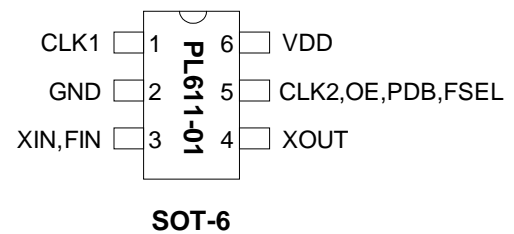
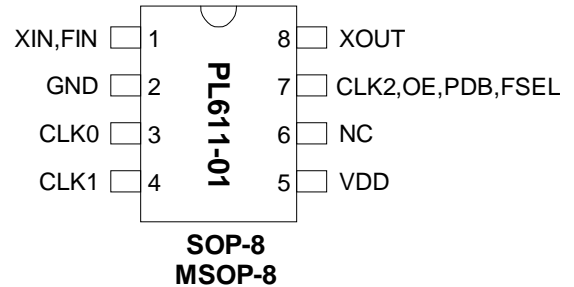


### FEATURES

- Advanced programmable PLL design
- Very low Jitter and Phase Noise (30-70ps Pk-Pk typical)
- Up to 3 programmable outputs
- Output frequency up to 200MHz CMOS.
- Accepts Crystal or reference clock inputs
  - Fundamental crystal: 10MHz-30MHz
  - 3<sup>RD</sup> overtone crystal: Up to 75MHz
  - Reference input: Up to 200MHz
- Accepts <1.0V reference signal input voltage
- One programmable I/O pin can be configured as Programmable clock, or Frequency Selection input, or output Enable (OE) or Power Down (PDB) input.
- Supply operating range 2.25V to 3.63V
- Operating temperature range from -40°C to 85°C
- Available in 8-pin MSOP/SOP, and 6-pin SOT Green/ RoHS compliant Packages

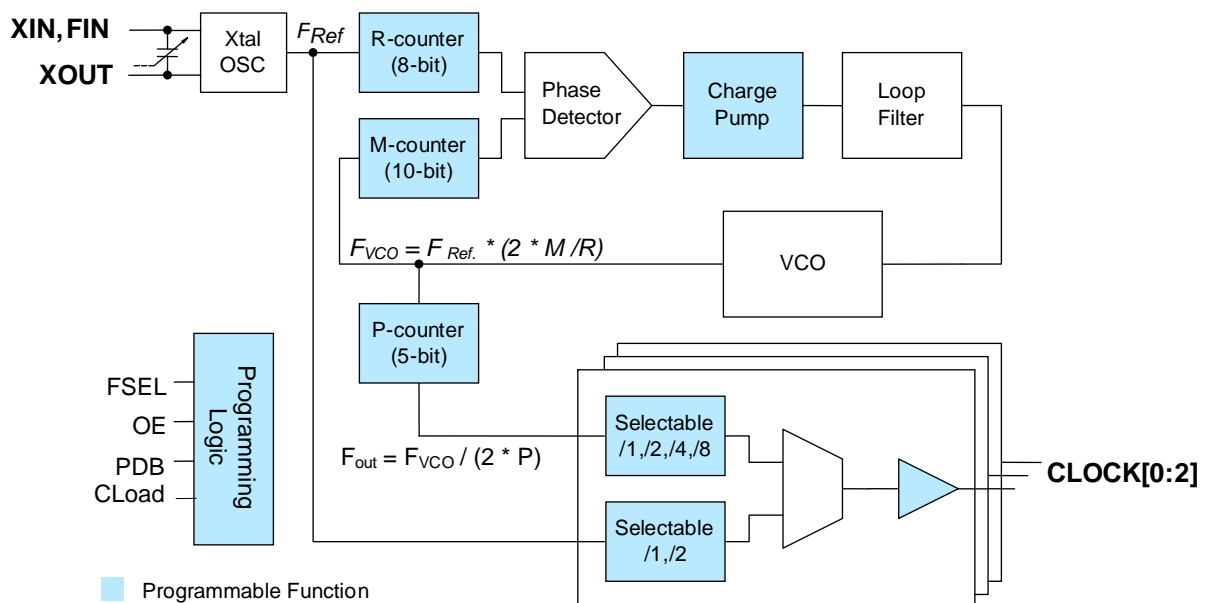
### PIN CONFIGURATION



### DESCRIPTION

The PL611-01 is a low-cost general purpose frequency synthesizer and a member of Programmable Clock family. PL611-01 product family offers the versatility of using a single Crystal or Reference Clock input and producing up to three different system clocks. They can generate any output frequency up to 200 MHz from fundamental crystal input between 10 MHz - 30 MHz, or a 3rd overtone crystal of up to 75MHz, or a Reference clock input of up to 200 MHz. Cascading of the ICs to produce additional clock frequencies is also supported.

### BLOCK DIAGRAM



**KEY PROGRAMMING PARAMETERS**

| CLK[ 0:2 ]<br>Output Frequency   | Output Drive<br>Strength              | Crystal<br>Load    | Programmable<br>Input/Output  | Charge-Pump<br>Current            |
|--|---------------------------------------|--------------------|---|-----------------------------------|
| $F_{OUT} = F_{REF} * M / (R * P)$<br>where M=10 bit<br>R= 8 bit<br>P= 5 bit<br>$CLK[0:2] = F_{out} / (1,2,4,8), F_{REF} \text{ OR } F_{REF} / 2$ | Std: 10mA (default)<br><br>High: 24mA | +/- 200ppm tuning. | One output pin can be configured as<br>1. CLK2 - output<br>2. FSEL - input<br>3. OE - input<br>4. PDB - input | 4 levels of pump current settings |

**PIN DESCRIPTION**

| Name                | Pin #             |                 | Type             | Description   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
|---------------------|-------------------|-----------------|------------------|---|-------|----|-----|------|---|-------------------|-----------------|------------------|-------------|-------------|-------------|------------------|
|                     | MSOP-8<br>SOIC-8  | SOT-23          |                  |   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| XIN, FIN            | 1                 | 3               | I                | Crystal or Reference input pin  |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| GND                 | 2                 | 2               | P                | GND connection  |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| CLK[0:1]            | 3,4               | 1               | O                | Programmable Clock Output   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| VDD                 | 5                 | 6               | P                | VDD connection (2.25~3.63V)   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| NC                  | 6                 |                 |                  | No Connect  |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| CLK2, OE, PDB, FSEL | 7                 | 5               | B                | This programmable I/O pin can be configured as a programmable clock output (CLK2), or Output Enable (OE) input, or Power Down input (PDB), or Frequency Selection (FSEL) input pin. This pin has an internal 60KΩ pull up resistor. <table border="1" data-bbox="852 1381 1481 1556"> <thead> <tr> <th>State</th> <th>OE</th> <th>PDB</th> <th>FSEL</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Tristate CLK[0:1]</td> <td>Power Down Mode</td> <td>Select Freq. '1'</td> </tr> <tr> <td>1 (default)</td> <td>Normal mode</td> <td>Normal mode</td> <td>Select Freq. '2'</td> </tr> </tbody> </table> | State | OE | PDB | FSEL | 0 | Tristate CLK[0:1] | Power Down Mode | Select Freq. '1' | 1 (default) | Normal mode | Normal mode | Select Freq. '2' |
| State               | OE                | PDB             | FSEL             |   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| 0                   | Tristate CLK[0:1] | Power Down Mode | Select Freq. '1' |   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| 1 (default)         | Normal mode       | Normal mode     | Select Freq. '2' |   |       |    |     |      |   |                   |                 |                  |             |             |             |                  |
| XOUT                | 8                 | 4               | O                | Crystal output pin  |       |    |     |      |   |                   |                 |                  |             |             |             |                  |

**ELECTRICAL SPECIFICATIONS**
**ABSOLUTE MAXIMUM RATINGS**

| PARAMETERS                            | SYMBOL   | MIN. | MAX.         | UNITS |
|---------------------------------------|----------|------|--------------|-------|
| Supply Voltage Range                  | $V_{DD}$ | -0.5 | 4.6          | V     |
| Input Voltage Range                   | $V_i$    | -0.5 | $V_{DD}+0.5$ | V     |
| Output Voltage Range                  | $V_o$    | -0.5 | $V_{DD}+0.5$ | V     |
| Soldering Temperature (Green package) |          |      | 260          | °C    |
| Storage Temperature                   | $T_s$    | -65  | 150          | °C    |
| Ambient Operating Temperature         |          | -40  | 85           | °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. \*Operating temperature is guaranteed by design. Parts are tested to commercial grade only.

**AC SPECIFICATIONS**

| PARAMETERS   | CONDITIONS  | MIN. | TYP. | MAX.     | UNITS         |
|--|---|------|------|----------|---------------|
| Crystal Input Frequency(XIN)                           | Fundamental Crystal   | 10   |      | 30       | MHz           |
|  | 3 <sup>rd</sup> Overtone Crystal  |      |      | 75       | MHz           |
| Input (FIN) Frequency                                  |   |      |      | 200      | MHz           |
| Input (FIN) Signal Amplitude                           | Internally AC coupled   | 0.9  |      | $V_{DD}$ | Vpp           |
| Settling Time  | At power-up (after $V_{DD}$ increases over 2.25V)                               |      |      | 2        | ms            |
| Output Enable Time                                     | OE Function; $T_a=25^\circ\text{C}$ , 15pF Load                                 |      |      | 100      | $\mu\text{s}$ |
|  | PDB Function; $T_a=25^\circ\text{C}$ , 15pF Load                                |      |      | 2        | ms            |
| PLL Settling Time                                      | After Crystal Start Up (Crystal Input)  |      |      | 100      | $\mu\text{s}$ |
|  | After Reference Input Present (FIN)   |      |      | 100      | $\mu\text{s}$ |
| Output Rise Time                                       | 15pF Load, 10/90% $V_{DD}$ , Standard drive                                     |      | 2.5  | 3.5      | ns            |
|  | 15pF Load, 10/90% $V_{DD}$ , High drive   |      | 1.0  | 1.5      | ns            |
| Output Fall Time                                       | 15pF Load, 90/10% $V_{DD}$ , Standard drive                                     |      | 2.5  | 3.5      | ns            |
|  | 15pF Load, 90/10% $V_{DD}$ , High drive   |      | 1.0  | 1.5      | ns            |
| Duty Cycle   | At $V_{DD}/2$   | 45   | 50   | 55       | %             |
| Max. output skew between same frequency clocks         | Equal loading (15 pF). Equal frequency & drive strength                         |      |      | 500      | ps            |
| Period Jitter, peak-to-peak* (10,000 samples measured) | With capacitive decoupling between $V_{DD}$ and GND. Operating only one output. |      | 70   |          | ps            |

\* Note: Jitter performance depends on the programming parameters.

**DC SPECIFICATIONS**

| PARAMETERS                                   | SYMBOL           | CONDITIONS                                     | MIN.                  | TYP. | MAX. | UNITS |
|--|------------------|--|-----------------------|------|------|-------|
| Supply Current, Dynamic, with Loaded Outputs | I <sub>DD</sub>  | At 10MHz, load=15pF (PDB=1)                    |                       |      | 15   | mA    |
|  |                  | PDB=0  |                       |      | 5    | μA    |
| Operating Voltage                            | V <sub>DD</sub>  |  | 2.25                  |      | 3.63 | V     |
| Output Low Voltage                           | V <sub>OL</sub>  | I <sub>OL</sub> = +4mA<br>Standard drive       |                       |      | 0.4  | V     |
| Output High Voltage                          | V <sub>OH</sub>  | I <sub>OH</sub> = -4mA<br>Standard drive       | V <sub>DD</sub> - 0.4 |      |      | V     |
| Output Current, Standard drive               | I <sub>OSD</sub> | V <sub>OL</sub> = 0.4V, V <sub>OH</sub> = 2.4V |                       |      | 10   | mA    |
| Output Current, High drive                   | I <sub>OHD</sub> | V <sub>OL</sub> = 0.4V, V <sub>OH</sub> = 2.4V |                       |      | 24   | mA    |
| Short-circuit Current                        | I <sub>S</sub>   |  |                       | ±50  |      | mA    |

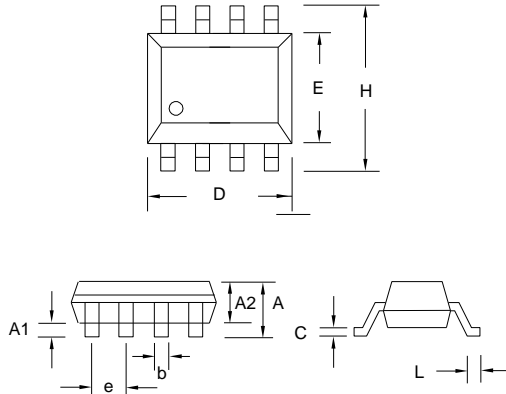
**CRYSTAL SPECIFICATIONS**

| PARAMETERS   | SYMBOL                | MIN. | TYP. | MAX.   | UNITS |
|--|-----------------------|------|------|--------|-------|
| Fundamental Crystal Resonator Frequency  | F <sub>XIN</sub>      | 10   |      | 30     | MHz   |
| 3 <sup>rd</sup> Overtone Crystal Resonator Frequency   | F <sub>XIN</sub>      |      |      | 75     | MHz   |
| Crystal Loading Rating<br>(The IC can be programmed for any value in this range.)  | C <sub>L (xtal)</sub> | 5    |      | 20     | pF    |
| Maximum Sustainable Drive Level  |                       |      |      | 500    | μW    |
| Operating Drive Level  |                       |      | 100  |        | μW    |
| Crystal Shunt Capacitance  | C <sub>0</sub>        |      |      | 6      | pF    |
| Effective Series Resistance, Fundamental, 10-30MHz   | ESR                   |      |      | 30     | Ω     |
| Effective Series Resistance, 3 <sup>rd</sup> Overtone, 30-50MHz<br>[C <sub>0</sub> < 4pF, C <sub>L</sub> =(5pF)/(8pF)]     | ESR                   |      |      | 100/70 | Ω     |
| Effective Series Resistance, 3 <sup>rd</sup> Overtone, 50-65MHz,<br>[C <sub>0</sub> < 4pF, C <sub>L</sub> =5pF(5pF)/(8pF)] | ESR                   |      |      | 60/40  | Ω     |
| Effective Series Resistance, 3 <sup>rd</sup> Overtone, 65-75MHz<br>[C <sub>0</sub> < 4pF, C <sub>L</sub> =(5pF)/(8pF)]     | ESR                   |      |      | 45/30  | Ω     |

### PACKAGE DRAWINGS (GREEN PACKAGE COMPLIANT)

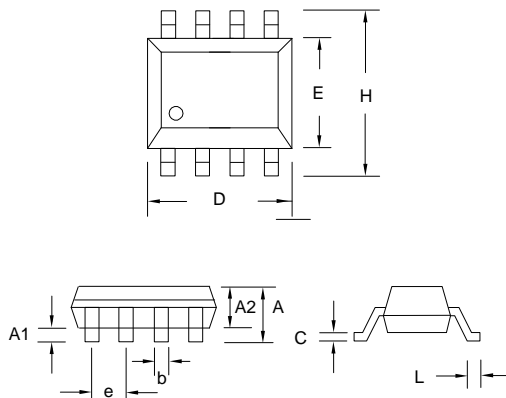
#### MSOP-8L

| Symbol | Dimension in MM |       |
|--------|-----------------|-------|
|        | Min.            | Max.  |
| A      | ---             | 1.10  |
| A1     | 0.05            | 0.15  |
| A2     | 0.81            | 0.91  |
| B      | 0.25            | 0.40  |
| C      | 0.13            | 0.23  |
| D      | 2.90            | 3.10  |
| E      | 2.90            | 3.10  |
| H      | 4.90 BSC        |       |
| L      | 0.445           | 0.648 |
| e      | 0.65 BSC        |       |



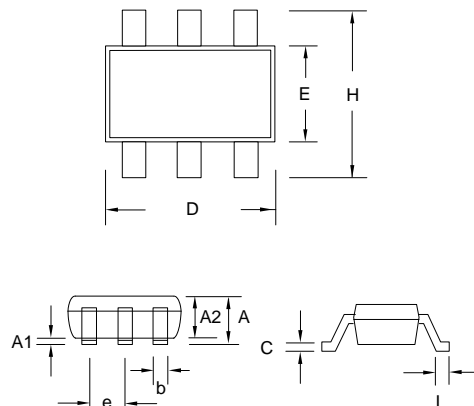
#### SOP-8L

| 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            | 1.45 |
| A1     | 0.05            | 0.15 |
| A2     | 0.90            | 1.30 |
| b      | 0.30            | 0.50 |
| C      | 0.08            | 0.22 |
| D      | 2.80 BSC        |      |
| E      | 1.60 BSC        |      |
| H      | 2.80 BSC        |      |
| L      | 0.30            | 0.60 |
| e      | 0.95 BSC        |      |



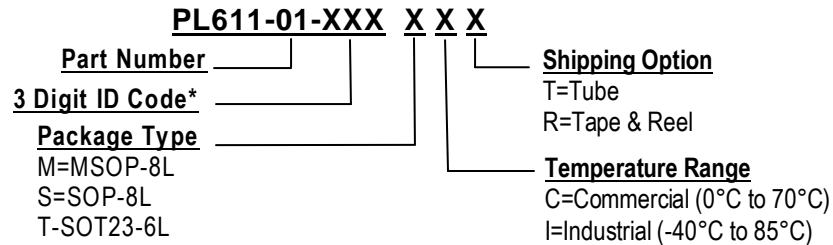
### ORDERING INFORMATION (GREEN PACKAGE COMPLIANT)

**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



\* Micrel will assign a unique 3-digit ID code for each approved programmed part number.

| Part / Order Number | Marking        | Part / Order Number | Marking         | Package Option               |
|---------------------|----------------|---------------------|-----------------|------------------------------|
| PL611-01-XXXMC      | C1XXX          | PL611-01-XXXMI      | C1XXX           | 8-Pin MSOP (Tube)            |
| PL611-01-XXXMC-R    | LLL            | PL611-01-XXXMI-R    | LLLI            | 8-Pin MSOP (Tape and Reel)   |
| PL611-01-XXXSC      | P611-01<br>XXX | PL611-01-XXXSI      | P611-01<br>XXXI | 8-Pin SOP (Tube)             |
| PL611-01-XXXSC-R    | LLLLL          | PL611-01-XXXSI-R    | LLLLL           | 8-Pin SOP (Tape and Reel)    |
| PL611-01-XXXTC      | C1XXX          | PL611-01-XXXTI      | C1XXX           | 6-Pin SOT-23 (Tape)          |
| PL611-01-XXXTC-R    | LLL            | PL611-01-XXXTI-R    | LLLI            | 6-Pin SOT-23 (Tape and Reel) |

† Note: 'XXX' designates marking identifier that, at times, could be independent of the part number.  
 "LLL" and "LLLLL" means assembly from which lot number.

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