



MICREL[®]
Innovation Through Technology™

Product Selector Guide

2011



CHINA ROHS



EU ROHS

www.micrel.com
www.phaselink.com

An Overview of Micrel

Micrel Inc. is a leading manufacturer of IC solutions for the worldwide analog, Ethernet and high bandwidth markets. The Company's products include high performance analog, power, advanced mixed-signal and radio frequency semiconductors; high speed communication, clock management, Ethernet switch and physical layer transceiver integrated circuits. These products address a wide range of rapidly growing end markets including cellular handsets, portable and enterprise computing, enterprise and home networking, wide area and metropolitan area networks and industrial equipment.

Founded in 1978, Micrel has an excellent record of revenue growth and sustained profitability. The Company has posted year-over-year revenue growth in 23 out of 31 years and been profitable in 30 of its 31 years of its existence. The Company has consistently generated positive cash flows since going public in 1994.

Corporation headquarters and state-of-the-art wafer fabrication facilities are located in San Jose, California with regional sales and support offices and advanced technology design centers situated throughout the Americas, Europe and Asia. In addition, the Company maintains an extensive worldwide network of sales representatives and distributors.

Micrel utilizes both its own world-class wafer fabrication facility, which contains a broad array of process technologies that allow Micrel to quickly develop and introduce state-of-the-art products. Micrel combines its expertise in fabrication technology with world-class design teams to develop and produce these high performance products to provide our customers with the solutions they need to compete in today's fast paced technology industry.

Micrel is fiercely committed to its customers' success. Micrel's outstanding sales, customer service and technical support organizations, together with its manufacturing operations, are structured specifically to address customer needs and requirements. Micrel is known throughout the industry for its service orientation and for being, "fast on its feet".

Contents

Featured Products

- 4 Analog Frequency Multiplier (AFM)
- 5 PhasorVI Frequency Multiplier
- 6-17 PicoPLL Programmable Clocks

Frequency Generation

Voltage Controlled Frequency Source (VCXO ICs)

- 22-23 VCXO with PhasorVI Frequency Multiplier IC
- 24-25 VCXOs with & without PLL Multiplier
- 26-27 VCXO with Analog Frequency Multiplier IC

Reference Frequency Clock (XO ICs)

- 28-29 Crystal Oscillator (XO) ICs
- 30-31 Programmable Clocks with Differential Outputs
- 22-23 PhasorVI Frequency Multiplier Clocks
- 26-27 Analog Frequency Multiplier Clocks

PicoPLL - Programmable Clocks

- 6-21 Programmable Clocks
- 30-31 Programmable Clocks with Differential Outputs
- 32-33 Programmable PCIe/HCSL Compatible Clocks

Signal Conditioning

- 18-21 EMI Reduction ICs

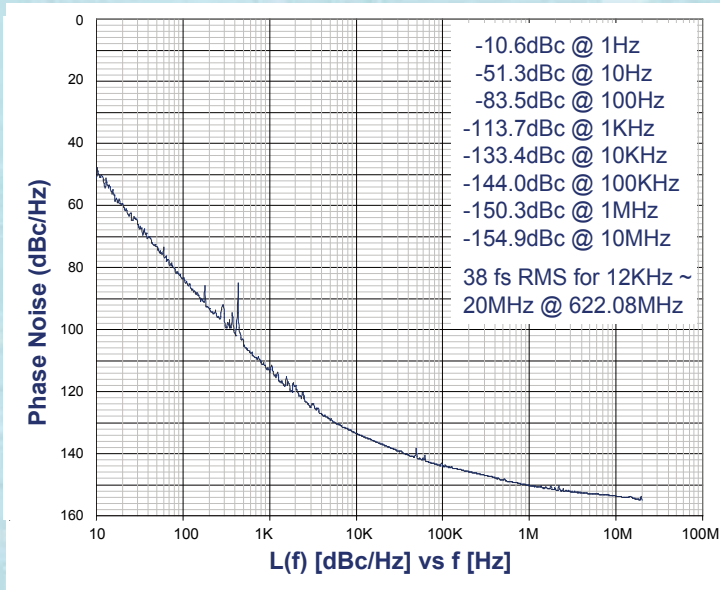
Clock Distribution

- 34-35 Zero Delay Buffers
- 34-35 Reference Input Fanout Buffers
- 34-35 Crystal Input Fanout Buffers
- 34-35 TCXO Buffer
- 34-35 Translator Buffers

Analog Frequency Multiplier (AFM)

Unbeatable Performance

- **< 50fs Phase Jitter (12KHz to 20MHz), @ 622MHz**
- **< 2.5ps RMS Period Jitter**
- **< 30ps PK-PK Period Jitter**



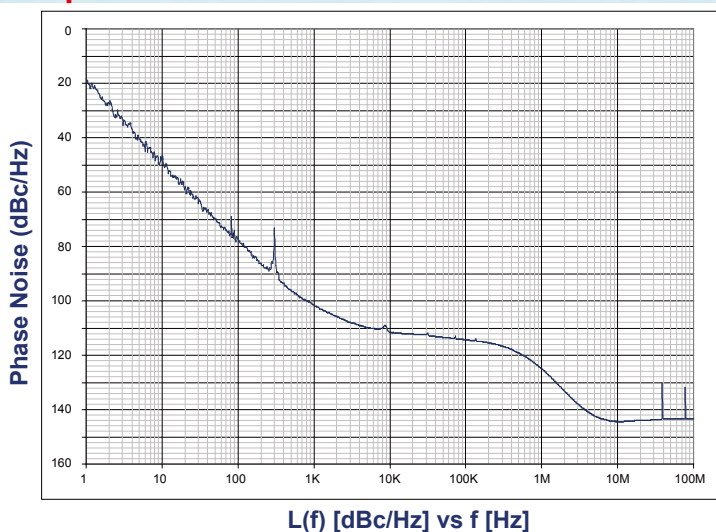
Industry's first CMOS Non-PLL multiplier utilizing analog multiplication of a high frequency fundamental or 3rd overtone crystal input. Our patented AFM technology can generate up to 800MHz in PECL, LVDS or CMOS without using a Phase-Locked Loop. This is achieved with practically no jitter or phase noise deterioration.

See page 27 for detailed product selector guide.

PhasorVI Frequency Multiplier

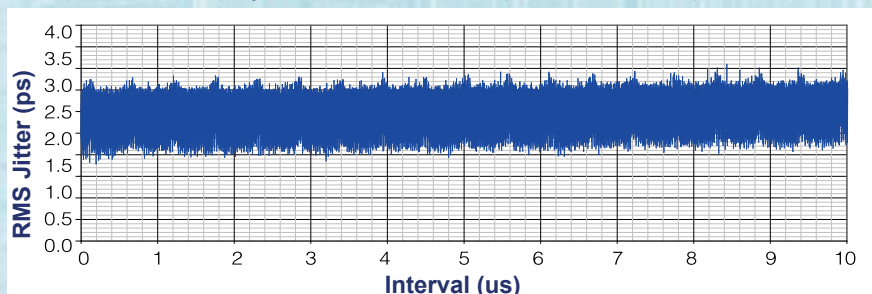
The Best In Class Multiplier

- < 500fs Phase Jitter (12KHz to 20MHz), @ 622MHz
- < 30ps PK-PK Period Jitter



- Practically, No Accumulated Jitter

PhasorVI Long Term Jitter
(Crystal=38.88MHZ, Output=155.52MHz)

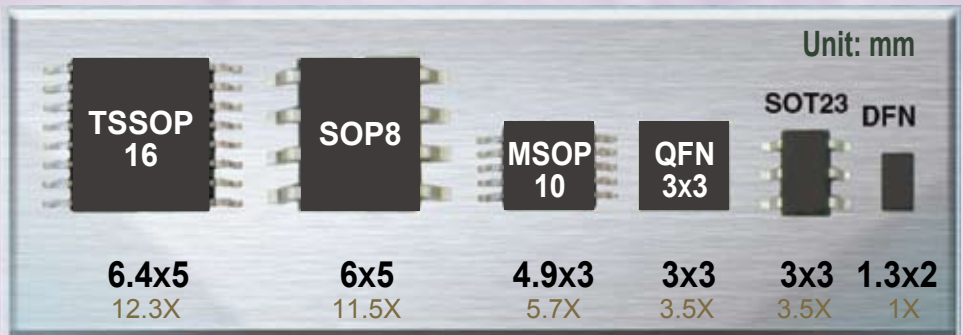


See page 23 for detailed product selector guide.

Tiny Package, World's Smallest



- ▶ Lowest Power Consumption
- ▶ 1.8V, 2.5V, 3.3V Supply
- ▶ 30~70ps Peak-Peak Jitter
- ▶ Fast Turnaround with Factory Programming



Micrel's PicoPLL programmable clock family is a general purpose frequency synthesizer with the key features of low jitter, low power and tiny package. This low cost frequency source solution is designed to fit almost any application where high performance, space saving and time to market is crucial.

Big Benefits!

Programmable Clock

**Applications
Unlimited!**



Device Family	# of PLLs	EMI	Input (MHz)	# of Outputs	Voltage	Package
PL611s	1		Crystal: 10-40 Ref Clock: 0.01-200	Up to 2	1.62V~ 3.63V	DFN, SOT-6
PL613	3		Crystal: 10-40 Ref Clock: 5-200	Up to 8	1.62V~ 3.63V	QFN 3x3, (T)SSOP
PL613-21	3		Crystal: 10-40 Ref Clock: 5-200	Up to 4 with varying voltage on each output	1.62V~ 3.63V	QFN 3x3, (T)SSOP
PL671	1	√	Crystal: 10-40 Ref Clock: 1-200	Up to 3	2.25V~ 3.63V	SOT-23, (M)SOP
PL585/685	1		Crystal: 19-40	PECL, LVDS	3.3V	(T)SSOP

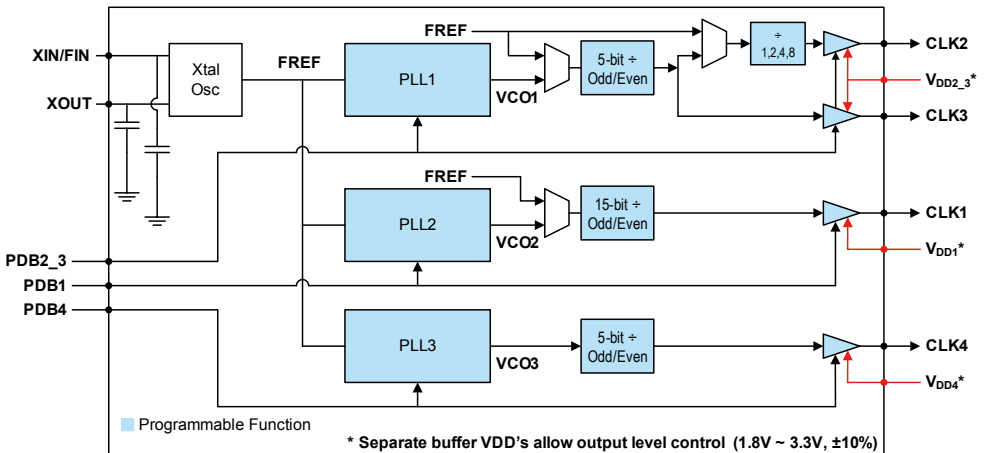
Programmable Clocks

PicoPLL is Micrel's line of programmable, high performance clock ICs. Accepting a single reduce system cost and fit almost any application where high performance, low-power, space

FEATURES (PL613-21)

- 3-programmable PLLs, with individual Power Down (PDB) pins
 - One 32.768K Clock and 3 pins with 'MHz' range Clock outputs
- 4 outputs with individual voltage on each output
 - Covers from 1.62V to 3.63V
- Small form-factor for PCB Space Savings
- Ultra Low-Power Consumption
 - Ultra-Low Power-Down Mode, <math><5\mu\text{A}</math>
- Input Frequency:
 - Fundamental Crystal: 10MHz to 40MHz
 - Reference Input: 10MHz to 200MHz
- Active Low or Hi-Z Disabled Output State
- Operating Temperature Ranges:
 - Commercial: 0°C to 70°C
 - Industrial: -40°C to 85°C
- Power supply voltages: 1.62V to 3.63V
- Available in GREEN/RoHS Compliant 3x3 QFN-16 Package

BLOCK DIAGRAM

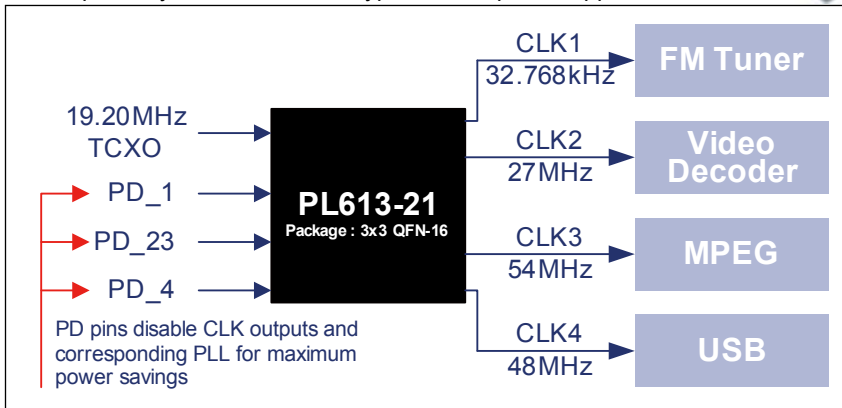


crystal or reference clock input and producing up to 8 outputs, the PicoPLL family is designed to saving, cost sensitivity, and time-to-market are crucial.

APPLICATION EXAMPLES

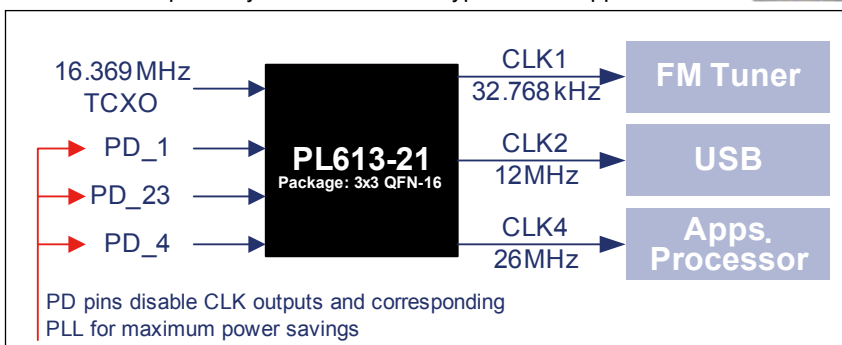
Smartphone

PL613 takes advantage of the available TCXO reference clock to four required system clocks for a typical Smartphone application.



Portable Navigation Device (PND)

PL613-21 takes advantage of the available TCXO reference clock to create three required system clocks for a typical PND application.



Programmable Clocks

Micrel's extensive arrays of programmable clock families allow selection from a wide

Part Number	# of PLLs	Input (MHz)		Output (MHz)	# of Outputs	Voltage (V)			Ultra-Low Power
		Xtal Range	Reference			1.8	2.5	3.3	

MHz to MHz Clocks

PL611s-02 PL611s-04	1	10 - 40	1 - 200	≤200	≤2	✓	✓	✓	
PL611s-27	1	-	1 - 200	≤125	≤2	✓	✓	✓	✓
PL611s-6X	1	10 - 40	-	≤200	1	✓	✓	✓	✓
PL611-01	1	10 - 30	1 - 200	≤200	≤3		✓	✓	
PL611-30	1	10 - 30	1 - 200	≤400	≤3		✓	✓	
PL611-31	1	10 - 30	1 - 200	≤200	≤3		✓	✓	
PL613-01	3	10 - 40	5 - 200	≤200	≤8	✓	✓	✓	
PL613-05	3	10 - 40	5 - 200	≤200	≤3	✓	✓	✓	
PL613-21	3	10 - 40	5 - 200	≤125	≤4	✓	✓	✓	✓

EMI Reduction Clocks

PL671-01	1	10 - 40	1-200	≤200	≤3		✓	✓	
PL671-02	1	-	1-200	≤200	≤3		✓	✓	

MHz to kHz Clocks

PL610-32	0	16.67772	-	.0325768	1	✓	✓	✓	✓
PL611s-18	1	10 - 40	1 - 200	0.5kHz-125	≤2	✓	✓	✓	✓
PL611s-19	1	-	DC - 200	0.5kHz-125	≤2	✓	✓	✓	✓
PL613-21	3	10 - 40	5 - 200	≤125	≤4	✓	✓	✓	✓

High Performance Clocks

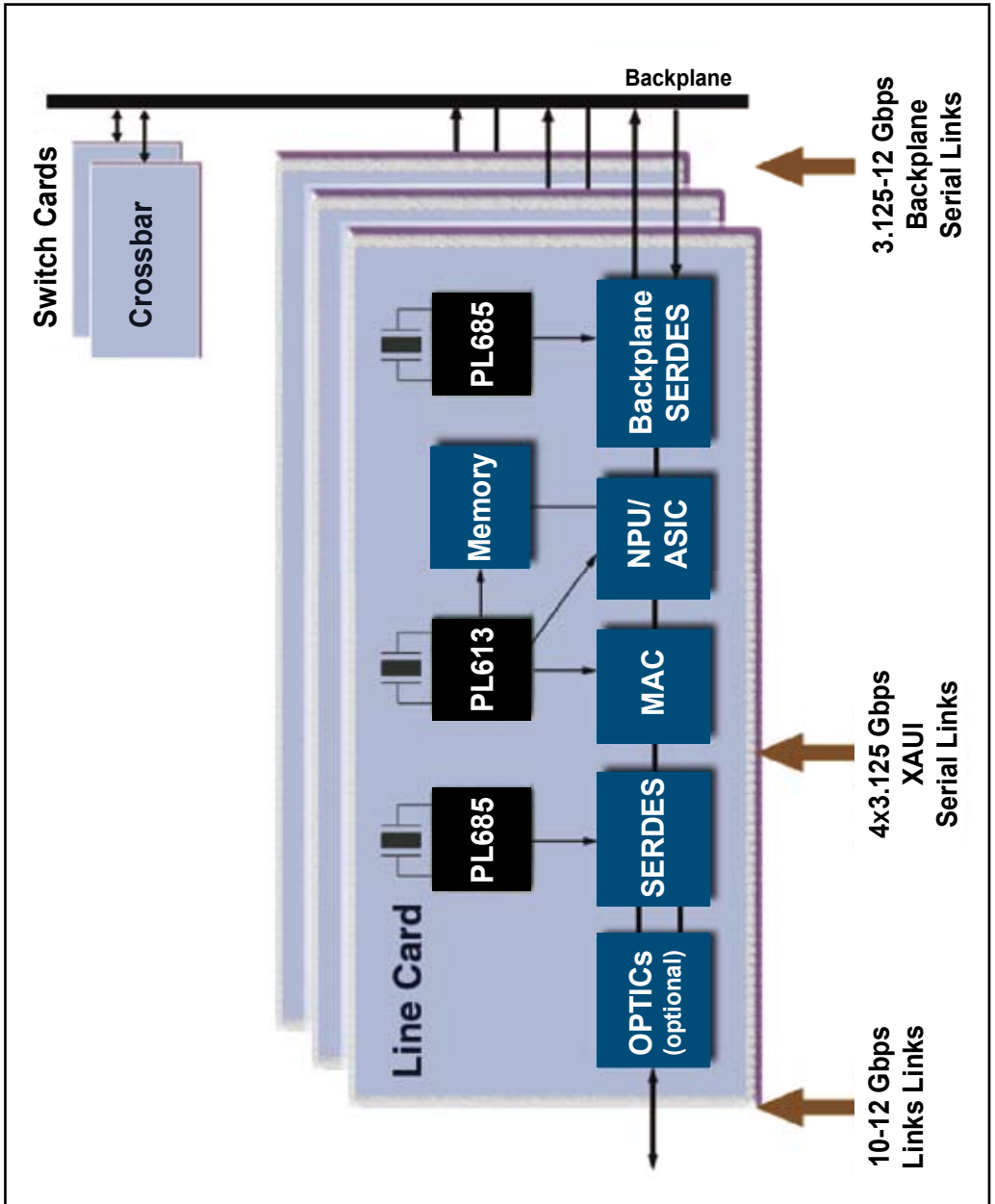
PL585/685-XX	1	19 - 40	Yes	≤800	LVPECL LVDS			✓	✓
--------------	---	---------	-----	------	----------------	--	--	---	---

variety of features and form-factors to suit most demanding design requirements.

Programmable Pin				Other Features	Package
PDB	OE	FSEL	CLK		
✓	✓	✓	✓	• World's smallest programmable clock	Die, Wafer, DFN-6L, SOT23-6L
✓	✓	✓		• 2 CLKs & PDB/OE	DFN-6L, SOT23-6L
✓				• By 4/8 multiplier	Die, Wafer
✓	✓	✓	✓	• 3 output multiplier PLL	Die, Wafer, SOT23-6L
	✓	✓	✓	• Complementary LVCMOS Outputs	MSOP-8L, SOP-8L
✓	✓	✓	✓	• Master OE/PDB • 4 Clocks with 4 OE	QFN-16L, (T)SSOP-16L
✓	✓	✓	✓	• Master OE/PDB	SOP-8L
✓	✓	✓	✓	• Variable Voltage on Each Output • Individual CLK/PLL Power-Down pins • KHz outputs on CLK1	QFN-16L(3x3mm)
✓		✓	✓	• SS Rate: $\pm 0.125\% \sim \pm 2.0\%$ (Center), or $-0.25\% \sim -4.0\%$ (Down)	SOT23-6L, MSOP-8L, SOP-8L
✓		✓	✓	• Contact Micrel for Cross Ref. List	SOT23-6L
				• 0.3mA from MHz to 32K clock out	Die, Wafer
✓	✓	✓	✓	• Low-power MHz to RTC clock	DFN-6L, SOT-6
✓	✓	✓		• Ideal for Two Outputs, One a Low-Power 32K Clock, With Ref. Input	DFN-6L, SOT-23-6L
✓	✓	✓	✓	• Variable Voltage on Each Output • Individual CLK/PLL Power-Down pins • KHz output on CLK1	QFN-16L(3x3mm)
✓	✓	✓	N/A	• 0.5 ps phase jitter at 622.08MHz • 90 mA (PECL) Power Consumption	TSSOP-16L

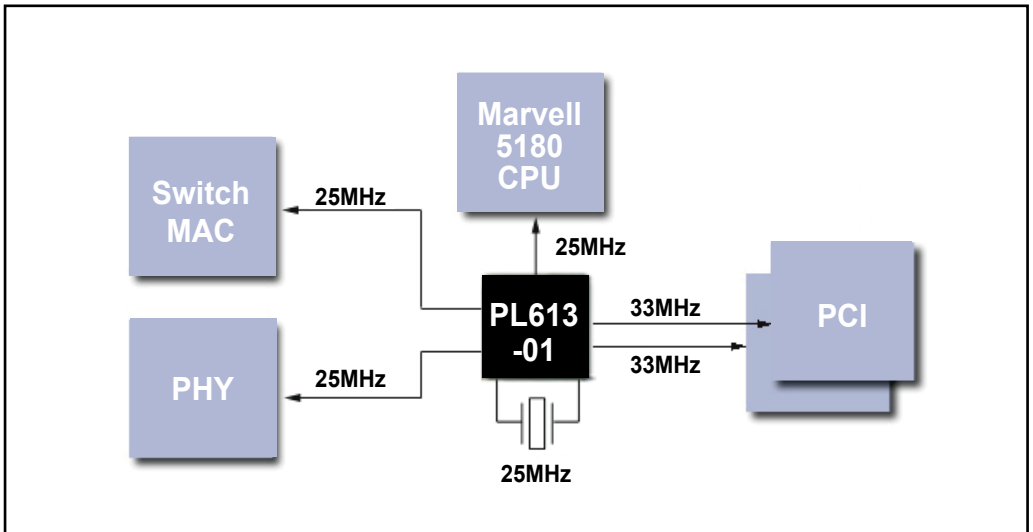
1. Line Card for High Speed Serial Links

PhaseLink offers a variety of high performance timing sources for the most demanding communication applications such as 10Gbps line cards.



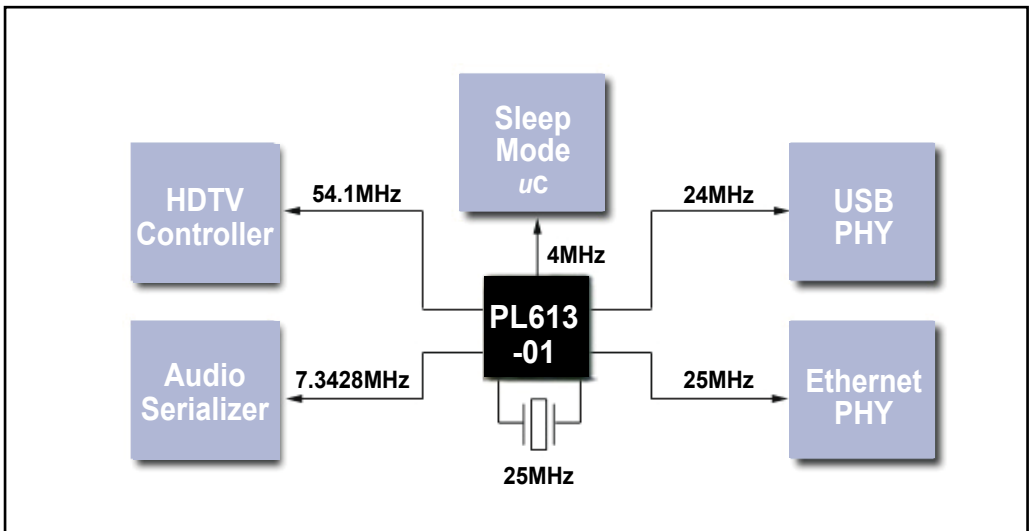
2. 802.11n AP Router

PL613-01, a three PLL Programmable Frequency Synthesizer, can replace multiple crystals oscillators reducing cost, size and power in AP router designs.



3. DTV/HDTV

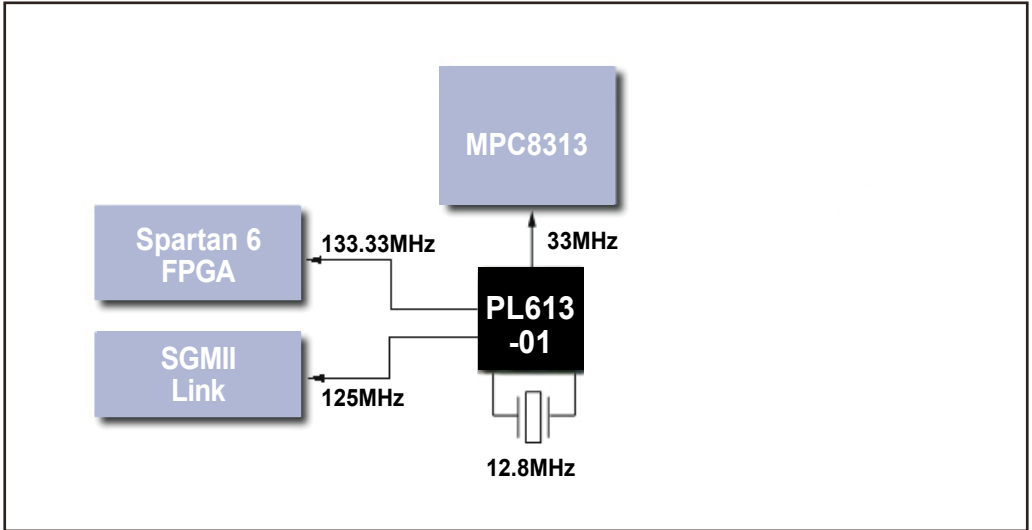
PL613-01, a three PLL Programmable Frequency Synthesizer, provides all the necessary clocks for common DTV/HDTV requirements.



Application Examples

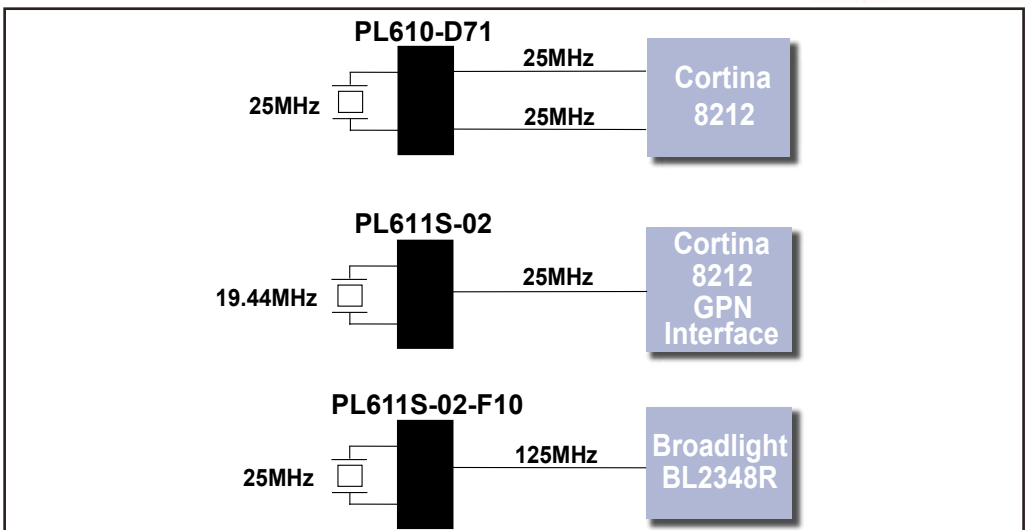
4. ATSC USB DVB-T

The PL613-01's multiple PLLs and frequency generator circuitry provides all the clocking requirements for the complex Optical Networking systems, in a small form-factor package.



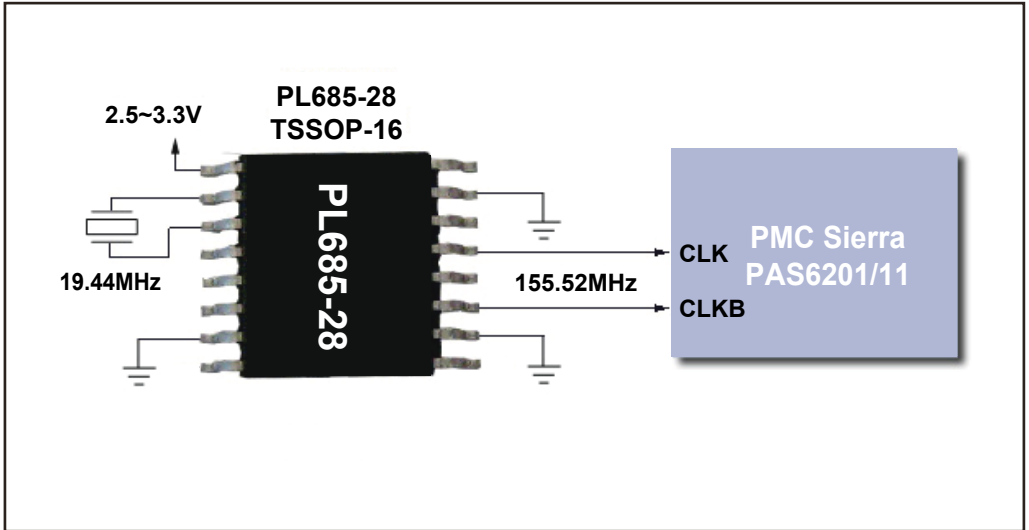
5. GPON (Gigabit Passive Optical Network)

Using Micrel's PL611s-02, customers can create high frequency and low-jitter clocks by using low-cost, low-frequency crystals.



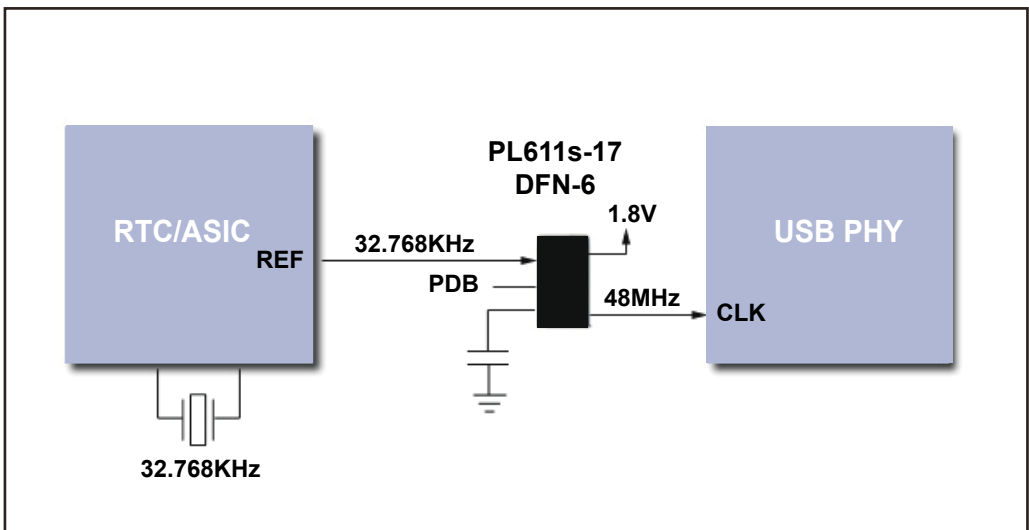
6. GE-PON (Gigabit Ethernet Passive Optical Network)

PL685-XX can create high freq. differential (LVPECL, LVDS) from a low-cost crystals to support low jitter requirements in communications app.



7. USB Clock

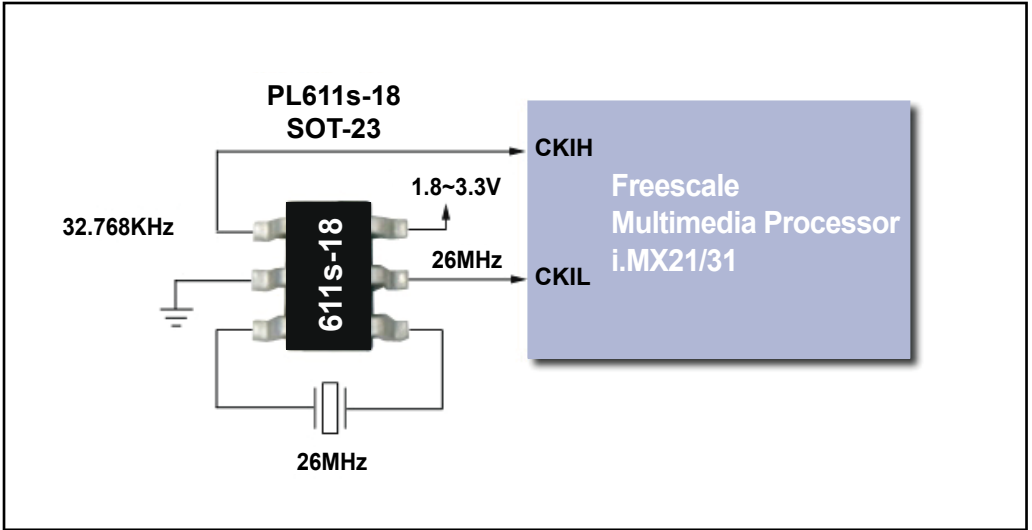
PL611s-17, a KHz to MHz Programmable Frequency Synthesizer, can generate a USB clock from a 32.768KHz reference input.



Application Examples

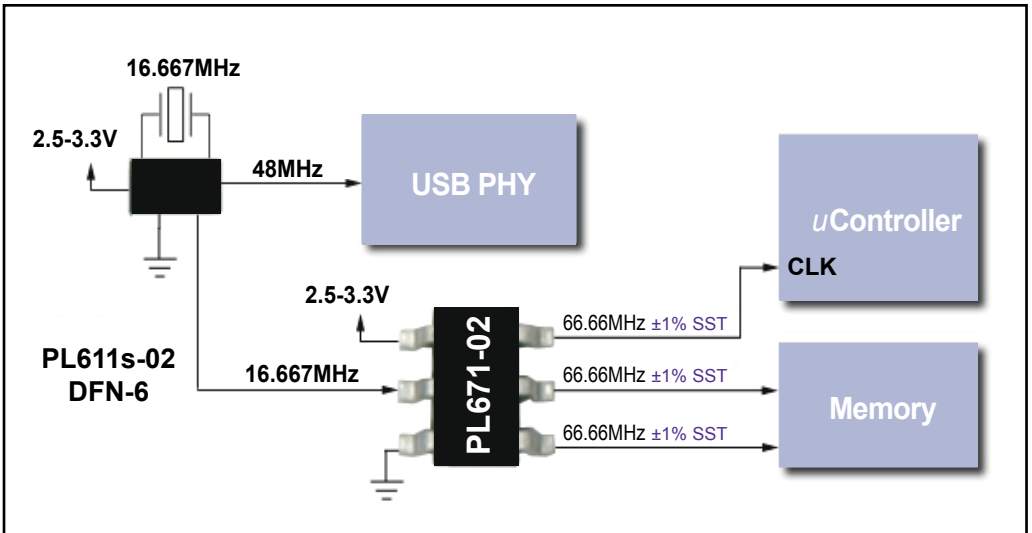
8. VOIP Phone

PL611s-18, a MHz to KHz Programmable Frequency Synthesizer, can generate both MHz and KHz clock outputs from a MHz crystal input.



9. Printer

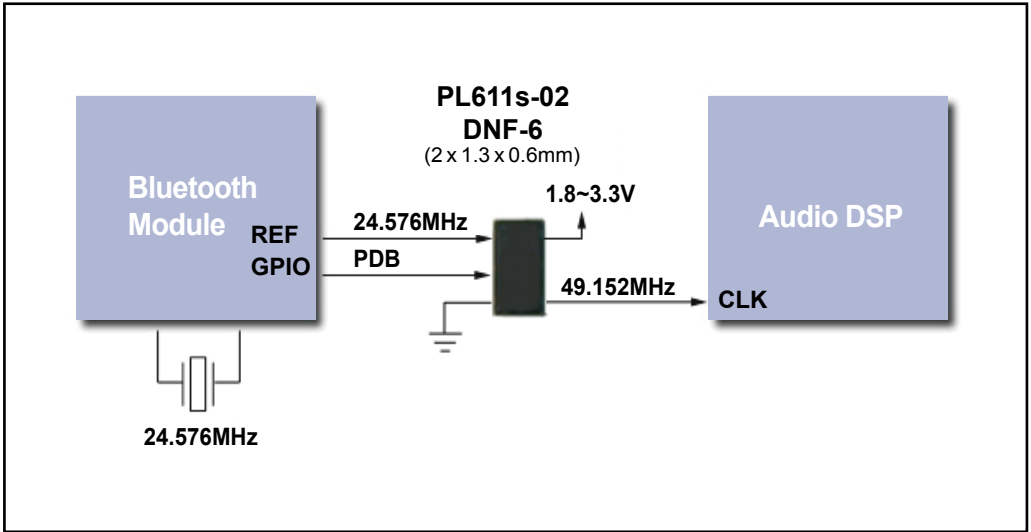
Micrel's PL671 PicoEMI programmable Spectrum Clock Generator (PSSCG) can generate multiple clocks to reduce EMI emission.



10. Bluetooth Headset

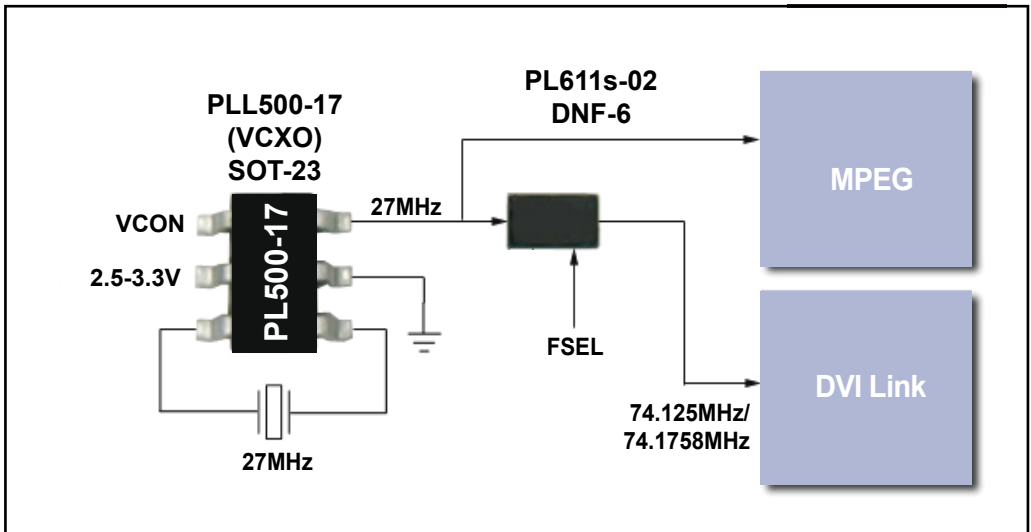


PL611s-02, a low power programmable PLL, is the ideal clocking solution to generate any frequency for handheld and small footprint applications.



11. Digital Video (Set top Box, DTV)

Using PLL500 VCXO IC and PL611s Pico-PLL programmable clock, users are able to generate multiple VCXO clocks at low cost.



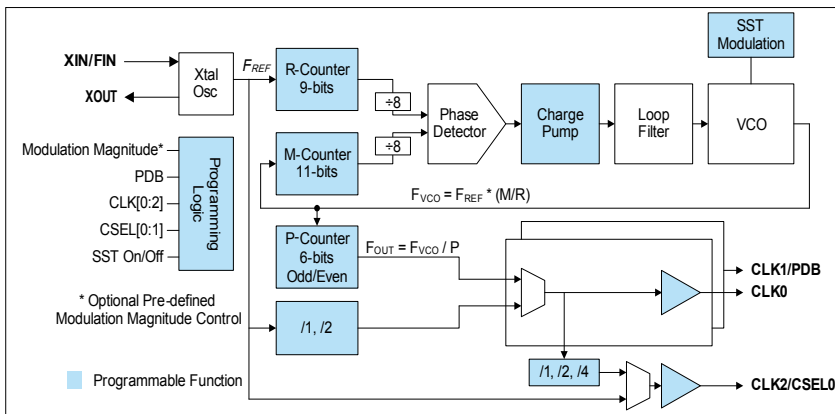
Pico-EMI Clock Summary

Micrel's proprietary Spread Spectrum Timing (SST) technology can efficiently suppress ICs with very low cycle to cycle jitter (100ps Peak-Peak) are suitable for clock generation

FEATURES (PL671-01)

- Advanced programmable PLL with Spread Spectrum with up to 3 outputs
- Crystal or Reference Clock input
 - Fundamental crystal: 10MHz to 40MHz
 - Reference input: 1MHz to 200MHz
- Four programmed configurations to select from (CSEL)
- Output frequency range: $\leq 166\text{MHz}$ @ 2.5V operation
- $\leq 200\text{MHz}$ @ 3.3V operation
- Programmable Spread Spectrum Modulation Magnitude:
 - Center Spread: $\pm 0.125\%$ to $\pm 2.0\%$ in $\pm 0.125\%$ steps
 - Down Spread: -0.25% to -4.0% in 0.25% steps
- Spread Spectrum On/Off selection
- Low Cycle to Cycle jitter.
- Programmable output drive (4mA, 8mA, 16mA)
- Single 2.5V to 3.3V, $\pm 10\%$ power supply
- Operating temperature range from -40°C to 85°C
- Available in 8-pin SOP, MSOP and 6-pin SOT GREEN/RoHS compliant packaging

BLOCK DIAGRAM

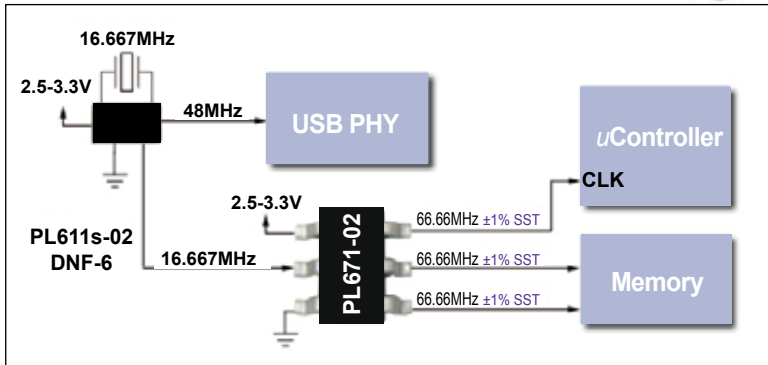


EMI without requiring expensive enclosures or system redesign. These EMI reduction from a single crystal or a signal reference.

APPLICATION EXAMPLES

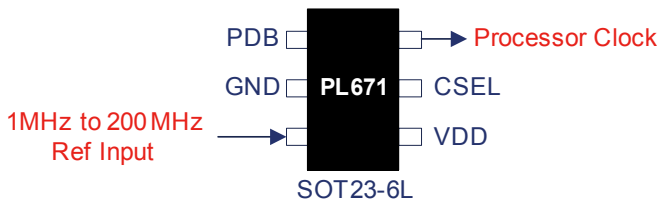
Printer

Micrel's PL671 PicoEMI Programmable Spread Spectrum Clock Generator (PSSCG) can generate multiple clocks to reduce EMI emission.



Note: ^ Denotes 60KΩ Pull-up resistor

Application Example: Using Reference CLK to Generate SST Processor CLK



CSEL1	CLK0
1	33MHz, $\pm 1.0\%$
0	66MHz, $\pm 2.0\%$

EMI Reduction ICs

Micrel's PicoEMI PL671 Programmable Spread Spectrum Clocks provide the flexibility

EMI Reduction Starter Kit (Pre-Programmed)



PL671-01A/B/C/D

Features	-01A	-01B	-01C	-01D
Input (MHz)	Crystal: 10-40 Ref: 10-40		Ref: 30-150	
Output (MHz)	CLK0 = FIN X 1			
Selectable Spread Spectrum Magnitude	±0.5% ±1.0% ±1.5% OFF	-1.0% -2.0% -3.0% OFF	±0.25% ±0.50% ±1.00% OFF	-0.5% -1.0% -2.0% OFF

Small Footprint: SOT23-6 Package (Programmable)



PL671-01



PL671-02

Features	PL671-01	PL671-02
Input (MHz)	Crystal: 10-40 Ref: 1-200	Reference: 1-200
Output (MHz)	Programmable up to 200MHz	
# of outputs	Up to 2 ¹	Up to 2 ¹
Spread Spectrum Magnitude²	Fixed	Fixed Selectable
Power Down	Yes ¹	Yes ¹

1: Pin 1 can be configured as PDB input or CLK output.
2: Factory Program: Center: ±0.125~±2.0% (+0.125% step)
Down: -0.25~ -4.0% (-0.25 step), or OFF

SOP8/MSOP8 Package (Programmable)



PL671-01

Features	PL671-01
Input (MHz)	Crystal: 10-40 or Ref : 1-200
Output (MHz)	Programmable up to 200MHz
# of outputs	Up to 3 ¹
Spread Spectrum Magnitude²	Up to 4 Fixed Selectable
Power Down	Yes ¹

1: Pin 2,6 can be configured as CLK output.
2: Factory Program: Center: ±0.125~±2.0% (+0.125% step)
Down: -0.25~ -4.0% (-0.25 step), or OFF

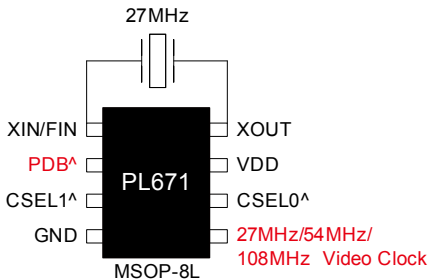
and performance required for the most demanding EMI reduction requirements.

Part Number	Function	Input (MHz)	Output (MHz)	Other Features	Voltage	Package
PL671-01 PL671-00	Programmable PLL	Xtal: 10-40 Ref.:1-200	≤200	SS Rate: ±0.125%~ ±2.0% (C) or -0.25%~ -4.0% (D)	2.25V~ 3.63V	SOT23-6L MSOP-8L SOP-8L Die, Wafer
PL671-02		Ref: 200	≤200			
PL671-29		Xtal: 10-40 Ref.:1-200	≤200	SS Rate: ±0.125%~ ±2.0% (C) or -0.25%~ -4.0% (D)	2.25V~ 3.63V	SOT23-6L MSOP-8L SOP-8L Die, Wafer

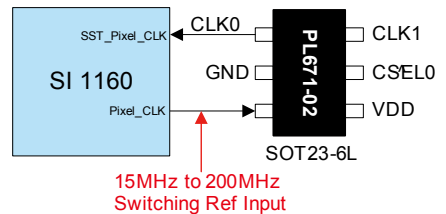
Note: C: Center Spread. D: Down Spread.

General SS spread is at .25% increments. Please refer to the datasheet for more detail

Application Example: Selectable Frequency Video System Clock, using the CSEL Feature, or Adding Spread to DVI Video



CSEL0	CSEL1	CLK0	Drive Strength
1	1	27MHz, SST Off	8mA
1	0	27MHz, ±1.0%	8mA
0	1	54MHz, ±1.0%	16mA
0	0	108MHz, ±1.0%	16mA



CSEL0	CLK0	CLK1
1	Input Frequency, ±1.0%	Ref Out
0	Input Frequency, ±2.0%	Ref Out

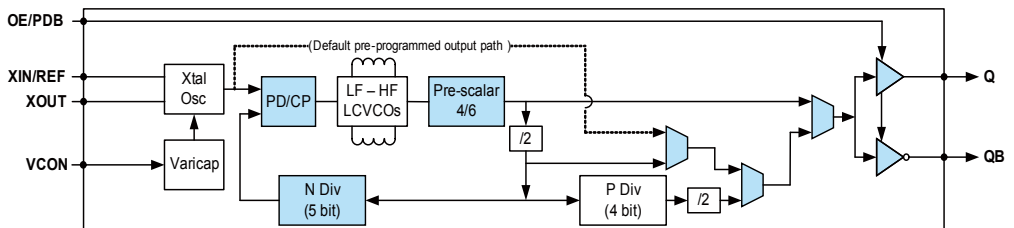
PhasorVI Frequency Multiplier

The PhasorVI is a low jitter and low phase noise frequency multiplier, capable of achieving 0.5ps Using a low-cost crystal of 19 to 40MHz, the PhasorVI enables output frequencies of up to 800MHz, and LVPECL outputs.

FEATURES

- <500fs RMS phase jitter (12kHz to 20MHz) at 622.08MHz (LVPECL/LVDS)
- 30ps max peak to peak period jitter
- Ultra Low-Power Consumption
 - < 90mA @622MHz PECL output
 - <15 μ A at Power Down (PDB) Mode
- Input Frequency:
 - Fundamental Crystal: 19MHz to 40MHz
- Output Frequency:
 - 19MHz to 800MHz output.
- Output types: LVPECL, or LVDS
- High Linearity VCXO: <10% linearity
- Pullability: \pm 150 ppm
- Programmable OE input polarity,
 - o Programmable Hi-Z or Active Low disabled state
- Power Supply: 3.3V, \pm 10%
- Operating Temperature Ranges:
 - Commercial: 0°C to 70°C
 - Industrial: -40°C to 85°C
- Available in Die or Wafer

PhasorVI BLOCK DIAGRAM



RMS phase jitter and less than 30ps peak to peak period jitter, with practically no Accumulated Jitter. in a single IC, with specific frequencies above 800MHz in discrete ICs. The family supports , LVDS,

VCXO

Part Number	Input Range (MHz)	Output Range (MHz)	Output Type	Voltage	Jitter ² (PS) - Typical			Package
					RMS Period	Peak to Peak Period Jitter	Phase Jitter ¹ (12kHz to 20MHz)	
PL585-88	19 - 40	≤800	LVPECL	3.3V	5	<30	<0.5	DIE/Wafer TSSOP-16
PL585-28	19 - 40	≤250	LVPECL	3.3V	5	<30	<0.5	DIE/Wafer TSSOP-16

XO

PL685-88 PL685-89	19 - 40	≤800	LVPECL (-88) LVDS (-89)	3.3V	5	<30	<0.5	DIE/Wafer TSSOP-16
PL685-28	19 - 40	≤250	LVPECL	3.3V	5	<30	<0.5	DIE/Wafer TSSOP-16

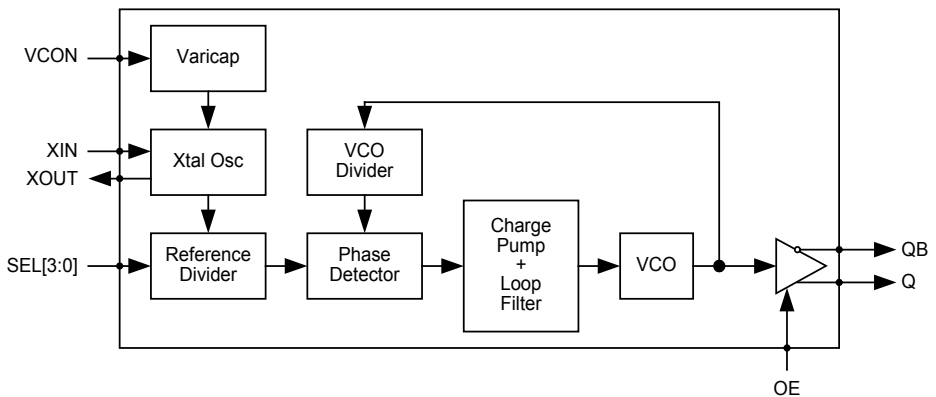
VCXO (Voltage Controlled Crystal Oscillator) ICs

Micrel's integrated low phase noise VCXO products provide cost efficient solutions with high packaged ICs, or die form. Our products meet performance requirements of SONET, ADSL, VDSL,

FEATURES (PL502-3X)

- 750kHz to 800MHz output range.
- Low phase noise output
 - -127dBc/Hz for 155.52MHz @ 10kHz offset
 - -115dBc/Hz for 622.08MHz @ 10kHz offset
- Selectable LVCMOS, LVPECL or LVDS output.
- Selectable High Drive or Standard Drive LVCMOS.
- 12MHz to 25MHz crystal input.
- No external load capacitor or varicap required.
- Output Enable selector.
- Wide pull range (± 200 ppm)
- Single 3.3V, $\pm 10\%$ power supply

PL502-30 BLOCK DIAGRAM



linearity, wide pull-range, and very high temperature stability. They are available in small form factor video, and many more applications.

MULTIPLIER AND NON MULTIPLIER VCXO ICS

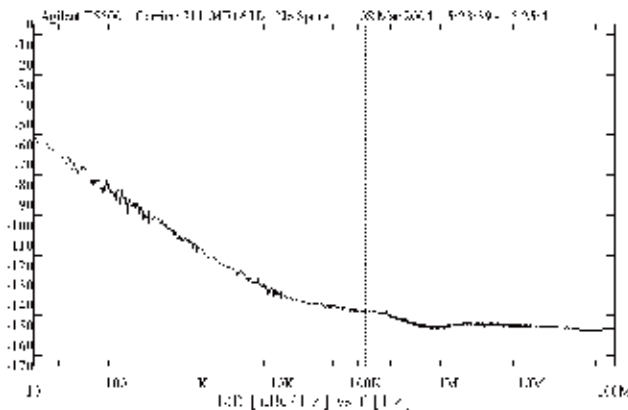
Part Number	Function	Input (MHz)	Multiplier	Output (MHz)	Output Type	Pull Range (ppm)	Voltage	Package
PL500-15 PL500-16 PL500-17	VCXO	17 - 36	N/A	1 - 36	LVC MOS	±200	2.5V, 3.3V	Die, Wafer SOT23-6 SOP-8
PL500-37	VCXO	36 - 130	N/A	36 - 130	LVC MOS	±150	2.5V, 3.3V	Die, Wafer SOP-8
PL520-20	VCXO	120 - 200	N/A	120 - 200	LVC MOS LVPECL LVDS	±110	3.3V	Die, Wafer
PL520-30	VCXO	65 - 130	N/A	32.5 - 130	LVPECL LVDS	±120	2.5V, 3.3V	Die, Wafer
PL520-80	VCXO	19 - 65	N/A	9.5 - 65	LVPECL LVDS	±200	2.5V, 3.3V	Die, Wafer
PL502-00	VCXO+PL	12 - 25	1,2,4,8	12 - 200	LVC MOS	±200	3.3V	Die, Wafer
PL502-02	VCXO+PL	12 - 25	2	24 - 50	LVC MOS	±200	3.3V	SOP-8
PL502-03	VCXO+PL	12 - 25	4	48 - 100	LVC MOS	±200	3.3V	SOP-8
PL502-04	VCXO+PL	12 - 25	8	96 - 200	LVC MOS	±200	3.3V	SOP-8
PL502-11	VCXO+PL	12 - 25	8	96 - 200	LVPECL	±200	3.3V	TSSOP-16
PL502-30	VCXO+PL	12 - 25	±16 to x32	0.75 - 800	LVC MOS LVPECL LVDS	±200	3.3V	Die, Wafer
PL502-37 PL502-35/38 PL502-39	VCXO+PL	12 - 25	±16 to x32	0.75 - 800	LVC MOS LVPECL LVDS	±200	3.3V	QFN-16, 3x3 TSSOP-16
PL520-00	VCXO+PL	100 - 200	1,2,4,8	100 - 800	LVC MOS LVPECL LVDS	±110	3.3V	Die, Wafer

Analog Frequency (non-PLL) Multiplier (AFM)

Micrel's Analog Frequency Multiplier products offer the world's lowest phase noise and jitter of most cost efficient clocking solutions for high performance applications. The AFM ICs are designed and high speed networking LAN applications.

FEATURES

- Non-PLL frequency multiplication
- Input frequency from 30-200 MHz
- Output frequency from 60-800 MHz
- World's best phase noise and jitter performance (equivalent to fundamental crystal at the output frequency)
- Ultra-low jitter
 - RMS phase jitter < 0.25 ps (12kHz-20MHz)
 - RMS period jitter < 2.5 ps
- Low phase noise
 - -142 dBc/Hz @100kHz offset from 155.52 MHz
 - -150 dBc/Hz @10MHz offset from 155.52 MHz
- High linearity pull range (typ. 5%)
- +/- 120 PPM pullability VCXO
- Differential output levels (PECL, LVDS), or single-ended CMOS
- Single 3.3V, ±10% power supply
- Temperature range (-40°C to +85°C)
- Available in 16-pin Green/RoHS compliant TSSOP, and 3x3 QFN packages



2x AFM Phase Noise at 311.04MHz

any multiplier clock IC, without the use of a PLL. Analog Frequency Multiplier products provide the to surpass the most stringent performance requirements of telecommunications, storage networking,

VCXO ICs (AFM)

Part Number	Input Range (MHz)	Output Range (MHz)	Output Type	Voltage	Jitter ² (fs) - Typical		
					RMS Period	Peak to Peak Period Jitter	Phase Jitter ¹ (12kHz to 20MHz)
PL560-08	75 - 150	300 - 600 (4X)	LVPECL (-08)	3.3V	4	25	50 @ 491MHz
PL565-08	150 - 200	600 - 800 (4X)	LVPECL (-08)	3.3V	4	25	50 @ 622MHz
PL560-37 PL560-38	30 - 62.5	120 - 250 (4X)	LVC MOS (-37) LVPECL (-38)	3.3V	2.5	25	150
PL560-47 PL560-48	30 - 80	60 - 160 (2X)	LVC MOS (-47) LVPECL (-48)	3.3V	2.5	18	250
PL565-68	62.5 - 160	125 - 320 (2X)	LVPECL (-68)	3.3V	2.5	18	100

XO ICs (AFM)

Part Number	Input Range (MHz)	Output Range (MHz)	Output Type	Voltage	Jitter ² (fs) - Typical		
					RMS Period	Peak to Peak Period Jitter	Phase Jitter ¹ (12kHz to 20MHz)
PL663-18	75 - 140	150 to 280 (2X)	PECL (-18) LVDS (-19)	3.3V	2.5	18	70 @156M
PL663-28 PL663-29	140 - 160	280 to 320 (2X)	PECL (-28) LVDS (-29)	3.3V	2.5	18	100 @311M

Note1: Phase noise was measured using Agilent E5052B.

Note2: No filtering was used in Jitter Calculations.

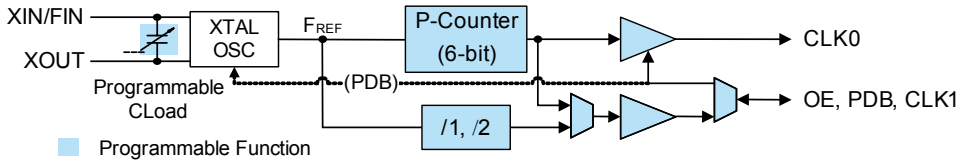
Crystal Oscillator (XO) ICs

Micrel's crystal oscillator ICs provide the best level of negative impedance, lowest jitter, and them suitable for all types of applications, including low-current, low-jitter, low-phase noise system

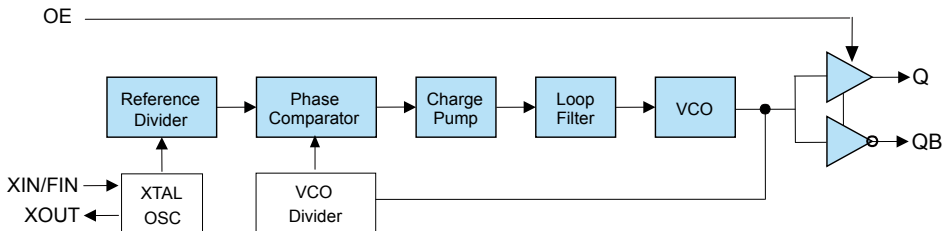
FEATURES (PL610-01/03)

- Single die, wide frequency coverage, programmable advanced oscillator design.
- Single IC to cover up to 130MHz output frequency.
- Direct oscillation operation with optional programmable features:
 - o ± 50 ppm Frequency Tuning
 - o Output Drive Setting (4, 8, or 16mA)
 - o 6-bit Odd/Even Output Divider ($\leq +63$)
- Input Frequency: Fundamental crystal:
 - o 10MHz to 60MHz (Default)
 - o 60MHz to 130MHz (programming option)
- Output Frequency: LVCMOS
 - o 160kHz to 130MHz.
- Very low-Jitter and Phase Noise
- Low current consumption
- Operating temperature range from -40°C to 85°C

BLOCK DIAGRAM OF ALL PROGRAMMABLE PL610 DEVICES



BLOCK DIAGRAM OF PL 602-XX MULTIPLIER , FOR PCIe/HCSL OUTPUT



lowest phase noise up to 200MHz. Our best in class buffer outputs (LVCMOS, LVDS, LVPECL) make clock reference, and for replacing ceramic based SMD modules.

CRYSTAL OSCILLATOR (XO) ICS

Part Number	Function	Input (MHz)	Output (MHz)	Output Type	Voltage	Package
PL610-01 PL610-03	XO With Programmable CLoad, Output Dividers	10 - 130	0.16 - 130	LVCMOS	1.8V to 3.3V	Die, Wafer DFN-6 SOT23-6
PL610-61 PL610-62 PL610-63	Smallest non Programmable XO (± 1 , ± 2 , ± 4)	10 - 60	2.5 - 60	LVCMOS	1.8V to 3.3V	Wafer
PL610-32	MHz to KHz Clock IC	16.777	.032768	LVCMOS	1.8V to 3.3V	Die, Wafer DFN-6 SOT23-6
PL611s-64 PL611s-68	Fixed Multiplier IC (x4, x8)	10 - 25	40-200	LVCMOS	1.8V to 3.3V	Die, Wafer
PL600-27T	XO	10 - 52	10 - 52	3-LVCMOS	1.8V to 3.3V	SOP-8
PL620-20	XO	100 - 200	100 - 200	LVPECL, LVDS	3.3V	Die, Wafer
PL620-30	XO	65 - 130	32.5 - 130	LVPECL, LVDS (selectable %2)	2.5V to 3.3V	Die, Wafer
PL620-80	XO	19 - 65	9.5 - 65	LVCMOS, LVPECL, LVDS (selectable %2)	3.3V	Die, Wafer

GENERAL PURPOSE PLL MULTIPLIER CLOCKS

Part Number	Function	Input (MHz)	Output (MHz)	Output Type	Voltage	Package
PL602-00	XO+PL	12 - 25	12 - 200	LVCMOS	3.3V	Die, Wafer
PL602-03	XO+PL	12 - 25	48 - 100	LVCMOS	3.3V	SOP-8
PL602-04	XO+PL	96 - 200	12 - 200	LVCMOS	3.3V	SOP-8
PL602-2X	XO+PL	25	25, 100, 125, 200, 250	Diff. CMOS/HCSL	3.3V	SOT-6 SOP-8
PL602-30	XO+PL	12 - 25	0.75 - 800	LVCMOS, LVPECL, LVDS	3.3V	Die, Wafer
PL602-37 PL602-38 PL602-39	XO+PL	12 - 25	0.75 - 800	LVCMOS (-37) LVPECL (-38) LVDS (-39)	3.3V	QFN-16, 3x TSSOP-16
PL620-00	XO+PL	100 - 200	100 - 800	LVCMOS LVPECL, LVDS	3.3V	Die, Wafer
PL620-21	XO	50 - 200	50 - 200	LVPECL, LVDS	3.3V	Die, Wafer
PL620-30	XO	65 - 130	32.5 - 130	LVPECL, LVDS	3.3V	Die, Wafer
PL620-80	XO	19 - 65	9.5 - 65	(selectable %2)	3.3V	Die, Wafer

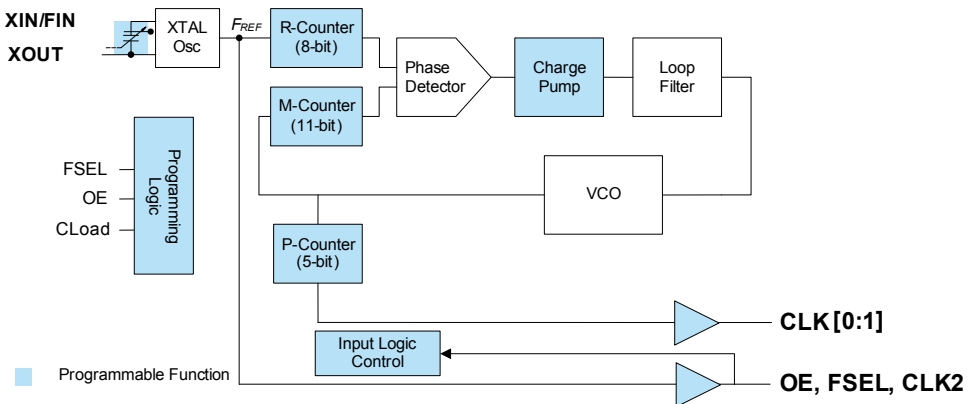
Programmable Clock with Differential Output

Micrel's PL611-30 is world's first programmable clock that is capable of offering differential PL611-30 offers the best performance for applications requiring performance, space savings,

FEATURES (PL611-30)

- Advanced programmable PLL design
- Very low Jitter and Phase Noise (< 40ps Pk-Pk typ.)
- Supports complementary LVCMOS outputs to drive LVPECL and LVDS inputs.
- Output Frequencies:
 - ≤ 400MHz at 3.3V
 - ≤ 350MHz at 2.5V
- Input Frequencies:
 - Fundamental Crystal: 10MHz - 30MHz
 - 3RD overtone Crystal: Up to 75MHz
 - Reference Input: 1MHz to 200MHz
- Accepts <1.0V reference signal input voltage
- One programmable I/O pin can be configured as Output Enable (OE) input, Frequency Selection (FSEL) input or Reference Clock (CLK2) output.
- Single 2.5V or 3.3V ± 10% power supply
- Operating temperature range from -40°C to 85°C

PL611-30/31 BLOCK DIAGRAM



PECL, LVDS, and CMOS outputs. Housed in a small 6-pin SOT package or in an 8-pin SOP, differential outputs, at an affordable price.

13. Application Specific Standard Clock for HD Video

PL611-31A/B/C/D are specially designed to support the high frequency clock requirements for HD Video applications. Utilizing a 27MHz crystal or reference clock input, this family provides selectable complementary CMOS for both US and European HD standard clock frequencies. This unique complementary CMOS output structure can clock both PECL and LVDS inputs and provide the low jitter required for video applications.



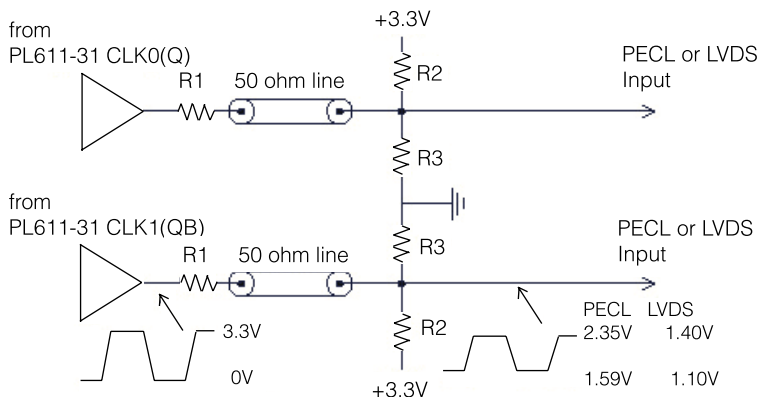
PL611-31B/D



PL611-31A/C

Features	-31A	-31B	-31C	-31D
Crystal Input (MHz)	-	27	-	27
Ref Input (MHz)	27	27	27	27
PK-PK Jitter	<50ps			
Selectable Output Frequency (MHz) via FSEL input	148.50000 148.35164		74.25000 74.17582	
Package Type	SOT6	SOP8	SOT6	SOP8

Turning Differential CMOS output to PECL and LVDS.



For PECL input	For LVDS Input
R1 = 130 ohm	R1 = 360 ohm
R2 = 82 ohm	R2 = 130 ohm
R3 = 130 ohm	R3 = 82 ohm

Notes: 1. Place R1 as close to the CMOS outputs as possible
2. Place R2 and R3 as close to the PECL/LVDS Inputs as possible

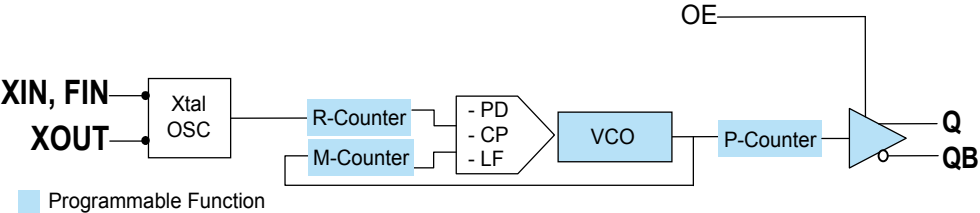
HCSL Compatible Clock Generator for PCI Express

Micrel's PL602-2X is the smallest, high performance, lowest power differential output clock 100MHz, with a very low jitter (2 ps TIE RMS), making it ideal for HCSL applications requiring any given input, or you can select for standard HCSL frequencies.

FEATURES

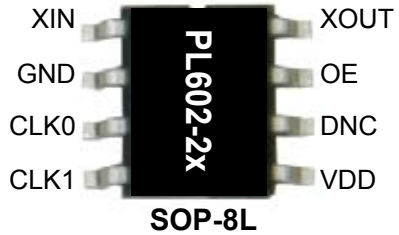
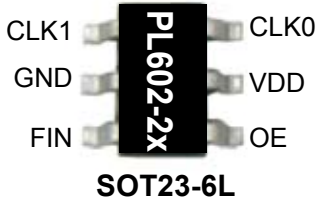
- Input Frequency:
 - Fundamental Crystal: 10-30MHz
 - Reference Input: $\leq 200\text{MHz}$
- Output Frequency: $\leq 200\text{MHz}$
- Very low Jitter: 28ps Pk-Pk typ.
- Very low Phase Noise:
 - -130 dBc at 10kHz offset at 100MHz
- No external loop filter is required
- Power supply range: 2.25V to 3.63V
- Operating temperature range from -40°C to 85°C
- Available in 6-pin SOT or 8-pin SOP Green/RoHS compliant package.
- Power supply range: 2.25V to 3.63V
- Operating temperature range from -40°C to 85°C
- Available in 6-pin SOT or 8-pin SOP Green/RoHS compliant package.

BLOCK DIAGRAM of Programmable PL602-20, for PCIe/HCSL OUTPUT



IC available for HCSL timing applications. Micrel's PL602-2X offers -130dBc at 10kHz offset at small size and low power. PL602-2X family offers fully programmable output frequencies for

PIN CONFIGURATION



FREQUENCY OPTIONS

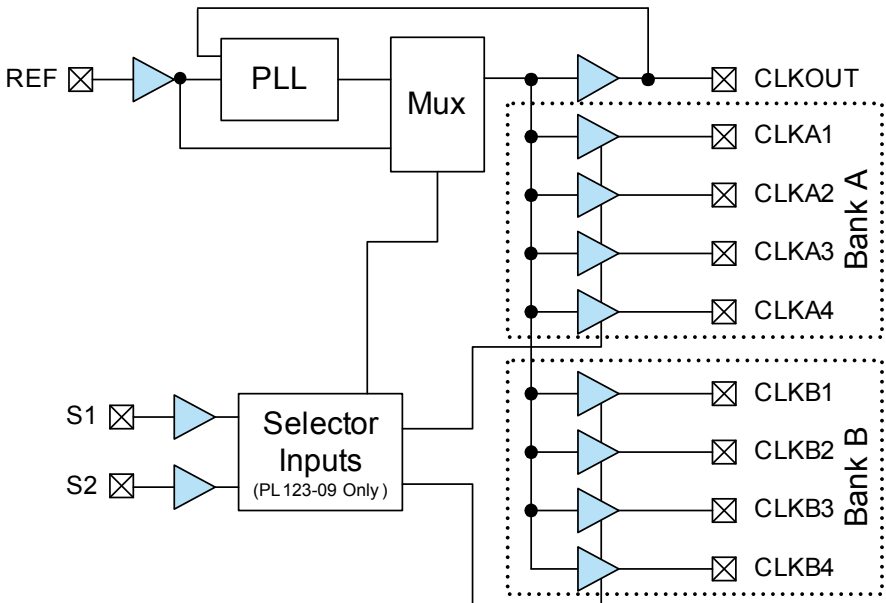
Part Number	Input (MHz)		Output (MHz)
	Crystal	Reference	
PL602-20 (Programmable)	10-30	≤200	≤200
PL602-21	25	25	100
PL602-22		25	125
PL602-23		25	200
PL602-26		25	25
PL602-27		25	250

Clock Distribution

Micrel's clock distribution products consist of zero delay buffers, TCXO fanout buffers, crystal or reference input fan out buffers, and translator buffers. These general purpose buffer products will reproduce a master clock frequency up to 1GHz with low skew between the outputs. Our zero delay buffers use a phase locked loop to ensure zero-delay between the outputs and the master signal.

FEATURES

- Frequency Range 10MHz to 134 MHz
- Output Options:
 - 5 outputs *PL123-05*
 - 9 outputs *PL123-09*
- Zero input - output delay
- Optional Drive Strength:
 - Standard (8mA) *PL123-05/-09*
 - High (12mA) *PL123-05H/-09H*
- Single 3.3V $\pm 10\%$ power supply
- Available in Commercial and Industrial temperature ranges



Zero Delay Buffers

Part Number	# of Outputs	Input/Output (MHz)	Description	Output Type	Voltage	Package
PL123-05(H) PL123S-05(H) PL123E-05(H)	5	10-134 10-134 10-220	(H): High Drive Buffer (S): Spread Spectrum Ready (E): High Speed Enhanced	CMOS	2.25V, 3.63V	SOP-8
PL123-09(H) PL123S-09(H) PL123E-09(H)	9	10-134 10-134 10-220	(H): High Drive Buffer (S): Spread Spectrum Ready (E): High Speed Enhanced	CMOS	2.25V, 3.63V	TSSOP-16
PL102-10	3	15-170	High Performance, Low-skew	CMOS	2.25V, 3.63V	SOT-23-6 SOP-8

Non PLL Buffers

Part Number	# of Outputs	Input/Output	Description	Output Type	Voltage	Package
PL135-27	2	10 - 40	Crystal input fan out buffer	CMOS	1.62V ~ 3.63V	DFN
PL135-37	3	10 - 40	Crystal input with 1-OE pin	CMOS	1.62V ~ 3.63V	SOT23-6
PL135-47	4	10 - 40	Crystal input with 4-OE pins	CMOS	1.62V ~ 3.63V	QFN3x3-16 Tssop-16
PL135-67	6	10 - 40	Crystal input with 2-OE pins	CMOS	1.62V ~ 3.63V	QFN3x3-16 Tssop-16
PL133-27	2	DC - 150	Clock input fan out buffer	CMOS	1.62V ~ 3.63V	DFN
PL133-37	3	DC - 150	Clock input with 1-OE pin	CMOS	1.62V ~ 3.63V	SOT23-6
PL133-47	4	1 - 150	Clock input with 4-OE pins	CMOS	1.62V ~ 3.63V	QFN3x3-16 Tssop-16
PL133-67	6	1 - 150	Clock input with 2-OE pins	CMOS	1.62V ~ 3.63V	QFN3x3-16 Tssop-16

Translator Buffers

Part Number	Function	Input Output (MHz)	Description/Output Type	Operating Voltage	Package
PL130-05	Translator to PECL	1MHz - 1.0 GHz	- AC coupled input (min. 100mV swing) - ≤1GHz PECL Output	2.5V, 3.3V	QFN3x3-16
PL130-07	Translator to CMOS	1MHz - 200	- AC coupled input (min. 100mV swing) - ≤200MHz CMOS Output	2.5V, 3.3V	SOP-8 QFN3x3-16
PL130-08 PL130-09	Translator to PECL	1MHz - 1.0 GHz	- AC coupled input (min. 100mV swing) - PECL (-08), LVDS (-09)	2.5V, 3.3V	SOP-8 QFN3x3-16

