Syntronix SBF508M-21

SBF50xM
PCBA module

Datasheet

Rev 0.9a
2019/08/26

Preliminary Edition

Revision History

Version	Date	Owner	Change Log
0.1	2019/05/02	Syntronix	First release
0.5	2019/06/19	Syntronix	Re-assign GPIO pin out
0.9	2019/07/08	Syntronix	Add XIP test points and fix PCB layout
0.9a	2019/08/26	Syntronix	Add Antenna list

Notice

1. All information included in this document is subject to change without any prior notice. Before purchasing please contact Syntronix Corporation for the latest product information.
2. Exporting the products or technology described in this product should comply with export control laws and regulations. Users should not use Syntronix Corporation products for any application relating to which may cause loss of human life, bodily injury or severe property damage. Such application including but not limited to: military instruments, medical instruments, atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, all types of safety devices, and other applications intended to support or sustain life.
3. Users should follow the specified range described in this document, especially maximum rating, operating supply voltage range and temperature range. Syntronix Corporation shall have no liability for malfunctions or damages arising out of the use of Syntronix Corporation products beyond such specified ranges.
4. ARM® and Cortex™ are registered trademarks or trademarks of ARM® in the EU and other countries. Other brands and names mentioned herein may be the trademarks of their respective owners.

Federal Communication Commission Interference Statement

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.

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

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.

IMPORTANT NOTE:

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

IMPORTANT NOTE:

This module is intended for OEM integrator. This module is only FCC authorized for the specific rule parts listed on the grant, and that 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.

Additional testing and certification may be necessary when multiple modules are used.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied.

The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: 2AUBRBF508".

This device complies with Part 15 of 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.

Table of Content

List of Figure

List of Table

1. Overview

SBF50xM-xx series is a System-On-Chip integrated 2.4GHz radio transceiver and baseband processor for Bluetooth Low Energy 5(BLE5). It contains high-performance ARM ® Cortex TM -M0 32-bit RISC core, embedded Flash/OTP/ROM, embedded SRAM, the hardware of Link Layer for BLE5, 2.4GHz radio transceiver and peripheral for application.

The chip has flexible power management and low power consumption, which is suitable for IoT or wearable device application. The integrated Buck DC-DC converter is convenient to generate system power and it provides power for external devices.

The BLE (Bluetooth low energy) core is a qualified Bluetooth baseband controller that compatible with the Bluetooth low energy 5.0 specifications and it is in charge of packet encoding/decoding and frame scheduling.

2. Features

- 2.4 GHz GFSK RF transceiver
- 1 Mbps, 2Mbps and long range (125kbps and 500kbps mode) Bluetooth® low energy

Modes

- Supports Frequency-Hopping Spread Spectrum.
- Complaint to BLE 5.0 core specifications.
- All device states-advertising, scanning, initiating and connection.
- All packet types (Advertising / Data / Control).
- Support 8 connects.
- Support 4 extended advertising sets.
- White List & Duplicate filtering.
- Support long range.
- Support advertising length extensions.
- Support data length extensions.
- Manages connection setup procedures – both as the master and the slave.
- Framing and De-framing of the packet.
- Hardware AES encryption.

3. Antenna List

Antenna gain(dBi)	廠牌 Brand：Syntronix 型號 model： IFMA 類型 Type：printed ANT BT : 0 dBi

Figure 3-1 Antenna List

4. DC Power Connection

MODE	MCU STATE	Description	MIN	TYP	MAX	Unit
Typical DC-DC power connection, CPU running at 26MHz and no RF active				1.81		mA
Typical DC-DC power connection, CPU running at 26MHz and advertising interval 20ms (0dBm)				2.3		mA
Typical DC-DC power connection, CPU running at 26MHz and advertising interval 1s (0dBm)				0.101		mA
Typical DC-DC power connection, CPU running at 26MHz and connection interval 50ms (0dBm)				0.514		mA
Typical DC-DC power connection, CPU at 32.768KHz Sleep Mode				0.217		mA
Typical DC-DC power connection, CPU at 32.768KHz Deep-Sleep Mode (ECO mode)				0.209		mA
Typical DC-DC power connection, CPU at Power standby Mode				0.208		mA
Typical DC-DC power connection, CPU at SPU Sleep Mode				39.7		uA
Typical DC-DC power connection, CPU at SPU Deep-sleep Mode				29.8		uA
Typical DC-DC power connection, CPU at SPU Power Down Mode			0.9		2	uA
Typical DC-DC power connection, CPU at SPU Deep Power Down Mode			0.6		0.8	uA

Table 4-1 DC power Connection

5. General Specification

Model Name	SBF50xM –xx
Bluetooth standard	BLE5
Main Chipset	SBF50xF-48
PCBA Dimension	22× 15 × 2.8（mm）
Frequency Range	2.4—2.485 GHz ISM Band
Date Rates	1 Mbps, 2Mbps and long range (125kbps and 500kbps mode)
Modulation	GFSK
Operating conditions	
Voltage	3.3V (TYP)
Operating Temperature	-40 ~ 85°C ambient temperature
Storage Temperature	-40 ~ 85°C ambient temperature
Operating Humidity	5 to 90% maximum（non-condensing）

Radio Specifications					
Maximum input / output power level	Mode	Data Rate		Power	Unit
	input			10	dBm
	output			0 (TYP)	dBm
RX sensitivity(IC)	Mode	Conditions		Sensitivity	Unit
	1M	PER < 30.7%		-95	dBm
	2M	PER < 30.7%		-93	dBm
	500Kb	PER < 30.7%		-97	dBm
	125Kb	PER < 30.7%		-102	dBm
C/I	Mode	Parameter	Conditions	Sensitivity	Unit
	1Mbps	Co-Channel interference	BER < 0.1%	3	dB
	1Mbps	Adjacent -1 MHz interference	BER < 0.1%	-10	dB
	1Mbps	Adjacent +1 MHz interference	BER < 0.1%	-10	dB
	1Mbps	Adjacent -2 MHz interference	BER < 0.1%	-24	dB

	1Mbps	Adjacent +2 MHz interference	BER < 0.1%	-45	dB
	1Mbps	Adjacent -3 MHz interference	BER < 0.1%	-45	dB
	1Mbps	Adjacent +3 MHz interference	BER < 0.1%	-49	dB
	2Mbps	Co-Channel interference	BER < 0.1%	4	dB
	2Mbps	Adjacent -2 MHz interference	BER < 0.1%	-19	dB
	2Mbps	Adjacent +2 MHz interference	BER < 0.1%	-24	dB
	2Mbps	Adjacent -4 MHz interference	BER < 0.1%	-25	dB
	2Mbps	Adjacent +4 MHz interference	BER < 0.1%	-54	dB
	2Mbps	Adjacent -6 MHz interference	BER < 0.1%	-53	dB
	2Mbps	Adjacent +6 MHz interference	BER < 0.1%	-56	dB
PBL	I	Block performance 30 – 2000MHz	Min= -10	0	dBm
	II	Block performance 2000 – 2399MHz	Min= -27	-6	dBm
	III	Block performance 2484 – 3000MHz	Min= -27	-3	dBm
	IV	Block performance 3 – 12.75GHz	Min= -10	0	dBm
IMD	1M	Intermodulation performance	Min= -50	-48	dBm
	2M	Intermodulation performance	Min= -50	-43	dBm

Table 5-1 DC General Specification

6. Pin Description and PCBA size : SBF50xM-21

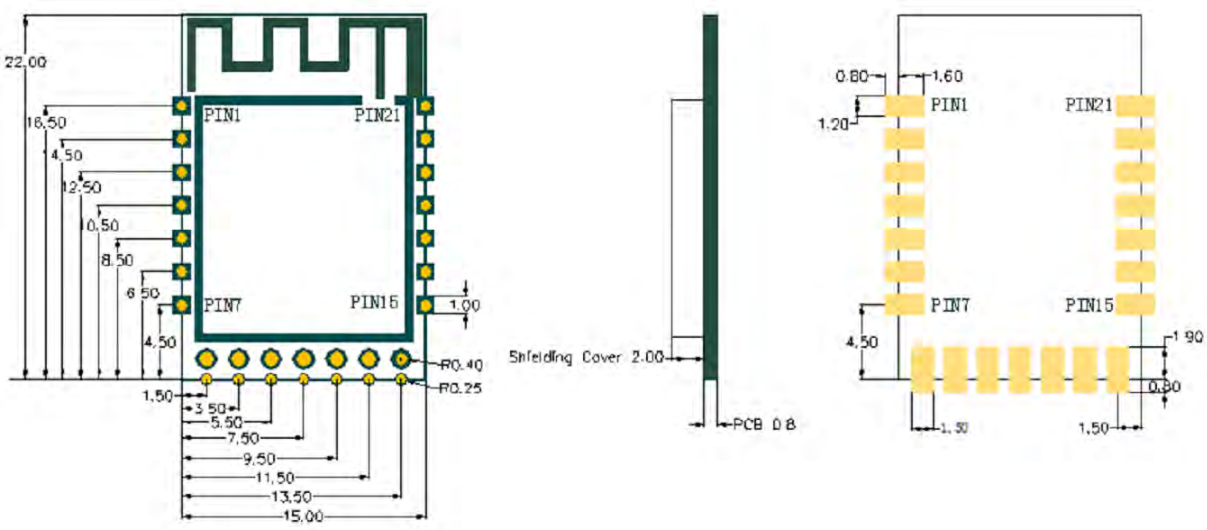

Figure 6-1 PCBA size

NO	Name	Type	Description
1	GND	-	Ground Connections
2	PA28	I/O	SWCLK
3	PA29	I/O	SWDIO
4	RESETN	EN	RESETN
5	PB00	I/O	UART0_RX
6	PB01	I/O	UART0_TX
7	GND	-	Ground Connections
8	VBAT	-	VBAT
9	GND	-	Ground Connections
10	PB06	I/O	SCL
11	PB07	I/O	SDA
12	PB08	I/O	UART1_RX
13	PB09	I/O	UART1_TX
14	PA02	I/O	PWM4
15	PA03	I/O	PWM5

16	PA08	I/O	PWM7/MOSI
17	PA09	I/O	SCK
18	PA10	I/O	SS
19	PA11	I/O	MOSI
20	VCC	I/O	VCC
21	GND	-	Ground Connections

Table 6-1 Pin Description

7. Recommended Reflow Profile

Referred IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : □2 times

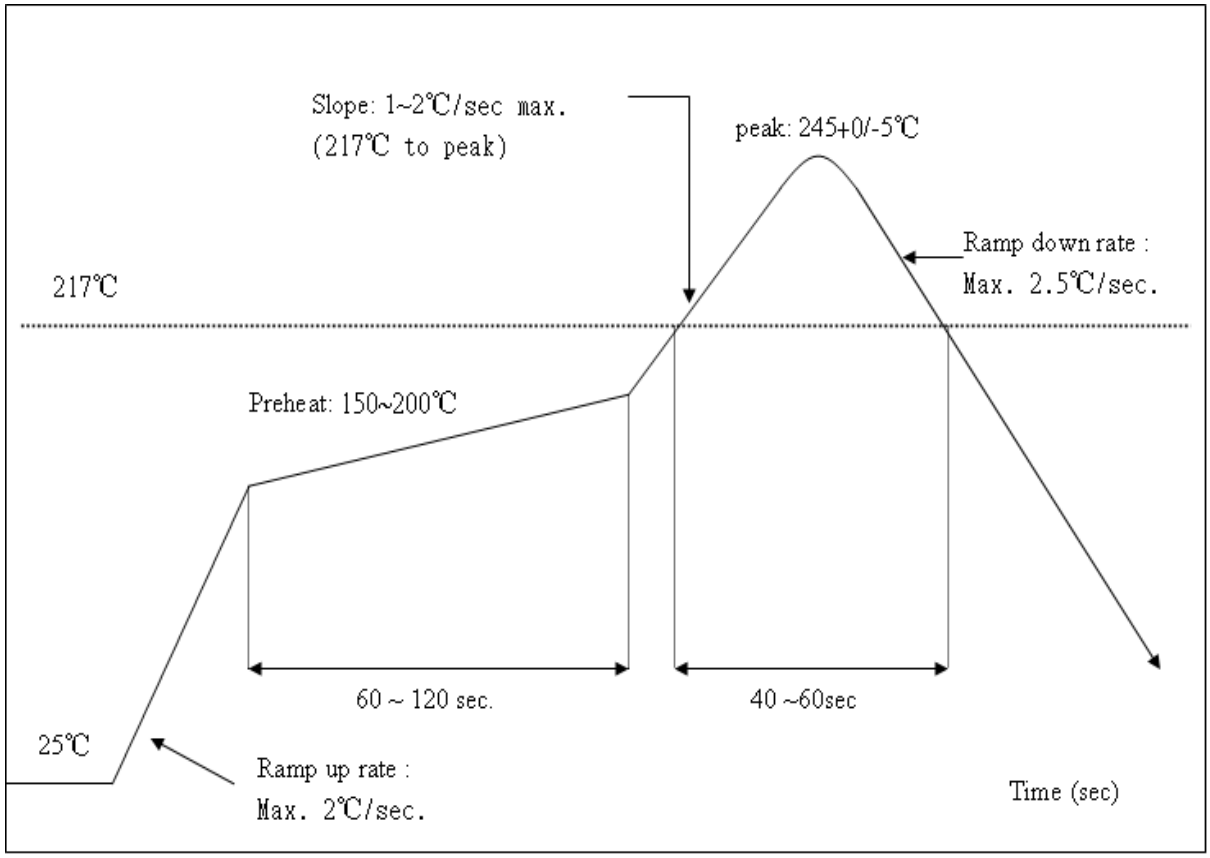

Figure 8-1 Recommended Reflow Profile

ESD CAUTION

The SBF50xM is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although SBF50xM is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.

STATEMENT OF FEDERAL COMMUNICATIONS COMMISSION (FCC)

FCC ID:2AUBRBF508

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