

BM16 BLE Module Specification

Version: V2.1

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Revision History

Revision	Author	Reviewer	Date	Description
V1.9	LUO	LIANG	2021/11/4	1.Update power consumption parameters
V2.1	YANG	ZHU	2024/11/27	1. Update the power consumption description 2. Update size package: increase error value

Revision History	- 2 -
1. Overview	- 5 -
1.1 Product Overview	- 5 -
1.2 Characteristic	- 5 -
1.3 Application Field	- 6 -
2 Module Interface	- 7 -
2.1 Size package	- 7 -
2.2 Pin port (UART)	- 7 -
2.3 Pin definition (UART)	- 8 -
2.4 Pin definition (I2C)	- 9 -
3 Electrical parameters	- 9 -
3.1 Absolute electrical parameters	- 9 -
3.2 Working conditions	- 10 -
3.3 Power Consumption	- 10 -
4 RF characteristics	- 12 -
4.1 Basic RF characteristics	- 12 -
4.2 RF output power	- 13 -
4.3 RF receiving sensitivity	- 13 -
5 Antenna information	- 13 -
5.1 Antenna type	- 13 -
5.2 Reduce antenna interference	- 13 -
6 Hardware Reference Design	- 14 -
6.1 Typical Application Diagram	- 14 -
6.2 Design Instructions	- 15 -
7 Protocol	- 15 -
7.1 Instruction	- 15 -
7.2 General transmission	- 15 -
7.3 AiLink protocols	- 15 -
7.4 Other custom protocols	- 16 -
8 Production guidance	- 16 -
8.1 Production guidelines	- 16 -
8.2 Test gear	- 16 -
9 Contact us	- 17 -

1. Overview

1.1 Product Overview

BM16 BLE module is specially built for intelligent wireless data transmission by Shenzhen ElinkThings Co., Ltd ,using BK chip, following BLE V4.2 Bluetooth specification.

This module supports UART / I2C interface protocol and has the advantages of low cost, small volume, low power consumption and high transceiver sensitivity. It can realize its powerful function with only a few peripheral components. The protocol can be customized according to customer requirements to meet multi scenario purposes. Depending on the firmware version, multiple master and slave modes can be supported.

The module has passed reach, ROHS, BQB RF certification (refer to appendix).

1.2 Characteristic

- Bluetooth V4.2
- Built-in PCB RF antenna
- UART interface
- 160KB flash memory
- 2.35_3.0V wide input voltage range
- lowest power consumption, with dormant current as low as 5.9uA
- Support for customer definition of development agreements

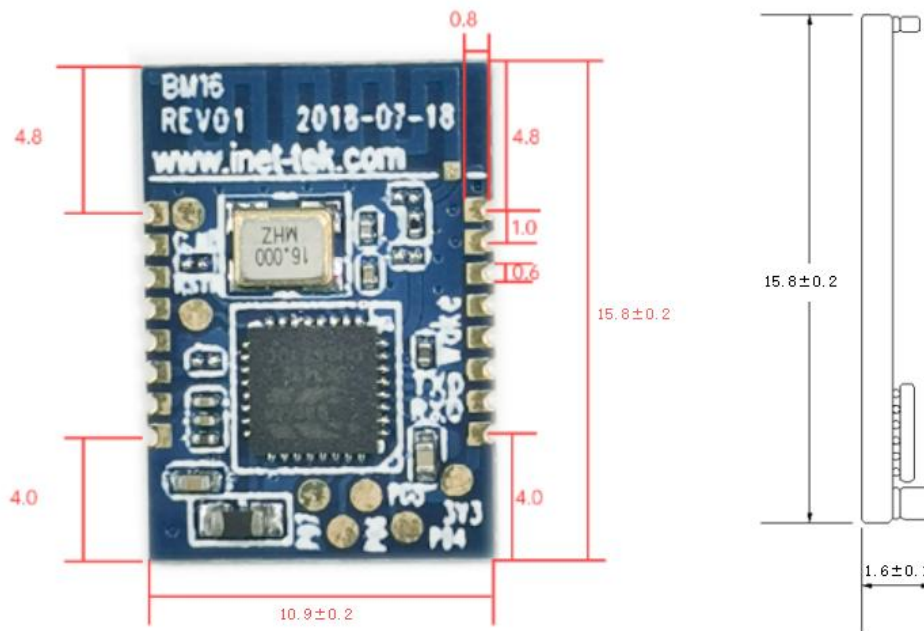
1.3 Application Field

The module is mainly used in the field of short-range data wireless transmission. It can facilitate the interaction and control between intelligent devices and app.

- ◆ intelligent weighing (scale, body fat weight, nutrition scale, etc.);
- ◆ Sports Health (intelligent rope skipping, pedometer, electric toothbrush, etc.);
- ◆ Smart meter;
- ◆ Smart Medical Device (glucose meter, digital sphygmomanometer, etc.)
- ◆ Sensor Internet of Things et al;

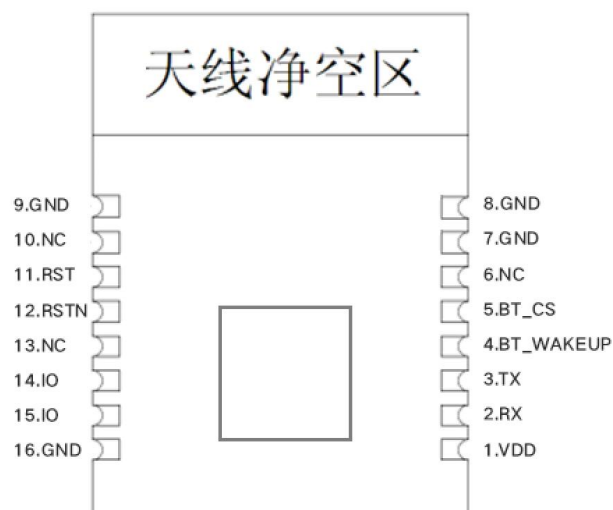
2 Module Interface

2.1 Size package



(Unit: mm)

2.2 Pin port (UART)



2.3 Pin definition (UART)

PIN	Name	Type	Description
1	VDD [A]	Power input	+ 3.0V power supply
2	RX [B]	CMOS input	Serial input
3	TX [B]	CMOS output	Serial output
4	BT_WAKEUP [D]	Sleep and wake up	Wake up after inputting a low-level pulse for more than 30ms during sleep; When a low-level pulse is input for more than 30ms when waking up, it will go to sleep.
5	BT_CS [C]	BT Connection status output	Low output level: Bluetooth is connected. Output high level: Bluetooth is not connected.
6	NC	NC	NC
7	GND	GND	GND
8	GND	GND	GND
9	GND	GND	GND
10	NC	NC	NC
11	RST [D]	Software reset	Input low level pulse above 30ms module reset
12	RSTN	Hardware reset	Input low level: module reset. Input high level: The module works normally.
13	NC	NC	NC
14	IO	IO port	IO
15	IO	IO port	IO
16	GND	GND	GND

Note:

[A] .Operating scope of the power supply: 2.3V~3.3V;

[B] .Baud rate, 9600 by default

[C] .BT_CS serves as an indication of the Bluetooth connection status. When the BM16 is connected to a mobile phone, BT_CS is at a low level; when it is not connected, BT_CS is at a high level, and it should be left floating when not in use.

[D] The pin is only valid on the BM16_V6.3.3 firmware version, and the other firmware versions are not functional.

2.4 Pin definition (I2C)

PIN	Name	Type	Description
1	VDD 【A】	Power input	+ 3.0V power supply
2	WAKEUP	IO port	Default low level, high level effective
3	BT_CS	BT Connection status output	Low output level: Bluetooth is connected. Output high level: Bluetooth is not connected.
4	SCL	SCL	SCL
5	SDA	SDA	SDA
6	NC	NC	NC
7	GND	GND	GND
8	GND	GND	GND
9	GND	GND	GND
10	NC	NC	NC
11	IO	IO port	IO
12	RST	RST	Input low level: module reset. Input high level: The module works normally.
13	NC	NC	NC
14	IO	IO port	IO
15	IO	IO port	IO
16	GND	GND	GND

Note:

【A】.Operating scope of the power supply: 2.3V~3.3V;

3 lectrical parameters

3.1 Absolute electrical parameters

Parameter	Description	Min	Typical	Max	Unit
Ts	Storage temperature	-65		+150	°C
VDD	Supply voltage	-0.4		3.3	V

3.2 Working conditions

Parameter	Description	Min	Typical	Max	Unit
Ta	Working temperature	-20	-	85	°C
VDD	Input voltage	2.35	3.0	3.3	V
VIL	IO low-level input	-0.3	-	VDD+0.3	V
VIH	IO high-level input	VDD-0.3	-	VDD	V
VOL	IO low-level output	VSS	-	VDD+0.3	V
VOH	IO high-level output	VDD-0.3	-	VDD	V

3.3 Power Consumption

Parameter	Working conditions	Typical	Remarks
I_Peak	Peak current	9.18mA	
I_Sleep	Without broadcast sleep current	5.51uA	
I_normal (Working mode, open serial communication)	200ms Broadcast current	875uA	Figure 1
	500ms Broadcast current	784uA	
	1000ms Broadcast current	749uA	Figure 2
	2000ms Broadcast current	731uA	
I_Low power model (Low power consumption mode, close serial communication)	200ms Broadcast current	193uA	
	500ms Broadcast current	76uA	
	1000ms Broadcast current	38uA	Figure 3
	2000ms Broadcast current	21uA	
I_connect (Working mode, open serial communication)	40ms connection current (default)	1.06mA	

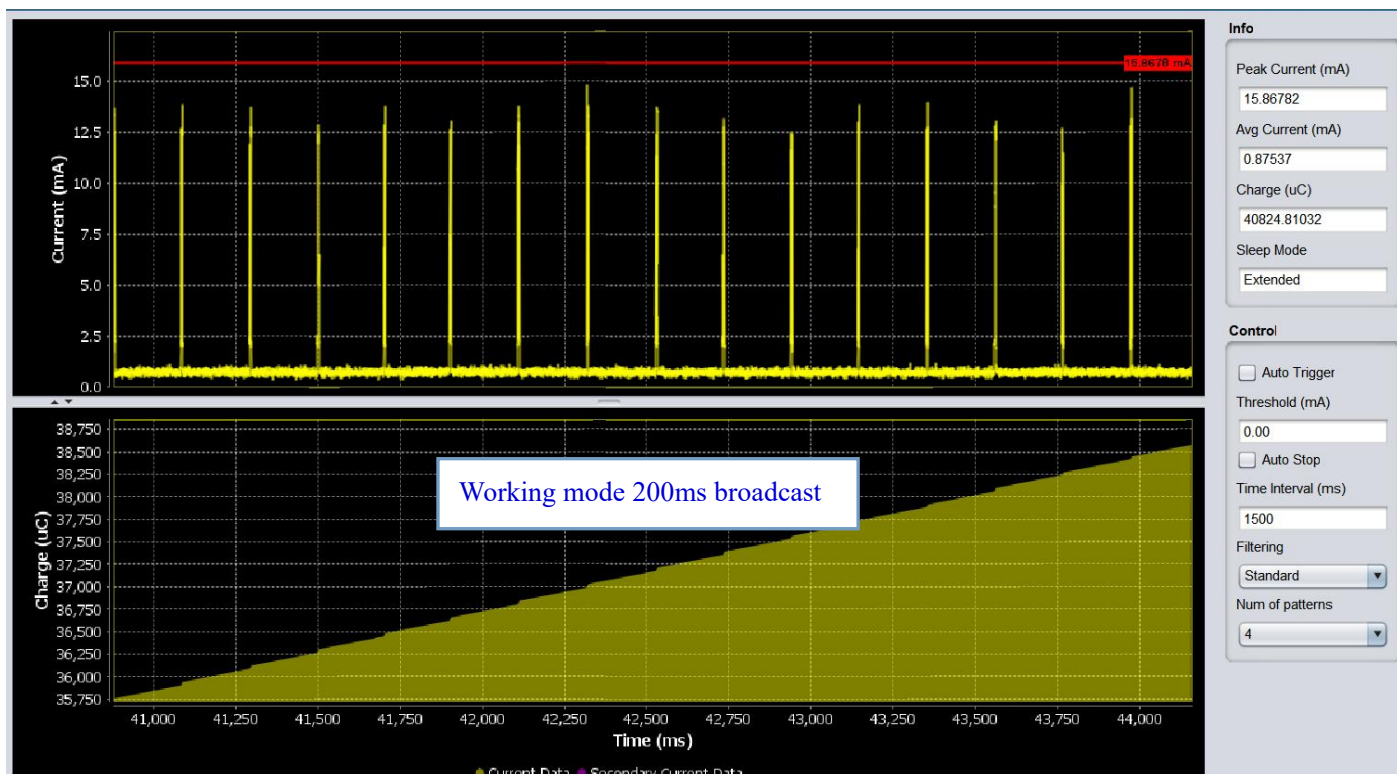


Figure 1 (Working mode 200ms broadcast)

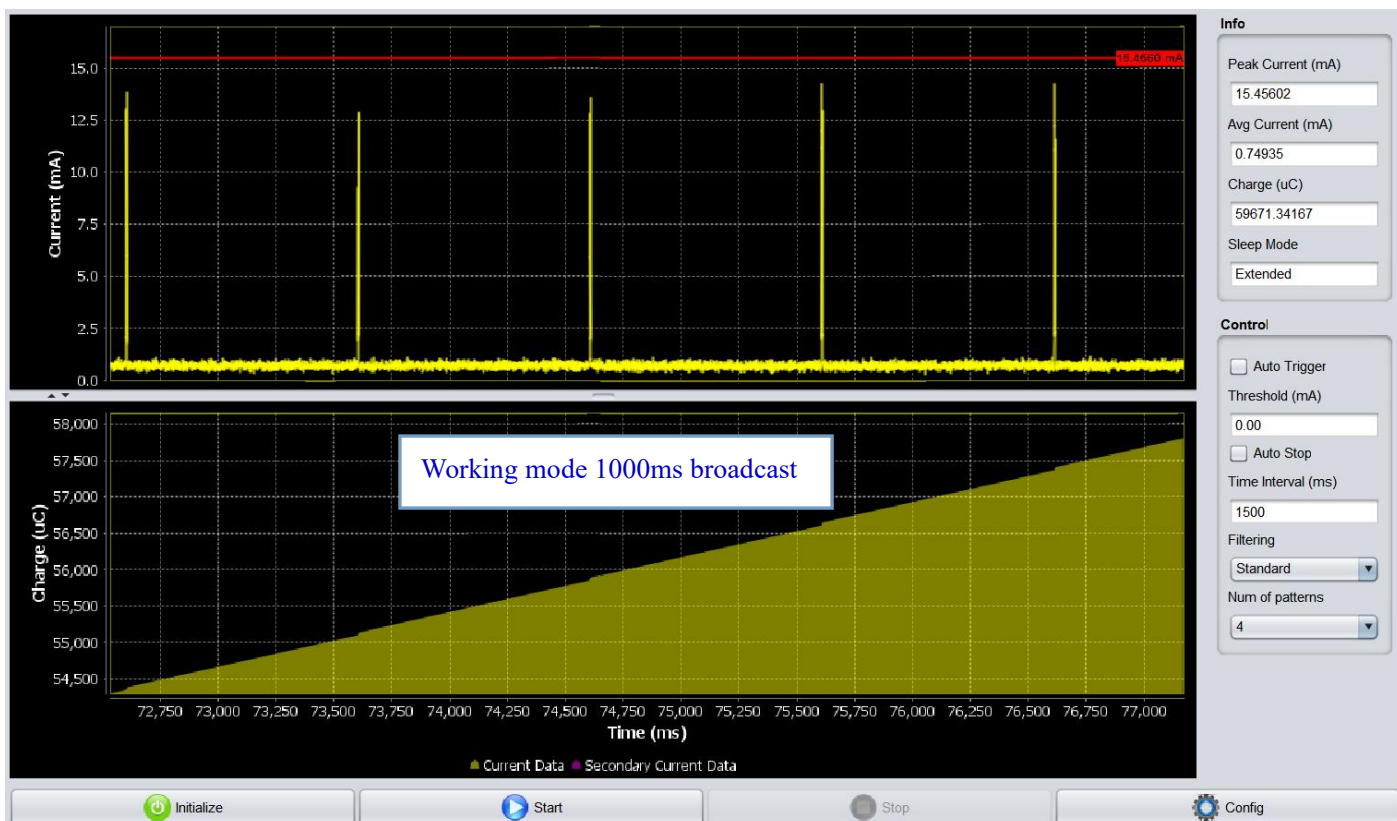


Figure 2 (Working mode 1000ms broadcast)

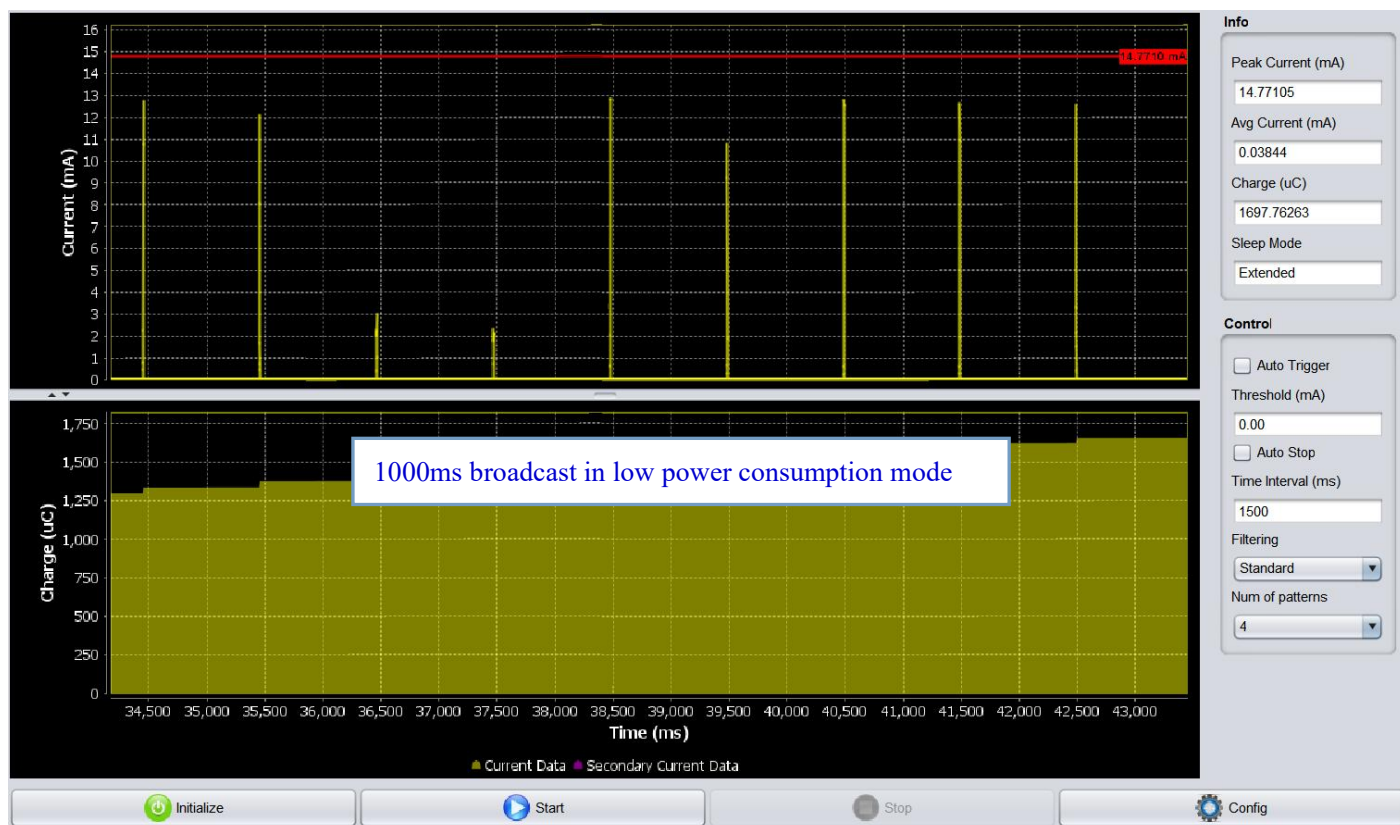


Figure 3 (1000ms broadcast in low power consumption mode)

4 RF characteristics

4.1 Basic RF characteristics

Parameter	Description
Working Frequency	2.4GHz ISM band
Wireless Standard	BLE
Data Transmission Rate	1Mbps
Antenna type	On-board PCB antenna (default)

4.2 RF output power

Parameter	Min	Typical	Max	Unit
RF average output power	-	0	4	dBm
20dB occupies bandwidth		1		MHz

4.3 RF receiving sensitivity

Parameter	Min	Typical	Max	Unit
RX receiving sensitivity	-97	-96		dBm

5 Antenna information

5.1 Antenna type

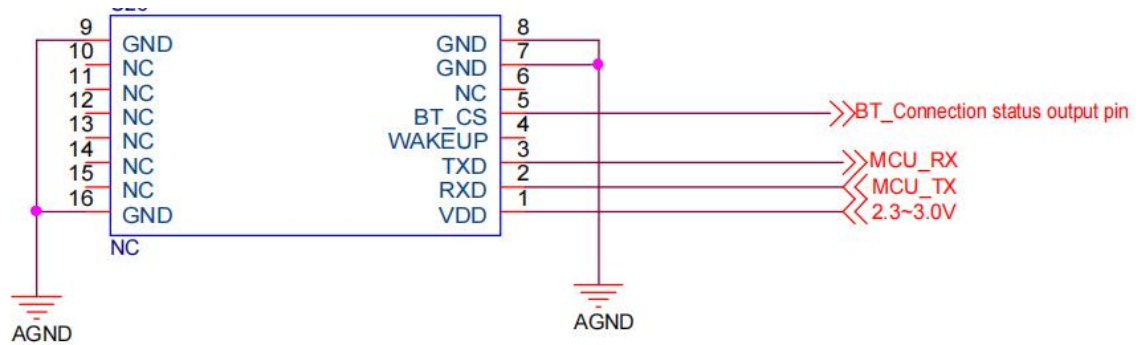
The PCB antenna used is the 2.4GHZ MIFA onboard antenna

5.2 Reduce antenna interference

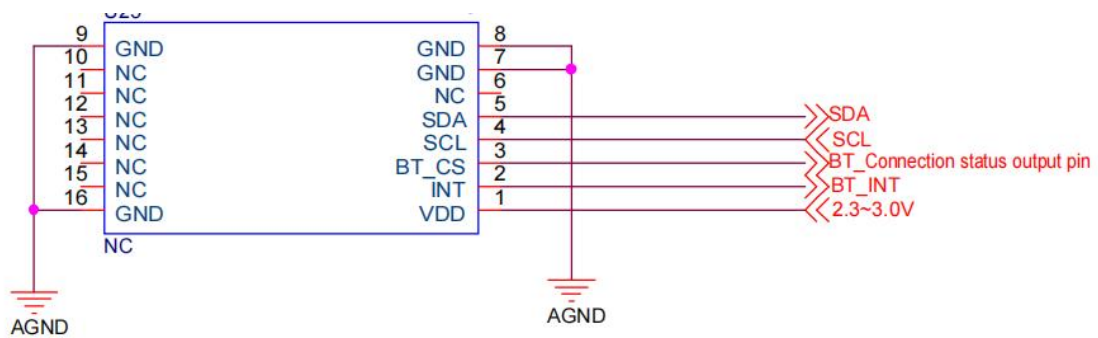
- 5.2.1 Layout note: there shall be no wiring or copper laying under the antenna clearance area of the module.
- 5.2.2 Assembly Note: Ensure clearance height and clearance distance greater than 5MM, to avoid other metal interference with Bluetooth signals.

6 Hardware Reference Design

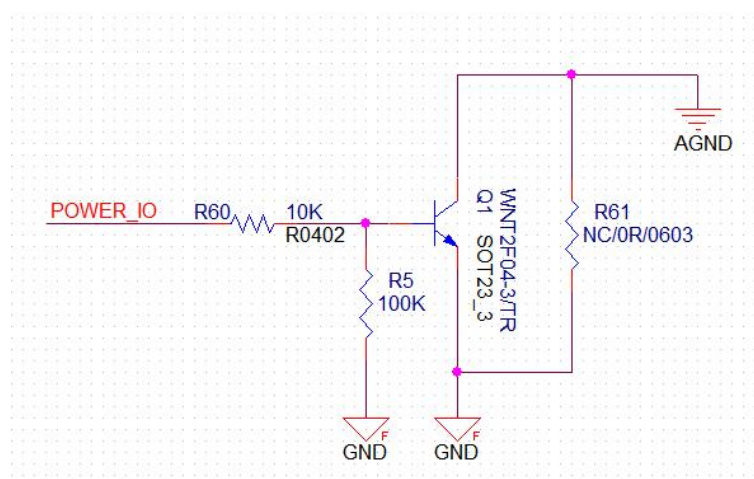
6.1 Typical Application Diagram



UART interface reference design drawing



I2C interface reference design drawing



Module power supply control circuit (control module AGND)

(1. Welding R61, is normal power supply mode; 2. Welding R5/R60/Q1, is power-off mode)

6.2 Design Instructions

6.2.1 BM16 supports normal power mode and power off mode:

Normal power mode - Bluetooth supports history function; The product does not work and Bluetooth is in low power mode.

Power off mode - Bluetooth will be directly cut off, consuming 0 power current, but Bluetooth module cannot support history function; You can supply power when you need it again.

6.2.2 Normal power mode: It can be put into low frequency broadcasting mode by serial command, referring to the communication protocol specifically.

6.2.3 Power off mode: The power supply will be switched off directly.

6.2.4 Power-on requirements: When the module is powered on, first power on the module to the normal power supply voltage, and then **delay 1200ms** to send data to the RX/TX communication interface. Please pay attention to the power-on voltage and text wave not to exceed the limit requirements to avoid damage to the module.

6.2.5 PCB LAYOUT Recommendation:

The feet are long and wide: 1.8mm*0.7mm;

The foot position center spacing (vertical) is: 1.0mm;

The foot position center spacing (transverse) is: 10.9mm;

7 Protocol

7.1 Instruction

The communication protocol is related to the firmware version of the module, and the specific protocol functions shall be subject to the firmware version. Different protocol functions and application scenarios are completely different. Generally speaking, it supports Bluetooth master mode and can scan and connect other Bluetooth devices; Bluetooth slave mode is mainly used for transparent transmission similar to Bluetooth. Special commands and interfaces are required when there is a special protocol.

7.2 General transmission

Universal transmission is supported by default, and users can configure module parameters. Refer to the BM series application manual of this module.

7.3 AiLink protocols

To facilitate customers to develop AiLink series products, this module has corresponding protocols

to support AiLink protocol, AiLink APP and platform, referring to the corresponding AiLink product application manual, such as ailink frontal temperature gun application manual:
<http://www.elinkthings.com/cn/help-detail-171.html> .

7.4 Other custom protocols

To meet the different customer needs, this module can provide a high degree of customer protocol customization requirements, each customized module will have a new firmware version number, please contact our sales staff.

8 Production guidance

8.1 Production guidelines

- 8.1.1 Steel mesh ---- when opening the steel mesh, be sure to open the hole of the module pad. Please open the steel mesh at the ratio of 1:1 and then expand it outward by 0.7mm, with the thickness of 0.12mm.
- 8.1.2 Hold ----- when you need to hold the module, you can't hold it with bare hands. You must wear gloves and electrostatic ring.
- 8.1.3 Plant ambient temperature and humidity----- $\leq 30^{\circ}\text{C}$, $\leq 60\%\text{R.H.}$
- 8.1.4 Baking - baking temperature 125°C , 8 hours.
- 8.1.5 Furnace pass ----- the furnace pass temperature shall be determined according to the requirements of the customer's main board.

8.2 Test gear

To ensure product quality and customer production efficiency, we provide the corresponding test and treatment tools. Please refer to the BM Series Test Box Description. Please contact our company for obtain

9 Contact us

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Web: www.elinkthings.com

10 Appendix (Certification)

REACH



REPORT No.: SZ18110220R02

TEST REPORT

APPLICANT : ShenZhen Elink Technology Co.,LTD

PRODUCT NAME : BM16

MODEL NAME : BM16

BRAND NAME : Elink

TEST REQUEST : As specified by client, to screen 191 substances of very high concern(SVHC) under Regulation(EC) No 1907/2006 of REACH in the submitted sample(s).

RECEIPT DATE : 2018-11-21

TEST DATE : 2018-11-27 to 2018-12-03

ISSUE DATE : 2018-12-04

SUMMARY:

According to the specified scope and analytical techniques, concentrations of tested SVHC are $\leq 0.1\%$ (W/W) in the submitted sample.

ROHS**RoHS TEST REPORT**

APPLICANT : ShenZhen Elink Technology Co. ,LTD
PRODUCT NAME : BM16
MODEL NAME : BM16
BRAND NAME : Elink
TEST REQUEST : Test as requested by client
RECEIPT DATE : 2018-11-21
TEST DATE : 2018-11-27 to 2018-12-03
ISSUE DATE : 2018-12-04
CONCLUSION : Based on the verification results of the submitted samples, the results of Lead,Mercury,Cadmium,Hexavalent chromium, Polybrominated biphenyls (PBBs),Polybrominated diphenyl ethers (PBDEs) and Phthalates such as Bis (2-ethylhexyl) phthalate (DEHP), Dibutyl phthalate (DBP), Butyl benzyl Phthalate (BBP), Diisobutyl phthalate (DIBP)comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU

BQB RF TEST

REPORT No. : SZ18110219B01

TEST REPORT

APPLICANT : ShenZhen Elink Technology Co. ,LTD
PRODUCT NAME : BM16
MODEL NAME : BM16
BRAND NAME : Elink
BLUETOOTH VERSION : 4.2
STANDARD(S) : Bluetooth Low Energy RF PHY Test Specification
RF-PHY.TS.5.0.3
RECEIPT DATE : 2018-11-22
TEST DATE : 2018-11-27 to 2018-12-04
ISSUE DATE : 2018-12-05