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Version: A
Issued Date: 2018/10/19

Approval Sheet

(產品承認書)

產品名稱 (Product): BT 4.2 / BT 5 Module (nRF52832)

產品型號 (Model No.): **MDBT42Q – ATM** (Chip Antenna)

MDBT42Q – PATM (PCB Antenna)

Advantage of MDBT42Q & MDBT42Q-P series:

1. *Long working distance:*
   ***MDBT42Q**: over 80 meters in open space.*
   ***MDBT42Q-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), and KC (South Korea).*

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1. Overall Introduction

Raytac's MDBT42Q-ATM & MDBT42Q-PATM 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 central/master role for data bridge in compact size **(L) 16 x (W) 10 x (H) 2.2 mm**.

2. AT Command

2.1. List of supported commands

- Setting of scanned device name
- Setting of scanned base UUID/service UUID/TX character/RX character
- Setting of scanned RSSI threshold
- Choose data rate of 1M bps or 2M bps on-air
- Set TX output power in 5 levels.
- Set scanning time
- Enable/disable scanning
- Set LED pattern indicating scanning or connecting status
- 7 sets of UART baud rates
- Enable/disable UART flow control
- 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
- Retrieve MAC Address
- Retrieve ADC value for battery detection
- Support maximum MTU 247bytes / data payload up to maximum 244 bytes
- Enable/Disable Beacon information printed out through UART interface (31 bytes beacon)
- Support scan Beacon company ID/UUID (31 bytes beacon)

2.2. AT Command Sets

2.2.1. “Write” Commands

No.	Command	Description
(1)	**AT+NAME**	Set scanned 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+SCANOLDSTART**	Set to start scanning paired device
(4)	**AT+SCANNEWSTART**	Set to start scanning **ALL** devices
(5)	**AT+SCANSTOP**	Set to stop scanning
(6)	**AT+SLEEP**	Set to get into deep sleep mode
(7)	**AT+BAUDRATE9600**	Set UART baud rate at 9600 bps,n,8,1
(8)	**AT+BAUDRATE19200**	Set UART baud rate at 19200 bps,n,8,1
(9)	**AT+BAUDRATE38400**	Set UART baud rate at 38400 bps,n,8,1
(10)	**AT+BAUDRATE57600**	Set UART baud rate at 57600 bps,n,8,1
(11)	**AT+BAUDRATE115200**	Set UART baud rate at 115200 bps,n,8,1
(12)	**AT+BAUDRATE230400**	Set UART baud rate at 230400 bps,n,8,1 **(recommended enabling flow control)**
(13)	**AT+BAUDRATE460800**	Set UART baud rate at 460800 bps,n,8,1 **(recommended enabling flow control)**
(14)	**AT+FLOWCONTROLDIS**	Disable UART flow control
(15)	**AT+FLOWCONTROLEN**	Enable UART flow control
(16)	**AT+TXPOWER4DBM**	Set RF TX power at + 4dBm
(17)	**AT+TXPOWER0DBM**	Set RF TX power at 0dBm
(18)	**AT+TXPOWER-4DBM**	Set RF TX power at - 4dBm
(19)	**AT+TXPOWER-8DBM**	Set RF TX power at - 8dBm
(20)	**AT+TXPOWER-20DBM**	Set RF TX power to - 20dBm
(21)	**AT+XTALINTERNAL**	Use internal RC 32.768KHZ low frequency oscillator
(22)	**AT+XTALEXTERNAL**	Use external crystal 32.768KHZ low frequency oscillator
(23)	**AT+CONNECTINDICATORLOW**	Set logic low output when connecting BT
(24)	**AT+CONNECTINDICATORHIGH**	Set logic high output when connecting BT

No.	Command	Description
(25)	**AT+PHYMODE1MBPS**	Set PHY mode at 1Mbps
(26)	**AT+PHYMODE2MBPS**	Set PHY mode at 2Mbps
(27)	**AT+WAKEUPLOW**	Set logic low at wake-up when in deep sleep
(28)	**AT+WAKEUPHIGH**	Set logic high at wake-up when in deep sleep
(29)	**AT+IDLETIMEtttt**	Set idle time **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(30)	**AT+SCANOLDTIMEtttt**	Set time of scanning of paired device **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(31)	**AT+SCANNEWTIMEtttt**	Set time of scanning all devices **(Hex)** e.g. 0x001E (min. 30secs), 0x0258 (Max. 600secs) 0x0000 (forever)
(32)	**AT+DCDCDIS**	Disable DC to DC converter
(33)	**AT+DCDCEN**	Enable DC to DC converter
(34)	**AT+CONNECTINTERVALMODE0**	Set connection interval mode for Peripheral 20ms/40ms usage (min. 20ms / Max. 75ms),
(35)	**AT+CONNECTINTERVALMODE1**	Set connection interval mode for Peripheral 8ms/8ms usage (min. 8ms / Max. 8ms)
(36)	**AT+IDLEPATTERNnnnnffff**	Set LED idle pattern **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5,000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(37)	**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. 5,000ms) 0x00000000 (off) 0xFFFFFFFF (on)

No.	Command	Description
(38)	**AT+SCANOLDPATTERNnnnnffff**	Set LED pattern for scanning paired device **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(39)	**AT+SCANNEWPATTERNnnnnffff**	Set LED pattern for scanning all devise **(Hex)**, where n = time when LED on, f = time when LED off e.g. 0x0064 (min. 100ms) 0x1388 (Max. 5000ms) 0x00000000 (off) 0xFFFFFFFF (on)
(40)	**AT+SERIALNOnnnnnnnn**	Set serial number e.g. AB000001, fixed 8-character length
(41)	**AT+RESPONSEDIS**	Disable response when sending “write” command
(42)	**AT+RESPONSEEN**	Enable response when sending “write” command
(43)	**AT+DISCONNECT**	Terminate the connection
(44)	**AT+RSSITHRESHOLDnnn**	Set RSSI threshold for scanning all devices (Ascii), e.g. -69 (min.); -29 (Max.)
(45)	**AT+BEACONINFODIS**	Disable scanning beacon (31 bytes)
(46)	**AT+BEACONINFOEN**	Enable scanning beacon (31 bytes) **When AT+BEACONINFOEN is set, *the device become a BEACON SCANNER only*. If you want to exchange data, please set “AT+BEACONINFODIS”.**
(47)	**AT+COMPANYIDdddd**	Set company ID for beacon **(Hex)**, e.g. 0x004C (for Apple ID)
(48)	**AT+BEACONUUID** **uuuuuuuuuuuuuuuu** **uuuuuuuuuuuuuuuu**	Set UUID for beacon **(Hex)**, e.g. 01122334455667788 99AABBCCDDEEFF0
(49)	**AT+TXCHARACTERUUIDuuuu**	Set TX character UUID for NUS **(Hex)**, e.g. 0x0003

No.	Command	Description
(50)	**AT+RXCHARACTERUUIDuuuu**	Set RX character UUID for NUS **(Hex)**, e.g. 0x0002
(51)	**AT+SERVICEUUIDuuuu**	Set service UUID for NUS **(Hex)**, e.g. 0x0001
(52)	**AT+BASEUUID** **uuuuuuuuuuuuuuuu** **uuuuuuuuuuuuuuuu**	Set base UUID for NUS **(Hex)**, e.g. 9ECADC240EE5A9E093F3A3B5**0000**406E 13th & 14th byte is reserved for service / TX character RX character UUID, always be 0000.
(53)	**AT+DEFAULT**	Back to default

2.2.2. “Read” Commands

No.	Command	Description
(1)	**AT?NAME**	To retrieve scanned 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 32.768KHz 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?IDLETIME**	To retrieve idle time **(Hex)**
(12)	**AT?SCANOLDTIME**	To retrieve time of scanning paired device **(Hex)**
(13)	**AT?SCANNEWTIME**	To retrieve time of scanning all devices **(Hex)**
(14)	**AT?DCDC**	To retrieve DC to DC converter status
(15)	**AT?CONNECTINTERVALMODE**	To retrieve status of connection interval mode
(16)	**AT?IDLEPATTERN**	To retrieve LED idle pattern **(Hex)**
(17)	**AT?CONNECTPATTERN**	To retrieve LED connecting pattern **(Hex)**
(18)	**AT?SCANOLDPATTERN**	To retrieve LED pattern when scanning paired device **(Hex)**
(19)	**AT?SCANNEWPATTERN**	To retrieve LED pattern when scanning all devices **(Hex)**
(20)	**AT?SERIALNO**	To retrieve serial number
(21)	**AT?ADCVALUE**	To retrieve 10bit ADC value
(22)	**AT?RESPONSE**	To retrieve status of response
(23)	**AT?RSSITHRESHOLD**	To retrieve scanning new RSSI threshold value **(Ascii)**
(24)	**AT?CONNECTRSSI**	To retrieve RSSI value when in BLE connection **(Ascii)**
(25)	**AT?BEACONINFO**	To retrieve beacon information
(26)	**AT?COMPANYID**	To retrieve company ID value **(Hex)**
(27)	**AT?BEACONUUID**	To retrieve beacon UUID value **(Hex)**

No.	Command	Description
(28)	**AT?TXCHARACTERUUID**	To retrieve TX character UUID value **(Hex)**
(29)	**AT?RXCHARACTERUUID**	To retrieve RX character UUID value **(Hex)**
(30)	**AT?SERVICEUUID**	To retrieve service UUID value **(Hex)**
(31)	**AT?BASEUUID**	To retrieve base UUID value **(Hex)**
(32)	**AT?ALLPARAMETERS**	To retrieve value of all parameters

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?IDLETIME**	0000 (default: **Hex**, forever idle with no timeout, tttt: 0x0000)
(12)	**AT?SCANOLDTIME**	0000 (default: **Hex**, forever scanning paired device with no timeout, tttt: 0x0000)
(13)	**AT?SCANNEWTIME**	0000 default: **Hex**, forever scanning ALL devices with no timeout, tttt: 0x0000)
(14)	**AT?DCDC**	0 dcdc dis (default) (0 = disabled; 1 = enabled)
(15)	**AT?CONNECTINTERVALMODE**	0 connect interval mode 0 (default) (0 = connection interval for Peripheral 20ms/40ms usage 1 = connection interval for Peripheral 8ms/8ms usage)
(16)	**AT?IDLEPATTERN**	00640f3c (default: Hex, 0.1sec on / 3.9sec off, nnnn: 0x0064, ffff: 0x0f3c)

No.	Command	Response
(17)	**AT?CONNECTPATTERN**	00c80708 (default: Hex, 0.2sec on / 1.8sec off, nnnn: 0x00c8, ffff: 0x0708)
(18)	**AT?SCANOLDPATTERN**	03e803e8 (default: Hex, 1sec on / 1sec off, nnnn: 0x03e8, ffff: 0x03e8)
(19)	**AT?SCANNEWPATTERN**	00640064 (default: Hex, 0.1sec on / 0.1sec off, nnnn: 0x0064, ffff: 0x0064)
(20)	**AT?SERIALNO**	Display “ no data! ” string (default)
(21)	**AT?ADCVALUE**	Value varies from input voltage
(22)	**AT?RESPONSE**	1 response en (default) (0 = disable response; 1 = enable response)
(23)	**AT?RSSITHRESHOLD**	-51 (default: Ascii, nnn: -51)
(24)	**AT?BEACONINFO**	0 beaconinfo dis (default) (0 = disable print beacon info.; 1 = enable print beacon info.)
(25)	**AT?COMPANYID**	004C (default: **Hex**, dddd: 0x004C)
(26)	**AT?BEACONUUID**	01122334455667788 99AABBCCDDEEFF0 (default: **Hex**, uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu: 0x01122334455667788 99AABBCCDDEEFF0)
(27)	**AT?TXCHARACTERUUID**	0003 (default: **Hex**, uuuu: 0x0003)
(28)	**AT?RXCHARACTERUUID**	0002 (default: **Hex**, uuuu: 0x0002)
(29)	**AT?SERVICEUUID**	0001 (default: **Hex**, uuuu: 0x0001)
(30)	**AT?BASEUUID**	9ECADC240EE5A9E093F3A3B50000406E (default: **Hex**, uuuuuuuuuuuuuuuuuuuuuuuuuuuuuuuu: 0x9ECADC240EE5A9E093F3A3B50000406E)
(31)	**AT?ALLPARAMETERS**	Display value of all parameters, separated by "0x0d0x0a"

2.3. Default Info

No.	Description	Default
(1)	**Scanned 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 1,000ms 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)	**Idle time**	Forever idle with no timeout
(12)	**Time of scanning paired device**	Forever scanning for paired device with no timeout
(13)	**Time of scanning all devices**	Forever scanning for all devices with no timeout
(14)	**Status of DC-to-DC converter**	Disabled
(15)	**Connection interval mode**	Set at min. 20ms and Max. 75ms for Peripheral 20ms/40ms usage
(16)	**Idle LED pattern**	0.1sec on / 3.9sec off
(17)	**Connecting LED pattern**	0.2sec on / 1.8secs off
(18)	**LED pattern for scanning paired device**	1sec on / 1sec off
(19)	**LED pattern for scanning all devices**	0.1sec on / 0.1sec off
(20)	**Serial number**	Display “ no data! ” string
(21)	**ADC value**	Value varies from input voltage between 0x0000 ~ 0x03FF **(Hex)**.
(22)	**State of response**	Enabled

No.	Description	Default
(23)	**Scanning new RSSI threshold**	-51 **(Ascii)**.
(24)	**Beacon UUID**	0x01, 0x12, 0x23, 0x34, 0x45, 0x56, 0x67, 0x78, 0x89, 0x9A, 0xAB, 0xBC, 0xCD, 0xDE, 0xEF, 0xF0
(25)	**Company ID**	0x004C

2.4. Pin Assignment

Pin No.	Name	Pin Function	Description
(1)	**GND**	Ground	The pad must be connected to a solid ground plane
(2)	**NC**	No function	Not connected
(3)	**NC**	No function	Not connected
(4)	**NC**	No function	Not connected
(5)	**NC**	No function	Not connected
(6)	**NC**	No function	Not connected
(7)	**NC**	No function	Not connected
(8)	**NC**	No function	Not connected
(9)	**DEC4**	Power	1V3 regulator supply decoupling. Input from DC/DC converter. Output from 1V3 LDO .
(10)	**DCC**	Power	DC/DC converter output pin
(11)	**VDD**	Power	Power-supply pin
(12)	**GND**	Ground	The pad must be connected to a solid ground plane
(13)	**NC**	No function	Not connected when using internal RC (LFXO)
	XL1	Analog input	Connecting to 32.768KHz crystal when using external LFXO
(14)	**NC**	No function	Not connected when using internal RC (LFXO)
	XL2	Analog input	Connecting to 32.768KHz crystal when using external LFXO
(15)	**ADC**	Analog input	10bit resolution ADC is always on and update every 200ms
(16)	**Indicator**	Output / Logic	Output logic is selective about the action of BT connection
(17)	**Connecting or Adver. LED**	Output	Setting of LED pattern is changeable when it is active-low
(18)	**UART RTS**	Output	RTS, request to send
(19)	**UART TX**	Output	UART transmitter
(20)	**UART CTS**	Input	CTS, clear to send
(21)	**UART RX**	Input	UART receiver

Pin No.	Name	Pin Function	Description
(22)	**Wakeup**	Input / Logic	Output logic is selective about the action of wakeup from deep sleep
(23)	**UART PD**	Input	Active-high with internal pull-high to disable hardware UART interface. The default is disabled.
(24)	**GND**	Ground	The pad must be connected to a solid ground plane
(25)	**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.
(26)	**NC**	No function	Not connected
(27)	**NC**	No function	Not connected
(28)	**NC**	No function	Not connected
(29)	**NC**	No function	Not connected
(30)	**NC**	No function	Not connected
(31)	**NC**	No function	Not connected
(32)	**NC**	No function	Not connected
(33)	**NC**	No function	Not connected
(34)	**NC**	No function	Not connected
(35)	**RESET**	Input	Active-low to enable hardware system RESET pin
(36)	**SWDCLK**	Digital input	Serial Wire debug clock input for debug and programming
(37)	**SWDIO**	Digital I/O	Serial Wire debug I/O for debug and programming
(38)	**NC**	No function	Not connected
(39)	**GND**	Ground	The pad must be connected to a solid ground plane

3. How to Control External MCU

3.1. How to Send AT Commands

- **When BT is NOT connected (for all commands)**

1. Output low to P0.10 (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.

3. **Send command " AT+RESET " to save all your settings.**

4. Output high or NC to P0.10 (UART PD pin) to turn off UART interface.

- **When BT is connected (for AT?ADCVALUE, AT+DISCONNECT, AT?CONNECTRSSI, AT+SCANNEWSTART and AT+SLEEP only)**

1. Output low to P0.11 (flash default pin) to enable receiving AT commands when BT is connected. Please keep it low during the whole time when sending AT commands.

2. Send "AT?ADCVALUE" or "AT+DISCONNECT" or "AT?CONNECTRSSI" or "AT+SCANNEWSTART" or "AT+SLEEP".

3. Output high or NC to P0.11 (flash default pin) to disable receiving AT commands when BT is connected.

3.2. How to Return to Flashed Default Setting

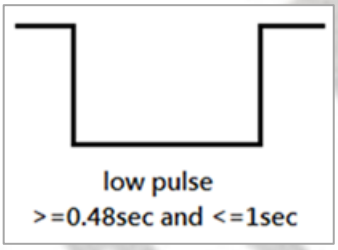
**** Only when BT is NOT connected ****

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

- ## Use Hardware Method

1. Read P0.03 (indicator pin) first to check if BT is *NOT* in connection.

2. Output a low pulse to P0.11 (flash default pin), then system will return to default setting.

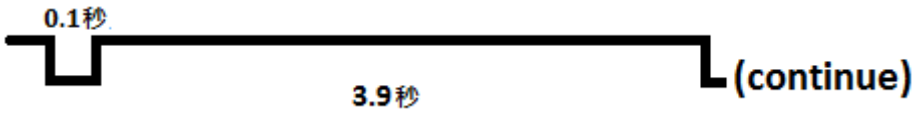
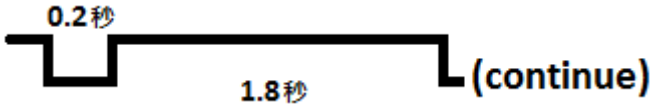
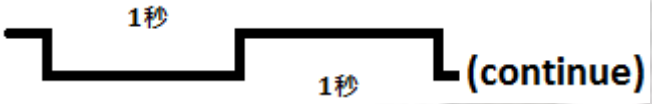


- ## Use Software method

1. Output low to P0.10 (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.

- Default Definition of LED (P0.4) Status

Mode	LED Status
Idle	 0.1 sec ON / 3.9 secs OFF
Connected	 0.2 sec ON / 1.8 secs OFF
Scan the paired device	 1 sec ON / 1 sec OFF
Scan all devices	 0.1 sec ON / 0.1 sec OFF

3.3. How to Start Scanning

This section describes how to start scanning using a physical button (hardware) or the AT Command (firmware) under various occasions. Before getting started, here are some notes applied to both methods.

- Each central device is only able to pair with 1 Peripheral.
- The device will be in idle directly when it is powered or not in BLE connection. It will go into deep sleep after a given timeout (no timeout in default).
- A few criteria must be met in order to complete BLE connection:

	Under Paired Scanning	**Under All-Devices Scanning**
Base UUID	√	√
Service UUID	√	√
Device name	√	√
RSSI Threshold		√
Mac Address in Paired Record	√	

Use Key/Button

START Scanning Paired Device --- (a)

- Press the button for less than 2 seconds and release it to start scanning paired device.

START Scanning All Devices --- (b)

- Press the button for 2 seconds or longer directly to start scanning all devices.

STOP Scanning Paired / All Device(s)

- Press the button for less than 2 seconds and release it to stop scanning. The device will be back to idle and go into deep sleep after a given a timeout (no timeout in default).

	How to Start Scanning	
	Paired Device	All Devices
Device Status		
Idle	(a)[1]	(b)
BLE Connection	Not Available	(b)
Scanning Paired Device	Not Available	(b)

Remark 1: The device stays in idle when there is no paired record.

Use AT Command

START Scanning Paired Device --- (a)

- Enter “AT+SCANOLDSTART” to start scanning paired device.

START Scanning All Devices --- (b)

- Enter “AT+SCANNEWSTART” to start scanning all devices.

STOP Scanning Paired / All Device(s)

- Enter “AT+SCANSTOP” to stop scanning. The device will be back to idle and go into deep sleep after a given timeout.

	How to Start Scanning	
	Paired Device	All Devices
Device Status		
Idle	(a)[1]	(b)
BLE Connection	Not Available	(b)
Scanning Paired Device	Not Available	(b)

Remark 1: The device stays in idle when there is no paired record.

4. Report of Data Transmission

All testing is done under **PHY mode at 1M bps** and **D.L.** means "**Data Length**" and **D.I.** means "**Data Interval**" in the table.

4.1. MCU → Peripheral (MDBT42Q-AT/MDBT42Q-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					

4.2. MCU → Central → Peripheral (MDBT42Q-AT/MDBT42Q-PAT) → Console

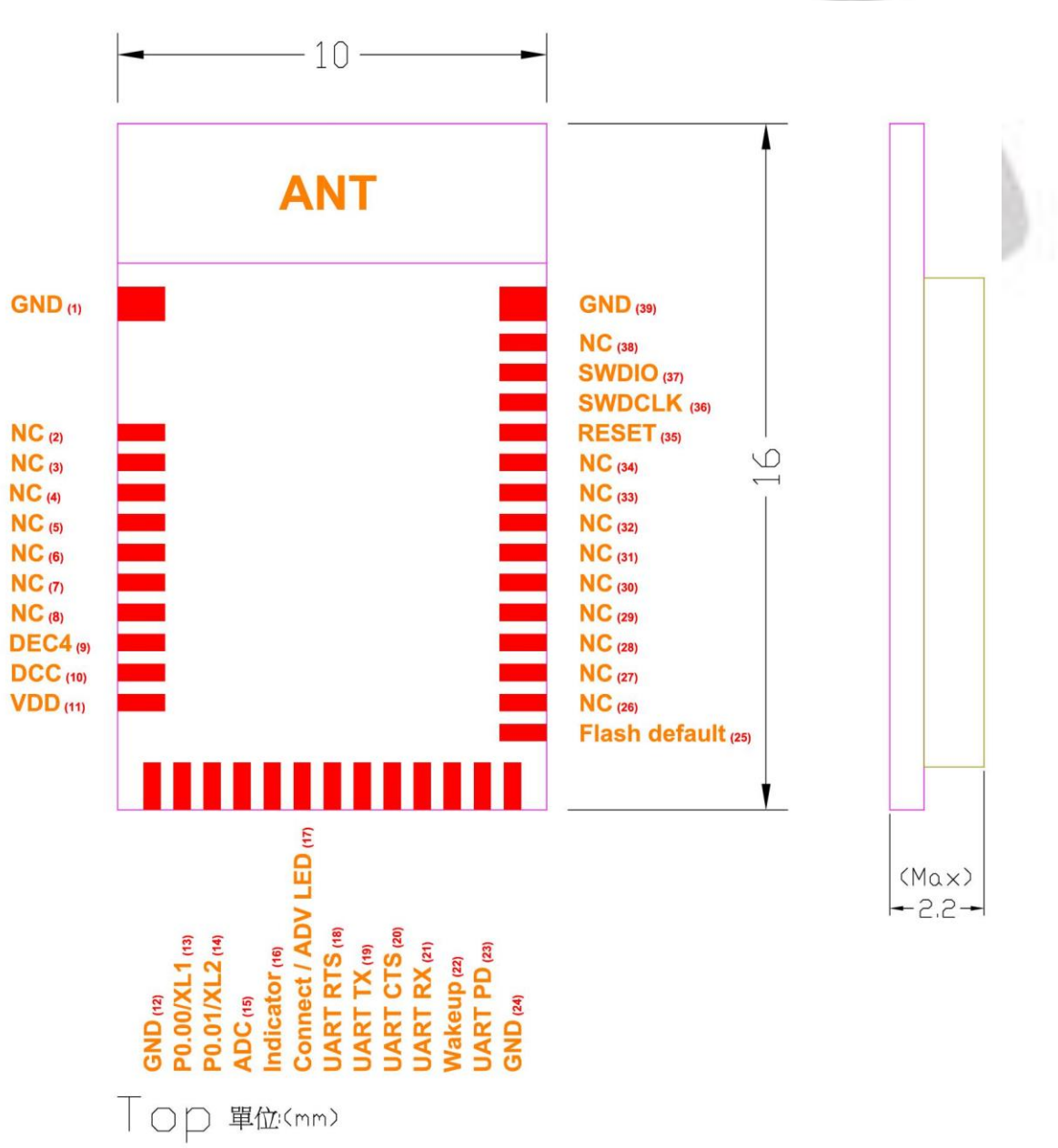
Central Connection Interval	Peripheral Connection Interval	Baud Rate	Flow Control	MCU D.L. (bytes)	MCU D.I. (ms)	Total D.L. (bytes)	Total Trans. Time (sec)	Data Rate (k-bytes/sec)
min = 20ms Max = 75ms	min = 20ms Max = 40ms	9600	X	64	60	262152	273	0.96
				244	250	999432	1,042	
			V	244	250	999432	1,042	
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

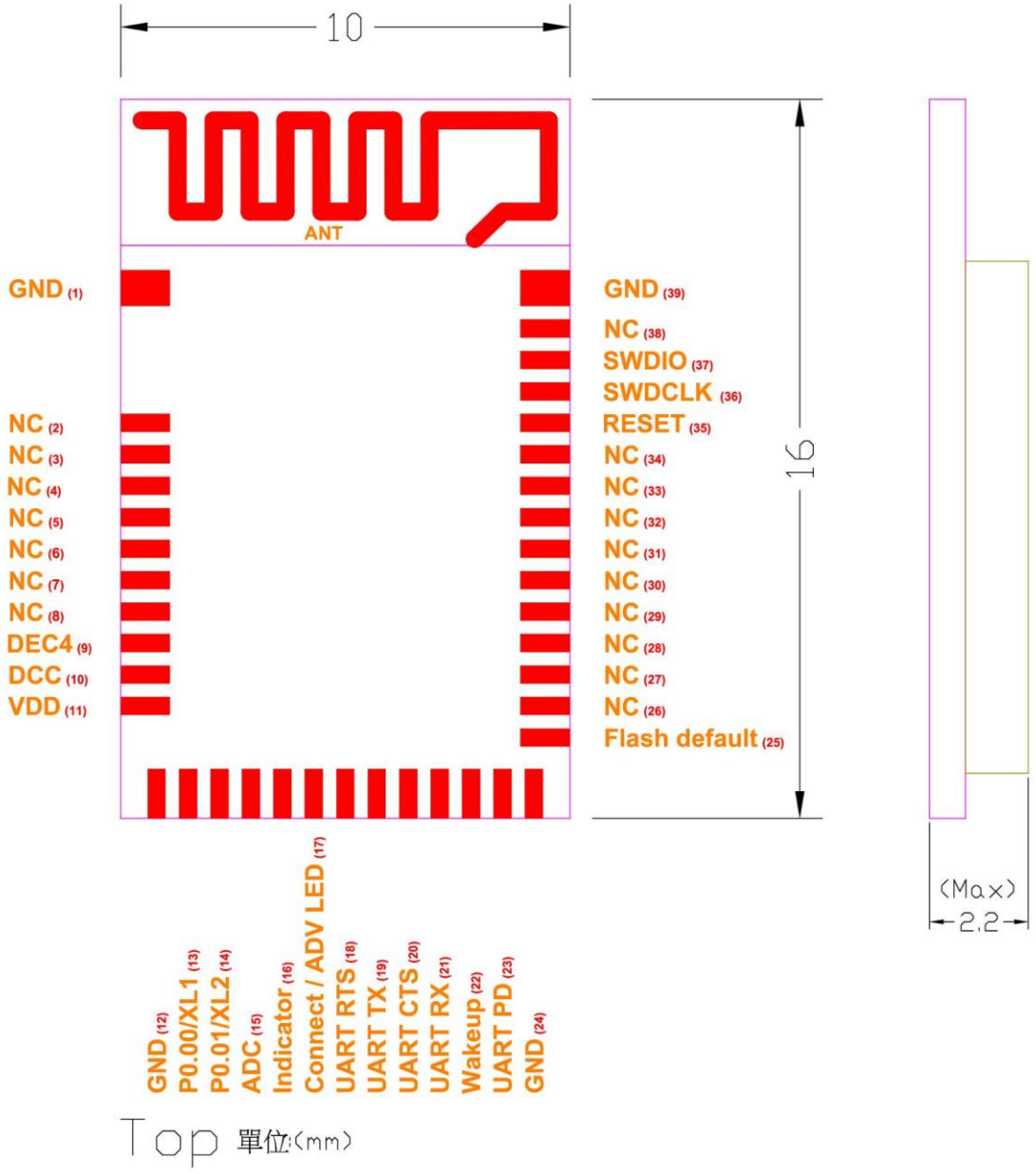
- **MDBT42Q-ATM**

PCB SIZE: (L) 16 x (W) 10 x (H) 2.2 mm



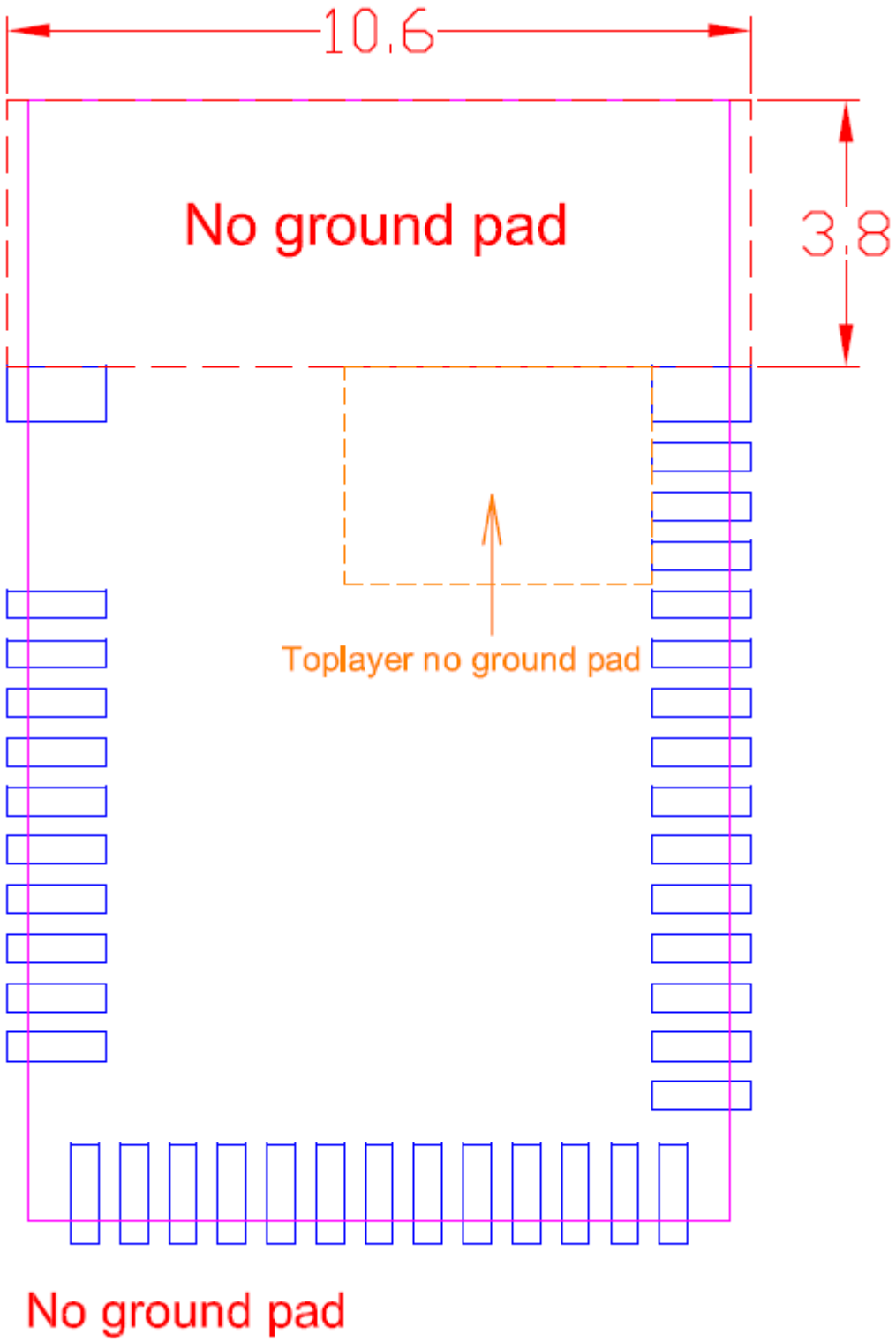
- **MDBT42Q-PATM**

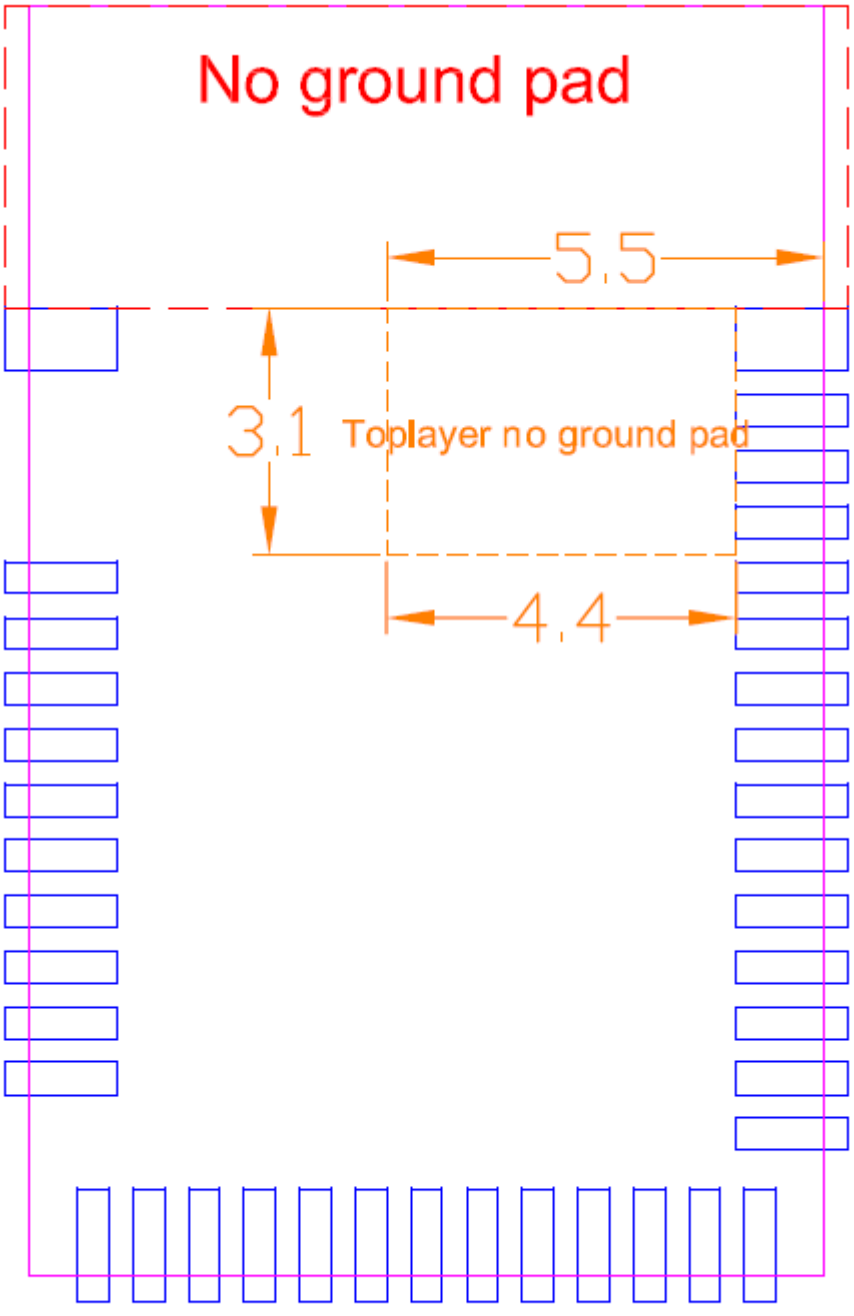
PCB SIZE: (L) 16 x (W) 10 x (H) 2.2 mm



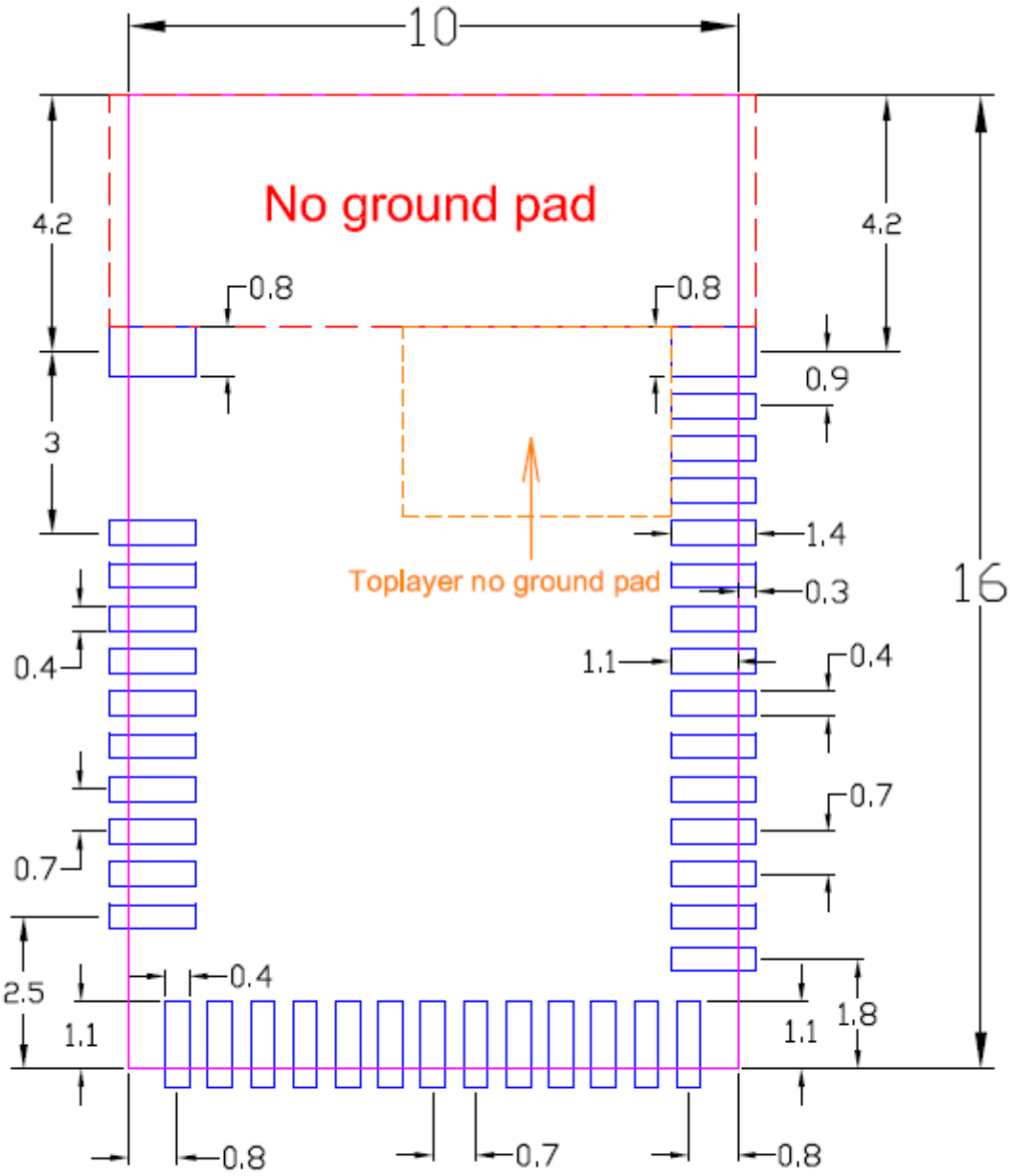
5.2. Recommended Layout of Solder Pad

Graphs are all in Top View, Unit in mm.





Toplayer no ground pad



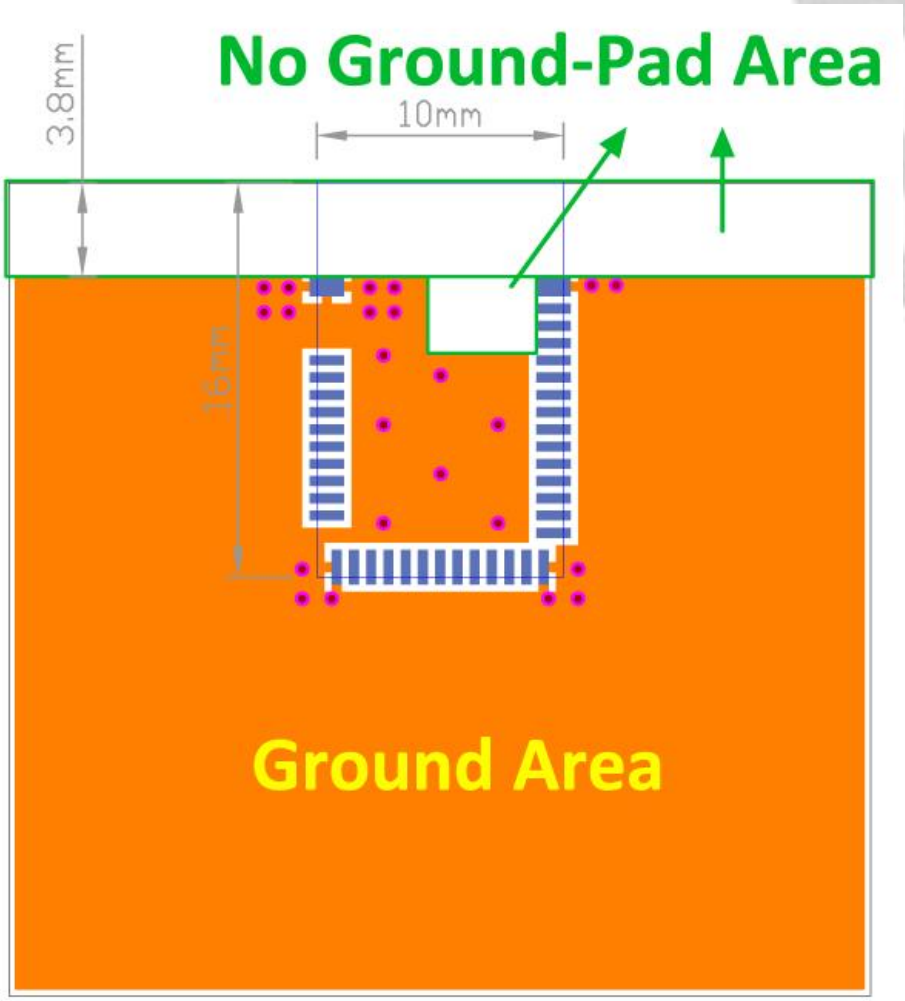
Top View（單位：mm）

recommended solder pad layout

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

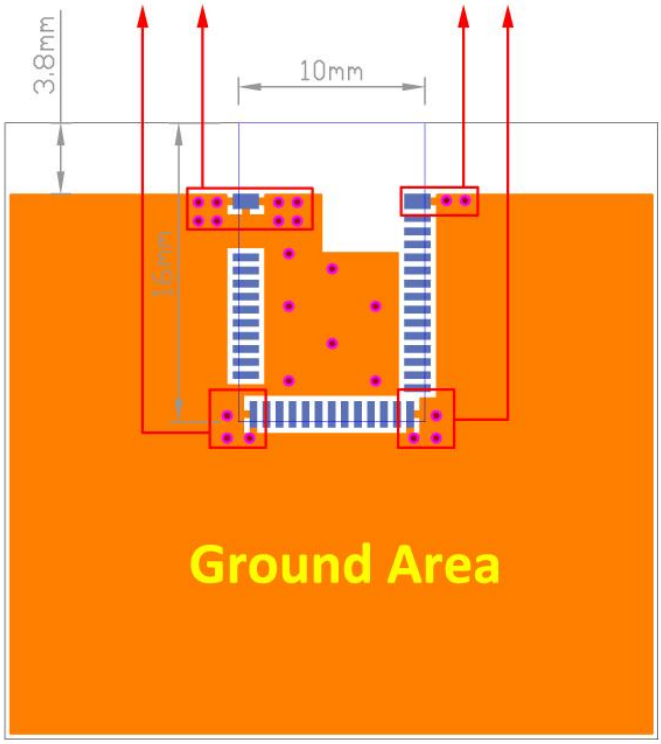
Please follow below instruction to have better wireless performance. Make sure to keep the "No-Ground-Pad" as wider as possible when there is no enough space in your design.

Welcome to send us your layout in PDF for review at service@raytac.com or your contact at Raytac with title "Layout reviewing – MDBT42Q-ATM/MDBT42Q-PATM – YOUR company's name".

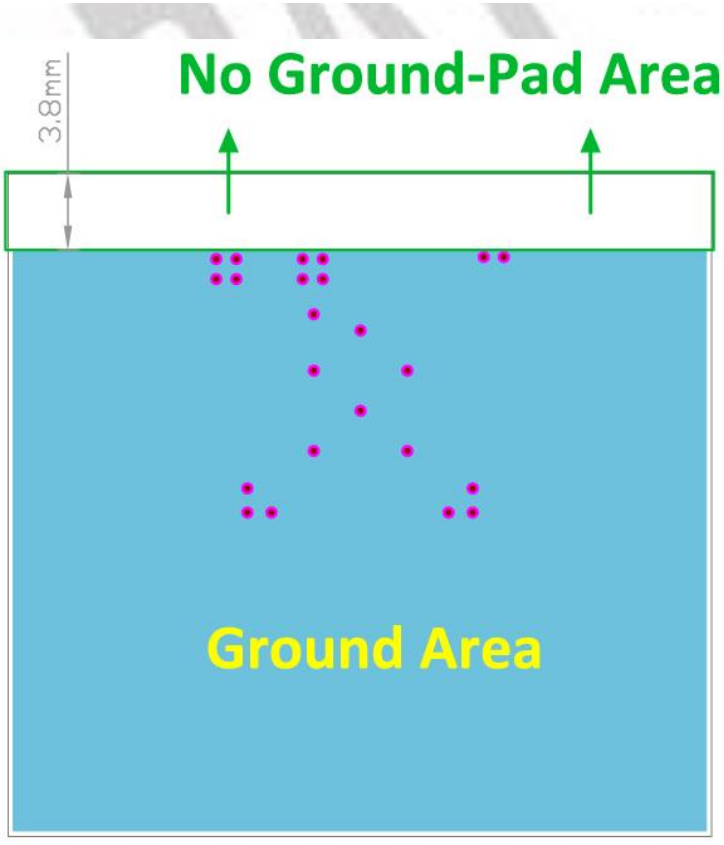


Top layer

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

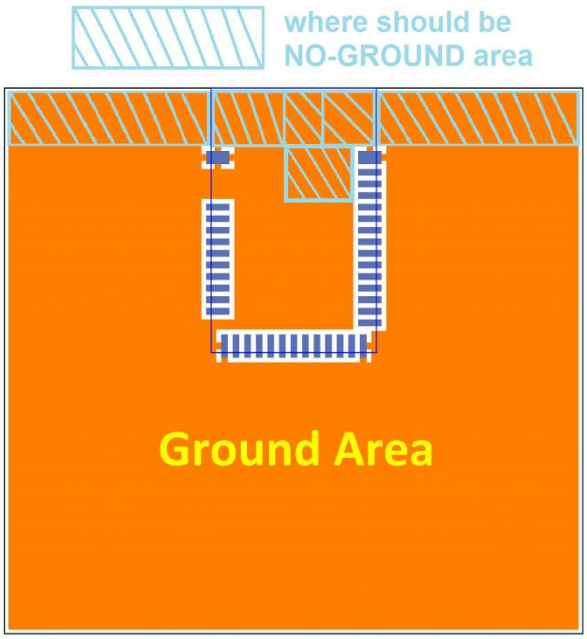


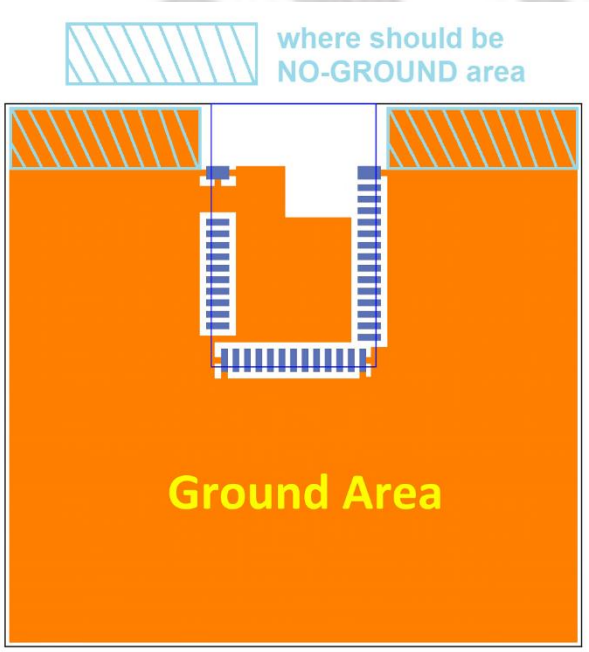
Top layer



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

Antenna	Model
Chip/Ceramic Antenna	MDBT42Q-ATM
	
PCB/Printed Antenna	MDBT42Q-PATM
	

- Unit Weight of Module:

  MDBT42Q-ATM: 0.64g / pc (±0.02g) ; MDBT42Q-PATM: 0.62g / pc (±0.02g)

- Packaging Type: Anti-Static tray only

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

- Carton Contents: 1,760 pcs per carton (20 Full Tray + 1 Empty Tray)

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

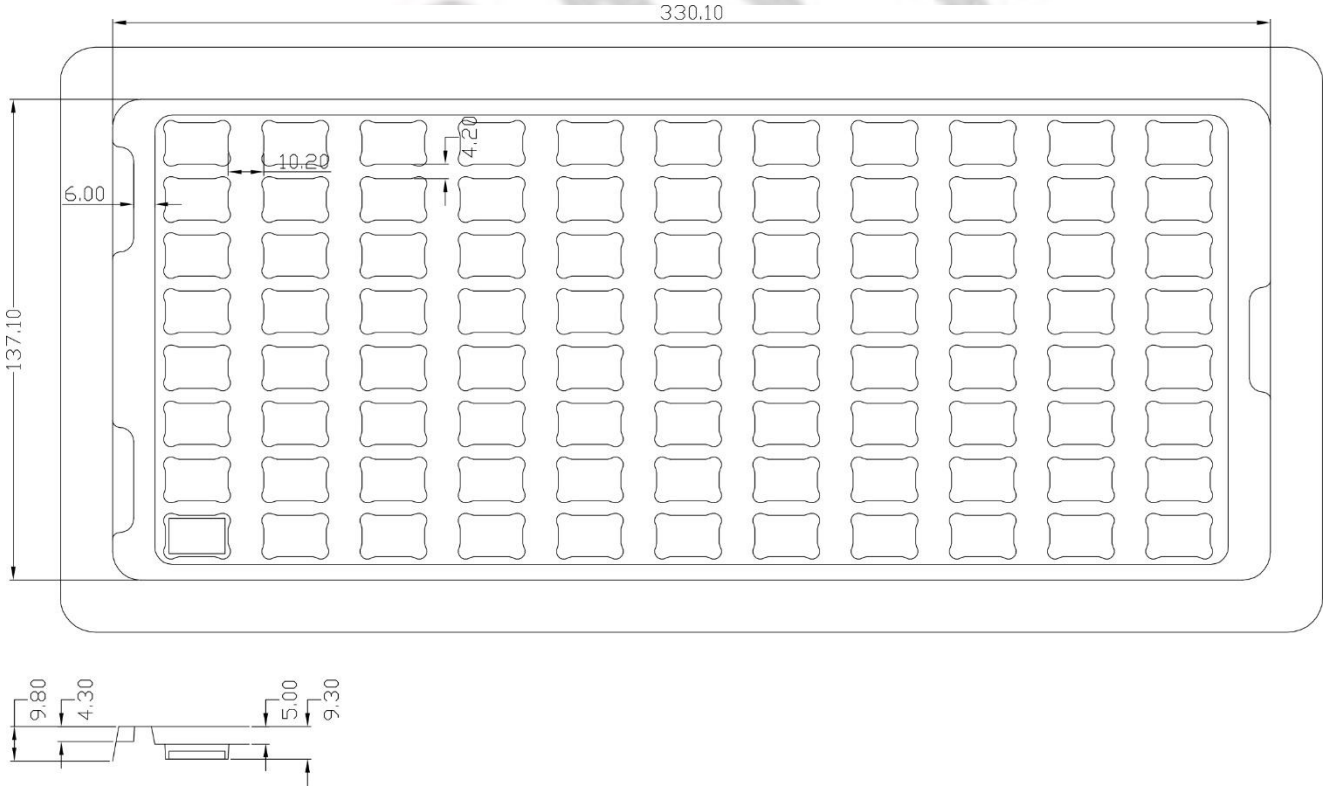
- Gross Weight: approx. 2.80 kgs per full carton (contains 1,760pcs)

7.1. Marking on Metal Shield

Raytac Corporation
FCC ID: SH6MDBT42Q
IC: 8017A-MDBT42Q
CMIIT ID: 2016DJ4571
Model No.: MDBT42Q
R 201-160496

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", visit the link to view 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
Environmental QFN48, 6×6 mm package			
Storage temperature	-40	+125	°C
MSL (moisture sensitivity level)		2	
ESD HBM (human body model)		4	kV
ESD CDM (charged device model)		1000	V
Flash memory			
Endurance	10 000		Write/erase cycles
Retention	10 years at 40°C		

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

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
$P_{SENS,DT,SP,2M,BLE}$	Sensitivity, 2Msps BLE dirty transmitter, Packet length <=37bytes		-93		dBm
$P_{SENS,IT,LP,2M,BLE}$	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
$C/I_{1M,co-channel}$	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
$C/I_{1MBLE,co-channel}$	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
$C/I_{2M,co-channel}$	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
$C/I_{2MBLE,co-channel}$	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

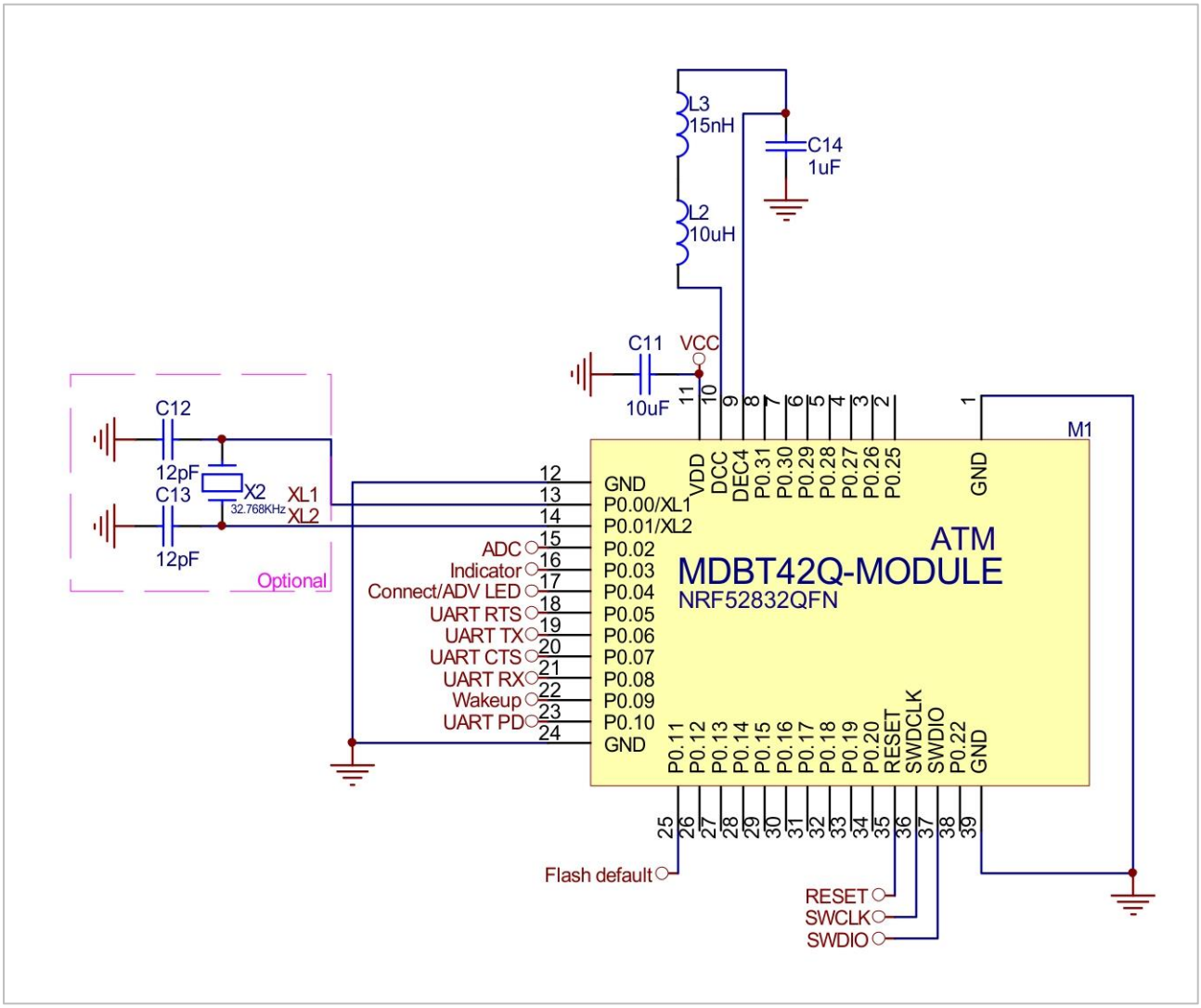
9. Reference Circuit

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.***



10. Certification

10.1. Declaration ID

QDL Bluetooth® qualified design listing

The Bluetooth SIG Hereby Recognizes

Raytac Corporation
Member Company

MDBT42 Series nRF52 Bluetooth Low Energy Module
Qualified Design Name

Declaration ID: D033661
Qualified Design ID: 91882
Specification Name: 4.2
Project Type: End Product
Model Number: MDBT42/MDBT42-P/MDBT42Q/MDBT42Q-P/MDBT42V/MDBT42V-P
Listing Date: 29 December 2016
Assessment Date: 29 December 2016
Hardware Version Number: V1
Software Version Number:

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

Bluetooth®

QDL Bluetooth® qualified design listing

The Bluetooth SIG Hereby Recognizes

Raytac Corporation
Member Company

Multiprofile Subsystem for MDBTXX series module
Qualified Design Name

Declaration ID: D033622
Qualified Design ID: 91659
Specification Name: 4.2
Project Type: Profile Subsystem
Model Number: Multiprofile Subsystem for MDBTXX series module
Listing Date: 19 December 2016
Assessment Date: 19 December 2016
Hardware Version Number: NA
Software Version Number: 1

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

Bluetooth®

QDL Bluetooth® qualified design listing

The Bluetooth SIG Hereby Recognizes

Raytac Corporation
Member Company

nRF52xxx Bluetooth Module
Qualified Design Name

Declaration ID: D036781
Qualified Design ID: 100551
Specification Name: 5.0
Project Type: End Product
Model Number: MDBT42/MDBT42-P/MDBT42Q/MDBT42Q-P/MDBT42V/MDBT42V-P
Listing Date: 30 August 2017
Assessment Date: 30 August 2017
Hardware Version Number: 1
Software Version Number: 2

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

Bluetooth®

10.2. 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: 02/21/2017

Application
Dated: 02/21/2017

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:	SH6MDBT42Q
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 Emission Tolerance Designator
	15C	**2402.0 - 2480.0**	**0.0023**	

C2PC: To change module to be certified under portable device.
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 antenna's as listed in this application 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.: 162181172/AA/01	Mohammad Elhaj Product Assessor	

10.3. TELEC Certificate (Japan)

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

telefication

Certificate

of

Radio Equipment in JAPAN

No: 201-160496 / 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 Terminal equipment (ordinance of MPT N° 31,1984)

Product description: **BT 4.2 Module**
Trademark: **Raytac**
Type designation: **MDBT42Q**
Hardware / Software version: **1 / 1**
Variants: **See Annex 3**

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

This statement is granted to:

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

This statement has THREE Annexes.

Zevenaar, 19 August 2016

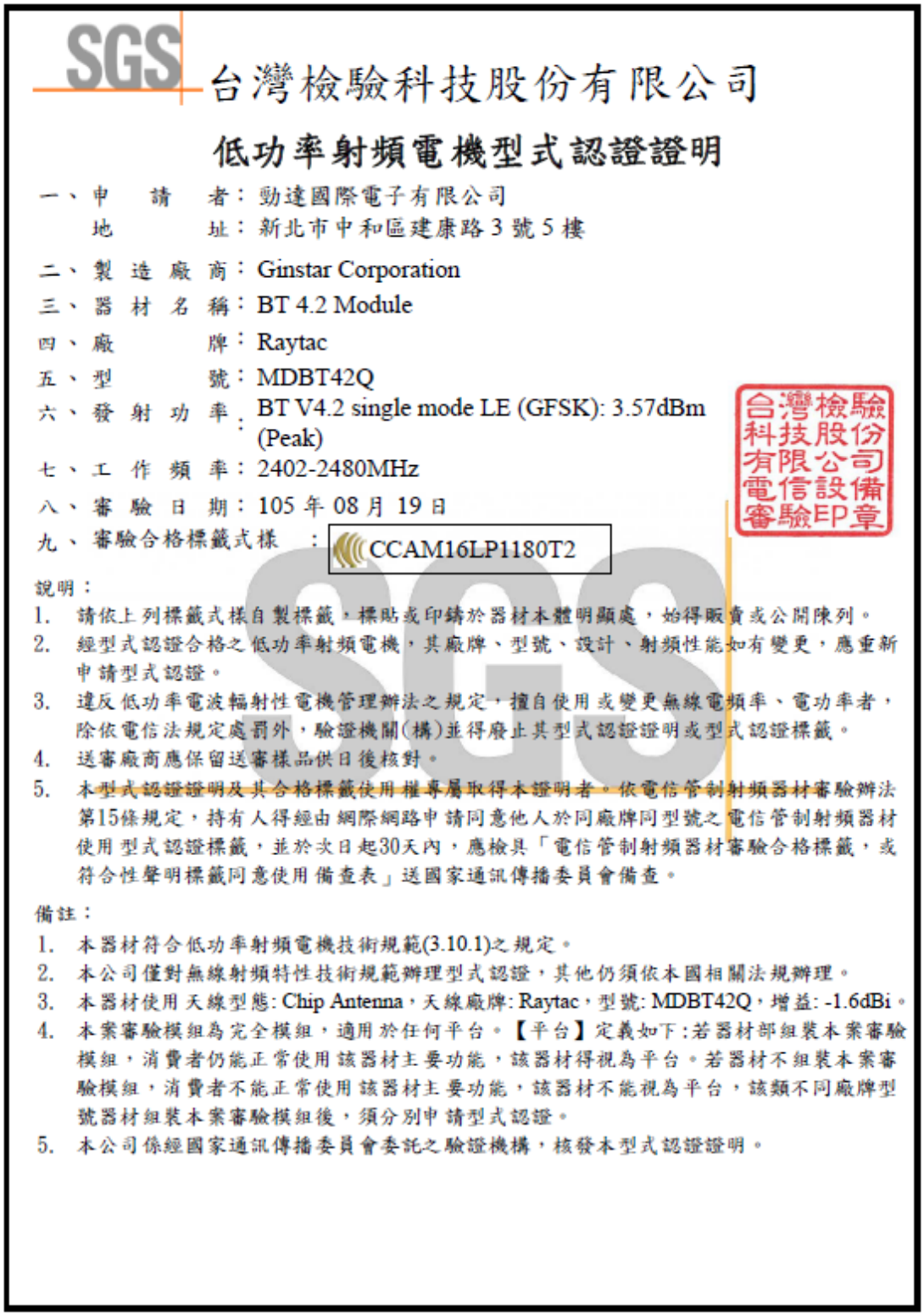
CAB

Ramy Nabod
Product Assessor

PRODUCTS
RvA C 224

10.4. NCC Certificate (Taiwan)

MDBT42Q Series



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：新北市中和區建康路 3 號 5 樓
二、製造廠商：Ginstar Corporation
三、器材名稱：BT 4.2 Module
四、廠牌：Raytac
五、型號：MDBT42Q
六、發射功率：BT V4.2 single mode LE (GFSK): 3.57dBm (Peak)
七、工作頻率：2402-2480MHz
八、審驗日期：105 年 08 月 19 日
九、審驗合格標籤式樣：CCAM16LP1180T2

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: Chip Antenna，天線廠牌: Raytac，型號: MDBT42Q，增益: -1.6dBi。
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：若器材部組裝本案審驗模組，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。

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：新北市中和區建康路 3 號 5 樓
二、製 造 廠 商：Ginstar Corporation
三、器 材 名 稱：BT 4.2 Module
四、廠　　牌：Raytac
五、型　　號：MDBT42Q-P
六、發 射 功 率：BT V4.2 single mode LE (GFSK): 3.57dBm (Peak)
七、工 作 頻 率：2402-2480MHz
八、審 驗 日 期：105 年 08 月 19 日
九、審驗合格標籤式樣：CCAM16LP1181T1

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: PCB Antenna，天線廠牌: Raytac，型號: MDBT42Q-P，增益: -1.61dBi。
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:若器材部組裝本案審驗模組，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。

10.5. CE Test Report (EU)

SGS Reference No: E1/2016/90006C-01

VERIFICATION OF EMC COMPLIANCE

Verification No.	:	E1/2016/90006C-01
Representative Model No.	:	MDBT42Q
Added Model(s)	:	MDBT42Q-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	:	E1/2016/90006-01
Date of Issue	:	May 18, 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. Supervisor

VERIFICATION OF COMPLIANCE

Applicant:	Raytac Corporation 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City , 23586, Taiwan
Product Name:	BLE Module
Brand Name:	Raytac
Model No.:	MDBT42Q, MDBT42Q-P
Model Difference:	MDBT42Q with Chip antenna, MDBT42Q-P with PCB antenna
File Number:	ER/2017/70008-01
Date of test:	Nov. 09, 2017~ Nov. 28, 2017
Date of EUT Received:	Nov. 09, 2017

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
ETSI EN 300 328 V2.1.1: 2016	Complied

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 V2.1.1: 2016 under RED 2014/53/EU Class II. 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:***	Dec. 05, 2017
	Marcus Tsen / Engineer		
Prepared By:	Yuri Tsai	***Date:***	Dec. 05, 2017
	Yuri Tsai/ Clerk		
Approved By:	Jim Chang	***Date:***	Dec. 05, 2017
	Jim Chang / Asst. Manager		

10.6. 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-MDBT42Q
TELEFICATION No. No. DE TELEFICATION	162170280/AA/01
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 / MDBT42Q Raytac / MDBT42Q-P

CERTIFIED TO CERTIFIÉ SELON LE	SPECIFICATION CAHIER DES CHARGES	RSS-102 RSS-247	ISSUE EDITION	5 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 21 Feb 2017 BY

Mohammad Elhaj
Product Assessor

This certificate has one annex.

PRODUCTS
RvA C 224

10.7. 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: 2016DJ4571
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：五年
Validity

2016 年 8 月 12 日
Year Month Date

10.8. KC Certificate (South Korea)

B58D-F9C0-417D-C63A

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*	MDBT42Q
파생모델명 *Series Model Number*	MDBT42Q-P
인증번호 *Certification No.*	MSIP-CRM-ryt-MDBT42Q
제조자/제조국가 *Manufacturer/ Country of Origin*	Raytac Corporation / 대만
인증연월일 *Date of Certification*	2016-10-06
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) 10월(Month) 06일(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.

10.9. RoHS & REACH Report

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

10.10. 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.

10.10.1. 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: SH6MDBT42Q”.

10.10.2. TELEC (Japan)

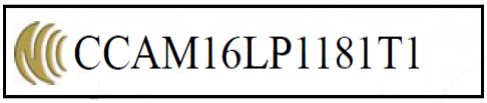
When manufacturer is placing the product on the Japanese market, the product must be affixed with the following Specified Radio Equipment marking:

10.10.3. 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。

MDBT42Q Series

MDBT42Q-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 CCAM16LP1180T2」或「本產品內含射頻模組：ID 編號 CCAM16LP1181T1」。

「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。

10.10.4. 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-MDBT42Q”.

11. Notes and Cautions

Module is not designed to be used and lasting 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

- 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 methods 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 process will oxidize the shielding and have chemistry reaction with No-Clean Paste. Functions of the module are not guaranteed when it goes through washing process.

The module is not suitable for life support device or system and not allowed to be used in destructive device or system in any direct, or indirect ways. The customer is agreeing to indemnify Raytac for any losses when applying modules under such application as described above.

12. Basic Facts for nRF52 Chip

Below is the comparison chart between nRF52840, nRF52832 and nRF52810. Any discrepancy shall refer to Nordic's technical document as final reference.

	nRF52840	nRF52832	nRF52810
RAYTAC Model No.:	Click to see "*Full List of Raytac's BLE Modules*"		
Bluetooth 5 Long Range (x4)	V		
Bluetooth 5 High Speed	V	V	V
Bluetooth 5 Advertisement Extension (x8)	V	V	V
Flash (kBytes)	1024	512	192
RAM (kBytes)	256	64	24
ANT	V	V	V
IEEE 802.15.4	V		
ARM® TrustZone® Cryptocell	V		
USB	V		
QSPI	V		
NFC	V	V	
I2S	V	V	
SPI, TWI, UART, PWM	V	V	V
PDM	V	V	V
ADC, Comparators	V	V	V
Supply Range (V)	1.7 to 5.5	1.7 to 3.6	1.7 to 3.6

13. 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.

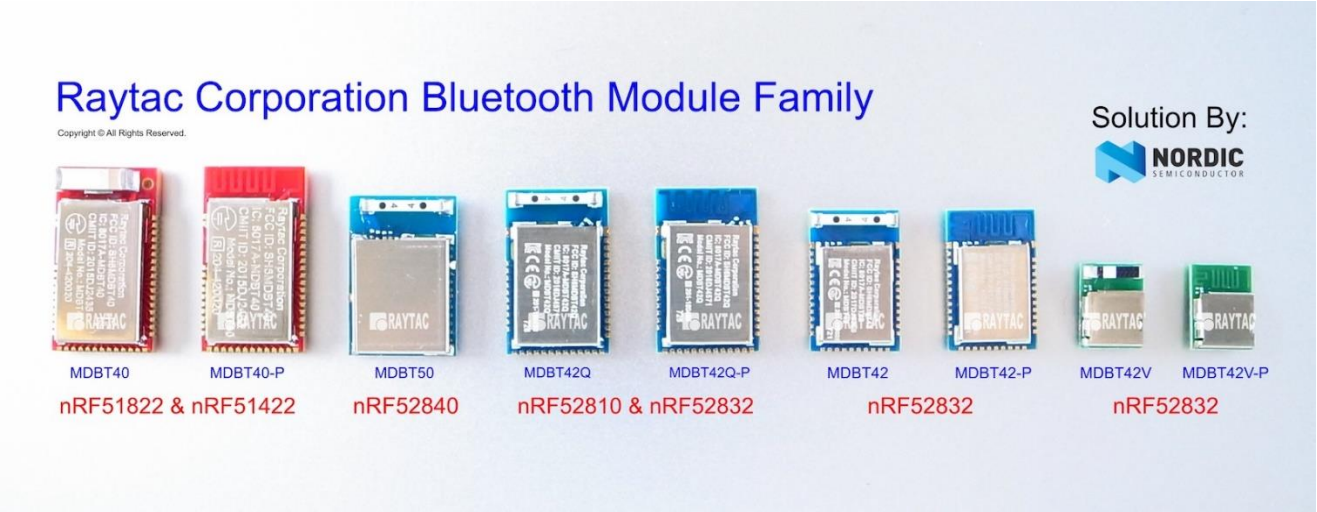
- Nordic Developer Zone: https://devzone.nordicsemi.com/questions/
  A highly recommended website for firmware developer. Interact with other developers and Nordic's employees will help with your questions. The site also includes tutorials in detail to help you get started.

- 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		2018/10/15	1st release.	99-52832-12A

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
MDBT40 - ANT	nRF51422	MDBT40-ANT -256V3	3	Chip Antenna	16 kb	256 K
		MDBT40-ANT -256RV3			32 kb	
MDBT40 - ANT-P	nRF51422	MDBT40-ANT -P256V3	3	PCB Antenna	16 kb	256 K
		MDBT40-ANT -P256RV3			32 kb	
MDBT40 Nano	nRF51822	MDBT40-n256V3	3	N/A	16 kb	256 K
MDBT40 - ANT-Nano	nRF51422	MDBT40-ANT -n256V3	3	N/A	16 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

MDBT42Q-P	nRF52832	MDBT42Q-P512KV2	2	PCB Antenna	64 kb	512 K
	nRF52810	MDBT42Q-P192K	1		24 kb	192 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-1M	1	Chip Antenna	256 kb	1MB
MDBT50Q-P		MDBT50Q-P1M		PCB Antenna		
MDBT50Q-U		MDBT50Q-U1M		u.FL Connector		

Release Note

- 2018/10/19 Version A: 1st release