

Stand-alone Bluetooth modules



Bluetooth modules										
	ALMA-B101	ALMA-B106	NORA-B201	NORA-B206	NORA-B100	NORA-B101	NORA-B106	NORA-B120	NORA-B121	NORA-B126
Grade										
Automotive										
Professional	•	•	•	•	•	•	•	•	•	•
Standard										
Physical										
Image										
Size [mm]	10.4 × 11.2/14.3 × 1.9		10.4 × 11.2/14.3 × 1.9		10.4 × 14.3 × 1.7					
Operating temperature [°C]	-40 to +105		-40 to +85		-40 to +105					
Radio										
Chip inside	nRF54H20		nRF54L15		nRF5340					
Bluetooth qualification version	5.4	5.4	5.4	5.4	5.2	5.2	5.2	5.2	5.2	5.2
Bluetooth Low Energy	•	•	•	•	•	•	•	•	•	•
Thread / Zigbee	•	•	•	•	•	•	•	•	•	•
NFC	•	•	•	•	•	•	•	•	•	•
Max range [meters]	1400	1400	TBD	TBD	700	700	400	1700	1700	1500
Bluetooth output power [dBm]	13	13	10	10	8	8	5	18	18	15
Antenna type (see footnotes)	pin	pcb	pin	pcb	U.FL	pin	pcb	U.FL	pin	pcb
Application software										
u-connectXpress										
Open CPU for embedded SW	•	•	•	•	•	•	•	•	•	•
Interfaces										
CAN FD	◆	◆								
UART	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
SPI	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
I2C	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
I2S	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
USB	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
PDM and/or PWM	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
GPIO pins	64	64	31	31	48	48	48	46	46	46
AD converters [number of bits]	14	14	14	14	12	12	12	12	12	12
Features										
MCU (see footnotes)	2 x M33+RISC-V		Arm Cortex-M33		Dual-core Arm® Cortex-M33					
RAM [kB] (including all cores)	1 MB		256		512 + 64			512 + 64		
NVM [kB] (including all cores)	2 MB		1524		1024 + 256			1024 + 256		
Matter	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Max Bluetooth connections	TBD	TBD	TBD	TBD	>20	>20	>20	>20	>20	>20
Direction finding (AoA/AoD)	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Bluetooth long range	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Bluetooth mesh	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Bluetooth LE audio	◆	◆			◆	◆	◆	◆	◆	◆
Low Energy Serial Port Service										
Arm TrustZone®	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Security Root of Trust	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Secure boot	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Secure storage	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Throughput [Mbit/s]	TBD	TBD	TBD	TBD	1.4	1.4	1.4	1.4	1.4	1.4
FOTA	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Simultaneous GATT server/client	◆	◆	◆	◆						

pin = Antenna pin
pcb = Internal PCB antenna
U.FL = U.FL antenna connector

M33/RISC-V = Dual Arm® Cortex®-M33,
Dual RISC-V

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.

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Stand-alone Bluetooth modules



Bluetooth modules										
	NINA-B501A	NINA-B506A	NINA-B501	NINA-B506	NINA-B400	NINA-B401	NINA-B406	NINA-B410	NINA-B411	NINA-B416
Grade										
Automotive	•	•								
Professional			•	•	•	•	•	•	•	•
Standard										
Physical										
Image										
Size [mm]	10.0 x 11.6 x 2.4 / 10.0 x 15.0 x 2.4				10.0 x 15.0 x 2.2 / 10.0 x 11.6 x 2.2					
Operating temperature [°C]	-40 to +105		-40 to +85		-40 to +105					
Radio										
Chip inside	NXP KW45		NXP K32W148		nRF52833					
Bluetooth qualification version	5.3	5.3	5.3	5.3	5.1	5.1	5.1	5.1	5.1	5.1
Bluetooth Low Energy	•	•	•	•	•	•	•	•	•	•
Thread / Zigbee			•	•	•	•	•			
NFC					•	•	•	•	•	•
Max range [meters]	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Bluetooth output power [dBm]	13	13	13	13	11	11	11	11	11	11
Antenna type (see footnotes)	pin	pcb	pin	pcb	U.FL	pin	pcb	U.FL	pin	pcb
Application software										
u-connectXpress								•	•	•
Open CPU for embedded SW	•	•	•	•	•	•	•			
Interfaces										
FlexCAN / CAN FD and LIN bus	◆	◆								
UART	◆	◆	◆	◆	◆	◆	◆	2	2	2
SPI	◆	◆	◆	◆	◆	◆	◆			
I2C	◆	◆	◆	◆	◆	◆	◆			
I2S	◆	◆	◆	◆	◆	◆	◆			
USB					◆	◆	◆			
PDM and PWM	◆	◆	◆	◆	◆	◆	◆			
GPIO pins	29	29	29	29	40	40	40	26	26	26
AD converters [number of bits]	16	16	16	16	12	12	12			
Features										
AT command interface								•	•	•
Direction finding (AoA/AoD)					◆	◆	◆			
MCU (see footnotes)	Arm® Cortex-M33 and -M3 and -M0+				M4F	M4F	M4F			
RAM [kB]	128 + 88				128	128	128			
NVM [kB]	1024 + 256				512	512	512			
Matter			◆	◆						
Max Bluetooth connections	24	24	24	24	20	20	20	8	8	8
Bluetooth long range	◆	◆	◆	◆	◆	◆	◆	•	•	•
Bluetooth mesh					◆	◆	◆			
Low Energy Serial Port Service								•	•	•
Channel Sounding-ready	◆	◆	◆	◆						
Arm TrustZone®	◆	◆	◆	◆						
Security Root of Trust	◆	◆	◆	◆						
On-the-fly flash encryption	◆	◆	◆	◆						
Throughput [Mbit/s]	1.4	1.4	1.4	1.4	1.4	1.4	1.4	0.8	0.8	0.8
Secure boot	◆	◆	◆	◆	◆	◆	◆	•	•	•
FOTA	◆	◆	◆	◆	◆	◆	◆			
Dual-PAN HW support			◆	◆						

pin = Antenna pin
pcb = Internal PCB antenna
U.FL = U.FL antenna connector

M33 = 260 MHz Arm® Cortex-M33
M4F = 64 MHz Arm® Cortex-M4 with FPU

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.

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Stand-alone Bluetooth modules



Bluetooth modules																												
	NINA-B301		NINA-B302		NINA-B306		NINA-B311		NINA-B312		NINA-B316		NINA-B221		NINA-B222		NINA-B111		NINA-B112		ANNA-B402		ANNA-B412		ANNA-B112			
Grade																												
Automotive																												
Professional																												
Standard																												
Physical																												
Image																												
Size [mm]	10.0 x 11.6 x 2.2 / 10.0 x 15.0 x 3.8 / 10.0 x 15.0 x 2.2												10 x 10.6 x 2.2 / 10 x 14.0 x 3.8						6.5 x 6.5 x 1.2									
Operating temperature [°C]	-40 to +85												-40 to +85						-40 to +105		-40 to +85							
Radio																												
Chip inside	nRF52840												ESP32				nRF52832				nRF52833		nRF52832					
Bluetooth qualification version	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Bluetooth Low Energy																												
Bluetooth BR/EDR																												
Thread / Zigbee																												
NFC																												
Max range [meters]	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	200	200	200	200	350	350	350	350	800 / 1400*	800 / 1400*	160 / 190*	160 / 190*			
Bluetooth output power [dBm]	10	10	10	10	10	10	10	10	10	10	10	10	10	8	8	8	8	7	6	7	6	9 / 13*	9 / 13*	5 / 8*	5 / 8*			
Antenna type (see footnotes)	pin	metal	pcb	pin	metal	pcb	pin	metal	pcb	pin	metal	pcb	pin	metal	pin	metal	pin	metal	pin	metal	chip or pin	chip or pin	chip or pin	chip or pin				
Application software																												
u-connectXpress																												
Open CPU for embedded SW																												
Interfaces																												
UART	◆	◆	◆	2	2	2	2	2	2	1	1	1	1	◆	1	◆	1	◆	1	◆	2	◆	1					
SPI	◆	◆	◆							1	1			◆		◆		◆		◆		◆						
I2C	◆	◆	◆											◆		◆		◆		◆		◆						
I2S	◆	◆	◆											◆		◆		◆		◆		◆						
USB	◆	◆	◆																		◆							
PDM and PWM	◆	◆	◆															◆	◆		◆		◆					
GPIO pins	38	38	38	28	28	28	28	28	28	16	16	16	16	19	7	19	7	19	7	19	7	33	19	25	11			
AD converters [number of bits]	12	12	12															12	12		12		12					
Features																												
AT command interface																												
Direction finding (AoA/AoD)																												
MCU (see footnotes)	M4F	M4F	M4F														M4F	M4F	M4F	M4F								
RAM [kB]	256	256	256														64	64	128	64								
NVM [kB]	1024	1024	1024														512	512	512	512								
Matter	◆	◆	◆																									
Max Bluetooth connections	20	20	20	8	8	8	8	8	8	8	8	8	8	8	8	20	7	20	7	20	7	20	7					
Bluetooth long range	◆	◆	◆																									
Bluetooth mesh	◆	◆	◆																									
Low Energy Serial Port Service																												
Throughput [Mbit/s]	1.4	1.4	1.4	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.4	0.8	1.4	0.8	1.4	0.8	1.4	0.8	1.4	0.8					
Secure boot	◆	◆	◆																									
FOTA	◆	◆	◆																									

chip = Internal chip antenna
pin = Antenna pin
pcb = Internal PCB antenna
metal = Internal metal PIFA antenna

M4F = 64 MHz Arm® Cortex-M4 with FPU
* = Different values for use with internal or external antenna

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.

Stand-alone Bluetooth modules



	Bluetooth modules									Antenna boards	
	BMD-360	BMD-380	BMD-340	BMD-341	BMD-345	BMD-350	BMD-301	BMD-300	BMD-330	ANT-B10	ANT-B11
Grade											
Automotive											
Professional											
Standard	•	•	•	•	•	•	•	•	•	•	•
Physical											
Image											
Size [mm]	9.8 x 14.0 x 1.9	7.5 x 9.5 x 1.5	10.2 x 15.0 x 1.9			6.4 x 8.6 x 1.5		9.8 x 14.0 x 1.9		126 x 126	29.5 x 93.5
Operating temperature [°C]	-40 to +85									-40 to +85	-40 to +85
Radio											
Chip inside	nRF52811		nRF52840			nRF52832			nRF52810	nRF52833	nRF52833
Bluetooth qualification version	5.1	5.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.1	5.1
Bluetooth Low Energy	•	•	•	•	•	•	•	•	•	•	•
Thread	•	•	•	•	•						
Zigbee		•	•	•	•						
NFC		•	•	•	•	•	•	•			
Max range [meters]	200	500	500	750	1700	190	400	200	200	70	70
Bluetooth output power [dBm]	3	7	7	11	18	5	9	3	3	N.A.	N.A.
Antenna type (see footnotes)	pcb	chip	pcb	U.FL	U.FL	chip	U.FL	pcb	pcb	8 patch elements	3 patch elements
Application software											
u-locateEmbed <small>(previously named u-connectLocate)</small>										•	•
Open CPU for embedded SW	•	•	•	•	•	•	•	•	•		
Interfaces											
UART	◆	◆	◆	◆	◆	◆	◆	◆	◆	1	1
SPI	◆	◆	◆	◆	◆	◆	◆	◆	◆	1	
I2C	◆	◆	◆	◆	◆	◆	◆	◆	◆		
I2S		◆	◆	◆	◆	◆	◆	◆			
USB		◆	◆	◆	◆					1	
PDM and PWM	◆	◆	◆	◆	◆	◆	◆	◆	◆		
GPIO pins	32	44	48	48	44	32	32	32	32	3	
AD converters [number of bits]	12	12	12	12	12	12	12	12	12		
Features											
AT command interface										•	•
Direction finding (AoA/AoD)	◆									•	•
MCU (see footnotes)	M4	M4F	M4F	M4F	M4F	M4F	M4F	M4F	M4		
RAM [kB]	24	256	256	256	256	64	64	64	24		
NVM [kB]	192	1024	1024	1024	1024	512	512	512	192		
Matter		◆	◆	◆	◆						
Max Bluetooth connections	4	20	20	20	20	20	20	20	4		
Bluetooth mesh		◆	◆	◆	◆	◆	◆	◆			
Bluetooth long range	◆	◆	◆	◆	◆						
Throughput [Mbit/s]	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4		
Secure boot		◆	◆	◆	◆					•	•
FOTA	◆	◆	◆	◆	◆	◆	◆	◆	◆		

chip = Internal chip antenna
pin = Antenna pin
pcb = Internal PCB antenna
U.FL = U.FL antenna connector

M4 = 64 MHz Arm® Cortex-M4
M4F = 64 MHz Arm® Cortex-M4 with FPU

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.

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Stand-alone short range radio modules



	Multiradio (Wi-Fi and Bluetooth)										
	NORA-W401	NORA-W406	NORA-W301	NORA-W306	NORA-W361	NORA-W366	NORA-W251 AWS	NORA-W256 AWS	NORA-W101 -00B	NORA-W106 -00B	NORA-W106 -10B
Grade											
Automotive											
Professional	•	•	•	•	•	•	•	•	•	•	•
Standard											
Physical											
Image											
Size [mm]	10.4 × 14.3 × 1.9		10.4 × 14.3 × 1.9				10.4 × 14.3 × 1.8				
Operating temperature [°C]	-40 to +85										
Radio											
Chip inside	ESP32-C6		Realtek RTL8720DF				ESP32-S3		ESP32-S3		
Bluetooth qualification version	5.3		5.3		5.3		5.0		5.0		
Bluetooth Low Energy	•	•	•	•	•	•	•	•	•	•	•
Thread	•	•									
Bluetooth output power [dBm]	TBD	TBD	TBD	TBD	TBD	TBD	8	8	10	10	10
Wi-Fi band [GHz]	2.4		2.4 and 5		2.4 and 5		2.4	2.4	2.4	2.4	2.4
Wi-Fi IEEE 802.11 standards	b/g/n/ax		a/b/g/n		a/b/g/n		b/g/n	b/g/n	b/g/n	b/g/n	b/g/n
Wi-Fi output power [dBm]	TBD	TBD	TBD	TBD	TBD	TBD	20	20	20	20	20
Max Wi-Fi range [meters]	TBD	TBD	TBD	TBD	TBD	TBD	500	500	500	500	500
Antenna type (see footnotes)	pin	pcb	pin	pcb	pin	pcb	pin	pcb	pin	pcb	pcb
Application software											
AWS IoT ExpressLink											
u-connectXpress											
Open CPU for embedded apps	•	•	•	•	•	•			•	•	•
Interfaces											
UART	◆	◆	◆	◆	•	•	•	•	◆	◆	◆
USB	◆	◆	◆	◆					◆	◆	◆
SDIO	◆	◆	◆	◆					◆	◆	◆
SPI	◆	◆	◆	◆					◆	◆	◆
I2C	◆	◆	◆	◆					◆	◆	◆
I2S	◆	◆	◆	◆					◆	◆	◆
RMII											
GPIO pins	22	22	21	21					38	38	33
AD converters [number of bits]	12	12	12	12					12	12	12
Features											
AT command interface											
MCU (see footnotes)	RISC-V, 160 MHz		M33 + M23	M33 + M23			LX7	LX7	LX7	LX7	LX7
RAM [kB]	512	512	512	512			512	512	512	512	8192
NVM [MB]	4/8	4/8	4	4			8	8	8	8	ext
Matter											
Bluetooth LE audio											
Max Bluetooth connections											
Micro Access Point [stations]											
Wi-Fi throughput [Mbit/s]	TBD	TBD	TBD	TBD	TBD	TBD	20	20	150	150	150
Wi-Fi enterprise security	◆	◆	◆	◆	•	•			◆	◆	◆
End-to-end security (TLS)	◆	◆	◆	◆	•	•	•	•	◆	◆	◆
Secure boot	◆	◆	◆	◆	•	•	•	•	◆	◆	◆
WPA3	◆	◆	◆	◆	•	•	•	•	◆	◆	◆

pin = Antenna pin
pcb = Internal PCB antenna
ext = External flash required

LX7 = 240 MHz dual-core Xtensa LX7
M33 = 260 MHz Arm® Cortex-M33
M23 = 20 MHz Arm® Cortex-M23

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.

Stand-alone short range radio modules



	Multiradio (Wi-Fi and Bluetooth)									Wi-Fi				
	IRIS-W101	IRIS-W106	IRIS-W161	IRIS-W166	NINA-W151	NINA-W152	NINA-W156	NINA-W101	NINA-W102	NINA-W106	NINA-W131	NINA-W132		
Grade														
Automotive														
Professional	•	•	•	•	•	•	•	•	•	•	•	•		
Standard														
Physical														
Image														
Size [mm]	14.6 × 16.8 × 2.1 / 14.6 × 20.9 × 2.1				10.0 × 10.6 × 2.2 / 10.0 × 14.0 × 3.8 / 10.0 × 14.0 × 2.2									
Operating temperature [°C]	-40 to +85													
Radio														
Chip inside	NXP RW612		NXP RW610		ESP32			ESP32			ESP32			
Bluetooth qualification version	5.3		5.3		4.2			4.2						
Bluetooth Low Energy	•	•	•	•	•	•	•	•	•	•	•	•		
Thread	•	•												
Bluetooth output power [dBm]	TBD	TBD	TBD	TBD	8	8	8	8	8	8				
Wi-Fi band [GHz]	2.4 and 5		2.4 and 5		2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4		
Wi-Fi IEEE 802.11 standards	a/b/g/n/ax		a/b/g/n/ax		b/g/n	b/g/n	b/g/n	b/g/n	b/g/n	b/g/n	b/g/n	b/g/n		
Wi-Fi output power [dBm]	TBD	TBD	TBD	TBD	18	18	18	18	18	18	18	18		
Max Wi-Fi range [meters]	TBD	TBD	TBD	TBD	500	400	400	500	400	400	500	400		
Antenna type (see footnotes)	pin	pcb	pin	pcb	pin	metal	pcb	pin	metal	pcb	pin	metal		
Application software														
u-connectXpress														
Open CPU for embedded apps	•	•							•	•	•	•	•	
Interfaces														
UART	◆	◆	•	•	1	1	1	◆	◆	◆	1	1		
USB	◆	◆												
SDIO	◆	◆												
SPI	◆	◆				1	1	1	◆	◆	◆	1	1	
I2C	◆	◆												
I2S	◆	◆												
RMII	◆	◆				1	1	1	◆	◆	◆	1	1	
GPIO pins	64	64				16	16	18	24	24	26	16	16	
AD converters [number of bits]	16	16												
Features														
AT command interface														
MCU (see footnotes)	M33	M33	•	•	•	•	•	LX6	LX6	LX6	•	•		
RAM [kB]	1200	1200										520	520	520
NVM [MB]	8	8										2	2	4/8
Matter	◆	◆												
Bluetooth LE audio	◆	◆												
Point-to-Point Protocol														
Low Energy Serial Port Service														
Max Bluetooth connections	TBD	TBD	TBD	TBD	8	8	8	8	8	8				
Micro Access Point [stations]	TBD	TBD	TBD	TBD	10	10	10	10	10	10	10	10		
Wi-Fi throughput [Mbit/s]	TBD	TBD	TBD	TBD	13	13	13	25	25	25	16	16		
Wi-Fi enterprise security	◆	◆	•	•	•	•	•	◆	◆	◆	•	•		
End-to-end security (TLS)	◆	◆	•	•	•	•	•	◆	◆	◆	•	•		
Secure boot	◆	◆	•	•	•	•	•	◆	◆	◆	•	•		
WPA3	◆	◆	•	•	•	•	•	◆	◆	◆	•	•		

pin = Antenna pin
pcb = Internal PCB antenna
metal = internal metal PIFA antenna

LX6 = 240 MHz dual-core Xtensa LX6
M33 = 260 MHz Arm® Cortex-M33

◆ = Feature enabled by hardware. The actual support depends on the open CPU application software.