PRELIMINARY

CY2XP21

125 MHz LVPECL Clock Generator

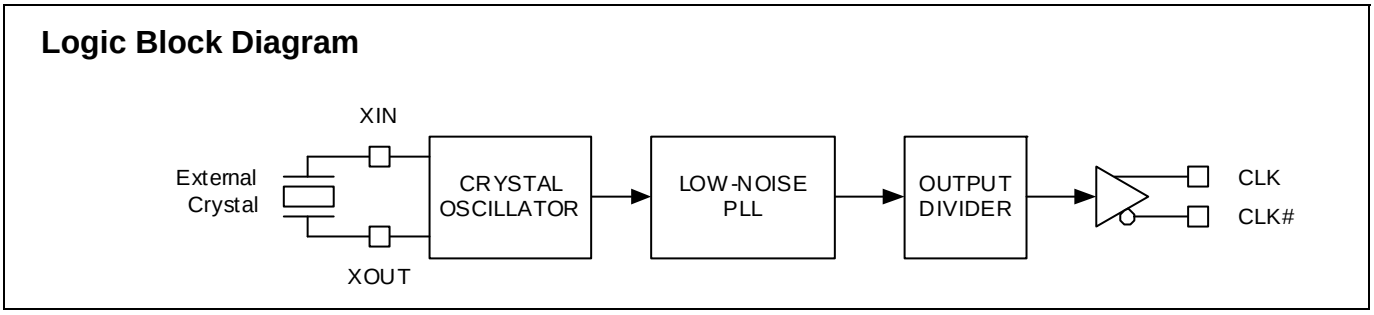
Features

- One LVPECL Output Pair
- Output Frequency: 112 MHz to 140 MHz
- External Crystal Frequency: 22.4 MHz to 28 MHz
- Low RMS Phase Jitter at 125 MHz, using 25 MHz Crystal (1.875 MHz to 20 MHz): 0.4 ps (Typical)
- Pb-free 8-Pin TSSOP Package
- Supply Voltage: 3.3V or 2.5V
- Commercial and Industrial Temperature Ranges

Functional Description

The CY2XP21 is a PLL (Phase Locked Loop) based high performance clock generator. It is optimized to generate a 125 MHz clock, which is ideal for 10 Gb Ethernet applications. It also produces an output frequency that is five times the crystal frequency. It uses Cypress's low noise VCO technology to achieve less than 1 ps typical RMS phase jitter. The CY2XP21 has a crystal oscillator interface input and one LVPECL output pair.

Logic Block Diagram



Pinouts

Figure 1. Pin Diagram - 8-Pin TSSOP

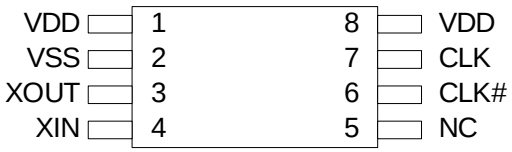


Table 1. Pin Definition - 8-Pin TSSOP

Pin Number	Pin Name	I/O Type	Description
1, 8	VDD	Power	3.3V or 2.5V power supply
2	VSS	Power	Ground
3, 4	XOUT, XIN	XTAL output and input	Parallel resonant crystal interface
5	NC		No Connect
6,7	CLK#, CLK	LVPECL output	Differential clock output

Frequency Table

Inputs		Output Frequency (MHz)
Crystal Frequency (MHz)	PLL Multiplier Value	
25	5	125
26.6	5	133

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}	3.3V Supply Voltage	3.135	3.465	V
	2.5V 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

DC Electrical Characteristics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
I_{DD}	Operating Supply Current with output unterminated	V_{DD} = 3.465V, Output unterminated	–	–	125	mA
		V_{DD} = 2.625V, Output unterminated	–	–	120	mA
I_{DDT}	Operating Supply Current with output terminated	V_{DD} = 3.465V, Output terminated	–	–	150	mA
		V_{DD} = 2.625V, Output terminated	–	–	145	mA
V_{OH}	LVPECL Output High Voltage	V_{DD} = 3.3V or 2.5V, R_{TERM} = 50Ω to V_{DD} – 2.0V	V_{DD} –1.15	–	V_{DD} –0.75	V
V_{OL}	LVPECL Output Low Voltage	V_{DD} = 3.3V or 2.5V, R_{TERM} = 50Ω to V_{DD} – 2.0V	V_{DD} –2.0	–	V_{DD} –1.625	V
V_{OD1}	LVPECL Peak-to-Peak Output Voltage Swing	V_{DD} = 3.3V or 2.5V, R_{TERM} = 50Ω to V_{DD} – 2.0V	600	–	1000	mV
V_{OD2}	LVPECL Output Voltage Swing (V_{OH} - V_{OL})	V_{DD} = 2.5V, R_{TERM} = 50Ω to V_{DD} – 1.5V	500	–	1000	mV

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.

DC Electrical Characteristics

Parameter	Description	Test Conditions	Min	Typ	Max	Unit
V_{OCM}	LVPECL Output Common Mode Voltage (V_{OH} + V_{OL})/2	V_{DD} = 2.5V, R_{TERM} = 50Ω to V_{DD} – 1.5V	1.2	–	–	V
C_{INX}[3]	Pin Capacitance, XIN & XOUT		–	4.5	–	pF

AC Electrical Characteristics[3]

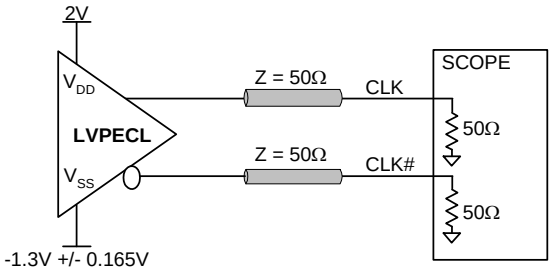
Parameter	Description	Conditions	Min	Typ	Max	Unit
F_{OUT}	Output Frequency		112	–	140	MHz
T_R, T_F	Output Rise or Fall Time	20% to 80% of full output swing	–	0.5	1.0	ns
$T_{Jitter(\phi)}$	RMS Phase Jitter (Random)	125 MHz, (1.875–20 MHz)	–	0.4	–	ps
T_{DC}	Output Duty Cycle	Measured at zero crossing point	48	–	52	%
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[4]

Parameter	Description	Min	Max	Unit
Mode	Mode of Oscillation	Fundamental		
F	Frequency	22.4	28	MHz
ESR	Equivalent Series Resistance	–	50	Ω
C_0	Shunt Capacitance	–	7	pF

Parameter Measurements

Figure 2. 3.3V Output Load AC Test Circuit



Notes
3. Not 100% tested, guaranteed by design and characterization.
4. Characterized using an 18 pF parallel resonant crystal.

Figure 3. 2.5V Output Load AC Test Circuit

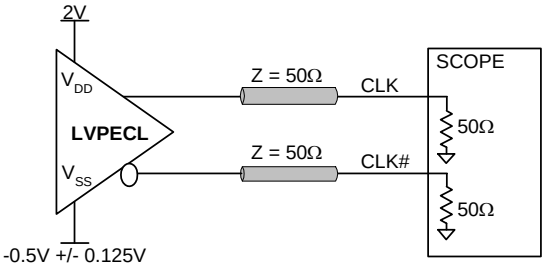
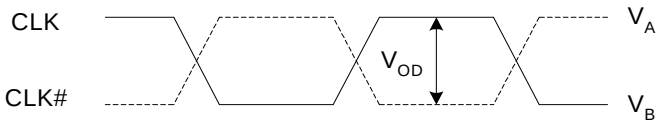


Figure 4. Output DC Parameters



$V_{OCM} = (V_A + V_B)/2$

Figure 5. Output Rise and Fall Time

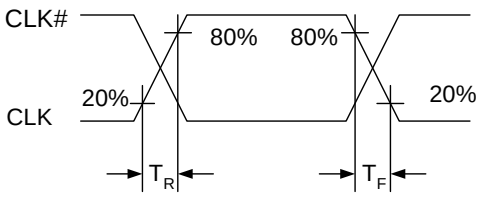


Figure 6. RMS Phase Jitter

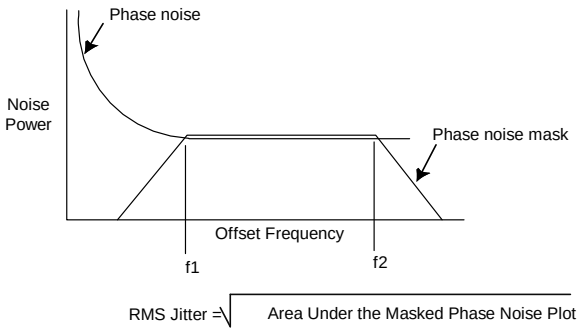
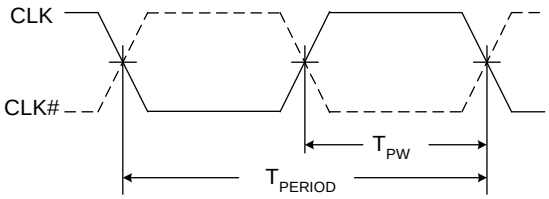


Figure 7. Output Duty Cycle



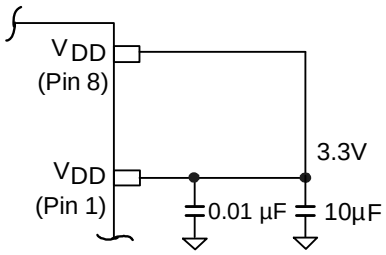
$$T_{DC} = \frac{T_{PW}}{T_{PERIOD}}$$

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 8 illustrates a typical filtering scheme. Since all 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 is located in the general vicinity of this device and may be shared with other devices.

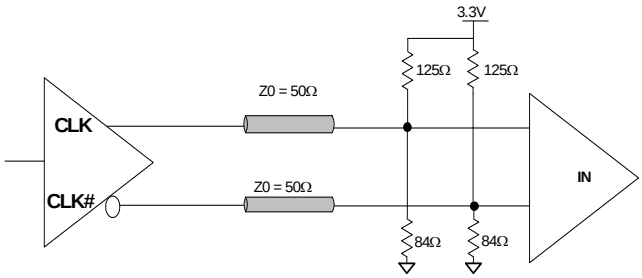
Figure 8. Power Supply Filtering



Termination for LVPECL Output

The CY2XP21 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 3.3V operation, this data sheet specifies output levels for termination to V_{DD}–2.0V. This same termination voltage can also be used for V_{DD} = 2.5V operation, or it can be terminated to V_{DD}-1.5V. 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 9 shows a standard termination scheme.

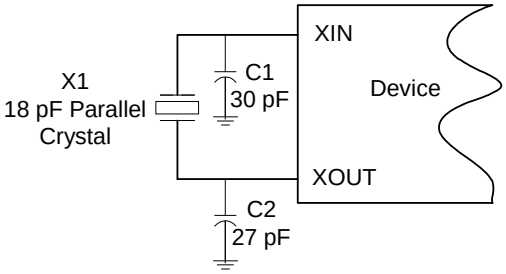
Figure 9. LVPECL Output Termination



Crystal Interface

The CY2XP21 is characterized with 18 pF parallel resonant crystals. The capacitor values shown in Figure 10 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 thus layout dependent.

Figure 10. Crystal Input Interface



Board Layout and NC Pin

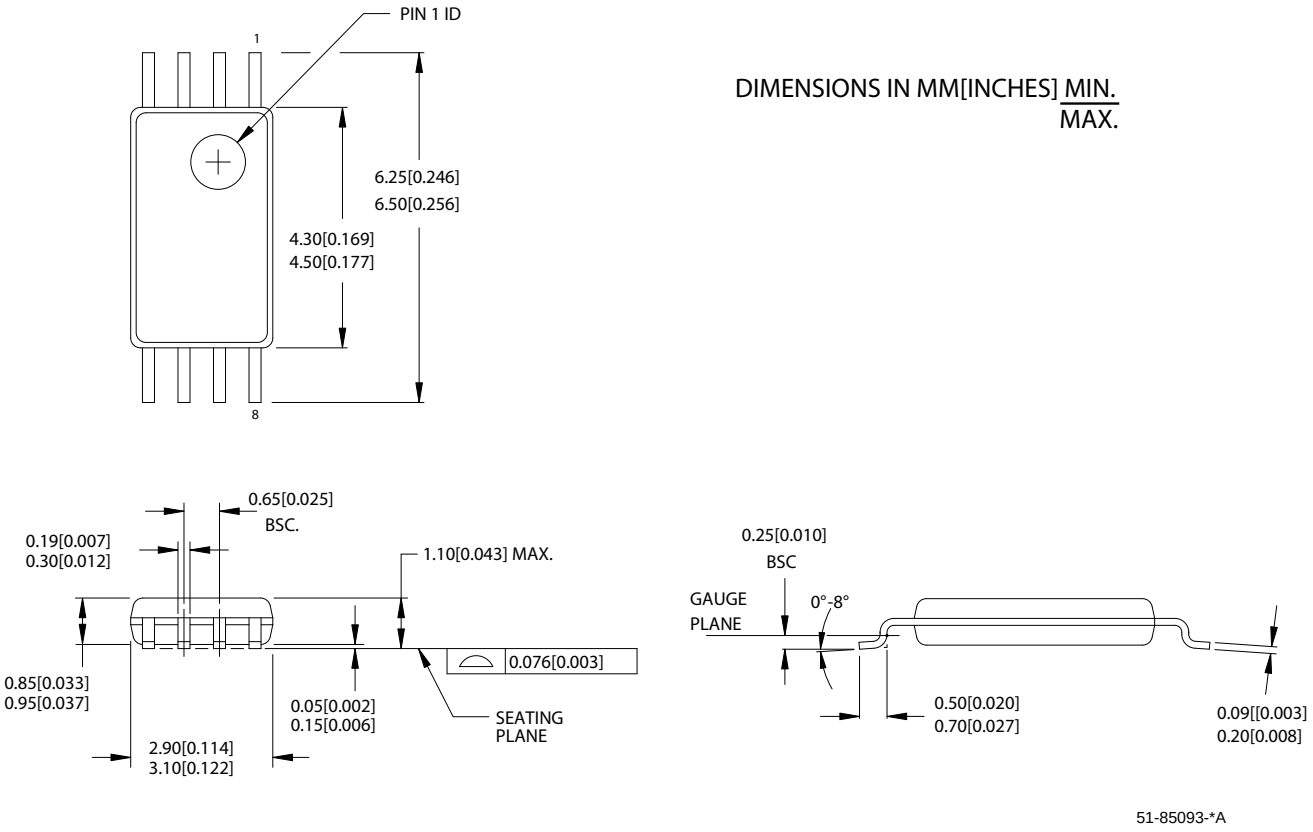
Pin 5 (NC) does not perform any function on the CY2XP21. Although not used electrically, it is very useful for heat dissipation. For this reason, users are advised to connect pin 5 to either a V_{DD} or V_{SS} plane. This helps to lower the thermal resistance of the board / package combination, thus reducing the die temperature.

Ordering Information

Part Number	Package Type	Product Flow
CY2XP21ZXC	8-pin TSSOP	Commercial, 0°C to 70°C
CY2XP21ZXCT	8-pin TSSOP - Tape and Reel	Commercial, 0°C to 70°C
CY2XP21ZXI	8-pin TSSOP	Industrial, -40°C to 85°C
CY2XP21ZXIT	8-pin TSSOP - Tape and Reel	Industrial, -40°C to 85°C

Package Drawing and Dimensions

Figure 11. 8-Pin Thin Shrunk Small Outline Package (4.40 MM Body) Z8



Document History Page

Document Title: CY2XP21 125 MHz LVPECL Clock Generator Document Number: 001-52849				
REV.	**ECN NO.**	**Submission Date**	**Orig. of Change**	**Description of Change**
**	2700242	04/30/09	KVM/PYRS	New data sheet
*A	2718898	06/15/09	WWZ	Minor ECN to post data sheet to external web
*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 reference to C_{INX}:not 100% tested Add max limit for T_R, T_F: 1.0 ns Change T_{LOCK} max from 10 ms to 5 ms

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