



# WLE600VX-I

Wi-Fi 5 (802.11ac Wave 1) Dual Band Wireless Module

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## Hardware User Guide

|                                                       |                                              |                                                  |                                               |
|-------------------------------------------------------|----------------------------------------------|--------------------------------------------------|-----------------------------------------------|
| <b>Wi-Fi 5 / 802.11ac</b><br>2.4GHz + 5GHz Selectable | <b>QCA9892</b><br>Qualcomm Atheros Peregrine | <b>MiniPCle Interface</b><br>PCIe 1.1 Compatible | <b>2×2 MIMO</b><br>Up to 866.7 Mbps<br>(5GHz) |
|-------------------------------------------------------|----------------------------------------------|--------------------------------------------------|-----------------------------------------------|

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# 1. Introduction

Thank you for choosing the Compex WLE600VX-I. This document provides complete hardware integration guidance for engineers and system developers deploying the WLE600VX-I Wi-Fi 5 wireless module in embedded, industrial, and networking platforms.

The WLE600VX-I is a dual-band Wi-Fi 5 (802.11ac Wave 1) wireless module based on the Qualcomm Atheros QCA9892 'Peregrine' series chipset. Built on the Qualcomm Atheros XB140 reference design, the module delivers 2×2 MIMO operation in either the 2.4GHz or 5GHz band (selectable) through a standard MiniPCIe (PCIe 1.1) host interface.

## Key Highlights

- Qualcomm Atheros QCA9892 'Peregrine' Series chipset.
- 2.4GHz, 2×2 MIMO, up to 400 Mbps physical data rate.
- 5GHz, 2×2 MIMO, up to 866.7 Mbps physical data rate.
- Dual Band Selectable 2.4GHz / 5GHz Wi-Fi 5 (802.11ac Wave 1) operation.
- MiniPCIe interface with PCIe 1.1 host connectivity.
- Based on the Qualcomm Atheros XB140 reference design.
- IEEE 802.11ac Wave 1 compliant; backward compatible with 802.11a/b/g/n.
- Supports up to 256-QAM modulation.
- Supports 4.9GHz operation.
- Cards are individually calibrated for Quality Assurance.
- Industrial-grade operating temperature: -40°C to 70°C (up to 90°C with reduced long-term reliability margin — see Section 5.2). Storage: -40°C to 90°C.
- FCC, CE & 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 × WLE600VX-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](mailto: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 WLE600VX-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 1.1 interface.

### 3.1 Module Layout

The WLE600VX-I features the following major components and connectors:

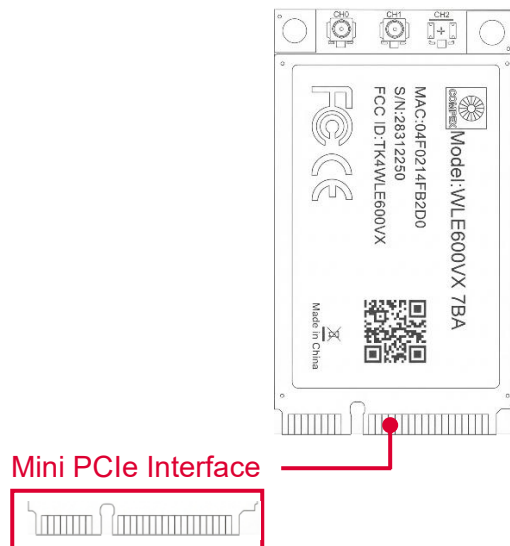


|                               |                                             |
|-------------------------------|---------------------------------------------|
| <b>Chipset</b>                | Qualcomm Atheros QCA9892 'Peregrine' Series |
| <b>Reference Design</b>       | Qualcomm Atheros XB140                      |
| <b>Host Interface</b>         | MiniPCle Interface with PCIe 1.1            |
| <b>RF Connectors</b>          | 2× U.FL Connectors (CH0, CH1)               |
| <b>Dimensions (W × H × D)</b> | 29.85mm × 50.8mm × 3.2mm                    |

## 3.2 Connector Descriptions

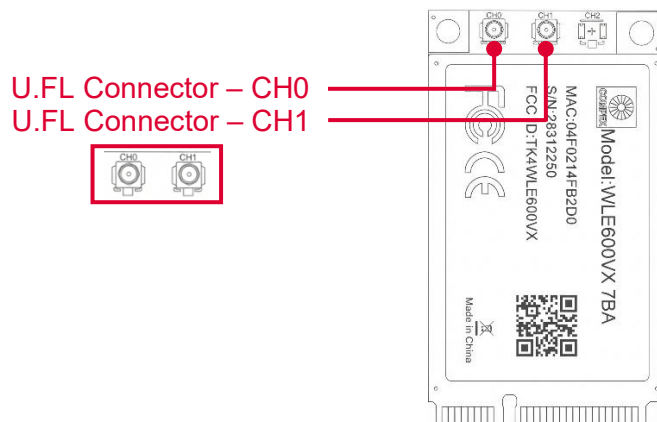
### MiniPCle Edge Connector

- Standard MiniPCle (PCIe 1.1) 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

- 2× U.FL Connectors (CH0 and CH1) located at the top edge of the module.
- CH0 and CH1 support 2×2 MIMO operation in either the 2.4GHz or 5GHz bands (selectable).
- Connect suitable external antennas that support both the 2.4GHz and 5GHz bands.



## 3.3 Hardware Pinouts

### MiniPCle Slot Pin Assignment

| Top side                |                  | Bottom side |                         |
|-------------------------|------------------|-------------|-------------------------|
| 1                       | WAKE_L           | 2           | +3.3V                   |
| 3                       | NC               | 4           | GND                     |
| 5                       | NC               | 6           | NC                      |
| 7                       | CLKREQ_L         | 8           | MCI_CLK_IN (RESERVED)   |
| 9                       | GND              | 10          | MCI_CLK_OUT (RESERVED)  |
| 11                      | REFCLK-          | 12          | MCI_DATA_OUT (RESERVED) |
| 13                      | REFCLK+          | 14          | MCI_DATA_IN (RESERVED)  |
| 15                      | GND              | 16          | NC                      |
| Mechanical key MiniPCle |                  |             |                         |
| 17                      | NC               | 18          | GND                     |
| 19                      | NC               | 20          | W_DISABLE_L             |
| 21                      | GND              | 22          | RESET                   |
| 23                      | PERn0            | 24          | +3.3V                   |
| 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                      | GND              | 38          | NC                      |
| 39                      | +3.3V (RESERVED) | 40          | GND                     |
| 41                      | +3.3V (RESERVED) | 42          | NC                      |
| 43                      | GND              | 44          | LED_WLAN_L              |
| 45                      | NC               | 46          | BT_LED                  |
| 47                      | Test point       | 48          | NC                      |
| 49                      | NC               | 50          | GND                     |
| 51                      | NC               | 52          | +3.3V                   |

## GPIO Pin Assignment

| GPIO Pin | Function       | GPIO Pin | Function    |
|----------|----------------|----------|-------------|
| GPIO_0   | WLAN_DISABLE_L | GPIO_1   | LED_WLAN_L  |
| GPIO_2   | MCI_CLK_IN     | GPIO_3   | MCI_CLK_OUT |
| GPIO_4   | MCI_DATA_OUT   | GPIO_5   | MCI_DATA_IN |
| GPIO_19  | FEM_VRX        |          |             |

# 4. Radio Module Specifications

## 4.1 Wi-Fi Capability

|                                |                                                                                                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Wi-Fi Standards</b>         | 2.4GHz: 802.11b/g/n<br>5GHz: 802.11a/n/ac                                                                                                              |
| <b>Bands</b>                   | 2.4GHz + 5GHz Selectable                                                                                                                               |
| <b>MIMO Configuration</b>      | 2×2 MIMO                                                                                                                                               |
| <b>Max Physical Data Rate</b>  | 2.4GHz: up to 400 Mbps<br>5GHz: up to 866.7 Mbps                                                                                                       |
| <b>Frequency Range</b>         | 2.4GHz: 2.412 ~ 2.472GHz<br>5GHz: 4.920 ~ 5.825GHz                                                                                                     |
| <b>Modulation Techniques</b>   | OFDM: BPSK, QPSK, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM                                                                                           |
| <b>Channel Spectrum Widths</b> | Supports 20/40MHz at 2.4GHz<br>Supports 20/40/80MHz at 5GHz                                                                                            |
| <b>TX Power</b>                | Max 21dBm per chain @ 2.4GHz<br>Max 20dBm per chain @ 5GHz                                                                                             |
| <b>RF Connectors</b>           | 2× U.FL Connectors (CH0, CH1)                                                                                                                          |
| <b>Supported Standards</b>     | IEEE 802.11d, e, h, i, k, r, v and w                                                                                                                   |
| <b>Advanced RF Features</b>    | Spatial Multiplexing, Cyclic-Delay Diversity (CDD), Low-Density Parity Check (LDPC) Codes, Maximal Ratio Combining (MRC), Space Time Block Code (STBC) |

## 4.2 Notes & Recommendations

- Use external antennas supporting both the 2.4GHz and 5GHz bands on both U.FL connectors.
- Refer to the CompexWRT (Qualcomm Atheros reference wireless drivers) or OpenWRT/LEDE (ath10k wireless drivers) documentation for channel and regulatory domain configuration. Supported on WPJ344, WPJ558, WPJ563, WPJ564, WPQ864, and WPQ865.
- 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

|                               |                                |
|-------------------------------|--------------------------------|
| <b>Dimensions (W × H × D)</b> | 29.85mm × 50.8mm × 3.2mm       |
| <b>Form Factor</b>            | Standard MiniPCle, no heatsink |

## 5.2 Environmental Ratings

|                              |                           |
|------------------------------|---------------------------|
| <b>Operating Temperature</b> | -40°C to 70°C             |
| <b>Storage Temperature</b>   | -40°C to 90°C             |
| <b>Operating Humidity</b>    | 5% to 95%, Non-Condensing |
| <b>Storage Humidity</b>      | Max. 90%                  |

## 5.3 Mounting & Installation Notes

- Secure with the mounting screw at the designated hole if the host chassis provides one.
- This module has no heatsink; ensure adequate airflow in the installation environment.

# 6. Power Specifications

## 6.1 Power Requirements

|                          |                                                         |
|--------------------------|---------------------------------------------------------|
| <b>Operating Voltage</b> | 3.3V DC                                                 |
| <b>Power Consumption</b> | 3.5W (Max)                                              |
| <b>Power Source</b>      | 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 3.5W 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 deployments, verify thermal dissipation is adequate at sustained 3.5W 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 1.1.
- Prepare two external antennas covering both the 2.4GHz and 5GHz bands with U.FL connectors or pigtail adapters.

## 7.2 Module Installation

- Align the WLE600VX-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 and CH1 U.FL connectors.
- Ensure antenna cables are routed without sharp bends to avoid signal loss or connector damage.

## 8. Troubleshooting

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Not Detected</b>                      | <ul style="list-style-type: none"><li>•Verify the module is fully seated in the MiniPCle slot and the retaining screw (if present) is secured.</li><li>•Confirm the host platform's MiniPCle slot supports PCIe 1.1 and provides 3.3V power.</li><li>•Check that the appropriate CompexWRT (Qualcomm Atheros reference wireless drivers) or OpenWRT/LEDE (ath10k wireless drivers) package is installed; supported on WPJ344, WPJ558, WPJ563, WPJ564, WPQ864, and WPQ865.</li></ul> |
| <b>No Wireless Signal / Weak RF Performance</b> | <ul style="list-style-type: none"><li>•Verify external antennas are securely connected to the CH0 and CH1 U.FL connectors.</li><li>•Confirm antennas cover both the 2.4GHz and 5GHz bands.</li><li>•Check for physical damage to U.FL connectors or antenna cables.</li></ul>                                                                                                                                                                                                       |
| <b>Overheating or Unexpected Shutdown</b>       | <ul style="list-style-type: none"><li>•Ensure adequate airflow around the module for sustained high-throughput operation.</li><li>•Confirm ambient temperature is within the rated -40°C to 70°C operating range.</li></ul>                                                                                                                                                                                                                                                         |

## 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.
- This module is ESD Sensitivity Class 1C; use proper ESD (electrostatic discharge) precautions, including a grounded wrist strap, when handling the module.
- Do not operate the module without antennas connected to all U.FL connectors, 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 Compex Technical Support for service.

# 10. Technical Support

Compex Systems Pte Ltd provides engineering and technical support for the WLE600VX-I. For technical assistance, integration support, or to report a hardware issue, please contact:

|                                  |                                                                                                                                                                                                           |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Company</b>                   | Compex Systems Pte Ltd                                                                                                                                                                                    |
| <b>Headquarters</b>              | Singapore                                                                                                                                                                                                 |
| <b>Sales Enquiries</b>           | <a href="mailto:sales@compex.com.sg">sales@compex.com.sg</a>                                                                                                                                              |
| <b>Technical Support</b>         | <a href="https://compex.com.sg/support-downloads/">https://compex.com.sg/support-downloads/</a>                                                                                                           |
| <b>Website</b>                   | <a href="https://compex.com.sg">https://compex.com.sg</a>                                                                                                                                                 |
| <b>Product Page (WLE600VX-I)</b> | <a href="https://compex.com.sg/shop/wifi-module/802-11ac-wave-1/wle600vx-i-wifi5-11ac-qca9882-qca9892/">https://compex.com.sg/shop/wifi-module/802-11ac-wave-1/wle600vx-i-wifi5-11ac-qca9882-qca9892/</a> |
| <b>Qualcomm Design Centre</b>    | 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](mailto:sales@compex.com.sg).

# 11. Full Specifications

|                                  |                                                                                                                                                                    |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Model</b>                     | WLE600VX-I                                                                                                                                                         |
| <b>Chipset</b>                   | Qualcomm Atheros QCA9892 'Peregrine' Series                                                                                                                        |
| <b>Reference Design</b>          | Qualcomm Atheros XB140                                                                                                                                             |
| <b>Host Interface</b>            | MiniPCle Interface with PCIe 1.1                                                                                                                                   |
| <b>Operating Voltage</b>         | 3.3V                                                                                                                                                               |
| <b>Power Consumption</b>         | 3.5W (Max)                                                                                                                                                         |
| <b>Wireless</b>                  | 2×2 2.4GHz 802.11b/g/n, max 21dBm per chain<br>2×2 5GHz 802.11a/n/ac, max 20dBm per chain<br>2× U.FL Connectors                                                    |
| <b>Frequency Range</b>           | 2.4GHz: 2.412 ~ 2.472GHz<br>5GHz: 4.920 ~ 5.825GHz                                                                                                                 |
| <b>Modulation Techniques</b>     | OFDM: BPSK, QPSK, DBPSK, DQPSK, CCK, 16-QAM, 64-QAM, 256-QAM                                                                                                       |
| <b>Channel Spectrum Widths</b>   | Supports 20/40MHz at 2.4GHz<br>Supports 20/40/80MHz at 5GHz                                                                                                        |
| <b>Operating System</b>          | CompexWRT (Qualcomm Atheros reference wireless drivers) or OpenWRT/LEDE (ath10k wireless drivers); supported on WPJ344, WPJ558, WPJ563, WPJ564, WPQ864, and WPQ865 |
| <b>Certification</b>             | FCC, CE & IC Certified, REACH & RoHS Compliance                                                                                                                    |
| <b>Environmental Temperature</b> | Operating: -40°C to 70°C<br>Storage: -40°C to 90°C                                                                                                                 |
| <b>Environmental Humidity</b>    | Operating: 5% to 95%, Non-Condensing<br>Storage: Max. 90%                                                                                                          |
| <b>Dimensions (W × H × D)</b>    | 29.85mm × 50.8mm × 3.2mm                                                                                                                                           |
| <b>ESD Sensitivity</b>           | Class 1C                                                                                                                                                           |

# 12. Regulatory Information

## Declaration of Conformity

The WLE600VX-I is FCC, CE and IC Certified and designed to comply with applicable regional regulatory requirements. The WLE600VX-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.

## 5GHz DFS Band Restrictions

Operation in DFS (Dynamic Frequency Selection) channels within the 5 GHz band is subject to national regulatory authority requirements. Manufacturers must ensure compliance with local regulations before enabling DFS channels. Unauthorized use of restricted frequency bands may be illegal and could cause harmful interference to radar and other services.

## FCC, CE & IC Certified, 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.

### Legal Notices

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