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## Low Phase Noise, LVPECL VCXO (for 150MHz to 160MHz Fundamental Crystals)

### FEATURES

- Advanced non multiplier VCXO Design for High Performance Crystal Oscillators
- Input/Output Range: 150MHz to 160MHz
- Phase Noise Optimized for 155.52MHz: -68dBc @10Hz, -152dBc @100kHz
- Very low Phase Jitter: <100fs RMS
- High Pull Range:  $\pm 100$ ppm
- Linearity: <5%
- Integrated Variable Capacitors
- Complementary LVPECL Outputs
- Power Supply: 3.3V  $\pm 10\%$
- Available in Die or Wafer Form

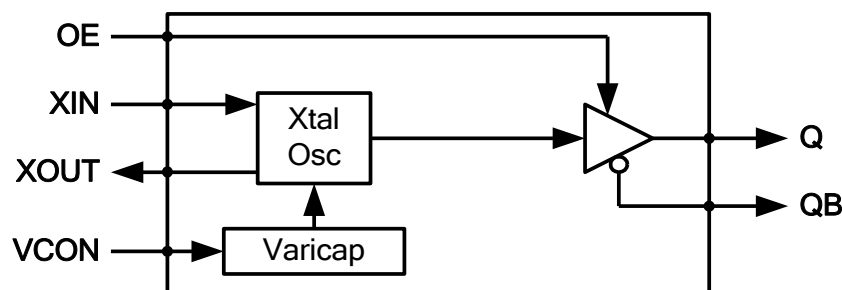
### DESCRIPTION

The PL586-55/-58 is a non-multiplier VCXO IC specifically designed to pull fundamental mode crystals from 150MHz to 160MHz. This IC achieves a typical pull range of  $\pm 100$ ppm with <5% linearity. The phase noise performance is optimized for close-in performance and with <100fs 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.

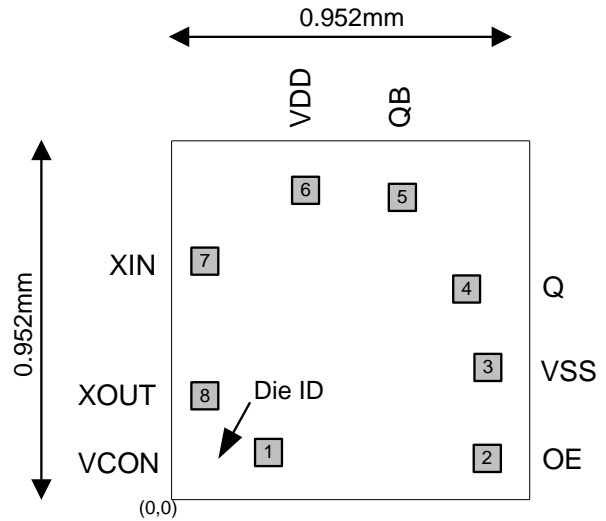
### DIE SPECIFICATIONS

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 PL586-55

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

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

### OUTPUT ENABLE LOGIC PL586-58

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

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

**Low Phase Noise, LVPECL VCXO (for 150MHz to 160MHz Fundamental Crystals)**
**PAD ASSIGNMENT**

Pad #	Name	X (μm)*	Y (μm)*	Description
1	VCON	-194	-365	Voltage Control input
2	XOUT	-372	-190	Crystal output connection
3	XIN	-372	158	Crystal input connection
4	VDD	-117	329	V <sub>DD</sub> connection
5	QB	140	315	Complementary LVPECL output
6	Q	315	75	LVPECL output
7	VSS	373	-127	GND connection
8	OE	373	-373	Output enable pin. Internal pull up (-55) or pull down (-58).

\* **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.

**Low Phase Noise, LVPECL VCXO (for 150MHz to 160MHz Fundamental Crystals)**
**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 $C_1 = 6.8$ , $C_0/C_1 = 270$ $0V \leq VCON \leq V_{DD}$ (at 25°C)		$\pm 120$		ppm
		XTAL $C_1 = 3.7$ , $C_0/C_1 = 480$ $0V \leq VCON \leq V_{DD}$ (at 25°C)		$\pm 70$		ppm
Varicap Control Range *		$VCON = 0$ to $V_{DD}$	0		3.3	V
Linearity *		$0.0V \leq VCON \leq 3.3V$		7		%
		$0.3V \leq VCON \leq 3.0V$		2.5		%
VCON Input Impedance *		DC Input resistance	10			MΩ
VCON Modulation BW *		$0V \leq VCON \leq V_{DD}$ , -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	150		160	MHz
Crystal Loading Rating	$C_{L(xtal)}$	$VCON = 1.65V$		5		pF
Shunt Capacitance	$C_0$				2.0	pF
Motional Capacitance	$C_1$	Recommended for at least $\pm 100ppm$ Frequency Pulling	5.5			fF
Recommended ESR	$R_E$	$C_0 \leq 2.0pF$			10	Ω
		$C_0 \leq 1.5pF$			12	Ω

**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		@ $V_{DD} = 1.3V$ (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 155.52MHz, 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 155.52MHz	Integrated 12 kHz to 20 MHz		90		fs

### 6. Phase Noise Specifications

PARAMETERS	FREQUENCY	@10Hz	@100Hz	@1kHz	@10kHz	@100kHz	@1MHz	@10MHz	UNITS
Phase Noise, relative to carrier	155.52MHz	-68	98	124	144	152	156	158	dBc/Hz

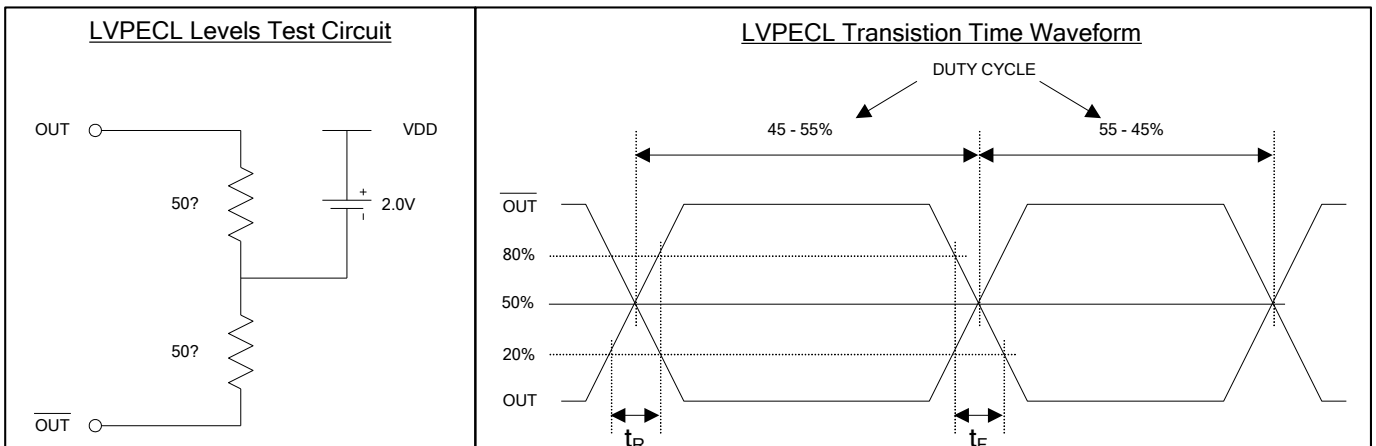
Note: Phase Noise measured at V<sub>CON</sub> = 0.3V to 3.0V.

### 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		400	600	ps
Clock Fall Time	t <sub>f</sub>	@80/20% of output waveform		400	600	ps



**Low Phase Noise, LVPECL VCXO (for 150MHz to 160MHz Fundamental Crystals)**

**ORDERING INFORMATION**

***For part ordering, please contact our Sales Department:***

2180 Fortune Drive, San Jose, CA 95131, USA

Tel: (408) 944-0800 Fax: (408) 474-1000

**PART NUMBER**

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

**Part Number**           **PL586-5X XX**          

**Packaging Option** \_\_\_\_\_

*D = Die*

*W = Wafer*

**Temperature Range**

*C=Commercial (0°C to 70°C)*

<b>Order Number</b>	<b>Packaging</b>
PL586-55DC PL586-58DC	Die – Waffle Pack
PL586-55WC PL586-58WC	Wafer

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