Makerfabs UWB AT Module

AT Command Manual

V1.1.1

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Date	Versions	Description	Author
20230815	v1.0.0	Introduction to Use & Function	Jerry
20230823	V1.0.1	1) Correct clerical errors 2) Anchor&Tag Software integration 3) Improve the Run Led pin description 4) Improve the Tx Led pin description 5) Improve the Rx Led pin description 6) Improved UART2 RX /RESET /WAKEUP pin description	Jerry
20230829	V1.0.2	1) Add frequency option for 850K rate 2) Modify the boot log 3) Modify command，AT+SETCFG 4) Modify command，AT+GETCFG? 5) Modify command，AT+RANGE	Jerry
20230926	V1.0.3	1) Improve documentation 2) Add hardware application circuits	Jerry
20230926	V1.0.4	1) Added package size diagram	Jerry
20231013	V1.0.5	First edition of translation	Vincent
20240227	V1.0.6	The maximum number of labels increased to 64	Vincent
20240315	V1.0.7	second edition of translation	Carla
20240920	V1.0.8	1)Modify command，AT+SETCAP 2)Modify command，AT+GETCAP 3)Add command，AT+SETPOW	Yuki

		4)Add command，AT+GETPOW? 5)Add command，AT+DATA 6)Add command，AT+RDATA	
20250227	V1.0.9	1)Add command，AT+SETPAN 2)Add command，AT+GETPAN?	Yuki
20250707	V1.1.0	1)Firmware MaUWB(v1.1.3) add functions: Anchor capacity expanded from 8 to unlimited, supporting multi-zone positioning. (Tags can now automatically detect and select the 8 nearest Anchors from a larger pool of deployed Anchors) 2)Modify command，AT+RANGE 3)Add command note， AT+GETCAP/ AT+GETCAP? 4)Add command note，AT+SETCFG / AT+GETCFG? 5)Add command default value，AT+GETCFG? / AT+GETANT? / AT+GETCAP? / AT+GETRPT? / AT+GETPOW? / AT+GETPAN?	Yuki
20250729	V1.1.1	Modify the error description to change the supported number of Anchors to "unlimited".	Yuki

Contents

1 Product description

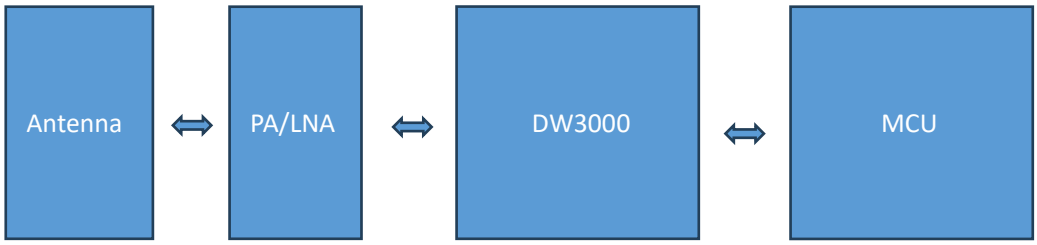
1.1 Introduction

This module describes the high-precision real-time positioning module developed by our company based on Qorvo DW3000 series chips. The module integrates MCU and all RF circuits, antennas, power management and clock circuits. The module can be quickly configured and used by AT command. The target readers are software and hardware engineers, UWB learners and users. This module is based on TOF (TWR) two-sided distance measurement and a variety of filtering algorithms to achieve distance calculation. After combination and collocation between multiple modules, it can be adapted to most of the location application scenarios, which is convenient for users to learn and research and rapid product application. Its ranging accuracy may be less than 10cm; And the module supports data transfer rates of up to 6.8Mbps.

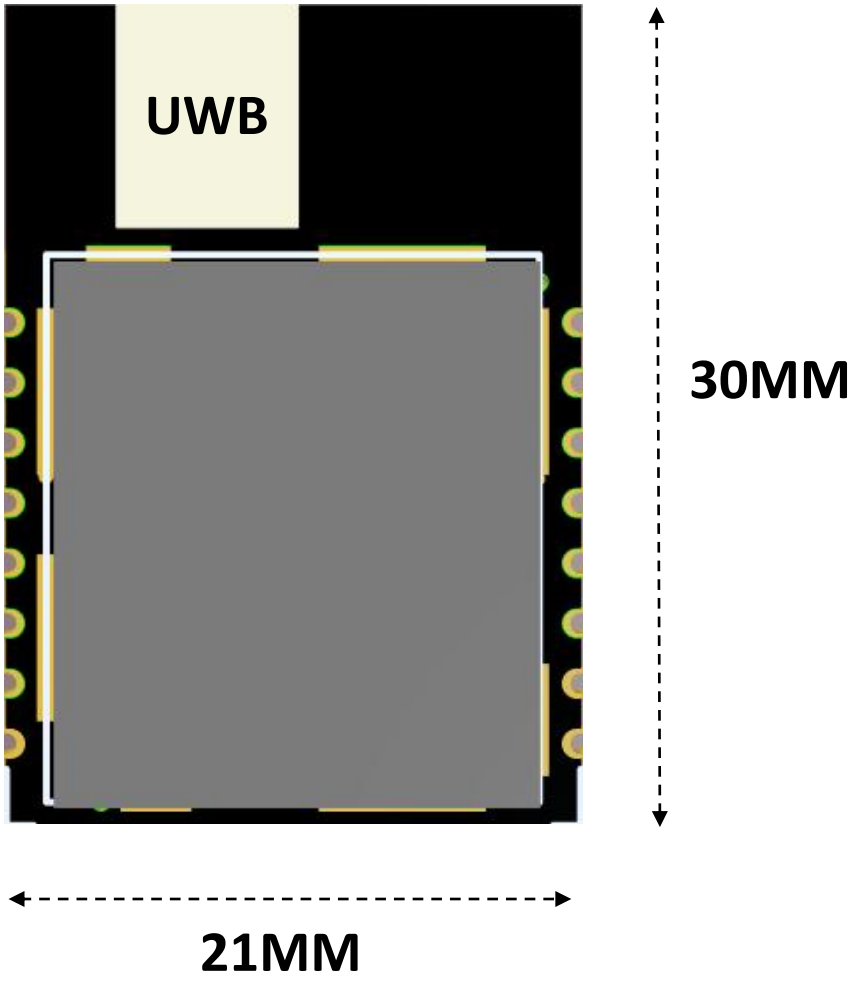
1.2 Feature

1) Comply with IEEE802.15.4-2011 ultra-wideband standard;
2) Easy to integrate without additional RF design;
3) Support CH5 (6489.6MHZ) RF band;
4) Strong resistance to multi-path fading;
5) Two modes of data transmission rate of 850kbps and 6.8Mbps;
6) The maximum packet length is 1023 bytes, which meets the application requirements of high data volume exchange;
7) The system supports unlimited Anchor 64 tags.
8) The module supports free configuration of refresh rate, up to 100Hz;
9) Module serial port communication baud rate 115200;
10) Module (Tag) deep hibernation working current as low as 35uA, working current 34mA;
11) Support AT command;

1.3 Functional block diagram

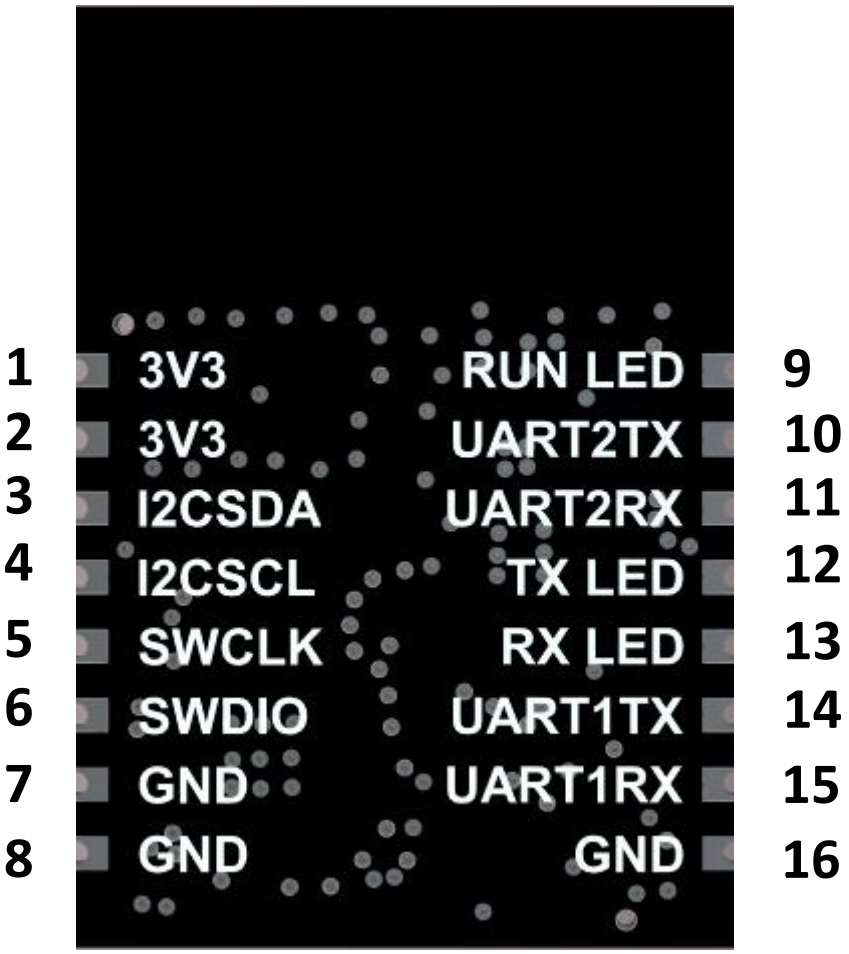


1.4 Product size



2 Module hardware description

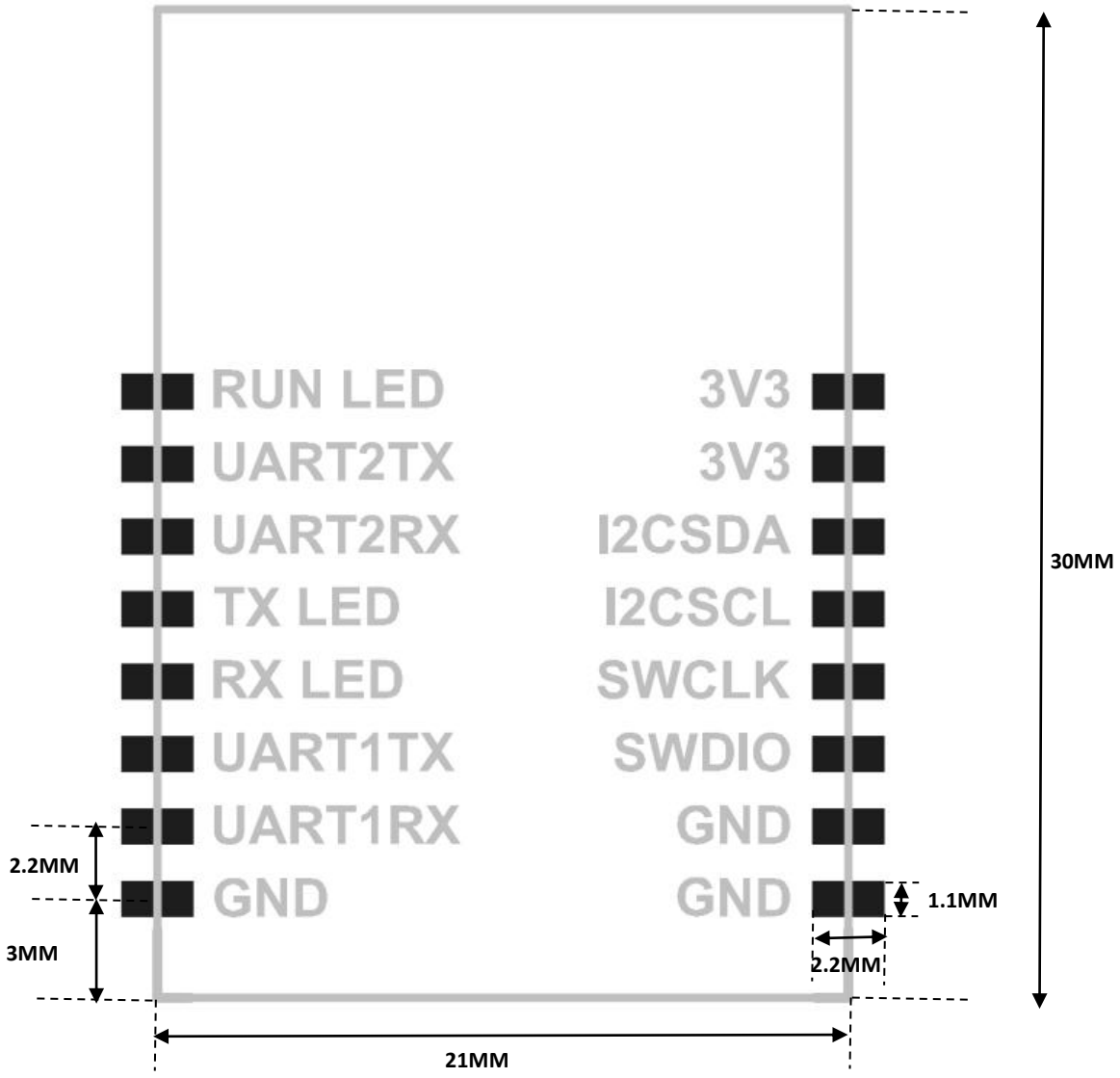
2.1 Module hardware pin definition



Index	Pin	Function
1	3V3	Power 3.3v
2	3V3	Power 3.3v
3	I2CSDA	Reserve pin(NC)
4	I2CSCL	Reserve pin(NC)
5	SWCLK	Module download port
6	SWDIO	Module download port

7	GND	GND
8	GND	GND
9	RUN LED	Module running indicator,Anchor/Tag universal (except for Tag entering Sleep) Configuration status: Blinking slowly (1 second) Working status: Blinking at short intervals (0.1 seconds)
10	UART2 TX	Reserve pin(NC)
11	UART2 RX/RESET/WAKEUP	Function 1: Pull down 3 seconds reset (reset function) Function 2: Tag low power state, pull down any time to wake up (wake up function, only valid Tag)
12	TX LED	Module UWB transmit indicator (Anchor valid,Tag invalid)
13	RX LED	Module UWB acceptance indicator (Anchor valid,Tag invalid)
14	UART1 TX	Module serial TX port
15	UART1 RX	Module serial RX port
16	GND	GND

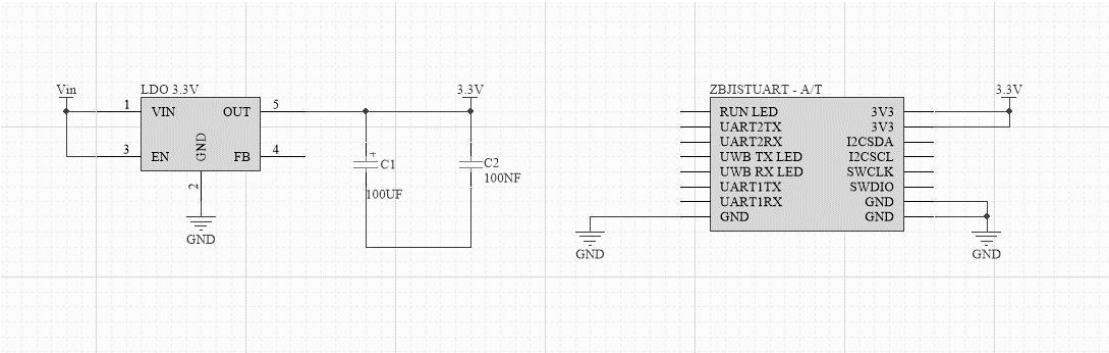
2.2 Module hardware package size



2.3 Power interface

Index	Pin	Function
1 2	3V3	Power supply 3.3V (Note: If the power supply voltage exceeds 3.3, the module will be damaged)
7 8 16	GND	GND

IDO voltage regulator chip is used to increase 100UF tantalum capacitor and 100NF capacitor to stabilize voltage and reduce interference caused by power supply.



2.4 UART application circuit

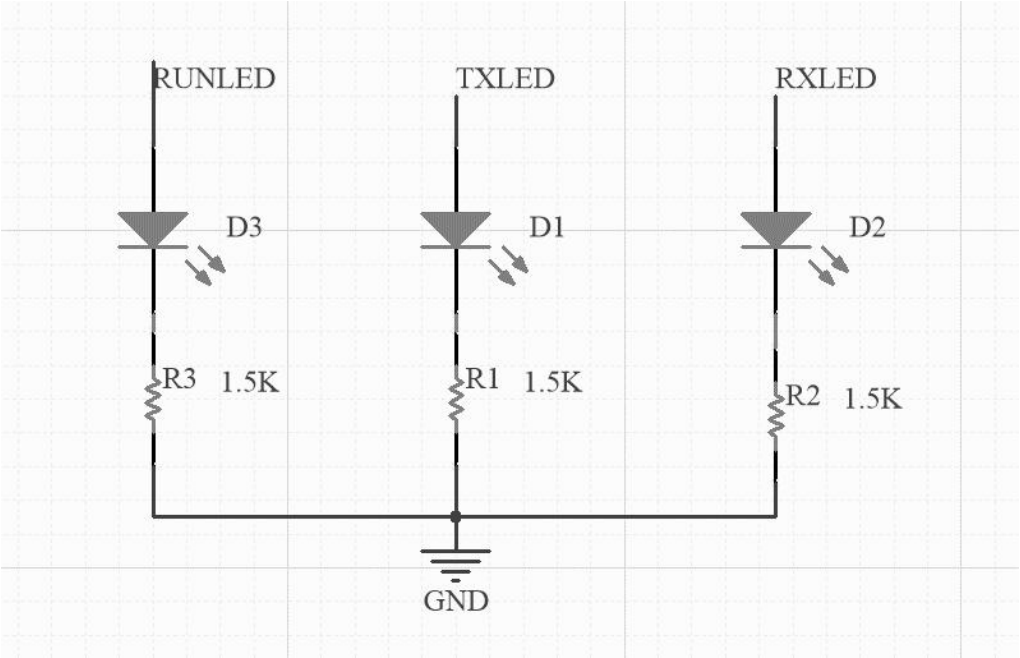
Index	Pin	Function
14	UART1 TX	Module TX
15	UART1 RX	Module RX

Serial port communication level is 3.3VTTL, different level systems should do level matching.

2.5 LED application circuit

Index	Pin	Function
9	RUN LED	Module running indicator,Anchor/Tag universal (except for Tag entering Sleep) Configuration status: Blinking slowly (1 second) Working status: Blinking at short intervals (0.1 seconds)
12	TX LED	Module UWB transmit indicator (Anchor valid,Tag invalid)
13	RX LED	Module UWB acceptance indicator (Anchor valid,Tag invalid)

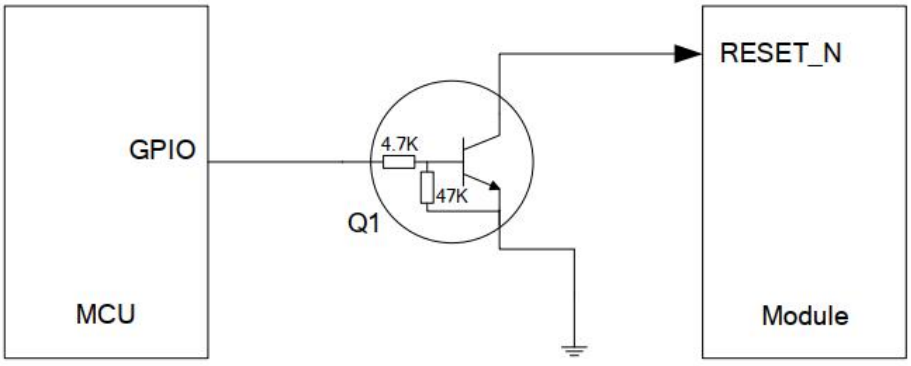
LED output High level LED is on, low level LED is off.

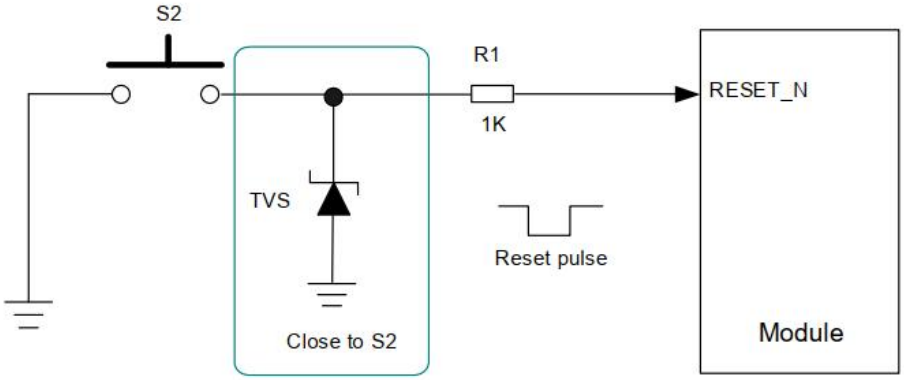


2.6 Reset interface

Index	Pin	Function
11	UART2 RX/RESET/WAKEUP	1: Pull down 3 seconds reset (reset function) 2: Label low power state, pull down any time to wake up (wake up function, only valid label)

It is recommended to use an open set or open drain drive circuit to control RESET.

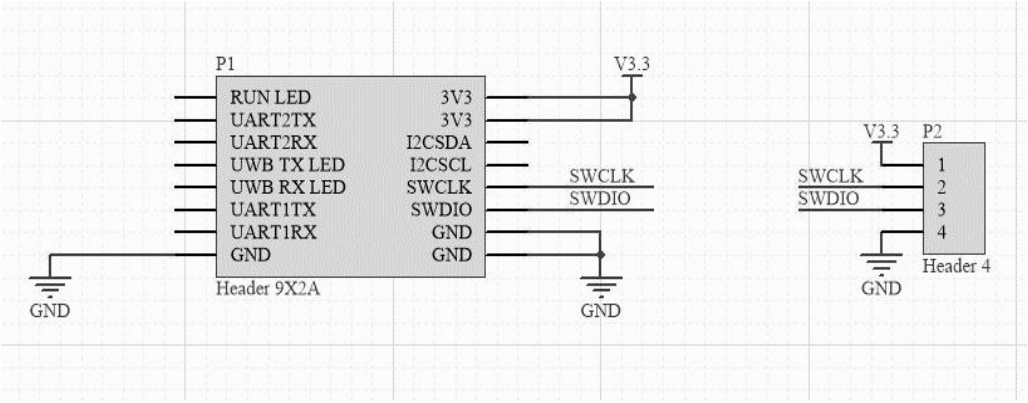




2.7 Download interface

Index	Pin	Function
5	SWCLK	Module download port
6	SWDIO	Module download port

Firmware upgrades for hardware modules can be performed via ST-LINK.



3 Description of the module AT command

3.1 Command summary description

Index	Command	Function	Role
1	AT?	Serial port test	Tag/Anchor
2	AT+GETVER?	Get version	Tag/Anchor
3	AT+RESTART	Restart module	Tag/Anchor
4	AT+RESTORE	Restore configuration	Tag/Anchor
5	AT+SAVE	Save configuration	Tag/Anchor
6	AT+SETCFG	Set role message	Tag/Anchor
7	AT+GETCFG?	Get role message	Tag/Anchor
8	AT+SETANT	Set antenna delay	Tag/Anchor
9	AT+GETANT?	Get antenna delay	Tag/Anchor
10	AT+SETCAP	Set the Anchor/Tag capacity of the system	Tag/Anchor
11	AT+GETCAP?	Get the Anchor/Tag capacity of the system	Tag/Anchor
12	AT+SETRPT	Set the automatic reporting status	Tag/Anchor
13	AT+GETRPT?	Get the automatic reporting status	Tag/Anchor
14	AT+RANGE	Active reporting command	Tag/Anchor

15	AT+SLEEP	Sleep command	Tag
16	AT+SETPOW	Configuration of the device's transmission power.	Tag/Anchor
17	AT+GETPOW?	Get device transmit power	Tag/Anchor
18	AT+DATA	Transparent data transmission, supporting up to 32 bytes of data transfer.	Tag/Anchor
19	AT+RDATA		Tag/Anchor
20	AT+SETPAN	Used to differentiate between different networks, if shared by more than one system, use this field for differentiation.	Tag/Anchor
21	AT+GETPAN?	Used to differentiate between different networks, if shared by more than one system, use this field for differentiation.	Tag/Anchor

3.2 **Command：** AT?

Command	AT?
Parameter	
Return	
Example	AT? OK
Function	Verify that the serial port communication of the module is normal

3.3 **Command：** AT+GETVER?

Command	AT+GETVER?
Parameter	

Return	x1: indicates the software version x2: Hardware version
Example	AT+GETVER? AT+GETVER=software:v01_00_000,hardware:v01_03_000
Function	Obtain the module software version and hardware version

3.4 **Command：** AT+RESTART

Command	AT+RESTART
Parameter	
Return	
Example	AT+RESTART OK
Function	Reset module

3.5 **Command：** AT+RESTORE

Command	AT+RESTORE
Parameter	
Return	
Example	AT+RESTORE OK
Function	Restore factory mode (clear all configuration information)

3.6 **Command：** AT+SAVE

Command	AT+SAVE
Parameter	
Return	

Example	AT+SAVE OK
Function	Save the configuration parameters (after configuring the information, be sure to save and write to the flash)

3.7 **Command：** AT+SETCFG

Command	AT+SETCFG=(x1),(x2),(x3),(x4)
Parameter	x1:Device ID(Anchor 0-unlimited，Tag 0-63) x2:Device Role(0:Tag / 1:Anchor) x3:Equipment communication rate(0:850K/1:6.8M) x4:Range filtering is enabled(0:Close / 1:Open) Note: If the user intends to implement multi-zone positioning, it is recommended to use 6.8Mbps data rate and close the distance filtering function.
Return	
Example	AT+SETCFG=0,1,1,1 OK
Function	Set basic module parameters

3.8 **Command：** AT+GETCFG?

Command	AT+GETCFG?
Parameter	
Return	x1:Device ID(Anchor 0-unlimited，Tag 0-63, Default:-1) x2:Device Role(0:Tag / 1:Anchor / -1:Not set, Default:-1) x3:Equipment communication rate(0:850K / 1:6.8M, Default:1) x4:Range filtering is enabled(0:Close / 1:Open, Default:1) Note: If the user intends to implement multi-zone positioning, it is recommended to use 6.8Mbps data rate and close the distance filtering function.
Example	AT+GETCFG? AT+GETCFG=-1,-1,1,1
Function	Obtain basic module parameters

3.9 **Command**：AT+SETANT

Command	AT+SETANT=(x1)
Parameter	x1:Device antenna delay
Return	
Example	AT+SETANT=16536 OK
Function	Set module antenna delay (antenna delay is used to: calibrate distance values)

3.10 **Command**：AT+GETANT?

Command	AT+GETANT?
Parameter	
Return	x1:Device antenna delay (Default:16336)
Example	AT+GETANT? AT+GETANT=16336
Function	Get module antenna delay (antenna delay for: calibrating distance values)

3.11 **Command**：AT+SETCAP

Command	AT+SETCAP=(x1),(x2),(x3)
Parameter	x1:Tag capacity (default: 10, maximum: 64) x2:Time of a single time slot (6.8M not less than 10ms,850K not less than 15ms) X3:extMode, whether to increase the passthrough command when transmitting (0: normal packet when communicating, 1: extended packet when communicating) 6.8M, Minimum single slot time 10ms for normal packet, Minimum single slot time 10ms for extended packet. 850K. Minimum single slot time 15ms for normal packet, Minimum single slot time 25ms for extended packet. (Note:850K currently does not support extended data packet.)

	(Note: The refresh rate relationship is as follows: label capacity x single slot time, Example 1: If x1=10 and x2=10, the refresh rate is 10Hz Example 2: If x1=5 and x2=10, the refresh rate is 20Hz Example 3: x1=1 x2=10, then refresh rate = 100Hz)
Return	
Example	AT+SETCAP=10,10,1 OK
Function	Set system base station/label capacity (refresh rate)/Whether the transmitted packet is in extended mode

3.12 **Command:** AT+GETCAP?

Command	AT+GETCAP?
Parameter	
Return	x1:Tag capacity (default: 10, maximum: 64) x2: Time of a single time slot (6.8M not less than 10ms,850K not less than 15ms, default: 10) X3:extMode, whether to increase the passthrough command when transmitting (0: normal packet when communicating, 1: extended packet when communicating, default: 0) 6.8M, Minimum single slot time 10ms for normal packet, Minimum single slot time 10ms for extended packet. 850K. Minimum single slot time 15ms for normal packet, Minimum single slot time 25ms for extended packet. (Note:850K currently does not support extended data packet.) (Note: The refresh rate relationship is as follows: label capacity x single slot time, Example 1: If x1=10 and x2=10, the refresh rate is 10Hz Example 2: If x1=5 and x2=10, the refresh rate is 20Hz Example 3: x1=1 x2=10, then refresh rate = 100Hz)
Example	AT+GETCAP? AT+GETCAP=10,10,0
Function	Get system base station/label capacity (refresh rate)/Whether the transmitted packet is in extended mode

3.13 **Command：** AT+SETRPT

Command	AT+SETRPT=(x1)
Parameter	x1: Whether the report is reported automatically (0: off 1: on)
Return	
Example	AT+SETRPT=1 OK
Function	Enable whether the module actively reports distance data.

3.14 **Command：** AT+GETRPT?

Command	AT+GETRPT?
Parameter	x1: Whether the report is reported automatically (0: off 1: on, default: 1)
Return	
Example	AT+GETRPT? AT+GETRPT=1
Function	Enable whether the module actively reports distance data.

3.15 **Command：** AT+RANGE

Command	AT+RANGE=tid:x1,mask:x2,seq:x3,range:(x4,x5,x6,x7,x8,x9,x10,x11), rssi:(x12,x13,x14,x15,x16,x17,x18,x19), ancid:(x20,x21,x22,x23,x24,x25,x26,x27)
Parameter	
Return	tid:x1(Tag ID, in decimal format) mask:x2(Significance bit, in hexadecimal format) seq:x3(Tag communication sequence, in decimal format) range0:x4(The distance from Tag to Abchor0 ,in cm, in decimal format) range1:x5(Tag to Anchor 1) range2:x6(Tag to Anchor 2) range3:x7(Tag to Anchor 3) range4:x8(Tag to Anchor 4)

	range5:x9(Tag to Anchor 5) range6:x10(Tag to Anchor 6) range7:x11(Tag to Anchor 7) rssi0:x12(Signal strength value from Tag to Anchor 0, in dBm, floating point type) rssi1:x13(Signal strength value from Tag to Anchor 1) rssi2:x14(Signal strength value from Tag to Anchor 2) rssi3:x15(Signal strength value from Tag to Anchor 3) rssi4:x16(Signal strength value from Tag to Anchor 4) rssi5:x17(Signal strength value from Tag to Anchor 5) rssi6:x18(Signal strength value from Tag to Anchor 6) rssi7:x19(Signal strength value from Tag to Anchor 7) ancid0:x20(Device ID of the Tag to Anchor 0, configured via the SETCFG command) ancid0:x20(Device ID of the Tag to Anchor 0) Ancid1:x21(Device ID of the Tag to Anchor 1) Ancid2:x22(Device ID of the Tag to Anchor 2) Ancid3:x23(Device ID of the Tag to Anchor 3) Ancid4:x24(Device ID of the Tag to Anchor 4) Ancid5:x25(Device ID of the Tag to Anchor 5) Ancid6:x26(Device ID of the Tag to Anchor 6) Ancid7:x27(Device ID of the Tag to Anchor 7)
Example	AT+RANGE=tid:2,timer:1166463,timerSys:753058,mask:12,seq:11, range:(0,105,0,0,71,0,0,0), rssi:(0.00,-81.50,0.00,0.00,-80.70,0.00,0.00,0.00), ancid:(0,25,0,0,28,0,0,0)
Function	After the 3.12 command is set, the distance value is actively reported (common to Tag and Anchor).

3.16 **Command：** AT+SLEEP

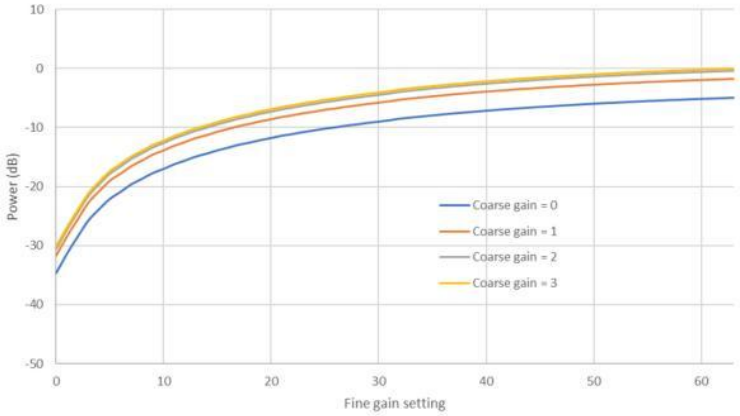
Command	AT+SLEEP=(x1)
Parameter	x1: Sleep time(Unit : ms)[Range: 0-65535,65535=Forever] (Wake up mode: ① serial port wake up (send any data) ②UART2 RX drop-down wake up at any time)
Return	OK
Example	AT+SLEEP=1000 OK

Function	Set the device sleep time (valid for Tags only)

3.17 **Command：** AT+SETPOW

Command	AT+SETPOW=(x1)
Parameter	x1:Transmit Power Gain Configuration(Default FD, generally does not need to be modified) ①Gain Register ②Gain Diagram
Return	
Example	AT+SETPOW=FD OK
Function	Configuration of the device's transmission power.

7	6	5	4	3	2	1	0
Fine Gain,Total 64						Coarse Gain,Total 4	



3.18 **Command：** AT+GETPOW?

Command	AT+GETPOW?
Parameter	
Return	Default:FD
Example	AT+GETPOW? AT+GETPOW=FD

Function	Get device transmit power

3.19 **Command：** AT+DATA

Command	AT+DATA=(x1),(x2)
Parameter	x1:Length of transmitted data x2:Transmitted data This command can be used if the device has an extMode of 1.
Return	
Example	AT+DATA=10,1234567890 OK
Function	Transmitted data, supporting up to 32 bytes of data transfer.

3.20 Command： AT+RDATA

Command	AT+RDATA=(x1),(x2),(x3),(x4),(x5)
Parameter	
Return	x1: Tag or Anchor x2: Anchor or Tag address x3: Device Local Time x4: Length of transmitted data x5: Transmitted data
Example	
Function	

3.21 Command： AT+SETPAN

Command	AT+SETPAN=(x1)
Parameter	x1: Network ID (Only the same network ID can communicate)
Return	

Example	AT+SETPAN=1234 OK
Function	Used to differentiate between different networks, if shared by more than one system, use this field for differentiation.

3.22 Command：AT+GETPAN?

Command	AT+GETPAN?
Parameter	
Return	Default:1111
Example	AT+GETPAN? AT+GETPAN=1111
Function	Used to differentiate between different networks, if shared by more than one system, use this field for differentiation.