

## 5GHz 2x2 MU-MIMO 802.11ac Mini PCIe WiFi Module Designed for Next Generation 802.11ac Wave 2 Access Points



**Model: WLE650V5-25A-I**

### KEY FEATURES

- Qualcomm Atheros QCA9898
- 5GHz max 25dBm output power (per chain)
- Heat sink allows free air operation
- 2x2 MU-MIMO Technology, up to 867Mbps
- 2 spatial streams (2SS) at 80MHz bandwidth
- 1 spatial stream (1SS) at 80+80MHz bandwidth
- Built-in ESD Protection with ESD/EMP Immunity Threshold: 15KeV<sup>[1]</sup>
- Supports Spatial Multiplexing, Cyclic Delay Diversity (CDD), Low-Density Parity-Check (LDPC) Codes, Maximal Ratio Combining (MRC), Space Time Block Code (STBC)
- Supports IEEE 802.11d, e, h, i, k, r, v time stamp, and w standards
- Supports Dynamic Frequency Selection (DFS)

## Specifications

Chipset	QCA9898
System Memory	256Kbit serial I <sup>2</sup> C bus EEPROM
Host Interface	Mini PCI Express 2.0 Standard
Operating Voltage	DC 3.3V and 5V <sup>[2]</sup>
Antenna Connector	2x MMCX
Frequency Range	5.150GHz to 5.825GHz
Certification	REACH & RoSH Compliance
Power Consumption	9.49W (Max)
Supported Operating System	CompexWRT ≥ v3.1.3 or OpenWRT/LEDE kernel ≥ v4.13.0 on WPJ558/WPJ563/WPJ564 with 5V jumper, WPQ864, and WPQ865
Modulation Techniques	OFDM: BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM
Temperature Range	Operating: -40°C to 85°C Storage: -40°C to 90°C
Humidity	Operating: 5% to 95% (non-condensing) Storage: Max. 90% (non-condensing)
ESD Sensitivity	Class 1B
Dimensions (W x H x D) in mm	29.9 x 50.8 x 12.2

[1] Module grounding cable included.

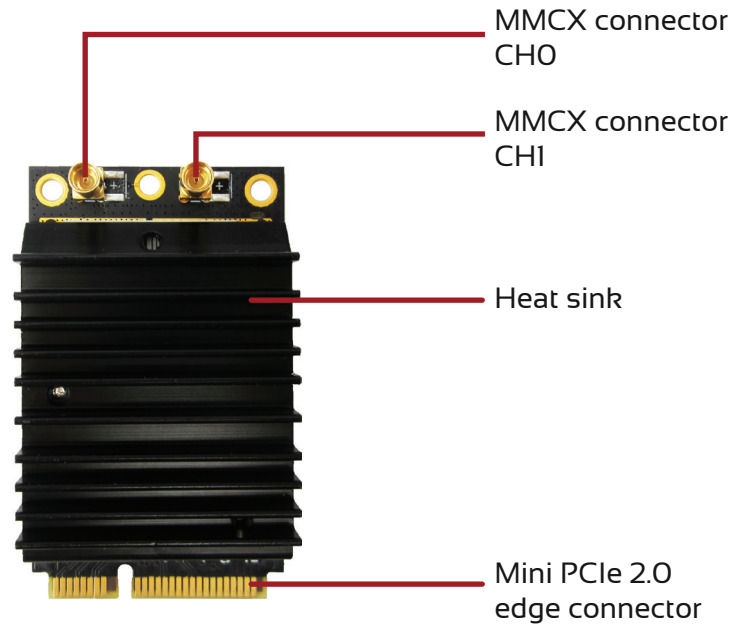
[2] The 5V is for the power amplifier (PA). The 5V jumper labels are J5, R309, and J18 on the WPJ558-A, WPJ563-A, and WPJ564-A boards respectively. Please enable 5V supply to the mPCIe card by shorting the 5V jumper next to the card slot on these boards.

## RF Performance Table

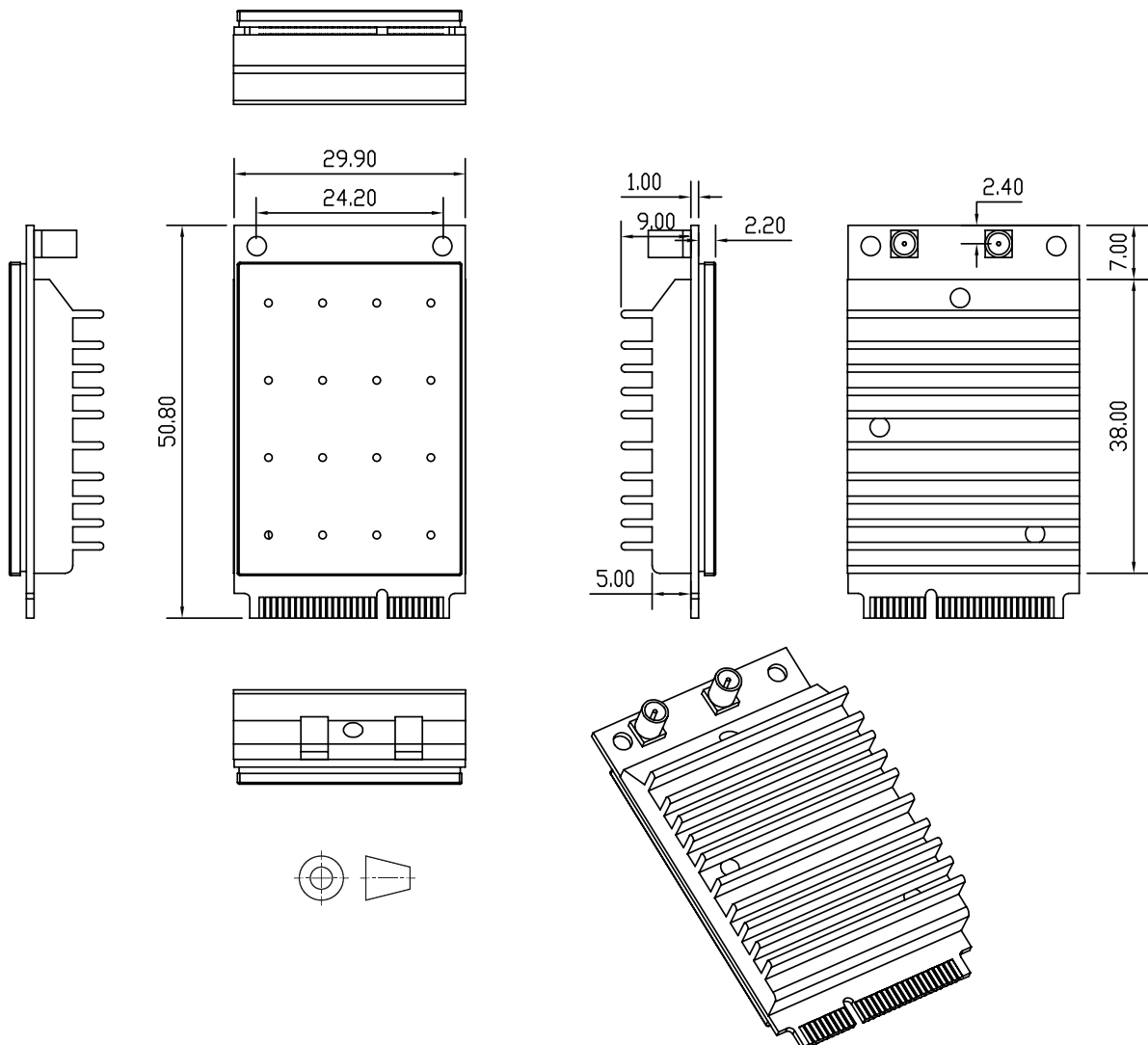
	Data Rate	TX Power (per chain)	TX Power (2 chains)	Tolerance
5GHz 802.11a	6Mbps	25dBm	28dBm	±2dB
	9Mbps	25dBm	28dBm	±2dB
	12Mbps	25dBm	28dBm	±2dB
	18Mbps	25dBm	28dBm	±2dB
	24Mbps	24dBm	27dBm	±2dB
	36Mbps	23dBm	26dBm	±2dB
	48Mbps	22dBm	25dBm	±2dB
	54Mbps	21dBm	24dBm	±2dB
5GHz 802.11n/ac VHT20	MCS 0	25dBm	28dBm	±2dB
	MCS 1	25dBm	28dBm	±2dB
	MCS 2	25dBm	28dBm	±2dB
	MCS 3	24dBm	27dBm	±2dB
	MCS 4	23dBm	26dBm	±2dB
	MCS 5	22dBm	25dBm	±2dB
	MCS 6	21dBm	24dBm	±2dB
	MCS 7	20dBm	23dBm	±2dB
	MCS 8	18dBm	21dBm	±2dB
5GHz 802.11n/ac VHT40	MCS 0	25dBm	28dBm	±2dB
	MCS 1	25dBm	28dBm	±2dB
	MCS 2	25dBm	28dBm	±2dB
	MCS 3	24dBm	27dBm	±2dB
	MCS 4	23dBm	26dBm	±2dB
	MCS 5	22dBm	25dBm	±2dB
	MCS 6	21dBm	24dBm	±2dB
	MCS 7	20dBm	23dBm	±2dB
	MCS 8	19dBm	22dBm	±2dB
	MCS 9	18dBm	21dBm	±2dB
5GHz 802.11ac VHT80	MCS 0	25dBm	28dBm	±2dB
	MCS 1	25dBm	28dBm	±2dB
	MCS 2	25dBm	28dBm	±2dB
	MCS 3	24dBm	27dBm	±2dB
	MCS 4	23dBm	26dBm	±2dB
	MCS 5	22dBm	25dBm	±2dB
	MCS 6	21dBm	24dBm	±2dB
	MCS 7	20dBm	23dBm	±2dB
	MCS 8	19dBm	22dBm	±2dB
	MCS 9	18dBm	21dBm	±2dB
5GHz 802.11ac VHT80+80	MCS 0	24dBm	27dBm	±2dB
	MCS 1	24dBm	27dBm	±2dB
	MCS 2	24dBm	27dBm	±2dB
	MCS 3	24dBm	27dBm	±2dB
	MCS 4	23dBm	26dBm	±2dB
	MCS 5	22dBm	25dBm	±2dB
	MCS 6	21dBm	24dBm	±2dB
	MCS 7	20dBm	23dBm	±2dB
	MCS 8	18dBm	21dBm	±2dB
	MCS 9	17dBm	20dBm	±2dB

	Data Rate	RX Specifications Sensitivity	Tolerance
5GHz 802.11a	6Mbps	-96dBm	±2dB
	9Mbps	-95dBm	±2dB
	12Mbps	-94dBm	±2dB
	18Mbps	-92dBm	±2dB
	24Mbps	-90dBm	±2dB
	36Mbps	-86dBm	±2dB
	48Mbps	-82dBm	±2dB
	54Mbps	-79dBm	±2dB
	5GHz 802.11n/ac VHT20	MCS 0	-94dBm
MCS 1		-91dBm	±2dB
MCS 2		-89dBm	±2dB
MCS 3		-85dBm	±2dB
MCS 4		-82dBm	±2dB
MCS 5		-78dBm	±2dB
MCS 6		-76dBm	±2dB
MCS 7		-74dBm	±2dB
MCS 8		-70dBm	±2dB
5GHz 802.11n/ac VHT40	MCS 0	-90dBm	±2dB
	MCS 1	-86dBm	±2dB
	MCS 2	-84dBm	±2dB
	MCS 3	-81dBm	±2dB
	MCS 4	-78dBm	±2dB
	MCS 5	-73dBm	±2dB
	MCS 6	-71dBm	±2dB
	MCS 7	-70dBm	±2dB
	MCS 8	-66dBm	±2dB
	MCS 9	-65dBm	±2dB
5GHz 802.11ac VHT80	MCS 0	-87dBm	±2dB
	MCS 1	-84dBm	±2dB
	MCS 2	-82dBm	±2dB
	MCS 3	-79dBm	±2dB
	MCS 4	-74dBm	±2dB
	MCS 5	-71dBm	±2dB
	MCS 6	-69dBm	±2dB
	MCS 7	-67dBm	±2dB
	MCS 8	-63dBm	±2dB
	MCS 9	-60dBm	±2dB

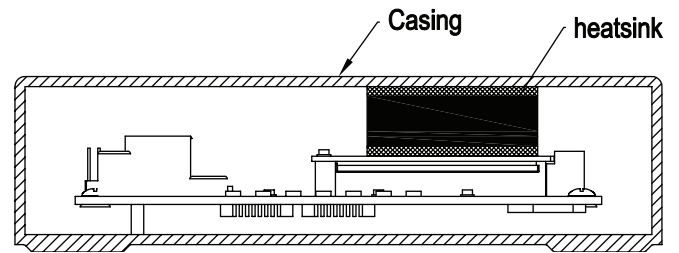
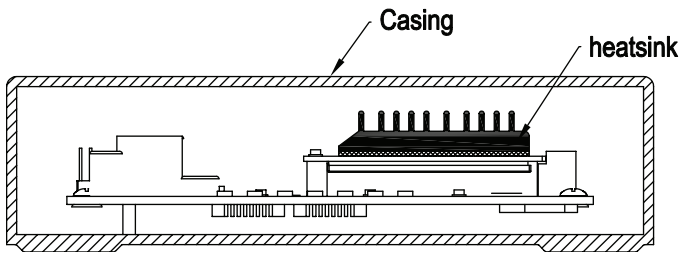
## Connector Map



## Mechanical Dimensions



## Heatsink Options



## Ordering Configuration

Item Code	Model	Description
WLE650V5-25 7B0000-I	WLE650V5-25A-I	Industrial Grade 2x2 802.11a/n/ac 5GHz miniPCIe card with MMCX connectors