# TSPM0424123

## Product Datasheet

- Revision: B
- Date: 2019-06-05
- Document Number: MS-RD60-GEN-04-A_EN

## Revision History

| Revision | Date | Description |
|---|---|---|
| A | 2018-12-19 | Initial release; |
| B | 2019-06-05 | Add FCC information; |

# Table of Contents

# 1 Introduction

TSPM0424123 is a passthrough module based on Bluetooth Low Energy (BLE). It can transmit and receive data through BLE. It has a plenty of peripheral interface. It can be widely used in the field of Internet of Things.

## 1.1 Main Features

- BLE Core v4.2;
- Support LE Dual Mode Topology;
- Antenna Type: PCB Antenna;
- Antenna Gain: 1.5dBi;
- Support AT Command as a passthrough module;
- Support user development with SDK;
- ARM Cortex-M0, up to 26MHZ;
- 512kB FLASH, 128kB RAM;
- Pin compatible with other modules of TSPMx series.

## 1.2 Main Parameters

- Operation voltage: 1.9~3.6V;
- Bluetooth RF transmission power (chip's parameter): 0dBm;
- Bluetooth RF receiving sensitivity (chip's parameter): -93.5dBm;
- Current consumption of sleep mode: lowest to 2.4μA;
- Peak current of RF transmission: 3.3mA@0dBm;
- Peak current of RF receiving: 3.3mA.

# 2 Hardware

## 2.1 Package and Pins

The package and pin definitions are shown as Figure 2.1 and Table 2.1.

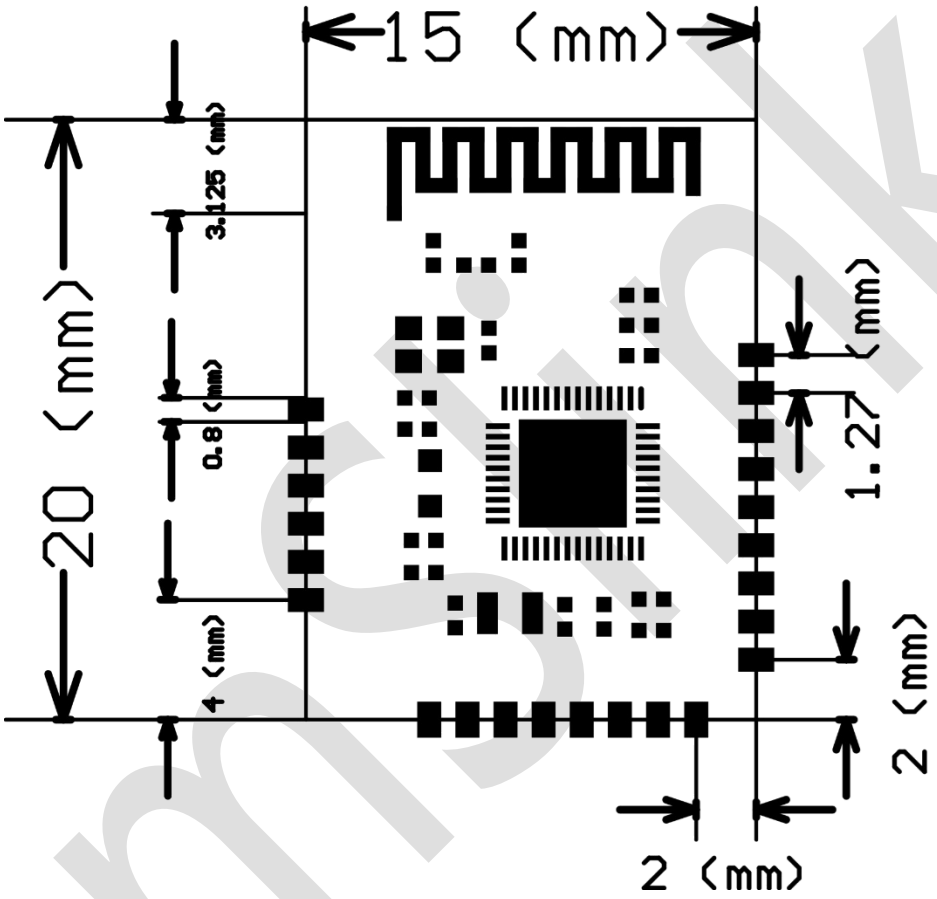


*Figure 2.1: The package of module*

| Pin No. | Name | Type | Description |
|---|---|---|---|
| 1, 8 | GND | P | Ground; |
| 2 | GPIO8 | I/O | GPIO; |
| 3 | GPIO7 | I/O | GPIO; |
| 4 | ADC_1 | I | 10-bit ADC input; |
| 5 | ADC_0 | I | 10-bit ADC input; |
| 6, 7 | VCC | P | Power, 1.9~3.6V, recommend 3.0V; |
| 9 | PWM0 | O | PWM output; |

| | | | |
|---|---|---|---|
| 10 | PWM1 | O | PWM output; |
| 11 | PWM2 | O | PWM output; |
| 12 | PWM3 | O | PWM output; |
| 13, 14 | NC | - | - |
| 15 | SCL | O | I2C clock; |
| 16 | SDA | I/O | I2C data; |
| 17 | GPIO0 | I/O | GPIO; |
| 18 | GPIO15 | I/O | GPIO; |
| 19 | SWDIO | I/O | SWD data; |
| 20 | SWCLK | O | SWD clock; |
| 21 | RXD | I | UART RX; |
| 22 | TXD | O | UART TX; |
| 23 | RST | I | Reset, active low. |

*Table 2.1: The pin definitions of module*

## 2.2 Circuit Schematic

The circuit schematic of module is shown as Figure 2.2.

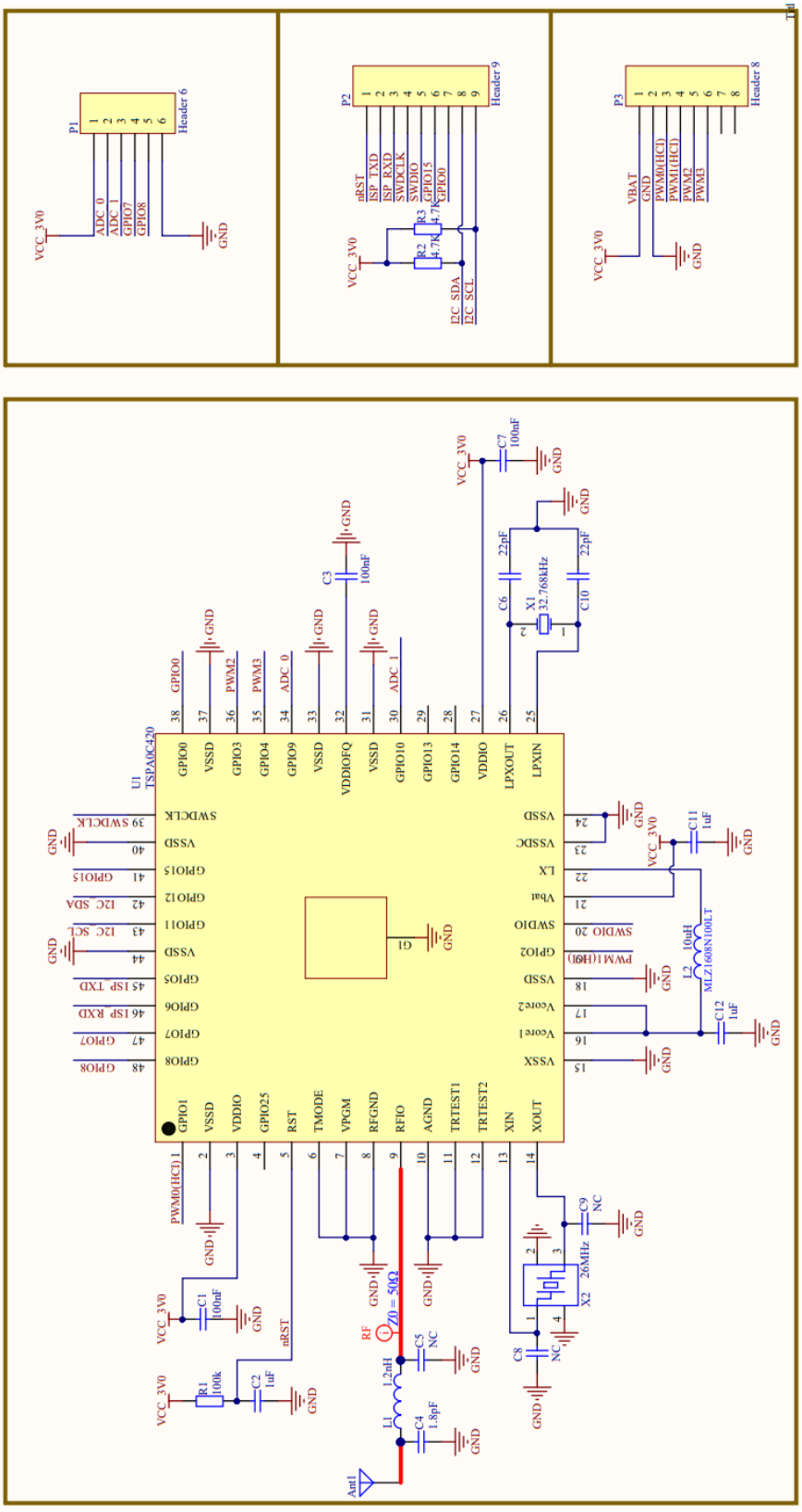


*Figure 2.2: The circuit schematic of module*

## 2.3 Precautions Hardware Design

- Input power is recommended to use magnetic beads for filtering;
- Copper plating, trace and component mounting are not allowed directly above/below the PCB antenna, otherwise it will affect the RF performance. It is recommended to use the Keep Out Layer to knock out this area;
- Other components should be mounted away from the antenna to reduce the impact of object occlusion on RF performance. It is recommended to arrange the antenna at the outermost periphery of the whole board PCB;
- Metal casing may shield RF electromagnetic waves and affect RF performance. If the RF performance requirements are high, metal casing should be avoided as much as possible, or use a module with an external antenna to lead the antenna to the outside of the metal casing.

# 3 Electrical Parameters

## 3.1 Limiting values

| Parameter | Description | Min. | Max. | Unit |
|---|---|---|---|---|
| Supply voltage | | -0.3 | +3.9 | V |
| Storage temperature | | -40 | +125 | ℃ |

*Table 3.1: Limiting values*

## 3.2 Operation Range

| Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Supply voltage | | 1.9 | 3.0 | 3.6 | V |
| Operation temperature | | -40 | +25 | +85 | ℃ |

*Table 3.2: Operation Range*

## 3.3 Current Consumption

Ambient temperature: 25℃, supply voltage: 3.0V.

| Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Current consumption | Sleep, only 32.768kHz crystal working; | - | 2.5 | - | μA |
| | Wakeup standby; | - | 0.8 | - | mA |
| | Peak of RF transmission@0dBm; | - | 3.3 | - | mA |
| | Peak of RF receiving, sensitivity -94dBm; | - | 3.3 | - | mA |

*Table 3.3: Current consumption*

## 3.4 RF parameters

Ambient temperature: 25℃, supply voltage: 3.0V, center frequency 2440MHz

| Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| RF frequency | | 2400 | - | 2483.5 | MHz |
| Output power | | - | 0 | - | dBm |
| RX sensitivity | | - | -93.5 | - | dBm |

*Table 3.4: RF parameters*

# 4 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with Part 15, Part 15.247 of the FCC Rules. The FCC ID for this device is 2AS3M-TSPM0424123. If the FCC ID is not visible with the module is installed inside another device， then it must be still responsible for the FCC compliance requirement of the end product which referring to the enclosed module and it also must display a label, such as the following: Contains Transmitter module FCC ID: 2AS3M-TSPM0424123 or contains FCC ID: 2AS3M-TSPM0424123.

This device has been tested without own RF shielding, if final host product use this device with RF shielding, then it must be tested C2PC again.

The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that

to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

WARNING: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

The device must not be co-located or operating in conjunction with any other antenna or transmitter.