECN No.**	**Submission Date**	**Orig. of Change**	**Description of Change**
**	2897143	3/22/2010	KVM	New data sheet.
*A	2915328	04/16/2010	KVM	Changed status from Preliminary to Final
*B	3201150	03/21/2011	BASH	Added Ordering Code Definition. Updated Package Drawing and Dimensions. Added Acronyms and Units of Measure.
*C	4335323	04/07/2014	CINM	Updated Package Drawing and Dimensions: spec 51-85093 – Changed revision from *C to *D. Updated in new template. Completing Sunset Review.
*D	4570097	11/14/2014	CINM	Added related documentation hyperlink in page 1. Removed the prune part numbers CY2XP311ZXC and CY2XP311ZXCT in Ordering Information. Updated Figure 13 in Package Drawing and Dimensions (spec 51-85093 *D to *E).
*E	5686604	04/06/2017	XHT	Updated to new template Completing sunset review

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