Product summary

RUBY-W1 series

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Host-based flexible automotive modules

Standard

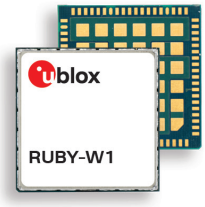
Professional

Automotive

Automotive grade modules featuring tri-band Wi-Fi™ 6E and Bluetooth® Dual-Mode

- High-performance for in-vehicle infotainment
- Telematics applications with simultaneous use cases
- Concurrent dual Wi-Fi 6E (2x2 + 2x2)
- Bluetooth LE Audio and Qualcomm aptX™ audio technology support
- Qualified against Bluetooth Core 5.4
- Optimized for parallel operation of Wi-Fi and Bluetooth

23 × 23 × 3 mm



Product description

RUBY-W1 automotive host-based modules are designed, built, and tested to meet the high reliability and quality requirements of applications in advanced in-vehicle infotainment and telematics use cases requiring high throughput (in-car hotspots), display (e.g. Apple CarPlay) and video streaming for multiple clients.

The modules deliver data speeds up to 2.9 Gbit/s (PHY) in IEEE 802.11ax technology in three bands with concurrent dual Wi-Fi: 2x2 at 5/6 GHz + 2x2 at 2.4 GHz. The modules can operate as access point, station, in P2P connections, or combinations of these.

Qualified against Bluetooth Core 5.4, RUBY-W1 supports Bluetooth Classic and LE features, such as high data rates, extended advertising, long range, and the use of isochronous channels for LE Audio, fully simultaneously to Wi-Fi operation.

The modules work with host processors running a Linux or Android operating system connected through various interfaces.

RUBY-W1 modules are based on the automotive-qualified Qualcomm QCA6688AQ and QCA6698AQ chipsets. They undergo automotive qualification according to u-blox qualification policy based on AEC-Q104 and are manufactured in line with ISO/TS 16949.

Key features

- 2x2 MIMO 802.11ax 2.4 GHz and 5/6 GHz
- Wi-Fi concurrent dual band 2.4 and 5/6 GHz - dual MAC
- Wi-Fi data rates (PHY): up to 2.9 Gbit/s
- Wi-Fi 20, 40, 80, and 160* MHz channels
- Multi-role operation: AP, STA, P2P
- Security: WPA2/3; AES/CCMP, AES/GCMP and WAPI encryption; Secure boot**
- Bluetooth LE physical layer (PHY) data rates up to 2 Mbit/s
- Bluetooth long range
- Advertising extension, high duty cycle directed advertising
- All standard pairing, authentication, link key, and encryption operation
- Operating temperature up to 100˚C

	RUBY-W162	RUBY-W163	RUBY-W182	RUBY-W183
Grade				
Automotive	•	•	•	•
Professional				
Standard				
Radio				
Chip inside	QCA6688AQ		QCA6698AQ	
Qualified against Bluetooth Core	5.4		5.4	
Bluetooth profiles	HCI		HCI	
Bluetooth BR/EDR	•	•	•	•
Bluetooth Low Energy	•	•	•	•
Wi-Fi IEEE 802.11 standards	Wi-Fi 6 (802.11 a/b/g/n/ac/ax)		Wi-Fi 6E (802.11 a/b/g/n/ac/ax)	
Wi-Fi 2.4 / 5 / 6 [GHz]	2.4 and 5		2.4, 5 and 6	
Wi-Fi output power conducted [dBm]	20	20	20	20
Antenna type	2p	3p	2p	3p
OS support				
Android / Linux drivers (from Qualcomm)	•	•	•	•
Interfaces				
High-speed UART (for Bluetooth only)	1	1	1	1
PCM / I2S (Bluetooth audio)	1	1	1	1
PCIe (for Wi-Fi only)	1	1	1	1
Features				
Micro Access Point [max connects]	64	64	64	64
Wi-Fi direct	•	•	•	•
WPA3	•	•	•	•
MAC addresses in OTP memory	•	•	•	•
Secure boot**	•	•	•	•

2p = 2 antenna pins, one each for Bluetooth and Wi-Fi
3p = 3 pins, 2 for Wi-Fi and 1 for Bluetooth antenna
* for RUBY-W182 and RUBY-W183 only
** Can be delivered by the chipset provider directly upon request

RUBY-W1 series

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Features

Wi-Fi standards	Wi-Fi 6/E IEEE 802.11 a/b/g/n/ac/ax IEEE 802.11 d/e/h/i/k/r/u/v/w/ai/mc
Wi-Fi channels	2.4 GHz: 1-13 5 GHz: 36-165 6 GHz: 1-233 (for RUBY-W182/RUBY-W183)
Bluetooth	Qualified against Bluetooth Core 5.4 Bluetooth Dual-Mode Class 1 and 2 transmission Long range, Power management, LE Audio
Antenna	RUBY-W162/RUBY-W182: Pin 1: 2.4 GHz and 5/6 GHz Wi-Fi Pin 2: 5/6 GHz Wi-Fi and (Bluetooth or 2.4 GHz Wi-Fi) RUBY-W163/RUBY-W183: Pin 1: 2.4 GHz and 5/6 GHz Wi-Fi Pin 2: 2.4 GHz and 5/6 GHz Wi-Fi Pin 3: Bluetooth
Output power (preliminary max values)	Wi-Fi: 802.11b: 20 dBm Wi-Fi: 802.11a/g: 18 dBm Wi-Fi: 802.11n/ac/ax: 16-18 dBm Bluetooth BR/EDR: 12/9 dBm Bluetooth LE: 12 dBm
RX sensitivity (preliminary, indicative)	Wi-Fi: 802.11ax 20 MHz MCS0: 2.4 GHz: -95 dBm 5 GHz: -98 dBm 6 GHz: -98 dBm Bluetooth BR/EDR: -94 / -88 dBm Bluetooth LE: -95 dBm (1M), -106 dBm (LE coded S=8)
Security	Full AES hardware encryption Secure boot*

* Can be delivered by the chipset provider directly upon request

Software features

MAC addresses	Available in on-board OTP memory
Security	WPA2 (CCMP, AES) WPA3 WAPI
Wi-Fi operational	Station, access point, Wi-Fi direct, or any combination of these
Driver support	Linux and Android

Interfaces

Wi-Fi	PCIe Gen 3
Bluetooth	High-speed UART, 4-wire
Bluetooth audio	PCM and I2S
Coexistence	WSI-2 (2-wire) for LTE radio coexistence I/Os for 5G NR coexistence I/Os for LTE-LAA coexistence
Other interfaces	GPIOs

Package

Dimensions	23 × 23 × 3 mm
Mounting	Solder pins (LGA), 112 pins including central pads for ground and power

Environmental data, quality & reliability

Operating temperature –40 °C to +100 °C
Moisture sensitivity level 3
RoHS and REACH compliance
Automotive qualification according to u-blox Qualification Policy based on AEC-Q104

Electrical data

Power supply	3.3 V / 1.9 V / 1.8 V / 1.35 V / 0.95 V
I/O power supply	1.8 V

Certifications and approvals [1]

Type approvals	Europe (RED); US (FCC); Canada (ISED); Japan (Giteki) Other certifications will be considered upon request
Bluetooth	Qualified against Bluetooth Core 5.4 Bluetooth Dual-Mode

1 = Certifications are pending

Support products

EVK-RUBY-W182-00C	Evaluation kit for RUBY-W182 modules
EVK-RUBY-W183-00C	Evaluation kit for RUBY-W183 modules

Product variants

RUBY-W162-03A	2 antenna pins, 100 °C, dual MAC, automotive grade, iFEM 2.4 GHz / eFEM 5GHz
RUBY-W163-03A	3 antenna pins, 100 °C, dual MAC, automotive grade, iFEM 2.4 GHz / eFEM 5GHz
RUBY-W182-03A	2 antenna pins, 100 °C, dual MAC, automotive grade, iFEM 2.4 GHz / eFEM 5/6GHz
RUBY-W183-03A	3 antenna pins, 100 °C, dual MAC, automotive grade, iFEM 2.4 GHz / eFEM 5/6GHz

Further information

For contact information, see **www.u-blox.com/contact-u-blox**.

For more product details and ordering information, see the product data sheet.

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UBXDOC-465451970-3229 - R03

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