

P60 IEEE 1588 Prototyping Board



APPLICATIONS

- Macro eNodeB
- Carrier Ethernet switches and routers
- Access equipment
- PTP Edge Grandmasters
- Power grid time synchronization
- Internet of Things
- Industrial precise time synchronization

FEATURES

- Full IEEE 1588 -2008 grandmaster, slave and gateway clock functionality
- Supports one-step and two-step clock
- Can operate with peer-to-peer and end-to-end transparent clocks
- Supports multicast and unicast PTP
- Synchronous Ethernet transmit capability
- 1PPS and ToD time output,
- 5/10/20/25 MHz frequency output
- Telecom, power and default profiles
- Fully transparent, low latency pass through traffic interface
- Industry leading algorithms achieve best-in-class performance on G.8261 test suite

BENEFITS

- Simple integration into host system
- Low power consumption
- Rapid time to market
- Low total cost of ownership



**P60
Prototyping
Board**

Emerging applications in 4G LTE and LTE-Advanced infrastructure, and the migration of transmission and distribution substations towards the smart grid have been fueling the need for higher precision time synchronization. The P60 board is a best-in-class solution for network equipment vendors looking to implement a time synchronization system using IEEE 1588 PTP packet timing to deliver a full, high performance, robust timing solution.

The P60 can operate as either a slave or master ordinary clock using just a single network interface, or both network interfaces can be used together with the P60 operating in a boundary/gateway clock mode. When operating as a master, the P60 provides time to multiple other devices over the network, whereas in slave mode it recovers time from a remote master. Gateway operation enables increased fanout (more slaves per master) and improved performance by segmenting larger networks.

Design & Integration

The P60 board offers a simple path to quickly integrate a precision synchronization system into a host system for either prototyping or lower-volume production.

The P60 contains everything needed to operate as a PTP clock – Ethernet interfaces with timestamping, a CPU running a full IEEE 1588-2008 protocol stack and clock recovery servo and time-of-day generation and reception.

The P60 has two Ethernet interfaces – a triple speed RJ45 copper port and an SFP socket that can support a 1000Base-LX/SX optical or a 1000Base-T copper transceiver. Five SMA coaxial connectors provide easy connectivity for 1PPS/ToD input and output and frequency output. A 40-pin header provides connectivity to the host system, including a serial port for control of the P60. A standard debug connector allows connection of a Trace Adapter for software development and debug and a micro-USB port allows easy control from a PC. The P60 can be powered through the micro-USB connector or from a separate power supply.

The P60 can receive a 1PPS and ToD from a GNSS (GPS, GLONASS or Beidou) timing engine as input (in addition to PTP) and produce PTP and accurate timing signals as output.

Two precise synchronized output signals are generated – a 5/10/20/25 MHz frequency output and a configurable 1PPS output signal. The “Time of Day” (ToD) information is available in NMEA, ASCII and ‘China Mobile’ format.

The P60 is fitted with an OCXO local oscillator to enable best performance.

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Pass-Through Technology

One of the innovative features of the P60 is that it can be integrated into an existing communication path. It features a low latency, fully transparent data communication channel at gigabit speed. It also allows for daisy chaining architectures of host systems.

Multi-sync & Algorithms

The P60 board has industry leading algorithms that enable it to extract precise time signals from packets impeded over the network by traffic load, congestion and packet delay variation (PDV). In addition, the P60 has cutting edge patented technology that enables it to use multiple synchronization inputs. This is particularly powerful in today's applications, where a host system may need to be versatile and deployable in multiple environments.

System Features

- IEEE 1588-2008 master, slave and gateway (boundary) clocks
- Fully compliant to telecom, power and default profiles
- Transparent clock support
- Frequency accuracy better than 10 ppb under ITU-T G.8261 test conditions¹
- Phase accuracy better than $\pm 1 \mu\text{s}$ accuracy under G.8261 testing conditions¹
- Enhanced synchronization and network performance metrics

¹ ITU-T G.8261 tests conducted at internal labs and 3rd party labs – details available on request and under NDA

Network Interface

- One Upstream/Downstream triple-speed RJ45
- One Upstream/Downstream 1GbE SFP
- Wire speed low latency pass-through
- Integrated TCP/IP stack
- IPv4 and IPv6 PTP

Technical Specifications

Ethernet

- Wire speed 1GbE pass-through

PTP Master

- Accuracy with GPS as reference, better than $\pm 25 \text{ ns}$
- Supports up to eight slaves
- Output Sync rate: up to 128 sync packet per second (individually programmable per slave)
- Holdover with fitted OCXO: 120 minutes (typical value at constant temperature)

PTP Slave

- Time alignment, better than $\pm 1 \mu\text{s}$ on a managed 10-switch GbE network under G.8261 test conditions.²
- Frequency alignment, better than $\pm 10 \text{ ppb}$ on a managed 10-switch GbE network under G.8261 test conditions.²
- Supports 1-step and 2-step master operation
- Input sync rate: up to 128 sync packets per second
- Holdover (typical value at constant temperature) with fitted OCXO: 120 minutes

Other Features

- DHCP client
- FTP server
- TELNET server
- SSH server
- Serial terminal
- Remote firmware upgrade
- Command line interface configuration (Telnet, SSH or serial port terminal)

Input Synchronization Interfaces

- 1 PPS

²With industry standard PDV profiles of switches and network conditions.

- ToD In: TTL, 4800/9600 bps, via dedicated pin port up to 115,200 bps via serial port
- PTP: Ethernet (L2) or UDP IPv4/IPv6 (L3)

Output Synchronization Interfaces

- Freq out: 5/10/20/25 MHz
- PPS out: up to 2 kHz with $1 \mu\text{s}$ resolution
- ToD out: TTL 4800/9600 bps on dedicated pin. Up to 115,200 bps on serial port.
- PTP: Ethernet (L2) or UDP IPv4 / IPv6 (L3)

ToD Format (input & output)

- ASCII: YYYY-MM-DD HH:MM:SS
- NMEA and China Mobile Binary format

Other Interfaces

- Input / output: 40 pin connector with serial interface
- ToD and PPS input/output & syntonized frequency on SMA coax
- One gigabit SFP
- One 10/100/1000 BaseT RJ45

Operating Specifications

- Supply: 3.3V or 5V +/- 10%
- Power consumption: 1.1 W (excluding SFP module)
- Operating temperature 0°C to 70°C (-40°C to 85°C optional)
- RoHS compliant
- Size: 100 mm X 60 mm X 15/25 mm

Ordering Information

- P60 IEEE 1588 Board with OCXO
(Contact Silicon Labs for availability of other oscillator options)