AC7063M2 Datasheet

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Zhuhai Jieli Technology Co.,LTD

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AC7063M Features

CPU

- 32-bit DSP
- with IEEE754 Single precision FPU
- Icache
- 64Vectored interrupts
- 8 Levels interrupt priority
- Support EMU

Memory

- Support MMU
- Built-In Flash
- 8 region MPU protects

Clocks

- On-chip 16 MHz clock oscillator
- On-chip 200 kHz lower-temperature-drift clock oscillator
- 24 MHz crystal oscillator

DSP Audio Processing

- SBC, AAC Audio decodes supported for BT audio
- mSBC voice codec supported for BT phone
- Packet Loss Concealment (PLC) for voice processing
- Single MIC Environmental Noise Cancellation (ENC)
- Single-band DRC limiter
- Multi-band EQ configuration for voice Effects

Audio Codec

- Double channels 16-bit DAC,SNR maximum 103dB
- One channel 16-bit ADC,SNR maximum 98dB
- Audio DAC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/ 32kHz/44.1kHz/48kHz/64kHz/88.2kHz/ 96kHz are supported
- Audio ADC Sampling rates of 8kHz/11.025kHz/16kHz/22.05kHz/24kHz/32 kHz/44.1kHz/48kHz are supported
- Support analog MIC input
- Support AMUX and ADC to DAC
- Audio DAC supports differential cap-less mode or single-ended mode
- Direct drive 16ohm/32ohm Speaker loading

Bluetooth

- Compliant with Bluetooth V5.4+BR+EDR+BLE specification （QDID：222830）
- Support AoA/AoD direction finding
- Support LE audio BIS/CIS full function
- Meet class1、class2 and class3 transmitting power requirement
- Maximum +10dbm transmitting power
- EDR receiver with minimum -93dBm sensitivity
- Support a2dp\avctp\avdtp\avrcp\hfp\spp\smp\ att\gap\gatt\rfcomm\sdp\l2cap profile
- BAP 1.0.1\PACS 1.0.1\CCP 1.0\MCP 1.0\MICP 1.0\VCP 1.0\CSIP 1.0.1\ASCS1.0\BASS 1.0\CAP 1.0\HAP 1.0\PBP 1.0\TMAP 1.0\LC3 1.0
- A2DP 1.4\AVCTP 1.4\AVDTP 1.3\ AVRCP 1.6.2\HFP 1.8 \SPP 1.2\RFCOMM 1.2\PNP 1.3\HID 1.1.1\SDP core5.4\L2CAP core 5.4

Peripherals

- One full speed USB OTG controller
- Four multi-function 16-bit timers, support capture and PWM mode
- Two UART interface
- I2C Master/Slave interface
- Two SPI Master/Slave interface
- 7-channel 10-bit ADC for analog sampling
- 8 Individually programmable and multiplexed GPIO pins
- Support IO function remapping
- Up to 8 external interrupt/wake-up source

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(low power available,can be multiplexed to any I/O)

PMU

- Built-in lithium battery charging manager,up to 300mA charging current
- Built-in LDO
- Minimum 3uA current consumption in the soft-off mode
- VPWR range : 4.5V to 5.5V
- VBAT range : 2.7V to 4.5V
- IOVDD range : 2.2V to 3.4V

Packages

- QFN20（3mm*3mm）

Temperature

- Operating temperature: -40℃ to +85℃
- Storage temperature: -65℃ to +150℃

Applications

- Wireless microphone

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1. Block Diagram

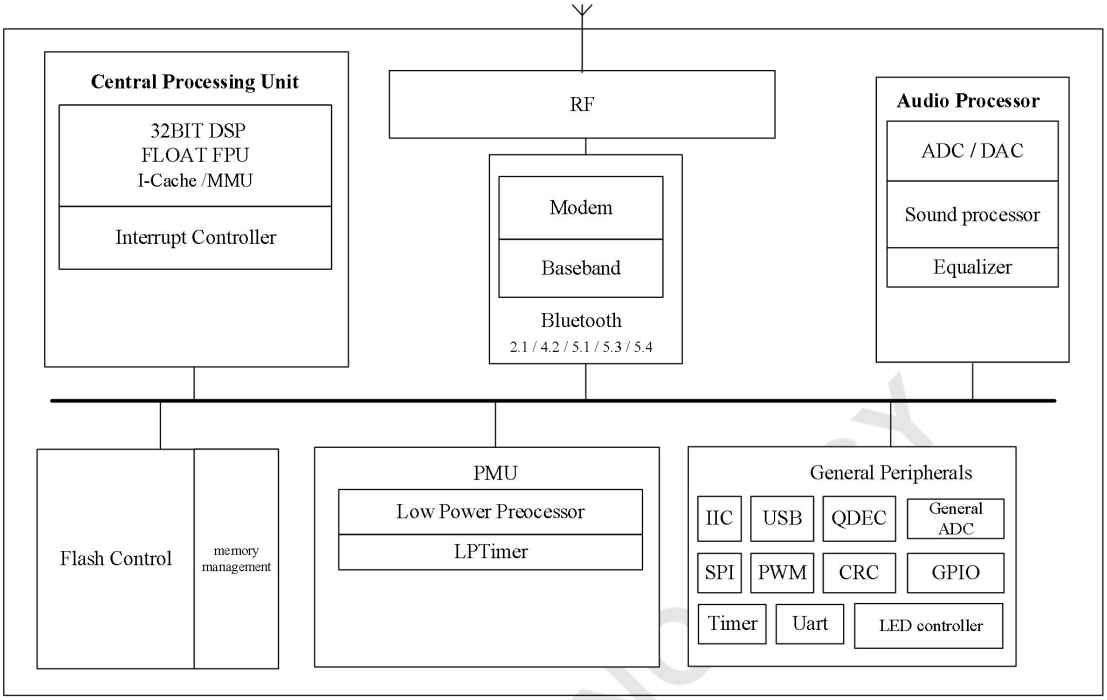

Figure 1-1 AC7063M Block Diagram

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2. Pin Definition

2.1. Pin Assignment

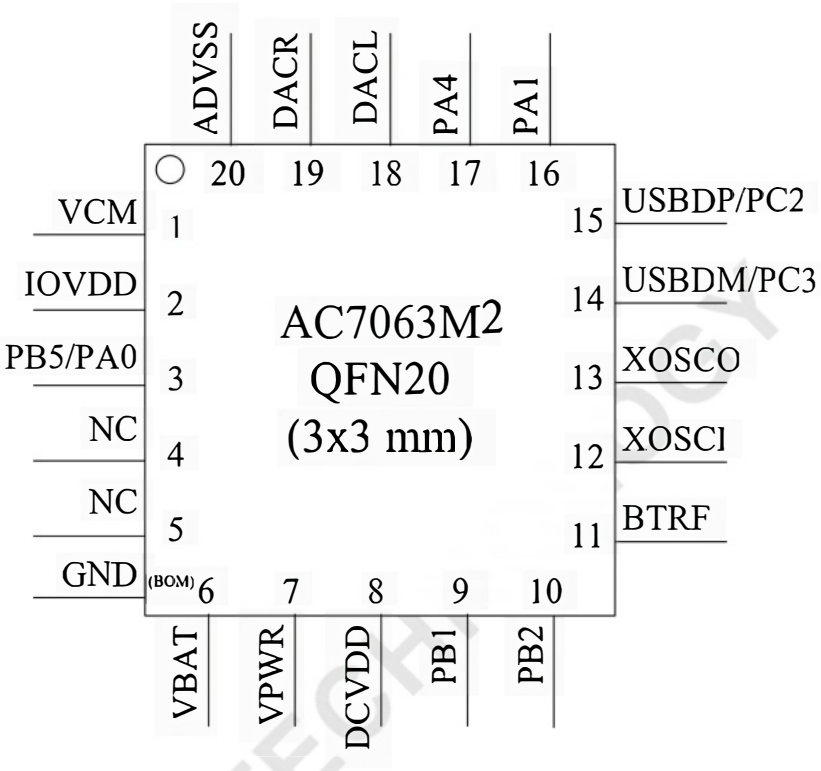

Figure 2-1 AC7063M Package Diagram

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2.2. Pin Description

Table 2-2 AC7063M Pin Description

Pin No.	Pin name	Type	Function	Other function
1	VCM	P		
2	IOVDD	PO		
3	PB5	I/O	GPIO	ADC Input Channel 5 SD power gate SPI1 Data1 In(C)/SPI0 Data1 In(B)
	PA0	I/O	GPIO	ADC Input Channel 0; MIC0 Bias Output(Built-in resistor)/MICLDO Clock Out0 WiFi bluetooth co-existence WLC_EXT_ACT
4	NC		(No Connection)	
5	NC		(No Connection)	
6	VBAT	PI		Battery Input
7	VPWR	PI (I/O)	GPIO (High Voltage Resistant)	Charge Power Input Uart0 Data Out(C)/Uart0 Data In(C) Timer3 PWM Output Timer1 Capture
8	DCVDD	P		
9	PB1	I/O	GPIO (pull up)	Hold down 0 to reset ADC Input channel 0 Uart0 Data In(B) Timer2 Clock In Uart0 Data In
10	PB2	I/O	GPIO	ADC Input Channel 6 32k Crystal Oscillator input Timer0 Capture
11	BTRF	RF		Bluetooth RF antenna
12	XOSCI	I		System Crystal Oscillator Input
13	XOSCO	O		System Crystal Oscillator Output
14	USBDM	I/O	GPIO (pull down)	USB Negative Data ADC Input Channel 14 SPI1 Data0 Out(D) IIC Serial Data(A)
	PC3	I/O	GPIO	ADC Input Channel 10 SPI1 Data1 In(D) Uart0 Data Out(D)/Uart0 Data In(D) Timer2 Capture Clock Out2

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15	USBDP	I/O	GPIO (pull down)	USB Positive Data ADC Input Channel 13 SPI1 Clock(D) IIC Serial Clock(A)
	PC2	I/O	GPIO	ADC Input Channel 15 SPI1 Data2(B/C/D) Clock Out1 External LNA enable
16	PA1	I/O	GPIO	ADC Input Channel 1 MIC input
17	PA4	I/O	GPIO	ADC Input Channel 3 AUX2 input SPI1 Data In(A) SPI0 Data Out WiFi bluetooth co-existence WLC_EXT_ACTIVE
18	DACL	AO	Analog Output	Left channel audio output
19	DACR	AO	Analog Output	Right channel audio output
20	ADVSS	G		Audio Ground
BOM	GND	G		Ground
Uart1、SD-card function can be remapped to any I/O				

Pin Type	**Description**	**Pin Type**	**Description**
P	Power	I/O	Input or Output
PO	Power Output	I	Input
PI	Power Input	O	Output
G	Ground	RF	RF antenna
AO	Analog Output		

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3. Electrical Characteristics

3.1. Absolute Maximum Ratings

Table 3-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	℃
Tstg	Storage temperature	-65	+150	℃
VBAT	Supply Voltage	-0.3	4.5	V
VPWR	Charger Voltage	-0.3	6	V
V_{IOVDD}	Voltage applied at IOVDD	-0.3	3.6	V
V_{GPIO}	Voltage applied to GPIO	-0.3	3.6	V
V_{HVTIO}	Voltage applied to High Voltage Resistant IO	-0.3	+5.5	V

Note : The chip can be damaged by any stress in excess of the absolute maximum ratings listed below

3.2. PMU Characteristics

Table 3-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.7	3.7	4.5	V	
VPWR	Charger supply Voltage	4.5	5.0	5.5	V	
Operating mode						
IOVDD	Voltage output		3.2		V	VBAT = 4.2V, 10mA loading
	Loading current			300	mA	IOVDD=3.2V@VBAT = 3.7V
DCVDD	Voltage output		1.4		V	IOVDD=3.2V, 10mA loading
	Loading current			150	mA	DCVDD=1.4V@IOVDD=3.2v on LDO mode
Low Power mode						
IOVDD	Loading current			20	mA	IOVDD=3.2V@VBAT = 3.7V

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3.3. Battery Charge

Table 3-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VPWR	Charge Input Voltage	4.5	5	5.5	V	
$V_{bat\ float}$	Charge Voltage	4.15	4.2	4.25	V	VPWR＞4.5V
		4.30	4.35	4.40	V	VPWR＞4.65V
I_{bat}	Charge Current	15		350	mA	Charge current at fast charge mode VBAT=4.0V@VPWR=5.0V
I_{end}	End Of Charge Current	1.5		35	mA	End of charge current
V_{Trikl}	Trickle Charge Voltage		3.0		V	VPWR＞4.5V

3.4. IO Input/Output Electrical Logical Characteristics

Table 3-4

GPIO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3		1.4	V	IOVDD = 3.2V
V_{IH}	High-Level Input Voltage	1.8		3.6	V	IOVDD = 3.2V
High Voltage Resistant IO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3		1.4	V	IOVDD = 3.2V
V_{IH}	High-Level Input Voltage	1.8		5.5	V	IOVDD = 3.2V

GPIO & High Voltage Resistant IO output characteristics					
Symbol	**Parameter**	GPIO	**Typ**	**Unit**	**Test Conditions**
V_{OL}	0.1* IOVDD Drive current	Except VPWR	HD=0 : -1.8 HD=1 : -6 HD=2 : -20 HD=3 : -24	mA	IOVDD = 3.2V
		VPWR	-8		
V_{OH}	0.9* IOVDD Drive current	Except VPWR	HD=0 : 1.8 HD=1 : 6 HD=2 : 20 HD=3 : 45	mA	IOVDD = 3.2V
		VPWR	8		

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3.5. Internal Resistor Characteristics

Table 3-5

Port	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA0,PA1,PA4 PB2 PC2,PC3	10K	10K	1、PB1 default pull up 200KΩ 2、USBDM & USBDP default pull Down 15KΩ 3、internal pull-up / pull-down resistance | accuracy ±20%
PB1,PB5 PP0(VPWR)	200K	10K	
USBDP	1.5K	15K	
USBDM	180K	15K	

3.6. Audio DAC Characteristics

Table 3-6

Parameter	MODE		Min	Typ	Max	Unit	Test Conditions
Frequency Response			20		20k	Hz	
Output Swing	Single-ended			0.8		Vrms	Fin=1kHz/0dB
	Differential			1.7		Vrms	Fs=44.1kHz
THD+N	Single-ended			-80		dB	B/W=20Hz~20kHz
	Differential			-85		dB	A-Weighted Filter
S/N	Single-ended			100		dB	10k ohm loading
	Differential			103		dB	
Noise Floor	Single-ended			8		uVrms	A-Weighted Filter
	Differential			12		uVrms	
Crosstalk	Single-ended			-110		dB	Fin=1kHz/0dB
Output Power	32ohm	Single-ended		20		mW	Fin=1kHz Fs=44.1kHz THD+N < 0.1%
		Differential		52		mW	
	16ohm	Single-ended		30		mW	
		Differential		75		mW	

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3.7. Audio ADC Characteristics

Table 3-7

Parameter		Min	Typ	Max	Unit	Test Conditions
Maximum Input Level	Differential		1.8		Vrms	Gain Level = 0 Fin = 1kHz Fs = 44.1kHz THD+N < 0.1%
	Single-ended		0.9		Vrms	
SNR	Differential		98		dB	Gain Level = 0 Fs = 44.1kHz Fin = 1kHz,Maximum Input B/W = 20Hz~20kHz A-Weighted Filter
	Single-ended		97		dB	
THD+N	Differential		-80		dB	
	Single-ended		-80		dB	
SNR (AD to DA)	Differential to Single-ended		96		dB	
	Differential to Differential		97		dB	
	Single-ended to Single-ended		94		dB	
	Single-ended to Differential		95		dB	
THD+N (AD to DA)	Differential to Single-ended		-80		dB	
	Differential to Differential		-80		dB	
	Single-ended to Single-ended		-80		dB	
	Single-ended to Differential		-80		dB	

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3.8. BT Characteristics

3.8.1. Transmitter

Basic Data Rate **Table 3-8-1-1**

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power，DH5			7.5	10	dBm	25℃ Power Supply VBAT=3.7V 2441MHz 4 Layer Board
RF Power Control Range，DH1			20		dB	
20dB Bandwidth，DH5			950		KHz	
Adjacent Channel Transmit Power，DH1	+2MHz		-40		dBm	
	-2MHz		-40		dBm	
	+3MHz		-45		dBm	
	-3MHz		-45		dBm	

Enhanced Data Rate **Table 3-8-1-2**

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-3		dB	25℃ Power Supply VBAT=3.7V 2441MHz 2DH5 4 Layer Board
π/4 DQPSK Modulation Accuracy	DEVM RMS		10		%	
	DEVM 99%		15		%	
	DEVM Peak		20		%	
In-band spurious Emissions	+2MHz		-35		dBm	
	-2MHz		-35		dBm	
	+3MHz		-40		dBm	
	-3MHz		-40		dBm	

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3.8.2. Receiver

Basic Data Rate **Table 3-8-2-1**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25℃ Power Supply VBAT=3.7V 2441MHz DH1 4 Layer Board
Co-channel Interference Rejection			10		dB	
Adjacent Channel Interference Rejection	+1MHz		-30		dB	
	-1MHz		-30		dB	
	+2MHz		-40		dB	
	-2MHz		-40		dB	
	+3MHz		-40		dB	
	-3MHz		-		dB	

Enhanced Data Rate **Table 3-8-2-2**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25℃ Power Supply VBAT=3.7V 2441MHz 2DH5 4 Layer Board
Co-channel Interference Rejection			10		dB	
Adjacent Channel Interference Rejection	+1MHz		-30		dB	
	-1MHz		-30		dB	
	+2MHz		-40		dB	
	-2MHz		-40		dB	
	+3MHz		-40		dB	
	-3MHz		-		dB	

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3.8.3. BLE

1M Data Rate **Table 3-8-3-1**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-95		dBm	25℃ Power Supply VBAT=3.7V 2440MHz 4 Layer Board
RF Transmit Power			7.5		dB	
In-band spurious Emissions	+2MHz		-40		dBm	
	-2MHz		-40		dBm	
	+3MHz		-40		dBm	
	-3MHz		-40		dBm	
Modulation Characteristics	Δf1 avg		250		KHz	
	Δf2 99%		210		KHz	
	Δf1avg/Δf2av		0.9			
Carrier Frequency Offset		-15		+15	KHz	
Frequency Drift		-25		+25	KHz	
Frequency Drift Rate		-5		+5	KHz/50us	

2M Data Rate **Table 3-8-3-2**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25℃ Power Supply VBAT=3.7V 2440MHz 4 Layer Board
RF Transmit Power			7.5		dB	
In-band spurious Emissions	+4MHz		-40		dBm	
	-4MHz		-40		dBm	
	+5MHz		-40		dBm	
	-5MHz		-40		dBm	
	+6MHz		-50		dBm	
	-6MHz		-35		dBm	
Modulation Characteristics	Δf1 avg		500		KHz	
	Δf2 99%		430		KHz	
	Δf1avg/Δf2av		0.9			
Carrier Frequency Offset		-15		+15	KHz	
Frequency Drift		-25		+25	KHz	
Frequency Drift Rate		-5		+5	KHz/50us	

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3.9. ESD Protection

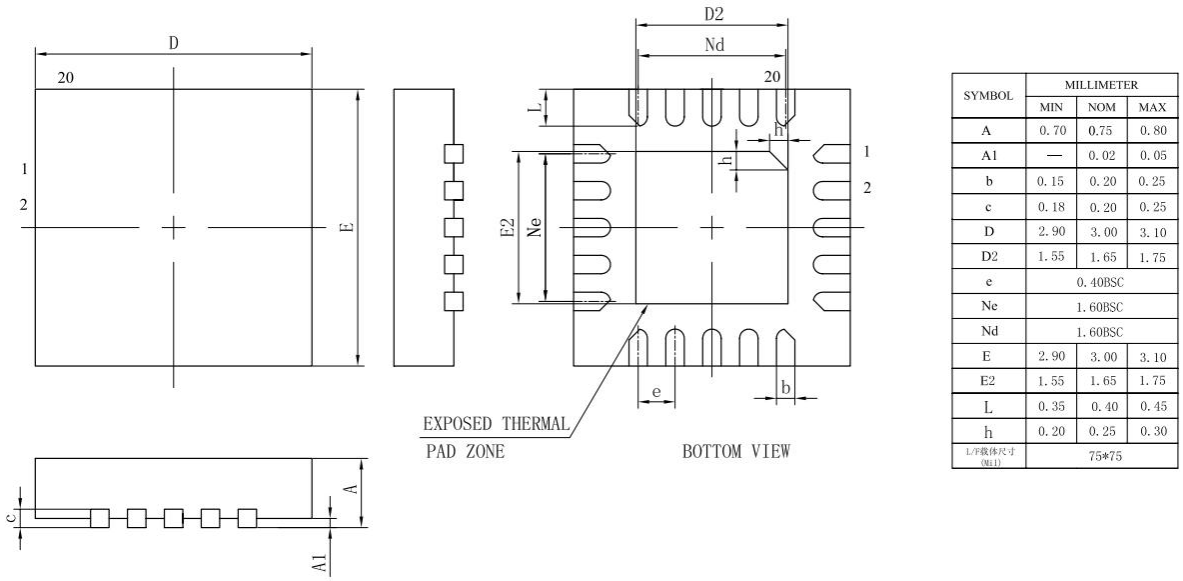
Table 3-10

Parameter	Typ.	Test pin	Reference standard
Human Body Mode	±4KV	All pins	JEDEC EIA/JESD22-A114
Machine Mode	±200V	All pins	JEDEC EIA/JESD22-A115
Charge Device Model	±1KV	All pins	JEDEC EIA/JESD22-C101F
Latch up	±200mA	All GPIO pins	JEDEC STANDARD NO.78E
	1.5xVopmax	All power pins	

Note : 1.5xVopmax = 1.5 times maximum operating voltage.

4. Package Information

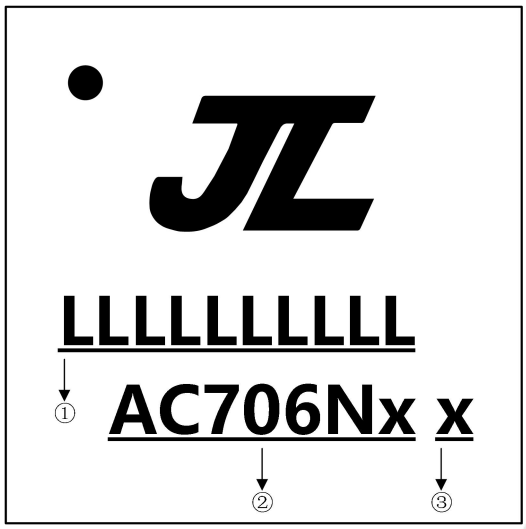
4.1 QFN20_3mm x 3mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	1.55	1.65	1.75
e	0.40BSC		
Ne	1.60BSC		
Nd	1.60BSC		
E	2.90	3.00	3.10
E2	1.55	1.65	1.75
L	0.35	0.40	0.45
h	0.20	0.25	0.30
芯片封装体尺寸(MIL)	75*75		

Figure 4-1 AC7063M Package

5. IC Marking Information



① LLLLLLLLLL：Production Batch

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

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6. Solder-Reflow Condition

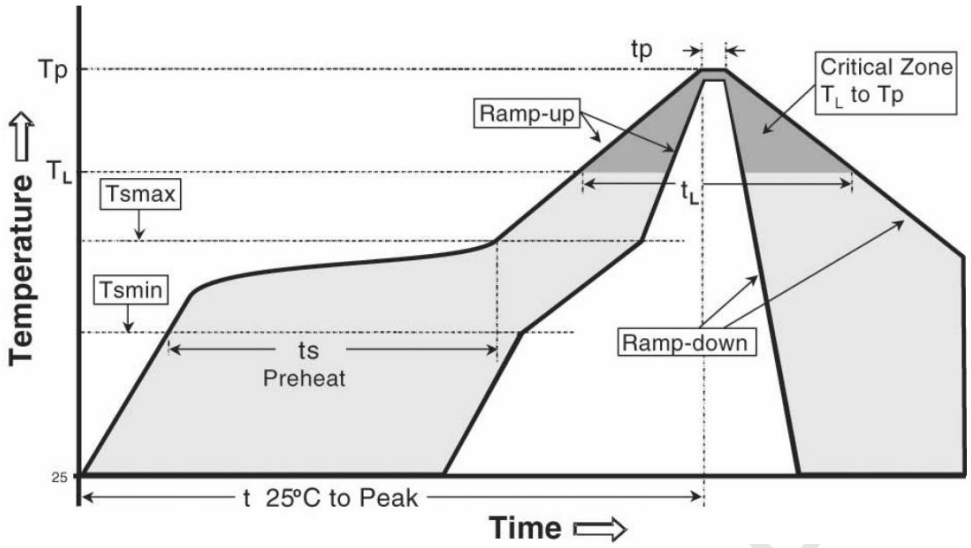

Figure 6-1 Classification Reflow Profile

Classification Profiles **Table 6-1**

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 5-2	See Table 5-3
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.

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

SnPb - Classification Temperature **Table 6-2**

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℃

Pb-free - Classification Temperature **Table 6-3**

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℃

*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.

7. Revision History

Date	Revision	Description
2023.06.29	V1.0	Initial Release
2023.07.31	V1.1	Update resource description
2023.09.16	V1.2	Update Features
2023.10.13	V1.3	Add IC Marking Information Update Absolute Maximum Ratings Update IO Input/Output Electrical Logical Characteristics Update BT_Features
2023.10.24	V1.4	Update Block Diagram
2023.11.03	V1.5	Update BT_Features Update IC Marking Information

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