# Dual Band 2.4/5GHz 4x4 802.11ac Wave 2 MiniPCIe WiFi Module

## Designed for High Bandwidth Enterprise Wireless Access Points

### Model: WLE1216VX-I

KEY FEATURES

- Qualcomm Atheros QCA9994
- 2.4GHz, 4x4 MU-MIMO OFDM Technology, up to 800Mbps physical data rate
- 5GHz, 4x4 MU-MIMO OFDM Technology, up to 1733Mbps physical data rate
- Dual Band 2.4/5GHz 4x4 WiFi 5 (802.11ac Wave 2)
- MiniPCIe interface with PCIe 2.0
- Heat sink allows free air operation
- Supports IEEE 802.11d, e, h, i, j, k, r, u, v time stamp, w, and z standards
- Supports Dynamic Frequency Selection (DFS)

## Specifications

| | |
|---|---|
| Chipset | Qualcomm Atheros QCA9994 'Cascade' Series |
| System Memory | 256Kbit serial I²C bus EEPROM |
| Reference Design | Qualcomm Atheros CAS03 |
| Host Interface | MiniPCIe interface with PCIe 2.0 |
| Operating Voltage | 3.3V |
| Power Consumption | 9W (Max) |
| Wireless | 2.4GHz 802.11b/g/n/ac, max 20dBm per chain<br>5GHz 802.11a/n/ac, max 19dBm per chain<br>4x U.FL Connectors |
| Frequency Range | 2.412~2.472GHz, 5.150~5.825GHz |
| Modulation Techniques | CCK, OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM |
| Channel Spectrum Widths for WLAN | Supports 20/40MHz at 2.4GHz, Support 20/40/80/80+80MHz at 5GHz |
| Supported Operating System | CompexWRT or OpenWRT/ LEDE |
| Certification | REACH and RoHS Compliance |
| Environmental Temperature (Industrial Grade) | Operating: -40°C to 85°C, Storage: -40°C to 90°C |
| Environmental Humidity, Non-Condensing | Operating: 5% to 95%, Storage: Max. 90% |
| Dimensions (W x H x D) in mm | 29.9 x 50.8 x 12.9 |

**Configurations are subject to change without notifications.*

# RF Performance Table for 2.4GHz

| | Data Rate | TX Power (per chain) | TX Power (4 chains) | Tolerance |
|---|---|---|---|---|
| 2.4GHz 802.11b | 1Mbps | 20dBm | 26dBm | ±2dB |
| | 2Mbps | 20dBm | 26dBm | ±2dB |
| | 5.5Mbps | 20dBm | 26dBm | ±2dB |
| | 11Mbps | 20dBm | 26dBm | ±2dB |
| 2.4GHz 802.11g | 6Mbps | 20dBm | 26dBm | ±2dB |
| | 9Mbps | 20dBm | 26dBm | ±2dB |
| | 12Mbps | 20dBm | 26dBm | ±2dB |
| | 18Mbps | 20dBm | 26dBm | ±2dB |
| | 24Mbps | 19dBm | 25dBm | ±2dB |
| | 36Mbps | 18dBm | 24dBm | ±2dB |
| | 48Mbps | 17dBm | 23dBm | ±2dB |
| | 54Mbps | 16dBm | 22dBm | ±2dB |
| 2.4GHz 802.11n HT20 | MCS 0 | 20dBm | 26dBm | ±2dB |
| | MCS 1 | 20dBm | 26dBm | ±2dB |
| | MCS 2 | 20dBm | 26dBm | ±2dB |
| | MCS 3 | 19dBm | 25dBm | ±2dB |
| | MCS 4 | 18dBm | 24dBm | ±2dB |
| | MCS 5 | 17dBm | 23dBm | ±2dB |
| | MCS 6 | 16dBm | 22dBm | ±2dB |
| | MCS 7 | 15dBm | 21dBm | ±2dB |
| | MCS 8 | 14dBm | 20dBm | ±2dB |
| 2.4GHz 802.11n/ac HT40 | MCS 0 | 20dBm | 26dBm | ±2dB |
| | MCS 1 | 20dBm | 26dBm | ±2dB |
| | MCS 2 | 20dBm | 26dBm | ±2dB |
| | MCS 3 | 19dBm | 25dBm | ±2dB |
| | MCS 4 | 18dBm | 24dBm | ±2dB |
| | MCS 5 | 17dBm | 23dBm | ±2dB |
| | MCS 6 | 16dBm | 22dBm | ±2dB |
| | MCS 7 | 15dBm | 21dBm | ±2dB |
| | MCS 8 | 14dBm | 20dBm | ±2dB |
| | MCS 9 | 13dBm | 19dBm | ±2dB |

| | Data Rate | RX Specifications Sensitivity | Tolerance |
|---|---|---|---|
| 2.4GHz 802.11b | 1Mbps | -96dBm | ±2dB |
| | 2Mbps | -93dBm | ±2dB |
| | 5.5Mbps | -90dBm | ±2dB |
| | 11Mbps | -86dBm | ±2dB |
| 2.4GHz 802.11g | 6Mbps | -90dBm | ±2dB |
| | 9Mbps | -88dBm | ±2dB |
| | 12Mbps | -86dBm | ±2dB |
| | 18Mbps | -84dBm | ±2dB |
| | 24Mbps | -81dBm | ±2dB |
| | 36Mbps | -78dBm | ±2dB |
| | 48Mbps | -76dBm | ±2dB |
| | 54Mbps | -73dBm | ±2dB |
| 2.4GHz 802.11n HT20 | MCS 0 | -89dBm | ±2dB |
| | MCS 1 | -87dBm | ±2dB |
| | MCS 2 | -84dBm | ±2dB |
| | MCS 3 | -81dBm | ±2dB |
| | MCS 4 | -78dBm | ±2dB |
| | MCS 5 | -75dBm | ±2dB |
| | MCS 6 | -72dBm | ±2dB |
| | MCS 7 | -69dBm | ±2dB |
| | MCS 8 | -66dBm | ±2dB |
| 2.4GHz 802.11n/ac HT40 | MCS 0 | -87dBm | ±2dB |
| | MCS 1 | -85dBm | ±2dB |
| | MCS 2 | -82dBm | ±2dB |
| | MCS 3 | -79dBm | ±2dB |
| | MCS 4 | -76dBm | ±2dB |
| | MCS 5 | -74dBm | ±2dB |
| | MCS 6 | -71dBm | ±2dB |
| | MCS 7 | -68dBm | ±2dB |
| | MCS 8 | -65dBm | ±2dB |
| | MCS 9 | -62dBm | ±2dB |





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# RF Performance Table for 5GHz

| | Data Rate | TX Power (per chain) | TX Power (4 chains) | Tolerance |
|---|---|---|---|---|
| 5GHz 802.11a | 6Mbps | 19dBm | 25dBm | ±2dB |
| | 9Mbps | 19dBm | 25dBm | ±2dB |
| | 12Mbps | 19dBm | 25dBm | ±2dB |
| | 18Mbps | 19dBm | 25dBm | ±2dB |
| | 24Mbps | 18dBm | 24dBm | ±2dB |
| | 36Mbps | 17dBm | 23dBm | ±2dB |
| | 48Mbps | 16dBm | 22dBm | ±2dB |
| | 54Mbps | 15dBm | 21dBm | ±2dB |
| 5GHz 802.11n/ac VHT20 | MCS 0 | 19dBm | 25dBm | ±2dB |
| | MCS 1 | 19dBm | 25dBm | ±2dB |
| | MCS 2 | 19dBm | 25dBm | ±2dB |
| | MCS 3 | 18dBm | 24dBm | ±2dB |
| | MCS 4 | 17dBm | 23dBm | ±2dB |
| | MCS 5 | 16dBm | 22dBm | ±2dB |
| | MCS 6 | 15dBm | 21dBm | ±2dB |
| | MCS 7 | 14dBm | 20dBm | ±2dB |
| | MCS 8 | 13dBm | 19dBm | ±2dB |
| 5GHz 802.11n/ac VHT40 | MCS 0 | 19dBm | 25dBm | ±2dB |
| | MCS 1 | 19dBm | 25dBm | ±2dB |
| | MCS 2 | 19dBm | 25dBm | ±2dB |
| | MCS 3 | 18dBm | 24dBm | ±2dB |
| | MCS 4 | 17dBm | 23dBm | ±2dB |
| | MCS 5 | 16dBm | 22dBm | ±2dB |
| | MCS 6 | 16dBm | 22dBm | ±2dB |
| | MCS 7 | 15dBm | 21dBm | ±2dB |
| | MCS 8 | 13dBm | 19dBm | ±2dB |
| | MCS 9 | 12dBm | 18dBm | ±2dB |
| 5GHz 802.11ac VHT80 | MCS 0 | 18dBm | 24dBm | ±2dB |
| | MCS 1 | 18dBm | 24dBm | ±2dB |
| | MCS 2 | 18dBm | 24dBm | ±2dB |
| | MCS 3 | 18dBm | 24dBm | ±2dB |
| | MCS 4 | 17dBm | 23dBm | ±2dB |
| | MCS 5 | 16dBm | 22dBm | ±2dB |
| | MCS 6 | 16dBm | 22dBm | ±2dB |
| | MCS 7 | 15dBm | 21dBm | ±2dB |
| | MCS 8 | 13dBm | 19dBm | ±2dB |
| | MCS 9 | 12dBm | 18dBm | ±2dB |
| 5GHz 802.11ac VHT80+80 | MCS 0 | 18dBm | 24dBm | ±2dB |
| | MCS 1 | 18dBm | 24dBm | ±2dB |
| | MCS 2 | 18dBm | 24dBm | ±2dB |
| | MCS 3 | 18dBm | 24dBm | ±2dB |
| | MCS 4 | 17dBm | 23dBm | ±2dB |
| | MCS 5 | 16dBm | 22dBm | ±2dB |
| | MCS 6 | 16dBm | 22dBm | ±2dB |
| | MCS 7 | 15dBm | 21dBm | ±2dB |
| | MCS 8 | 13dBm | 19dBm | ±2dB |
| | MCS 9 | 12dBm | 18dBm | ±2dB |

| | Data Rate | RX Specifications Sensitivity | Tolerance |
|---|---|---|---|
| 5GHz 802.11a | 6Mbps | -91dBm | ±2dB |
| | 9Mbps | -89dBm | ±2dB |
| | 12Mbps | -87dBm | ±2dB |
| | 18Mbps | -85dBm | ±2dB |
| | 24Mbps | -83dBm | ±2dB |
| | 36Mbps | -80dBm | ±2dB |
| | 48Mbps | -77dBm | ±2dB |
| | 54Mbps | -74dBm | ±2dB |
| 5GHz 802.11n/ac VHT20 | MCS 0 | -90dBm | ±2dB |
| | MCS 1 | -88dBm | ±2dB |
| | MCS 2 | -86dBm | ±2dB |
| | MCS 3 | -84dBm | ±2dB |
| | MCS 4 | -81dBm | ±2dB |
| | MCS 5 | -79dBm | ±2dB |
| | MCS 6 | -77dBm | ±2dB |
| | MCS 7 | -74dBm | ±2dB |
| | MCS 8 | -71dBm | ±2dB |
| 5GHz 802.11n/ac VHT40 | MCS 0 | -89dBm | ±2dB |
| | MCS 1 | -87dBm | ±2dB |
| | MCS 2 | -85dBm | ±2dB |
| | MCS 3 | -82dBm | ±2dB |
| | MCS 4 | -80dBm | ±2dB |
| | MCS 5 | -77dBm | ±2dB |
| | MCS 6 | -74dBm | ±2dB |
| | MCS 7 | -71dBm | ±2dB |
| | MCS 8 | -68dBm | ±2dB |
| | MCS 9 | -65dBm | ±2dB |
| 5GHz 802.11ac VHT80 | MCS 0 | -85dBm | ±2dB |
| | MCS 1 | -83dBm | ±2dB |
| | MCS 2 | -81dBm | ±2dB |
| | MCS 3 | -78dBm | ±2dB |
| | MCS 4 | -75dBm | ±2dB |
| | MCS 5 | -73dBm | ±2dB |
| | MCS 6 | -70dBm | ±2dB |
| | MCS 7 | -67dBm | ±2dB |
| | MCS 8 | -64dBm | ±2dB |
| | MCS 9 | -61dBm | ±2dB |





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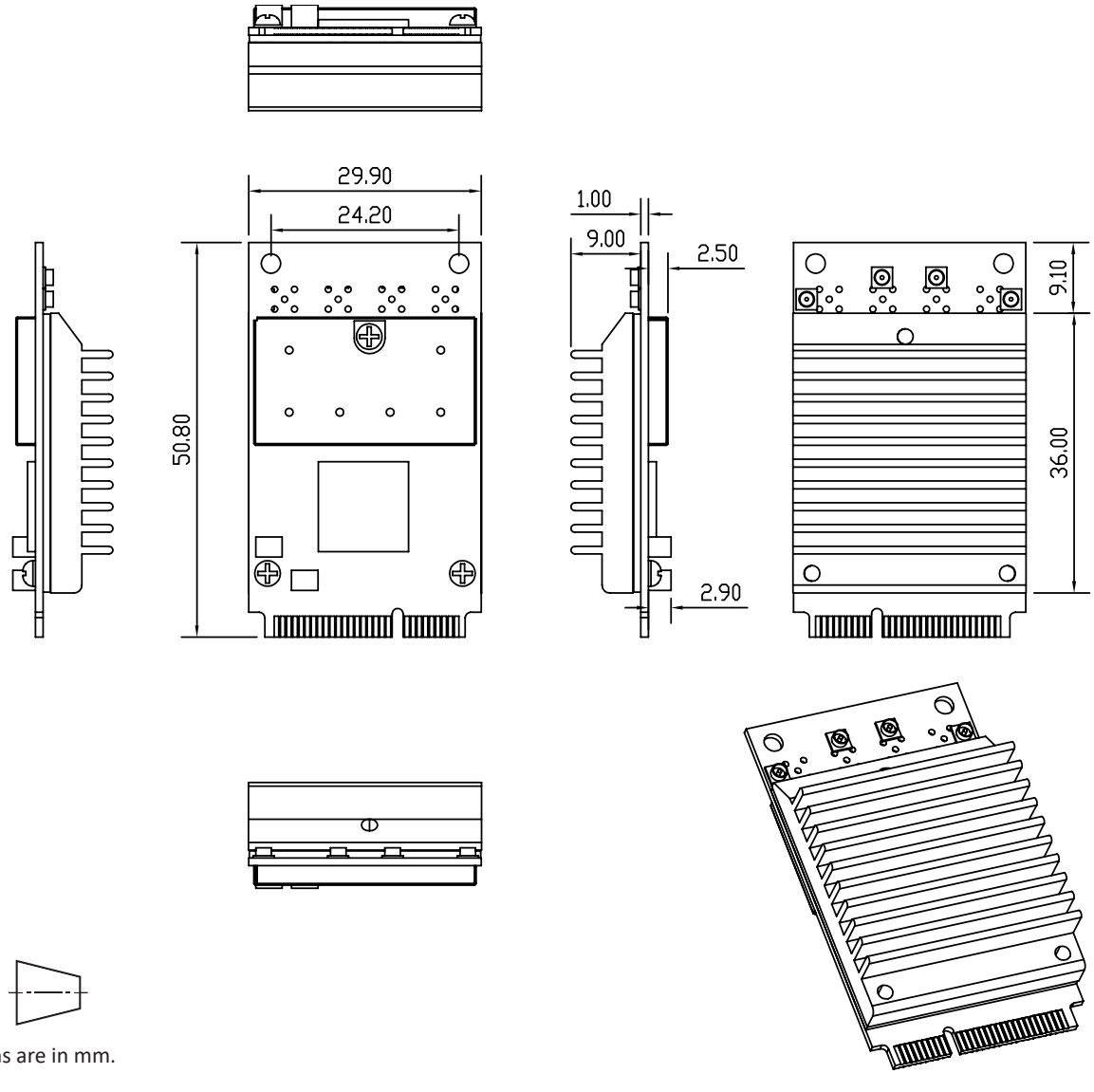
## Component Map


## Mechanical Dimensions




All dimensions are in mm.

# Ordering Configuration

| Item Code | Model | Description |
|---|---|---|
| WLE1216VX 7B0001.01-I-2 | WLE1216VX I-Temp | 4x4 802.11 a/b/g/n/ac Dual Band Wave 2 miniPCIe Card with flat heatsink industrial chip |





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