

Low Phase Noise PECL VCXO (100MHz to 200MHz)

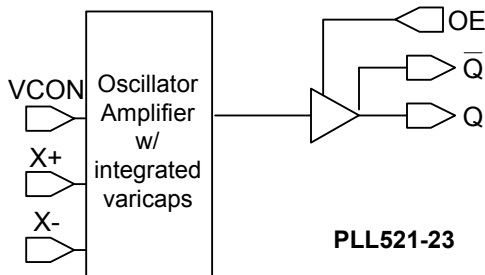
FEATURES

- 100MHz to 200MHz Fundamental Mode Crystal.
- Output range: 100MHz – 200MHz.
- Complementary PECL outputs.
- Selectable OE Logic (enable high or enable low).
- Integrated variable capacitors.
- High pull linearity: < 5%.
- +/- 120 ppm pull range
- Supports 2.5V or 3.3V-Power Supply.
- Available in 16-pinTSSOP and die form.
- Thickness 10 mil.

DESCRIPTION

PLL521-23 is a VCXO IC specifically designed to pull high frequency fundamental crystals. Its internal varicaps allow an on chip frequency pulling, controlled by the VCON input. The chip provides a low phase noise, low jitter PECL differential clock output.

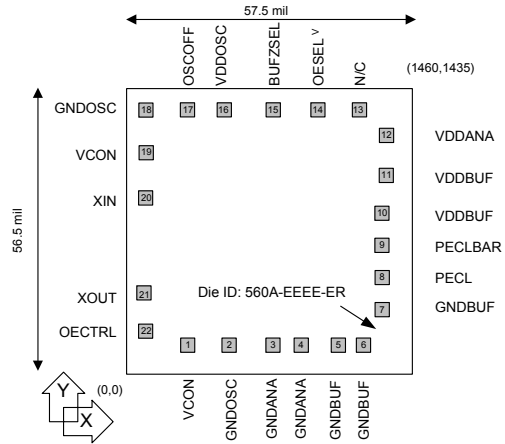
BLOCK DIAGRAM



DIE SPECIFICATIONS

Name	Value
Size	56.5 x 57.5 mil
Reverse side	GND
Pad dimensions	80 micron x 80 micron
Thickness	10 mil

DIE CONFIGURATION



PACKAGE CONFIGURATION

OUTPUT ENABLE LOGIC SELECTION

OESEL* (Pad/Pin #14)	OECTRL* (Pad #22, Pin # 6)	State
0 (Default)	0 (Default)	Output enabled
	1	Tri-state
1	0	Tri-state
	1 (Default)	Output enabled

* Bond to GND to set to "0", bond to VDD to set to "1". No connection results to "default" setting through internal pull-up/-down.
Pad #22, Pin #6: Logical states defined by PECL V_{IH} and V_{IL} levels.

HIGH IMPEDANCE BUFFER LOGIC SELECTION

BUFZSEL (Pad/Pin #15)	State
0 (Default)	Hi Z if Output is Disabled
1	(Q=0) +(Qbar=1) if Output Disabled

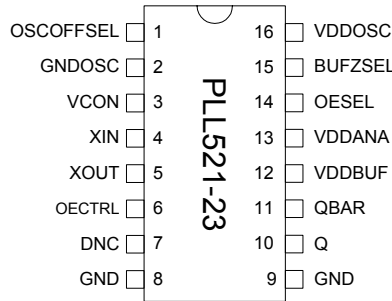
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PAD ASSIGNMENT AND DESCRIPTION

Name	Die Pad			Description
	Pad #	X (μm)	Y (μm)	
VCON	1	329.6	110.1	Control Voltage input. Use this pin to change the output frequency by varying the applied Control Voltage.
GNDOSC	2	498.3	110.0	GND connection for oscillator circuitry.
GNDANA	3	696.2	110.0	GND connection for analog circuitry.
GNDANA	4	825.0	110.0	GND connection for analog circuitry.
GNDBUF	5	973.6	110.0	GND connection for output buffer circuitry.
GNDBUF	6	1150.0	109.1	GND connection for output buffer circuitry.
GNDBUF (optional)	7	1183.6	302.2	GND connection for output buffer circuitry.
PECL	8	1183.6	452.3	PECL output
PECLBAR	9	1183.6	613.5	PECL complementary output.
VDDBUF (optional)	10	1182.4	745.9	VDD connection for output buffer circuitry. VDDBUF should be separately decoupled from other VDDs whenever possible.
VDDBUF	11	1252.4	903.6	VDD connection for output buffer circuitry. VDDBUF should be separately decoupled from other VDDs whenever possible.
VDDANA	12	1252.4	1081.3	VDD connection for analog circuitry. VDDANA should be separately decoupled from other VDDs whenever possible.
DNC	13	1058.5	1221.6	Do Not Connect
OESEL	14	864.5	1221.6	Selector input to choose the OE control logic. See table on page 1.
BUFZSEL	15	624.0	1222.6	Output impedance selector
VDDOSC	16	467.1	1222.7	VDD connection for oscillator circuitry. VDDOSC should be separately decoupled from other VDDs whenever possible.
OSCOFF	17	271.1	1222.6	Oscillator Off Selection input pad. When low, turns off the oscillator when output is disabled. When high (default), oscillator running when output is disabled. Internal pull-up
GNDOSC (optional)	18	109.4	1222.9	GND connection for oscillator circuitry.
VCON	19	108.9	1062.1	Control Voltage input. Use this pin to change the output frequency by varying the applied Control Voltage (internally connected to pad 1).
XIN	20	109.0	865.8	Crystal oscillator input pad.
XOUT	21	108.6	358.4	Crystal oscillator output pad.
OECTRL	22	108.6	146.5	OE input pad. See table on page 1.

Note: for optimal Phase Noise performance, it is recommended to bond all optional VDD and GND pads.

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PACKAGE PIN ASSIGNMENT AND DESCRIPTION



Pin #	Name	Description
1	OSCOFFSEL	Oscillator Off Selection input pad. When low, turns off the oscillator when output is disabled. When high (default), oscillator running when output is disabled. Internal pull-up
2	GNDOSC	GND connection for oscillator circuitry.
3	VCON	Control Voltage input. Use this pin to change the output frequency by varying the applied Control Voltage.
4	XIN	Crystal oscillator input pin.
5	XOUT	Crystal oscillator output pin.
6	OCTRL	OE input pad. See table on page 1.
7	DNC	Do Not Connect.
8	GND	Ground connection.
9	GND	Ground connection.
10	Q	PECL Output.
11	QBAR	PECL complementary output.
12	VDDBUF	VDD connection for output buffer circuitry. VDDBUF should be separately decoupled from other VDDs whenever possible.
13	VDDANA	VDD connection for analog circuitry. VDDANA should be separately decoupled from other VDDs whenever possible.
14	OESEL	Selector input to choose the OE control logic. See table on page 1.
15	BUFZSEL	Output impedance selector
16	VDDOSC	VDD connection for oscillator circuitry. VDDOSC should be separately decoupled from other VDDs whenever possible.

Low Phase Noise PECL VCXO (100MHz to 200MHz)

ELECTRICAL SPECIFICATIONS

1. Absolute Maximum Ratings

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage	V_{DD}		4.6	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	-45	85	°C
Junction Temperature	T_J		125	°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.

2. Crystal Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Crystal Resonator Frequency	F_{XIN}	Parallel Fundamental Mode	100		200	MHz
Crystal Loading Rating	$C_L (xtal)$	Die at $V_{CON} = 1.65V$		5.0		pF
Interelectrode Capacitance	C_0				3.5	pF
Crystal Pullability	$C_0/C_1 (xtal)$	AT cut			350	-
Recommended ESR	R_E	AT cut			30	Ω

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		XTAL $C_0/C_1 < 350$	250			ppm
CLK output pullability		$0V \leq V_{CON} \leq 3.3V$ at room temperature XTAL $C_0/C_1 = 350$		± 120		ppm
On-chip Varicaps control range		$V_{CON} = 0$ to 3.3V		3.3 – 8.8		pF
Linearity					5	%
VCXO Tuning Characteristic				75		ppm/V
VCON input impedance			2000			k Ω
VCON modulation BW		$0V \leq V_{CON} \leq 3.3V, -3dB$	25			kHz

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4. General Electrical Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current (Loaded Outputs)	I _{DD}	at 3.3V @ 155MHz			55	mA
Output valid after OE enabled		Oscillator off		10		ms
		Oscillator on			0.0001	
Operating Voltage	V _{DD}		2.25		3.63	V
Output Clock Duty Cycle		@ V _{dd} – 1.3V (PECL)	45	50	55	%
Short Circuit Current				±50		mA

5. Jitter specifications

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Period jitter RMS at 155MHz	At 155.52MHz, with capacitive decoupling between VDD and GND. Over 10,000 cycles		2.0		ps
Period jitter peak-to-peak at 155MHz			15	20	
Accumulated jitter RMS at 155MHz	At 155.52MHz, with capacitive decoupling between VDD and GND. Over 1,000,000 cycles.		2.0		ps
Accumulated jitter peak-to-peak at 155MHz				20	
Random Jitter	“RJ” measured on Wavecrest SIA 3000		2.0		ps
Integrated jitter RMS at 155MHz	Integrated 12 kHz to 20 MHz		0.25	0.35	ps

Measured on Wavecrest SIA 3000

6. Phase noise specifications

PARAMETERS	FREQUENCY	10Hz	100Hz	1kHz	10kHz	100kHz	1MHz	UNITS
Phase Noise relative to carrier	155.52MHz	-70	-100	-130	-145	-145	-150	dBc/Hz

Note: Phase Noise measured at VCON = 0V

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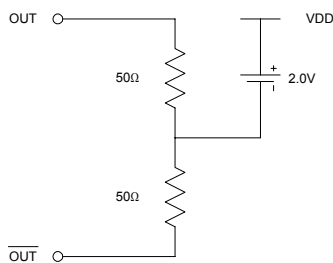
7. PECL Electrical Characteristics

PARAMETERS	SYMBOL	CONDITIONS	MIN.	MAX.	UNITS
Output High Voltage	V_{OH}	$R_L = 50 \Omega$ to $(V_{DD} - 2V)$ (see figure)	$V_{DD} - 1.025$		V
Output Low Voltage	V_{OL}			$V_{DD} - 1.620$	V

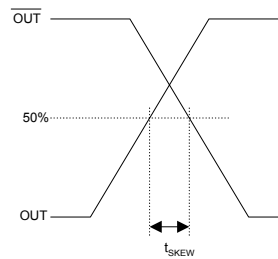
8. PECL Switching Characteristics

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Clock Rise Time	t_r	@20/80% - PECL		0.6	1.5	ns
Clock Fall Time	t_f	@80/20% - PECL		0.6	1.5	ns

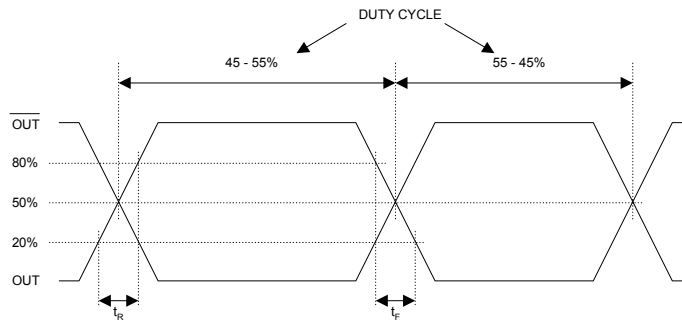
PECL Levels Test Circuit



PECL Output Skew



PECL Transition Time Waveform



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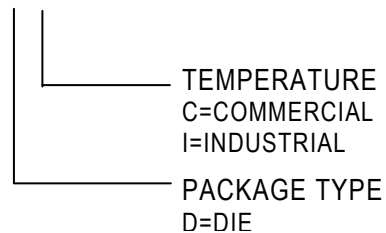
ORDERING INFORMATION

PART NUMBER

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

PLL521-23 D C

PART NUMBER



Order Number	Marking	Package Option
P521-23DC	P521-23DC	Die – Waffle Pack

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