

Multiplier VCXO IC Die for 12 to 25MHz Parallel Resonant Crystals

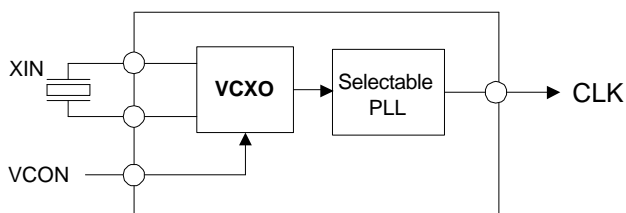
FEATURES

- Integrated voltage-controlled crystal oscillator circuitry (VCXO) (pull range 500ppm minimum).
- Low phase noise (-130dBc @ 10kHz offset at 44MHz output)
- selectable frequency multipliers (x2, x4, x1, x8).
- 3.3V supply voltage.
- Uses inexpensive fundamental-mode parallel resonant crystals (from 12 to 25MHz).
- Selectable High Drive (36mA drive capability at TTL level) or Standard Drive (12mA drive capability at TTL) output.
- Available in DIE (65 mil x 62 mil).

DESCRIPTION

The PLL502-00 is a monolithic low jitter and low phase noise (-130dBc @10kHz offset at 44MHz output), high performance CMOS VCXO IC Die, using a low cost crystal (12-25MHz). The same die can be used as a VCXO with output frequencies ranging from $F_{XIN} \times 1$ to $F_{XIN} \times 8$ using selector pad bonding options (see Divider Selection Table on this page). This makes the PLL502-00 ideal for a wide range of applications from 12MHz to 190MHz (including 27MHz, 35.328MHz, 77.76MHz and 155.52MHz, etc.).

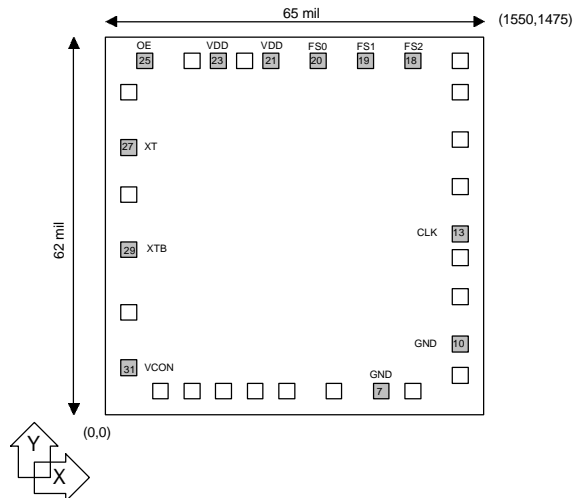
BLOCK DIAGRAM



DIE SPECIFICATIONS

Name	Value
Size	62 x 65 mil
Reverse side	GND
Pad dimensions	80 micron x 80 micron
Thickness	10 mil

DIE CONFIGURATION



MULTIPLIER SELECTION

SELECTION			F_{XIN}	CLK (MHz)
S2	S1	S0		
0	0	0	12MHz – 25MHz	$F_{XIN} \times 2$
0	0	1		$F_{XIN} \times 4$
0	1	0		$F_{XIN} \times 1$
0	1	1		$F_{XIN} \times 2^*$
1	0	0		$F_{XIN} \times 8$
1	0	1		$F_{XIN} \times 1^*$
1	1	0		$F_{XIN} \times 4^*$
1	1	1		$F_{XIN} \times 8^*$

Note: - Selector pads default to '0', wire bond to VDD to set to '1'
 - (*) High-drive output

PAD DESCRIPTION

Name	Number	Description
XT	27	Crystal input connection.
XTB	29	Crystal connection.
VCON	31	Voltage Control Input.
GND	7,10	Ground.
CLK	13	Clock Output.
FS[0:2]	18,19,20	Frequency selection pad
VDD	21,22,23	3.3V Power Supply.
OE	25	Output Enable: '0' to disable (tri-state output), '1' (default value when not connected) to enabled the output.

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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.

2. DC Electrical Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current, Dynamic, with Loaded Outputs	I_{DD}	$F_{XIN} = 12 - 25\text{MHz}$ Output load of 10pF		16	20	mA
Operating Voltage	V_{DD}		3.13		3.47	V
Output High Voltage	V_{OH}	$I_{OH} = -12\text{mA}$ (low drive)	2.4			V
Output Low Voltage	V_{OL}	$I_{LO} = 12\text{mA}$ (low drive)			0.4	V
Output High Voltage at CMOS level	V_{OHC}	$I_{OH} = -4\text{mA}$ (low drive)	$V_{DD} - 0.4$			V
Output drive current		At TTL level (High drive)	36	51		mA
		At TTL level (Low drive)	12	17		mA
Short Circuit Current				±50		mA
VCXO Control Voltage	VCON		0		3.3	V
ESD Protection		Human Body Model, all pads except XT and XTB	3000			V
		Human Body Model, XT and XTB pads	2000			

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3. AC Electrical Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Crystal Frequency			12		25	MHz
Output Clock Rise/Fall Time (Low Drive)		0.8V ~ 2.0V with 10 pF load		1.15		ns
		0.3V ~ 3.0V with 15 pF load		3.7		
Output Clock Rise/Fall Time (High Drive)		0.8V ~ 2.0V with 10 pF load		0.5		
		0.3V ~ 3.0V with 15 pF load		1.5		
Output Clock Duty Cycle		Measured @ 1.4V	45	50	55	%
Short Circuit Current				±50		mA

4. 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	500			ppm
CLK output pullability		0V ≤ VCON ≤ 3.3V	±250			ppm
VCXO Tuning Characteristic				165		ppm/V
Pull range linearity					10	%
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.

5. 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 Vcon = 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 VCON = 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.

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6. Jitter and Phase Noise specification

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
RMS Period Jitter (1 sigma – 1000 samples)	at 155MHz, with capacitive decoupling between VDD and GND.		15		ps
	at 80MHz, with capacitive decoupling between VDD and GND.		12		
	at 44MHz, with capacitive decoupling between VDD and GND.		10		
Phase Noise relative to carrier	44MHz @100Hz offset		-80		dBc/Hz
Phase Noise relative to carrier	44MHz @1kHz offset		-110		dBc/Hz
Phase Noise relative to carrier	44MHz @10kHz offset		-130		dBc/Hz
Phase Noise relative to carrier	44MHz @100kHz offset		-123		dBc/Hz
Phase Noise relative to carrier	44MHz @1MHz offset		-124		dBc/Hz
Phase Noise relative to carrier	155MHz @100Hz offset		-80		dBc/Hz
Phase Noise relative to carrier	155MHz @1kHz offset		-110		dBc/Hz
Phase Noise relative to carrier	155MHz @10kHz offset		-120		dBc/Hz
Phase Noise relative to carrier	155MHz @100kHz offset		-115		dBc/Hz
Phase Noise relative to carrier	155MHz @1MHz offset		-120		dBc/Hz

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PAD ASSIGNMENT

Pad #	Name	X (μm)	Y (μm)
7	GND	1042	109
10	GND	1400	259
13	CLK	1400	716
18	FS2	1232	1365
19	FS1	1042	1365
20	FS0	854	1365
21	VDD	659	1365
23	VDD	459	1365
25	OE	194	1365
27	XT	109	1017
29	XTB	109	646
31	VCON	109	181

ORDERING INFORMATION

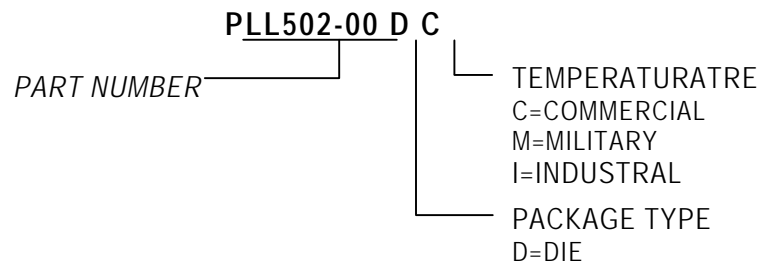
For part ordering, please contact our Sales Department:

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



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