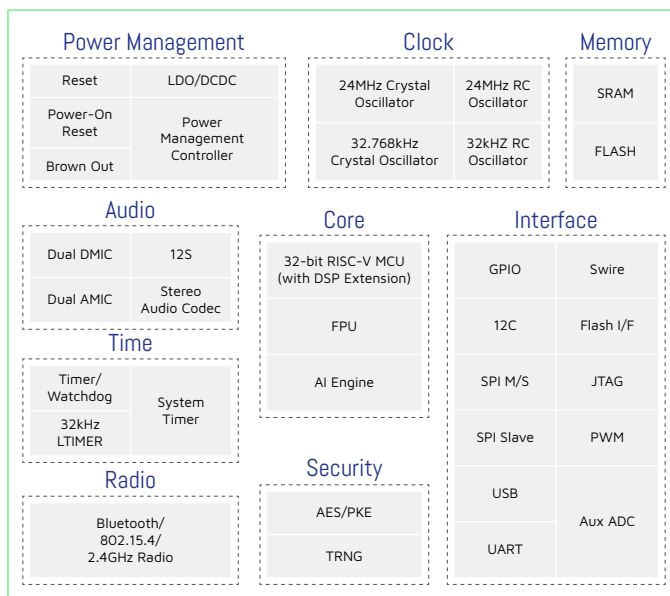




Overview

The TLSR9 Series is the latest addition to Telink's family of high-performance, ultra-low-power, cost-optimized RF connectivity SoCs. The TLSR9 integrates a powerful 32-bit RISC-V MCU with a variety of powerful core features and peripheral blocks to provide a foundation for advanced IoT, hearable, and wearable devices. The TLSR9 includes multistage power management design that enables ultra-low-power operation, making it ideal for power-sensitive applications. Further, the TLSR9's high level of integration allows customers to achieve optimal total system cost.



Applications

- **Bluetooth Dual-mode Multi-connection**
- **TWS Earbuds, Wireless Headsets**
- **Smart Watch, Smart Wristband**
- **Human Interface Devices, PC Peripherals**
- **Mesh Lighting, Wireless Sensor Network**
- **Advanced Remote Control Units**
- **Indoor Positioning/Navigation, Direction Finding**
- **Open Platforms, Free RTOS**

Resources

- Datasheet*
- Generic hardware development kit
- Application-specific demos and development kits
- Reference designs and design guide
- RISC-V-based IDE and tools
- Software development kits and handbooks*
- IC samples
- Field application engineer support
- [Telink Wiki](#)
- [Technical forum](#)
- *NDA required

Key Features

*Optional Features

32-bit RISC-V MCU

- Max. 96MHz operating frequency
- 5-stage in-order execution pipeline
- 2.59 DMIPS/MHz, 3.54 CoreMark/MHz
- DSP instruction set, floating-point unit

Protocols

- Bluetooth 5.2-compliant
- BLE: 1Mbps/2Mbps/Coded PHY/AOA/AOD/Mesh
- BT Classic*: BDR 1Mbps/EDR 2Mbps/EDR 3Mbps
- IEEE 802.15.4: Zigbee/RF4CE/6LoWPAN/Thread
- HomeKit, 2.4GHz proprietary
- Multi-protocol concurrent mode*
- HW OTA upgrade and multiple boot switch

Memory

- Max. 256KB SRAM w/ max. 64KB retention
- Program memory: max. 2MB Flash*

Power Consumption (whole chip @ 4.2V DC-DC)

- EDR: Rx 5mA, Tx 13mA @ 0 dBm
- BLE: Rx 5mA, Tx 5.2mA @ 0 dBm
- Deep sleep: 0.7uA

RF Specification

- Rx sensitivity (dBm): -92@BR, -92.5@EDR 2Mbps, -86@EDR 3Mbps, -96@BLE 1Mbps, -92.5@BLE 2Mbps, -99.5@LR 125kbps, -98.5@LR 500kbps, -99.5@802.15.4 250kbps
- Tx output power (max.): +10dBm@BR/BLE, +2.5 dBm@EDR

AI Engine*

- Parallel 20 instructions per cycle
- Supports vector algebra operations
- Supports vector special functions operations
- 4 MAC per cycle up to 24b multiplier and 64b accumulation
- AHB/AXI interface

Supply Voltage

- 1.8 V~5.5 V

Operating Temperature

- -40°C~+125°C

Audio Features

- High-performance stereo audio codec: 24-bit ADC/DAC, SNR >96dB, max. sampling rate 192kHz
- Patented proprietary technology for TWS and 1+N hearable devices with synchronized playback and balanced power on all devices
- Audio codec: SBC, OPUS, LC3
- Voice codec: G.711, a-Law, u-Law, CVSD, mSBC
- Bluetooth profiles: HFP 1.7, HSP 1.2, A2DP 1.3, AVRCP 1.6, SPP 1.2, PBAP 1.0, ANCS, DIS
- Apple iAP2 protocol
- EDR+BLE dual-mode operation
- Noise suppression and echo cancellation
- Active noise cancellation (ANC)*
- Supports packet loss concealment (PLC) for voice processing

Security

- HW AES and AES-CCM
- HW accelerator for ECC
- Embedded TRNG
- Secure boot*

Rich Set of Interfaces

- Max 40 GPIOs
- Configurable to select 2-wire SDP or 5-wire JTAG debug interface
- Flash I/F interface, up to quad data line
- Dual DMIC & Dual AMIC
- SPI, I2C, USB 2.0, Swire, UART with hardware flow control and 7816 protocol support
- Max 6 channels of differential PWM
- IR transmitter with DMA
- 10-channel 14-bit auxiliary ADC
- Low-power comparator
- PTA for WiFi coexistence

Package Options

- Multiple package options

Product Table

Product	Bluetooth Dual-mode	Multi-protocol	AOA/AOD	High Tx Power	GPIO	Audio	Application
9518	Y	Y	Y	N	40	Stereo	Evaluation only
9515	Y	N	Y	N	27	Stereo	Hearable/Wearable
9513	Y	N	N	Y	13	Stereo	Bluetooth dual-mode multi-connection
9218	BLE	Y	Y	N	26	Mono	High-end IoT – RCU
9215	BLE	Y	Y	N	28	N	High-end IoT – Wearable
9213	BLE	Y	Y	N	40	N	High-end IoT – HID