



WLE1216VX-I

Wi-Fi 5 (802.11ac Wave 2) Single-Band Wireless Module

Hardware User Guide

Wi-Fi 5 / 802.11ac 2.4GHz + 5GHz	QCA9994 Qualcomm Atheros Cascade	MiniPCle Interface PCIe 2.0 Compatible	4×4 MU-MIMO Up to 1733 Mbps (5GHz)
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1. Introduction

Thank you for choosing the Compex WLE1216VX-I. This document provides complete hardware integration guidance for engineers and system developers deploying the WLE1216VX-I Wi-Fi 5 wireless module in embedded, industrial, and networking platforms.

The WLE1216VX-I is a dual-band Wi-Fi 5 (802.11ac Wave 2) wireless module based on the Qualcomm Atheros QCA9994 'Cascade' series chipset (industrial grade, -40°C to 85°C). Built on the Qualcomm Atheros CAS03 reference design, the module delivers 4x4 MU-MIMO operation across both the 2.4GHz and 5GHz bands through a standard MiniPCle (PCIe 2.0) host interface.

Key Highlights

- Qualcomm Atheros QCA9994 'Cascade' Series chipset.
- 2.4GHz, 4x4 MU-MIMO, up to 800 Mbps physical data rate.
- 5GHz, 4x4 MU-MIMO, up to 1733 Mbps physical data rate.
- Dual Band Concurrent 2.4GHz + 5GHz Wi-Fi 5 (802.11ac Wave 2) operation.
- MiniPCle interface with PCIe 2.0 host connectivity.
- Based on the Qualcomm Atheros CAS03 reference design.
- Heatsink design allows free air operation.
- Supports up to 256-QAM modulation.
- Operating temperature: -40°C to 85°C (Industrial Grade). Storage: -40°C to 90°C.
- FCC & IC Certified; REACH and RoHS compliant for global deployment.

2. Package Contents

Verify the following items are included in the package before proceeding with installation:

Checklist

- 1 × WLE1216VX-I Wi-Fi 5 wireless module

⚠ Note: External antennas (U.FL pigtail cables), host carrier board, and power supply are not included unless specified in the order. Contact sales@compex.com.sg for accessory options.

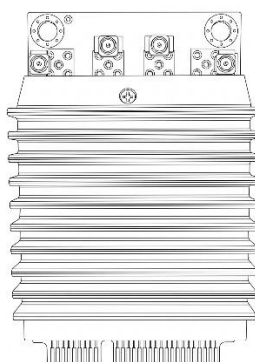
If any item is missing or damaged, contact Compex Technical Support (see Chapter 10) before proceeding.

3. Hardware Overview

The WLE1216VX-I is a radio-only Wi-Fi 5 module designed to be installed into a host platform's MiniPCle slot. To install on another slot such as an M.2 key slot, an M.2 key to MiniPCle adapter may be used. All wireless baseband and RF processing is handled onboard the module; the host platform supplies power and exchanges data over the PCIe 2.0 interface.

3.1 Module Layout

The WLE1216VX-I features the following major components and connectors:

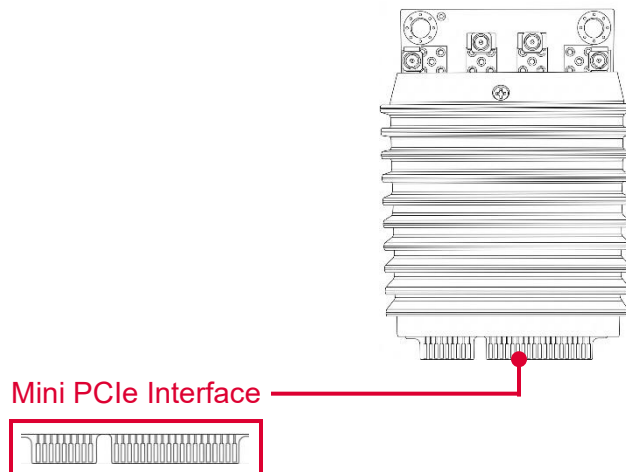


Chipset	Qualcomm Atheros QCA9994 'Cascade' Series
Reference Design	Qualcomm Atheros CAS03
Host Interface	MiniPCle Interface with PCIe 2.0
RF Connectors	4× U.FL Connectors (CH0, CH1, CH2, CH3)
System Memory	256Kbit serial I ² C bus EEPROM
Dimensions (W × H × D)	29.9mm × 50.8mm × 12.9mm

3.2 Connector Descriptions

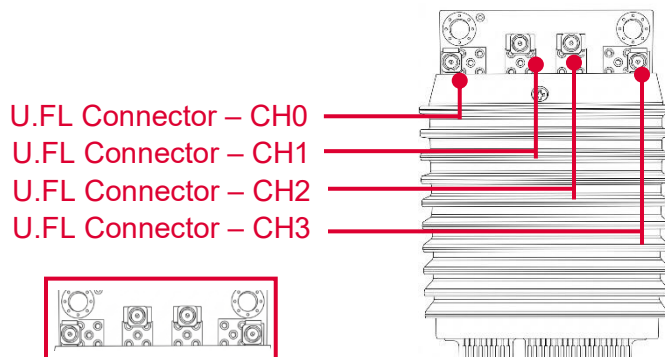
MiniPCle Edge Connector

- Standard MiniPCle (PCIe 2.0) edge connector along the bottom edge of the module.
- Carries PCIe data lanes, 3.3V power input, ground, and control signals to the host platform.



U.FL RF Connectors

- 4× U.FL Connectors (CH0, CH1, CH2, and CH3) located at the top edge of the module.
- CH0, CH1, CH2, and CH3 jointly support concurrent 4×4 MU-MIMO operation across both the 2.4GHz and 5GHz bands.
- Connect suitable external antennas that support both the 2.4GHz and 5GHz bands (dual-band antennas).



3.3 Hardware Pinouts

MiniPCle Slot Pin Assignment

Top side		Bottom side	
1	WAKE_L	2	+3.3V
3	CHIP_PWD_L	4	GND
5	NC	6	NC
7	CLKREQ_L	8	NC
9	GND	10	NC
11	REFCLK-	12	NC
13	REFCLK+	14	NC
15	GND	16	NC
Mechanical key MiniPCle			
17	NC	18	GND
19	NC	20	WLAN_DISABLE_N (GPIO18)
21	GND	22	RESET_L
23	PERn0	24	VDD_3V3
25	PERp0	26	GND
27	GND	28	NC
29	GND	30	NC
31	PETn0	32	NC
33	PETp0	34	GND
35	GND	36	NC
37	NC	38	NC
39	VDD_3V3	40	GND
41	VDD_3V3	42	NC
43	GND	44	WLAN_LED_L (GPIO17)
45	NC	46	NC
47	NC	48	NC
49	NC	50	GND
51	NC	52	VDD_3V3

4. Radio Module Specifications

4.1 Wi-Fi Capability

Wi-Fi Standards	2.4GHz: 802.11b/g/n/ac 5GHz: 802.11a/n/ac
Bands	2.4GHz + 5GHz
MIMO Configuration	4×4 MU-MIMO
Max Physical Data Rate	2.4GHz: up to 800 Mbps 5GHz: up to 1733 Mbps
Frequency Range	2.4GHz: 2.412 ~ 2.472GHz 5GHz: 5.150 ~ 5.825GHz
Modulation Techniques	CCK, OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM
Channel Spectrum Widths	Supports 20/40MHz at 2.4GHz Supports 20/40/80/80+80MHz at 5GHz
TX Power	Max 20dBm per chain @ 2.4GHz Max 19dBm per chain @ 5GHz
RF Connectors	4× U.FL Connectors (CH0, CH1, CH2, CH3)
Supported Standards	IEEE 802.11d, e, h, i, j, k, r, u, v, w and z

4.2 Notes & Recommendations

- Use dual-band external antennas on all four U.FL connectors to support concurrent 4×4 MU-MIMO operation across both the 2.4GHz and 5GHz bands.
- Refer to the CompexWRT or OpenWRT/LEDE driver documentation supplied by Compex or Qualcomm Atheros for channel and regulatory domain configuration.
- This module supports Dynamic Frequency Selection (DFS); ensure local regulatory requirements for DFS channels are met before deployment.
- Actual throughput will vary depending on host platform, driver configuration, channel width, and RF environment.

5. Mechanical Specifications

5.1 Module Dimensions

Dimensions (W × H × D)	29.9mm × 50.8mm × 12.9mm
Form Factor	Standard MiniPCle with heatsink

5.2 Environmental Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-40°C to 90°C
Operating Humidity	5% to 95%, Non-Condensing
Storage Humidity	Max. 90%

5.3 Mounting & Installation Notes

- Secure with the mounting screw at the designated hole if the host chassis provides one.
- The integrated heatsink allows free air (convection) operation without requiring forced cooling in standard deployment conditions.
- Ensure adequate airflow or thermal contact with the heatsink fins for sustained high-throughput operation.

6. Power Specifications

6.1 Power Requirements

Operating Voltage	3.3V DC
Power Consumption	9W (Max)
Power Source	Supplied via MiniPCle edge connector from host platform

6.2 Power Delivery Protection

- The host platform's MiniPCle slot is responsible for providing regulated 3.3V power and short-circuit/overcurrent protection.
- Ensure the host power rail can supply the module's peak 9W power consumption without voltage droop.

6.3 Notes & Recommendations

- Use a host platform with a stable, well-regulated 3.3V MiniPCle power rail.
- Avoid hot-plugging the module; always power down the host before installation or removal.
- For high-duty-cycle or industrial deployments, verify thermal dissipation is adequate at sustained 9W operation.

7. Installation & Integration

7.1 Pre-Installation Checklist

- Power off and disconnect the host platform before installation.
- Verify the host platform provides a MiniPCle slot compatible with PCIe 2.0.
- Prepare four dual-band external antennas (2.4GHz + 5GHz) with U.FL connectors or pigtail adapters.

7.2 Module Installation

- Align the WLE1216VX-I module's gold-finger edge connector with the host MiniPCle slot.
- Insert at a slight angle (typically 15–20°) and press down firmly until fully seated.
- Rotate the module flat and secure with the mounting screw if provided by the host chassis.

7.3 Power Connection

- Power is supplied automatically through the MiniPCle edge connector; no separate power cable is required.
- Confirm the host platform's MiniPCle slot delivers a stable 3.3V supply before powering on.

7.4 Antenna Connection

- Connect external antennas to the CH0, CH1, CH2 and CH3 U.FL connectors.
- Ensure antenna cables are routed without sharp bends to avoid signal loss or connector damage.

8. Troubleshooting

Module Not Detected	•Verify the module is fully seated in the MiniPCle slot and the retaining screw (if present) is secured. •Confirm the host platform's MiniPCle slot supports PCIe 2.0 and provides 3.3V power. •Check that the appropriate Linux driver/SDK package is installed on the host.
No Wireless Signal / Weak RF Performance	•Verify external antennas are securely connected to the CH0, CH1, CH2 and CH3 U.FL connectors. •Confirm antennas support both the 2.4GHz and 5GHz bands. •Check for physical damage to U.FL connectors or antenna cables.
Overheating or Unexpected Shutdown	•Ensure adequate airflow or thermal contact with the heatsink fins for sustained high-throughput operation. •Confirm ambient temperature is within the rated -40°C to 85°C operating range. •For sustained high-throughput or industrial use, consider a customized heatsink solution.

9. Safety Precautions

- Always power off and disconnect the host system before installing or removing the module.
- Handle the module by its edges; avoid touching the gold-finger connector or RF components.
- Use proper ESD (electrostatic discharge) precautions, including a grounded wrist strap, when handling the module.
- Do not operate the module without an antenna connected, as this may damage the transmitter.
- Operation in DFS channels is subject to local regulatory requirements — see Section 12 for details.
- Do not attempt to modify or repair the module; contact Complex Technical Support for service.

10. Technical Support

Compex Systems Pte Ltd provides engineering and technical support for the WLE1216VX-I. For technical assistance, integration support, or to report a hardware issue, please contact:

Company	Compex Systems Pte Ltd
Headquarters	Singapore
Sales Enquiries	sales@compex.com.sg
Technical Support	https://compex.com.sg/support-downloads/
Website	https://compex.com.sg
Product Page (WLE1216VX-I)	https://compex.com.sg/shop/wifi-module/802-11ac-wave-2/wle1216vx-i-temp-2/
Qualcomm Design Centre	Qualcomm Authorized Design Centre (ADC) since 2014

Before contacting support, please:

- Note the firmware version (visible via webUI: System > Software, or via SSH/serial console: `cat /etc/openwrt_release`)
- Record the MAC address of the board (visible on PCB label).
- Describe the issue with steps to reproduce, observed symptoms, and host platform details.

For sample requests, pre-production evaluations, or OEM/ODM partnership enquiries, contact the Compex sales team at sales@compex.com.sg.

11. Full Specifications

Model	WLE1216VX-I
Chipset	Qualcomm Atheros QCA9994 'Cascade' Series
System Memory	256Kbit serial I ² C bus EEPROM
Reference Design	Qualcomm Atheros CAS03
Host Interface	MiniPCIe Interface with PCIe 2.0
Operating Voltage	3.3V
Power Consumption	9W (Max)
Wireless	4×4 2.4GHz 802.11b/g/n/ac, max 20dBm per chain 4×4 5GHz 802.11a/n/ac, max 19dBm per chain 4× U.FL Connectors
Frequency Range	2.4GHz: 2.412 ~ 2.472GHz 5GHz: 5.150 ~ 5.825GHz
Modulation Techniques	CCK, OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM
Channel Spectrum Widths	Supports 20/40MHz at 2.4GHz Supports 20/40/80/80+80MHz at 5GHz
Operating System	CompexWRT or OpenWRT/LEDE
Certification	FCC & IC Certified, REACH & RoHS Compliance
Environmental Temperature	Operating: -40°C to 85°C Storage: -40°C to 90°C
Environmental Humidity	Operating: 5% to 95%, Non-Condensing Storage: Max. 90%
Dimensions (W × H × D)	29.9mm × 50.8mm × 12.9mm

12. Regulatory Information

Declaration of Conformity

The WLE1216VX-I is FCC, IC and CE RED Certified and designed to comply with applicable regional regulatory requirements. The WLE1216VX-I is a component-level radio module intended for integration into end products. End-product manufacturers are responsible for obtaining all necessary regulatory certifications (e.g., FCC, CE, IC, or other applicable regional approvals) for their final product in each target market, including any additional certifications required for the complete host platform assembly.

REACH & RoHS Compliance

This product is manufactured in compliance with REACH Regulation (EC) No 1907/2006 and RoHS Directive 2011/65/EU (amended by 2015/863/EU), restricting the use of hazardous substances in electrical and electronic equipment.

Disposal & Recycling

This product is subject to the Waste Electrical and Electronic Equipment (WEEE) Directive. At the end of its service life, return the product to an authorised recycling facility or contact Compex Systems for take-back options.

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