UWM200A, UWB (SR150) + BLE SoC (QN9090) Module

Applications

- ✓ Hand-Free Access Control

- ✓ Location-based Services

- ✓ Device to Device Applications

Features & Supports

- ✓ UWB Transceiver: NXP SR150

- ✓ BLE SoC: NXP QN9090

- ✓ IEEE 802.15.4z HRP PHY compliant

- ✓ 6.24GHz to 8.24GHz UWB band

- ✓ 2.4GHz Bluetooth LE 5.0 Compliant

- ✓ Ranging and localization with UWB

- ✓ Two-way and one-way ranging (TDoA)

- ✓ Dual-RX for AoA functionality

- ✓ 3 UWB RF ports (2D or 3D AoA support)

- ✓ 1 Bluetooth LE RF port

- ✓ UWB TX Power Calibration at FCC limits

- ✓ Interfaces: UART, I2C, SPI, SWD, GPIOs

- ✓ Supply Voltage: 3.3V

- ✓ Size [mm]: 13.0 (W) X 30.0 (L) X 2.8 (H)

Descriptions

UWM200A module provides UWB and BLE wireless solution with configurations of NXP UWB transceiver IC, SR150 and NXP BLE SoC chip, QN9090 on board.

NXP SR150 chipset provides highly reliable UWB ranging technologies like SS-TWR, DS-TWR and TDoA ranging achieving an accuracy of <±10cm. also, can perform measurement of angle of arrival(AoA) with an accuracy of <±3°in one measurement cycle using the on-chip dual receiver architecture. NXP QN9090 is a host processor supporting Bluetooth LE 5.0. It controls UWB IC via SPI interface on module.

UWM200A module is designed to enable providing highly accurate ranging and positioning capabilities with these UWB technologies in IoT market applications**.**
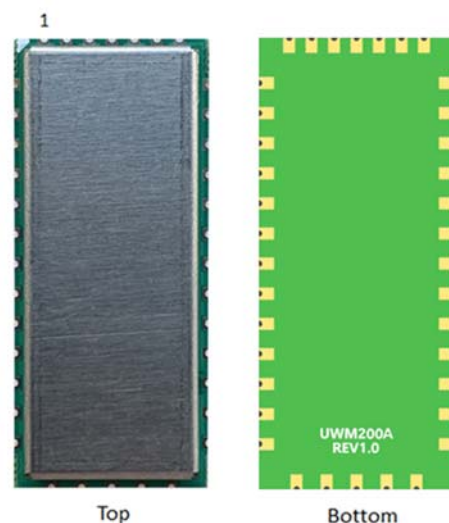
The UWM200 module consists of the following components:

- ✓ QN9090, Bluetooth Low Energy 5.0 wireless MCU

- ✓ SR150, Ultra-Wideband Transceiver

- ✓ 8-bit bidirectional multi-voltage level translator (1.8V to 3.3V)

- ✓ Low Iq step-down DC-DC convertor (3.3V to 1.8V)

- ✓ 2 SPDT RF switches and 3 Band pass filters for UWB 3D AoA

- ✓ 4 crystals for reference clock of transceiver IC and MCU

Pin Descriptions
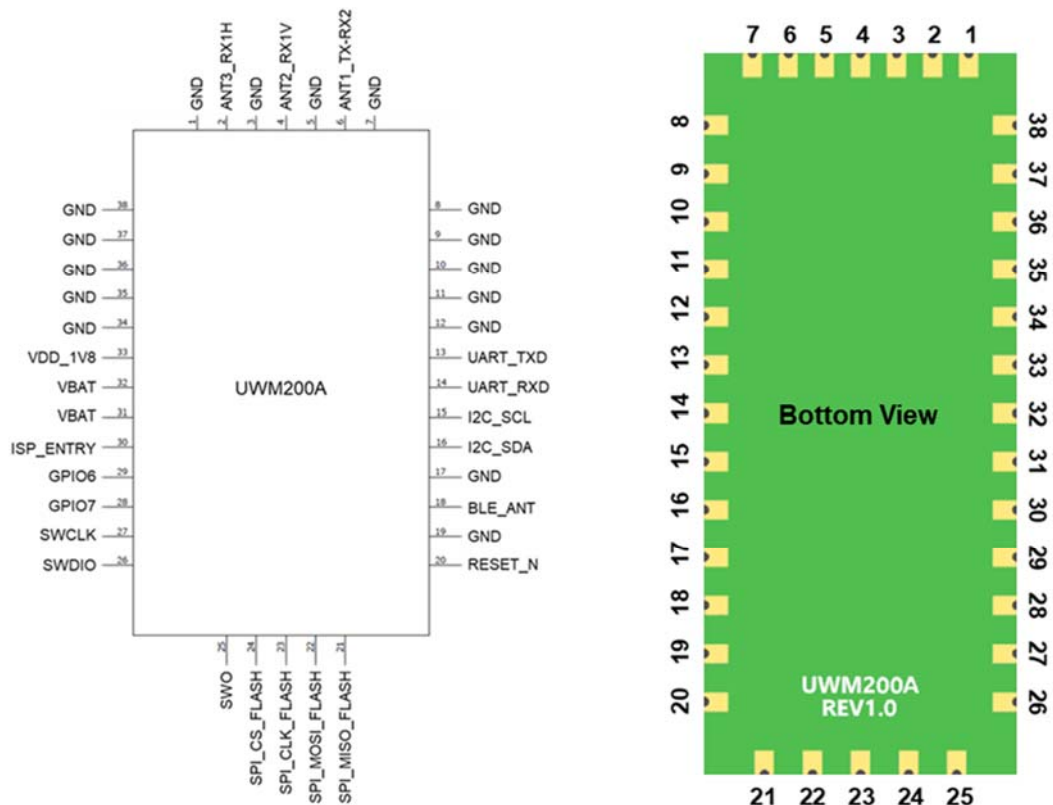
Preliminary Datasheet

UWM200A Pin Descriptions

Pin	Name	Type	Description
1	GND	-	Ground
2	ANT3_RX1H	RF In	UWB RF RX1 Input (connected to RX1_horizental antenna for 3D AoA)
3	GND	-	Ground
4	ANT2_RX1V	RF In	UWB RF RX1 Input (connected to RX1_Vertical antenna for 3D AoA)
5	GND	-	Ground
6	ANT1_TX-RX2	RF In/Out	UWB RF TX Out/ RX2 Input (connected to TX/RX2 antenna for 3D AoA)
7	GND	-	Ground
8	GND	-	Ground
9	GND	-	Ground
10	GND	-	Ground
11	GND	-	Ground
12	GND	-	Ground
13	UART_TXD	Digital Output	UART Transmit Data Output
14	UART_RXD	Digital Input	UART Receiver Data Input
15	I2C_SCL	Digital In/out	I^{2}C-Bus master/slave SCL Input / Output
16	I2C_SDA	Digital In/out	I^{2}C-Bus master/slave SDA Input / Output
17	GND	-	Ground
18	BLE_ANT	RF In/Out	Bluetooth LE RF TX Output/ RX Input
19	GND	-	Ground
20	RESET_N	Digital In	Reset signal; Active low
21	SPI_MISO_FLASH	Digital In/out	Serial Peripheral Interface-bus, Master Input Slave Output on using external flash
22	SPI_MOSI_FLASH	Digital In/out	Serial Peripheral Interface-bus, Master Output Slave Input on using external flash
23	SPI_CLK_FLASH	Digital In/out	Serial Peripheral Interface-bus, Clock Input/ Output on using external flash
24	SPI_CS_FLASH	Digital Out	Serial Peripheral Interface-bus, chip select on using external flash
25	SWO	Digital Out	Serial Wire Output
26	SWDIO	Digital In/out	Serial Wire Data Input/ Output
27	SWCLK	Digital In/out	Serial Wire Clock Input/ Output
28	GPIO7	Digital In/out	GPIO Input/ Output
29	GPIO6	Digital In/out	GPIO Input/ Output
30	ISP ENTRY	Digital In	Input to enter ISP_ENTRY mode
31	VBAT	Supply In	+3.3V Input supply

32	VBAT	Supply In	+3.3V Input supply
33	VDD_1V8	Analog Out	Internal DC-DC 1.8V Output
34	GND	-	Ground
35	GND	-	Ground
36	GND	-	Ground
37	GND	-	Ground
38	GND	-	Ground

Electrical Specifications

Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit.
V_{DD}	Supply voltage	-	3.96	V
V_{IO}	IO pins voltage	-	3.96	V
T_{stg}	Storage temperature	-40	+ 85	°C
V_{ESD}	Static Discharge Voltage*	-	±2	KV

* System level ESD : IEC 61000-4-2; C = 150pF, R = 330Ω

Recommended Operating Conditions

Symbol	Parameter	Min.	Max.	Unit.
V_{in}	Input voltage	3.0	3.6	V
V_{IO}	IO pins voltage	3.0	3.6	V
T_A	Operating ambient temperature	-30	+ 85	°C

Electrical Reference data – UWB

Parameter	Conditions	Min.	Typ	Max.	Unit.
Freq. Range	Operating frequency	6.24		8.24	GHz
Output Power	Calibrated power (RMS) at FCC limit			-41.3	dBm/MHz
Sensitivity	6.8Mbps data rate		-89		dBm
ToF Accuracy	Line of sight accuracy when STS is used.[2]	-10		10	cm
3D AoA Accuracy (AoA$_{KPI}$[1])	Azimuth and elevation sweep from -60° to +60° with a step of 6°.[2]		95		%

[1] AoA$_{KPI}$(%) = (Number of AoA$_{ERROR}$≤5°) / (Number of AoA Measurement)

[2] The AoA, ToF performance is measured and verified in conducted and radiated test environment using UWM2X0 evaluation platform connected to UWB antennas. More details can be found in the application note 'AoA, ToF Performance Report'

Electrical Reference data – BLE RF

Parameter	Conditions	Min.	Typ	Max.	Unit.
Freq. Range	Operating frequency	2.40		2.48	GHz
Output Power	@Radiated Power		7		dBm
Sensitivity			-96		dBm

Electrical Reference data – Power consumption

@VDD=3.3V, T_A=25℃

Parameter	Conditions	Min.	Typ	Max.	Unit.
UWB / Peak Current RX	Single RX @9-channel(7.987GHz)	-	145	-	mA
	Dual RX @9-channel(7.987GHz)	-	230	-	mA
UWB / Peak Current TX	TX Max output power @9-channel(7.987GHz)	-	170	-	mA
	TX Calibrated power (RMS) at FCC limit @9-channel(7.987GHz)		124		mA
	TX Max output power CW Mode @9-channel(7.987GHz)	-	152	-	mA
UWB / DS-TWR average current consumption excluding DPD During active ranging	Controller/initiator average current consumption @9-channel(7.987GHz)	-	86	-	mA
	Controlee/responder average current consumption in dual RX mode @9-channel(7.987GHz)	-	91	-	mA
	Controlee/responder average current consumption in Single RX mode @9-channel(7.987GHz)	-	83	-	mA
UWB / DS-TWR average current consumption including DPD for 100ms ranging block	Controller/initiator average current consumption @9-channel(7.987GHz)	-	15	-	mA
	Controlee/responder average current consumption in dual RX mode @9-channel(7.987GHz)	-	16	-	mA
	Controlee/responder average current consumption in Single RX mode @9-channel(7.987GHz)	-	15	-	mA
BLE / TX Average Current	@19Channel(2440MHz), 1M, Max Power(+15dBm), PRBS9 random-payload	-	27	-	mA
BLE / TX (CW Mode) Average Current	@19Channel(2440MHz), 1M, Max Power(+15dBm)	-	33	-	mA
BLE / RX Average Current	@1Channel(2404MHz), 1M, RX Trigger mode test	-	15	-	mA
BLE / RX (Continuous) Average Current	@1Channel(2404MHz), 1M, RX Continuous mode test	-	21	-	mA
Supply Current	Active State, CPU Idle	-	15	-	mA

| Sleep mode | @QN9090_Deep Power Down Mode | - | 850 | - | nA |

Mechanical Specifications
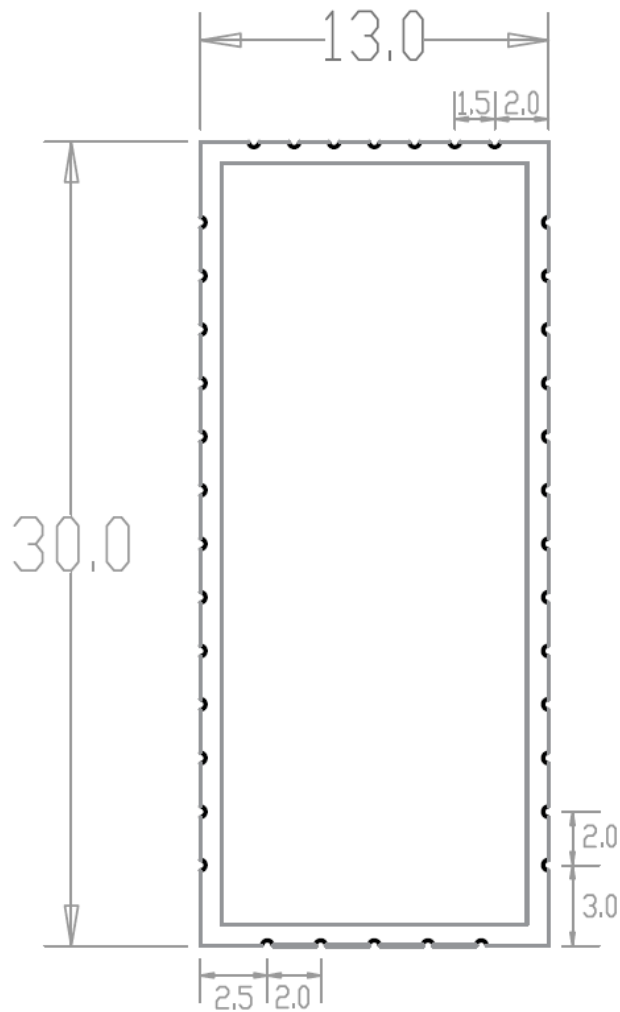
TOP VIEW

BOTTOM VIEW

SIDE VIEW

FCC Part 15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Part 15.21

Any changes or modifications(including the antennas) to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.

FCC Information to User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may

cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

·Reorient or relocate the receiving antenna.

·Increase the separation between the equipment and receiver.

·Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

·Consult the dealer or an experienced radio/TV technician for help.

Caution

THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

IMPORTANT NOTE : FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

§ 15.519 Technical requirements for hand held UWB systems.

(a) UWB devices operating under the provisions of this section must be hand held, i.e., they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.

(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

(2) The use of antennas mounted on outdoor structures, e.g., antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.

(3) UWB devices operating under the provisions of this section may operate indoors or outdoors.

UWB. modules can only be granted under the requirements specified in §15.519 (b) – (e) and only used in a host intended to operate under the conditions of §15.519 (a). Host device with potential for outdoor use.

OEM/integrators Installation Manual

the modules limited to OEM installation only

the OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Instructions to the OEM/integrator

The OEM integrator must include the instructions or statements required by part 15.19 and 15.21 in the user manual.

the OEM integrator must include a separate section in the host user's manual concerning the operating conditions to satisfy RF exposure compliance.

there is requirement that the grantee provide guidance to the host manufacturer for compliance with part 15b requirements.

- End Product Labeling

To satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product.

Contains Transmitter module FCC ID: 2AS8LUWM200

IC: 25119-UWM200