

**Low Phase Noise, LVPECL VCXO (for 120MHz to 125MHz Fundamental Crystals)**

**FEATURES**

- Advanced non multiplier VCXO Design for High Performance Crystal Oscillators
- Input/Output Range: 120MHz to 125MHz
- Phase Noise Optimized for 122.88MHz: -70dBc @10Hz, -154dBc @100kHz
- Very low Phase Jitter: 110fs RMS
- High Pull Range:  $\pm 110$ ppm
- Linearity: <5%
- Integrated Variable Capacitors
- Complementary LVPECL Outputs
- Power Supply: 3.3V  $\pm 10\%$
- Available in Die or Wafer Form

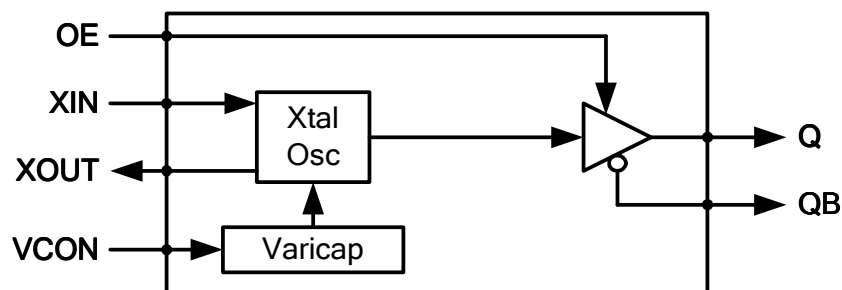
**DESCRIPTION**

The PL586-25/-28 is a non-multiplier VCXO IC specifically designed to pull fundamental mode crystals from 120MHz to 125MHz. This IC achieves a typical pull range of  $\pm 110$ ppm with <5% linearity. The phase noise performance is optimized for close-in performance and with 110fs phase jitter, makes this an ideal solution for all high end clocking applications such as SONET, WiMax, CPRI, OBSAI, Fiber Channel, and any application where performance and quality are required.

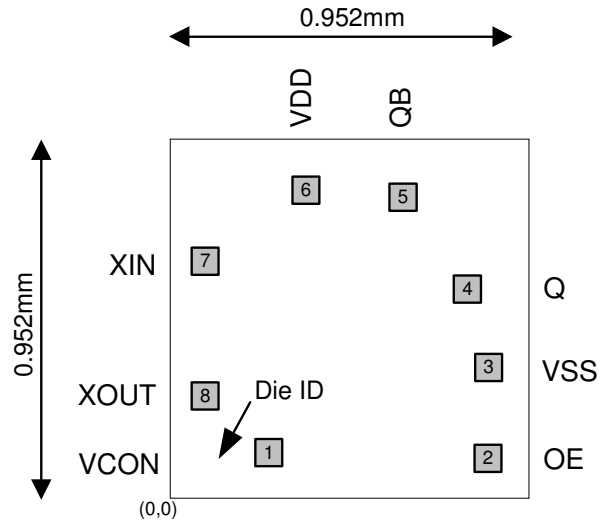
**DIE SPECIFICATIONS**

Name	Value
Size	952 micron x 952 micron
Reverse side	GND
Pad dimensions	80 micron x 80 micron
Thickness	8 mil

**BLOCK DIAGRAM**



**DIE CONFIGURATION**



**OUTPUT ENABLE LOGIC PL586-25**

OE State (Pad 4)	Output Buffers State
0	Outputs Tri-Stated
1 (Default)	Outputs Enabled

\* Internal 60K $\Omega$  pull-up resistor

**OUTPUT ENABLE LOGIC PL586-28**

OE State (Pad 4)	Output Buffers State
0 (Default)	Outputs Enabled
1	Outputs Tri-Stated

\* Internal 60K $\Omega$  pull-down resistor

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**PAD ASSIGNMENT**

Pad #	Name	X (μm)*	Y (μm)*	Description
1	VCON	-194	-365	Voltage Control input
2	OE	373	-373	Output enable pin. Internal pull up (-25) or pull down (-28).
3	VSS	373	-127	GND connection
4	Q	315	75	LVPECL output
5	QB	140	315	Complementary LVPECL output
6	VDD	-117	329	V <sub>DD</sub> connection
7	XIN	-372	158	Crystal input connection
8	XOUT	-372	-190	Crystal output connection

\* **Note:** Referenced to center of the die.

**ELECTRICAL SPECIFICATIONS**

**1. Absolute Maximum Ratings**

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage	V <sub>DD</sub>		4.6	V
Input Voltage, DC	V <sub>I</sub>	V <sub>SS</sub> -0.5	V <sub>DD</sub> +0.5	V
Output Voltage, DC	V <sub>O</sub>	V <sub>SS</sub> -0.5	V <sub>DD</sub> +0.5	V
Storage Temperature	T <sub>S</sub>	-65	150	°C
Ambient Operating Temperature	T <sub>A</sub>	-40	85	°C
HBM ESD Protection		2,000		V

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. \*Operating temperature is guaranteed by design. Parts are tested to commercial grade only.

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**2. Voltage Control Crystal Oscillator**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
VCXO Stabilization Time *	$T_{VCXOSTB}$	From power valid			10	ms
VCXO Pullability *		XTAL $C_1 = 6.6\text{fF}$ , $C_0/C_1 = 260$ $0\text{V} \leq V_{CON} \leq V_{DD}$ (at $25^\circ\text{C}$ )		$\pm 110$		ppm
Varicap Control Range *		$V_{CON} = 0$ to $V_{DD}$	0		3.3	V
Linearity *		$0.0\text{V} \leq V_{CON} \leq 3.3\text{V}$		4		%
		$0.3\text{V} \leq V_{CON} \leq 3.0\text{V}$		2.5		%
VCON Input Impedance *		DC Input resistance	10			M $\Omega$
VCON Modulation BW *		$0\text{V} \leq V_{CON} \leq V_{DD}$ , -3dB		30		kHz

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

**3. Crystal Specifications**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Crystal Resonator Frequency	$F_{XIN}$	Fundamental Mode, AT cut	120		125	MHz
Crystal Loading Rating	$C_{L(xtal)}$	$V_{CON} = 1.65\text{V}$		8		pF
Shunt Capacitance	$C_0$				3.0	pF
Motional Capacitance	$C_1$	Recommended for at least $\pm 100\text{ppm}$ Frequency Pulling	6.0			fF
Recommended ESR	$R_E$	$C_0 \leq 3.0\text{pF}$			19	$\Omega$
		$C_0 \leq 2.5\text{pF}$			21	$\Omega$
		$C_0 \leq 2.0\text{pF}$			22	$\Omega$

**4. General Electrical Specifications**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current	$I_{DD}$	Standard LVPECL Loading (See LVPECL Levels Test Circuit, page 4)			50	mA
Operating Voltage	$V_{DD}$		2.97	3.3	3.63	V
Output Clock Duty Cycle		@ $V_{DD} = 1.3\text{V}$ (See LVPECL Transition Time Waveform, page 4)	45	50	55	%
Short Circuit Current				$\pm 50$		mA

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**5. Jitter Specifications**

PARAMETERS	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Period Jitter RMS	At 122.88MHz, with capacitive decoupling between V <sub>DD</sub> and GND. Over 10,000 cycles		2.5		ps
Period Jitter pk-to-pk			20		
Integrated Jitter RMS at 122.88MHz	Integrated 12 kHz to 20 MHz		110		fs

**6. Phase Noise Specifications**

PARAMETERS	FREQUENCY	@10Hz	@100Hz	@1kHz	@10kHz	@100kHz	@1MHz	UNITS
Phase Noise, relative to carrier	122.88MHz	-70	-98	-125	-145	-155	-156	dBc/Hz

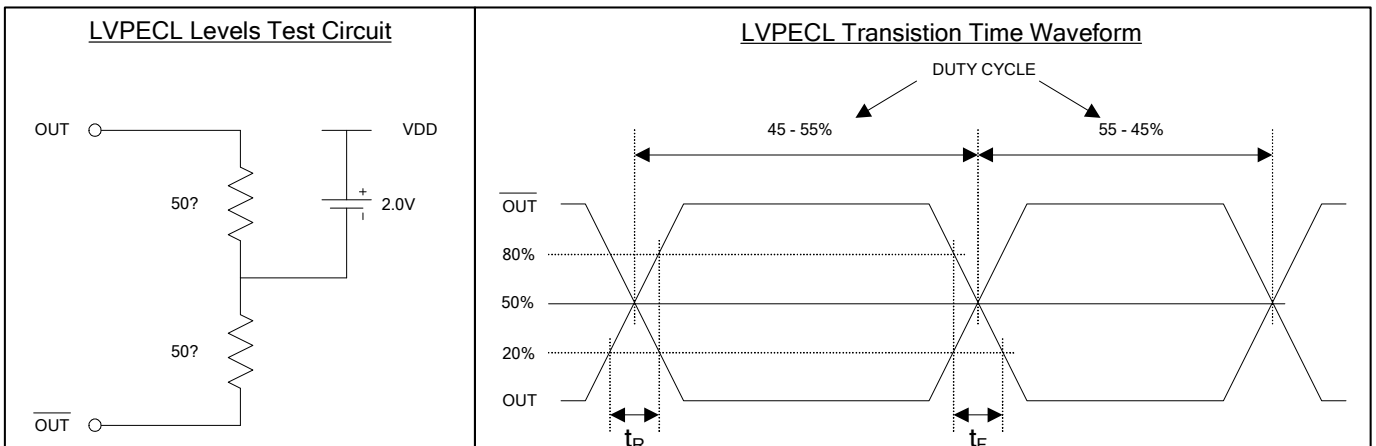
Note: Phase Noise measured at VCON = 0.3V to 3.0V.

**7. LVPECL Electrical Characteristics**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Output High Voltage	V <sub>OH</sub>	R <sub>L</sub> = 50 Ω to (V <sub>DD</sub> - 2V) (see figure)	V <sub>DD</sub> - 1.025	V <sub>DD</sub> - 0.950	V <sub>DD</sub> - 0.880	V
Output Low Voltage	V <sub>OL</sub>		V <sub>DD</sub> - 1.810	V <sub>DD</sub> - 1.700	V <sub>DD</sub> - 1.620	V

**8. LVPECL Switching Characteristics**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Clock Rise Time	t <sub>r</sub>	@20/80% of output waveform			300	ps
Clock Fall Time	t <sub>f</sub>	@80/20% of output waveform			300	ps



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**ORDERING INFORMATION**

**For part ordering, please contact our Sales Department:**  
2880 Zanker Road, San Jose, CA, USA  
Tel: (408) 571-1668 Fax: (408) 571-1688

**PART NUMBER**

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

Part Number PL586-2X XX  
Packaging Option \_\_\_\_\_ Temperature Range  
*D = Die* *C=Commercial (0°C to 70°C)*  
*W = Wafer*

Order Number	Packaging
PL586-25DC PL586-28DC	Die – Waffle Pack
PL586-25WC PL586-28WC	Wafer

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