

# Stand-alone Bluetooth modules



	Bluetooth								
	NORA-B100	NORA-B101	NORA-B106	NINA-B400	NINA-B406	BMD-380	BMD-340	BMD-341	BMD-345
<b>Grade</b>									
Automotive									
Professional	•	•	•	•	•		•	•	•
Standard						•			
<b>Physical</b>									
<b>Image</b>									
Size [mm]	10.4 × 14.3 × 1.8			10.0 × 15.0 × 2.2		7.5 × 9.5 × 1.5	10.2 × 15.0 × 1.9		
Operating temperature [°C]	-40 to +105			-40 to +105		-40 to +85	-40 to +85		
<b>Radio</b>									
Chip inside	nRF5340			nRF52833		nRF52840	nRF52840		
Bluetooth qualification	v5.2	v5.2	v5.2	v5.1	v5.1	v5.1	v5.0	v5.0	v5.0
Bluetooth low energy	•	•	•	•	•	•	•	•	•
Thread / Zigbee	•	•	•	•	•	•	•	•	•
NFC	•	•	•	•	•	•	•	•	•
Max range [meters]	700	700	700	1400	1400	500	500	750	1000
Bluetooth output power EIRP [dBm]	3	3	3	10	10	7	16	13	7
Antenna type (see footnotes)	U.FL	pin	pcb	U.FL	pcb	chip	pcb	U.FL	U.FL
<b>Application software</b>									
Open CPU for embedded applications	•	•	•	•	•	•	•	•	•
<b>Interfaces</b>									
UART	♦	♦	♦	♦	♦	♦	♦	♦	♦
SPI	♦	♦	♦	♦	♦	♦	♦	♦	♦
I2C	♦	♦	♦	♦	♦	♦	♦	♦	♦
I2S	♦	♦	♦	♦	♦	♦	♦	♦	♦
USB	♦	♦	♦	♦	♦	♦	♦	♦	♦
PDM and PWM	♦	♦	♦	♦	♦	♦	♦	♦	♦
AD converters [number of bits]	12	12	12	12	12	12	12	12	12
GPIO pins	48	48	48	40	40	44	48	48	44
<b>Features</b>									
MCU (see footnotes)	Dual-core Arm® Cortex®-M33			M4F	M4F	M4F	M4F	M4F	M4F
RAM [kB]	512 / 64 *			128	128	256	256	256	256
Flash [kB]	1024 / 256 *			512	512	1024	1024	1024	1024
Application core frequency [MHz]	128 or 64								
Arm TrustZone®	♦	♦	♦						
Arm CryptoCell™-312 and KMU	♦	♦	♦						
Simultaneous GATT server and client	♦	♦	♦	♦	♦	♦	♦	♦	♦
Throughput [Mbit/s]	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Maximum Bluetooth connections	>20	>20	>20	20	20	20	20	20	20
Direction finding (AoA/AoD)	♦	♦	♦	♦	♦				
Bluetooth mesh	♦	♦	♦	♦	♦	♦	♦	♦	♦
Secure boot	♦	♦	♦	♦	♦	♦	♦	♦	♦
FOTA	♦	♦	♦	♦	♦	♦	♦	♦	♦

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

U.FL = U.FL antenna connector  
M4F = 64 MHz Arm® Cortex-M4 with FPU  
KMU = Key management unit

♦ = Feature enabled by hardware. The actual support depends on the open CPU application software.  
\* = Application / Network core

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	Bluetooth							
	NINA-B301	NINA-B302	NINA-B306	NINA-B311	NINA-B312	NINA-B316	NINA-B221	NINA-B222
<b>Grade</b>								
Automotive								
Professional	•	•	•	•	•	•	•	•
Standard								
<b>Physical</b>								
<b>Image</b>								
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 x 3.8	
Operating temperature [°C]	-40 to +85							
<b>Radio</b>								
Chip inside	nRF52840						ESP32	
Bluetooth qualification	v5.0	v5.0	v5.0	v5.0	v5.0	v5.0	v4.2	
Bluetooth low energy	•	•	•	•	•	•	•	•
Bluetooth BR/EDR							•	•
Thread / Zigbee	•	•	•					
NFC	•	•	•	•	•	•		
Max range [meters]	1400	1400	1400	1400	1400	1400	200	200
Bluetooth output power EIRP [dBm]	10	10	10	10	10	10	8	8
Antenna type (see footnotes)	pin	metal	pcb	pin	metal	pcb	pin	metal
<b>Application software</b>								
u-connectXpress				•	•	•	•	•
Open CPU for embedded applications	•	•	•					
<b>Interfaces</b>								
UART	◆	◆	◆	2	2	2	1	1
SPI	◆	◆	◆				1	1
I2C	◆	◆	◆					
I2S	◆	◆	◆					
USB	◆	◆	◆					
PDM and PWM	◆	◆	◆					
AD converters [number of bits]	12	12	12					
GPIO pins	38	38	38	28	28	28	21	21
<b>Features</b>								
AT command interface				•	•	•	•	•
MCU (see footnotes)	M4F	M4F	M4F					
RAM [kB]	256	256	256					
Flash [kB]	1024	1024	1024					
Simultaneous GATT server and client	◆	◆	◆	•	•	•	•	•
Low Energy Serial Port Service				•	•	•	•	•
Throughput [Mbit/s]	1.4	1.4	1.4	0.8	0.8	0.8	1.0	1.0
Maximum Bluetooth connections	20	20	20	8	8	8	7	7
Bluetooth mesh	◆	◆	◆	•	•	•		
Secure boot	◆	◆	◆	•	•	•	•	•
FOTA	◆	◆	◆					

pin = Antenna pin  
pcb = Internal PCB antenna

metal = Internal metal PIFA antenna  
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										
		ANNA-B112	NINA-B111		NINA-B112		BMD-350	BMD-301	BMD-300	BMD-360	BMD-330	R41Z
<b>Grade</b>												
Automotive												
Professional		•	•		•		•	•	•	•	•	•
Standard												
<b>Physical</b>												
<b>Image</b>												
Size [mm]		6.5x6.5x1.2	10x10.6x2.2 / 10x14x3.8				6.4x8.6x1.5	9.8 x 14.0 x 1.9				10.6x16.2x2.1
Operating temperature [°C]		-40 to +85										
<b>Radio</b>												
Chip inside		nRF52832	nRF52832		nRF52832		nRF52832			nRF52811	nRF52810	KW41Z
Bluetooth qualification		v5.0	v5.0		v5.0		v5.0	v5.0	v5.0	v5.1	v5.0	v4.2
Bluetooth low energy		•	•		•		•	•	•	•	•	•
Bluetooth BR/EDR												
Thread / Zigbee												
NFC		•	•		•		•	•	•			
Max range [meters]		160 / 190*	350		300		190	400	200	200	200	150
Bluetooth output power EIRP [dBm]		5 / 8*	7		6		5	9	3	3	3	3
Antenna type (see footnotes)		chip / pin	pin		metal		chip	U.FL	pcb	pcb	pcb	pcb
<b>Application software</b>												
u-connectXpress		•	•		•							
Open CPU for embedded applications		•	•		•		•	•	•	•	•	•
<b>Interfaces</b>												
UART		1	◆	1	◆	1	◆	◆	◆	◆	◆	◆
SPI		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
I2C		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
I2S		◆	◆	◆	◆	◆	◆	◆	◆			
TSI												
PDM and PWM		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
AD converters [number of bits]		12	12	12	12	12	12	12	12	12	12	16
GPIO pins		11	25	7	19	7	19	32	32	32	32	25
<b>Features</b>												
AT command interface		•	•		•							
Direction finding (AoA/AoD)												
MCU (see footnotes)		M4F	M4F		M4F		M4F	M4F	M4F	M4	M4	M0+
RAM [kB]		64	64		64		64	64	64	24	24	128
Flash [kB]		512	512		512		512	512	512	192	192	512
Simultaneous GATT server and client		•	◆	•	◆	•	◆	◆	◆	◆	◆	
Low Energy Serial Port Service		•										
Throughput [Mbit/s]		0.8	1.4	0.8	1.4	0.8	1.4	1.4	1.4	1.4	1.4	
Maximum Bluetooth connections		7	20	7	20	7	20	20	20	20	4	4
Bluetooth mesh		◆	◆	◆	◆	◆	◆	◆	◆			
Secure boot												
FOTA		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

pin = Antenna pin  
 pcb = Internal PCB antenna  
 \* = Different values for use with internal or external antenna  
 chip = Internal chip antenna  
 metal = Internal metal PIFA antenna  
 U.FL = U.FL antenna connector  
 M0+ = 48 MHz Arm® Cortex-M0+  
 M4 = 64 MHz Arm® Cortex-M4  
 M4F = 64 MHz Arm® Cortex-M4 with FPU  
 ◆ = Feature enabled by hardware. Actual support depends on the open CPU application software.



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# Stand-alone short range radio modules



	Multiradio (Wi-Fi and Bluetooth)									Wi-Fi	
	ODIN-W260	ODIN-W262	ODIN-W263	NINA-W151	NINA-W152	NINA-W156	NINA-W101	NINA-W102	NINA-W106	NINA-W131	NINA-W132
<b>Grade</b>											
Automotive											
Professional	•	•	•	•	•	•	•	•	•	•	•
Standard											
<b>Physical</b>											
<b>Image</b>											
Size [mm]	14.8 x 22.3 x 3.2 / 4.7			10.0 x 10.6 x 2.2 / 10.0 x 14.0 x 3.8 / 10.0 x 14.0 x 2.2							
Operating temperature [°C]	-40 to +85										
<b>Radio</b>											
Chip inside	WL1837			ESP32			ESP32			ESP32	
Bluetooth qualification	v4.0			v4.2			v4.2				
Bluetooth low energy	•	•	•	•	•	•	•	•	•		
Bluetooth BR/EDR	•	•	•	•	•	•	•	•	•		
Bluetooth output power EIRP [dBm]	14	11	11	8	8	8	8	8	8		
Wi-Fi 2.4 / 5 [GHz]	2.4 and 5	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	a/b/g/n	a/b/g/n	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 EIRP [dBm]	18	15	15	18	18	18	18	18	18	18	18
Max Wi-Fi range [meters]	300	250	250	500	400	400	500	400	400	500	400
Antenna type (see footnotes)	U.FL	metal	metal	pin	metal	pcb	pin	metal	pcb	pin	metal
<b>Application software</b>											
u-connectXpress	•	•	•	•	•	•				•	•
Open CPU for embedded apps							•	•	•		
<b>Interfaces</b>											
UART	1	1	1	1	1	1	◆	◆	◆	1	1
SPI				1	1	1	◆	◆	◆	1	1
I2C							◆	◆	◆		
I2S							◆	◆	◆		
RMII	1	1	1	1	1	1	◆	◆	◆	1	1
GPIO pins	23	23	23	21	21	21	24	24	26	21	21
AD converters [number of bits]							12	12	12		
<b>Features</b>											
AT command interface	•	•	•	•	•	•				•	•
Point-to-Point Protocol	•	•	•	•	•	•	◆	◆	◆	•	•
Low Energy Serial Port Service	•	•	•	•	•	•	◆	◆	◆		
MCU (see footnotes)				LX6	LX6	LX6	LX6	LX6	LX6	LX6	LX6
RAM [kB]				520	520	520	520	520	520	520	520
Flash [kB]				2048	2048	2048	2048	2048	2048	2048	2048
Wi-Fi throughput [Mbit/s]	20	20	20	13	13	13	25	25	25	16	16
Maximum Bluetooth connections	7	7	7	7	7	7	8	8	8		
Micro Access Point [max stations]	10	10	10	10	10	10	10	10	10	10	10
Wi-Fi enterprise security	•	•	•	•	•	•	◆	◆	◆	•	•
End-to-end security (TLS)	•	•	•	•	•	•	◆	◆	◆	•	•
Secure boot				•	•	•	◆	◆	◆	•	•
WPA/WPA2	•	•	•	•	•	•	◆	◆	◆	•	•
ATEX / IECEx certified	•	•									




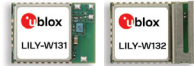
pin = Antenna pin  
 metal = internal metal PIFA antenna  
 pcb = Internal PCB antenna

U.FL = U.FL connector(s) for external antenna  
 LX6 = 240 MHz dual-core Xtensa LX6

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

# Host-based short range radio modules and chips



	V2X						Wi-Fi	
	VERA-P173	VERA-P174	VERA-P311	VERA-P321	UBX-P3011	UBX-P3021	LILY-W131	LILY-W132
<b>Grade</b>								
Automotive	•	•	•	•	•	•	•	•
Professional								
Standard								
<b>Physical</b>								
<b>Image</b>								
Size [mm]	24.8 x 29.6 x 3.5				9.0 x 11.0 x 1.04		10.0 x 14.0 x 2.2 / 3.8	
Operating temperature [°C]	-40 to +95		-40 to +105		-40 to +105		-40 to +85	
<b>Radio</b>								
Chip inside	NXP SAF5100EL/ TEF5200EL		UBX-P3				NXP 88W8801	
Wi-Fi IEEE 802.11 standards	p	p	p	p	p	p	b/g/n	b/g/n
Wi-Fi 2.4 / 5 [GHz]							2.4	2.4
LTE filter								•
Channel width [MHz]	10	10	10 or 20	10 or 20	10/20	10/20	20	20
Rx/Tx diversity	•	•		•		•		
Antenna type (see footnotes)	2p	2p	pin	2p	2p	2p	pin	metal
<b>OS support</b>								
Android / Linux	Linux	Linux	Linux	Linux	Linux	Linux	Android and Linux	
QNX (via third party)			o	o	o	o		
<b>Interfaces</b>								
High-speed UART	2	2	3	3	4	4		
Ethernet (RGMII/MII/Reverse MII)			1	1	1	1		
I2C					1	1		
Quad SPI and Octal SPI			1	1	1	1		
SDIO [version]			v3	v3	v3	v3	v2	v2
USB 2.0	1	1					1	1
GPIO	8	8	16	16	20	20		
PPS	1	1	1	1	1	1		
<b>Features</b>								
Micro Access Point [max connects]							8	8
AES hardware support							•	•
Wi-Fi direct							•	•
Factory-assigned MAC address in OTP			•	•			•	•
Factory calibrated RF in OTP			•	•			•	•
Antenna diversity	•	#		•		•		
Single channel operation	•	•	•	•	•	•		
Concurrent dual-channel operation		#						
Security Acceleration Engine	•		•	•	•	•		

o = On request  
m = Metal PIFA antenna

pin = 1 pin for external antenna  
2p = 2 pins for 2 external antennas

# = User can configure as dual-channel or diversity

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# Host-based short range radio modules



	Multiradio (Wi-Fi and Bluetooth)									
	JODY-W374	JODY-W377	JODY-W263-A	JODY-W263	JODY-W163	JODY-W164	JODY-W167	EMMY-W161	EMMY-W163	EMMY-W165
Grade										
Automotive	•	•	•		•	•	•	•	•	•
Professional	•	•		•				•	e•	•
Standard										
Physical										



	13.8 x 19.8 x 2.5						13.8 x 19.8 x 2.5			
Size [mm]										
Operating temperature [°C]	-40 to +85		-40 to +105		-40 to +85		-40 to +85			
Radio										
Chip inside	NXP 88Q9098 / NXP 88W9098		NXP 88W8987		CYW 89359			NXP 88W8887A		
Bluetooth qualification	v5.1		v5.0		v5.0 (without optional features)			v4.2		
Bluetooth profiles	HCI		HCI		HCI			HCI		
Bluetooth BR/EDR	•	•	•	•	•	•	•	•	•	
Bluetooth low energy	•	•	•	•	•	•	•	•	•	
Wi-Fi IEEE 802.11 standards	a/b/g/n/ac/ax		a/b/g/n/ac		a/b/g/n/ac			a/b/g/n/ac		
Wi-Fi 2.4 / 5 [GHz]	2.4 and 5		2.4 and 5		2.4 and 5			2.4 and 5		
LTE filter	o	o			o	o		•		
Bluetooth output power conducted [dBm]	10	10	10	10	10	10	10	10	10	
Wi-Fi output power conducted [dBm]	18	18	18	18	18	18	18	18	18	
Antenna type (see footnotes)	2p	3p	2p	2p	2p	2p	3p	pin	2p	pin
OS support										
Android / Linux drivers	•	•	•	•	•	•	•	•	•	
QNX (via third party)					•	•	•	•	•	
Interfaces										
High-speed UART <sup>B</sup>	1	1	1	1	1	1	1	1	1	
PCIe <sup>W</sup>	1	1				1	1			
SDIO [version] <sup>W</sup>	v3	v3	v3	v3	v3			v3	v3	v3
PCM (Bluetooth audio)	1	1	1	1	1	1	1	1	1	
Features										
Micro Access Point [max connects]	32	32	8	8	10	10	10	10	10	
AES hardware support	•	•	•	•	•	•	•	•	•	
Wi-Fi direct	•	•	•	•	•	•	•	•	•	
Factory-assigned MAC address in OTP	•	•	•	•	•	•	•	•	•	
Factory calibrated RF in OTP	•	•	•	•	•	•	•	•	•	
Simultaneous STA/AP roles	DRCS	DRCS	DRCS	DRCS	•	•	•	DRCS	DRCS	DRCS
Concurrent dual band	•	•			•	•	•			

B = For Bluetooth only  
W = For Wi-Fi only

pin = 1 antenna pin for combined Bluetooth and Wi-Fi  
2p = 2 antenna pins, one each for Bluetooth and Wi-Fi  
3p = 3 pins, 2 for Wi-Fi and 1 for Bluetooth antenna

DRCS = Dynamic Rapid Channel Switching  
RSDB = Real Simultaneous Dual Band

o = On request

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