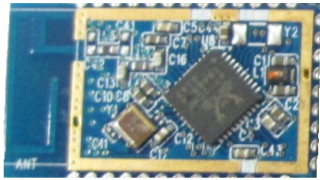


Radicom Research, Inc.

Designer's Guide for

RB8762CMF Series

(RoHS BLE 5.0 MESH Serial Bluetooth Modules)



RB8762CMF



RB8762CMF EVK dongle



RoHS Compliant

Date: 09/30/2019

Doc#RRD2Z50-20190903001-A07-C3



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Introduction

Thank you for choosing Radicom RB8762CMF Module. We are committed to providing you quality service and technical support. The RB8762CMF modules are designed to meet OEM's needs of embedding low power, wireless data connectivity to their products. The RB8762CMF family offers a quick and simple solution for wireless Bluetooth communications.

Radicom RB8762CMF module is designed to meet the emerging market for Bluetooth 5.0 applications. These embedded Bluetooth 5.0 modules integrate entire profiles, applications, and Bluetooth protocol stack, and no external processor is needed. It also contains 256KB flash memory and 80KB RAM.

The RB8762CMF can be factory configured for other Bluetooth cost-effective and power-efficient wireless consumer products such as watches, medical sensors, mice, TV remote controls and fitness trainers. **Contact Radicom** for help to add the BLE Data Protocol functionality to your 4.2 Bluetooth device or for help in determining which Bluetooth Module is the best fit for your particular Bluetooth application.

The RB8762CMF family modules can be powered with standard 1.8V~3.6V low power. In lowest mode it consumes only 1.1 nA level power and will wake up in few hundred microseconds. The RB8762CMF family provides superior performance in the presence of interference from 802.11 (WiFi) wireless devices and other 2.4GHz radios.

The RB8762CMF modules support quick connections and data transfers allowing an application to establish a Bluetooth connection within a few milliseconds for short communication bursts before quickly disconnecting the Bluetooth connection to save power. It takes much less time to make a connection than conventional Bluetooth wireless technology and consumes approximately only 1/20th of the power of Bluetooth Basic Rate.

The RB8762CMF is available in surface mount (SMD) or through-hole (DIP) hardware designs. The RB8762CMF module is the surface mount model. The RB8762CMF can also be mounted on a conversion board to create the RB8762CMF-HM model for serial through-hole designs.

RB8762CMF EVK and BLE Functionality

Radicom provides RB8762CMFEVK (development kits) as a quick platform for testing and evaluating the RB8762CMF and RB8762CMF-HM Bluetooth modules. The kit includes two RB8762CMF modules mounted on the RB8762CMF-HM DIP Module. Each RB8762CMF-HM is installed into a RB8762CMF-MB evaluation board. One of the RB8762CMF-HM is configured to operate in BLE Data Protocol Master Mode. The other RB8762CMF-HM is configured to operate in BLE Data Protocol Slave mode. The RB8762CMF-MB boards have an RS232 Serial Port connector and USB interface that allows the user to immediately connect to any standard serial port to evaluate the Bluetooth modules.

The RB8762CMF modules are defaulted to use the BLE Data Protocol. For BLE Data Protocol operation, you need one Radicom Master and one Radicom Slave module. The Slave Model RB8762CMF-S advertises or broadcasts the Bluetooth signal. The Master Model RB8762CMF-M will scan for Bluetooth signals and then request a Bluetooth connection. The RB8762CMF-S Slave can then accept the connection for BLE Data transfers. The RB8762CMF-S Slave can also operate with remote devices that also support the BLE Data Protocol.

Features

- Support the Bluetooth 5.0 core specification
- Frequency Range 2.402 – 2.480 GHz
- Integrate MCU to execute Bluetooth protocol stack
- Ultra low power consumption with intelligent PMU
- Support BT5.0 MESH
- Supports Master and Slave modes
- Support fully multiple Low Energy states
- Support LE L2CAP Connection Oriented Channel Support
- Support LE low duty directed advertising
- Support LE data length extension feature
- Integrated Bluetooth low energy stack including ATT, GATT, SMP, L2CAP, GAP
- Generic Applications for GAP Central, Peripheral, Observer and Broadcaster Roles
- Support OTA (Over-the-Air) programming
- Firmware upgradeable through serial port
- Support internal 32KHz OSC or external 32KHz clock input for low power mode
- Low power 3.3V operation
- TX Power: 4.0 dBm Max ~ RX Sensitivity: -97dBm Min
- Range: Up to 20 meters (line of sight)
- 15 GPIOs, 3 configurable LED pins
- Hardware Keyscan and Quad-decoder
- Embedded 4MB flash
- Embedded IR transceiver
- Embedded 8-CH 12-bit ADC
- Embedded G-sensor
- Support AES128/192/256 encrypt/decrypt engine
- Serial Interface (SPI / I²C / PWM)
- Support 3wire/2wire SPI
- Wake-up interrupt
- Watch Dog Timer
- Small sizes:RB8762CMF ~ 23.5x13.1 mm
RB8762CMF-D ~ 90x20 mm
- On-board microprocessor, RAM and ROM
- On-board antenna or on-board U.FL connector for external antenna
- 0°C to +70°C temperature operating

Approvals

Pending

FCC Certification

- 47 CFR FCC Part 15.247 & ANSI C63.10 2013 KDB 558074 D01 v03r05
- FCC 1.1310

CE Certification

- EN 300 328 V2.1.1
- ETSI EN 301 489-17 V2.2.1 / ETSI EN 301 489-1 V1.9.2
- EN 61000-3-2: 2014 / EN 61000-3-3: 2013
- EN 55032: 2015 / EN 55024: 2010+A1: 2015
- ETSI EN 301 489-17 V2.2.1
- ETSI EN 301 489-1 V1.9.2
- EN 61000-3-2: 2014
- EN 61000-3-3: 2013
- EN 55032: 2015
- EN 55024: 2010+A1: 2015

IC Certified

RoHS Compliant

Electronic Characteristics

	Minimum	Typical	Maximum	Unit
Operation voltage	2.35	3.3	3.6	V
Output Power			4.0	dBm
Sensitivity	-92.5			dBm
Current Consumption *				
Pairing mode		4.4		mA
RX active		6.9		mA

Model Naming System

Product Series:

RB8762CMF-(X)

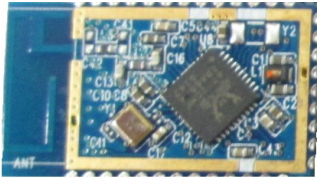

C: BT 5.0

Optional

D: EVK dongle

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Model and Ordering Information

Model Numbers	Description
 RB8762CMF	Surface mount RB8762CMF Bluetooth module with on-board antenna.
 RB8762CMF-D	RB8762CMF EVK dongle via USB interface.

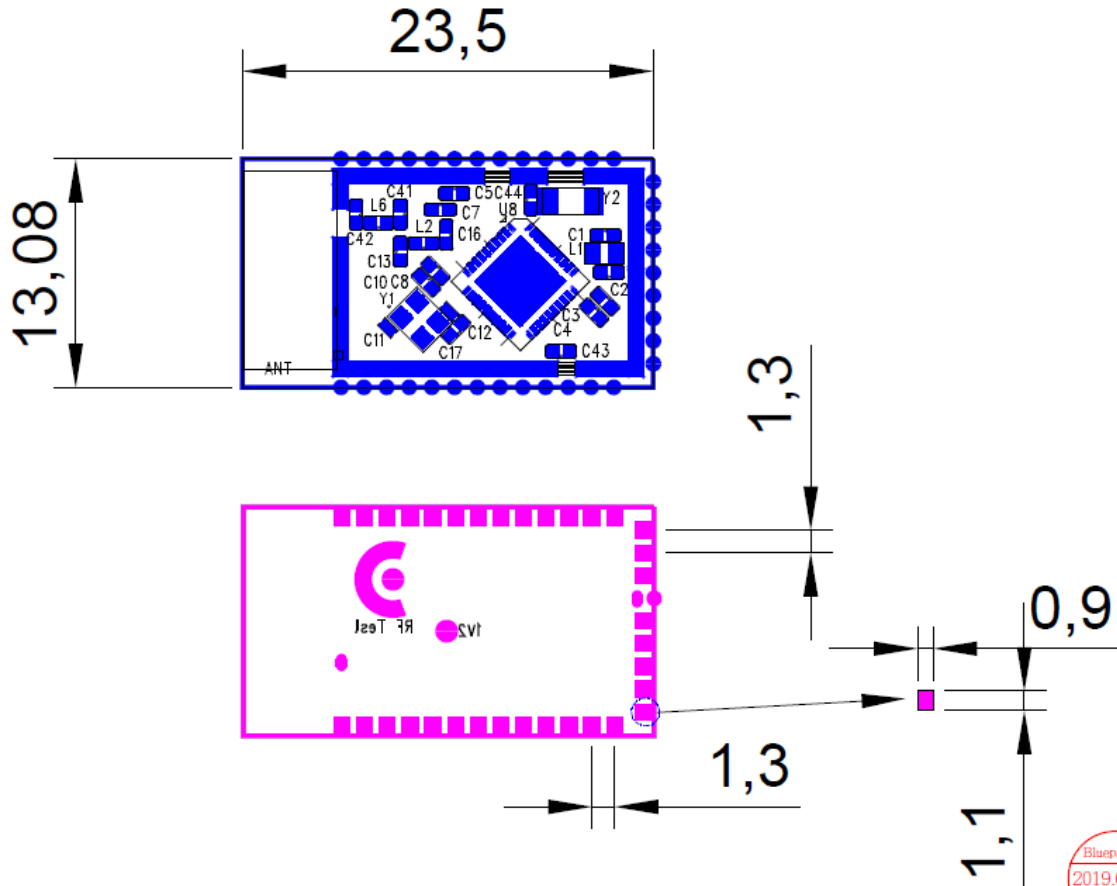
RB8762CMF Module Mechanical Dimensions & Pin Definitions

Definitions

Size:

Unit: mm

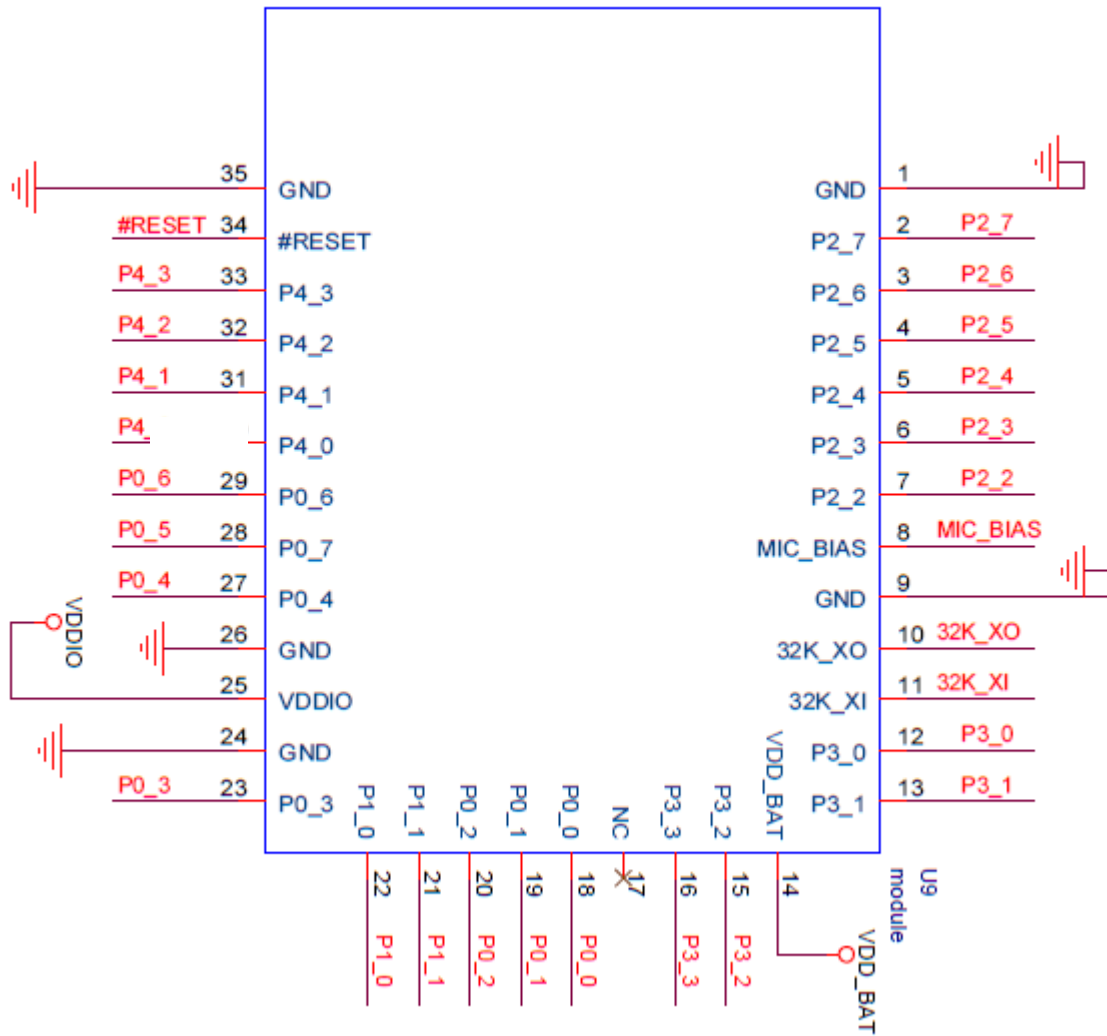
Module= 23.5x13.1 x 2.75 mm



Rac

Bluepacket
2019.03.25
Leo

Pin Definitions

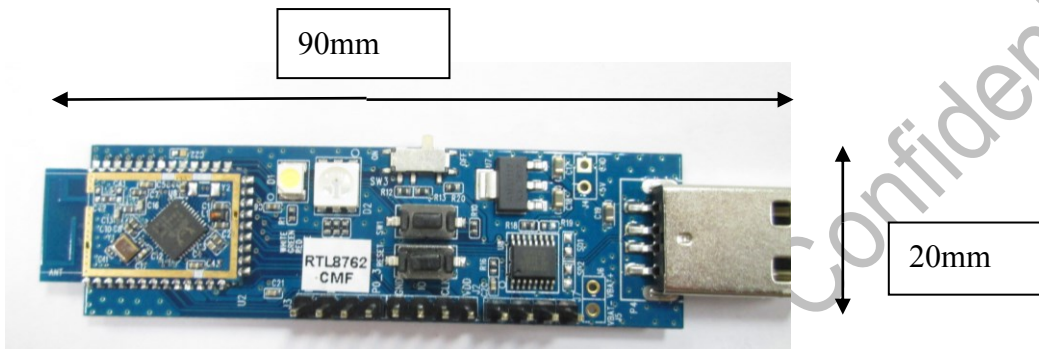


RB8762CMF-D Mechanical Dimensions & Pin Definitions

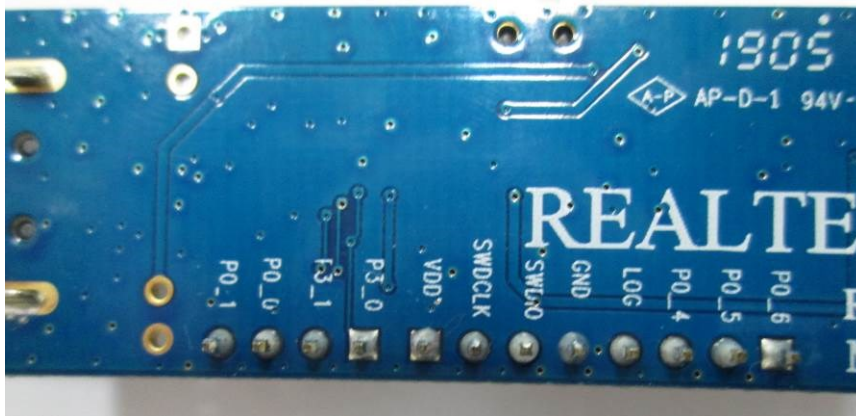
Size:

RB8762CMF-D= 90 x 20 x 5.6 mm

Unit: mm



Pin Define:



Layout Design Suggestions

General Layout Rules:

All Printed Circuit Boards must comply with UL94 V0 standard for flammability. Always use RoHS compliant Parts and materials.

Suggestions for Layout:

Step 1. Do not place Power circuit, X'tal, Inductor, etc. near RF area.

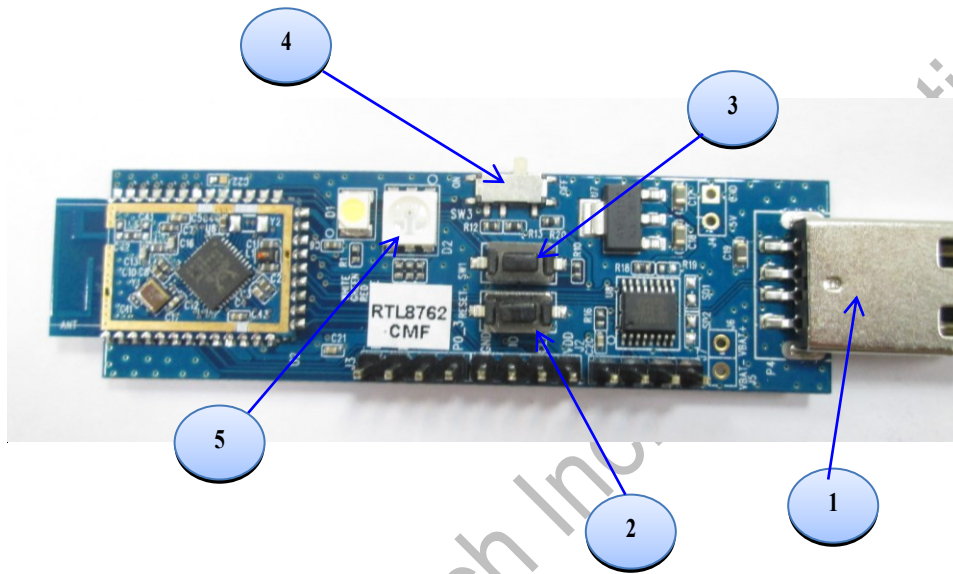
Step 2. The bigger Antenna clearance area, the better. The Antenna itself needs to stay away from any circuit or component at least 3mm. Antenna clearance area means Top and Bottom both required to be cleared.

Step 3. Do not use metal materials on design where near Antenna area. For example, battery snaps, USB connector, iron case, etc.

These guidelines are for design reference; real performance still depends on actual design.

RB8762CMF EVK Development Board Figure and Functions

The RB8762CMF-MB Development Board has white silkscreen legend located by the switches and connectors described below.



1. USB connector
2. Active button
3. RESET button
4. Power switch
5. MESH LED

Operating RB8762CMF-D

Introduction:

Radicom provides RTL8762CMF Development Kit as a quick platform for testing. Each RTL8762CMF DONGLE has an USB connector interface.

If you use **USB** interface to transmit your data, please plug one USB cable to USB connector and insert a 4piece jumper into J13 (as below). This USB connector can work as power supply and data transmission at the same time. With USB interface, you may use [AT-command](#) (at-i) to check information of RTL8762CMF dongle

After above connection, you can issue AT commands to instruct the modules to establish a Bluetooth connection to transmit and receive data through this USB-UART interface.



※The actual data transportation is USB to UART Bridge Virtual COM Port for this usage.

Please download FT232 USB driver from below link:

<http://www.silabs.com/products/mcu/pages/usbtouartbridgevcpdrivers.aspx>

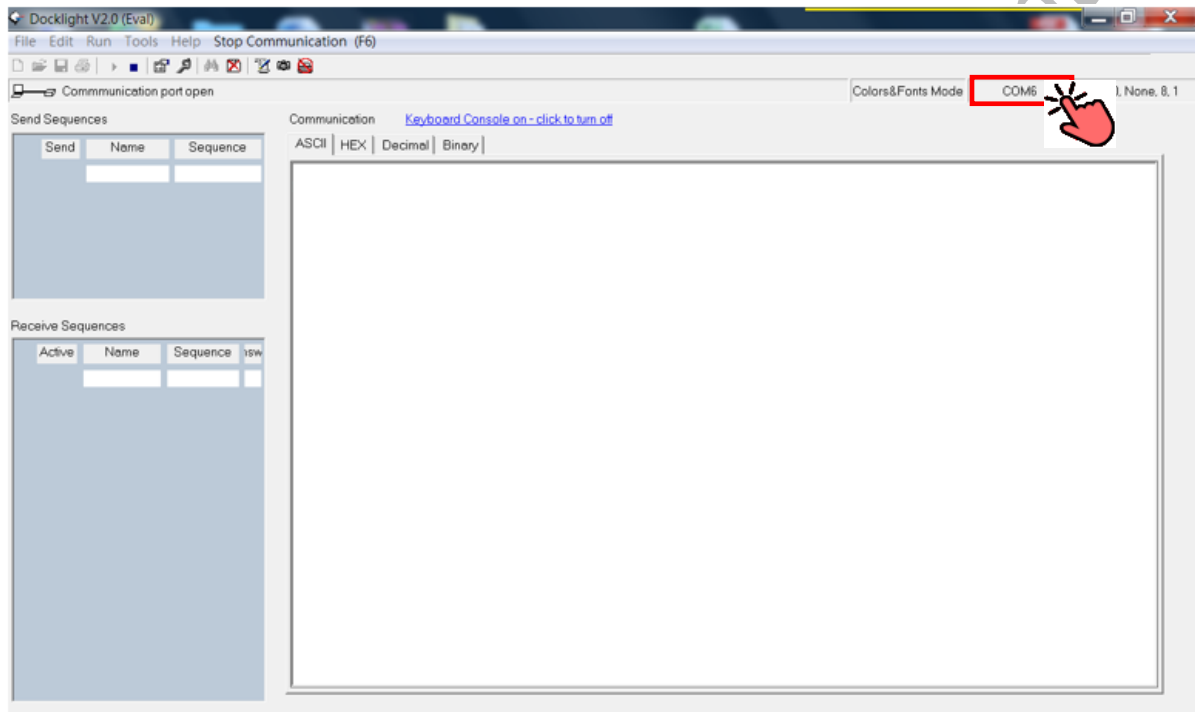
Hardware Set-up - To provide power to the RB8762CMF-MB, plug one end of the USB cable into USB connector on the RB8762CMF-MB. Plug the other end into the PC USB port.

Pending

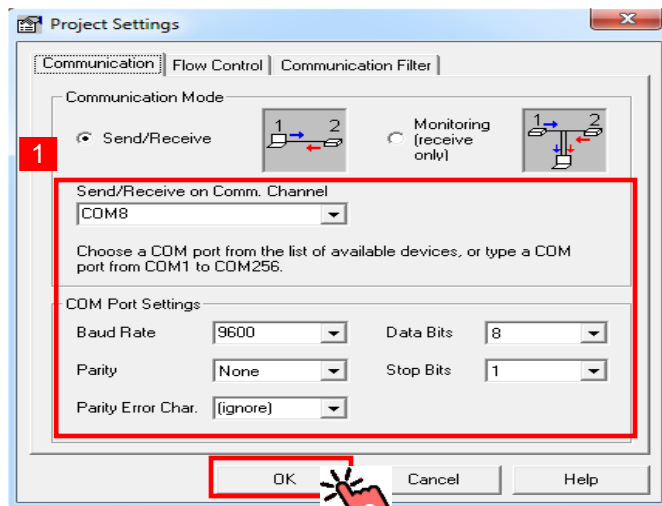
PC Set-up - Turn on the PC. To send the AT commands and transmit & receive data with the RB8762CMF-MB use a serial communication package such as Docklight. Set the appropriate COM port for each side with the DTE speed set to 9600 and parity set to 8N1.

Docklight setting is as follows:

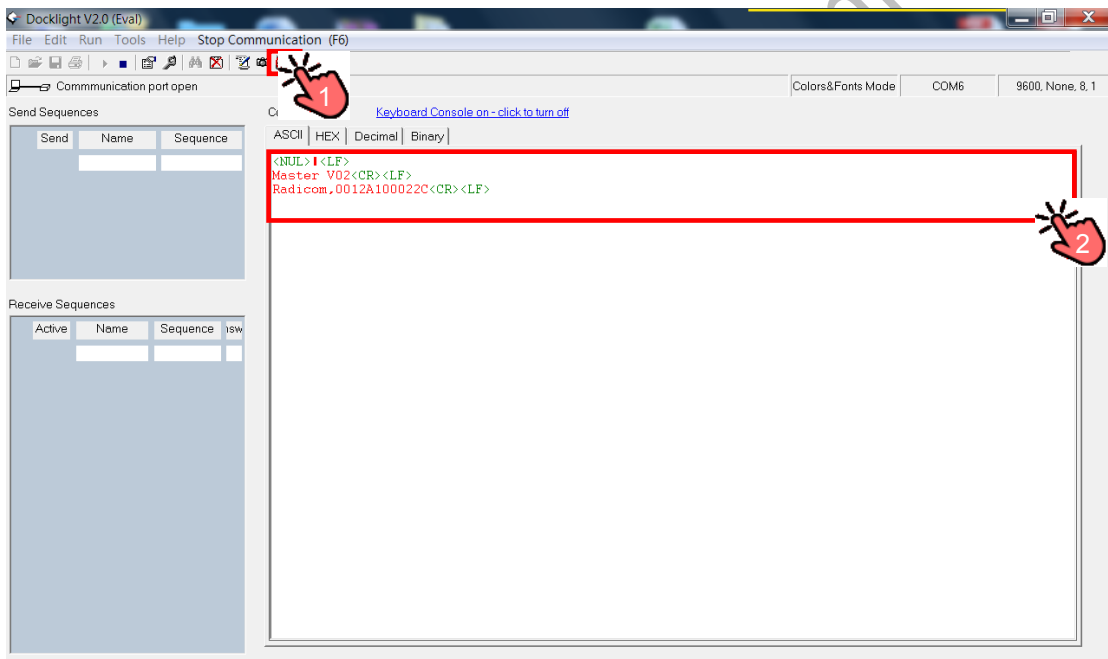
Step 1. Click upper-right corner of Docklight (as below) to enter “Project Settings”.



Step 2. Enter “Project Settings” and choose the appropriate COM port. Then set “COM Port Settings” as: **Baud rate: 9600, 8 data bits, None parity, 1 stop bits and None flow control.** Click “OK” to complete setting.



Step 3. After these steps, power on the RB8762CMF-MB and you'll see device information as below.



※ Actual version of RB8762CMF-MB and BT device address might be different as above.
If you want to know the latest FW version, please contact Radicom.

Supported AT Command List

AT Commands	Slave Side	Master Side	Description
at	√	√	Test UART channel
at+laddr	√	√	Read BD address
at+name	√	√	Read device name
at+name<Parameter>	√	√	Set device name(Max. length=16 byte) Default name is “Radicom”. After changing name, you should use “at+reset\r\n” command and the new name will work.
at+baud	√	√	Check current Baud rate.
at+baud< Parameter>	√	√	Set Baud rate. Parameter range(1, 2,...,9): 1: 1200bit/s 2: 2400bit/s 3: 4800bit/s 4: 9600bit/s 5: 19200bit/s 6: 38400bit/s 7: 57600bit/s 8: 115200bit/s 9: 230400bit/s(USB only)
at+role	√	√	Check the role of device.
at+role< Parameter>	√	√	Role setting. Parameter range(0,1,2): 0: slave device 1: master device 2: OTA
at+inq	Invalid	√	Get slave device’s BD address (Max.=10 slave, sequence number 0-9)
at+sinq	Invalid	√	Stop searching for BT device. *Must-do step, or master device will keep searching.
at+conn< Parameter>	Invalid	√	Connect a slave device. *Input parameter from “AT+INQ”.

AT Commands	Slave Side	Master Side	Description
at+i	√	√	Check role, FW version, device name and BD address
at+adv	√	Invalid	Check the setting of advertising
at+adv< Parameter>	√	Invalid	Set advertising. 1:Enable 0:Disable
at+reset	√	√	Reboot the device

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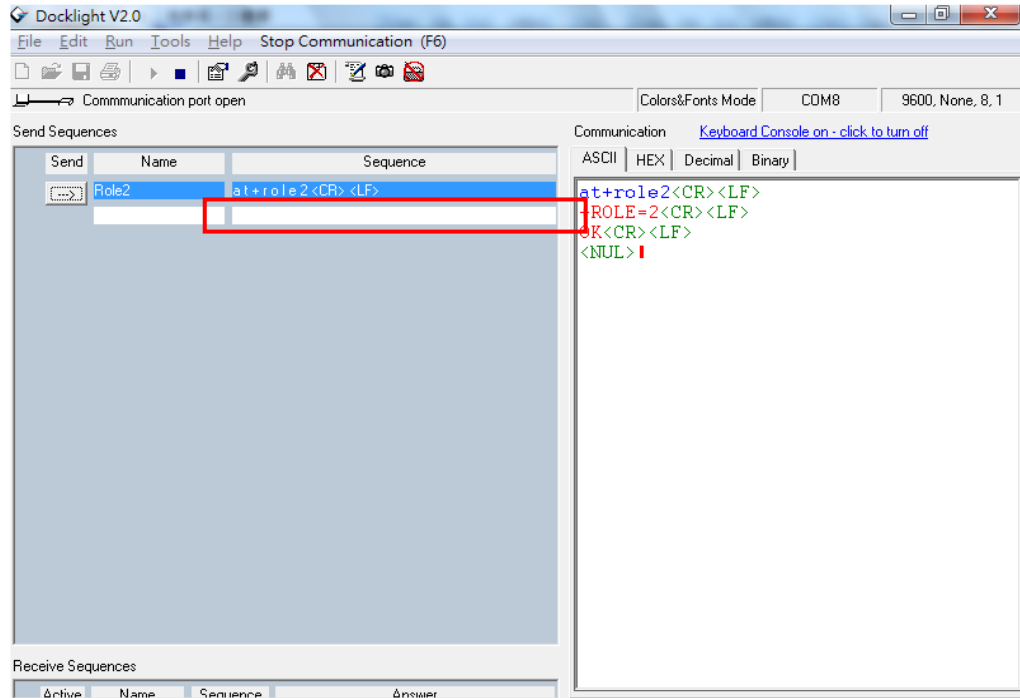
OTA Upgrade Firmware

This chapter will show you how to use OTA to upgrade firmware.

Step 1. Plug in USB cable to power on RB8762CMF-MB.

Step 2. Follow [page14](#) to setup RB8762CMF-MB with Docklight

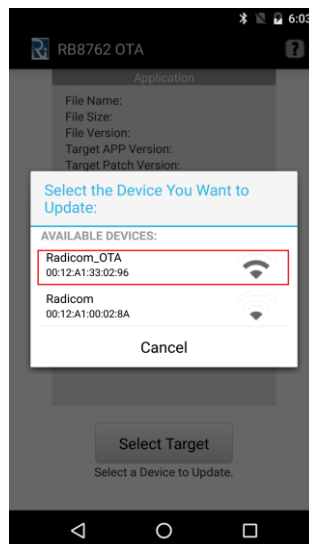
Step 3. Issue “`at+role2<CR><LF>`” to enter OTA mode(as below)



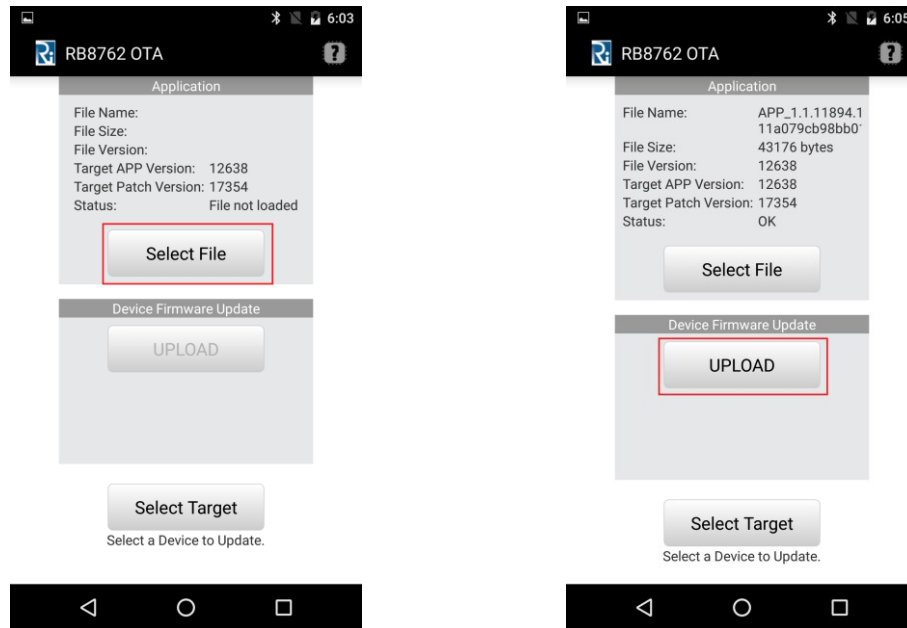
Step 4. Install OTA APP (OTA.apk) in your Android smart phone.

Step 5. Upload the latest firmware file into your smart phone.

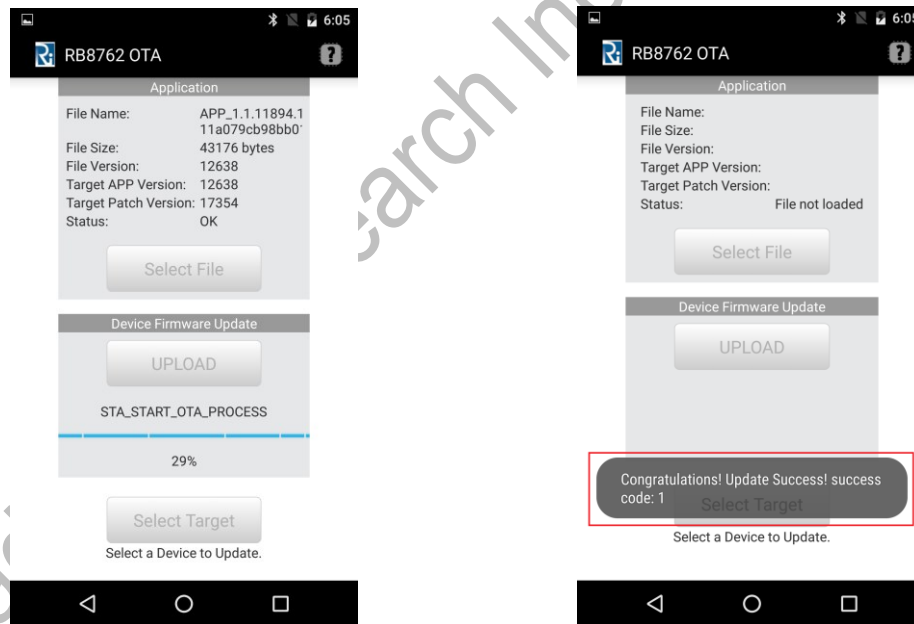
Step 6. Launch OTA APP and search for “Radicom_OTA” device. Then click the device to enter next step.



Step 7. Click “Select File” from APP. Click “UPLOAD”.



Step 8. The firmware upgrade will start immediately. Once the screen shows “Update Success!” means firmware upgrade successfully.



Step 9. When new firmware upgraded successfully through OTA, you must return RB8762CMF-MB to its original mode (master/slave). Issue “**at+role0<CR><LF>**” to enter slave mode and “**at+role1<CR><LF>**” to enter master mode.

How to access RB8762CMF from smartphone

The RB8762CMF can support two mainly platform for smartphone (iOS and Android). You can access RB8762CMF from smartphone by 3rd app or your own designed app. Here we provide some notes for access RB8762CMF from smartphone, also some examples.

※This chapter assumes that the reader has a basic understanding of the BLE specification including some knowledge of service, characteristic and transfer protocols.

1. BLE support

The Android system applies to version 4.3 or above and requires Bluetooth Low Energy (BLE) support. iOS system are fully supported iPhone 4S and above devices.

2. Data transfer Service

Under BLE communication architecture, each BLE Device will be in accordance with the different applications to provide different Services. The RB8762CMF provides a Service to achieve data transfer with smartphone. Service related information are shown below.

Service uuid: 0000E0FF-3C17-D293-8E48-14FE2E4DA212

Characteristic uuid: 0000FFE1-0000-1000-8000-00805F9B34FB

3. Test RB8762CMF APP in google play and APP store

There're many BLE related application you can find in in both google play(Android) and App store(iOS). Or you may use below app to test RB8762CMF module.

In Android

[BLE Scanner: Read, Write, Notify](#)

In iOS

[LightBlue® Explorer](#)

4. Customized APP

If you want to build your own BLE APP, please refer to below official documents and examples.

Android

Documentation

<https://developer.android.com/guide/topics/connectivity/bluetooth-le.html>

Example

<https://github.com/googlesamples/android-BluetoothLeGatt/#readme>

iOS

Documentation

https://developer.apple.com/library/content/documentation/NetworkingInternetWeb/Conceptual/CoreBluetooth_concepts/CoreBluetoothOverview/CoreBluetoothOverview.html#//apple_ref/doc/uid/TP40013257-CH2-SW1

Example

https://developer.apple.com/library/content/samplecode/BTLE_Transfer/BTLE_Transfer.zip

The wired method upgrades RB8762CMF firmware code

1. Software platform and software

Windows 7 Service Pack 1, BeeMPTool2.0.5,

App image: APP_1.1.11894.12638-0d68345b87439211a079cb98bb0

(The app image will change for each release.)

2. Hardware type:

Pending

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FCC & IC Label and Model Identification

Pending

The RB8762CMF module family is FCC Part 15 and IC (Industry Canada) certified. The RB8762CMF is also CE marked. The modules are labeled with the RB8762CMF module model number and FCC Part 15 ID, IC registration number and CE mark. The label can be found on top of the metal shielding on the RB8762CMF Module.

Note: Models RB8762CMF-HM will have an additional Product ID label containing the HM model number.



Important Regulatory Compliance and User Information

The final product with the modules installed needs to be tested for FCC Part 15, IC (Industry Canada) CE, EMI/RFI compliance. Radicom certification documentation will help streamline the final product approval process. Contact Radicom for more information. To maintain compliance in the finished product, carefully follow guidelines in this section. This device is intended only for OEM integrators under the following condition:

The transmitter module may not be co-located with any other transmitter or antenna. As long as this condition is met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance requirements required with the module installed (for example, digital device emissions, PC peripheral requirements, etc).

IMPORTANT NOTE: In the event that this condition cannot be met then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

Host (End Product) Labeling Requirements

To maintain compliance, the end product hosting the module must be properly labeled to identify that this module is installed. The final end product must have a label located in a visible area with the following information:



XXXXXXX is for the model of the module used in the end equipment. The XXXXXXXX will be RB8762CMF, RB8762CMF-HM. The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device's expected lifetime. These requirements may be met either by a separate label or nameplate permanently attached to the device or by permanently imprinting or impressing the label directly onto the device. The label text shall be legible without the aid of magnification, but is not required to be larger than 8-point font size.

End User Information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF Exposure compliance. The end user should NOT be provided any instructions on how to remove or install the device. The user's manual for end users must include the following information in a prominent location.

FCC RF Radiation Exposure Statement

IMPORTANT NOTE: To comply with the FCC RF exposure compliance requirements, this device must not be co-located or operating in conjunction with any antenna or transmitter. This device contains a low power transmitter. When this device is operational, use only with the supplied, or recommended antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations. Changes or modifications not expressly approved by the manufacturer or party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- (1) This device may not cause harmful interference
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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 and radiates radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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 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 assistance.

IC (Industry Canada) Statement:

“This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device”

Le present appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de license. L'exploitation est autorisee aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit acceptor tout brouillage radioelectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

CE Declaration of Conformity


For the following equipment:

Radicom Research, Inc. Bluetooth Module

Model(s): RB8762CMF, RB8762CMF-HM

are herewith confirmed to comply with the requirements set out in the Council (European parliament) Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility of Radio and Telecom device (2014/53/EU). For the evaluation regarding this Directive, the following standards were applied:

EN 61000-4-2:2010, EN 300 328 V2.1.1:2016, EN 62311: 2008,
EN 61000-4-3:2010, EN 301 489-17 V2.1.1: 2009-05, EN301 489-1 V1.92,
EN 60950-1:2006+A11:2009+A1: 2010+A12:2011,

This equipment is marked with  and can be used throughout the European community.

France – 2.4GHz for Metropolitan France:

In all Metropolitan departments, wireless LAN frequencies can be used under the following conditions, either for public or private use:

- Indoor use: maximum power (EIRP*) of 100 mW for the entire 2400-2483.5 MHz frequency band
- Outdoor use: maximum power (EIRP*) of 100 mW for the 2400-2454 MHz band and with maximum power (EIRP*) of 10 mW for the 2454-2483 MHz band

Europe – R&TTE Compliance Statement:

Hereby, Radicom Research Inc. declares that this equipment complies with the essential requirements and other relevant provisions of LVD 2014/53/EU and EMC 2014/30/EU OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of April 14, 2014 on Radio Equipment Directive (RED) 2014/53/EU and the mutual recognition of their conformity.

Limited Warranty

Warranty Coverage and Duration

Radicom Research, Inc. (“RRI”) warrants to the original purchaser its RRI-manufactured products (“Product”) against defects in material and workmanship under normal use and service for a period of one year from the date of delivery. During the applicable warranty period, at no charge, RRI will, at its option, either repair, replace or refund the purchase price of this Product, provided it is returned in accordance with the terms of this warranty to RRI. Repair, at the option of RRI, may include the replacement of parts, boards or other components with functionally equivalent reconditioned or new parts, boards or other components. Replaced parts, boards or other components are warranted for the balance of the original applicable warranty period. All replaced items shall become the property of RRI.

RRI MAKES NO GUARANTEE OR WARRANTY THAT THE PRODUCT WILL PREVENT OCCURRENCES, OR THE CONSEQUENCES THEREOF, WHICH THE PRODUCT IS DESIGNED TO DEFECT.

This expressed limited warranty is extended by RRI to the original end-user purchaser only, and is not assignable or transferable to any other party. This is the complete warranty for the Product manufactured by RRI, and RRI assumes no obligation or liability for additions or modifications to this warranty. In no case does RRI warrant the installation, maintenance or service of the Product. RRI is not responsible in any way for any ancillary equipment not furnished by RRI that is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment and all such equipment is expressly excluded from this warranty. Because of wide variations in topographical and atmospheric conditions, which may require availability of repeater stations or of particular radio frequencies, RRI assumes no liability for range, coverage or suitability of the Product for any particular application. Buyer acknowledges that RRI does not know a particular purpose for which buyer wants the Product, and that buyer is not relying on RRI’s skill and judgment to select or furnish suitable goods.

What this Warranty does NOT Cover:

1. Defects or damage resulting from use of the Product in other than its normal and customary manner.
2. Defects or damage from misuse, accident or neglect.
3. Defects of damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment.
4. Disassembly or repair of the Product in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim.
5. Any Product that has had its serial number or date code removed or made illegible.

How to Receive Warranty Service:

To obtain warranty service, contact RRI by phone (408) 383 9006 for RMA Department and RMA (Return Merchandise Authorization) number. Deliver or send the Product, transportation and insurance prepaid to RRI, with the RMA number clearly marked on the outside of the package.

General Provision

This warranty sets forth the full extent of RRI's responsibilities regarding the Product. Repair, replacement or refund of the purchase price, at RRI's option, is the exclusive remedy. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY APPLICABLE IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTY OF MERCHANTABILITY, ARE LIMITED TO THE DURATION OF THIS LIMITED WARRANTY. TO THE FULLEST EXTENT PERMITTED BY LAW, RRI DISCLAIMS ANY LIABILITY FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVING OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE OR FAILURE OF SUCH PRODUCT.

Contacting Radicom Research

If more information or technical support is needed, please contact us:



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