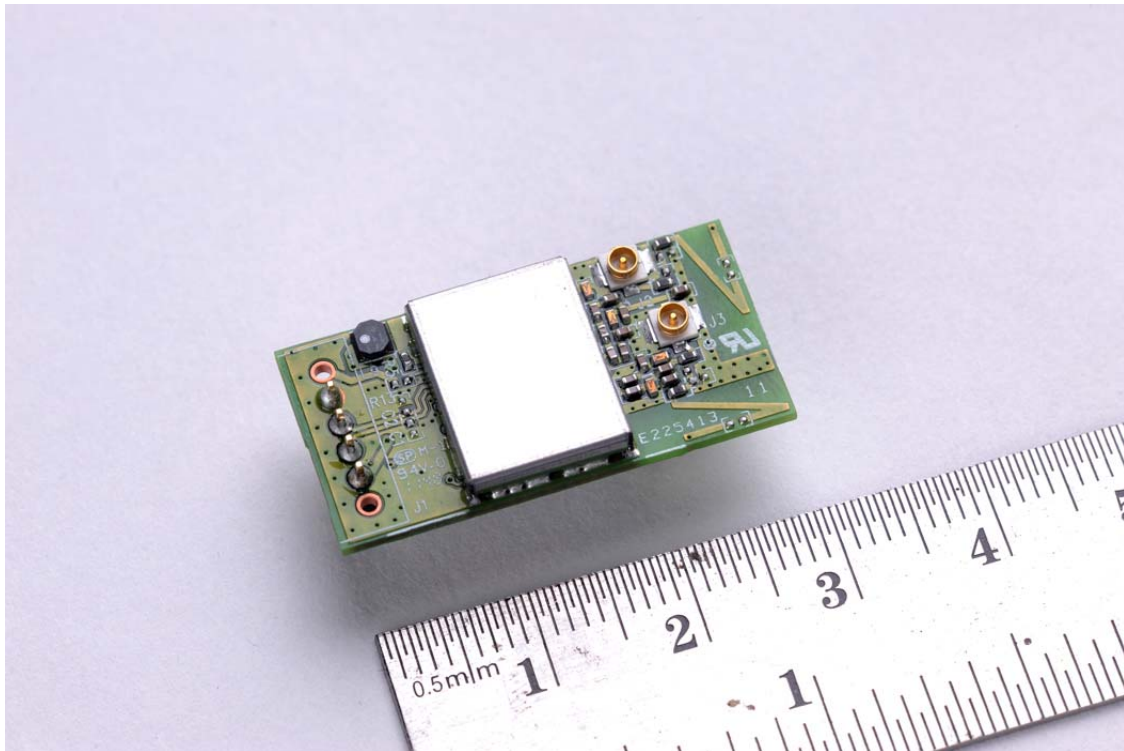


# Nano WiReach™ USB

## Datasheet Version 1.1



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**WARNING:** THE Nano WiReach USB IS AN RF MODULE INTENDED FOR EMBEDDING IN A HOST DEVICE. LOCAL RELEVANT RF REGULATIONS SUCH AS ALLOWED FREQUENCIES AND USAGE IN COMMERCIAL FLIGHTS MUST BE OBSERVED. SAFETY INSTRUCTIONS MUST BE INCLUDED IN THE MANUALS OF THE HOST DEVICE. CONNECT ONE ASSUMES NO LIABILITY FOR CUSTOMER FAILURE TO COMPLY WITH THESE PRECAUTIONS.

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## Revision History

### 11-4600-01

Version	Date	Description
1.0	April 2012	Initial preliminary version
1.1	April 2012	Corrections to certifications

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# 1 Introduction

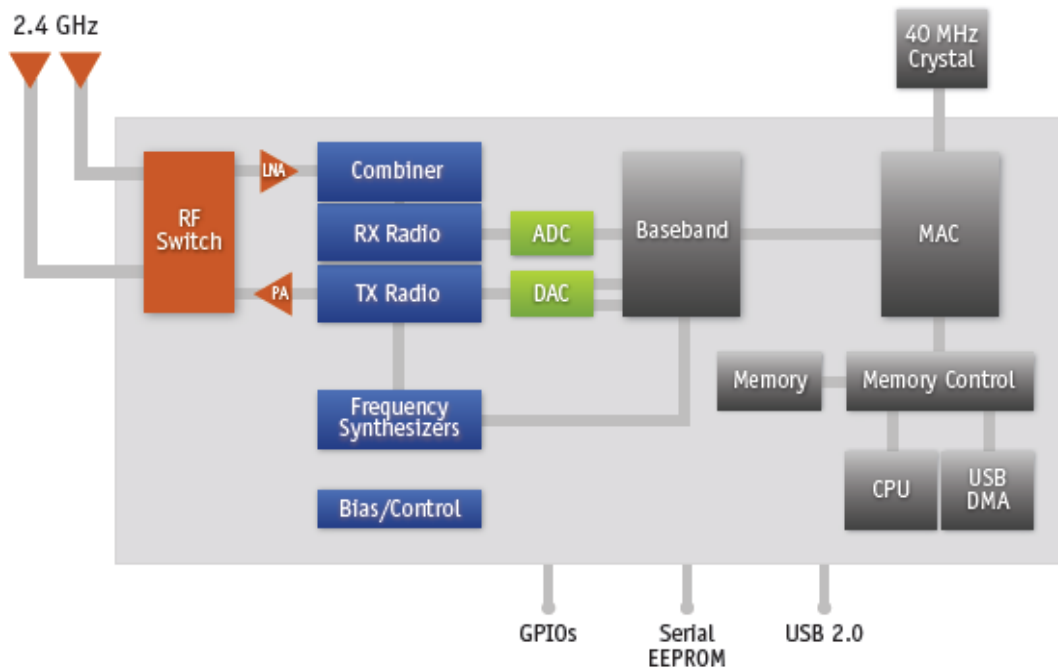
## 1.1 General Description

The Nano WiReach USB provides enhanced Wi-Fi performance and value for home gateways, set-top boxes, gaming consoles, printers and a variety of other embedded wireless products. The solution can also be integrated into wireless USB adapters for notebooks and desktops, to enable simple, low-cost performance upgrades on legacy products.

The Nano WiReach USB features an architecture that integrates both a CPU and memory to run more of the wireless LAN functions on-module. Unlike competitive 11g and 11n USB solutions, the integrated CPU offloads the wireless processing overhead from the host appliance. This design breakthrough enables consumer electronics devices with host processors not originally intended to support wireless functions, to now offer robust Wi-Fi performance. With the Nano WiReach USB innovative host offload capability, the WLAN operates autonomously and enables the main device application to operate seamlessly.

The II-EVB-410 evaluation board provides an easy environment for testing the Nano WiReach USB prior to designing it into your product.

- 802.11n compliant wireless LAN client solution with integrated CPU and memory to run more of the wireless LAN functions on-module.
- Integrated RF front end with high-output PA, LNA, Rx/Tx switch
- Internal diversity switch which selects antenna 1 or 2 for baseband signal processing
- Enables PHY rate of up to 150 Mbps
- Based on 802.11n compliant technology
- WiFi Direct compliant
- Compliant with IEEE 802.11b, 802.11g, 802.11d, 802.11e, 802.11i, and 802.11n
- Lead-free RoHS compliant



## 1.2 Hardware Description

- Size: 30 x 15 x 8.8 mm
- Operating Voltage: 5V +/-10%
- Operating Temperature: 0° – 60° C
- Storage Temperature: -10° – 80° C
- Power Consumption:
- Transmit: 340mA
- Receive: 280mA
- Connectors:
- One 1x4 pin header
- Two IPEX connectors for external antennas.
- Host Interface: USB 2.0
- RoHS-compliant; lead-free

## 1.3 Performance Specifications

- Host interface: USB 2.0
- Transfer rates:
  - 11a (6, 9, 12, 18, 24, 36, 48, 54 Mbps)
  - 11b (1, 2, 5.5, 11 Mbps)
  - 11g (6, 9, 12, 18, 24, 36, 48, 54 Mbps)
  - 11n: @800GI (400GI)
    - 20MHz BW
      - 1 Nss: 65 (72.2) Mbps max
    - 40MHz BW
      - 1 Nss: 135 (150) Mbps max

## 1.4 Wireless Specifications

- Standards supported: IEEE 802.11b/g/n
- Frequency:
  - Europe: 2.400 – 2.483GHz
  - USA: 2.400 – 2.483GHz
  - Japan: 2.400 – 2.497 GHz
  - China: 2.400 – 2.483 GHz
- Channels:
  - 802.11n b/g
    - USA/Canada: 11 (1~11)
    - Europe: 13 (1~13)
    - France: 4 (10~13)
    - Japan: 11b: 14 (1~13 or 14th), 11g: 13 (1~13)
    - China: 13 (1~13)
  - 802.11n a
    - US/Canada: 12 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140; 149,153,157,161,165)

- Europe: 19 non-overlapping channel (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140)
  - Japan: 19 non-overlapping channels (36,40,44,48,52,56,60,64; 100,104,108,112,116,120,124,128,132,136,140)
  - China: 5 non-overlapping channels (149,153,157,161,165)
- Modulation:
  - 802.11 Legacy b/g
    - DSSS (DBPSK, DQPSK, CCK)
    - OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
  - 802.11ng
    - OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- Channel Spacing: 5MHz

## 1.5 Warranty

- One Year

## 1.6 Certifications:

### Radio and EMC:

- USA: CFR Title 47 FCC Part 15, Subpart B and C (**Pending**)
- Canada: Industry Canada ICES-003, RSS-Gen, RSS-210 (**Pending**)
- EU: EN 300 328 (R&TTE Directive 1999/5/EC), EN 301 489 (EMC Directive 2004/108/EC) (**Pending**)

## 1.7 Current Consumption

- For throughput TX mode: 300mA (5V)
- For throughput RX mode: 280 (5V)
- For 6M Continuous TX mode: 310mA (5V)
- For HT40 MCS0 Continuous TX mode: 310mA (5V)
- For HT20 MCS0 Continuous TX mode: 300mA (5V)



- For HT40 MCS7 Continuous TX mode: 300mA (5V)
- For HT20 MCS7 Continuous TX mode: 300mA (5V)

## 1.8 Output Power

(For each chain, with  $\pm 2$ dBm tolerance)

	Test Frequencies	1/2 Target	5.5 Target	11 Target
802.11b	2412	18	18	18
	2472	18	18	18
	2484	18	18	18
802.11g	2412	18	18	18
	2472	18	18	18
	2484	18	18	18

802.11n	Test Freq.	MCS 0/8	MCS 1/9	MCS 2/10	MCS 3/11	MCS 4/12	MCS 5/13	MCS 6/14	MCS 7/15
Freq. Range HT20	2412	18	18	18	18	18	18	16	15
	2437	18	18	18	18	18	18	16	15
	2472	18	18	18	18	18	18	16	15
Freq. Range HT40	2412	16	16	16	16	16	16	15	14
	2437	16	16	16	16	16	16	15	14
	2472	16	16	16	16	16	16	15	14

## 1.9 Error Vector Magnitude

The transmit modulation accuracy is measured using error vector magnitude (EVM). EVM is the magnitude of the phase difference as a function of time between an ideal reference signal and the measured transmitted signal.

### 802.11b

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
DBPSK		-10	-24
DQPSK		-10	-24
CCK		-10	-24

### 802.11g

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
BPSK	1/2	-5	-24
BPSK	3/4	-8	-24
QPSK	1/2	-10	-24
QPSK	3/4	-13	-24
16-QAM	1/2	-16	-24
16-QAM	3/4	-19	-26
64-QAM	2/3	-22	-28
64-QAM	3/4	-25	-30

### 802.11ng (HT20)

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
(MCS0) BPSK	1/2	-5	-24

(MCS1) QPSK	1/2	-10	-24
(MCS2) QPSK	3/4	-13	-24
(MCS3) 16-QAM	1/2	-16	-24
(MCS4) 16-QAM	3/4	-19	-24
(MCS5) 64-QAM	2/3	-22	-26
(MCS6) 64-QAM	3/4	-25	-28
(MCS7) 64-QAM	5/6	-28	-30

### 802.11ng (HT40)

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
(MCS0) BPSK	1/2	-5	-24
(MCS1) QPSK	1/2	-10	-24
(MCS2) QPSK	3/4	-13	-24
(MCS3) 16-QAM	1/2	-16	-24
(MCS4) 16-QAM	3/4	-19	-24
(MCS5) 64-QAM	2/3	-22	-26
(MCS6) 64-QAM	3/4	-25	-28
(MCS7) 64-QAM	5/6	-28	-30

## 1.10 Sensitivity

(with +/- 3 dB tolerance, dBm)

### 802.11b

Modulation	IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
DBPSK	Not specified	-92
DQPSK	Not specified	-89
CCK	Not specified	-87

## 802.11g

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
BPSK	1/2	-82	-91
BPSK	3/4	-81	-90
QPSK	1/2	-79	-89
QPSK	3/4	-77	-87
16-QAM	1/2	-74	-85
16-QAM	3/4	-70	-82
64-QAM	2/3	-66	-78
64-QAM	3/4	-65	-75

## 802.11ng (HT20)

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)
(MCS0) BPSK	1/2	-82	-90
(MCS1) QPSK	1/2	-79	-89
(MCS2) QPSK	3/4	-77	-87
(MCS3) 16-QAM	1/2	-74	-85
(MCS4) 16-QAM	3/4	-70	-82
(MCS5) 64-QAM	2/3	-66	-79
(MCS6) 64-QAM	3/4	-65	-75
(MCS7) 64-QAM	5/6	-64	-72

## 802.11ng (HT40)

Modulation	Code Rate	Relative constellation error (dB)	Relative constellation error (dB)
		IEEE Spec (1Tx dB)	Typical/Max. (1Tx dB)

(MCS0) BPSK	1/2	-79	-88
(MCS1) QPSK	1/2	-76	-87
(MCS2) QPSK	3/4	-74	-86
(MCS3) 16-QAM	1/2	-71	-82
(MCS4) 16-QAM	3/4	-67	-78
(MCS5) 64-QAM	2/3	-63	-75
(MCS6) 64-QAM	3/4	-62	-73
(MCS7) 64-QAM	5/6	-61	-70

## 1.11 Transmit Spectrum Mask

- For transmitted spectral mask for 11a shall be less than -40dBm for  $fc-30MHz < f < fc+30MHz$ .
- For transmitted spectral mask for 11b shall be less than -50dBm for  $fc-22MHz < f < fc+22MHz$ .
- For transmitted spectral mask for 11g shall be less than -40dBm for  $fc-30MHz < f < fc+30MHz$ .
- For transmitted spectral mask for 11n 20MHz shall be less than -45dBm for  $fc-30MHz < f < fc+30MHz$ .
- For transmitted spectral mask for 11n 40MHz shall be less than -45dBm for  $fc-60MHz < f < fc+60MHz$ .

## 1.12 Transmit Spectrum Flatness

- For 802.11a/g the average energy of the constellations in each of spectral lines -16..-1 and +1..+16 will deviate no more than +/- 2dB from their average energy.
- For 802.11n 40MHz mode, the average energy of the constellations in each of spectral lines -42..-2 and +2..+42 will deviate no more than +/- 2dB from their average energy.
- The transmitted spectral flatness should be within +/- 4dB.

## 1.13 Transmit Center Frequency Tolerance

- The transmitted center frequency tolerance shall be  $\pm 20$  ppm maximum.

## 1.14 Transmit Power On & Power Down Ramp Time

- The transmitting power-on ramp for 10% to 90% of maximum power shall be no greater than 2  $\mu$ s.
- The transmitting power-down ramp for 90% to 10% of maximum power shall be no greater than 2  $\mu$ s.

## 1.15 Receiver Maximum Input Level

### 802.11a

Modulation	Code Rate	IEEE Spec (1Rx dB)
		>-30

### 802.11b

Modulation	Code Rate	IEEE Spec (1Rx dB)
DBPSK		>-10
DQPSK		>-10
CCK		>-10

### 802.11g

Modulation	Code Rate	IEEE Spec (1Rx dB)
		>-20

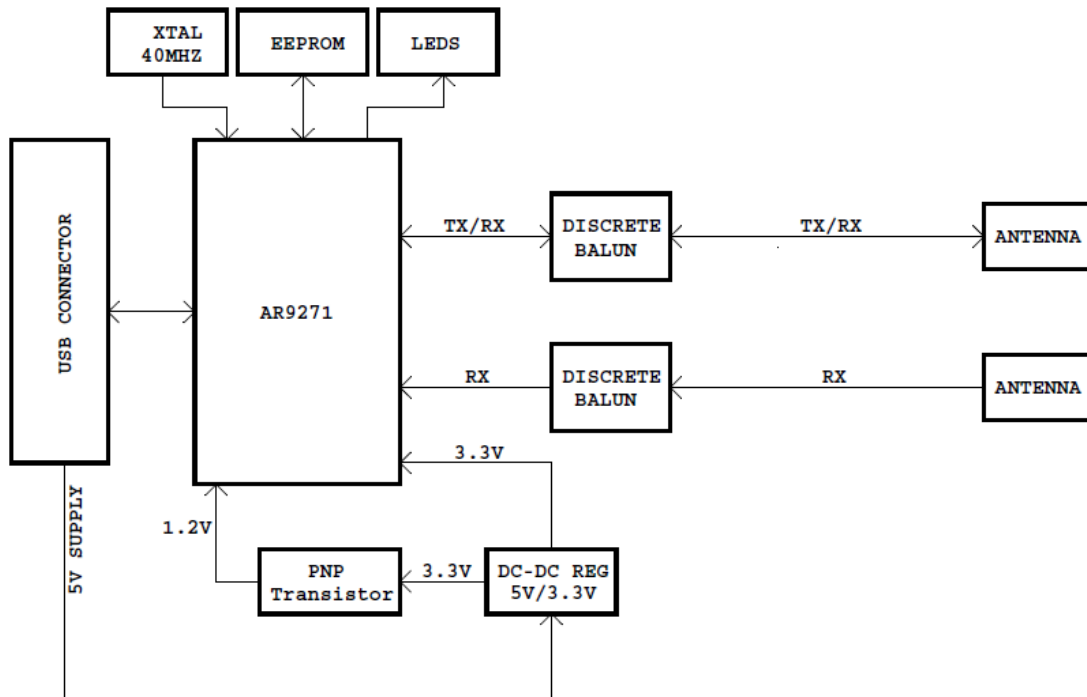
## 802.11na

Modulation	Code Rate	IEEE Spec (1Rx dB)
		>-30

## 802.11nb

Modulation	Code Rate	IEEE Spec (1Rx dB)
		>-20

## 1.16 Block Diagram



## 2 Typical Applications

- Home gateways, set-top boxes
- Gaming consoles, printers
- Medical devices, Handheld terminals

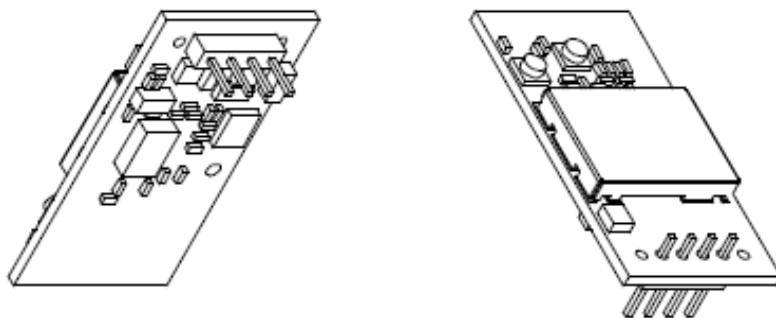
- Security systems, Smart grid meters
- Other embedded wireless products

### 3 Connector Pin Assignment

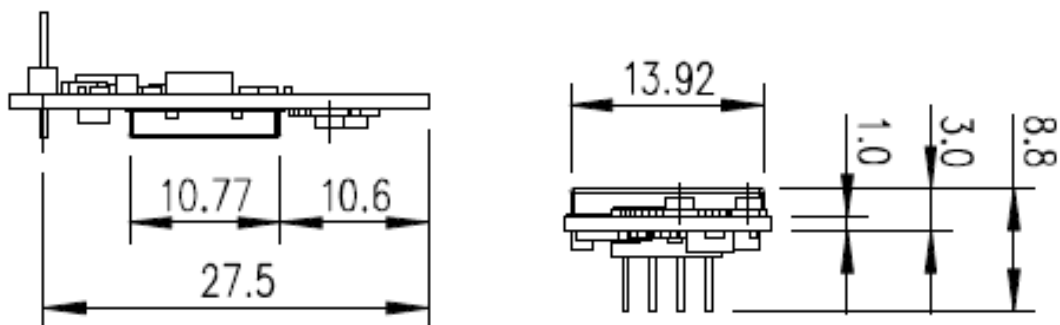
#	Signal	type	Description
1	VCC	Power	5V
2	D-	Data	
3	D+	Data	
4	GND	Power	Ground

### 4 Mechanical Views

#### 4.1 3-D

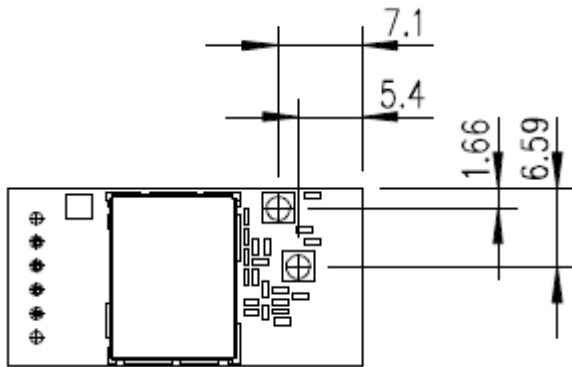


#### 4.2 Side View

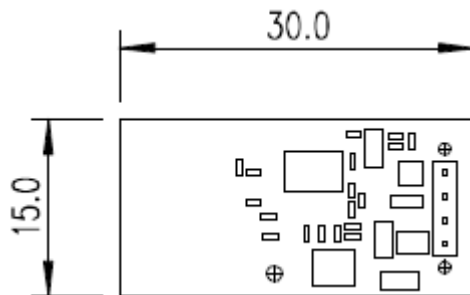




### 4.3 Top View



### 4.4 Bottom View



## 5 Software Drivers

In order to work with the Nano WiReach USB module you will need to install on your Windows OS or Linux OS the appropriate drivers.

The Windows driver can be downloaded from our website in the support section, under utilities & drivers. Please follow the driver software installation instructions.

For Linux you will need to download the latest Linux Wireless drivers from Linux Wireless Org. <http://wireless.kernel.org/en/users/Documentation/iw>

## 6 Ordering Information

Part Number	Description
iW-USBn-HDC-01	Nano WiReach SMT module, External Antenna