



RAYTAC
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Approval Sheet

(產品承認書)

產品名稱	(Product)	Bluetooth Low Energy Module
解決方案	(Solution)	Nordic nRF54L15 QFN Package
產品型號	(Model No.)	AN54LQ-P15 (Chip Antenna)
產品料號	(Part No.)	See 4.3 Order code

Model	Working distance (in Meters)			Operating Temperature
	125 Kbps	1 Mbps	2 Mbps	
AN54LQ-15	over 750	over 400	over 300	-40 ~ 105°C
AN54LQ-P15	over 450	up to 250	up to 200	-40 ~ 105°C
AN54LQ-U15	over 750	up to 400	up to 300	-40 ~ 85°C

Working range is tested in open space

Index

1. Overall introduction	4
1.1. Application	4
1.2. Features	5
2. Product dimension	6
2.1. PCB dimensions & pin Indication	6
2.2. Recommended layout of solder pad	7
2.3. RF layout suggestion (AKA, antenna keep-out area)	9
2.4. Footprint & design guide	11
2.5. Pin assignment	12
3. Main chip solution	17
4. Shipment packaging information	18
4.1. Marking on metal shield	19
4.2. Packaging Info	19
4.3. Order code	20
5. Specification	21
5.1. Recommended operating conditions	21
5.2. Radio specifications	21
5.2.1. General radio characteristics	21
5.2.2. Radio current consumption (Transmitter)	22
5.2.3. Radio current consumption (Receiver)	22
5.2.4. Transmitter specification	23
5.2.5. Receiver operation	23
5.2.6. RX selectivity	24
5.2.7. RX intermodulation	25
5.2.8. Radio timing parameters	26
5.2.9. RSSI specifications	26
5.3. Absolute maximum ratings	27
6. Reference circuit	29
7. Certification	30
7.1. Declaration ID for Bluetooth	30
7.2. FCC Certificate (USA)	32
7.3. TELEC Certificate (Japan)	36
7.4. NCC Certificate (Taiwan)	37
7.5. CE (EU) & RCM (Australia & New Zealand) test report	40
7.6. IC Certificate (Canada)	43

7.7.	KC Certificate (South Korea)	44
7.8.	UKCA and EU Declarations of Conformity	45
7.9.	RoHS & REACH report.....	45
7.10.	End-product label	45
7.10.1.	FCC (USA).....	45
7.10.2.	TELEC (Japan)	46
7.10.3.	NCC (Taiwan).....	46
7.10.4.	IC (Canada)	47
7.11.	Compliance and Certification.....	47
7.11.1.	List of Applicable FCC Rules	47
7.11.2.	RF Exposure Considerations	47
7.11.3.	Antennas	48
7.11.4.	Information on Test Modes and Additional Testing Requirements	49
7.11.5.	Additional Testing, Part 15 Subpart B Disclaimer	49
7.11.6.	Note EMI Considerations	50
7.11.7.	How to Make Changes	50
8.	Notes and Cautions.....	51
9.	Useful links	52
	Full list of Raytac's Wi-Fi modules.....	53
	Full list of Raytac's Bluetooth modules.....	54
	Release Note	59

1. Overall introduction

Raytac's AN54LQ family us a Bluetooth® 6.0 stack (Bluetooth low energy or BLE) modules designed based on **Nordic nRF54L15 SoC solution**, which incorporates: **GPIO**, **QSPI (emulated)**, **SPI**, **UART**, **I2C**, **I2S**, **PDM**, **PWM**, **ADC** and **NFC** interfaces for connecting peripherals and sensors.

Product Character:

1. MCU (Microcontroller Unit) featuring a 128 MHz Arm Cortex-M33 processor.
2. Embedded **1524 KB** NVM and up to **256 KB** RAM.
3. An integrated RISC-V coprocessor.
4. The multiprotocol 2.4 GHz radio modes are supported based on customer preference.
5. Compact size with **(L) 13.7 x (W) 9.5 x (H) 1.8mm**
6. Wide supply voltage range **1.7V to 3.6V**.
7. Operation temperature from **-40°C to 105°C**.
8. Up to **31** GPIOs.

1.1. Application

- IoT
 - Smart home sensors and actuators
 - Industrial sensors and actuators
 - Gateways and hubs
- Advanced computer peripherals and I/O devices
 - Keyboard
 - Mouse
 - Stylus
- Interactive entertainment devices
 - Remote controls
 - Gaming controllers
- Safety and security
 - Access control
 - Asset tracking
- Wearable health and fitness monitoring
- Lighting control

1.2. Features

- Multi-protocol 2.4GHz radio
- 128MHz Arm Cortex-M33 with Thumb-2 (16/32-bit instruction set)
- 1524KB flash programmed memory and 256KB RAM
- 128-bit AES / ECB / CCM / AAR co-processor
- Up to +7dBm configurable output power
- RSSI (1dB resolution)

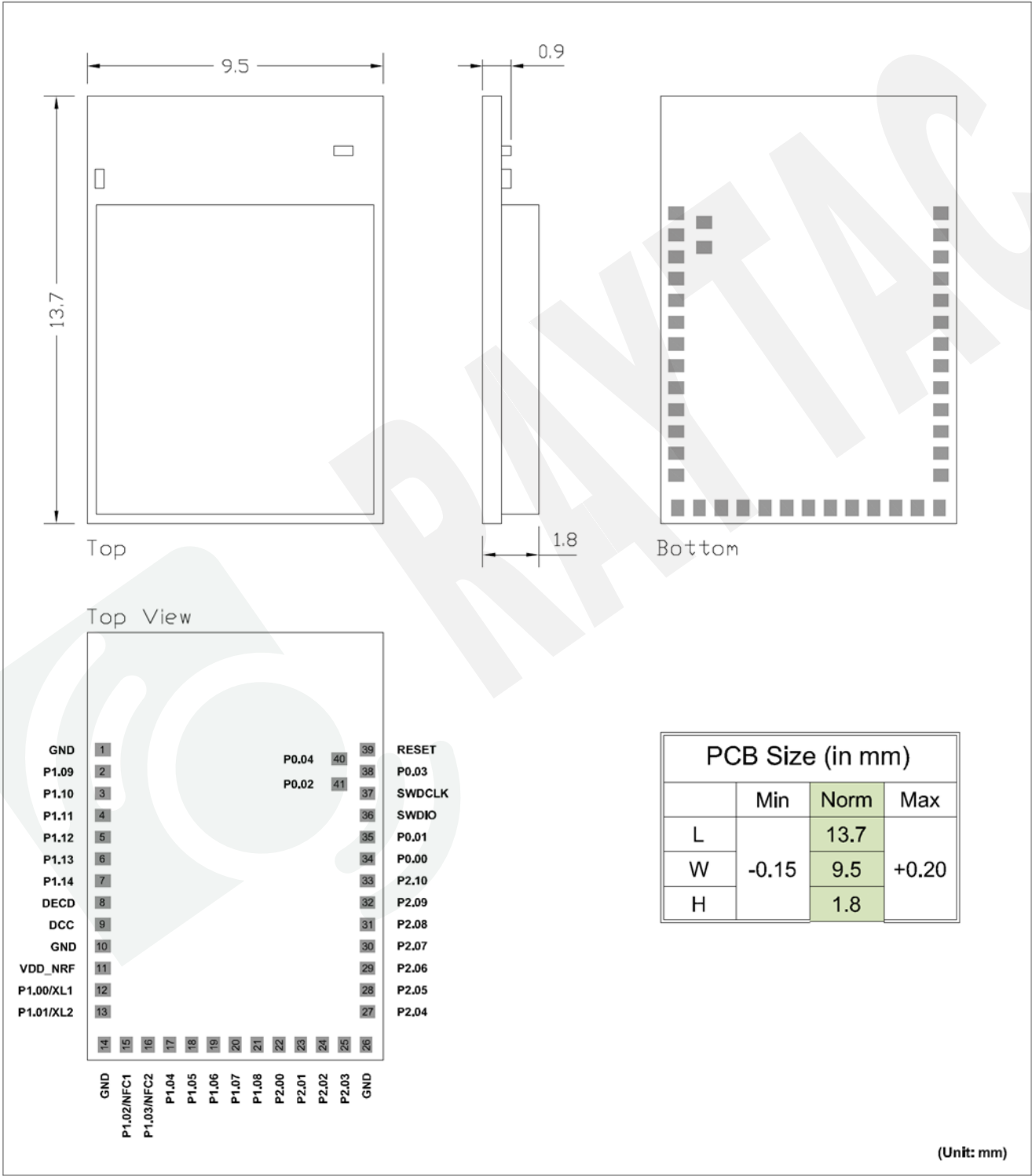
Peripherals

- 128 MHz RISC-V coprocessor which is a fast, lightweight peripheral processor (FLPR)
- Timer counter
 - 7 x 32-bit
 - 2 x 24-bit RTC
- Fully featured serial interface with EasyDMA support including:
 - One high-speed SPIM up to 32 MHz, four up to 8 MHz
 - One high-speed UARTE up to 4 Mbps, four up to 1 Mbps
 - I2C up to 400 kHz
- Three pulse width modulator (PWM) units with EasyDMA
- I2S two channel Inter-IC sound interface
- ADC with up to eight programmable gain channels.
- Pulse density modulation (PDM) interface
- Near field communication (NFC)
- Quadrature decoders(QDEC)
- Temperature sensor

2. Product dimension

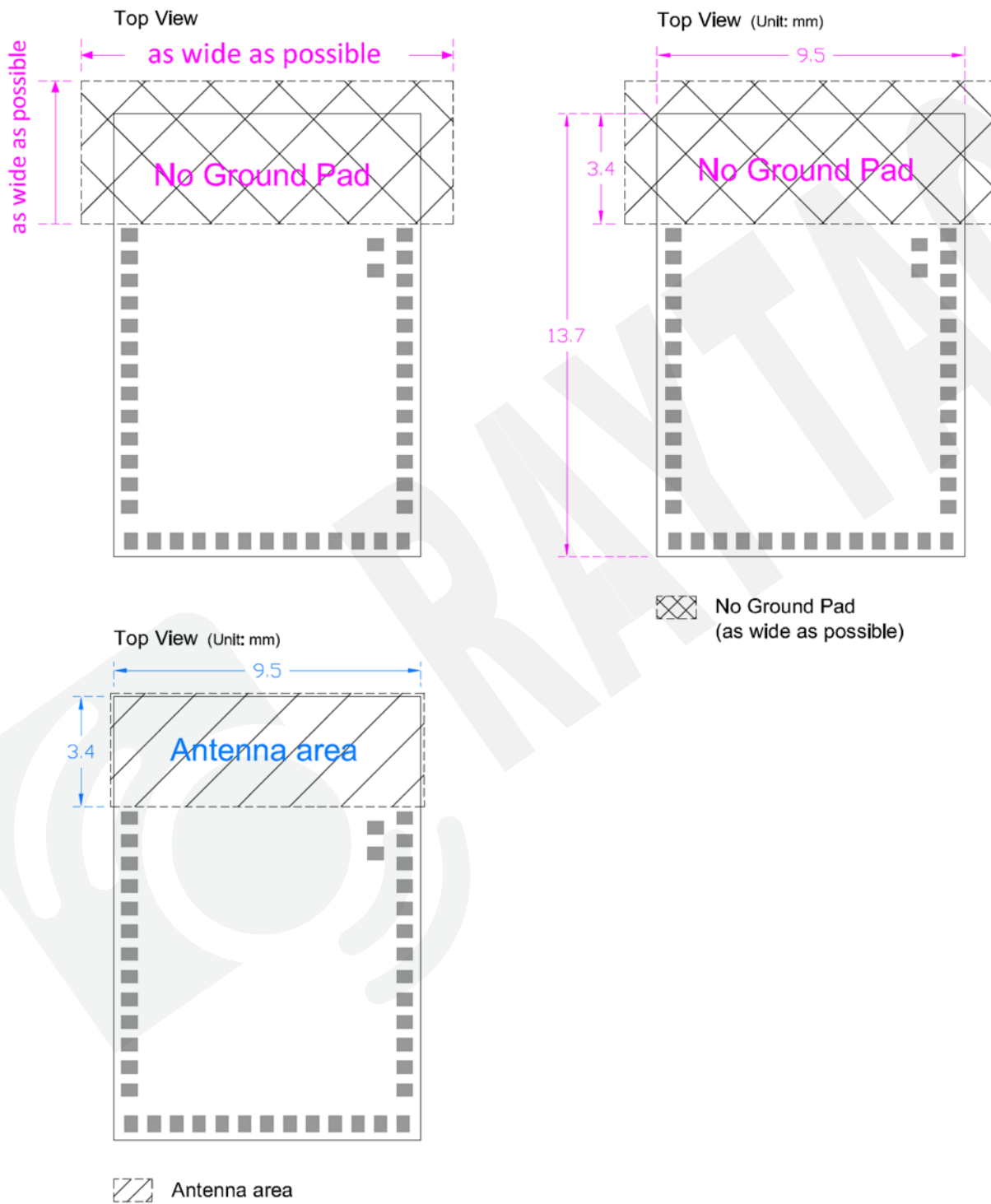
2.1. PCB dimensions & pin Indication

• AN54LQ-P15

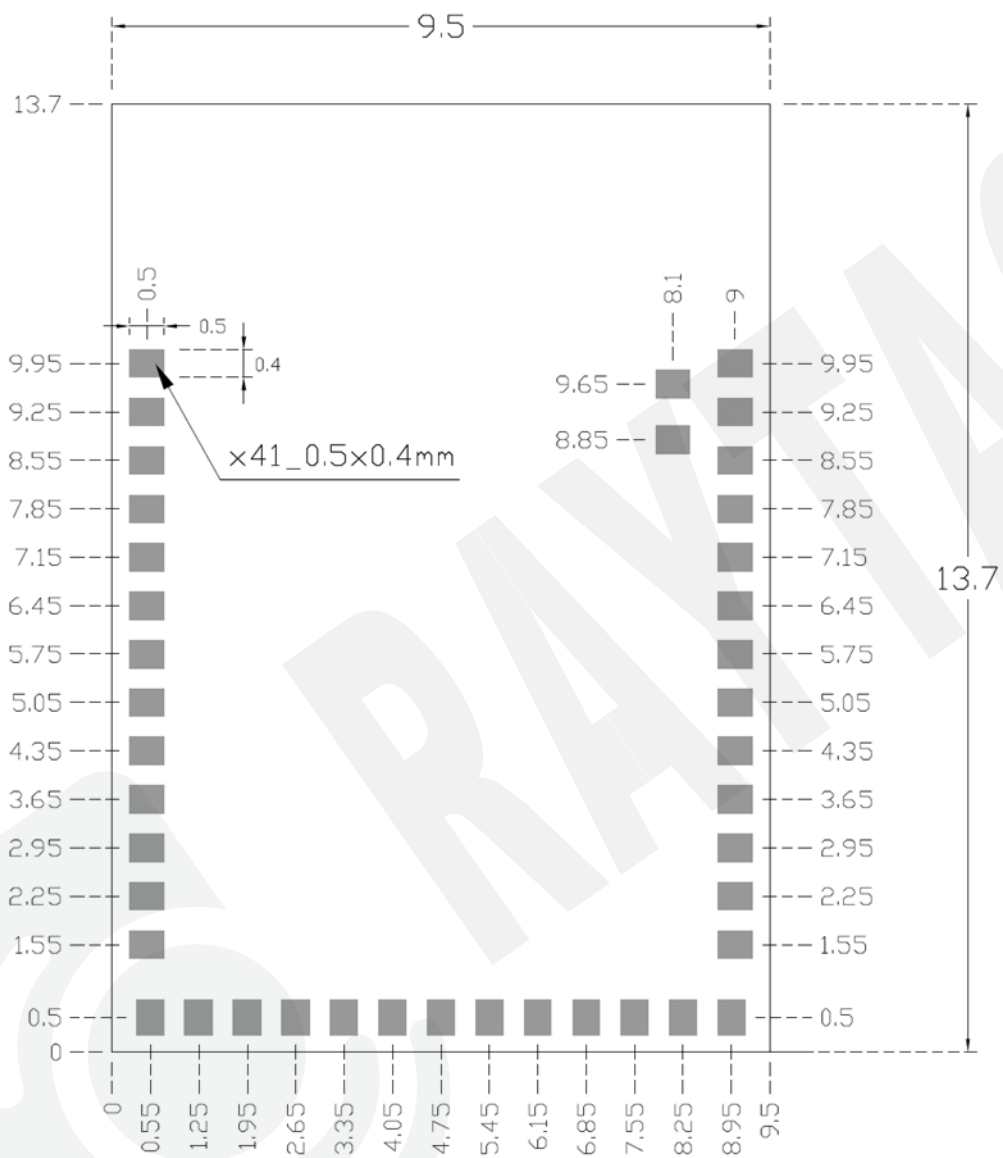


2.2. Recommended layout of solder pad

Graphs are all in Top View, Unit in mm.



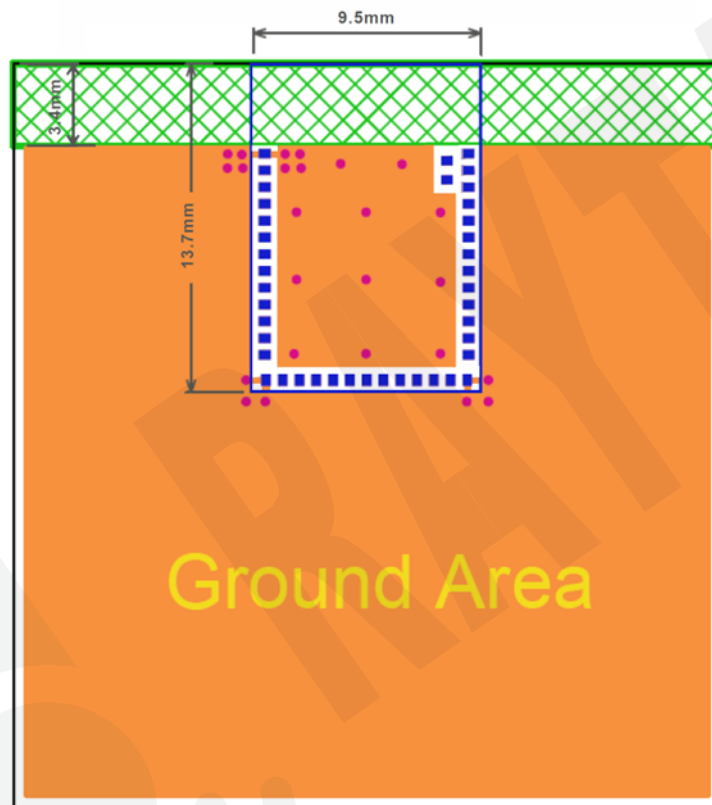
Top View (Unit: mm)



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

Please ensure that no ground pad overlaps the “No Ground-Pad Area”, as shown in the images below. This is important to maintain antenna performance and to prevent potential short circuits within the module.

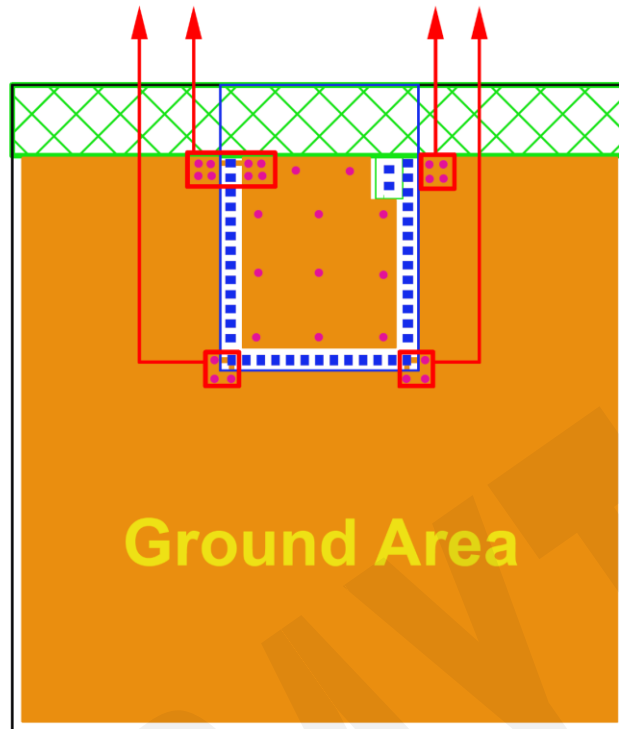
You are welcome to send us your design files for review at sales@raytac.com or to your Raytac contact with email subject titled: “Layout Review – Raytac Model No. – Your company name”.



Top View

 No Ground Pad Area

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



Top View

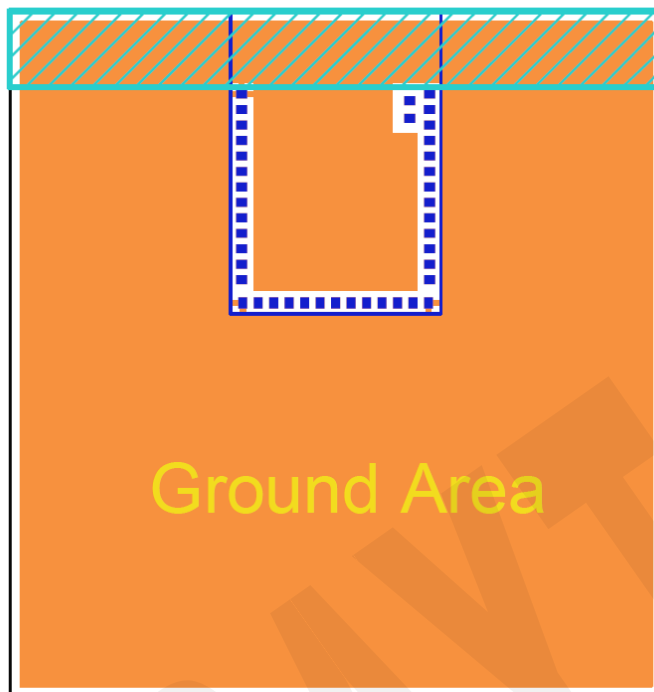


Perspective View

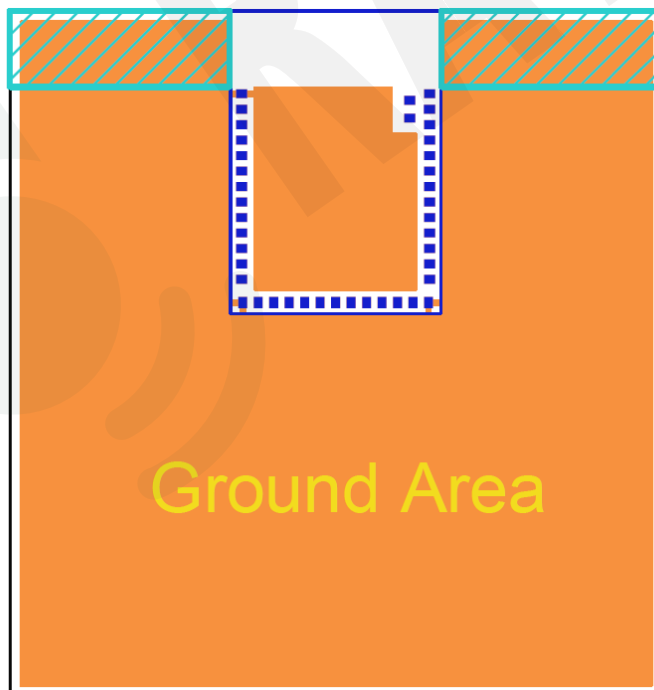
 No Ground Pad Area

Examples of “**NOT RECOMMENDED**” layout

▨ where should be NO-GROUND area



▨ where should be NO-GROUND area



2.4. Footprint & design guide

Please visit “[Support](#)” page of our website to download. The package includes footprint, 2D/3D drawing, and reflow graph/solder profile.

2.5. Pin assignment

Pin No.	Name	Pin function	Description
(1)	GND	Ground	The pad must be connected to a solid ground plane
	P1.09	Digital I/O	General-purpose I/O
(2)	ASO [2]	Digital I/O	TAMPC active shield 2 output
	RADIO [0]	Digital I/O	RADIO DFEGPIO
(3)	P1.10	Digital I/O	General-purpose I/O
	ASI [2]	Digital I/O	TAMPC active shield 2 input
(4)	RADIO [1]	Digital I/O	RADIO DFEGPIO
	P1.11	Digital I/O	General-purpose I/O Clock pin
(5)	ASO [3]	Digital I/O	TAMPC active shield 3 output
	RADIO [2]	Digital I/O	RADIO DFEGPIO
(6)	AIN4	Analog input	Analog input
	P1.12	Digital I/O	General-purpose I/O Clock pin
(7)	ASI [3]	Digital I/O	TAMPC active shield 3 input
	RADIO [3]	Digital I/O	RADIO DFEGPIO
(8)	AIN5	Analog input	Analog input
	P1.13	Digital I/O	General-purpose I/O
(9)	RADIO [4]	Digital I/O	RADIO DFEGPIO
	AIN6	Analog input	Analog input
(10)	P1.14	Digital I/O	General-purpose I/O
	RADIO [5]	Digital I/O	RADIO DFEGPIO
(11)	AIN7	Analog input	Analog input
	DECD	Power	0.9 V regulator supply decoupling
(12)	DCC	Power	DC/DC regulator output
(13)	GND	Ground	The pad must be connected to a solid ground plane
	VDD_NRF	Power	Power-supply pin
(14)	P1.00	Digital I/O	General-purpose I/O
	XL1	Analog input	Connection for 32.768khz crystal
(15)	P1.01	Digital I/O	General-purpose I/O
	XL2	Analog input	Connection for 32.768khz crystal

Pin No.	Name	Pin function	Description
(14)	GND	Ground	The pad must be connected to a solid ground plane
(15)	P1.02	Digital I/O	General-purpose I/O
	NFC1	NFC input	NFC antenna connection
(16)	P1.03	Digital I/O	General-purpose I/O Clock pin
	NFC2	NFC input	NFC antenna connection
(17)	P1.04	Digital I/O	General-purpose I/O Clock pin
	ASO [0]	Digital I/O	TAMPC active shield 0 output
	AIN0	Analog input	Analog input
(18)	P1.05	Digital I/O	General-purpose I/O
	ASI [0]	Digital I/O	TAMPC active shield 0 input
	RADIO [6]	Digital I/O	RADIO DFEGPIO
	AIN1	Analog input	Analog input
(19)	P1.06	Digital I/O	General-purpose I/O
	ASO [1]	Digital I/O	TAMPC active shield 1 output
	AIN2	Analog input	Analog input
(20)	P1.07	Digital I/O	General-purpose I/O
	ASI [1]	Digital I/O	TAMPC active shield 1 input
	AIN3	Analog input	Analog input
(21)	P1.08	Digital I/O	General-purpose I/O
			GRTC CLKOUTFAST
			Clock pin
	EXTREF	Analog input	External reference for SAADC
(22)	P2.00	Digital I/O	General-purpose I/O
			SPIM DCX
			UARTE RXD
			FLPR.4
			QSPI D3

Pin No.	Name	Pin function	Description
(23)	P2.01	Digital I/O	General-purpose I/O
			SPIM SCK
			SPIS SCK
			FLPR.0
			QSPI SCK
			Clock pin
(24)	P2.02	Digital I/O	General-purpose I/O
			SPIM SDO
			SPIS SDO
			UARTE TXD
			FLPR.1
			QSPI D0
(25)	P2.03	Digital I/O	Serial wire output (SWO)
			General-purpose I/O
			FLPR.3
(26)	GND	Ground	QSPI D2
			The pad must be connected to a solid ground plane
(27)	P2.04	Digital I/O	General-purpose I/O
			SPIM SDI
			SPIS SDI
			UARTE CTS
			FLPR.2
			QSPI D1
(28)	P2.05	Digital I/O	General-purpose I/O
			SPIM CS
			SPIS CS
			UARTE RTS
			FLPR.5
			QSPI CS

Pin No.	Name	Pin function	Description
(29)	P2.06	Digital I/O	General-purpose I/O
			FLPR.6
			SPIM SCK
			SPIS SCK
			Clock pin
	TRACECLK	Digital I/O	Trace clock
(30)	P2.07	Digital I/O	General-purpose I/O
			FLPR.7
			SPIM DCX
			UARTE RXD
	TRACEDATA [0]		Trace data
	SWO		Serial wire output (SWO)
(31)	P2.08	Digital I/O	General-purpose I/O
			FLPR.8
			SPIM SDO
			SPIS SDO
			UARTE TXD
	TRACEDATA [1]	Digital I/O	Trace data
(32)	P2.09	Digital I/O	General-purpose I/O
			FLPR.9
			SPIM SDI
			SPIS SDI
			UARTE CTS
	TRACEDATA [2]	Digital I/O	Trace data
(33)	P2.10	Digital I/O	General-purpose I/O
			FLPR.10
			SPIM CS
			SPIS CS
			UARTE RTS
	TRACEDATA [3]	Digital I/O	Trace data
(34)	P0.00	Digital I/O	General-purpose digital I/O
(35)	P0.01	Digital I/O	General-purpose digital I/O

Pin No.	Name	Pin function	Description
(36)	SWDIO	Debug	Serial wire data.
			Bidirectional with standard-drive and on-chip pull-down.
(37)	SWDCLK	Debug	Serial wire clock.
			Input with on-chip pull-up.
(38)	P0.03	Digital I/O	General-purpose I/O
			GRTC PWM
			Clock pin
(39)	RESET	Reset	Pin reset with on-chip pull-up (low active)
(40)	P0.04	Digital I/O	General-purpose I/O
			GRTC CLKOUT32K
			Clock pin
(41)	P0.02	Digital I/O	General-purpose digital I/O

3. Main chip solution

RF IC	Crystal Frequency
Nordic NRF54L15 / QFN	32MHz

32MHz crystal is already inside the module. The module does NOT include external capacitor for 32MHz crystal. Load capacitance use default value without change now.



4. Shipment packaging information

Model	Antenna	Photo
AN54LQ-15	Chip/Ceramic	
AN54LQ-P15	PCB/Printed	
AN54LQ-U15	U.FL/Connector	

- Unit weight of module:

AN54LQ-15 : 0.51 g (± 0.02 g) ; AN54LQ-P15 : 0.51 g (± 0.02 g) ; AN54LQ-U15 : 0.55 g (± 0.02 g) ;

- Packaging type: Anti-static Tray

Tray	
MPQ (Min. Package Q'ty)	88 pcs per tray
Carton Contents (per carton)	1,760 pcs
Carton Dimension (L) x (W) x (H) cm	37 x 21 x 13
Gross Weight	about 2.6 kgs

4.1. Marking on metal shield

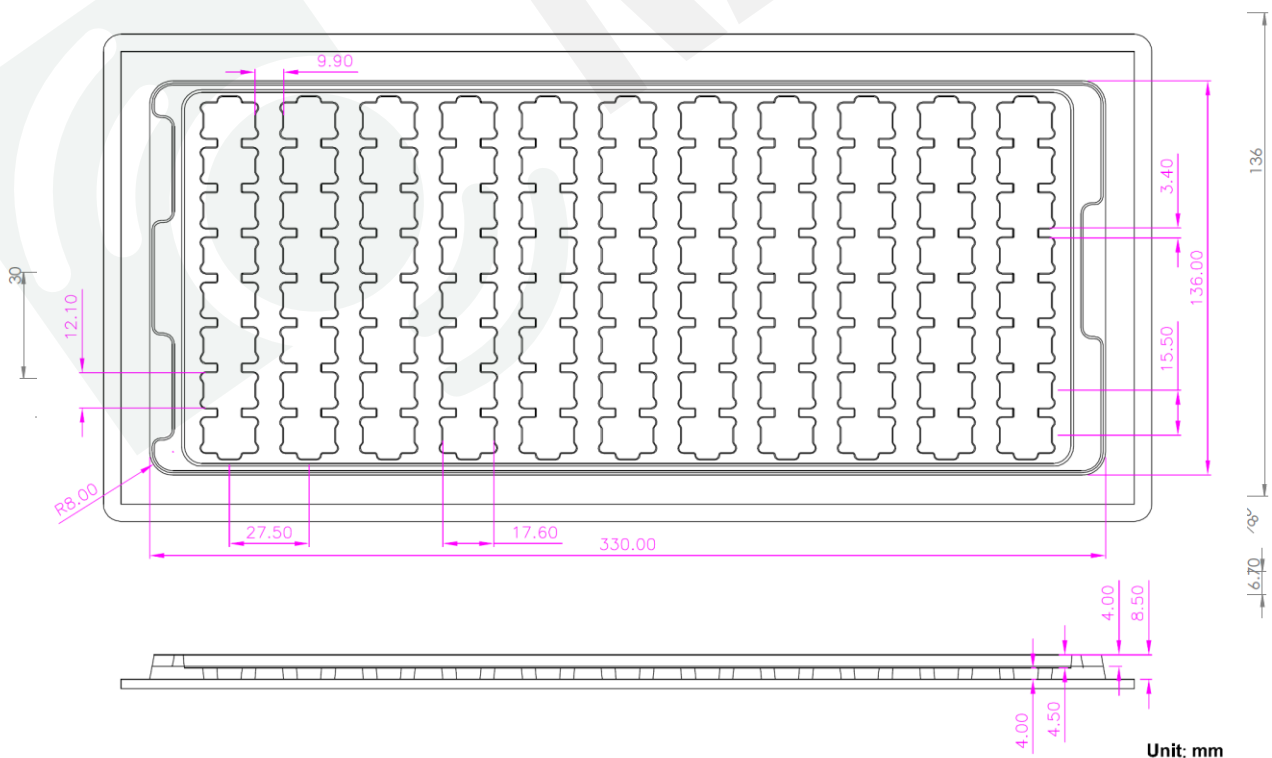
Label context on metal shield is as below:



4.2. Packaging Info

4.2.1. Tray Packaging

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



4.3. Order code

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

Model	Tray
AN54LQ-15	MD-240A8-001
AN54LQ-P15	MD-240A8-002
AN54LQ-U15	MD-240A8-003

Tray packaging MPQ: 88 pcs.

5. Specification

Any technical spec shall refer to Nordic's official documents as final reference. Contents below are from "[nRF54L15 Product Specification v0.10](#)", please click to download full spec.

5.1. Recommended operating conditions

Symbol	Parameter	Min.	Nom.	Max.	Units
VDD	VDD supply voltage	1.7		3.6	V
VDD _{EXT}	VDD supply voltage under extended operating temperature	1.7		3.4	V
VDD _{POR}	VDD supply voltage needed during power-on reset	1.75			V
TA	Operating temperature	-40	25	85	°C
TA _{EXT}	Extended operating temperature	85		105	°C
T _{RST}	Recommended storage temperature			40	°C
RH _{RST}	Recommended storage relative humidity			90	%

The operating conditions are the physical parameters that the device can operate within.

5.2. Radio specifications

5.2.1. General radio characteristics

Symbol	Description	Min.	Typ.	Max.	Units
f _{OP}	Operating frequencies	2400		2500	MHz
f _{PLL,CH,SP}	Channel spacing		1.0		MHz
f _{DELTA,1M}	Frequency deviation @ 1 Mbps		±160		kHz
f _{DELTA,BLE,1M}	Frequency deviation @ Bluetooth LE 1 Mbps		±250		kHz
f _{DELTA,2M}	Frequency deviation @ 2 Mbps		±320		kHz
f _{DELTA,BLE,2M}	Frequency deviation @ Bluetooth LE 2 Mbps		±500		kHz
f _{DELTA,4M}	Frequency deviation @ 4 Mbps		±1000		kHz
f _{skBPS}	On-the-air data rate	125		4000	kbps
f _{chip, IEEE 802.15.4}	Chip rate in IEEE 802.15.4 mode		2000		kchip/s

5.2.2. Radio current consumption (Transmitter)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{TX,MaxdBm,QFN}$	TX only run current for QFN package, P_{RF} at maximum power setting		9.1		mA
$I_{TX,MaxdBm,CSP}$	TX only run current for CSP package, P_{RF} at maximum power setting		9.7		mA
$I_{TX,0dBm}$	TX only run current, $P_{RF} = 0$ dBm		3.7		mA
$I_{TX,MINUS4dBm}$	TX only run current $P_{RF} = -4$ dBm		2.8		mA
$I_{TX,MINUS8dBm}$	TX only run current $P_{RF} = -8$ dBm		2.2		mA
$I_{TX,MINUS12dBm}$	TX only run current $P_{RF} = -12$ dBm		1.9		mA
$I_{TX,MINUS16dBm}$	TX only run current $P_{RF} = -16$ dBm		1.7		mA
$I_{TX,MINUS40dBm}$	TX only run current $P_{RF} = -40$ dBm		1.2		mA
$I_{START,TX}$	TX start-up current, $P_{RF} = 4$ dBm		..		mA

5.2.3. Radio current consumption (Receiver)

Symbol	Description	Min.	Typ.	Max.	Units
$I_{RX,1M}$	RX only run current, 1 Mbps/1 Mbps Bluetooth LE mode		2.1		mA
$I_{RX,2M}$	RX only run current, 2 Mbps/2 Mbps Bluetooth LE mode		2.1		mA
$I_{START,RX,1M}$	RX start-up current, 1 Mbps/1 Mbps Bluetooth LE mode		1.6		mA

5.2.4. Transmitter specification

Symbol	Description	Min.	Typ.	Max.	Units
P _{RF,QFN}	Maximum output power for QFN package		7		dBm
P _{RF,CSP}	Maximum output power for CSP package		8		dBm
P _{RFCR}	RF power accuracy	-2		2	dB
P _{RF1,BLE1M,2MHZ}	Adjacent Channel Transmit Power 2 MHz (1 Mbps Bluetooth LE mode)		-48		dBc
P _{RF1,BLE1M,3MHZ}	Adjacent Channel Transmit Power 3 MHz (1 Mbps Bluetooth LE mode)		-54		dBc
P _{RF1,BLE2M,4MHZ}	Adjacent Channel Transmit Power 4 MHz (2 Mbps Bluetooth LE mode)		-51		dBc
P _{RF1,BLE2M,6MHZ}	Adjacent Channel Transmit Power 6 MHz (2 Mbps Bluetooth LE mode)		-56		dBc
E _{vm}	Error vector magnitude in IEEE 802.15.4 mode		2		%rms
P _{harm2nd, IEEE 802.15.4}	2nd harmonics in IEEE 802.15.4 mode		-63		dBm
P _{harm3rd, IEEE 802.15.4}	3rd harmonics in IEEE 802.15.4 mode		-68		dBm

5.2.5. 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 ⁴		-93		dBm
P _{SENS,IT,2M}	Sensitivity, 2 Mbps nRF mode ideal transmitter ⁴		-90		dBm
P _{SENS,IT,4M}	Sensitivity, 4 Mbps nRF mode ideal transmitter ⁴		-90		dBm
P _{SENS,IT,SP,1M,BLE}	Sensitivity, 1 Mbps Bluetooth LE ideal transmitter, packet length ≤ 37 bytes BER = 1E-3 ⁵		-96 ⁶		dBm
P _{SENS,IT,LP,1M,BLE}	Sensitivity, 1 Mbps Bluetooth LE ideal transmitter, packet length ≥ 128 bytes BER = 1E-4		-95		dBm
P _{SENS,IT,SP,2M,BLE}	Sensitivity, 2 Mbps Bluetooth LE ideal transmitter, packet length ≤ 37 bytes		-94		dBm
P _{SENS,IT,BLE LE125k}	Sensitivity, 125 kbps Bluetooth LE mode		-104		dBm
P _{SENS,IT,BLE LE500k}	Sensitivity, 500 kbps Bluetooth LE mode		-99		dBm
P _{SENS,IEEE 802.15.4}	Sensitivity in IEEE 802.15.4 mode		-102		dBm

⁴ Typical sensitivity applies when RXADDRESS.ADDR0 is used for receiver address. When RXADDRESS.ADDR[1...7] are used for receiver address, the typical sensitivity for this mode is degraded by 3 dB.

⁵ As defined in the *Bluetooth Core Specification v4.0 Volume 6: Core System Package (Low Energy Controller Volume)*.

⁶ QFN package sensitivity is degraded by approximately 1 dB compared to the provided value

5.2.6. RX selectivity

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{1M,co-channel}$	1Mbps mode, co-channel interference		9		dB
$C/I_{1M,-1MHz}$	1 Mbps mode, Adjacent (-1 MHz) interference		-4		dB
$C/I_{1M,+1MHz}$	1 Mbps mode, Adjacent (+1 MHz) interference		-9		dB
$C/I_{1M,-2MHz}$	1 Mbps mode, Adjacent (-2 MHz) interference		-28		dB
$C/I_{1M,+2MHz}$	1 Mbps mode, Adjacent (+2 MHz) interference		-40		dB
$C/I_{1M,-3MHz}$	1 Mbps mode, Adjacent (-3 MHz) interference		-39		dB
$C/I_{1M,+3MHz}$	1 Mbps mode, Adjacent (+3 MHz) interference		-43		dB
$C/I_{1M,\pm 6MHz}$	1 Mbps mode, Adjacent (≥ 6 MHz) interference		-48		dB
$C/I_{1MBLE,co-channel}$	1 Mbps Bluetooth LE mode, co-channel interference		6		dB
$C/I_{1MBLE,-1MHz}$	1 Mbps Bluetooth LE mode, Adjacent (-1 MHz) interference		-2		dB
$C/I_{1MBLE,+1MHz}$	1 Mbps Bluetooth LE mode, Adjacent (+1 MHz) interference		-6		dB
$C/I_{1MBLE,-2MHz}$	1 Mbps Bluetooth LE mode, Adjacent (-2 MHz) interference		-29		dB
$C/I_{1MBLE,+2MHz}$	1 Mbps Bluetooth LE mode, Adjacent (+2 MHz) interference		-43		dB
$C/I_{1MBLE,>3MHz}$	1 Mbps Bluetooth LE mode, Adjacent (≥ 3 MHz) interference		-46		dB
$C/I_{1MBLE,image}$	Image frequency interference		-29		dB
$C/I_{1MBLE,image,1MHz}$	Adjacent (1 MHz) interference to in-band image frequency		-39		dB
$C/I_{2M,co-channel}$	2 Mbps mode, co-channel interference		10		dB
$C/I_{2M,-2MHz}$	2 Mbps mode, Adjacent (-2 MHz) interference		-5		dB
$C/I_{2M,+2MHz}$	2 Mbps mode, Adjacent (+2 MHz) interference		-9		dB
$C/I_{2M,-4MHz}$	2 Mbps mode, Adjacent (-4 MHz) interference		-27		dB
$C/I_{2M,+4MHz}$	2 Mbps mode, Adjacent (+4 MHz) interference		-42		dB
$C/I_{2M,-6MHz}$	2 Mbps mode, Adjacent (-6 MHz) interference		-38		dB
$C/I_{2M,+6MHz}$	2 Mbps mode, Adjacent (+6 MHz) interference		-45		dB
$C/I_{2M,\geq 12MHz}$	2 Mbps mode, Adjacent (≥ 12 MHz) interference		-50		dB
$C/I_{2MBLE,co-channel}$	2 Mbps Bluetooth LE mode, co-channel interference		6		dB
$C/I_{2MBLE,-2MHz}$	2 Mbps Bluetooth LE mode, Adjacent (-2 MHz) interference		-2		dB
$C/I_{2MBLE,+2MHz}$	2 Mbps Bluetooth LE mode, Adjacent (+2 MHz) interference		-6		dB
$C/I_{2MBLE,-4MHz}$	2 Mbps Bluetooth LE mode, Adjacent (-4 MHz) interference		-29		dB
$C/I_{2MBLE,+4MHz}$	2 Mbps Bluetooth LE mode, Adjacent (+4 MHz) interference		-44		dB
$C/I_{2MBLE,\geq 6MHz}$	2 Mbps Bluetooth LE mode, Adjacent (≥ 6 MHz) interference		-46		dB

RX selectivity with equal modulation on interfering signal⁷

⁷ Desired signal level at $P_{IN} = -67$ dBm. One interferer is used, having equal modulation as the desired signal. The input power of the interferer where the sensitivity equals BER = 0.1% is presented.

Symbol	Description	Min.	Typ.	Max.	Units
$C/I_{4M,co-channel}$	4 Mbps mode, co-channel interference		6		dB
$C/I_{4M,-4MHz}$	4 Mbps mode, Adjacent (-4 MHz) interference		-4		dB
$C/I_{4M,+4MHz}$	4 Mbps mode, Adjacent (+4 MHz) interference		-11		dB
$C/I_{4M,-8MHz}$	4 Mbps mode, Adjacent (-8 MHz) interference		-27		dB
$C/I_{4M,+8MHz}$	4 Mbps mode, Adjacent (+8 MHz) interference		-46		dB
$C/I_{4M,-12MHz}$	4 Mbps mode, Adjacent (-12 MHz) interference		-40		dB
$C/I_{4M,+12MHz}$	4 Mbps mode, Adjacent (+12 MHz) interference		-50		dB
$C/I_{4M,\geq 24MHz}$	4 Mbps mode, Adjacent (≥ 24 MHz) interference		-56		dB
$C/I_{2MBLE,image}$	Image frequency interference		-29		dB
$C/I_{2MBLE,image, 2MHz}$	Adjacent (2 MHz) interference to in-band image frequency		-38		dB
$C/I_{125k BLE LR,co-channel}$	125 kbps Bluetooth LE LR mode, co-channel interference		1		dB
$C/I_{125k BLE LR,-1MHz}$	125 kbps Bluetooth LE LR mode, Adjacent (-1 MHz) interference		-13		dB
$C/I_{125k BLE LR,+1MHz}$	125 kbps Bluetooth LE LR mode, Adjacent (+1 MHz) interference		-16		dB
$C/I_{125k BLE LR,-2MHz}$	125 kbps Bluetooth LE LR mode, Adjacent (-2 MHz) interference		-36		dB
$C/I_{125k BLE LR,+2MHz}$	125 kbps Bluetooth LE LR mode, Adjacent (+2 MHz) interference		-52		dB
$C/I_{125k BLE LR,>3MHz}$	125 kbps Bluetooth LE LR mode, Adjacent (≥ 3 MHz) interference		-55		dB
$C/I_{125k BLE LR,image}$	Image frequency interference		-36		dB
$C/I_{IEEE 802.15.4,-5MHz}$	IEEE 802.15.4 mode, Adjacent (-5 MHz) rejection		-35		dB
$C/I_{IEEE 802.15.4,+5MHz}$	IEEE 802.15.4 mode, Adjacent (+5 MHz) rejection		-38		dB
$C/I_{IEEE 802.15.4,\pm 10MHz}$	IEEE 802.15.4 mode, Alternate (± 10 MHz) rejection		-50		dB

5.2.7. RX intermodulation

Symbol	Description	Min.	Typ.	Max.	Units
$P_{IMD,5TH,1M}$	IMD performance, 1 Mbps, 5th offset channel, packet length ≤ 37 bytes				dBm
$P_{IMD,5TH,1M,BLE}$	IMD performance, Bluetooth LE 1 Mbps, 5th offset channel, packet length ≤ 37 bytes		-19		dBm
$P_{IMD,5TH,2M}$	IMD performance, 2 Mbps, 5th offset channel, packet length ≤ 37 bytes				dBm
$P_{IMD,5TH,2M,BLE}$	IMD performance, Bluetooth LE 2 Mbps, 5th offset channel, packet length ≤ 37 bytes		-16		dBm

RX intermodulation. Desired signal level at $P_{IN} = -64$ dBm. Two interferers with equal input power are used. The interferer closest in frequency is not modulated, the other interferer is modulated equal with the desired signal. The input power of the interferers where the sensitivity equals $BER = 1E-3$ is presented.

5.2.8. 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 Bluetooth LE and 150 μ s TIFS)		140		μ s
$t_{TXEN,FAST,BLE,1M}$	Time between TXEN task and READY event after channel FREQUENCY configured (1 Mbps Bluetooth LE with fast ramp-up and 150 μ s TIFS)		40		μ s
$t_{TXDIS,BLE,1M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	2			μ s
$t_{RXEN,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps Bluetooth LE)		134		μ s
$t_{RXEN,FAST,BLE,1M}$	Time between the RXEN task and READY event after channel FREQUENCY configured (1 Mbps Bluetooth LE with fast ramp-up)		40		μ s
$t_{RXDIS,BLE,1M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_1Mbit and MODE = Ble_1Mbit	1			μ s
$t_{TXDIS,BLE,2M}$	When in TX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	2			μ s
$t_{RXDIS,BLE,2M}$	When in RX, delay between DISABLE task and DISABLED event for MODE = Nrf_2Mbit and MODE = Ble_2Mbit	1			μ s
$t_{TXEN,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 mode)		130		μ s
$t_{TXEN,FAST,IEEE\ 802.15.4}$	Time between TXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 mode with fast ramp-up)		40		μ s
$t_{TXDIS,IEEE\ 802.15.4}$	When in TX, delay between DISABLE task and DISABLED event (IEEE 802.15.4 mode)		18		μ s
$t_{RXEN,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 mode)		130		μ s
$t_{RXEN,FAST,IEEE\ 802.15.4}$	Time between the RXEN task and READY event after channel FREQUENCY configured (IEEE 802.15.4 mode with fast ramp-up)		40		μ s
$t_{RXDIS,IEEE\ 802.15.4}$	When in RX, delay between DISABLE task and DISABLED event (IEEE 802.15.4 mode)		0.2		μ s
$t_{RX\text{-}to\text{-}TX\text{ turnaround, IEEE 802.15.4}}$	Maximum RX-to-TX turnaround time in IEEE 802.15.4 mode		17		μ s

5.2.9. RSSI specifications

Symbol	Description	Min.	Typ.	Max.	Units
$RSSI_{ACC}$	RSSI accuracy in the range -90 to -30 dBm		± 2		dB
$RSSI_{RESOLUTION}$	RSSI resolution		1		dB
$RSSI_{PERIOD}$	RSSI sampling time from RSSISTART task		0.25		μ s
$RSSI_{SETTLE}$	RSSI settling time after signal level change	15		20	μ s

5.3. Absolute maximum ratings

	Parameter	Min.	Max.	Unit
Supply voltage				
VDD	VDD supply voltage	-0.3	3.9	V
VDD _{EXT}	VDD supply voltage under extended operating temperature	-0.3	3.7	V
I/O pin voltage				
V _{I/O} , VDD ≤ 3.6 V	IO voltage	-0.3	VDD + 0.3	V
V _{I/O} , VDD > 3.6 V	IO voltage	-0.3	3.9	V
V _{I/O,EXT} , VDD _{EXT} ≤ 3.4 V	IO voltage under extended operating temperature	-0.3	VDD + 0.3	V
V _{I/O,EXT} , VDD _{EXT} > 3.4 V	IO voltage under extended operating temperature	-0.3	3.7	V
Radio				
RF input level			10	dBm
RRAM memory				
Endurance		10,000		Write/ rewrite cycles
Retention at 85°C		10		y
Retention at 105°C		2		y

	Note	Min.	Max.	Unit
Environmental QFN package types				
Storage temperature		-40	+125	°C
Reflow soldering temperature	Reflow cycle time is 30 seconds with 3 maximum reflow cycles.		260	°C
Moisture Sensitivity Level (MSL)			2	
ESD Human Body Model (HBM)			1	kV
ESD Charged Device Model (CDM)			500	V
Environmental CSP package types				
Storage temperature	Recommended storage condition is < 40°C and < 90% RH (relative humidity)	-40	+125	°C
Reflow soldering temperature	Reflow cycle time is 30 seconds with 3 maximum reflow cycles.		260	°C
Moisture Sensitivity Level (MSL)			1	
ESD Human Body Model (HBM)			3	kV
ESD Charged Device Model (CDM)			250	V

6. Reference circuit

Module is pre-programmed with Raytac's testing code. Default is using "DC-DC mode". The Nordic NCS firmware is set to use external 32.768KHz so please add it to make module work.

REMARK:

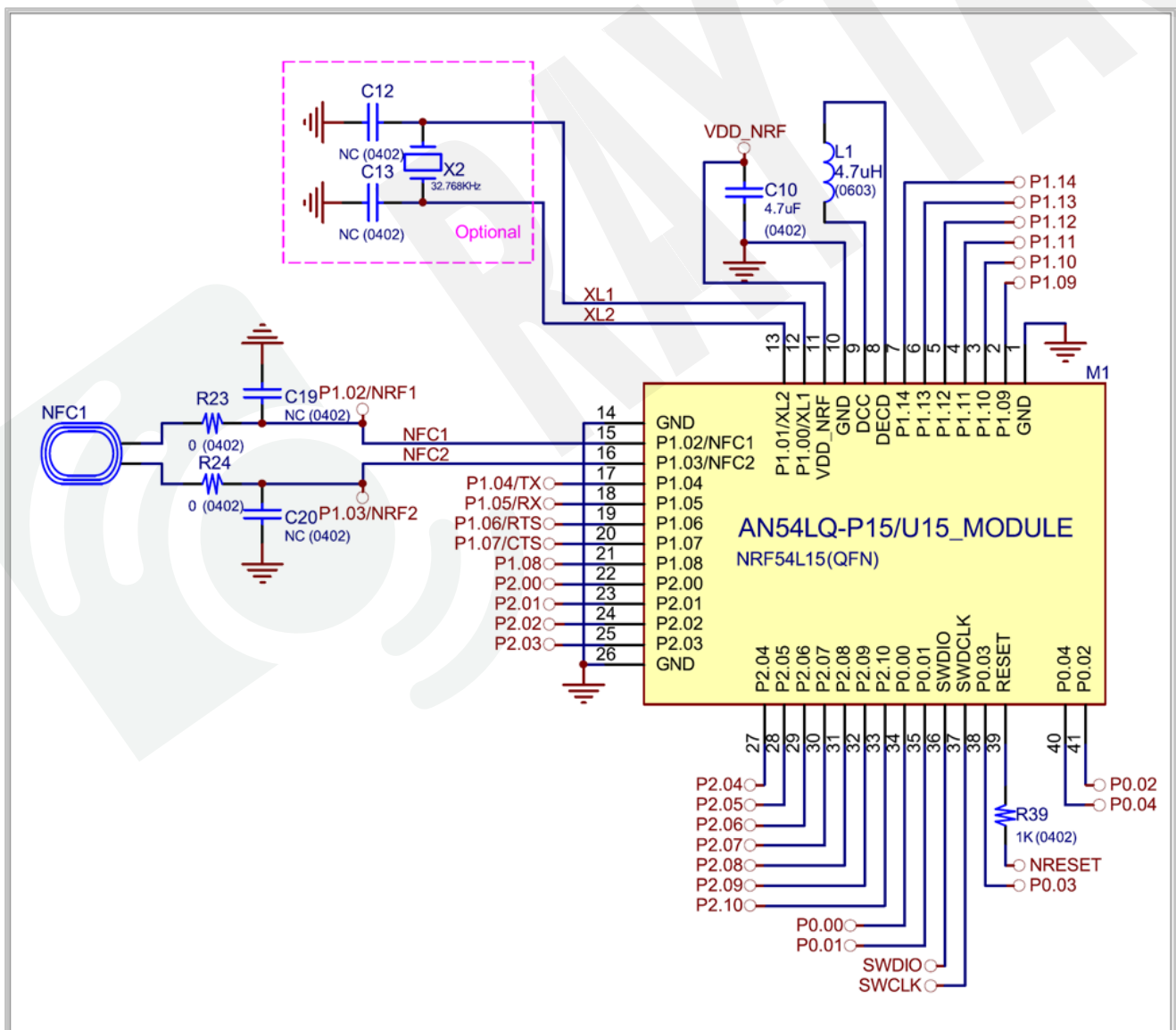
**** DECD decoupling capacitor (2.2μF) is already inside the module. ****

**** When enabling the DC/DC regulator, the device checks if an inductor (L1) is connected to the DCC pin. If L1 is not detected, the device remains in LDO mode. ****

**** When *NOT* using NFC, please remove NFC1 / C19 / C20. ****

**** When using internal 32.768KHz RC oscillator, please remove X2 / C12 / C13. ****

**** R39: Place close to the module. ****



7. Certification

7.1. Declaration ID for Bluetooth

BT 6.0

BT 5.4

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

BT 5.1

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

BT 5.2

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

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

7.2. FCC Certificate (USA)

2.4G





TCB

GRANT OF EQUIPMENT
AUTHORIZATION

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

Kiwa Nederland B.V.
Wilmsdorf 50
Apeldoorn, NL-7300 AC
Netherlands

Date of Grant: 07/30/2025

Application
Dated: 07/23/2025

TCB

Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist.,
New Taipei City,, 235
Taiwan

Attention: Lyon Liu , President

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:
Name of Grantee:
Equipment Class:
Notes:
Modular Type:

SH6AN54LQ
Raytac Corp.
Digital Transmission System
Bluetooth Low Energy Module
Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Emission Tolerance Designator
	15C	2402.0 - 2480.0	0.006	

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 be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users may not be provided with the module installation instructions. OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

Certificate No.:
252181162/AA/00

Ron Scheepers
Managing director



32

1Mbps & 2Mbps

SGS

Report No.: TERF2502000650E2

Page: 1 of 111

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



EUT Description Bluetooth Low Energy Module
Applicant: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan
Manufacturer: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan
Brand Name: Raytac
Model No./ISED HVIN: AN54LQ
**Family Model No.
/ Family ISED HVIN:** AN54LQ-P, AN54LQ-U
Model Difference: Dimensions, Antenna type
ISED PMN: AN54LQ, AN54LQ-P, AN54LQ-U
Report Number: TERF2502000650E2
FCC ID SH6AN54LQ
IC: 8017A-AN54LQ
Date of EUT Received: February 5, 2025
Date of Test: February 13, 2025~July 1, 2025
Issue Date: July 18, 2025

Approved By

Vito Pei

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT comply with FCC rule part §15.247, ISED RSS-247.

The results of this report relate only to the sample identified in this report.

SAR report

SGS

Report No.: TESA2502000154ES

Page: 1 of 9

RF EXPOSURE REPORT



Applicant: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan

Manufacturer: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan

Product Name: Bluetooth Low Energy Module

Brand Name: Raytac

Model No.: AN54LQ

Family Model No.: AN54LQ-P, AN54LQ-U

Model Difference: Dimensions, Antenna type

FCC ID SH6AN54LQ

IC: 8017A-AN54LQ

Date of EUT Received: Feb. 05, 2025

Issue Date: Jul. 21, 2025

Approved By

John Yeh
John Yeh

We hereby certify that:

The above equipment was evaluated by SGS Taiwan Ltd. The evaluation in this report is in compliance with FCC Rule Part §2.1091, KDB 447498 D01 v06 and RSS-102 issue 6.

The results of this report relate only to the sample identified in this report.



SGS Reference No. : VTMHY2502000327YEA/2025
Page: 1 of 1

VERIFICATION OF COMPLIANCE

Issue Date: Jul. 11, 2025
Applicant: Raytac Corp.
Address: 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Manufacturer: Raytac Corp.
Address: 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Product: Bluetooth Low Energy Module
Brand Name/Trade Mark: Raytac
Model/Type: AN54LQ
Added Model(s): AN54LQ-P, AN54LQ-U
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.: TMHY2502000327YE, dated on Jul. 11, 2025

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:

SGS Taiwan Ltd.
Eddy Cheng
Asst. Supervisor

7.3. TELEC Certificate (Japan)

1 Mbps & 2 Mbps





**Certificate of
Radio Equipment in JAPAN**
201-250520 / 00

Issued 25 July 2025

Page 1 of 5
This certificate has THREE Annexes

Kiwa Nederland B.V., operating as Japan Conformity Assessment Body (CAB ID Number: 201), according procedure RD_740, declares that the listed product complies with the Technical Regulations Conformity Certification of Specified Radio equipment (ordinance of MPT N° 37,1981)

Product description:	Bluetooth Low Energy Module
Trademark:	Raytac
Type designation:	AN54LQ
Hardware / Software:	1 / 1
Variants:	See Annex 3
Manufacturer:	Raytac Corp.
Address:	8F., No. 788-1, Zhongzheng Rd., Zhonghe Dist.,
City:	235 New Taipei City
Country:	Taiwan

This certificate is granted to:

Name:	Raytac Corp.
Address:	8F., No. 788-1, Zhongzheng Rd., Zhonghe Dist.,
City:	235 New Taipei City
Country:	Taiwan



Ron Scheepers
Managing director

Kiwa Nederland B.V.
Wilmersdorf 50
Postbus 137
7300 AC Apeldoorn
The Netherlands

[https://www.kiwa.com/nl/en/markets/
radio-wireless-and-electrical-
equipment/](https://www.kiwa.com/nl/en/markets/radio-wireless-and-electrical-equipment/)

Chamber of commerce
08090048



7.4. NCC Certificate (Taiwan)

1 Mbps & 2 Mbps

AN54LQ



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：藍牙模組
- 五、廠牌：Raytac
- 六、型號：AN54LQ
- 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：114年07月28日

- 十、審驗合格標籤式樣：



- 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。

AN54LQ-P



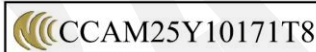
台灣檢驗科技股份有限公司 電信管制射頻器材型式認證證明



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：藍牙模組
- 五、廠牌：Raytac
- 六、型號：AN54LQ-P
- 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：114年07月28日

- 十、審驗合格標籤式樣：



- 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。

AN54LQ-U



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：藍牙模組
- 五、廠牌：Raytac
- 六、型號：AN54LQ-U
- 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：114年07月28日

- 十、審驗合格標籤式樣：



- 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。

7.5. CE (EU) & RCM (Australia & New Zealand) test report

1 Mbps & 2 Mbps

	Report No.: TERF2502000649E2 Page: 1 of 62
AS/NZS 4268:2017 Amd 1:2021 ETSI EN 300 328 V2.2.2: 2019 TEST REPORT	  Testing Laboratory 3702
Applicant:	Raytac Corp. 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Manufacturer:	Raytac Corp. 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Product Name:	Bluetooth Low Energy Module
Brand Name:	Raytac
Model No.:	AN54LQ
Family Model No.:	AN54LQ-P, AN54LQ-U
Model Difference:	Dimensions, Antenna type
Report Number:	TERF2502000649E2
Date of EUT Received:	February 5, 2025
Date of Test:	February 13, 2025~July 2, 2025
Issue Date:	July 21, 2025
Approved By 	<u>Vito Pei</u>
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 Amd 1:2021, 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.	



Report No.: TESA2502000153ES

Page: 1 of 16

RF EXPOSURE REPORT



Applicant: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan

Manufacturer: Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei
City, 235, Taiwan

Product Name: Bluetooth Low Energy Module

Brand Name: Raytac

Model No.: AN54LQ

Family Model No.: AN54LQ-P, AN54LQ-U

Model Difference: Dimensions, Antenna type

Date of EUT Received: Feb. 05, 2025

Issue Date: Jul. 21, 2025

Approved By

John Teh

John Yeh

We hereby certify that:

The above equipment was evaluated by SGS Taiwan Ltd. for compliance with the requirements set forth in the European Standard EN 62479:2010, EN 50663: 2017 and Australia/New Zealand Standard AS/NZS 2772.2:2016.

The results in this report apply to this specific product system.



SGS Reference No. : VTMHY2502000325YEA/2025

Page: 1 of 1

VERIFICATION OF COMPLIANCE

Issue Date: Jul. 11, 2025
Applicant: Raytac Corp.
Address: 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Manufacturer: Raytac Corp.
Address: 8F, No.788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City, 235, Taiwan
Product: Bluetooth Low Energy Module
Brand Name/Trade Mark: Raytac
Model/Type: AN54LQ
Added Model(s): AN54LQ-P, AN54LQ-U
Applicable Standards: EN 301 489 –1 v2.2.3 : 2019-11
EN 301 489 –17 v3.3.1 : 2024-09
EN 55032 : 2015+A11:2020
EN IEC 61000-3-2 : 2019+A1:2021
EN 61000-3-3 : 2013+A1:2019+A2:2021+AC:2022-01
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.: TMHY2502000325YE, dated on Jul. 11, 2025

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:

SGS Taiwan Ltd.
Eddy Cheng
Asst. Supervisor

7.6. IC Certificate (Canada)

1 Mbps & 2 Mbps

CB

TECHNICAL ACCEPTANCE CERTIFICATE
CERTIFICAT D'APPROBATION TECHNIQUE

► Reg. No. NL0001

CERTIFICATION No
No. DE CERTIFICATION

8017A-AN54LQ

Issued 30 July 2025

Page 1 of 2
This certificate has ONE Annex

KIWA No.
No. DE KIWA

252170402/AA/00

TEST SITE No.
No. DE LABORATOIRE

4620E

ISSUED TO
DÉLIVRÉ A

Raytac Corp.
8F, No.788-1, Zhongzheng Rd., Zhonghe Dist. New
Taipei City 235 Taiwan

TYPE OF EQUIPMENT
GENRE DE MATÉRIEL

Bluetooth device

TRADE NAME
MARQUE

Raytac

MODEL (HVIN)
MODELE (HVIN)

AN54LQ, AN54LQ-P, AN54LQ-U

FVIN

1

PMN

AN54LQ, AN54LQ-P, AN54LQ-U

CERTIFIED TO
CERTIFIÉ SELON LE

SPECIFICATION
CAHIER DES CHARGES

RSS-102
RSS-247

ISSUE
EDITION

6
3

ISSUED BY KIWA NEDERLAND B.V. (NL0001), RECOGNIZED CERTIFICATION BODY BY INNOVATION, SCIENCE AND ECONOMIC DEVELOPMENT CANADA, ACCORDING TO THE CANADIAN CERTIFICATION BODY SCHEME (REC-CB).
DÉLIVRÉ PAR KIWA NEDERLAND B.V. (NL0001), ORGANISME DE CERTIFICATION RECONNU PAR INNOVATION, SCIENCES ET DÉVELOPPEMENT ÉCONOMIQUE CANADA, SELON LE SYSTÈME D'ORGANISME DE CERTIFICATION DE CANADA (REC-CB).

I hereby attest that the subject equipment was tested and found to be in compliance with the noted specification.

J'atteste, par la présente, que le matériel a fait l'objet d'essai et a été jugé conforme à la spécification indiquée.

Kiwa Nederland B.V.
Wilmsdorp 50
Postbus 137
7300 AC Apeldoorn
The Netherlands

[https://www.kiwa.com/nl/en/markets/
radio-wireless-and-electrical-
equipment/](https://www.kiwa.com/nl/en/markets/radio-wireless-and-electrical-equipment/)

Chamber of commerce
08090048

David Chen

David Chen
Reviewer

George

George Chen
Decision maker

7.7. KC Certificate (South Korea)

1 Mbps & 2 Mbps

038F-75EF-DD68-7C60

방송통신기자재등의 적합등록 필증 <i>Registration of Broadcasting and Communication Equipments</i>	
상호 또는 성명 Trade Name or Registrant	Raytac Corporation
기자재명칭(제품명칭) Equipment Name	Bluetooth Low Energy Module
기기부호/추가 기기부호 Equipment code /Additional Equipment code	LARN8
기본모델명 Basic Model Number	AN54LQ-U
파생모델명 Series Model Number	
등록번호 Registration No.	R-R-ryt-AN54LQ
제조사/제조국가 Manufacturer/Country of Origin	Raytac Corporation/대만
등록연월일 Date of Registration	2025-07-28
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. 2025년(Year) 07월(Month) 28일(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.	

7.8. UKCA and EU Declarations of Conformity

The product is in conformity with relevant UK Statutory Instruments that adopt European Union harmonized standards, specifically:

- ***Radio Equipment Directive: 2014/53/EU***
- ***RoHS Directive: 2011/65/EU Annex II and its amendment Directive (EU) 2015/863***

Conformity is demonstrated with reference to the following harmonized standards, based on test reports issued by SGS Taiwan Ltd.:

- ***EN 301 489-1 V2.2.3 : 2019-11***
- ***EN 301 489-17 V3.3.1 : 2024-09***
- ***EN 55032 : 2015+A11:2020***
- ***EN IEC 61000-3-2 : 2019+A1:2021***
- ***EN 61000-3-3 : 2013+A1:2019+A2:2021+AC:2022-01***
- ***EN 61000-4-2 : 2009***
- ***EN IEC 61000-4-3 : 2020***
- ***EN 61000-4-4 : 2012***
- ***EN 61000-4-6 : 2014+AC:2015***

RoHS compliance reports were issued by **TÜV Rheinland Hong Kong Ltd.**, covering Directive 2011/65/EU and its amendment Directive (EU) 2015/863.

7.9. RoHS & REACH report

Please visit "[Support](#)" page of our website to download.

7.10. 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 regulation for final reference.

7.10.1. FCC (USA)

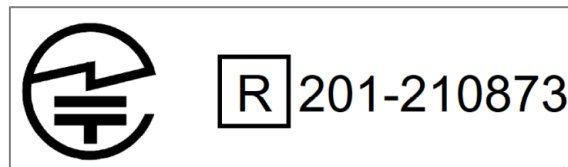
The FCC statement should be included in the user manual when there is no enough space on label. Otherwise, it should be included on the label.

"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: SH6AN54LQ**”.

7.10.2. TELEC (Japan)

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



7.10.3. NCC (Taiwan)

根據 NCC LP0002 低功率射頻器材技術規範_章節 3.8.2：

- 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模組之頻率、加大功率或更改原設計之特性與功能。
- 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。
- 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。

前述合法通信，係指依《電信管理法》規定作業之無線電通信。

此模組於取得認證後，將依規定於模組本體標示審驗合格標籤，並要求平台廠商於平台上標示。

請依下列標籤式樣自製標籤，標貼或印鑄於器材本體明顯處，始得販賣或公開陳列。

Series	標籤樣式
AN54LQ Series	
AN54LQ- P Series	
AN54LQ- U Series	

以 AN54LQ-15 為例，平台廠商必須於平台上標示字樣「本產品內含射頻模組：ID 編號 CCAM25Y10170T6」。

「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。

7.10.4. 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-AN54LQ**”.

7.11. Compliance and Certification

7.11.1. List of Applicable FCC Rules

This module has been tested and found to comply with the following requirements for Modular Approval.

- 47 CFR Part 15 Subpart C Intentional Radiators.

7.11.2. RF Exposure Considerations

This module has been evaluated for portable RF exposure conditions and is compliant with FCC RF exposure requirements when used in portable configurations. The module is approved for use without a minimum separation distance from the user's body.

Host product manufacturers integrating this module must ensure that their final host product maintains the portable use conditions as tested and documented in the RF exposure compliance reports referenced in the RF exposure exhibit.

Configuration with multiple transmitters in the same host, routine evaluation or SAR testing for the simultaneous transmission of the co-located transmitters according to KDB 447498 is required. The portable host product shall be evaluated for ensuring to continue compliance FCC rule part 2.1093 & part 1.1310 by C2PC. The additional guidance for the portable host products is provided in KDB Publication 996369 D02 and D04.

For the host product is not installed according to this guide, the module certification will be invalid, and a new grant certification will be required for the host product.

End-user documentation shall include the RF exposure information provided below.

RF Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The device has been evaluated for portable operation without separation distance from the user and meets the FCC RF exposure requirements for such use.

7.11.3. Antennas

This radio transmitter has been approved by Federal Communications Commission and Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Cet émetteur radio a été approuvé par la Commission fédérale des communications et Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antennes énumérés ci-dessous, avec le gain maximal autorisé indiqué. Les types d'antennes non mentionnés dans cette liste dont le gain est supérieur au gain maximal indiqué pour l'un des types énumérés sont strictement interdits avec cet appareil.

On board antenna

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Monopole	Raytac	AN54LQ	2400~2500	1.42
PIFA	Raytac	AN54LQ-P	2400~2500	0.06

External antenna

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)
Dipole	Aristotle	RFA-02-5-F17H170100B	2400~2500	5
Dipole	YAGEO	ANTX100P111B24003	2400~2500	3.3
Dipole	YAGEO	ANTX100P011B24003	2400~2500	2.2
Dipole	Pulse	ANTX100ETHAB24553	2400~2500	2

7.11.4. Information on Test Modes and Additional Testing Requirements

The module can be configured to continuously transmit on a specific frequency with a fixed modulation pattern. This allows evaluation of radiated emissions and spurious emissions in a controlled condition.

These test modes are intended for compliance testing only and must not be enabled during normal operation of the final product.

For more detailed information, please contact the grantee for assistance with test modes needed for module/host compliance test requirements.

7.11.5. Additional Testing, Part 15 Subpart B Disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

7.11.6. Note EMI Considerations

Note that a host manufacture is recommended to use KDB996369 D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

For standalone mode, reference the guidance in KDB996369 D04 Module Integration Guide and for simultaneous mode; see KDB996369 D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

7.11.7. How to Make Changes

Only Grantees are permitted to make permissive changes, if the module will be used differently than granted conditions, please contact us to ensure modifications will not affect compliance.

8. Notes and Cautions

To ensure proper integration and long-term reliability of this RF module, the following regulatory and technical considerations must be observed:

The OEM integrator must not provide instructions to the end user regarding how to install or remove this RF module in the user manual of the final product that integrates this module.

The end user manual shall include all required regulatory information and warnings as shown in the official user manual.

This module is not designed for lifetime use. Like general electronic products, it may degrade after continuous usage over the years. To ensure optimal performance and longevity, please observe the following precautions:

- Follow the guidelines of this document while designing circuit/end-product. Any discrepancy of core Bluetooth technology and technical specification of IC should refer to definition of Bluetooth Organization and Nordic Semiconductor as final reference.
- Do not supply voltage that is not within range of specification.
- Eliminate static electricity at any cost when working with the module as it may cause damage. It is highly recommended adding anti-ESD components to circuit design to prevent damage from real-life ESD events. Anti-ESD methods can be also applied in mechanical design.
- Do not expose modules under direct sunlight for long duration. Modules should be kept away from humid and salty air conditions, and any corrosive gasses or substances. Store it within -40°C to +125°C before and after installation.
- Avoid any physical shock, intense stress to the module or its surface.
- Do not wash the module. No-Clean Paste is used in production. Washing it will oxidize the metal shield and have chemistry reaction with No-Clean Paste. Functions of the module are not guaranteed if it has been washed.

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

9. Useful links

- **Nordic Infocenter:** <https://docs.nordicsemi.com/>
All the necessary technical files and software development kits of Nordic's chip are on this website.
- **Nordic DevZone:** <https://devzone.nordicsemi.com/questions/>
A highly recommended website for firmware developer. Interact with other developers and Nordic's employees will help with your questions. The site also includes tutorials in detail to help you get started.
- **Official page of nRF54L15 :** <https://www.nordicsemi.com/Products/nRF54L15>
A brief introduction to nRF54L15 and download links for Nordic's developing software and SoftDevices.



Full list of Raytac's Wi-Fi modules

● AN7002Q series (QFN package IC)

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

Full list of Raytac's Bluetooth modules

- **AN54H20 series** ~ coming soon
- **AS1262Q series (QFN package IC)** ~ coming soon
- **AN54LQ series (QFN package IC)**

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

● AN54LV series (WLCSP package IC)

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

● MDBT53 series (WLCSP package IC)

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

● MDBT53V series (WLCSP package IC)

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

● MDBT50 series (QFN package IC)

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

● MDBT50Q series (aQFN package IC)

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

● MDBT42T series (WLCSP package IC)

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

● MDBT42TV series (WLCSP package IC)

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

● MDBT42 series (WLCSP package IC)

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

● MDBT42V series (WLCSP package IC)

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

● MDBT42Q series (QFN package IC)

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

● MDBT40 series

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

Release Note

- 2024/11/05 Version 0.1: Preliminary.

- 2025/02/10 Version 0.2: Preliminary.
 - (1) Updated information in Chapter 1.
 - (2) Updated pin indication and pin assignment in Chapter 2.
 - (3) Updated reference circuit in Chapter 5.

- 2025/08/13 Version 0.3: Preliminary.
 - (1) Update the model name “AN54L15Q series” to “AN54LQ-15,” “AN54LQ-P15,” and “AN54LQ-U15.”
 - (2) Adding antenna information on the cover page.
 - (3) Updated Chapter 1: Overall Introduction Information.
 - (4) Updated Chapter 2.3: RF Layout Suggestion Information.
 - (5) Updated Chapter 3: Main chip solution.
 - (6) Updated Chapter 4: Shipment Packaging Information.
 - (7) Added marking on the metal shield and packaging information to Chapter 4.
 - (8) Updated Chapter 5: Specification corresponding to Nordic's new nRF54L15 Product Specification v0.10.
 - (9) Updated Chapter 6: Reference Circuit to include remark information.
 - (10) Added certification information to Chapter 7.
 - (11) Updated Chapter 9: Useful Links.
 - (12) Updated the Full List of Raytac BLE Modules.