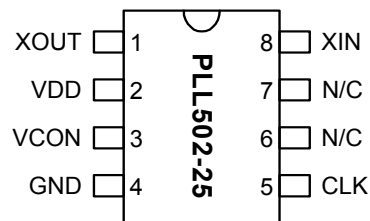


## Low Phase Noise VCXO (12MHz to 27MHz)

### FEATURES

- Low phase noise VCXO output for the 12MHz to 27MHz range (-135 dBc at 10kHz offset).
- CMOS output.
- 12 to 27MHz crystal input.
- Integrated variable capacitors.
- Wide pull range (+/- 250 ppm).
- Low jitter (RMS): 2.2ps period.
- 2.5V or 3.3V operation voltage.
- Available in 8-Pin SOIC.

### PIN CONFIGURATION



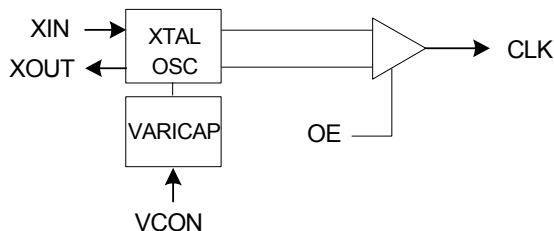
### DESCRIPTION

The PLL502-25 is a low cost, high performance and low phase noise VCXO, providing less than -135dBc at 10kHz offset in the 12MHz to 27MHz operating range. The very low jitter (2.2 ps RMS period jitter) makes this chip ideal for applications requiring voltage controlled frequency sources. Input crystal can range from 12 to 27MHz (fundamental resonant mode).

### OUTPUT RANGE

| MULTIPLIER | FREQUENCY RANGE | OUTPUT BUFFER |
|------------|-----------------|---------------|
| No PLL     | 12 - 27MHz      | CMOS          |

### BLOCK DIAGRAM



## Low Phase Noise VCXO (12MHz to 27MHz)

### PIN DESCRIPTIONS

| Name | Number | Type | Description                                          |
|------|--------|------|------------------------------------------------------|
| XOUT | 1      | I    | Crystal output. See Crystal Specification on page 3. |
| VDD  | 2      | P    | Power supply.                                        |
| VCON | 3      | I    | Voltage Control input.                               |
| GND  | 4      | P    | Ground.                                              |
| CLK  | 5      | O    | Output clock.                                        |
| N/C  | 6      | -    | No connection.                                       |
| N/C  | 7      | -    | No connection.                                       |
| XIN  | 8      | I    | Crystal input. See Crystal Specification on page 3.  |

### 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.

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

#### 2. DC Electrical Specifications

| PARAMETERS                                   | SYMBOL   | CONDITIONS                                           | MIN. | TYP. | MAX.     | UNITS |
|----------------------------------------------|----------|------------------------------------------------------|------|------|----------|-------|
| Supply Current, Dynamic, with Loaded Outputs | $I_{DD}$ | $F_{XIN} = 12 - 25\text{MHz}$<br>Output load of 10pF |      | 16   | 20       | mA    |
| Operating Voltage                            | $V_{DD}$ |                                                      | 2.25 |      | 3.63     | V     |
| Output drive current                         | $I_{OH}$ | $V_{OH} = V_{DD}-0.4\text{V}$ , $V_{DD}=3.3\text{V}$ | 10   |      |          | mA    |
|                                              | $I_{OL}$ | $V_{OL} = 0.4\text{V}$ , $V_{DD} = 3.3\text{V}$      | 10   |      |          | mA    |
| Short Circuit Current                        |          |                                                      |      | ±50  |          | mA    |
| VCXO Control Voltage                         | VCON     |                                                      | 0    |      | $V_{DD}$ | V     |

## Low Phase Noise VCXO (12MHz to 27MHz)

### 3. AC Electrical Specifications

| PARAMETERS                  | SYMBOL | CONDITIONS                     | MIN. | TYP. | MAX. | UNITS |
|-----------------------------|--------|--------------------------------|------|------|------|-------|
| Input Crystal Frequency     |        |                                | 12   |      | 27   | MHz   |
| Output Clock Rise/Fall Time |        | 0.3V ~ 3.0V with 15 pF load    |      | 2.4  |      | ns    |
| Output Clock Duty Cycle     |        | Measured @ 50% V <sub>DD</sub> | 45   | 50   | 55   | %     |

### 4. Voltage Control Crystal Oscillator (3.3V)

| PARAMETERS                 | SYMBOL               | CONDITIONS                                                                                      | MIN. | TYP. | MAX. | UNITS |
|----------------------------|----------------------|-------------------------------------------------------------------------------------------------|------|------|------|-------|
| VCXO Stabilization Time *  | T <sub>VCXOSTB</sub> | From power valid                                                                                |      |      | 10   | ms    |
| VCXO Tuning Range          |                      | F <sub>XIN</sub> = 12 – 25MHz;<br>XTAL C <sub>0</sub> /C <sub>1</sub> < 250<br>0V ≤ VCON ≤ 3.3V |      | 500  |      | ppm   |
| CLK output pullability     |                      | VCON=1.65V, ±1.65V                                                                              | ±200 |      |      | ppm   |
| VCXO Tuning Characteristic |                      |                                                                                                 |      | 150  |      | ppm/V |
| Pull range linearity       |                      |                                                                                                 |      |      | 10   | %     |
| VCON pin input impedance   |                      |                                                                                                 | 2000 |      |      | 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.

### 5. Jitter and Phase Noise specification

| PARAMETERS                                    | CONDITIONS                                      | MIN. | TYP. | MAX. | UNITS  |
|-----------------------------------------------|-------------------------------------------------|------|------|------|--------|
| RMS Period Jitter<br>(1 sigma – 1000 samples) | with capacitive decoupling between VDD and GND. |      | 2.2  |      | ps     |
| Phase Noise relative to carrier               | 27MHz @100Hz offset                             |      | -95  |      | dBc/Hz |
| Phase Noise relative to carrier               | 27MHz @1kHz offset                              |      | -120 |      | dBc/Hz |
| Phase Noise relative to carrier               | 27MHz @10kHz offset                             |      | -142 |      | dBc/Hz |
| Phase Noise relative to carrier               | 27MHz @100kHz offset                            |      | -150 |      | dBc/Hz |
| Phase Noise relative to carrier               | 27MHz @1MHz offset                              |      | -150 |      | dBc/Hz |

### 6. Crystal Specifications

| PARAMETERS                         | SYMBOL                | MIN. | TYP. | MAX. | UNITS |
|------------------------------------|-----------------------|------|------|------|-------|
| Crystal Resonator Frequency        | F <sub>XIN</sub>      | 12   |      | 27   | MHz   |
| Crystal Loading Capacitance Rating | C <sub>L</sub> (xtal) |      | 9.5  |      | pF    |
| C <sub>0</sub> /C <sub>1</sub>     |                       |      |      | 250  | -     |
| ESR                                | R <sub>s</sub>        |      |      | 30   | Ω     |

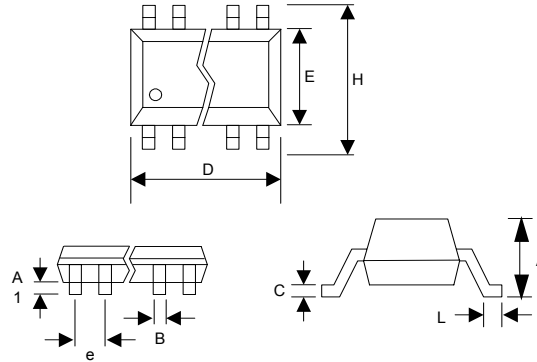
**Note:** Crystal Loading rating: 9.5pF is the loading the crystal sees from the VCXO chip at VCON = 1.65V. It is assumed that the crystal will be at nominal frequency at this load. If the crystal requires more load to be at nominal frequency, the additional load must be added externally. This however may reduce the pull range.

**Low Phase Noise VCXO (12MHz to 27MHz)**

**PACKAGE INFORMATION**

8 PIN ( dimensions in mm )

| Narrow SOIC |          |      |
|-------------|----------|------|
| Symbol      | Min.     | Max. |
| A           | 1.47     | 1.73 |
| A1          | 0.10     | 0.25 |
| B           | 0.33     | 0.51 |
| C           | 0.19     | 0.25 |
| D           | 4.80     | 4.95 |
| E           | 3.80     | 4.00 |
| H           | 5.80     | 6.20 |
| L           | 0.38     | 1.27 |
| e           | 1.27 BSC |      |



**ORDERING INFORMATION**

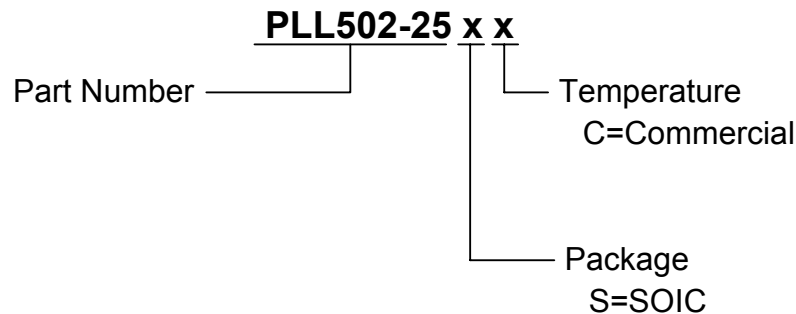
**For part ordering, please contact our Sales Department:**

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



| <u>Order Number</u> | <u>Marking</u> | <u>Package Option</u>      |
|---------------------|----------------|----------------------------|
| PLL502-25SC         | P502-25SC      | 8-Pin SOIC (Tube)          |
| PLL502-25SC-R       | P502-25SC      | 8-Pin SOIC (Tape and Reel) |

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**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331