



SC4402R-C Mini Card User manual for ODM manufacturers

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1 Introduction

1.1 Objective

This document details the hardware specification for the RC2 based Full Mini Card which will support operation on BG1 for the US region using a High Pass filter and external antenna and installation guide for ODM manufacturers.

The Mini Card is designed to be incorporated into WUSB video receiver products.

1.2 Scope

This document defines the electrical and mechanical specifications.

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2 Mini Card Overview

2.1 Form Factor

The proposed form factor for the Mini card RDK is shown in figure 1, below. The width and the length of the PCB are 30mm and 50.95 mm respectively. The PCB will be 1.0mm thick. The maximum component height on the top and bottom side of the board will not exceed 2.4mm and 1.35mm respectively.

A footprint will be provided on the PCB top side to fit a one piece metal shielding can to enclose all components that are potential sources of secondary emissions and to meet the relevant radio specifications. This will also aid heat dissipation by the use of a thermal pad between RC2 and the shield.

The PCB will be made from UL94V-0 approved materials and be marked accordingly.



Figure 1 – Mini Card

2.2 Mini Card Deliverables

The Otter Mini Card is designed to provide ODMs with a complete package of information to allow them to quickly develop and test the Mini Card with the minimum of specialist skills, design time and effort.

The following information will be delivered to ODMs for manufacture:

- RC2 data sheet
- Orcad schematics
- PADS PCB design files
- PCB stackup information
- BOM in Excel format
- PDF schematics
- GERBER files for 1 up PCB
- Assembly drawings
- Design Guidelines
- Relevant certification documents

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2.3 Mini Card Installation

The PCB will comply with the mechanical requirements of the PCI Express® Mini Card Electromechanical Specification Revision 1.2 [6], card type F1 (Full-Mini without bottom-side keep-outs) so that it can be slotted into the PCI connector on the WUSB video receiver mother board and secured.

2.4 FCC Logo placement

FCC Logo and FCC ID labels, as defined in § 15.19, must be placed on the mini card module and also on the enclosure of the final WUSB video product.

Labelling of any end product is required to prominently display the any associated FCC ID. The following is a suggested, example label for an end product:

Contains FCC ID: UQL-RC2-SC4402R

2.5 Attestation statement

Veebeam Corporation (OEM) will ensure the necessary attestation statements are included in the final product user manual. An example is given below.

Attestation Statement

This device complied with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment may only be operated indoors. Operation outdoors is in violation of 47 U.S.C. 301 and could subject the operator to serious legal penalties.

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3 Mini Card Specification

The Mini Card is designed specifically for use in the WUSB video receivers and will support BG1 operation using a high pass filter.

Note: WUSB video receivers (powered by a AC mains adaptor) with video outputs to connect to a TV set. Hence, conforms to FCC part 15.517(a).

3.1 RF Specification

The mini card is designed to meet the following requirements.

3.1.1 Frequency Band

Mini card is designed to operate in the 3100MHz to 4800MHz frequency band (WiMedia BG1).

3.1.2 Operational Bandwidth

Mini card is designed to support the OBW requirements defined in 15.503(a) of the FCC specification

3.1.3 Transmit Power

Transmit power: $\leq -41.3\text{dBm/MHz}$ (ensured through mini card firmware and can not be altered by the end user).

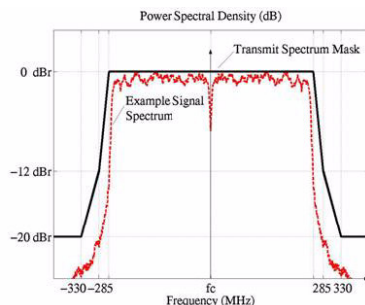
3.1.4 Transmit Signal Quality

Mini card is designed to meet the EVM requirements defined in the WiMedia specification, as follows.

| Data Rate (Mbps) | Transmit EVM |
|---------------------------|--------------|
| 53.3, 80, 106.7, 160, 200 | -15.5dB |
| 320, 400, 480 | -18dB |

3.1.5 Transmit power spectral density

The transmitted spectral mask shall have the following break points: an emissions level of 0 dBr (dB relative to the maximum spectral density of the signal) from -260 MHz to 260 MHz around the center frequency, -12 dBr at 285 MHz frequency offset, and -20 dBr at 330 MHz frequency offset and above. For all other intermediate frequencies, the emissions level is assumed to be linear in the dB scale. The transmitted spectral density of the transmitted signal shall fall within the spectral mask, as shown in Figure below.



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3.1.6 Transmit Center Frequency Tolerance

The transmitted center frequency tolerance shall be ± 20 ppm maximum.

3.1.7 Symbol Clock Frequency Tolerance

The symbol clock frequency tolerance shall be ± 20 ppm maximum.

3.1.8 Receiver Sensitivity

Mini card design includes an LNA in the receive path (using two Tx/Rx switches) to improve the radio range and meets the following receiver sensitivity specification.

| Data rate (Mb/s) | Minimum Receiver Sensitivity (dBm) |
|------------------|------------------------------------|
| 53.3 | -84.8 |
| 80 | -82.9 |
| 106.7 | -81.8 |
| 160 | -79.9 |
| 200 | -78.5 |
| 320 | -76.8 |
| 400 | -75.5 |
| 480 | -74.0 |

3.1.9 Mini card Emissions

Mini card is designed to meet the FCC 15.517& 15.209 specifications.

3.1.10 Rx Immunity

The data throughput on a channel shall not degrade by $>10\%$ in the presence of standard consumer interference sources when operated with >1 m separation.

3.1.11 Antenna

The Mini Card is fitted with a UFL connector for the ODM manufacturer to assemble the following antenna part.

Antenna: Acon antenna ADM6P-700042

Once assembled, both antenna and the antenna port must be inaccessible to the end user in the final product. This is to prevent the end user from using a higher gain or directional antennas.

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3.2 Power supply requirement

Mini card designed to be incorporated into the WUSB video receiver will be powered by a 3.3V \pm 5% supply through PCI connector from the WUSB video receiver mother board.

Note: The WUSB video receiver is powered by an AC – 12V wall adaptor.

3.3 Digital Interfaces

The card will support USB & PCIe interfaces.

3.4 USB

The USB interface will be connected to the applications processor on the main board and serve as the main data path.

The Mini Card shall be capable of continuous operation at the following speeds.

1. Full Speed (12Mbps)
2. High Speed (480Mbps)

3.5 PCI Express

The Mini Card will be electrically compatible with the pin assignments for mini PCIe connectors. It will support the data signalling requirements but the control & power management features of PCI Express will not be implemented.

3.6 UART

The RC2 UART connections are brought out using the PCIe SMBUS connections.

3.7 GPIO Allocations

GPIO allocations are as detailed in the schematics.

3.7.1 Initial Programming

There are 2 options available for Mini card programming:

- Devices are programmed prior to assembly. (minimum quantities would apply)
- Devices are programmed after assembly using the Production Test Fixture

4 Mechanical

4.1.1 RF Shield

Provision will be made to fit a rectangular metal screen. The Mini Card shall be designed to minimise the RC2 temperature by maximising copper flood around RC2 and on all inner PCB layers.

Good thermal connection to the RF screen will be accomplished using Gap pad or similar material attached to the top of RC2.

4.2 Certification

Certification is a mandatory requirement for UWB products. The certification process is quite involved and requires specialist knowledge. Not all customers will have the resources necessary to achieve certification. Therefore Veebeam Corporation will undertake certification of the Mini Card and deliver a complete package of information which will enable ODMs to design and manufacturer certifiable products. These reports will be made available to ODMs on request.

The Mini Card will be certifiable to the following standards:

- RF Certifications - FCC BG1
- WiMedia (achieved at WiMedia Interop events)
- CWUSB (achieved at Intel Labs)
- USB 2.0 Electrical and Functional

4.3 Environmental Limits

- Operational temperature range shall be from 0°C to 55°C.
(Based on a 15degC temp rise inside the Motherboard enclosure which is specified to operate from 0°C to 40°C external).
- Storage temperature limits shall be -40°C to +100°C.
- RC2 Mini Card characterised over 0°C to +70°C.

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