

Multiplier XO IC Die for 12 to 25MHz Parallel Resonant Crystals

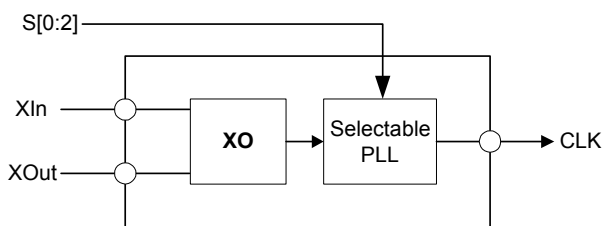
FEATURES

- Integrated crystal oscillator circuitry (XO).
- Low phase noise (-135dBc @ 10kHz offset) selectable frequency multipliers (x1, x2, x4, x8 as bonding options).
- 3.3V supply voltage.
- Uses inexpensive fundamental-mode parallel resonant crystals (from 12 to 25MHz).
- Selectable High Drive (30mA) or Standard Drive (10mA) output.
- Available in DIE (65 mil x 62 mil).

DESCRIPTION

The PLL602-00 is a monolithic low jitter and low phase noise (-135dBc @10kHz offset), high performance CMOS XO IC. This flexible device can be used as a XO with output frequencies ranging from $F_{XIN} \times 1$ to $F_{XIN} \times 8$ thanks to selector pads allowing bonding options (see Divider Selection Table on this page). This makes the PLL602-00 ideal for a wide range of applications from 12MHz to 200MHz (including 50MHz, 77.76MHz, 125MHz and 155.52MHz, etc.).

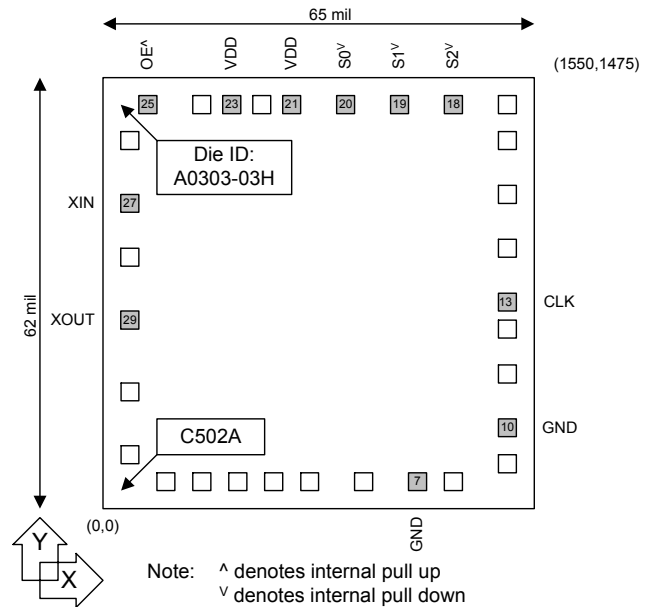
BLOCK DIAGRAM



DIE SPECIFICATIONS

| Name | Value |
|----------------|-----------------------|
| Size | 62 x 65 mil |
| Reverse side | GND |
| Pad dimensions | 80 micron x 80 micron |
| Thickness | 10 mil |

DIE CONFIGURATION



MULTIPLIER SELECTION

| SELECTION | | | F_{XIN} | CLK (MHz) |
|-----------|----|----|---------------|----------------------|
| S2 | S1 | S0 | | |
| 0 | 0 | 0 | 12MHz – 25MHz | $F_{XIN} \times 2$ |
| 0 | 0 | 1 | | $F_{XIN} \times 4$ |
| 0 | 1 | 0 | | $F_{XIN} \times 1$ |
| 1 | 0 | 0 | | $F_{XIN} \times 8$ |
| 0 | 1 | 1 | | $F_{XIN} \times 2^*$ |
| 1 | 1 | 0 | | $F_{XIN} \times 4^*$ |
| 1 | 0 | 1 | | $F_{XIN} \times 1^*$ |
| 1 | 1 | 1 | | $F_{XIN} \times 8^*$ |

Note: - Selector pads default to '0', wire bond to VDD to set to '1'
 - (*) High-drive CMOS output

PAD DESCRIPTION

| Name | Number | Description |
|--------|----------|---|
| XIN | 27 | Crystal input connection. |
| XOUT | 29 | Crystal connection. |
| GND | 7,10 | Ground. |
| CLK | 13 | Clock Output. |
| S[0:2] | 18,19,20 | Frequency selection pad |
| VDD | 21,22,23 | 3.3V Power Supply. |
| OE | 25 | Output Enable: '0' to disable (tri-state output), '1' (default value when not connected) to enabled the output. |

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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} | $F_{XIN} = 12 - 25\text{MHz}$ Output load of 10pF | | 16 | 20 | mA |
| Operating Voltage | V_{DD} | | 2.97 | | 3.63 | V |
| Output drive current (High Drive) | I_{OH} | $V_{OH} = V_{DD}-0.4\text{V}$, $V_{DD}=3.3\text{V}$ | 30 | | | mA |
| | I_{OL} | $V_{OL} = 0.4\text{V}$, $V_{DD} = 3.3\text{V}$ | 30 | | | mA |
| Output drive current (Standard Drive) | 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 |

3. AC Electrical Specifications

| PARAMETERS | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|--------|-----------------------------|------|------|------|-------|
| Input Crystal Frequency | | | 12 | | 25 | 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 | % |

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4. Crystal Specifications

| PARAMETERS | SYMBOL | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|-----------------------------|--------------|---------------------------|------|------|------|----------|
| Crystal Resonator Frequency | F_{XIN} | Parallel Fundamental Mode | 12 | | 25 | MHz |
| Crystal Loading Rating | C_L (xtal) | | | 20 | | pF |
| Recommended ESR | R_E | AT cut | | | 30 | Ω |

5. Jitter and Phase Noise Specification

| PARAMETERS | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|--|------|------|------|--------|
| RMS Period Jitter (1 sigma – 1000 samples) | at 155MHz, with capacitive decoupling between VDD and GND. | | 4 | | ps |
| | at 80MHz, with capacitive decoupling between VDD and GND. | | 3 | | |
| | at 44MHz, with capacitive decoupling between VDD and GND. | | 2.5 | | |
| Phase Noise relative to carrier | 44MHz @100Hz offset | | -80 | | dBc/Hz |
| Phase Noise relative to carrier | 44MHz @1kHz offset | | -110 | | dBc/Hz |
| Phase Noise relative to carrier | 44MHz @10kHz offset | | -135 | | dBc/Hz |
| Phase Noise relative to carrier | 44MHz @100kHz offset | | -130 | | dBc/Hz |
| Phase Noise relative to carrier | 44MHz @1MHz offset | | -132 | | dBc/Hz |
| Phase Noise relative to carrier | 155MHz @100Hz offset | | -80 | | dBc/Hz |
| Phase Noise relative to carrier | 155MHz @1kHz offset | | -110 | | dBc/Hz |
| Phase Noise relative to carrier | 155MHz @10kHz offset | | -125 | | dBc/Hz |
| Phase Noise relative to carrier | 155MHz @100kHz offset | | -120 | | dBc/Hz |
| Phase Noise relative to carrier | 155MHz @1MHz offset | | -125 | | dBc/Hz |

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PAD ASSIGNMENT

| Pad # | Name | X (μm) | Y (μm) | Description |
|-------|------|--------|--------|---|
| 7 | GND | 1042 | 109 | Ground. |
| 10 | GND | 1400 | 259 | Ground. |
| 13 | CLK | 1400 | 716 | CMOS clock output. |
| 18 | S2 | 1232 | 1365 | Used to select multiplication factor and drive level. Internal pull down. |
| 19 | S1 | 1042 | 1365 | Used to select multiplication factor and drive level. Internal pull down. |
| 20 | S0 | 854 | 1365 | Used to select multiplication factor and drive level. Internal pull down. |
| 21 | VDD | 659 | 1365 | 3.3V power supply. |
| 23 | VDD | 459 | 1365 | 3.3V power supply. |
| 25 | OE | 194 | 1365 | Used to enable/disable the output(s). Internal pull up. |
| 27 | XIN | 109 | 1017 | Crystal input. See crystal specification page 3. |
| 29 | XOUT | 109 | 646 | Crystal output. See crystal specification page 3. |

ORDERING INFORMATION

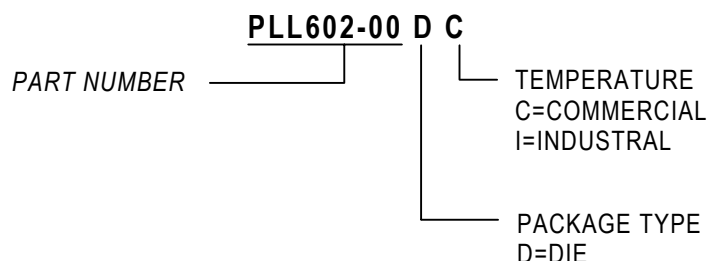
For part ordering, please contact our Sales Department:

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 |
|--------------|-----------|-------------------|
| PLL602-00DC | P602-00DC | Die – Waffle Pack |

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