

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



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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Contents

1.	. Description	4
2.	. Applications	5
3.	EH-MC16 Product numbering	5
4.	Electrical Characteristics	5
	4.1 Recommended Operation Conditions	5
	4.2 Absolute Maximum Rating	
	4.3 Input/Output Terminal Characteristics.	6
5.	Pinout and Terminal Description	7
	5.1 Pin Configuration.	7
6.	Physical Interfaces	9
	6.1 Power Supply	9
	6.2 PWMs	9
	6.3 UART	9
	6.4 I2C Master/ Slave	10
	6.5 SPI	10
	6.6 Audio	10
7	Reference Design	11
8	Layout and Soldering Considerations	11
	8.1 Soldering Recommendations	11
	8.2 Layout Guidelines	12
9	Mechanical and PCB Footprint Characteristics	12
10	0 Packaging	13
11	1 Contact Information	13



Tables

TABLE	1:	RECOMMENDED OPERATION CONDITIONS	<u>5</u>
TABLE	2:	ABSOLUTE MAXIMUM RATING	6
TABLE	3:	DIGITAL I/O CHARACTERISTICS	6
		AIO CHARACTERISTICS	
TABLE	5:	ESD PROTECTION.	7
F	ig	ures	
FIGURE	1:	PINOUT OF EH-MC16	7
		POWER SUPPLY PCB DESIGN	
FIGURE	3:	CONNECTION TO HOST DEVICE	10
FIGURE	4:	Reference Design	
FIGURE	5:	REFERENCE DESIGN IMPORTANT	11
FIGURE	6:	CLEARANCE AREA OF ANTENNA	12
FIGURE	7:	PHYSICAL DIMENSIONS AND RECOMMENDED FOOTPRINT (UNIT: MM, DEVIATION: 0.02MM)	12
		EH-MC16 PACKAGING (PALLET)	

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

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, l _{OL} =	-	-	20%X	V
8.0mA(Max Drive Strength)			VDD_PADS	
V _{OH} output logic level high, lo _L = - 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	ΚΩ
With strong pull-down	3.5	4.7	6.0	ΚΩ
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

^{*} 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.



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

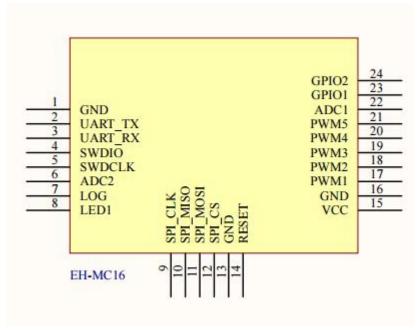


Figure 1: Pinout of EH-MC16

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



Rull-down to bypase executing program code in flash (PAD internal pull-up by default).					
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 reserved Use of calibration 15 VCC VCC for LDO and Buck Support PWM function LED (fixed Timer) 16 GND 17 PWM1 AIO Programmable IO Support PWM function LED (fixed Timer) 18 PWM2 AIO Programmable IO Support PWM function LED (fixed Timer) 20 PWM4 OD_GPIO Programmable IO Programmable IO Programmable IO Support PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 4. DP_GPIO Programmable IO GPIO TESTPO INT GPIO2 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be					
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 Programmable IO Support PWM programmable IO Support PWM function LED (fixed Timer) 15 VCC Support PWM function LED (fixed Timer) 16 GND 17 PWM1 AIO Programmable IO Support PWM function LED (fixed Timer) 18 PWM2 AIO Programmable IO Support PWM function LED (fixed Timer) 19 PWM3 OD_GPIO Programmable IO Programmable IO Support PWM function LED (fixed Timer) 20 PWM4 OD_GPIO Programmable IO Programmable IO Support PWM function LED (fixed Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 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 25 GPIO3 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	8	LED1	AIO/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 reserved Use of calibration 15 VCC VCC for LDO and Buck DVCC and be used for battery voltage detection 3. Test point for MP calibration shall be reserved DVCC fixed Timer) 16 GND 17 PWM1 AIO Programmable IO Support PWM function LED (fixed Timer) Connect cold light by default Support PWM function LED (fixed Timer) Connect cold light by default DVCC DVCC fixed Timer) 19 PWM3 OD_GPIO Programmable IO Programmable IO Programmable IO Support PWM such as breathing lamp (adjustable Timer) 3. RED by default DVCC DVCC DVCC DVCC DVCC DVCC DVCC DVC	9	SPI_CLK	DIO	Programmable IO	GPIO
12 SPI_CSN DIO Programmable IO GPIO 13 GND 14 RESET Global reset, active low reserved Use of calibration 15 VCC VCC for LDO and Buck VCC for LDO and Buck Support PVM function LED (fixed Timer) 16 GND 17 PWM1 AIO Programmable IO Support PVM function LED (fixed Timer) 18 PWM2 AIO Programmable IO Programmable IO (fixed Timer) 19 PWM3 OD_GPIO Programmable IO Programmable IO Programmable IO Programmable IO Support PVM such as breathing lamp (adjustable Timer) 20 PWM4 OD_GPIO Programmable IO GPIO ITESTPO INT GPIO2 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim II. The MPTOOL crystal trim II. The MPTOOL crystal trim II. The III. The MPTOOL crystal trim III. The III II. The III II. The III III II. The III III III III III III III III III I	10	SPI_MISO	DIO	Programmable IO	GPIO
Support PWM function LED (fixed Timer) Connect cold light by default	11	SPI_MOSI	DIO	Programmable IO	GPIO
RESET	12	SPI_CSN	DIO	Programmable IO	GPIO
active low reserved Use of calibration 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 18 PWM2 AIO Programmable IO 19 PWM3 OD_GPIO Programmable IO 20 PWM4 OD_GPIO Programmable IO 21 PWM5 OD_GPIO Programmable IO 22 ADC1 AIO/DIO Programmable IO 23 GPIO1 DIO Programmable IO Programmable IO GPIO 24 GPIO2 DIO Programmable IO GPIO 25 GPIO3 TPX Programmable IO GPIO 26 GPIO3 TPX Programmable IO GPIO 27 GPIO2 TPX Programmable IO GPIO 28 GPIO2 TPX Programmable IO GPIO 29 GPIO2 TPX Programmable IO GPIO 21 TESTPO INT 21 The IZC SDA 2 ABC I AIO/DIO Programmable IO GPIO 2 GPIO3 TPX Programmable IO GPIO 3 GPIO4 TIX Programmable IO GPIO 4 GPIO2 TPX Programmable IO BLE Test mode 4 TESTPO INT 5 INT	13	GND			
VCC for LDO and Buck Support PWM calibration shall be reserved	14	RESET		,	*
PWM1 AIO Programmable IO Support PWM function LED (fixed Timer) Connect cold light by default	15	VCC			2. A set of ADC can be used for battery voltage detection3. Test point for MP calibration shall be
17	16	GND			
19 PWM3 OD_GPIO Programmable IO (fixed Timer) Connect cold light by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 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 TESTPO INT GPIO3 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	17	PWM1	AIO	Programmable IO	(fixed Timer)
PWM3 OD_GPIO Programmable IO Programmable IO 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. RED by default 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 1. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 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 TESTPO INT GPIO3 TPx Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	18	PWM2	AIO	Programmable IO	(fixed Timer)
20 PWM4 OD_GPIO Programmable IO 1. The I2C SDA 2. LED supported PWM such as breathing lamp (adjustable Timer) 3. GREEN by default 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 TESTPO INT GPIO2 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	19	PWM3	OD_GPIO	Programmable IO	The I2C SDA LED supported PWM such as breathing lamp (adjustable Timer)
Programmable IO 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 TESTPO INT GPIO2 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	20	PWM4	OD_GPIO	Programmable IO	The I2C SDA LED supported PWM such as breathing lamp (adjustable Timer)
23 GPIO1 DIO Programmable IO GPIO 24 GPIO2 DIO Programmable IO GPIO TESTPO INT GPIO2 TPx Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	21	PWM5	OD_GPIO	Programmable IO	breathing lamp (adjustable Timer)
24 GPIO2 DIO Programmable IO GPIO TESTPO INT GPIO2 TPx Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	22	ADC1	AIO/DIO	Programmable IO	GPIO
TESTPO INT	23	GPIO1	DIO	Programmable IO	GPIO
TESTPO GPIO2 TPX Programmable IO BLE Test mode 1. The MPTOOL crystal trim 2. Test point for MP calibration shall be	24	GPIO2	DIO	Programmable IO	GPIO
INIT GPIO2 TPx Programmable IO 2. Test point for MP calibration shall be		GPIO3	TPx	Programmable IO	BLE Test mode
		GPIO2	TPx	Programmable IO	2. Test point for MP calibration shall be

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.

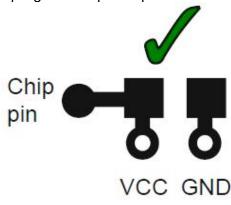


Figure 2: Power Supply PCB Design

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.



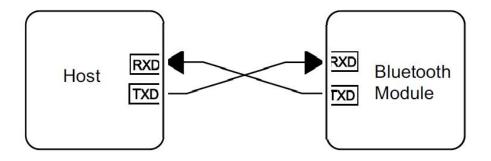


Figure 3: Connection To Host Device

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

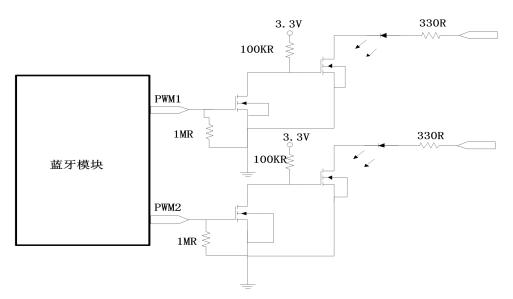


Figure 4: Reference Design



7 Reference Design

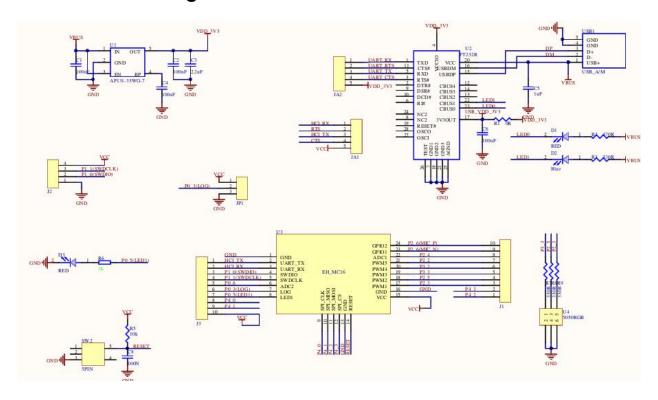


Figure 5: Reference Design important

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.

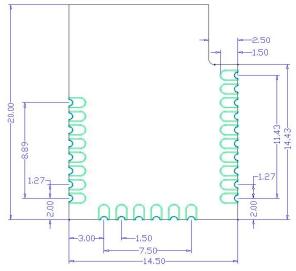


Figure 6: Clearance area of antenna

9 Mechanical and PCB Footprint Characteristics

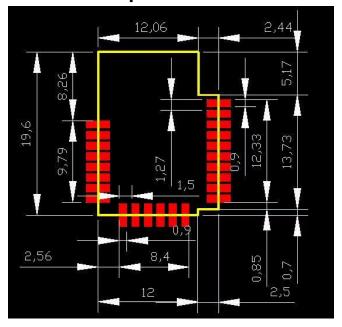


Figure 7: Physical Dimensions and Recommended Footprint (Unit: mm, Deviation:0.02mm)



10 Packaging

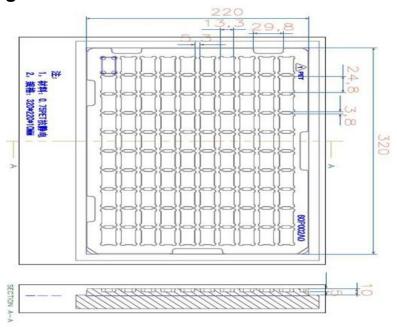


Figure 8: EH-MC16 Packaging (Pallet)

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

11 Contact Information

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