Ehong Technology Co.,Ltd

EH-MC30

Low Energy Module Data Sheet
EH-20170218-DS Rev1.1

- **Bluetooth® Radio**
  - Fully embedded Bluetooth® v4.2 single mode
  - TX power +4 dBm, -93dbm RX sensitivity
  - 128-bit encryption security
  - Range up to 80m
  - Integrated chip antenna
  - Multipoint capability (2devices at master)
  - 32-bit ARM Cortex M0 CPU core
- **Support Profiles**
  - BLE (Master and slave) the same
  - The generic attribute profile (GATT)
  - HID Health care, Sports and fitness, Proximity sensing
  - Alerts and timer profiles
  - HID （keyboards, remote）
- **User Interface**
  - UART（CTS/RTS）
  - SPI master/Slave interface
  - Debug SPI interface for programming（SWD）
  - I²C master controller
  - Quadrature Decoder (QDEC)
  - Real Timer Counter (RTC)
  - 4 x LED PWMs
  - 10 bit Aux ADC
  - 256 KB internal flash
- **General I/O**
  - 22 general purpose I/Os
  - 5 analogue I/O (10bit ADC)
- **Single voltage supply: 1.8V--3.6V typical**
- **Small form factor: 15.72 x 9.15x 2.2mm**
- **Operating temperature range: -25 °C to 75 °C**

Feb 18 2017

VERSION HISTORY

Version	Comment
V1.0	Current consumption added
V1.1	Certification information updated.

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1. Description

EH-MC30 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 V4.2: radio, stack, profiles and application space for customer applications, internal integration Cortex-M0 CPU 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.

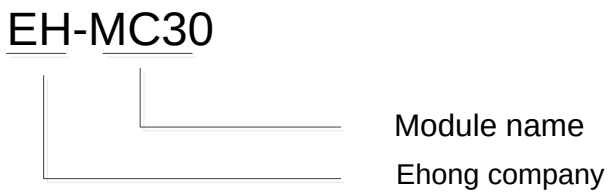
The module can be powered directly with a standard 3V coin cell batteries or pair of AAA batteries. In lowest power sleep mode it consumes only 2.6uA and will wake up in few hundred microseconds.

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

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-MC30 Product numbering



4. Electrical Characteristics

4.1 Recommended Operation Conditions

Operating Condition	Min	Typical	Max	Unit
Operating Temperature Range	-25	+25	+75	°C
Battery (VDD_BAT) operation	2.1	+3.0	+3.6	V
I/O Supply Voltage (VDD_PIO)	1.8	+3.0	+3.6	V
AIO input	0	-	+3.6	V
Frequency Range	2402		2480	MHz

Table 1: Recommended Operation Condition

4.2 Absolute Maximum Rating

Rating	Min	Max	Unit
Storage Temperature	-40	+125	°C
Battery (VBAT) operation*	-0.3	3.9	V
I/O supply voltage	-0.3	+VDD+0.3V	V
Other Terminal Voltages except RF	Vss-0.4	VBAT+0.4	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.

Condition	Class	Max Rating
Human Body Model Contact Discharge per JEDEC EIA/JESD22-A114	1C	4000V (all pins)
Charged Device Model Contact Discharge per JEDEC EIA/JESD22-C101	C1	750V (all pins)

Table 3: ESD Protection

4.4 Power Consumption

The current consumption are measured at the VBAT

Mode	Description	Total typical current at 3.3V (average)
TX at -4dBm	3V using on-chip DC-DC	6.3mA
TX at 0dBm	3V using on-chip DC-DC	10.5mA
TX at +4dBm	3V using on-chip DC-DC	11.8mA
RX mode	3V using on-chip DC-DC	13 mA
Sleep mode	SYSTEM-OFF, no RAM retention	0.6uA
Sleep mode	SYSTEM-OFF, 8KB RAM retention	1.2uA
Sleep mode	SYSTEM-ON, All peripherals in idle mode	2.6uA

Table 4: Current Consumption

5. Pinout and Terminal Description

5.1 Pin Configuration

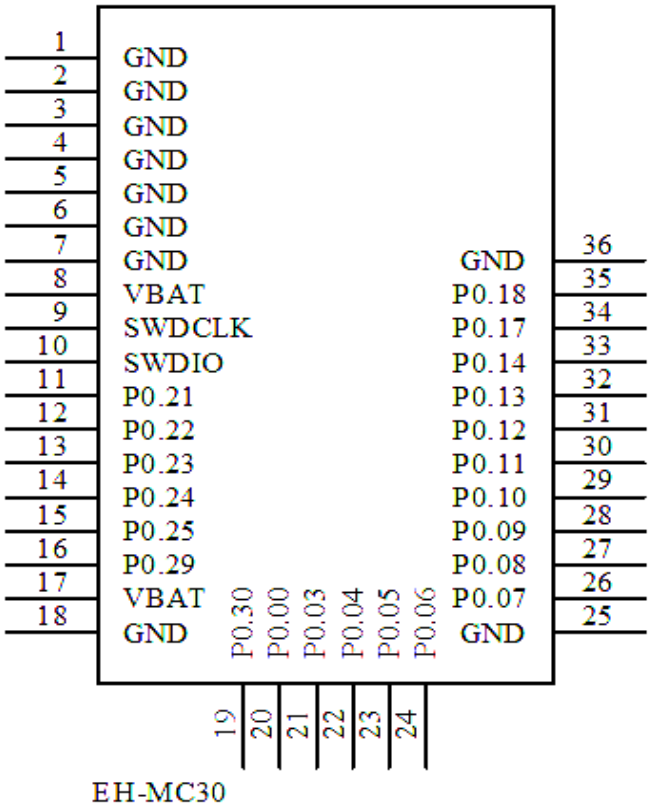


Figure 1： Pinout of EH-MC30

Symbol	Pin	PAD Type	Description
GND	1	Ground	Ground
GND	2	Ground	Ground
GND	3	Ground	Ground
GND	4	Ground	Ground
GND	5	Ground	Ground
GND	6	Ground	Ground
GND	7	Ground	Ground
VBAT	8	Power supply	Power supply 3.3V
SWDCLK	9	Digital input	Hardware debug and flash programming I/O.
SWDIO	10	Digital IO	System reset (active low). Hardware debug and flash programming I/O.
P0.21	11	Digital IO	General purpose I/O pin

P0.22	12	Digital IO	General purpose I/O pin
P0.23	13	Digital IO	General purpose I/O pin.
P0.24	14	Digital IO	General purpose I/O pin
P0.25	15	Digital IO	General purpose I/O pin
P0.29	16	Digital IO	General purpose I/O pin
VBAT	17	Power supply	Power supply 3.3V
GND	18	Ground	Ground
P0.30	19	Digital IO	General purpose I/O pin
P0.00 (AREF0)	20	Digital IO Analog input	General purpose I/O pin ADC/LPCOMP reference input 0
P0.03 (AIN4)	21	Digital IO Analog input	General purpose I/O pin ADC/LPCOMP reference input4
P0.04 (AIN5)	22	Digital IO Analog input	General purpose I/O pin ADC/LPCOMP reference input5
P0.05 (AIN6)	23	Digital IO Analog input	General purpose I/O pin ADC/LPCOMP reference input6
P0.06 (AIN7)	24	Digital IO Analog input	General purpose I/O pin General purpose I/O pin ADC/LPCOMP reference input7
GND	25	Ground	Ground
P0.07	26	Digital IO	General purpose I/O pin
P0.08	27	Digital IO	General purpose I/O pin
P0.09	28	Digital IO	General purpose I/O pin
P0.10	29	Digital IO	General purpose I/O pin
P0.11	30	Digital IO	General purpose I/O pin
P0.12	31	Digital IO	General purpose I/O pin
P0.13	32	Digital IO	General purpose I/O pin
P0.14	33	Digital IO	General purpose I/O pin
P0.17	34	Digital IO	General purpose I/O pin
P0.18	35	Digital IO	General purpose I/O pin
GND	36	Ground	Ground

Table 5：PIN Terminal Description

Note: The module UARTs and I2C can be mapped any PIOs.

6. Physical Interfaces

6.1. Power 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.
- Support power on reset

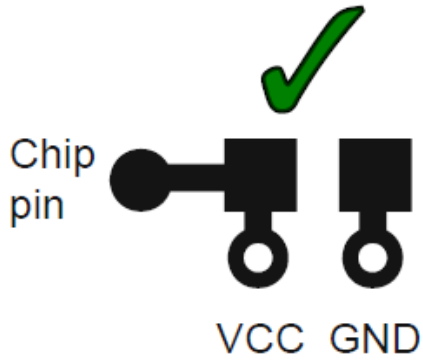


Figure 2： Power Supply PCB Design

6.2. PIO

The general purpose I/O is organized as one port with up to 19 I/Os (dependent on package) enabling access and control of up to 19 pins through one port. Each GPIO can be accessed individually with the following user configurable features:

- Input/output direction
- Output drive strength
- Internal pull-up and pull-down resistors
- Wake-up from high or low level triggers on all pins
- Trigger interrupt on all pins
- All pins can be used by the PPI task/event system.

The maximum number of pins that can be interfaced through the PPI at the same time is limited by the number of GPIOTE channels. All pins can be individually configured to carry serial interface or quadrature demodulator signals.

6.3. AIO

The 10 bit incremental Analog to Digital Converter (ADC) enables sampling of up to 8 external signals through a front-end multiplexer. The ADC has configurable input, reference presaging, and sample resolution (8, 9, and 10 bit)

6.4. PWMs

The module has 4 independently configurable PWM instances.

6.5. UART

The module has 1 UART interface. The Universal Asynchronous Receiver/Transmitter offers fast, full-duplex, asynchronous serial communication with built-in flow control (CTS, RTS) support in hardware up to 1Mbps baud. Parity checking is supported. The GPIOs used for each UART interface line can be chosen from any GPIO on the device and are independently configurable. This enables great flexibility in device pinout and efficient use of board space and signal routing.

Parameter		Possible Values
Baud Rate	Minimum	1200 baud (≤2%Error)
		9600 baud (≤1%Error)
	Maximum	2M baud (≤1%Error)
Parity		None, Odd or Even
Number of Stop Bits		1 or 2
Bits per Byte		8

Table 6: Possible UART Settings

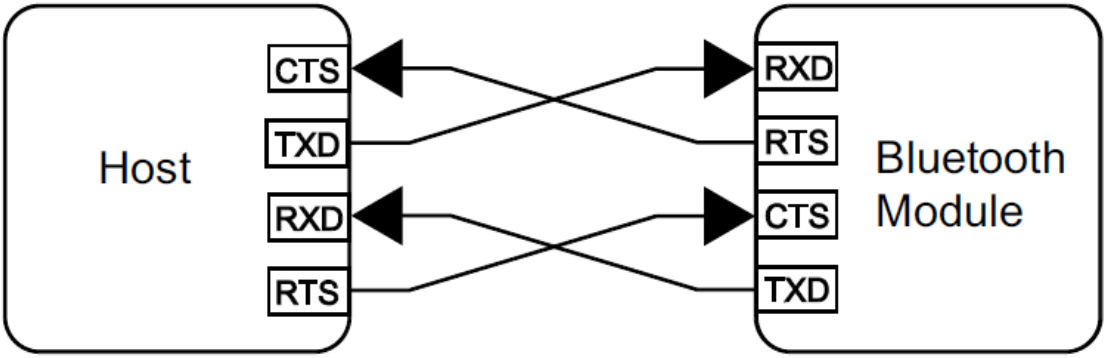


Figure 3： Connection To Host device

6.6. I2C Master/ Slave

The module has 1 I²C master/slave general interface for communication with external peripherals and sensors.

Symbol	Description	Note	Min	Typ.	Max.	Units	Test Level
I_{2W100K}	Run current for TWI at 100 kbps.			380		μA	1
I_{2W400K}	Run current for TWI at 400 kbps.			400		μA	1
f_{2W}	Bit rates for TWI.		100		400	kbps	N/A
$t_{TWI,START}$	Time from STARTRX/STARTTX task is given until start condition.	Low power mode.[1] Constant latency mode.[1]		3 1	4.4	μs	1

For more information on how to control the sub power modes, see the Series Reference Manual.

Figure 4： WTI specifications

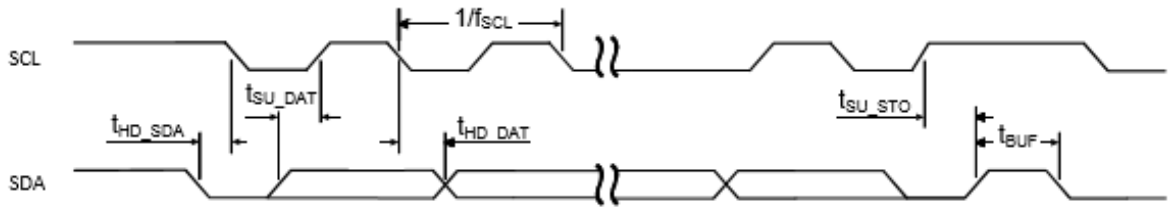


Figure 5： SCL/SDA timing

Symbol	Description	Standard		Fast		Units	Test level
		Min.	Max.	Min.	Max.		
f_{SCL}	SCL clock frequency.		100		400	kHz	1
t_{HD_STA}	Hold time for START and repeated START condition.	5200		1300		ns	1
t_{SU_DAT}	Data setup time before positive edge on SCL	300		300		ns	1
t_{HD_DAT}	Data hold time after negative edge on SCL.	300		300		ns	1
t_{SU_STO}	Setup time from SCL goes high to STOP condition.	5200		1300		ns	1
t_{BUF}	Bus free time between STOP and START conditions.	4700		1300		ns	1

Figure 6： TWI timing parameters

Note: Strong pull is sufficient for I²C on all PIO pads.

6.7. SPI Master/Slave

Symbol	Description	Min.	Typ.	Max.	Units	Test level
$I_{GPIOTE,IN}$	Run current with 1 or more GPIOTE active channels in Input mode.		22		μA	1
$I_{GPIOTE,OUT}$	Run current with 1 or more GPIOTE active channels in Output mode.		0.1		μA	1
$I_{GPIOTE,IDLE}$	Run current when all channels are in Idle mode. PORT event can be generated with a delay of up to t_{1V2}		0.1		μA	1

Figure 7：SPI specifications

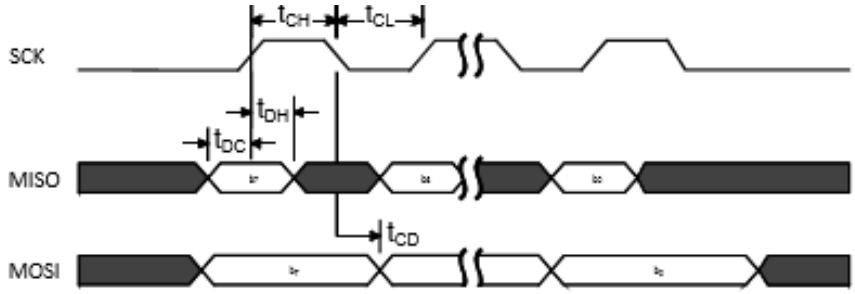


Figure 8：SPI timing diagram, one byte transmission, SPI mode

Symbol	Description	Note	Min.	Typ.	Max.	Units	Test level
t_{DC}	Data to SCK setup.		10			ns	1
t_{DH}	SCK to data hold.		10			ns	1
t_{CD}	SCK to data valid.	C_{LOAD} = 10 pF			97[2]	ns	1
t_{CL}	SCK low time.		40			ns	1
t_{CH}	SCK high time.		40			ns	1
f_{SCK}	SCK frequency.		0.125			MHz	1
t_R, t_F	SCK rise and fall time.					ns	1

Figure 9： SPI timing parameters

6.8. SPI Debug

The two pin Serial Wire Debug (SWD) interface provided as a part of the Debug Access Port (DAP) offers a flexible and powerful mechanism for non-intrusive debugging of program code. Breakpoints and single stepping are part of this support.

7. Reference Design

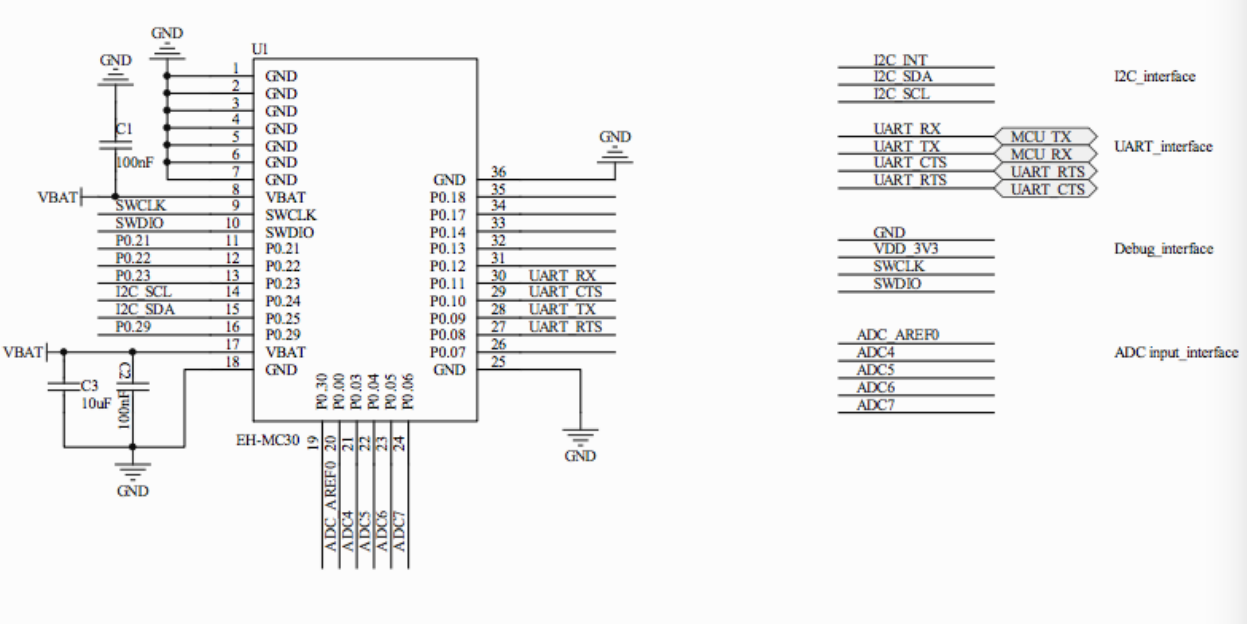


Figure 10： Reference Design

8. Layout Guidelines

For optimal performance of the antenna place the module at the corner of the PCB as shown in the figure 3. 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 via 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.

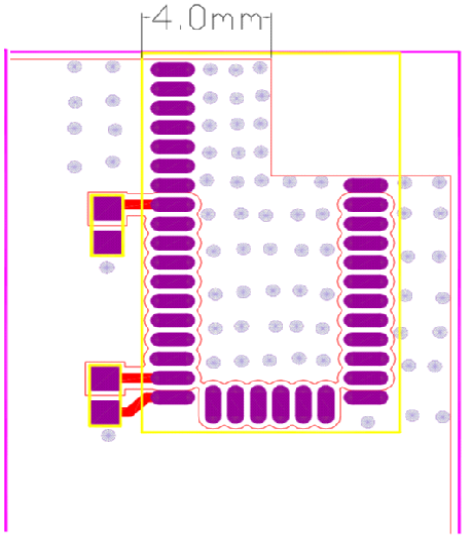


Figure 11： Clearance area of antenna

9. Mechanical and PCB Footprint Characteristics

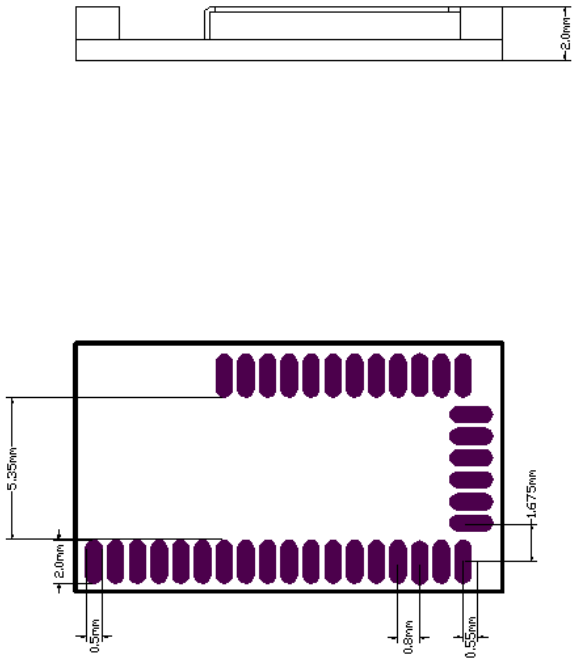


Figure 12：Physical Dimensions and Recommended Footprint (Unit: mm, Deviation:0.02mm)

10. EH-MEVK-MC30

10.1. EH-MEVK-MC30-PCB

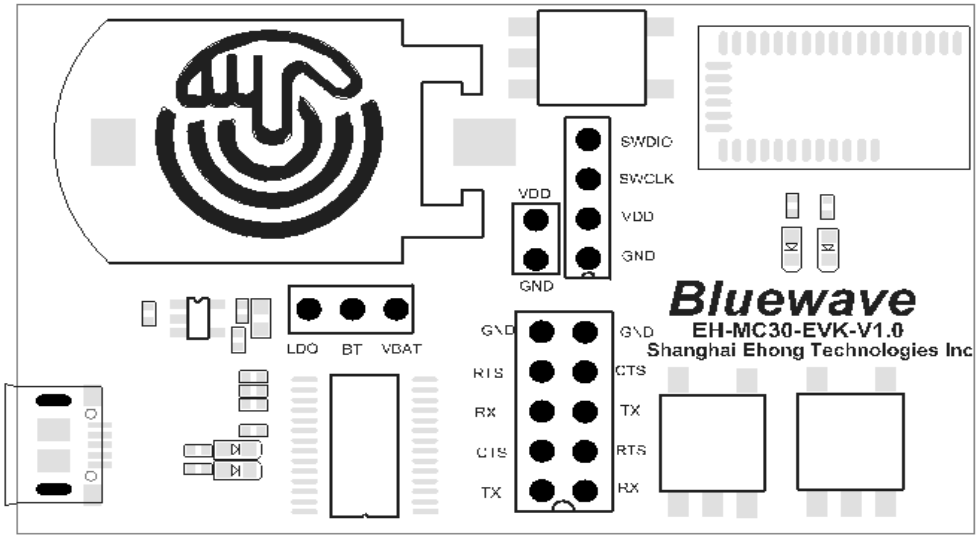


Figure 13： EH-MEVK-MC30-PCB

A. EH-MEVK-MC30 has two power supplies: LDO_3V3 and cell battery.
B. USB RS232 interface, connect to module UART.
C. SWD PIN, Button and LED interface.
D. Any more information, please document of EH-MEVK-MC30 using guide.

10.2. EH-MEVK-MC30-SCH

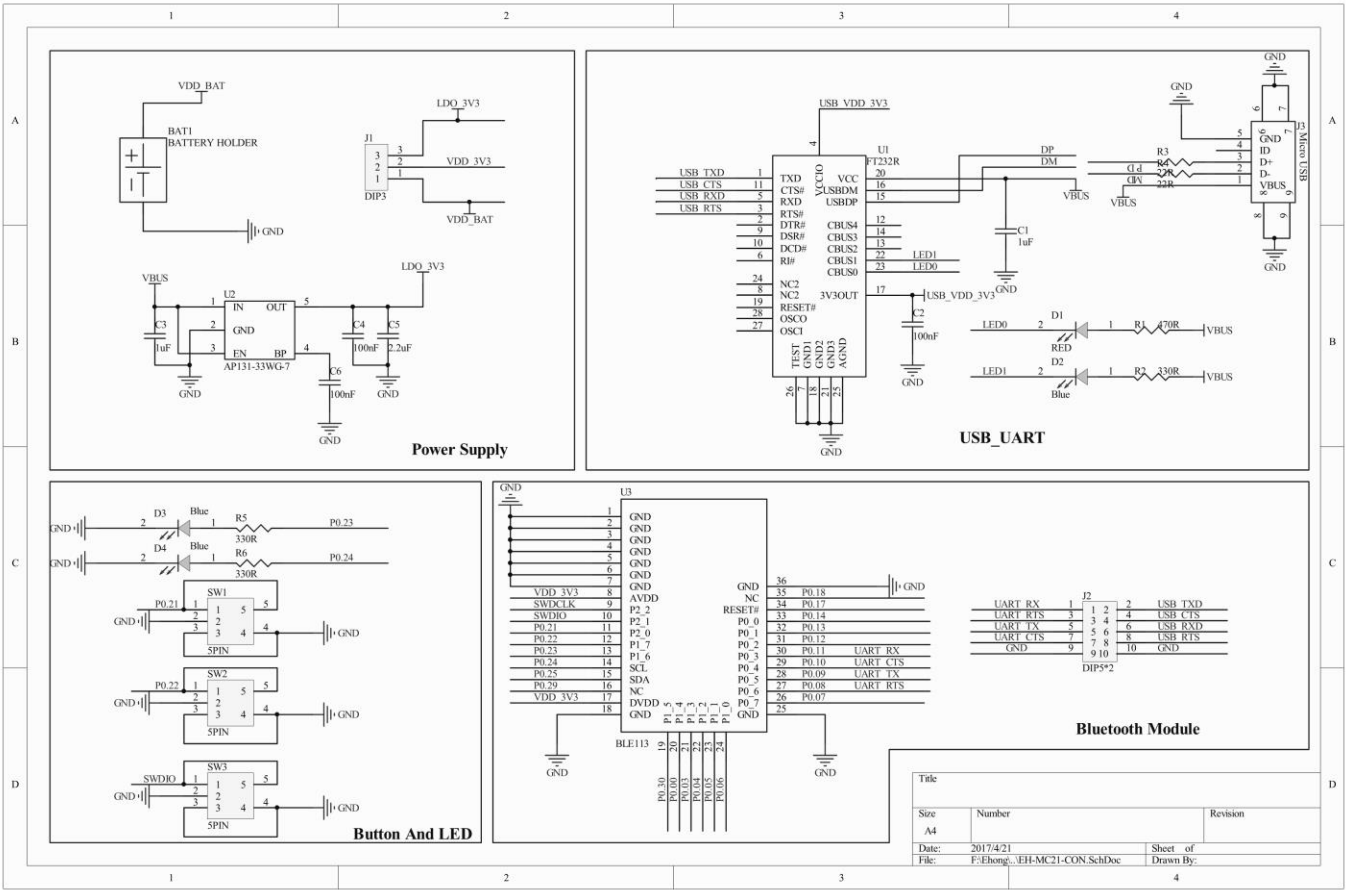


Figure 14: EH-MEVK-MC30-SCH

11. Packing

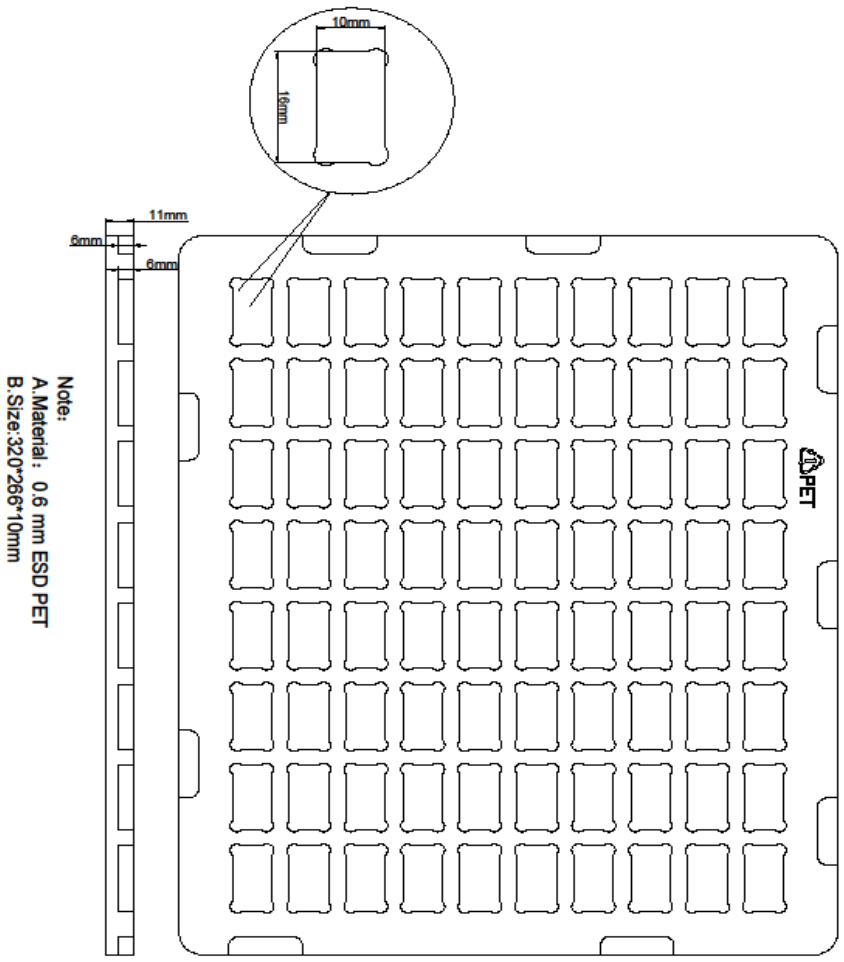


Figure 15： EH-MC30 Packaging（Pallet）

Remark: Packing for the pallet，one packaging quantity is 80 PCS。

12. Soldering Recommendations

EH-MC30 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.

SMT stencil making requirements

- ✧ If bluetooth module PIN pitch ≥ **0.25mm** and other component PIN pitch ≥ **0.25mm** ,so you choose SMT stencil thickness **0.15mm**。
- ✧ If bluetooth module PIN pitch ≥ **0.25mm** and other component PIN pitch ≤ **0.25mm** ,so you choose SMT Ladder stencil Bluetooth module thickness **0.15mm** other component thickness **0.13mm.**
- ✧ Solder pad open via ratio **Length 1:1.2, width 1:1.**

13. Certification

EH-MC30 is compliant to following specifications.

13.1. FCC and IC

EH-MC30 complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

✧ This device may not cause harmful interference;

✧ This device must accept any interference received, including interference that may cause undesired operation.

Contains FCC ID: 2ACCRMC30

Contains IC: 20625-EHMC230

13.2. RED

EH-MC30 is in conformity with the essential requirements and other relevant requirements of the EU-RED Directive (2014/53/EU). The product is conformity with the following standards and/or normative documents.

✧ EMC (immunity only) EN 301 489-1 V.2.2.0 in accordance with EN 301 489-17 V3.2.0

✧ Radiated emissions EN 300 328 V2.1.1

✧ Safety EN60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013

13.3. RoHS

EH-MC30 is in conformity with the essential requirements and other relevant requirements of the EC Council 2011/65/EU (RoHS 2.0), The applied standards: IEC 62321 Ed 1.0:2013

14. Contact Information

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