96MHz – 200MHz Low Phase Noise LVDS VCXO (12 – 25MHz Crystals)

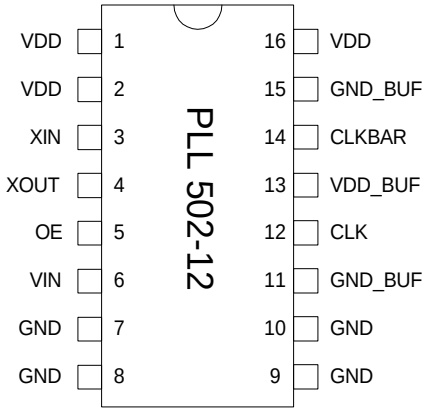
FEATURES

- Low phase noise output for the 96MHz to 200MHz range (-125 dBc at 10kHz offset).
- LVDS output.
- 12 to 25MHz crystal input.
- Integrated crystal load capacitor: no external load capacitor required.
- Output Enable selector.
- Wide pull range (min. +/-190 ppm)
- 3.3V operation.
- Available in 16 Pin TSSOP or SOIC.

DESCRIPTION

The PLL502-12 is a monolithic low jitter and low phase noise (-125dBc/Hz @ 10kHz offset) VCXO IC with LVDS output, for 96MHz to 200MHz output range. It allows the control of the output frequency with an input voltage (VIN), using a low cost crystal. The chip provides a pullable output at a frequency of F_{XIN} x 8. This makes the PLL502-12 ideal for a wide range of applications, including 155.52MHz for SONET.

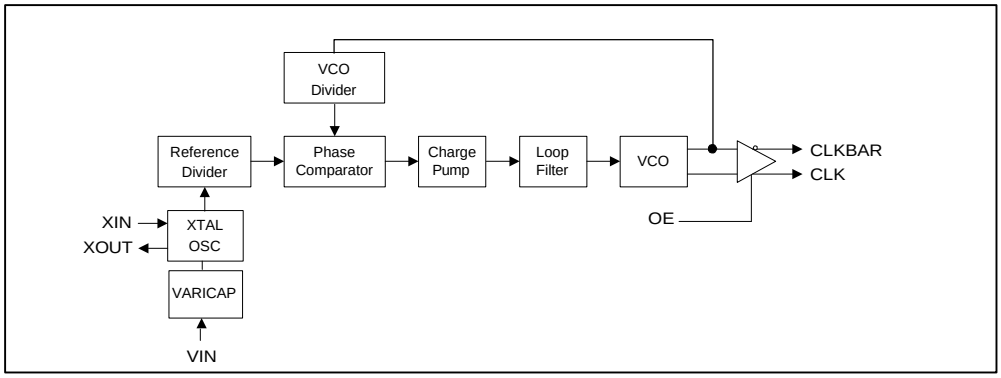
PIN CONFIGURATION



$F_{OUT} = F_{XIN}$ x 8

OE (Pin 5)	Output State
0	Tri-state
1 (Default)	Output enabled

BLOCK DIAGRAM



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PIN DESCRIPTIONS

Name	Number	Type	Description
VDD	1,2,16	P	+3.3V Power supply connectors.
XIN	3	I	Crystal input pin.
XOUT	4	I	Crystal output pin.
OE	5	I	Output enable input pin. Disables (tri-state) output when low. Internal pull-up enables output by default if pin is not connected to low.
VIN	6	I	Frequency control voltage input pin.
GND	7,8,9,10	P	GND Power connectors.
GND_BUF	11,15	P	GND connector for output buffers.
CLK	12	O	True clock output pin.
VDD_BUF	13	P	+3.3V Power supply connector for output buffers.
CLKB	14	O	Complementary clock output pin.

ELECTRICAL SPECIFICATIONS

1. Absolute Maximum Ratings

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage	V_{DD}		7	V
Input Voltage, dc	V_I	V_{SS}-0.5	V_{DD}+0.5	V
Output Voltage, dc	V_O	V_{SS}-0.5	V_{DD}+0.5	V
Storage Temperature	T_S	-65	150	°C
Ambient Operating Temperature*	T_A	-40	85	°C
Junction Temperature	T_J		125	°C
Lead Temperature (soldering, 10s)			260	°C
Input Static Discharge Voltage Protection			2	kV

Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied.

* **Note**: Operating Temperature is guaranteed by design for all parts (COMMERCIAL and INDUSTRIAL), but tested for INDUSTRIAL grade only.

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2. Crystal Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Crystal Resonator Frequency	F_{XIN}	Parallel Fundamental Mode	12		25	MHz
Crystal Loading Rating	$C_{L\ (xtal)}$	At VIN = 1.65V		9.5		pF
Crystal Pullability	$C_0/C_{1\ (xtal)}$	AT cut			250	-
Recommended ESR	R_E	AT cut			30	Ω

Note: Crystal Loading rating: 9.5pF is the loading the crystal sees from the VCXO chip at VIN = 1.65V. It is assumed that the crystal will be at nominal frequency at this load. If the crystal requires more load to be at nominal frequency, the additional load must be added externally. This however may reduce the pull range.

3. Voltage Control Crystal Oscillator

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
VCXO Stabilization Time *	$T_{VCXOSTB}$	From power valid		10		ms
VCXO Tuning Range		F_{XIN} = 12 - 25MHz; XTAL C_0/C_1 < 250	380			ppm
CLK output pullability		0V ≤ VCON ≤ 3.3V	±190			ppm
Linearity				5	10	%
VCXO Tuning Characteristic				115		ppm/V
VCON pin input impedance			2000			kΩ
VCON modulation BW		0V ≤ VCON ≤ 3.3V, -3dB	25			kHz

Note: Parameters denoted with an asterisk (*) represent nominal characterization data and are not production tested to any specific limits.

4. General Electrical Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current, Dynamic (with Loaded Outputs)	I_{DD}	LVDS			60	mA
Operating Voltage	V_{DD}		3.13		3.47	V
Output Clock Duty Cycle		@ 1.25V (LVDS)	45	50	55	%
Short Circuit Current				±50		mA

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5. Jitter and Phase Noise specification

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Period jitter RMS at 155MHz	With capacitive decoupling between VDD and GND.		9		ps
Accumulated jitter RMS at 155MHz	With capacitive decoupling between VDD and GND. Over 10,000 cycles.		TBM		ps
Integrated jitter RMS at 155MHz	Integrated 12 kHz to 20 MHz		3	4	ps
Phase Noise relative to carrier	155MHz @10Hz offset		-60		dBc/Hz
Phase Noise relative to carrier	155MHz @100Hz offset		-90		dBc/Hz
Phase Noise relative to carrier	155MHz @1kHz offset		-112		dBc/Hz
Phase Noise relative to carrier	155MHz @10kHz offset		-125		dBc/Hz
Phase Noise relative to carrier	155MHz @100kHz offset		-123		dBc/Hz

Note: Phase Noise measured at VIN = 0V

6. LVDS Electrical Characteristics

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output Differential Voltage	V_{OD}	R_L = 100 Ω (see figure)	247	355	454	mV
V_{DD} Magnitude Change	ΔV_{OD}		-50		50	mV
Output High Voltage	V_{OH}			1.4	1.6	V
Output Low Voltage	V_{OL}		0.9	1.1		V
Offset Voltage	V_{OS}		1.125	1.2	1.375	V
Offset Magnitude Change	ΔV_{OS}		0	3	25	mV
Power-off Leakage	I_{OXD}	V_{out} = V_{DD} or GND, V_{DD} = 0V		±1	±10	uA
Output Short Circuit Current	I_{OSD}			-5.7	-8	mA

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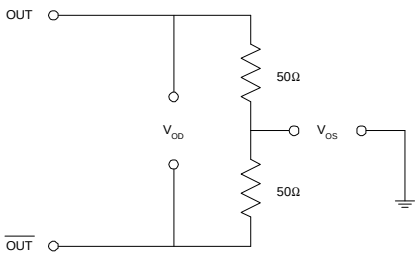
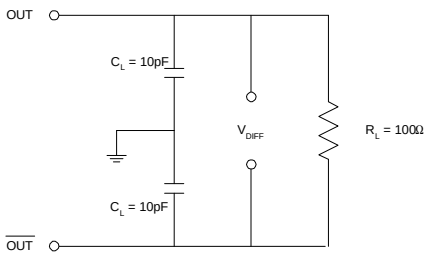
7. LVDS Switching Characteristics

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Differential Clock Rise Time	t_r	R_L = 100 Ω C_L = 10 pF (see figure)	0.2	0.7	1.0	ns
Differential Clock Fall Time	t_f		0.2	0.7	1.0	ns

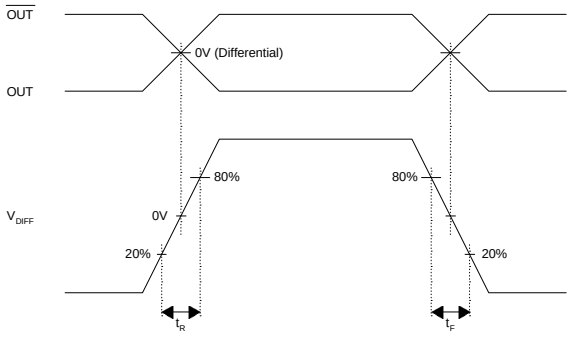
LVDS Levels Test Circuit



LVDS Switching Test Circuit



LVDS Transistion Time Waveform



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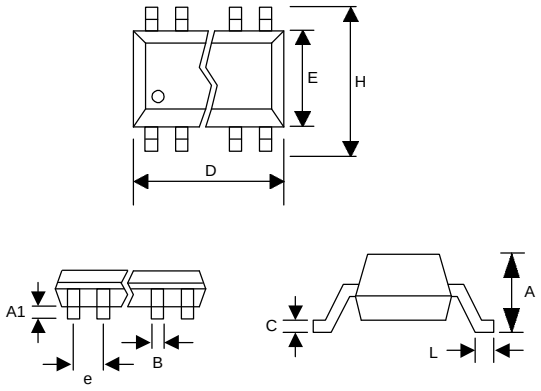
PACKAGE INFORMATION

16 PIN Narrow SOIC, TSSOP (mm)

	SOIC		TSSOP	
Symbol	Min.	Max.	Min.	Max.
A	1.35	1.75	-	1.20
A1	0.10	0.25	0.05	0.15
B	0.33	0.51	0.19	0.30
C	0.19	0.25	0.09	0.20
D	9.80	10.00	4.90	5.10
E	3.80	4.00	4.30	4.50
H	5.80	6.20	6.40 BSC	
L	0.40	1.27	0.45	0.75
e	1.27 BSC		0.65 BSC	



ORDERING INFORMATION

For part ordering, please contact our Sales Department:
47745 Fremont Blvd., Fremont, CA 94538, USA
Tel: (510) 492-0990 Fax: (510) 492-0991

PART NUMBER
The order number for this device is a combination of the following:
Device number, Package type and Operating temperature range

PLL502-12 S C XX

PART NUMBER

REVISION CODE
(when applicable)

TEMPERATURATURE
C=COMMERCIAL
M=MILITARY
I=INDUSTRAL

PACKAGE TYPE
S=SOIC. O=TSSOP