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Version: 1.0
Issued Date: 2025/05/13

Approval Sheet

(產品承認書)

產品名稱	(Product)	Bluetooth USB-C Dongle (nRF52840) deployed MDBT50Q-P module
產品型號	(Model No.)	**MDBT50Q-CX-40**
產品料號	(Part No.)	**MD – 240A7 – 001** (Raytac Logo) **MD – 240A7 – 002** (No Logo)

Working distance of MDBT50Q-CX-40

- ***1Mbps:*** up to 250 meters in open space.
- ***2Mbps:*** up to 120 meters in open space.

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1. Overall introduction

Raytac's MDBT50Q-CX-40 is a BT 5.4 stack (Bluetooth low energy or BLE) USB-C dongle designed based on **Nordic nRF52840 SoC solution**, which incorporates: **GPIO**, **PWM** and **USB** interfaces for connecting peripherals and sensors.

Features:

1. Embedded 2.4GHz transceiver supports Bluetooth 5.4 (Bluetooth), IEEE 802.15.4 (THREAD & Zigbee) & 2.4Ghz RF & ANT+ upon customer's preference.
2. Compact size with **(L) 26.2 x (W) 15.1 x (H) 6.8 mm**.(excluding Type C USB Connector)
3. Low power requirements, ultra-low peak, average and idle mode power consumption.
4. Be compatible with a large installed base of mobile phones, tablets and computers.
5. Fully coverage of BLE software stack.
6. BLE & RF transmission switching helps products fit all operation systems and most hardware.
7. This is a plug-in USB-C dongle without front side or back side differentiation ; Try to get better wireless signal by putting the compliance /RF ID claim side UP.

1.1. Applications

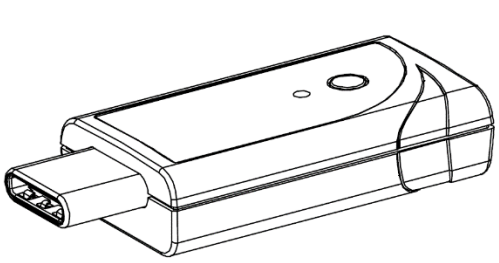
- IoT Networks
  - Smart home (such as door locks, lighting) sensors and controllers
  - Smart city sensor networks
  - Industrial IoT sensors and controllers
  - Connected white goods
- Personal Area Networks
  - Health / fitness sensor and monitor device
  - Medical device
- Advanced wearables
  - Gateway for smart watches or connected health
  - Advanced personal fitness devices
  - Virtual/Augmented Reality applications
- High performance HID Controllers
- Mesh Network

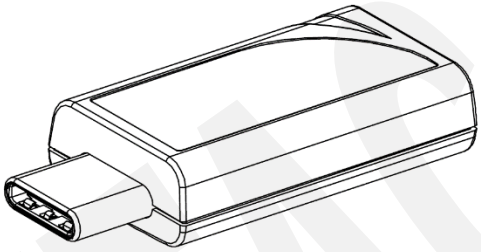
1.2. Features

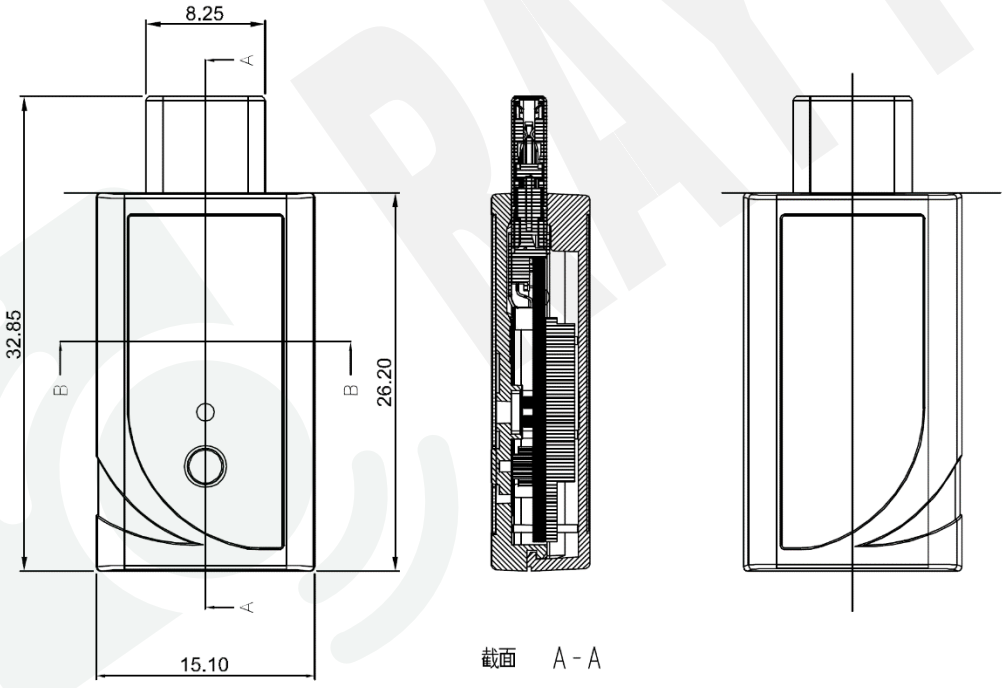
- Bluetooth 5, IEEE 802.15.4, 2.4 GHz transceiver
    - -95dBm sensitivity in 1Mbps Bluetooth low energy (BLE) mode
    - -103dBm sensitivity in 125Kbps BLE mode (long range)
    - +8 dBm TX power (down to -20 dBm in 4 dB steps)
    - On-air compatible with nRF52, nRF51, nRF24L and nRF24AP Series
    - Programmable output power from +8dBm to -20dB
    - RSSI (1dB resolution)
    - Supported data rates:
        - Bluetooth 5: 2 Mbps, 1 Mbps, 500 kbps, 125 kbps
        - IEEE 802.15.4-2006: 250 kbps
        - Proprietary 2.4 GHz: 2 Mbps, 1 Mbps
- ARM Cortex –M4 32-bit processor with FPU, 64 MHz
- Memory: 1MB flash / 256KB RAM
- HW accelerated security
    - ARM TrustZone Cryptocell 310 security subsystem
    - 128 bit AES / ECB / CCM / AAR co-processor (on-the-fly packet encryption)
- Interfaces on device
    - USB 2.0 full speed (12Mbps) controller
    - Programmable peripheral interconnect (PPI)
    - 1 x Switch and max. 2 x LED (Default: 1x LED)
    - EasyDMA automated data transfer between memory and peripherals.
- 4 x 4 channel pulse width modulator (PWM) units with EasyDMA
- 5 X 32-bit timers with counter mode
- 3 x 24-bit real-time counters (RTC)
- Flexible power management
    - On-chip LDO regulators with automated low current modes
    - Automated peripheral power management
    - Fast wake-up using 64MHz internal oscillator
- Nordic SoftDevice ready and with support for concurrent multi-protocol

2. Product dimension

DONGLE SIZE: (L) 32.85 x (W) 15.10 x (H) 6.8 mm







3. Main chip solution

RF IC	Module	Crystal Frequency
Nordic nRF52840	**MDBT50Q-P (PCB/Printed Antenna)**	**32MHz**

4. Shipment packaging information

Production Code	Logo on the casing
MD-240A7-001	Raytac Logo
	
MD-240A7-002	No Logo
	

- Unit Weight (with casing): 3.09 g (± 0.2 g)

- Packaging Type: Anti-static Tray only

- Minimum Package Quantity (MPQ): 35 pcs per Tray

- Carton Contents: 280 pcs per carton (8 Full Trays + 1 Empty Tray Cover)

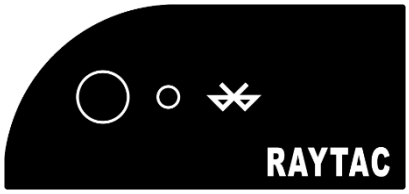
- Dimension of Carton: (L) 37 x (W) 21 x (H) 13 cm

- Gross Weight: approx. 1.83 kgs per full carton (contains 280 pcs)

4.1. Label

Labels presented on the front and backside of USB-C dongle shown below.

Surface protective Film applied on front side, which can be peeled off when use.

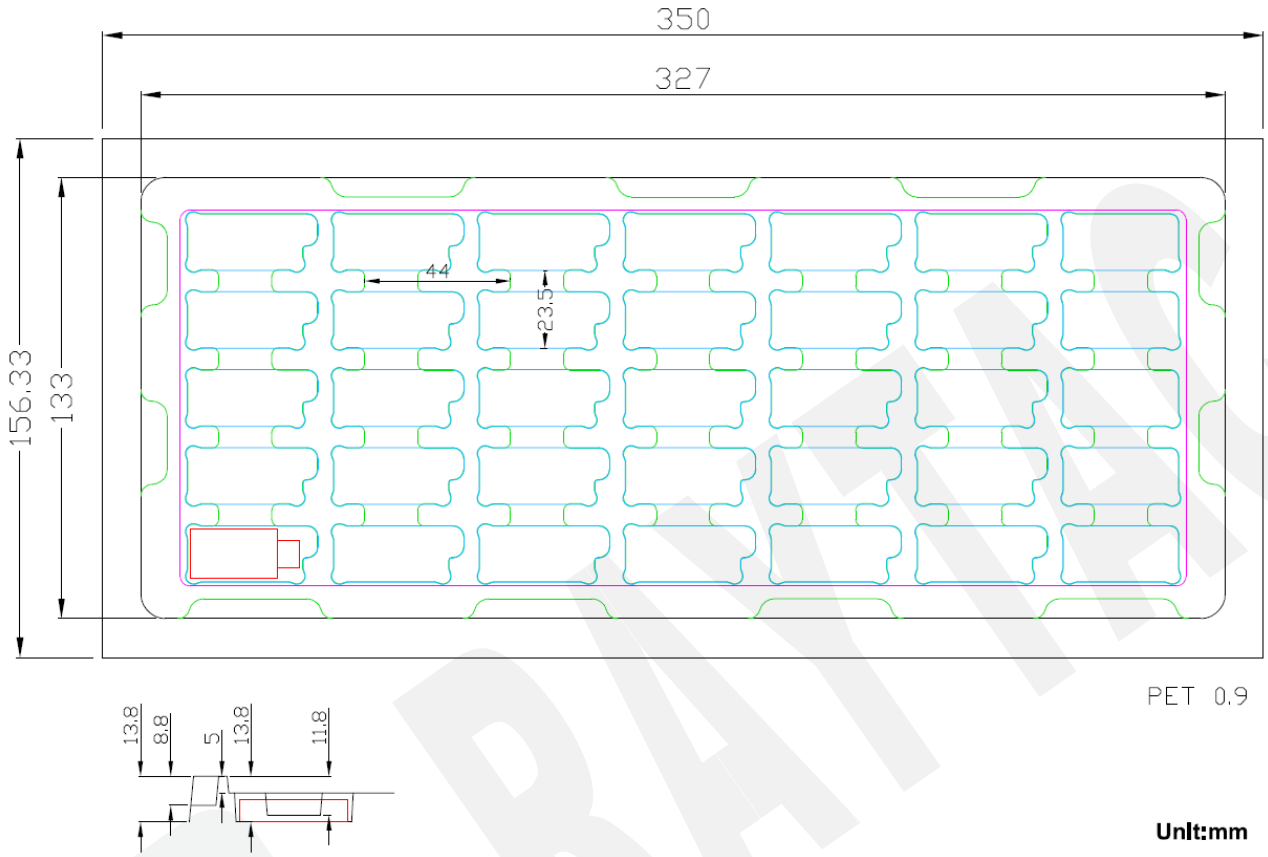
Label (Front)	Label (Back) Compliance Info.
 Surface protective Film applied, Which can be peeled off when use.	

Note: The test reports & certificate can be referred in Chapter 10

4.2. Tray specifications

The USB-C Dongle will be packed in a tray (5x7=35pcs) for volume order.

Tray Specification is presented as follows:



5. Specification

5.1. Recommended operating conditions

Symbol	Parameter	Min.	Nom.	Max.	Units
VDDH	VDDH supply voltage, independent of DCDC enable	2.5	3.7	5.5	V
VBUS	VBUS USB supply voltage	4.35	5.0	5.5	V
TA	Operating emperature	-40	25	85	°C
T_J	Junction emperature			90	°C
t_{R_VDDH}	Supply rise time (0 V o 3.7 V)			100	ms

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

Contents below are extracted from "nRF52840 Product Specification v1.8",
Please refer to Nordic's official release as the latest update.

5.2. Absolute maximum ratings

	Note	Min.	Max.	Unit
Supply voltages				
VDDH		-0.3	+5.8	V
VBUS		-0.3	+5.8	V
VSS			0	V
I/O pin voltage				
$V_{I/O}$, VDD ≤3.6 V		-0.3	VDD + 0.3	V
$V_{I/O}$, VDD >3.6 V		-0.3	3.9	V
NFC antenna pin current				
$I_{NFC1/2}$			80	mA
Radio				
RF input level			10	dBm
Environmental aQFN™ 73 package				
Storage temperature		-40	+125	°C
MSL	Moisture Sensitivity Level		2	
ESD HBM	Human Body Model		2	kV
ESD HBM Class	Human Body Model Class		2	
ESD CDM	Charged Device Model		450	V
Flash memory				
Endurance		10 000		write/erase cycles
Retention at 85 °C		10		years

5.3. Electrical specifications

5.4. General radio characteristics

Symbol	Description	Min.	Typ.	Max.	Units
f_{OP}	Operating frequencies	2360		2500	MHz
$f_{PLL,CH,SP}$	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_{BPS}	On the air data rate	125		2000	kbps
$f_{chip,\ IEEE\ 802.15.4}$	Chip rate in IEEE 802.15.4 mode		2000		kchips

5.5. Radio current consumption (Transmitter)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{TX,PLUS8dBM,DCDC}$	TX only run current (DC/DC, 3 V) P_{RF} = +8 dBm	..	14.8	..	mA
$I_{TX,PLUS8dBM}$	TX only run current P_{RF} = +8 dBm	..	32.7	..	mA
$I_{TX,PLUS4dBM,DCDC}$	TX only run current (DC/DC, 3 V) P_{RF} = +4 dBm	..	9.6	..	mA
$I_{TX,PLUS4dBM}$	TX only run current P_{RF} = +4 dBm	..	21.4	..	mA
$I_{TX,0dBM,DCDC,5V,REG0HIGH}$	TX only run current (DC/DC, 5 V, REG0 out = 3.3 V)P_{RF} = 0 dBm		3.0		mA
$I_{TX,0dBM,DCDC,5V,REG0L}$	TX only run current (DC/DC, 5 V, REG0 out = 1.8 V)P_{RF} = 0 dBm		3.0		mA
$I_{TX,0dBM,DCDC}$	TX only run current (DC/DC, 3 V)P_{RF} = 0 dBm	..	4.8		mA
$I_{TX,0dBM}$	TX only run current P_{RF} = 0 dBm	..	10.6	..	mA
$I_{TX,MINUS4dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -4 dBm	..	3.1	..	mA
$I_{TX,MINUS4dBM}$	TX only run current P_{RF} = -4 dBm	..	8.1	..	mA
$I_{TX,MINUS8dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -8 dBm		3.3		mA
$I_{TX,MINUS8dBM}$	TX only run current P_{RF} = -8 dBm	..	7.2		mA
$I_{TX,MINUS12dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -12 dBm		3.0		mA
$I_{TX,MINUS12dBM}$	TX only run current P_{RF} = -12 dBm	..	6.4	..	mA
$I_{TX,MINUS16dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -16 dBm		2.8		mA
$I_{TX,MINUS16dBM}$	TX only run current P_{RF} = -16 dBm	..	6.0	..	mA
$I_{TX,MINUS20dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -20 dBm		2.7		mA
$I_{TX,MINUS20dBM}$	TX only run current P_{RF} = -20 dBm	..	5.6	..	mA

Symbol	Description	Min.	Typ.	Max.	Units
$I_{TX,MINUS40dBM,DCDC}$	TX only run current DC/DC, 3 V P_{RF} = -40 dBm		2.3		mA
$I_{TX,MINUS40dBM}$	TX only run current P_{RF} = -40 dBm	..	4.6	..	mA
$I_{START,TX,DCDC}$	TX start-up current DC/DC, 3 V, P_{RF} = 4 dBm		5.2		mA
$I_{START,TX}$	TX start-up current, P_{RF} = 4 dBm		11.0		mA

5.6. Radio current consumption (Receiver)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{RX,1M,DCDC}$	RX only run current (DC/DC, 3 V) 1 Mbps / 1 Mbps BLE	..	4.6	..	mA
$I_{RX,1M}$	RX only run current (LDO, 3 V) 1 Mbps / 1 Mbps BLE	..	9.9	..	mA
$I_{RX,2M,DCDC}$	RX only run current (DC/DC, 3 V) 2 Mbps / 2 Mbps BLE	..	5.2	..	mA
$I_{RX,2M}$	RX only run current (LDO, 3 V) 2 Mbps / 2 Mbps BLE	..	11.1	..	mA
$I_{START,RX,1M,DCDC}$	RX start-up current (DC/DC, 3 V) 1 Mbps / 1 Mbps BLE		3.7		mA
$I_{START,RX,1M}$	RX start-up current 1 Mbps / 1 Mbps BLE		6.7		mA

5.7. Transmitter specification

Symbol	Description	Min.	Typ.	Max.	Units
P_{RF}	Maximum output power	..	8.0	..	dBm
P_{RFC}	RF power control range		28.0		dB
P_{RFCR}	RF power accuracy			±4	dB
$P_{RF1,1}$	1st Adjacent Channel Transmit Power 1 MHz (1 Mbps)	..	-24.8	..	dBc
$P_{RF2,1}$	2nd Adjacent Channel Transmit Power 2 MHz (1 Mbps)	..	-54.0	..	dBc
$P_{RF1,2}$	1st Adjacent Channel Transmit Power 2 MHz (2 Mbps)	..	-25	..	dBc
$P_{RF2,2}$	2nd Adjacent Channel Transmit Power 4 MHz (2 Mbps)	..	-54.0	..	dBc
E_{vm}	Error vector magnitude IEEE 802.15.4	..	8	..	%rms
$P_{harm2nd,\ IEEE\ 802.15.4}$	2nd harmonics in IEEE 802.15.4 mode	..	-51.0	..	dBm
$P_{harm3rd,\ IEEE\ 802.15.4}$	3rd harmonics in IEEE 802.15.4		-48.0	..	dBm

5.8. 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
$RSSI_{PERIOD}$	RSSI sampling time from RSSI_START task		0.25		µs
$RSSI_{SETTLE}$	RSSI settling time after signal level change		15		µs

5.9. Receiver operation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{RX,MAX}$	Maximum received signal strength at < 0.1% PER		0		dBm
$P_{SENS,IT,1M}$	Sensitivity, 1 Mbps nRF mode ideal transmitter[1]		-93		dBm
$P_{SENS,IT,2M}$	Sensitivity, 2 Mbps nRF mode ideal transmitter[2]		-89		dBm
$P_{SENS,IT,SP,1M,BLE}$	Sensitivity, 1 Mbps BLE ideal transmitter, packet length ≤ 37 bytes BER=1E-3[3]		-95		dBm
$P_{SENS,IT,LP,1M,BLE}$	Sensitivity, 1 Mbps BLE ideal transmitter, packet length ≥ 128 bytes BER=1E-4[4]		-94		dBm
$P_{SENS,IT,SP,2M,BLE}$	Sensitivity, 2 Mbps BLE ideal transmitter, packet length ≤ 37 bytes		-92		dBm
$P_{SENS,IT,BLE\ LE125k}$	Sensitivity, 125 kbps BLE mode		-103		dBm
$P_{SENS,IT,BLE\ LE500k}$	Sensitivity, 500 kbps BLE mode		-99		dBm
$P_{SENS,IEEE\ 802.15.4}$	Sensitivity in IEEE 802.15.4 mode		-100		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 3 dB.
2. Same as above.
3. As defined in the Bluetooth Core Specification v4.0 Volume 6: Core System Package (Low Energy Controller Volume)
4. Equivalent BER limit < 10E-04

5.10. RX selectivity

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{1M,co\text{-}channel}$	1Mbps mode, Co-Channel interference		9		dB
$C/I_{1M,-1MHz}$	1 Mbps mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1M,+1MHz}$	1 Mbps mode, Adjacent (+1 MHz) interference		-10		dB
$C/I_{1M,-2MHz}$	1 Mbps mode, Adjacent (-2 MHz) interference		-19		dB
$C/I_{1M,+2MHz}$	1 Mbps mode, Adjacent (+2 MHz) interference		-42		dB
$C/I_{1M,-3MHz}$	1 Mbps mode, Adjacent (-3 MHz) interference		-38		dB
$C/I_{1M,+3MHz}$	1 Mbps mode, Adjacent (+3 MHz) interference		-48		dB
$C/I_{1M,\pm6MHz}$	1 Mbps mode, Adjacent (≥6 MHz) interference		-50		dB
$C/I_{1MBLE,co\text{-}channel}$	1 Mbps BLE mode, Co-Channel interference		6		dB
$C/I_{1MBLE,-1MHz}$	1 Mbps BLE mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1MBLE,+1MHz}$	1 Mbps BLE mode, Adjacent (+1 MHz) interference		-9		dB
$C/I_{1MBLE,-2MHz}$	1 Mbps BLE mode, Adjacent (-2 MHz) interference		-22		dB
$C/I_{1MBLE,+2MHz}$	1 Mbps BLE mode, Adjacent (+2 MHz) interference		-46		dB
$C/I_{1MBLE,>3MHz}$	1 Mbps 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
$C/I_{2M,co\text{-}channel}$	2 Mbps mode, Co-Channel interference		10		dB

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{2M,-2MHz}$	2 Mbps mode, Adjacent (-2 MHz) interference		6		dB
$C/I_{2M,+2MHz}$	2 Mbps mode, Adjacent (+2 MHz) interference		-19		dB
$C/I_{2M,-4MHz}$	2 Mbps mode, Adjacent (-4 MHz) interference		-20		dB
$C/I_{2M,+4MHz}$	2 Mbps mode, Adjacent (+4 MHz) interference		-44		dB
$C/I_{2M,-6MHz}$	2 Mbps mode, Adjacent (-6 MHz) interference		-42		dB
$C/I_{2M,+6MHz}$	2 Mbps mode, Adjacent (+6 MHz) interference		-42		dB
$C/I_{2M,\geq12MHz}$	2 Mbps mode, Adjacent (≥12 MHz) interference		-52		dB
$C/I_{2MBLE,co-channel}$	2 Mbps BLE mode, Co-Channel interference		6.8		dB
$C/I_{2MBLE,\pm2MHz}$	2 Mbps BLE mode, Adjacent (±2 MHz) interference		-10		dB
$C/I_{2MBLE,\pm4MHz}$	2 Mbps BLE mode, Adjacent (±4 MHz) interference		-45		dB
$C/I_{2MBLE,\geq6MHz}$	2 Mbps BLE mode, Adjacent (≥6 MHz) interference		-48		dB
$C/I_{2MBLE,image}$	Image frequency interference		-24		dB
$C/I_{2MBLE,image,\ 2MHz}$	Adjacent (2 MHz) interference to in-band image frequency		-35		dB
$C/I_{125k\ BLE\ LR,\ co-channel}$	125 kbps BLE LR mode, Co-Channel interference		4.4		dB
$C/I_{125k\ BLE\ LR,-1MHz}$	125 kbps BLE LR mode, Adjacent (-1 MHz) interference		-4.0		dB
$C/I_{125k\ BLE\ LR,+1MHz}$	125 kbps BLE LR mode, Adjacent (+1 MHz) interference		-12		dB
$C/I_{125k\ BLE\ LR,-2MHz}$	125 kbps BLE LR mode, Adjacent (-2 MHz) interference		-28		dB
$C/I_{125k\ BLE\ LR,+2MHz}$	125 kbps BLE LR mode, Adjacent (+2 MHz) interference		-50		dB
$C/I_{125k\ BLE\ LR,>3MHz}$	125 kbps BLE LR mode, Adjacent (≥3 MHz) interference		-55		dB
$C/I_{125k\ BLE\ LR,image}$	Image frequency interference		-29		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.

5.11. RX intermodulation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{IMD,5TH,1M}$	IMD performance, 1 Msps, 5th offset channel, Packet length <= 37 bytes		-33		dBm
$P_{IMD,5TH,1M,BLE}$	IMD performance, BLE 1 Msps, 5th offset channel, Packet length <= 37 bytes		-30		dBm
$P_{IMD,5TH,2M}$	IMD performance, 2 Msps, 5th offset channel, Packet length <= 37 bytes		-33		dBm
$P_{IMD,5TH,2M,BLE}$	IMD performance, BLE 2 Msps, 5th offset channel, Packet length <= 37 bytes		-31		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.

5.12. Radio timing parameters

Symbol	Description	Min.	Typ.	Max.	Units
$t_{TXEN,BLE,1M}$	Time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE and 150 µs TIFS)	140		140	µs
$t_{TXEN,FAST,BLE,1M}$	Time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE with fast ramp-up and 150 µs TIFS)	40		40	µs
$t_{TXDIS,BLE,1M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	6		6	µs
$t_{RXEN,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE)	140		140	µs
$t_{RXEN,FAST,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps BLE with fast ramp-up)	40		40	µs
$t_{RXDIS,BLE,1M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	0		0	µs
$t_{TXDIS,BLE,2M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	4		4	µs
$t_{RXDIS,BLE,2M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	0		0	µs
$t_{TXEN,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4)	130		130	µs
$t_{TXEN,FAST,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 with fast ramp-up)	40		40	µs
$t_{TXDIS,IEEE\ 802.15.4}$	When in TX, delay between DISABLE task and DISABLED event (IEEE 802.15.4)	21		21	µs
$t_{RXEN,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4)	130		130	µs
$t_{RXEN,FAST,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 with fast ramp-up)	40		40	µs
$t_{RXDIS,IEEE\ 802.15.4}$	When in RX, delay between DISABLE task and DISABLED event (IEEE 802.15.4)	0.5		0.5	µs
$t_{RX\text{-}to\text{-}TX\ turnaround}$	Maximum TX-to-RX or RX-to-TX turnaround time in IEEE 802.15.4 mode		40		µs

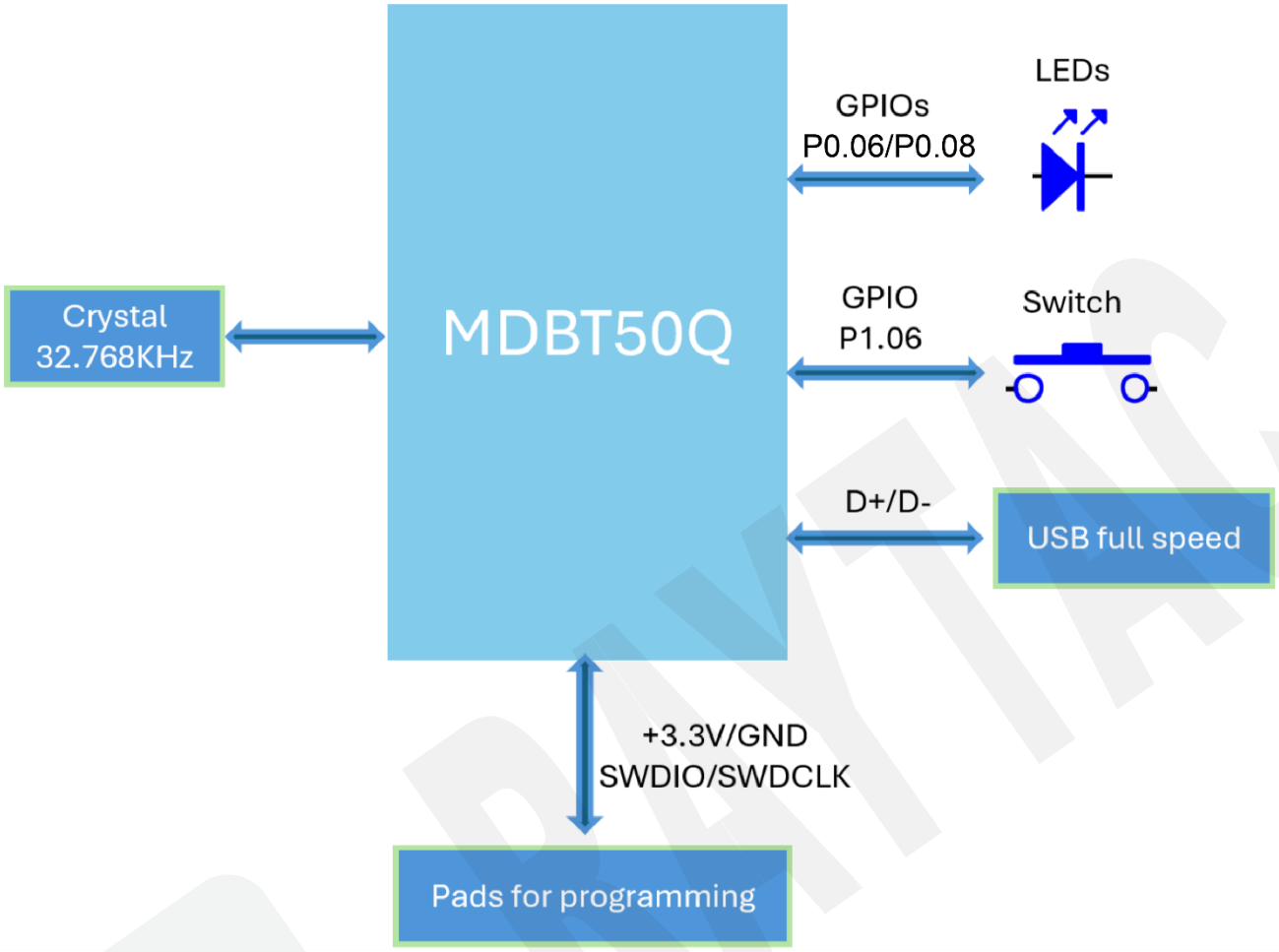
5.13. CPU performance

Symbol	Description	Min.	Typ.	Max.	Units
W_{FLASH}	CPU wait states, running CoreMark from flash, cache disabled			2	
$W_{FLASHCACHE}$	CPU wait states, running CoreMark from flash, cache enabled			3	
W_{RAM}	CPU wait states, running CoreMark from RAM			0	
CM_{FLASH}	CoreMark, running CoreMark from flash, cache enabled		212		CoreM
$CM_{FLASH/MHz}$	CoreMark per MHz, running CoreMark from flash, cache enabled		3.3		CoreMark/MHz
$CM_{FLASH/mA}$	CoreMark per mA, running CoreMark from flash, cache enabled, DCDC 3V		64		CoreM mA

5.14. Power management

Symbol	Description	Min.	Typ.	Max.	Units
$I_{ON\_RAMOFF\_EVENT}$	System ON, no RAM retention, wake on any event		0.97		µA
$I_{ON\_RAMON\_EVENT}$	System ON, full 256 kB RAM retention, wake on any event		2.35		µA
$I_{ON\_RAMON\_POF}$	System ON, full 256 kB RAM retention, wake on any event, power-fail comparator enabled		2.35		µA
$I_{ON\_RAMON\_GPIOTE}$	System ON, full 256 kB RAM retention, wake on GPIOTE input (event mode)		17.37		µA
$I_{ON\_RAMON\_GPIOTEPORT}$	System ON, full 256 kB RAM retention, wake on GPIOTE PORT event		2.36		µA
$I_{ON\_RAMOFF\_RTC}$	System ON, no RAM retention, wake on RTC (running from LFRC clock)		1.5		µA
$I_{ON\_RAMON\_RTC}$	System ON, full 256 kB RAM retention, wake on RTC (running from LFRC clock)		3.16		µA
$I_{OFF\_RAMOFF\_RESET}$	System OFF, no RAM retention, wake on reset		0.40		µA
$I_{OFF\_RAMOFF\_LPCOMP}$	System OFF, no RAM retention, wake on LPCOMP		0.86		µA
$I_{OFF\_RAMON\_RESET}$	System OFF, full 256 kB RAM retention, wake on reset		1.86		µA
$I_{ON\_RAMOFF\_EVENT\_5V}$	System ON, no RAM retention, wake on any event, 5 V supply on VDDH, REG0 output = 3.3 V		1.29		µA
$I_{OFF\_RAMOFF\_RESET\_5V}$	System OFF, no RAM retention, wake on reset, 5 V supply on VDDH, REG0 output = 3.3 V		0.95		µA

6. Block diagram



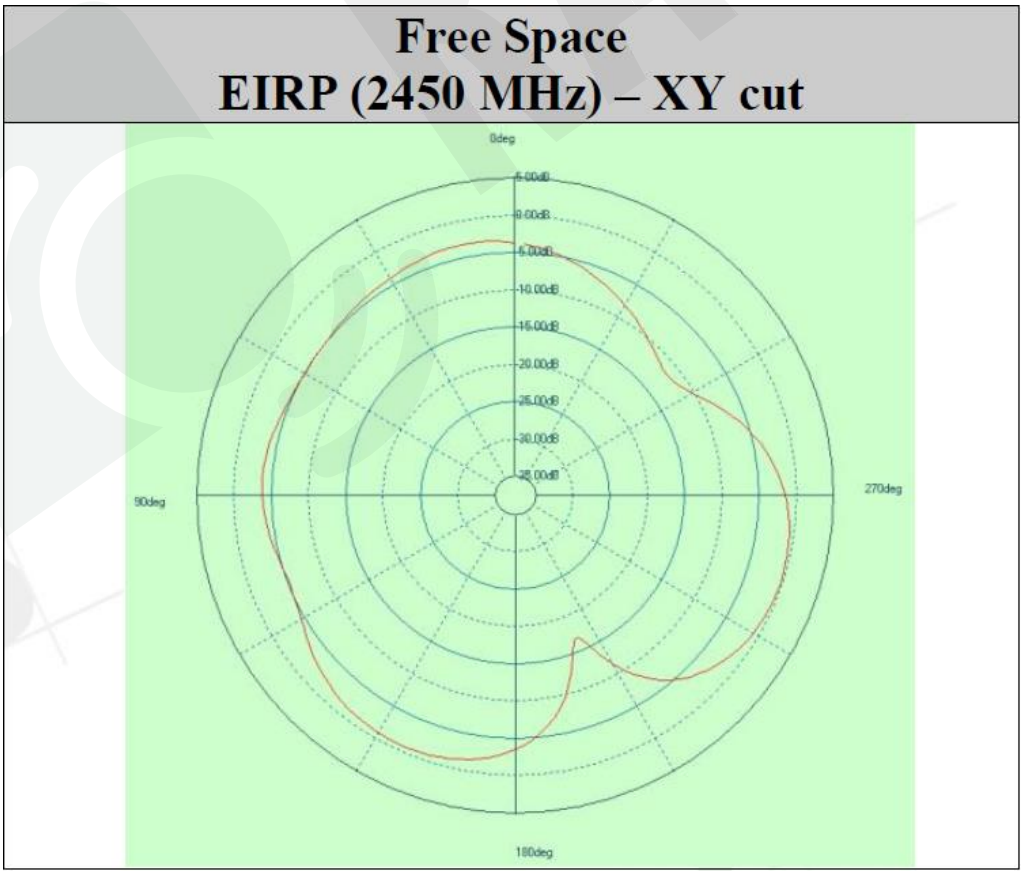
7. Antenna

7.1. MDBT50Q-P

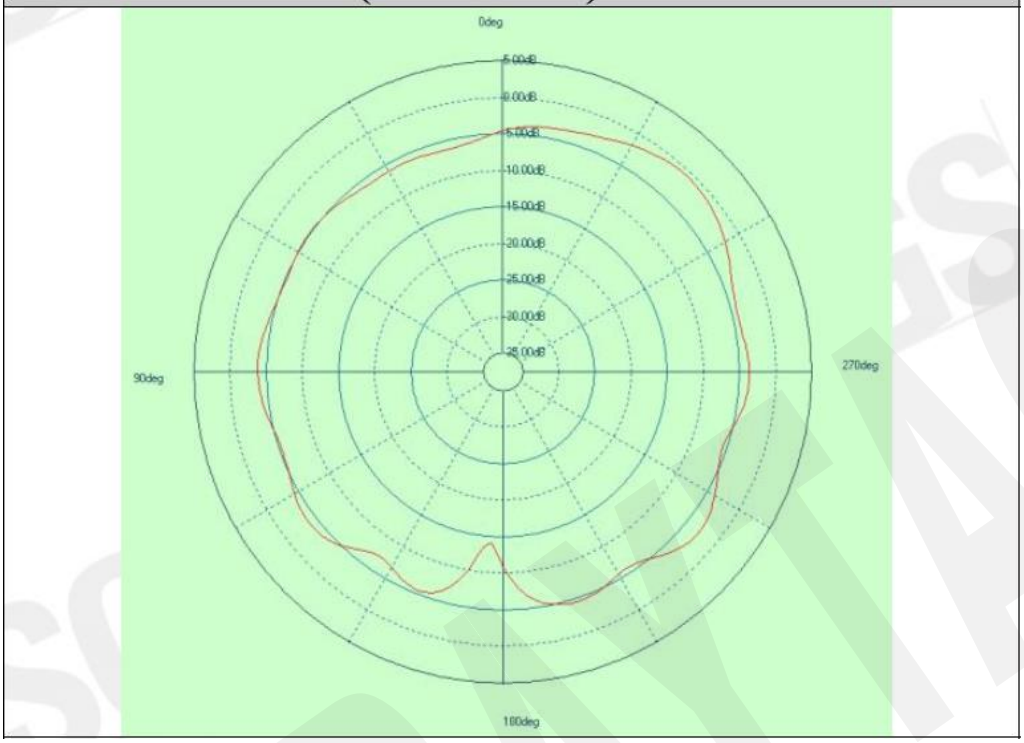
Antenna Gain and Efficiency

MDBT50Q (PCB antenna)			
Freq(MHz)	Peak. dBi	Efficiency	Average . dBi
2400.00	-0.72	29.40%	-5.32
2410.00	-0.62	31.02%	-5.08
2420.00	-0.44	32.89%	-4.83
2430.00	-0.44	35.00%	-4.56
2440.00	0.08	36.98%	-4.32
2450.00	0.05	37.76%	-4.23
2460.00	0.24	37.40%	-4.27
2470.00	0.26	37.43%	-4.27
2480.00	0.41	36.96%	-4.32
2490.00	0.37	35.03%	-4.56
2500.00	-0.15	31.71%	-4.99

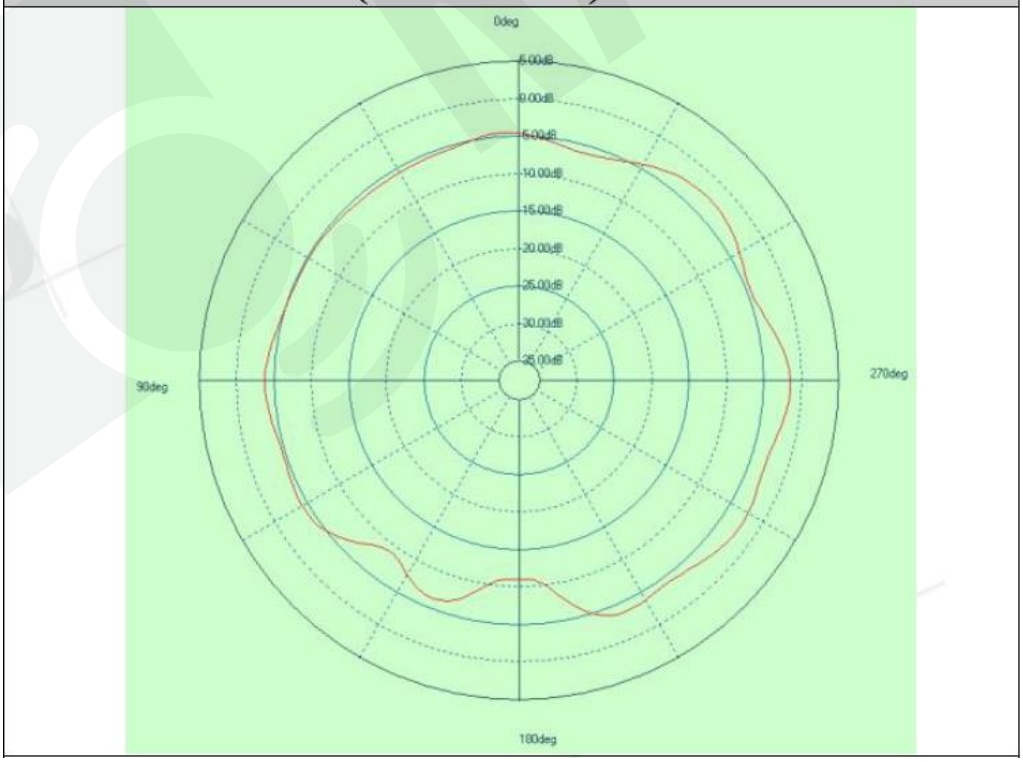
Free Space
EIRP (2450 MHz) – XY cut



Free Space
EIRP (2450 MHz) – XZ cut



Free Space
EIRP (2450 MHz) – YZ cut

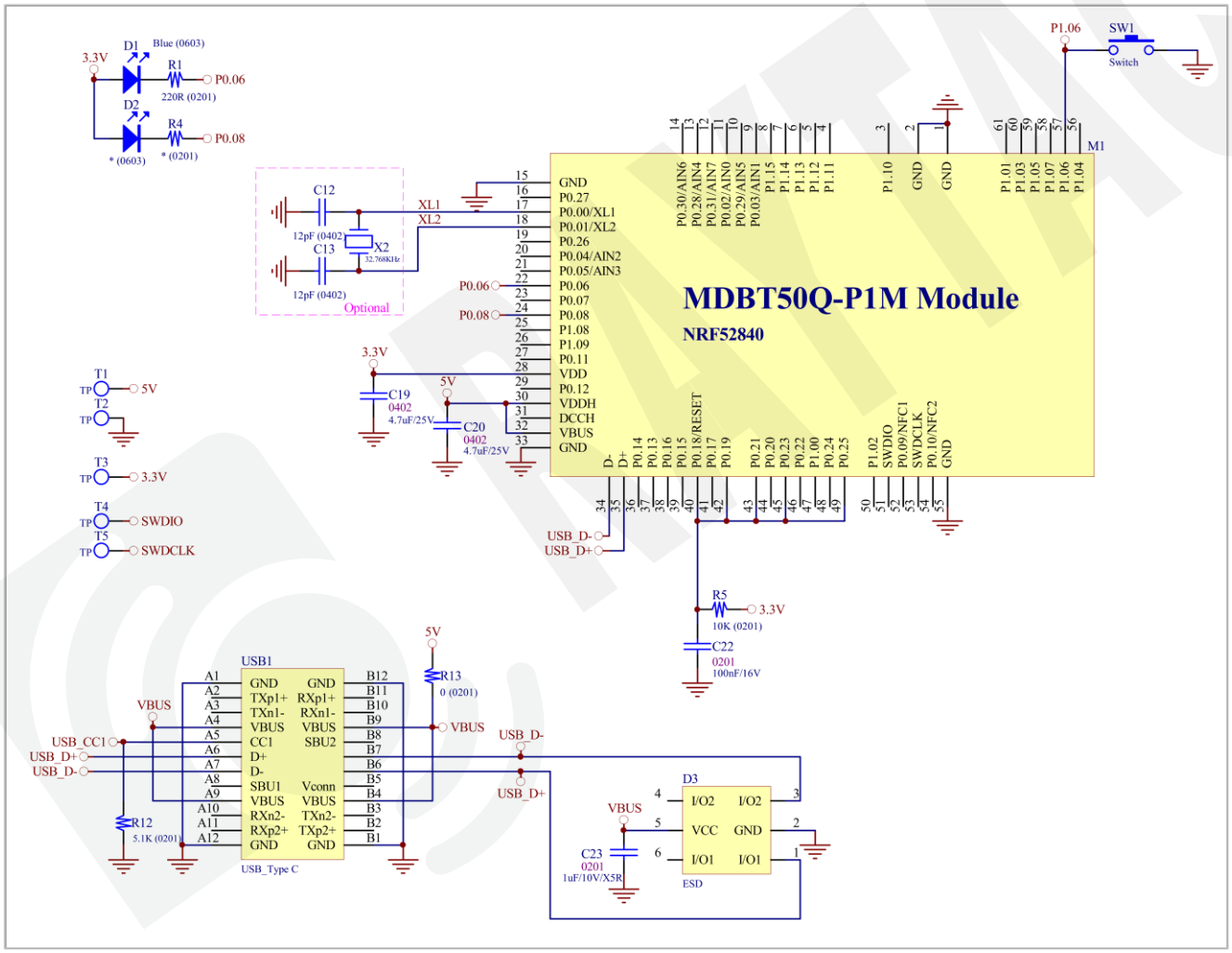


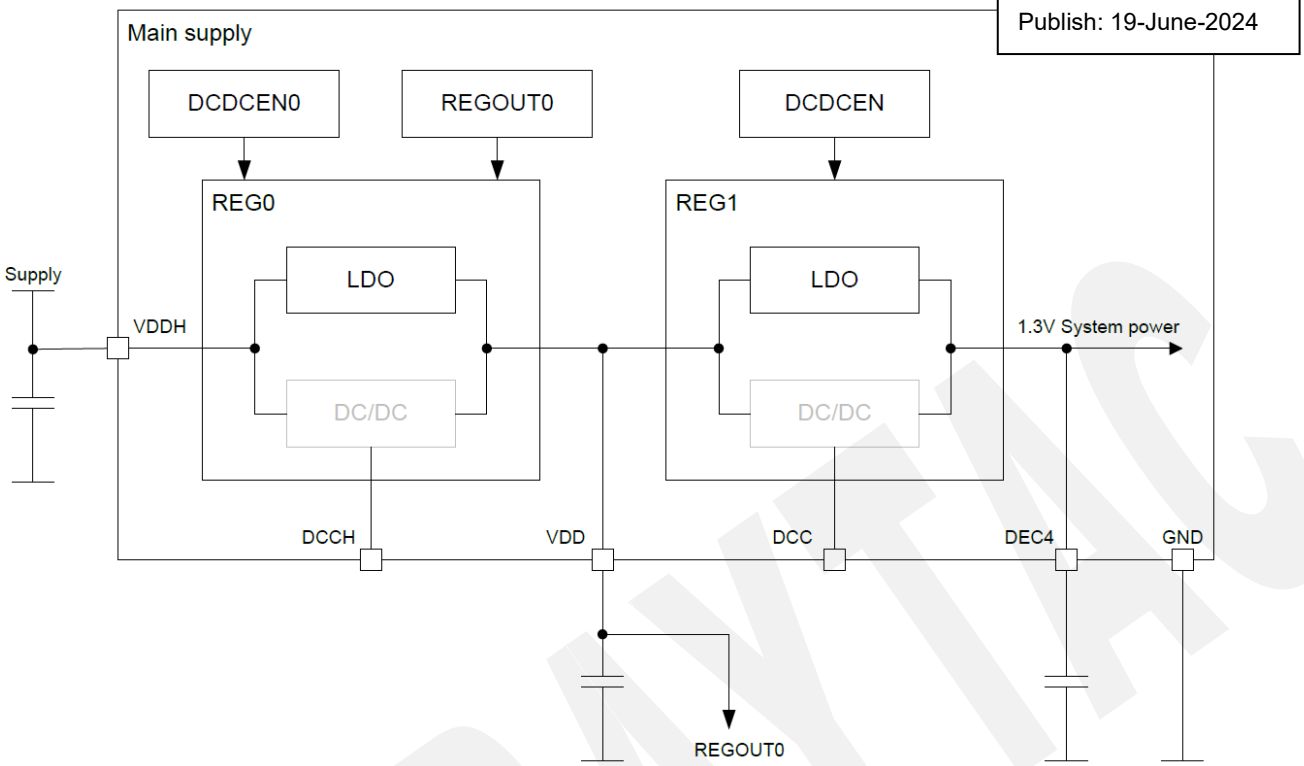
8. Reference circuit

System is working on high voltage mode, LDO only. VDD default supplies 3.0V.

- External 32.768kHz is equipped on the USB-C dongle board.

- Raytac Standard USB-C dongle has one LED (D1) mounted.
  2 LEDs (D1+D2) is feasible for production (With prior discussion)
  Please come to Raytac service center (sales team) for more details if you need 2 LEDs.




Main supply
DCDCEN0
REGOUT0
DCDCEN
REG0
REG1
LDO
LDO
Supply
VDDH
DC/DC
DC/DC
1.3V System power
DCCH
VDD
DCC
DEC4
GND
REGOUT0

9. Programming pin

Here's the drawing indicates the programming pin (SWDIO, SWCLK) for jump wire programming or for debug mode.

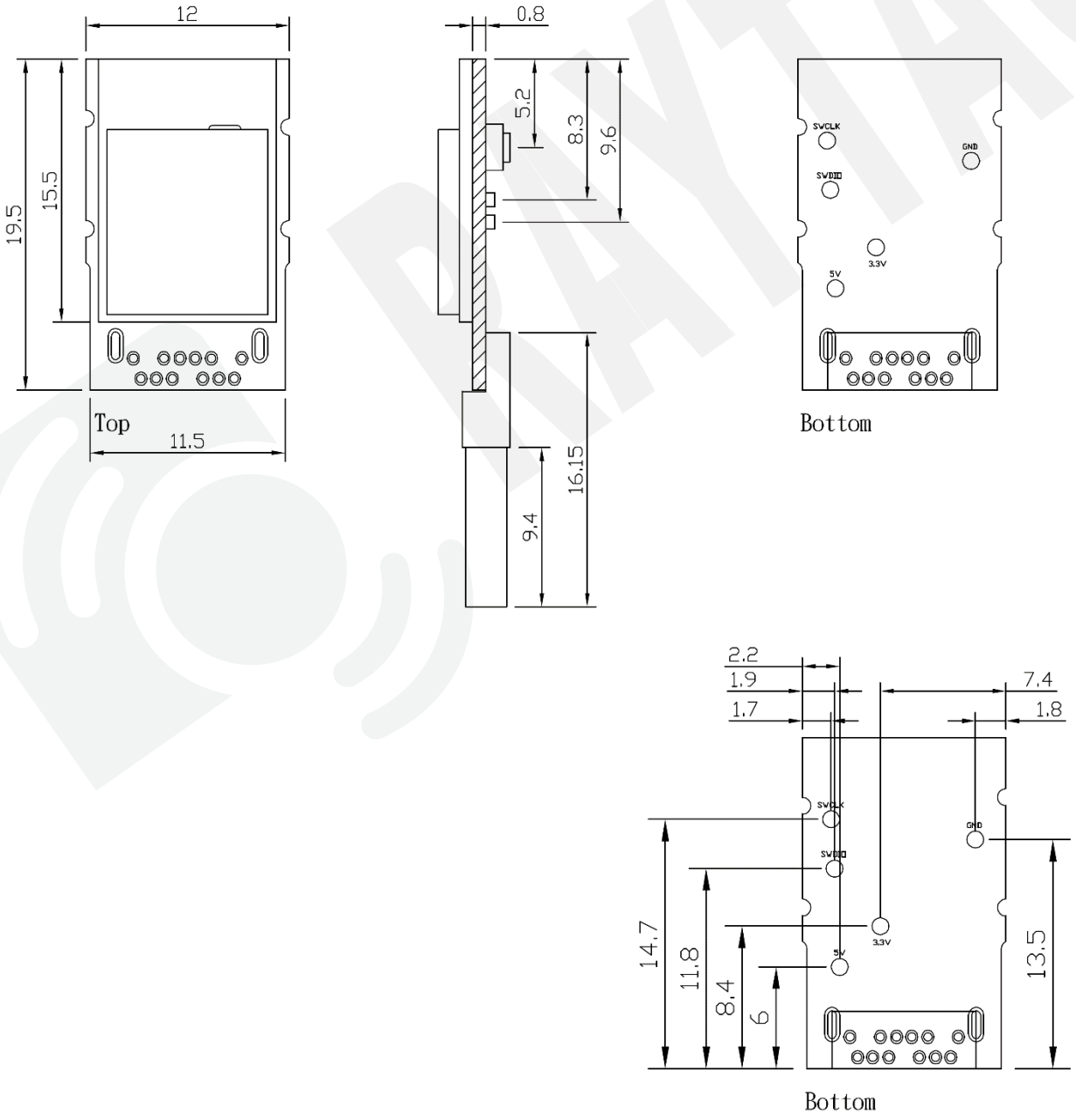
This USB-C Dongle is pre-programmed with Raytac production test code as well as built in bootloader.

You can execute USB DFU(Device Firmware Update) to flash your own firmware to USB-C dongle without hardware wiring.

User Guidance can be found and referred at :

User Manual of MDBT50Q-CX (nRF52840 USB-C Dongle)

Here is Gerber file to make programming jig for mass programming.



10. Certification

10.1. Declaration ID for Bluetooth

BT 5.4

Declaration ID	QDID(s)	Company	Specification Name
D066910	232392 - End Product > 228005 - Component (Tested)	Raytac Corporation	5.4

BT 5.2

Declaration ID	QDID(s)	Company	Specification Name
D053149	159932 - End Product	Raytac Corporation	5.2

BT 5.1

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

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

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: 07/26/2018

Application Dated: 07/25/2018

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:	SH6MDBT50Q
Name of Grantee:	Raytac Corp.
Equipment Class:	**Digital Transmission System**
Notes:	**Bluetooth Low Energy & IEEE 802.15.4 Combo Module**
Modular Type:	**Single Modular**

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Emission Tolerance Designator
	15C	**2402.0 - 2480.0**	**0.0066**	
	15C	**2405.0 - 2480.0**	**0.0066**	

Modular Approval. This is a portable device. Power Output 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. 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.: 182180940/AA/00	Ramy Nabod Product Assessor	

VERIFICATION OF COMPLIANCE

Issue Date:	Nov. 01, 2024
Applicant:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name/Trade Mark:	Raytac
Model/Type:	MDBT50Q-CX
Added Model(s):	N/A
Applicable Standards:	47 CFR FCC Part 15 Subpart B ICES-003 Issue 7 : October 2020 ANSI C63.4 : 2014
Test Laboratory:	SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan
Test Report No.:	TMHY2409001577YE, dated on Nov. 01, 2024

Conclusion: Based upon a review of the Test Report(s), the tested sample of the product mentioned above is deemed to comply with the requirements of the above standards.

Note: This verification is only valid for the product and configuration described and in conjunction with the test report as detailed above.

Authorised Signatory:

Bill Cheng

SGS Taiwan Ltd.
Bill Cheng
Supervisor

10.3. TELEC certificate (Japan)

Certificate Technical Support Center Co.,Ltd:
RAB ID No. 018

Construction Type Certification

Registration No.	CSRT180280
Certificate Holder	Raytac Corporation 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Product Category	Article 2, Paragraph 1, Item 19
Model Type or Name	MDBT50Q, MDBT50Q-1M, MDBT50Q-P1M, MDBT50Q-U1M
Type of Emission, Frequency and Antenna Power	F1D 2402MHz - 2480MHz (2MHz separation, 40 channels) 5.9704mW, 5.0816mW
Manufacturer	Raytac Corporation 5F, No.3, Jiankang Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Factory	Tech-Lin's Electronics Corp. 5F/11F, No. 778, Zhongzheng Rd., Zhonghe Dist., New Taipei City 23586, Taiwan R.O.C
Remarks	The scope of evaluation relates to the submitted documents and product only. It is only valid in conjunction with the Annex.

When the product is placed on the Japanese market, the Specified Radio Equipment marking as shown on the right must be attached on visible part of the product.

R 018-180280

Witnesses that the certification is on Construction Type Certification under Article 38-24 of the Radio Law.

Date of Certificate
2018/7/30

Takuji Nakano

Certification Examiner : Takuji Nakano
C&S /Certificate Technical Support Center Co., Ltd.

Address: Shinyokohama First Bldg.B1, 1-2-1 Shinyokohama, Kohoku-ku, Yokohama-City, 222-0033 Japan
Tel.: +81 45 478 3365 • Fax: +81 45 478 3382 • E-mail: cert@cns-web.co.jp

10.4. NCC certificate (Taiwan)

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

證照字號：型式字第 AM 號

一、申　請　者：勁達國際電子股份有限公司

二、地　　址：臺北市大安區和平東路 1 段 145 號 5 樓之 1

三、製 造 廠 商：勁達國際電子股份有限公司

四、器 材 名 稱：Bluetooth Low Energy(低功耗藍牙)接收器

五、廠　　牌：Raytac

六、型　　號：MDBT50Q-CX

七、發 射 功 率（電 場 強 度）：詳細射頻規格如備註欄

八、工 作 頻 率：詳細射頻規格如備註欄

九、審 驗 日 期：113年10月28日

十、審驗合格標籤式樣：CCAM24LP1840T8

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：(器材本體、使用手冊、外包裝盒等應遵守下列標示要求)

1. 應於本體明顯處標示審驗合格標籤或符合性聲明標籤及其型號，並於包裝盒標示主管機關標章。最終產品應於本體明顯處標示非隨插即用射頻模組（組件）之審驗合格標籤及最終產品型號，並於包裝盒標示主管機關標章，始得販賣。
2. 依主管機關或相關技術規範規定於指定位置標示正體中文警語。
3. 經授權使用射頻模組(組件)之審驗合格標籤者，應於最終產品說明書及包裝盒提供充分與正確之資訊。
4. 於網際網路販賣電信管制射頻器材者，應於該網際網路網頁標示其型號及審驗合格標籤或符合性聲明標籤資訊。但最終產品得僅標示其型號及其組裝之非隨插即用射頻模組（組件）之審驗合格標籤資訊。
5. 使用手冊應標示下列資訊：
   (1) 取得審驗證明之低功率射頻器材，非經核准，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。低功率射頻器材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。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材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。

10.5. 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-MDBT50Q
TELEFICATION No. No. DE TELEFICATION	182170262/AA/00
TEST SITE No. No. DE LABORATOIRE	4620A-5
ISSUED TO DÉLIVRÉ A	Raytac Corporation
TYPE OF EQUIPMENT GENRE DE MATÉRIEL	Bluetooth device Spread Spectrum/Digital Device (2400-2483.5 MHz)
TRADE NAME AND MODEL MARQUE ET MODELE	Raytac / MDBT50Q Raytac / MDBT50Q-1M Raytac / MDBT50Q-P1M
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 30 Jul 2018 BY

Ramy Nabod
Product Assessor

This certificate has one annex.

PRODUCTS
RvA C 224

VERIFICATION OF COMPLIANCE

Issue Date:	Nov. 01, 2024
Applicant:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name/Trade Mark:	Raytac
Model/Type:	MDBT50Q-CX
Added Model(s):	N/A
Applicable Standards:	47 CFR FCC Part 15 Subpart B ICES-003 Issue 7 : October 2020 ANSI C63.4 : 2014
Test Laboratory:	SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan
Test Report No.:	TMHY2409001577YE, dated on Nov. 01, 2024

Conclusion: Based upon a review of the Test Report(s), the tested sample of the product mentioned above is deemed to comply with the requirements of the above standards.

Note: This verification is only valid for the product and configuration described and in conjunction with the test report as detailed above.

Authorised Signatory:

Bill Cheng

SGS Taiwan Ltd.
Bill Cheng
Supervisor

10.6. 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:2021DJ1849
to the provisions with its CMIIT ID:

有效期：五年
Validity

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

2021 年 03 月 01 日
Year Month Date

10.7. KC certificate (South Korea)

6A78-89E6-8271-5732

방송통신기자재등의 적합등록 필증

Registration of Broadcasting and Communication Equipments

상호 또는 성명 Trade Name or Registrant	Raytac Corporation
기자재명칭(제품명칭) Equipment Name	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
기기부호/추가 기기부호 Equipment code /Additional Equipment code	IMC21 / LARN8
기본모델명 Basic Model Number	MDBT50Q-CX
파생모델명 Series Model Number	
등록번호 Registration No.	R-R-ryt-MDBT50Q-CX
제조자/제조국가 Manufacturer/Country of Origin	Raytac Corporation/대만
등록연월일 Date of Registration	2024-11-26
기타 Others	

위 기자재는 「전파법」 제58조의2 제3항에 따라 등록되었음을 증명합니다.

It is verified that foregoing equipment has been registered under the Clause 3, Article 58-2 of Radio Waves Act.

2024년(Year) 11월(Month) 26일(Day)

국립전파연구원장

Director General of National Radio Research Agency

※ 적합등록 방송통신기자재는 반드시 "적합성평가표시" 를 부착하여 유통하여야 합니다.
위반시 과태료 처분 및 등록이 취소될 수 있습니다.

10.8. CE(EU) test report

AS/NZS 4268:2017
ETSI EN 300 328 V2.2.2: 2019
TEST REPORT

Testing Laboratory 3702

Applicant:	Raytac Corp. 5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp. 5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product Name:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name:	Raytac
Model No.:	MDBT50Q-CX
Report Number:	TERF2409002674E2
Date of EUT Received:	September 06, 2024
Date of Test:	September 09, 2024 ~ October 01, 2024
Issue Date:	November 01, 2024

Approved By _____
Vito Pei

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Central RF Lab for compliance with the requirements set forth in the European Standard ETSI EN 300 328 V2.2.2: 2019 under 2014/53/EU and Australian/New Zealand Standard AS/NZS 4268:2017, Row 59. 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.

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan/新北市五股區新北產業園區五工路 134 號
t (886-2) 2299-3279 f (886-2) 2298-0488 www.sgs.com.tw
Member of SGS Group

VERIFICATION OF COMPLIANCE

Issue Date:	Nov. 01, 2024
Applicant:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name/Trade Mark:	Raytac
Model/Type:	MDBT50Q-CX
Added Model(s):	N/A
Applicable Standards:	EN 301 489 –1 v2.2.3 : 2019-11 EN 301 489 –17 v3.2.4 : 2020-09 EN 55032 : 2015+A11:2020 EN 61000-4-2 : 2009 EN IEC 61000-4-3 : 2020 EN 61000-4-4 : 2012 EN 61000-4-6 : 2014+AC:2015
Test Laboratory:	SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan
Test Report No.:	TMHY2409001575YE, dated on Nov. 01, 2024

Conclusion: Based upon a review of the Test Report(s), the tested sample of the product mentioned above is deemed to comply with the requirements of the above standards.

Note: This verification is only valid for the product and configuration described and in conjunction with the test report as detailed above.

Authorised Signatory:

Bill Cheng

SGS Taiwan Ltd.
Bill Cheng
Supervisor

10.9. RCM (Australia & New Zealand) test report

AS/NZS 4268:2017
ETSI EN 300 328 V2.2.2: 2019
TEST REPORT

Applicant:	Raytac Corp. 5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp. 5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product Name:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name:	Raytac
Model No.:	MDBT50Q-CX
Report Number:	TERF2409002674E2
Date of EUT Received:	September 06, 2024
Date of Test:	September 09, 2024 ~ October 01, 2024
Issue Date:	November 01, 2024

Approved By _____
Vito Pei

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Central RF Lab for compliance with the requirements set forth in the European Standard ETSI EN 300 328 V2.2.2: 2019 under 2014/53/EU and Australian/New Zealand Standard AS/NZS 4268:2017, Row 59. 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.

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VERIFICATION OF COMPLIANCE

Issue Date:	Nov. 01, 2024
Applicant:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Manufacturer:	Raytac Corp.
Address:	5F.,No.3, Jiankang Road.,Zhonghe District,New Taipei City,23586,Taiwan.
Product:	Bluetooth Low Energy & IEEE 802.15.4 Combo Dongle
Brand Name/Trade Mark:	Raytac
Model/Type:	MDBT50Q-CX
Added Model(s):	N/A
Applicable Standards:	EN 55032 : 2015+A11:2020 AS/NZS CISPR 32 : 2015+A1:2020 EN 55035 : 2017+A11:2020 IEC 61000-4-2 : 2008 IEC 61000-4-3 : 2020 IEC 61000-4-4 : 2012 IEC 61000-4-6 : 2013+COR1:2015 IEC 61000-4-8 : 2009
Test Laboratory:	SGS Taiwan Ltd. Electromagnetic Compatibility Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan
Test Report No.:	TMHY2409001576YE, dated on Nov. 01, 2024

Conclusion: Based upon a review of the Test Report(s), the tested sample of the product mentioned above is deemed to comply with the requirements of the above standards.

Note: This verification is only valid for the product and configuration described and in conjunction with the test report as detailed above.

Authorised Signatory:

Bill Cheng

SGS Taiwan Ltd.
Bill Cheng
Supervisor

10.10. RoHs & Reach report

Visit “Support” page at our website to get the document.

11. Notes and Cautions

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

- Follow the guidelines of this document while working with the product. Any discrepancy of core Bluetooth technology and technical specification of IC should refer to the 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 dongle without casing as it may cause damage to the PCBA. It is highly recommended using anti-ESD measurements when working with the dongle without casing or during assembly to prevent damage from real-life ESD events.

- Do not expose modules under direct sunlight for longer periods of time. Dongles should be kept away from humid and salty air conditions, and any corrosive gasses or substances. Store it within -40℃ to +75℃ before and after installation.

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

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

The dongle is not suitable for life support devices or systems and is not allowed to be used in destructive devices or systems in any direct or indirect ways. The customer agrees to indemnify Raytac for any losses when using dongle(s) in applications such as the ones described above.

- The USB-C dongle may not function properly with those type-C hubs/device which is lack of type-C driver /certification.

12. Basic facts for nRF52 chip

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

Visit [Raytac product page] for comprehensive module Sku of each item.

Nordic Solution	nRF52840	nRF52833	nRF52820	nRF52832	nRF52810	nRF52811	nRF52805
RAYTAC Model No. (MDBTXX)	50Q series	50Q series 50 series	50 series	42Q series 42 series 42V series	42Q series	42Q Series	42T series 42TV series
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	V
Bluetooth 5 Ad. Extention (x8)	V	V	V	V	V	V	V
Flash (kBytes)	1024	512	256	512	192	192	192
RAM (kBytes)	256	128	32	64	24	24	24
ANT Plus	V	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	without PWM
PDM	V	V		V	V	V	
ADC, Comparators	V	V	without ADC	V	V	V	without comparators
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	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 DevZone: https://devzone.nordicsemi.com/questions/
  A highly recommended website for firmware developers. Interact, discuss and consult with other fellow developers and Nordic's employees to get answers to your questions. The site also includes tutorials in detail to help you get started.

- Official Page of nRF52840 : https://www.nordicsemi.com/eng/Products/nRF52840
  A brief introduction to nRF52840 and download links for Nordic's developing software and SoftDevices.

14. USB driver for windows

Please check "Support" page of our website to download.

Note: It is NOT necessary to download the USB Driver when you're using Linux system.

Full list of Raytac's WiFi Modules

● AN7002Q Series (QFN Package IC)

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

Full list of Raytac's Bluetooth Modules

- **AN54H20 Series ~ Coming soon**

- **AS1262 Series (QFN Package IC) ~ Coming soon**

- **AN54L15Q series (QFN package IC)**

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
AN54L15Q	nRF54L15	AN54L15Q	1	Chip Antenna	256 kb	1.5 MB
	nRF54L15	AN54L15Q-P	1	PCB Antenna	256 kb	1.5 MB
	nRF54L15	AN54L15Q-U	1	u.FL Connector	256 kb	1.5 MB

- **MDBT53 Series (WLCSP Package IC)**

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

- **MDBT53V Series (WLCSP Package IC)**

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

MDBT50 Series (QFN Package IC)

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

MDBT50Q Series (aQFN Package IC)

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

MDBT42T Series (WLCSP Package IC)

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

MDBT42TV Series (WLCSP Package IC)

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

MDBT42 Series (WLCSP Package IC)

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

MDBT42V Series (WLCSP Package IC)

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

MDBT42Q Series (QFN Package IC)

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

MDBT40 Series

Series	Nordic Solution	Raytac No.	IC Ver.	Antenna	RAM	Flash Memory
MDBT40	nRF51822	MDBT40-256V3	3	Chip Antenna	16 kb	256 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

Release Note

- 2024/07/26: Version 0.1: Preliminary.

- 2024/12/05: Version 0.2: Preliminary.

  (1) Updated reference circuit in Chapter 8.

  (2) Updated shipment packaging info and tray specifications in Chapter 4.

  (3) Updated block diagram info in Chapter 6.

- 2025/05/13 1ST release.

  (1) Updated overall introduction info in Chapter 1.

  (2) Updated Label (Back) info in Chapter 4.1.

  (3) Updated Schematic in Chapter 8.

  (4) Add FCC, EMC, Canada IC and CE test report in Chapter 10.

  (5) Updated NCC, KC certificate in Chapter 10.

  (6) Add CE, RCM test report in Chapter 10.

  (7) Add ROHS & REACH content in Chapter 10.

  (8) Updated content in Chapter 12 and 14.

  (9) Updated list of Raytac's Model no.

  (10) Add list of WiFi Model no.

  (11) Updated service email address info.