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Version: E
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Approval Sheet

(產品承認書)

產品名稱 (Product):	BLE AT Command Module
	in **Peripheral / Slave** role
解決方案 (Solution):	Nordic nRF52832
產品型號 (Model No.):	**MDBT42V – AT** (Chip Antenna)
	MDBT42V – PAT (PCB Antenna)
韌體版本 (FW Revision):	1.2

Advantage of MDBT42V & MDBT42V-P series:

1. *Long working distance:*

   ***MDBT42V**: over 80 meters in open space.*

   ***MDBT42V-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).

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1. Overall Introduction

Raytac's MDBT42V-AT & MDBT42V-PAT is a BT 4.2 and BT 5 stack (Bluetooth low energy or BLE) module designed based on **Nordic nRF52832 SoC solution**, which incorporates: **UART** interface in only peripheral/slave role for data bridge in compact size **(L) 8.4 x (W) 6.4 x (H) 1.75 or 1.50 mm**.

2. AT Command

2.1. List of supported commands

- Setting of device name
- Choose data rate of 1Mbps or 2Mbps on-air
- Set TX output power in 5 levels.
- Set advertising time
- Set connection interval under Mode 2
- Enable/disable advertising
- Set LED pattern indicating advertising or connecting status
- 7 sets of UART baud rates
- Enable/disable UART flow control
- Enable/disable interface of UART hardware
- Support 4 programmable output GPIO
- Power-down mode for power saving and GPIO wake-up
- Support DC-to-DC and LDO power mode
- Use internal or external 32.768KHz oscillator
- Recover-to-default setting with hardware and software method
- System reset of hardware and software
- Set serial number and retrieve
- Set or retrieve MAC Address
- Retrieve ADC value for battery detection, delivering the information through battery service.
- Support maximum MTU 247bytes / data payload up to maximum 244 bytes

2.2. AT Command Sets

2.2.1. “Write” Commands

No.	Command	Description
(1)	**AT+NAME**	Set device name. Max. length of 20 characters e.g. AT+NAME123 (device name 123, 3 characters)
(2)	**AT+RESET**	Set to reset system
(3)	**AT+ADVSTART**	Set to start advertising
(4)	**AT+ADVSTOP**	Set to stop advertising
(5)	**AT+SLEEP**	Set to get into deep sleep mode
(6)	**AT+BAUDRATE9600**	Set UART baud rate at 9600 bps,n,8,1
(7)	**AT+BAUDRATE19200**	Set UART baud rate at 19200 bps,n,8,1
(8)	**AT+BAUDRATE38400**	Set UART baud rate at 38400 bps,n,8,1
(9)	**AT+BAUDRATE57600**	Set UART baud rate at 57600 bps,n,8,1
(10)	**AT+BAUDRATE115200**	Set UART baud rate at 115200 bps,n,8,1
(11)	**AT+BAUDRATE230400**	Set UART baud rate at 230400 bps,n,8,1 **(recommended enabling flow control)**
(12)	**AT+BAUDRATE460800**	Set UART baud rate at 460800 bps,n,8,1 **(recommended enabling flow control)**
(13)	**AT+FLOWCONTROLDIS**	Disable UART flow control
(14)	**AT+FLOWCONTROLEN**	Enable UART flow control
(15)	**AT+TXPOWER4DBM**	Set RF TX power at + 4dBm
(16)	**AT+TXPOWER0DBM**	Set RF TX power at 0dBm
(17)	**AT+TXPOWER-4DBM**	Set RF TX power at - 4dBm
(18)	**AT+TXPOWER-8DBM**	Set RF TX power at - 8dBm
(19)	**AT+TXPOWER-20DBM**	Set RF TX power to - 20dBm
(20)	**AT+XTALINTERNAL**	Use internal RC 32.768KHZ low frequency oscillator
(21)	**AT+XTALEXTERNAL**	Use external crystal 32.768KHZ low frequency oscillator
(22)	**AT+CONNECTINDICATORLOW**	Set logic low output when connecting BT
(23)	**AT+CONNECTINDICATORHIGH**	Set logic high output when connecting BT
(24)	**AT+PHYMODE1MBPS**	Set PHY mode at 1Mbps

No.	Command	Description
(25)	**AT+PHYMODE2MBPS**	Set PHY mode at 2Mbps
(26)	**AT+WAKEUPLOW**	Set logic low at wake-up when in deep sleep
(27)	**AT+WAKEUPHIGH**	Set logic high at wake-up when in deep sleep
(28)	**AT+ADVTIMEtttt**	Set advertising time (Hex) e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(29)	**AT+DCDCDIS**	Disable DC to DC converter
(30)	**AT+DCDCEN**	Enable DC to DC converter
(31)	**AT+CONNECTINTERVALMODE0**	Set connection interval mode for iOS/Android APP usage (min. 20ms / Max. 40ms),
(32)	**AT+CONNECTINTERVALMODE1**	Set connection interval mode for nRF52832 Central usage (min. 8ms / Max. 8ms)
(33)	**AT+CONNECTINTERVALMODE2**	Set connection interval mode for iOS/Android APP usage (programmable : min. / Max. range is 8ms ~ 1,000ms)
(34)	**AT+CONNECTINTERVALTIMEtttttttt**	Set connection interval time (Hex), available when activating “AT+CONNECTINTERVALMODE2” e.g. 0x0008 (8ms), 0x03E8 (1,000ms), conditions to be met: “min. connection interval ≦Max. connection interval”
(34)	**AT+ADVPATTERNnnnnffff**	Set LED advertising pattern (Hex), where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms), 0x00000000 (off) 0xFFFFFFFF (on)
(35)	**AT+CONNECTPATTERNnnnnffff**	Set LED connecting pattern (Hex), where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms) 0x00000000 (off) 0xFFFFFFFF (on)

No.	Command	Description
(36)	**AT+SERIALNOnnnnnnnn**	Set serial number e.g. AB000001, fixed 8-character length
(37)	**AT+RESPONSEDIS**	Disable response when sending “write” command
(38)	**AT+RESPONSEEN**	Enable response when sending “write” command
(39)	**AT+DISCONNECT**	Terminate the connection
(40)	**AT+DEFAULT**	Back to default
(42)	**AT+SETGPIOnnHIGH**	Setup GPIO number p0.nn to high, where “nn” is 02, 03, 11, 20 **(Ascii)**
(43)	**AT+SETGPIOnnLOW**	Setup GPIO number p0.nn to low, where “nn” is 02, 03, 11, 20 **(Ascii)**
(44)	**AT+SETGPIOnnOFF**	Setup GPIO number p0.nn to unused, where “nn” is 02, 03, 11, 20 **(Ascii)**
(45)	**AT+MACADDRnnnnnnnnnnnn**	Set IC MAC address, when n is **HEX**. Written order is from MSB byte to LSB byte.

2.2.2. “Read” Commands

No.	Command	Description
(1)	**AT?NAME**	To retrieve device name
(2)	**AT?VERSION**	To retrieve firmware version
(3)	**AT?MACADDR**	To retrieve IC MAC address
(4)	**AT?BAUDRATE**	To retrieve current UART baud rate
(5)	**AT?FLOWCONTROL**	To retrieve UART status of flow control
(6)	**AT?TXPOWER**	To retrieve RF TX power
(7)	**AT?XTAL**	To retrieve status of oscillator
(8)	**AT?CONNECTINDICATOR**	To retrieve logic of pin for BT-connecting indicator
(9)	**AT?PHYMODE**	To retrieve status of PHY mode
(10)	**AT?WAKEUP**	To retrieve logic of wake-up pin
(11)	**AT?ADVTIME**	To retrieve advertising time (Hex)
(12)	**AT?DCDC**	To retrieve DC to DC converter status
(13)	**AT?CONNECTINTERVALMODE**	To retrieve status of connection interval mode
(14)	**AT?ADVPATTERN**	To retrieve LED advertising pattern (Hex)
(15)	**AT?CONNECTPATTERN**	To retrieve LED connecting pattern (Hex)
(16)	**AT?SERIALNO**	To retrieve serial number
(17)	**AT?ADCVALUE**	To retrieve 10bit ADC value
(18)	**AT?RESPONSE**	To retrieve status of response
(19)	**AT?ALLPARAMETERS**	To retrieve value of all parameters
(20)	**AT?CONNECTINTERVALTIME**	To retrieve value of connection interval time under Mode 2

2.2.3. Response (Default)

No.	Command	Response
(1)	AT?NAME	Raytac AT-UART (default)
(2)	AT?VERSION	e.g. version: 1.0
(3)	AT?MACADDR	e.g. D352BDE1E414
(4)	AT?BAUDRATE	0 baudrate9600 (default) (0 = 9600; 1 = 19200; 2 = 38400; 3 = 57600; 4 = 115200; 5 = 230400; 6 = 460800)
(5)	AT?FLOWCONTROL	0 flowcontrol dis (default) (0 = disabled; 1 = enabled)
(6)	AT?TXPOWER	0 txpower 4dbm (default) (0 = 4dBm; 1 = 0dBm; 2 = -4dBm; 3 = -8dBm, 4 = -20dBm)
(7)	AT?XTAL	0 xtal internal (default) (0 = internal; 1 = external, and XTAL = 32.768KHz oscillator)
(8)	AT?CONNECTINDICATOR	0 connect indicator low (default) (0 = output low; 1 = output high)
(9)	AT?PHYMODE	0 PHY mode 1Mbps (default) (0 = 1Mbps; 1 = 2Mbps)
(10)	AT?WAKEUP	0 wakeup low (default) (0 = low active; 1 = high active)
(11)	AT?ADVTIME	0000 (default: Hex, forever advertising with no timeout, tttt: 0x0000)
(12)	AT?DCDC	0 dcdc dis (default) (0 = disabled; 1 = enabled)
(13)	AT?CONNECTINTERVALMODE	0 connect interval mode 0 (default) (0 = fixed connection interval for iOS/Android APP usage 1 = fixed connection interval for nRF52832 Central usage 2 = Programmable connection interval for iOS/Android APP usage)
(14)	AT?ADVPATTERN	01F401F4 (default: Hex, 0.5sec on / 0.5sec off, nnnn: 0x01F4, ffff: 0x01F4)

No.	Command	Response
(15)	**AT?CONNECTPATTERN**	00c80708 (default: Hex, 0.2sec on / 1.8sec off, nnnn: 0x00c8, ffff: 0x0708)
(16)	**AT?SERIALNO**	Display “ no data! ” string (default)
(17)	**AT?ADCVALUE**	Value varies from input voltage
(18)	**AT?RESPONSE**	1 response en (default) (0 = disable response; 1 = enable response)
(19)	**AT?ALLPARAMETERS**	Display value of all parameters, separated by "0x0d0x0a"
(20)	**AT?CONNECTINTERVALTIME**	006400C8 (default: **Hex**, 100ms min. connection interval / 200ms Max. connection interval, tttttttt: 0x006400C8)

2.3. Default Info

No.	Description	Default
(1)	**Device name**	Raytac AT-UART
(2)	**Base UUID**	0x9E, 0xCA, 0xDC, 0x24, 0x0E, 0xE5, 0xA9, 0xE0 0x93, 0xF3, 0xA3, 0xB5, 0x00, 0x00, 0x40, 0x6E
(3)	**Service UUID**	0x0001 TX characteristic: 0x0003; RX characteristic: 0x0002
(4)	**Baud rate**	9600bps,n,8,1
(5)	**Status of flow control**	Disabled
(6)	**RF TX power**	+4dBm
(7)	**32.768Khz oscillator**	Using internal RC with 1000ms calibration time
(8)	**Logic of BT connecting indicator**	Output set as logic low when BT is connecting
(9)	**PHY mode**	1Mbps
(10)	**Logic of wake-up pin**	Set logic low to wake up in deep sleep
(11)	**Advertising time**	Forever advertising with no timeout
(12)	**Status of DC-to-DC converter**	Disabled
(13)	**Connection interval mode**	Set at min. 20ms and Max. 40ms for iOS/Android usage
(14)	**Advertising LED pattern**	0.5sec on / 0.5sec off
(15)	**Connecting LED pattern**	0.2sec on / 1.8secs off
(16)	**Serial number**	Display “ no data! ” string
(17)	**ADC value**	Value varies from input voltage between 0x0000 ~ 0x03FF (Hex).
(18)	**State of response**	Enabled
(19)	**Programmable output GPIO**	P0.02, P0.03, P0.11, P0.20 are unused

2.4. Pin Assignment

Pin No.	Name	Pin Function	Description
(1)	GND	Ground	The pad must be connected to a solid ground plane
(2)	SWDCLK	Digital input	Serial Wire debug clock input for debug and programming
(3)	RESET	Input	Active-low to enable hardware system RESET pin
(4)	SWDIO	Digital I/O	Serial Wire debug I/O for debug and programming
(5)	P0.20	Output / NC	Programable output GPIO, NC when set unused
(6)	Indicator	Output / Logic	Output logic is selective about the action of BT connection
(7)	Connecting or Adver. LED	Output	Setting of LED pattern is changeable when it is active-low
(8)	Wakeup	Input / Logic	Output logic is selective about the action of wakeup from deep sleep
(9)	UART PD	Input	Active-high with internal pull-high to disable hardware UART interface. The default is disabled.
(10)	GND	Ground	The pad must be connected to a solid ground plane
(11)	UART RTS	Output	RTS, request to send
(12)	UART TX	Output	UART transmitter
(13)	UART CTS	Input	CTS, clear to send
(14)	UART RX	Input	UART receiver
(15)	NC	No function	Not connected when using internal RC (LFXO)
	XL2	Analog input	Connecting to 32.768KHz crystal when using external LFXO
(16)	NC	No function	Not connected when using internal RC (LFXO)
	XL1	Analog input	Connecting to 32.768KHz crystal when using external LFXO
(17)	ADC	Analog input	10bit resolution ADC is always on and update every 200ms
(18)	GND	Ground	The pad must be connected to a solid ground plane
(19)	Flashed Default	Input	Active-low with internal pull-high for 0.48sec ≦ logic low ≦ 1sec and return to logic high, then system will back to default.
(20)	VCC	Power	Power-supply pin

Pin No.	Name	Pin Function	Description
(21)	**DEC4**	Power	1V3 regulator supply decoupling. Input from DC/DC converter. Output from 1V3 LDO
(22)	**DCC**	Power	DC/DC converter output pin
(23)	**NC**	No function	Not connected
(24)	**NC**	No function	Not connected
(25)	**NC**	No function	Not connected
(26)	**P0.02**	Output / NC	Programable output GPIO, NC when set unused
(27)	**P0.03**	Output / NC	Programable output GPIO, NC when set unused
(28)	**P0.11**	Output / NC	Programable output GPIO, NC when set unused
(29)	**GND**	Ground	The pad must be connected to a solid ground plane

3. How to Control via External MCU

3.1. How to Send AT Commands

- **When BT is NOT connected, for ALL commands**

1. Output low to UART PD pin to enable UART interface. Please keep it enabling during the whole time when sending AT commands.

2. Send any AT commands you want. Please wait for at least 250 ms between sending each command.

3. **Send command " AT+RESET " (not HW reset) to save all your settings.**

4. Output high or NC to UART PD pin to turn off UART interface.

- **When BT is connected**

  Write: AT+DISCONNECT, AT+SLEEP, AT+SETGPIOnnHIGH, AT+SETGPIOnnLOW, AT+SETGPIOnnOFF

  Read: AT?ADCVALUE

1. Output low to UART PD pin to enable UART interface. Please keep it enabling during the whole time when sending AT commands.

2. Output low to flash default pin to enable the module to receive AT commands when BT is connected. Please keep it low during the whole time when sending AT commands.

3. Send "AT?ADCVALUE" or "AT+DISCONNECT" or "AT+SLEEP" or "AT+SETGPIOnnHIGH" or "AT+SETGPIOnnLOW" or "AT+SETGPIOnnOFF".

4. Output high or NC to UART PD pin to turn off UART interface.

3.2. How to Transmit Data

**** Only when BT is connected ****

1. Output low to UART PD pin to enable UART interface. Please keep it enabling during the whole time when transmitting data.

2. Output high or NC to UART PD pin to turn off UART interface.

3.3. How to Return to Flashed Default Setting

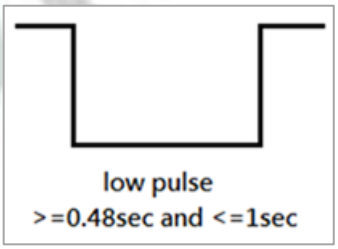
**** Only when BT is NOT connected ****

**** Note that default baud rate is "9600bps,n,8,1". For other default, please check "2.3 Default Info"***

- ## Use Hardware Method

1. Read indicator pin first to check if BT is *NOT* in connection.

2. Output a low pulse to flash default pin, then system will return to default setting.



- ## Use Software method

1. Output low to UART PD pin to enable UART interface. Please keep in enabling during the whole time when sending AT commands.

2. Send command " AT+DEFAULT ", then system will return to default setting.

4. Test Report

All testing is done under **PHY mode at 1M bps**.

4.1. Current Test

DC/DC	Logic of UART PD pin	Advertising Current	Connected Current
Disable	High	1.10 mA	0.50 mA
	Low	3.30 mA	2.75 mA
Enable	High	0.60 mA	0.27 mA
	Low	1.70 mA	1.40 mA

4.2. Throughput Test

Here **D.L.** means "**Data Length**" and **D.I.** means "**Data Interval**" in the table.

- MCU → Peripheral (MDBT42V-AT/MDBT42V-PAT) → Central → Console

Central Connection Interval	Peripheral Connection Interval	Baud Rate	Flow Control	MCU D.L. (bytes)	MCU D.I. (ms)	Total D.L. (bytes)	Total Trans. Time (sec)	Data Rate (k-bytes/sec)
min = 20ms Max = 75ms	min = 20ms Max = 40ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = 20ms Max = 75ms	min = 20ms Max = 40ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = 20ms Max = 75ms	min = 20ms Max = 40ms	460800	X	244	25	999432	103	9.7
			V					
min = Max = 8ms	min = Max = 8ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = Max = 8ms	min = Max = 8ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = Max = 8ms	min = Max = 8ms	460800	X	244	15	999432	62	16.1
			V					

- MCU → Central → Peripheral (MDBT42V-AT/MDBT42V-PAT) → Console

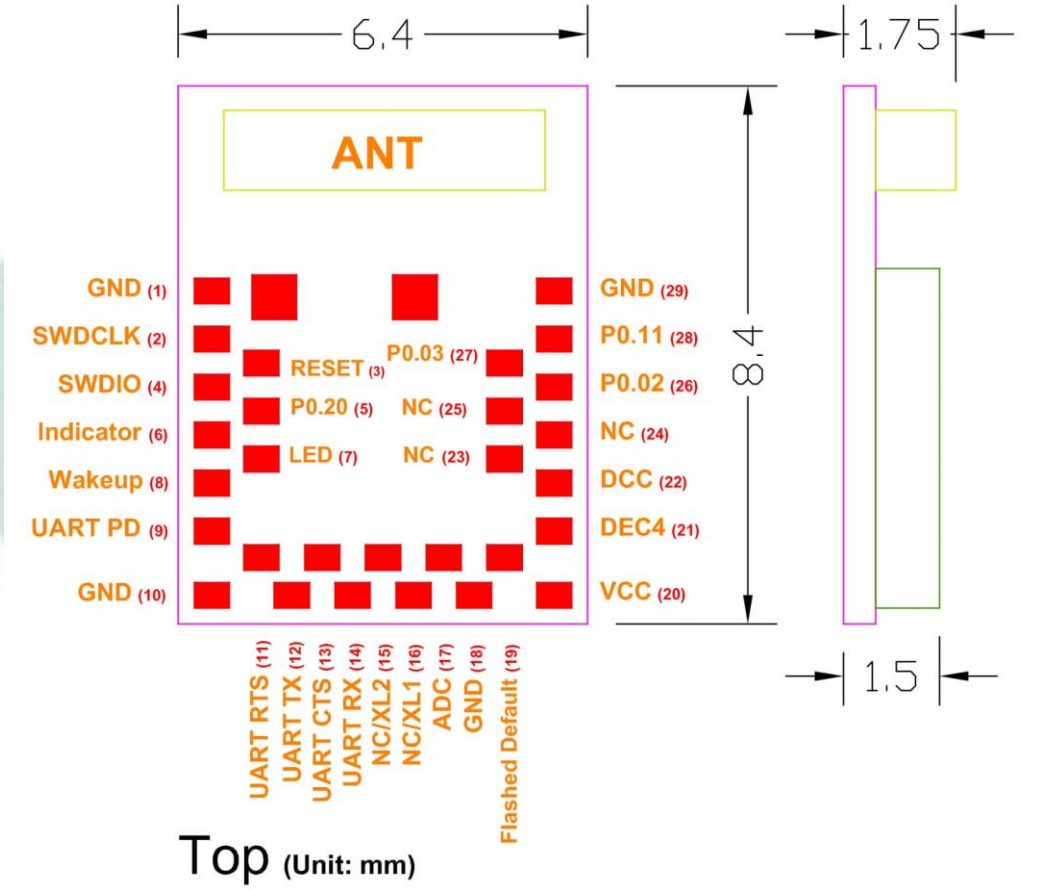
Central Connection Interval	Peripheral Connection Interval	Baud Rate	Flow Control	MCU D.L. (bytes)	MCU D.I. (ms)	Total D.L. (bytes)	Total Trans. Time (sec)	Data Rate (k-bytes/sec)
min = 20ms Max = 75ms	min = 20ms Max = 40ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = 20ms Max = 75ms	min = 20ms Max = 40ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = 20ms Max = 75ms	min = 20ms Max = 40ms	460800	X	244	18	999432	74	13.5
			V					
min = Max = 8ms	min = Max = 8ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
min = Max = 8ms	min = Max = 8ms	115200	X	64	8	262152	33	7.9
				244	30	999432	124	8
			V	244	30	999432	124	8
min = Max = 8ms	min = Max = 8ms	460800	X	244	15	999432	61	16.3
			V					

5. Product Dimension

5.1. PCB Dimensions & Pin Indication

- **MDBT42V-AT**

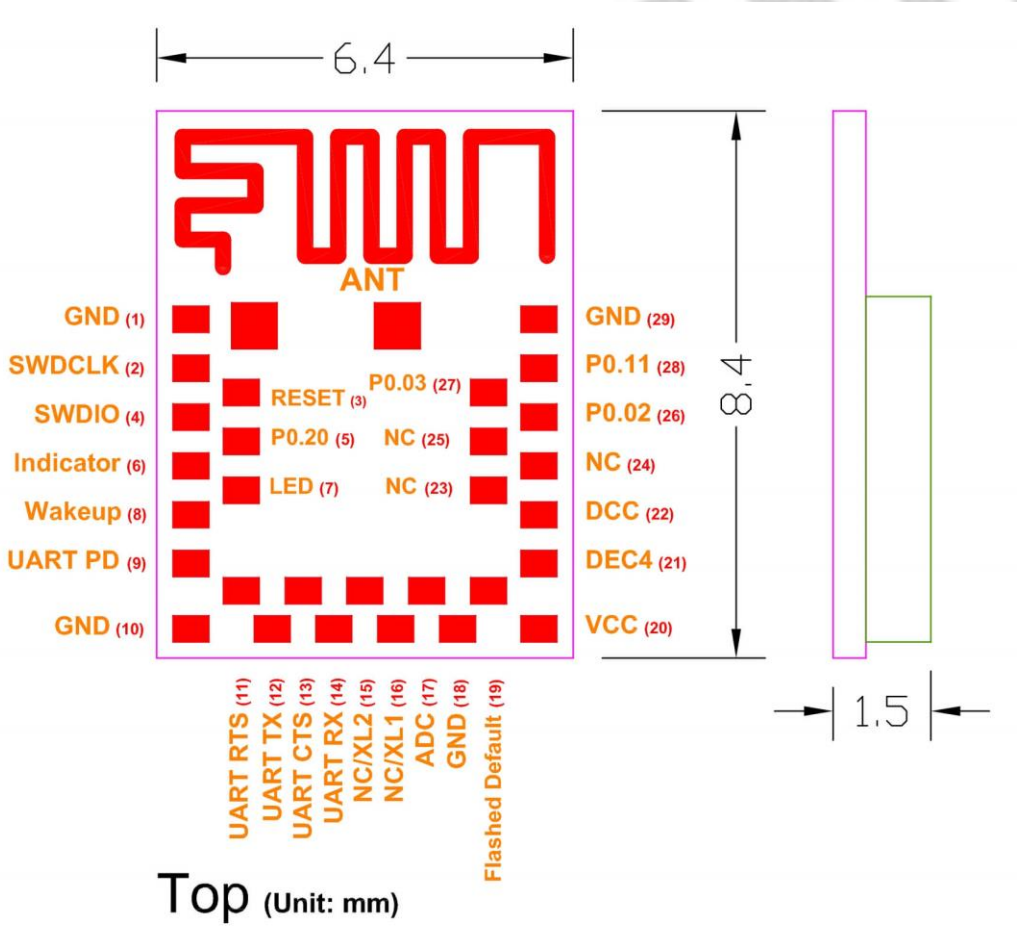
PCB Size (in mm)			
	Min.	Norm	MAX.
L		8.40	
W	- 0.15	6.40	+ 0.2
H		1.75	



Top (Unit: mm)

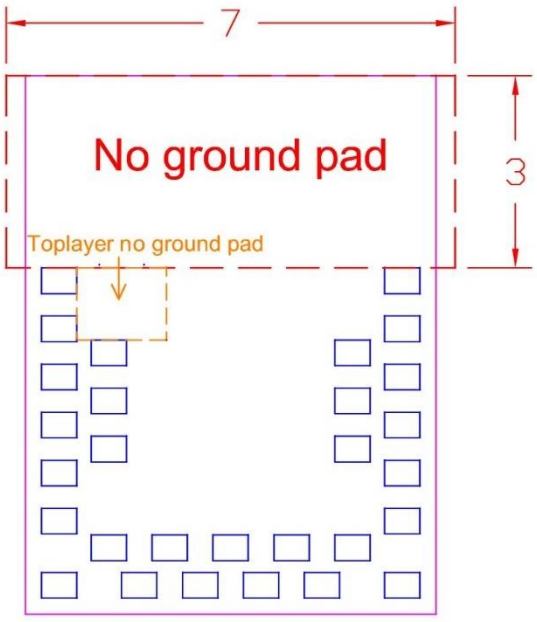
- **MDBT42V-PAT**

PCB Size (in mm)			
	Min.	Norm	MAX.
L		8.40	
W	- 0.15	6.40	+ 0.2
H		1.50	

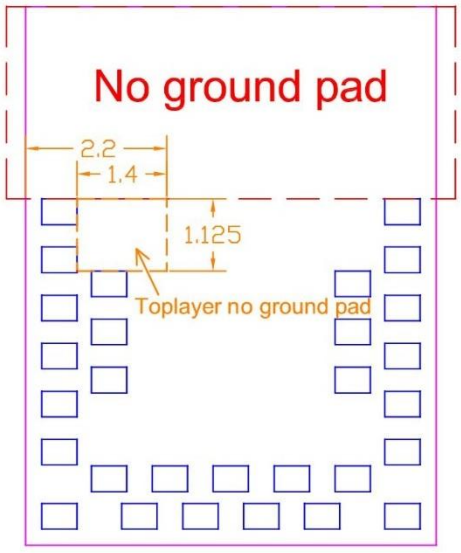


5.2. Recommended Layout of Solder Pad

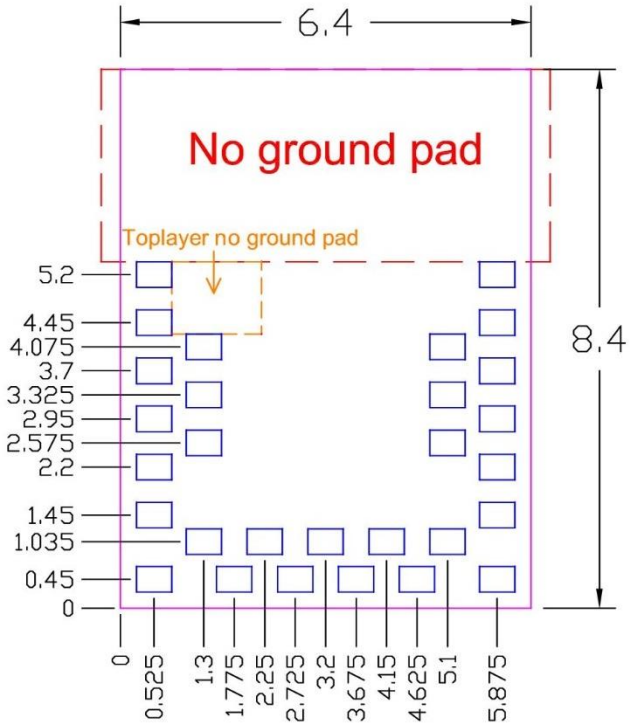
Graphs are all in Top View, Unit in mm.

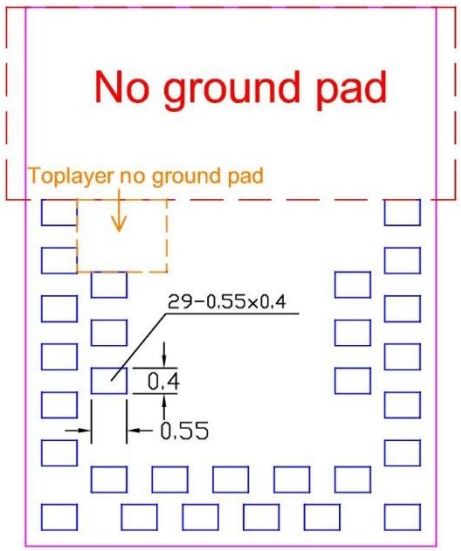


No ground pad



Toplayer no ground pad





Top View (單位：mm)

recommended solder pad layout

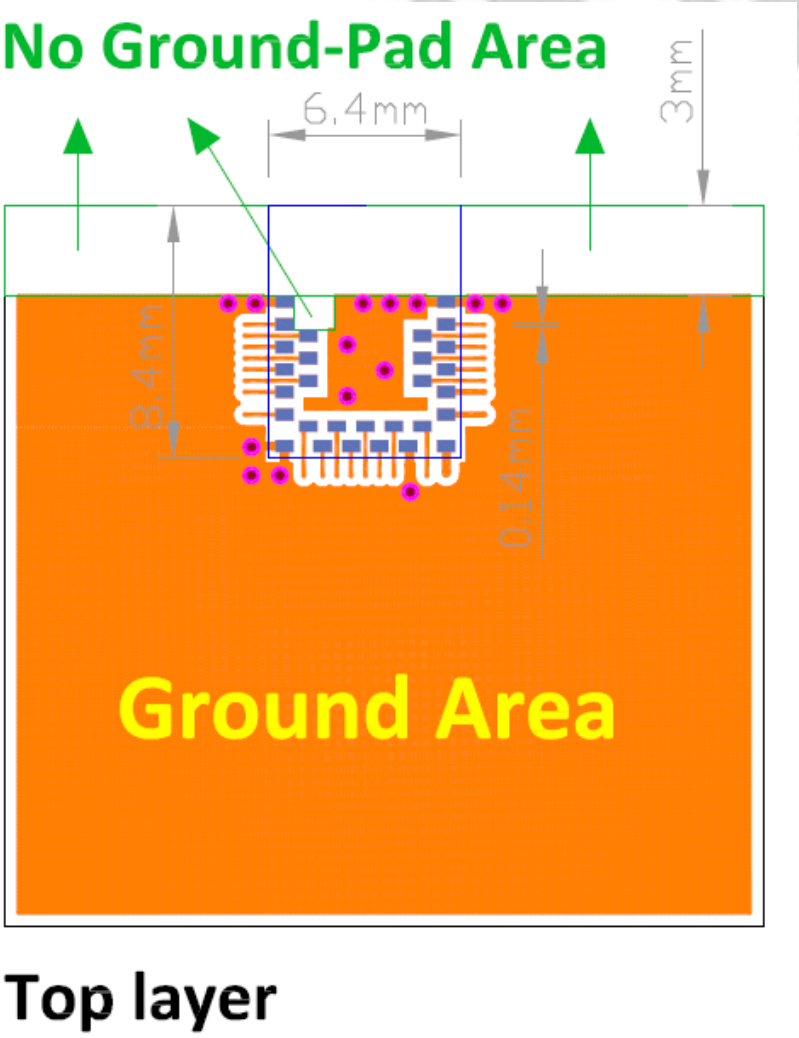
5.3. RF Layout Suggestion (aka Keep-Out Area)

Please follow below instruction to have better wireless performance. Make sure to keep the “No-Ground-Pad” as wider as you can when there is not enough space in your design.

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

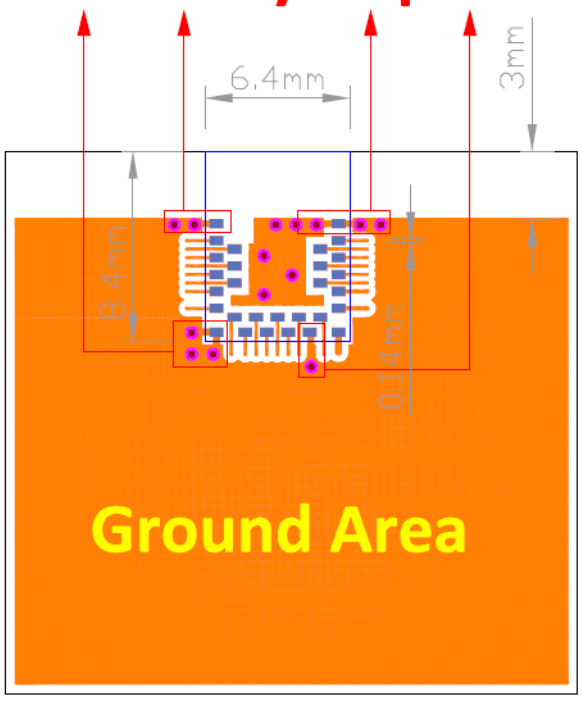
Place the module towards the edge of PCB to have better performance than placing it on the center.

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

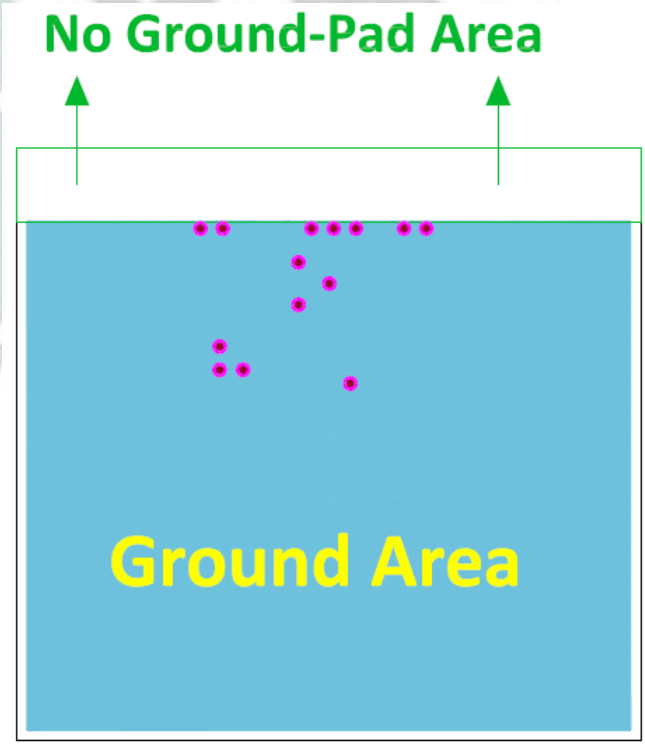


Top layer

Please add via holes in these areas as many as possible

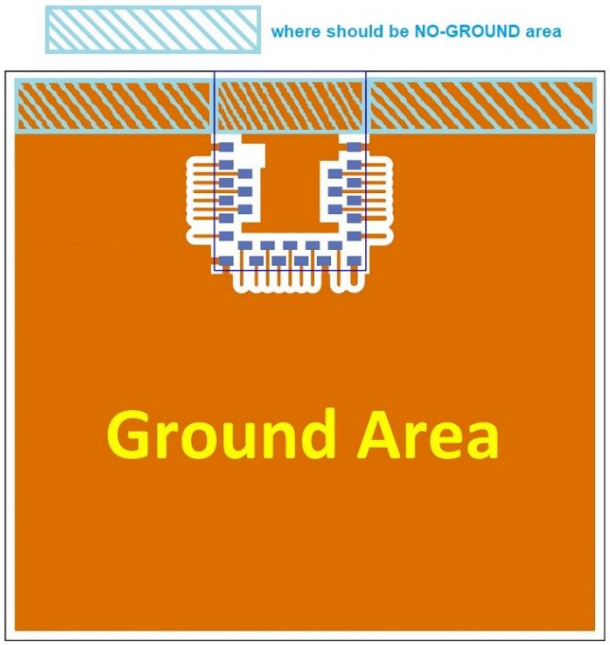


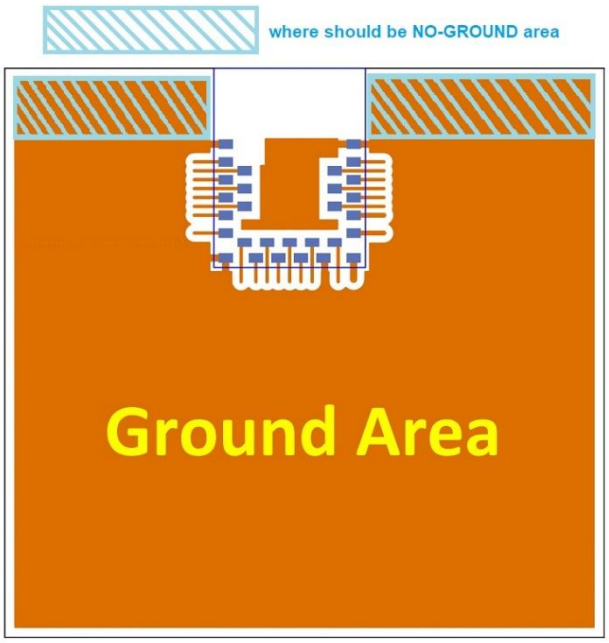
Top layer



Bottom layer

Examples of “**NOT RECOMMENDED**” layout





5.4. 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.

6. Main Chip Solution

RF IC	Crystal Frequency
Nordic NRF52832	**32MHZ**

32MHz crystal is already inside the module.

7. Shipment Packaging Information

Model	Antenna	Photo
MDBT42V-AT	Chip/Ceramic	
MDBT42V-PAT	PCB/Printed	

- Unit Weight of Module:

  MDBT42V-AT: 0.17g / pc (±0.02g) ; MDBT42V-PAT: 0.15g / pc (±0.02g)

- Packaging Type: Anti-Static Tray only

- Minimum Package Quantity (MPQ): 160 pcs per Tray

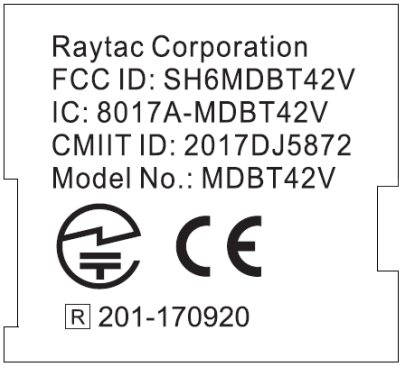
- Carton Contents: 3,200 pcs per carton (20 Full Tray + 1 Empty Tray)

- Dimension of Carton: (L) 37 x (W) 21 x (H) 13 cm

- Gross Weight: approx. 2.20 kgs per full carton (contains 3,200 pcs)

7.1. Marking on Metal Shield

7.1.1. Label

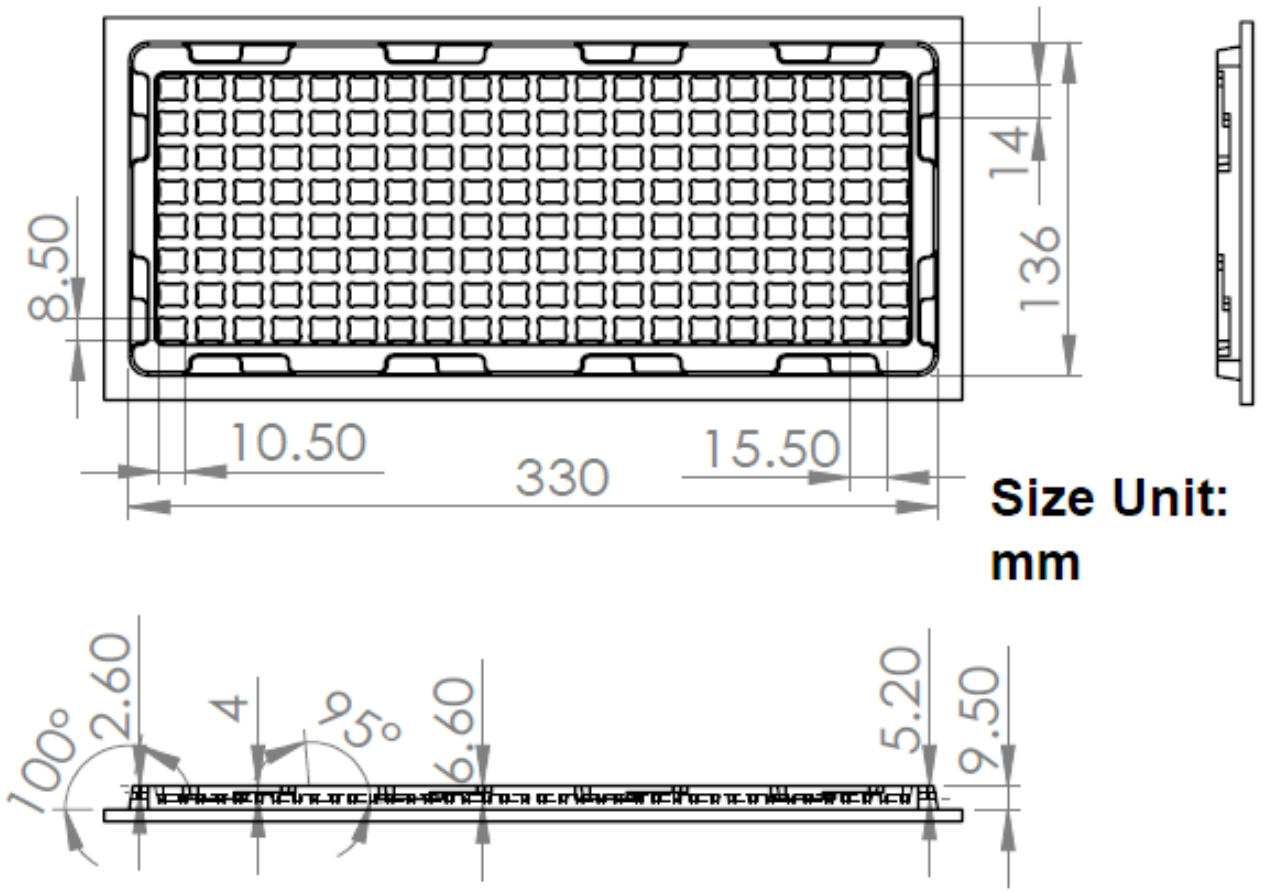


7.1.2. Dot Marking

Dot	Date Code	Photo
Yellow x 2	before 019	
Yellow x 1	019	

7.2. Tray Info

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



8. Specification

Any technical spec shall refer to Nordic's official documents as final reference. Contents below are from "nRF52832 Product Specification V1.4", please click to download full spec.

8.1. Absolute Maximum Ratings

	Min.	Max.	Unit
Supply voltages			
VDD	-0.3	+3.9	V
VSS		0	V
I/O pin voltage			
$V_{I/O}$, VDD ≤3.6 V	-0.3	VDD + 0.3 V	V
$V_{I/O}$, VDD >3.6 V	-0.3	3.9 V	V
NFC antenna pin current			
$I_{NFC1/2}$		80	mA
Radio			
RF input level		10	dBm
Flash memory			
Endurance	10 000		Write/erase cycles
Retention	10 years at 40°C		
Environmental WLCSP, 3.0×3.2 mm package			
Storage temperature	-40	+125	°C
MSL		1	
ESD HBM (human body model)		2	kV
ESD CDM (charged device model)		500	V

8.2. Operation Conditions

Symbol	Parameter	Min.	Nom.	Max.	Units
VDD	Supply voltage, independent of DCDC enable	1.7	3.0	3.6	V
t_{R_VDD}	Supply rise time (0 V to 1.7 V)			60	ms
TA	Operating temperature	-40	25	85	°C

Important: The on-chip power-on reset circuitry may not function properly for rise times longer than the specified maximum.

8.3. Electrical Specifications

8.3.1. General Radio Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
f_{OP}	Operating frequencies	2360		2500	MHz
$f_{PLL,PROG,RES}$	PLL programming resolution		2		kHz
$f_{PLL,CH,SP}$	PLL channel spacing		1		MHz
$f_{DELTA,1M}$	Frequency deviation @ 1 Mbps		±170		kHz
$f_{DELTA,BLE,1M}$	Frequency deviation @ BLE 1 Mbps		±250		kHz
$f_{DELTA,2M}$	Frequency deviation @ 2 Mbps		±320		kHz
$f_{DELTA,BLE,2M}$	Frequency deviation @ BLE 2 Mbps		±500		kHz
fsk_{SPS}	On-the-air data rate	1		2	Mbps

8.3.2. Radio Current Consumption (Transmitter)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{TX,PLUS4dBM,DCDC}$	TX only run current (DCDC, 3V) P_{RF} =+4 dBm		7.5		mA
$I_{TX,PLUS4dBM}$	TX only run current P_{RF} = +4 dBm		16.6		mA
$I_{TX,0dBM,DCDC}$	TX only run current (DCDC, 3V)P_{RF} = 0dBm		5.3		mA
$I_{TX,0dBM}$	TX only run current P_{RF} = 0dBm		11.6		mA
$I_{TX,MINUS4dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -4dBm		4.2		mA
$I_{TX,MINUS4dBM}$	TX only run current P_{RF} = -4 dBm		9.3		mA
$I_{TX,MINUS8dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -8 dBm		3.8		mA
$I_{TX,MINUS8dBM}$	TX only run current P_{RF} = -8 dBm		8.4		mA
$I_{TX,MINUS12dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -12 dBm		3.5		mA
$I_{TX,MINUS12dBM}$	TX only run current P_{RF} = -12 dBm		7.7		mA
$I_{TX,MINUS16dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -16 dBm		3.3		mA
$I_{TX,MINUS16dBM}$	TX only run current P_{RF} = -16 dBm		7.3		mA
$I_{TX,MINUS20dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -20 dBm		3.2		mA
$I_{TX,MINUS20dBM}$	TX only run current P_{RF} = -20 dBm		7.0		mA
$I_{TX,MINUS40dBM,DCDC}$	TX only run current DCDC, 3V P_{RF} = -40 dBm		2.7		mA
$I_{TX,MINUS40dBM}$	TX only run current P_{RF} = -40 dBm		5.9		mA
$I_{START,TX,DCDC}$	TX start-up current DCDC, 3V, P_{RF} = 4 dBm		4.0		mA
$I_{START,TX}$	TX start-up current, P_{RF} = 4 dBm		8.8		mA

8.3.3. Radio Current Consumption (Receiver)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{RX,1M,DCDC}$	RX only run current (DCDC, 3V) 1Msps / 1Msps BLE		5.4		mA
$I_{RX,1M}$	RX only run current 1Msps / 1Msps BLE		11.7		mA
$I_{RX,2M,DCDC}$	RX only run current (DCDC, 3V) 2Msps / 2Msps BLE		5.8		mA
$I_{RX,2M}$	RX only run current 2Msps / 2Msps BLE		12.9		mA
$I_{START,RX,DCDC}$	RX start-up current (DCDC 3V)		3.5		mA
$I_{START,RX,LDO}$	RX start-up current (LDO 3V)		7.5		mA

8.3.4. Transmitter Specification

Symbol	Description	Min.	Typ.	Max.	Units
P_{RF}	Maximum output power		4	6	dBm
P_{RFC}	RF power control range		24		dB
P_{RFCR}	RF power accuracy			±4	dB
$P_{RF1,1}$	1st Adjacent Channel Transmit Power 1 MHz (1 Msps Nordic proprietary mode)		-25		dBc
$P_{RF2,1}$	2nd Adjacent Channel Transmit Power 2 MHz (1 Msps Nordic proprietary mode)		-50		dBc
$P_{RF1,2}$	1st Adjacent Channel Transmit Power 2 MHz (2 Msps Nordic proprietary mode)		-25		dBc
$P_{RF2,2}$	2nd Adjacent Channel Transmit Power 4 MHz (2 Msps Nordic proprietary mode)		-50		dBc
$P_{RF1,2,BLE}$	1st Adjacent Channel Transmit Power 2 MHz (2 Msps BLE mode)		-20		dBc
$P_{RF2,2,BLE}$	2nd Adjacent Channel Transmit Power 4 MHz (2 Msps BLE mode)		-50		dBc

8.3.5. Receiver Operation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{RX,MAX}$	Maximum received signal strength at < 0.1% BER		0		dBm
$P_{SENS,IT,1M}$	Sensitivity, 1Msps nRF mode[1]		-93		dBm
$P_{SENS,IT,SP,1M,BLE}$	Sensitivity, 1Msps BLE ideal transmitter, <=37 bytes BER=1E-3[2]		-96		dBm
$P_{SENS,IT,LP,1M,BLE}$	Sensitivity, 1Msps BLE ideal transmitter >=128 bytes BER=1E-4 [3]		-95		dBm
$P_{SENS,IT,2M}$	Sensitivity, 2Msps nRF mode [4]		-89		dBm
$P_{SENS,IT,SP,2M,BLE}$	Sensitivity, 2Msps BLE ideal transmitter, Packet length <=37bytes		-93		dBm
$P_{SENS,DT,SP,2M,BLE}$	Sensitivity, 2Msps BLE dirty transmitter, Packet length <=37bytes		-93		dBm

1. Typical sensitivity applies when ADDR0 is used for receiver address correlation. When ADDR [1...7] are used for receiver address correlation, the typical sensitivity for this mode is degraded by 3dB.
2. As defined in the Bluetooth Core Specification v4.0 Volume 6: Core System Package (Low Energy Controller Volume).
3. Equivalent BER limit < 10E-04.
4. Same as remark 1.

Symbol	Description	Min.	Typ.	Max.	Units
$P_{SENS,IT,LP,2M,BLE}$	Sensitivity, 2Msps BLE ideal transmitter >= 128bytes		-92		dBm
$P_{SENS,DT,LP,2M,BLE}$	Sensitivity, 2Msps BLE dirty transmitter, Packet length >= 128bytes		-92		dBm

8.3.6. RX Selectivity

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{1M,co\text{-}channel}$	1Msps mode, Co-Channel interference		9		dB
$C/I_{1M,-1MHz}$	1 Msps mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1M,+1MHz}$	1 Msps mode, Adjacent (+1 MHz) interference		-10		dB
$C/I_{1M,-2MHz}$	1 Msps mode, Adjacent (-2 MHz) interference		-19		dB
$C/I_{1M,+2MHz}$	1 Msps mode, Adjacent (+2 MHz) interference		-42		dB
$C/I_{1M,-3MHz}$	1 Msps mode, Adjacent (-3 MHz) interference		-38		dB
$C/I_{1M,+3MHz}$	1 Msps mode, Adjacent (+3 MHz) interference		-48		dB
$C/I_{1M,\pm6MHz}$	1 Msps mode, Adjacent (≥6 MHz) interference		-50		dB
$C/I_{1MBLE,co\text{-}channel}$	1 Msps BLE mode, Co-Channel interference		6		dB
$C/I_{1MBLE,-1MHz}$	1 Msps BLE mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1MBLE,+1MHz}$	1 Msps BLE mode, Adjacent (+1 MHz) interference		-9		dB
$C/I_{1MBLE,-2MHz}$	1 Msps BLE mode, Adjacent (-2 MHz) interference		-22		dB
$C/I_{1MBLE,+2MHz}$	1 Msps BLE mode, Adjacent (+2 MHz) interference		-46		dB
$C/I_{1MBLE,>3MHz}$	1 Msps BLE mode, Adjacent (≥3 MHz) interference		-50		dB
$C/I_{1MBLE,image}$	Image frequency Interference		-22		dB
$C/I_{1MBLE,image,1MHz}$	Adjacent (1 MHz) interference to in-band image frequency		-35		dB
$C/I_{1MBLE,image}$	Image frequency Interference		-22		dB
$C/I_{1MBLE,image,1MHz}$	Adjacent (1 MHz) interference to in-band image frequency		-35		dB
$C/I_{2M,co\text{-}channel}$	2Msps mode, Co-Channel interference		10		dB
$C/I_{2M,-2MHz}$	2 Msps mode, Adjacent (-2 MHz) interference		6		dB
$C/I_{2M,+2MHz}$	2 Msps mode, Adjacent (+2 MHz) interference		-14		dB
$C/I_{2M,-4MHz}$	2 Msps mode, Adjacent (-4 MHz) interference		-20		dB
$C/I_{2M,+4MHz}$	2 Msps mode, Adjacent (+4 MHz) interference		-44		dB
$C/I_{2M,-6MHz}$	2 Msps mode, Adjacent (-6 MHz) interference		-42		dB
$C/I_{2M,+6MHz}$	2 Msps mode, Adjacent (+6 MHz) interference		-47		dB
$C/I_{2M,\geq12MHz}$	2 Msps mode, Adjacent (≥12 MHz) interference		-52		dB
$C/I_{2MBLE,co\text{-}channel}$	2 Msps BLE mode, Co-Channel interference		7		dB
$C/I_{2MBLE,\pm2MHz}$	2 Msps BLE mode, Adjacent (±2 MHz) interference		0		dB
$C/I_{2MBLE,\pm4MHz}$	2 Msps BLE mode, Adjacent (±4 MHz) interference		-47		dB
$C/I_{2MBLE,\geq6MHz}$	2 Msps BLE mode, Adjacent (≥6 MHz) interference		-49		dB
$C/I_{2MBLE,image}$	Image frequency Interference		-21		dB
$C/I_{2MBLE,image,\ 2MHz}$	Adjacent (2 MHz) interference to in-band image frequency		-36		dB

Remark: Wanted signal level at PIN = -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.

8.3.7. RX Intermodulation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{IMD,1M}$	IMD performance, 1 Msps (3 MHz, 4 MHz, and 5 MHz offset)		-33		dBm
$P_{IMD,1M,BLE}$	IMD performance, BLE 1 Msps (3 MHz, 4 MHz, and 5 MHz offset)		-30		dBm
$P_{IMD,2M}$	IMD performance, 2 Msps (6 MHz, 8 MHz, and 10 MHz offset)		-33		dBm
$P_{IMD,2M,BLE}$	IMD performance, BLE 2 Msps (6 MHz, 8 MHz, and 10 MHz offset)		-32		dBm

Remark: Wanted signal level at PIN = -64dBm. Two interferers with equal input power are used. The interferer closet in frequency is not modulated, the other interferer is modulated equal with the wanted signal. The input power of the interferers where the sensitivity equals BER = 0.1% is presented.

8.3.8. Radio Timing Parameters

Symbol	Description	Min.	Typ.	Max.	Units
t_{TXEN}	Time between TXEN task and READY event after channel FREQUENCY configured		140		us
$t_{TXEN,FAST}$	Time between TXEN task and READY event after channel FREQUENCY configured (Fast Mode)		40		us
$t_{TXDISABLE}$	Time between DISABLE task and DISABLED event when the radio was in TX and mode is set to 1Msps		6		us
$t_{TXDISABLE,2M}$	Time between DISABLE task and DISABLED event when the radio was in TX and mode is set to 2Msps		4		us
t_{RXEN}	Time between the RXEN task and READY event after channel FREQUENCY configured in default mode		140		us
$t_{RXEN,FAST}$	Time between the RXEN task and READY event after channel FREQUENCY configured in fast mode		40		us
t_{SWITCH}	The minimum time taken to switch from RX to TX or TX to RX (channel FREQUENCY unchanged)		20		us
$t_{RXDISABLE}$	Time between DISABLE task and DISABLED event when the radio was in RX		0		us
$t_{TXCHAIN}$	TX chain delay		0.6		us
$t_{RXCHAIN}$	RX chain delay		9.4		us
$t_{RXCHAIN,2M}$	RX chain delay in 2Msps mode		5		us

8.3.9. RSSI Specifications

Symbol	Description	Min.	Typ.	Max.	Units
$RSSI_{ACC}$	RSSI Accuracy Valid range -90 to -20 dBm		±2		dB
$RSSI_{RESOLUTION}$	RSSI resolution		1		dB
$RSSI_{PERIOD}$	Sample period		0.25		us

8.3.10. CPU

Symbol	Description	Min.	Typ.	Max.	Units
W_{FLASH}	CPU wait states, running from flash, cache disabled	0		2	
$W_{FLASHCACHE}$	CPU wait states, running from flash, cache enabled	0		3	
W_{RAM}	CPU wait states, running from RAM			0	
$I_{DDFLASHCACHE}$	CPU current, running from flash, cache enabled, LDO		7.4		mA
$I_{DDFLASHCACHEDCDC}$	CPU current, running from flash, cache enabled, DCDC 3V		3.7		mA
$I_{DDFLASH}$	CPU current, running from flash, cache disabled, LDO		8.0		mA
$I_{DDFLASHDCDC}$	CPU current, running from flash, cache disabled, DCDC 3V		3.9		mA
I_{DDRAM}	CPU current, running from RAM, LDO		6.7		mA
$I_{DDRAMDCDC}$	CPU current, running from RAM, DCDC 3V		3.3		mA
$I_{DDFLASH/MHz}$	CPU efficiency, running from flash, cache enabled, LDO		125		µA/ MHz
$I_{DDFLASHDCDC/MHz}$	CPU efficiency, running from flash, cache enabled, DCDC 3V		58		µA/
CM_{FLASH}	CoreMark[5], running from flash, cache enabled		215		CoreM
$CM_{FLASH/MHz}$	CoreMark per MHz, running from flash, cache enabled		3.36		CoreM MHz
$CM_{FLASH/mA}$	CoreMark per mA, running from flash, cache enabled, DCDC 3V		58		CoreM mA

8.3.11. Power Management

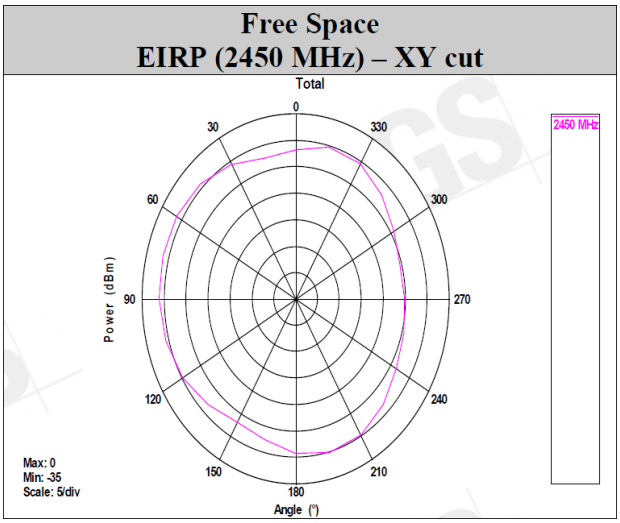
Symbol	Description	Min.	Typ.	Max.	Units
$I_{ON\_RAMOFF\_EVENT}$	System ON, No RAM retention, Wake on any event		1.2		µA
$I_{ON\_RAMON\_EVENT}$	System ON, Full RAM retention, Wake on any event		1.5		µA
$I_{ON\_RAMOFF\_RTC}$	System ON, No RAM retention, Wake on RTC		1.9		µA
$I_{OFF\_RAMOFF\_RESET}$	System OFF, No RAM retention, Wake on reset		0.3		µA
$I_{OFF\_RAMOFF\_GPIO}$	System OFF, No RAM retention, Wake on GPIO		0.3		µA
$I_{OFF\_RAMOFF\_LPCOMP}$	System OFF, No RAM retention, Wake on LPCOMP		1.9		µA
$I_{OFF\_RAMOFF\_NFC}$	System OFF, No RAM retention, Wake on NFC field		0.7		µA
$I_{OFF\_RAMON\_RESET}$	System OFF, Full 64 kB RAM retention, Wake on reset		0.7		µA

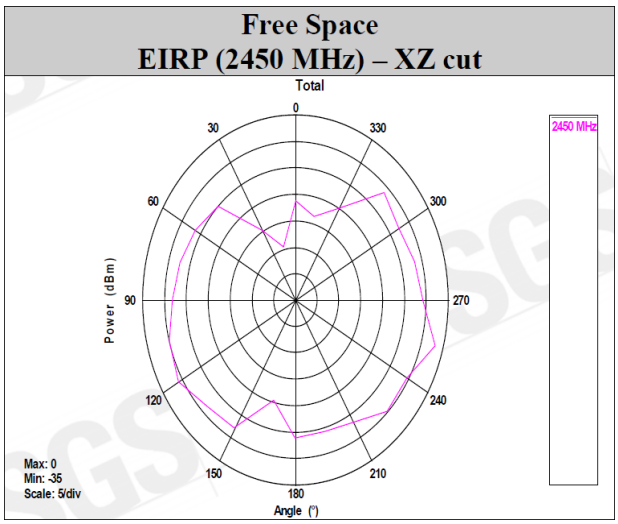
9. Antenna

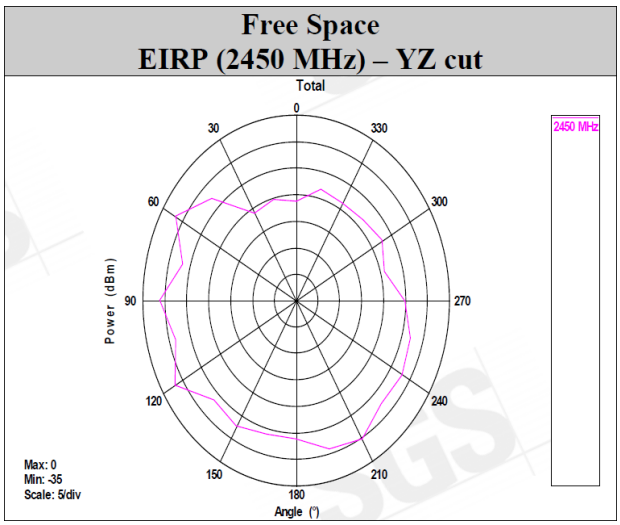
9.1. MDBT42V

Test Result

Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Gain (dBi)	-1.26	-1.12	-1.13	-1.29	-1.55	-1.89	-2.32	-2.81	-3.39	-3.88	-4.59
Peak EIRP (dBm)	-1.26	-1.12	-1.13	-1.29	-1.55	-1.89	-2.32	-2.81	-3.39	-3.88	-4.59
Directivity (dBi)	4.81	4.87	4.91	4.96	4.99	5.01	4.99	4.98	4.92	4.88	4.95



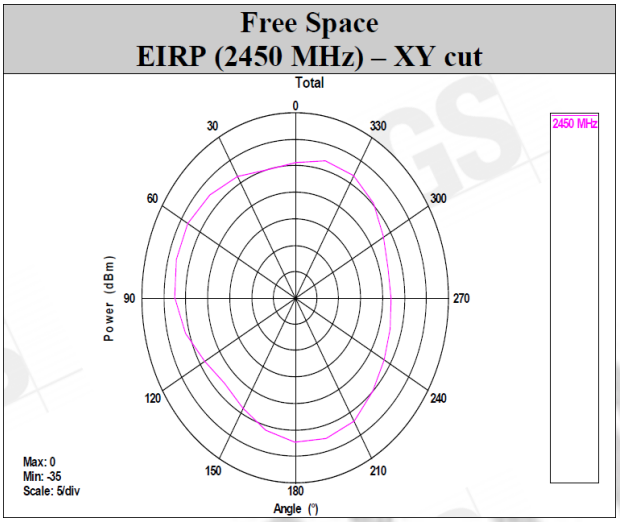


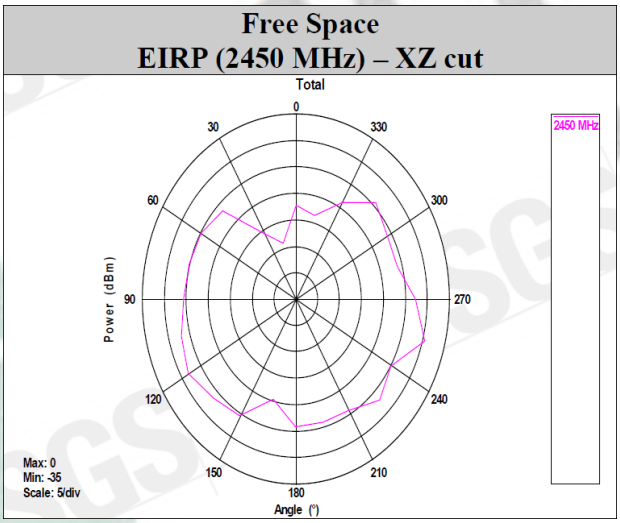


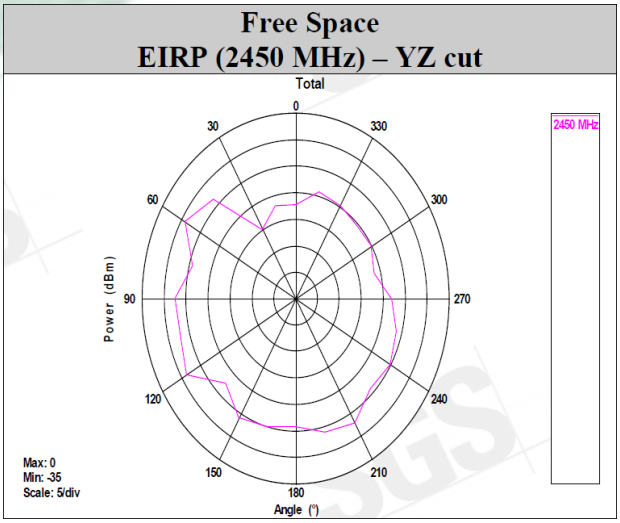
9.2. MDBT42V-P

Test Result

Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Gain (dBi)	-3.85	-3.81	-3.92	-4.00	-4.07	-4.14	-4.22	-4.32	-4.46	-4.63	-5.13
Peak EIRP (dBm)	-3.85	-3.81	-3.92	-4.00	-4.07	-4.14	-4.22	-4.32	-4.46	-4.63	-5.13
Directivity (dBi)	5.29	5.36	5.36	5.43	5.51	5.49	5.45	5.37	5.33	5.31	5.30







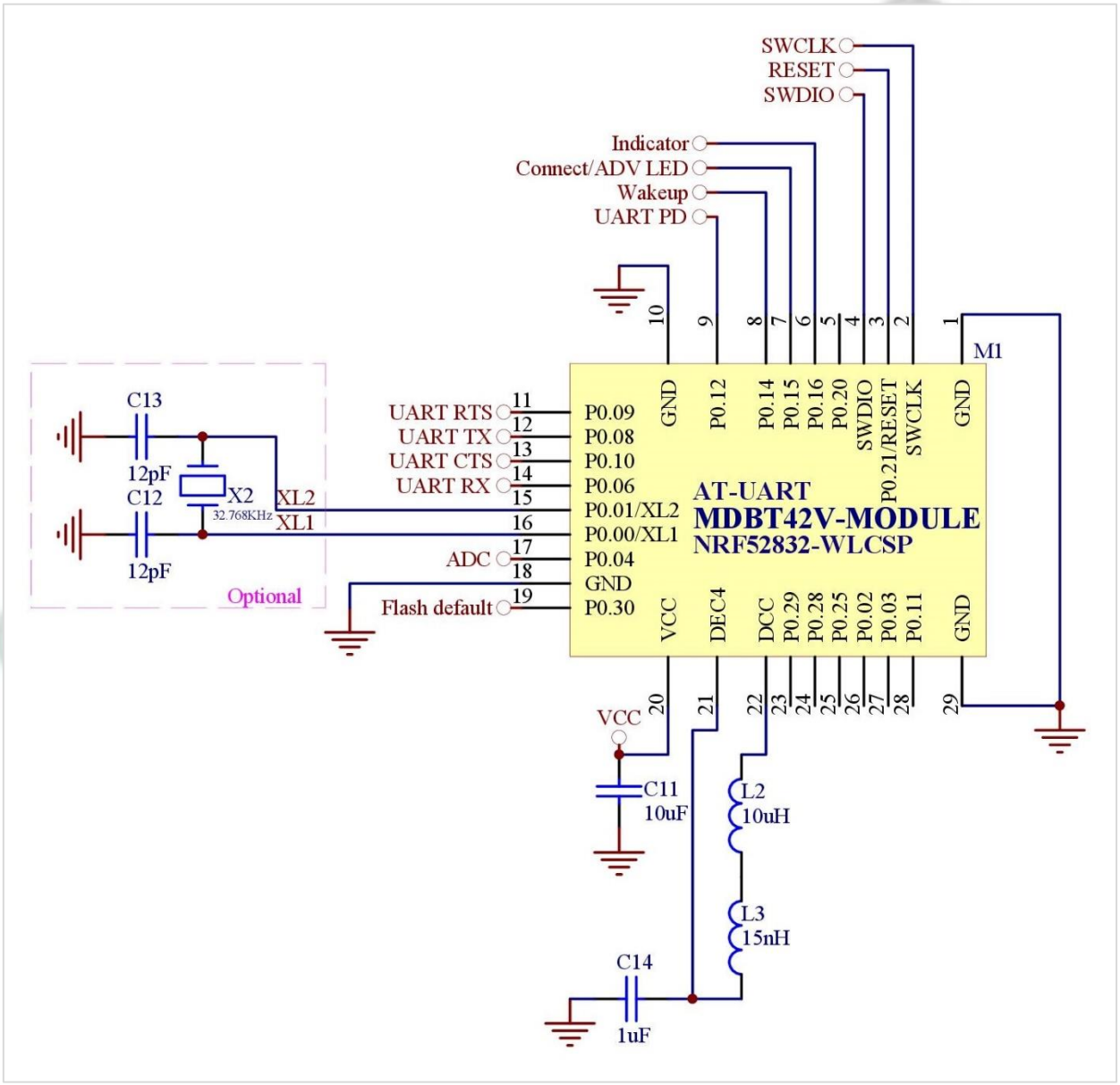
10. Reference Circuit

Module is pre-programmed with Raytac's AT command firmware. Default is NOT using "DC-DC mode" and is using internal 32.768khz RC oscillator.

REMARK:

***** When using DC-DC mode, please add L2 / L3 / C14. *****

***** When NOT using internal 32.768khz RC oscillator, please add X2 / C12 / C13.***



11. Certification

11.1. Declaration ID

BT 4.2

Declaration ID	QDID(s)	Company	Specification Name
D033661	91882 - End Product	Raytac Corporation	4.2

BT 5.0

Declaration ID	QDID(s)	Company	Specification Name
D036781	100551 - End Product	Raytac Corporation	5.0

BT 5.1

Declaration ID	QDID(s)	Company	Specification Name
D047708	139361 - End Product	Raytac Corporation	5.1

11.2. FCC Certificate (USA)

telefication

TCB

GRANT OF EQUIPMENT AUTHORIZATION

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

TCB

Telefication B.V.
Edisonstraat 12a
Zevenaar, NL-6902 PK
Netherlands

Date of Grant: 09/07/2017

Application
Dated: 09/05/2017

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:	SH6MDBT42V
Name of Grantee:	Raytac Corp.
Equipment Class:	**Digital Transmission System**
Notes:	**BT 4.2 Module**
Modular Type:	**Single Modular**

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	**2402.0 - 2480.0**	**0.0029**		

Modular Approval. Power output listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. The antennas used for this transmitter as shown in this filing must be installed to provide a separation distance of at least 5 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users may not be provided with the module installation instructions.OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

Certificate No.: 172181318/AA/00	George Lo Product Assessor	George Lo

11.3. TELEC Certificate (Japan)

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

telefication

Certificate

of
Radio Equipment in JAPAN

No: 201-170920 / 00

Telefication, operating as Conformity Assessment Body (CAB ID Number: 201) 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)

Product description: **BT 4.2 Module**
Trademark: **Raytac**
Type designation: **MDBT42V**
Hardware / Software version: **1 / 1**
Variants: **See Annex 3**

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

This statement is granted to:

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

This statement has THREE Annexes.

Zevenaar, 12 September 2017

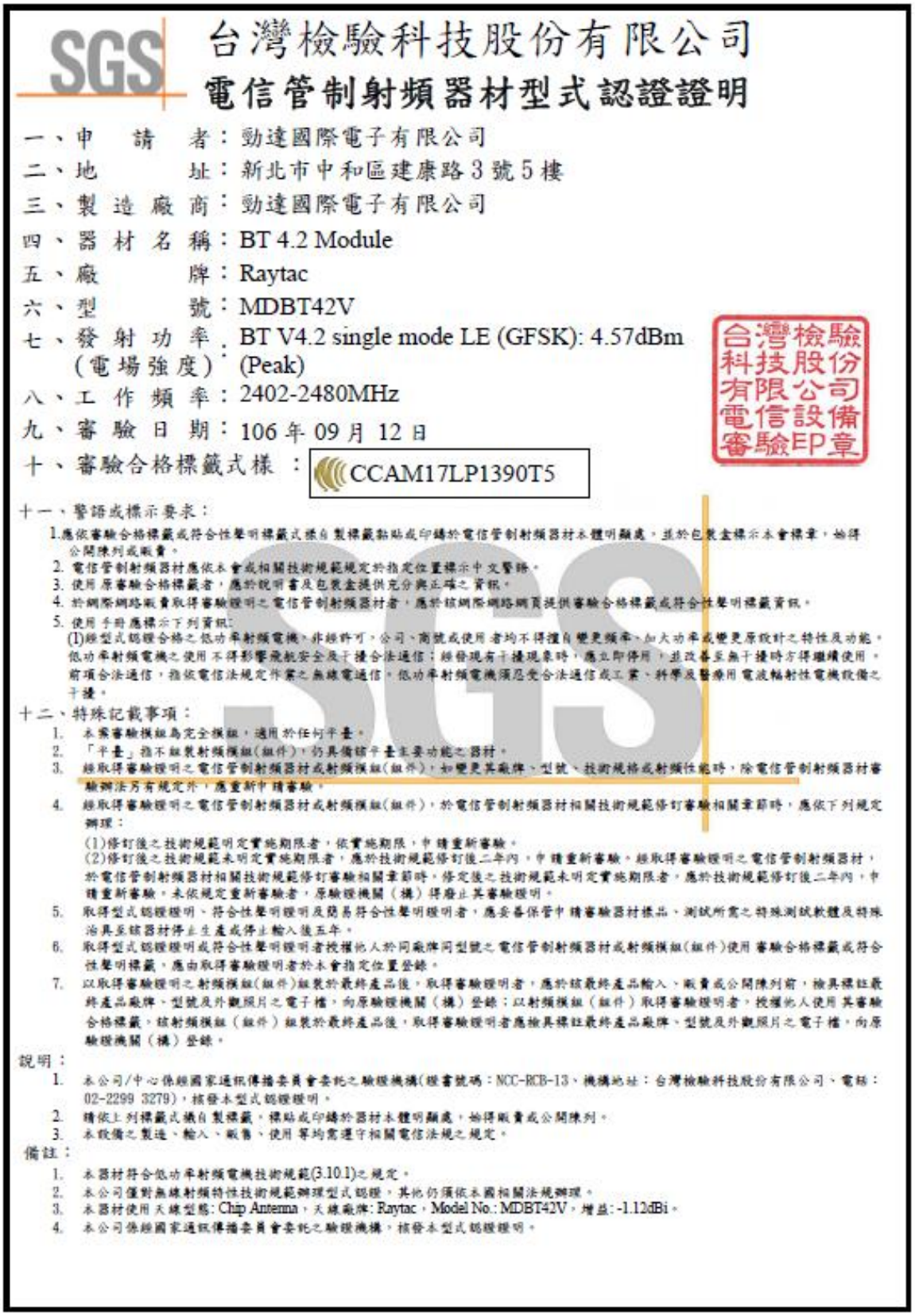
CAB

Ramy Nabod
Product Assessor

PRODUCTS
RvA C 224

11.4. NCC Certificate (Taiwan)

MDBT42V Series



台灣檢驗科技股份有限公司

電信管制射頻器材型式認證證明

一、申　請　者：勁達國際電子有限公司
二、地　　址：新北市中和區建康路3號5樓
三、製造廠商：勁達國際電子有限公司
四、器材名稱：BT 4.2 Module
五、廠　　牌：Raytac
六、型　　號：MDBT42V
七、發射功率（電場強度）：BT V4.2 single mode LE (GFSK): 4.57dBm (Peak)
八、工作頻率：2402-2480MHz
九、審驗日期：106 年 09 月 12 日
十、審驗合格標籤式樣：CCAM17LP1390T5

台灣檢驗科技股份有限公司 電信設備審驗EP章

十一、警語或標示要求：

1. 應依審驗合格標籤或符合性聲明標籤式樣自製標籤黏貼或印鑄於電信管制射頻器材本體明顯處，並於包裝盒標示本會標章，始得公開陳列或販賣。
2. 電信管制射頻器材應依本會或相關技術規範規定於指定位置標示中文警語。
3. 使用原審驗合格標籤者，應於說明書及包裝盒提供充分與正確之資訊。
4. 於網際網路販賣取得審驗證明之電信管制射頻器材者，應於該網際網路網頁提供審驗合格標籤或符合性聲明標籤資訊。
5. 使用手冊應標示下列資訊：
   (1)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。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。

十二、特殊記載事項：

1. 本案審驗模組為完全模組，適用於任何平臺。
2. 「平臺」指不組裝射頻模組(組件)，仍具備部分主要功能之器材。
3. 經取得審驗證明之電信管制射頻器材或射頻模組(組件)，如變更其廠牌、型號、技術規格或射頻性能時，除電信管制射頻器材審驗辦法另有規定外，應重新申請審驗。
4. 經取得審驗證明之電信管制射頻器材或射頻模組(組件)，於電信管制射頻器材相關技術規範修訂審驗相關章節時，應依下列規定辦理：
   (1)修訂後之技術規範明定實施期限者，依實施期限，申請重新審驗。
   (2)修訂後之技術規範未明定實施期限者，應於技術規範修訂後二年內，申請重新審驗。經取得審驗證明之電信管制射頻器材，於電信管制射頻器材相關技術規範修訂審驗相關章節時，修定後之技術規範未明定實施期限者，應於技術規範修訂後二年內，申請重新審驗。未依規定重新審驗者，原驗證機關（構）得廢止其審驗證明。
5. 取得型式認證證明、符合性聲明證明及簡易符合性聲明證明者，應妥善保管申請審驗器材樣品、測試所需之特殊測試軟體及特殊治具至該器材停止生產或停止輸入後五年。
6. 取得型式認證證明或符合性聲明證明者授權他人於同廠牌同型號之電信管制射頻器材或射頻模組(組件)使用審驗合格標籤或符合性聲明標籤，應由取得審驗證明者於本會指定位置登錄。
7. 以取得審驗證明之射頻模組(組件)組裝於最終產品後，取得審驗證明者，應於該最終產品輸入、販賣或公開陳列前，檢具標註最終產品廠牌、型號及外觀照片之電子檔，向原驗證機關（構）登錄；以射頻模組（組件）取得審驗證明者，授權他人使用其審驗合格標籤，該射頻模組（組件）組裝於最終產品後，取得審驗證明者應檢具標註最終產品廠牌、型號及外觀照片之電子檔，向原驗證機關（構）登錄。

說明：

1. 本公司/中心係經國家通訊傳播委員會委託之驗證機構(證書號碼：NCC-RCB-13、機構地址：台灣檢驗科技股份有限公司、電話：02-2299 3279)，核發本型式認證證明。
2. 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。
3. 本設備之製造、輸入、販售、使用等均需遵守相關電信法規之規定。

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: Chip Antenna，天線廠牌: Raytac，Model No.: MDBT42V，增益: -1.12dBi。
4. 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。

台灣檢驗科技股份有限公司

電信管制射頻器材型式認證證明

一、申　請　者：勁達國際電子有限公司
二、地　　址：新北市中和區建康路 3 號 5 樓
三、製 造 廠 商：勁達國際電子有限公司
四、器 材 名 稱：BT 4.2 Module
五、廠　　牌：Raytac
六、型　　號：MDBT42V-P
七、發射功率（電場強度）：BT V4.2 single mode LE (GFSK): 4.57dBm (Peak)
八、工 作 頻 率：2402-2480MHz
九、審 驗 日 期：106 年 09 月 12 日
十、審驗合格標籤式樣：CCAM17LP1391T7

台灣檢驗科技股份有限公司電信設備審驗印章

十一、警語或標示要求：

1. 應依審驗合格標籤或符合性聲明標籤式樣自製標籤黏貼或印鑄於電信管制射頻器材本體明顯處，並於包裝盒標示本會標章，始得公開陳列或販賣。
2. 電信管制射頻器材應依本會或相關技術規範規定於指定位置標示中文警語。
3. 使用原審驗合格標籤者，應於說明書及包裝盒提供充分與正確之資訊。
4. 於網際網路販賣取得審驗證明之電信管制射頻器材者，應於該網際網路網頁提供審驗合格標籤或符合性聲明標籤資訊。
5. 使用手冊應標示下列資訊：
   (1)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。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。

十二、特殊記載事項：

1. 本案審驗模組為完全模組，適用於任何平臺。
2. 「平臺」指不組裝射頻模組(組件)，仍具備該平臺主要功能之器材。
3. 經取得審驗證明之電信管制射頻器材或射頻模組(組件)，如變更其廠牌、型號、技術規格或射頻性能時，除電信管制射頻器材審驗辦法另有規定外，應重新申請審驗。
4. 經取得審驗證明之電信管制射頻器材或射頻模組(組件)，於電信管制射頻器材相關技術規範修訂審驗相關章節時，應依下列規定辦理：
   (1)修訂後之技術規範明定實施期限者，依實施期限，申請重新審驗。
   (2)修訂後之技術規範未明定實施期限者，應於技術規範修訂後二年內，申請重新審驗，經取得審驗證明之電信管制射頻器材，於電信管制射頻器材相關技術規範修訂審驗相關章節時，修定後之技術規範未明定實施期限者，應於技術規範修訂後二年內，申請重新審驗，未依規定重新審驗者，原驗證機關（構）得廢止其審驗證明。
5. 取得型式認證證明、符合性聲明證明及簡易符合性聲明證明者，應妥善保管申請審驗器材樣品、測試所需之特殊測試軟體及特殊治具至該器材停止生產或停止輸入後五年。
6. 取得型式認證證明或符合性聲明證明者授權他人於同廠牌同型號之電信管制射頻器材或射頻模組(組件)使用審驗合格標籤或符合性聲明標籤，應由取得審驗證明者於本會指定位置登錄。
7. 以取得審驗證明之射頻模組(組件)組裝於最終產品後，取得審驗證明者，應於該最終產品輸入、販賣或公開陳列前，檢具標註最終產品廠牌、型號及外觀照片之電子檔，向原驗證機關（構）登錄；以射頻模組（組件）取得審驗證明者，授權他人使用其審驗合格標籤，該射頻模組（組件）組裝於最終產品後，取得審驗證明者應檢具標註最終產品廠牌、型號及外觀照片之電子檔，向原驗證機關（構）登錄。

說明：

1. 本公司/中心係經國家通訊傳播委員會委託之驗證機構(證書號碼：NCC-RCB-13、機構地址：台灣檢驗科技股份有限公司、電話：02-2299 3279)，核發本型式認證證明。
2. 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。
3. 本設備之製造、輸入、販售、使用等均需遵守相關電信法規之規定。

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: PCB Antenna，天線廠牌: Raytac，Model No.: MDBT42V-P，增益: -3.81dBi。
4. 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。

11.5. CE Test Report (EU)

CE

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

FOR

Applicant:	Raytac Corporation 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City , 23586, Taiwan
Product Name:	BLE Module
Brand Name:	Raytac
Model No.:	MDBT42V, MDBT42V-P
Model Difference:	MDBT42V with chip antenna; MDBT42V-P with PCB antenna
Report Number:	E2/2017/80017-01
Issue Date:	May 20, 2020
Date of Test:	Aug. 01, 2017 ~ Aug. 24, 2017 (Original) Apr. 16, 2020 ~ May 11, 2020 (Updated)
Date of EUT Received:	Aug. 01, 2017 (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: E1/2017/80007C

VERIFICATION OF EMC COMPLIANCE

Verification No.	:	E1/2017/80007C
Representative Model No.	:	MDBT42V
Added Model(s)	:	MDBT42V-P
Product Name	:	BT 4.2 Module
Brand Name	:	Raytac
Applicant	:	Raytac Corporation
Address of Applicant	:	5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City , 23586, Taiwan
Test Report Number	:	E1/2017/80007
Date of Issue	:	Sep. 04, 2017
Applicable Standards	:	EN 301 489 –1 $_{v2.2.0:}$ 2017-03 (Draft) EN 301 489 –17 $_{v3.2.0:}$ 2017-03 (Draft) 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.

Authorized Signatory:

Eddy Cheng

SGS TAIWAN LTD.
Eddy Cheng
Technical Asst. Supervisor

11.6. IC Certificate (Canada)

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

telefication

TECHNICAL ACCEPTANCE CERTIFICATE — **CERTIFICAT D'ACCEPTABILITÉ TECHNIQUE**

CERTIFICATION No. No. DE CERTIFICATION	8017A-MDBT42V
TELEFICATION No. No. DE TELEFICATION	172170518/AA/00
TEST SITE No. No. DE LABORATOIRE	4620A-5
ISSUED TO DÉLIVRÉ A	Raytac Corporation
TYPE OF EQUIPMENT GENRE DE MATÉRIEL	Bluetooth device
TRADE NAME AND MODEL MARQUE ET MODELE	Raytac / MDBT42V Raytac / MDBT42V-P
CERTIFIED TO CERTIFIÉ SELON LE	SPECIFICATION CAHIER DES CHARGES

RSS-102 ISSUE 5
RSS-247 EDITION 2

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 ISED 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 ISED. 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 ISED.

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'ISDE 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'ISDE. 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 ISDE.

ISSUED BY TELEFICATION BV (NL0001), RECOGNIZED CERTIFICATION BODY BY INNOVATION, SCIENCE AND ECONOMIC DEVELOPMENT CANADA
DÉLIVRÉ PAR TELEFICATION BV (NL0001), ORGANISME DE CERTIFICATION RECONNU PAR INNOVATION, SCIENCES ET DÉVELOPPEMENT ÉCONOMIQUE 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 07 Sep 2017 BY

George Lo
Product Assessor

This certificate has one annex.

George Lo

PRODUCTS
RvA C 224

11.7. 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: 2017DJ5872
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：
Validity 五年

2017 年 9 月 14 日
Year Month Date

11.8. RoHS & REACH Report

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

11.9. 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.

11.9.1. FCC (USA)

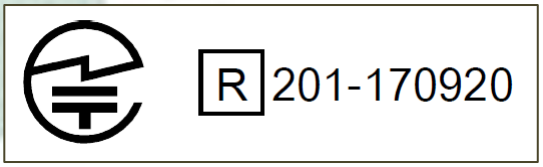
The FCC statement should be included in the user manual when there is no enough space on label. Otherwise, it should be included on the label.

“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: SH6MDBT42V”.

11.9.2. TELEC (Japan)

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



11.9.3. 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。

MDBT42V Series 

MDBT42V-P Series 

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 CCAM17LP1390T5」或「本產品內含射頻模組：ID 編號 CCAM17LP1391T7」。

「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。

11.9.4. 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-MDBT42V”.

12. 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.

13. Basic Facts for nRF52 Chip

Below chart shows basic spec for Nordic nRF52 family, which is helpful to understand the differences between each SoC. Any discrepancy shall refer to Nordic's technical document as final reference.

Nordic Solution	nRF52840	nRF52833	nRF52820	nRF52832	nRF52810	nRF52811
RAYTAC Model No. (MDBTXX)	50Q-1MV2 50Q-P1MV2 50Q-U1MV2	50Q-512K 50Q-P512K 50Q-U512K	50-256R 50-P256R	42Q-512KV2 42Q-P512KV2 42 series 42V series	42Q-192KV2 42Q-P192KV2	42Q-192KL 42Q-P192KL
Bluetooth Direction Finding		V	V			V
Bluetooth 5 Long Range (125kbps)	V	V	V			V
Bluetooth 5 High Speed	V	V	V	V	V	V
Bluetooth 5 Ad. Extention (x8)	V	V	V	V	V	V
Flash (kBytes)	1024	512	256	512	192	192
RAM (kBytes)	256	128	32	64	24	24
ANT Plus	V	V		V	V	V
IEEE 802.15.4	V	V	V			V
ARM® TrustZone® Cryptocell	V					
USB	V	V	V			
QSPI	V					
NFC	V	V		V		
I2S	V	V		V		
SPI, TWI, UART, PWM	V	V	V	V	V	V
PDM	V	V		V	V	V
ADC, Comparators	V	V	without ADC	V	V	V
Supply Range (V)	1.7 to 5.5	1.7 to 5.5	1.7 to 5.5	1.7 to 3.6	1.7 to 3.6	1.7 to 3.6

14. 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 Developer Zone: 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 nRF52832 :
  https://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF52832
  A brief introduction to nRF52832 and download links for Nordic's developing software and SoftDevices.

History of Firmware Revision

FW Ver.	Compatible HW Build	Release Date	Description of Revision	Note
1.0		2018/07/02	1st release.	99-52832-10A
1.1		2018/10/17	1. Improved power consumption. 2. UI Changes: - Add “AT+SLEEP” to sleep in connected state 3. Add new AT commands - AT+CONNECTINTERVALMODE2 - AT+CONNECTINTERVALTIMEtttttttt - AT?CONNECTINTERVALTIME - AT+SETGPIOnnHIGH - AT+SETGPIOnnLOW - AT+SETGPIOnnOFF 4. Modify detection for ADC value. 5. Add function of setting MAC address by the user.	99-52832-10B
1.2		2020/04/09	1. Fixed issues of reading MAC address. 2. Added an update process on DLE after connection.	99-52832-10C

Full List of Raytac's BLE Modules

MDBT40 & MDBT40-P Series

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

MDBT42Q Series (QFN Package IC)

Series	Nordic Solution	Raytac No.	IC Version	Antenna	RAM	Flash Memory
MDBT42Q	nRF52832	MDBT42Q-512KV2	2	Chip Antenna	64 kb	512 K
	nRF52810	MDBT42Q-192K	1		24 kb	192 K
	nRF52811	MDBT42Q-192KL	1			
MDBT42Q-P	nRF52832	MDBT42Q-P512KV2	2	PCB Antenna	64 kb	512 K
	nRF52810	MDBT42Q-P192K	1		24 kb	192 K
	nRF52811	MDBT42Q-P192KL	1			
MDBT42Q-U	nRF52832	MDBT42Q-U512KV2	2	u.FL Connector	64 kb	512 K

MDBT42 Series (WLCSP Package IC)

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

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

MDBT50Q Series (aQFN Package IC)

Series	Nordic Solution	Raytac No.	IC Version	Antenna	RAM	Flash Memory
MDBT50Q	nRF52840	MDBT50Q-1MV2	2	Chip Antenna	256 kb	1MB
	nRF52833	MDBT50Q-512K	1		128 kb	512 kb
MDBT50Q-P	nRF52840	MDBT50Q-P1MV2	2	PCB Antenna	256 kb	1MB
	nRF52833	MDBT50Q-P512K	1		128 kb	512 kb
MDBT50Q-U	nRF52840	MDBT50Q-U1MV2	2	u.FL Connector	256 kb	1MB
	nRF52833	MDBT50Q-U512K	1		128 kb	512 kb

Dongle	nRF52840	MDBT50Q-RX	1, 2	PCB Antenna	256 kb	1MB

MDBT50 & MDBT50-P Series

Series	Nordic Solution	Raytac No.	IC Version	Antenna	RAM	Flash Memory
MDBT50	nRF52820	MDBT50-256R	1	Chip Antenna	256 kb	32 K

MDBT50-P	nRF52820	MDBT50-P256R	1	PCB Antenna	256 kb	32 K

Release Note

- 2018/07/02 Version A: 1st release

- 2018/08/15 Version B:

  (1) Revised typo of model no. on the first page.

  (2) Added Chapter 5: Product Dimension, “no washing” note in Chapter 11.

  (3) Updated link for RoHS & REACH.

- 2018/11/02 Version C:

  (1) See *History of Firmware Revision* for FW revision 1.1.

- 2020/04/09 Version D:

  (1) See *History of Firmware Revision* for FW revision 1.2.

  (2) Updated the tray info in section 7.2.

  (3) Added section 9: Antenna.

  (4) Added MDBT50-256R & MDBT50-P256R (nRF52820 module) in the list of Raytac BLE module.

- 2020/06/09 Version E:

  (1) Refined description in section 3.

  (2) Added tolerance of size info in section 5.

  (3) Updated module photo and info of dot marking in section 7.

  (4) Updated CE EN300 328 v.2.2.2 in section 11.

  (5) Added nRF52820 in section 13.