CY2XP41

Crystal to LVPECL Clock Generator

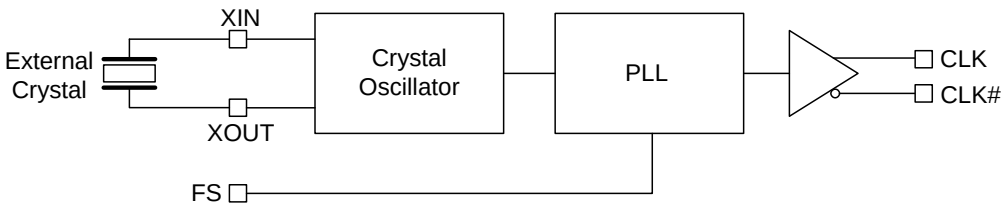
Features

- One LVPECL output pair
- External crystal frequency: 25.0 MHz
- Selectable output frequency: 62.5 MHz or 75 MHz
- Low RMS phase jitter at 75 MHz, using 25 MHz crystal (1.5 MHz–10 MHz): 0.27 ps (typical)
- Low RMS phase jitter at 62.5 MHz, using 25 MHz crystal (1.5 MHz–10 MHz): 0.38 ps (typical)
- Pb-free 8-Pin TSSOP package
- Supply voltage: 3.3 V
- Commercial temperature range

Functional Description

The CY2XP41 is a PLL (Phase Locked Loop) based high performance clock generator. It is optimized to generate high performance clock frequencies for DVD-R applications. It uses Cypress's low noise VCO technology to achieve less than 1 ps typical RMS phase jitter, that meets application jitter requirements. The CY2XP41 has a crystal oscillator interface input and one LVPECL output pair.

Logic Block Diagram



Contents

Pinouts **3**
Absolute Maximum Conditions **4**
Operating Conditions **4**
Electrical Characteristics for Input **4**
DC Electrical Characteristics for Power Supplies **4**
Frequency Table **4**
DC Electrical Characteristics for LVPECL Output **5**
Crystal Characteristics **5**
Measurement Definitions **6**
Application Information **7**
Power Supply Filtering Techniques 7
Termination for LVPECL Output 7
Crystal Interface 7
Ordering Information **8**
Acronyms **9**
Document Conventions **9**
Document History Page **10**
Sales, Solutions, and Legal Information **10**
Worldwide Sales and Design Support 10
Products 10
PSoC Solutions 10

Pinouts

Figure 1. Pin Diagram – 8 Pin TSSOP

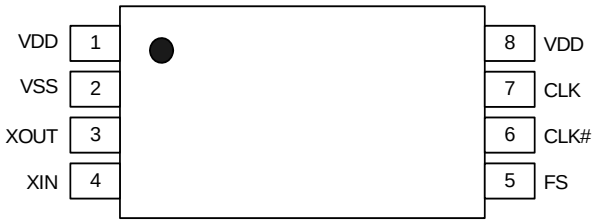


Table 1. Pin Definitions – 8 Pin TSSOP

Pin	Name	Type	Description
1, 8	VDD	Power	3.3 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	FS	LVCMOS/LVTTL input	Frequency Select Input, See “Frequency Table” on page 4
6,7	CLK#, CLK	LVPECL output	Differential Clock Output

Frequency Table

Input		Output Frequency (MHz)
Input Xtal Frequency (MHz)	FS	
25	0	62.5
25	1	75.0

Absolute Maximum Conditions

Parameter	Description	Condition	Min	Max	Unit
V_{DD}	Supply Voltage		–0.5	4.4	V
V_{IN}[1.]	Input Voltage, DC	Relative to VSS	–0.5	V_{DD} + 0.5	V
T_S	Temperature, Storage	Non Functional	–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
T_A	Ambient Temperature, Commercial	0	70	°C
T_{PU}	Power up time for all V_{DD} to reach minimum specified voltage (ensure power ramps are monotonic)	0.05	500	ms

Electrical Characteristics for Input

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
V_{IL}	Input Low Voltage , FS		–	–	$0.3*V_{DD}$	V
V_{IH}	Input High Voltage, FS		$0.7*V_{DD}$	–	–	V
I_{IL}	Input Low Current , FS	FS = V_{SS}	–50	–	–	µA
I_{IH}	Input High Current, FS	FS = V_{DD}	–	–	115	µA
C_{IN}[3]	Input Capacitance, FS		–	15	–	pF
C_{INX}[3]	Input Capacitance, XIN & XOUT		–	4.5	–	pF

DC Electrical Characteristics for Power Supplies

Parameter	Description	Min	Typ	Max	Unit
I_{DD}	Power Supply Current with output unterminated	–	–	125	mA
I_{DDT}	Power Supply Current with output terminated	–	–	180	mA

Note
1. The voltage on any input or IO pin cannot exceed the power pin during power up. Power supply sequencing is NOT required.
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% metallization. No vias are included in the model.
3. Not 100% tested, guaranteed by design and characterization.

DC Electrical Characteristics for LVPECL Output

Parameter	Description	Min	Typ	Max	Unit
V_{CM}	Common-Mode Voltage (CLK + CLK#) / 2, defined in Figure 5 on page 6, using Figure 2 on page 6 circuit.	175	–	2000	mV
V_{PP}	Differential Peak Output Voltage, defined in Figure 5 on page 6, using Figure 2 on page 6 circuit.	350	780	850	mV

Crystal Characteristics

Parameter	Description	Min	Typ	Max	Unit
	Mode of Oscillation	Fundamental			
F	Frequency	–	25	–	MHz
ESR	Equivalent Series Resistance	–	–	50	Ω
C_L	Crystal Load Capacitance	–	10	–	pF
C_S	Shunt Capacitance	–	–	7	pF
DL	Crystal Drive Level	–	–	300	µW

AC Characteristics[3]

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
F_{OUT}	Output Frequency		62.5	–	75.0	MHz
T_R, T_F	Output Rise/Fall time	Defined in Figure 5 on page 6	–	0.35	1.0	ns
$T_{Jitter(\phi)}$	RMS Phase Jitter (Random)	75 MHz, (1.5 MHz - 10 MHz filter), 3.3 V	–	0.27	–	ps
		62.5 MHz, (1.5 MHz - 10 MHz filter), 3.3 V	–	0.38	–	ps
T_{DC}	Duty Cycle	Defined in Figure 4 on page 6	45	–	55	%
T_{LOCK}	Startup Time	Time for CLK to reach valid frequency measured from the time $V_{DD} = V_{DD}$(min.)	–	–	5	ms
T_{LFS}	Re-lock Time	Time for CLK to reach valid frequency from FS pin change	–	–	1	ms

Measurement Definitions

Figure 2. Output Load AC Test Circuit

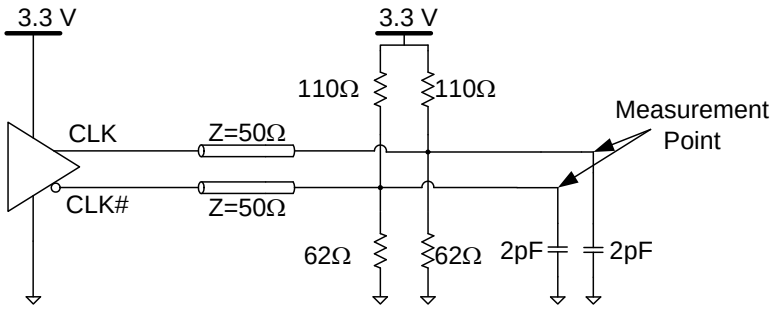


Figure 3. RMS Phase Jitter

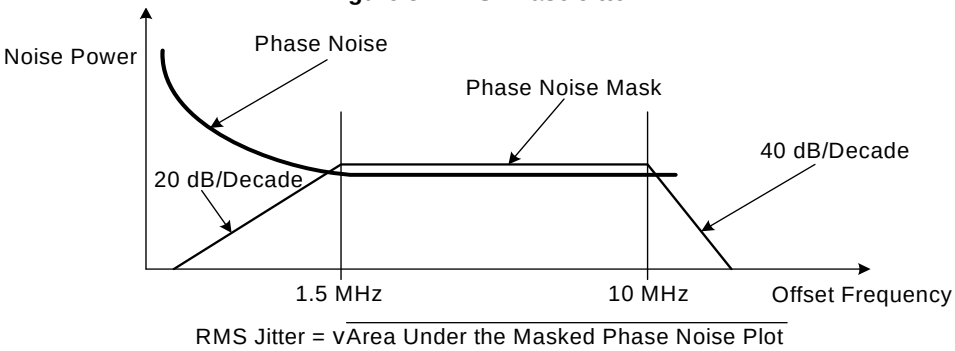


Figure 4. Output Duty Cycle

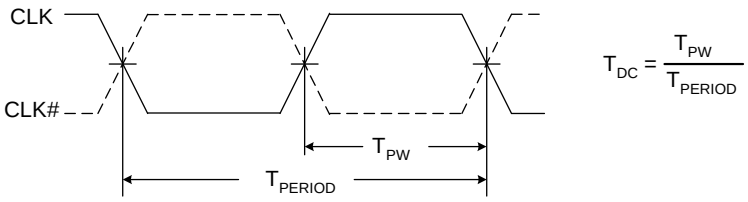
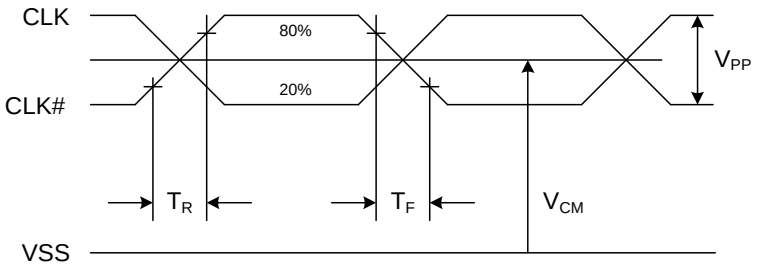


Figure 5. Output Rise and Fall Time and Peak-Peak Voltage Swing

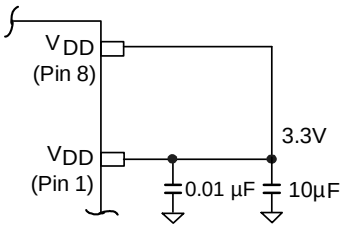


Application Information

Power Supply Filtering Techniques

As in any high speed analog circuitry, noise at the power supply pins degrades performance. To achieve optimum jitter performance, use good power supply isolation practices. Figure 6. shows a typical filtering scheme. Since all of the current flows through pin 1, the resistance and inductance between this pin and the supply is minimized. A 0.01 or 0.1 µF ceramic chip capacitor is also located close to this pin to provide a short and low impedance AC path to ground. A 1 to 10 µF ceramic or tantalum capacitor shouldbe located in the vicinity of this device, and may be shared with other devices.

Figure 6. Power Supply Filtering



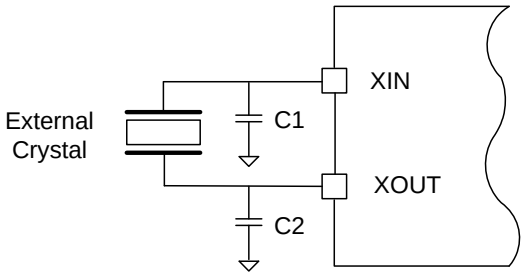
Termination for LVPECL Output

The CY2XP41 implements its LVPECL driver with a current steering design. For proper operation, it requires resistor termination. This datasheet specifies a termination voltage of VDD–2.1 V. Impedance matching is advised for best signal integrity. Figure 2 on page 6 shows a termination scheme that is recommended as a guideline. Other suitable clock layouts exist and it is recommended that the board designers simulate to guarantee compatibility across all printed circuit and process variations. The recommended termination is a 40Ω load, which is used to achieve the specified common mode and peak-to-peak voltage swing. For optimal signal integrity, traces should also be 40Ω. The device will also operate with 50Ω termination, but is not specified with such a load.

Crystal Interface

The CY2XP41 is characterized with 10 pF parallel resonant crystals. The capacitor values shown in Figure 7. are determined using a 25 MHz 10 pF parallel resonant crystal and are chosen to minimize the ppm error. Cypress recommends the following C1 and C2 values: C1 = C2 = 6.8 pF.

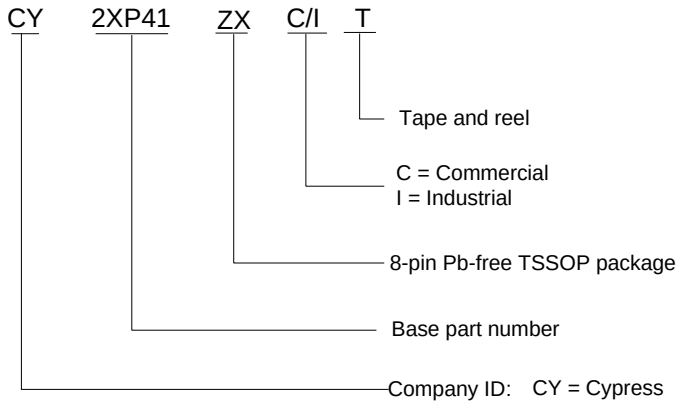
Figure 7. Crystal Input Interface



Ordering Information

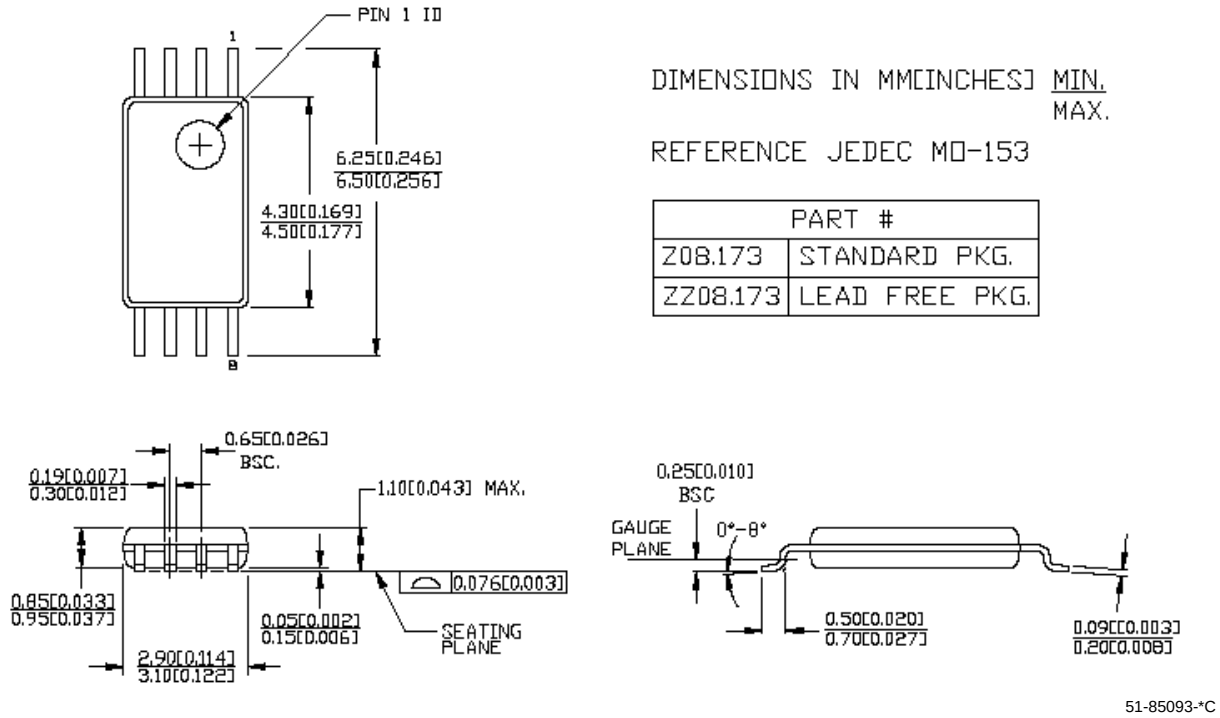
Part Number	Package Type	Product Flow
CY2XP41ZXC	8-Pin TSSOP	Commercial, 0 °C to 70 °C
CY2XP41ZXCT	8-Pin TSSOP–Tape and Reel	Commercial, 0 °C to 70 °C

Ordering Code Definitions



Package Drawing and Dimensions

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



Acronyms

Acronym	Description
ESD	electrostatic discharge
FAE	field application engineer
HBM	human body model
JEDEC	joint electron devices engineering council
LCC	leadless chip carrier
LVDS	Low-voltage differential signaling
OE	output enable
PCB	printed circuit board
PLL	phase-locked loop
RMS	root mean square
XO	crystal oscillator
OTP	one-time programmable

Document Conventions

Units of Measure

Symbol	Unit of Measure
°C	degrees Celsius
mA	milliampere
mV	millivolts
MHz	megahertz
ms	millisecond
ns	nanoseconds
pF	picofarads
µA	microamperes
ppm	parts per million
ps	picoseconds
V	volts
Ω	ohms
W	watts

Document History Page

Document Title: CY2XP41 Crystal to LVPECL Clock Generator Document Number: 001-48923				
Revision	**ECN**	**Submission Date**	**Orig. of Change**	**Description of Change**
**	2669117	03/05/09	XHT/CXQ/ KVM	New data sheet
*A	2718433	06/12/09	WWZ/HMT	No change. Submit to ECN for product launch.
*B	2767298	09/22/09	KVM	Add I_{DD} spec for unterminated outputs Change parameter name for I_{DD} (terminated outputs) from I_{DD} to I_{DDT} Remove I_{DD} footnote about externally dissipated current Add footnote: not 100% tested; plus corresponding references Add new parameter: C_{INX} Add max limit for T_R, T_F: 1.0 ns Add new parameters: T_{LOCK} and T_{LFS} Edits to the Application Information text
*C	3196237	03/14/11	BASH	Template updates. Included ordering code defintions, acronyms, and units of measure. Updated package diagram from *A to *C.

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