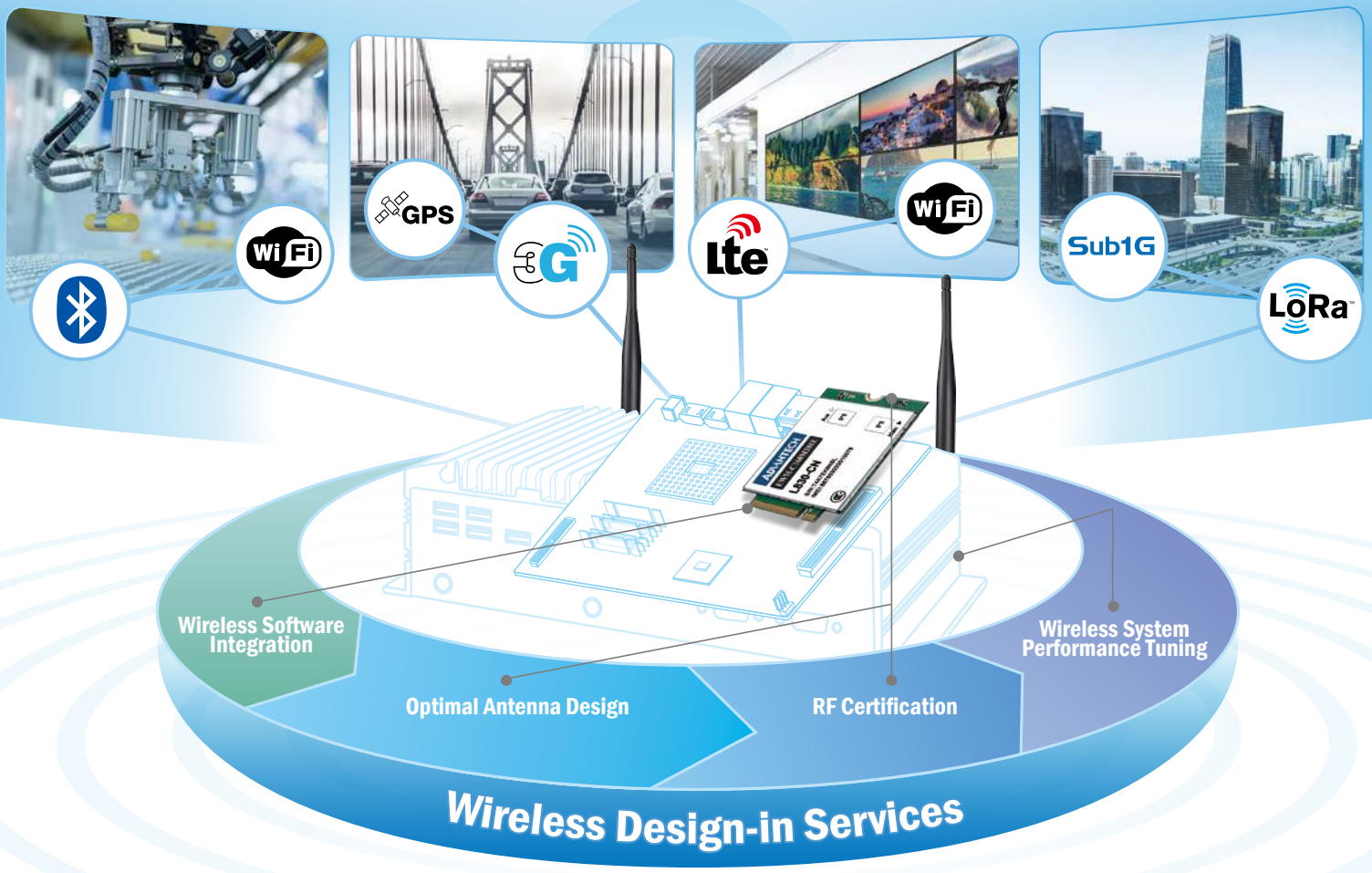
Embedded IoT Wireless Modules & Design-in Services

Simplifying Wireless Connectivity for IoT Platforms

- Wi-Fi
- Wi-Fi + Bluetooth
- 3G+GPS
- 4G LTE
- Wireless Design-in Services



ADVANTECH

Enabling an Intelligent Planet

www.advantech.com

Simplifying embedded IoT wireless connectivity on your embedded platforms

To fully realize the benefits of connected platforms in the IoT era, Advantech Embedded IoT Wireless Module Solutions offer Bluetooth, Wi-Fi, GPS, 3G, and 4G modules with ready-to-use software and wireless design-in services as a total package for embedded vertical applications. With Advantech wireless modules, system integrators, and industrial PC vendors can easily implement extra wireless functions into their own systems or board level applications.

Benefits of Adopting Advantech Embedded IoT Wireless Module Solutions

Wireless Modules Integration Services for Rapid Application Development

With a dedicated service team, complete documentation and reference guides, customers can easily integrate their own application with our module solutions. Furthermore, with Advantech's full software package, it's easier to implement wireless features into systems with I/O that can be fully utilized without waste.

Software Services for Bus Interface/ CPU/ OS Differentiation

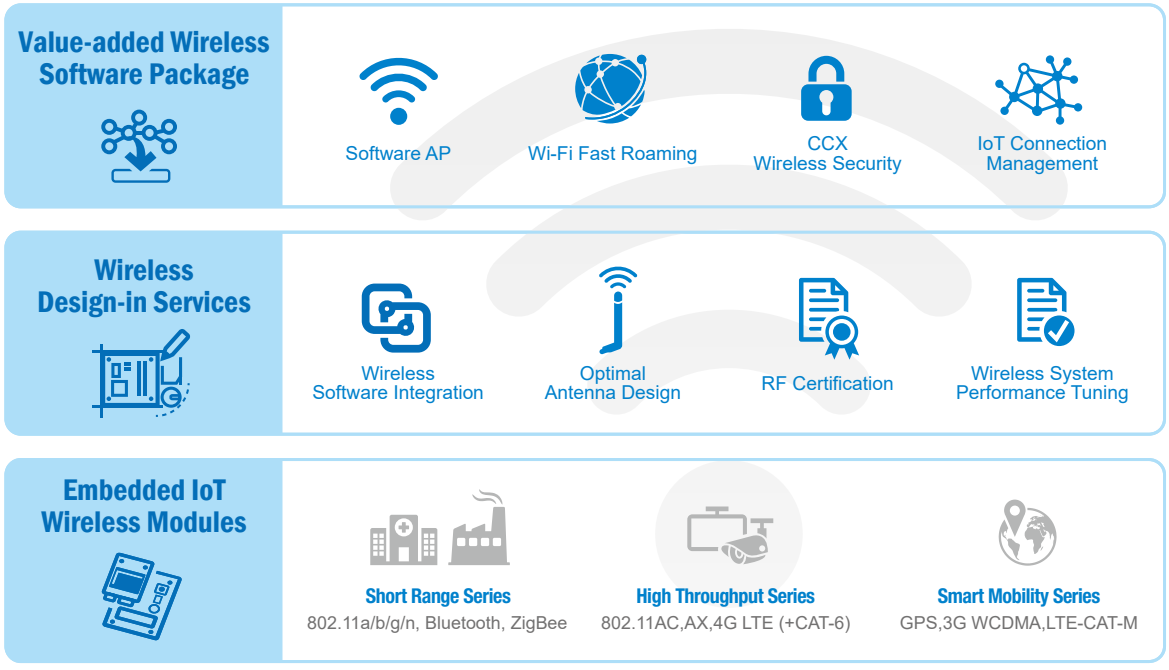
Wireless modules software services can help make your application more portable so that users can easily move their application between different platforms. Our standardized software package is available in different form factors and different IC solutions and helps your product development process. It's particularly useful for system integration and function verification since our development related data is standardized and verified.

Global Certification Documentation and Programming Tools for Lab Certification

Advantech provides verified documents and tools for wireless modules. Our product documents are available for different platforms and different operating systems. We provide user manuals, SOP, and test related documents specifically for each Advantech product. That makes life easier for system certification with Advantech's certified wireless IoT Solutions.

Overview of Advantech Embedded IoT Wireless Module Solutions

Advantech Embedded IoT Wireless Module Solutions provides wireless module products from short range series, high throughput series, to smart mobility series to fulfill various application fields. To simplify wireless connection on IoT platforms, Advantech leverages on its design-in expertise and experiences to provide wireless design-in service and wireless software package.



Embedded IoT Wireless Modules

Reliable Short Range Wireless Solutions

Advantech has developed unique and robust short range wireless IOT solutions such as Wi-Fi 802.11b/g/a/n+ BT 4.0/4.1/4.2 combo solutions and will migrate to BT5.0 . Compared with other legacy wireless technology the new BT5.0 is more suitable for low power short range but higher throughput related applications.

High Throughput and Leading Smart Mobility Wireless Technology

Advantech's wireless IoT incorporates industry-leading RF specification and features such as 802.11 ac wave2, MU-MIMO, 802.11AX, and LTE CAT4/CAT6 /CAT9, to empower the newest wireless high data throughput solutions. Users can access their web and cloud application information through our high performance wireless solution to make sure their system will keep operating at its optimum performance.

Commitment to Premium Quality & Longevity

Wireless IoT solutions are verified with Advantech platforms and fully tested in rugged environments to ensure their high compatibility and reliability. They provide 3-5 years longevity and at least 18-month lifecycle information to provision long design-in schedules for embedded projects.

Wireless Design-in Services

To help customers quickly develop intelligent platforms with wireless functions, Advantech offers streamlined wireless design-in services including wireless module design package with RF certification, optimal antenna and module configuration, wireless system performance verification, and an online document center. All provided by Advantech's expert team to help customers create an efficient development environment.

Wireless Software Integration → **Optimal Antenna Design** → **RF Certification** → **Wireless System Performance Tuning**

1 Wireless Software Integration

For embedded systems there are many different SCO/CPU types with PCI-E/USB/SDIO/UART multi bus interface for different wireless solutions running different OS. Some solutions offer open source software and some IC solutions offer proprietary software. Some solutions need RF lab related software support but Advantech wireless solution service provides clear driver related information and support, helping embedded system integrators to quickly add wireless functionality.

2 Optimal Antenna Design

To fulfill antenna design requirements, Advantech provides different types of antennas to configure with various modules selected by customers. Here's how Advantech can help:

Select an antenna based on different module FCC reports

The FCC report discloses various types and features of antenna. If the customer wants to use a module from the original RF report, the most important thing is to compare the antenna peak gain and then select a suitable high efficiency antenna.

Optimizing antenna performance through RF tuning

Some customers order antennas from an on-line market directly for their system, but the problem is it can be hard to get the optimal antenna performance. The performance of an antenna can be influenced by the system metal part and the antenna placement inside the case.

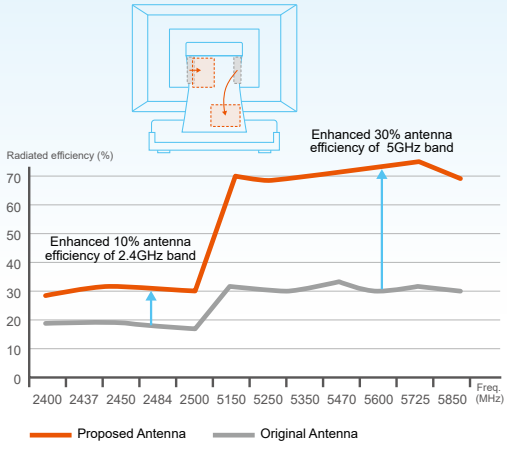
Antenna Selection

Communication Protocol	Antenna Type
GPS	active antenna /passive antenna
Wi-Fi & Bluetooth	external Dipole antenna/ system inside PIFA antenna/chip antenna
LTE	multi band wide band antenna

Case Study on mPOS Wireless Performance Tuning

Challenge: antennas are one of the most important factors in the overall performance of wireless, but not every company has the domain knowledge to choose an optimal antenna solution for their specific wireless application. A suitable antenna should consider the operating frequency band, the peak gain, and efficiency, and we have to consider the antenna location versus EMI coverage and isolation.

Solution: After redesigning, the new antenna performance was much greater than the original design and had an improved efficiency of 10~30%, and isolation values of better than 20dB.



Efficiency Test of a 7" System

3 RF Certification Design Package

Wireless solutions are diversified and require different RF tools based on multi-IC solutions. Advantech offers a complete RF certification design package including RF testing tools, certification reports, and testing tool application notes. Advantech's professional RF engineer teams are able to verify and fine tune RF certification specifications for customers our own shielding room and RF spectrum analyzer equipment. This helps customers quickly get regulation certification for different RF technologies such as CE, FCC, PTCRB and more. Every electronic product needs to pass specific RF certifications when shipping to different countries. The RF test cost is huge and the test procedures are quite long for most customers. The test package contains the test software and tool configurations for different IC. The application notes save test setup and lab times.

Advantech Shielding Box & RF Spectrum Analyzer

GCF PTCRB PCS Type Certification Review Board

4 Wireless System Optimization

Unlike wire-connected communications, wireless signals decay rapidly during propagation. Once receiving signal strength is below the threshold power index that the IC transceiver can successfully demodulate, users will notice a signal drop as a result. So Advantech offers streamlined services for wireless system optimization. Advantech's technical team provides design services to make sure wireless communications are totally reliable. This means that communication links between transmitters and receivers are sustainable and dependable.

Multiple Standard Wireless Protocol Support

Advantech wireless module solutions provide multi-standard wireless protocol modules for customer selection. Different standards define their own transmission power (Tx) and receiving signal (Rx) sensitivity levels. As a result, each standard affects the transmission distance and signal capability, as well as interference from other wireless systems, so for different application scenarios, we will help customers select a suitable wireless platform with the right modulation, Tx, and Rx protocols that match their application. Advantech also provides a private connection service (proprietary protocol) for enhancing communication security.

Frequency Band Selection

Wireless Propagation Considerations

Regarding protocol selection, operating frequency bands is also an important index. Wireless signals carried by higher frequency microwaves decay faster than signals carried by lower frequency microwave during propagation. For example, 5 GHz WiFi signals decay faster than 2.4 GHz WiFi signals which means that 2.4 GHz signal can propagate longer than 5 GHz signal with same transmission power.

Environment Considerations

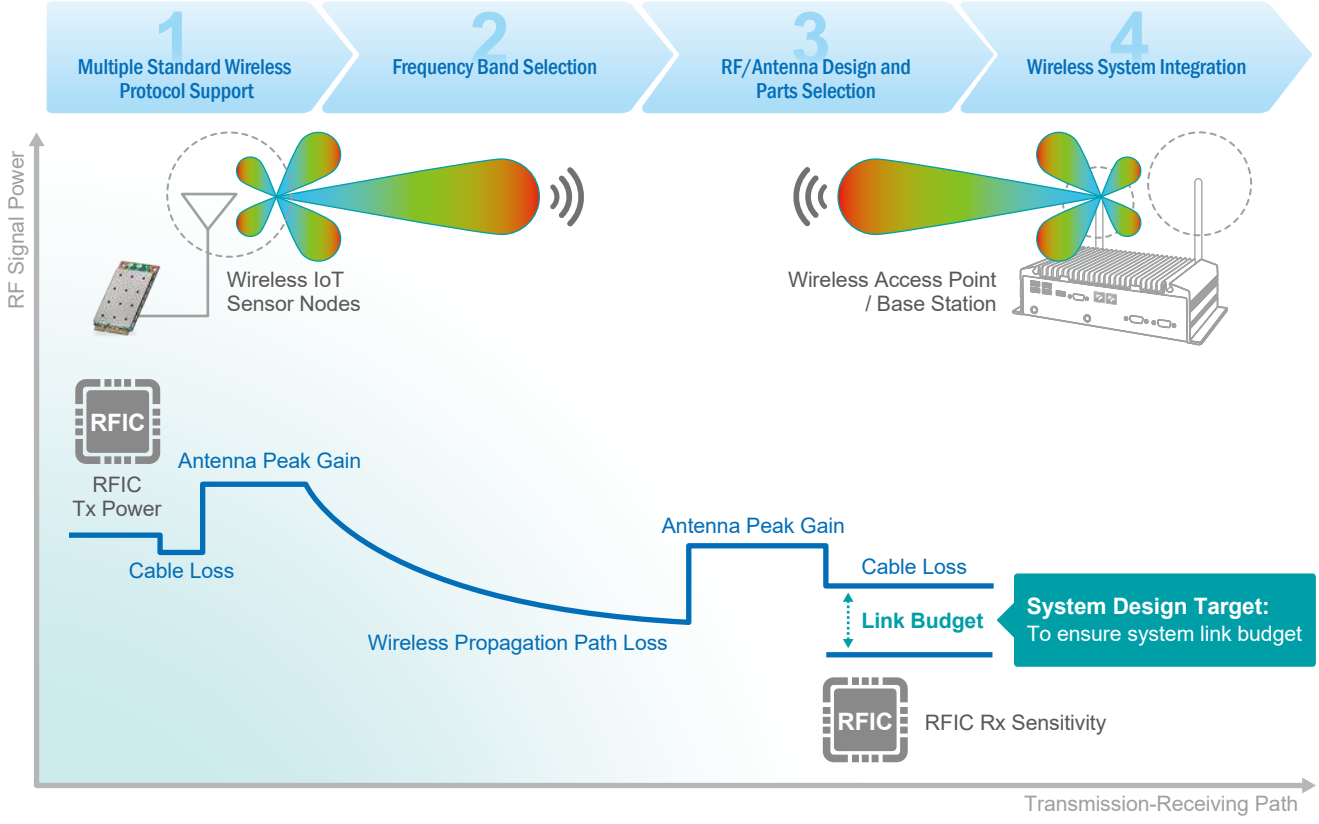
Although 2.4 GHz signals can propagate longer than 5 GHz signals, the 2.4 GHz ISM band is too crowded with all the wireless devices in operation. Advantech's technical team helps customers consider their application environment, and gives advice before offering a suitable total solution.

Certification Considerations

Advantech provides ready certified modules, antennas, and M2M solutions based on regional regulations and rules.

RF/Antenna Design and Parts Selection

We offer a comprehensive standard antenna parts portfolio for different frequency band operations. Customers can easily select antennas for their module and system. Advantech also provides customized RF design including RF circuit matching, antenna placement, and antenna design. For customized design, we have different types of antennas such as Dipole, Monopole, PIFA, Loop, and Patch. They are formed by different PCB manufacturing processes, metals, FPC, ceramics, and LDS.



Wireless System Integration

Advantech Wireless Design-In Service provides customers with a total solution from the physical hardware and middleware, to application layer software. To verify system performance, we conduct QA range tests for line-of-sight transmission distances. Furthermore, for specific application scenarios with different wireless communications that need to operate simultaneously, we also conduct specific QA range tests to specify the system limits then optimize the software to ensure signal quality.

5 Smart Antenna Technology Support

Smart antenna technology was commonly used in radar systems for military usage. The benefit of using this technology is to increase link reliability and to improve wireless communication accuracy. As wireless applications are booming, many kinds of different wireless standards are available (ie. WiFi 2.4/5 GHz, 3G, 4G LTE, and more). The difficulties of point-to-point communication increase from all the different conflicting systems creating environment noise which makes it harder for the RF receiver to demodulate correct signals.

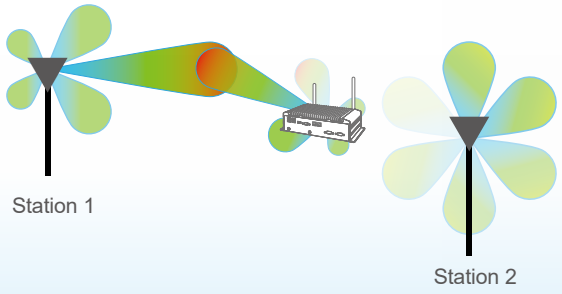
Advantech's wireless solution with smart antenna is part of our wireless design in service. One application scenario is a wireless access point in a smart factory. Each wireless gateway handles more than a hundred terminal devices within a large factory. The smart antenna's beam scanning function was ideal for this scenario because it could continuously 3D scan for terminal device locations and communicate with them.

By using smart antenna systems, antenna patterns can be mathematically calculated and its beam can be formed to be within a narrow beam angle. Most important is that the beam width and beam direction are programmable based on specific application scenarios.

See figure 1-3 for example:

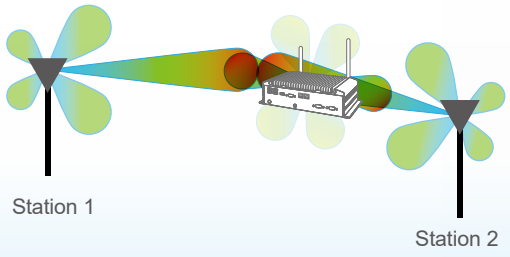
Smart Antenna Signal Scan

Figure 1 shows that the wireless system is communicating with station #1, while station #2's antenna is scanning continuously to see if any device comes to its covering area.



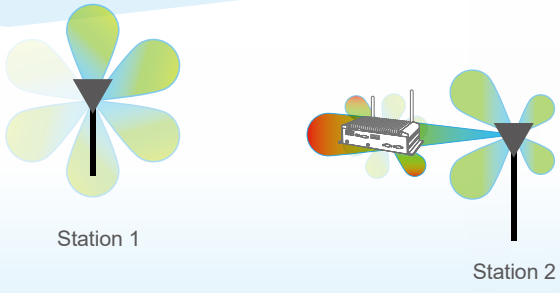
Active Connection from Station 2

Figure 2 shows that when the device is detected by station #2's antenna, the communication link between the device and station's antenna is being set up while the device is still talking with station #1's antenna. This means that there will be no signal drop when the communication link has been established from station #1 to station #2.



Smooth Hand Over

Figure 3 shows that communication has successfully handed over to station #2 and that station #1 has started its scanning mode.



6 Wireless System Performance Verification

There are many factors limiting Wi-Fi connection speeds. For instance, Wi-Fi performance can be influenced by network protocol overheads, radio interference, physical obstructions on the line of sight between devices, and the distance between devices. As more devices communicate on the network simultaneously, its performance will decrease. Good wireless performance is based on good RF signal quality, suitable antenna gain and efficiency, and good system compatibility between CPU performance and platform power management. We also need to consider normal operation and critical environment modes. Advantech wireless module team ensures a professional wireless system performance verification service as follows:

RF performance check and tuning

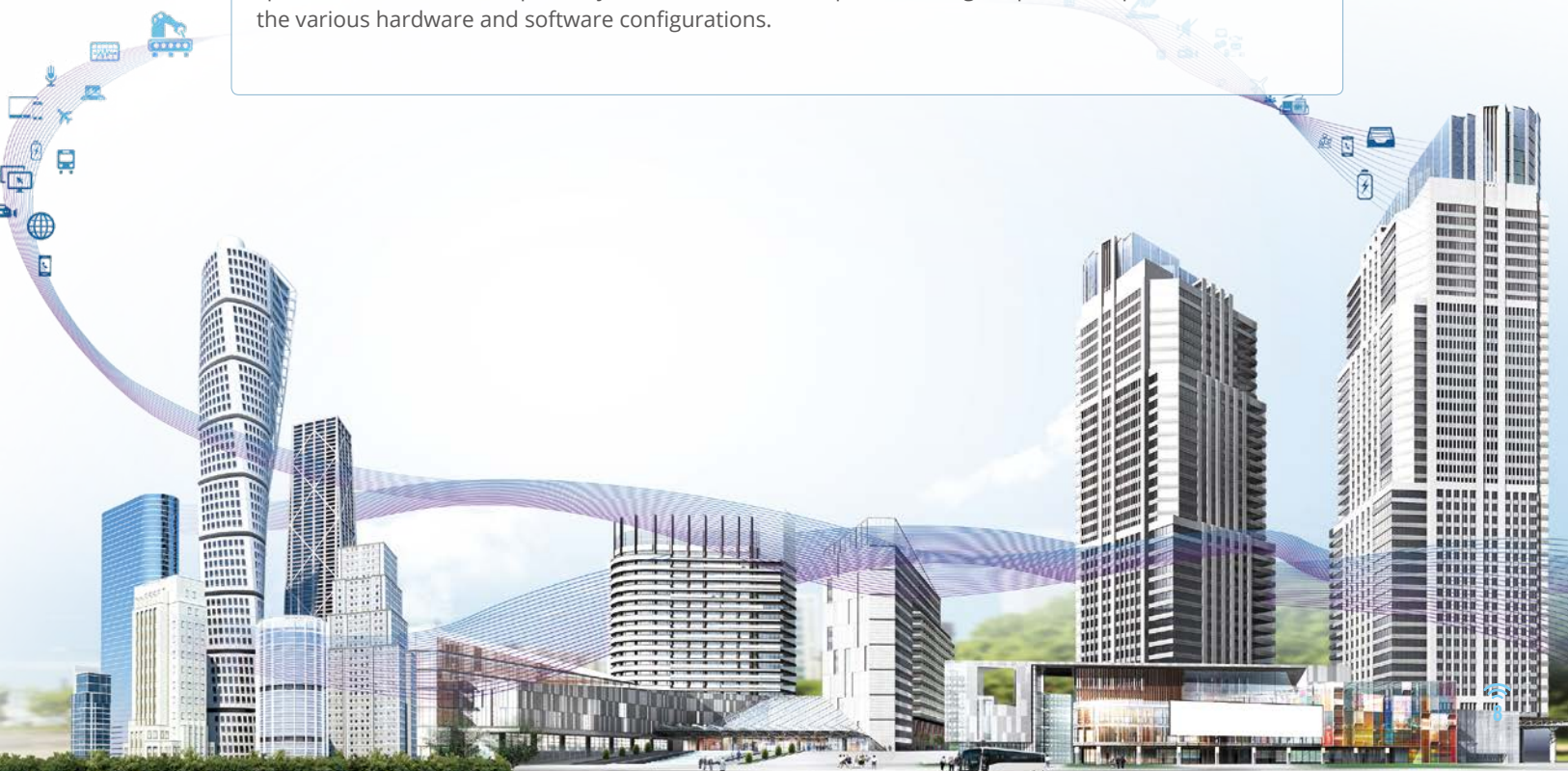
Verifies TX power range/EVM/mask; RX signal sensitivity level using professional RF equipment and engineering methods.

System throughput check and tuning

Uses the Chariot standard TCP/IP base test tool recognized by labs. Shows overall system wireless throughput and also requires RF engineers to perform data analysis and judgements for different vertical applications.

Compatibility check and tuning

Some wireless performance issues are caused by system power management settings and specific bus interface compatibility issues that will need specific settings dependent upon the various hardware and software configurations.

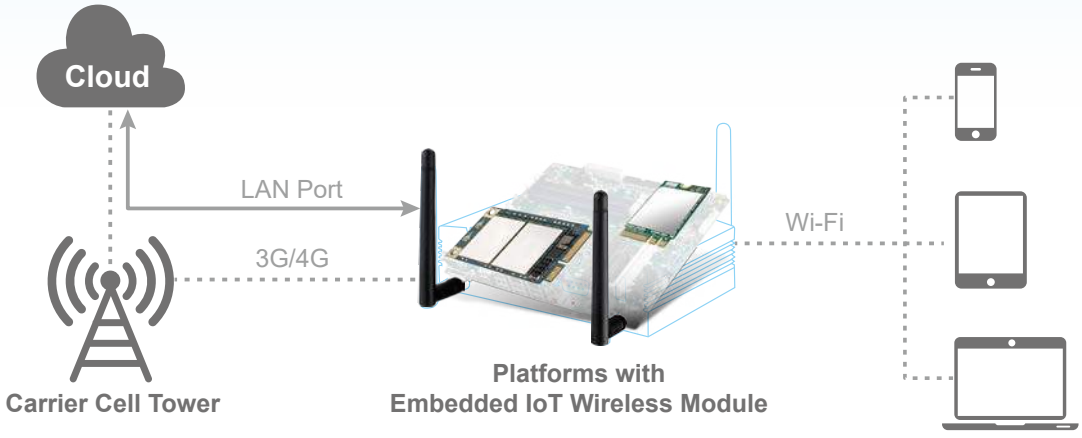


Value-added Wireless Software Package

To help customers develop intelligent wireless platforms for different vertical applications, wireless software must be developed, but not all IoT system integrator or platform providers have this kind of resource. Advantech wireless module team is able to provide a software APP for wireless server/router, with fast roaming for mobile machines in smart factory applications. Advantech's value-added wireless software package includes:

Software AP

Using a hotspot to enable other WLAN devices to access the WAN to Internet is a form of bridging known as "tethering." Manufacturers and firmware creators can enable this functionality on many Wi-Fi devices, depending upon the capabilities of the hardware, and most operating systems, including Android, Windows and Linux include features to support this. Advantech's embedded IoT Wi-Fi solution offers this function for many different hardware/software configurations.



CCX Wireless Security

CCX specification is a superset used for Wi-Fi certification. The Cisco Compatible Extensions Program ensures that wireless devices are fully interoperable with Cisco WLAN infrastructure, so that they can take advantage of enhanced security, mobility, quality of service, and network management. Some on-going applications need the CCX certification for new IoT devices to join the existing CCX ready wireless environment. Advantech IoT wireless client solutions apply CCX certification for specific projects which could save time and certification cost and covers legacy wireless infrastructures.

On-line Document Center

To help customers access resources quickly, Advantech Embedded IoT Wireless Modules have created an "online document center" to store all product datasheets, module reports, drivers and other information. Please visit wireless-module.advantech.com

Scan to Visit Website

Embedded IoT Wireless Modules On-line Document Center Resources

Document Type	Content
Datasheet	Module RF spec/ features / operating temperature/ support OS
Report	Module RF certification report / RoHs data
Design Guideline	Detail pin function description, module power on sequence ,I/O reference schematics, detail TX/RX spec
Drivers	Multi-OS drivers (depending on IC)

Wireless Fast Roaming

Wireless fast roaming allows a client device to roam quickly in environments with WPA2 Enterprise security. This ensures the client device does not need to re-authenticate to the RADIUS server every time it roams from one access point to another. This function is very typical but not easy to optimize for different application environments. Advantech applies not only the basic roaming setting but also the optimal settings for a range of different environments.

IoT Connection Management

IoT connection management provides full connection between things and supports multiple vertical industry applications. Carriers and enterprises with E2E IoT connection management can integrate industry services, accelerate service rollout, and reduce integration costs. IoT Connection Management implements a cost-effective and short product development cycle ensuring that effective and relevant consultative information is delivered prior to commencement of a project. Our consultants have experience within nearly every segment of the communications world.

Worldwide Certified Wi-Fi/ Bluetooth Combo Solutions for Ultrasound Application

The new generation ultrasound platforms need advanced signal transmission and reception processors providing highly sensitive and accurate echo detection. Innovative transducer technologies allow better penetration, higher resolution, greatly enhancing users' diagnostic experience

Requirements & Solutions

A China medical devices solution company needs reliable and high quality wireless solution for medical electronics platform. They also require full RF certification supporting difference countries.

Advantech wireless solution can work with the original platform OS. We also apply the hardware + software system design-in technical service that can meet customers' RF performance/ throughput/ system compatible reliability requirements. EWM-W163M201E is a highly integrated wireless local area network (WLAN) solution to let users enjoy the digital content through the latest wireless technology without using the extra design cost and effort. It combines with Bluetooth 4.1 and provides a complete 2.4GHz Bluetooth system which is fully compliant with Bluetooth 4.1 and v2.1 that supports EDR of 2Mbps and 3Mbps for data and audio communications. It enables a high performance, cost effective, low power, compact solution that easily fits onto the PCI Express and USB M.2 interface for customers.

Benefits

- Worldwide RF certification
- 5 years product longevity
- New standard M.2 2230 form factor
- 2.4G/5G dual band

Wide Temperature Mobile Wireless Solutions for In-vehicle IP Camera Application

There is an increasing demand for mobile-based CCTV systems especially on trains and buses as well as in-vehicle surveillance, tracking, and monitoring of fleets on the road. Wireless communication is needed between vehicle and control center. Adapting varying mobile communications infrastructures at different locations, diverse and flexible wireless communications including Wi-Fi, 3G, or LTE is necessary here.

Requirements & Solutions

One vehicles company in the US needed high computing power to connect IP Cameras located in the bus. This application needs 4G LTE functions for communication. The automotive environment is, by nature, subject to constant vibration and occasional shock and wide temp range. The wireless solution should be able to operate under harsh environments.

Advantech provides Embedded Fanless Box PC ARK-2151V, ARK-2121V, ARK-2231R integrated with LTE module EWM-C117FL which supports wide temperature -40 to +85 °C to fulfillment customer's request. It supports 4G/LTE Bands Cat. 4(Max DL 150Mbps), The industry standard Mini PCIe package enables easy integration onto an application board, and is also ideal for manufacturing of small series. EWM-C117FL modules are manufactured in ISO/TS 16949 certified sites, with the highest production standards and the highest quality and reliability. Each module is fully tested and inspected during production. The EWM-C117FL series comes in module variants for North America,Europe/ Asia/ Africa, APAC/ South America, and Japan. It is easy to support different countries for different market also.

Benefits

- Wide temperature: -40 to +85 °C
- 5 years product longevity.
- Standard mini PCIe form factor

High Throughput Wireless Solutions for Digital Signage Application

For digital signage application, digital signs rely on a variety of hardware to deliver the content. The components of a typical digital sign installation include one or more display screens, one or more media players, and a content management server. Digital signage media players run on a variety of operating systems including Windows, Linux, and Android. More and more digital signage systems need some wireless path to get the contact from internet.

Requirements & Solutions

One on-line advertising company needs high graphic performance to support independent display/ high resolution display. The wireless video solution should be compatible with the main CPU/GPU/VGA IC and support the Wi-Fi direct /Miracast technology for multi hardware/OS configuration.

Advantech DS-570 which has independent GPU to enhance graphics capability to 4K and integrated with EWM-W157 is 802.11 a/b/g/n/ac + Bluetooth 4.0 combo solution. It provides much better experience with high-bandwidth applications, enabling systems to handle demanding applications such as Ultra HD and 4K video and multimedia streaming. It offers higher capacity, improved power management and lower latency to readily handle today's demanding wireless applications while paving the way for new services at home, in public places, and in enterprise networks alike. In addition, multi OS support and worldwide certification did save the system development schedule and certification cost.

Benefits

- 802.11 ac high speed wireless combo solution
- X86/ARM+Windows/Android configuration.
- Typical mini PCIe form factor

Embedded Platform Wireless Solution for Smart Lighting Application

Intelligent street lighting is an important part of the energy conservation mix in smart cities. With digital networks and embedded sensors, intelligent street lights can collect and transmit data that help cities monitor and respond to any environmental circumstances, from traffic congestion to parking availability and air quality.

Requirements & Solutions

A lighting company in US wanted to develop smart street lighting solutions by installing sensors and digital tools into their existing product lines. They also need to apply remote management through wireless technology. For wireless module integration, the main challenges are the working temperature range, wireless software security integration and specific antenna and RF certification. Advantech provided Wi-Fi, Bluetooth EWM-W162M plus support for -30~85°C wide temperature operation for wireless connectivity.

EWM-W162M is 802.11 ac/a/b/g/n + Bluetooth 4.2 M.2 2230 (E-Key) Card. We worked with customer for the specific antenna+ RF certification while our IoT wireless solution can apply the necessary wireless security at customer's platform ; support the WPA/WPA2 and WEP 64-bit and 128-bit encryptionThe EWM-W162M also supports the IEEE 802.11i security standard through the implementation of Advanced Encryption Standard (AES)/Counter Mode CBC-MAC Protocol (CCMP), Wired Equivalent Privacy (WEP) with Temporal Key Integrity Protocol (TKIP), Advanced Encryption Standard (AES)/Cipher-Based Message Authentication Code (CMAC). These security features are necessary for smart city application.

Benefits

- Wide temperature -30 to 85 °C
- 5 years product longevity
- Linux driver integration software service

Embedded IoT Wireless Modules

WiFi




Model Name	EWM-W135H/F	EWM-W158F	EWM-W151H	EWM-W160M2
Form Factor	Full/Half size Mini PCIe Card	Full Size Mini PCIe Card	Half Size Mini PCIe Card	M.2 2230 (A-E key)
Wireless Standard	802.11 a/b/g/n	802.11 a/b/g/n	802.11 b/g/n	802.11 b/g/n
Chipset	Atheros AR9382	Atheros AR9592- AR1B	Realtek RTL8188EE	Realtek RTL8188EE
Signal Protocol	PCIe Differential	PCIe Differential	PCIe Differential	PCIe Differential
Antenna	2 x U.FL connectors	2 x U.FL connectors	1 x U.FL connectors	2 x I-PEX MHF4 connectors
Operating Voltage	DC 3.3V ± 5%	DC 3.3V ± 5%	DC 3.3V ± 5%	DC 3.3V ± 5%
Temperature Range	-10 ~ 70 °C (Operating)	-40 ~ 85 °C (Operating)	0 ~ 80 °C (Operating)	0 ~ 70 °C (Operating)
Dimensions (L x W x H)	26.65 x 29.85 x 3.25 mm	50.8 x 29.85 x 2.86 mm	26.65 x 29.85 x 3.05 mm	22 x 30 x 2.3 mm
Security	64/128/152-bit WEP, WPA, WPA2, 802.1x, TKIP and AES	64/128-bit WEP, WPA, WPA2, 802.1x, TKIP and AES	64/128-bit WEP, WPA, WPA2	64/128-bit WEP, WPA, WPA2,802.1x, TKIP and AES
SISO/MIMO	2T x 2R	2T2R	1T1R	1T1R
Data Rate	300Mbps	300Mbps	150Mbps	150Mbps
Bluetooth	-	-	-	-
O.S Supported	Win 7/ 8/ 8.1	Win 7/ 8/ 8.1	Win 7/ 8/ 8.1/ 10	Win 7/ 8/ 8.1/ 10
Host connector type	PCIe Mini card	PCIe Mini card	PCIe Mini card	PCIe M.2 card

WiFi+BT





Model Name	EWM-W157H	EWM-W162M2	EWM-W163M2	EWM-W167M2	EWM-W168H
Form Factor	Half Size Mini PCIe Card	M.2-2230(E key)	M.2-2230(A-E key)	M.2-2230(E key)	Half Size Mini PCIe card
Wireless Standard	802.11 ac/a/b/g/n	802.11a/b/g/n/ac+BT4.2	802.11a/b/g/n/ac+BT4.1	802.11b/g/n+BT4.0	802.11a/b/g/n/ac+BT4.2
Chipset	Realtek RTL8821AE	Marvell 88W8897P	Atheros QCA6174A	Realtek RTL8723BS	Realtek RTL8822BE
Signal Protocol	WiFi: PCIe BT: USB Differential	WiFi: PCIe BT: USB Differential	WiFi: PCIe BT: USB Differential	WiFi: SDIO 3.0 BT: UART	WiFi: PCIe BT: USB Differential
Antenna	2 x U.FL connectors	2 x I-PEX MHF4 connectors	2 x I-PEX MHF4 connectors	1 x I-PEX MHF4 connector	2 x I-PEX MHF4 connectors
Operating Voltage	DC 3.3V ± 5%	DC 3.3V ± 5%	DC 3.3V ± 5%	DC 3.3V ± 5%	DC 3.3V ± 5%
Temperature Range	0 ~ 70 °C (Operating)	-30 ~ +80 °C (Operating)	-20 ~ +80 °C (Operating)	0 ~ 70 °C (Operating)	0 ~ 70 °C (Operating)
Dimensions (L x W x H)	26.65 x 29.85 x 3.25 mm	22 x 30 x 2.3 mm	22 x 30 x 2.3 mm	22 x 30 x 2.3 mm	26.65 x 29.85 x 2.75 mm
Security	64/128-bit WEP, WPA, WPA2, 802.1x, TKIP and AES	WAPI, 64/ 128-bit WEP, WPA/WPA2 TKIP and AES	WAPI, 64/ 128-bit WEP, WPA/WPA2 TKIP and AES	WAPI, 64/ 128-bit WEP, WPA/WPA2 TKIP and AES	WAPI, 64/ 128-bit WEP, WPA/WPA2 TKIP and AES
SISO/MIMO	1T1R	2T2R	2T2R	1T1R	2T2R
Data Rate	433Mbps	867Mbps	867Mbps	150Mbps	867Mbps
Bluetooth	2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)	2.1, 2.1+EDR, 3.0,3.0+HS, 4.0 (BLE), 4.1, 4.2	2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE), 4.1	2.1, 2.1+EDR, 3.0, 3.0+HS, 4.0 (BLE)	2.1, 2.1+EDR, 3.0,3.0+HS, 4.0 (BLE), 4.1, 4.2
O.S Supported	Win 7/8/8.1/10	Linux	win7/8/8.1/10	Linux	win7/8/8.1/10
Host Type	PCIe Mini card	PCIe M.2 card	PCIe M.2 card	PCIe M.2 card	PCIe Mini card

Optional Antenna Selection


Model Name	1750008717-01	1750008772-01
size (cm)	10.9 x 1.0	15 x 1.0
support frequency	WiFi Dual band antenna (2.4Ghz and 5Ghz)	WiFi Dual band antenna (2.4Ghz and 5Ghz)
antenna gain	2.89 dBi @ 2.4-2.5GHZ, 3.58dBi @ 5.15-5.85GHz	2.93 dBi @ 2.4-2.5GHZ, 4.4dBi @ 5.15-5.85GHz
Polarization	Linear	Linear
connector	RP-SMA male	RP-SMA male
impedance	50 ohm	50 ohm

Optional Accessories

Model Name	1750008767-01
length (cm)	150
cable type	WiFi cable
cable loss	0.62dB@2500MHz for 1Meter
Polarization	Linear
connector	SMA(F)/SMA(M)
impedance	50 ohm

3G



Model Name	EWM-C109F601E	EWM-C109F6G1E	EWM-C118HD01E
Radio Technology	HSPA	HSPA	HSPA
Downlink/ Uplink	7.2 Mbps/ 5.76 Mbps	7.2 Mbps/ 5.76 Mbps	7.2 Mbps/ 5.76 Mbps
Frequency Band	6-band UMTS/HSPA network, 800/850/900/1700/1900/2100 MHz	6-band UMTS/HSPA network, 800/850/900/1700/1900/2100 MHz	2-band UMTS/HSPA network, 900/2100 MHz
Main Chipset	u-blox LISA-U200	u-blox LISA-U200 and MAX-6	u-blox SARA-U270
Operating Temperature	-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
size	Full-size Mini PCIe	Full-size Mini PCIe	Half-size Mini PCIe
SIM slot	With SIM card slot	With SIM card slot	With SIM card slot
GPS RF Receiver Type	-	50-channel, GPS L1 C/A code, SBAS: WAAS, EGNOS, MSAS	-
GPS Acquisition	-	Cold starts: 26s/ Aided starts: 1s/ Hot starts: 1s	-
GPS Accuracy	-	Position 2.5m / SBAS 2.0m	-
GPS Sensitivity	-	Tracking: -162 dBm/ Cold starts: -148 dBm / Hot starts: -157 dBm	-
GPS Type	-	Hardware standalone	-

4G LTE CAT4/CAT6





Model Name	EWM-C117FL01E	EWM-C117FL02E	EWM-C141M201E	EWM-C160M201E	EWM-C163M201E
Form Factor	Full SizeMini PCIe Card	Full SizeMini PCIe Card	M.2 3042 (B key)	M.2 3042 (B key)	M.2 3042 (B key)
Radio Technology	LTE CAT4	LTE CAT4	LTE CAT4	LTE CAT6	LTE CAT6
Downlink/ Uplink	FDD LTE Max150Mbps(DL) / 50Mbps(UL)	FDD LTEMax150Mbps(DL) / 50Mbps(UL)	FDD LTE Max150Mbps(DL) / 50Mbps(UL)	FDD LTE Max 300Mbps(DL) / 50Mbps(UL) TDD LTE 112Mbps(DL) / 10Mbps(UL	FDD LTEMax300Mbps(DL) / 50Mbps(UL)
Frequency Band	4G LTE bands 2 / 4 / 5 / 7 / 17, 3G bands 1/2/4/5/8, GPRS band 850 / 900 / 1800 / 1900	4G LTE bands 1 / 3 / 5 / 7 / 8 / 20, 3G bands 1/2/5/8, GPRS: 850/ 900/1800/1900MHz	4G LTE FDD: 1, 3, 5, 7, 8, 20, 28, 3G bands: 1, 5, 8,GPRS: 850(B5), 900(B8), 1800(B3), 1900(B2)	LTE FDD: 1, 3, 8 /TDD: 38, 39, 40, 41 3G bands: 1, 8	4G LTE FDD: Band 1, 3, 7, 8, 20, 28, 32 3G bands: 1, 8
Main Chipset	u-blox TOBY-L200	u-blox TOBY-L200	Intel 7120M	Intel 7262	Intel 7262
Operating Temperature	-40 ~ +85 °C (Operating)	-40 ~ +85 °C (Operating)	-20 ~ +70 °C (Operating)	-10 ~ +55 °C (Operating)	-30 ~ +65 °C (Operating)
Signal protocol	USB 2.0	USB 2.0	USB 2.0	USB 2.0	USB 2.0
support area	US	EU/APAC	EMEA	China	EMEA

GPS


Model Name	EWM-G108H*	EWM-G109H*
GPS Mini Card	Half-size Mini PCIe card	Half-size Mini PCIe card
GPS Type	Hardware standalone	Hardware standalone
Signal Protocol	USB	USB
Chipset	NEO-7	NEO-M8N
Operating Temperature	-40 to +85 °C	-40 to +85 °C
RF Receiver Type	56-channel, GPS L1 C/A, GLONASS L1 FDMA, QZSS L1 C/A, Galileo E1B/C, Compass ready SBAS: WAAS, EGNOS, MSAS	GPS module, multi-GNSS (GPS, Beidou, GLONASS, Galileo, QZSS and SBAS)
GPS Acquisition	Cold starts: 29s / Aided starts: 5s / Reaquistion: 1s	Cold starts: 26s / Aided starts: 2
GPS Accuracy	Position 2.5m / SBAS 2.0m	Aided starts: 2
GPS Sensitivity	Tracking: -162 dBm / Cold starts: -148 dBm / Reacquisition: -148 dBm	Tracking: -167 dBm / Cold starts: -148 dBm / Reacquisition: -160 dBm

Products Coming Soon in 2018

Model Name	EWM-W306S	EWM-C111	EWM-G110	EWM-NB0XX	EWM-L1XX
Form Factor	M.2 solder down 1216	Ful SizeMini PCIe Card	Half Size Mini PCIe Card	TBD	TBD
Radio Spec	802.11 a/b/g/n/ac+BT4.2	LTE Cat 1	GPS, GLONASS, BeiDou and QZSS	NB-IoT 3GPP Rel.14	LoRa+BT
Data Rate	Up to 867Mbps	up to 5.2 Mb/s uplink, 10.3 Mb/s downlink	Tracking & Navigation -160 dBm	DL 34 Kbps / UL 66Kbps	LoRa Modulation: 0.018 ~ 37.5kbps
RF Spec	2.4GHz/5GHz dual bands	up to four LTE bands, up to two UMTS/HSPA bands and up to two GSM/EGPRS bands	72-channel u-blox M8 engine	698 -2180MHz	LoRa Modulation: Typical 13 dBm BLE: Typical 0 dBm
Main Chipset	RTL8822BE	u-blox LARA-R2XX	U-blox M-8	Hi2115	SX1276
Signal Protocol	USB 2.0	USB 2.0	USB 2.0	TBD	TBD

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