List of Contents

ATS2853 Bluetooth Module

Features

- 32bit RISC processor Core, up to240MHz
- 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
- Supports Bluetooth V5.0,compatiable with Bluetooth 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/96 kHz
- 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/96 kHz
- 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, 3COM、4 COM , maximum 9SEG SEG_LCD Driver,7/8pin LED
- 24 Programmable GPIOs, and 10 analog IOs can also configure as GPIOs.
- PCB Dimension: 21mm (L) × 14mm (W) ×1mm (H)

Bluetooth Audio Solution

Wireless Audio Applications

MMC/SD Card Audio Playback

Bluetooth car audio unit

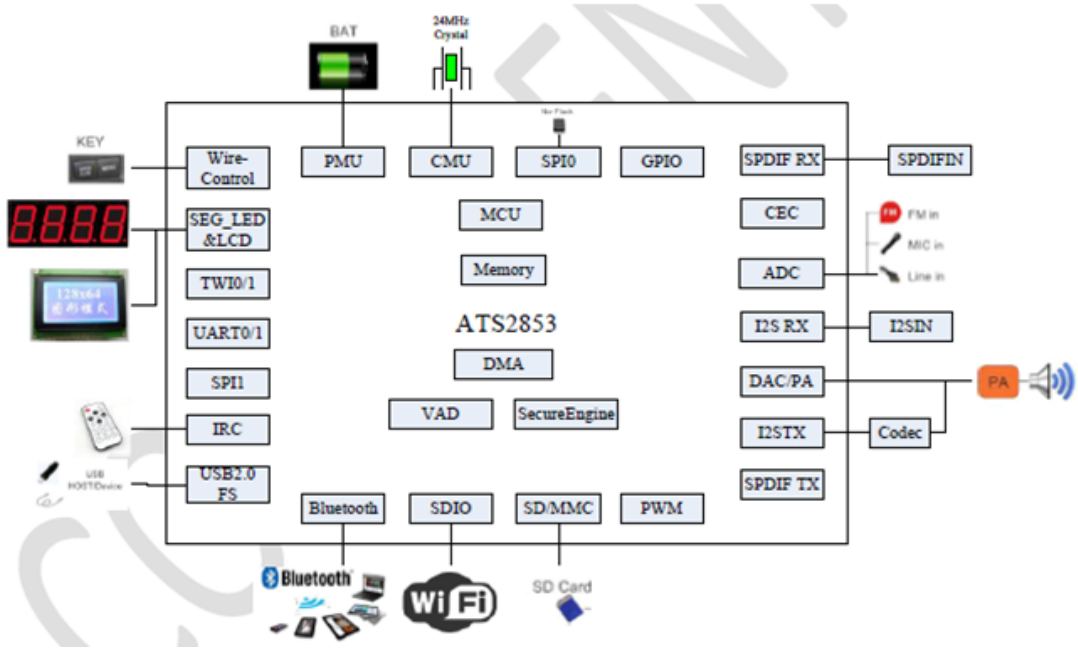
Sound Bar

Bluetooth V5.0

Applications

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

Application Diagram



Specifications

Operating Frequency Band	2.4GHz ~ 2.48GHz unlicensed ISM band
Bluetooth Specification	V5.0
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	-10℃ ~ +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 (Tstg)	-55	+150	℃
ESD Stress voltage	VESD (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

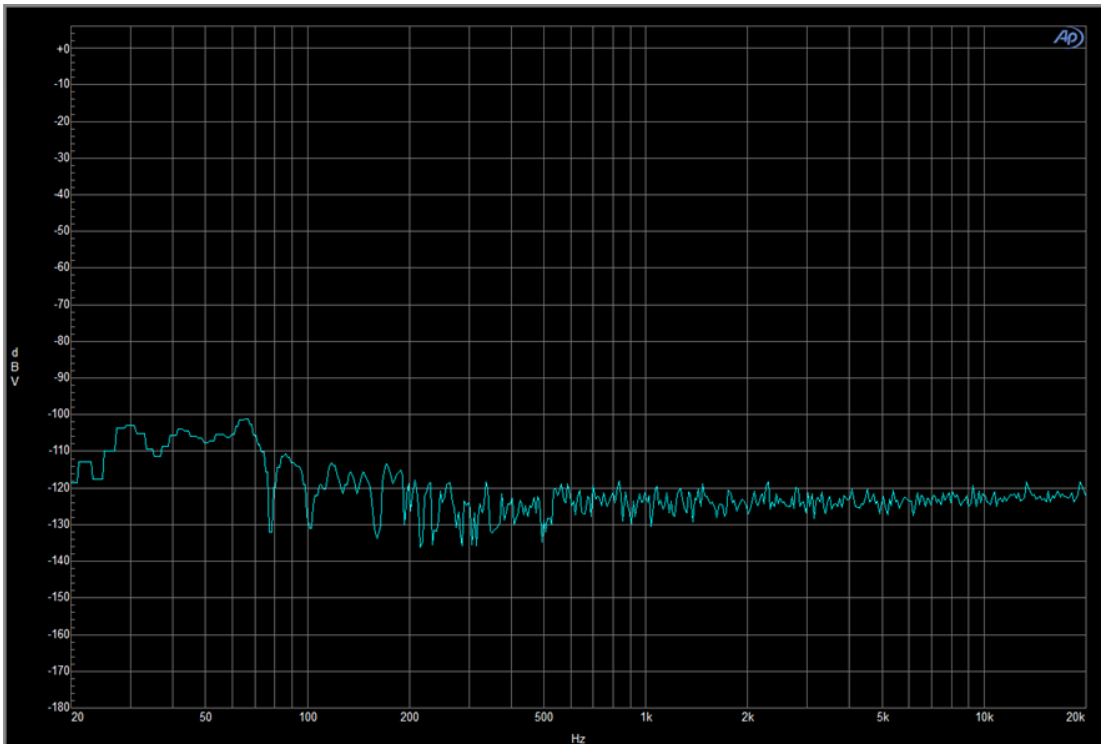
Note: The output voltages are precisely within ±2%.

AUDIO Features

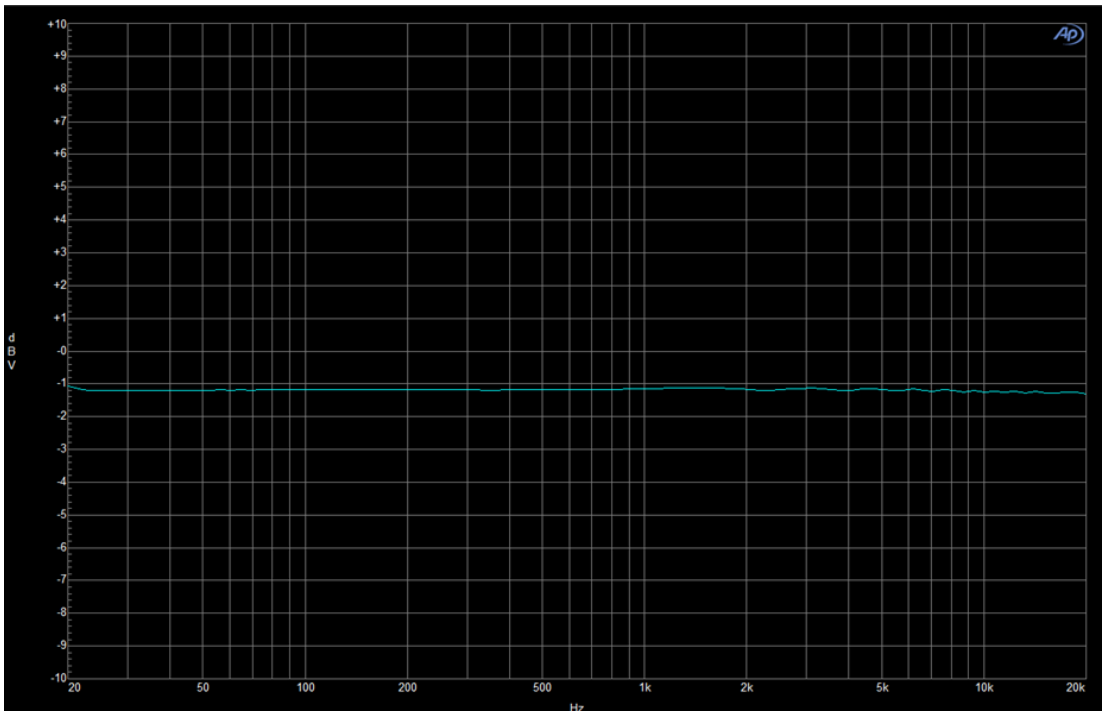
Test Condition: Power BAT=3.8V, Analog audio output AOUTL/R, Load = 10K ohm,
BW=20Hz ~ 20 KHz, Test equipment: AP2722.

DAC/ADC audio output performance chart:

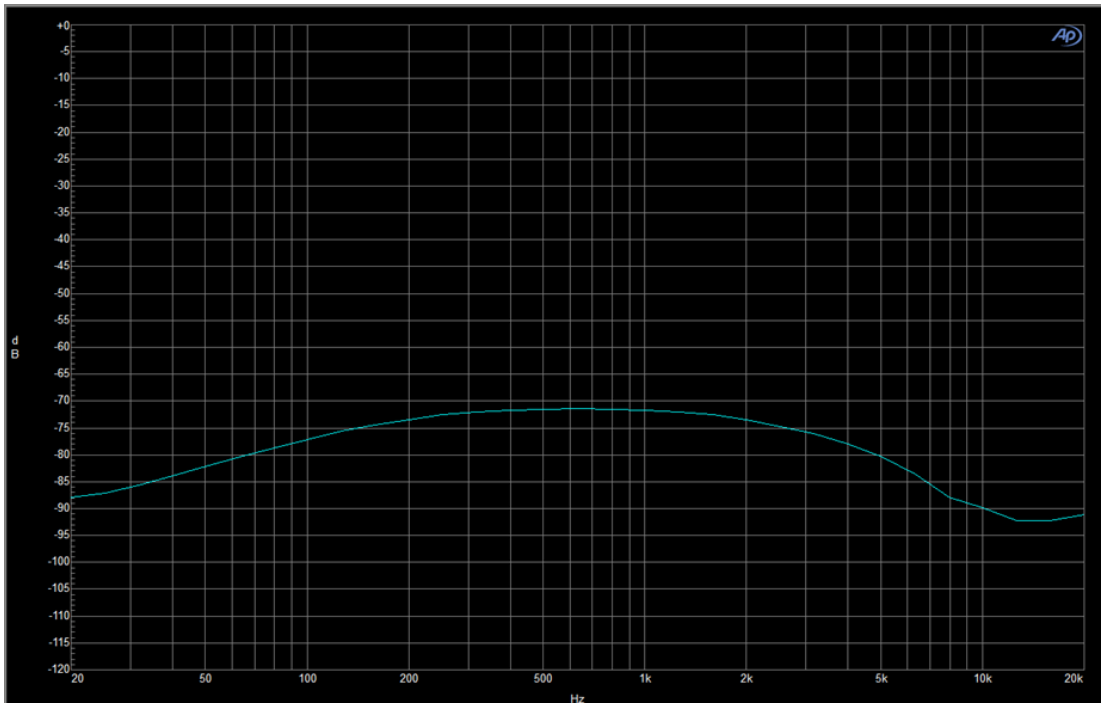
Line in Input Mode:



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

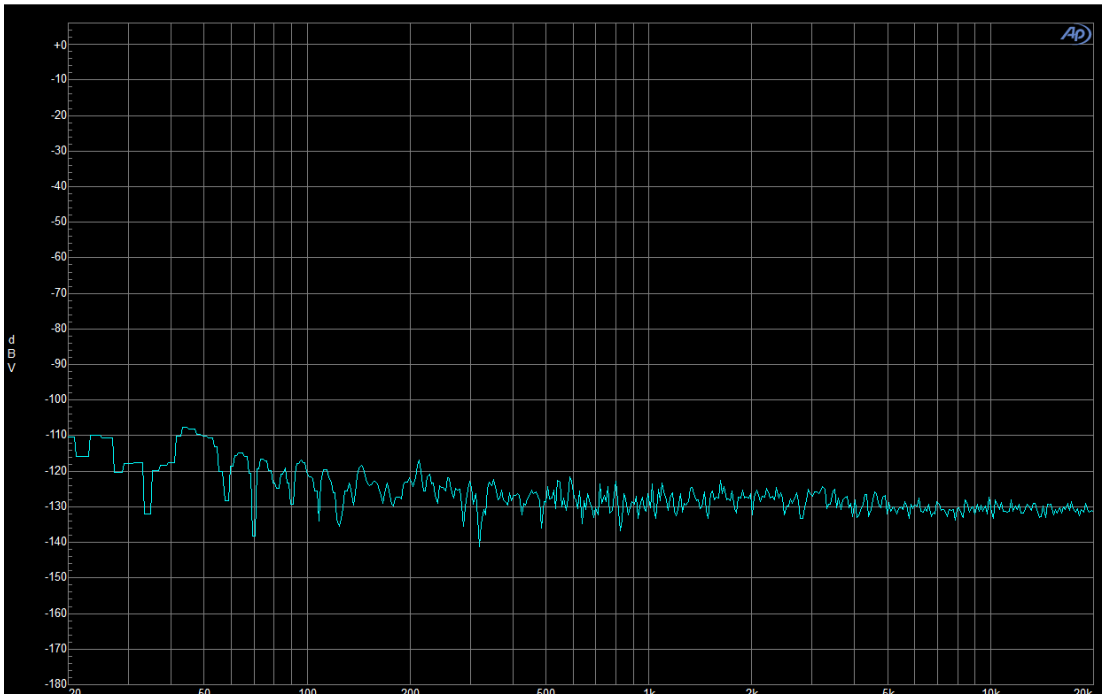


Line in Input Player: Frequency Response 20Hz ~ 20 KHz

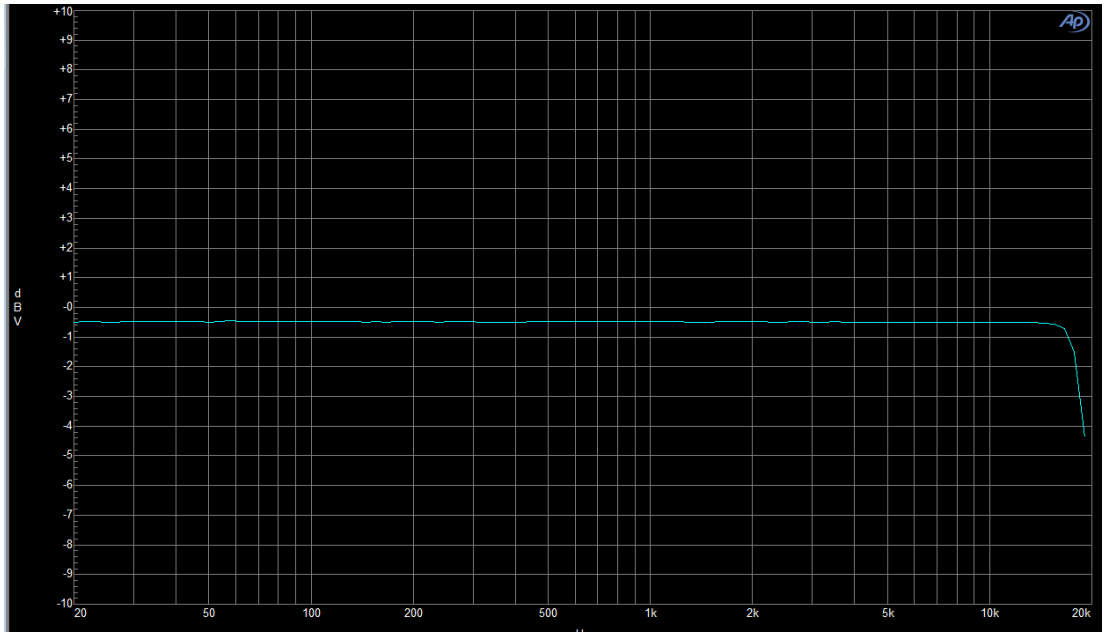


Line in Input player: THD+N (A-Weighting) 20Hz ~ 20 KHz

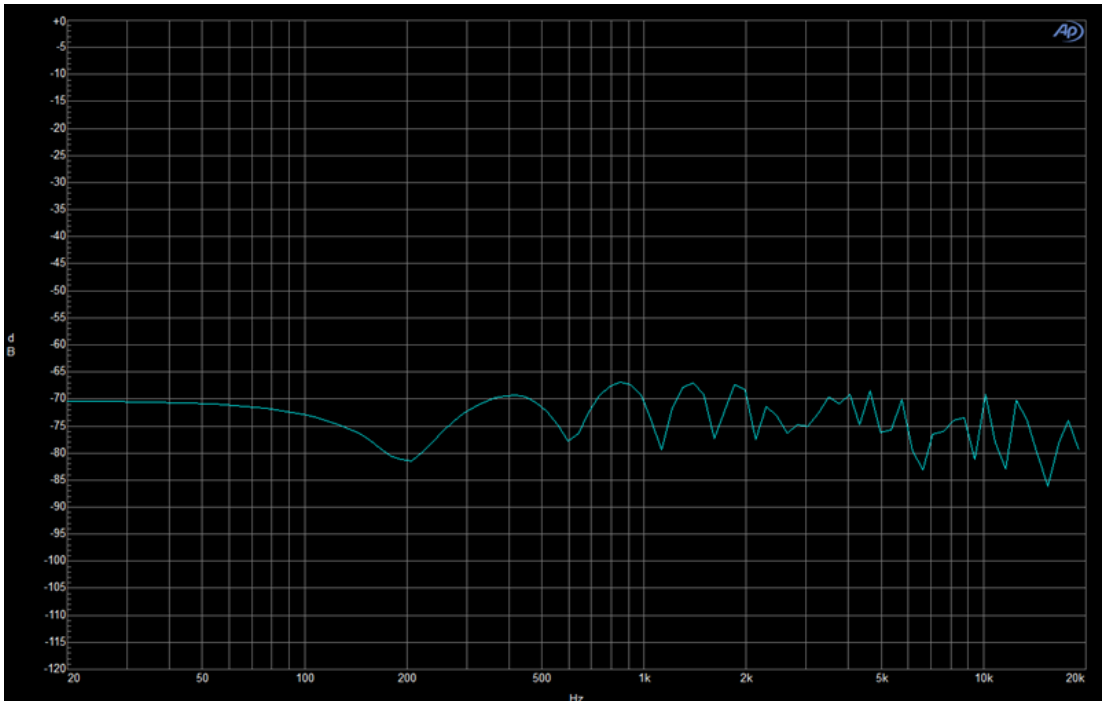
Bluetooth Player Music Mode:



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
		AVRCP1.6
		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	-	-	7	10	dBm
RF Power Control Range	-	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	140	166	175	KHz
	Δf2max Maximum	115	130	-	KHz
	Δf1avg/Δf2avg	0.8	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	20	KHz/50us

Enhanced Data Rate of Transmitter					
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Relative Transmit Power	-	-4	-1.5	1	dB
π/4 DQPSK max carrier frequency stability $\|\omega_0\|$	-	-10	±3	10	KHz
π/4 DQPSK max carrier frequency stability $\|\omega_i\|$	-	-75	±5	75	KHz
π/4 DQPSK max carrier frequency stability $\|\omega_0+\omega_i\|$	-	-75	±4	75	KHz
8DPSK max carrier frequency stability$\|\omega_0\|$	-	-10	±3	10	KHz
8DPSK max carrier frequency stability$\|\omega_i\|$	-	-75	±5	75	KHz
8DPSK max carrier frequency stability$\|\omega_0+\omega_i\|$	-	-75	±5	75	KHz
π/4 DQPSK Modulation Accuracy	RMS DEVIN	-	-	20	%
	99% DEVM	99	100	-	%
	Peak DEVM	-	-	35	%

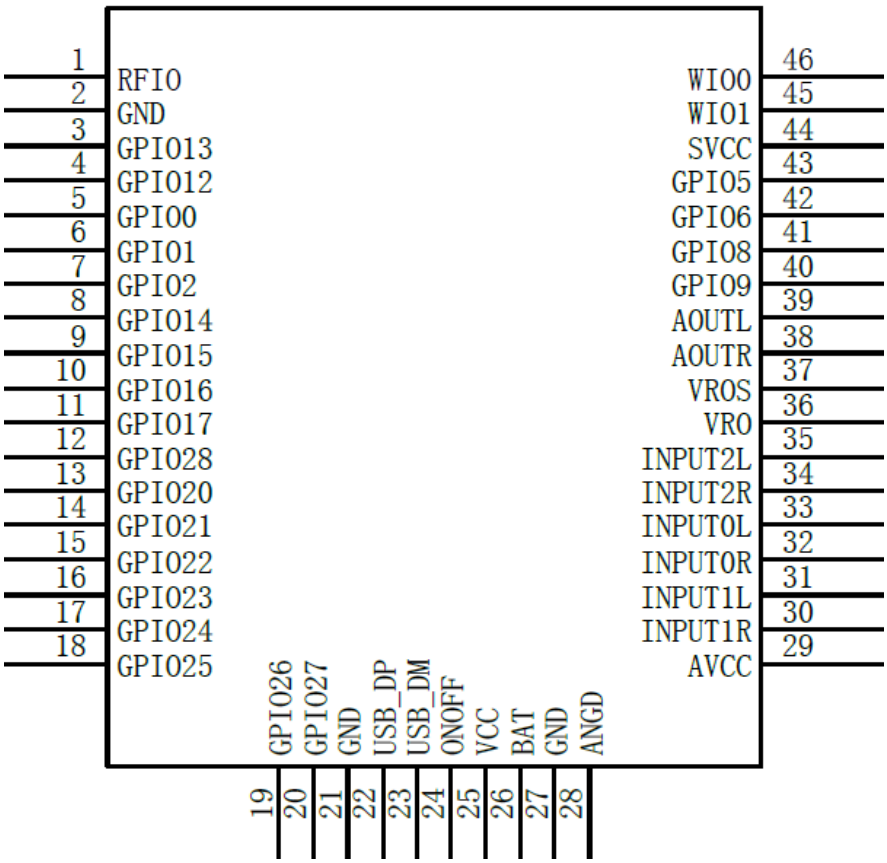
In-band spurious emissions	F > F0 + 3MHz	-	-	-40	dBm
	F < F0 - 3MHz	-	-	-40	dBm
	F = F0 + 3MHz	-	-	-40	dBm
	F = F0 - 3MHz	-	-	-40	dBm
	F = F0 + 2MHz	-	-	-20	dBm
	F = F0 - 2MHz	-	-	-20	dBm
	F = F0 + 1MHz	-	-	-26	dB
	F = F0 - 1MHz	-	-	-26	dB
EDR Differential Phase Encoding	-	99	100	-	%

Basic Data Rate of Receiver					
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Sensitivity at 0.1% BER		-	-91	-	dBm
Maximum Input Power 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					
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**	**Unit**
Sensitivity at 0.01% BER	π/4 DQPSK	-	-90	-	dBm
	8DPSK	-	-85	-	dBm
Maximum Input Power at 0.1% BER	π/4 DQPSK	-20	-	-	dBm
	8DPSK	-20	-	-	dBm
Co-Channel Interference	π/4 DQPSK	-	-	13	dB
	8DPSK	-	-	21	dB

Module Pin definitions

ATS2853Module



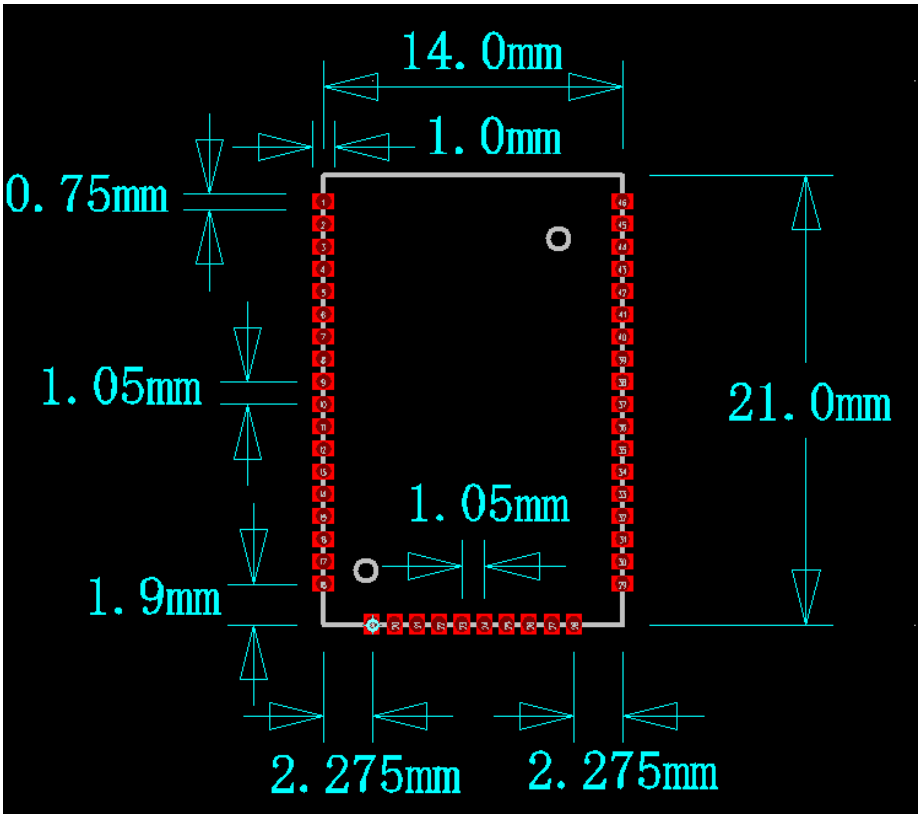
Pin Configurations

PIN NO.	NAME	TYPE	FUNCTION
1	RFIO	RFIO	RFIO
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

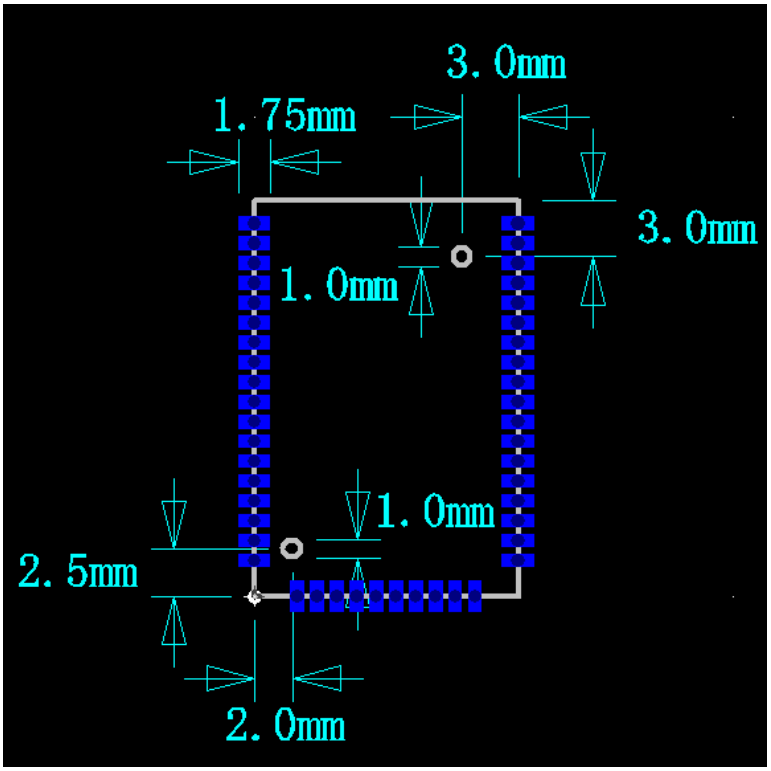
35	INPUT2L	Analog input	INPUT2 Left channel input
36	VRO	Analog output	Direct drive mode bias
37	VRO_S	Analog output	Direct drive mode bias
38	AOUTR	Analog output	Right channel output
39	AOUTL	Analog output	Left channel output
40	GPIO9	Bi-directional	General Purpose Input Output 9
41	GPIO8	Bi-directional	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

Module Package Information

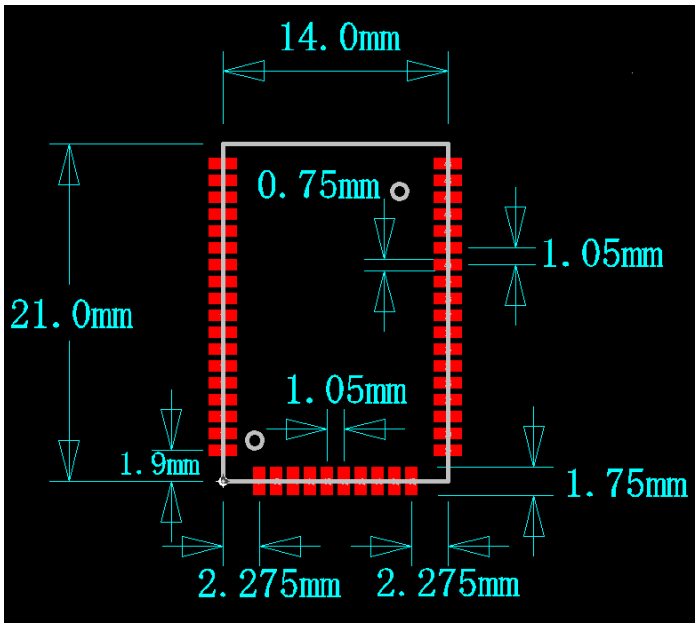
ATS28353 Module：



Module Dimension (Top View)



Module Dimension (Bottom View)



Recommended PCB layout

Document History

Revision	Date	History
V0.1	2021-04-23	First release