

Apollo330 Plus Series Ultra-Low Power SoCs

Product Brief

Apollo330 Plus System-on-Chip (SoC) is a groundbreaking solution engineered to redefine the boundaries of ultra-low-power performance in conventional edge and AI applications. Built upon Ambiq's renowned Subthreshold Power Optimized Technology (SPOT®), the Apollo330 Plus SoC sets a new standard for energy efficiency, enabling devices to operate for extended periods running more AI operations than ever before. This advanced SoC features an integrated Arm® Cortex®-M55 application processor running up to 250 MHz and a dedicated Arm Cortex-M4F network processor for low power radio communication, allowing for efficient and high-performance connectivity while consuming minimal active power.

Apollo330 Plus Series SoCs boast an array of peripherals and connectivity options designed to address the diverse needs of body-worn and ambient AI. *Apollo330B Plus* extends upon Apollo330 Plus with Bluetooth® Low Energy wireless connectivity. *Apollo330M Plus* further extends connectivity with the addition of Thread and Matter. Both SoCs facilitate seamless communication with a wide range of devices, enabling effortless data exchange and interoperability in diverse endpoints. Apollo330 Plus offers a rich set of peripherals for conventional edge and AI applications, empowering developers to create sophisticated sensor-based applications easily.

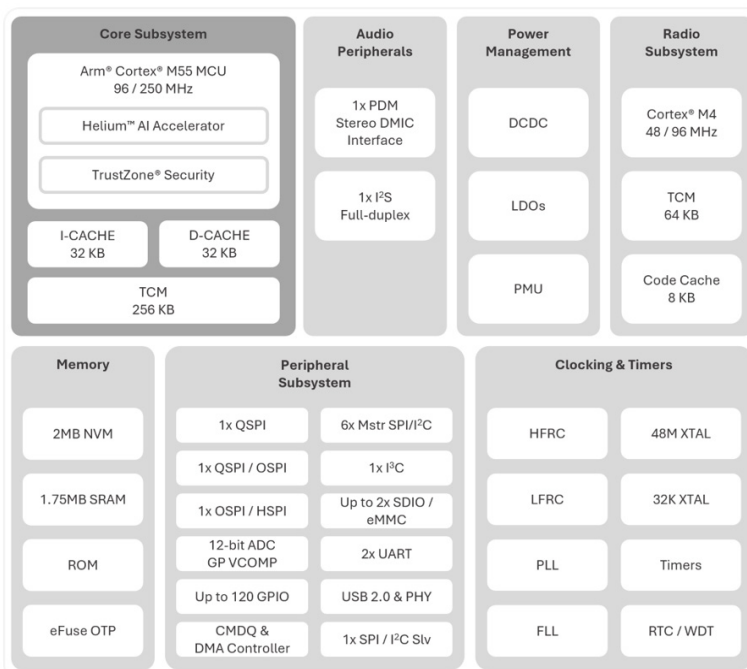
Innovative secureSPOT® 3.0 features based on TrustZone® technology further enhance Apollo330 Plus Series SoCs, ensuring the integrity and confidentiality of data transmitted and processed by connected devices. With hardware-based security mechanisms such as secure boot and secure firmware updates, these SoCs provides robust protection against unauthorized access and malicious attacks, enabling secure deployment in various applications.



*Apollo330 Plus, Apollo330B Plus, and Apollo330M Plus*¹

Feature Highlights:

- Up to 250 MHz Arm Cortex-M55 application processor with turboSPOT® and Helium™ technology
- 48/96 MHz Arm Cortex-M4F network coprocessor and multi-protocol radio in wireless product options
- Enhanced memory performance with 32kB I-cache and 32kB D-cache, over 2MB of system RAM, and 2MB of embedded non-volatile memory for code/data
- Ultra-low power digital microphone PDM for truly always-on voice
- Wide range of integrated sensor interfaces including ADC, SPI, I²C, I³C, and UART
- Multiple package and connectivity options for diverse endpoints



Block Diagram for the Ultra-Low Power Apollo330 Plus / Apollo330B Plus / Apollo330M Plus

Features and Specifications

Arm Cortex-M55 Processor with Helium Technology

- Up to 250 MHz clock frequency
- Helium (MVE) AI accelerator, up to 8 MACs per cycle
- Scalar floating-point: double, single, and half-precision arithmetic
- Supports TrustZone security extensions
- Integrated 32 kB Instruction Cache and 32 kB Data Cache
- Integrated 256 kB Instr./Data Tightly Coupled Memory (TCM)
- Memory Protection Unit (MPU)

Bluetooth Low Energy 5.4 (Apollo330B Plus and Apollo330M Plus)

- Low Energy Audio with Auracast™ broadcast audio with LC3 codec
- Direction Finding (single antenna)
- Advertising Extensions
- Long Range
- Periodic Advertising with Response (PAWR)
- Tx Power: Up to +14dBm output power
- Rx Sensitivity: -95/-98/-104dBm (2Mbps/1Mbps/125kbps)

802.15.4, Thread, and Matter (Apollo330M Plus)

secureSPOT 3.0 Security Features

- Arm TrustZone technology
- Secure boot
- OTP key storage
- PUF-based identity/sign/verify
- Secure over-the-air (OTA) updates
- Secure wired updates
- Key revocation

Ultra-Low Power Memory

- Up to 2MB of non-volatile memory for code/data
- 2MB of TCM and system RAM for code/data

Ultra-Low Power Interface for On- and Off-Chip Sensors

- 12-bit ADC, 11 selectable input channels
- Up to 1.7 MS/s sampling rate
- Integrated temperature sensor

Ultra-Low Power Flexible Serial Peripherals

- 1x I³C master interface
- 6x I²C/SPI masters for peripheral communication
- Full-duplex I²C/SPI slave for host communications
- Pin Config 1 (BGA): 2x QSPI at 96 MT/s + 1x HSPI at 250 MT/s
- Pin Config 2 (BGA): 1x QSPI at 96 MT/s + 2x OSPI at 96/192 MT/s
- Pin Config 3 (CSP): 1x QSPI at 250MT/s + 1x OSPI at 250 MT/s or 1x HSPI at 250 MT/s
- 2x UART modules with FIFOs and flow control
- 2x SDIO (v3.0) / eMMC (v4.51)
- 1x USB 2.0 FS/HS device controller
- Up to 120 GPIO

Audio Processing

- 1x PDM stereo DMIC interface
- 1x full-duplex multichannel I²S port

Rich Set of Clock Sources

- PLL for precise clocking applications
- 48 MHz and 32.768 kHz Crystal (XTAL) oscillators
- Low Frequency RC (LFRC) oscillator
- High Frequency RC (HFRC) oscillator

Power Management

- Operating range: 1.71-3.63V
- Single Inductor Multiple Outputs (SIMO) Buck Converter
- Multiple I/O voltages supported

Applications

- Smartwatches/bands
- Smart home devices
- Body-worn and ambient AI
- Wireless sensors and industrial edge
- Smart remotes
- Patient health monitoring
- Hearing assist
- Condition monitoring
- Factory predictive maintenance
- Livestock monitoring
- Asset tracking

Package Options

- BGA
- CSP (est. 4 x 4 mm)

Ordering Information

Product	Commercial SKU (-20°C to +70°C)	Industrial SKU (-40°C to +85°C)	Connectivity Type	Package
Apollo330 Plus	AP330NPA-CCR	AP330NPA-ICR	No Connectivity	CSP
Apollo330 Plus	AP330NPA-CBR	AP330NPA-IBR	No Connectivity	BGA
Apollo330B Plus	AP330BPA-CCR	AP330BPA-ICR	Bluetooth Low Energy	CSP
Apollo330B Plus	AP330BPA-CBR	AP330BPA-IBR	Bluetooth Low Energy	BGA ²
Apollo330M Plus	AP330MPA-CCR	AP330MPA-ICR	Multi-Protocol	CSP
Apollo330M Plus	AP330MPA-CBR	AP330MPA-IBR	Multi-Protocol	BGA

¹ Product images shown are for illustration purposes only and may not be an exact representation of the products.

² Package option under consideration.



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