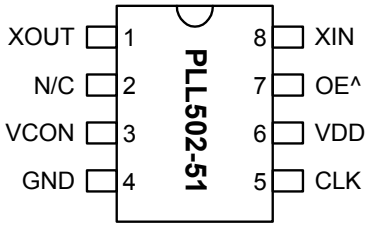
# PLL502-51

## Low Phase Noise VCXO (20MHz to 52MHz)

### FEATURES

- Integrated voltage-controlled crystal oscillator circuitry (VCXO) (pull range 380ppm minimum).
- VCXO tuning range: 0V - $V_{DD}$V.
- Uses inexpensive fundamental-mode parallel resonant crystals (from 20 to 52MHz).
- 2.5V or 3.3V supply voltage.
- Selectable High Drive (30mA) or Standard Drive (10mA) CMOS output.
- Available in 8-Pin SOIC or TSSOP.

### PIN CONFIGURATION




Note: ^ denotes internal pull up

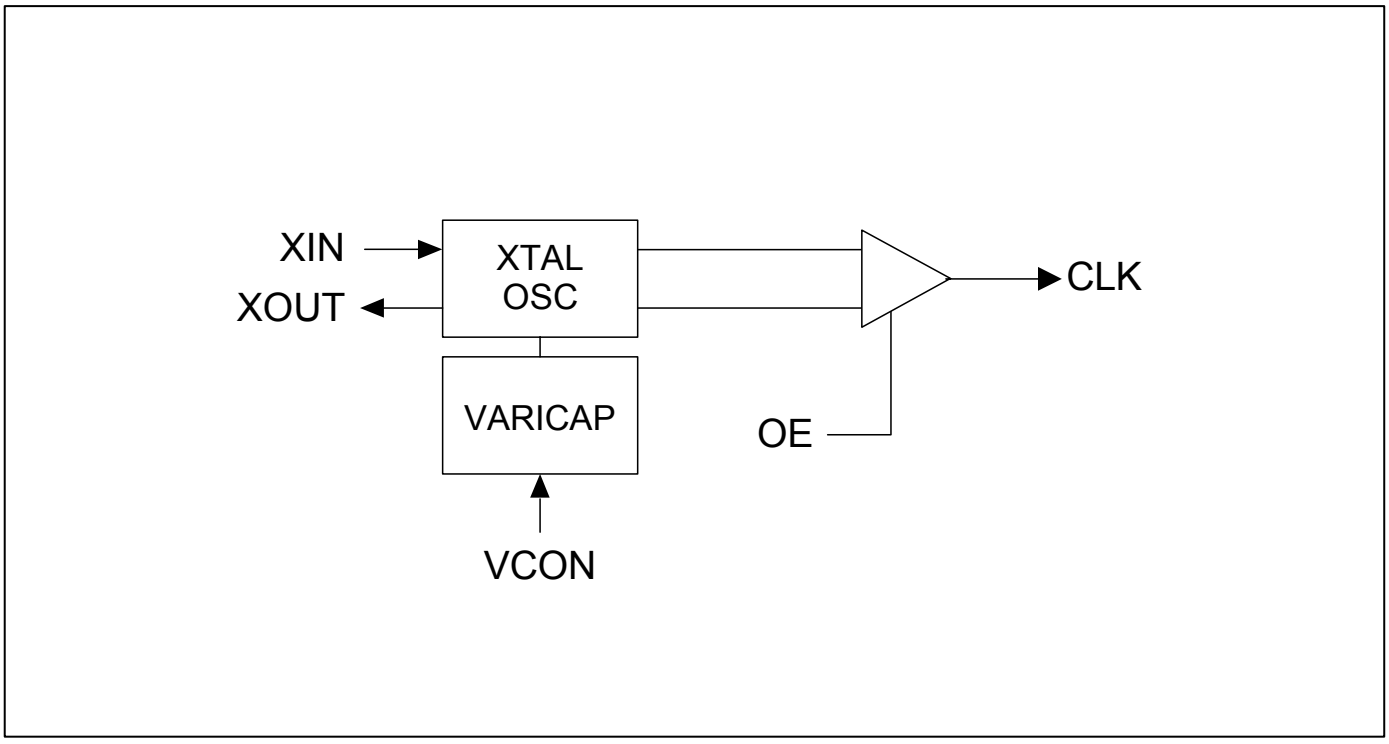
### DESCRIPTION

The PLL502-51 is a monolithic low jitter, high performance CMOS VCXO IC. It allows control of the output frequency with an input voltage (VCON), using a low cost crystal.
This makes the PLL502-51 ideal for a wide range of applications from 20MHz to 52MHz (including 27MHz, 35.328MHz, etc.).

### OUTPUT RANGE

| MULTIPLIER | FREQUENCY RANGE | OUTPUT BUFFER |
|---|---|---|
| No PLL | 20 - 52MHz | CMOS |

### BLOCK DIAGRAM



## PIN DESCRIPTIONS

| Name | Number | Type | Description |
|---|---|---|---|
| XOUT | 1 | I | Crystal output. See Crystal Specification on page 4. |
| N/C | 2 | - | Not connected. |
| VCON | 3 | I | Voltage Control input. |
| GND | 4 | P | Ground. |
| CLK | 5 | O | Output clock. |
| VDD | 6 | P | Power supply. |
| OE | 7 | I | Output enable input. Disables (tri-state) output when low. Internal pull-up enables output by default if pin is not connected to low. |
| XIN | 8 | I | Crystal input. See Crystal Specification on page 4. |

## 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 | $I_{DD}$ | $F_{XIN}$ = 20 - 52MHz<br>Output load of 10pF | | 10 | | mA |
| Operating Voltage | $V_{DD}$ | | 2.25 | | 3.63 | V |
| Output drive current (High Drive) | $I_{OH}$ | $V_{OH}$= $V_{DD}$-0.4V, $V_{DD}$=3.3V | 30 | | | mA |
| | $I_{OL}$ | $V_{OL}$ = 0.4V, $V_{DD}$ = 3.3V | 30 | | | mA |
| Output drive current (Standard Drive) | $I_{OH}$ | $V_{OH}$= $V_{DD}$-0.4V, $V_{DD}$=3.3V | 10 | | | mA |
| | $I_{OL}$ | $V_{OL}$ = 0.4V, $V_{DD}$ = 3.3V | 10 | | | mA |
| Short Circuit Current | | | | ±50 | | mA |
| VCXO Control Voltage | VCON | | 0 | | $V_{DD}$ | V |

## 3. AC Electrical Specifications

| PARAMETERS | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Input Crystal Frequency | | | 20 | | 52 | MHz |
| Output Clock Rise/Fall Time (Standard Drive) | | 0.3V ~ 3.0V with 15 pF load | | 2.4 | | ns |
| Output Clock Rise/Fall Time (High Drive) | | 0.3V ~ 3.0V with 15 pF load | | 1.2 | | |
| Output Clock Duty Cycle | | Measured @ 50% $V_{DD}$ | 45 | 50 | 55 | % |

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

| PARAMETERS | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| VCXO Stabilization Time * | $T_{VCXOSTB}$ | From power valid | | | 10 | ms |
| VCXO Tuning Range | | $F_{XIN}$ = 20 - 52MHz;<br>XTAL $C_0/C_1$ < 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 input impedance | | | | 80 | | 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 Specifications

| PARAMETERS | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|
| Period jitter RMS | 35.328 MHz | | 2.3 | | ps |
| Period jitter peak-to-peak | 35.328MHz | | 18 | | ps |
| Integrated jitter RMS | Integrated 12 kHz to 20 MHz at 35.328MHz | | 1 | | ps |

## 6. Phase Noise Specifications

| PARAMETERS | FREQUENCY | @10Hz | @100Hz | @1kHz | @10kHz | @100kHz | UNITS |
|---|---|---|---|---|---|---|---|
| Phase Noise relative to carrier | 51.85MHz | -65 | -90 | -120 | -140 | -147 | dBc/Hz |

Note: Phase Noise at VCON = 0V

## 7. Crystal Specifications

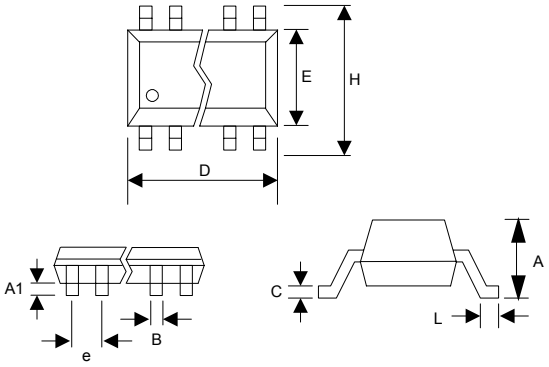
| PARAMETERS | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Crystal Resonator Frequency | $F_{XIN}$ | Parallel Fundamental Mode | 20 | | 52 | MHz |
| Crystal Loading Rating | $C_{L\ (xtal)}$ | At Vcon = 1.65V | | 9.5 | | pF |
| Crystal Pullability | $C_0/C_{1\ (xtal)}$ | AT cut | | | 250 | - |
| Recommended ESR | $R_E$ | AT cut | | | 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

## PACKAGE INFORMATION

8 PIN ( dimensions in mm )

| | Narrow SOIC | | TSSOP | |
|---|---|---|---|---|
| Symbol | Min. | Max. | Min. | Max. |
| A | 1.47 | 1.73 | - | 1.20 |
| A1 | 0.10 | 0.25 | 0.05 | 0.15 |
| B | 0.33 | 0.51 | 0.19 | 0.30 |
| C | 0.19 | 0.25 | 0.09 | 0.20 |
| D | 4.80 | 4.95 | 2.90 | 3.10 |
| E | 3.80 | 4.00 | 4.30 | 4.50 |
| H | 5.80 | 6.20 | 6.20 | 6.60 |
| L | 0.38 | 1.27 | 0.45 | 0.75 |
| e | 1.27 BSC | | 0.65 BSC | |



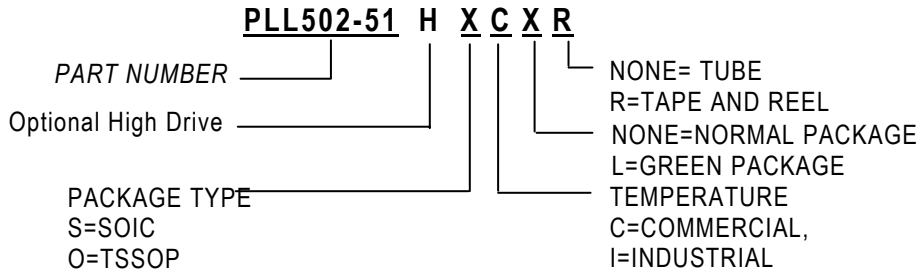
## ORDERING INFORMATION

***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 |
|---|---|---|
| PLL502-51OC | P502-51OC | TSSOP – Tube |
| PLL502-51OC-R | P502-51OC | TSSOP - Tape and Reel |
| PLL502-51OCL | P502-51OCL | TSSOP – Tube, GREEN |
| PLL502-51OCL-R | P502-51OCL | TSSOP - Tape and Reel, GREEN |
| PLL502-51HOC | P502-51HOC | TSSOP – Tube |
| PLL502-51HOC-R | P502-51HOC | TSSOP - Tape and Reel |
| PLL502-51HOCL | P502-51HOCL | TSSOP – Tube, GREEN |
| PLL502-51HOCL-R | P502-51HOCL | TSSOP - Tape and Reel, GREEN |
| PLL502-51SC | P502-51SC | SOIC - Tube |
| PLL502-51SC-R | P502-51SC | SOIC - Tape and Reel |
| PLL502-51SCL | P502-51SCL | SOIC – Tube, GREEN |
| PLL502-51SCL-R | P502-51SCL | SOIC - Tape and Reel, GREEN |
| PLL502-51HSC | P502-51HSC | SOIC - Tube |
| PLL502-51HSC-R | P502-51HSC | SOIC - Tape and Reel |
| PLL502-51HSCL | P502-51HSCL | SOIC – Tube, GREEN |
| PLL502-51HSCL-R | P502-51HSCL | SOIC - Tape and Reel, GREEN |

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