



XIAMEN COMFORT SCIENCE & TECHNOLOGY GROUP CO., LTD.

ATS2853BluetoothModuleWithANT SPEC

Latest Version: 0.2

2023-11-27



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Features

- 32bit RISC processor Core, up to 240MHz
- Internal 203KB RAM for data and program storage
- Internal 2MByte Nor flash
- Support 24MHz OSC with on-chip PLL
- Internal 32KHz RC oscillator
- 8-channel ordinary DMA, support for transmission in burst 8 mode
- Support Bluetooth V5.3, compatible with Bluetooth V5.0/4.2/4.2 LE/4.0/2.1 + EDR system
- Compatible with AVRCP Profile V1.6
- Compatible with A2DP Profile V1.3
- Compatible with HFP Profile V1.7
- Built-in stereo 24bit sigma-delta DAC
- DAC supports sample rate of 8k/11.025k/12k/16k/22.05k/24k/32k/44.1k/48k/88.2k/96kHz
- Built-in stereo 20mW PA for headphone
- Built-in stereo 24bit sigma-delta ADC
- ADC supports sample rate of 8k/11.025k/12k/16k/22.05k/24k/32k/44.1k/48k/88.2k/96kHz
- Support 3 pairs input 0/1/2; each pair can be formed as mix or differential input.
- Support 2 DMIC input
- I2S TX&RX support master and slave mode separately, and support sample rate of 192k/96k/48k/44.1k/32k/24k/22.05k/16k/12k/11.025k/8k
- Support SPDIF TX, SPDIF RX and CEC
- Rich Interfaces support: SD, MMC/eMMC, USB2.0FS, 2xUART, 2xTWI, 1xSPI, IR RX, 9xPWM, support LCD with 8bit CPU interface, 1/3Bias, SEG_LCD Driver, 7/8pin LED
- 24 Programmable GPIOs, and 10 analog IOs can also configure as GPIOs.
- PCB Dimension:
L27±0.1×W14±0.1×H25±0.1 mm

Applications

- Wireless Audio Application
- MMC/SD Card Audio Playback
- Bluetooth car audio unit
- Sound Bar

3COM、4 COM, maximum 9SEG

ATS2853 BT Module With ANT

Bluetooth Audio Solution

Wireless Audio Applications

MMC/SD Card Audio Playback

Bluetooth car audio unit

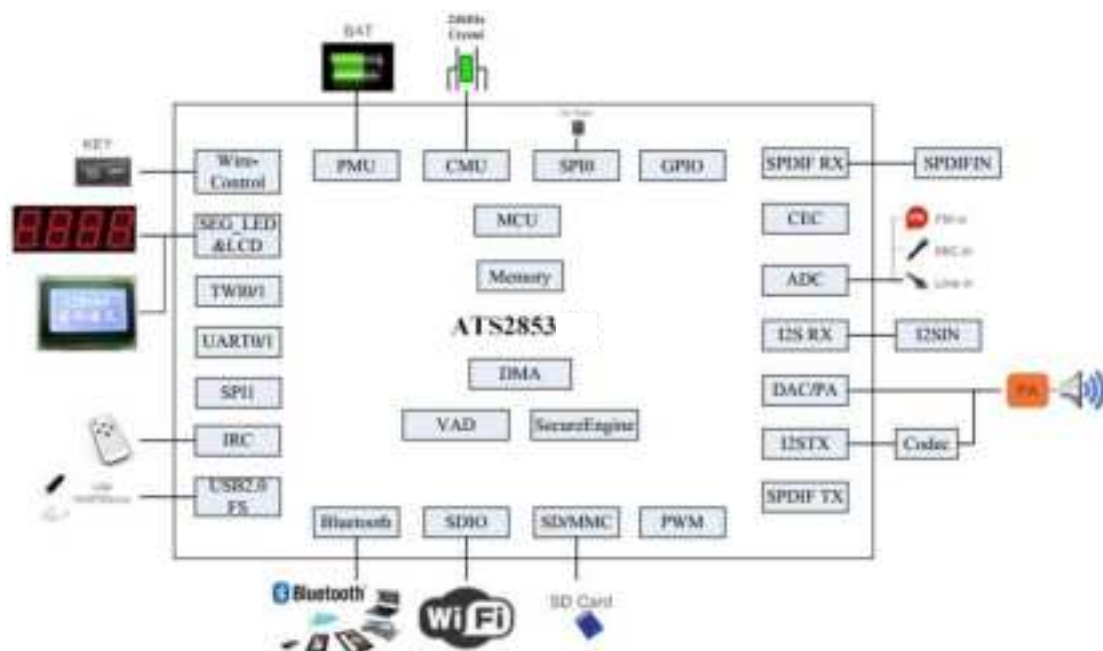
Sound Bar

Bluetooth V5.3





Application Diagram



Specifications

Operating Frequency Band	2.4GHz ~ 2.48GHz unlicensed ISM band
Bluetooth Specification	V5.3
Bluetooth Protocol	A2DP,AVRCP,HFP
Output Power Class	Class 1
Operating Voltage	Core :1.2V, IO:3.1V, BAT:3.4V~4.3V
Operating temperate range	(-20 ℃ ~ 70℃)
External Interface	UART,SPI,TWI,I2S TX/RX,IR,SD Card, USB,DMIC,SPDIF TX/RX



Electrical Characteristics

Absolute Maximum Ratings				
Parameter	Symbol	Min	Max	Unit
Temperature	Storage temperature (T _{stg})	-55	+150	°C
ESD Stress voltage	V _{ESD} (Human body model)	4000	--	V
Supply Voltage	VCC/AVCC/SVCC	2.7	3.6	V
	VD15	1.0	1.7	V
	BAT	3	5	V
Input Voltage	3.3V IO	2.7	VCC+0.2	V
	ONOFF	-	5	V

Recommended Power Supply				
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	3.1V	300mA
AVCC	2.95V	40mA
SVCC	3.1V	100mA

Note: The output voltages are precisely within $\pm 2\%$.

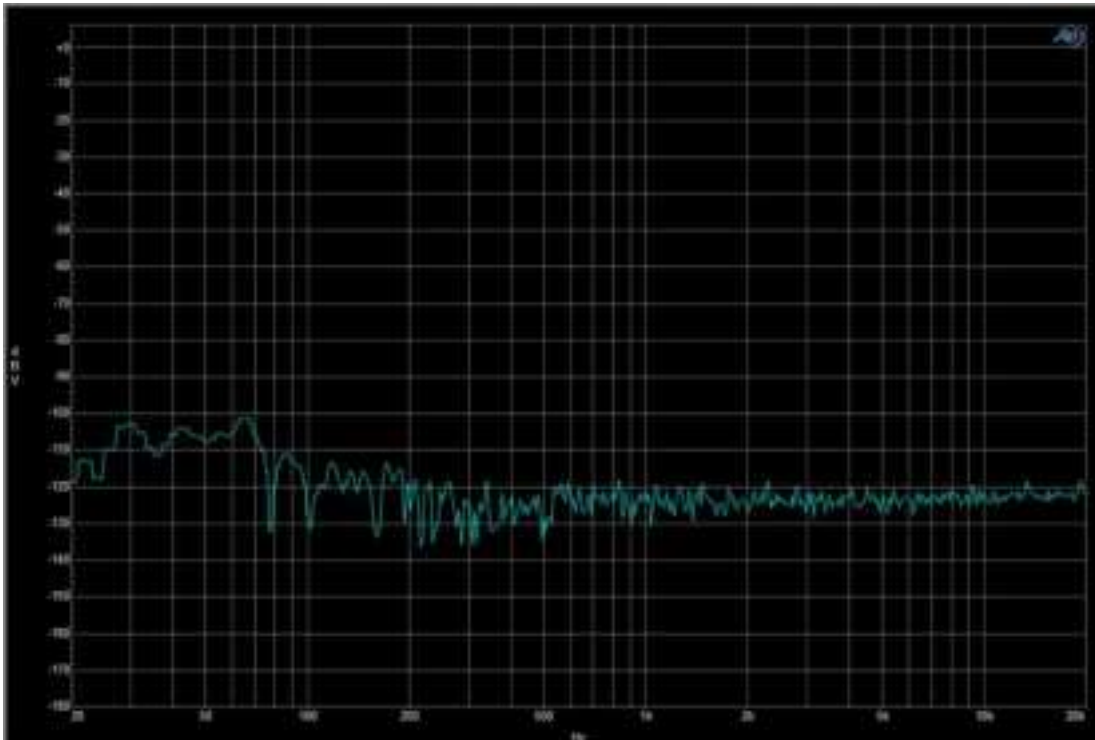


AUDIO Features

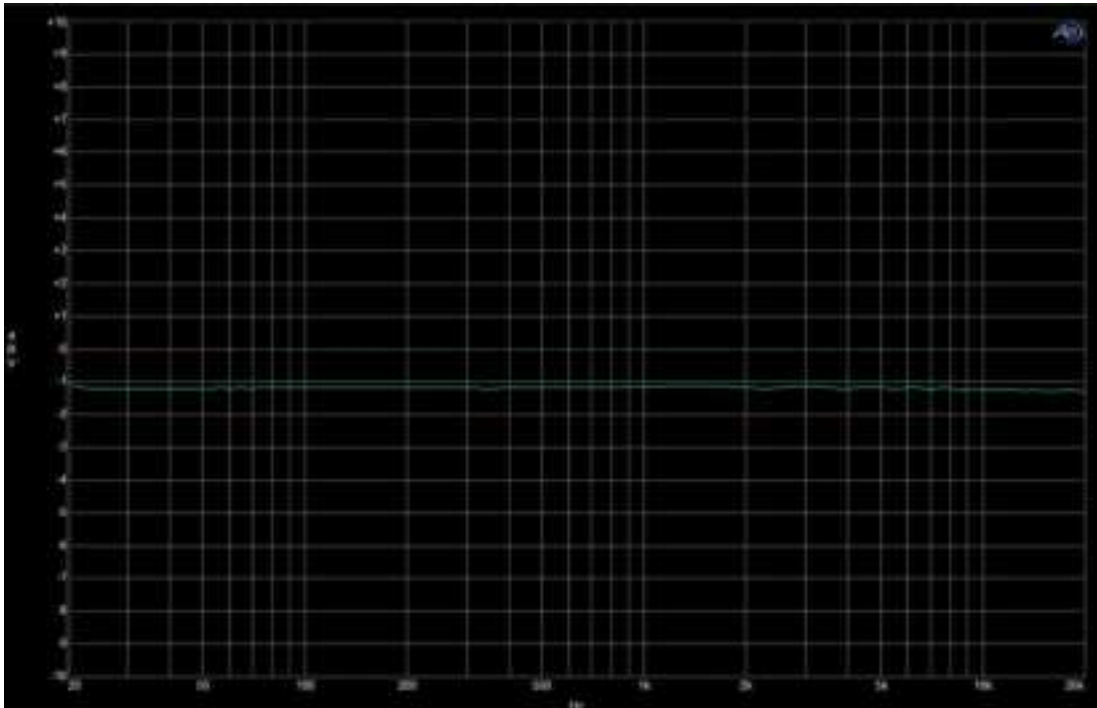
Test Condition: Power BAT=3.8V, Analog audio output AOCTL/R, Load = 10K ohm,
BW=20Hz ~ 20 KHz, Test equipment: AP2722.

DAC/ADC audio output performance chart:

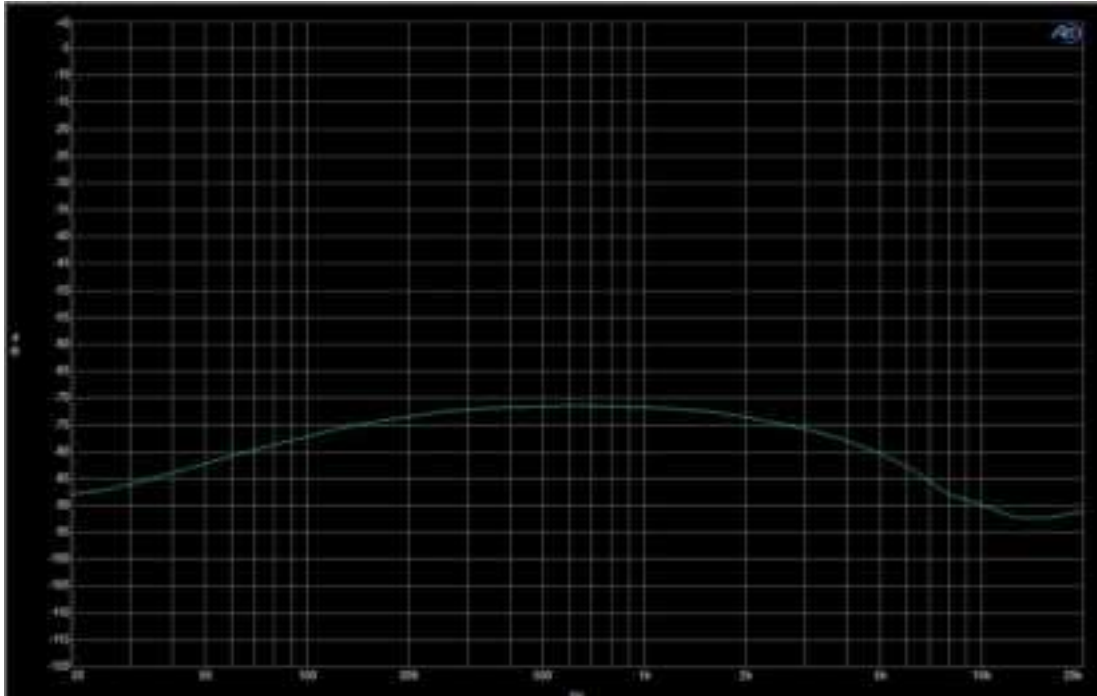
Line in Input Mode:



Line in Input player: 0KHz FFT 20Hz ~ 20 KHz



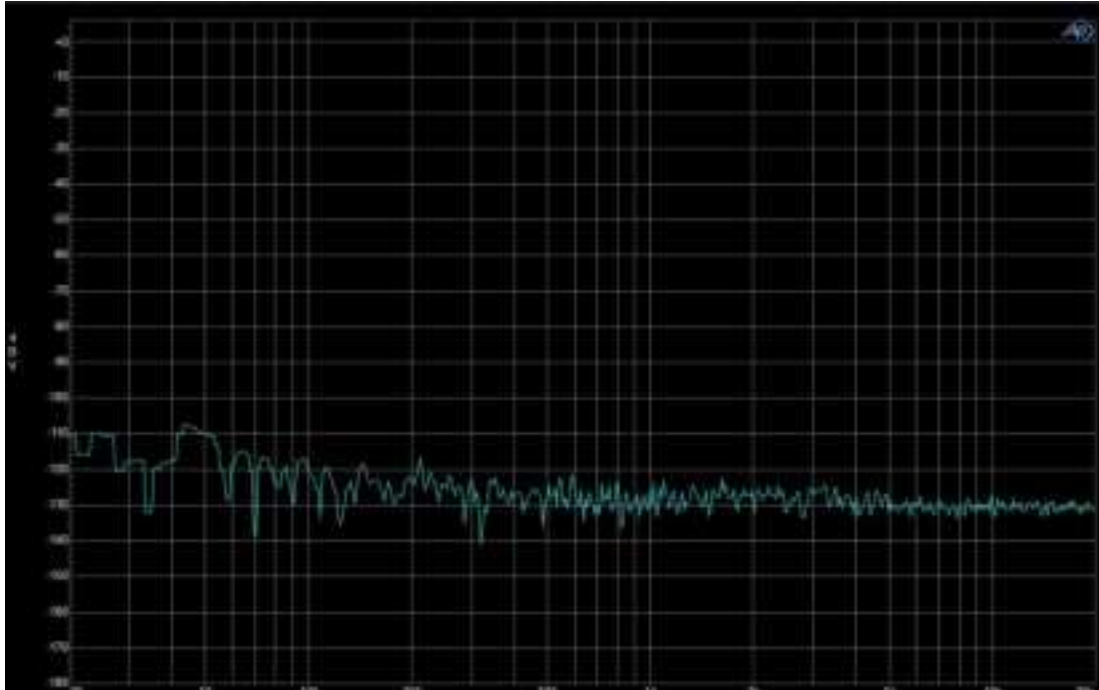
Line in Input Player: Frequency Response 20Hz ~ 20 KHz



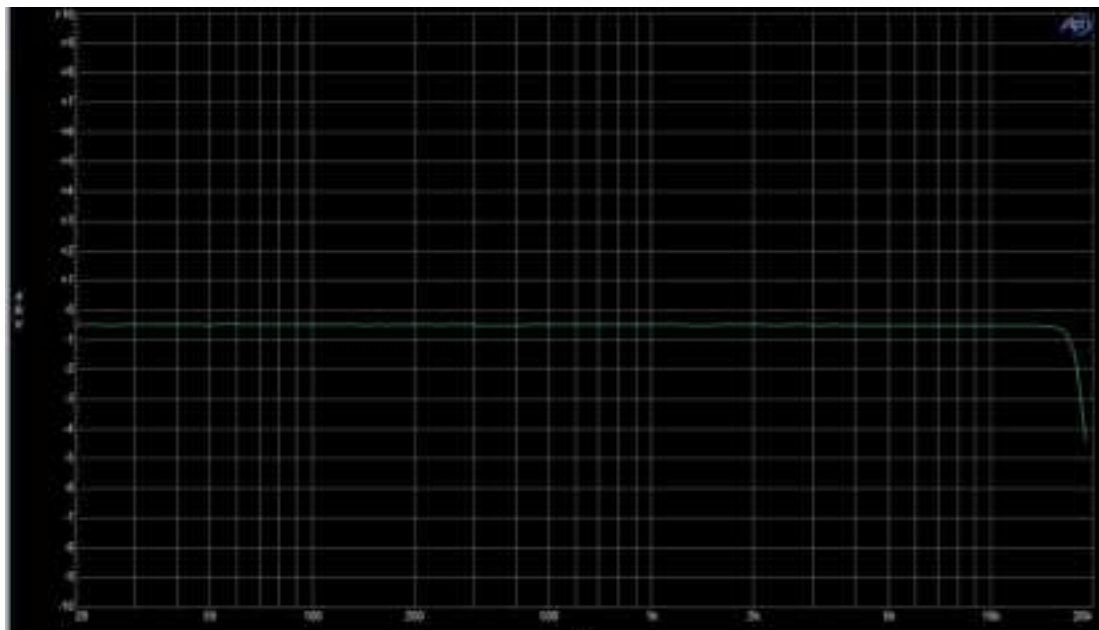
Line in Input player: THD+N (A-Weighting) 20Hz ~ 20 KHz



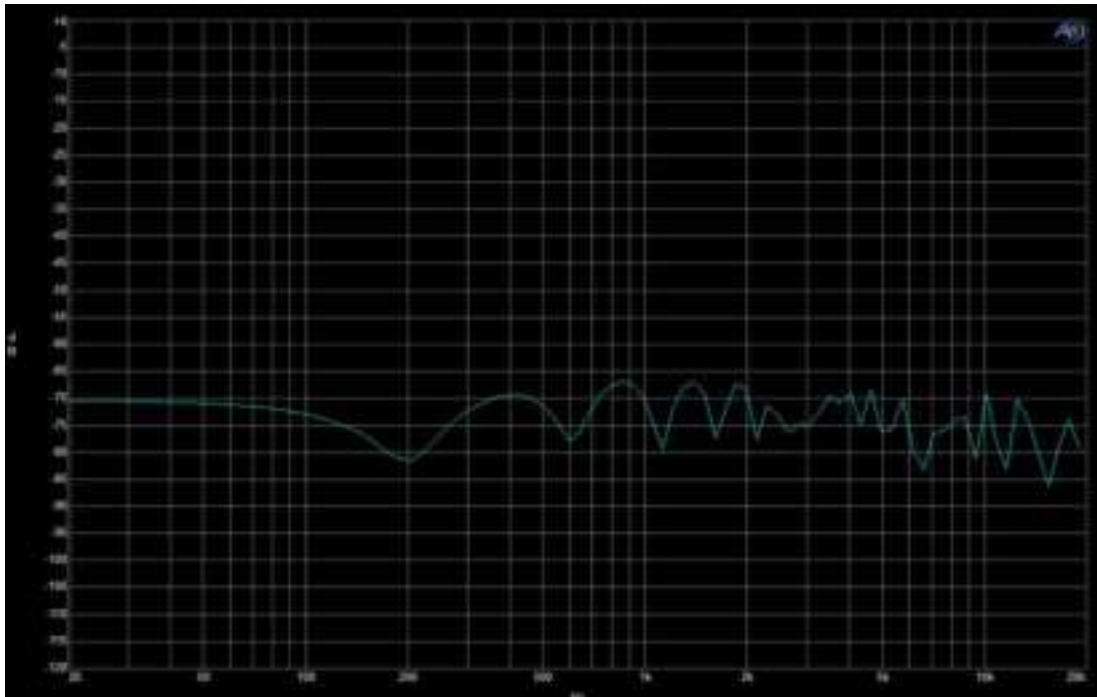
Bluetooth Player Music Mode:



Bluetooth A2DP Player: 0Hz FFT 20Hz ~ 20 KHz



Bluetooth A2DP Player: Frequency Response 20Hz ~ 20 KHz



Bluetooth A2DP Player: THD+N 20Hz ~ 20 KHz

RF Characteristics

BT Protocols	A2DP/AVRCP/HFP	A2DP1.3.2
		AVRCP1.6.2
		HFP1.7
Power Consumption	A2DP	Typical : 18.1mA NOTE1
	HFP	Typical : 20.8mA NOTE1
	Sniff	Typical : 2.1mA NOTE2
	Standby	Typical : 20uA NOTE3

NOTE1:Vbat = 3.8V,10K load, related to SDK.

NOTE2:Vbat = 3.8V,BLE broadcast is on.

NOTE3:Vbat = 3.8V.



Basic Data Rate of Transmitter					
Parameter	Condition	Min.	Typ.	Max.	Unit
Maximum RF Transmit Power	-	4	5.5	6.8	dBm
RF Power Control Range	-	2	4	8	dB
20dB Bandwidth for Modulated Carrier	-	-	928		KHz
Adjacent Channel Transmit	+2 MHz	-	-	-20	dBm
	-2 MHz	-	-	-20	dBm
	+3 MHz	-	-	-40	dBm
	-3 MHz	-	-	-40	dBm
Frequency Deviation	Δf_{1avg} Maximum	140	164.35	175	KHz
	Δf_{2max} Maximum	115	149	-	KHz
	$\Delta f_{1avg}/\Delta f_{2avg}$	0.8	1.1	-	-
Initial Carrier Frequency Tolerance		-75	± 10	75	KHz
Frequency Drift	HD1 Packet	-25	± 10	25	KHz
	HD3 Packet	-40	± 10	40	KHz
	HD5 Packet	-40	± 10	40	KHz
Frequency Drift Rate		-20	3.8	20	KHz/50us

Enhanced Data Rate of Transmitter					
Parameter	Condition	Min.	Typ.	Max.	Unit
Relative Transmit Power	-	-4	-1.5	1	dB
$\pi/4$ DQPSK max carrier frequency stability $ \omega_0 $	-	-10	± 3	10	KHz
$\pi/4$ DQPSK max carrier frequency stability $ \omega_i $	-	-75	± 5	75	KHz
$\pi/4$ DQPSK max carrier frequency stability $ \omega_0+\omega_i $	-	-75	± 4	75	KHz
8DPSK max carrier frequency stability $ \omega_0 $	-	-10	± 3	10	KHz
8DPSK max carrier frequency stability $ \omega_i $	-	-75	± 5	75	KHz
8DPSK max carrier	-	-75	± 5	75	KHz



frequency stability $ \omega_0+\omega_i $					
$\pi/4$ DQPSK Modulation Accuracy	RMS DEVIN	-	-	20	%
	99% DEVM	99	100	-	%
	Peak DEVM	-	-	35	%
In-band spurious emissions	$F > F_0 + 3\text{MHz}$	-	-	-40	dBm
	$F < F_0 - 3\text{MHz}$	-	-	-40	dBm
	$F = F_0 + 3\text{MHz}$	-	-	-40	dBm
	$F = F_0 - 3\text{MHz}$	-	-	-40	dBm
	$F = F_0 + 2\text{MHz}$	-	-	-20	dBm
	$F = F_0 - 2\text{MHz}$	-	-	-20	dBm
	$F = F_0 + 1\text{MHz}$	-	-	-26	dB
	$F = F_0 - 1\text{MHz}$	-	-	-26	dB
EDR Differential Phase Encoding	-	99	100	-	%

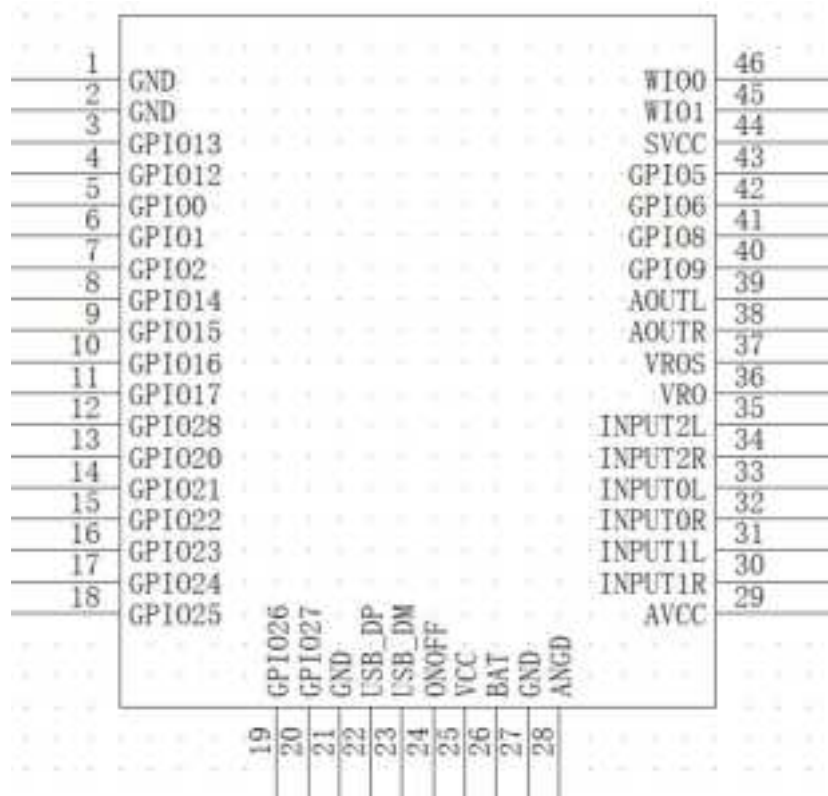
Basic Data Rate of Receiver					
Parameter	Condition	Min.	Typ.	Max.	Unit
Sensitivity at 0.1% BER		-	-90	-	dBm
Maximum Input Power at 0.1% BER		-20	-	-	dBm
		-	-		
Adjacent Channel Selectivity C/I	$F = F_0 + 1\text{MHz}$	-	-	0	dB
	$F = F_0 - 1\text{MHz}$	-	-	0	dB
	$F = F_0 + 2\text{MHz}$	-	-	-30	dB
	$F = F_0 - 2\text{MHz}$	-	-	-30	dB
	$F = F_0 + 3\text{MHz}$	-	-	-40	dB
	$F = F_{\text{image}}$	-	-	-9	dB

Enhanced Data Rate of Receiver					
Parameter	Condition	Min.	Typ.	Max.	Unit
Sensitivity at 0.01% BER	$\pi/4$ DQPSK	-	-90	-	dBm
	8DPSK	-	-82	-	dBm
Maximum Input Power at 0.1% BER	$\pi/4$ DQPSK	-20	-	-	dBm
	8DPSK	-20	-	-	dBm



Module Pin definitions

ATS2853 Module



Pin Configurations

PIN NO.	NAME	TYPE	FUNCTION
1	GND	Power ground	Ground

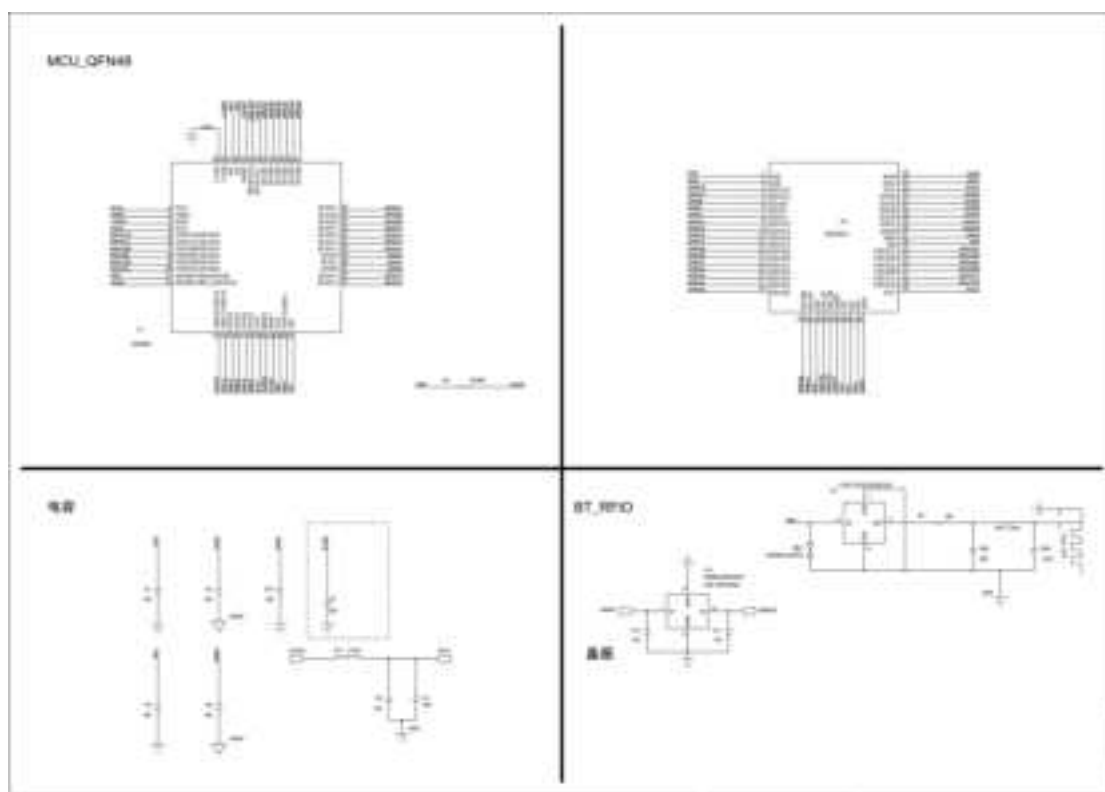


2	GND	Power ground	Ground
3	GPIO13	Bi-directional	General Purpose Input Output 13
4	GPIO12	Bi-directional	General Purpose Input Output 12
5	GPIO0	Bi-directional	General Purpose Input Output 0
6	GPIO1	Bi-directional	General Purpose Input Output 1
7	GPIO2	Bi-directional	General Purpose Input Output 2
8	GPIO14	Bi-directional	General Purpose Input Output 14
9	GPIO15	Bi-directional	General Purpose Input Output 15
10	GPIO16	Bi-directional	General Purpose Input Output 16
11	GPIO17	Bi-directional	General Purpose Input Output 17
12	GPIO28	Bi-directional	General Purpose Input Output 28
13	GPIO20	Bi-directional	General Purpose Input Output 20
14	GPIO21	Bi-directional	General Purpose Input Output 21
15	GPIO22	Bi-directional	General Purpose Input Output 22
16	GPIO23	Bi-directional	General Purpose Input Output 23
17	GPIO24	Bi-directional	General Purpose Input Output 24
18	GPIO25	Bi-directional	General Purpose Input Output 25
19	GPIO26	Bi-directional	General Purpose Input Output 26
20	GPIO27	Bi-directional	General Purpose Input Output 27
21	GND	Power ground	Ground
22	USB_DP	Bi-directional	USB D+
23	USB_DM	Bi-directional	USB D-
24	ONOFF	Input	All-purpose hardware switch
25	VCC	Power output	Power for Peripherals, typical voltage:3.1V
26	BAT	Power input	Battery Voltage input
27	GND	Power ground	Ground
28	ANGD	Analog ground	Ground for Analog circuit
29	AVCC	Power output	Power for Analog module, typical voltage:2.95V
30	INPUT1R	Analog input	INPUT1 Right channel input
31	INPUT1L	Analog input	INPUT1 Left channel input
32	INPUT0R	Analog input	INPUT0 Right channel input
33	INPUT0L	Analog input	INPUT0 Left channel input
34	INPUT2R	Analog input	INPUT2 Right channel input
35	INPUT2L	Analog input	INPUT2 Left channel input
36	VRO	Analog output	Direct drive mode bias
37	VRO_S	Analog output	Direct drive mode bias
38	AOUTR	Analog output	Right channel output



39	AOUTL	Analog output	Left channel output
40	GPIO9	Bi-directional	General Purpose Input Output 9
41	GPIO8	Bi-directional	General Purpose Input Output 8
42	GPIO6	Bi-directional	General Purpose Input Output 6
43	GPIO5	Bi-directional	General Purpose Input Output 5
44	SVCC	Power output	Power Supply for Hosc
45	WIO1	Input	Wake up IO1 and LRADC2 input
46	WIO0	Input	Wake up IO0 and LRADC1 input

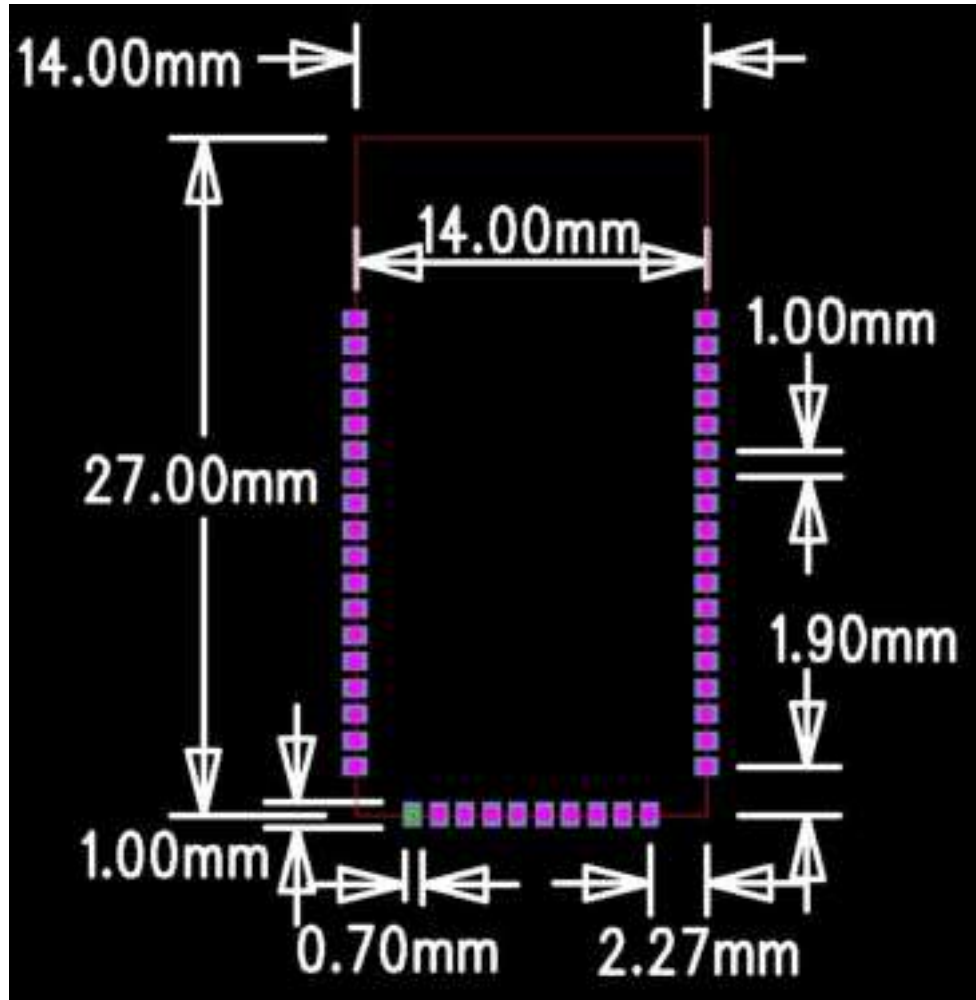
Circuit Diagram



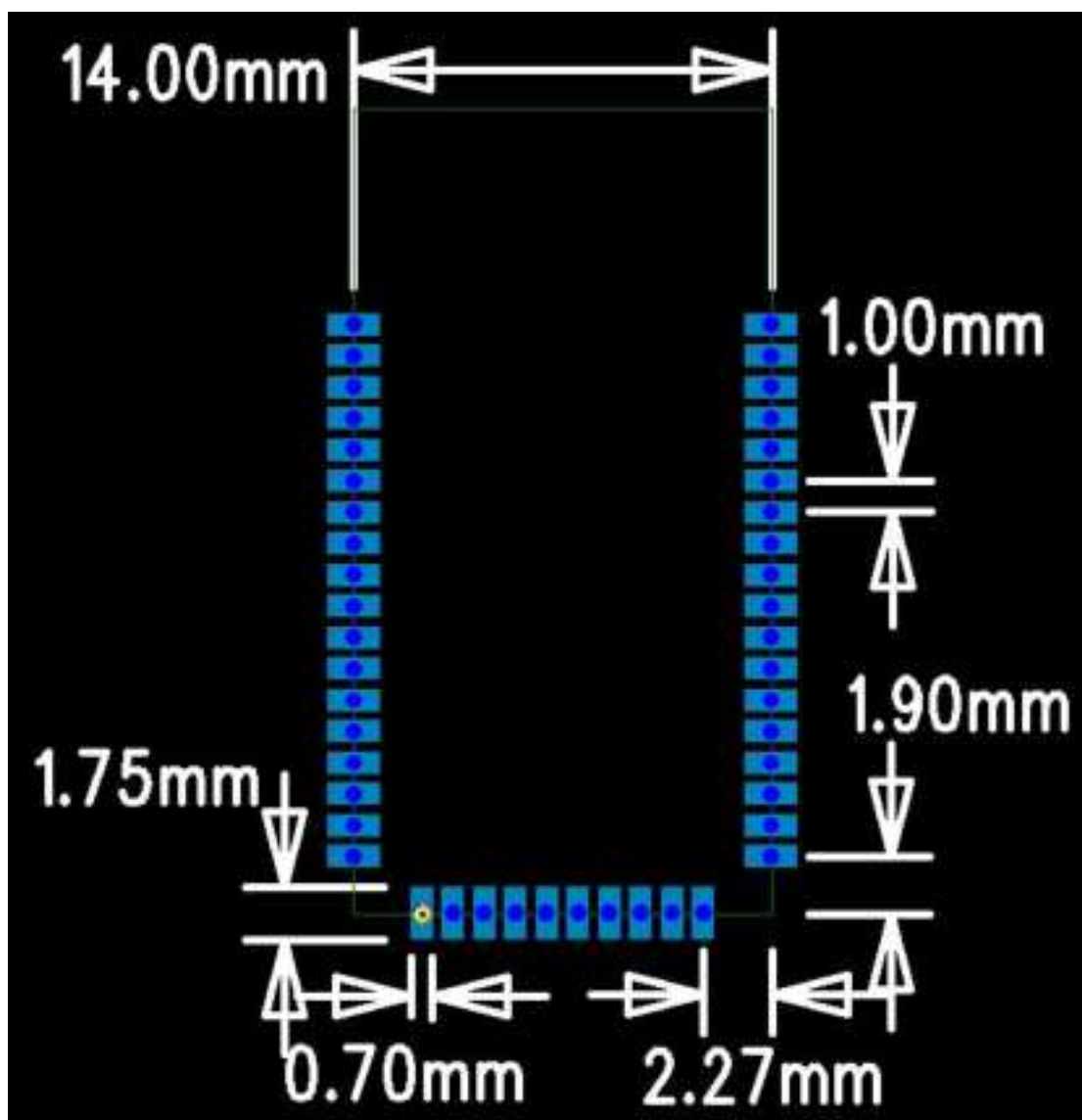


Module Package Information

ATS2853 Module:

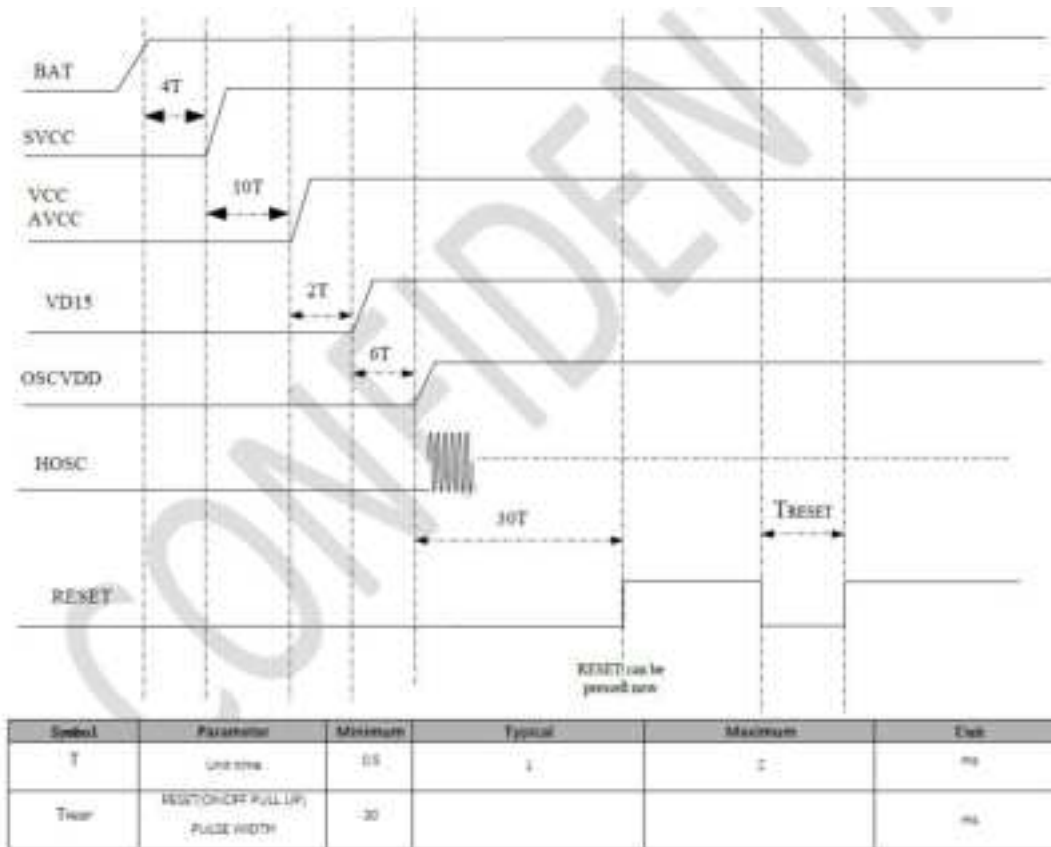


Module Dimension (Top View)



Recommended PCB layout

Power on sequence

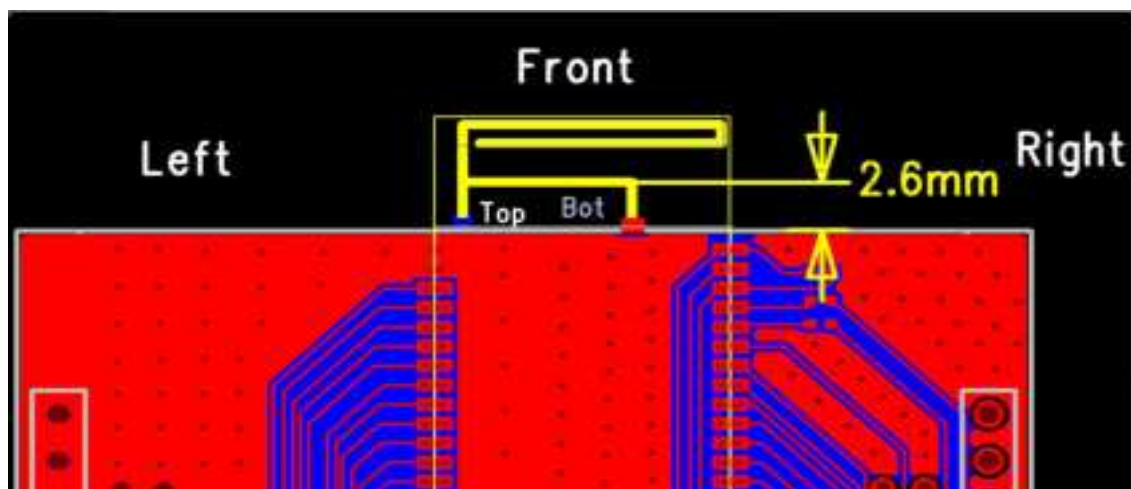


Recommended keepout area information

. It is recommended to place it at the end of the printed circuit board

. Clearance area size: the distance is greater than 2.5mm

Do not place metal objects in front, left, right, up and down positions





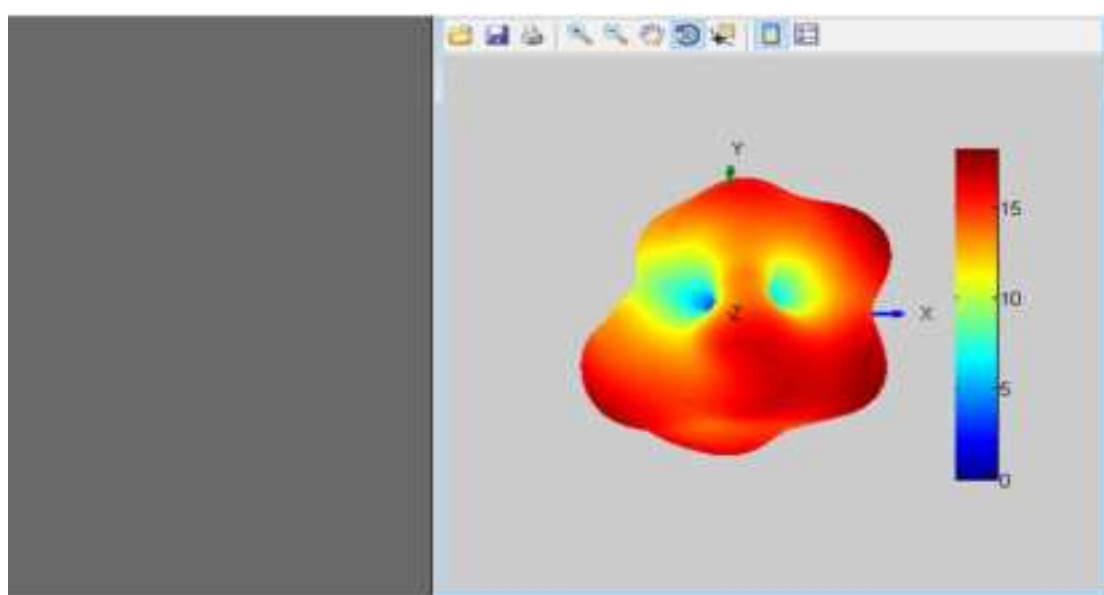
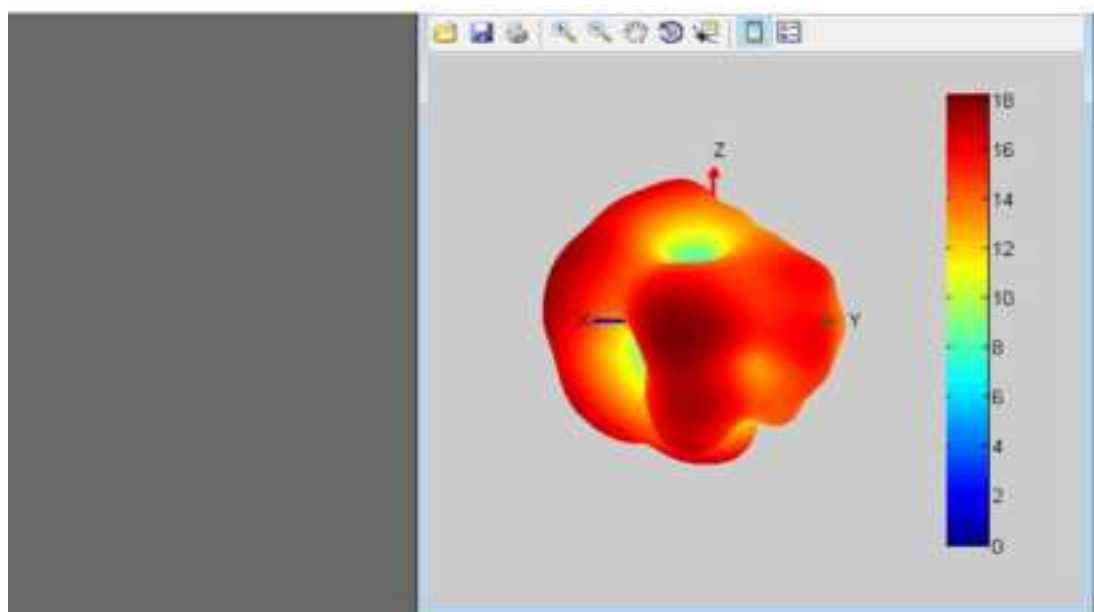
PCB antenna radiation pattern

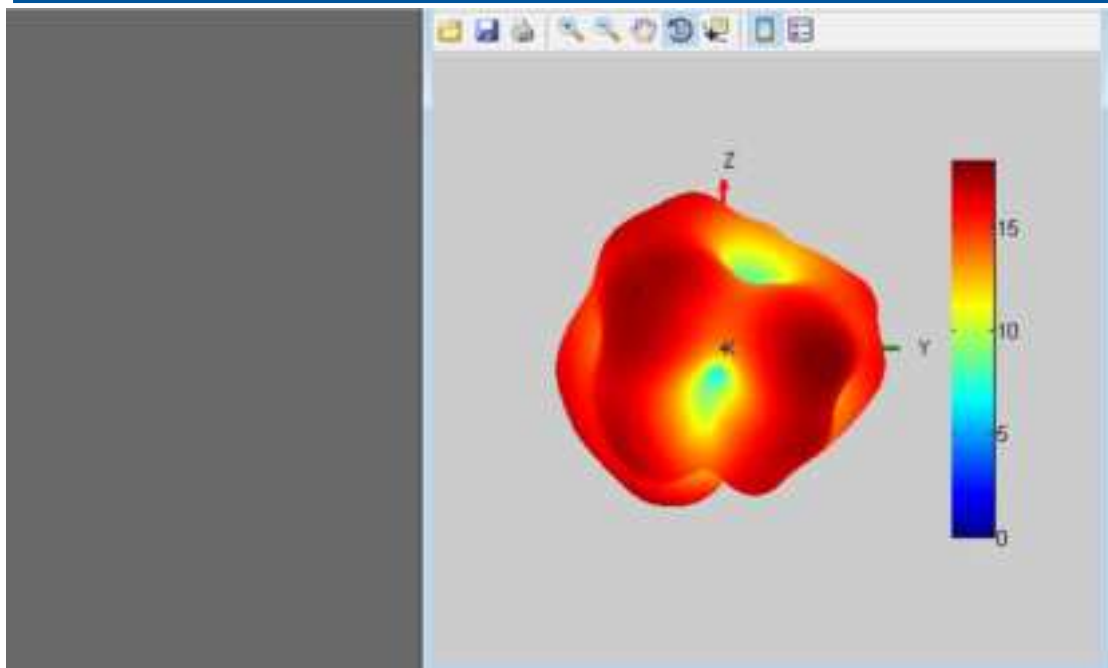
Antenna Gain

Gain&Efficiency				
增益和效率				
frequency	gain	mingain	efficiency	efficiency
频率(MHz)	增益(dBi)	最小增益(dBi)	效率(dBi)	效率(%)
2400	-0.79	-18.23	-4.41	36.24
2410	-0.7	-17.58	-4.24	37.69
2420	-0.58	-17.95	-4.08	39.12
2430	-0.75	-18.48	-4.25	37.62
2440	-1.1	-17.68	-4.41	36.23
2450	-1.07	-16.82	-4.35	36.74
2460	-1.53	-16.57	-4.75	33.52
2470	-1.41	-17.09	-4.65	34.31
2480	-1.71	-18.12	-5.05	31.26
2490	-1.92	-18.51	-5.22	30.09
2500	-2.38	-20.09	-5.78	26.40

Active Test (free space)

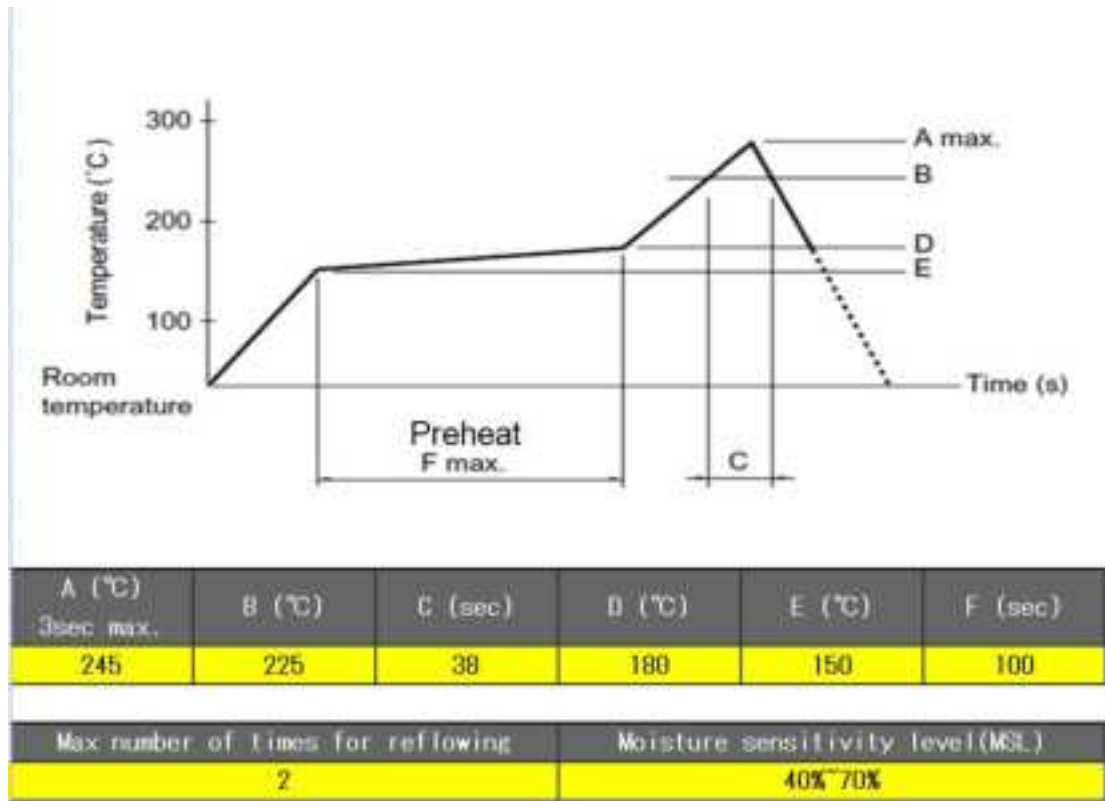
Result	2402	2441	2480
TRP(dbm)	2.69dbm	2.96dbm	2.48
TIS(dbm)	-89.75	-89.98	-89.66







Soldering recommendations



Document History

Revision	Date	History
V0.1	2023-6-13	First release
V0.2	2023-11-27	Second release

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 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 or more 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.

Caution: Any 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. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. T

2.7 Antennas

This radio transmitter ATS2853 has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Operate frequency band	Antenna Type	Maximum antenna gain
Antenna 1	2402MHz~2480MHz	PCB Antenna	-0.58dBi

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains FCC ID: YMX-ATS2853 ".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

THE END!
