

ALMA-B1 series

Stand-alone Bluetooth 5.4 Low Energy modules



Standard



Professional



Automotive

High-performance quad-core wireless MCU with Bluetooth® 5.4, Thread, Matter, and NFC

- Highly efficient 4th generation Nordic SoC nRF54H20
- Superior processing power with dual Arm Cortex-M33 and dual RISC-V up to 320 MHz
- 2 MB non-volatile memory, 1 MB RAM
- High-performance internal antenna or antenna pin
- Compact size with access to all nRF54H20 features
- Global certification

10.4 × 11.2 × 1.9 mm



10.4 × 14.3 × 1.9 mm



ALMA-B101

ALMA-B106

Product description

The ALMA-B1 series of multicore wireless MCU modules drives innovation with its ground-breaking processing power, efficiency, receiver sensitivity, and tiny form factor. Powered by Nordic Semiconductor's nRF54H20 SoC with quad-core MCU up to 320 MHz, ALMA-B1 revolutionizes design by replacing multiple components, streamlining your wireless project in terms of complexity, cost, and footprint. Along with the high receiver sensitivity of more than -100 dBm, the high-performance internal antenna of ALMA-B106 further improves the extended range and robust coverage, while the ALMA-B101 offers the flexibility for the customer to select their own internal or external antenna.

The multicore ALMA-B1 doubles the application processing performance and memory compared to the flagship module NORA-B1, reaching 2 MB NVM and 1 MB RAM. This paves the way for new innovative use-cases, such as machine learning and sensor fusion at the edge, and it allows ALMA-B1 to replace high-end general purpose MCUs, memory, and wireless radio with one single compact module. On top of this, the exceptional processing efficiency includes dynamic performance scaling along with coprocessors optimized for different work-tasks, all to minimize power consumption.

Despite the very compact size of ALMA-B1, all features and interfaces of the nRF54H20 SoC are available, including high-speed USB, CAN FD, I3C, 64 GPIOs, and 14-bit ADC. It includes multiple radio protocols and features like full and upgradeable Bluetooth low energy 5.4 including LE Audio/Auracast™, direction finding, and mesh. It also includes Thread, Matter, and NFC. Its versatility is further improved with an operating temperature range of -40 to +105 °C and global country certification.

ALMA-B1 is built for cybersecurity; it is designed for PSA Certified Level 3, which is the highest level of the PSA IoT security standard. ALMA-B1 includes hardware root-of-trust, secure boot and updates, secure storage, trusted execution environment with Arm TrustZone, and tamper detection for protection against physical attack attempts.

	ALMA-B101	ALMA-B106
Grade		
Automotive		
Professional	•	•
Standard		
Radio		
Chip inside	nRF54H20	
Bluetooth qualification	v5.4	v5.4
Bluetooth low energy	•	•
Thread / Zigbee	•	•
Bluetooth output power EIRP [dBm]	13	13
Max range [meters]	1400	1400
NFC	•	•
Antenna type (see footnotes)	pin	pcb
Application software		
Open CPU for embedded applications	•	•
Interfaces		
UART	•	•
QSPI and SPI	•	•
CAN FD	•	•
I2C	•	•
I3C	•	•
I2S and PDM	•	•
USB	•	•
PWM	•	•
GPIO pins	64	64
AD converters [number of bits]	14	14
Features		
Application core frequency [MHz]	320	320
MCU	Dual-core Arm® Cortex®-M33 Dual-core RISC-V	
RAM [MB]	1	1
NVM [MB]	2	2
Matter	◆	◆
Max Bluetooth connections	TBD	TBD
Direction finding (AoA/AoD)	◆	◆
Bluetooth long range	◆	◆
Bluetooth mesh	◆	◆
Bluetooth LE audio	◆	◆
Arm TrustZone®	◆	◆
Security Root of Trust	◆	◆
Secure boot	◆	◆
Secure storage	◆	◆
FOTA	◆	◆
Simultaneous GATT server / client	◆	◆

pcb = Internal PCB antenna
pin = Antenna pin

◆ = Feature enabled by HW. The actual support depends on the open CPU application SW.

Features

Chip inside	Nordic Semiconductor nRF54H20
Bluetooth	v5.4 (Bluetooth low energy): LE audio, Mesh, Auracast™, AoA/AoD, Coded PHY, 2 Mbps mode
802.15.4	Thread, Matter, Zigbee
NFC	NFC-A tag support
Estimated range	1400 m
Max. conducted output power	10 dBm
Conducted sensitivity	Bluetooth LE: -100 dBm (1 Mbit/s) 802.15.4: -104 dBm

Open CPU for customer application

Customers develop and embed their own application on top of the Bluetooth stack in the ALMA-B1 modules (open CPU concept). This section describes the possible features enabled by the ALMA-B1 hardware. The Nordic Semiconductor SDK environment for the nRF54H20 chip (available for free) is required to develop the connectivity and application software.

MCU	Dual Arm Cortex-M33, up to 320 MHz Dual RISC-V co-processors, up to 320 MHz 2 MB NVM + 1 MB RAM Application core: 132-170 ULPMark-CM score @ 1290-515 CoreMark Radio core + RISC-V co-processors: TBD CoreMark Application core with DVFS for dynamic throttling of processing power Radio core with fast start-stop
Development environment	nRF Connect SDK (based on Zephyr RTOS)
HW interfaces *	64 x GPIOs (across 6 ports with individual voltage supply per port) 8 x SPI/TWI/UART 1 x HS-USB 1 x HS-SPI EXMIF and EXMEE CAN FD controller 2 x I3C 2 x I2S / TDM 1 x PDM High speed PWM and 4 x PWM 14-bit ADC 10 x Timer/Counter RTC (52-bit) 2 x QDEC
Security	Designed for PSA certified level 3 Trusted execution environment (Arm TrustZone) Root of Trust and Physically Unclonable Function (PUF) Secure Storage Secure boot Secure firmware update Authenticated debug (ADAC) Tamper detection Cryptographic Accelerators 256-bit AES encryption

* Not all simultaneously

Package

Dimensions	ALMA-B101: 10.4 x 11.2 x 1.9 mm ALMA-B106: 10.4 x 14.3 x 1.9 mm
Weight	< 0.6 g
Mounting	Machine mountable ALMA-B101: 103 solder pins ALMA-B106: 109 solder pins 0.9 mm pitch

Environmental data, quality and reliability

Operating temperature	-40 °C to +105 °C
Storage temperature	-40 °C to +125 °C
Humidity	RH 5 – 90% non-condensing

Electrical data

Power supply	1.7 to 5.5 V (@3V DCDC)
Power consumption	Active TX @ 10 dBm: TBD RX only: 2.0 mA Standby: TBD Sleep: TBD

Certifications and approvals ¹

Type approvals	Europe (ETSI RED); US (FCC/CFR 47 part 15 unlicensed modular transmitter approval); Canada (ISED RSS); Great Britain (UKCA), Japan (MIC), South Korea (KCC), Taiwan (NCC), Australia/New Zealand (RCM)
Health and safety	EN 62479, EN 62368-1, IEC 62368-1
Medical Electrical Equipment	EN 60601-1-2:2015+A1:2021
Bluetooth qualification	v5.4 (Bluetooth low energy)

¹ = Pending approvals

Support products

EVK-ALMA-B101	Evaluation kit for ALMA-B101: U.FL connector for external antenna, 4x Micro-E click-board connectors, and SEGGER J-LINK-OB debugger
EVK-ALMA-B106	Evaluation kit for ALMA-B106: internal PCB antenna, 4x Micro-E click-board connectors, and SEGGER J-LINK-OB debugger

Product variants

ALMA-B101	Bluetooth low energy module with pin for external antenna
ALMA-B106	Bluetooth low energy module with internal PCB antenna

Further information

For contact information, see www.u-blox.com/contact-u-blox.

For more product details and ordering information, see the product data sheet.

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