RAYTAC

勁達國際電子有限公司
新北市中和區建康路 3 號 5 樓
Tel: +886-2-32340208　　　Fax: +886-2-32340547

Approval Sheet
(　　　　)

BT 4.0 Module (Nordic nRF51822)

MDBT40-P128 (128K) / MDBT40-P256 (256K)

Approved	Checked	Designed

The Merit of Raytac MDBT40-P Module

1. Long Working Distance (Over 60M in open space)

2. Declaration ID includes all Nordic applied profiles.

3. FCC (USA), Telec (Japan), NCC (Taiwan) certificate & CE(EU)

report granted.

Index

1. Overall Introduction

Raytac's MDBT40-P is a BT4.0 & BT4.1 stack (Bluetooth low energy or BLE) module designed based on Nordic nRF518xx SoC solution which incorporates: GPIO, UART, I2C and ADC interfaces for connecting peripherals and sensors.

The features of the module:

1. Dual Transmission Mode of BLE & RF 2.4G upon customer preference.

2. Compact size with (L) 18 x (W) 10 x (H) 3.2 mm

3. Low power requirements, ultra-low peak, average and idle mode power consumption.

4. Compatible with a large installed based of mobile phones, tablets and computers.

5. Fully coverage of BLE software stack including:

Proximity Profile; Heart Rate Profile; Health Thermometer Profile;
Blood Pressure Profile; Running Speed & Cadence Profile;
HID Over GATT Profile; Alert Notification Profile; Glucose Profile;
Cycling Speed & Cadence Profile

Fully support customers to suit the needs of any application!

6. BLE & RF transmission switching may help products fit all operation system

7. BLE & RF transmission switching may help products fit all kinds of hardware.

1.1 Applications

. Computer peripherals and I/O devices

. Mouse

. Keyboard

. Multi-touch track pad

. Interactive entertainment devices

. Remote control

. 3D Glasses

. Gaming controller

. Personal Area Networks

. Health/fitness sensor and monitor devices

. Medical devices

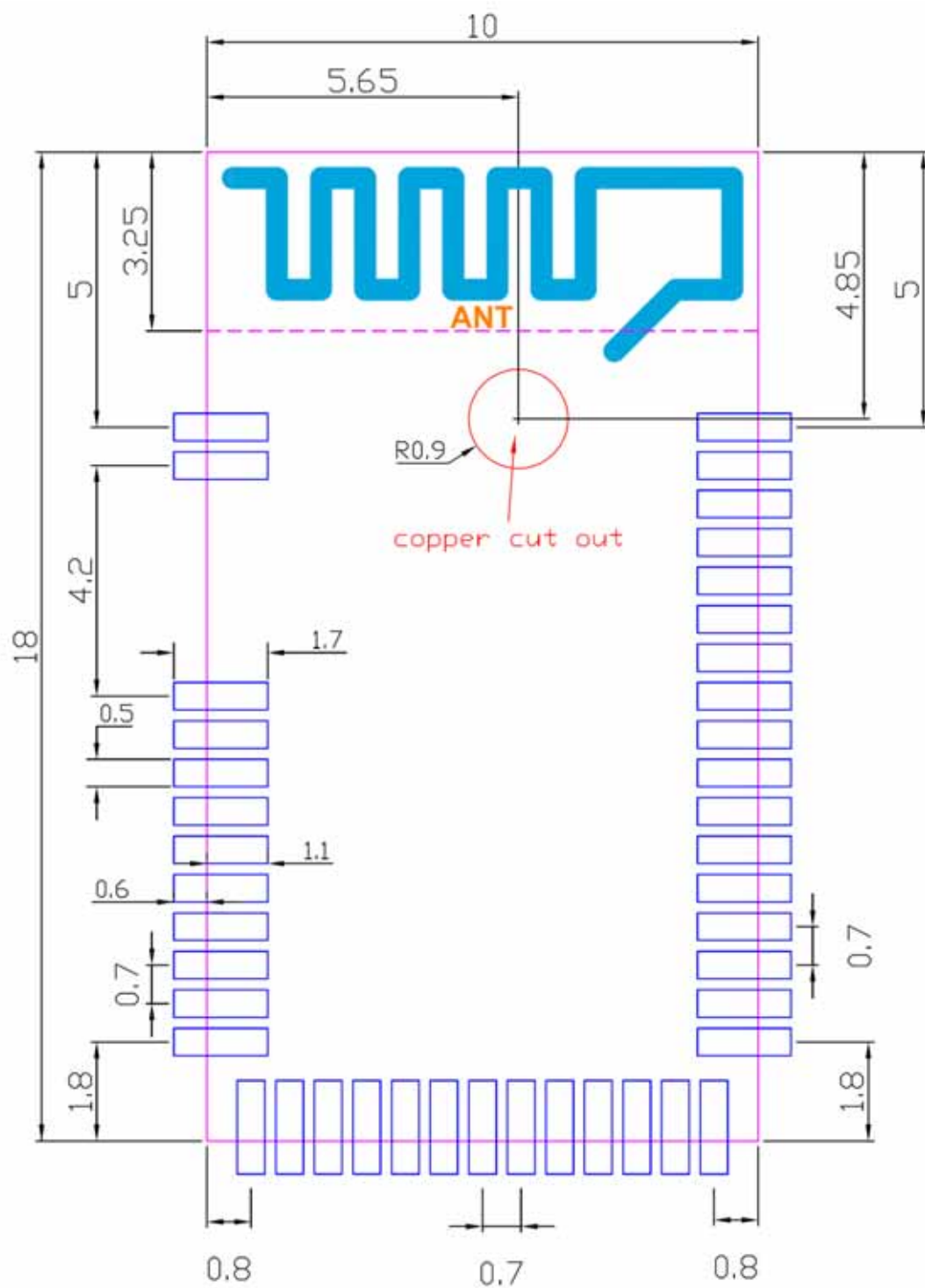. Key-fobs + wrist watch

. Remote control toys

1.2 Features

- . 2.4GHZ transceiver
    - . -93dbm sensitivity in Bluetooth low energy mode
    - . TX Power -20 to +4dbm
    - . RSSI (1db resolution)
- . ARM Cortex – M0 32 bit processor
    - .Serial Wire Debug (SWD)
- . S100 series SoftDevice ready
- . Memory
    - . 256kb or 128kb embedded flash program, memory
    - . 16kb RAM
- . Support for non-concurrent multiprotocol operation
    - . On-air compatibility with nRF24L series
- . Flexible Power Management
    - . Supply voltage range 1.8V to 3.6V
    - . 2.5us wake-up using 16MHz RCOSC
    - . 0.6uA @ 3V mode
    - . 1.2uA @ 3V in OFF mode + 1 region RAM retention
    - . 2.6uA @ 3V ON mode, all blocks IDLE
- . 8/9/10 bit ADC- 8 configurable channels
- . 31 General Purpose I/O Pins
- . One 32 bit and two 16 bit timers with counter mode
- . SPI Master
- . Two-wire Master (I2C compatible)
- . UART (CTS/RTS)
- . CPU independent Programmable Peripheral Interconnect (PPI)
- . Quadrature Decoder (QDEC)
- . AES HW encryption
- . Real Timer Counter (RTC)

1.3 Profile & Service Information

Profile & Service below are supported by MDBT40-P.

Profile Description	Service Description
Alert Notification Profile	Alert Notification Service
Blood Pressure Profile	Blood Pressure Service
	Device Information Service
Cycling Speed & Cadence Profile	Cycling Speed & Cadence Service
	Device Information Service
Glucose Profile	Glucose Service
	Device Information Service
Health Thermometer Profile	Health Thermometer Service
	Device Information Service
Heart Rate Profile	Heart Rate Service
	Device Information Service
HID over GATT Profile	HID Service
	Battery Service
Proximity Profile	Link Loss Service
	Immediate Alert Service
	TX Power Service
Running Speed & Cadence Profile	Running Speed & Cadence Service
	Device Information Service

2. Product Dimension

2.1 PCB Dimensions, & Pin Indication & Layout Guide

PCB SIZE   10 x18 (mm)

10

5.65

3.25

5

ANT

R0.9

copper cut out

4.85

5

18

4.2

1.7

0.5

1.1

0.6

0.7

0.7

1.8

1.8

0.8

0.7

0.8

Top View（單位：mm）

recommended solder pad layout

2.2 Pin Assignment

Pin No.	Name	Pin function	Description
(1)(2)	GND	Ground	The pad must be connected to a solid ground plane
(3)	AVDD	Power	Analog power supply
(4)	P0.21	Digital I/O	General-purpose digital I/O
(5)	P0.22	Digital I/O	General-purpose digital I/O
(6)	P0.23	Digital I/O	General-purpose digital I/O
(7)	P0.24	Digital I/O	General-purpose digital I/O
(8)	P0.25	Digital I/O	General-purpose digital I/O
(9)	P0.26	Digital I/O	General-purpose digital I/O
	AIN0	Analog input	ADC input 0
	XL2	Analog output	Connector for 32.768KHz crystal
(10)	P0.27	Digital I/O	General-purpose digital I/O
	AIN1	Analog input	ADC input 1
	XL1	Analog input	Connector for 32.768KHz crystal or external 32.768KHz clock reference
(11)	P0.28	Digital I/O	General-purpose digital I/O
(12)	P0.29	Digital I/O	General-purpose digital I/O
(13)	GND	Ground	The pad must be connected to a solid ground plane
(14)	VDD	Power	Power supply
(15)	DCC	Power	DC/DC output voltage to external LC filter
(16)	P0.30	Digital I/O	General-purpose digital I/O
(17)	P0.00	Digital I/O	General-purpose digital I/O
	AREF0	Analog input	ADC Reference voltage
(18)	P0.01	Digital I/O	General-purpose digital I/O
	AIN2	Analog input	ADC input 2
(19)	P0.02	Digital I/O	General-purpose digital I/O
	AIN3	Analog input	ADC input 3
(20)	P0.03	Digital I/O	General-purpose digital I/O
	AIN4	Analog input	ADC input 4
(21)	P0.04	Digital Input	General-purpose digital I/O
	AIN5	Analog input	ADC input 5
(22)	P0.05	Digital I/O	General-purpose digital I/O
	AIN6	Analog input	ADC input 6

Pin No.	Name	Pin function	Description
(23)	P0.06	Digital I/O	General-purpose digital I/O
	AIN7	Analog input	ADC input 7
	AREF1	Analog input	ADC Reference voltage
(24)	P0.07	Digital I/O	General-purpose digital I/O
(25)	GND	Ground	The pad must be connected to a solid ground plane
(26)	P0.08	Digital I/O	General-purpose digital I/O
(27)	P0.09	Digital I/O	General-purpose digital I/O
(28)	P0.10	Digital I/O	General-purpose digital I/O
(29)	P0.11	Digital I/O	General-purpose digital I/O
(30)	P0.12	Digital I/O	General-purpose digital I/O
(31)	P0.13	Digital I/O	General-purpose digital I/O
(32)	P0.14	Digital I/O	General-purpose digital I/O
(33)	P0.15	Digital I/O	General-purpose digital I/O
(34)	P0.16	Digital I/O	General-purpose digital I/O
(35)	SWDIO/RESET	Digital I/O	System reset(active low).Also HW debug and flash Programming
(36)	SWDCLK	Digital input	HW debug and flash programming. Connect a 12K ohm resister to GND for flash programming .
(37)	P0.17	Digital I/O	General-purpose digital I/O
(38)	P0.18	Digital I/O	General-purpose digital I/O
(39)	P0.19	Digital I/O	General-purpose digital I/O
(40)	P0.20	Digital I/O	General-purpose digital I/O
(41)	DEC2	Power	Power supply decoupling. Low voltage mode VCC
(42)	GND	Ground	The pad must be connected to a solid ground plane

[1] Digital I/O pad with 5mA source/sink capability.

3. Main Chip Solution

RF IC	Crystal Frequency
Nordic NRF51822/QFN48	16MHZ

4. Shipment Packaging Information

Model	Marking (in Dot)	Photo
MDBT40-P128	Black	
MDBT40-P256	Red	

- Packaging Type: Tray

- Minimum Package Quantity (MPQ): 88 pcs per Tray

- Contents in Carton: 1760 pcs per Carton (20 Full Tray + 1 Empty Tray)

- Dimension of Carton: 37.5*21*13 cm (±1 cm)

Remark: Packing may be subject to change without further notice.

5. Specification

5.1 Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit
Supply voltages				
VDD		-0.3	+3.6	V
DEC2[1]			2	V
VSS			0	V
I/O pin voltage				
VIO		-0.3	VDD + 0.3	V
Environmental QFN48 package				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		2	
ESD HBM	Human Body Model		4	kV
ESD CDM	Charged Device Model		750	V
Flash memory				
Endurance		20 000		write/erase cycles
Retention		10 years at 40 °C		
Number of times an address can be written between erase cycles			2	times

5.2 Operation Conditions

Symbol	Parameter	Notes	Min.	Typ.	Max.	Units
VDD	Supply voltage, normal mode		1.8	3.0	3.6	V
VDD	Supply voltage, normal mode, DC/DC converter output voltage 1.9 V		2.1	3.0	3.6	V
VDD	Supply voltage, low voltage mode	1	1.75	1.8	1.95	V
t_{R_VDD}	Supply rise time (0 V to 1.8 V)	2			60	ms
T_A	Operating temperature		-25	25	75	°C

5.3 Electrical Specifications

5.3.1 Radio Transceiver

. General Radio Characteristics

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
f_{OP}	Operating frequencies	1 MHz channel spacing	2400		2483	MHz	N/A
PLL_{res}	PLL programming resolution			1		MHz	N/A
$\Delta f250$	Frequency deviation @ 250 kbps			±170		kHz	2
Δf_{1M}	Frequency deviation @ 1 Mbps			±170		kHz	2
Δf_{2M}	Frequency deviation @ 2 Mbps			±320		kHz	2
Δf_{BLE}	Frequency deviation @ BLE		±225	±250	±275	kHz	4
bps_{FSK}	On-air data rate		250		2000	kbps	N/A

. Radio Current Consumption

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
$I_{TX,+4dBm}$	TX only run current @ P_{OUT} = +4 dBm	1		16		mA	4
$I_{TX,0dBm}$	TX only run current @ P_{OUT} = 0 dBm	1		10.5		mA	4
$I_{TX,-4dBm}$	TX only run current @ P_{OUT} = -4 dBm	1		8		mA	2
$I_{TX,-8dBm}$	TX only run current @ P_{OUT} = -8 dBm	1		7		mA	2
$I_{TX,-12dBm}$	TX only run current @ P_{OUT} = -12 dBm	1		6.5		mA	2
$I_{TX,-16dBm}$	TX only run current @ P_{OUT} = -16 dBm	1		6		mA	2
$I_{TX,-20dBm}$	TX only run current @ P_{OUT} = -20 dBm	1		5.5		mA	2
$I_{TX,-30dBm}$	TX only run current @ P_{OUT} = -30 dBm	1		5.5		mA	2
$I_{START,TX}$	TX startup current	2		7		mA	1
$I_{RX,250}$	RX only run current @ 250 kbps			12.6		mA	1
$I_{RX,1M}$	RX only run current @ 1 Mbps			13		mA	4
$I_{RX,2M}$	RX only run current @ 2 Mbps			13.4		mA	1
$I_{START,RX}$	RX startup current	3		8.7		mA	1

1. Valid for data rates 250 kbps, 1 Mbps, and 2 Mbps
2. Average current consumption (at 0 dBm TX output power) for TX startup (130 μs), and when changing mode from RX to TX (130 μs).
3. Average current consumption for RX startup (130 μs), and when changing mode from TX to RX (130 μs).

5.3.2 Transmitter Specifications

Symbol	Description	Min.	Typ.	Max.	Units	Test level
P_{RF}	Maximum output power		4		dBm	4
P_{RFC}	RF power control range	20	24		dB	2
PRFCR	RF power accuracy			±4	dB	1
P_{WHISP}	RF power whisper mode		-30		dBm	2
P_{BW2}	20 dB bandwidth for modulated carrier (2 Mbps)		1800	2000	kHz	2
P_{BW1}	20 dB bandwidth for modulated carrier (1 Mbps)		950	1100	kHz	2
P_{BW250}	20 dB bandwidth for modulated carrier (250 kbps)		700	800	kHz	2
$P_{RF1.2}$	1st Adjacent Channel Transmit Power 2 MHz (2 Mbps)			-20	dBc	2
$P_{RF2.2}$	2nd Adjacent Channel Transmit Power 4 MHz (2 Mbps)			-45	dBc	2
$P_{RF1.1}$	1st Adjacent Channel Transmit Power 1 MHz (1 Mbps)			-20	dBc	2
$P_{RF2.1}$	2nd Adjacent Channel Transmit Power 2 MHz (1 Mbps)			-40	dBc	2
$P_{RF1.250}$	1st Adjacent Channel Transmit Power 1 MHz (250 kbps)			-25	dBc	2
$P_{RF2.250}$	2nd Adjacent Channel Transmit Power 2 MHz (250 kbps)			-40	dBc	2
$t_{TX,30}$	Maximum consecutive transmission time, $f_{TOL} < ±30$ ppm			16	ms	1
$t_{TX,60}$	Maximum consecutive transmission time, $f_{TOL} < ±60$ ppm			4	ms	1

5.3.3 Receiver Specifications

Symbol	Description	Min.	Typ.	Max.	Units	Test level
Receiver operation						
PRX_{MAX}	Maximum received signal strength at < 0.1% PER		0		dBm	1
$PRX_{SENS,2M}$	Sensitivity (0.1% BER) @ 2 Mbps		-85		dBm	2
$PRX_{SENS,1M}$	Sensitivity (0.1% BER) @ 1 Mbps		-90		dBm	2
$PRX_{SENS,250k}$	Sensitivity (0.1% BER) @ 250 kbps		-96		dBm	2
$P_{SENS}IT$ 1 Mbps BLE	Receiver sensitivity: Ideal transmitter		-93		dBm	2
$P_{SENS}DT$ 1 Mbps BLE	Receiver sensitivity: Dirty transmitter		-91		dBm	2
RX selectivity - modulated interfering signal[1]						
	2 Mbps					
C/I_{CO}	C/I co-channel		12		dB	2
C/I_{1ST}	1st ACS, C/I 2 MHz		-4		dB	2
C/I_{2ND}	2nd ACS, C/I 4 MHz		-24		dB	2
C/I_{3RD}	3rd ACS, C/I 6 MHz		-28		dB	2
C/I_{6th}	6th ACS, C/I 12 MHz		-44		dB	2
C/I_{Nth}	Nth ACS, C/I f_i > 25 MHz		-50		dB	2
	1 Mbps					
C/I_{CO}	C/I co-channel (1 Mbps)		12		dB	2
C/I_{1ST}	1st ACS, C/I 1 MHz		4		dB	2
C/I_{2ND}	2nd ACS, C/I 2 MHz		-24		dB	2
C/I_{3RD}	3rd ACS, C/I 3 MHz		-30		dB	2
C/I_{6th}	6th ACS, C/I 6 MHz		-40		dB	2
C/I_{12th}	12th ACS, C/I 12 MHz		-50		dB	2
C/I_{Nth}	Nth ACS, C/I f_i > 25 MHz		-53		dB	2

Symbol	Description	Min.	Typ.	Max.	Units	Test level
	250 kbps					
C/I_{CO}	C/I co-channel		4		dB	2
C/I_{1ST}	1st ACS, C/I 1 MHz		-10		dB	2
C/I_{2ND}	2nd ACS, C/I 2 MHz		-34		dB	2
C/I_{3RD}	3rd ACS, C/I 3 MHz		-39		dB	2
C/I_{6th}	6th ACS, C/I f_i > 6 MHz		-50		dB	2
C/I_{12th}	12th ACS, C/I 12 MHz		-55		dB	2
C/I_{Nth}	N^{th} ACS, C/I f_i > 25 MHz		-60		dB	2
	Bluetooth **Low Energy RX selectivity**					
C/I_{CO}	C/I co-channel		10		dB	2
C/I_{1ST}	1st ACS, C/I 1 MHz		1		dB	2
C/I_{2ND}	2nd ACS, C/I 2 MHz		-25		dB	2
C/I_{3+N}	ACS, C/I (3+n) MHz offset [n = 0, 1, 2, . . .]		-51		dB	2
C/I_{Image}	Image blocking level		-30		dB	2
$C/I_{Image\pm1MHz}$	Adjacent channel to image blocking level (±1 MHz)		-31		dB	2
RX intermodulation[2]						
P_IMD_{2Mbps}	IMD performance, 2 Mbps, 3rd, 4th and 5th offset channel		-41		dBm	2
P_IMD_{1Mbps}	IMD performance, 1 Mbps, 3rd, 4th and 5th offset channel		-40		dBm	2
$P\_IMD_{250kbps}$	IMD performance, 250 kbps, 3rd, 4th and 5th offset channel		-36		dBm	2
P_IMD_{BLE}	IMD performance, 1 Mbps BLE, 3rd, 4th and 5th offset channel		-39		dBm	2

1. Wanted signal level at P_{IN} = -67 dBm. One interferer is used, having equal modulation as the wanted signal. The input power of the interferer where the sensitivity equals BER = 0.1% is presented.
2. Wanted signal level at P_{IN} = -64 dBm. Two interferers with equal input power are used. The interferer closest in frequency is unmodulated, the other interferer is modulated equal with the wanted signal. The input power of interferers where the sensitivity equals BER = 0.1% is presented.

5.3.4 Radio Timing Parameters

Symbol	Description	250 k	1 M	2 M	BLE	Jitter	Units
t_{TXEN}	Time between TXEN task and READY event	132	132	132	140	0	µs
$t_{TXDISABLE}$	Time between DISABLE task and DISABLED event when the radio was in TX	10	4	3	4	1	µs
t_{RXEN}	Time between the RXEN task and READY event	130	130	130	138	0	µs
$t_{RXDISABLE}$	Time between DISABLE task and DISABLED event when the radio was in RX	0	0	0	0	1	µs
$t_{TXCHAIN}$	TX chain delay	5	1	0.5	1	0	µs
$t_{RXCHAIN}$	RX chain delay	12	2	2.5	3	0	µs

5.3.5 RSSI Specifications

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
$RSSI_{ACC}$	RSSI accuracy	Valid between: -50 dBm and -80 dBm			±6	dB	2
$RSSI_{RESOLUTION}$	RSSI resolution			1		dB	1
$RSSI_{PERIOD}$	Sample period		8.8			µs	1
$RSSI_{CURRENT}$	Current consumption in addition to I_{RX}			250		µA	1

5.3.6 CPU

Symbol	Description	Min.	Typ.	Max.	Units	Test level
$I_{CPU, Flash}$	Run current at 16 MHz, Executing code from flash memory		4.4[1]		mA	2
$I_{CPU, RAM}$	Run current at 16 MHz, Executing code from RAM		2.4[2]		mA	1
$I_{START, CPU}$	CPU startup current		600		µA	1
$t_{START, CPU}$	IDLE to CPU execute	0	[3]		µs	1

5.3.7 Power Management

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
$t_{POR, 1\mu s}$	Time Reset is active from VDD reaches 1.7 V with 1 µs rise time		0.2	2.7		ms	1
$t_{POR, 50 ms}$	Time Reset is active from VDD reaches 1.7 V with 50 ms rise time		6.5	29		ms	1
I_{OFF}	Current in SYSTEM-OFF, no RAM retention			0.4		µA	1
$I_{OFF, 8 k}$	Current in SYSTEM-OFF mode 8 kB SRAM retention			0.6		µA	1
$I_{OFF, 16 k}$	Current in SYSTEM-OFF mode 16 kB SRAM retention			0.8		µA	1
I_{OFF2ON}	OFF to CPU execute transition current			400		µA	1
t_{OFF2ON}	OFF to CPU execute			9.6	10.6	µs	1
I_{ON}	SYSTEM-ON base current			2.3		µA	2
I_{1V2}	Current drawn by 1V2 regulator			290		µA	2
t_{1V2}	Startup time for 1V2 regulator			2.3		µs	1
I_{1V7}	Current drawn by 1V7 regulator			90		µA	2
t_{1V7}	Startup time for 1V7 regulator			2	3.6	µs	1
$I_{1V2RC16}$	Current drawn by 1V2 regulator and 16 MHz RCOSC when both are on at the same time	See Table 24		830[1]		µA	1

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
$I_{1V2XO16}$	Current drawn by 1V2 regulator and 16 MHz XOSC when both are on at the same time	See Table 24		740[1]		µA	1
I_{DCDC}	Current drawn by DC/DC converter			300		µA	1
F_{DCDC}	DC/DC converter current conversion factor		0.65[2]		1.2[2]		1
$t_{START,DCDC}$	DC/DC converter startup time		10[2]		425[2]	µs	1

1. This number includes the current used by the automated power and clock management system.
2. F_{DCDC} and $t_{START,DCDC}$ will vary depending on VDD and device internal current consumption (I_{DD}). The range of values stated in this specification is for VDD between 2.1 V and 3.6 V, and I_{DD} between 4 mA and 20 mA. Please refer to the *nRF51 Series Reference Manual*, v1.1 or later, for a method to calculate these numbers based on VDD and I_{DD}.
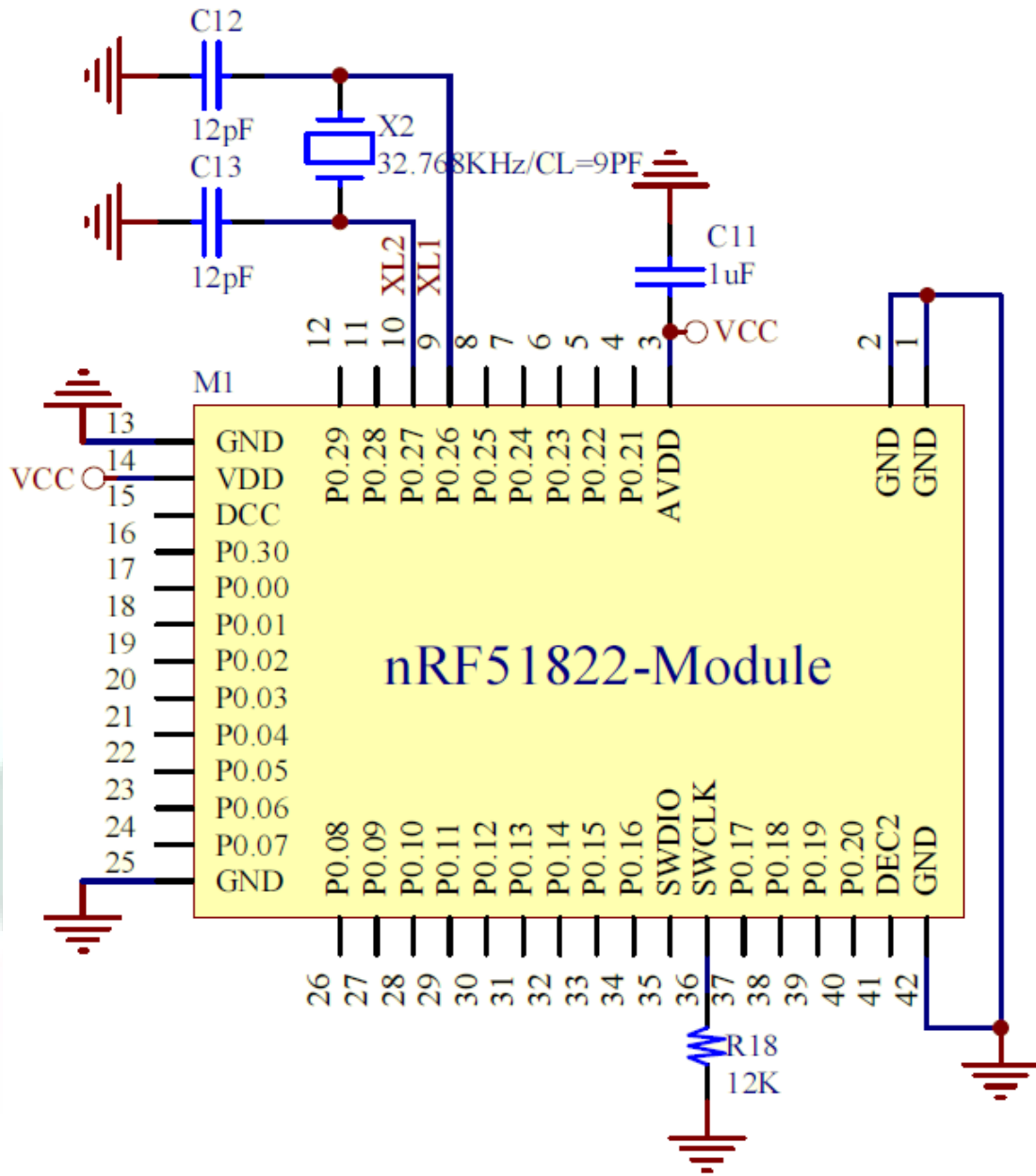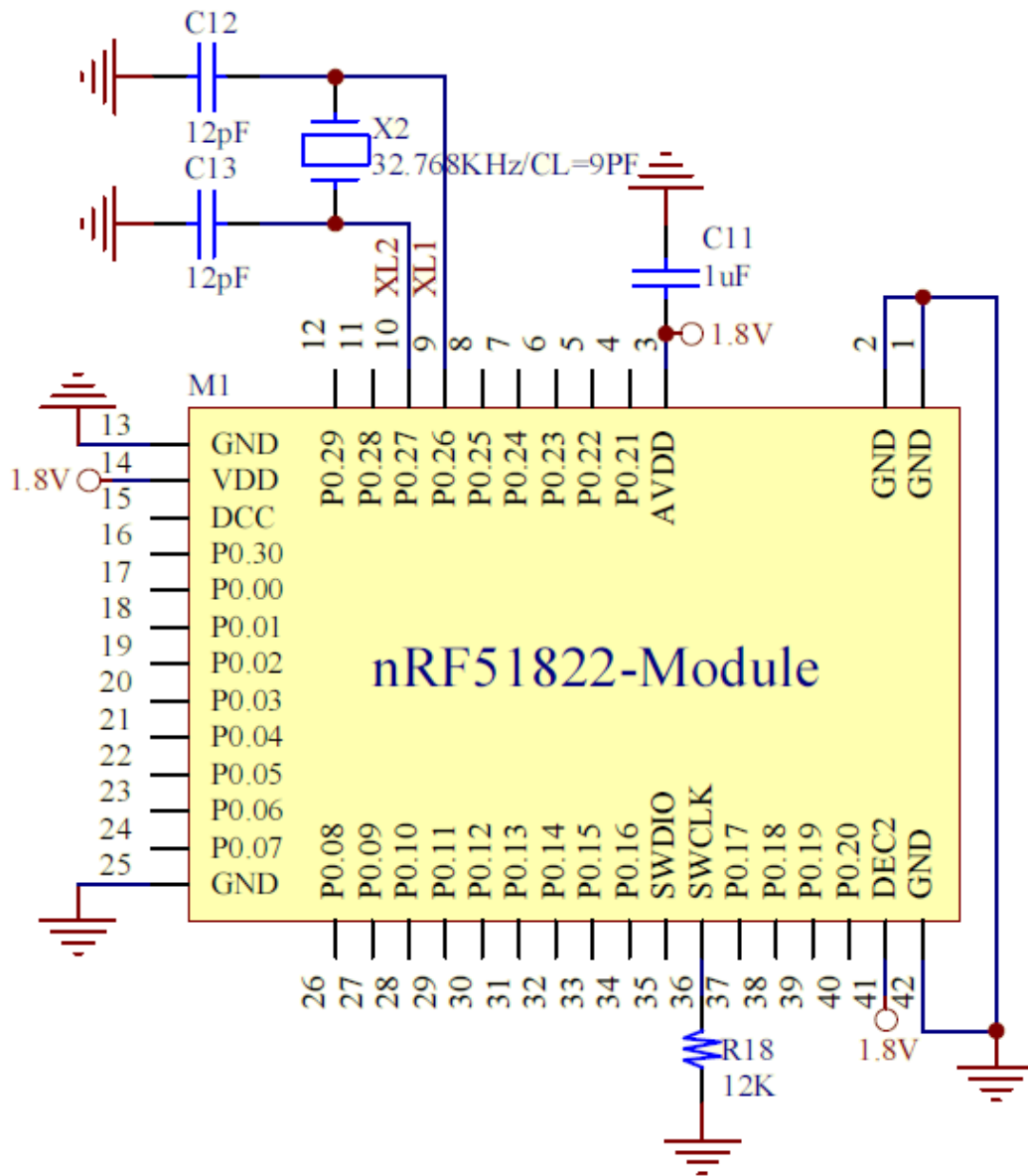
6. Block Diagram
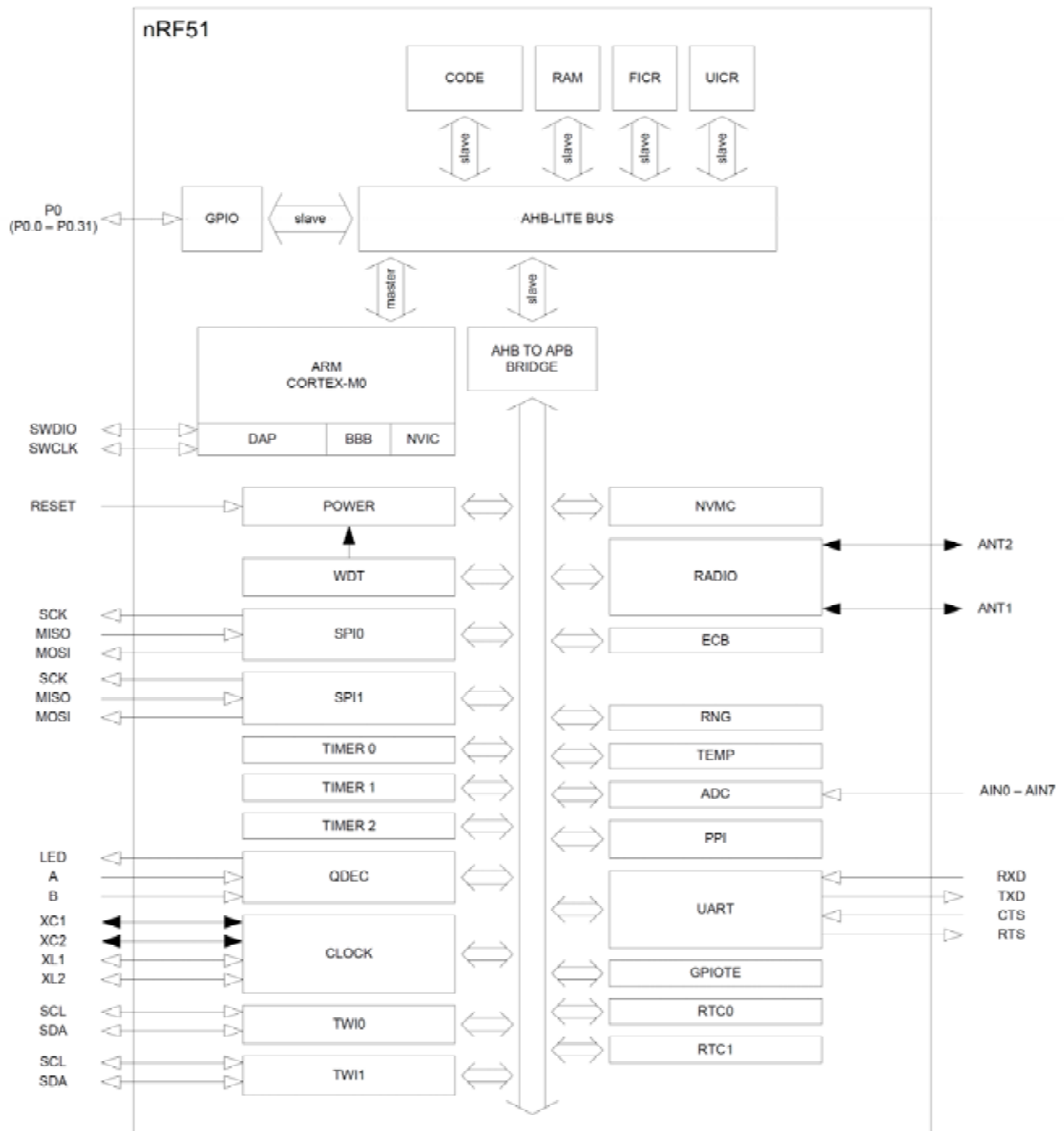
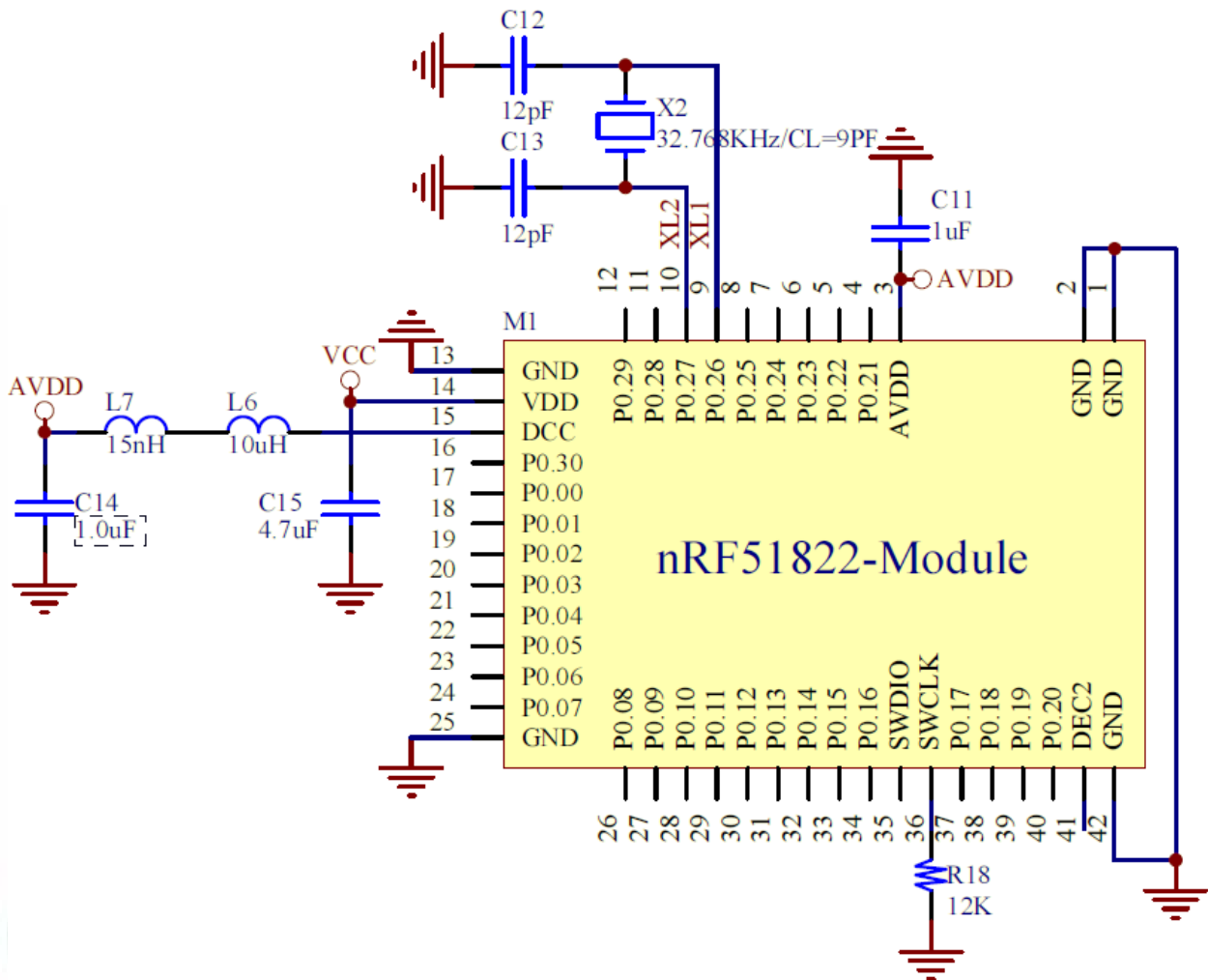**nRF51822 block diagram**

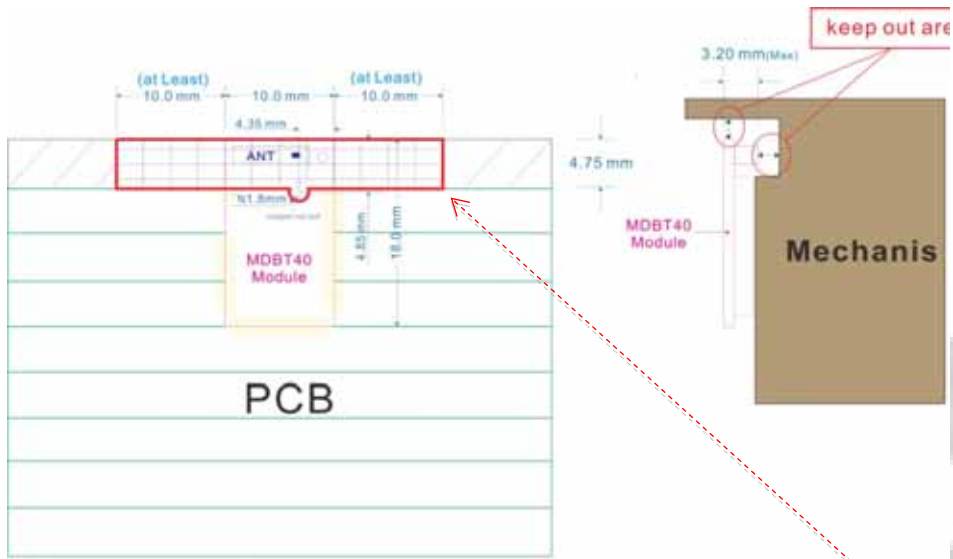# 7. Reference Circuit

7.1 nRF51822 Schematic with Internal LDO

7.2 nRF51822 Schematic with 1.8V Low Voltage Mode

7.3 nRF51822 Schematic with Internal DC/DC Converter

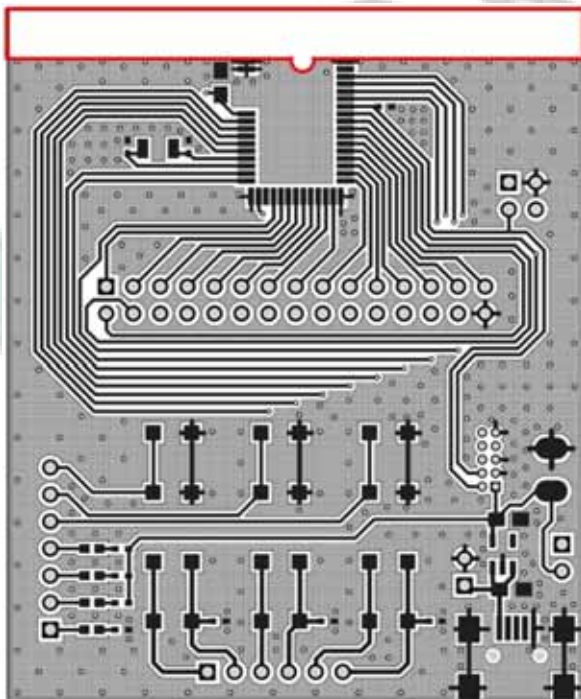# 8. Carrier Keep-Out Area

Ground (as big as possible)

Components (if needed, but as far from antenna as possible)

Keep out area (as wider as possible)

Carrier Board
Keep Out Area

9. Certification

9.1 EPL Certification

EPL Bluetooth® End Product Listing

The Bluetooth SIG Hereby Recognizes

Raytac Corporation
Member Company

MDBT40
Qualified Design Name

Qualified Design ID(s): B020654
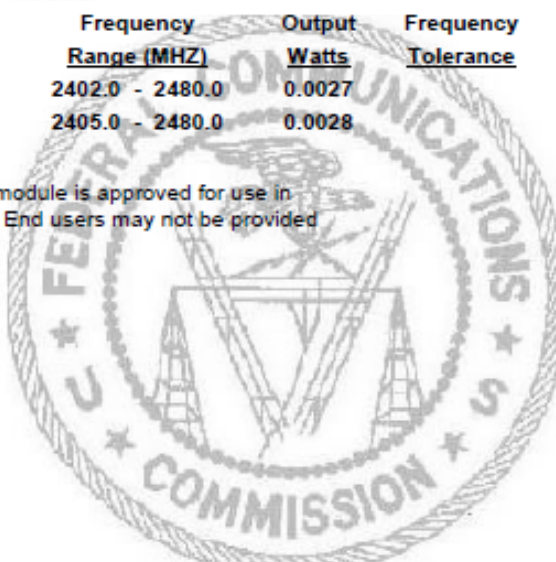
Contact Person: Sharon Chen

Series:

Publish Date: 17 December 2013

EPL Type: Other

This certificate acknowledges the *Bluetooth®* Specifications declared by the member were achieved in accordance with the *Bluetooth* Qualification Process as specified within the *Bluetooth* Specifications and as required within the current PRD

Bluetooth®
SPECIAL INTEREST GROUP

9.2 FCC Certification

TCB

TCB

GRANT OF EQUIPMENT AUTHORIZATION

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

PHOENIX TESTLAB GmbH
Koenigswinkel 10
32825 Blomberg,
Germany

Date of Grant: 02/17/2014

Application Dated: 02/17/2014

Raytac Corp.
5F., No.3, Jiankang Rd., Zhonghe Dist.,
New Taipei City,, 23586
Taiwan

Attention: Venson Liao , R&D Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE,
and is VALID ONLY for the equipment identified hereon for use under the
Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SH6MDBT40
Name of Grantee: Raytac Corp.
Equipment Class: Digital Transmission System
Notes: Bluetooth Module
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2402.0 - 2480.0	0.0027		
	15C	2405.0 - 2480.0	0.0028		

Output power listed is peak conducted. This OEM module is approved for use in
products operating as portable transmitting device. End users may not be provided
with the module installation instructions.

International
Certification
Corp

CERTIFICATE OF COMPLIANCE

Certificate Number: INF412101

This is to certify that the following products have been tested by us with the listed standards and found in conformity with the procedures given in ANSI C63.4-2009 and all tests are performed according to FCC Part 15 and Canada Standard ICES-003 Issue 5 Rules.

This Certificate applies to the tested sample below mentioned only and shall not imply an assessment of the whole production. It is only valid in connection with the test report number: FD412101.

Applicant	:	Raytac Corporation
Product Name	:	BT4.0 module
Model No.	:	MDBT40
Brand Name	:	Raytac

Applied Standards : FCC Part 15, Subpart B, Class B
ICES-003 Issue 5
ANSI C63.4:2009

FC

Kent Chen / Assistant Manager
February 12, 2014

9.3 Telec Certification

PHOENIX TESTLAB

Certificate

No: 14-110771

of
Technical Regulations Conformity
for
Specified Radio Equipment in Japan

PHOENIX TESTLAB GmbH, operating as a Registered Certification Body (RCB ID: 204) with respect to Japan, declares that the listed product complies with the Technical Regulations Conformity Certification of Specified Radio Equipment (ordinance of MPT N°. 37, 1981), Article 2, Paragraph 1, Item 19.

Product description:	**BT4.0 module**
Trademark / model name:	**Raytac / MDBT40**
Family name:	--
Serial No:	--
Software Release No:	--
Type of emissions:	F1D/G1D
Frequency and power:	2402-2480 MHz; 40 ch; 3.0 mW
	2405-2480 MHz; 16 ch; 3.0 mW
Manufacturer:	Raytac Corporation
Address:	5F., No.3, Jiankang Rd., Zhonghe Dist
City:	23586 New Taipei City
Country:	Taiwan

This certificate is granted to:

Certificate holder:	**Raytac Corporation**
Address:	**5F., No.3, Jiankang Rd., Zhonghe Dist**
City:	**23586 New Taipei City**
Country:	**Taiwan**

This certificate has 2 annexes.

PHOENIX TESTLAB GmbH
Königswinkel 10
32825 Blomberg
Tel 0 52 35 / 95 00 0
Fax 0 52 35 / 95 00 10
Signature, Stamp

Blomberg, 17 Feb. 2014
Place, Date

26

9.4 End-Product Label

Customers are suggested using following label content for FCC and TELEC certification.

FCC

Federal Communication Commission Interference Statement

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 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.

FCC Caution:

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

This device complies 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.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

The product comply with the US portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter

This device is intended only for OEM integrators under the following conditions:

1) The transmitter module may not be co-located with any other transmitter or antenna,

As long as 1 condition above is met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is

no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be respon sible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following: "Contains FCC ID: SH6MDBT40".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

TELEC

技術基準認証済みの無線装置を内蔵
204-420020
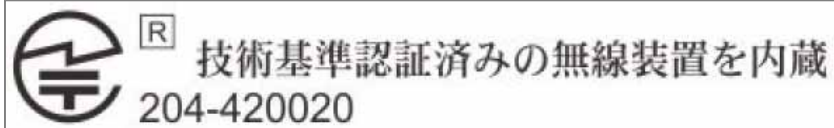
NCC

NCC Statement: 須加在使用手冊內

根據 NCC 低功率電波輻射性電機管理辦法 規定:

第十二條　經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條　低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。
低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

9.5 CE Test Report

Produkte Products		▲ TÜVRheinland®	
Prüfbericht-Nr.: Test Report No.:	10047574 002	Auftrags-Nr.: Order No.:	114024339
			Seite 1 von 26 Page 1 of 26
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	July 7, 2014
Auftraggeber: Client:	Raytac Corporation, 5F., No. 3, Jiankang Rd., TW-23586 Zhonghe Dist,, New Taipei City, Taiwan, ROC		
Prüfgegenstand: Test item:	Bluetooth 4.1 Module		
Bezeichnung / Typ-Nr.: Identification / Type No.:	MDBT40		
Auftrags-Inhalt: Order content:	Test Report for CE compliance, R&TTE Directive		
Prüfgrundlage: Test specification:	EN 300 328 V 1.8.1 EN 62479:2010 Refer to section 1.1 Test Specifications for more details.		
Wareneingangsdatum: Date of receipt:	7/15/2014		
Prüfmuster-Nr.: Test sample No.:	A000085167-002 A000085167-001		
Prüfzeitraum: Testing period:	21-Jul-2014 - 24-Jul-2014		
Ort der Prüfung: Place of testing:	EMC/RF Laboratory Taipei		
Prüflaboratorium: Testing laboratory:	TUV Rheinland Taiwan Ltd.		
Prüfergebnis*: Test result*:	Pass		

geprüft von / tested by:		kontrolliert von / reviewed by:	
2014-08-04	Ryan W. T. Chen / Project Engineer	2014-08-04	René Charton/Senior Project Manager
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date

Sonstiges / Other:

Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
V04

TÜV Rheinland LGA Products GmbH · Tillystraße 2 · D - 90431 Nürnberg · Tel.: +49 911 655 5225 · Fax: +49 911 655 5226
Mail: service@de.tuv.com · Web: www.tuv.com

10. Current Consumption Reference Data (BT3.0 VS BT4.0)

Mouse Power Consumption

	BT4.0 (Based on nRF51822)		BT3.0
	BT4.0 Mode	RF2.4GHz	
2 x AAA	9.5 Months	10 Months	2.9 Months
2 x AA	21 Months	22 Months	6.2 Months
Including Sensor	BT4.0 (Based on nRF51822)		BT3.0 @3V
	BT4.0 Mode @ 1.5V	RF2.4GHz @1.5V	
Active-Mouse moving (4.3%) (7.5ms report rate)	5.4 mA 8.1 mW	5.8 mA 8.7 mW	8.7 mA 26.1 mW
Rest 1>1s (4.1%) Link maintained Sensor latency: 20ms	900 uA 1.35 mW	350 uA No link 1.05 mW	1.24 mA 3.72 mW
Rest 2>10 sec (4.9%) Link maintained Sensor latency: 100ms	680 uA 1.02 mW	120 uA 198 uW	900 uA 2.7 mW
Rest 2d>60 sec Link maintained Sensor latency: 100ms	120 uA 180 uW	120 uA 198 uW	900 uA 2.7 mW
Rest 3>600s (86.3) Link disconnected Sensor latency: 500ms	90 uA 135 uW	90 uA 135 uW	797 uA 2.3 mW

Keyboard Power Consumption

	BT4.0 (Based on nRF51822)		BT3.0 @3V
	BT4.0 Mode @3V	RF2.4GHz @3V	
Active 6 letters/s	200 uA	5.8 mA 8.7 mW	8.7 mA 26.1 mW
Rest 1 Maintain link	20 - 40 uA	NA	20 - 40 uA
Rest 2 after>1min, disconnected	0.8 uA	0.8 uA	2 uA Only when PC is off