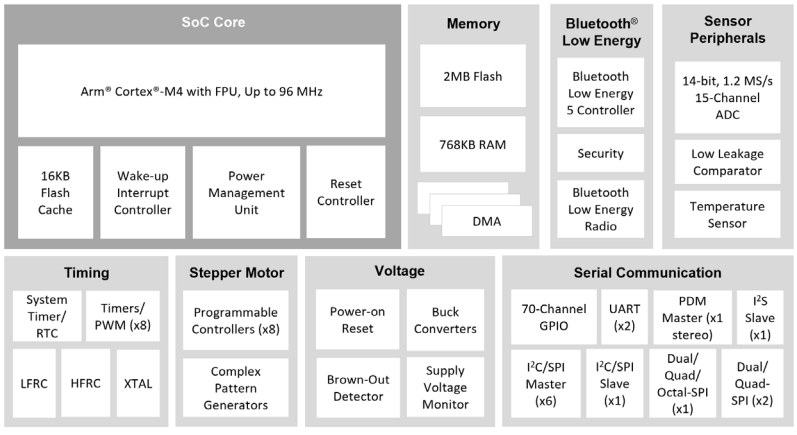
apollo
by ambiq inc.

Apollo3 **Blue Plus** Low Power SoC

Product Brief

The Apollo3 Blue Plus is an ultra-low power, highly integrated system on a chip (SoC) platform based on Ambiq's patented Subthreshold Power Optimized Technology (SPOT®) and designed for battery-powered and portable, mobile devices. The Apollo3 Blue Plus SoC sets a new standard in energy efficiency for battery-powered devices with an integrated Arm® Cortex®-M4 processor with Floating Point Unit and turboSPOT® increasing the computational capabilities of the Arm Cortex-M4F core to 96 MHz while lowering the active power consumption to < 6 µA/MHz. This combination dramatically reduces energy consumption while still enabling abundant application processing power to add greater capability and extended life to battery operated devices.

The Apollo3 Blue Plus brings several new features to Ambiq's SPOT based Apollo SoC family including an integrated DMA engine, QSPI interface and advanced stepper motor control for ultra-low power analog watch hand management. The Apollo3 Blue Plus also forms the core of Ambiq's Voice-on-SPOT® reference platform making it the perfect device for always-on voice assistant integration and command recognition to battery-powered devices. The Apollo3 Blue Plus provides a dedicated second core for the ultra-low power Bluetooth Low Energy 5 connectivity platform providing superior RF throughput and leaving plenty of resources available for user applications. The Apollo3 Blue Plus adds two additional MSPI modules (3 total), and increases the external memory execute-in-place (XiP) aperture from 64MB to 96MB (32MB/MSPI instance). Additionally, internal flash increases from 1MB to 2MB, SRAM from 384KB to 768KB (TCM size remains at 64KB) and the GPIO count increases from 50 to 74.



Block Diagram for the Ultra-Low Power Apollo3 Blue Plus SoC

Apollo3 Blue Plus AMA3B2EVB (EVB)

Feature Highlights:

- An ideal solution for battery-powered applications requiring sensor measurement and data analysis.
- Serves as an applications processor for one or more sensors and has a fully integrated Bluetooth Low Energy 5 radio.
- A host processor can communicate with the Apollo3 Blue Plus SoC over its serial slave port using the I²C, SPI or I²S protocol.
- turboSPOT technology allows applications to meet critical timing as/when needed while still providing extremely high energy efficiency operation.
- A scalable SAR ADC monitors the temperature sensor, several internal voltages, and up to 8 external sensor signals.
- 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.
- Supports highly optimized PWM pattern generation for complex, efficient stepper motor control operation.
- Supported by a complete suite of standard software development tools to shorten development times.

Features and Specifications

Ultra-Low Supply Current

- 6 µA/MHz executing from flash or RAM at 3.3 V
- 1 µA deep sleep mode (Bluetooth Low Energy Off) with RTC at 3.3 V (Bluetooth Low Energy in SD)

High-Performance Arm Cortex-M4 Processor

- Up to 48 MHz nominal clock frequency with 96 MHz performance turboSPOT Mode
- Floating Point Unit (FPU)
- Memory Protection Unit (MPU)
- Wake-up interrupt controller (WIC) with 32 interrupts

Integrated Bluetooth Low Energy Module

- RF sensitivity: -93 dBm (typical)
- Tx: Up to +3 dBm output power

Ultra-low Power Memory

- Up to 2MB of flash memory for code/data
- Up to 768KB of low power RAM for code/data
- 16KB 2-way Associative/Direct-Mapped Cache

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

- 14-bit ADC, 14 selectable input channels available
- Up to 2.67 MS/s sampling rate
- Voltage Comparator (VCOMP)
- Temperature sensor with ±3°C accuracy after calibration

Ultra-low Power Flexible Serial Peripherals

- ISO7816 Secure interface
- 1x 2/4/8-bit and 2x 2/4-bit SPI master interface (MSPIs)
- 6x I^2C/SPI masters for peripheral communication
- 1x I^2C/SPI slave for host communications
- 2x UART modules with 32-location Tx and Rx FIFOs
- PDM for mono and stereo audio microphones
- 1x I^2S slave for PDM audio pass-through

Rich Set of Clock Sources

- 32.768 kHz Crystal (XTAL) oscillator
- Low Frequency RC (LFRC) oscillator (1.024 kHz)
- High Frequency RC (HFRC) oscillator (48/96 MHz)
- RTC based on Ambiq's AM08X5/18X5 family

Wide Operating Range

- 1.755-3.63 V, -40°C to 85°C

Applications

- Voice-on-SPOT compatible for always-listening keyword detect, audio command recognition and voice assistant integration in battery-powered devices including:
  - Bluetooth headsets, earbuds, and truly wireless earbuds
  - Remote and Gaming Controls
  - Smart home
- Wearables including smart watches and fitness/activity trackers
- Hearing aids, Digital Health Monitoring and Sensing Devices
- Smart Home Automation, Security and Lighting control applications

Package Option

- 5.3 mm x 4.3 mm x 0.8 mm, 108-pin BGA with 74 GPIO

Ordering Information

- AMA3B2KK-KBR (768KB RAM, 108-pin BGA)
- AMA3B2EVB (EVB)

AMA3B2KK-KBR BGA

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

ambiq

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

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

A-SOCA3P-PBGA01EN v1.9 April 2023