

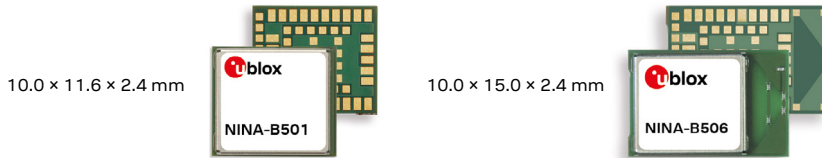
NINA-B50 series



Stand-alone Bluetooth 5.3 low energy modules

Bluetooth LE 5.3 module for automotive and professional applications

- Professional grade modules support Thread, Zigbee, and Matter
- FlexCAN and LIN bus interfaces for automotive grade modules
- Powerful Cortex-M33 with open CPU architecture for customized applications
- Full set of enhanced security features with NXP EdgeLock
- Extended temperature range up to 85 °C or 105 °C
- Global certification



Product description

NINA-B50 series are small Bluetooth Low Energy 5.3 triple-core wireless MCU modules, qualified in automotive or professional grade. The main core is a powerful Arm Cortex-M33 processor for implementation of advanced applications with the MCUXpresso SDK. A wide range of interfaces (including 16-bit ADC) offer flexibility.

Automotive NINA-B50 modules support FlexCAN and LIN bus, for seamless integration in automotive or industrial bus networks, for a lightweight alternative to traditional cables.

The dedicated radio core, with its own flash and RAM, frees up resources for the main application and provides optimized current consumption. This can be used to improve system level power consumption, letting other systems sleep when not in use, such as cellular or full systems in keyless entry systems. In addition to upgradeable Bluetooth low energy 5.3, the NINA-B50 professional grade modules also support Matter, Thread, and Zigbee. This allows interoperability in the growing Matter ecosystem, and the dual-PAN feature allows bridging use cases for Thread and Zigbee with fast and reliable time-slicing.

The third core is the isolated EdgeLock secure enclave, with advanced security features including secure boot, debug, over-the-air updates, root-of-trust, hardware cryptography, on-the-go flash encryption, and Arm TrustZone secure execution environment. NINA-B50 also supports the NXP EdgeLock2GO service for installing keys and certificates into the end device; it is authorized for Matter device attestation certificates, making it easier to deploy Matter devices.

NINA-B506 comes with an internal PCB antenna providing high performance and an extensive range, while NINA-B501 has a module pin for an external antenna. NINA-B50 is globally certified, reducing time, cost, and effort for customers. Example applications include in-vehicle light control, keyless entry, access control, battery management, telematics, smart buildings and homes, and industrial automation.

	NINA-B501A	NINA-B506A	NINA-B501	NINA-B506
Grade				
Automotive	•	•		
Professional			•	
Standard				•
Radio				
Chip inside		KW45	K32W148	
Bluetooth qualification	v5.3	v5.3	v5.3	v5.3
Bluetooth low energy	•	•	•	•
802.15.4 / Thread / Zigbee / Matter			•	•
Bluetooth output power EIRP [dBm]	13	13	13	13
Max range [meters]	1400	1400	1400	1400
Antenna type (see footnotes)	pin	pcb	pin	pcb
Application software				
Open CPU for embedded applications	•	•	•	•
Interfaces				
FlexCAN (CAN/CAN FD)	◆	◆		
UART with LIN support	◆	◆		
UART			◆	◆
SPI	◆	◆	◆	◆
I2C and I3C	◆	◆	◆	◆
Timer / PWM	◆	◆	◆	◆
GPIO pins	29	29	29	29
AD converters [number of bits]	16	16	16	16
DA converters [number of bits]	8	8	8	8
Coexistence interface	◆	◆	◆	◆
Features				
MCU	Arm Cortex-M33 and M3 and M0+			
RAM [kB]	128 + 88			
Flash [kB]	1024 + 256			
Simultaneous GATT server and client	◆	◆	◆	◆
Maximum Bluetooth connections	24	24	24	24
Bluetooth LE long range (coded PHY)	◆	◆	◆	◆
Bluetooth Channel Sounding-ready	◆	◆	◆	◆
Matter			◆	◆
Secure boot	◆	◆	◆	◆
HW root-of-trust	◆	◆	◆	◆
Arm TrustZone-M	◆	◆	◆	◆
On-the-fly flash encryption	◆	◆	◆	◆
Secure FOTA	◆	◆	◆	◆
Dual-PAN HW support			◆	◆

pin = Antenna pin
pcb = Internal PCB antenna

◆ = Enabled by HW; depends on open CPU SW

NINA-B50 series

Features

Chip inside	Automotive: NXP KW45 Professional: NXP K32W148
Bluetooth	v5.3 (Bluetooth low energy) 24 simultaneous connections
Bluetooth PHY rate	125 kbit/s, 500 kbit/s, 1 Mbit/s, 2 Mbit/s
802.15.4 ¹	Thread Zigbee Matter Dual-PAN
Max. conducted output power	10 dBm
Output power, radiated (EIRP)	13 dBm with approved antennas
Receiver sensitivity, conducted	Bluetooth LE, 125 kbit/s: -105 dBm Bluetooth LE, 500 kbit/s: -101 dBm Bluetooth LE, 1 Mbit/s: -97 dBm Bluetooth LE, 2 Mbit/s: -94 dBm 802.15.4, 250 kbit/s: -103 dBm ¹
Antenna	NINA-B501: Antenna pin for connecting to an external antenna NINA-B506: Internal PCB antenna
Range	1400 m

1 = Professional grade variants only

Open CPU for customer application

Customers develop and embed their own apps on NINA-B50 modules with the NXP MCUXpresso SDK (open CPU concept). This section describes the hardware features that NINA-B50 modules can enable.

MCU system	Application: 96 MHz Arm Cortex-M33, 1 MB flash, 128 kB RAM, 8 kB code cache Radio: Arm Cortex-M3, 256 kB flash, 88 kB RAM Security: Arm Cortex-M0+, dedicated ROM/RAM
Hardware interfaces ²	FlexCAN with CAN FD support ³ 2 x LPUART (LIN capable ³) 2 x LPSP1 2 x LPI2C 1 x I3C Timers / PWM 29 x GPIO 1 x FlexIO 1 x 16-bit SAR ADC, up to 2 MS/s (2x single end 16-bit ADC) 2 x CMP (6-bit high speed with 8-bit DAC) Wi-Fi PTA coexistence interface
Security	Arm TrustZone-M Hardware cryptographic accelerator Secure bootloader Isolated ROM and RAM Secure storage On-the-fly flash encryption Secure debug Random Number Generator (PRNG, TRNG) Digital tamper pins Support for NXP EdgeLock 2GO security service
Development environment	NXP MCUXpresso SDK Automotive: MISRA and ASPICE level 2 compliance, AutoSAR MCAL drivers

2 = Not all simultaneously

3 = Automotive grade variants only

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.

Package

Dimensions	10.0 x 11.6 x 2.4 mm (NINA-B501) 10.0 x 15.0 x 2.4 mm (NINA-B506)
Weight	< 1.0 g
Mounting	Machine mountable; solder pins

Environmental data, quality and reliability

Operating temperature	Automotive: -40 °C to +105 °C Professional: -40 °C to +85 °C
Storage temperature	Automotive: -40 °C to +105 °C Professional: -40 °C to +85 °C
Humidity	RH 5 – 90% non-condensing
RoHS directive	RoHS 2 and RoHS 3

Electrical data

Power supply	1.71 to 3.60 V
Power consumption	Active TX @ 0 dBm: 4.6 mA Active TX @ 10 dBm: 18.7 mA RX only: 4.7 mA Deep sleep: 2.5 µA Deep power down: 0.4 µA LE advertising without MCU intervention Auto switch between RUN and deep sleep modes

Certifications and approvals⁴

Type approvals	Europe (RED), Great Britain (UKCA), US (FCC), Canada (ISED), Japan (MIC) ⁵ , South Korea (KCC) ⁵ , Taiwan (NCC) ⁵ , Australia (ACMA) ⁵ , New Zealand ⁵
Health and safety	EN 62479, EN 62368-1
Medical Electrical Equipment	IEC 60601-1-2
Bluetooth qualif.	Bluetooth Low Energy 5.3

4 = Certifications are pending for automotive grade modules

5 = Certification is pending for professional grade modules

Support products

EVK-NINA-B501-A	Evaluation kit for automotive grade NINA-B501A with open CPU and pin for external antenna
EVK-NINA-B506-A	Evaluation kit for automotive grade NINA-B506A with open CPU and internal PCB antenna
EVK-NINA-B501	Evaluation kit for professional grade NINA-B501 with open CPU and pin for external antenna
EVK-NINA-B506	Evaluation kit for professional grade NINA-B506 with open CPU and internal PCB antenna

Product variants

NINA-B501A	Automotive grade Bluetooth low energy module with open CPU and pin for external antenna
NINA-B506A	Automotive grade Bluetooth low energy module with open CPU and internal PCB antenna
NINA-B501	Professional grade Bluetooth low energy module with open CPU and pin for external antenna
NINA-B506	Professional grade Bluetooth low energy module with open CPU and internal PCB antenna

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