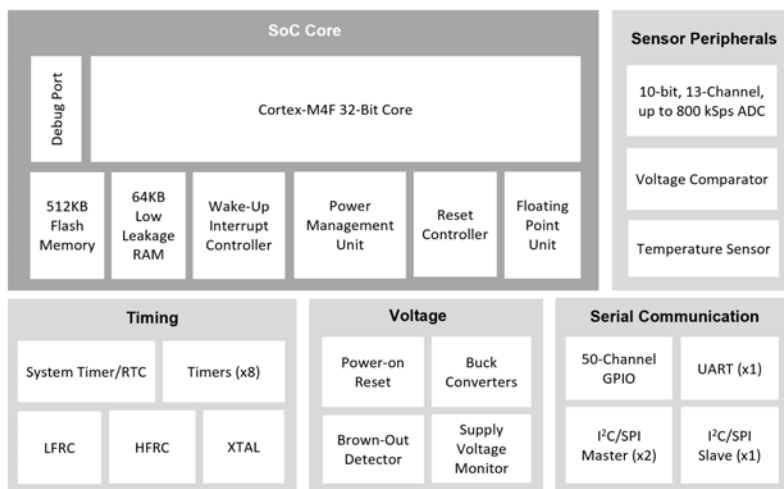


# Apollo Low Power System on a Chip

## Product Brief

The Apollo is an ultra-low power, highly integrated system on chip (SoC) designed for battery-powered devices including wearable electronics, activity and fitness monitors, and wireless sensors. By combining ultra-low power sensor conversion electronics with the powerful Arm® Cortex®-M4F processor with the Floating Point Unit (FPU) options, the Apollo SoC enables complex sensor processing tasks to be completed with unprecedented battery life. Weeks, months, and years of battery life are achievable while doing complex context detection, gesture recognition, and activity monitoring. The Apollo SoC takes full advantage of Ambiq's patented Subthreshold Power Optimized Technology (SPOT®) platform, setting a new industry benchmark in low power design.

The Apollo SoC also integrates up to 512KB of flash memory and 64KB of RAM to accommodate radio and sensor overhead while still leaving plenty of space for application code. This system on chip also includes a serial master and UART port for communicating with radios and sensors including accelerometers, gyroscopes, and magnetometers.



Block Diagram for the Apollo Ultra-Low Power SoC



Apollo AMAP1EVB (EVB)

### Feature Highlights:

- An ideal solution for battery-powered applications requiring sensor measurement and data analysis.
- Can measure analog sensor outputs using an integrated ultra-low power 10-bit ADC and digital sensor outputs using the integrated serial master ports.
- Capable of running complex data analysis and sensor fusion algorithms to process the sensor data.
- Enables months and years of battery life for products only achieving days or months of battery life today.
- Implementation of the Cortex-M4F core delivers both greater performance and much lower power than 8-bit, 16-bit, and other comparable 32-bit cores.
- ADC is uniquely tuned for minimum power with a configurable measurement mode that does not require SoC intervention.
- Supported by a complete suite of standard software development tools.

## Features and Specifications

### Ultra-Low Supply Current

- EEMBC ULP Bench score of 377
- 35  $\mu$ A/MHz executing from flash at 3.3 V
- 143 nA deep sleep mode at 3.3 V
- 419 nA deep sleep mode with XTAL-assisted RTC at 3.3 V

### High-Performance Arm Cortex-M4 Processor

- Up to 24 MHz clock frequency
- Floating Point Unit (FPU)
- Memory Protection Unit (MPU)
- Wake-up interrupt controller with 12 interrupts

### Ultra-low Power Memory

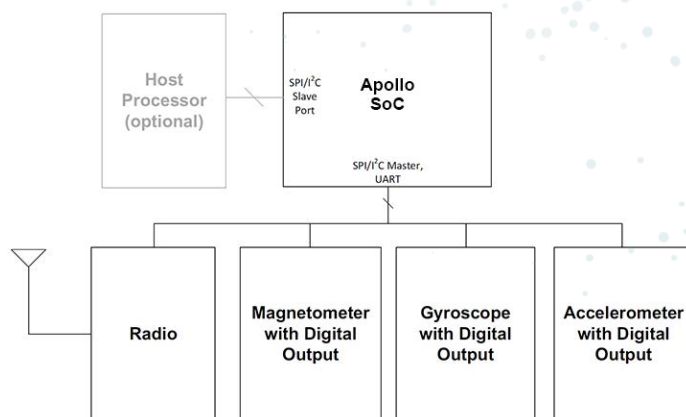
- Up to 512KB of flash memory for code/data
- Up to 64KB of low power RAM for code/data

### Ultra-low Power Interface for Off-Chip Sensors

- 10-bit, 13-channel up to 800 kSps ADC
- Up to 800 kSps sampling rate
- Temperature sensor with  $\pm 4^{\circ}\text{C}$  accuracy

### Ultra-low Power Flexible Serial Peripherals

- 2x I<sup>2</sup>C/SPI masters for communication with sensors, radios, and other peripherals
- 1x I<sup>2</sup>C/SPI slave for host communications
- 1x UART for communication with peripherals and legacy devices



Typical Sensor Application Circuit for the Apollo SoC

### Rich Set of Clock Sources

- 32.768 kHz Crystal (XTAL) oscillators
- Low Frequency RC (LFRC) oscillator (1.024 kHz)
- High Frequency RC (HFRC) oscillator (24 MHz)
- RTC based on Ambiq's AM08X5/18X5 family

### Wide Operating Range

- 1.8-3.8 V,  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

### Applications

- Wearable electronics
- Wireless sensors
- Activity and fitness monitors
- Consumer medical devices

### Package Options

- 4.5 mm x 4.5 mm 64-pin BGA with 50 GPIO
- 2.49 mm x 2.90 mm 41-pin WLCSP with 27 GPIO

### Ordering Information

- APOLLO512-KBR (512KB Flash, 64KB RAM, 64-pin BGA)
- APOLLO512-KCR (512KB Flash, 64KB RAM, 41-pin WLCSP)
- AMAP1EVB (EVB)



APOLLO512-KBR

APOLLO512-KCR

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



www.ambiq.com  
sales@ambiq.com  
+1 (512) 879-2850

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6500 River Place Boulevard, Building 7, Suite 200, Austin, TX 78730

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