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Approval Sheet

(產品承認書)

產品名稱	(Product)	Bluetooth Low Energy Module
解決方案	(Solution)	Nordic nRF51822 QFN Package
產品型號	(Model No.)	**MDBT40** Series (Chip Antenna)
		MDBT40-P Series (PCB Antenna)
產品料號	(Part No.)	see *4.3 Order code*

Advantage of MDBT40 & MDBT40-P series:

1. *Long working distance under 1 Mbps:*
   ***MDBT40**: over 80 meters in open space.*
   ***MDBT40-P**: up to 60 meters in open space.*
2. *Declaration ID includes all Nordic applied profiles.*
3. *Granted main regional certification such as FCC (USA), CE(EU)*
   TELEC (Japan), SRRC (China), IC (Canada), NCC (Taiwan), KC (South Korea)
   RCM (Australia & New Zealand).

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1. Overall introduction

Raytac's MDBT40 & MDBT40-P is a BT 4.2 stack (Bluetooth low energy or BLE) module designed based on **Nordic nRF51822 SoC solution**, which incorporates: **GPIO**, **UART, I2C, SPI**, **PWM**, and **ADC** interfaces for connecting peripherals and sensors.

Features:

1. Dual Transmission mode of BLE & 2.4GHz RF upon customer's preference.
2. Compact size with **(L) 18 x (W) 10 x (H) 3.0 or 2.5 mm**.
3. Low power requirements, ultra-low peak, average and idle mode power consumption.
4. Be compatible with a large installed base of mobile phones, tablets and computers.
5. Fully coverage of BLE software stack.
6. BLE & RF transmission switching helps products fit all operation system and most hardware.

1.1. Application

- Computer peripherals and I/O devices
  - Mouse
  - Keyboard
  - Multi-touch trackpad
- Interactive entertainment devices
  - Remote control
  - 3D Glasses
  - Gaming controller
- Personal Area Networks
  - Health / fitness sensor and monitor devices
  - Medical devices
  - Key-fobs and wrist watches
  - Remote control toys

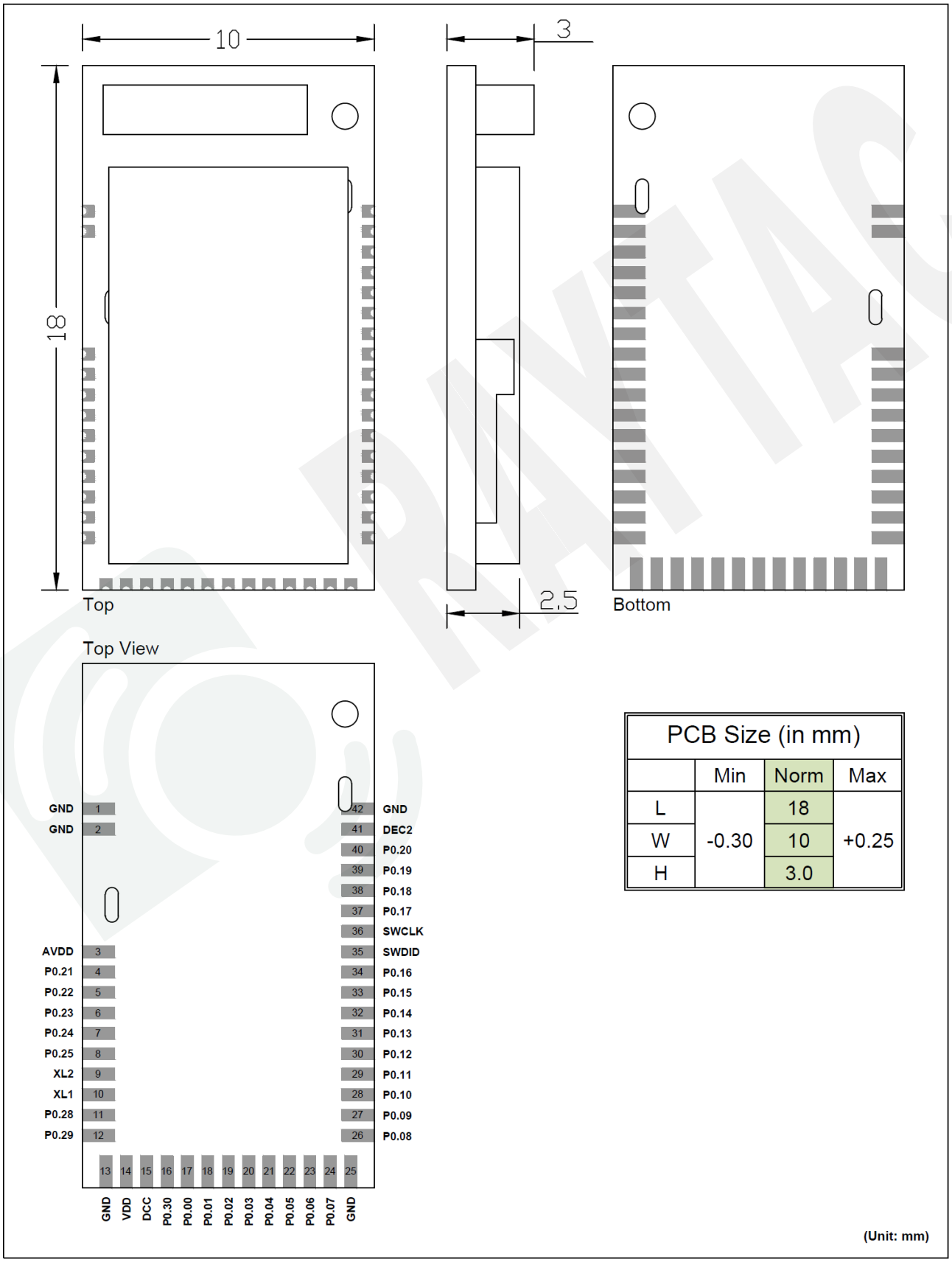
1.2. Features

- 2.4GHz transceiver
    - -93dbm sensitivity in Bluetooth low energy mode
    - TX Power -20 to +4dbm in 4dB steps
    - RSSI (1dB resolution)
- ARM Cortex – M0 32 bit processor
    - Serial Wire Debug (SWD)
- S100 series SoftDevice ready
- Memory
    - 256kb embedded flash programmed memory
    - 16kb RAM or 32kb RAM
- Support for non-concurrent multiprotocol operation
    - On-air compatibility with nRF24L series
- Flexible Power Management
    - Supply voltage range 1.8V to 3.6V
    - 4.2us wake-up using 16MHz RCOSC
    - 0.6uA @ 3V OFF 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 / Slave
- Two-wire Master (I2C compatible)
- UART (CTS/RTS)
- CPU independent Programmable Peripheral Interconnect (PPI)
- Quadrature Decoder (QDEC)
- AES HW encryption
- Real Timer Counter (RTC)

2. Product dimension

2.1. PCB dimensions & pin indication

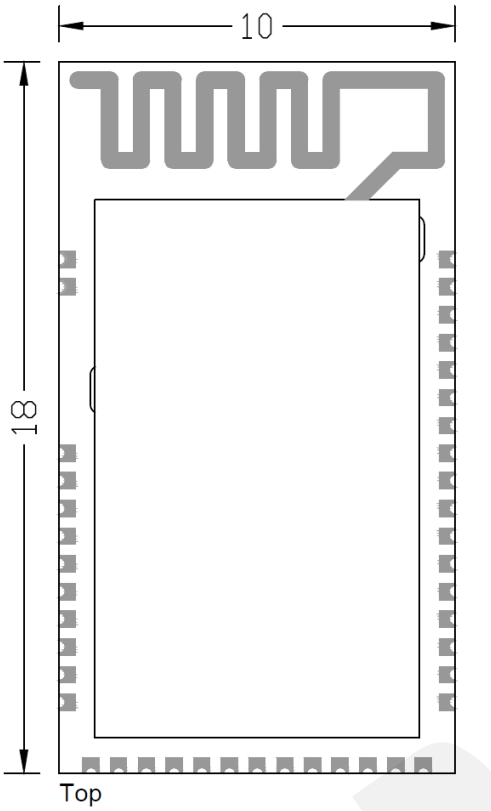
- **MDBT40** series

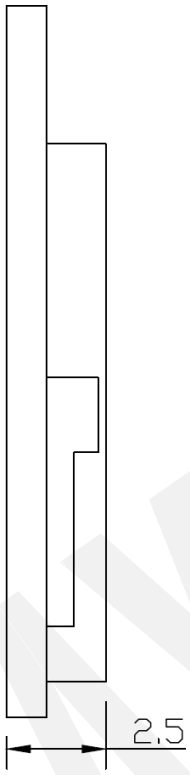


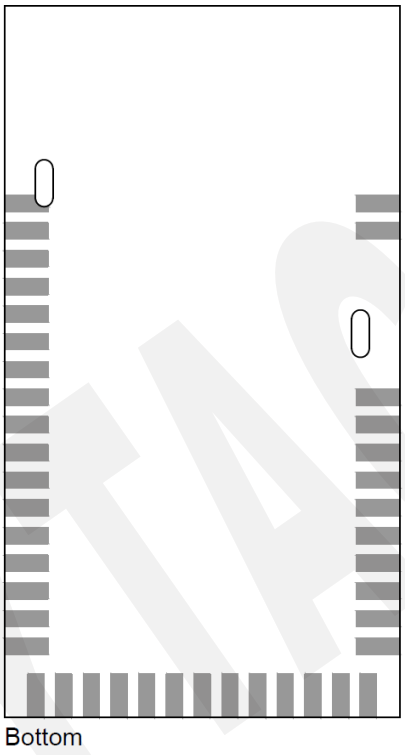
PCB Size (in mm)			
	Min	Norm	Max
L	-0.30	18	+0.25
W		10	
H		3.0	

(Unit: mm)

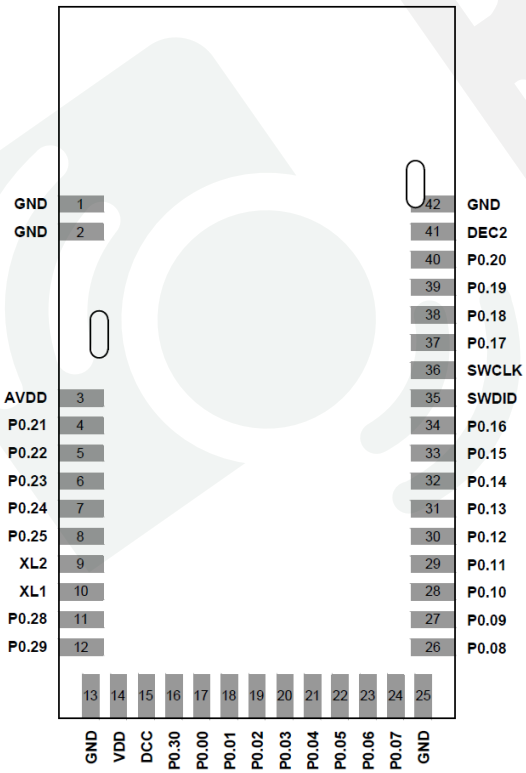
- **MDBT40-P** series







Top View

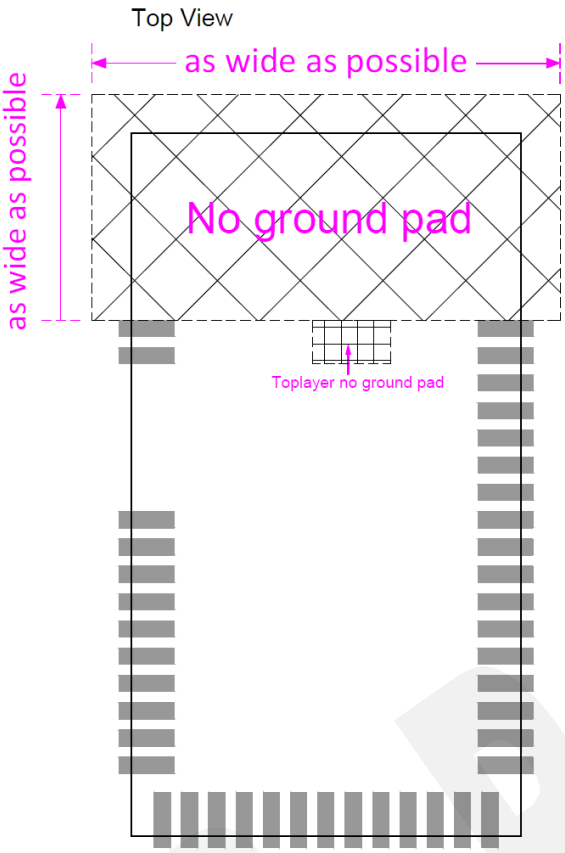


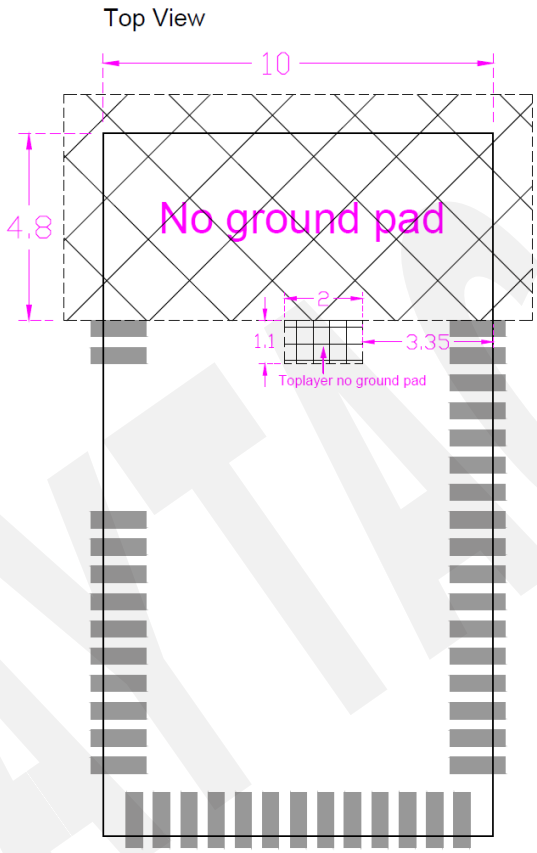
PCB Size (in mm)			
	Min	Norm	Max
L	-0.15	18	+0.20
W		10	
H		2.5	

(Unit: mm)

2.2. Recommended layout of solder pad

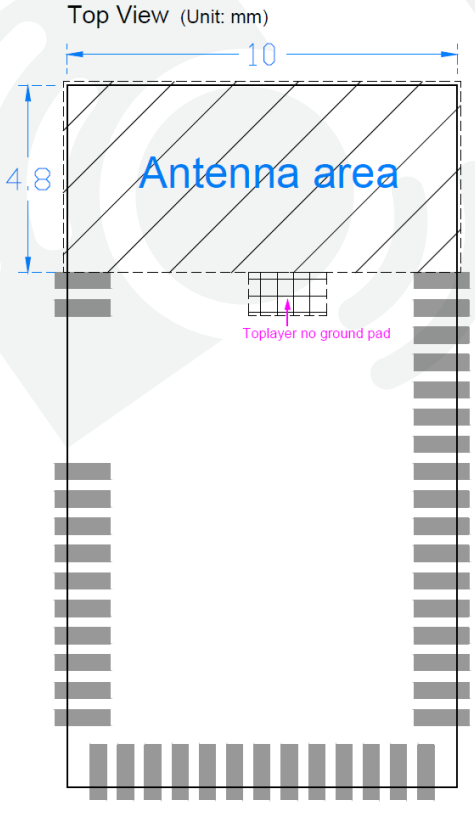
Graphs are all in Top View, Unit in mm.





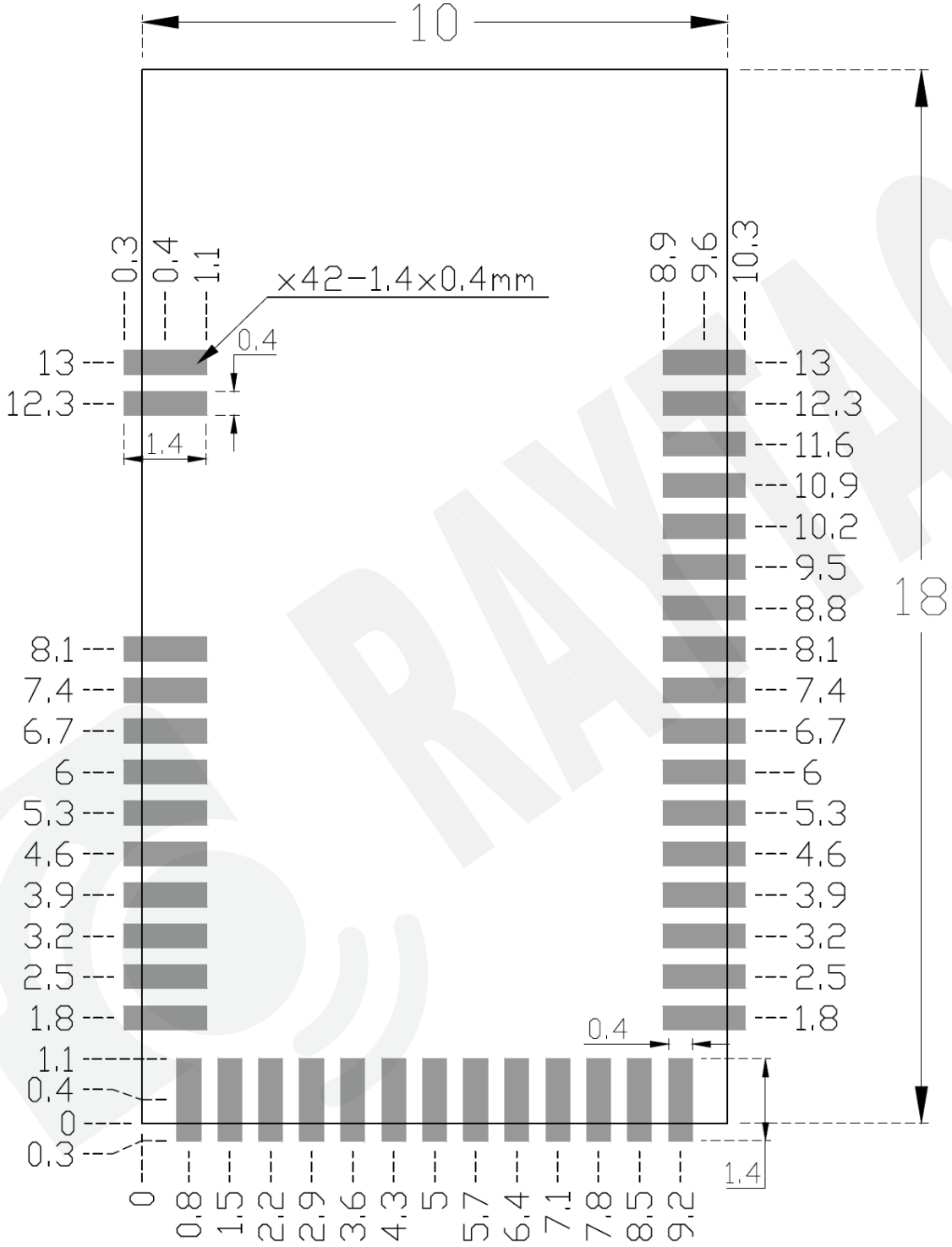
No ground pad
(as wide as possible)

Toplayer no ground pad



Antenna area

Top View


10
18
×42−1.4×0.4mm
0.3
0.4
1.1
8.9
9.6
10.3
0.4
1.4
13
12.3
11.6
10.9
10.2
9.5
8.8
8.1
7.4
6.7
6
5.3
4.6
3.9
3.2
2.5
1.8
1.1
0.4
0
0.3
0.8
1.5
2.2
2.9
3.6
4.3
5
5.7
6.4
7.1
7.8
8.5
9.2

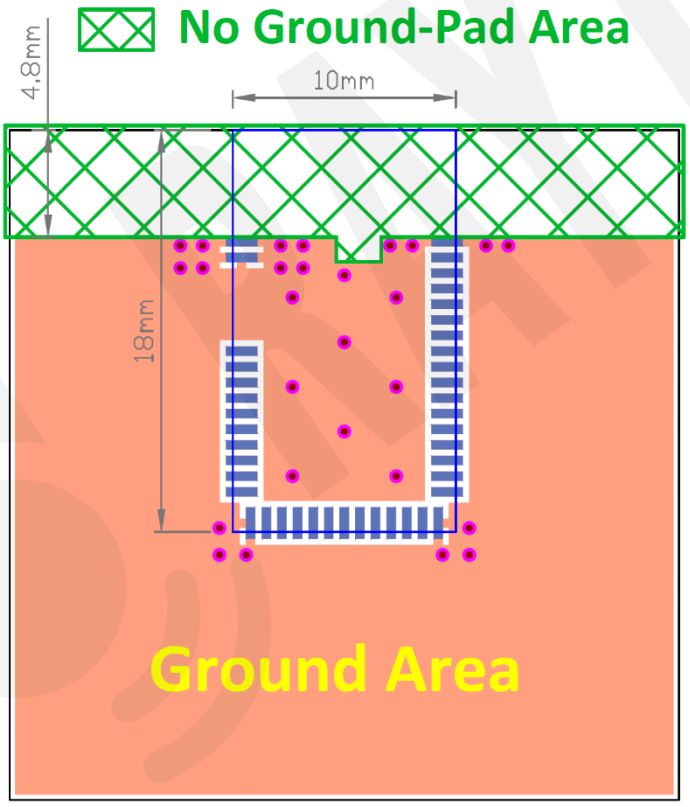
2.3. RF layout suggestion (AKA, antenna keep-out area)

Make sure to keep the “No Ground Pad” as wider as you can regardless of the size of your PCB.

No Ground Pad should be included in the corresponding position of the antenna in **EACH LAYER**.

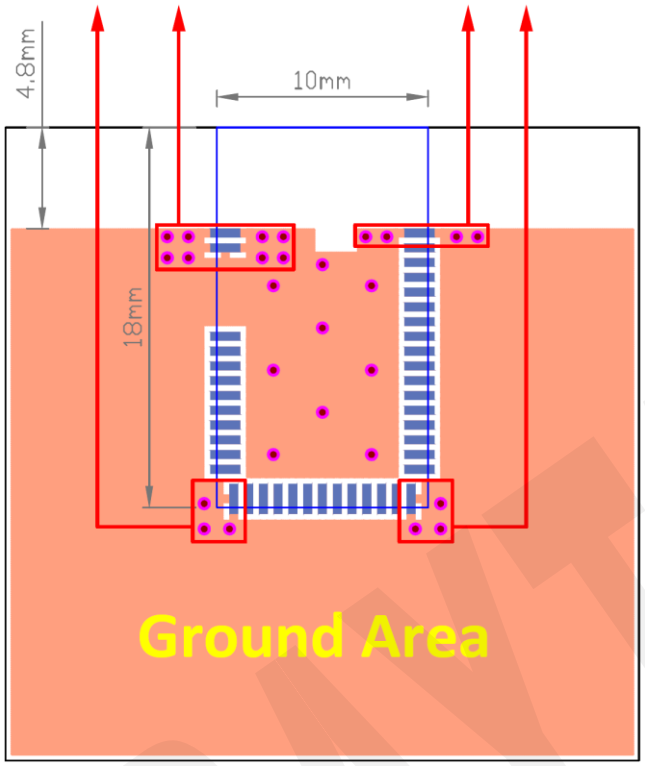
Place the module towards the edge of PCB to have better performance than placing it on the center.

Welcome to send us your layout in PDF for review at sales@raytac.com or your contact at Raytac with title “Layout reviewing – Raytac Model No. – YOUR company’s name”.



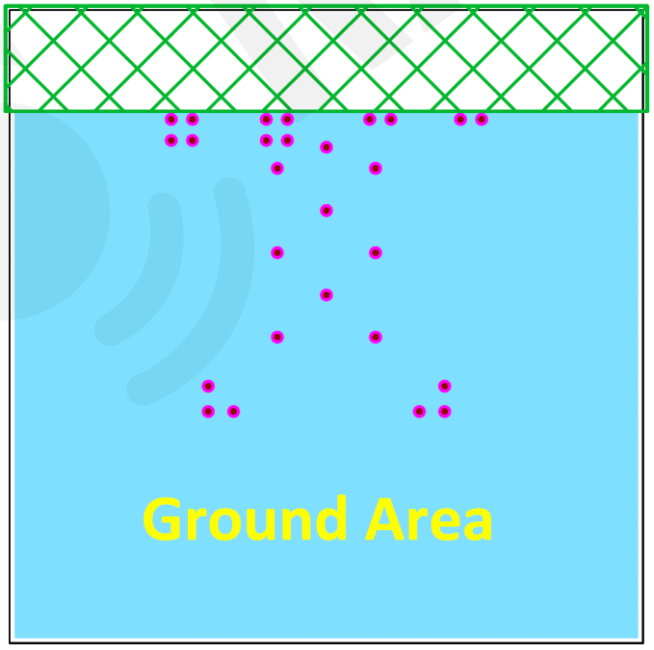
Top View

Please add via holes in GROUND area as many as possible, especially around the four corners.



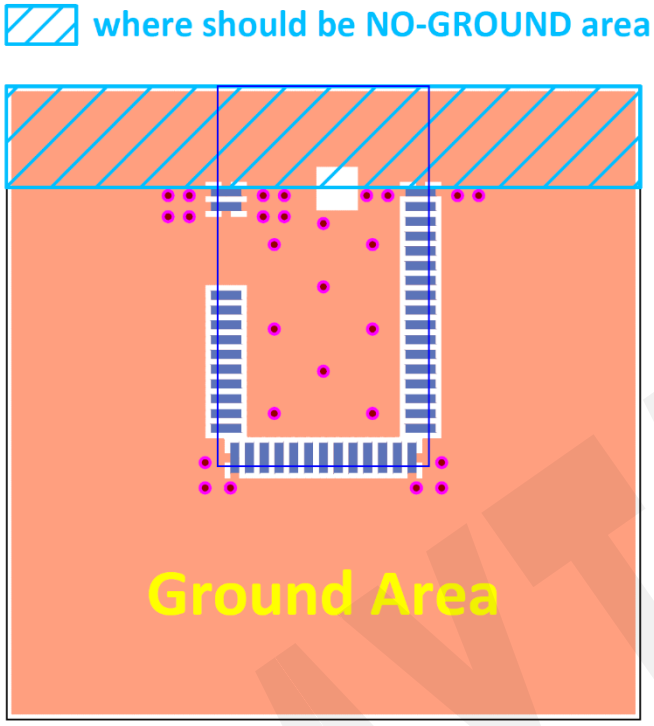
Top View

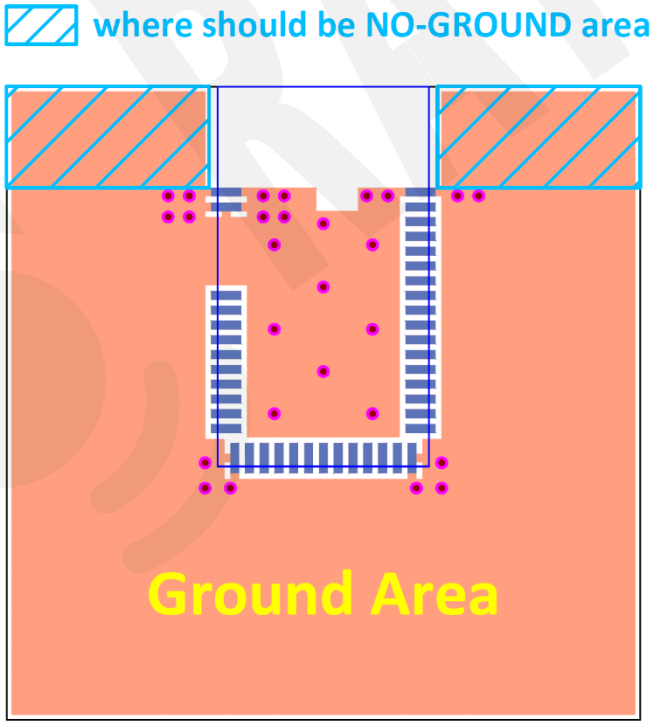
No Ground-Pad Area



Perpective View

Examples of “**NOT RECOMMENDED**” layout





2.4. Footprint & Design guide

Please visit “Support” page of our website to download. The package includes footprint, 2D/3D drawing, reflow graph and recommended spec for external 32.768KHz.

2.5. 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

Pin No.	Name	Pin function	Description
(21)	**P0.04**	Digital I/O	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
(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.
(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	16MHz

16MHz crystal is already inside the module.

4. Shipment packaging information

Marking	Model	
Red		
	MDBT40-256V3	MDBT40-P256V3
Yellow		
	MDBT40-256RV3	MDBT40-P256RV3

Modules produced in 2021 with date code 101 and later have marking with only one red dot or one yellow dot.

- Unit weight of module:

MDBT40 Series: 0.88 g (±0.02 g) ; MDBT40-P Series: 0.78 g (±0.02 g)

- Packaging type: Anti-static Tray or Tape & Reel.

	Tray	Tape & Reel
MPQ (Min. Package Q'ty)	88 pcs per tray	1,200 pcs per reel
Carton Contents (per carton)	1,760 pcs	1,200 pcs
Carton Dimension (L) x (W) x (H) cm	37 x 21 x 13	37 x 36 x 6
Gross Weight	about 2.8 kgs	about 1.9 kgs

4.1. Marking on metal shield

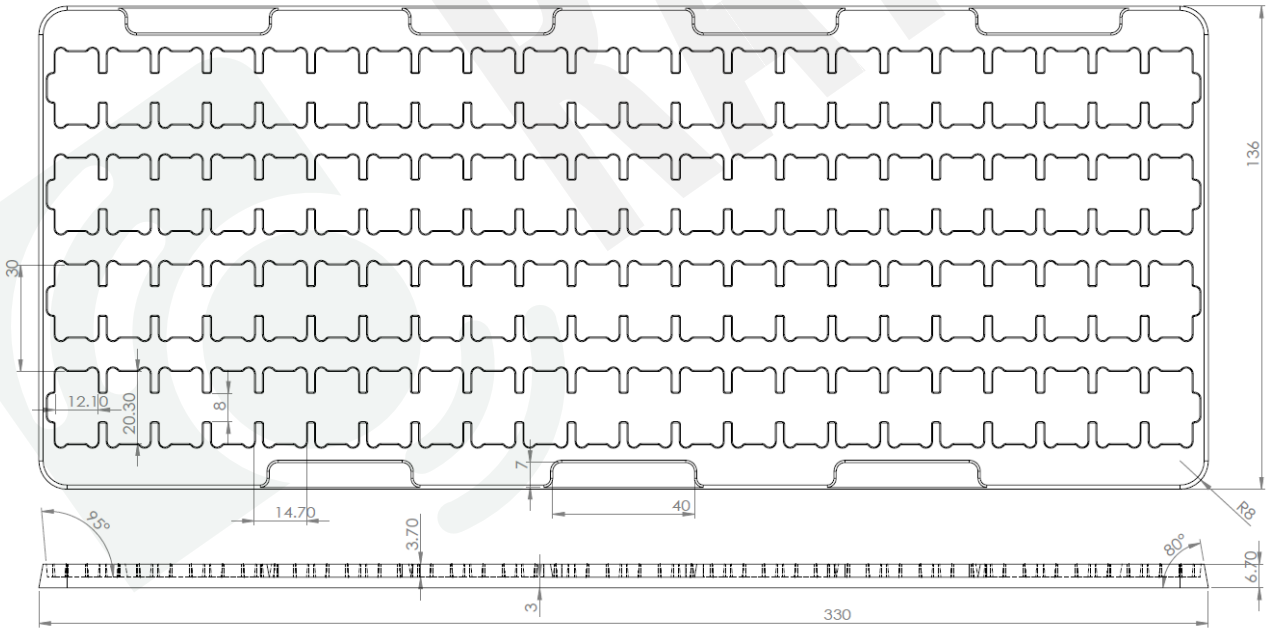
Label context on metal shield is as below.

Raytac Corporation
FCC ID: SH6MDBT40
IC: 8017A-MDBT40
CMIIT ID: 2015DJ2435
Model No.: MDBT40
R 204-420020

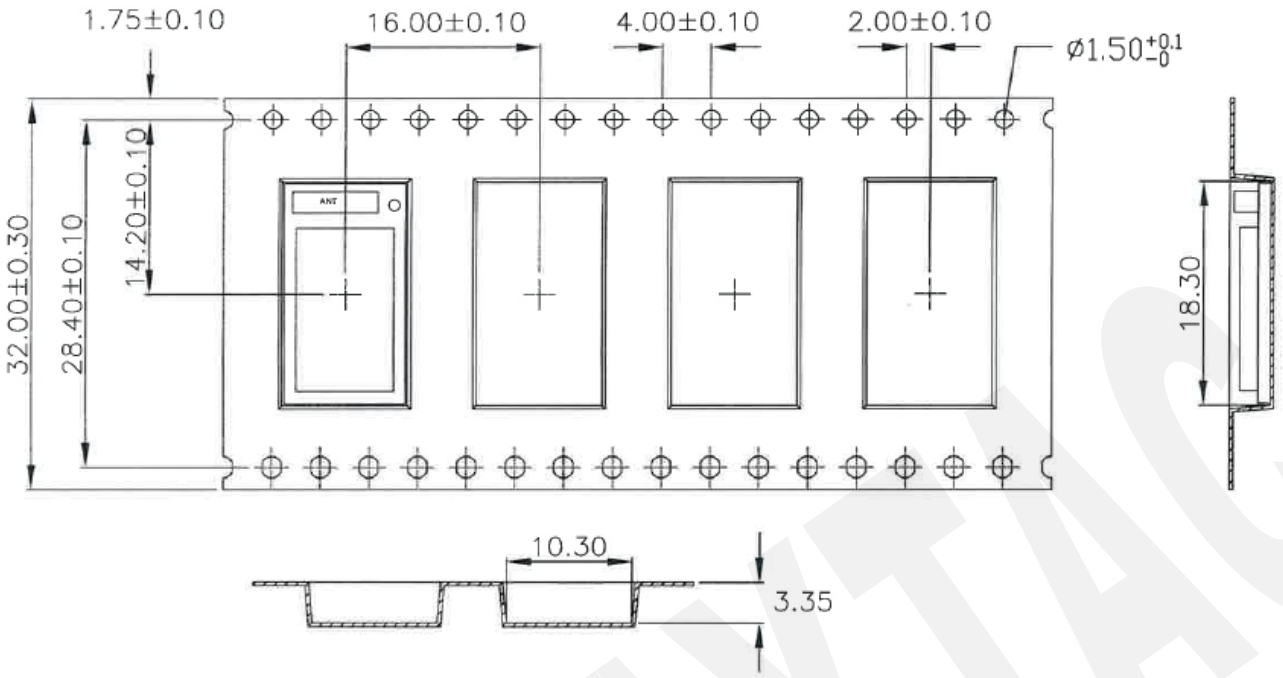
4.2. Packaging info

4.2.1. Tray packaging

Anti-static tray is specifically designed for mass production. It can be used directly on SMT automatic machine.



4.2.2. Reel packaging



W	32.00±0.30
A0	10.30±0.10
B0	18.30±0.10
K0	3.35±0.10

4.3. Order code

Each model has two options of packaging. Please use following part no. when placing order to us.

Model	Tray	Tape & Reel
MDBT40-256V3	MD-240A1-S32	MD-240A1-S32R
MDBT40-P256V3	MD-240A1-S33	MD-240A1-S33R
MDBT40-256RV3	MD-240A1-S26	MD-240A1-S26R
MDBT40-P256RV3	MD-240A1-S30	MD-240A1-S30R

MPQ of Reel packaging is 1,200 pcs and Tray packaging is 88 pcs.

5. Specification

Any technical spec shall refer to Nordic's official documents as final reference. Contents below are from "nRF51822 Specification for Extended Industrial Temperature Range" and "nRF51822 Product Specification v3.4", visit the link to view full spec.

5.1. Industrial temperature range

Industrial temperature range is applied in below IC.

nRF51822 variant	Build Code	Raytac Model #
QFAA	Hx0	MDBT40-256V3 MDBT40-P256V3

Operating conditions of supported industrial temperature:

Symbol	Parameter	Notes	Min.	Typ.	Max.	Units
VDD	Supply voltage, internal LDO setup		**1.9**	3.0	3.6	V
VDD	Supply voltage, DC/DC converter setup		2.1	3.0	3.6	V
T_A	Operating temperature		**-40**	25	**105**	°C

Other changes are including:

(1) 2.4GHz transceiver: not supported 1Mbps data rates

(2) Not support 1.8V low voltage mode.

When use above modules within -25℃ to 75℃, please see *5.3 Operation conditions* and *5.4 Electrical specifications* to know its normal operating spec.

5.2. Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Unit
Supply voltages				
VDD		-0.3	+3.9	V
DEC2			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[1]		write/erase cycles
Retention		10 years at 40 °C 50 years at 25 °C		
Number of times an address can be written between erase cycles			2	times

1. Flash endurance is 20,000 erase cycles. The smallest element of flash that can be written is a 32 bit word.

5.3. Operation conditions

Symbol	Parameter	Notes	Min.	Typ.	Max.	Units
VDD	Supply voltage, internal LDO setup		1.8	3.0	3.6	V
VDD	Supply voltage, DC/DC converter setup		2.1	3.0	3.6	V
VDD	Supply voltage, low voltage mode setup	1	1.75	1.8	1.95	V
t_{R_VDD}	Supply rise time (0 V to VDD)	2			100	ms
T_A	Operating temperature		-25	25	75	°C

1. DEC2 shall be connected to VDD in this mode.
2. The on-chip power-on reset circuitry may not function properly for rise times outside the specified interval.

5.4. Electrical specifications

5.4.1. 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 at 250 kbps.			±170		kHz	2
Δf_{1M}	Frequency deviation at 1 Mbps.			±170		kHz	2
Δf_{2M}	Frequency deviation at 2 Mbps.			±320		kHz	2
Δf_{BLE}	Frequency deviation at BLE.		±225	±250	±275	kHz	4
bps_{FSK}	On-air data rate.		250		2000	kbps	N/A

5.4.2. Radio current consumption

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

5.4.3. Transmitter specification

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
$P_{RF1.2}$	1^{st} Adjacent Channel Transmit Power. ±2 MHz (2 Mbps).			-20	dBc	2
$P_{RF2.2}$	2^{nd} Adjacent Channel Transmit Power. ±4 MHz (2 Mbps).			-45	dBc	2
$P_{RF1.1}$	1^{st} Adjacent Channel Transmit Power. ±1 MHz (1 Mbps).			-20	dBc	2
$P_{RF2.1}$	2^{nd} Adjacent Channel Transmit Power. ±2 MHz (1 Mbps).			-40	dBc	2
$P_{RF1.250}$	1^{st} Adjacent Channel Transmit Power. ±1 MHz (250 kbps).			-25	dBc	2
$P_{RF2.250}$	2^{nd} 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

5.4.4. 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) at 2 Mbps.		-85		dBm	2
$PRX_{SENS,1M}$	Sensitivity (0.1% BER) at 1 Mbps.		-90		dBm	2
$PRX_{SENS,250k}$	Sensitivity (0.1% BER) at 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.[1]		-91		dBm	2
RX selectivity - modulated interfering signal[2]						
	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}	Nth 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[3]						
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. As defined in the *Bluetooth Core Specification* v4.0 Volume 6: Core System Package (Low Energy Controller Volume).
2. 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.
3. Wanted signal level at P_{IN} = -64 dBm. Two interferers with equal input power are used. The interferer closest in frequency is not modulated, the other interferer is modulated equal with the wanted signal. The input power of interferers where the sensitivity equals BER = 0.1% is presented.

5.4.5. 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.	12.5	3	2	3	0	µs

5.4.6. RSSI specifications

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
$RSSI_{ACC}$	RSSI accuracy.	Valid range -50 dBm to -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

5.4.7. CPU

Symbol	Description	Min.	Typ.	Max.	Units	Test level
$I_{CPU, FLASH}$	Run current at 16 MHz (XOSC). Executing code from flash memory.		4.1[1]		mA	2
$I_{CPU, RAM}$	Run current at 16 MHz (XOSC). 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

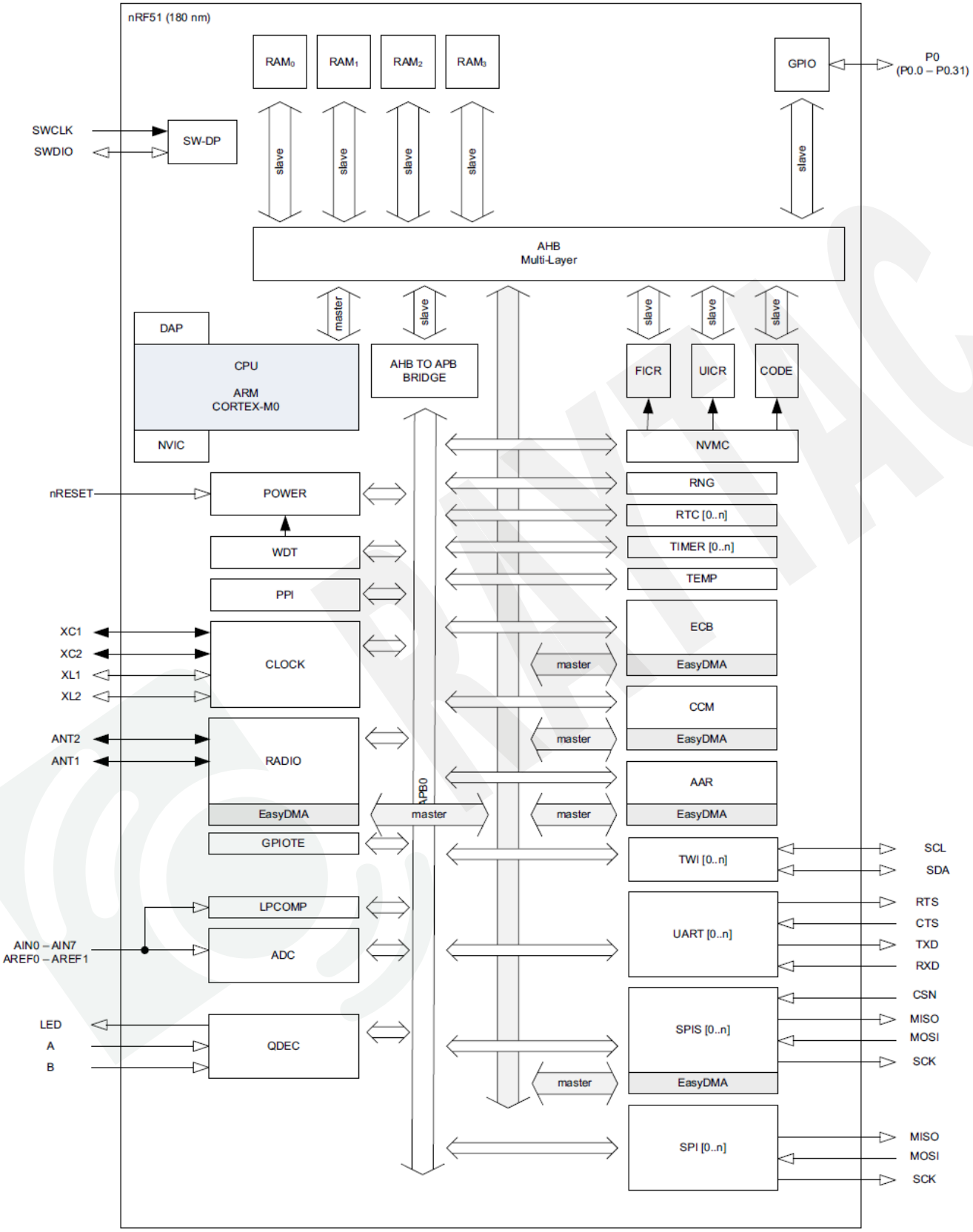
1. Includes CPU, flash, 1V2, 1V7, RC16M.
2. Includes CPU, RAM, 1V2, RC16M.
3. t_{1V2} if 1V2 regulator is not running already.

5.4.8. Power management

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
I_{OFF}	Current in SYSTEM OFF, no RAM retention.			0.6[1]		µA	2
$I_{OFF, RET, 8k}$	Additional current in SYSTEM OFF per retained RAM block (8 kB).			0.6[1]		µA	2
I_{OFF2ON}	OFF to CPU execute transition current.			400		µA	1
t_{OFF2ON}	OFF to CPU execute.			9.6	10.6	µs	1
$I_{ON,16k}$	SYSTEM-ON base current with 16 kB RAM enabled.			2.6[1]		µA	2
$I_{ON,32k}$	SYSTEM-ON base current with 32 kB RAM enabled.			3.8[1]		µA	2
t_{1V2}	Startup time for 1V2 regulator.			2.3		µs	1
$I_{1V2XO16}$	Current drawn by 1V2 regulator and 16 MHz XOSC when both are on at the same time.			810[2]		µA	1
$I_{1V2XO32}$	Current drawn by 1V2 regulator and 32 MHz XOSC when both are on at the same time.			840[2]		µA	1
$I_{1V2RC16}$	Current drawn by 1V2 regulator and 16 MHz RCOSC when both are on at the same time.			880[2]		µA	1
$I_{1V2XO16,1M}$	For HFCLK in 1 MHz mode[3]. Current drawn by 1V2 regulator and 16 MHz XOSC when both are on at the same time.	See ***Table 33*** on page 49.		520[2]		µA	1
$I_{1V2XO32,1M}$	For HFCLK in 1 MHz mode[3]. Current drawn by 1V2 regulator and 32 MHz XOSC when both are on at the same time.	See ***Table 33*** on page 49.		560[2]		µA	1
$I_{1V2RC16,1M}$	For HFCLK in 1 MHz mode[3]. Current drawn by 1V2 regulator and 16 MHz RCOSC when both are on at the same time.	See ***Table 33*** on page 49.		630[2]		µA	1
t_{XO}	Startup time for the clock management system when the XTAL is in standby.			2.3	5.3	µs	1
t_{1V7}	Startup time for 1V7 regulator.			2	3.6	µs	1
I_{1V7}	Current drawn by 1V7 regulator.			105		µA	2
F_{DCDC}	DC/DC converter current conversion factor.		0.65[4]		1.2[4]		1

1. Add 1 uA to the current value if the device is used in Low voltage mode.
2. This number includes the current used by the automated power and clock management system.
3. For details on 1 MHz mode, see Nordic's nRF51822 spec sheet.
4. F_{DCDC} will vary depending on VDD and internal radio current consumption (I_{DD}). Please refer to the nRF51 series reference manual v.3.0 or later, for a method to calculate $I_{DD,DCDC}$.

6. Block diagram



7. Antenna

7.1. MDBT40 series

ACX
Advanced Ceramic X

AT7020 Series

Multilayer Chip Antenna

Features

- ❖ Monolithic SMD with small, low-profile and light-weight type.
- ❖ Wide bandwidth

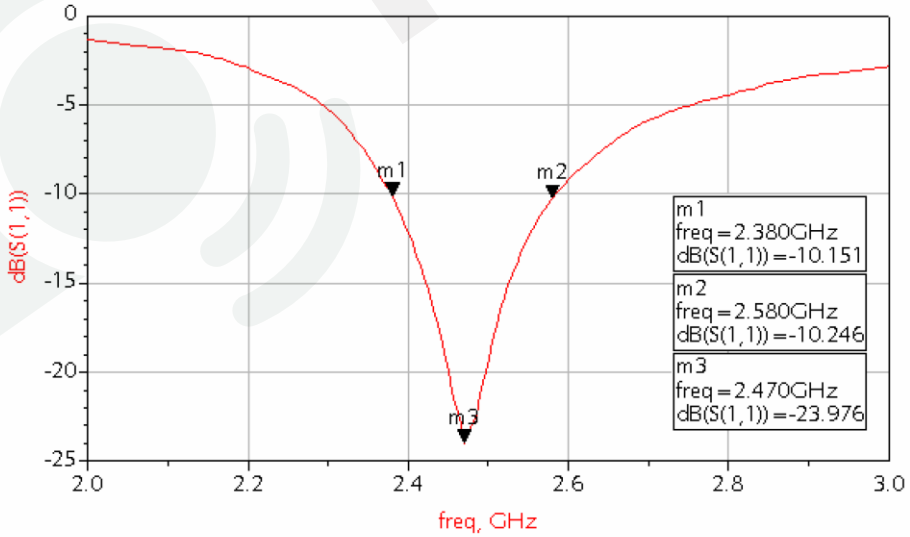
Applications

- ❖2.4GHz WLAN, Home RF, Bluetooth Modules, etc.

Specifications

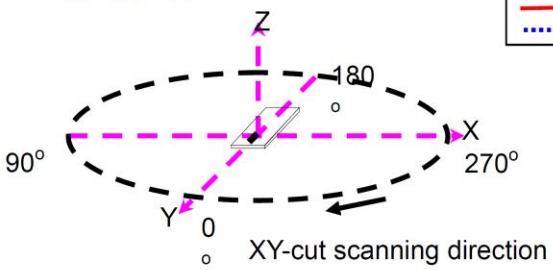
Part Number	Frequency Range (MHz)	Peak Gain (dBi typ.)	Average Gain (dBi typ.)	VSWR	Impedance
AT7020 -E3R0HBA_	2400~2500	1.3dBi (XZ-V)	-0.5dBi (XZ-V)	2 max.	50 Ω

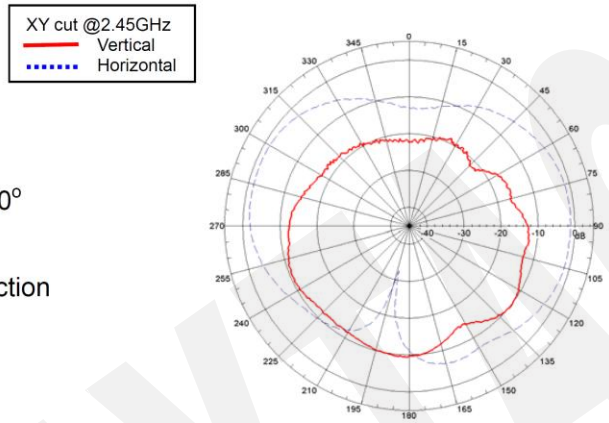
❖ Return Loss/With Matching Circuits



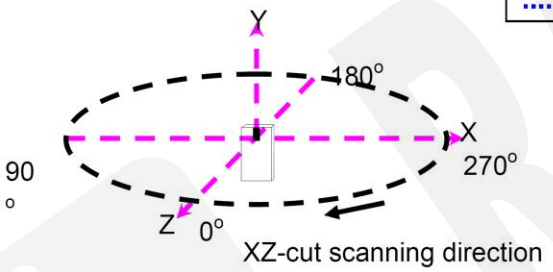
❖ Radiation Patterns

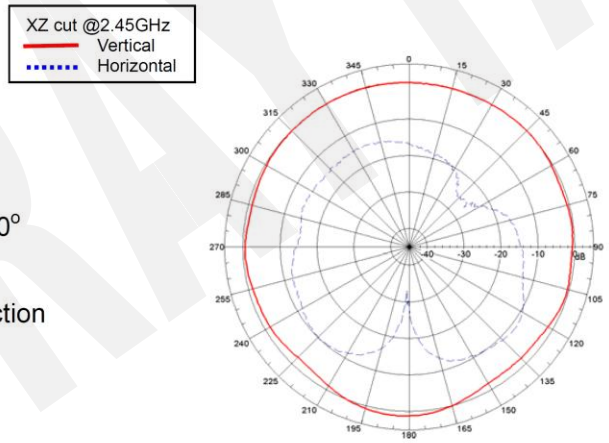
XY-V/XY-H



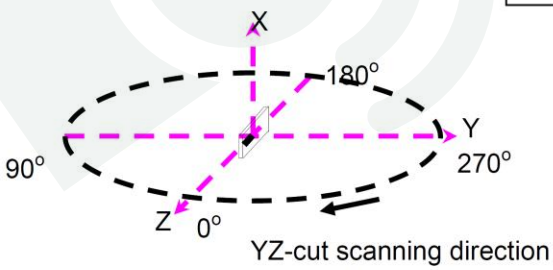


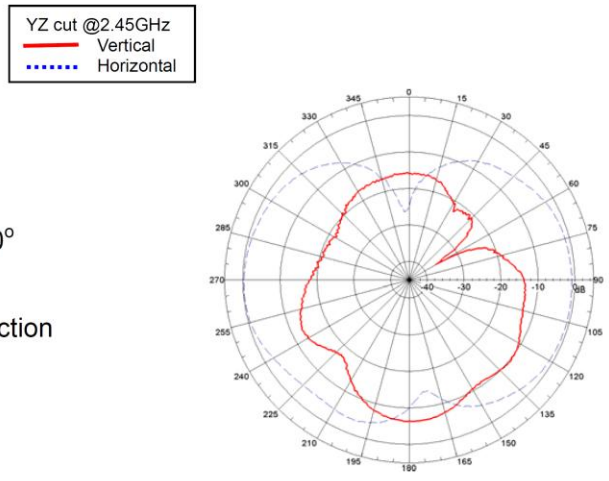
XZ-V/XZ-H





YZ-V/YZ-H

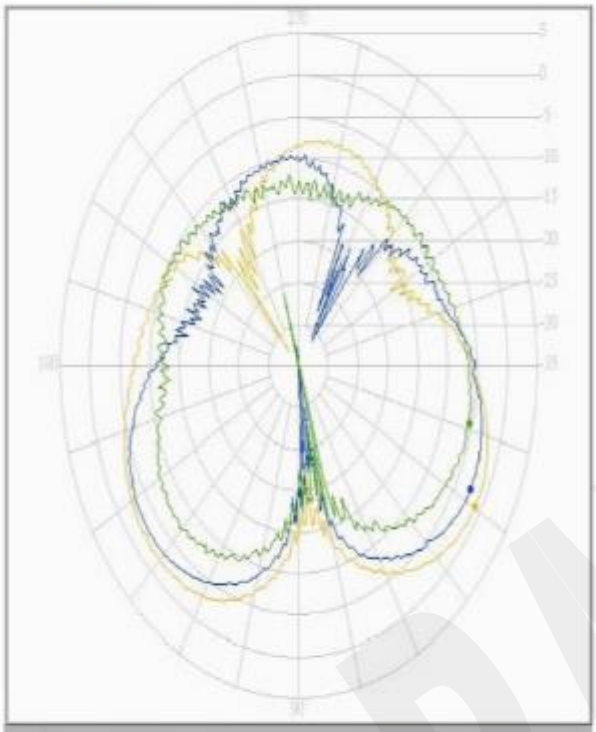




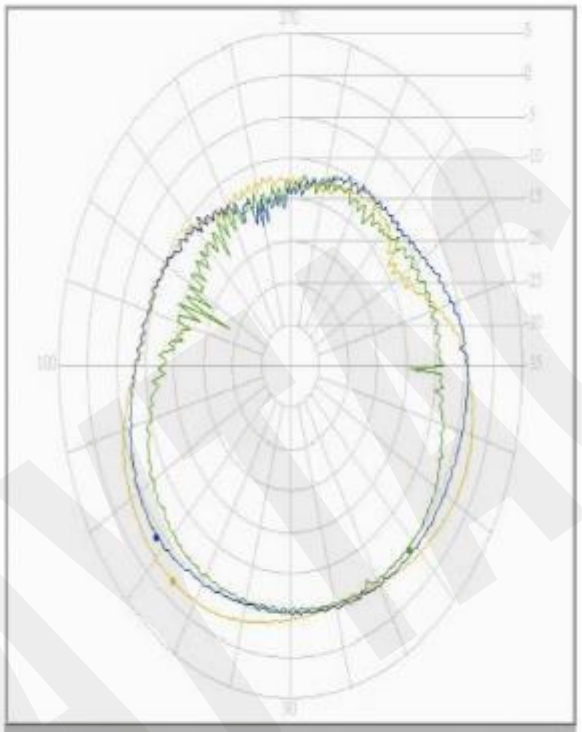
7.2. MDBT40-P series

Antenna Manufacturer : Raytac Corporation.
MODEL:Printed Trace Antenna

C. X-Z polarization scan



Model No.	Ant. Polarization	Freq(MHz)	Peak angle	Value	Average
XZ 2400 H	Horizontal	2400.0	330.3	-0.9	-6.1
XZ 2450 H	Horizontal	2450.0	332.8	-2.5	-7.6
XZ 2500 H	Horizontal	2500.0	346.0	-5.5	-9.8

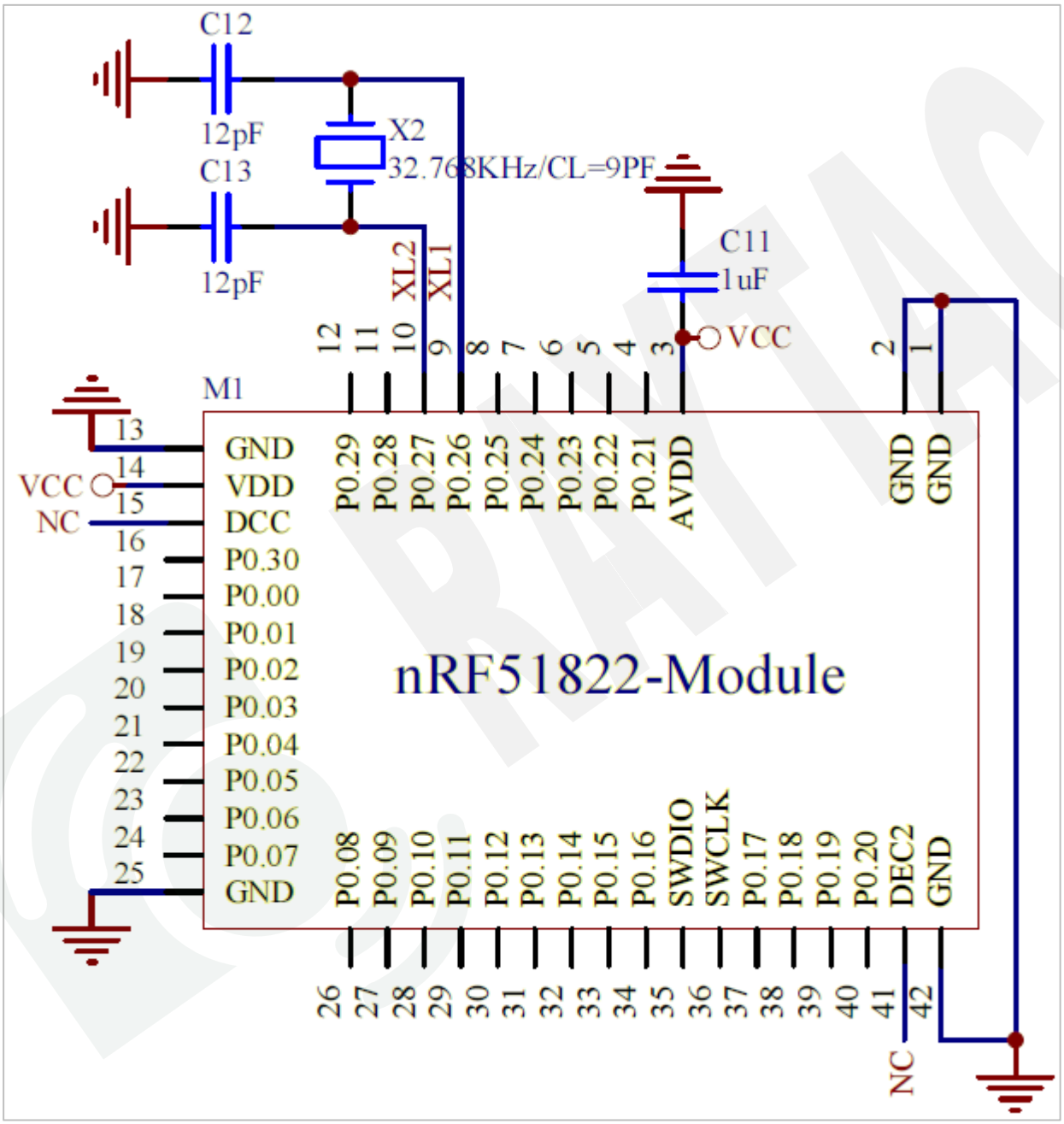


Model No.	Ant. Polarization	Freq(MHz)	Peak angle	Value	Average
XZ 2400 V	Vertical	2400.0	232.1	-2.0	-5.7
XZ 2450 V	Vertical	2450.0	221.8	-4.1	-6.6
XZ 2500 V	Vertical	2500.0	312.7	-4.8	-8.5

8. Reference circuit

8.1. Internal LDO mode **(Module's default)**

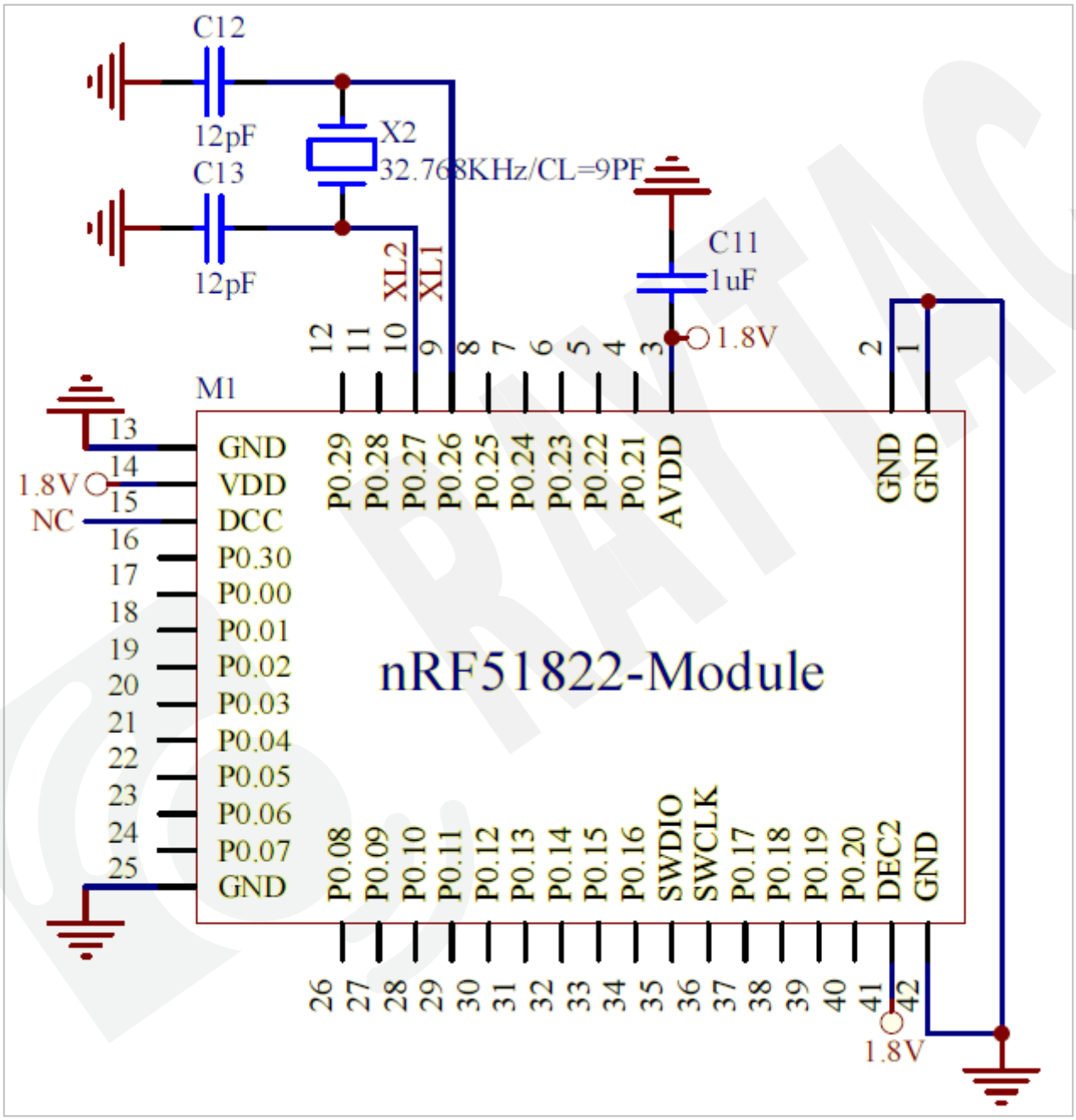
Module is pre-programmed with Raytac's testing code. Default uses external 32.768KHz crystal. Please make sure it is connected to make the module work.



8.2. 1.8V low voltage mode

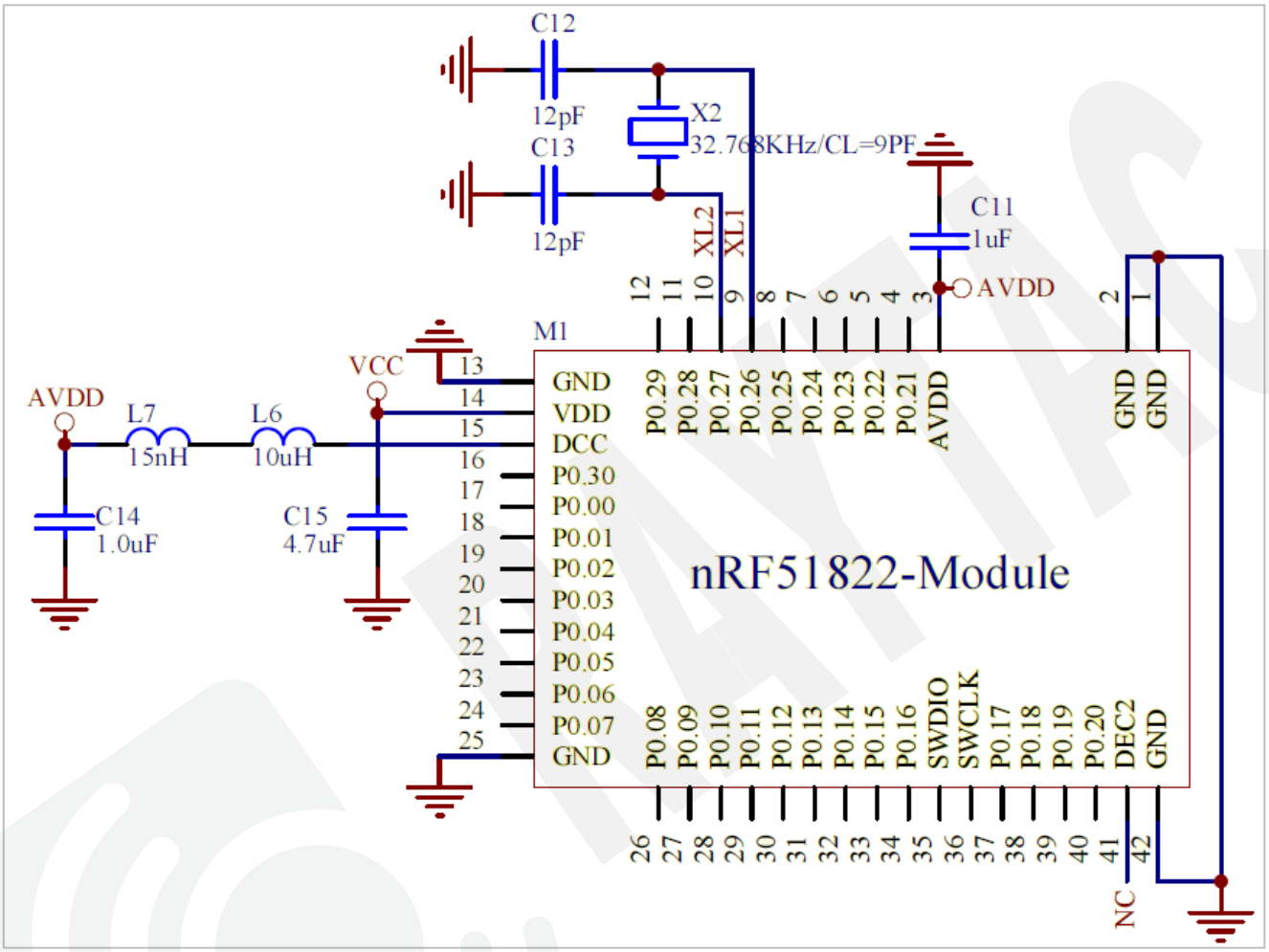
(1) When operating temperature is from -40℃ to 105℃, it is not supported 1.8V low voltage mode.

(2) External 32.768KHz is optional.



8.3. Internal DC/DC converter mode

External 32.768KHz is optional.



9. Certification

9.1. Declaration ID for Bluetooth

Declaration ID	QDID(s)	Company	Specification Name
D042310	91659 - Profile Subsystem 80592 - End Product 111537 - Profile Subsystem	Raytac Corporation	4.2

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

9.2. FCC certificate (USA)

TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

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

PHOENIX TESTLAB GmbH
Koenigswinkel 10
32825 Blomberg,
Germany

Date of Grant: 03/24/2015

Application Dated: 03/24/2015

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: BT 4.0 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.

This Class II Permissive Change covers the performed modifications as documented in the filing.

9.3. TELEC certificate (Japan)

Annex 1 to
Certificate No 14-110771
of Technical Regulations Conformity
for Specified Radio Equipment in Japan

PHOENIX TESTLAB

- The validity of this certificate is limited to products, which are equal to the one examined in the type-examination.
- When the holder of this certificate is placing the product on the Japanese market, the product must be affixed with the following Specified Radio Equipment marking:

R 204-420020

Remarks and observations:

The following conditions are applicable:

- Chip Antenna, MDBT40, with a maximum gain of 1.3 dBi for the 2.4 GHz band

Documentation lodged for the type examination:

Testreports:

- International Certification Corp.: JR412101AC, Feb.12, 2014
- International Certification Corp.: JR412101AE, Feb.12, 2014

Product documentation:

- Block Diagram
- Bill of Materials
- Photos
- User Manual
- Circuit Diagram
- Placement Drawings
- Antenna Specifications

Technical standards and specifications

The product complies with:

Ordinance Regulating Radio Equipment
- Chapter I, General Provisions
- Chapter II, Transmitting Equipment
- Chapter III, Receiving Equipment
- Chapter IV, Article 49.20

9.4. NCC certificate (Taiwan)

MDBT40 Series

耕興股份有限公司

低功率射頻電機型式認證證明

(1) 申　請　者	：	勁達國際電子有限公司 (臺北市大安區和平東路 1 段 145 號 5 樓之 1)
(2) 製 造 廠 商	：	Ginstar Corporation
(3) 器 材 名 稱	：	BT4.0 module
(4) 廠 牌 / 型 號	：	Raytac / MDBT40
(5) 發射功率（電場強度）	：	2.402-2.480 GHz: 4.38dBm
(6) 工 作 頻 率	：	2.402-2.480 GHz (GFSK 40CH,ChS-2MHz)
(7) 審 驗 日 期	：	104 年 02 月 04 日
(8) 審驗合格標籤式樣	：	

CCAF15LP0280T1

說明：

1. 請依上列標籤式樣自製標籤，標貼或印鑄於器材本體明顯處，始得販賣或公開陳列。
2. 經型式認證合格之低功率射頻電機，其廠牌、型號、設計、射頻性能如有變更，應重新申請型式認證。
3. 違反低功率電波輻射性電機管理辦法之規定，擅自使用或變更無線電頻率、電功率者，除依電信法規定處罰外，驗證機關(構)並得廢止其型式認證證明或型式認證標籤。
4. 送審廠商應保留送審樣品供日後核對。
5. 本型式認證證明及其合格標籤使用權專屬取得本證明者。依電信管制射頻器材審驗辦法第 15 條規定，持有人得經由網際網路申請同意他人於同廠牌同型號之電信管制射頻器材使用型式認證標籤，並於次日起 30 天內，應檢具「電信管制射頻器材審驗合格標籤或符合性聲明標籤同意使用備查表」送國家通訊傳播委員會備查。

備註：

1. 本器材符合低功率射頻電機技術規範(第 3.10.1 章節)之規定。
2. 本器材使用 Chip 天線，天線增益 1.3dBi。
3. 本公司係經國家通訊傳播委員會委託之驗證機構(電信管制射頻器材驗證機購認證證書號碼：NCC-RCB-05/電信終端設備驗證機構認證證書號碼：NCC-RCB-05)，核發本型式認證證明。
4. 依「商品標示法」及「資訊、通信及消費性電子商品標示基準」規定，標示事項貼於商品或內外包裝上，以免違法而受處分。
5. 本案審驗模組為完全模組，適用於任何平台。「平台」定義如下：若器材不組裝本案審驗模組，消費者仍能正常使用該器材主要功能，該器材得視為平台。若器材不組裝本案審驗模組，消費者不能正常使用該器材主要功能，則該器材不能視為平台，該類不同廠牌型號器材組裝本案審驗模組後，須分別申請型式認證。

SGS 台灣檢驗科技股份有限公司

低功率射頻電機型式認證證明

一、申　　請　者：勁達國際電子有限公司
　　地　　址：106 臺北市大安區和平東路 1 段 145 號 5 樓之 1
二、製 造 廠 商：Ginstar Corporation (中國廣東省中山市坦州鎮前進三路)
三、器 材 名 稱：BT BLE Module
四、廠　　牌：Raytac
五、型　　號：MDBT40
六、發 射 功 率：BT V4.0 Single Mode: 4.18dBm (Peak)
七、工 作 頻 率：2402MHz – 2480MHz
八、審 驗 日 期：104 年 04 月 02 日
九、審驗合格標籤式樣：CCAM15LP0230T1

台灣檢驗科技股份有限公司電信設備審驗印章

說明：
1. 請依上列標籤式樣自製標籤，標貼或印鑄於器材本體明顯處，始得販賣或公開陳列。
2. 經型式認證合格之低功率射頻電機，其廠牌、型號、設計、射頻性能如有變更，應重新申請型式認證。
3. 違反低功率電波輻射性電機管理辦法之規定，擅自使用或變更無線電頻率、電功率者，除依電信法規定處罰外，驗證機關(構)並得廢止其型式認證證明或型式認證標籤。
4. 送審廠商應保留送審樣品供日後核對。
5. 本型式認證證明及其合格標籤使用權專屬取得本證明者。依電信管制射頻器材審驗辦法第15條規定，持有人得經由網際網路申請同意他人於同廠牌同型號之電信管制射頻器材使用型式認證標籤，並於次日起30天內，應檢具「電信管制射頻器材審驗合格標籤，或符合性聲明標籤同意使用備查表」送國家通訊傳播委員會備查。

備註：
1. 本器材符合低功率射頻電機技術規範(3.10.1)之規定。
2. 本公司僅對無線射頻特性技術規範辦理型式認證，其他仍須依本國相關法規辦理。
3. 本器材使用天線型態: Printed Trace Antenna，廠牌: Raytac Corporation，型號: Printed Trace Antenna，增益: -0.8dBi。
4. 本案審驗模組為完全模組，適用於任何平台。【平台】定義如下:若器材不組裝本案審驗模組，消費者仍能正常使用該器材主要功能，該器材得視為平台。若器材不組裝本案審驗模組，消費者不能正常使用該器材主要功能，該器材不能視為平台，該類不同廠牌型號器材組裝本案審驗模組後，須分別申請型式認證。
5. 本公司係經國家通訊傳播委員會委託之驗證機構，核發本型式認證證明。

9.5. CE test report (EU)

CE

RED (2014/53/EU)
ETSI EN 300 328 V2.2.2 : 2019
TEST REPORT

FOR

Applicant:	Raytac, Corp. 5F., No.3, Jiankang Road, Zhonghe District 23586, Taiwan
Product Name:	BLE Module
Brand Name:	Raytac
Model No.:	MDBT40, MDBT40-P
Model Difference:	MDBT40 with chip antenna MDBT40-P with PCB antenna
Report Number:	ER/2016/80199-03
Issue Date:	May 20, 2017
Date of Test:	Aug. 26, 2016~May 04, 2017 (Original) Apr. 16, 2020~May 04, 2020 (Updated)
Date of EUT Received:	Aug. 26, 2016 (Original) Apr. 16, 2020 (Updated)

We hereby certify that:
The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory for compliance with the requirements set forth in the European Standard ETSI EN 300 328 V2.2.2: 2019 under RED 2014/53/EU. The results of testing in this report apply to the product system that was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By: CHUN-CHIEH, CHEN
Chun Chieh Chen / Supervisor

ilac-MRA TAF Testing Laboratory 0513

SGS Reference No: E1/2017/40113C

VERIFICATION OF EMC COMPLIANCE

Verification No.	:	E1/2017/40113C
Representative Model No.	:	MDBT40
Added Model(s)	:	MDBT40-P
Product Name	:	BT 4.1 Module
Brand Name	:	Raytac
Applicant	:	Raytac Corporation
Address of Applicant	:	5F., No.3, Jiankang Road, Zhonghe District 23586, Taiwan
Test Report Number	:	E1/2017/40113
Date of Issue	:	May 19, 2017
Applicable Standards	:	EN 301 489–1$_{v2.1.1}$: 2017-02, EN 301 489–17$_{v3.1.1}$: 2017-02 EN 55032 : 2015+AC:2016-07 EN 61000-4-2 : 2009, EN 61000-4-3 : 2006+A1:2008+A2:2010

Conclusion

The apparatus meets the requirements of the above standards and hence compliance the essential requirements under article 3.1b of the RED (2014/53/EU) Directive.

*This verification is only valid for the equipment and configuration described, and in conjunction with the test report as detailed above.

CE

Authorized Signatory:

Wisely Huang

SGS TAIWAN LTD.
Wisely Huang
Technical Asst. Manager

9.6. IC certificate (Canada)

telefication bv
The Netherlands
Chamber of Commerce
51565536
www.telefication.com

telefication

CB Industry Canada Industrie Canada

► Reg. No. NL0001

TECHNICAL ACCEPTANCE CERTIFICATE
CERTIFICAT D'ACCEPTABILITÉ TECHNIQUE

CERTIFICATION No. / No. DE CERTIFICATION	► 8017A-MDBT40
TELEFICATION No. / No. DE TELEFICATION	► 152170125/AA/00
TEST SITE No. / No. DE LABORATOIRE	► 4620A-5
ISSUED TO / DÉLIVRÉ A	► Raytac Corporation
TYPE OF EQUIPMENT / GENRE DE MATÉRIEL	► Bluetooth Device Modular Approval
TRADE NAME AND MODEL / MARQUE ET MODELE	► Raytac MDBT40
CERTIFIED TO / CERTIFIÉ SELON LE	► SPECIFICATION / CAHIER DES CHARGES RSS-247 ISSUE / EDITION Issue 1

Certification of equipment means only that the equipment has met the requirements of the above-noted specification. Licence applications, where applicable to use certified equipment, are acted on accordingly by the Industry Canada issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with the requirements and procedures issued by Industry Canada. The equipment for which this certificate is issued shall not be manufactured, imported, distributed, leased, offered for sale or sold unless the equipment complies with the applicable technical specifications and procedures issued by Industry Canada.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licences nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance d'Industrie Canada et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploitation. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux procédures d'Industrie Canada. Le matériel à l'égard duquel le présent certificat est délivré ne doit pas être fabriqué, importé, distribué, loué, mis en vente ou vendu à moins d'être conforme aux procédures et aux spécifications techniques applicables publiées par Industrie Canada.

ISSUED BY TELEFICATION BV, RECOGNIZED CERTIFICATION BODY BY INDUSTRY CANADA
DÉLIVRÉ PAR TELEFICATION BV, ORGANISME DE CERTIFICATION RECONNU PAR INDUSTRIE CANADA

I hereby attest that the subject equipment was tested and found in compliance with the above-noted specification.
J'atteste, par la présente, que le matériel a fait l'objet d'essai et a été jugé conforme à la spécification ci-dessus.

DATE 15 June 2015 BY

This certificate has one annex.

W.J.M. Jong
Manager Product Certification
i.o.

PRODUCTS
RvA C 224

9.7. SRRC certificate (China)

无线电发射设备
Radio Transmission Equipment
型号核准证
Type Approval Certificate

劲达国际电子有限公司（台湾）：

根据《中华人民共和国无线电管理
In accordance with the provisions on the Radio

条例》，经审查，下列无线电发射设备
Regulations of the People's Republic of China , the following

符合中华人民共和国无线电管理规定和
radio transmission equipment , after examination , conforms

技术标准，其核准代码为：CMIIT ID:2015DJ2435
to the provisions with its CMIIT ID:

中华人民共和国工业和信息化部
（发证机关）
Sealed by issuing authority

有效期：2025-12-31
Validity

2023 年 06 月 12 日
Year Month Date

9.8. KC certificate (South Korea)

0D0F-48CC-97AD-AA45

방송통신기자재등의 적합인증서

Certificate of Broadcasting and Communication Equipments

상호 또는 성명 *Trade Name or Applicant*	Raytac Corporation
기자재 명칭 *Equipment Name*	특정소출력 무선기기(무선데이터통신시스템용 무선기기)
기본모델명 *Basic Model Number*	MDBT40
파생모델명 *Series Model Number*	MDBT40-P
인증번호 *Certification No.*	MSIP-CRM-ryt-MDBT40
제조자/제조국가 *Manufacturer/ Country of Origin*	Raytac Corporation / 대만
인증연월일 *Date of Certification*	2016-11-29
기타 *Others*	

위 기자재는「전파법」제58조의2 제2항에 따라 인증되었음을 증명합니다.

It is verified that foregoing equipment has been certificated under the Clause 2, Article 58-2 of Radio Waves Act.

2016년(Year) 11월(Month) 29일(Date)

국립전파연구원장 국립전파연구원장인

Director General of National Radio Research Agency

※ 인증 받은 방송통신기자재는 반드시"**적합성평가표시** 를 부착하여 유통하여야 합니다.
위반시 과태료 처분 및 인증이 취소될 수 있습니다.

9.9. RCM test report (Australia & New Zealand)

VERIFICATION OF COMPLIANCE

Applicant:	Raytac Corporation 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City , 23586, Taiwan
Product Name:	BT 4.0 Module
Brand Name:	Raytac
Model No.:	MDBT40-P, MDBT40
Model Difference:	MDBT40-P use Printed Trace Antenna MDBT40 use Chip Antenna
Report Number:	BT 4.0 Module
Date of test:	Dec. 31, 2015 ~ Jan. 11, 2016
Date of EUT Received:	Dec. 31, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
AS/NZS 4268:2012 Row 45A	Complied

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory for compliance with the requirements set forth in the Australian/New Zealand Standard AS/NZS 4268:2012, Row 45A. The results of testing in this report apply to the product system that was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Test By:	Marcus Tseng	***Date:***	Jan. 15, 2016
	Marcus Tseng / Sr. Engineer		
Prepared By:	Allen Tsai	***Date:***	Jan. 15, 2016
	Allen Tsai / Engineer		
Approved By:	Jim Chang	***Date:***	Jan. 15, 2016
	Jim Chang / Asst. Manager		

9.10. IFETEL certificate (Mexico) – MDBT40-P Only

UNIDAD DE CONCESIONES Y SERVICIOS
DIRECCION GENERAL DE AUTORIZACIONES
Y SERVICIOS

ift
INSTITUTO FEDERAL DE TELECOMUNICACIONES

CERTIFICADO DE HOMOLOGACION
Clase: DEFINITIVO
Número: RCPRAMD16-0550

LIC. LUCY LOZANO PEREZ
REPRESENTANTE LEGAL DE
JF INTERNACIONAL, S.A. DE C.V.
Av. Alcanfores No. 16
Col. Jardines de San Mateo
C.P. 53240, Naucalpan, Edo. de México

Fecha de emisión: **7 de abril de 2016**	Oficio respuesta a solicitud: **IFT/223/UCS/DG-AUSE/1631/2016**
Equipo: **Módulo BLUETOOTH 4.1**	
Marca: **Raytac**	Modelo: **MDBT40**
Organismo de Certificación: **NORMALIZACION Y CERTIFICACION ELECTRONICA S.C. (NYCE)**	
Tipo De Certificado: **Certificado de Conformidad de producto nuevo en la modalidad prueba de tipo más seguimiento**	Número: **NYCE/CT/0287/16/TS**

CUMPLIMIENTO NORMATIVO

NOM-EM-016-SCFI-2015 (Disposición Técnica IFT-008-2015)

Banda de frecuencias:	2400 - 2483.5 MHz
Modulación digital Densidad espectral de potencia:	-16.49 dBm/3kHz
Potencia pico máxima de salida:	0.000 576 W
Emisiones no esenciales:	<75 nW

Dictaminó:	Revisó: El Director de Homologación	Autorizó: El Director General
JAVIER CASTRO RIVERA	ÁNGEL AGUILAR LÓPEZ	GERARDO LÓPEZ MOCTEZUMA

Insurgentes Sur 1143,
Col. Nochebuena, C.P. 03720
Delegación Benito Juárez,
Ciudad de México
Tel. (55) 5015 4000

El presente Certificado está sujeto a las condiciones y notas descritas al reverso de la hoja 1.

hoja 1 de 1

Premio ETICA Y VALORES EN LA INDUSTRIA 2003 • Premio ETICA Y VALORES EN LA INDUSTRIA 2004
Av. Lomas de Sotelo 1097 • Col. Lomas de Sotelo • 11200 México, D.F. • Tel. 5395 0777 • Fax 5395 0700
nyce@nyce.org.mx • www.nyce.org.mx
Organismo de certificación de producto acreditado por la Entidad Mexicana de Acreditación (ema)

NYCE (MR) NORMALIZACION Y CERTIFICACION ELECTRONICA, S.C.

Número de acreditación: 02/10, vigente a partir del 01/06/2010

FR12PCT4C

CERTIFICADO DE CONFORMIDAD DE PRODUCTO NUEVO EN LA MODALIDAD PRUEBA DE TIPO MÁS SEGUIMIENTO

Certificado No.: **NYCE/CT/0287/16/TS**

Con fundamento en lo establecido en los artículos 3 fracciones I, III, IV-A, XII, XV-A, 38 fracción VI, 52, 53 párrafos primero y segundo, 68, 70C fracciones I, II, III, IV y V, 73, 74, 76, 79 y 80 de la Ley Federal sobre Metrología y Normalización; 80, 83, 87 y 88 del Reglamento de la Ley Federal sobre Metrología y Normalización; Normalización y Certificación Electrónica S.C. (NYCE), otorga el presente certificado de conformidad con la(s) **NOM-EM-016-SCFI-2015**; a:

con domicilio en: JF INTERNACIONAL SA DE CV
AV ALCANFORES NO 16 COL:JARDINES DE SAN MATEO
C.P. 53240 NAUCALPAN DE JUAREZ , EDO MEX
R.F.C. JIN0204309V4

Para el (los) siguiente (s)

Producto(s): **MODULO BLUETOOTH 4.1**

Marca: **Raytac**

Modelo (s): **MDBT40**

País(es) de fabricación o de ensamblado final: **TAIWAN —**

País(es) de procedencia: **TAIWAN —**

Con base en el (los) informe(s) de pruebas **IV-031-16** emitido(s) por el (los) laboratorio(s) de pruebas **INGENIERIA Y VERIFICACIÓN DE EQUIPOS Y SISTEMAS DE TELECOMUNICACIONES SA DE CV (IVESTEL)**; con acreditación(es) **EE-087-004/09**, con aprobación(es) **EE-087-004/09**, y con autorización(es) por parte del **Instituto Federal de Telecomunicaciones (IFT)**, de conformidad con lo establecido en la Ley Federal sobre Metrología y Normalización y su Reglamento; en el procedimiento PCPPCT2E de NYCE y a la solicitud con No. de referencia **STOC0357-16**.
El presente certificado de conformidad se expide en México, D.F., el día **29-marzo-2016**; la vigencia de este certificado estará sujeta a los seguimientos respectivos de acuerdo con la Ley Federal sobre Metrología y Normalización y demas disposiciones legales aplicables y deberá constatarse en las listas de certificados de conformidad vigentes que mantiene NYCE S.C.

ATENTAMENTE

NYCE NORMALIZACION Y CERTIFICACION ELECTRONICA, S.C.

JUAN PABLO NAVA GRUBE
DIRECTOR DE OPERACIONES

EN CASO DE EXISTIR UNA CONTROVERSIA, NYCE, S.C. UNICAMENTE RESPALDARA EL ORIGINAL DEL CERTIFICADO

Certificó: Adrián López Hernández

Analizó: Ramón España Silva

9544T-5567

9.11. RoHS & REACH report

Please visit “Support” page of our website to download.

9.12. Reliability Test report

Please visit “Support” page of our website to download.

9.13. End-Product label

It is suggested using following content adding to package or user manual or label to obey the regulation. Any rules of end-product label shall refer to each certification for final reference.

9.13.1. FCC (USA)

The FCC statement should be included in the user manual when there is no enough space on label. Otherwise, it should be included on the label.

“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. (2) This device must accept any interference received, including interference that may cause undesired operation.”

The final end product must be labeled in a visible area with the following: “Contain FCC ID: SH6MDBT40”.

9.13.2. TELEC (Japan)

When manufacturer is placing the product on the Japanese market, the product must be affixed with the following Specified Radio Equipment marking:

9.13.3. NCC (Taiwan)

請依下列標籤式樣自製標籤，標貼或印鑄於器材本體明顯處，始得販賣或公開陳列。

Series	標籤樣式
MDBT40 Series	
MDBT40-P Series	

以 MDBT40 為例，平台廠商必須於平台上標示字樣「本產品內含射頻模組：ID 編號 CCAF15LP0280T1」。

「平台」定義如下：若器材組裝本案模組，消費者仍能正常使用該器材主要功能，該器材得視為平台。若器材不組裝本案模組，消費者不能正常使用該器材主要功能，該器材不能視為平台。該類不同廠牌型號器材組裝本案審驗模組後，須分別申請型式認證。

9.13.4. IC (Canada)

The IC statement should be included in the user manual when there is no enough space on label. Otherwise, it should be included on the label.

“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 harmful interference. (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.”

The final end product must be labeled in a visible area with the following: “Contain IC ID: 8017A-MDBT40”.

10. Notes and cautions

Module is not designed to last for a lifetime. Like general products, it is expected to be worn out after continuous usage through the years. To assure that product will perform better and last longer, please make sure you:

- Follow the guidelines of this document while designing circuit/end-product. Any discrepancy of core Bluetooth technology and technical specification of IC should refer to definition of Bluetooth Organization and Nordic Semiconductor as final reference.

- Do not supply voltage that is not within range of specification.

- Eliminate static electricity at any cost when working with the module as it may cause damage. It is highly recommended adding anti-ESD components to circuit design to prevent damage from real-life ESD events. Anti-ESD methods can be also applied in mechanical design.

- Do not expose modules under direct sunlight for long duration. Modules should be kept away from humid and salty air conditions, and any corrosive gasses or substances. Store it within -40℃ to +125℃ before and after installation.

- Avoid any physical shock, intense stress to the module or its surface.

- Do not wash the module. No-Clean Paste is used in production. Washing it will oxidize the metal shield and have chemistry reaction with No-Clean Paste. Functions of the module are not guaranteed if it has been washed.

The module is not suitable for life support device or system and not allowed to be used in destructive device or systems in any direct or indirect ways. The customer agrees to indemnify Raytac for any losses when applying modules in applications such as the ones described above.

11. Useful links

- Nordic Infocenter: https://infocenter.nordicsemi.com/index.jsp
  All the necessary technical files and software development kits of Nordic's chip are on this website.

- Nordic DevZone: https://devzone.nordicsemi.com/questions/
  A highly recommended website for firmware developer. Interact with other developers and Nordic's employees will help with your questions. The site also includes tutorials in detail to help you get started.

- Official Page of nRF51822: https://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF51822
  A brief introduction to nRF51822 and download links for Nordic's developing software and SoftDevices.

Full list of Raytac's Wi-Fi modules

● AN7002Q series (QFN package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	Size	Weight
AN7002Q	nRF7002	AN7002Q	1	Chip Antenna	17.1 x 10.8 x 2.1 mm	0.78 (±0.02g)
		AN7002Q-P	1	PCB Antenna	17.1 x 10.8 x 2.1 mm	0.79 (±0.02g)
		AN7002Q-U	1	u.FL Connector	16.4 x 10.8 x 2.1 mm	0.85 (±0.02g)

Full list of Raytac's Bluetooth modules

● AN54LQ series (QFN package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	NVM
AN54LQ	nRF54L15	AN54LQ-15	1	Chip Antenna	256 kB	1.5 MB
	nRF54L10	AN54LQ-10	1		192 kB	1MB
	nRF54L05	AN54LQ-05	1		96 kB	0.5MB
AN54LQ-P	nRF54L15	AN54LQ-P15	1	PCB Antenna	256 kB	1.5 MB
	nRF54L10	AN54LQ-P10	1		192 kB	1MB
	nRF54L05	AN54LQ-P05	1		96 kB	0.5MB
AN54LQ-U	nRF54L15	AN54LQ-U15	1	u.FL Connector	256 kB	1.5 MB
	nRF54L10	AN54LQ-U10	1		192 kB	1MB
	nRF54L05	AN54LQ-U05	1		96 kB	0.5MB

● AN54LV series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	NVM
AN54LV	nRF54L15	AN54LV-15	1	Chip Antenna	256 kB	1.5 MB
AN54LV-P		AN54LV-P15	1	PCB Antenna		

MDBT53 series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT53	nRF5340	MDBT53-1M	1	Chip Antenna	512 kB	1 MB
MDBT53-P	nRF5340	MDBT53-P1M	1	PCB Antenna	512 kB	1 MB
MDBT53-U	nRF5340	MDBT53-U1M	1	u.FL Connector	512 kB	1 MB

MDBT53V series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT53V	nRF5340	MDBT53V-1M	1	Chip Antenna	512 kB	1 MB
MDBT53V-P	nRF5340	MDBT53V-P1M	1	PCB Antenna	512 kB	1 MB

MDBT50 series (QFN package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT50	nRF52820	MDBT50-256R	1	Chip Antenna	32 kB	256 kB
	nRF52833	MDBT50-512K	1		128 kB	512 kB
MDBT50-P	nRF52820	MDBT50-P256R	1	PCB Antenna	32 kB	256 kB
	nRF52833	MDBT50-P512K	1		128 kB	512 kB

MDBT50Q series (aQFN package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT50Q	nRF52840	MDBT50Q-1MEN	3	Chip Antenna	256 kB	1 MB
	nRF52840	MDBT50Q-1MV2	2			
	nRF52833	MDBT50Q-512K	1		128 kB	512 kB
MDBT50Q-P	nRF52840	MDBT50Q-P1MEN	3	PCB Antenna	256 kB	1 MB
	nRF52840	MDBT50Q-P1MV2	2			
	nRF52833	MDBT50Q-P512K	1		128 kB	512 kB
MDBT50Q-U	nRF52840	MDBT50Q-U1MEN	3	u.FL Connector	256 kB	1 MB
	nRF52840	MDBT50Q-U1MV2	2			
	nRF52833	MDBT50Q-U512K	1		128 kB	512 kB
Dongle	nRF52840	MDBT50Q-RX	1, 2	PCB Antenna	256 kB	1 MB
		MDBT50Q-CX-40	1			
	nRF52833	MDBT50Q-CX-33	1		128 kB	512 kB

MDBT42T series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT42T	nRF52805	MDBT42T-192K	1	Chip Antenna	24 kB	192 kB
MDBT42T-P		MDBT42T-P192K		PCB Antenna		

MDBT42TV series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT42TV	nRF52805	MDBT42TV-192K	1	Chip Antenna	24 kB	192 kB
MDBT42TV-P		MDBT42TV-P192K		PCB Antenna		

MDBT42 series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT42	nRF52832	MDBT42-512KV2	2	Chip Antenna	64 kB	512 kB
MDBT42-P		MDBT42-P512KV2		PCB Antenna		

MDBT42V series (WLCSP package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT42V	nRF52832	MDBT42V-512KV2	2	Chip Antenna	64 kB	512 kB
MDBT42V-P		MDBT42V-P512KV2		PCB Antenna		

MDBT42Q series (QFN package IC)

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT42Q	nRF52832	MDBT42Q-512KEN	3	Chip Antenna	64 kB	512 kB
	nRF52832	MDBT42Q-512KV2	2			
	nRF52810	MDBT42Q-192KV2	2		24 kB	192 kB
	nRF52811	MDBT42Q-192KL	1			
MDBT42Q-P	nRF52832	MDBT42Q-P512KEN	3	PCB Antenna	64 kB	512 kB
	nRF52832	MDBT42Q-P512KV2	2			
	nRF52810	MDBT42Q-P192KV2	2		24 kB	192 kB
	nRF52811	MDBT42Q-P192KL	1			
MDBT42Q-U	nRF52832	MDBT42Q-U512KEN	3	u.FL Connector	64 kB	512 kB
	nRF52832	MDBT42Q-U512KV2	2			

MDBT40 series

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT40	nRF51822	MDBT40-256V3	3	Chip Antenna	16 kB	256 kB
		MDBT40-256RV3			32 kB	256 kB
MDBT40-P	nRF51822	MDBT40-P256V3	3	PCB Antenna	16 kB	256 kB
		MDBT40-P256RV3			32 kB	256 kB

Release note

- 2015/02/13 Version A1

  (1) Added NCC certificate in Chapter 10: Certification.

- 2015/04/29 Version A2

  (1) Added MDBT40-P Spec, RoHS Report and List of Raytac's Model no.

  (2) Updated Chapter 8: Reference Circuit

  (3) Updated Chapter 9: Carrier Keep-Out Area

  (4) Updated Chapter 12: BT 4.0 Product Certification Cost Comparison Chart

  (5) Updated Chapter 13: nRF51 IC Compatibility with SDK & Softdevice.

- 2015/07/01 Version A3

  (1) Added IC (Canada) & SRRC (China) certificates in Chapter 10: Certification.

- 2015/11/03 Version A4

  (1) Revised layout guide for MDBT40 series in Chapter 2: Product Dimension.

  (2) Updated Chapter 5: Specification.

  (3) Updated List of Raytac's Model no.

  (4) Removed info of V2 module from Chapter 4: Shipment Packaging Information.

  (5) Added reliability test in Chapter 10: Certification.

- 2017/01/16 Version A5

  (1) Updated List of Raytac model no.

  (2) Removed Chapter 9: Carrier Keep-Out Area and combined it with Chapter 2: Product Dimension.

  (3) Updated Chapter 4: Shipment Packaging Information.

  (4) Updated Chapter 12: nRF51 IC Compatibility with SDK & Softdevice.

  (5) Added KC (South Korea) Certificate, RoHS & REACH reports in Chapter 9: Certification.

- 2017/05/19 Version A6

  (1) Updated List of Raytac's Model no.

(2) Added link for footprint & design guide in Chapter 2: Production Dimension.

(3) Updated CE reports to new RED directives in Chapter 9: Certification.

- 2017/07/19 Version A7

  (1) Updated section 3 and section 4 of Chapter 2: Product Dimension.

  (2) Updated List of Raytac's Model no.

- 2018/06/14 Version A8

  (1) Updated spec in section 2 of Chapter 1: Introduction and Chapter 5: Specification

  (2) Updated links for 2018 RoHS & REACH reports.

  (3) Replaced Chapter 10: Current Consumption Reference Data with Notes and Cautions

  (4) Replaced Chapter 11: BT 4.1 Product Certification Cost Comparison Chart with Useful Links.

  (5) Removed Chapter 12: nRF51 IC Compatibility with SDK & Softdevice.

- 2018/11/15 Version A9

  (1) Added Mesh Profile in section 3 of Chapter 1: Product Information.

  (2) Updated drawing & link of footprint & design guide in Chapter 2.

  (3) Removed info of MDBT40-128V3 /P128V3 and added tray info in Chapter 4: Shipment Packaging Information.

  (4) Added source of reference and updated Chapter 5: Specification.

  (5) Added new SIG BT 4.2 certification info, RCM report, ANATEL (Brazil) certificate, CNC (Argentina), IFETEL (Mexico) certificate and updated link of RoHS & REACH reports in Chapter 9: Certification.

  (6) Added "no-washing" warning in Chapter 10: Notes and Cautions.

- 2019/10/03 Version A10

  (1) Added tolerance information of PCB size in Chapter 2: Product Dimension.

  (2) Updated withdrawn information of SIG and removed Argentina certificate in Chapter 9: Certification.

- 2019/11/28 Version A11

  (1) Corrected information of size of PCB and tolerance in Chapter 2: Product Dimension.

  (2) Added nRF52833 module in Full List of Raytac's BLE Modules.

- 2020/06/10 Version A12

  (1) Moved section 3 in Chapter 1: Introduction to section 1 of Chapter 9: Certification.

  (2) Updated ANATEL certificate and CE reports EN300.328 V2.2.2 & EN62368-1 in Chapter 9: Certification.

  (3) Updated the Full List of Raytac's BLE module.

- 2020/12/14 Version A13

  (1) Added description about new marking of the module in Chapter 4: Shipment Packaging Information.

  (2) Updated SRRC certificate in Chapter 9: Certification.

  (3) Updated the Full List of Raytac BLE Modules.

- 2021/01/05 Version A14

  (1) Added information of T&R in Chapter 4: Shipment Packaging Information.

- 2021/07/23 Version A15

  (1) Updated graphs in section 2 of Chapter 2: Product Dimension.

  (2) Updated information of T&R in Chapter 4: Shipment Packaging Information.

  (3) Removed info MDBT40-n256V3 in Chapter 5: Specification

  (4) Added the download link for reliability test in section 13 of Chapter 9: Certification

- 2022/03/07 Version A16

  (1) Updated info of front cover in Advantage of MDBT40 & MDBT40-P series:

  (2) Updated Chapter 2: 2.3 RF Layout Suggestion (aka Keep-Out Area)

  (3) Removed ANATEL (Brazil) Certificate in Chapter 9: Certification.

  (4) Updated List of Raytac's Model no.

- 2025/07/14 Version A17

  (1) Updated drawing in Chapter 2 for a better understanding of PCB measurement & RF Layout Suggestion.

  (2) Updated the link to Nordic’s nRF51822 Specification for extended industrial temperature range in Chapter 5.

  (3) Updated Chapter 5: Specification corresponding to Nordic's new nRF51822 Product Specification v3.4.

  (4) Updated the SRRC (China) certificate in Chapter 9: Certification.

  (5) Added the list of Raytac’s Wi-Fi models.

  (6) Updated the list of Raytac’s model numbers.

  (7) Updated the company logo and service email address information.