

AC2102A Datasheet

Version 1.2

Date 2026.07.02

Revision History

Date	Revision	Description
2026.03.07	V1.0	Initial Release
2026.04.18	V1.1	Update Pin Assignment
2026.07.02	V1.2	Update Pin Description(Add note) Update Absolute Maximum Ratings Update Features_Temperature

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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 $\pi/4$ 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℃

- Storage temperature -65℃ to +150℃

Applications

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

1 Block Diagram

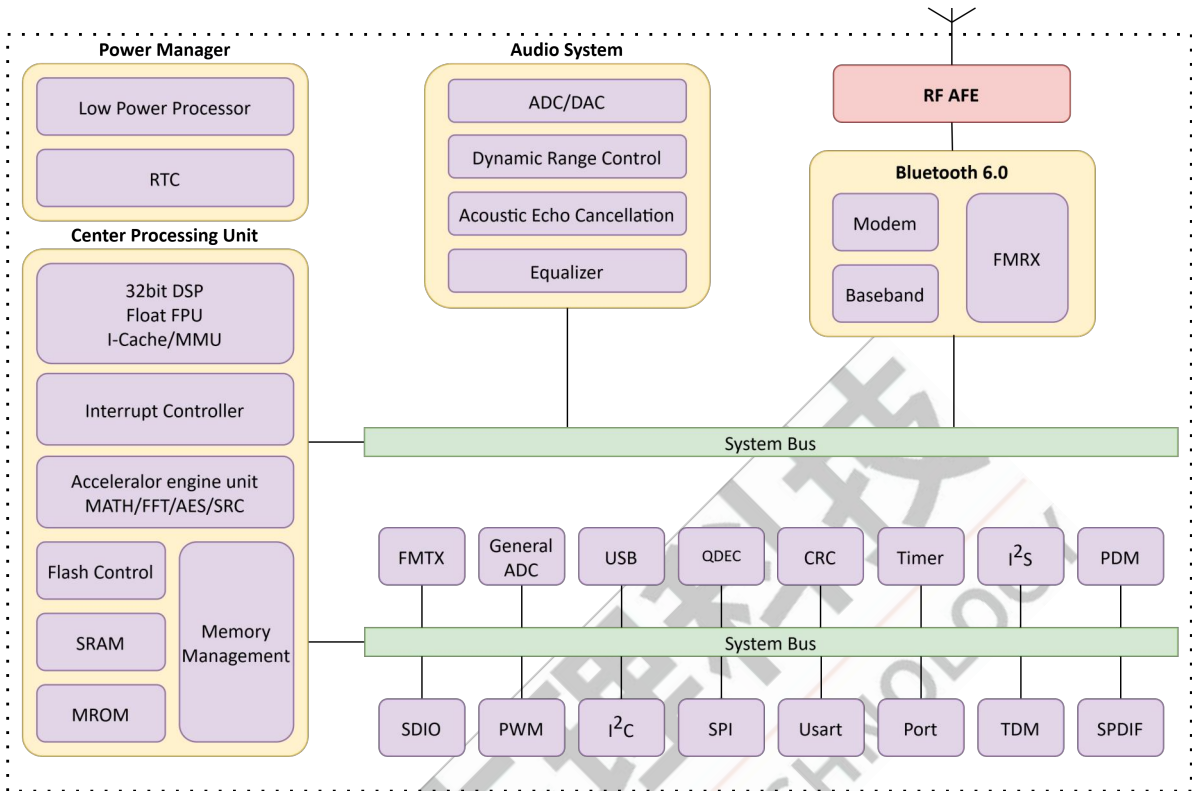


Figure 1-1 AC2102A Block Diagram

2 Pin Definition

2.1 Pin Assignment

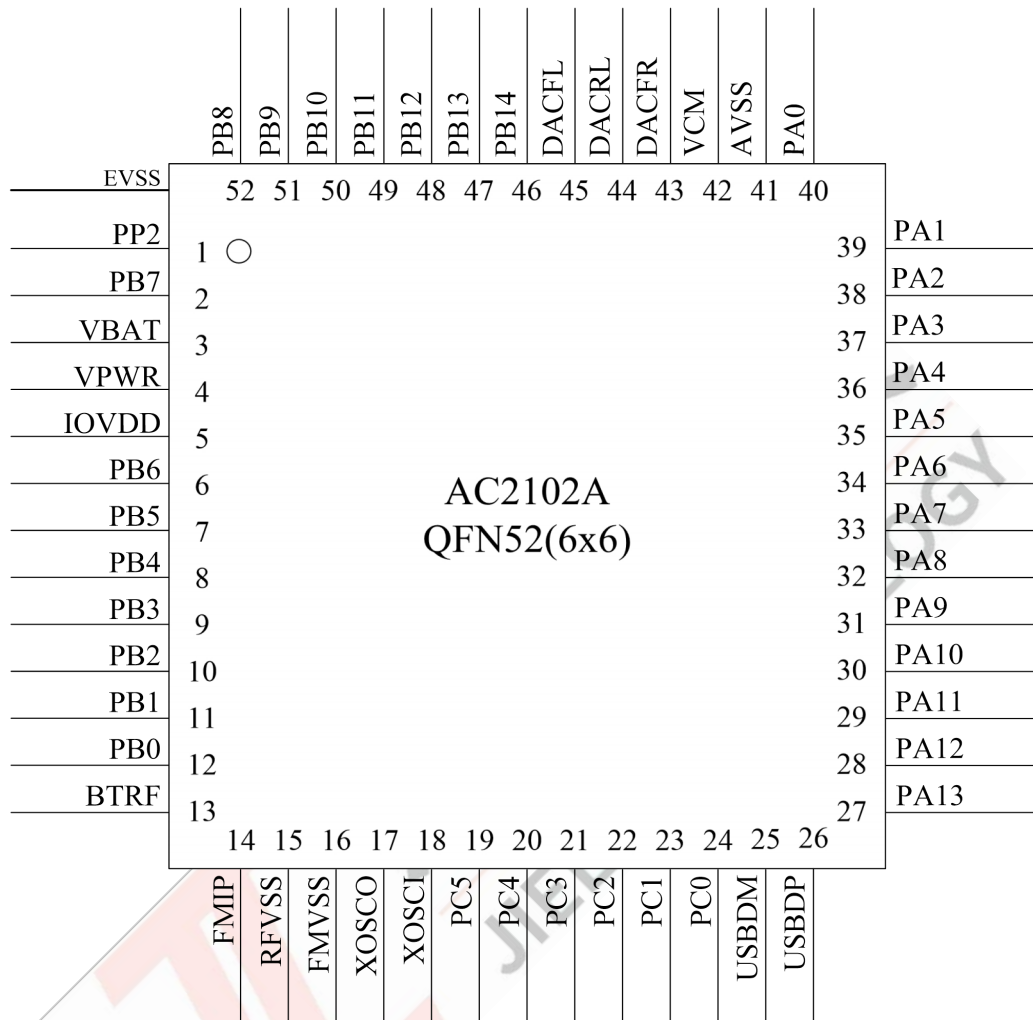


Figure 2-1 AC2102A Pin Assignment

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 Input
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	RFVSS	G	--	RF Ground
16	FMVSS	G	--	FM 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, NFC, QDEC, UART, I²C, SPI and SD functions can be remapped to any I/O.
- 3.If the ADCP1/ADCP2 function is enabled,the IO will be pulled down by 200kΩ resistor.

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
T _{opt}	Operating temperature	-40	+85	°C
T _{stg}	Storage temperature	-65	+150	°C
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

- Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.
- 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	
I _{OL}	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
I _{OH}	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 _{pd}	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 $\pm 20\%$

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
SNR ^①	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10k Ω	--	116	--	dB
	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10k Ω	--	114	--	dB
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16 Ω	--	107	--	dB
Dynamic Range	Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10k Ω	--	111	--	dB
	Single-ended Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=10k Ω	--	104	--	dB
	VCMO Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted	Load=16 Ω	--	102	--	dB
THD+N	Differential Mode Fin=1kHz@-0.5dBFS*	Load=10k Ω	--	-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 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 $\pi/4$ DQPSK EDR 8DPSK	--	10	--	dBm
Relative Transmit Power	EDR $\pi/4$ DQPSK EDR 8DPSK	--	-1	--	dB
Maximum RF Transmit Power	BLE-1Mbps/2Mbps	--	10	--	dBm
1 σ 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 $\pi/4$ DQPSK	--	-96	--	dBm
	EDR 8DPSK	--	-88.5	--	dBm
	BLE-1Mbps	--	-98.5	--	dBm
	BLE-2Mbps	--	-95.5	--	dBm
1 σ 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, $\Delta f = 22.5 \text{ kHz}, (S+N)/N = 26 \text{ dB}$, MONO		1.5		$\mu\text{V EMF}$

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

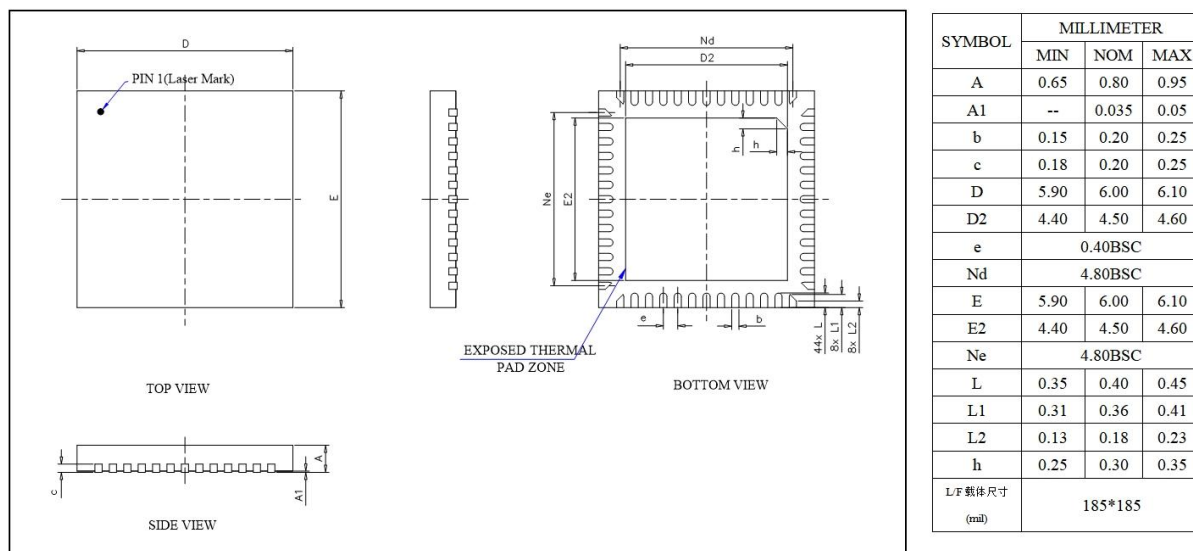


Figure 4-1 AC2102A Package

5 IC Marking Information

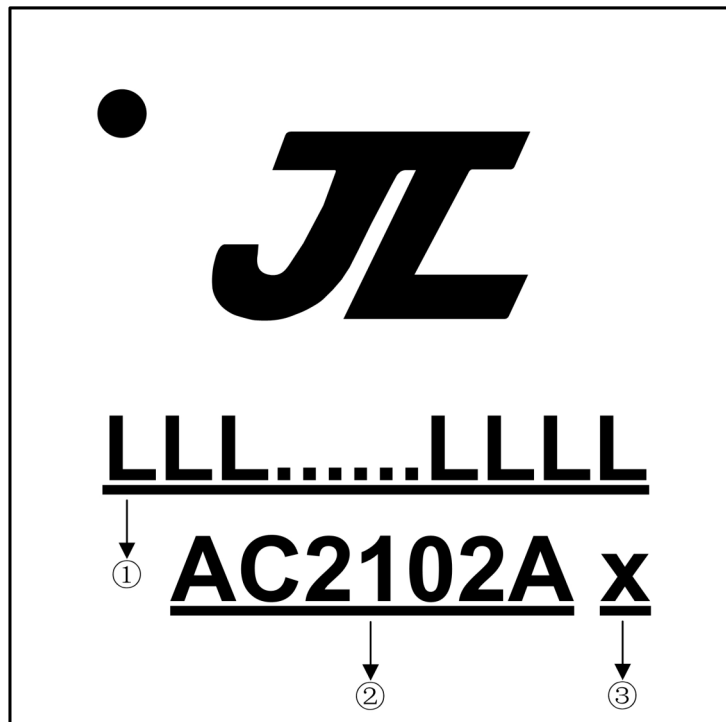


Figure 5-1 AC2102A Package Outline

- 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

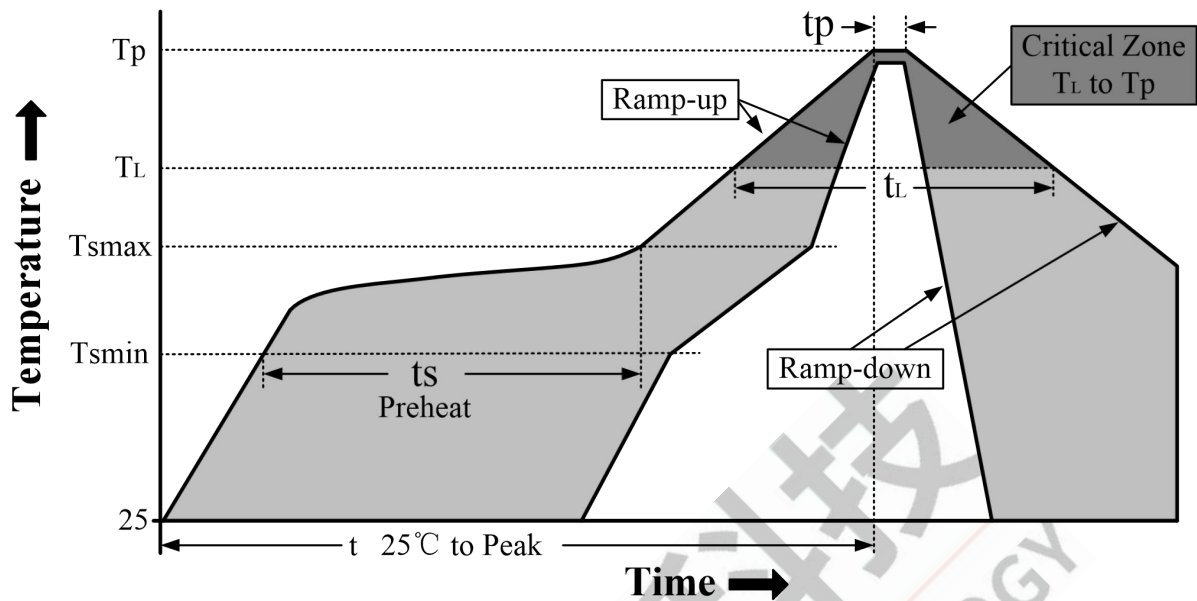


Figure 6-1 Classification Reflow Profile

Table 6-1 Classification Profiles

Profile Feature		Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak	Temperature Min (T_{smin})	100°C	150°C
	Temperature Max (T_{smax})	150°C	200°C
	Time (t_s) from (T_{smin} to T_{smax})	60-120 seconds	60-180 seconds
Average ramp-up rate (T_{smax} to T_p)		3°C/second max	3°C/second max
Liquidous temperature (T_L)		183°C	217°C
Time (t_L) maintained above T_L		60-150 seconds	60-150 seconds
Peak package body temperature (T_p)		See Table 6-2	See Table 6-3
Time within 5°C of actual Peak Temperature (t_p) ²		10-30 seconds	20-40 seconds
Ramp-down rate (T_p to T_L)		6°C/second max	6°C/second max
Time 25°C 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°C of actual peak temperature (t_p) specified for the reflow profiles is a "supplier" and "user" maximum.

Table 6-2 SnPb Classification Temperature

Package Thickness	Volume mm ³ < 350	Volume mm ³ ≥ 350
<2.5 mm	240 +0/-5°C	225 +0/-5°C
≥2.5 mm	225 +0/-5°C	225 +0/-5°C

Table 6-3 Pb-free - Classification Temperature

Package Thickness	Volume mm ³ < 350	Volume mm ³ 350 - 2000	Volume mm ³ > 2000
< 1.6mm	260°C	260°C	260°C
1.6 mm - 2.5mm	260°C	250°C	245°C
> 2.5mm	250°C	245°C	245°C

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°C.For example 260°C+0°C)at the rated MSL level.