

Apollo4 Low Power System on Chip

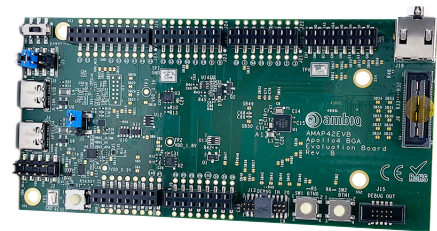
Product Brief

Ambiq®, the leader in low power system on chip (SoC) design, has once again raised the bar with the Apollo4 SoC. With the lowest dynamic power on the market and flexible low power sleep modes, the Apollo4 SoC allows designers of next generation wearables and smart devices to take their innovative products to the next level.

The Apollo4 SoC is the 4th generation system processor solution built upon Ambiq's proprietary Subthreshold Power-Optimized Technology (SPOT®) platform. The Apollo4's complete hardware and software solution enables the battery-powered endpoint devices of tomorrow to achieve a higher level of intelligence without sacrificing battery life. The Apollo4 is built with an 32-bit Arm® Cortex®-M4 core with Floating Point Unit (FPU) comes in a BGA package.

With up to 2MB of MRAM and 1.8MB of SRAM, the Apollo4 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, an external memory is supported through Ambiq's multi-bit SPI and eMMC interfaces.

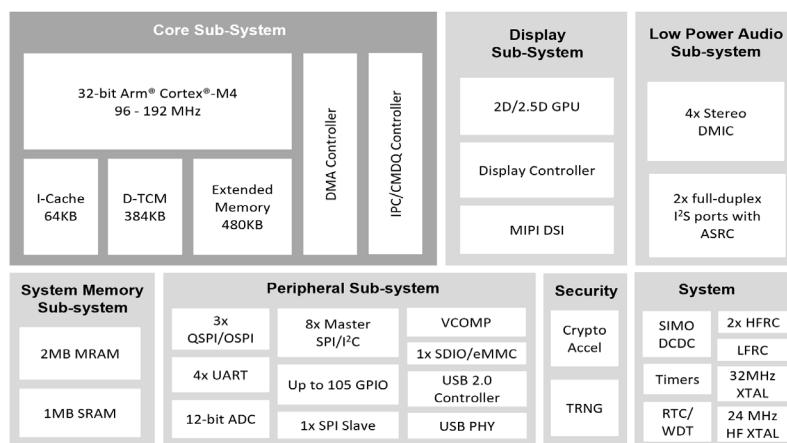
The Apollo4 is purpose-built to serve as both an application processor and a coprocessor for battery-powered endpoint devices, including smartwatches, children's watches, fitness bands, animal trackers, far-field voice remotes, predictive health and maintenance, and the smart home.



Apollo4 EVB

Feature Highlights:

- Achieving an unmatched 5 μ A/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 500Mbps delivering a feature-rich user interface
- Serves as an applications processor with a fully integrated audio subsystem and interface to other communication devices
- 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 I²S channels with ASRC
- PSA-L1 certified



Block Diagram for the Ultra-Low Power Apollo4 SoC

Features and Specifications

Ultra-Low Supply Current

- 5 μ A/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)
- Secure Boot

Ultra-Low Power Memory

- Up to 2MB of non-volatile MRAM for code/data
- Up to 1.8MB 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 $\pm 3^{\circ}\text{C}$ accuracy

Ultra-Low Power Flexible Serial Peripherals

- 3x 2/4/8-bit SPI master interfaces
- 8x I²C/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 up to 500 Mbps
- Up to 454 x 454 resolution
- 4 layers with alpha blending
- Frame Buffer Decompression

Graphics

- 2D/2.5D graphics accelerator
- Full Alpha Blending
- Texture and Frame Buffer Compression

Audio Processing

- 4x stereo Digital microphones
- 2x full-duplex I²S 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

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

- 5 mm x 5 mm, 146-pins BGA with 105 GPIO

Ordering Information

- AMAP42KK-KBR-B2 (BGA)



AMAP42KK-KBR-B2

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