Shaping the Future:
TSN Hardware & TSN Software

TSN Box 3.1

Overview

Hardware Interface, TAP and Emulator for TSN Test & Measurement Applications

The TSN Box 3.1 is designed to assist with automotive network development, particularly in the context of next-generation zonal architectures, as well as with planning and analysis of modern industrial automation systems based on TSN and OPC-UA.

Key Features

- Hardware interface for test and measurement
- Automotive and industrial networks
- Next-generation zonal architectures and TSN
- Transparent TAP
- Analysis with enhanced DUT synching and time stamping
- Signal generation
- Extended high-precision gPTP testing capabilities
- Enhanced AVB and audio testing capabilities

Features

TSN Box is the hardware physical interface to the network and can be configured as either a transparent TAP or as an active network participant or emulator, for example TSN Talker/Listener or SOME/IP endpoint. Our standard configuration includes the following:

Multi-functional AVB/TSN Device

- Multi-port TAP, DUT sync feature, packet filtering, 8ns time stamp precision, 802.1Qbu support
- gPTP Master/Slave with failure injection, 1PPS out
- AVB Talker/Listener, IEEE 1722 AVTP/1733, CRF, media clock recovery, failure insertion, audio matrix/mixer & tone generator, Qav shaping
- TSN Qbv Talker/Listener
- TSN pcapng player with dynamic time stamp refresh mechanism
- SOME/IP controller, entity
- REST API

Hardware Interfaces

- 4x 100 BASE-T1, 2x 100/1000BASE-T1, 2x 100/1000BASE-T
- 1x CAN/CAN-FD
- BNC Sync 1x in/1x out, SMA High speed 2x in/2x out, GPIO 2x in/2x out
- 1000BASE-T Host port, USB3 Host, 2x USB2 Host
- Digital audio TOSLINK/ADAT optical 2x in/2x out, 48kHz, 2ch/8ch each

P5 - P8 can be equipped either with Automotive T1 or regular BASE-T Ethernet PHYs

P7/8 PHY modules 100/1000 BASE-T

- Dual speed twin port Ethernet 100/1000 BASE-T PHY module with RJ45 connector for industrial or laboratory applications
- Replaces P7/8 100/1000 BASE-T1 PHY modules on TSN Box 3.1 if equipped

P5/6 PHY modules 100/1000 BASE-T1

- Dual speed twin port Automotive Ethernet 100/1000 BASE-T1 PHY module
- Replaces P5/6 100/1000 BASE-T PHY modules on TSN Box 3.1 if equipped

High performance analog audio option

Analog Audio Module 8in/4out

- High performance analog audio I/O module
  - 8 channel audio in, 4 channel audio out, 3.5 mm stereo TRS jack, line level
  - Separate 32bit D/A and A/D converters
  - >110dB SNR D/A, >100dB A/D
  - Local precision clock synthesizer
  - High quality precision audio op-amps, separated per channel for reduced crosstalk
  - Relay-driven analog outputs to ensure glitch-free start-up
  - Precision discrete analog, digital and op-amp power supplies for reduced noise and increased headroom
- Replaces digital audio I/O on TSN Box 3.1 if equipped

Up to 16 channels digital audio option for complex AVB applications

Digital Audio 16in/16out Option

- Software module, 2x 8 channel digital audio in, 2x 8 channel digital audio out
- 48kHz, 16/20/24bit, TOSLINK/ADAT format in combination with TSN Box 3.1 digital card
- Digital audio mixer/matrix, signal generator, CRF clock output

Digital Audio 8in/8out Option

- Software module, 1x 8 channel digital audio in, 1x 8 channel digital audio out
- 48kHz, 16/20/24bit, TOSLINK/ADAT format in combination with TSN Box 3.1 digital card
- Digital audio mixer/matrix, signal generator, CRF clock output

Use Cases

Use Case AVB

TSN Box supports in even the most complex AVB scenarios with precise signal generation and nanosecond precise time stamping. Very demanding hybrid use cases are supported with advanced media clock generation and synchronisation as well as live audio I/O and gPTP analysis.

Use Case SOME/IP

System validation in AVB and TSN context is challenging, especially in combination with service-oriented communication based on SOME/IP or DDS. Therefore, TSN Box provides full integration of generic SOME/IP communication to make validation on system level smooth and efficient.

Products

Our product range covers a variety of precision measurement and analysis tools. To find the right solutions for your special use cases, please have a look at our additional product flyers.

TSN Tools

TSN Tools is a platform-independent software environment specifically designed to capture complex measurements and analyse tasks at a glance.

TSN Switch

The TSN Switch is a highly flexible AVB/TSN capable switch intended for use in the lab, car or HIL. It is one of the most secure Automotive Ethernet switches available and offers a wide range of management capabilities.

TSN Media Converter

The Media Converter M10 is a simple, small and highly flexible tool that can be used in different scenarios. For convenience, all settings are intuitively hardware adjustable without a tethered configuration PC.

Time Matters.

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