AC2102A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version 1.0

Date 2026.03.07

Revision History

Date	Revision	Description
2026.03.07	V1.0	Initial Release

Table of Contents

AC2102A Features

SYSTEM

- 32bit DSP 307.2MHz
- With IEEE754 Single precision FPU
- Support FFT/MATH
- I-cache and D-cache
- Support EMU
- On-chip SRAM 288kbyte
- Support MMU
- Support MPU
- Built-In Flash
- 24MHz crystal oscillator
- Internal RC oscillator,PLL

DSP Audio Processing

- SBC/AAC/LDAC/LHDC/LC3/CVSD/mSBC codec
- mSBC voice codec supported for BT phone
- PLC for voice processing
- Single/Multi MIC ENC
- Multi-band DRC
- Multi-band EQ (FIR/IIR)
- Support spatial sound

Audio

- 3 x 24bit DAC
  - SNR 114dB
  - Noise 2uVrms
  - Supports single mode
  - Supports differential mode
  - Supports stereo VCMO mode 30mW
  - Sampling rate 8~384kHz
- 2 x 24bit ADC
  - SNR 100dB
  - Sampling rate 8~192kHz
  - support analog/digital microphone
  - Supports AMUX
- I²S/TDM/PDM/SPDIF AUDIO Master/Slave interface

Bluetooth

- Dual-mode BT6.0 with LE Audio (DN 332415)
- Support AoA TX
- Support LE audio BIS/CIS
- Maximum transmitting power 13dBm
- Receiver sensitivity
  - -96dBm @BR
  - -96dBm @EDR Π/4 DQPSK
  - -88.5dBm @EDR 8DPSK

Analog FM

- RX support stereo/mono
  - Frequency 50 - 108MHz
  - mono sensitivity 1.5uV EMF
- TX support stereo/mono
  - Frequency 50 - 108MHz

Peripherals

- 1 x Full speed USB
  1 x SD host controller
- 6 x GPMulti-function 32bit timer
- 1 x ADVMulti-function 32bit timer
- 3 x UART interface
- 1 x I²C Master/Slave interface
- 2 x SPI Master/Slave interface
- 1 x QDEC
- 1 x 10bit ADC(16 Channels)
- 1 x NFC ISO/IEC 14443 Type A (Low-Power Wake-Up support)
- 35 x GPIO Support function remapping

PMU

- Integrated battery charger up to 380mA
- Support temperature sensor
- VPWR range 4.5V to 5.5V
- VBAT range 2.7V to 4.5V
- IOVDD range 2.7V to 3.6V

Packages

- QFN52(6mm*6mm)

Temperature

- Operating temperature

TC = -40℃ to +85℃(standard range)

TC = -40℃ to +105℃(extended range)

- Storage temperature -65℃ to +150℃

Applications

- Auracast Broadcast Speaker
- Soundbar
- Party box
- Outdoor Speaker
- Car Audio
- Gaming Speaker

1 Block Diagram

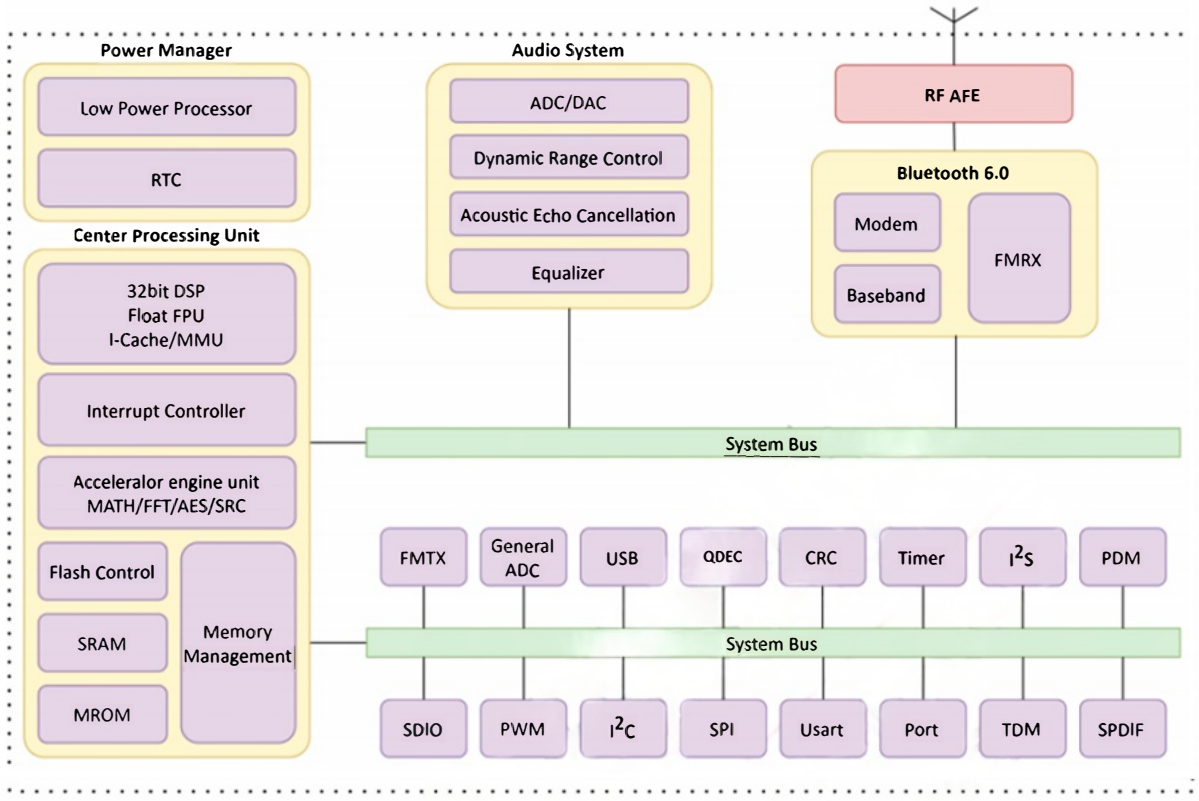


Figure 1-1 AC2102A Block Diagram

2 Pin Definition

2.1 Pin Assignment

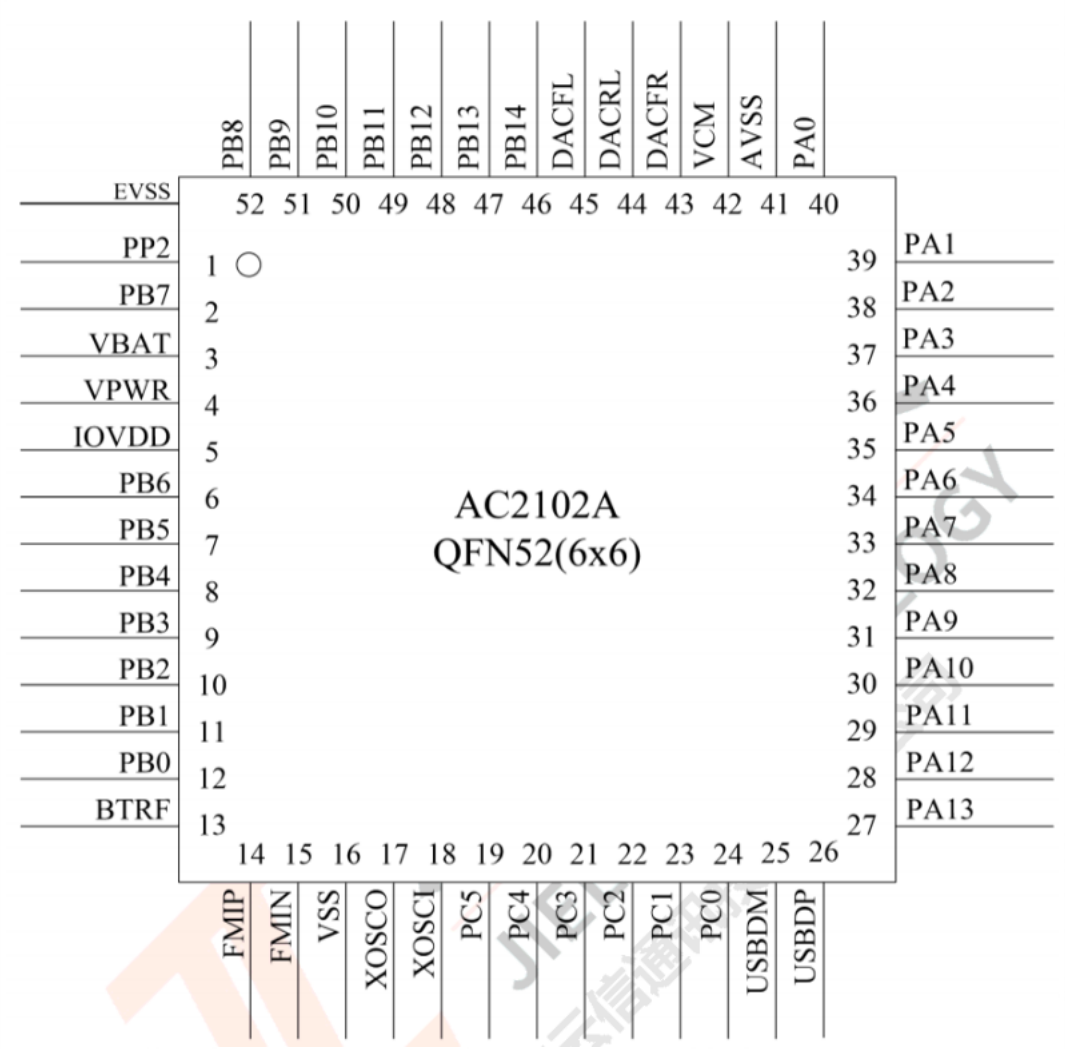


Figure 2-1 AC2102A Pin Assignment

2.2 Pin Description

Table 2-2-1 AC2102A Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	PP2	O	--	SD Power ADC13(ADC Input Channel 13)
2	PB7	I/O	--	--
3	VBAT	P	--	Battery Input
4	VPWR	P	--	Charge Power Input
5	IOVDD	P	--	IO Power
6	PB6	I/O	--	1/2 Voltage to ADCP2(ADC Input Channel P2)
7	PB5	I/O	--	32k Crystal Oscillator Output
8	PB4	I/O	--	32k Crystal Oscillator nput
9	PB3	I/O	--	MCLR(Device Reset)
10	PB2	I/O	--	LVD(External Low Voltage Detection Input)
11	PB1	I/O	10kΩ Pull-up	Hold down 0 to reset ADCP0(ADC Input Channel P0)
12	PB0	I/O	--	1/2 Voltage to ADCP1(ADC Input Channel P1)
13	BTRF	RF	--	Bluetooth RF Antenna
14	FMIP	I	--	FM Postive Input
15	FMIN	I	--	FM Negtive Input
16	VSS	G	--	Ground
17	XOSCO	O	--	Crystal Oscillator Output
18	XOSCI	I	--	Crystal Oscillator Input
19	PC5	I/O	--	ADC12(ADC Input Channel 12)
20	PC4	I/O	--	ADC11(ADC Input Channel 11)
21	PC3	I/O	--	ADC10(ADC Input Channel 10)
22	PC2	I/O	-	-
23	PC1	I/O	--	ADC9(ADC Input Channel 9)
24	PC0	I/O	--	--
25	USBDM	I/O	15kΩ Pull-down	ADC15(ADC Input Channel 15) USB Negative Data
26	USBDP	I/O	15kΩ Pull-down	ADC14(ADC Input Channel 14) USB Positive Data
27	PA13	I/O	--	SPDIF_IN3(AMP_D)
28	PA12	I/O	--	SPDIF_IN2(AMP_C) ADC4(ADC Input Channel 4)
29	PA11	I/O	--	SPDIF_IN1(AMP_B) ADC3(ADC Input Channel 3)
30	PA10	I/O	-	SPDIF_IN0(AMP_A)

Pin No.	Name	Type	IO Initial State	Description
31	PA9	I/O	--	NFC_RX ADC2(ADC Input Channel 2)
32	PA8	I/O	--	ADC1(ADC Input Channel 1)
33	PA7	I/O	--	AUX1(Audio ADC Input)
34	PA6	I/O	--	AUX0(Audio ADC Input)
35	PA5	I/O	--	ADC0(ADC Input Channel 0)
36	PA4	I/O	--	MIC_B0(Audio ADC Input)
37	PA3	I/O	--	AUX3(Audio ADC Input) AIN_BN(Audio ADC Negative Input)
38	PA2	I/O	--	AUX2(Audio ADC Input) AIN_AN(Audio ADC Negative Input)
39	PA1	I/O	--	MIC_A0(Audio ADC Input)
40	PA0	I/O	--	MICBIAS(MIC Bias Output) MICLDO(MIC Bias LDO Output)
41	AVSS	G	--	Audio Ground
42	VCM	P	--	Audio Reference Voltage
43	DACFR	O	--	Front Right Channel DAC Output
44	DACRL (VCMO)	O	--	Rear Left Channel DAC Output Audio Common-mode Output voltage
45	DACFL	O	--	Front Left Channel DAC Output
46	PB14	I/O	--	ADC8(ADC Input Channel 8)
47	PB13	I/O	--	--
48	PB12	I/O	-	ADC7(ADC Input Channel 7)
49	PB11	I/O	--	--
50	PB10	I/O	-	ADC6(ADC Input Channel 6)
51	PB9	I/O	-	--
52	PB8	I/O	--	FM_TX ADC5(ADC Input Channel 5)

Note

1.IO initial state abbreviations Z--High resistance, H--High level, L--Low level, X--May be changed during power on.

2.Timer, IRFC, QDEC, UART, I²C, SPI and SD functions can be remapped to any I/O.

Table 2-2-2 Pin Types Description

Pin Type	Description	Pin Type	Description
P	Power	I/O	Input or Output
G	Ground	I	Input
RF	RF antenna	O	Output

2.3 Pin Specialist

Table 2-3-1 Pin keep Description

Pin	Description for IOVDD power off mode
PB0~PB6	keep IO state in IOVDD power off mode
VPWR	Keep detection of charging insertion in IOVDD power off mode
Others IO	IO state loss in IOVDD power off mode

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3-1 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-20	+85	℃
Tstg	Storage temperature	-65	+150	℃
VBAT	Supply Voltage	-0.3	5.5*	V
VPWR		-0.3	6	V
IOVDD		-0.3	3.6	V
GPIO	Input voltage of GPIO (except PB0)	-0.3	3.6	V
HVTIO	Input voltage of HVT-IO (PB0)	-0.3	6	V

Note

1. **Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.**
2. **When VBAT is in the range of 4.5–5.5V, VPWR will connect to weak pull-up.**

3.2 ESD Ratings

Table 3-2 ESD Ratings

Parameter	Typ	Test pin	Reference standard
Human Body Mode	±4kV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±300V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±2kV	All pins	ANSI/ESDA/JEDEC JS-002-2022

3.3 PMU Characteristics

Table 3-3 PMU Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VBAT	Power supply	--	2.7	3.7	4.5	V
VPWR	Power supply	--	4.5	5.0	5.5	V
Operating mode						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
IOVDD	Voltage output	--	--	3	--	V
	Loading current	IOVDD=3.0V@VBAT = 3.7V or VPWR=5V	--	--	180	mA
Low Power mode						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
IOVDD	Loading current	IOVDD=3.0V@VBAT = 3.7V or VPWR=5V	--	--	10	mA

3.4 Battery Charge

Table 3-4 Charger Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
VPWR	Charge Input Voltage	4.5	5	5.5	V
CV	CV Mode Voltage Accuracy	4.175	4.2	4.225	V
		4.375	4.4	4.425	V
CC	CC Mode Current	40	--	380	mA
I_{end}	End Of Charge Current	4	--	38	mA
V_{Trikl}	Trickle Charge Voltage	--	3	--	V

3.5 IO Characteristics

Table 3-5 IO Characteristics

Input Characteristics						
Symbol	Parameter	Conditions	IO	Min	Max	Unit
V_{IL}	Low-Level Input Voltage	IOVDD = 3.0V	VPWR PA0~PA13 PB0~PB14 PC0~PC5 USBDP USBDM	-0.3	1.0	V
		IOVDD = 3.0V	PP2	--	--	V
V_{IH}	High-Level Input Voltage	IOVDD = 3.0VW	PA0~PA13 PB1~PB14 PC0~PC5 USBDP USBDM	2.0	3.3	V
		IOVDD = 3.0V	VPWR PB0	2.0	5.5	V
		IOVDD = 3.0V	PP2	--	--	V
Output Characteristics						
Symbol	Parameter	Conditions	IO	Typ		Unit
$\lvert I_{OL} \rvert$	Output Current	IOVDD = 3.0V Voutput = 0.3V	VPWR	2		mA
		IOVDD = 3.0V Voutput = 0.3V	PB0 PB6	1(HD=0) 4(HD=1) 8(HD=2) 9(HD=3)		mA
		IOVDD = 3.0V Voutput = 0.3V	PB8	1(HD=0) 4(HD=1) 8(HD=2) 64(HD=3)		mA
		IOVDD = 3.0V Voutput = 0.3V	PP2	--		mA

		IOVDD = 3.0V Voutput = 0.3V	PA0~PA13 PB1~PB5 PB7 PB9~PB14 PC0~PC5	1(HD=0) 4(HD=1) 8(HD=2) 32(HD=3)	mA
		IOVDD = 3.0V Voutput = 0.3V	USBDP USBDM	10	mA
$\lvert I_{OH} \rvert$	Output Current	IOVDD = 3.0V Voutput = 2.7V	VPWR	2	mA
		IOVDD = 3.0V Voutput = 2.7V	PB6 PB0	1(HD=0) 4(HD=1) 8(HD=2) 9(HD=3)	mA
		IOVDD = 3.0V Voutput = 2.7V	PB8	1(HD=0) 4(HD=1) 8(HD=2) 64(HD=3)	mA
		IOVDD = 3.0V Voutput = 2.7V	PP2	120	mA
		IOVDD = 3.0V Voutput = 2.7V	PA0~PA13 PB1~PB5 PB7 PB9~PB14 PC0~PC5	1(HD=0) 4(HD=1) 8(HD=2) 32(HD=3)	mA
		IOVDD = 3.0V Voutput = 2.7V	USBDP USBDM	10	mA

Internal Resistance Characteristics

Symbol	Parameter	Conditions	IO	Typ	Unit
R_{pu}	Pull-up Resistance	IOVDD = 3.0V	VPWR PA0~PA13 PB0~PB14 PC0~PC5	5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
		IOVDD = 3.0V	USBDP	1.5k 5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
		IOVDD = 3.0V	USBDM	180k 5k(PU=1) 10k(PU=2) 200K(PU=3)	Ω
		IOVDD = 3.0V	PP2	--	Ω
R	Pull-down Resistance	IOVDD = 3.0V	VPWR PA0~PA13	5k(PD=1) 10k(PD=2)	Ω

			PB0~PB14 PC0~PC5	200K(PD=3)	
		IOVDD = 3.0V	USBDP USBDM	15k 5k(PD=1) 10k(PD=2) 200K(PD=3)	Ω
		IOVDD = 3.0V	PP2	--	Ω

Note

1.Internal pull-up/pull-down resistance accuracy ±20%

3.6 Audio DAC Characteristics

Table 3-6 DAC Characteristics

Parameter	Conditions		Min	Typ	Max	Unit
Resolution	--		--	24	--	bits
Input Sample Rate	--		8	--	384	kHz
SNR①	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	116	--	dB
	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	114	--	dB
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16Ω	--	107	--	dB
Dynamic Range	Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	-	111	--	dB
	Single-ended Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	104	--	dB
	VCMO Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16Ω	--	102	--	dB
THD+N	Differential Mode Fin=1kHz@-0.5dBFS*	Load=10kΩ	-	-85	--	dB

	Fs=44.1kHz B/W=20Hz~20kHz A-Weighted					
	Single-ended Mode Fin=1kHz@-0.5dBFS* Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	-80	--	dB
	VCMO Mode Fin=1kHz@-0.5dBFS* Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=32Ω	--	-80	--	dB
Noise Floor	Differential Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	5.5	--	uVrms
	Single-ended Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	6.0	--	uVrms
	VCMO Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16Ω	--	5.5	--	uVrms
Noise Floor with MUTE	Differential Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	3.0	--	uVrms
	Single-ended Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	2.0	--	uVrms
	VCMO Mode Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16Ω	--	3.0	--	uVrms
Stereo Crosstalk	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	-100	--	dB
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10kΩ	--	-100	--	dB
Max Output Level	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted THD+N＜0.1%	Load=10kΩ	--	2	--	Vrms
	Single-ended Mode Fin=1kHz@0dBFS	Load=10kΩ	--	1	--	Vrms

	Fs=44.1kHz B/W=20Hz~20kHz A-Weighted THD+N＜0.1%					
Max Output Power	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted THD+N＜0.1%	Load=16Ω	-	30	--	mW

Note

1. ①**SNR is the ratio of output level with a 1kHz full-scale input to output level with MUTE on.**

3.7 Audio ADC Characteristics

Table 3-7 Audio ADC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Resolution	--	-	24	--	bits
Input Sample Rate	--	8	--	192	kHz
SNR	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
Dynamic Range	Differential input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	--	dB
	Single-ended input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	100	-	dB
THD+N	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-85	--	dB
	Single-ended input Mode	-	-80	-	dB

	Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB				
Analogue Gain	--	-3	--	33	dB
Max Input Level	Differential input Mode ADC gain=0dB	--	2	--	Vrms
	Single-ended input Mode ADC gain=0dB	--	1	--	Vrms

3.8 BT Characteristics

3.8.1 Transmitter

Table 3-8-1 Transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Maximum RF Transmit Power	BR	--	10	13	dBm
Maximum RF Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	10	--	dBm
Relative Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	-1	--	dB
Maximum RF Transmit Power	BLE-1Mbps/2Mbps	--	10	--	dBm
1σ of Maximum RF Transmit Power distribution	BR/EDR/BLE	--	2	--	dB

3.8.2 Receiver

Table 3-8-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BR	--	-96	--	dBm
	EDR Π/4 DQPSK	-	-96	--	dBm
	EDR 8DPSK	--	-88.5	--	dBm
	BLE-1Mbps	--	-98.5	--	dBm
	BLE-2Mbps	--	-95.5	--	dBm
1σ of sensitivity distribution	BR/EDR/BLE	--	2	--	dB

3.9 Radio Characteristics

3.9.1 Analog FM Receiver

Table 3-9-1 FM receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Frequency range		50		108	MHz
Mono sensitivity	f MOD = 1 kHz, Δf = 22.5 kHz,(S+N)/N = 26 dB, MONO		1.5		uV EMF

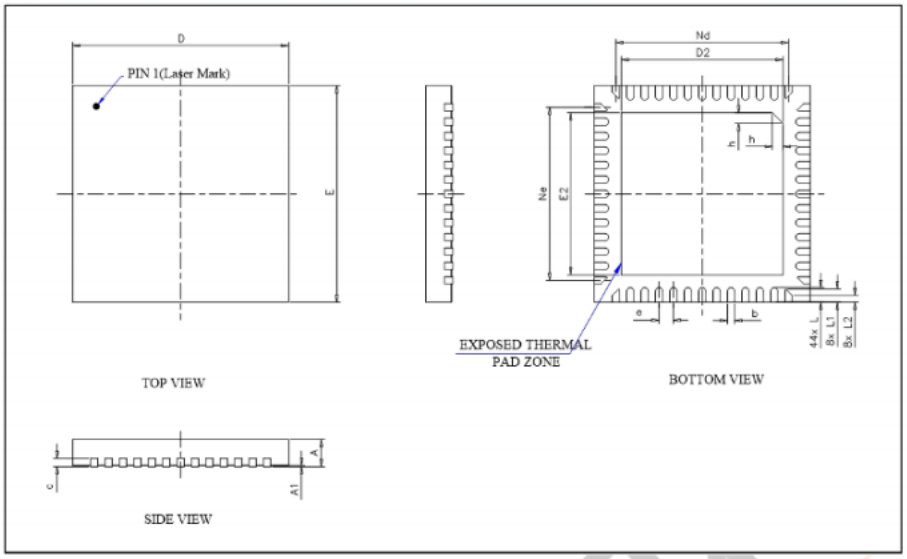
3.9.2 Analog FM Transmitter

Table 3-9-2 FM transmitter characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Frequency range		50		108	MHz
Transmitter power			TBD		dBm

4 Package Information

4.1 QFN52_6×6mm



SYMBOL	MILLIMETER		
	MIN	NON	MAX
A	0.65	0.80	0.95
A1	--	0.035	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	5.90	6.00	6.10
D2	4.40	4.50	4.60
e	0.40BSC		
Nd	4.80BSC		
E	5.90	6.00	6.10
E2	4.40	4.50	4.60
Ne	4.80BSC		
L	0.35	0.40	0.45
L1	0.31	0.36	0.41
L2	0.13	0.18	0.23
h	0.25	0.30	0.35
L/F 载体尺寸 (mil)	185*185		

Figure 4-1 AC2102A Package

5 IC Marking Information

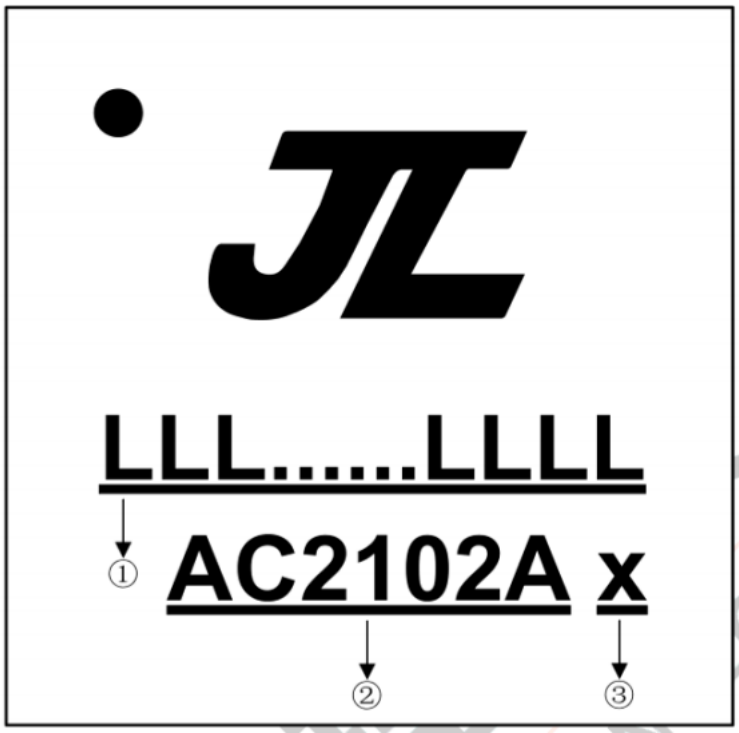


Figure 5-1 AC2102A Package Outline

① LLL.. . LLLL Production Batch
② AC2102A Chip Model
③ x Built-in flash size
4 4Mbit Flash
8 8Mbit Flash
6 16Mbit Flash
3 32Mbit Flash

6 Solder-Reflow Condition

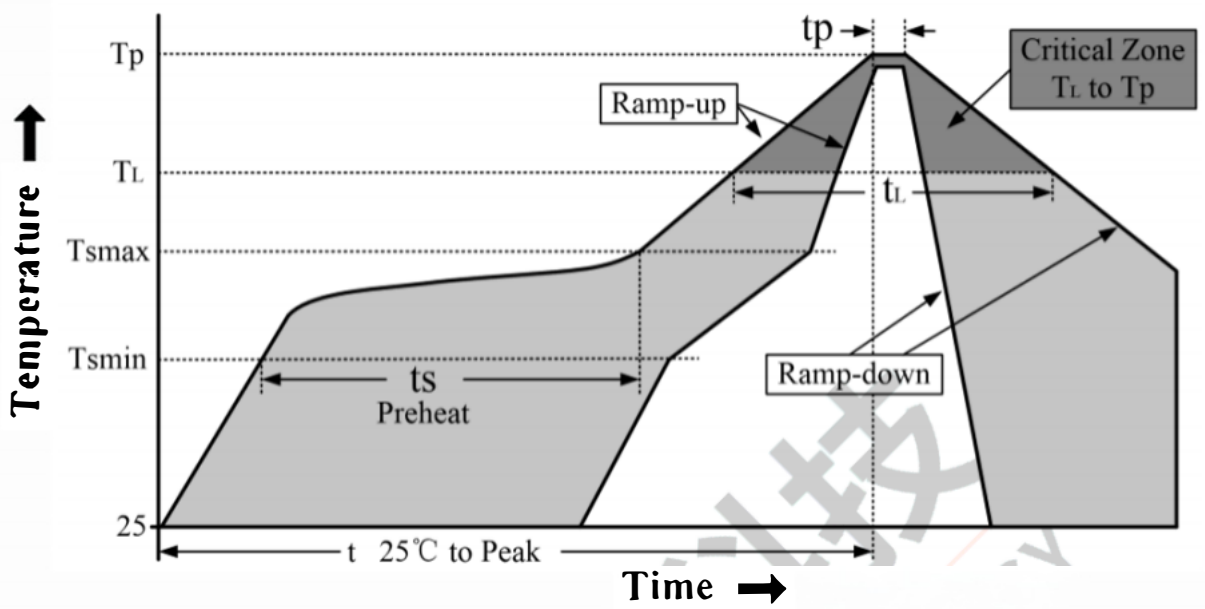


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak	Temperature Min (T_{smin})	100℃	150℃
	Temperature Max (T_{smax})	150℃	200℃
	Time (ts) from (T_{smin} to T_{smax})	60-120 seconds	60-180 seconds
Average ramp-up rate (T_{smax} to T_p)		3℃/second max	3℃/second max
Liquidous temperature (T_L) Time (t_L) maintained above T_L		183℃ 60-150 seconds	217℃ 60-150 seconds
Peak package body temperature (T_p)		See Table 6-2	See Table 6-3
Time within 5℃ of actual Peak Temperature (tp)[2]		10-30 seconds	20-40 seconds
Ramp-down rate (T_p to T_L)		6℃/second max	6℃/second max
Time 25℃ to peak temperature		6 minutes max	8 minutes max

Note

1.All temperatures refer to topside of the package, measured on the package body surface

2.Time within 5℃ of actual peak temperature (tp) specified for the reflow profiles is a "supplier" and "user" maximum.

Table 6-2 SnPb Classification Temperature

Package Thickness	Volume mm³ < 350	Volume mm³ ≥ 350
<2.5 mm	240 +0/-5℃	225 +0/-5℃
≥2.5 mm	225 +0/-5℃	225 +0/-5℃

Table 5-3 Pb-free - Classification Temperature

Package Thickness	Volume mm^3 < 350	Volume mm^3 350 - 2000	Volume mm^3 > 2000
< 1.6mm	260℃	260℃	260℃
1.6 mm - 2.5mm	260℃	250℃	245℃
> 2.5mm	250℃	245℃	245℃

Note

1.*Tolerance The device manufacturer/supplier shall assure process compatibility up to and including the stated classification temperature (this means Peak reflow temperature +0℃.For example 260℃+0℃)at the rated MSL level.