Low Phase Noise LVDS VCXO (27MHz to 65MHz)

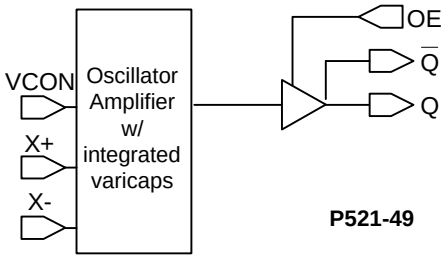
FEATURES

- 27MHz to 65MHz Fundamental Mode Crystal.
- Output range: 27MHz – 65MHz.
- Complementary LVDS outputs.
- Selectable OE Logic (enable high or enable low).
- Integrated variable capacitors.
- High pull linearity: < 5%.
- +/- 125 ppm pull range
- Supports 2.5V or 3.3V-Power Supply.
- Available in die form.
- Thickness 10 mil.

DESCRIPTIONS

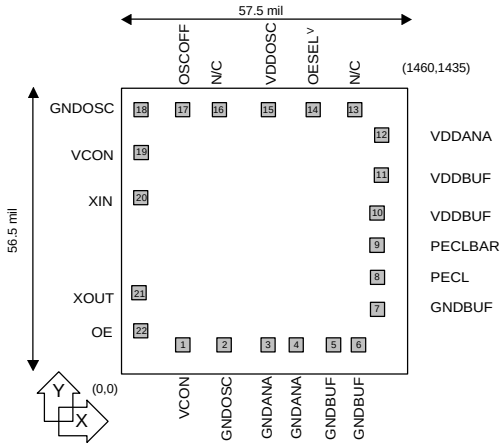
P521-49 is a VCXO IC specifically designed to pull high frequency fundamental crystals. Its internal varicaps allow an on chip frequency pulling, controlled by the VCON input. The chip provides a low phase noise, low jitter LVDS differential clock output.

BLOCK DIAGRAM



P521-49

DIE CONFIGURATION



DIE SPECIFICATIONS

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

OUTPUT ENABLE LOGIC SELECTION

OESEL (Pad #14)	OECTRL (Pad #22)	State
0 (Default)	0	Tri-state
	1 (Default)	Output enabled
1	0 (Default)	Output enabled
	1	Tri-state

Pad #14, 22: 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: Logical states defined by CMOS V_{IH} and V_{IL} levels.

PAD ASSIGNMENT AND DESCRIPTION

Pad #	Name	X (µm)	Y (µm)	Description
1	VCON	329.6	110.1	Control Voltage input. Use this pin to change the output frequency by varying the applied Control Voltage.
2	GNDOSC	498.3	110.0	GND connection for oscillator circuitry.
3	GNDANA	696.2	110.0	GND connection for analog circuitry.
4	GNDANA	825.0	110.0	GND connection for analog circuitry.
5	GNDBUF	973.6	110.0	GND connection for output buffer circuitry.
6	GNDBUF	1150.0	109.1	GND connection for output buffer circuitry.
7	GNDBUF (optional)	1183.6	302.2	GND connection for output buffer circuitry.
8	LVDS	1183.6	452.3	PECL output
9	LVDSBAR	1183.6	613.5	PECL complementary output.
10	VDDBUF (optional)	1182.4	745.9	VDD connection for output buffer circuitry. VDDBUF should be separately decoupled from other VDDs whenever possible.
11	VDDBUF	1252.4	903.6	VDD connection for output buffer circuitry. VDDBUF should be separately decoupled from other VDDs whenever possible.
12	VDDANA	1252.4	1081.3	VDD connection for analog circuitry. VDDANA should be separately decoupled from other VDDs whenever possible.
13	Not used	1058.5	1221.6	
14	OESEL	864.5	1221.6	Selector input to choose the OE control logic. See table on page 1.
15	VDDOSC	624.0	1222.7	VDD connection for oscillator circuitry. VDDOSC should be separately decoupled from other VDDs whenever possible.
16	Not used	467.1	1222.6	
17	OSCOFF	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
18	GNDOSC (optional)	109.4	1222.9	GND connection for oscillator circuitry.
19	VCON	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).
20	XIN	109.0	865.8	Crystal oscillator input pad.
21	XOUT	108.6	358.4	Crystal oscillator output pad.
22	OECTRL	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.

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	0	70	°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.

2. Crystal Specifications

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Crystal Resonator Frequency	F_{XIN}	Parallel Fundamental Mode	27		65	MHz
Crystal Loading Rating	$C_{L\ (xtal)}$	Die at VCON = 1.65V		7.5		pF
Interelectrode Capacitance	C_0				3.5	pF
Crystal Pullability	$C_0/C_{1\ (xtal)}$	AT cut			250	-
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 < 250	250*			ppm
CLK output pullability		0V ≤ VCON ≤ 3.3V at room temperature		±80*		ppm
On-chip Varicaps control range		VCON = 0 to 3.3V		4 – 18*		pF
Linearity				4*	5*	%
VCXO Tuning Characteristic				65		ppm/V
VCON input impedance				60		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 (Loaded Outputs)	I_{DD}	at 3.3V @ 61.44MHz			40	mA
Output valid after OE enabled		Oscillator off		10		ms
		Oscillator on			1	
Operating Voltage	V_{DD}		2.25		3.63	V
Output Clock Duty Cycle		@ 1.25V (LVDS)	45	50	55	%
Short Circuit Current				±50		mA

5. Jitter specifications

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Period jitter RMS at 61.44MHz	At 61.44MHz, with capacitive decoupling between VDD and GND. Over 10,000 cycles		2.5		ps
Period jitter peak-to-peak at 61.44MHz			18.5	20	
Accumulated jitter RMS at 61.44MHz	At 61.44MHz, with capacitive decoupling between VDD and GND. Over 1,000,000 cycles.		2.5		ps
Accumulated jitter peak-to-peak at 61.44MHz			24	27	
Random Jitter	"RJ" measured on Wavecrest SIA 3000		2.5		ps
Integrated jitter RMS at 61.44MHz	Integrated 12 kHz to 20 MHz		0.6	0.75	ps

Measured on Wavecrest SIA 3000

6. Phase noise specifications

PARAMETERS	FREQUENCY	10Hz	100Hz	1kHz	10kHz	100kHz	1MHz	UNITS
Phase Noise relative to carrier	61.44MHz	-75	-100	-125	-140	-145	-150	dBc/Hz

Note: Phase Noise measured at VCON = 0V

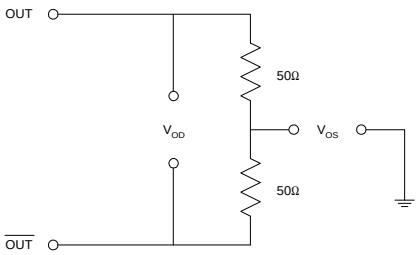
7. LVDS Electrical Characteristics

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

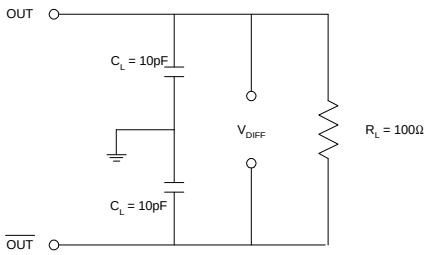
8. LVDS Switching Characteristics

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

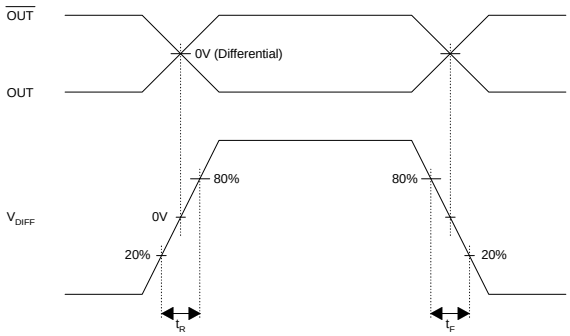
LVDS Levels Test Circuit



LVDS Switching Test Circuit



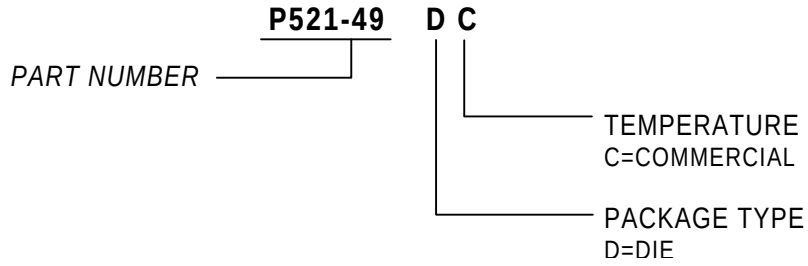
LVDS Transistion Time Waveform



ORDERING INFORMATION

PART NUMBER

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



Order Number	Marking	Package Option
P521-49DC	P521-49DC	Die – Waffle Pack