

# ULTRA LOW-POWER WIRELESS RMWIFI-QC

## Document Information

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Author(s)	Manish Bhakuni
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Name	Date	Signature
R, Gopalakrishnan(Gopal)		

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1.0	October 20, 2015	Manish Bhakuni	Initial draft
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## 1. Section1:

### 1.1 Summary:

RMWIFI-QC based on RMWIFI-M5 module provides a quick, easy and cost effective way to add Wi-Fi capabilities for RAE Systems products, such as 4GL, MutlRAE2, and RAE-Hub etc.

The module combined 802.11 MAC, security, PHY functions, FLASH SRAM, and external antenna connectors, provides a Wi-Fi radio for end customers. . It also integrates TCP/IP stack and other related network stacks such as DHCP client, DHCP server and web server etc thus providing a fully-integrated solution for embedded WLAN applications. It can be used to connect to Ethernet conveniently and transfer data to a network server directly. RMWIFI-Q3 module is a complete IEEE 802.11 b/g/n wireless device server that provides a wireless interface to any equipment with a SDIO, UART, SPI or USB interface.

### 1.2 Key Features:

- 46 \* 26 mm (Length \* Width) with M3 40-PINs interface
- RCS protocol API for application interface
- DSSS modulation for 1and 2Mbps, CCK modulation for 5.5 and 11Mbps
- OFDM modulation for 6Mbps to 54Mbps data rates
- Compatible with IEEE 802.11 b/g/n and support 802.11i security
- UART interface, SPI interface, I2C interface, one ADC channel, several GPIOs
- Low power consumption
- FCC and CE compliant
- RoHS compliant, certified lead- and halogen-free

## 2. Section2:

### 2.1 Overview:

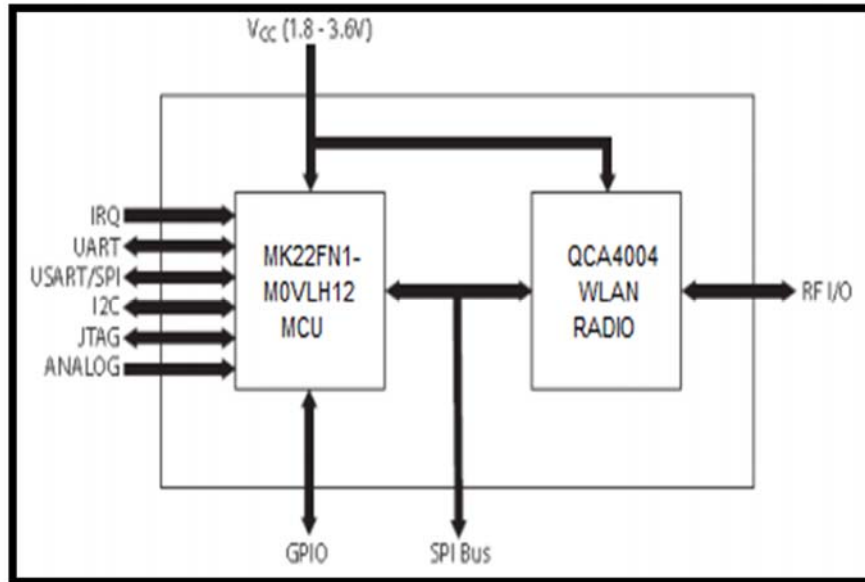
RMWIFI-QC operates in the unlicensed 2.4 radio bands IEEE 802.11b/g, which supports Direct Sequence Spread Spectrum (DSSS) 1 Mb/s and 2 Mb/s data rates, Complementary Code Keyed (CCK) 5.5 Mb/s and 11 Mb/s data rates and 6Mb/s to 54Mb/s OFDM .

RMWIFI-QC is based on RMWIFI-M5 module, which contains QC 4004A WIFI system-on-chip. The QC 4004A have fully integrated RF Transceiver, low power PA and application processor. Both TX and RX chain in the module incorporate internal power control loops.

RMWIFI-QC carries onboard single supply monitor for 1.8V voltage supply with optional module controlled external regulator enable control pin.

The module contains MK22FN1M0VLH12 Microcontroller and QCA4004 Radio. The QCA4004 single-chip Radio provides a complete 2.4 GHZ & 5 GHz radio interface between the antenna and the microcontroller. It comprises the analog radio part, digital modulation and demodulation including time and frequency synchronization, as well as data buffering. The differential to single ended TX & RX path conversion is done using lumped balun. Antenna is connected to TX & RX path using external 2.4 GHz antenna switch. 5 GHz part of the radio is disabled and not used in this module.

## 2.2 Block Diagram:



## 2.3 Pin Definition:

GND	1	2	GND
RESET	3	4	GND
UART1 TXD	5	6	UART0 TXD
HM0	7	8	UART0 RXD
GPIO16	9	10	UART0 RTS
UART1 RXD	11	12	UART0 CTS
USB DN	13	14	I2S0 SDI
USB DP	15	16	I2C SDA
GPIO17	17	18	I2C SCL
WakeUp	19	20	GPIO18
DAC0	21	22	VCC
I2S0 WS	23	24	GND
I2S0 SDO	25	26	ADC DP
PTB17	27	28	ADC DM
PTB16	29	30	POWERDOWN OUT
SPI MISO	31	32	I2C CLK
SPI MOSI	33	34	UART1RXD/I2S0 MCK
SPI CLK	35	36	TD0
SPI CS/HM1	37	38	UART0 RXD/I2C DATA
VCC	39	40	VCC

Connector Pin	Pin Name	Description	I/O
1,2,4,24	GND	Ground	
3	RESET	Active-low system reset for Micro	I
5	UART1_TXD	UART1 transmit output	O
7	HM0/Bootstrap	Enable/Disable into boot load / UART receive	I
9	GPIO16	General purpose IO	I/O
11	UART1_RXD	UART1 receive input	I
13	USB_DN	USB Data Minus	I/O
15	USB_DP	USB Data Plus	I/O
17	GPIO17	General purpose IO	I/O
19	WakeUp		I/O
21	DAC0	DAC Input	I/O
23	I2S0_WS	I2S0 Word select	I/O
25	I2S0_SDO	I2S0 serial data output	O
27	PTB17	GPIO	I/O
29	PTB16	GPIO	I/O
31	SPI_MISO	Slave SPI master in slave out line	I/O
33	SPI_MOSI	Slave SPI master out slave in line	I/O
35	SPI_CLK	Slave SPI clock line	I
37	SPI_CS/HM1	Slave SPI chip select line/ Enable/Disable into boot load	I
22,39,40	VCC	Power Supply to module	
6	UART0_TXD	UART0 transmit output	O
8	UART0_RXD	UART0 receive input	I
10	UART0_RTS	RTS input (Request To Send) for UART hardware flow control	I/O
12	UART0_CTS	CTS output (Clear To Send) for UART hardware flow control	I/O
14	I2S0_SDI	I2S0 Serial data input	I
16	I2C_SDA	I2C Serial data	I/O
18	I2C_SCL	I2C Serial clock	I/O
20	GPIO18	GPIO	I/O
26	ADC_DP	ADC Data line to micro	I/O
28	ADC_DM	ADC Data line to micro	I/O
30	POWERDOWN_OUT		
32	I2C_CLK	I2C Clock	I/O
34	UART1_RXD	UART1 receive input	I
36	TD0		
38	UART0_RXD / I2C Data	UART0 receive input / I2C Serial Data	I, I/O

### 3. Section3:

#### 3.1 Voltage:

Power supply for the RMWIFI-M3 module will be provided by the host power pins.

Symbol	Min	Typ	Max	Unit
VCC	2.7	3.3	3.6	V

#### 3.2 Current Consumption:

Condition: 25deg.C. The default voltage is 3.3V.

Item	Condition	Min	Nom	Max	Unit
Receive	RX		108		mA
Transmit	Pout=8dBm		135		mA
Sleep			<300		uA

#### 3.3 I/O DC Specification:

Parameter	Symbol	Min	Max	Unit
Input Low Voltage	V <sub>IL</sub>		0.25*VCC	V
Input High Voltage	V <sub>IH</sub>	0.8*VCC		V
Output Low Voltage	V <sub>OL</sub>		0.4	V
Output High Voltage	V <sub>OH</sub>	0.8*VCC		V



### 3.4 RF Specification:

The RF performance of RMWIFI-QC is given as follows. The default voltage is 3.3V.

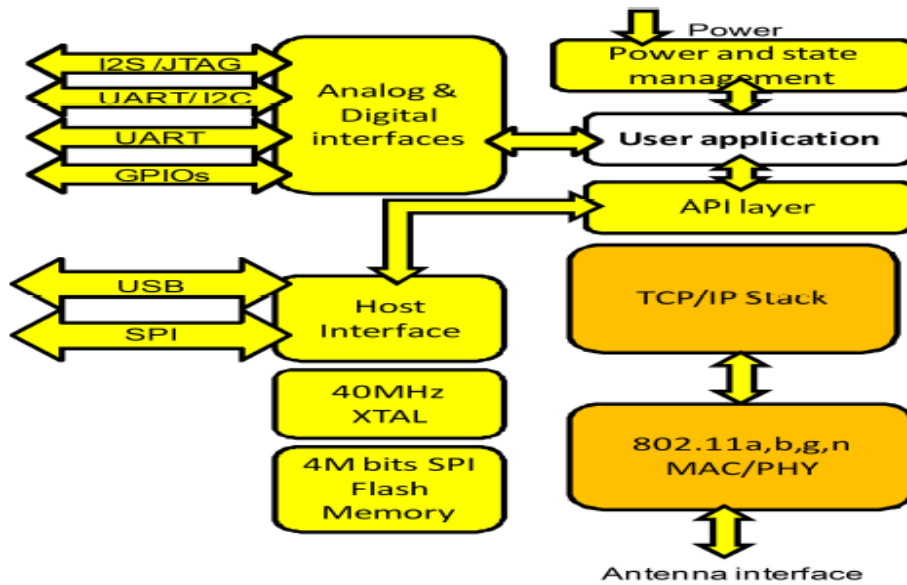
Parameter	Condition	Min	Nom	Max	Unit
Frequency Range		2412		2462	MHz
Channel Space			5		MHz
RX sensitivity	PER 10% @ 54Mbps 64QAM		-65		dBm
Tx Power		0	14	16	dBm

## 4. Section4:

### 4.1 Physical Characteristics:

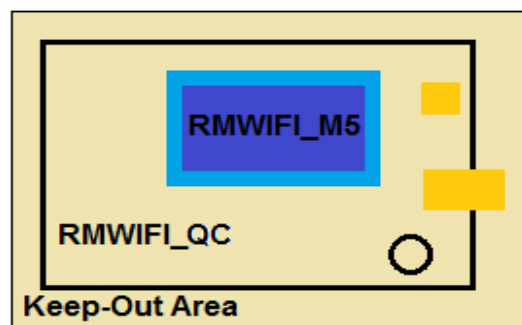
Parameter	Range	Unit
Size	46 * 26 * 10	mm
Operation Temperature Range	-40 to +85	°C

## 4.2 Typical RMWIFI-M5 Block diagram:

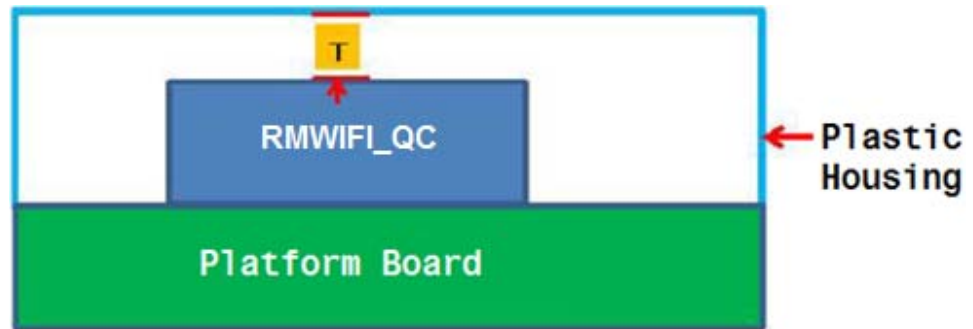


## 4.3 Mounting Information:

The below diagram shows the PCB layout recommended for RMWIFI-QC module.

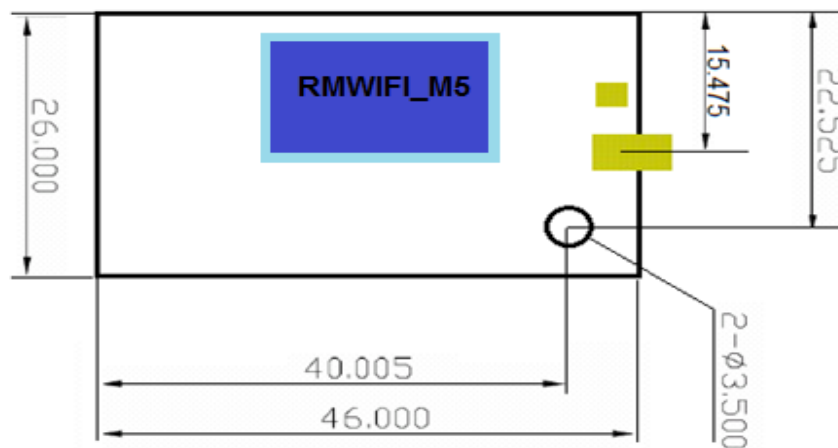


Please minimize components in the keep-out area. It is recommended to have a 0.4 mm gap (T) between the module's upper surface and the plastic housing.



**4.4 Mechanical Drawing:**

Unit: mm



**4.5 Ordering Information:**

Part Number	Description
A01-1106-000	ULTRA LOW-POWER WIRELESS

**5. Section 5**

General declaration for FCC and IC

**5.1 FCC & IC (Industry Canada)**

This device complies with Part 15 of the FCC Rules / Industry Canada license-exempt RSS standard(s). 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.

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

1. *L'appareil ne doit pas produire de brouillage, et*
2. *l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

## **Warning:**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

*Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.*

*Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.*

## 5.2 MPE (Maximum Radiated Power) Requirements

To satisfy FCC / IC RF exposure requirements, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during device operation.

To ensure compliance, operations at closer than this distance is not recommended.

*Les antennes installées doivent être situées de façon à ce que la population ne puisse y être exposée à une distance de moins de 20 cm. Installer les antennes de façon à ce que le personnel ne puisse approcher à 20 cm ou moins de la position centrale de l' antenne. La FCC des états-unis stipule que cet appareil doit être en tout temps éloigné d'au moins 20 cm des personnes pendant son fonctionnement.*

### Region Selection

Limited by local law regulations, version for North America does not have region selection option.

### **Information for the OEM Integrators**

This device is intended for OEM integrators only. Please see the full grant of equipment document for restrictions.

### **Label Information to the End User by the OEM or Integrators**

If the FCC ID of this module is not visible when it is installed inside another device, then the outside of the device into which the module is installed must be label with

“Contains **FCC ID: SU3RMWIFI-QC** and **IC: 20969-RMWIFIQC**”.

## 5.3 Antenna Requirements

This radio transmitter (20969-RMWIFIQC) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Gain of antenna: 4.9dBi max.

Type of antenna: W1038, Omni-directional

Impedance of antenna: 50ohm

Or

Gain of antenna: 0dBi max.

Type of antenna: PCB Antenna, Monopole

Impedance of antenna: 50ohm

Le présent émetteur radio (20969-RMWIFIQC) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Gain d'antenne: 4.9dBi maximal

Type d'antenne: 50 ohm, W1038, Omni-directionnel

Or

Gain d'antenne: 0dBi maximal

Type d'antenne: 50 ohm, PCB Antenna, Monopole

*For a composite system that incorporates devices contained either in a single enclosure or in separate enclosures connected by wire or cable, testing for compliance with the standards in this part shall be performed with all of the devices in the system functioning. If an intentional radiator incorporates more than one antenna or other radiating source and these radiating sources are designed to emit at the same time, measurements of conducted and radiated emissions shall be performed with all radiating sources that are to be employed emitting. A device which incorporates a carrier current system shall be tested as if the carrier current system were incorporated in a separate device; that is, the device shall be tested for compliance with whatever rules would apply to the device were the carrier current system not incorporated, and the carrier current system shall be tested for compliance with the rules applicable to carrier current systems.*