OSCILLOQUARTZ
A division of Adtran

Oscilloquartz OSAinside™

Data Sheet

OSA 5400 SyncModule™

Embedded module, PTP grandmaster, NTP server, boundary/slave clock

5G Mobile | Telecom | Defense | Data center | Smart grid | Transportation | Financial | Broadcast

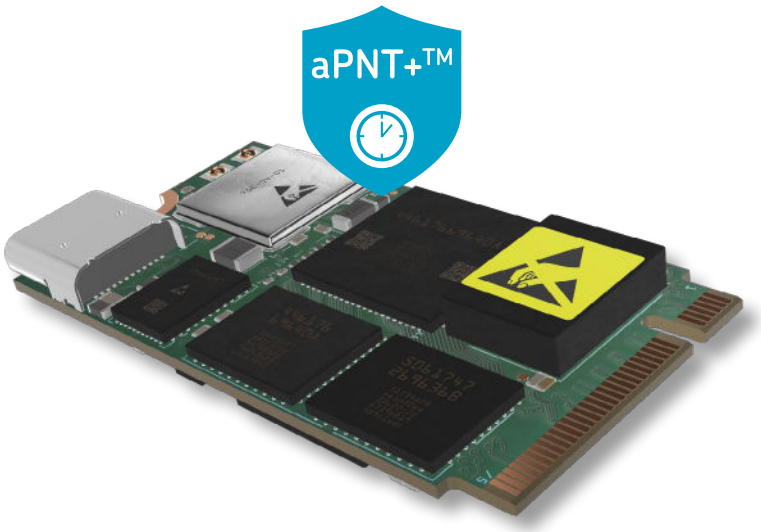
Benefits

- **Embedded timing module**
  Standardized M.2 design simplifies mechanical integration
- **Sophisticated, feature -rich synchronization**
  Built-in GNSS receiver enabling PRTC and IEEE 1588v2 grandmaster (GM), boundary (BC), slave clock (SC) and NTP server functionality
- **Syncjack™ technology**
  GNSS and synchronization assurance with comprehensive monitoring and analytics
- **Proven Oscilloquartz technology**
  OSAinside™ for faster time-to-market with less development and integration effort, while providing comprehensive timing functions
- **Highest reliability**
  Multiple fallback options – high-stability OCXO, SyncE and PTP can be used in the event of GNSS outage
- **Open control interfaces**
  Management integration with standardized information models

Overview

Suppliers of network equipment – such as routers, switches and mobile network devices – face the task of meeting increasingly stringent synchronization requirements. Failing to support accurate timing in a resilient and robust way puts them at a competitive disadvantage. The complexity of this challenge calls for an expert solution. Our OSA 5400 SyncModule™ provides suppliers of networking devices with timing technology that's simple to integrate yet sophisticated and powerful.

The OSA 5400 SyncModule™ offers a comprehensive set of synchronizations functions, including a GNSS receiver, PTP grandmaster, NTP server, SyncE and a precise boundary clock. With standardized M.2 design and open control interfaces, this highly compact module can be easily integrated into switches, routers and other networking devices. Our OSA 5400 SyncModule™ enables equipment vendors to add sophisticated timing and synchronization to their products, using a technology proven with the most demanding applications and built on operational experience from large-scale deployments.



Oscilloquartz multisource aPNT+™ engine

OSA 5400 SYNCMODULE™

High-level technical specifications

OSA 5400 SyncModule™

- Embedded timing module
- Integrated GNSS receiver
- Integrated GM, BC, SC, APTS
- Integrated NTP server
- Robust design
- Add-on plugs into hosting device

M.2 form factor

- Commonly applied miniature form factor
- Power consumption < 2.6W
- Extended operating temperature range

PTP functionalities

- Configurable as GM, BC, slave clock and APTS
- GM supported profiles:
  - IEEE 1588 2008 L3/L2,
  - ITU-T 8265.1 / 8275.1 / 8275.2
  - Power, broadcast
- PTP over L2 and over IPv4/IPv6 supported simultaneously

Timing accuracy

- +/-100nsec from UTC
- G.8272 / G.8273.1 compliant PRTC
- G.811 compliant PRC
- G.8262 / G.8264 Sync-E

Management

- Open control interfaces
- Local and remote management using SSH/Telnet/SNMP
- Secured management using SSH/SNMPv3

Built-in GNSS receiver

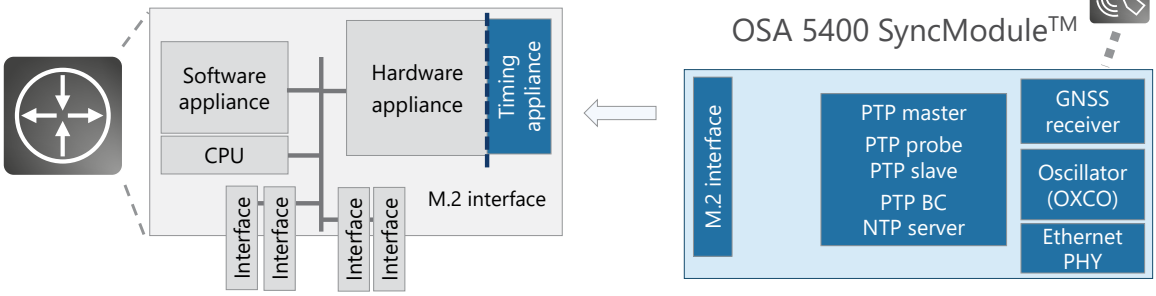
- 72-channel multi-GNSS
- Enhanced timing features
- Advanced jamming and spoofing detection
- GPS, Galileo, BeiDou, GLONASS,

Applications in your network

M.2 embedded timing module

- Integrates into 5G components such as DU/CU, switches, routers and other network devices
- Integrates into power utilities and broadcast studios network devices
- Delivers precise time, phase and synchronization
- Provides direct management integration

Generic architecture of a network device



Product specifications

Main applications

- GNSS receiver operating as PRTC and PRC
- 1588v2 PTP grandmaster, boundary, and slave clocks
- PTP to Sync-E and Sync-E to PTP conversion
- NTP server

PTP master modes of operation

- PTP Telecom profiles:
  - ITU-T G.8265.1 & Telecom2008 frequency delivery profiles
  - ITU-T G.8275.2 time/phase delivery profile
  - ITU-T G.8275.1 time/phase delivery profile (full timing support) also used for DOCSIS 3.1
- PTP enterprise profile (mixed IP multicast and unicast)
- PTP power and utility profiles:
  - IEC/IEEE 61850-9-3
  - IEEE C37.238-2011
  - IEEE C37.238-2017
- PTP broadcast profiles:
  - SMPTE ST 2059-2
  - AES67 media profile
- Grandmaster simultaneous support for multiple profiles

PTP slave modes of operation

- PTP power and utilities profiles
  - IEC/IEEE 61850-9-3
  - IEEE C37.238-2011
  - IEEE C37.238-2017
- PTP telecom profiles:
  - ITU-T G.8265.1 & Telecom2008 frequency delivery profiles
  - ITU-T G.8275.2 time/phase delivery profile (APTS, partial timing support with BMCA and automatic asymmetry compensation to two remote masters)
  - ITU-T G.8275.1 time/phase delivery profile (full timing support)
- IEEE1588v2 default PTP profiles over L3 (Annex D) and L2 (Annex F)
- PTP enterprise profile (Mixed IP multicast and unicast)

PTP features

- Up to 64 unicast slaves at 128pps
- Full featured IEEE 1588-2008 PTP grandmaster, boundary, and slave clocks
- Assisted partial timing support (APTS) – PTP input to backup GNSS outage over network with partial/ no timing support
- 1-step and 2-step clock
- Dedicated or common IP PTP interface
- VLAN (IEEE 802.1Q) or untagged
- Sync-E input to PTP output (frequency) conversion
- Conversion between PTP profiles
- Maintain PTP slaves list
- Fixed asymmetry compensation

M.2 connector interface

- SGMII (PTP, NTP, management)
- CLK in/out
- PPS in/out
- PPS+TOD in/out
- Power

HDMI type D connector:

- 1GbE copper (w/o magnetic).
- LED control

1PPS/CLK out

- User configurable output: 1PPS/10MHz
- Micro-Miniature AMC4 RF connector, 50 ohms (1.2mm Mated Height Max)

Synchronous Ethernet (SyncE)

- Compliant to the relevant sections of ITU-T G.8261 / G.8262 / G.8264
- Supported on ingress and egress
- G.811 compliant Sync-E primary reference clock (PRC) when locked to GNSS
- Ethernet synchronization message channel (ESMC)
- SyncE input for time holdover during GNSS outage

OSA 5400 SYNCMODULE™

NTP server

- Smallest NTP server formfactor
- Security-hardened NTP server with hardware-based responder
- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4 and SNTP over IPv4 /IPv6
- TIME & DAYTIME protocols
- Hardware-based timestamping
- Within +/–100nsec from UTC
- Hardware base DoS protection using NTP responder
- Up to 500,000 transactions per second
- Support PTP and NTP on same port
- PTP to NTP translation
- PTP backup in case of GNSS outage
- Stationary or moving platforms

GNSS receiver

- Provide high accuracy for PRTC-A applications
- Accuracy within +/-100nsec from UTC
- Independent 72-channel multi-constellation
- Supports single satellite timing modes
  - Survey fixed location
  - Configurable fixed location
- Navigation mode
- Configurable satellites SNR and elevation masks
- Advanced spoofing and jamming detection on device level
- AI based spoofing and jamming detection based on Ensemble Controller management featuring GNSS assurance
- GPS/QZSS L1 C/A and GLONASS L10F, BeiDou B1, Galileo E1, SBAS (QZSS , WAAS, EGNOS, MSAS)
- Up to three concurrent GNSS constellations
- User-configurable antenna cable delay compensation
- Micro-miniature AMC4 RF connector , 50 ohms (1.2mm mated height max)
- 3.3V@100mA max

Internal oscillator

- Frequency stability over temperature: +/-10ppb
- Frequency slope ΔF/ΔT: +/-0.5 ppb/C
- Long term stability (aging):
  - +/-1ppb/day
  - +/-2.5ppm /20 years

Frequency accuracy

- G.811 compliant PRC while locked to GNSS

Time and phase accuracy

- G.8272 / G.8273.1 compliant PRTC (±100nsec from UTC, MTIE<100nsec) while locked to GNSS
- During GNSS outage: time holdover using a G.811 PRC / G.8272 PRTC Sync-E input
  - Traceable to G.811 PRC: TimeError < UTC +/-1µsec for 24 hrs
  - Traceable to G.8272 PRTC: TimeError < UTC +/- 1µsec for 72 hrs

Indicators

- Onboard LEDs for power/GNSS/Eth status indication

Syncjack™ monitoring and assurance tools

- Clock Accuracy for up to two clock probes – computing TE and TIE of physical clocks
- Calculation TE/TIE between physical source and reference signals
- Programmable source and reference signals including SyncE, GNSS, PTP recovered clock.
- TE/TIE raw data collection and export to server
- Clock Analysis for up to two PTP clock probes – packet TE/TIE
- Calculation of packet TE/TIE between physical reference signal and timestamps within the PTP packets
- Programmable reference signals including SyncE and GNSS
- TE/TIE raw data collection and export to server

Management and security

- In-band management (over PTP / SyncE port)
- Remote CLI – Telnet & SSH (Secure Shell)
- Separate MGMT IP & PTP address
- VLAN and untagged
- System software download via TFTP & SCP (secure copy)
- Enable to disable each of the protocol via CLI
- Alarm log
- Syslog
- Remote authentication via RADIUS
- Remote, secured backup and restore
- Remote, secured SW upgrade
- Low touch provisioning using configuration file
- Multi-level user access
- Access control list (ACL)
- Full management using SNMP v2 / v3 including authentication and encryption
- Alarms, inventory, and traps reporting to NMS
- Managed by Adtran Ensemble Controller and Ensemble Sync Director, including GNSS assurance toolkit

Regulatory and standards compliance

- Sync and Time
  - ITU-T G.8261, G.8262, G.8264
  - ITU-T G.8272, G.811
  - ITU-T G.8265.1, G.8275.1. G.8275.2
  - IEEE 1588v2 (PTP)
  - RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3),
  - RFC 5905 (NTPv4), RFC 4330 (SNTPv4)
  - RFC868 (TIME), RFC867(DAYTIME)
- Safety. EMC, environmnetal
  - ETSI EN 300 386 V1.6.1
  - EN 55024
  - EN 55022 Class-B
  - AS/NZS CISPR 22
  - FCC CFR 47 Part 15 Subpart B
  - ANSI C63.4 Class-B
  - IEC/EN 61000-3-2
  - IEC/EN 61000-3-3
  - IEC/EN 61000-4-2 (ESD): ±15 kV / ±8 kV
  - (air/contact)
  - IEC/EN 61000-4-3 (RI)
  - IEC/EN 61000-4-4 (EFT): 1 kV / 50 A (5/50 ns)
  - IEC/EN 61000-4-5 (Surge): 4KV (10/700 µs)
  - IEC/EN 61000-4-6 (CI)
  - EN 60950-1: +A11, +A12, +2 (SAFETY)
- Others
  - RoHS compliance
  - CE
  - UL
  - FCC
  - WEEE

M.2 type

- 2242-D3-B (22x42mm , Key ID – B)

Environmental

- Operating temperature: 0 to +70ºC / 32 to 158ºF
- Storage temperature: -40ºC to +85ºC / -104 to 185ºF
- Humidity: 5 to 95% (non-condensing)

Power consumption

- Max power consumption <2.6W (with Ethernet PHY), 2.2W (without Ethernet PHY)