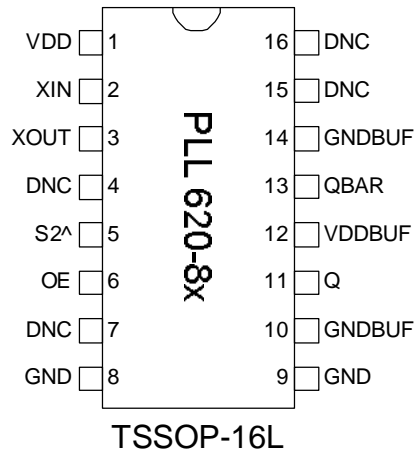


**Low Phase Noise XO (9.5-65MHz Output)**

**FEATURES**

- Crystal input range: 19MHz to 65MHz
- Output range: 9.5MHz – 65MHz
- Very low phase noise and jitter
- Complementary outputs:
  - LVPECL (PLL620-88)
  - LVDS (PLL620-89)
- Supports 2.5V or 3.3V Power Supply.
- Available in 16 pin TSSOP GREEN/RoHS compliant package.

**PIN CONFIGURATION**



Note: ^ denotes internal pull up

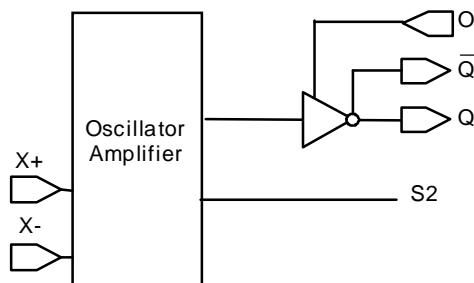
**DESCRIPTION**

The PLL620-88 (LVPECL) and PLL620-89 (LVDS) are XO ICs specifically designed to work with fundamental or 3<sup>rd</sup> OT crystals between 19MHz and 65MHz. The selectable divide by two feature extends the output range from 9.5MHz to 65MHz. They require very low current into the crystal resulting in better overall stability.

**OUTPUT ENABLE LOGIC TABLE**

| Part Number | OE          | State          |
|-------------|-------------|----------------|
| PLL620-88   | 0 (Default) | Output enabled |
|             | 1           | Tri-state      |
| PLL620-89   | 0           | Tri-state      |
|             | 1 (Default) | Output enabled |

**BLOCK DIAGRAM**



**OUTPUT FREQUENCY DIVIDE BY TWO SELECTOR (S2)**

| S2         | Output  |
|------------|---------|
| 0          | Input/2 |
| 1(Default) | Input   |

## Low Phase Noise XO (9.5-65MHz Output)

### PACKAGE PIN ASSIGNMENT

| Name   | Pin#         | Description   |
|--------|--------------|---|
| VDD    | 1            | Power Supply.   |
| XIN    | 2            | Crystal input. See Crystal Specification on page 3.                                       |
| XOUT   | 3            | Crystal output. See Crystal Specification on page 3.                                      |
| DNC    | 4, 7, 15, 16 | Do Not Connect.   |
| S2     | 5            | Output Divide by Two selector pin. See the OUTPUT DIVIDE BY TWO SELECTOR table on page 1. |
| OE     | 6            | Output Enable input. See OUTPUT ENABLE LOGIC table on page 1.                             |
| GND    | 8, 9         | Ground.   |
| GNDBUF | 10           | Ground for output buffer circuitry.   |
| Q      | 11           | LVPECL or LVDS output.  |
| VDDBUF | 12           | Power supply for output buffer circuitry.   |
| QBAR   | 13           | Complementary LVPECL or LVDS output.  |
| GNDBUF | 14           | Ground for output buffer circuitry.   |

### ELECTRICAL SPECIFICATIONS

#### 1. Absolute Maximum Ratings

| PARAMETERS                        | SYMBOL   | MIN  | MAX          | UNITS |
|-----------------------------------|----------|------|--------------|-------|
| Supply Voltage                    | $V_{DD}$ |      | 4.6          | V     |
| Input Voltage, dc                 | $V_I$    | -0.5 | $V_{DD}+0.5$ | V     |
| Output Voltage, dc                | $V_O$    | -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    |
| ESD Protection, Human Body Model  |          |      | 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.

## Low Phase Noise XO (9.5-65MHz Output)

### 2. Crystal Specifications

| PARAMETERS                  | SYMBOL        | CONDITIONS  | MIN | TYP | MAX | UNITS    |
|-----------------------------|---------------|-------------|-----|-----|-----|----------|
| Crystal Resonator Frequency | $F_{XIN}$     | Fundamental | 19  |     | 65  | MHz      |
| Crystal Loading Rating      | $C_{L(xtal)}$ |             |     | 8.5 |     | pF       |
| Interelectrode Capacitance  | $C_0$         |             |     |     | 5   | pF       |
| Recommended ESR             | $R_E$         | AT cut      |     |     | 30  | $\Omega$ |

### 3. General Electrical Specifications

| PARAMETERS                      | SYMBOL   | CONDITIONS                                   | MIN  | TYP      | MAX    | UNITS |
|---------------------------------|----------|--|------|----------|--------|-------|
| Supply Current (Loaded Outputs) | $I_{DD}$ | LVPECL/LVDS, 15pF Load                       |      |          | 100/80 | mA    |
| Operating Voltage               | $V_{DD}$ |  | 2.25 |          | 3.63   | V     |
| Output Clock Duty Cycle         |          | @ 1.25V (LVDS)<br>@ $V_{DD} - 1.3V$ (LVPECL) | 45   | 50       | 55     | %     |
| Short Circuit Current           |          |  |      | $\pm 50$ |        | mA    |

### 4. Jitter Specifications

| PARAMETERS                           | CONDITIONS  | MIN | TYP  | MAX | UNITS |
|--------------------------------------|---|-----|------|-----|-------|
| Period jitter RMS at 27MHz           | With capacitive decoupling between $V_{DD}$ and GND. Over 10,000 cycles     |     | 2.3  |     | ps    |
| Period jitter peak-to-peak at 27MHz  |   |     | 18.5 | 20  |       |
| Accumulated jitter RMS at 27MHz      | With capacitive decoupling between $V_{DD}$ and GND. Over 1,000,000 cycles. |     | 2.3  |     | ps    |
| Accumulated jitter pk-to-pk at 27MHz |   |     | 24   | 25  |       |
| Random Jitter                        | "RJ" measured on Wavecrest SIA 3000   |     | 2.3  |     | ps    |

Measured on Wavecrest SIA 3000

### 5. Phase Noise Specifications

| PARAMETERS                      | FREQUENCY | @10Hz | @100Hz | @1kHz | @10kHz | @100kHz | UNITS  |
|---------------------------------|-----------|-------|--------|-------|--------|---------|--------|
| Phase Noise relative to carrier | 27MHz     | -75   | -100   | -125  | -140   | -145    | dBc/Hz |

Note: Phase Noise measured on Agilent E5500

**Low Phase Noise XO (9.5-65MHz Output)**

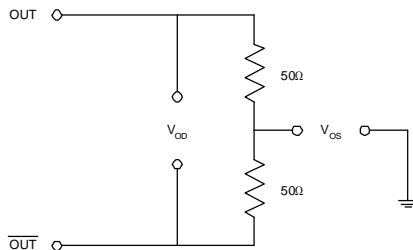
**6. LVDS Electrical Characteristics**

| PARAMETERS                   | SYMBOL          | CONDITIONS                                 | MIN   | TYP     | MAX      | UNITS   |
|------------------------------|-----------------|--|-------|---------|----------|---------|
| Output Differential Voltage  | $V_{OD}$        | $R_L = 100 \Omega$<br>(see figure)         | 247   | 355     | 454      | mV      |
| $V_{DD}$ Magnitude Change    | $\Delta V_{OD}$ |  | -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      | $\Delta V_{OS}$ |  | 0     | 3       | 25       | mV      |
| Power-off Leakage            | $I_{OXD}$       | $V_{out} = V_{DD}$ or GND<br>$V_{DD} = 0V$ |       | $\pm 1$ | $\pm 10$ | $\mu A$ |
| Output Short Circuit Current | $I_{OSD}$       |  |       | -5.7    | -8       | mA      |

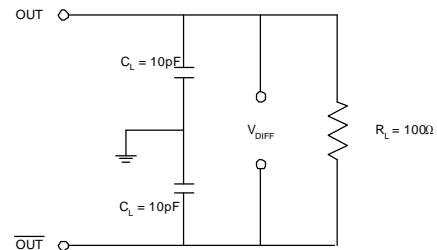
**7. LVDS Switching Characteristics**

| PARAMETERS                   | SYMBOL | CONDITIONS  | MIN | TYP | MAX | UNITS |
|------------------------------|--------|---|-----|-----|-----|-------|
| Differential Clock Rise Time | $t_r$  | $R_L = 100 \Omega$<br>$C_L = 10 \text{ pF}$<br>(see figure) | 0.2 | 0.7 | 1.0 | ns    |
| Differential Clock Fall Time | $t_f$  |   | 0.2 | 0.7 | 1.0 | ns    |

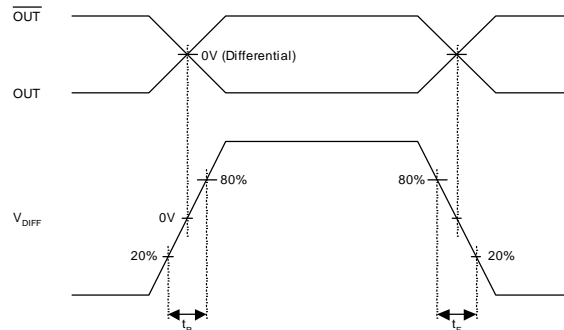
LVDS Levels Test Circuit



LVDS Switching Test Circuit



LVDS Transition Time Waveform



**Low Phase Noise XO (9.5-65MHz Output)**

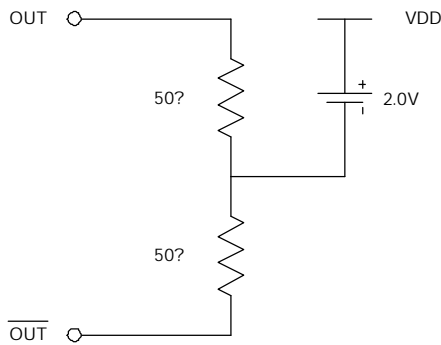
**8. LVPECL Electrical Characteristics**

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

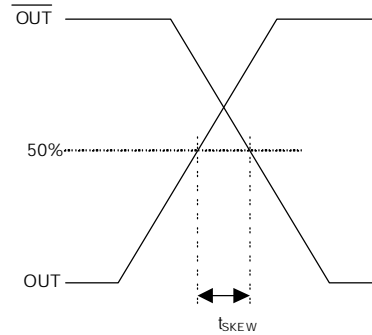
**9. LVPECL Switching Characteristics**

| PARAMETERS      | SYMBOL | CONDITIONS       | MIN | TYP | MAX | UNITS |
|-----------------|--------|------------------|-----|-----|-----|-------|
| Clock Rise Time | $t_r$  | @20/80% - LVPECL |     | 0.6 | 1.5 | ns    |
| Clock Fall Time | $t_f$  | @80/20% - LVPECL |     | 0.5 | 1.5 | ns    |

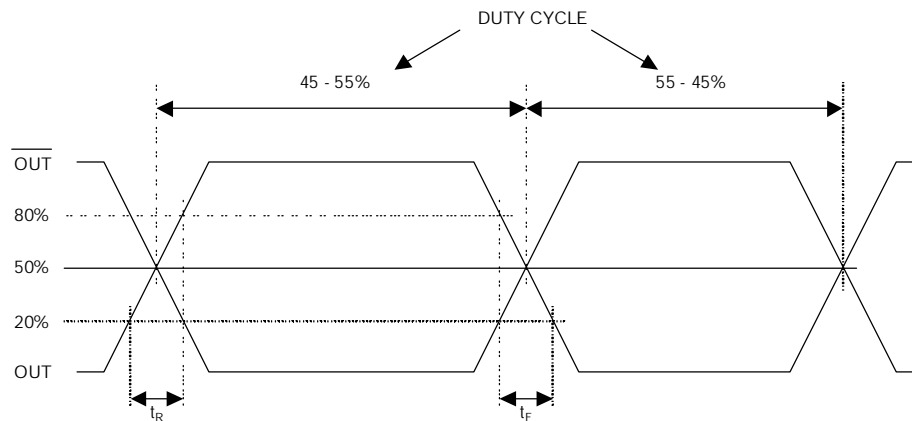
LVPECL Levels Test Circuit



LVPECL Output Skew



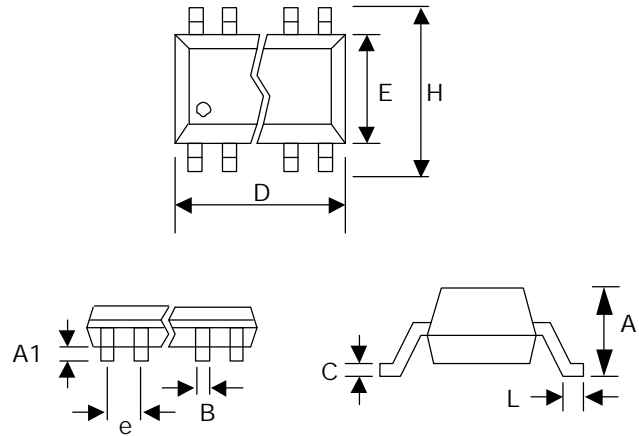
LVPECL Transition Time Waveform



**Low Phase Noise XO (9.5-65MHz Output)**

**PACKAGE INFORMATION**

| 16 PIN TSSOP (mm) |          |      |
|-------------------|----------|------|
| Symbol            | Min.     | Max. |
| A                 | -        | 1.20 |
| A1                | 0.05     | 0.15 |
| B                 | 0.19     | 0.30 |
| C                 | 0.09     | 0.20 |
| D                 | 4.90     | 5.10 |
| E                 | 4.30     | 4.50 |
| H                 | 6.40 BSC |      |
| L                 | 0.45     | 0.75 |
| e                 | 0.65 BSC |      |

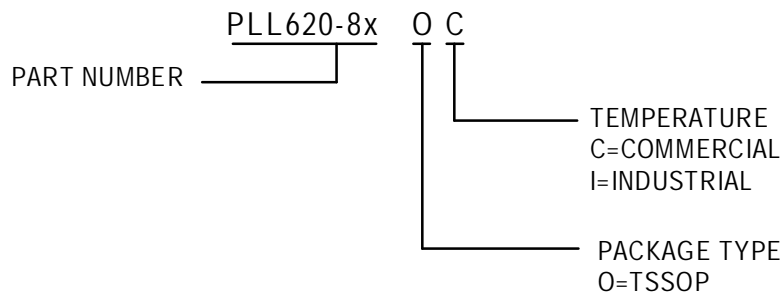


**ORDERING INFORMATION**

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



| Order Number  | Marking    | Package Option        |
|---------------|------------|-----------------------|
| PLL620-88OC-R | P620-88 OC | TSSOP – Tape and Reel |
| PLL620-88OC   | P620-88 OC | TSSOP – Tube          |
| PLL620-89OC-R | P620-89 OC | TSSOP – Tape and Reel |
| PLL620-89OC   | P620-89 OC | TSSOP – Tube          |

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