FSC-BT803

CSR 8670 Bluetooth Module Data Sheet

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Revision History

Date	Version	Description	Author
2013-09-06	V1.0	■ First Release	
2013-10-21	V1.3	■ Third Release	

CONTENT

1. INTRODUCTION

The FSC-BT803 Bluetooth® module is a perfect 4.0 dual-mode solution for wireless applications, such as smart watches, Bluetooth Bracelets, and wireless transmission devices. It can be connected with any Bluetooth® devices in an operating range. It is small and thin so the designers can have better flexibilities for the product shapes.

The FSC-BT803 Bluetooth® module complies with Bluetooth® specification version 4.0. It supports HSP,HFP,A2DP,AVRCP,PBAP,MAP,SPP, BLE….profiles. It integrates an ultra-low-power DSP and application processor with embedded flash memory, a high-performance stereo codec, a power management subsystem, LED and LCD drivers in a SOC IC. The dual-core architecture with flash memory enables manufactures to easily differentiate their products with new features without extending development cycles. It integrates RF Baseband controller, antenna,… etc. and provide UART interface, programmable I/O, stereo speaker output, microphone input,… etc.

The detail information of FSC-BT803 Bluetooth® module is presented in this document below.

1.1 Block Diagram

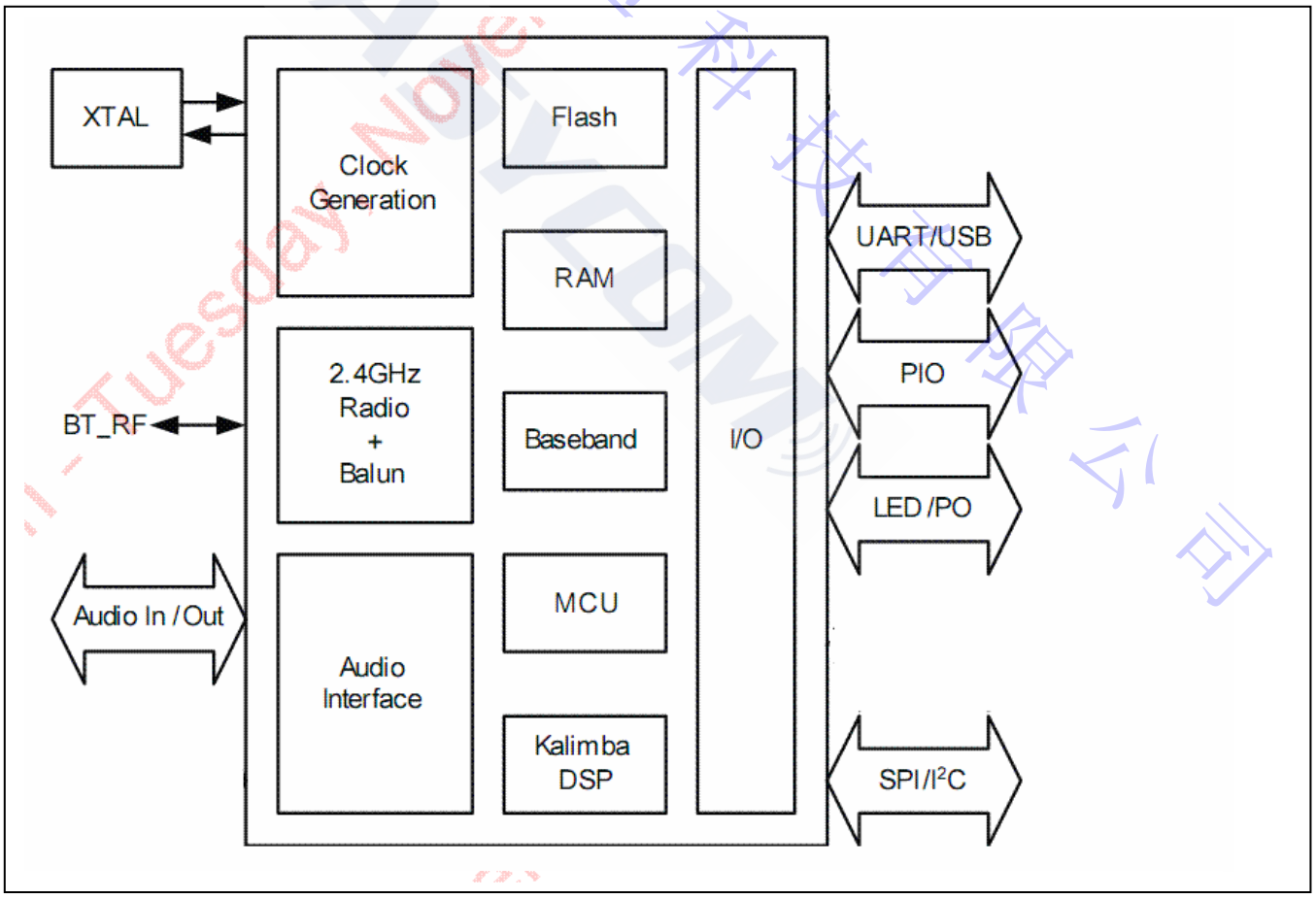


Figure 1

1.2 Features

- ✓ Small overall dimension(13mm x 13mm x 2.0mm)
- ✓ Bluetooth Specification V4.0(Dual Mode)
- ✓ Class1,Class 2 and Class 3 support
- ✓ Physical connection as SMD type
- ✓ 80MHz RISC MCU and 80MIPS Kalimba DSP
- ✓ 16Mb internal flash memory(64-bit wide,45ns);optional support for 64Mb of external SPI flash
- ✓ Stereo codec with 2 channels ADC and up to 6 microphone inputs(include bias generators and digital microphone support)
- ✓ Support for CSR's latest CVC technology for narrow-band and wideband voice connections including wind noise reduction
- ✓ Music Enhancements: SBC,MP3,AAC and AAC+,Faststream codec,atpX,5-band EQ,3D stereo separation and so on.
- ✓ Serial Interfaces: UART,USB 2.0,I2C and SPI
- ✓ Support HSP, HFP, A2DP, AVRCP,PBAP,MAP,SPP,BLE profile
- ✓ Multipoint support for HFP connection to 2 handsets for voice
- ✓ Multipoint support for A2DP connection to 2 A2DP source for music palyback
- ✓ 3 Hardware LED controllers (for RGB) and ability to drive LCD segment display directly
- ✓ Support for up to 6 capacitive touch sensor inputs
- ✓ Built-in RF combo filter, Integrated 26M Crystal.
- ✓ No radio signal interference, support for 802.11 co-existence

※ ***Some features are optional for customization on demand.***

1.3 Application

- ✓ Smart watches
- ✓ Bluetooth bracelets
- ✓ Bluetooth headphones
- ✓ Smart remote controllers
- ✓ Wired or wireless soundbars
- ✓ Wired or wireless speakers
- ✓ Wearable audio with sensors(health and well-bing applications)

2. GENERAL SPECIFICATION

Bluetooth Specification	
Chip Set	CSR8670
Module ID	FSC-BT803
BT Standard	Bluetooth® V4.0 specification
RF TX Output Power	10dBm (Max)
Sensitivity	-90dBm@0.1%BER
Frequency Band	2.402GHz~2.480GHz ISM Band
Baseband Crystal OSC	26MHz
Hopping	1600hops/sec, 1MHz channel space
RF Input Impedance	50 ohms
Major Interface	• Microphone : Input (Differential) • Speaker : Output (Differential) • UART : Tx/Rx • PIOs • Antenna
Profile	HSP, HFP, A2DP, AVRCP,PBAP,MAP,SPP, BLE
Voice Processor	80MIPS Kalimba with cVc support
Power	
Supply Voltage	1.8V ~ 4.2V DC
Working Current	Depends on profiles
Standby Current	<1mA
Operating Environment	
Temperature	-40ºC to +85ºC
Humidity	10%~90% Non-Condensing
Environmental	RoHS Compliant

Table 1

3. PHYSICAL CHARACTERISTIC

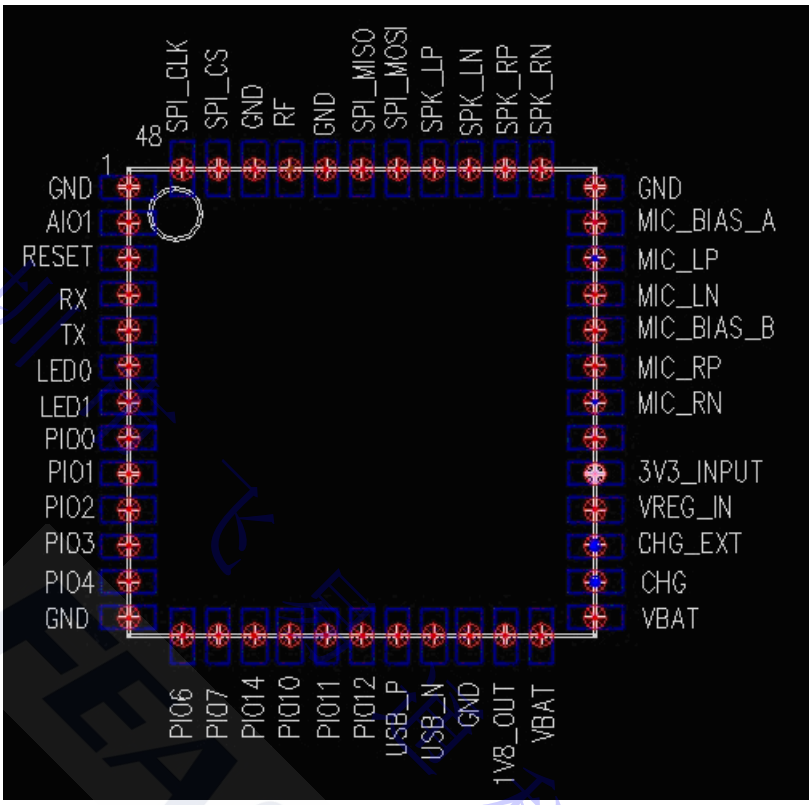


Figure 2

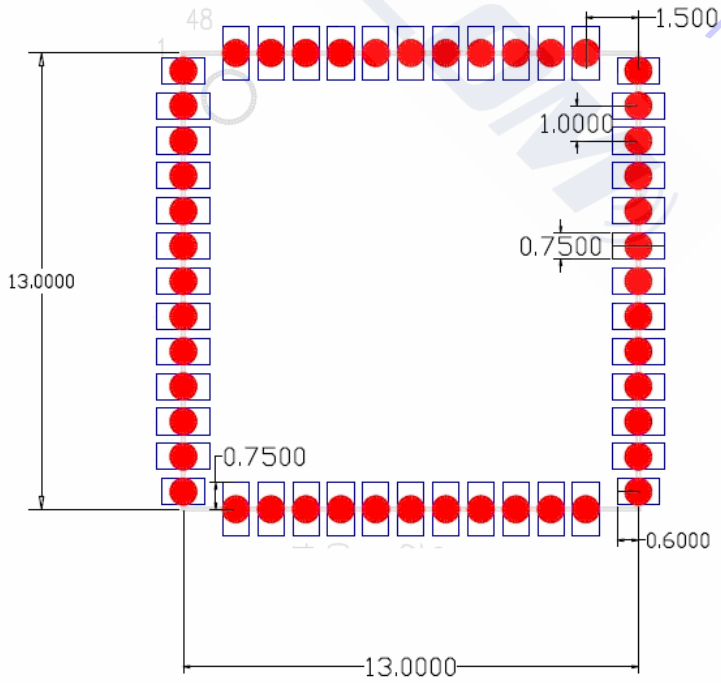


Figure 3

3.2 Pin Description

Pin #	Pin Name	Pad Type	Description
1	GND	Ground	Digital Ground
2	AIO_1	Bi-directional	Analogue programmable input / output line
3	RESET	Input with strong pull-up	Reset if low.Input debouced so must be low for >5ms to cause a reset
4	RX	Bi-directional with strong pull_up	UART data input
5	TX	Bi-directional with weak pull_up	UART data output
6	LED0	Open drain	LED driver Alternative function PO[29]
7	LED1	Open drain	LED driver Alternative function PO[30]
8	PIO0	NC	
9	PIO1	NC	
10	PIO2	NC	
11	PIO3	Bi-directional with weak pull_down	Programmable input/output line
12	PIO4	NC	
13	GND	Ground	Digital Ground
14	PIO6	Bi-directional with weak pull_down	Programmable input/output line
15	PIO7	Bi-directional with weak pull_down	Programmable input/output line
16	PIO14	Bi-directional with weak pull_down	Programmable input/output line
17	PIO10	Bi-directional with weak pull_down	Programmable input/output line
18	PIO11	Bi-directional with weak pull_down	Programmable input/output line
19	PIO12	Bi-directional with weak pull_down	Programmable input/output line
20	USB_P	Bi-directional	USB data plus with selectable internal 1.5kohm pull-up resistor
21	USB_N	Bi-directional	USB data minus

22	GND	Ground	Digital Ground
23	+1V8	Open drain output	+1V8
24	VBAT	Power supply	Battery positive terminal
25	VBAT	Power supply	Power supply
26	CHG	Connect to USB VBUS	Battery charger input
27	CHG_EXT	NC	External battery charger control
28	VREG_IN	Input enable	Regulator enable input. Can also be sensed as an input. Regulator enable and multifunction button. A high input (tolerant to VBAT) enables the on-chip regulators, which can then be latched on internally and the button used as a multifunction input.
29	3V3_INPUT	Connect to 3.3V	1.7V to 3.6V positive supply input for digital input/output ports
30	NC	NC	NC
31	MIC_RN	Analogue in	Microphone input negative,right
32	MIC_RP	Analogue in	Microphone input positive,right
33	MIC_BIAS_B	Analogue out	Microphone bias B
34	MIC_LN	Analogue in	Microphone input negative,left
35	MIC_LP	Analogue in	Microphone input positive,left
36	MIC_BIAS_A	Analogue out	Microphone bias A
37	GND	Ground	Digital Ground
38	SPKR_RN	Analogue out	Speaker output negative,right
39	SPKR_RP	Analogue out	Speaker output positive,right
40	SPKR_LN	Analogue out	Speaker output negative,left
41	SPKR_LP	Analogue out	Speaker output positive,left
42	SPI_MOSI	Input with weak pull-down	SPI data input
43	SPI_MISO	Output with weak pull-down	SPI data output
44	GND	Ground	Analogue Ground
45	RF	RF_IN	Bluetooth 50ohm transmitter output/ receiver input
	GND	Ground	

46			Analogue Ground
47	SPI_CSB	Input with strong pull-up	Chip select for SPI,active low
48	SPI_CLK	Input with weak pull-down	SPI Clock

Table 2

4. PHYSICAL INTERFACE

4.1 Power Supply

The transient response of the regulator is important. If the power rails of the module are supplied from an external voltage source, the transient response of any regulator used should be 20μs or less.

4.2 Audio Interfaces

The Audio interface circuit consists of:

- Stereo/dual-mono audio codec
- Dual analogue audio inputs
- Dual analogue audio outputs

4.2.1 Audio Codec Interface

The main features of the interface are:

- Stereo and mono analogue input for voice band and audio band
- Stereo and mono analogue output for voice band and audio band

4.2.2 ADC

Figure 3 shows the CSR8670 consists of 2 high-quality ADCs:

- Each ADC has a second-order Sigma-Delta converter
- Each ADC is a separate channel with identical functionality
- There are 2 gain stages for each channel,1 of which is an analogue gain stage and the other is a digital gain stages

4.2.3 ADC Sample Rate Selection

Each ADC supports the following pre-defined sample rates,although other rates are progrmmable,e.g.40kHz:

- 8kHz
- 11.025 kHz
- 16kHz
- 22.050kHz
- 24kHz
- 32 kHz
- 44.1kHz
- 48 kHz

4.2.4 ADC Digital Gain

A digital gain stage inside the ADC varies from -24dB to 21.5dB,see as below,there is also a fine gain interface with 9-bit gain setting allowing gain changes in 1/32 steps.
The Firmware controls the audio input gain.

4.2.5 DAC

The DAC consists of:

- 2 fourth-order Sigma-Delta converters enabling 2 separate channels that are identical functionality,as figure x shows
- 2 gain stages for each channel, 1 of which is an analogue gain stage and the other is a digital gain stage

4.2.6 DAC Sample Rate Selection

- 8kHz
- 11.025kHz
- 16kHz
- 22.050kHz
- 32kHz
- 40kHz
- 44.1kHz
- 48kHz
- 96kHz

4.2.7 DAC Digital Gain

A digital gain stage inside the DAC varies from -24dB to 21.5dB,see as below,there is alse a fine gain interface with 9-bit gain setting enabling gain changes in 1/32 steps.
The overall gain control of the ADC is controlled by the firmware.Its setting is a combined function of the digital and analogue amplifier settings

4.2.8 DAC Analogue Gain

As below shows that the DAC analogue gain stage consists of 8 gain selection values that represent seven 3dB steps
The firmware controls the overall gain control of the DAC.Its setting is a combined function of the digital and analogue amplifier settings

4.2.9 Microphone Input

FSC-BT803 contains 2 independent low-noise microphone bias generators.The microphone bias generators are recommended for biasing electret condensor microphones.A biasing circuit for microphones with a sensitivity between about -40dB to -60dB(0dB=1V/Pa)

4.2.10 Audio Output Stage

The output digital circuitry converts the signal from 16-bit per sample, linear PCM of variable sampling frequency to a 2Mbits/sec multi-bit stream, which is fed into the analogue output circuitry.
The output circuit comprises a digital to analogue converter with gain setting and output amplifier.Its class-AB output-stage is capable of driving a signal on both channels of up to 2V pk-pk- differential into a load of 16Ω. The output is available as a differential signal between SPK_R_RP and SPK_R_RN for the left channel; and between SPK_L_LP and SPK_L_LN for the right channel. The output is capable of driving a speaker directly if its impedance is at least 8Ω if only one channel is connected or an external regulator is used.

The gain of the output stage is controlled by a 3-bit programmable resistive divider, which sets the gain in steps of approximately 3dB.

The multi-bit stream from the digital circuitry is low pass filtered by a second order bi-quad filter with a pole at 20kHz. The signal is then amplified in the fully differential output stage, which has a gain bandwidth of typically 1MHz.

- 13-bit or 16-bit linear,8-bit u-law or A-law companded sample formats.

- Receives and transmits on any selection of 3 the first 4 slots following PCM_SYNC.

The PCM configuration options are enabled by setting the PS Key PSKEY_PCM_CONFIG32.

4.3 General Purpose Analog IO

The general purpose analog IOs can be configured as ADC inputs by software. Do not connect them if not use.

4.4 General Purpose Digital IO

There are nine general purpose digital IOs defined in the module. All these GPIOs can be configured by software to realize various functions, such as button controls, LED displays or interrupt signals to host controller, etc. Do not connect them if not use.

4.5 RF Interface

The module integrates a balun filter. The user can connect a 50ohms antenna directly to the RF port.

4.6 Serial Interfaces

4.6.1 UART

This is a standard UART interface for communicating with other serial devices. The UART interface provides a simple mechanism for communicating with other serial devices using the RS232 protocol.

When the module is connected to another digital device,UART_RX and UART_TX transfer data between the two devices. The remaining two signals, UART_CTS and UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators.

4.6.2 I2C Interface

As this I2C interface is software-driven it is suited to relatively slow functions such as driving a dot matrix LCD,keybaord scanner or EEPROM.If it is not used,then PIO[7:6] are available to form a software-driven master I2C interface.

4.6.3 SPI

The synchronous serial port interface (SPI) can be used for system debugging. It can also be used for in-system programming for the flash memory within the module. SPI interface uses the SPI_MOSI, SPI_MISO, SPI_CSB and SPI_CLK pins. Testing points for the SPI interface are reserved on board in case that the firmware shall be updated during manufacture.

The module operates as a slave and thus SPI_MISO is an output of the module. SPI_MISO is not in high-impedance state when SPI_CSB is pulled high. Instead, the module outputs 0 if the processor is running and 1 if it is stopped. Thus the module should NOT be connected in a multi-slave arrangement by simple parallel connection of slave SPI_MISO lines.

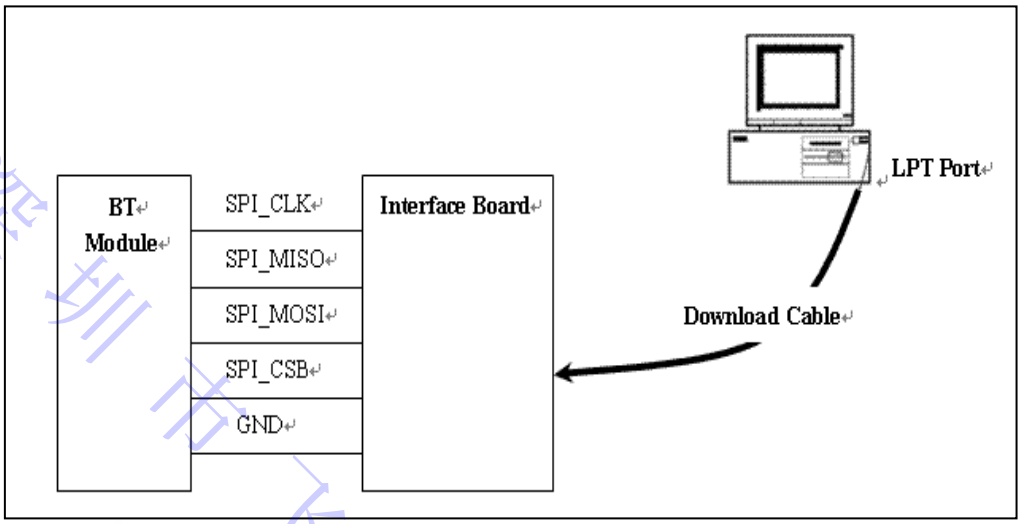


Figure 4

5. ELECTRICAL CHARACTERISTICS

5.1 Absolute Maximum Ratings

Rating		Min	Max	Unit
Storage temperature		-40	105	°C
Supply Voltage				
5V(USB VBUS)	CHG	-0.4	5.75	V
3.3V	3V3_INPUT	-0.4	3.60	V
Battery	LED[2:0]	-0.4	4.40	V
	VBAT	-0.4	4.40	V
	VBAT_SENSE	-0.4	4.40	V
	VREG_IN	-0.4	4.40	V
Other terminal voltages		VSS - 0.4	VDD + 0.4	V

Table 3

5.2 Recommended Operating Conditions

Rating		Min	Typ	Max	Unit
Operating temperature range		-40	20	85	℃
Supply Voltage					
5V(USB VBUS)	CHG	4.75 / 3.10	5	5.75	V
Battery	LED[2:0]	1.1	3.7	4.25	V
	VBAT	0	3.7	4.25	V
	VBAT_SENSE	0	3.7	4.25	V
	VREGENABLE	0	3.7	4.25	V
3.3V	3V3_INPUT	1.7	3.3	3.6	V

Table 4

6. RECOMMENDED TEMPERATURE REFLOW PROFILE

The soldering profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder reflow.

2F

Friday March 09, 2012 10:21:21

Site:

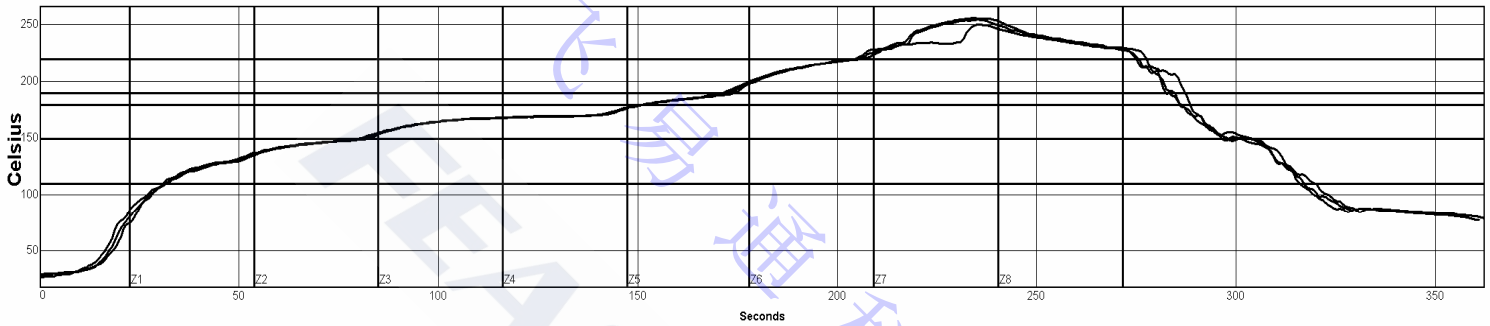
Oven Name: WQ

Process Window Name: 无铅

Setpoints (Celsius)

Zone	1	2	3	4	5	6	7	8
Top	140	150	170	170	190	225	265	230
Bottom	140	150	170	170	190	225	265	230

Conveyor Speed (cm/min): 75.0



PWI= 304%	Max Rising Slope		Preheat 110-190C		Soak Time 150-180C		Reflow Time /220C		Peak Temp	
2	3.9	189%	141.4	157%	70.4	-296%	71.1	111%	254.8	97%
3	4.0	197%	139.7	149%	70.6	-294%	70.3	103%	250.6	11%
4	3.9	192%	142.1	160%	69.6	-304%	71.2	112%	256.5	130%

Process Window:

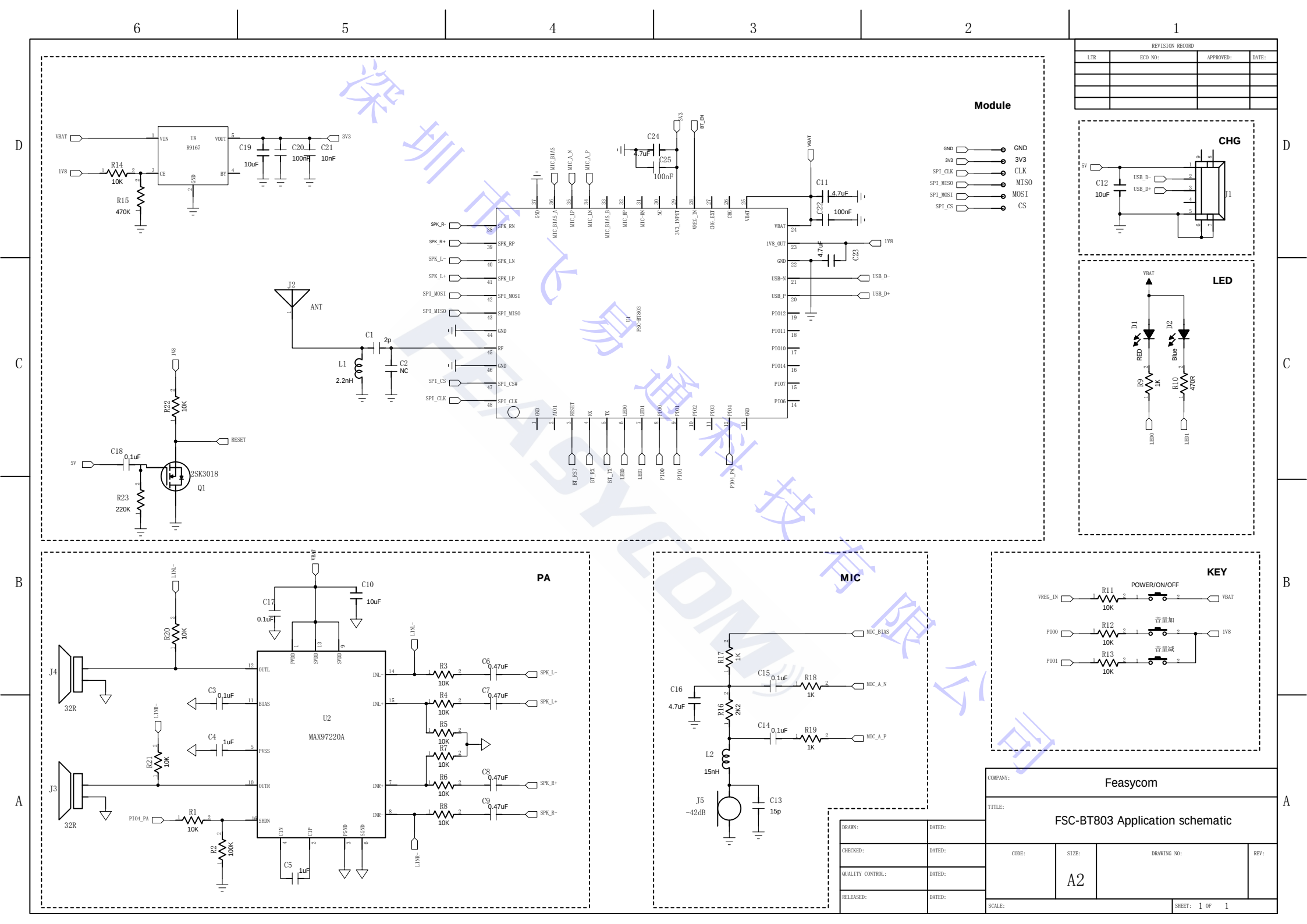
Solder Paste: SYSTEM DEFAULT

Statistic Name	Low Limit	High Limit	Units
Max Rising Slope (Target=2.0)	0.0	3.0	Degrees/Second
Preheat Time 110-190C	90	130	Seconds
Soak Time 150-180C	90	110	Seconds
Time Above Reflow - 220C	50	70	Seconds
Peak Temperature	245	255	Degrees Celsius

Description:

Figure 5

7. Application Schematic


REVISION RECORD
LTR
ECO NO:
APPROVED:
DATE:
Module
CHG
LED
KEY
PA
MIC
POWER/ON/OFF
音量加
音量减
U1
FSC-BT803
U2
MAX97220A
U8
R9167
J2
ANT
Q1
2SK3018
J1
J3
J4
J5
D1
D2
RED
Blue
VBAT
3V3
1V8
5V
GND
SPI_CLK
SPI_MISO
SPI_MOSI
SPI_CS
CLK
MISO
MOSI
CS
USB_D-
USB_D+
RESET
MIC_BIAS
MIC_A_N
MIC_A_P
SPK_L-
SPK_L+
SPK_R+
SPK_R-
BT_RST
BT_RX
BT_TX
LED0
LED1
P100
P101
P104_PA
VREG_IN
R1 10K
R2 100K
R3 10K
R4 10K
R5 10K
R6 10K
R7 10K
R8 10K
R9 1K
R10 470R
R11 10K
R12 10K
R13 10K
R14 10K
R15 470K
R16 2K2
R17 1K
R18 1K
R19 1K
R20 10K
R21 10K
R22 10K
R23 220K
C1 2p
C2 NC
C3 0.1uF
C4 1uF
C5 1uF
C6 0.47uF
C7 0.47uF
C8 0.47uF
C9 0.47uF
C10 10uF
C11 4.7uF
C12 10uF
C13 15p
C14 0.1uF
C15 0.1uF
C16 4.7uF
C17 0.1uF
C18 0.1uF
C19 10uF
C20 100nF
C21 10nF
C22 100nF
C23 4.7uF
C24 4.7uF
C25 100nF
L1 2.2nH
L2 15nH
32R
-42dB
COMPANY:
Feasycom
TITLE:
FSC-BT803 Application schematic
DRAWN:
CHECKED:
QUALITY CONTROL:
RELEASED:
DATED:
CODE:
SIZE:
A2
DRAWING NO:
REV:
SCALE:
SHEET: 1 OF 1