

# M68 Managed Timing Engine (MTE) Module



## APPLICATIONS

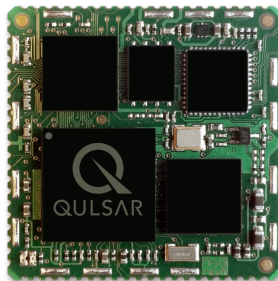
- Small cells, macro-cells (eNodeBs) etc.
- Mobile Backhaul Carrier Ethernet Equipment
- Power grid time synchronization client/slave systems
- Sensor network slave device
- Internet of things & Industrial automation precision timing

## FEATURES

- Gateway Clock (using IEEE-1588-2008 PTP)
- Supports GPS and PTP input
- Physical Layer Sync (SyncE )
- Supports one-step and two- step clock
- Supports both P2P and E2E modes
- Supports multicast and unicast
- Low power, small form factor
- Telecom, power and default profiles
- Fully transparent, low latency pass through traffic
- Industry leading algorithms for G.8261 test suite

## BENEFITS

- Easy integration in host system
- Low power consumption allows POE capability on host system
- Low total cost of ownership



M68 Gateway Module

As mobile networks architectures evolve from 3G to 4G LTE, to offer higher capacity amidst constraints of bandwidth, spectrum and interference management, innovative synchronization solutions are needed for both indoor and outdoor coverage.

Synchronization requirements are getting more stringent in the next generation 4G LTE-TDD and LTE-A infrastructure. Qulsar's Managed Timing Engine (MTE) Module M68, is a full packet network based synchronization engine, designed for applications that require distribution of frequency and phase synchronization from edge nodes; such as a Carrier Ethernet demarcation point, or macro base station that is aggregating traffic from small cells or substation clocks in power utility smart grids.

A key innovation is that the M68 is much more than a boundary clock. It is a Gateway Clock that can take 1 PPS and TOD from GNSS receiver as well as IEEE1588 PTP from the network, and deliver PTP and Frequency as output. Some key differences between Gateway and Boundary clocks are:

- a) In a boundary clock the master side gets its time reference from the slave side. When the master side uses the external time input it is not considered a boundary clock but rather is a "Grandmaster". In contrast, a Gateway clock utilizes the Time Input as the (primary) time reference (1PPS + ToD) for its master side and thus is, essentially, a Grandmaster. The slave clock is used as an assist to improve performance when the Time Input is not valid.
- b) A boundary clock identifies itself with an upstream Grandmaster and all downstream slaves are traceable to this upstream Grandmaster. In a Gateway clock the upstream Grandmaster identity is not necessarily relayed to downstream slaves.

## Design & Integration

The M68 is a gateway clock module that provides a simple and cost effective option to integrate precision timing, by replacing standard generic parts in host systems such as femtocells, small cells and carrier Ethernet equipment. The M68 can replace the PHY in the host system, supporting line-rate traffic

For rapid 'turnkey' integration, the M68 can be prepackaged in a subsystem (such as a P68 board or a Q68 sub-system) that can be immediately used as a synchronization 'system', enabling a rapid design cycle with later possibility for deeper integration. The first step towards integration is the purchase of a Evaluation Kit followed by a Developer Kit, that includes all the interface details, licenses and tools necessary for enabling the design effort.

# M68 MTE Module



## Pass-Through Technology

One of the innovative features of the M68 is that it can be integrated into an existing communication path. It features a low latency, fully transparent data communication channel or wire speed pass through at gigabit speed. This not only eliminates the need for an Ethernet switch to connect to the host, but also allows for daisy chaining architectures of host small cells.

## Multi-sync & Algorithms

The M68 module has industry leading algorithms. These enable it to extract precise time signals from packets impeded over the network by traffic load, congestion and delay variation (PDV).

In addition, the M68 has cutting edge patented technology that enables it to manage multiple clock domains from multiple inputs. The ability to use multiple synchronization inputs is particularly powerful in today's applications, where a host system may need to be versatile and deployable in multiple environments.

### System Features

- Assisted Partial Timing Support Clock (APTSC) G.8273.4
- Fully compliant to telecom, power and default profiles
- Multi-sync handling support
- Frequency accuracy better than 1ppb under ITU-T G.8261 test conditions <sup>1</sup>
- Phase accuracy better than  $\pm 1\mu\text{s}$  accuracy under G.8261 testing conditions <sup>1</sup>
- Enhanced synchronization and network performance metrics

### Network Interface

- Upstream 1GbE magnetics
- Downstream 1 RGMII port
- Wirespeed low latency pass-through
- Integrated TCP/IP stack
- IPv4 and IPv6 (PTP)

1. ITU-T G.8261 tests conducted at both Qulsar internal labs and 3<sup>rd</sup> party labs – details available on request and under NDA

## Technical Specifications

### Ethernet

- Wirespeed 1GbE pass-through

### PTP Master

- Accuracy with GPS as reference better than  $\pm 25\text{ns}$
- Output sync rate: up to 128 Hz

### PTP Slave

- Time alignment, better than  $\pm 1\mu\text{s}$  on a managed 10-switch GbE network under G.8261 test conditions.<sup>2</sup>
- Frequency alignment, better than  $\pm 10\text{ ppb}$  on a managed 10-switch GbE network under G.8261 test conditions.<sup>2</sup>
- Supports 1-step and 2-step masters
- Input sync rate: up to 128 Hz

### Other Features

- DHCPv4 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

- PTP: Ethernet (L2) or UDP IPv4/IPv6 (L3)

- 1PPS

- ToD in: TTL, 4800/9600 bps, via dedicated pin port up to 115200 bps via serial port

### 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 115200 bps on serial port.
- PTP: Ethernet (L2) or UDP IPv4/IPv6 (L3)

### ToD Format (output)

- ASCII, NMEA and China Mobile Binary format

### Physical Interfaces

- GPIO, Asynchronous serial, SPI, RGMII and MDIO

### Operating Specifications

- Supply: 3.3V, 1.8V, 1.2V +/- 10%
- Operating temperature: 0°C to 70°C (-40°C to 85°C optional)
- RoHS compliant
- Low power processor module: 1.1W (typical)

### Physical Specifications

- Package: LCC84
- Size: 29.2 mm X 29.2 mm X 2.8 mm

### Ordering Information

- 83-830-00 Managed Timing Engine Module (MTE) M68 Gateway Clock<sup>3</sup>

<sup>2</sup> With industry standard PDV profiles of switches and network conditions. <sup>3</sup> For different holdover options please check with your sales representative