



Beacon Specification

Version: V1.5

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| Version | Revision Data | Revisionist | Viewer | Modified Content |
|---------|---------------|-------------|--------|---|
| V1.0 | 2016-12-14 | 郭高亮 | 张眼 | First release |
| V1.1 | 2016-12-19 | 郭高亮 | 张眼 | 1.Add electrical characteristics 2.Add TX power and broadcast name modification commands |
| V1.3 | 2017-01-05 | 张眼 | 张眼 | 1.Add 2-way BEACON broadcast 2.Add password login description |
| V1.4 | 2017-01-06 | 郭高亮 | 张眼 | 1.modify electrical parameter |
| V1.5 | 2017-02-23 | 郭高亮 | 张眼 | 1.modify broadcast interval length and its default value 2. 增加 Beacon prefix 修改说明 3. 修改 UUID 寄存器读写属性 4. 增加广播模式设置指令 |

Content

| | | |
|--------|---|----|
| 1. | Electrical Characteristics..... | 1 |
| 1.1 | Features..... | 1 |
| 1.2 | Bluetooth power consumption table..... | 1 |
| 2. | Broadcast format description..... | 1 |
| 2.1 | Broadcast structure..... | 1 |
| 2.2 | Default broadcast data..... | 2 |
| 3. | Command description..... | 2 |
| 3.1 | UUID..... | 2 |
| 3.2 | Register list..... | 2 |
| 3.3 | Bluetooth channel operating instructions..... | 3 |
| 3.3.1 | Operation precautions..... | 3 |
| 3.3.2 | Operating Steps..... | 4 |
| 3.4 | Command Description..... | 6 |
| 3.4.1 | Password login and modification..... | 6 |
| 3.4.2 | Modify Major/Minor..... | 6 |
| 3.4.3 | Modify TX_POWER1..... | 6 |
| 3.4.4 | Modify the broadcast interval..... | 6 |
| 3.4.5 | Reset command..... | 7 |
| 3.4.6 | Power Level Reading..... | 7 |
| 3.4.7 | Login timeout and power detection period..... | 7 |
| 3.4.8 | Transmit power adjustment..... | 7 |
| 3.4.9 | Broadcast name modification..... | 8 |
| 3.4.10 | Broadcast mode modification..... | 8 |
| 4. | Contact Us..... | 10 |

1. Electrical Characteristics

1.1 Features

- Modulation mode: GFSK
- Receiver Sensitivity: -96dBm (type)
- Frequency Range: 2402~2480MHZ (2.4G ISM band)
- Output Power Range: -20~+5 dBm (can be set by programming)
- Operating Ambient Temperature Range: -20°C~+70°C
- Storage Temperature Range: -30°C~+85°C
- Operating Humidity: < 85%RH (at 40°C)
- Voltage: 1.8~3.8VDC
- Working Current:
 - Active-Mode RX: 5.9 mA max
 - Active-Mode TX at 0 dBm: 6.1 mA max
 - Active-Mode TX at +5 dBm: 9.1 mA max
 - Active-Mode 2.3 mA avg
 - Standby: 1 μA (0.13μA avg)
- Effective RX Range:
 - 50m (Output Power Set to 0 dBm, module directly face to face to iPhone 6S in the free distance testing result)
 - 70m (Output Power Set to 0 dBm, module directly face to face to iPhone 6S in the free distance testing result)

1.2 Bluetooth power consumption table

| Bluetooth State | Parameter setting | Actual interval time (ms) | Average current value |
|--------------------|-------------------|-----------------------------|-----------------------|
| Broadcast Interval | 32 | 20 | 1.5mA |
| | 160 | 100 | 402uA |
| | 800 | 500 | 82uA |
| | 1600 | 1000 | 42uA |

- Can support up to three groups of BEACON broadcast at the same time, can also be set to a group or two groups of broadcasts, you can set BEACON broadcast data, different broadcast content, you can also set the broadcast interval

2. Broadcast format description

2.1 Broadcast structure

Beacon prefix + UUID + Major + Minor + RSSI

- Beacon Prefix: Default as iBeacon prefix
- UUID: Used to distinguish between different vendors of Beacon

devices

- Major: Beacon device grouping
- Minor: Specific Beacon device
- RSSI : The signal strength value (complement format) measured from the Beacon device by 1 meter

2.2 Default broadcast data

- Beacon prefix(9Byte): 0x0201061AFF4C000215
- Note: Beacon prefix has a total of 9 bytes, the first 5 bytes of data (0x0201061AFF) for the fixed data, later 4 bytes of data (0x4C000215) can be modified by register operation.
- UUID(16Byte): 0xE031CCED1CE942C6A93683C78157D268
- Major(2Byte): 0x0049/0x0050/0x0051(In the case of three-way broadcast this parameter data is not the same)
- Minor(2Byte): 0x000A/0x000B/0x000C(In the case of three-way broadcast this parameter data is not the same)
- RSSI(1Byte) : 0xC5 (-59dBm)

3. Command description

3.1 UUID

| Type | Value | Attribute | Data length (bytes) | Mark |
|----------------|--------|--------------------|---------------------|-----------|
| Service | 0X1000 | NC | NC | NC |
| characteristic | 0X1001 | READ/WRITE/ NOTIFY | 20 | BLE RX |
| | 0X1002 | READ/NOTIFY | 20 | BLE TX |
| | 0X1003 | WRITE | 20 | REG_WRITE |
| | 0x1004 | READ | 20 | REG_READ |
| | 0x1005 | READ/WRITE | 20 | REG |

3.2 Register list

| Name | Address | Length(Byte) | Default Value | Read and write permissions |
|-----------|---------|--------------|---------------|----------------------------|
| PREFIX0 | 0x00 | 4 | 0x4C000215 | W/R |
| UUID0 | 0x01 | 16 | (See 2.2) | W/R |
| Major0 | 0x02 | 2 | 0x0049 | W/R |
| Minor0 | 0x03 | 2 | 0x000A | W/R |
| TX_POWER0 | 0x04 | 1 | 0xC5 | W/R |
| PREFIX1 | 0x05 | 4 | 0x4C000215 | W/R |
| UUID1 | 0x06 | 16 | (See 2.2) | W/R |
| Major1 | 0x07 | 2 | 0x0050 | W/R |

| | | | | |
|-------------------------------------|------|----|----------------|-----|
| Minor1 | 0x08 | 2 | 0x000B | W/R |
| TX_POWER1 | 0x09 | 1 | 0xC5 | W/R |
| PREFIX2 | 0x0a | 4 | 0x4C000215 | W/R |
| UUID2 | 0x0b | 16 | (See 2. 2) | W/R |
| Major2 | 0x0c | 2 | 0x0051 | W/R |
| Minor2 | 0x0d | 2 | 0x000C | W/R |
| TX_POWER2 | 0x0e | 1 | 0xC5 | W/R |
| Password | 0x0f | 6 | 0x010203040506 | W/R |
| Broadcast interval parameter | 0x10 | 4 | 480(*0. 625ms) | W/R |
| Reset | 0x11 | 1 | \ | W |
| Power level | 0x12 | 1 | \ | R |
| Login timeout | 0x13 | 2 | 30000 (ms) | W/R |
| Power sampling cycle | 0x14 | 2 | 10000 (ms) | W/R |
| Transmit power | 0x15 | 1 | 7 | W/R |
| Broadcast name | 0x16 | 18 | TTC Beacon | W/R |
| Broadcast mode | 0x17 | 1 | 0x31 | W/R |

Note: W means write only, R means Read only, W/R means Read and Write

3.3 Bluetooth channel operating instructions

3.3.1 Operation precautions

1. Read and write permissions

Register operations need to pay attention to read and write permissions, W means write only, R means Read only, W/R means Read and Write

2. Command length

The length of the command written to the register must be consistent with the table in Section 3.2. Note that only part of the prefix data can be modified.

3. Data Format

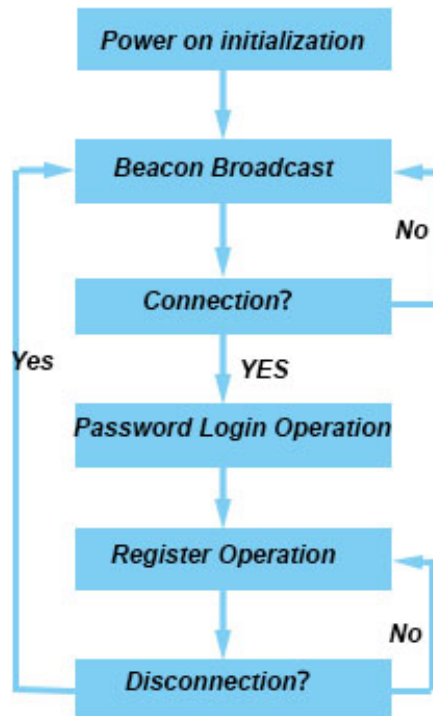
Broadcast interval, login timeout, power sampling cycle are used big end mode. Such as broadcast interval 480 (corresponding to hexadecimal data 0x000001E0), read 0XE0010000.

4. Parameter settings, support power-down save

Note: If you are using the CCa40 SDK, use the Beacon feature, select the appropriate project example to support SNV storage.

3.3.2 Operating Steps

TTC Beacon device operating steps as below:

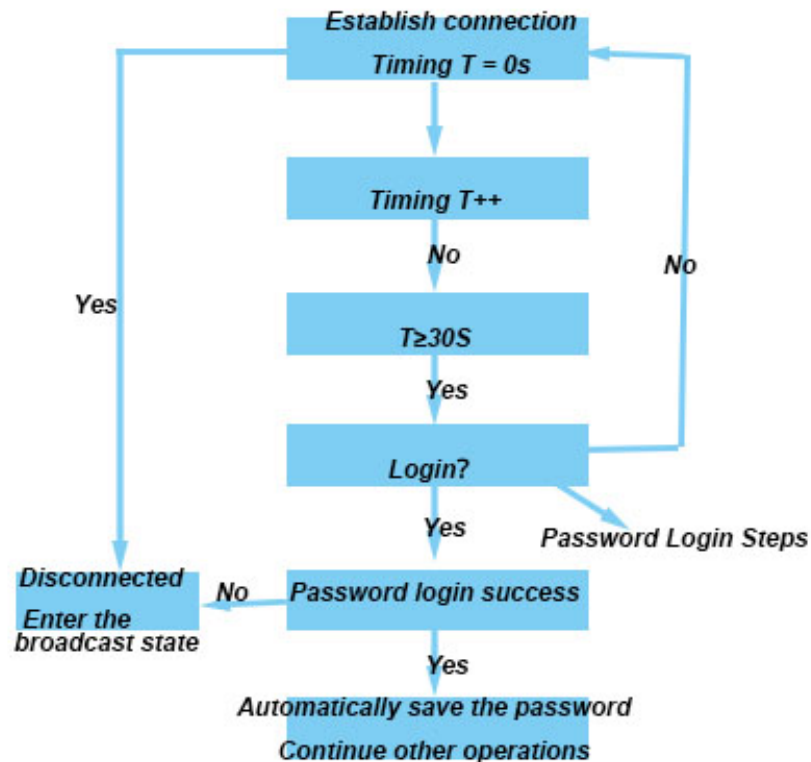


1. Password Login

Before Read / Write any registers, you need password login for the login timeout. If no password login, the operation of the register is invalid. After the connection is established, the link is automatically disconnected after 30 seconds timeout. The initial password is 0x010203040506, password login steps see as below:

Step 1: Write 0x0f (password register address) to REG (UUID1005).

Step 2: Write the password to REG_WRITE (UUID1003)



2. Read the register operation method, such as querying the Beacon device's broadcast interval

Step 1: Write 0x10 (register address) to REG (UUID1005).

Step 2: read from REG_READ (UUID1004), will return 0x4006, said the current effective broadcast interval parameters

3. Write register operation method, such as setting the Beacon device's broadcast interval

Step 1: Write 0x10 (register address) to REG (UUID1005).

Step 2: Write 0x800C to REG_WRITE (UUID1003), set the broadcast interval parameter to 2000. At this time, you can read the parameter settings via REG_READ (UUID1004).

3.4 Command Description

The following instructions are carried out after the connection with the APP.

3.4.1 Password login and modification

In order to improve the security of iBeacon device, it is necessary to password login before R/W operation to the register. It also supports password modification.

1. Password login
 - (1) Write 0x0f (password register address) to REG (UUID1005);
 - (2) Write the password to REG_WRITE (UUID1003) (initial password is 0x010203040506).
2. Modify Password
 - (1) use the original password to log in;
 - (2) Write a new password to REG_WRITE (UUID1003), such as 0x112233445566.

3.4.2 Modify Major/Minor

Range: 0~65535.

Example: Such as setting Major1 to 100 and Minor1 to 2000.

Steps(1) Set the Major1 to 100:

- A) Write 0x07 to REG (UUID1005)
- B) Write 0x6400 (low byte first) to REG_WRITE (UUID1003);
At this time, you can read the parameter settings via REG_READ (UUID1004).

Steps(2) Set Minor1 to 2000:

- A) Write 0x08 to REG (UUID1005)
- B) Write 0xD007 (low byte first) to REG_WRITE (UUID1003);
At this time, you can read the parameter settings via REG_READ (UUID1004).

3.4.3 Modify TX_POWER1

TX_POWER1 indicates the signal strength value (complement format) measured by 1 meter from the Beacon device.

Example: Assuming an RSSI of -59dbm measured at 1 meter from the Beacon device, the corresponding complement is $256-59 = 197$, ie 0xC5. Set TX_POWER1 to 0xC5.

Steps: (1) Write 0x09 to REG (UUID1005)

- (2) write 0xC5 to REG_WRITE (UUID1003)

At this time, you can read the parameter settings via REG_READ (UUID1004).

3.4.4 Modify the broadcast interval

Broadcast interval default is 1600, unit:0.625ms, that is $1600 * 0.625ms$

= 1000ms. Note: The interval of single broadcast is 20ms ~ 10.28s. The broadcast interval of the broadcast is shown in section 3.4.10. Example: Modify the broadcast interval to 500ms. 500ms / 0.625ms = 800, ie 0x0320.

Steps: (1) write 0x10 to REG (UUID1005)
 (2) Write 0x2003 (low byte first) to REG_WRITE (UUID1003);
 At this time, you can read the parameter settings via REG_READ (UUID1004).

3.4.5 Reset command

Reserved instruction, MCU reset. Note: Parameter settings will not lost. Steps: (1) Write 0x11 to REG (UUID1005)
 (2) Write 0x01 to REG_WRITE (UUID1003)

3.4.6 Power Level Reading

The percentage of residual power can be detected by the voltage of the supply pin VDD5. 0% to 100% of the electricity corresponding to the voltage of 2.5V ~ 3.3V.

Steps: (1) write 0x12 to REG (UUID1005)
 (2) from REG_READ (UUID1004) read, such as 0x64 that 100% power.

3.4.7 Login timeout and power detection period

The parameter unit is ms. Default timeout parameter is 30000, that is, 30 seconds. After linking success, you need to password login operation within 30 seconds. Note: The parameter range is 1ms to 65535ms.

3.4.8 Transmit power adjustment

The default transmit power parameter is 7, corresponding default transmit power is 0dbm. The parameter range is 0-12, the relationship between the parameters and the transmission power is as follows:

| Parameter range | TX Power(unit: dbm) |
|-----------------|---------------------|
| 0 | -21 |
| 1 | -18 |
| 2 | -15 |
| 3 | -12 |
| 4 | -9 |
| 5 | -6 |
| 6 | -3 |
| 7 (default) | 0 (default) |
| 8 | 1 |
| 9 | 2 |
| 10 | 3 |

| | |
|----|---|
| 11 | 4 |
| 12 | 5 |

3.4.9 Broadcast name modification

Up to 18 characters, written in ASCII format.

Such as "TTC_Beacon_123" corresponds to 0x5454435f4265616366f6e5f313233.

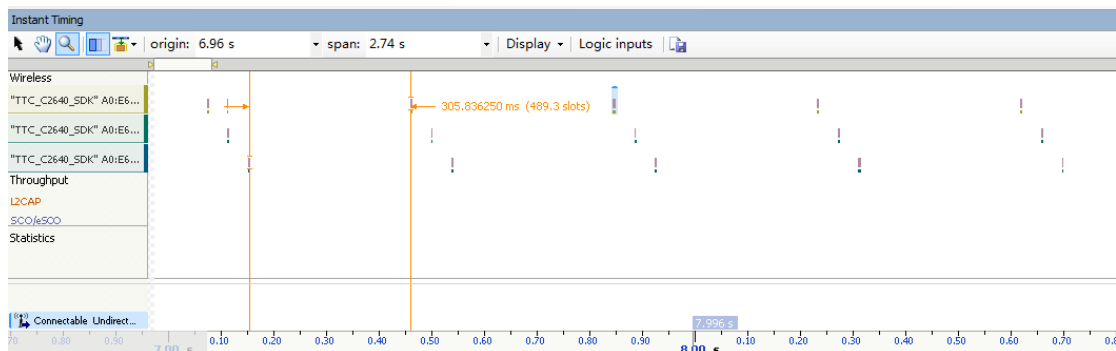
3.4.10 Broadcast mode modification

The "broadcast mode" register (0x17) sets the broadcast mode

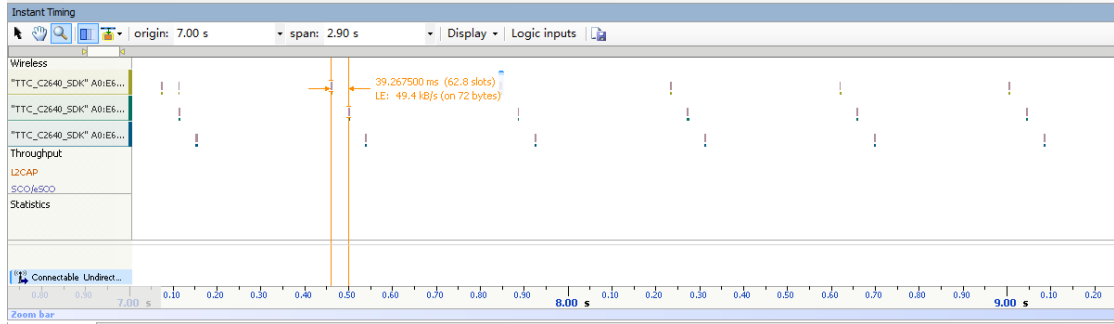
| Register bit | Function | Description |
|--------------|-------------------------|---|
| Bit4 ~ bit7 | Set up a few broadcasts | Range: 1~3 1:one broadcast 2:two broadcasts 3:three broadcasts |
| Bit0 ~ bit3 | Set broadcast mode | Range: 0~1 0: send one broadcast at the same time 1: send multiple broadcast at the same time |

Example 1: "Broadcast Mode" Register (0x17) Default: 0x31. Default Broadcast Interval: 300ms.

High 4-bit value: 3, that there are three broadcasts, as shown below is divided into three lines.



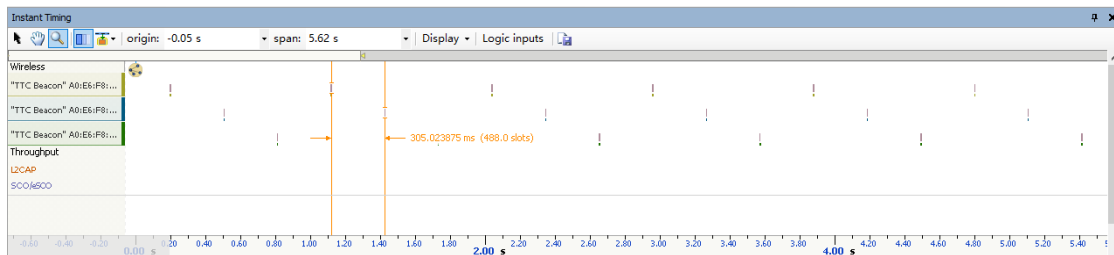
If the lower 4 bits are 1, multiple broadcasts are issued at the same time. "At the same time" means that there are 3 broadcasts in a short period of time. As shown below:



Example 2: Suppose you modify the Broadcast Mode register (0x17) by default to 0x30. The default broadcast interval is 300ms. High 4-bit value of 3, there are three broadcasts exist, as shown below is divided into three lines.



Low 4-bit value of 0, then "the same time" will only send one broadcast. "The same time" means that in a short period of time there is one broadcast issued. As shown below:



4. Contact Us

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