AC7066M Datasheet

Zhuhai Jieli Technology Co.,LTD

Version 2.0

Date 2025.01.16

Revision History

Date	Revision	Description
2023.07.19	V1.0	Initial Release
2023.08.29	V1.1	Update Pin Assignment
2023.10.13	V1.2	Add IC Marking Information Update BT_Features
2023.10.24	V1.3	Update Block Diagram
2023.11.03	V1.4	Update BT_Features Update IC Marking Information
2024.07.30	V1.5	Update Datasheet Format And Content Update Pin Description
2025.01.16	V2.0	Update Features_Bluetooth Update Block Diagram

Table of Contents

AC7066M Features

SYSTEM

- 32-bit Single-core DSP 192MHz
- With IEEE754 Single precision FPU
- Support FFT/MATRIX/MATH
- 1 x I-cache
- Support EMU
- Support MMU
- Support MPU
- Built-In Flash
- 24MHz crystal oscillator
- Internal RC oscillator,PLL

DSP Audio Processing

- SBC/AAC codec
- mSBC voice codec supported for BT phone
- PLC for voice processing
- Single MIC ENC
- Multi-band DRC
- Multi-band EQ
- Support spatial sound

Audio

- 2 x 16bit DAC
  - SNR 108dB
  - Noise 6uVrms
  - Support differential mode
  - Support VCMO mode
  - Sampling rate 8~96kHz
- 1 x 16bit ADC
  - SNR 98dB
  - Sampling rate 8~48kHz
  - Support AMUX
- I^2S AUDIO Master/Slave interface

Bluetooth

- Dual-mode BT6.0 with LE Audio (DN Q332415)
- Support LE audio BIS/CIS
- Support long range BLE
- Maximum transmitting power 10dBm
- Receiver sensitivity
  - -93dBm @BR
  - -92dBm @EDR Π/4 DQPSK
  - -86dBm @EDR 8DPSK

Peripherals

- 1 x Full speed USB
- 4 x Multi-function 16bit timer
- 2 x UART interface
- 1 x I^2C Master/Slave interface
- 2 x SPI Master/Slave interface
- 1 x QDEC
- 4 x MCPWM
- 1 x 10bit ADC(16 Channel)
- 18 x GPIO Support function remapping

PMU

- Integrated battery charger up to 300mA
- 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

- QFN32(4mm*4mm)

Temperature

- Operating temperature
  TC = -20℃ to +85℃(standard range)
  TC = -40℃ to +105℃(extended range)
- Storage temperature -65℃ to +150℃

Applications

- Wireless microphone

1 Block Diagram

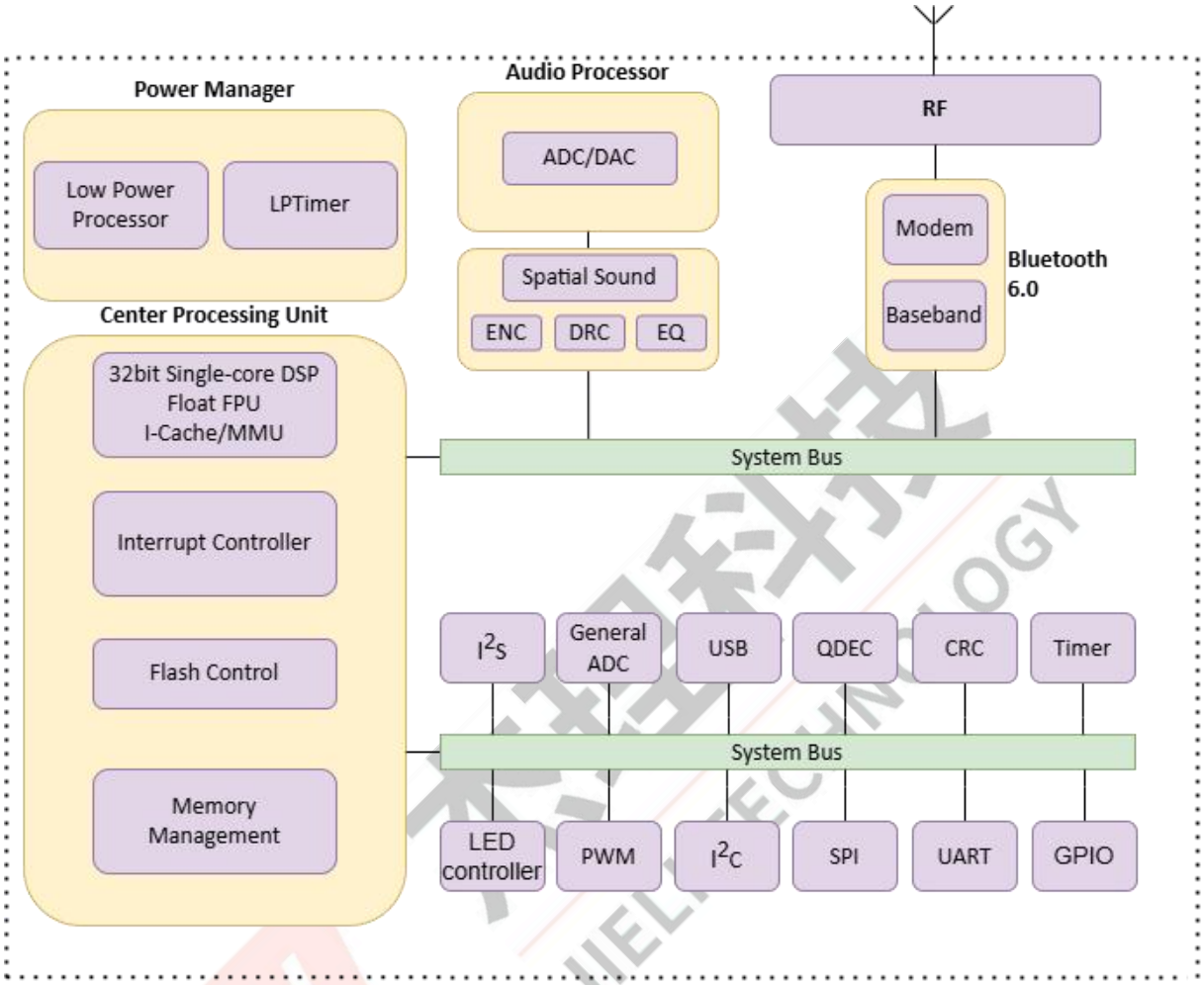


Figure 1-1 AC7066M Block Diagram

2 Pin Definition

2.1 Pin Assignment

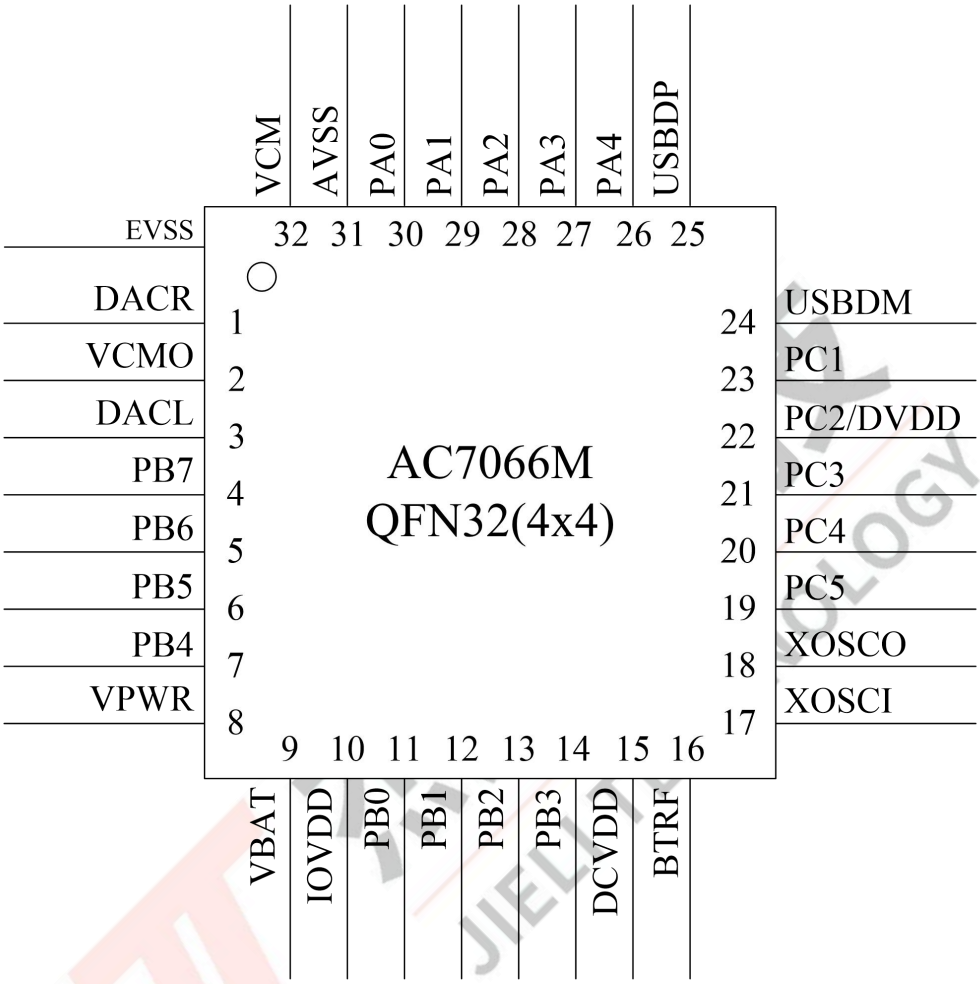


Figure 2-1 AC7066M Pin Assignment

2.2 Pin Description

Table 2-2-1 AC7066M Pin Description

Pin No.	Name	Type	IO Initial State	Description
1	DACR	O	--	Right Channel DAC Output
2	VCMO	O	--	Audio Common-mode Output voltage
3	DACL	O	--	Left Channel DAC Output
4	PB7	I/O	Z	ADC9(ADC Input Channel 9) SPI0 DATA0(B) SPI1 DATA0(C) I^2C SDA(C) Q-decoder DATA1
5	PB6	I/O	Z	ADC8(ADC Input Channel 8) AUX0(Audio ADC Input) SPI0 CLK(B) SPI1 CLK(C) I^2C SCL(C) TIMER3 CLK
6	PB5	I/O	Z	ADC5(ADC Input Channel 5) SD Power SPI0 DATA1(B) SPI1 DATA1(C)
7	PB4	I/O	Z	ADC7(ADC Input Channel 7) LVD(External Low Voltage Detection Input) Q-decoder DATA0 Clockout1
8	VPWR	I/O	Z	Charge Power Input UART0 TX(C) UART0 RX(C) TIMER3 PWM TIMER1 Capture
9	VBAT	P	--	Battery Input
10	IOVDD	P	--	IO Power
11	PB0	I/O	Z	UART0 TX(B)
12	PB1	I/O	200kΩ Pull-up	Hold down 0 to reset UART0 RX(B) TIMER2 CLK
13	PB2	I/O	Z	ADC6(ADC Input Channel 6) TIMER0 Capture
14	PB3	I/O	Z	AUX3(Audio ADC Input) TIMER2 PWM
15	DCVDD	P	--	1.2V Power

Pin No.	Name	Type	IO Initial State	Description
16	BTRF	RF	--	Bluetooth RF Antenna
17	XOSCI	I	--	Crystal Oscillator Input
18	XOSCO	O	--	Crystal Oscillator Output
19	PC5	I/O	Z	ADC12(ADC Input Channel 12) SPI1 DATA0(B) I²C SDA(B) TIMER1 CLK
20	PC4	I/O	Z	ADC11(ADC Input Channel 11) SPI1 CLK(B) I²C SCL(B) TIMER1 PWM
21	PC3	I/O	Z	ADC10(ADC Input Channel 10) SPI1 Data1(B) SPI1 Data1(D) UART0 TX(D) UART0 RX(D) TIMER2 Capture
22	PC2	I/O	Z	ADC15(ADC Input Channel 15) SPI1 DATA2(B) SPI1 DATA2(C) SPI1 DATA2(D) I²S MCLK(B)
	DVDD	P	--	Digital Power
23	PC1	I/O	10kΩ Pull-up	MCLR(Device Reset) SPI1 DATA3(B) SPI1 DATA3(C) SPI1 DATA3(D) TIMER0 CLK
24	USBDM	I/O	15kΩ Pull-down	ADC14(ADC Input Channel 14) USB Negative Data SPI1 DATA0(D) I²C SDA(A)
25	USBDP	I/O	15kΩ Pull-down	ADC13(ADC Input Channel 13) USB Positive Data SPI1 CLK(D) I²C SCL(A)
26	PA4	I/O	Z	ADC3(ADC Input Channel 3) AUX2(Audio ADC Input) SPI1 DATA1(A) I²S LRCK(A) I²S Data3(B)

Pin No.	Name	Type	IO Initial State	Description
27	PA3	I/O	Z	ADC2(ADC Input Channel 2) AUX1(Audio ADC Input) SPI1 DATA0(A) I²S SCLK(A) I²S Data2(B)
28	PA2	I/O	10kΩ Pull-down	SPI1 CLK(A) I²S MCLK(A) I²S Data1(B) TIMER3 Capture
29	PA1	I/O	Z	ADC1(ADC Input Channel 1) MIC(Audio ADC Input) I²S Data1(A)
30	PA0	I/O	Z	ADC0(ADC Input Channel 0) MICBIAS(MIC Bias Output) I²SData0(A) I²S Data0(B) Clockout0
31	AVSS	G	--	Audio Ground
32	VCM	P	--	Audio reference voltage

Note

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

2.Timer, UART0 and QDEC functions also can be remapped to any I/O.

3.MCPWM, UART1, 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

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	4.5	V
VPWR		-0.3	6.0	V
IOVDD		-0.3	3.6	V
DCVDD		-0.3	1.5	V
GPIO	Input voltage of GPIO (except PB0)	-0.3	3.6	V
HVTIO	Input voltage of HVT-IO (PB0)	-0.3	6.0	V

Note

1.Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device.

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	±400V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±2kV	All pins	JEDEC EIA/JESD22-C101F

3.3 PMU Characteristics

Table 3-3 PMU Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VPWR	Power supply	--	4.5	5.0	5.5	V
VBAT	Power supply	--	2.7	3.7	4.5	V
Operating mode						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
IOVDD	Voltage output	--	--	3.0	--	V
	Loading current	IOVDD=3.0V@VBAT = 3.7V	--	--	250	mA
DCVDD	Voltage output	--	--	1.35	--	V
	Loading current	DCVDD=1.25V@IOVDD = 3V	--	--	50	mA
Low Power mode						
Symbol	**Parameter**	**Conditions**	**Min**	**Typ**	**Max**	**Unit**
IOVDD	Loading current	IOVDD=3.0V@VBAT = 3.7V	--	--	10	mA

3.4 Battery Charge

Table 3-4 Charger Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
VPWR	Charge Input Voltage	VBAT+0.1V	5.0	5.5	V
CV	CV Mode Voltage Accuracy	4.175	4.2	4.225	V
		4.325	4.35	4.375	V
CC	CC Mode Current	20	--	300	mA
I_{end}	End Of Charge Current	2	--	30	mA
V_{Trikl}	Trickle Charge Voltage	--	3.0	--	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	PA0~PA4 PB0~PB7 PC1~PC5 USBDP USBDM VPWR	-0.3	1.4	V
V_{IH}	High-Level Input Voltage	IOVDD = 3.0V	PA0~PA4 PB1~PB7 PC1~PC5 USBDP USBDM	1.7	3.3	V
		IOVDD = 3.0V	PB0 VPWR	1.7	5.5	V
Output Characteristics						
Symbol	**Parameter**	**Conditions**	**IO**	**Typ**		**Unit**
| I_{OL} |	Output Current	IOVDD = 3.0V Voutput = 0.3V	PA0~PA4 PB1~PB7 PC1~PC5	2(HD=0) 6(HD=1) 20(HD=2) 24(HD=3)		mA
		IOVDD = 3.0V Voutput = 0.3V	VPWR	2		mA
		IOVDD = 3.0V Voutput = 0.3V	PB0 USBDP USBDM	8		mA
| I_{OH} |	Output Current	IOVDD = 3.0V Voutput = 2.7V	PA0~PA4 PB1~PB7 PC1~PC5	2(HD=0) 6(HD=1) 20(HD=2)		mA

				45(HD=3)	
		IOVDD = 3.0V Voutput = 2.7V	VPWR	2	mA
		IOVDD = 3.0V Voutput = 2.7V	PB0 USBDP USBDM	8	mA
Internal Resistance Characteristics					
Symbol	**Parameter**	**Conditions**	**IO**	**Typ**	**Unit**
R_{pu}	Pull-up Resistance	IOVDD = 3.0V	PA0~PA4 PB0,PB2~PB7 PC1~PC5	10k	Ω
		IOVDD = 3.0V	PB1 VPWR	200k	Ω
		IOVDD = 3.0V	USBDP	1.5k	Ω
		IOVDD = 3.0V	USBDM	180k	Ω
R_{pd}	Pull-down Resistance	IOVDD = 3.0V	PA0~PA4 PB0~PB7 PC1~PC5 VPWR	10k	Ω
		IOVDD = 3.0V	USBDP USBDM	15k	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	--	--	16	--	bit
Sample Rate	--	8	--	96	kHz
SNR①	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	108	--	dB
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	105	--	dB
	Single-ended Mode	--	107	--	dB

Parameter	Conditions	Min	Typ	Max	Unit
	Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ				
Dynamic Range	Differential Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	102	--	dB
	VCMO Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	100	--	dB
	Single-ended Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	100	--	dB
THD+N	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=32Ω	--	-85	--	dB
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=32Ω	--	-80	--	dB
	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=32Ω	--	-80	--	dB
Noise Floor	Differential Mode B/W=20Hz~20kHz A-Weighted load=10kΩ	--	12	--	uVrms
	VCMO Mode B/W=20Hz~20kHz A-Weighted load=10kΩ	--	8	--	uVrms
	Single-ended Mode B/W=20Hz~20kHz A-Weighted	--	8	--	uVrms

Parameter	Conditions	Min	Typ	Max	Unit
	load=10kΩ				
Noise Floor with MUTE	Differential Mode B/W=20Hz~20kHz A-Weighted load=10kΩ	--	6	--	uVrms
	VCMO Mode B/W=20Hz~20kHz A-Weighted load=10kΩ	--	5	--	uVrms
	Single-ended Mode B/W=20Hz~20kHz A-Weighted load=10kΩ	--	4	--	uVrms
Stereo Crosstalk	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	-120	--	dB
	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=10kΩ	--	-110	--	dB
Max Output Power	Differential Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=16Ω THD+N＜0.1%	--	82	--	mW
	VCMO Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=16Ω THD+N＜0.1%	--	33	--	mW
	Single-ended Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted load=16Ω THD+N＜0.1%	--	33	--	mW

Note

1.①SNR 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	--	--	16	--	bit
Sample Rate	--	8	--	48	kHz
SNR	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	98	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	97	--	dB
Dynamic Range	Differential input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	98	--	dB
	Single-ended input Mode Fin=1kHz@-60dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	97	--	dB
THD+N	Differential input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-90	--	dB
	Single-ended input Mode Fin=1kHz@0dBFS Fs=44.1kHz B/W=20Hz~20kHz A-Weighted ADC gain=0dB	--	-80	--	dB
Analogue Gain	--	-6	--	21	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	--	8	10	dBm
Maximum RF Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	8	--	dBm
Relative Transmit Power	EDR Π/4 DQPSK EDR 8DPSK	--	-3	--	dB
Maximum RF Transmit Power	BLE-1Mbps	--	8	--	dBm

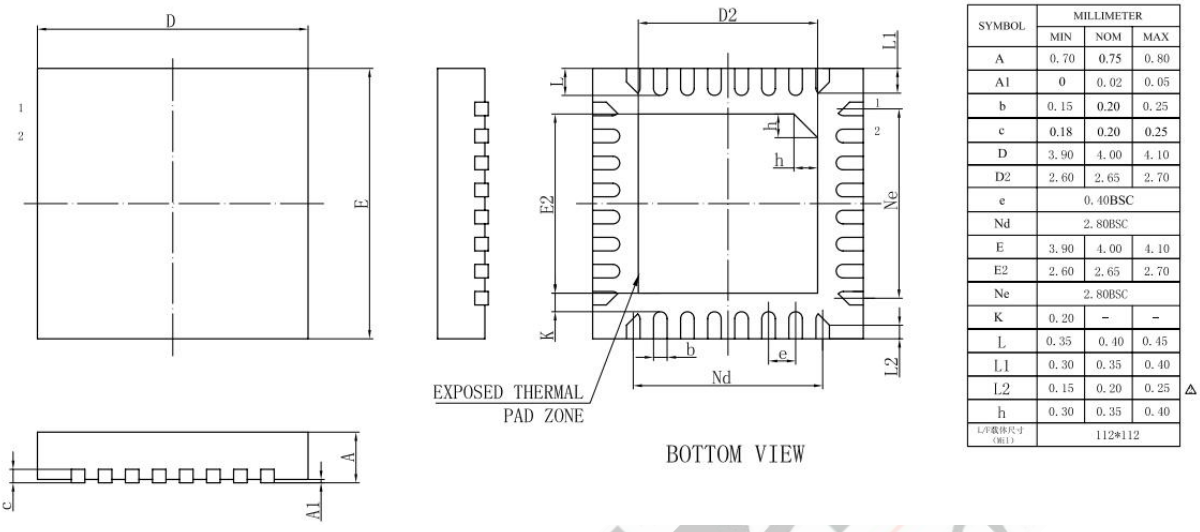
3.8.2 Receiver

Table 3-8-2 Receiver characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Sensitivity	BR	--	-93	--	dBm
	EDR Π/4 DQPSK	--	-92	--	dBm
	EDR 8DPSK	--	-86	--	dBm
	BLE-1Mbps	--	-97	--	dBm
	BLE-2Mbps	--	-93	--	dBm

4 Package Information

4.1 QFN32_4×4mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.60	2.65	2.70
e	0.40BSC		
Nd	2.80BSC		
E	3.90	4.00	4.10
E2	2.60	2.65	2.70
Ne	2.80BSC		
K	0.20	–	–
L	0.35	0.40	0.45
L1	0.30	0.35	0.40
L2	0.15	0.20	0.25
h	0.30	0.35	0.40
载体尺寸 (mil)	112*112		

Figure 4-1 AC7066M Package

5 IC Marking Information

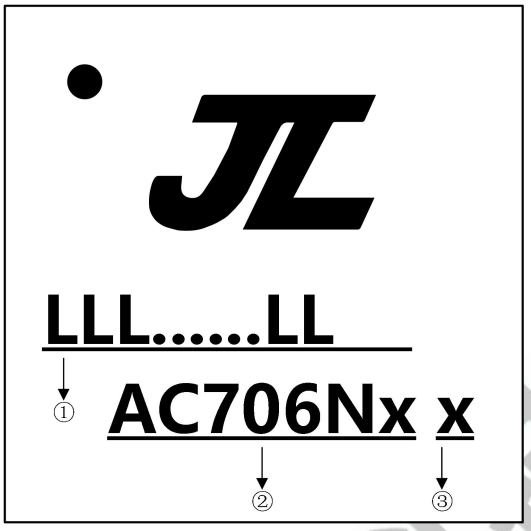


Figure 5-1 AC7066M Package Outline

① LLL……LL LOT No. , It contains 7 to 18 alphanumerics
② AC706Nx Chip Model
③ x Built-in flash size
0 No Flash Memory
2 2Mbit Flash
4 4Mbit Flash
8 8Mbit Flash
6 16Mbit Flash
3 32Mbit Flash

6 Solder-Reflow Condition

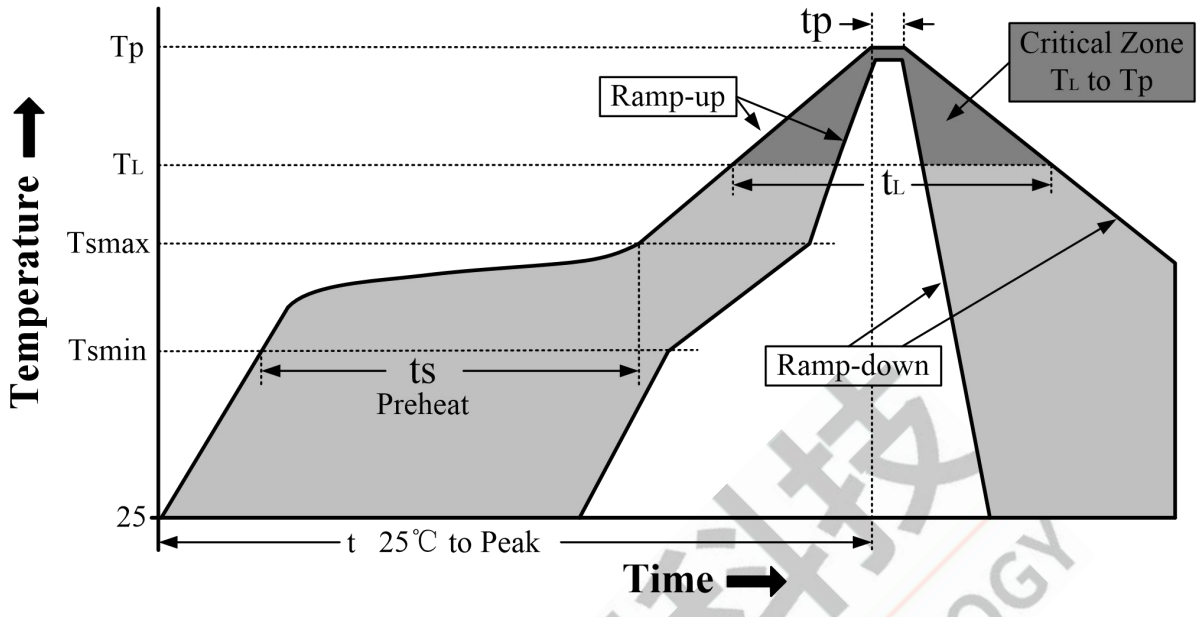


Figure 6-1 Classification Reflow Profile

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 mm^3 < 350	Volume mm^3 ≥ 350
<2.5 mm	240 +0/-5℃	225 +0/-5℃
≥2.5 mm	225 +0/-5℃	225 +0/-5℃

Table 6-3 Pb-free - Classification Temperature

Package Thickness	Volume mm³ < 350	Volume mm³ 350 - 2000	Volume mm³ > 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.