Apollo4 **Blue Plus** Low Power System on Chip

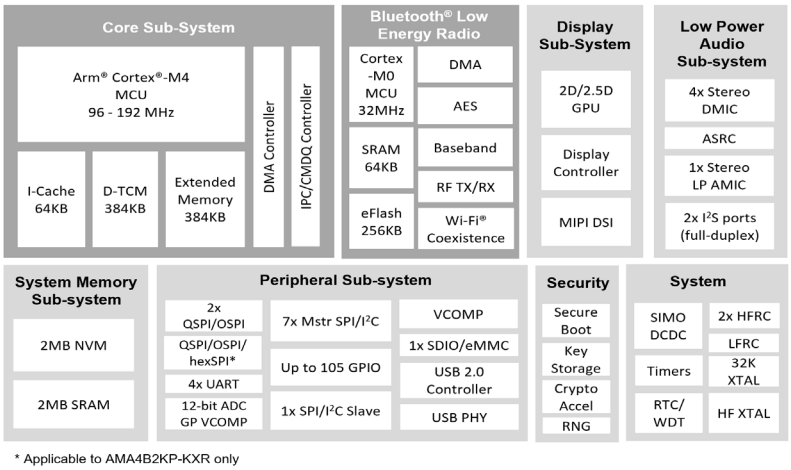
Product Brief

Ambiq®, the leader in low power System on chip (SoC) design, introduces the Apollo4 Blue Plus SoC, extending the Apollo4 Plus product family with integrated low power Bluetooth® Low Energy 5.1. Apollo4 Blue Plus enables designers of next generation wearables and smart devices to deliver even more stunning user interface (UI) effects and overall user experience to take their innovative products to the next level.

The Apollo4 Blue Plus SoC is the 4th generation system processor solution built upon Ambiq's proprietary Subthreshold Power-Optimized Technology (SPOT®) platform. The Apollo4 Blue Plus's complete hardware and software solution enables the wireless battery-powered endpoint devices of tomorrow to achieve a higher level of intelligence without sacrificing battery life. The Apollo4 Blue Plus includes a 32-bit Arm® Cortex®-M4 core with Floating Point Unit (FPU) and a Bluetooth® Low Energy 5.1 radio. There are two variants in BGA packages. The AMA4BKP-KBR, available now, is pin-compatible to the Apollo4 Blue AMA4BKK-KBR for easy migration. The AMA4BKP-KXR, available in Q3, 2022, includes a HexSPI interface for faster access to PSRAM or other external memory for richer graphics.

With up to 2MB of MRAM and 2.75MB of SRAM, the Apollo4 Blue Plus has more than enough compute and storage to handle complex algorithms and neural networks while displaying vibrant, crystal-clear, and smooth graphics. If additional memory is required, external memory is supported through Ambiq's high bandwidth multi-bit SPI and eMMC interfaces.

The Apollo4 Blue Plus is purpose-built to serve as both an application processor and a coprocessor for battery-powered endpoint devices, including smartwatches, children's watches, fitness bands, animal trackers, far-field voice remotes, predictive health and maintenance, and the smart home.



* Applicable to AMA4B2KP-KXR only

Block Diagram for the Ultra-Low Power Apollo4 Blue Plus SoC

Apollo Graphical Display

Feature Highlights:

- Achieving an unmatched 4 µA/MHz from MRAM or SRAM with low power sleep modes
- Up to 192 MHz clock frequency with turboSPOT®
- 2D/2.5D graphics accelerator and MIPI DSI 1.2 with up to two lanes at 500Mbps delivering a feature-rich user interface
- Embedded low power Bluetooth Low Energy 5.1 radio including Angle of Arrival (AOA) and Angle of Departure (AOD) for always-on applications
- Proprietary audio interfaces and an ultra-low power analog microphone ADC for truly always-on voice processing
- Serves as an applications processor with a fully integrated audio subsystem and interface to cellular/Wi-Fi® radios
- Includes an extensive set of digital and analog peripheral interfaces with integrated ADCs and digital sensor processing using the integrated serial master ports
- 8 PDM channels, 2 stereo I^2S channels with ASRC, and an ultra-low power ADC for analog mics
- PSA-L1 certified

Features and Specifications

Ultra-Low Supply Current
- 4 µA/MHz executing from MRAM (with cache)
- Low-power sleep and deep sleep modes with selectable levels of RAM/cache retention

High-Performance Arm Cortex-M4 Processor with FPU
- Up to 192 MHz clock frequency
- Floating Point Unit (FPU)
- Memory Protection Unit (MPU)

Bluetooth Low Energy 5.1
- 2 Mbps, extended advertising packets
- Angle of Arrival (AOA) and Angle of Departure (AOD)
- Tx: Up to +6 dBm output power
- Rx Sensitivity: -95 dBm

Security Features
- Secure Boot
- Secure over-the-air (OTA) updates
- Secure wired updates
- Key Recovation

Ultra-Low Power Memory
- Up to 2MB of non-volatile MRAM for code/data
- Up to 2.75MB of low power RAM for code/data

Ultra-Low Power Interface for On- and Off-Chip Sensors
- 12-bit ADC, 11 selectable input channels
- Up to 2.8 MS/s sampling rate
- Temperature sensor with ±3°C accuracy

Ultra-Low Power Flexible Serial Peripherals
- 2x 2/4/8-bit SPI master interfaces
- 2/4/8/16-bit SPI master interface (16-bit SPI available in AMA4BPK-KXR only)
- 7x I^2C/SPI masters for peripheral communication
- 1x SPI slave for host communications
- 4x UART modules with flow control
- 1x USB 2.0 HS/FS device controller
- 1x SDIO (SD3.0)/1x eMMC (v4.51)

Display
- MIPI DSI 1.2 with 2 data lanes up to 500 Mbps
- Up to 500 x 500 resolution
- 4 layers with alpha blending
- Frame Buffer Decompression

Graphics
- 2D/2.5D graphics accelerator
- Full Alpha Blending
- Texture and Frame Buffer Compression
- Anti-Aliasing
- Dithering
- Vector Graphics

Audio Processing
- 1x stereo Low Power Analog microphones
- 4x stereo Digital microphones
- 2x full-duplex I^2S ports with ASRC

Rich Set of Clock Sources
- 16-52 MHz and 32.768 kHz Crystal (XTAL) oscillators
- 1 kHz Low Frequency RC (LFRC) oscillator
- 2x High Frequency RC (HFRC) oscillator – 192/384 MHz

Power Management
- Operating range: 1.71-2.2 V, –20°C to 60°C
- SIMO buck
- Multiple I/O voltages supported

Applications
- Smart watches/bands
- Wireless sensors and IoT
- Activity and fitness monitors
- Children's watches
- Animal trackers
- Motion and tracking devices
- Alarms and security system
- Far-field voice remotes
- Consumer medical devices
- Predictive maintenance
- Smart home

Package Options
- 4.7 mm x 4.7 mm, 131-pin SiP BGA

Ordering Information
- AMA4B2KP-KXR (BGA)
- AMA4B2KP-KBR (BGA)

AMA4B2KP-KXR/AMA4B2KP-KBR

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

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