Product summary

ALMA-W1

Ultra-low power Wi-Fi 6E wireless MCU module

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Standard

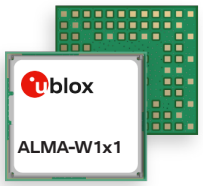
Professional

Automotive

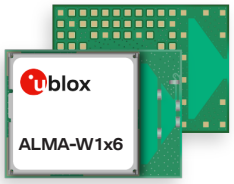
Compact modules for advanced IoT applications

- Tri-band Wi-Fi 6E and Bluetooth LE
- Powerful MCU for advanced applications
- Built-in Edge AI accelerator
- Multiple memory options
- Internal and external antenna variants
- Global certification

10.4 × 11.2 × 1.9 mm



10.4 × 14.3 × 1.9 mm



Product description

ALMA-W1 series are small, power-efficient, stand-alone Wi-Fi and Bluetooth Low Energy, wireless MCU modules. Built on the Nordic Semiconductor's nRF7120(E) System-on-Chip, the modules embed an Arm® Cortex®-M33 processor with several memory options for advanced applications. Additionally, there are variants with a built-in Neural Processing Unit (NPU) for fast and efficient Edge AI applications.

The radio system supports up to Wi-Fi 6E in the 2.4, 5 and 6 GHz bands. A low-power multiprotocol radio can be used for Bluetooth LE and IEEE 802.15.4 with the Thread or Zigbee protocols. The Matter protocol can be run over both Thread and Wi-Fi. The modules also include an NFC™ interface, capable of operating as an NFC tag.

With in total 63 GPIO pins and a wide range of interfaces like USB, QSPI, SPI, UART, I2C, I2S, and ADC, the modules can connect a number of different peripheral devices in a complex application. It also includes a RISC-V coprocessor that can handle time-critical tasks, offload the main processor, or add standard or customized peripheral interfaces through SW implementation.

The powerful MCU in ALMA-W1, clocked up to 256 MHz, can be used for high-performance applications. Module variants with built-in Axon NPU are capable of running Edge AI applications up to 15x more energy efficient and faster than using the MCU.. With 1 MB RAM memory and 4 MB non-volatile memory on-chip and possible addition of up to 16 MB in the module, the module series is ideal for demanding applications.

ALMA-W1 supports Bluetooth Channel Sounding as well as other legacy Bluetooth LE features. ALMA-W1x6 comes with an internal PCB antenna that provides high performance and an extensive range. ALMA-W1x1 has an antenna pin and provide the option to use an external antenna of choice. All ALMA-W1 modules are globally certified reducing time, cost and effort to integrate wireless connectivity into a product.

The modules suit a wide range of applications, including industrial automation, medical and healthcare devices, smart homes and buildings, smart city, and telematics.

	ALMA-W101	ALMA-W106	ALMA-W111	ALMA-W116
Grade				
Automotive				
Professional	•	•	•	•
Standard				
Radio				
Chip inside	Nordic nRF7120		Nordic nRF7120E	
Wi-Fi bands	2.4 and 5 GHz		2.4, 5 and 6 GHz	
Wi-Fi IEEE 802.11 standards	a/b/g/n/ac/ax			
Wi-Fi output power [dBm]	20	20	20	20
Bluetooth low energy	•	•	•	•
Bluetooth output power [dBm]	8	8	8	8
Qualified against Bluetooth Core	6.x	6.x	6.x	6.x
Antenna type (see footnotes)	pin	pcb	pin	pcb
Application software				
Open CPU for embedded applications	•	•	•	•
Interfaces				
HS-USB	♦	♦	♦	♦
UART	♦	♦	♦	♦
SPI	♦	♦	♦	♦
QSPI	♦	♦	♦	♦
I2C	♦	♦	♦	♦
I2S	♦	♦	♦	♦
PDM	♦	♦	♦	♦
PWM	♦	♦	♦	♦
QDEC	♦	♦	♦	♦
GPIO pins (user available)	63	63	63	63
AD converter (nbr of bits)	14	14	14	14
Features				
MCU	Arm Cortex-M33 , 256 MHz			
Coprocessor	RISC-V, 256 MHz			
Neural Processing Unit (NPU)			♦	♦
RAM [MB]	1	1	1	1
Non-Volatile Memory [MB]	4, 12 or 20			
Bluetooth Channel Sounding	♦	♦	♦	♦
Matter	♦	♦	♦	♦
Arm TrustZone®	♦	♦	♦	♦
Secure boot	♦	♦	♦	♦
WPA2/WPA3	♦	♦	♦	♦
FOTA	♦	♦	♦	♦

pin = Antenna pin
pcb = Internal PCB antenna

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

ALMA-W1

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Features

Chip inside	Nordic nRF7120 and nRF7120E
Wi-Fi standards	IEEE 802.11a/b/g/n/ac/ax
Wi-Fi channels (depending on region)	2.4 GHz channels 1-14 5 GHz channels 36-64, 100-177 (U-NII-1/2A/2C/3/4) 6 GHz channels 1-93 (U-NII-5)
Wi-Fi PHY rate	86 Mbps (MCS 7)
Bluetooth	Bluetooth LE
Bluetooth PHY rate	125 kbit/s, 500 kbit/s, 1 Mbit/s, 2 Mbit/s
Output power (conducted)	Wi-Fi 2.4 GHz 19 dBm Wi-Fi 5 GHz 20 dBm Bluetooth 8 dBm
Sensitivity (conducted)	Wi-Fi 2.4 GHz -97 dBm (1 Mbps DSSS) Wi-Fi 5 GHz -90 dBm (6 Mbps OFDM) Wi-Fi 6 GHz -86 dBm (6 Mbps OFDM) Bluetooth -105 dBm (125 kbps) Bluetooth -97 dBm (1 Mbps)
Antenna	ALMA-W101/-W111: Antenna pin for connecting to an external antenna ALMA-W106/-W116: Internal PCB antenna

Electrical data

Power supply	2.8 - 5.5 V
Power consumption	Wi-Fi 2.4 GHz RX: 10.3 mA Wi-Fi 5 & 6 GHz RX: 11.7 mA Wi-Fi 2.4 GHz TX, max output power: 210 mA Wi-Fi 5 GHz TX, max output power: 241 mA Wi-Fi connected stand-by (DTIM10, 5 GHz): 8 uA Bluetooth LE RX: 1.5 mA Bluetooth LE TX, 0 dBm: 4 mA

Open CPU for customer application

Customers develop and embed their own applications on ALMA-W1 modules with the Nordic Connect Software SDK (open CPU concept). This section describes the hardware features that the module enable.

MCU system	Arm® Cortex® -M33 processor at 256 MHz RISC-V coprocessor at 256 MHz Axon NPU (optional)
Memory	1 MB SRAM 4 MB MRAM (Non-Volatile Memory), with additional 8 or 16 MB optional
Hardware interfaces	HS-USB UART SPI QSPI I2C I2S PDM PWM QDEC 63 x GPIO pins AD converter
Security	Arm® TrustZone® technology Hardware cryptographic accelerator Root-of-trust Secure bootloader Secure key management Secure firmware update Physical tamper detection Debug port lock
Development environment	Nordic nRF Connect SDK

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	ALMA-W101/-W111: 10.4 x 11.2 x 1.9 mm ALMA-W106/-W116: 10.4 x 14.3 x 1.9 mm
Weight	< 1.0 g
Mounting	Machine mountable; solder pins

Environmental data, quality and reliability

Operating temperature	–40 °C to +85 °C
Humidity	RH 5 – 90% non-condensing
RoHS directive	RoHS 2 and RoHS 3
Module qualification	AEC-Q104 (relevant subset)

Certifications and approvals [1]

Type approvals	Europe (RED), Great Britain (UKCA), US (FCC), Canada (ISED), Japan (MIC), South Korea (KCC), Taiwan (NCC), Australia (ACMA), New Zealand, Brazil (Anatel), China (SRRC)
Health and safety	EN 62479, EN 62368-1, IEC 62311
Medical Electrical Equipment	IEC 60601-1-2
Bluetooth	Qualified against Bluetooth Core 6.x

1 = Certifications are pending

Support products

EVK-ALMA-W111	Evaluation kit for ALMA-W101/-W111 series with open CPU and pin for external antenna
EVK-ALMA-W116	Evaluation kit for ALMA-W106/-W116 series with open CPU and internal PCB antenna

Product variants

ALMA-W101-00B	Dual-band Wi-Fi 6, Bluetooth LE, wireless MCU module with 4 MB non-volatile memory and antenna pin
ALMA-W101-10B	Dual-band Wi-Fi6, Bluetooth LE, wireless MCU module with 4+8 MB non-volatile memory and antenna pin
ALMA-W106-00B	Dual-band Wi-Fi 6, Bluetooth LE, wireless MCU module with 4 MB non-volatile memory and internal PCB antenna
ALMA-W106-10B	Dual-band Wi-Fi 6, Bluetooth LE, wireless MCU module with 4+8 MB non-volatile memory and internal PCB antenna.
ALMA-W111-00B	Tri-band Wi-Fi 6E, Bluetooth LE, wireless MCU module with 4 MB non-volatile memory and antenna pin
ALMA-W111-20B	Tri-band Wi-Fi 6E, Bluetooth LE, wireless MCU module with 4+16 MB non-volatile memory and antenna pin
ALMA-W116-00B	Tri-band Wi-Fi 6E, Bluetooth LE, wireless MCU module with 4 MB non-volatile memory and internal PCB antenna
ALMA-W116-20B	Tri-band Wi-Fi 6E, Bluetooth LE, wireless MCU module with 4+16 MB non-volatile memory and internal PCB antenna

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