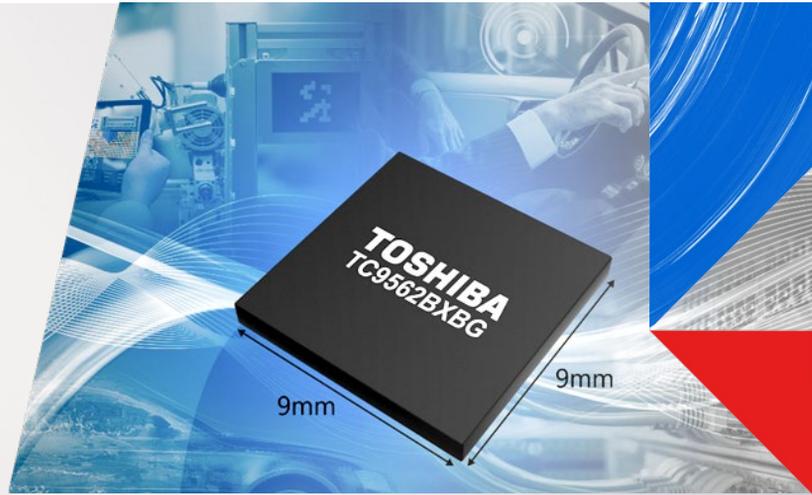# TOSHIBA

Ethernet-AVB/TSN Connectivity Solution

9mm **9mm**

Delivers Performance and Flexibility

TC9562 complements Toshiba's Ethernet connectivity IC line-up and provides advanced Ethernet capability for automotive and industrial applications. It enables deterministic real-time performance up to 1 Gbps Ethernet transfer rates and supports Time Sensitive Networking (TSN) protocol. The optimized hardware is supported by a programmable ARM® Cortex®-M3 core which can be used to implement additional features off-loading the host CPU or to enable stand alone operation for customized audio endpoints.

Applications

- Automotive applications, e.g. telematics, IVI, ADAS, car audio systems
- Industrial applications, e.g. factory automation
- Professional AV

Features

- Free programmable on-chip Arm® Cortex® M3 core (187 MHz)
- PCIe Gen 2 (5GT/s)
- Ethernet (AVB/TSN support) 10/100M/1Gbps
- Supports IEEE 802.1AS, IEEE 802.1Qav, IEEE 802.1Qbv, IEEE 802.1Qbu and IEEE 802.3br
- Dedicated HW for traffic shaping
- SGMII, RGMII, RMII or MII interface
- Hardware support for IEEE1722 audio format including media clock recovery PLL
- I2S/TDM, Quad SPI, I2C, SPI & UART
- Automotive AEC-Q100 / IATF 16949

Advantages

- Stand-alone operation without host CPU
- Flexible PHY interface
- Low jitter time synchronization
- High quality multichannel audio
- Superior QoS performance including frame pre-emption
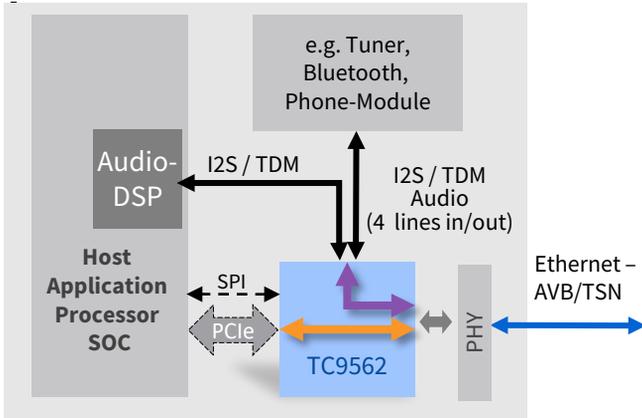- Share multiple traffic types on the same wire

Benefits

- Deterministic and bounded low-latency communication
- Full flexibility for the selection of Ethernet PHY types and switches
- Stand-alone audio endpoint applications without additional SoC
- Realisation of new Ethernet-AVB based car audio architectures
- Reduces cable harness
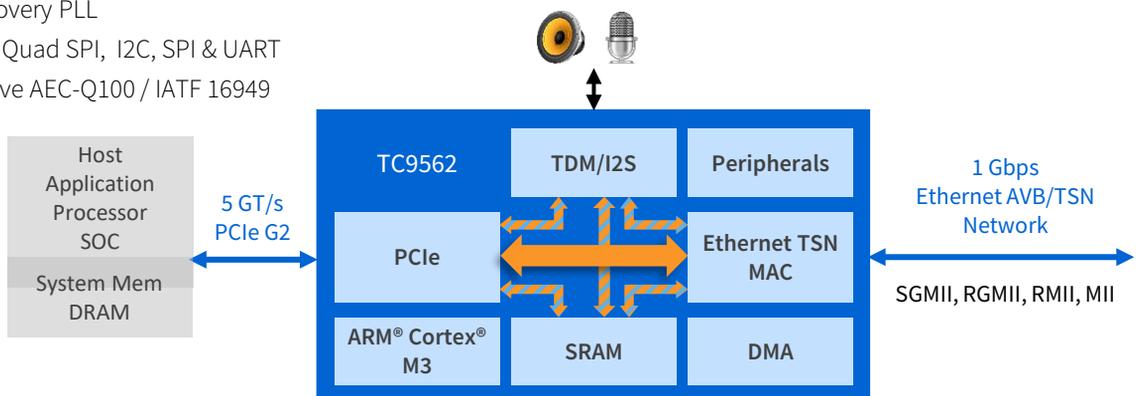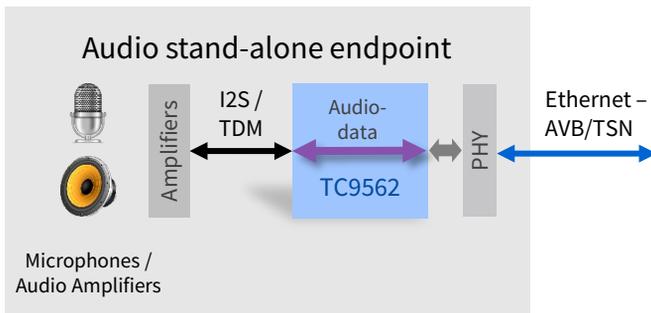
TC9562 application examples

Automotive – realize new Ethernet-AVB based car audio architectures

Audio transfers into Ethernet-AVB in parallel to PCIe host Ethernet traffic

e.g. Tuner, Bluetooth, Phone-Module

Audio-DSP

I2S / TDM

I2S / TDM Audio (4 lines in/out)

Host Application Processor SOC

SPI

PCIe

TC9562

PHY

Ethernet – AVB/TSN

- Audio in and out, transfer of audio into and from Ethernet-AVB without host load
- Audio-AVB traffic + standard & TSN traffic transfer on the same Ethernet wire.
- No separate audio cable harness needed, reduce cable harness cost in the car.
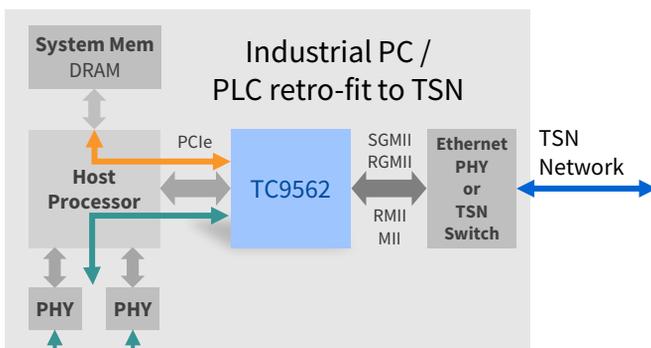- Audio path between SoC and TDM port possible, stream separation inside TC9562

Standalone car audio node, Ethernet-AVB connected (amplifier, microphones)

Audio stand-alone endpoint

Amplifiers

I2S / TDM

Audio-data

TC9562

PHY

Ethernet – AVB/TSN

Microphones / Audio Amplifiers

- TC9562 works stand-alone with integrated Arm® CPU
- Software library (source code) available for programming of individual audio solutions
- 4 x TDM/I2S data lines
- Up to 32 audio channels in TDM mode
- High quality audio: 16/20/24-bit, 32–192kHz
- Media clock recovery with own audio PLL
- Support for IEEE 1722, IEC 61883-6 and AAF

Industrial automation – add TSN into existing solutions

Brownfield device adaptation to Greenfield TSN network

System Mem DRAM

PCIe

Host Processor

TC9562

SGMII RGMII

RMII MII

Ethernet PHY or TSN Switch

TSN Network

PHY PHY

Real Time Industrial Ethernet to Legacy Machine / Devices

- PCIe for a direct communication between host and TSN MAC
- Preserves QoS for real-time legacy traffic in TSN networks
- Time synchronization
- Traffic shaping
- Time aware shaper with flexible queue management
- Frame pre-emption