**MtM Technology**

# M907

## Bluetooth 4.2 Low Energy/Zigbee SiP Module

with MCU and integrated antenna

Preliminary DATASHEET
8th March, 2017

# Table of Contents

# 1 Product Brief

The SiP module is a small size module with antenna inside. It's compatible with standards and industrial alliance specifications including Bluetooth Smart (BLE4.0 and BLE4.2), BLE Mesh, 6LoWPAN, Thread, Zigbee, RF4CE, HomeKit and 2.4GHz proprietary standard. It allows easy connectivity with Bluetooth Smart Ready mobile phones, tablets, laptops, which supports BLE slave and master mode operation, including broadcast, encryption, connection updates, and channel map updates.

It is completely RoHS-compliant and 100% lead (Pb)-free

For the software and driver development, we provide extensive technical document and reference software code for the system integration.  Hardware evaluation kit and development utilities are ready to applied.

## KEY FEATURES

- Bluetooth 4.2 Low Energy Compliant
- Embedded 32bits high-Performance MCU with clock up to 48MHz
- 512 kB programmable flash
- 32 kB SRAM
- Built-in antenna
- Module size: 12x12 mm

# 2 Features and Applications

## Feature List

- Embedded32-bit high performance MCU with clock up to 48MHz.
- Program memory: internal 512KB Flash.
- Data memory: 32KB on-chip SRAM.
- 12MHz/16MHz & 32.768KHz Crystal and 32KHz/32MHz embedded RC oscillator.
- A rich set of I/Os:
  - Up to 36/21 GPIOs depending on package option;
  - DMIC (Digital Mic);
  - AMIC (Analog Mic);
  - Mono-channel Audio output;
  - SPI;
  - I2C;
  - UART with hardware flow control;
  - USB;
  - Debug Interface.
- Up to 6 channels of PWM, 2-channel IR.
- Sensor:
  - 14bit ADC with PGA;
  - Temperature sensor.
- One quadrature decoder.
- Embedded hardware AES.
- Operating temperature:-40℃~+85℃ industrial temperature range.
- Antenna On Package (AoP)
- LGA-29 package,12 x 12 mm

## Applications

- IoT
  - Smart home
  - Sensor networks
  - Building automation
  - Industrial
  - Retail

- Personal area networks
  - Medical devices
  - Key-fobs and wrist watches

- Beacons
- Remote control toys

# 3 Block Diagram

There is fully integration module with TLSR8269F512, 12MHz low power crystal. Especially, there is a high-performance PCB antenna.
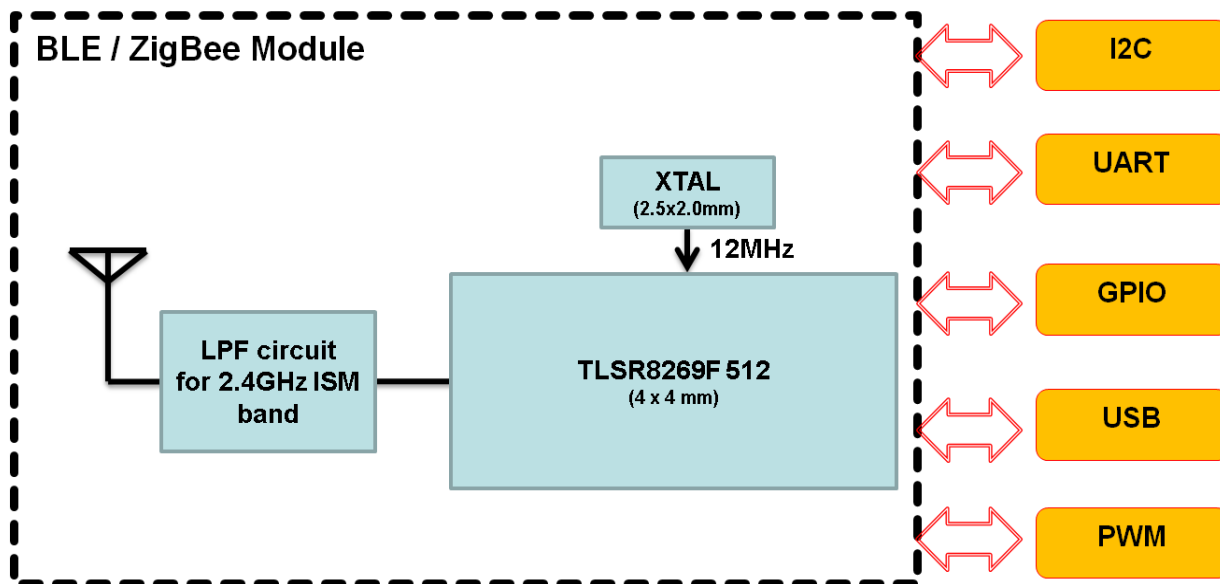
# 4 Technical Specifications

Operation and storage condition

## 4.1 Absolute Maximum Ratings

| Item | Description | | Value | Unit |
|------|-------------|---|-------|------|
| **Ratings Over Operating Free-Air Temperature Range** | | | | |
| **1** | Supply voltage | All supply pins must have the same voltage | -0.3 to 3.9 | V |
| **2** | Voltage on any pin | | -0.3 to 3.9 | V |
| **3** | Storage temperature range | | -40 to 125 | °C |
| **4** | Bluetooth RF output (Typ.) | | 4 | dBm |

## 4.2 Operation Condition

| Operating Condition | Min | Typical | Max | Unit |
|---------------------|-----|---------|-----|------|
| VCC | 1.7 | 3.3 | 3.6 | V |
| Operation ambient temperature range | -40 | | 85 | °C |

## 4.3 Wireless Specifications

The M907 module is compliant with the following features and standards:

| Features | Description |
|----------|-------------|
| Bluetooth Standards | Bluetooth core v4.2 Low Energy |
| Antenna Port | Built-in Antenna |
| Frequency Band | 2.402 – 2.480 GHz |

## 4.4 Radio Specifications – Bluetooth 4.2 Low Energy

| Features | Description |
|----------|-------------|
| Features | Bluetooth core v4.2 Low Energy |
| Frequency Band | 2.402 – 2.480 GHz |
| Number of selectable sub channels | 40 Channels |
| Modulation | GFSK |
| Support Rates | <2Mbps |
| Maximum receive level | -10dBm (with PER<30.8%) |

## 4.5 Built-In Antenna Performance

| Item | Freq. Band | Gain | Return Loss | VSWR |
|------|-----------|------|-------------|------|
| Spec | 2.4~2.5 GHz | >5dBi | <6dB | 3 max |
| Item | Impedance | Polarization | Directivity | Efficiency |
| Spec | 50 ohm | Linear | Omni-Directional | >30% |

## 4.6 Power Consumption

| Item | Typ. | Units |
|------|------|-------|
| Tx Mode 0dBm | | mA |
| Rx Mode @ 1Mb/s | | mA |
| Sleep Mode | | uA |
| | | uA |
| | | uA |

# 5 Dimensions

The size and thickness of the M907 module are 12mm (W) x 12mm (L) x 1.6mm (H):

PIN **1** CORNER

Bottom-View:

PIN **1** CORNER
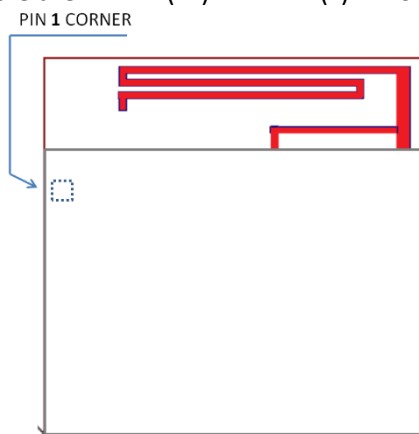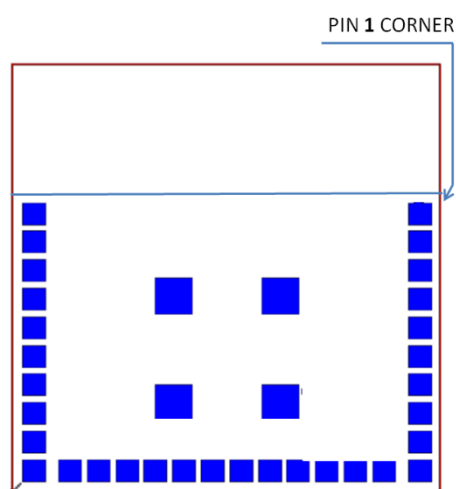
Dimensions

# 6 Pin Assignments

| Pin number | Pin name | Pin function | Description |
|---|---|---|---|
| 1 | DM/ANA_E<2> | Digital I/O | USB dataMinus/GPIO/ANA_E<2> |
| 2 | DP/ANA_E<3> | Digital I/O | USB data Positive/GPIO/ANA_E<3> |
| 3 | DMIC_DI/PWM0/ANA_A<0> | Digital I/O | DMIC data input/PWM0/GPIO/ANA_A<0> |
| 4 | DMIC_CLK/ANA_A<1> | Digital I/O | DMIC clock/GPIO/ANA_A<1> |
| 5 | DI/PWM1/ANA_A<3> | Digital I/O | SPI data input/PWM1 output/GPIO/ ANA_A<3>/I2C_SDA (I2C serial data) |
| 6 | CK/PWM1_N/ANA_A<4> | Digital I/O | SPI clock/PWM1 inverting output/GPIO/ ANA_A<4>/I2C_SCK (I2C serial clock) |
| 7 | PWM1/SDM_P/ANA_E<1> | Digital I/O | PWM1 output/GPIO /SDM Negative output /ANA_E<1> |
| 8 | PWM0/SDM_N/ANA_E<0> | Digital I/O | PWM0 output/GPIO /SDM Positive output/ANA_E<0> |
| 9 | GP5/ANA_D<3> | Digital I/O | GPIO5/ANA_D<3> |
| 10 | VBAT | Power | 3V3 |
| 11 | GND | Power | Ground (0V) |
| 12 | GND | Power | Ground (0V) |
| 13 | UART_RX/SWM/ANA_A<7> | Digital I/O | UART_RX/Single Wire Master/ GPIO/ANA_A<7> |
| 14 | PWM2/SWS/ANA_B<0> | Digital I/O | PWM2 output/Single wire slave/GPIO/ ANA_B<0> |
| 15 | PWM2_N/ANA_B<1> | Digital I/O | PWM2 inverting output /GPIO/ANA_B<1> |
| 16 | CN/PWM4/ANA_B<4> | Digital I/O | SPI chip select (Active low)/PWM4 output/GPIO/ ANA_B<4> |
| 17 | DO/PWM4_N/ANA_B<5> | Digital I/O | SPI data output/PWM4 inverting output/GPIO/ ANA_B<5> |
| 18 | DI/PWM5/ANA_B<6> | Digital I/O | SPI data input/PWM5 output/ GPIO/ ANA_B<6>/I2C_SDA (I2C serial data) |
| 19 | CK/PWM5_N/ANA_B<7> | Digital I/O | SPI clock/ PWM5 inverting output/ GPIO/ ANA_B<7>/I2C_SCK (I2C serial clock) |
| 20 | UART_TX/PWM2/ANA_C<2> | Digital I/O | UART_TX/PWM2 output/ GPIO/ANA_C<2>/ (optional) 32KHz crystal output |
| 21 | UART_RX/PWM3/ANA_C<3> | Digital I/O | UART_RX/PWM3 output/ GPIO/ANA_C<3>/ (optional) 32KHz crystal input |
| 22 | UART_RTS/PWM4/ANA_C<4> | Digital I/O | UAR_RTS/PWM4 output/ GPIO /ANA_C<4> |
| 23 | UART_CTS/PWM5/ANA_C<5> | Digital I/O | RT_CTS/PWM5 output/ GPIO /ANA_C<5> |
| 24~30 | GND | Power | Ground (0V) |
| 31 | RF OUT | | |
| 32 | ANT IN | | |
| 33~36 | GND | Power | Ground (0V) |

# 7  Recommended Footprint

Suggest on PCB: SMD (1:1)

TBD

# 8  Reference Design Circuit



Internal Antenna : Connect Pin 31 (RF OUT) and Pin 32 (ANT IN)
External Antenna : Connect Pin 31 (RF OUT) to External Antenna
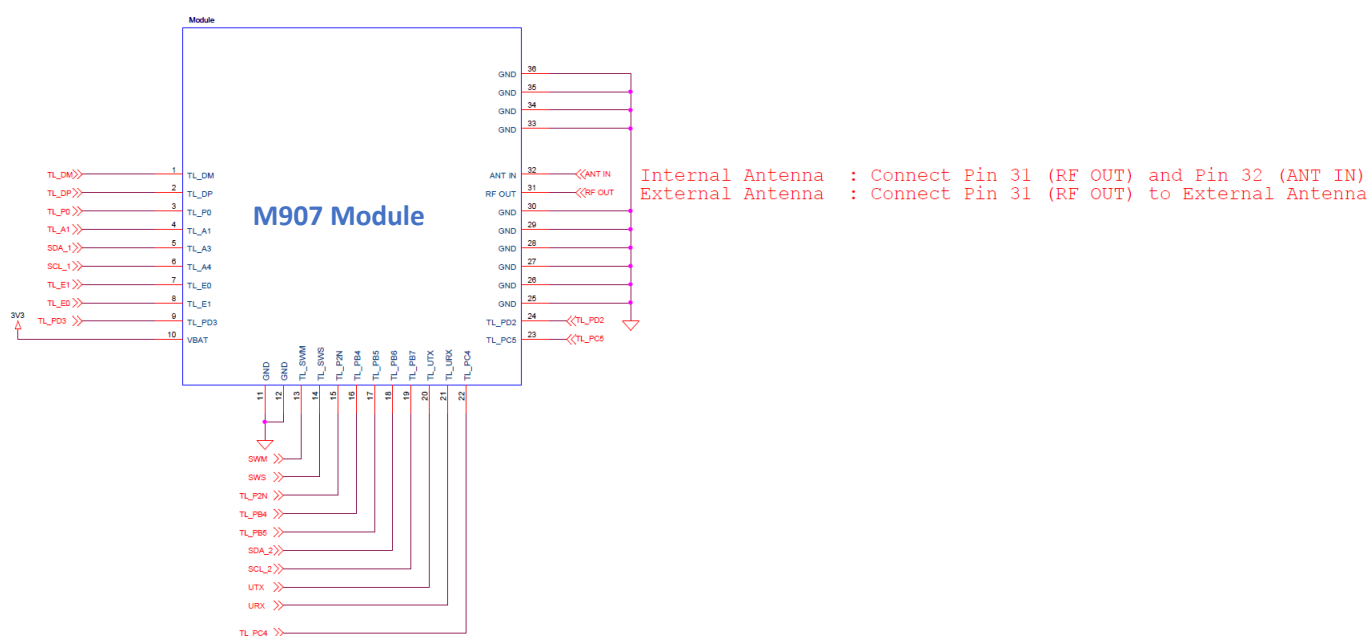
# 9 Recommended Reflow Profile
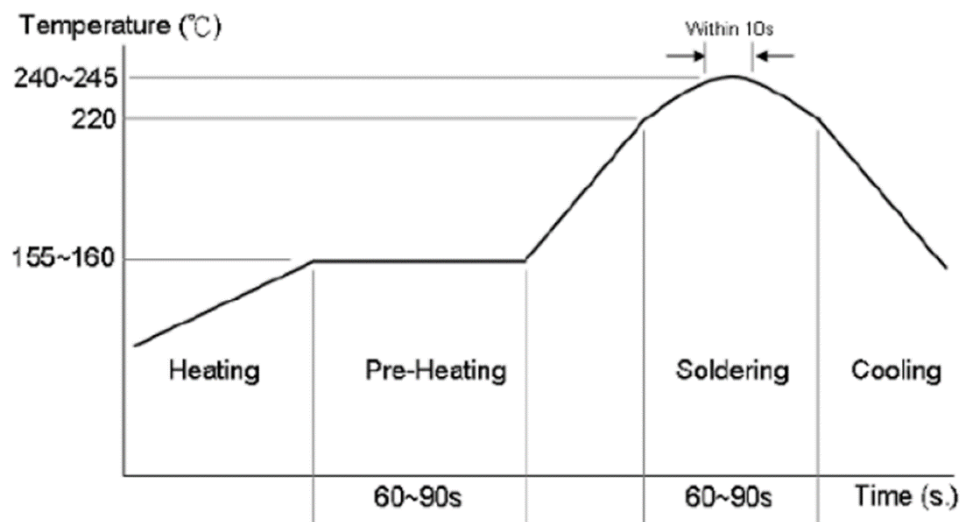


Profile Condition

a. Suitable for Lead-Free solder
b. Between 155~160°C: 60~90 sec.
c. Above 220°C: 60~90 sec.
d. Peak Temperature: 240~245 (<10 sec.)

www.mtmtech.com.tw

# 10   SiP Module Preparation

## 10.1  Handling

Handling the module must wear the anti-static wrist strap to avoid ESD damage. After each module is aligned and tested, it should be transport and storage with anti-static tray and packing. This protective package must be remained in suitable environment until the module is assembled and soldered onto the main board.

## 10.2  SMT Preparation

1. Calculated shelf life in sealed bag: 6 months at <40℃ and <90% relative humidity (RH).
2. Peak package body temperature: 250℃.
3. After bag was opened, devices that will be subjected to reflow solder or other high temperature process must.
   a. Mounted within: 72 hours of factory conditions <30℃/60% RH.
   b. Stored at ≦10% RH with N2 flow box.
4. Devices require baking, before mounting, if:
   a. Package bag does not keep in vacuumed while first time open.
   b. Humidity Indicator Card is >10% when read at 23±5℃.
   c. Expose at 3A condition over 8 hours or Expose at 3B condition over 24 hours.
5. If baking is required, devices may be baked for 12 hours at 125±5℃.

# 11  Package Information

## 11.1  Product Marking

TBD

## 11.2 Package Information

TBD

# 12 Document History

| Date | Modifications | Version |
|------|---------------|---------|
| Mar. 8, 2017 | Preliminary Version | 1.0 |
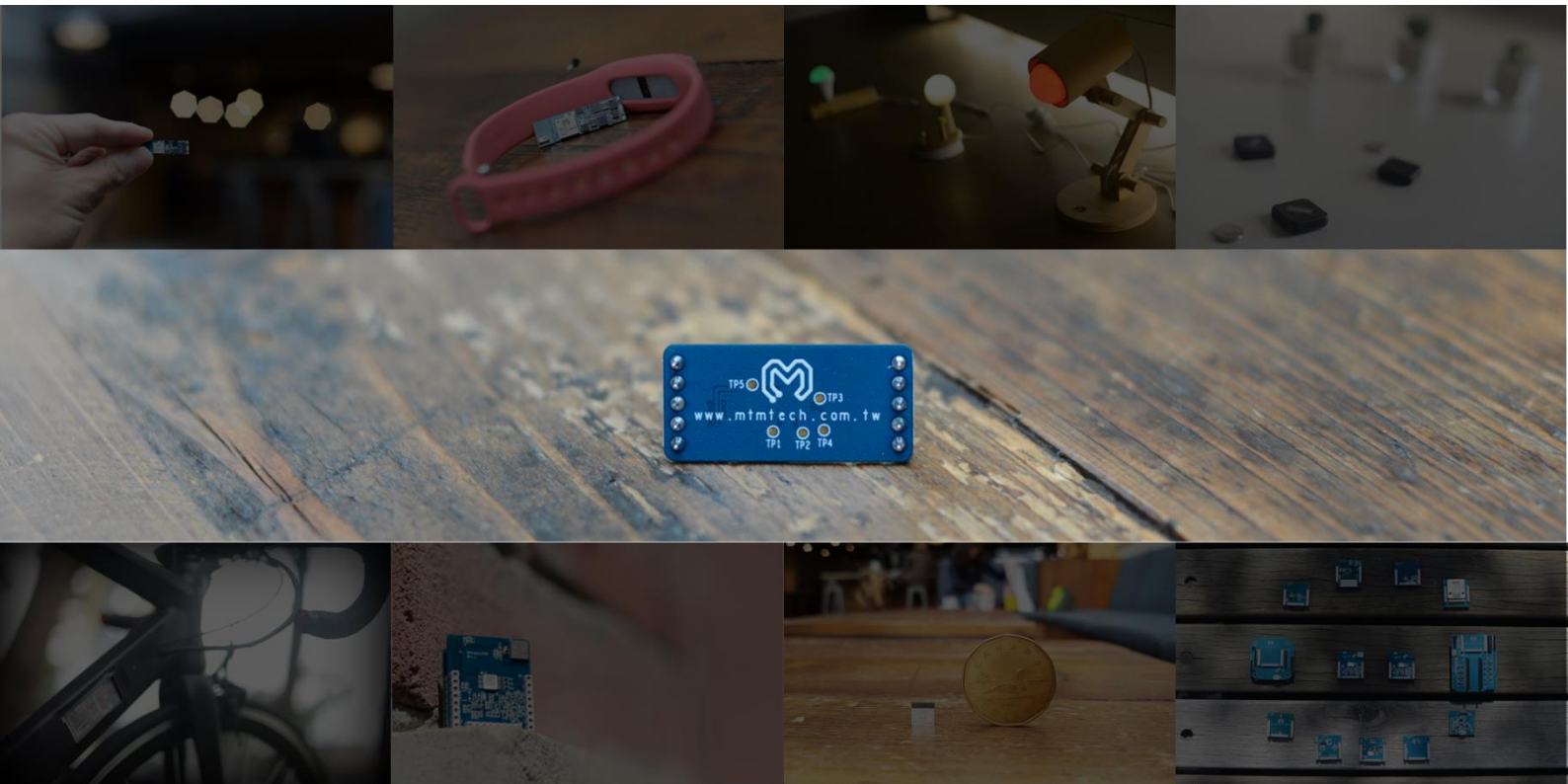
# MtM Technology Corporation

7F, 178 MinQuan East Road Section 3,
Songshan District, Taipei,
Taiwan (R.O.C.)

+886-2-7736-7386

http://www.mtmtech.com.tw

http://blog.mtmtech.com.tw

https://www.facebook.com/MtMTechnologyCorporation

http://www.Instagram.com/mtmtech

© 2017 MtM Technology Corporation