

**Ultra Low Current XO (Crystals from 10 MHz to 52 MHz)**

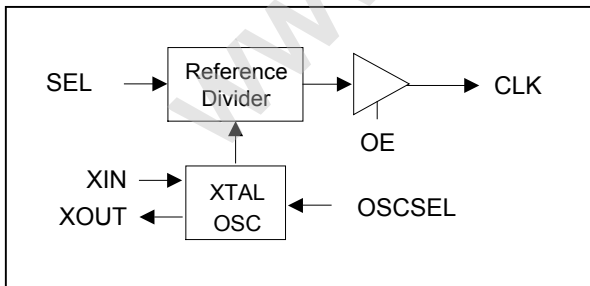
**FEATURES**

- Low phase noise (-130 dBc @ 10kHz offset).
- CMOS output with OE tri-state control.
- Selectable oscillator “on” or “off” feature in output disable mode
- Ultra Low current consumption (<2.5mA, <2mA, <1.3mA at 27MHz respectively for PLL600-17, PLL600-27, and PLL600-37)
- Ultra Low disable mode current (<2uA when disabled with osc. off)
- 10 to 52MHz fundamental crystal input.
- Selectable divider by 2 (PLL600-17 only).
- 12mA drive capability at TTL output.
- Low jitter (RMS): 2.5ps period jitter.
- 2.25V to 3.63V DC operation.
- Available in 8 pin SOIC, 6 pin SOT or DIE.

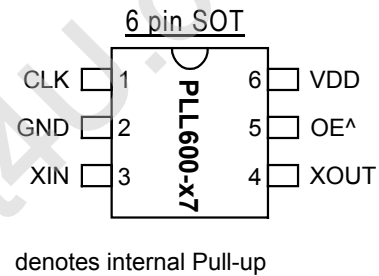
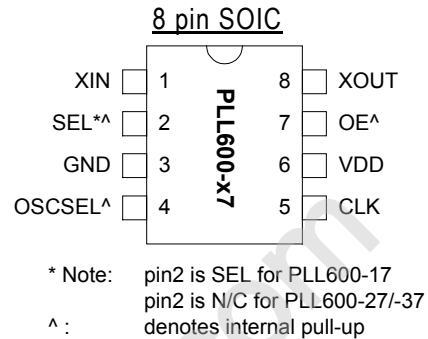
**DESCRIPTION**

The PLL600-17/-27/-37 form a low cost family of XO IC’s, designed to consume the lowest current on the market for the 5MHz to 52MHz range. It accepts input crystal from 10 to 52MHz (fundamental resonant mode) and offers a selectable divider by 2 (PLL600-17 only) or no division. Providing less than -130dBc at 10kHz offset at 30MHz, and with a very low jitter (2.5 ps RMS period jitter) makes this chip ideal for applications requiring low current frequency sources, such as handheld devices.

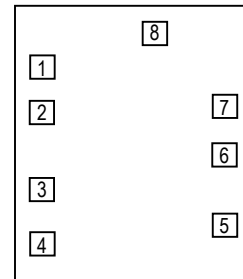
**BLOCK DIAGRAM**



**PIN ASSIGNMENT (PACKAGE)**



**PAD ASSIGNMENT (DIE)**



**SELECTION TABLE**

| SEL (PLL600-17 only) | DIVIDER     |
|----------------------|-------------|
| 0                    | / 2         |
| 1                    | No division |

Internal Pull-up, default value is '1' when not connected.  
Selectable divider only available on P600-17.

| OE | OSCSEL | OUTPUT              |
|----|--------|---------------------|
| 0  | 0      | Disabled - osc. off |
| 0  | 1      | Disabled - osc. on  |
| 1  | 0      | Enabled             |
| 1  | 1      | Enabled             |

Internal Pull-up, default value is '1' when not connected.  
Not available in 6 pin SOT package.

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**PIN DESCRIPTION**

| Name   | Pin # |       | Die Pad Position |         | Type | Description                                                                   |
|--------|-------|-------|------------------|---------|------|-------------------------------------------------------------------------------|
|        | 8 pin | 6 pin | X (μm)           | Y (μm)  |      |                                                                               |
| XOUT   | 1     | 4     | 94.183           | 768.599 | I    | Crystal output pin.                                                           |
| SEL    | 2     | n/a   | 94.157           | 605.029 | I    | PLL600-17 only: select pin. See Table on page 1.<br>PLL600-27/-37: no connect |
| GND    | 3     | 2     | 94.183           | 331.756 | P    | Ground pin.                                                                   |
| OSCSEL | 4     | n/a   | 94.193           | 140.379 | I    | Disable mode select pin. See Table on page 1.                                 |
| CLK    | 5     | 1     | 715.472          | 203.866 | O    | Output clock pin.                                                             |
| VDD    | 6     | 6     | 715.307          | 455.726 | P    | +3.3V VDD power supply pin.                                                   |
| OE     | 7     | 5     | 715.472          | 626.716 | I    | Output Enable input pin. See Table on page 1.                                 |
| XIN    | 8     | 3     | 715.472          | 888.881 | I    | Crystal input pin.                                                            |

SEL and OSCSEL have internal pull-ups, so the default value is '1' when not connected (not available on 6 pin package).

**ELECTRICAL SPECIFICATIONS**
**1. Absolute Maximum Ratings**

| PARAMETERS                     | SYMBOL          | MIN. | MAX.                 | UNITS |
|--------------------------------|-----------------|------|----------------------|-------|
| Supply Voltage Range           | V <sub>CC</sub> | -0.5 | 7                    | V     |
| Input Voltage Range            | V <sub>I</sub>  | -0.5 | V <sub>CC</sub> +0.5 | V     |
| Output Voltage Range           | V <sub>O</sub>  | -0.5 | V <sub>CC</sub> +0.5 | V     |
| Soldering Temperature          |                 |      | 260                  | °C    |
| Storage Temperature            | T <sub>S</sub>  | -65  | 150                  | °C    |
| Ambient Operating Temperature* |                 | 0    | 70                   | °C    |

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.

**Ultra Low Current XO (Crystals from 10 MHz to 52 MHz)**
**2. AC Electrical Specifications**

| PARAMETERS                  | CONDITIONS                     | MIN. | TYP. | MAX. | UNITS |
|-----------------------------|--------------------------------|------|------|------|-------|
| Input Crystal Frequency     |                                | 10   |      | 52   | MHz   |
| Settling time               | At power-up (Vdd reaches 2.2V) |      | 10*  |      | ms    |
|                             | Disable to enable, osc. Off    |      | 10*  |      | ms    |
|                             | Disable to enable, osc. On     |      |      | 500* | μs    |
| Output Clock Rise/Fall Time | 0.8V ~ 2.0V with 10 pF load    |      | 1.15 |      | ns    |
|                             | 0.3V ~ 3.0V with 15 pF load    |      | 3.7  |      |       |
| VDD sensitivity             | Frequency vs. VDD +/- 10%      | 0.8  |      | 0.8  | ppm   |
| Output Clock Duty Cycle     | Measured @ 1.4V                | 45   | 50   | 55   | %     |
| Short Circuit Current       |                                |      | ±50  |      | mA    |

Note: (\*) Preliminary Specifications still to be characterized.

**3. 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. |      | 2.1  | 2.5  | ps     |
| Phase Noise relative to carrier               | 30MHz @100Hz offset                             |      | -80  |      | dBc/Hz |
| Phase Noise relative to carrier               | 30MHz @1kHz offset                              |      | -110 |      | dBc/Hz |
| Phase Noise relative to carrier               | 30MHz @10kHz offset                             |      | -130 |      | dBc/Hz |
| Phase Noise relative to carrier               | 30MHz @100kHz offset                            |      | -138 |      | dBc/Hz |
| Phase Noise relative to carrier               | 30MHz @1MHz offset                              |      | -145 |      | dBc/Hz |

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**4. DC Specification**

| PARAMETERS                                                                                            | SYMBOL           | CONDITIONS                               | MIN.                  | TYP.            | MAX.            | UNITS |
|-------------------------------------------------------------------------------------------------------|------------------|------------------------------------------|-----------------------|-----------------|-----------------|-------|
| Supply Current, Dynamic, with Loaded Outputs<br>(at VDD = 3.3V)<br>Respectively for PLL600-17/-27/-37 | I <sub>DD</sub>  | At 10MHz, Cload=15pF                     |                       | 1.3 / 1 / 0.75  | 1.4 / 1.1 / 0.9 | mA    |
|                                                                                                       |                  | At 13.5MHz, Cload=15pF                   |                       | 1.5 / 1.2 / 0.8 | 1.6 / 1.3 / 1   |       |
|                                                                                                       |                  | At 17.7MHz, Cload=15pF                   |                       | 1.8 / 1.5 / 1   | 1.9 / 1.6 / 1.1 |       |
|                                                                                                       |                  | At 27MHz, Cload=15pF                     |                       | 2.4 / 2 / 1.2   | 2.5 / 2.1 / 1.3 |       |
|                                                                                                       |                  | At 48MHz, Cload=15pF                     |                       | 4.1 / 3.5 / 2.1 | 4.2 / 3.6 / 2.2 |       |
| Supply Current in tri-state                                                                           | I <sub>DD</sub>  | Output disabled, Osc. off                |                       | 2               | 4               | μA    |
|                                                                                                       |                  | Output disabled, Osc. On (PLL600-17)     |                       |                 | 620             | μA    |
|                                                                                                       |                  | Output disabled, Osc. On (PLL600-27/-37) |                       |                 | 520             |       |
| Operating Voltage                                                                                     | V <sub>DD</sub>  |                                          | 2.25                  |                 | 3.63            | V     |
| Output High Voltage                                                                                   | V <sub>OH</sub>  | I <sub>OH</sub> = -12mA*                 | 2.4                   |                 |                 | V     |
|                                                                                                       |                  | PLL600-37*, I <sub>OH</sub> = -12mA*     | 2.4                   | 2.9             |                 | V     |
| Output Low Voltage                                                                                    | V <sub>OL</sub>  | I <sub>OL</sub> = 12mA*                  |                       |                 | 0.4             | V     |
|                                                                                                       |                  | PLL600-37*, I <sub>OL</sub> = 12mA*      |                       | 0.32            | 0.4             | V     |
| Output High Voltage at CMOS level (PLL600-17/-27)                                                     | V <sub>OHC</sub> | I <sub>OH</sub> = -4mA                   | V <sub>DD</sub> - 0.4 |                 |                 | V     |
| Output drive current (PLL600-17/-27)                                                                  |                  | At TTL level                             | 12                    | 17              |                 | mA    |
| Short Circuit Current                                                                                 |                  |                                          |                       | ±50             |                 | mA    |
| ESD Protection                                                                                        |                  | Human Body Model                         | 3000                  |                 |                 | V     |

\* Note: PLL600-37 has non-standard CMOS V<sub>OH</sub> and V<sub>OL</sub> levels for lower current consumption, but meets CMOS input stage needs. PLL600-37 should be used to drive pure capacitive loads only.

**5. Crystal Specifications**

| PARAMETERS                                   | SYMBOL                | MIN. | TYP. | MAX. | UNITS |
|----------------------------------------------|-----------------------|------|------|------|-------|
| Crystal Resonator Frequency                  | F <sub>XIN</sub>      | 10   |      | 52   | MHz   |
| Crystal Loading Rating                       | C <sub>L</sub> (xtal) |      | 8.5  |      | pF    |
| Maximum Sustainable Drive Level              |                       |      |      | 200  | μW    |
| Operating Drive Level                        |                       |      | 50   |      | μW    |
| C <sub>0</sub> (for frequencies below 30MHz) |                       |      |      | 5    | pF    |
| C <sub>0</sub> (for frequencies above 30MHz) |                       |      |      | 4    | pF    |
| ESR                                          | R <sub>s</sub>        |      |      | 30   | Ω     |

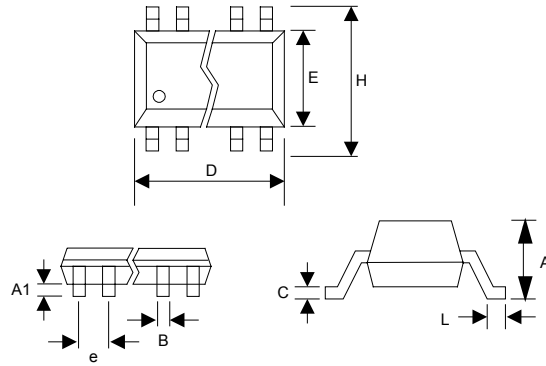
Note: A detailed crystal specification document is also available for this part

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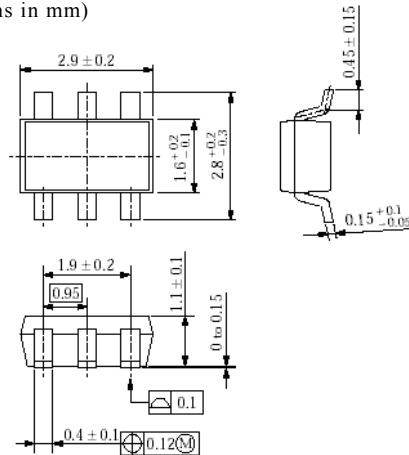
**PACKAGE INFORMATION**

8 PIN ( dimensions in mm )

| Symbol | Narrow SOIC |      | TSSOP    |      |
|--------|-------------|------|----------|------|
|        | 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 |      |



6 PIN SOT (dimensions in mm)

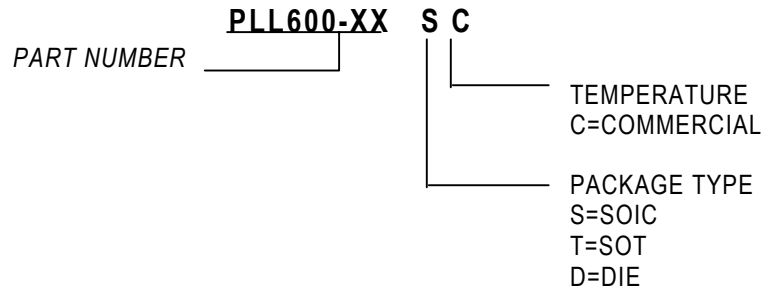


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**ORDERING INFORMATION**

**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> |
|---------------------|----------------|-----------------------|
| PLL600-17SC-R       | P600-17 SC     | 8SOIC - Tape and Reel |
| PLL600-17TC         | A17D0          | 6SOT - Tube           |
| PLL600-17TC-R       | A17D0          | 6SOT - Tape-Reel      |
| PLL600-17DC         | P600-27        | Die - Waffe Pack      |
| PLL600-27SC-R       | P600-27 SC     | 8SOIC - Tape and Reel |
| PLL600-27TC         | A27A1          | 6SOT - Tube           |
| PLL600-27TC-R       | A27A1          | 6SOT - Tape-Reel      |
| PLL600-27DC         | P600-27        | Die - Waffe Pack      |
| PLL600-37SC-R       | P600-37 SC     | 8SOIC - Tape and Reel |
| PLL600-37TC         | A37A2          | 6SOT - Tube           |
| PLL600-37TC-R       | A37A2          | 6SOT - Tape-Reel      |
| PLL600-37DC         | P600-37        | Die - Waffe Pack      |

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