WE- 8853S Bluetooth Module SPEC

Latest Version: 1. 2

BT V5.0

2021-05-15

User Manual

Since this module is not sold to general end users directly, there is no user manual of module.

For the details about this module, please refer to the specification sheet of module.

This module should be installed in the host device according to the interface specification (installation procedure).

This module is compliance with FCC rules part 15 subpart C.

The following information must be indicated on the host device of this module;

[for FCC]

Contains FCC ID: AK8-WE8853S

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.

*If it is difficult to describe this statement on the host device due to the size, please describe in the user's manual and also either describe on the device packaging or on a removable label attached on the device.

[for ISED(IC)]

Contains IC: 409B-WE8853S

The following statements must be described on the user manual of the host device of this module;

[for FCC]

FCC CAUTION **Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

[for ISED(IC)]

This device contains licence-exempt transmitters/receivers that comply with Innovation, Science and Economic Development Canada's license-exempt RSSs. Operation is subject to the following two conditions: **(1) This device may not cause interference** **(2) This device must accept any interference, including interference that may cause undesired operation of the device.**
L' émetterur/récepteur exempt de licence contenu dans le present appareil est conforme aus CNR d'Innovation, Science et Développement économique Canada applicables aux apparerils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : **1) L'appareil ne doit pas produire de brouillage;** **2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.**

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the ISED radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.
Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'ISDE. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

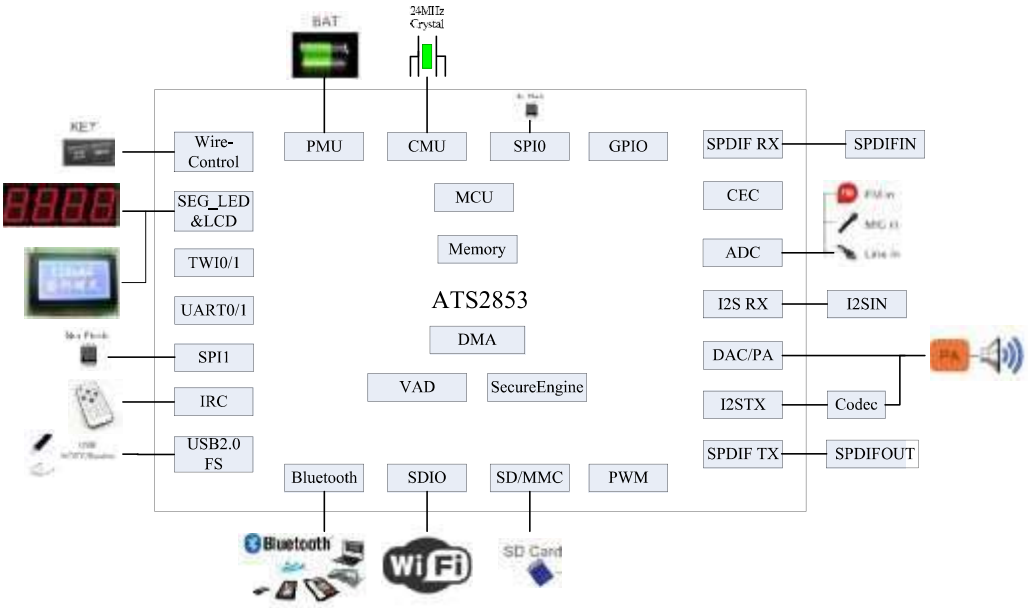
NOTE: The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

The end user manual shall include all required regulatory information/warning as shown in this manual, include:

This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

List of Contents

Application Diagram



Specifications

Operating Frequency Band	2.4GHz ~ 2.48GHz unlicensed ISM band
Bluetooth Specification	V2.1+EDR /V4.2/5.0
Bluetooth Protocol	A2DP,AVRCP,HFP,SPP BAS,DIS,FMP,HRP,HRS,HTP,HTS,IAS,LLS
Output Power Class	Class 2
Operating Voltage	Core :1.2V, IO:3.1V, BAT:3.3V~4.5V
Operating temperate range	-10 ℃ ~ +70 ℃
External Interface	UART,SPI,TWI,I2S,IR,SD Card,USB,DMIC,SPDIF RX

Electrical Characteristics

Parameter	Symbol	Min	Max	Unit
Ambient Temperature	Tamb	-10	+70	°C
Storage temperature	Tstg	-55	+150	°C
ESD Stress voltage	Vesd (Human body model)	4000	-	V
Supply Voltage	BAT	3.0	5	V
	VCC/AVCC/SVCC	2.7	3.6	V
	VD15	1.0	1.7	V
Input Voltage	ONOFF	-	5	V
	3.3V IO	2.7	VCC+0.2	V

Supply Voltage	Min	Typ	Max	Unit
BAT (Li)	3.3	3.8	4.5	V
VCC/SVCC	3.0	3.1	3.6	V
AVCC	2.9	2.95	3.25	V
VD15	1.2	1.5	1.7	V

Regulators Maximum Output Current		
Block Name	**Output Voltage**	**Load Capacity**
VCC	2.8V ~ 3.3V	300mA
AVCC	VCC – 0.15V	40mA
SVCC	2.8V ~ 3.3V	10mA

Note: The output voltages are precisely within ±2%, providing large currents with a significantly small dropout voltage within ±5%.

AUDIO Features

Test Condition: Power BAT=3.8V, Analog audio output AOUTL/R
BW=20Hz ~ 20 KHz, Test equipment: AP2722

DAC

Core Supply Voltage = 1.2V @ 25°C

Digital to Analogue Converter							
Parameter	**Conditions**			**Min**	**Typ**	**Max**	**Unit**
Resolution	-			-	-	24	Bits
Output Sample Rate	-			8	-	96	kHz
SNR	fin = 1kHz@0dBFS input B/W = 22Hz~22kHz Fs=48kHz	2.6VPP output@Load=10kΩ	-	-	98	-	dB
			A-Weighting		100		
		1.6VPP output@Load=16.5Ω	-	-	97	-	dB
			A-Weighting		100		
Dynamic Range	fin = 1kHz@-48dBFS input B/W = 22Hz~22kHz Fs=48kHz	2.6VPP output@Load=10kΩ	-	-	97	-	dB
			A-Weighting		100		
		1.6VPP output@Load=16.5Ω	-	-	96	-	dB
			A-Weighting		100		
THD+N	fin = 1kHz@0dBFS input B/W = 22Hz~22kHz	2.6VPP output@Load=10kΩ	-	-	-85	-	dB
		1.6VPP			-85		
	Fs=48kHz	output@Load=16.5Ω					
Digital gain	-				-		-
Stereo crosstalk	fin = 1kHz@0dBFS input		-	-	-113	-	dB
PWR Amplifier							
Max Amplitude/PWR	fin = 1kHz@0dBFS input Fs=48kHz	2.6VPP output@Load=10kΩ	Single Ended Output	-	952		mVrms
				-	-		mW
	fin = 1kHz@0dBFS input Fs=48kHz	1.6VPP output@Load=16.5Ω	Single Ended Output	-	568		mVrms
				-	19.5		mW

AUDIO Features

Test Condition: Power BAT=3.8V, Analog audio output AOUTL/R
BW=20Hz ~ 20 KHz, Test equipment: AP2722

ADC

Core Supply Voltage = 1.2V @ 25°C

Pre-Amplifier					
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
Full Scale Input Voltage	THD+N < 1%	-	-	2.6	Vpp
Analogue gain	Differential input	-12	-	33	dB
	Single Ended input	-18	-	27	dB
Analogue to Digital Converter					
Resolution	-	-	-	24	Bits
Input Sample Rate	-	8	-	96	kHz
SNR	fin = 1kHz@Full Scale Input Voltage, B/W = 22Hz~22kHz, Fs=48kHz & PA 1.6VPP output	-	96	-	dB
		A-Weighting	98		
Dynamic Range	fin = 1kHz@-40dBFS Input Voltage, B/W = 22Hz~22kHz, Fs=48kHz & PA 1.6VPP output	-	96	-	dB
		A-Weighting	98		
THD+N	fin = 1kHz(input=1.6Vpp), B/W = 22Hz~22kHz, Fs=48kHz & PA 1.6VPP output	-	-	-89	dB
Digital gain	-	0	-	52.5	dB

RF Characteristics

BT Protocols	A2DP/AVRCP/HFP /SPP	A2DP1.3
		AVRCP1.6
		HFP1.7
		SPP1.2
Power Consumption	A2DP	Typical : 29mA
	HFP	Typical : 43mA
	Sniff	Typical : mA
	Standby	Typical : 45uA

Basic Data Rate of Transmitter

Parameter	Condition	Min.	Typ.	Max.	Unit
Maximum RF Transmit PWR	-	-	8	10	dBm
RF PWR Control Step	-	2	4	8	dB
20dB Bandwidth for Modulated Carrier	-	-	914		KHz
Adjacent Channel Transmit	+2 MHz	-		-20	dBm
	-2 MHz	-		-20	dBm
	+3 MHz	-		-40	dBm
	-3 MHz	-		-40	dBm
Frequency Deviation	Δf1avg Maximum Modulation	140	166	175	KHz
	Δf2max Maximum Modulation	115	130		KHz
	Δf1avg/Δf2avg	0.8	1		
Initial Carrier Frequency Tolerance	-	-75	±10	75	KHz
Frequency Drift	DH1 Packet	-25	±10	25	KHz
	DH3 Packet	-40	±10	40	KHz
	DH5 Packet	-40	±10	40	KHz
Frequency Drift Rate	-	-20	3	20	KHz/50us

Enhanced Data Rate of Transmitter

Description		Min	Typ.	Max.	Unit
Relative Transmit PWR(EDR)		-4	-1.5	1	dB
π/4 DQPSK max carrier frequency stability|ω_0|		-10	±3	10	KHz
π/4 DQPSK max carrier frequency stability|ω_i|		-75	±5	75	KHz
π/4 DQPSK max carrier frequency stability|$\omega_0+\omega_i$|		-75	±4	75	KHz
8DPSK max carrier frequency stability |ω_0|		-10	±3	10	KHz
8DPSK max carrier frequency stability |ω_i|		-75	±5	75	KHz
8DPSK max carrier frequency stability|$\omega_0+\omega_i$|		-75	±5	75	KHz
π/4 DQPSK Modulation Accuracy	RMS DEVM			20	%
	99% DEVM	99	100		%
	Peak DEVM			35	%
In-band spurious emissions	F >F0 + 3MHz			-40	dBm
	F < F0 - 3MHz			-40	dBm
	F = F0 + 3MHz			-40	dBm
	F = F0 - 3MHz			-40	dBm
	F = F0 + 2MHz			-20	dBm
	F = F0 - 2MHz			-20	dBm
	F = F0 + 1MHz			-26	dBm
	F = F0 - 1MHz			-26	dBm
EDR Differential Phase Encoding		99	100		%

Basic Data Rate of Receiver

Description		Min.	Typ.	Max.	Unit
Sensitivity			-93		dBm
Maximum Input PWR at 0.1% BER		-20			dBm
Co-Channel Interface		-		11	dB
Adjacent Channel Selectivity C/I	$F = F_0 + 1MHz$	-		0	dB
	$F = F_0 - 1MHz$	-		0	dB
	$F = F_0 + 2MHz$	-		-30	dB
	$F = F_0 - 2MHz$	-		-30	dB
	$F = F_0 + 3MHz$	-		-40	dB
	$F = F_{image}$	-		-9	dB

Enhanced Data Rate of Receiver

Description		Min.	Typ.	Max.	Unit
Sensitivity at 0.1% BER	π/4 DQPSK		-92	-	dBm
	8DPSK		-87	-	dBm
Maximum Input PWR at 0.1% BER	π/4 DQPSK	-20			dBm
	8DPSK	-20			dB
C0-Channel Interference	π/4 DQPSK	-		13	dB
	8DPSK	-		21	dB

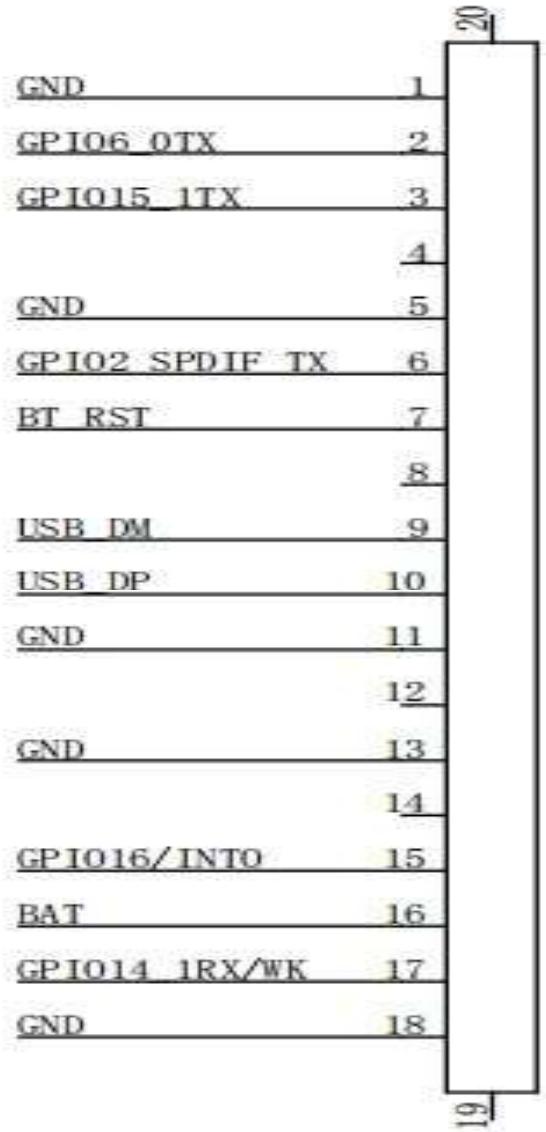
PMU Characteristics

Power Consumption (10Kohm load)	Test conditions: 1. BAT=3.8V, VCC=3.1V, VDD=1.2V, Tamb=25℃ . 2. BLE OFF, SPP OFF, Scan time:1.28S, DAE OFF.		
	Standby	45uA	(typical)
	Card music play	22mA	(typical) Note 1
	Line in music play	15mA	(typical) Note 1
	Bluetooth music play	29mA	(typical) Note 1
	Bluetooth hands free	43mA	(typical) Note 1

NOTES:
1. Power consumption is relevant to SDK.

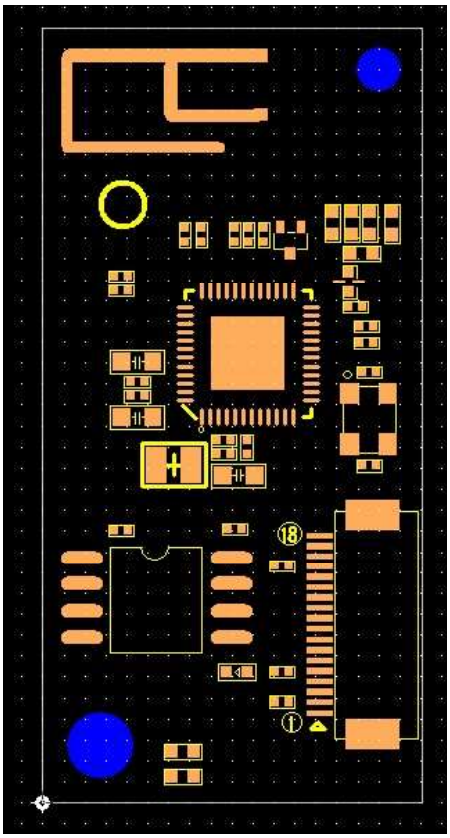
Key Part			
	part	Reference	Value
1	main chip	U1	ATS2853
2	crystal	YZ1	24MHz
3	Flash	UF1	BH25Q32
4	Flash	UF1 (option)	XM25QH32

FPC Connector Pin definitions

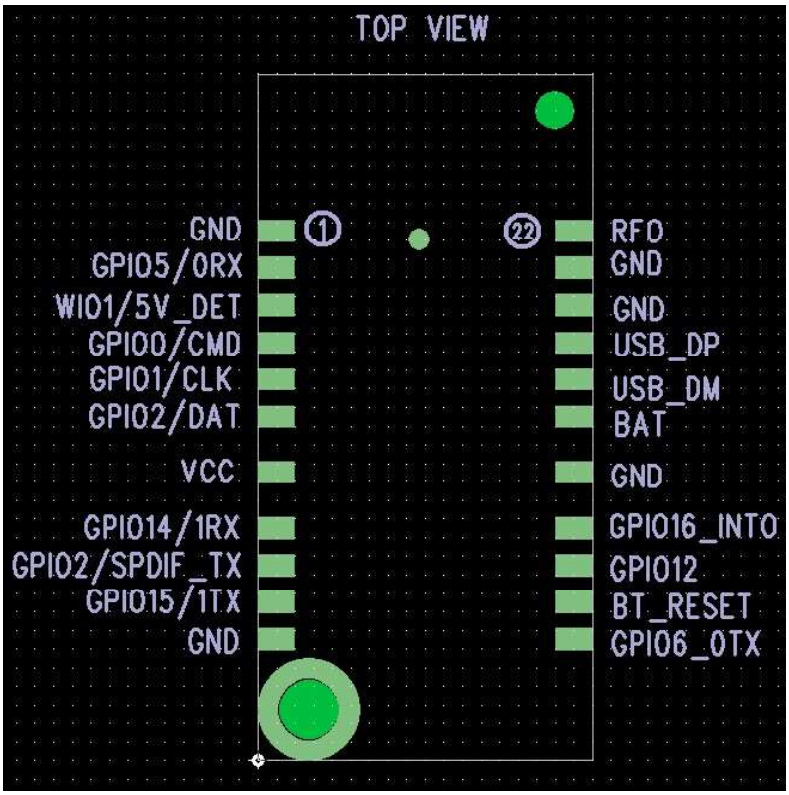


FPC Connector Pin Configurations

PIN NO.	NAME	TYPE	FUNCTION
1	GND	Power ground	Ground
2	TX0	Bi-directional	General Purpose Input Output
3	TX1	Bi-directional	General Purpose Input Output
4	NC		
5	GND	Power ground	Ground
6	NC		
7	BT_RESET	Input	On/Off
8	SPDIF_OUT	Out	SPDIF OUT
9	DM	AIO	USB Data minus
10	DP	AIO	USB Data plus
11	GND	Power ground	Ground
12	NC		
13	GND	Power ground	Ground
14	NC		
15	INTO	Bi-directional	General Purpose Input Output
16	BAT	VCC IN	typical voltage range:3.4V~4.2V
17	RX1	Bi-directional	General Purpose Input Output
18	GND	Power ground	Ground



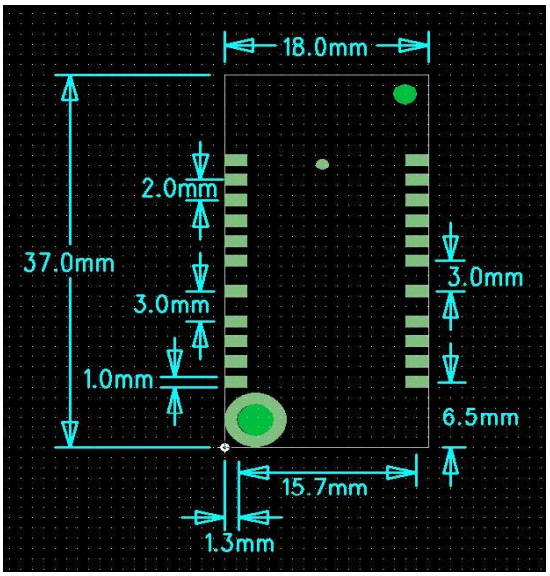
Module Pin definitions



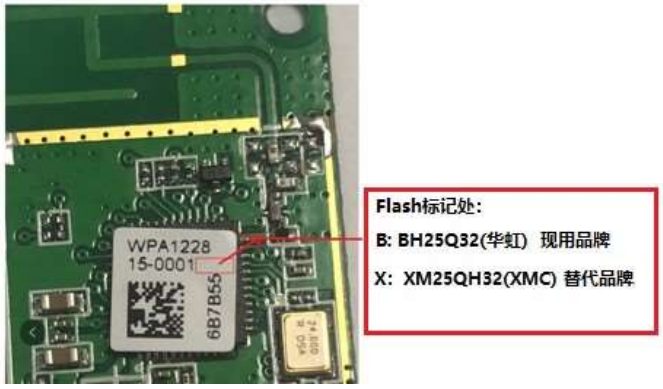
Module Pin Configurations

PIN NO.	NAME	TYPE	FUNCTION
1	GND	Power ground	Ground
2	GPIO5/0RX	Bi-directional	General Purpose Input Output
3	WIO1	Input	Wake up pin 1
4	GPIO0/CMD	Bi-directional	General Purpose Input Output
5	GPIO1/CLK	Bi-directional	General Purpose Input Output
6	GPIO2/DAT	Bi-directional	General Purpose Input Output
7	VCC	Out	3.1V_Out
8	GPIO14/1RX	Bi-directional	General Purpose Input Output
9	GPIO2/SPDIF_OUT	Out	SPDIF OUT
10	GPIO15/1TX	Bi-directional	General Purpose Input Output
11	GND	Power ground	Ground
12	GPIO6/0TX	Bi-directional	General Purpose Input Output
13	BT_RESET	Input	On/Off
14	GPIO12	Bi-directional	General Purpose Input Output
15	GPIO16_INTO	Bi-directional	General Purpose Input Output
16	GND	Power ground	Ground
17	BAT	VCC IN	Typical voltage range:3.4V~4.2V
18	DM	AIO	USB Data minus
19	DP	AIO	USB Data plus
20	GND	Power ground	Ground
21	GND	Power ground	Ground
22	RFO	Out	RF

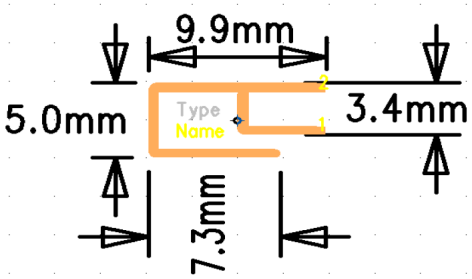
Module Package Information



Flash Version Control



ANTENNA SPECIFICATION



trace boundary limits	2.402~2480MHz
thickness	1.0mm
length	9.9mm
width	5.0mm
shape	Special shape
dielectric constant	4.2~4.7
impedance	50 ohm

Document History

Revision	Date	History
V1.0	2021/01/20	First release
V1.1	2021/04/16	Add Flash Version Control
V1.2	2021/05/15	Add User Manual

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