Ehong Technology Co.,Ltd

EH-MC16

Low Energy Module Data Sheet

EH-MC16 20180523-DS Rev1.1

- **Bluetooth® Radio**
  - Fully embedded Bluetooth® v5.0 single mode
  - ARM Cortex-M4, 160KB SRAM
  - +8dBm TX power
  - -97dbm RX sensitivity
  - LE advertising Extensions
  - AES128/192/256 encrypt/decrypt engine
  - Supports OTA(Over the Air)
- **Support Profiles**
  - BLE (Master and slave)the same
  - SIGmesh
  - The generic attribute profile (GATT)
  - Health care, Sports and fitness, Proximity sensing profiles
  - Alerts and timer profiles
  - HID （keyboards, remote）
- **User Interface**
  - UART*2
  - SPI master interface
  - RTC
  - I²C *2
  - PWM *8
  - I2S/PCM interface for external audio codec
  - Supports I8080 interface for LCD
  - 4M extend SPI flash
- **General I/O**
  - 15 general purpose I/Os
  - 1 analogue I/O (10bit ADC)
- **Voltage supply: 3.3V typical**
- **Small form factor: 19.6 x 14.5 x 2.2mm**
- **Operating temperature range: -30 °C to 85 °C**

Nov 23, 2018

VERSION HISTORY

Version	Date	Comment
V1.0	Oct 2018	Original publication of this document.
V1.1	Nov 2018	Update contact list

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1. Description

EH-MC16 Bluetooth® low energy single mode module is a single mode device targeted for low power sensors and accessories.

The module offers all Bluetooth® low energy features V5.0: radio, stack, profiles and application space for customer applications, so no external processor is needed. The module also provides flexible hardware interfaces to connect sensors, simple user interfaces or even displays directly to the module.

The module can be powered directly with a standard 3V coin cell batteries or pair of AAA batteries. In lowest power sleep mode it consumes only 1.6uA(no RAM retention and external interrupts enabled) and will wake up in few hundred microseconds.

After buying Bluetooth® module, we provide free technical support APP of iOS system or APP Android system.

2. Applications

- HID: keyboards, mice, touchpads, advanced remote controls with voice activation
- Sports and fitness sensors: heart rate, runner/cycle speed and cadence
- Health sensors: blood pressure, thermometer and glucose meters
- Mobile accessories: watches, proximity tags, alert tags and camera controls
- Smart home: heating/lighting control

3. EH-MC16 Product numbering

EH-MC16

A. EH ---------- Company Name(Ehong)

B. MC16 ---------- Module Name

4. Electrical Characteristics

4.1 Recommended Operation Conditions

Operating Condition	Min	Typical	Max	Unit
Operating Temperature Range	-30	+20	+85	°C
Battery (VDD_BAT) operation	2.1	+3.0	+3.6	V
I/O Supply Voltage (VDD_PIO)	2.1	+3.0	+3.6	V
AIO input	0	-	+1.26	V
Frequency range	2402		2480	MHz

Table 1: Recommended Operation Conditions

4.2 Absolute Maximum Rating

Rating	Min	Max	Unit
Storage Temperature	-40	+85	°C
Battery (VBAT) operation*	0	+3.6	V
I/O supply voltage	0	+3.6	V

Table 2：Absolute Maximum Rating

* Short-term operation up to a maximum of 10% of product lifetime is permissible without damage, but output regulation and other specifications are not guaranteed in excess of 4.2V.

4.3 Input/Output Terminal Characteristics

Input Voltage Levels	Min	Typical	Max	Unit
V_{IL} input logic level low	-	-	25% xVDD	V
V_{IH} input logic level high	70% x VDD	-	-	V
T_r/T_f	-	-	25	ns
Output Voltage Levels	Min	Typical	Max	Unit
V_{OL} output logic level low, I_{OL} = 8.0mA(Max Drive Strength)	-	-	20%X VDD_PADS	V
V_{OH} output logic level high, I_{OL} = - 8.0 mA (Max Drive Strength)	80% x VDD	-	--	V
T_r/T_f (For 30pF load)	-	-	2	ns
Input and Tri-state Current	Min	Typical	Max	Unit
With strong pull-up	3.5	4.7	6.0	KΩ
With strong pull-down	3.5	4.7	6.0	KΩ
With weak pull-up	8	40	50	μA
With weak pull-down	10	40	50	μA
C_I Input Capacitance	-	5	-	pF

Table 3: Digital I/O Characteristics

Input Voltage Levels	Min	Typical	Max	Unit
AIO	0	-	VDD_AUX	V

Table 4: AIO Characteristics

Condition	Class	Max Rating

Human Body Model Contact Discharge per JEDEC EIA/JESD22-A114	1C	2000V (all pins)
Charged Device Model Contact Discharge per JEDEC EIA/JESD22-C101	C1	500V (all pins)

Table 5 ESD Protection

5.Pinout and Terminal Description

5.1 Pin Configuration

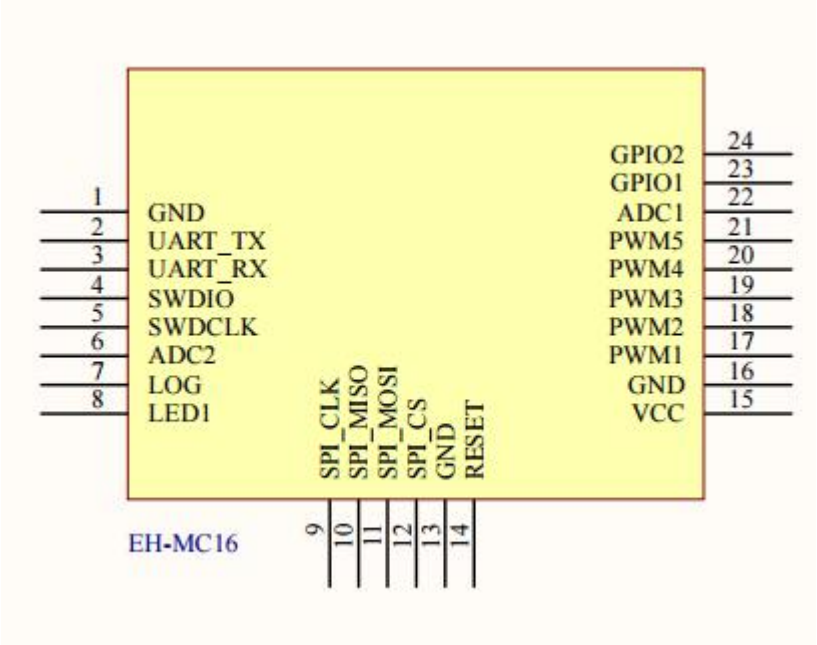

Figure 1： Pinout of EH-MC16

Pin	Pin	I/O	Description	Remark
1	GND			
2	UART_TX		UART TX	The test point for MP needs to be reserved Use of calibration
3	UART_RX		UART RX	The test point for MP needs to be reserved Use of calibration
4	SWDIO	AIO/DIO	Programmable IO	General purpose IO; 8mA driving capability.With wakeup function.With internal strong/weak pull-up and pull-down.SWDIO (default)
5	SWDCLK	AIO/DIO	Programmable IO	General purpose IO; 8mA driving capability.With wakeup function.With internal strong/weak pull-up and pull-down.SWDIO (default)
6	ADC2	AIO/DIO	Programmable IO	GPIO
7	LOG		UART RX	Power on trap: Pull-up for normal operation

				Pull-down to bypass executing program code in flash (PAD internal pull-up by default).
8	LED1	AIO/DIO	Programmable IO	GPIO
9	SPI_CLK	DIO	Programmable IO	GPIO
10	SPI_MISO	DIO	Programmable IO	GPIO
11	SPI_MOSI	DIO	Programmable IO	GPIO
12	SPI_CSN	DIO	Programmable IO	GPIO
13	GND			
14	RESET		Global reset, active low	The test point for MP needs to be reserved Use of calibration
15	VCC		VCC for LDO and Buck	1. Supply, 2 V ~ 3.6 V 2. A set of ADC can be used for battery voltage detection 3. Test point for MP calibration shall be reserved
16	GND			
17	PWM1	AIO	Programmable IO	Support PWM function LED (fixed Timer) Connect cold light by default
18	PWM2	AIO	Programmable IO	Support PWM function LED (fixed Timer) Connect cold light by default
19	PWM3	OD_GPIO	Programmable IO	1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default
20	PWM4	OD_GPIO	Programmable IO	1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default
21	PWM5	OD_GPIO	Programmable IO	1.LED supported PWM such as breathing lamp (adjustable Timer) 2. Default to receive BLUE
22	ADC1	AIO/DIO	Programmable IO	GPIO
23	GPIO1	DIO	Programmable IO	GPIO
24	GPIO2	DIO	Programmable IO	GPIO
TESTPOINT	GPIO3	TPx	Programmable IO	BLE Test mode
TESTPOINT	GPIO2	TPx	Programmable IO	1. The MPTOOL crystal trim 2. Test point for MP calibration shall be reserved

Table 6：PIN Terminal Description

6.Physical Interfaces

6.1Power Supply

- The module power supply 3v coin cell batteries or DC 3.3v
- Power supply pin connection capacitor to chip and pin as far as possible close
- Capacitor decouples power to the chip
- Capacitor prevents noise coupling back to power plane.

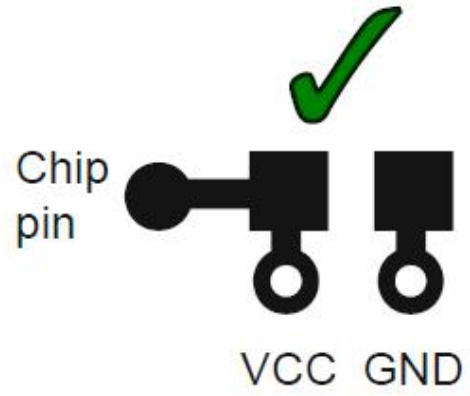

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Figure 2： Power Supply PCB Design

6.2 PWMs

BT Module has 5 PWM.
PWM1: Cold light LED;
PWM2: Warm light LED;
PWM3: RED LED;
PWM4: Green LED;
PWM5: Blue LED.
The PWM1, PWM2 is default high level. Prevent the light from turning on after power on. Need MOS to logic transformation.

6.3 UART

The MC16 embeds UART to implement full-duplex transmission and reception. Both TX and RX interface are 4-layer FIFO interface. Hardware flow control is also support via RTS and CTS.

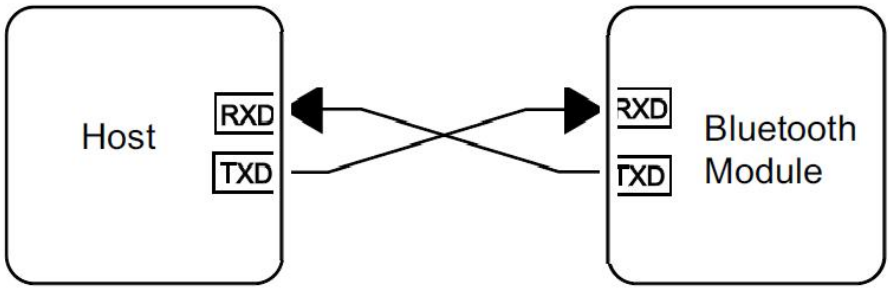

Figure 3： Connection To Host Device

Note：The maximum baud rate is 2400 baud during deep sleep.

6.4 I2C Master/ Slave

The MC16 embeds I2C hardware module, which could act as Master mode or Slave mode. I2C is POPULAR inter-IC interface requiring only 2 bus lines, a serial data line (SDA) and a serial clonk (SCL). M030 I2C module supports standard mode (100kbps), Fast-mode (400kbps), Fast-mode plus (1Mbps) and High-speed mode (3.4Mbps) with restriction that system clock must be by at least 10x of data rate. I2C module of the M030 acts as Slave mode by default. I2C slave mode supports two sub modes including DMA and Mapping mode.

6.5 SPI

The MC16 embed SPI, which could act as Master mode or Slave mode. SPI is high-speed, full-duplex and synchronous communication bus requiring 4bus lines including a chip select (CS) line, a data input (DI) line, a data output (DO)line and a clock (CK) line. SPI for the M030 acts as slave mode by default. SPI Slave mode support DMA.

6.6 Audio

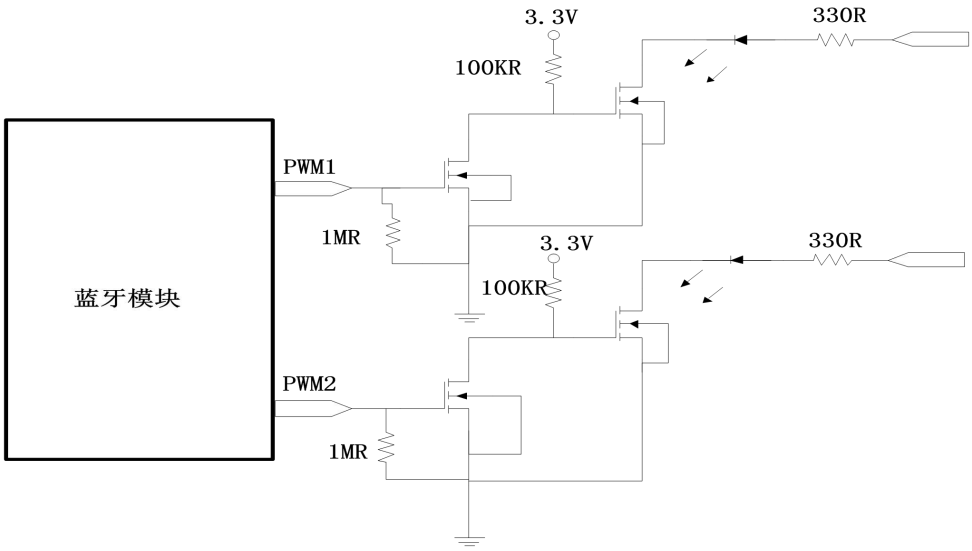

Figure 4： Reference Design

7 Reference Design

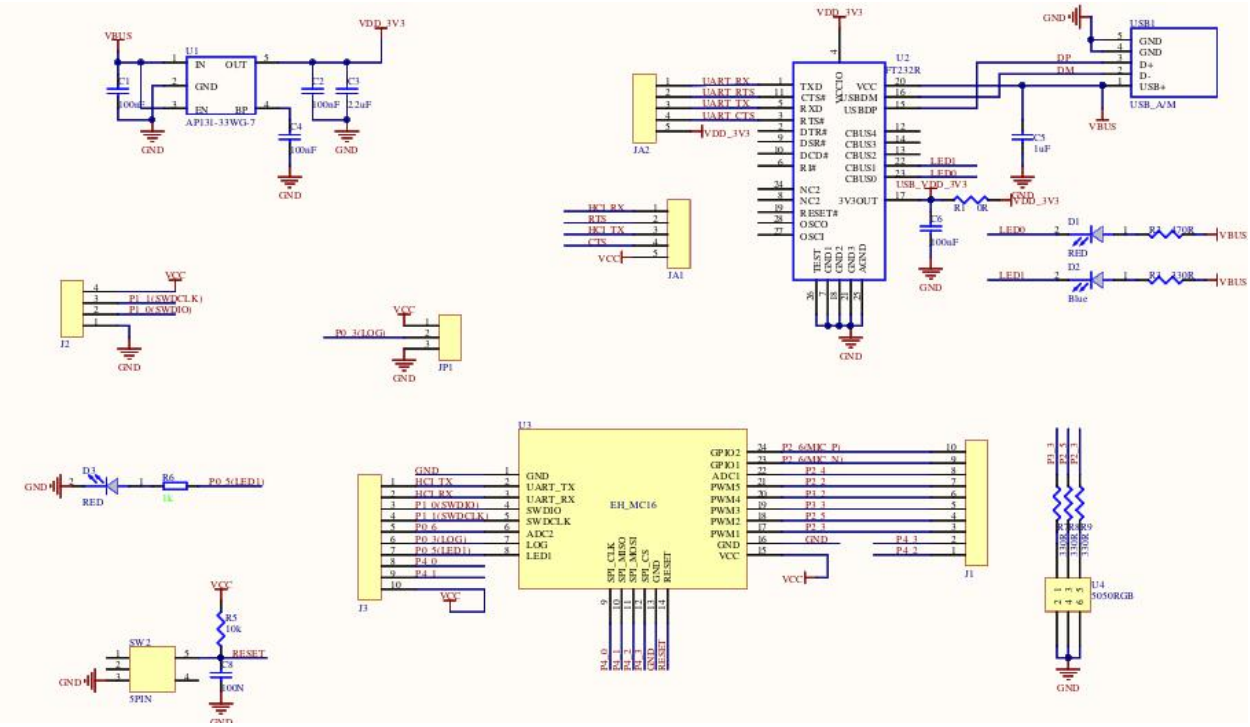

Figure 5: Reference Design important

8 Layout and Soldering Considerations

8.1 Soldering Recommendations

EH-MC16 is compatible with industrial standard reflow profile for Pb-free solders. The reflow profile used is dependent on the thermal mass of the entire populated PCB, heat transfer efficiency of the oven and particular type of solder paste used. Consult the datasheet of particular solder paste for profile configurations.
Comply will give following recommendations for soldering the module to ensure reliable solder joint and operation of the module after soldering. Since the profile used is process and layout dependent, the optimum profile should be studied case by case. The following recommendation should be taken as a starting point guide.

- Refer to technical documentations of particular solder paste for profile configuration.
- Avoid using more than one flow.
- Reliability of the solder joint and self-alignment of the component are dependent on the solder volume. Minimum of 150um stencil thickness is recommended.
- Aperture size of the stencil should be 1:1 with the pad size.
- A low residue, “no clean” solder paste should be used due to low mounted height of the component.

8.2 Layout Guidelines

For optimal performance of the antenna place the module at the corner of the PCB as shown in the figure 6. Do not place any metal (traces, components, battery etc.) within the clearance area of the antenna. Connect all the GND pins directly to a solid GND plane. Place the GND vias as close to the GND pins as possible. Use good layout practices to avoid any excessive noise coupling to signal lines or supply voltage lines. Avoid placing plastic or any other dielectric material closer than 6 mm from the antenna. Any dielectric closer than 6 mm from the antenna will detune the antenna to lower frequencies.

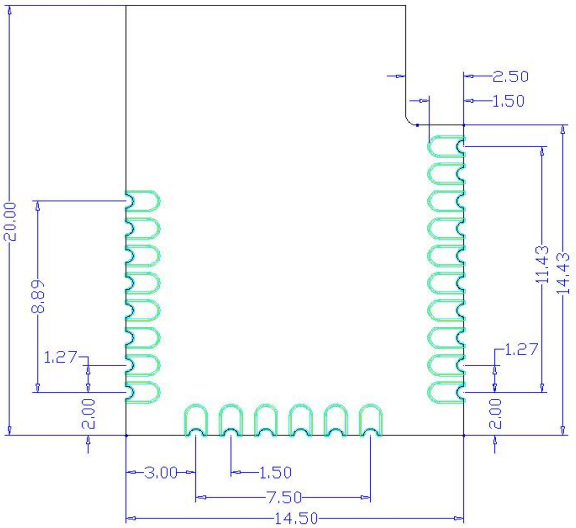

Figure 6： Clearance area of antenna

9 Mechanical and PCB Footprint Characteristics

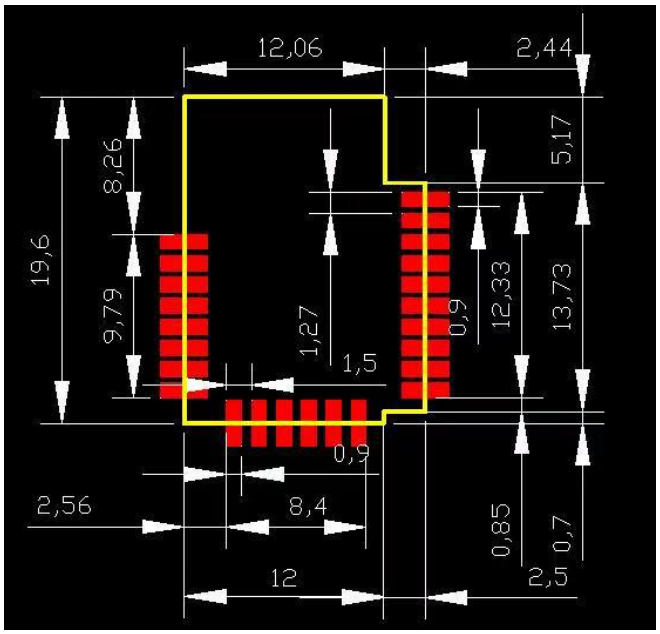

Figure 7：Physical Dimensions and Recommended Footprint (Unit: mm, Deviation:0.02mm)

10 Packaging

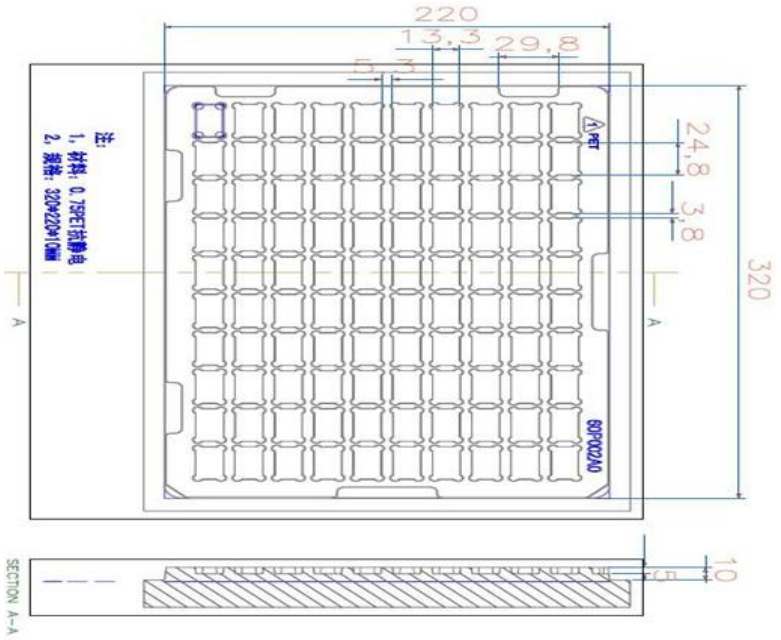

Figure 8： EH-MC16 Packaging (Pallet）

Remark：packaging for the pallet，one packaging quantity is 100 PCS。

11 Contact Information

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