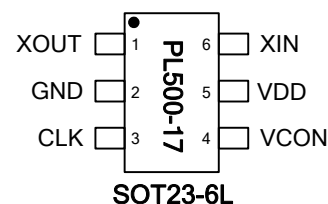
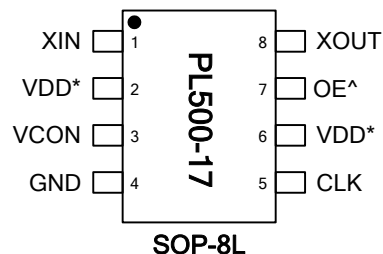


## Low Phase Noise VCXO (17MHz to 36MHz)

### FEATURES

- VCXO output for the 17MHz to 36MHz range
- Low phase noise (-130dBc @ 10kHz offset at 35.328MHz)
- LVCMOS output with OE tri-state control
- 17 to 36MHz fundamental crystal input
- Integrated high linearity variable capacitors
- 8mA drive capability at TTL output
- $\pm 150$  ppm pull range, max 5% (typ.) linearity
- Low jitter (RMS): 2.5ps period jitter
- 2.5 to 3.3V operation
- Available in 8-Pin SOP, 6-pin SOT23 GREEN/ RoHS compliant packages, or Die

### PIN CONFIGURATION



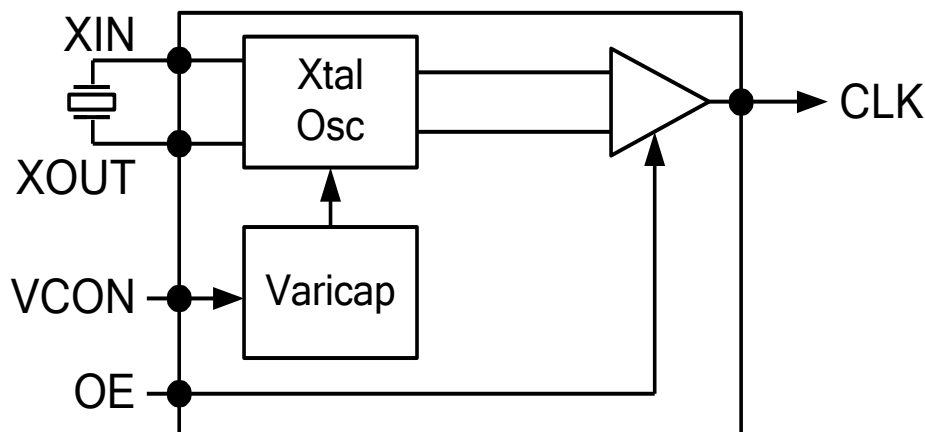
^: Denotes internal Pull-up

\*: Only one VDD pin needs to be connected

### DESCRIPTION

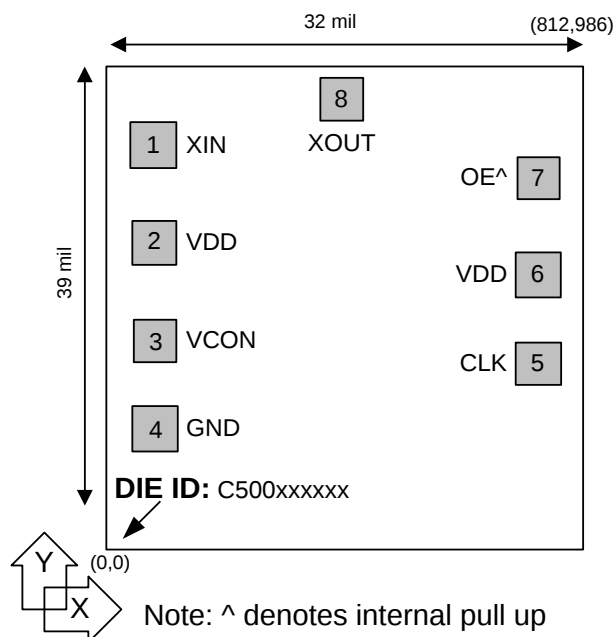
The PL500-17 is a low cost, high performance and low phase noise VCXO for the 17 to 36MHz range, providing less than -130dBc at 10kHz offset at 35.328MHz. The very low jitter (2.5 ps RMS period jitter) makes this chip ideal for applications requiring voltage controlled frequency sources. Input crystal can range from 17 to 36MHz (fundamental resonant mode).

### BLOCK DIAGRAM



## Low Phase Noise VCXO (17MHz to 36MHz)

### DIE PAD LAYOUT



### DIE SPECIFICATIONS

| Name           | Value                 |
|----------------|-----------------------|
| Size           | 39 x 32 mil           |
| Reverse side   | GND                   |
| Pad dimensions | 80 micron x 80 micron |
| Thickness      | 8 mil                 |

### PACKAGE PIN AND DIE PAD ASSIGNMENT

| Name | Pin#  |         | Die Pad Position |         | Type | Description                                                                                                                       |
|------|-------|---------|------------------|---------|------|-----------------------------------------------------------------------------------------------------------------------------------|
|      | SOP-8 | SOT23-6 | X (μm)           | Y (μm)  |      |                                                                                                                                   |
| XIN  | 1     | 6       | 94.183           | 768.599 | I    | Crystal input pin.                                                                                                                |
| VDD  | 2     | 5       | 94.157           | 605.029 | P    | VDD power supply pin. Only one VDD pin is necessary.                                                                              |
| VCON | 3     | 4       | 94.183           | 331.756 | I    | Frequency control voltage input pin.                                                                                              |
| GND  | 4     | 2       | 94.193           | 140.379 | P    | Ground pin.                                                                                                                       |
| CLK  | 5     | 3       | 715.472          | 203.866 | O    | Output clock pin.                                                                                                                 |
| VDD  | 6     | -       | 715.307          | 455.726 | P    | VDD power supply pin. Only one VDD pin is necessary.                                                                              |
| OE*  | 7     | -       | 715.472          | 626.716 | I    | Output Enable input pin. Disables the output when low. Internal pull-up enables output by default if pin is not connected to low. |
| XOUT | 8     | 1       | 476.906          | 888.881 | I    | Crystal output pin. Ref Clock input.                                                                                              |

\* OE (Output Enable) pin is not available in SOT23-6L package, the output will always be enabled by the build in pull-up resistor.

## Low Phase Noise VCXO (17MHz to 36MHz)

### 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, Machine Model     |          | 200  |              | V     |
| 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.\* **Note:** Operating Temperature is guaranteed by design for all parts (COMMERCIAL and INDUSTRIAL), but tested for COMMERCIAL grade only.

#### 2. 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 $C_0/C_1 < 250$<br>$0V \leq VCON \leq 3.3V$ |           | 300  |      | ppm        |
| CLK Output Pullability     |               | $VCON=1.65V, \pm 1.65V$                          | $\pm 150$ |      |      | ppm        |
| VCXO Tuning Characteristic |               |                                                  |           | 100  |      | ppm/V      |
| Pull Range Linearity       |               |                                                  |           |      | 5    | %          |
| Power Supply Rejection     | PWSRR         | Frequency change, $V_{DD} \pm 10\%$              | -1        |      | +1   | ppm        |
| VCON Pin Input Impedance   |               |                                                  | 5000      |      |      | k $\Omega$ |
| VCON Modulation BW         |               | $0V \leq VCON \leq 3.3V, -3dB$                   | 18        |      |      | kHz        |

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

## Low Phase Noise VCXO (17MHz to 36MHz)

### 3. AC Electrical Specifications

| PARAMETERS                  | SYMBOL      | CONDITIONS               | MIN. | TYP. | MAX. | UNITS |
|-----------------------------|-------------|--------------------------|------|------|------|-------|
| Input Crystal Frequency     | $F_{in}$    | Fundamental Mode         | 17   |      | 36   | MHz   |
| Output Clock Rise/Fall Time | $t_r / t_f$ | 0.8V to 2.0V, 10 pF load |      | 1.15 |      | ns    |
|                             | $t_r / t_f$ | 0.3V to 3.0V, 15 pF load |      | 3.7  |      |       |
| Output Clock Duty Cycle     |             |                          | 45   | 50   | 55   | %     |
| Output Enable/Disable Time  | $t_{OE}$    |                          |      | 5    |      | ns    |
| Start-Up Time               | $t_{SU}$    |                          |      | 1    |      | ms    |

### 4. Jitter and Phase Noise Specifications

| PARAMETERS                                    | CONDITIONS                                           | MIN. | TYP. | MAX. | UNITS  |
|-----------------------------------------------|------------------------------------------------------|------|------|------|--------|
| RMS Period Jitter<br>(1 sigma – 1000 samples) | With capacitive decoupling between $V_{DD}$ and GND. |      | 2.5  |      | ps     |
| Phase Noise,<br>Relative to Carrier           | 27MHz @100Hz offset                                  |      | -100 |      | dBc/Hz |
|                                               | 27MHz @1kHz offset                                   |      | -125 |      | dBc/Hz |
|                                               | 27MHz @10kHz offset                                  |      | -142 |      | dBc/Hz |
|                                               | 27MHz @100kHz offset                                 |      | -150 |      | dBc/Hz |
|                                               | 27MHz @1MHz offset                                   |      | -150 |      | dBc/Hz |

### 5. DC Specifications

| PARAMETERS                         | SYMBOL       | CONDITIONS                             | MIN.           | TYP. | MAX.     | UNITS |
|------------------------------------|--------------|----------------------------------------|----------------|------|----------|-------|
| Supply Current,<br>Dynamic         | $I_{DD}$     | 27MHz, 15pF Load, 3.3V                 |                | 3.7  | 5        | mA    |
|                                    |              | 27MHz, 15pF Load, 2.5V                 |                | 2.4  | 3.5      |       |
| Supply Current,<br>Output Disabled | $I_{DD\_OE}$ | 27MHz, 3.3V, OE=Low                    |                | 1.4  |          | mA    |
|                                    |              | 27MHz, 2.5V, OE=Low                    |                | 1    |          |       |
| Operating Voltage                  | $V_{DD}$     |                                        | 2.25           |      | 3.63     | V     |
| Output Low Voltage, CMOS           | $V_{OLC}$    | $I_{OL} = +4mA$                        |                |      | 0.4      | V     |
| Output High Voltage, CMOS          | $V_{OHC}$    | $I_{OH} = -4mA$                        | $V_{DD} - 0.4$ |      |          | V     |
| Output Drive Current               |              | For $V_{OL} < 0.4V$ or $V_{OH} > 2.4V$ | 8              | 9.5  |          | mA    |
| VCXO Control Voltage               | VCON         |                                        | 0              |      | $V_{DD}$ | V     |

## Low Phase Noise VCXO (17MHz to 36MHz)

### 6. Crystal Specifications

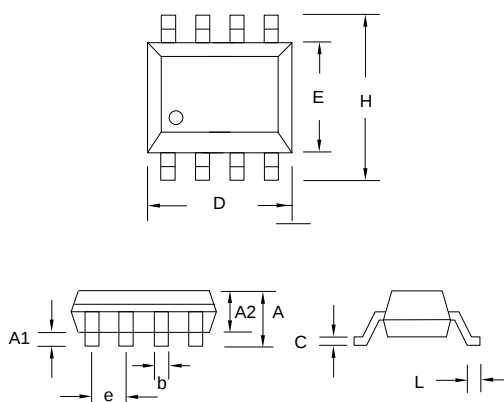
| PARAMETERS                                            | SYMBOL                            | MIN. | TYP. | MAX. | UNITS    |
|-------------------------------------------------------|-----------------------------------|------|------|------|----------|
| Crystal Loading Rating (VCON = 1.65V, 3.3V Operation) | $C_{L(xtal)}$<br>(see note below) |      | 7.8  |      | pF       |
| Crystal Loading Rating (VCON = 1.25V, 2.5V Operation) |                                   |      | 8.9  |      |          |
| Maximum Sustainable Drive Level                       |                                   |      |      | 200  | $\mu$ W  |
| Operating Drive Level                                 |                                   |      | 50   |      | $\mu$ W  |
| Max C0                                                |                                   |      |      | 5    | pF       |
| C0/C1                                                 |                                   |      |      | 250  | -        |
| ESR                                                   | $R_s$                             |      |      | 30   | $\Omega$ |

**Note:** The crystal must be such that it oscillates (parallel resonant) at nominal frequency when presented a C Load as specified above. If the crystal requires more load to be at nominal frequency, the additional load must be added externally. This however may reduce the pull range. Note that the Cload values above are for the IC only, and do not include PCB parasitics. Crystal specifications for Cload include PCB parasitics.

### PACKAGE INFORMATION (GREEN PACKAGE COMPLIANT)

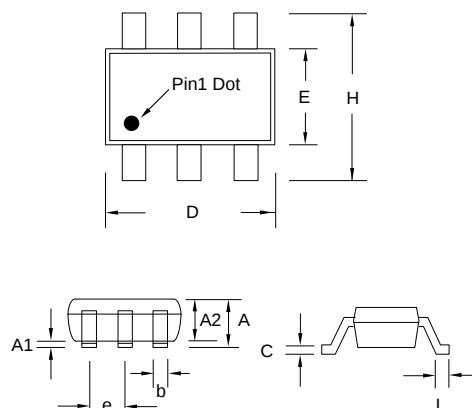
#### SOP-8L

| Symbol | Dimension in MM |      |
|--------|-----------------|------|
|        | Min.            | Max. |
| A      | 1.35            | 1.75 |
| A1     | 0.10            | 0.25 |
| A2     | 1.25            | 1.50 |
| B      | 0.33            | 0.53 |
| C      | 0.19            | 0.27 |
| D      | 4.80            | 5.00 |
| E      | 3.80            | 4.00 |
| H      | 5.80            | 6.20 |
| L      | 0.40            | 0.89 |
| e      | 1.27 BSC        |      |



#### SOT23-6 L

| Symbol | Dimension in MM |      |
|--------|-----------------|------|
|        | Min.            | Max. |
| A      | 1.05            | 1.35 |
| A1     | 0.05            | 0.15 |
| A2     | 1.00            | 1.20 |
| b      | 0.30            | 0.50 |
| c      | 0.08            | 0.20 |
| D      | 2.80            | 3.00 |
| E      | 1.50            | 1.70 |
| H      | 2.60            | 3.0  |
| L      | 0.35            | 0.55 |
| e      | 0.95 BSC        |      |



## Low Phase Noise VCXO (17MHz to 36MHz)

### ORDERING INFORMATION (GREEN PACKAGE)

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

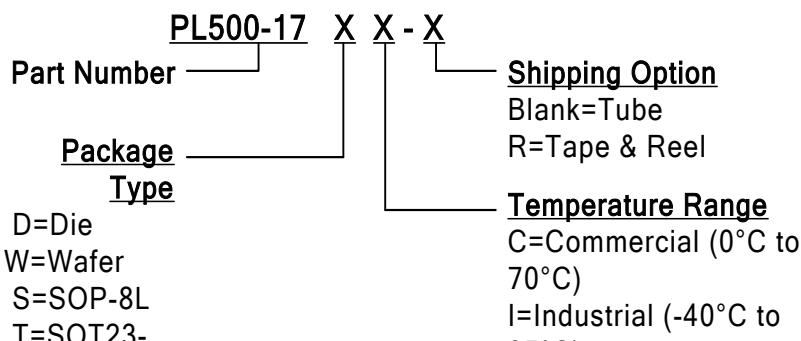
2180 Fortune Drive, San Jose, CA 95131, USA

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 / Order Number | Marking*      | Package Option              |
|---------------------|---------------|-----------------------------|
| PL500-17DC          | N/A           | Die (Waffle Pack)           |
| PL500-17WC          | N/A           | WAFER                       |
| PL500-17SC          | P500-17<br>SC | 8-Pin SOP (Tube)            |
| PL500-17SC-R        | LLLLL         | 8-Pin SOP (Tape and Reel)   |
| PL500-17TC-R        | B17<br>LLL    | 6-Pin SOT23 (Tape and Reel) |

\*Note: LLL and LLLLL represent the production lot number

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