



## 1.8V to 3.3V PicoPLL™ Programmable Clock

### KEY PROGRAMMING PARAMETERS

CLK Output Frequency	Output Drive Strength	Programmable Input/Output
$F_{OUT} = F_{REF} * M / (R * P)$ Where M = 11 bit R = 8 bit P = 5 bit $CLK0 = F_{OUT}, F_{REF} \text{ or } F_{REF} / (2 * P)$ $CLK1 = F_{REF}, F_{REF}/2, CLK0 \text{ or } CLK0/2$	Three optional drive strengths to choose from: <ul style="list-style-type: none"> <li>Low: 4mA</li> <li>Std: 8mA (default)</li> <li>High: 16mA</li> </ul>	One output pin can be configured as: <ul style="list-style-type: none"> <li>OE - input</li> <li>PDB - input</li> <li>FSEL – input</li> <li>HiZ or Active Low disabled state</li> </ul>

### PACKAGE PIN ASSIGNMENT

Name	Pin Assignment		Type	Description												
	DFN Pin#	SOT Pin #														
CLK1	2	1	O	Programmable Clock Output												
GND	3	2	P	GND connection												
FIN	1	3	I	Reference input pin												
OE, PDB, FSEL	6	4	I	<p>This programmable I/O pin can be configured as an Output Enable (OE) input, Power Down (PDB) input or Frequency Switching (FSEL) input. This pin has an internal 60KΩ pull up resistor.</p> <p>The OE and PDB features can be programmed to allow the output to float (Hi Z), or to operate in the 'Active low' mode.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>State</th> <th>OE</th> <th>PDB</th> <th>FSEL</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Disable CLK</td> <td>Power Down Mode</td> <td>Frequency '2'</td> </tr> <tr> <td>1 (default)</td> <td>Normal mode</td> <td>Normal mode</td> <td>Frequency '1'</td> </tr> </tbody> </table>	State	OE	PDB	FSEL	0	Disable CLK	Power Down Mode	Frequency '2'	1 (default)	Normal mode	Normal mode	Frequency '1'
State	OE	PDB	FSEL													
0	Disable CLK	Power Down Mode	Frequency '2'													
1 (default)	Normal mode	Normal mode	Frequency '1'													
VDD	5	5	P	VDD connection												
CLK0	4	6	O	Programmable Clock Output												

### OE AND PDB FUNCTION DESCRIPTION

OE	PDB	Osc.	PLL	CLK0	CLK1
1	N/A	On	On	On	On
0	N/A	On	Off	HiZ or Active Low	On
N/A	1	On	On	On	On
N/A	0	Off	Off	HiZ or Active Low	HiZ or Active Low

Note: HiZ or Active Low states are programmable functions and will be set per request.

**1.8V to 3.3V PicoPLL™ Programmable Clock****FUNCTIONAL DESCRIPTION**

PL611s-27 is a highly featured, very flexible, advanced programmable PLL design for high performance, low-power, small form-factor applications. The PL611s-27 accepts a reference clock input of 1MHz to 200MHz and is capable of producing two outputs up to 55MHz. This flexible design allows the PL611s-27 to deliver any PLL generated frequency,  $F_{REF}$  (Ref Clk) frequency or  $F_{REF}/(2*P)$  to CLK0 and/or CLK1. Some of the design features of the PL611s-27 are mentioned below:

**PLL Programming**

The PLL in the PL611s-27 is fully programmable. The PLL is equipped with an 8-bit input frequency divider (R-Counter), and an 11-bit VCO frequency feedback loop divider (M-Counter). The output of the PLL is transferred to a 5-bit post VCO divider (P-Counter). The output frequency is determined by the following formula [ $F_{OUT} = F_{REF} * M / (R * P)$ ].

**Clock Output (CLK0)**

CLK0 is the main clock output. The output of CLK0 can be configured as the PLL output ( $F_{VCO}/(2*P)$ ),  $F_{REF}$  (Ref Clk Frequency) output, or  $F_{REF}/(2*P)$  output. The output drive level can be programmed to Low Drive (4mA), Standard Drive (8mA) or High Drive (16mA). The maximum output frequency is 125MHz.

**Clock Output (CLK1)**

The CLK1 feature allows the PL611s-27 to have an additional clock output. This output can be programmed to one of the following:

- $F_{REF}$  - Reference (Ref Clk) Frequency
- $F_{REF} / 2$
- CLK0
- CLK0 / 2

When using the OE function CLK1 will remain "Always On" and will not be disabled when OE is pulled low. When using the PDB function CLK1 will be disabled along with CLK0. The output drive level can be programmed to Low Drive (4mA), Standard Drive (8mA) or High Drive (16mA). The maximum output frequency is 125MHz.

**Output Enable (OE)**

The Output Enable feature allows the user to enable and disable the clock output(s) by toggling the OE pin. The OE pin incorporates a 60kΩ pull up resistor giving a default condition of logic "1".

The OE feature can be programmed to allow the output to float (Hi Z), or to operate in the 'Active low' mode.

**Power-Down Control (PDB)**

The Power Down (PDB) feature allows the user to put the PL611s-27 into "Sleep Mode". When activated (logic '0'), PDB 'Disables the PLL, the oscillator circuitry, counters, and all other active circuitry. In Power Down mode the IC consumes <10μA of power. The PDB pin incorporates a 60kΩ pull up resistor giving a default condition of logic "1".

The PDB feature can be programmed to allow the output to float (Hi Z), or to operate in the 'Active low' mode.

**Frequency Select (FSEL)**

The Frequency Select (FSEL) feature allows the PL611s-27 to switch between two pre-programmed outputs allowing the device "On the Fly" frequency switching. The FSEL pin incorporates a 60kΩ pull up resistor giving a default condition of logic "1".

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### ELECTRICAL SPECIFICATIONS

#### ABSOLUTE MAXIMUM RATINGS

PARAMETERS	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage Range	V <sub>DD</sub>	-0.5	7	V
Input Voltage Range	V <sub>I</sub>	-0.5	V <sub>DD</sub> +0.5	V
Output Voltage Range	V <sub>O</sub>	-0.5	V <sub>DD</sub> +0.5	V
Soldering Temperature (Green package)			260	°C
Data Retention @ 85°C		10		Year
Storage Temperature	T <sub>S</sub>	-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
Input (FIN) Frequency	@ V <sub>DD</sub> =3.3V	1		200	MHz
	@ V <sub>DD</sub> =2.5V			166	
	@ V <sub>DD</sub> =1.8V			133	
Input (FIN) Signal Amplitude	Internally AC coupled (High Frequency)	0.9		V <sub>DD</sub>	V <sub>pp</sub>
Input (FIN) Signal Amplitude	Internally AC coupled (Low Frequency) 3.3V <=50MHz, 2.5V <=40MHz, 1.8V <=15MHz	0.1		V <sub>DD</sub>	V <sub>pp</sub>
Output Frequency	@ V <sub>DD</sub> =3.3V			125	MHz
	@ V <sub>DD</sub> =2.5V			90	MHz
	@ V <sub>DD</sub> =1.8V			65	MHz
Settling Time	At power-up (after V <sub>DD</sub> increases over 1.62V)			2	ms
Output Enable Time	OE Function; Ta=25° C, 15pF Load			10	ns
	PDB Function; Ta=25° C, 15pF Load			2	ms
Output Rise Time	15pF Load, 10/90% V <sub>DD</sub> , High Drive, 3.3V		1.2	1.7	ns
Output Fall Time	15pF Load, 90/10% V <sub>DD</sub> , High Drive, 3.3V		1.2	1.7	ns
Duty Cycle	V <sub>DD</sub> /2	45	50	55	%
Period Jitter, Pk-to-Pk* (measured from 10,000 samples)	With capacitive decoupling between V <sub>DD</sub> and GND.		70		ps

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

**1.8V to 3.3V PicoPLL™ Programmable Clock**

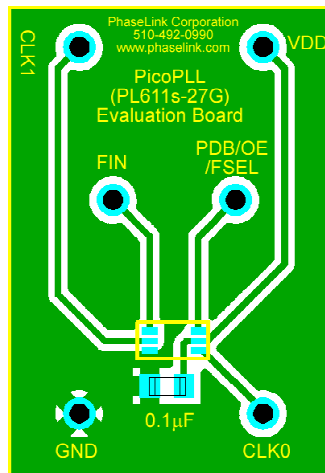
**DC SPECIFICATIONS**

PARAMETERS	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Supply Current, Dynamic, with Loaded CMOS Outputs	I <sub>DD</sub>	@ V <sub>DD</sub> =3.3V, 27MHz, load=15pF		5.5		mA
Supply Current, Dynamic, with Loaded CMOS Outputs	I <sub>DD</sub>	@ V <sub>DD</sub> =2.5V, 27MHz, load=15pF		3.8		mA
Supply Current, Dynamic with Loaded CMOS Outputs	I <sub>DD</sub>	@ V <sub>DD</sub> =1.8V, 27MHz, load=15pF		1.8*		mA
Stand By Current, with Loaded Outputs	I <sub>DD</sub>	When PDB=0			<10	μA
Operating Voltage	V <sub>DD</sub>		1.62		3.63	V
Output Low Voltage	V <sub>OL</sub>	I <sub>OL</sub> = +4mA Standard Drive			0.4	V
Output High Voltage	V <sub>OH</sub>	I <sub>OH</sub> = -4mA Standard Drive	V <sub>DD</sub> - 0.4			V
Output Current, Low Drive	I <sub>OSD</sub>	V <sub>OL</sub> = 0.4V, V <sub>OH</sub> = 2.4V	4			mA
Output Current, Standard Drive	I <sub>OSD</sub>	V <sub>OL</sub> = 0.4V, V <sub>OH</sub> = 2.4V	8			mA
Output Current, High Drive	I <sub>OHD</sub>	V <sub>OL</sub> = 0.4V, V <sub>OH</sub> = 2.4V	16			mA

\* Note: Please contact PhaseLink, if super low-power is required.

**1.8V to 3.3V PicoPLL™ Programmable Clock**

**LAYOUT RECOMMENDATIONS**



DFN-6L Evaluation Board

The following guidelines are to assist you with a performance optimized PCB design:

**Signal Integrity and Termination Considerations**

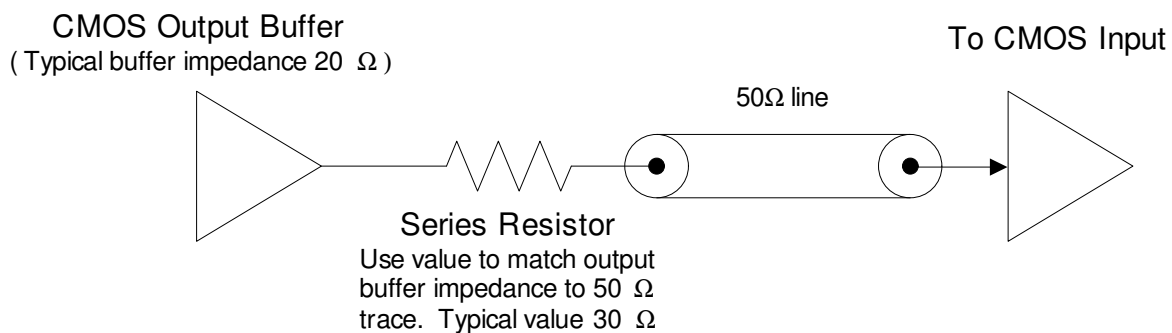
- Keep traces short!
- Trace = Inductor. With a capacitive load this equals ringing!
- Long trace = Transmission Line. Without proper termination this will cause reflections ( looks like ringing ).
- Design long traces as “striplines” or “microstrips” with defined impedance.
- Match trace at one side to avoid reflections bouncing back and forth.

**Decoupling and Power Supply Considerations**

- Place decoupling capacitors as close as possible to the VDD pin(s) to limit noise from the power supply
- Multiple VDD pins should be decoupled separately for best performance.
- Addition of a ferrite bead in series with VDD can help prevent noise from other board sources
- Value of decoupling capacitor is frequency dependant. Typical values to use are 0.1µF for designs using crystals < 50MHz and 0.01µF for designs using crystals > 50MHz.

**Typical CMOS termination**

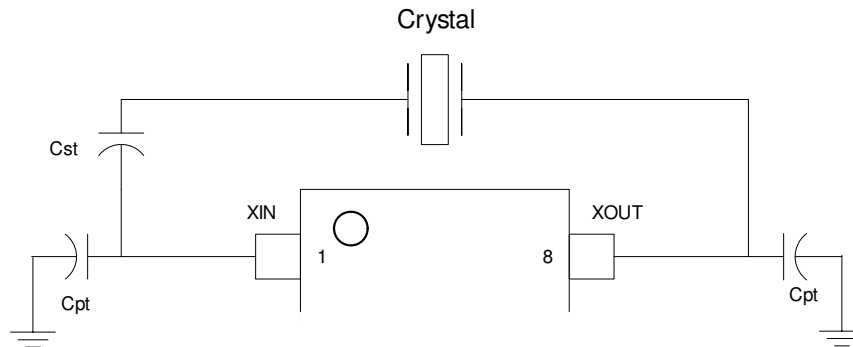
Place Series Resistor as close as possible to CMOS output



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**Crystal Tuning Circuit**

Series and parallel capacitors used to fine tune the crystal load to the circuit load .



**CST** – Series Capacitor, used to lower circuit load to match crystal load. Raises frequency offset. This can be eliminated by using a crystal with a Cload of equal or greater value than the oscillator.

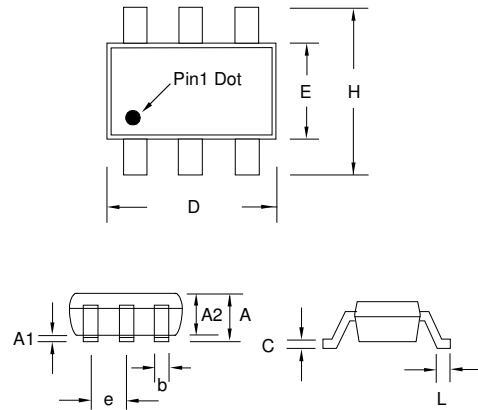
**CPT** – Parallel Capacitors, Used to raise the circuit load to match the crystal load. Lowers frequency offset.

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**PACKAGE DRAWINGS (GREEN PACKAGE COMPLIANT)**

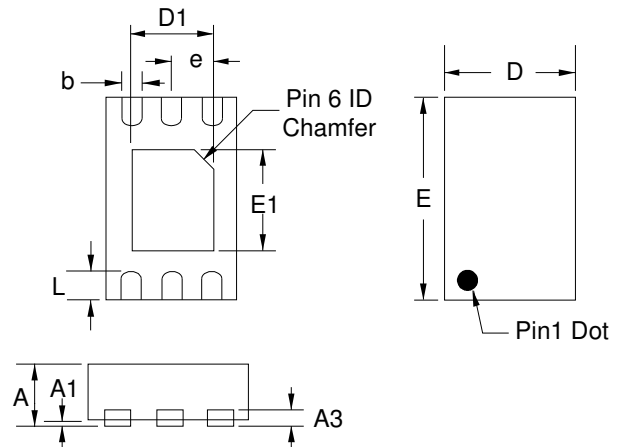
**SOT23-6L**

Symbol	Dimension in MM	
	Min.	Max.
A	1.05	1.35
A1	0.05	0.15
A2	1.00	1.20
b	0.30	0.50
c	0.08	0.20
D	2.80	3.00
E	1.50	1.70
H	2.60	3.0
L	0.35	0.55
e	0.95 BSC	



**DFN-6L**

Symbol	Dimension in MM	
	Min.	Max.
A	0.50	0.60
A1	0.00	0.05
A3	0.152	0.152
b	0.15	0.25
e	0.40BSC	
D	1.25	1.35
E	1.95	2.05
D1	0.75	0.85
E1	0.95	1.05
L	0.20	0.30





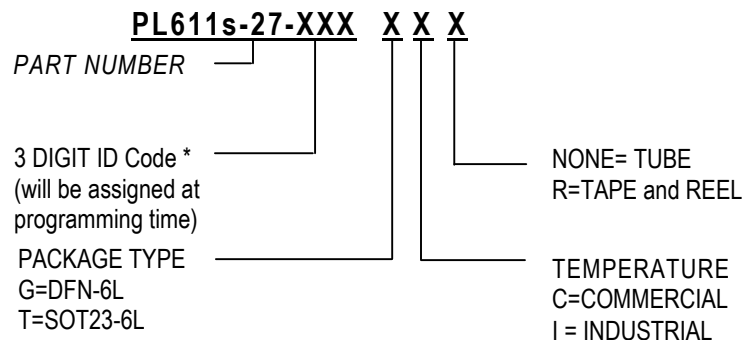
**1.8V to 3.3V PicoPLL™ Programmable Clock**

**ORDERING INFORMATION (GREEN PACKAGE COMPLIANT)**

**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:  
Part number, Package type and Operating temperature range



Part/Order Number	Marking†	Package Option
PL611s-27-XXXGC-R	XXX	6-Pin DFN (Tape and Reel)
PL611s-27-XXXTC-R	27XXX	6-Pin SOT23 (Tape and Reel)

† Note: 'XXX' designates marking identifier that, at times, could be independent of the part number. Please consult your PhaseLink sales for marking information.

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