AC6956M Datasheet

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Version：V1.2

Date：2025.01.09

AC6956M Features

CPU

- 32-bit DSP supports hardware Float Point Unit(FPU)
- Up to 240MHz programmable processor
- 64Vectored interrupts
- 4 Levels interrupt priority

DSP Audio Processing

- SBC, AAC Audio decodes supported for BT audio
- mSBC voice codecs supported for BT phone
- Supports MP2, MP3, WMA, APE, FLAC, AAC, MP4, M4A, WAV, AIF, AIFC audio decoding
- Packet Loss Concealment (PLC) for voice processing
- Acoustic echo cancellation/suppression (AEC,AES)
- Single/Dual MIC Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- 30-band EQ configuration for voice Effects

Audio Codec

- Four channels 16-bit DAC, SNR >= 95dB
- Three channels 16-bit ADC , SNR >= 90dB
- Sampling rates of 8KHz/11.025KHz/16KHz/22.05KHz/24KHz/ 32KHz/44.1KHz/48KHz are supported
- One analog MIC amplifier, build-in MIC bias generator
- Supports two PDM digital MIC inputs
- three channels Stereo analog MUX
- Supports cap-less, single-ended, and differential mode at the DAC path
- Supports 16ohm and 32ohm Speaker loading

Bluetooth

- Compliant with Bluetooth V6.0+BR+EDR+BLE specification (DN Q334307)
- Meet class2 and class3 transmitting power requirement
- Support GFSK and π/4 DQPSK all packet types
- Provides maximum +6dBm transmitting power
- receiver with minimum -90dBm sensitivity
- Fast AGC for enhanced dynamic range
- Supports a2dp\avctp\avdtp\avrcp\hfp\spp\smp\att\gap\ gatt\rfcomm\sdp\l2cap profile
- a2dp 1.4\avctp 1.4\avdtp 1.3\ avrcp 1.6.3\ hfp 1.9\spp 1.2\rfcomm 1.2\pnp 1.3\ hid 1.1.1\sdp core 6.0\l2cap core 6.0

Peripherals

- One full speed USB 2.0 OTG controller
- Four multi-function 16-bit timers, support capture and PWM mode
- Three 16-bit PWM generator for motor driving
- Three full-duplex basic UART, UART0 and UART1 supports DMA mode
- Two SPI interface supports host and device mode
- SD Card Host controller
- One hardware IIC interface supports host and device mode
- Built-in Cap Sense Key controller
- 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs

PMU

- Low voltage LDO for internal digital and analog circuit supply
- Built-in Li-Ion battery charger with up to 200mA charger current capability
- 3uA current consumption in the soft-off mode
- Built-in LDO for the core, I/O, Bluetooth and flash
- VBAT is 2.2V to 4.5V

- VDDIO is 2.2V to 3.6V

Packages

- QFN32(4mm*4mm)

Temperature

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

Applications

- Bluetooth Dongle

1、Pin Definition

1.1 Pin Assignment

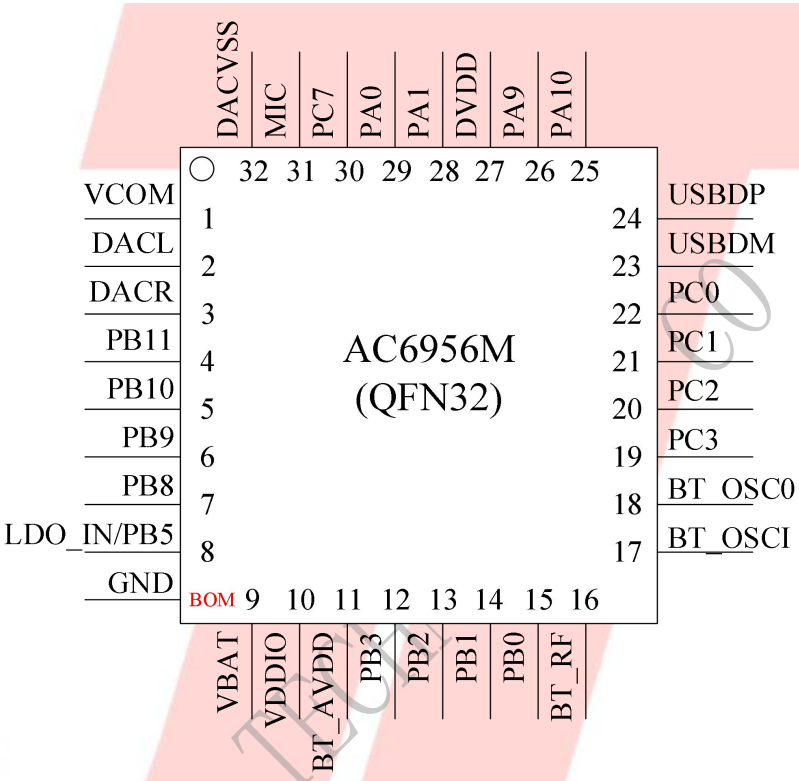


Figure 1-1 AC6956M Package Diagram

1.2 Pin Description

Table 1-1 AC6956M Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	VCOM	P	/		DAC Reference
2	DACL	O	/		DAC Left Channel
3	DACR	O	/		DAC Right Channel
4	PB11	I/O	/	GPIO	SDPG:SDC Power Gate; SPDIF_OUT：Sony/Philips Digital Interface Out
5	PB10	I/O	8/24	GPIO	AMUX2R：Analog Channel2 Right; SPI2DOA：SPI2 Data Out(A); ADC9：ADC Input Channel 9; UART2RXC：Uart2 Data In(C); PWMCH3L：Motor PWM Channel3(L)；
6	PB9	I/O	8/24	GPIO	AMUX2L：Analog Channel2 Left; SPI2CLKA：SPI2 Clk(A); CAP0：Timer0 Capture; UART2TXC：Uart2 Data Out(C); PWMCH3H：Motor PWM Channel3(H)；
7	PB8	I/O	8/24	GPIO	AMUX1R：Analog Channel1 Right; SPI2_DIA：SPI2 Data In(A); ADC8：ADC Input Channel 8; CLKOUT1：Clk Out1;
8	LDO_IN	P	/		Battery Charge Input
	PB5	I/O	8	GPIO (High Voltage Resistance)	PWM3：Timer3 PWM Output; CAP1：Timer1 Capture; UART0TXC：Uart0 Data Out(C); UART0RXC：Uart0 Data In(C);
9	VBAT	P	/		Power Supply
10	VDDIO	P	/		IO Power 3.3v
11	BT_AVDD	P	/		BT Power
12	PB3	I/O	8/24	GPIO	PWM2：Timer2 PWM Output; ADC6：ADC Input Channel 6;
13	PB2	I/O	8	GPIO (High Voltage Resistance)	SPI1DIA：SPI1 Data In(A); PWMCH1L：Motor PWM Channel1 (L)；
14	PB1	I/O	8/24	GPIO (pull up)	Long Press Reset； SPI1DOA：SPI1 Data Out(A);

					ADC5：ADC Input Channel 5; TMR2：Timer2 Clock Input; UART1RXA：Uart1 Data In(A);
15	PB0	I/O	8	GPIO (High Voltage Resistance)	SPI1CLKA：SPI1 Clock(A); UART1TXA：Uart1 Data Out(A); PWMCH1H：Motor PWM Channel1(H)；
16	BT_RF	/	/		BT Antenna
17	BT_OSCI	I	/	OSC In	
18	BT_OSCO	O	/	OSC Out	
19	PC3	I/O	8/24	GPIO	SD1DAT0A：SD1 Data0(A); SPI1DIB：SPI1 Data In(B);
20	PC2	I/O	8/24	GPIO	SD1DAT1A：SD1 Data1(A); ALNK1_DAT0：Audio Link Data0; Touch12：Touch Input Channel 12; FPIN5：Motor Auto-Stop Protective Pin5；
21	PC1	I/O	8/24	GPIO	SD1DAT2A：SD1 Data2(A); Touch11：Touch Input Channel 11; UART1RXB：Uart1 Data In(B); FPIN4：Motor Auto-Stop Protective Pin4；
22	PC0	I/O	8/24	GPIO	SD1DAT3A：SD1 Data3(A); Touch10：Touch Input Channel 10; UART1TXB：Uart1 Data Out(B); FPIN3：Motor Auto-Stop Protective Pin3；
23	USBDM	I/O	4	USB Negative Data (pull down)	UART1RXD：Uart1 Data In(D); IIC_SDA_A：IIC SDA(A);
24	USBDP	I/O	4	USB Positive Data (pull down)	UART1TXD：Uart1 Data Out(D); IIC_SCL_A：IIC SCL(A); ADC12：ADC Input Channel 12;
25	PA10	I/O	8/24	GPIO	SD0CLKA：SD0 Clock(A); ALNK0_LRCKB：Audio Link Word Select(B); ADC3：ADC Input Channel 3; SPDIF_IN_B：Sony/Philips Digital Interface Input(B) TMR1：Timer1 Clock Input; Touch9：Touch Input Channel 9; UART2RXB：Uart2 Data In(B); PWMCH4L：Motor PWM Channel4(L)；
26	PA9	I/O	8/24	GPIO	SD0CMA：SD0 Command(A); ALNK0_SCLKB：Audio Link Serial Clock(B); SPDIF_IN_A：Sony/Philips Digital Interface Input(A) Touch8：Touch Input Channel 8;

					UART2TXB：Uart2 Data Out(B); PWMCH4H：Motor PWM Channel4(H)；
27	DVDD	P			
28	PA1	I/O	8/24	GPIO	AMUX0R：Analog Channel0 Right; Touch1：Touch Input Channel 1; ADC0：ADC Input Channel 0; UART1RXC：Uart1 Data In(C); PWMCH0L：Motor PWM Channel0(L)；
29	PA0	I/O	8/24	GPIO	AMUX0L：Analog Channel0 Left; Touch0：Touch Input Channel 0; CLKOUT0： UART1TXC：Uart1 Data Out(C); PWMCH0H：Motor PWM Channel0(H)；
30	PC7	I/O	/	GPIO	MIC_BIAS：Microphone Bias Output
31	MIC	I	/		MIC：MIC Input Channel;
32	DACVSS	P	/		DAC Ground
BOM	GND	P	/		Ground

2、Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating temperature	-40	+85	℃
Tstg	Storage temperature	-65	+150	℃
VBAT	Supply Voltage	-0.3	4.5	V
LDO5v	Charger Voltage	-0.3	6.5	V
$V_{3.3IO}$	3.3V IO Input Voltage	-0.3	VDDIO+0.3	V

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

2.2 PMU Characteristics

Table 2-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.2	3.7	4.5	V	
LDO_IN	Charger Voltage	4.5	5.0	5.5	V	
$V_{3.3}$	Voltage output	_	3.3	_	V	VBAT = 4.2V, 100mA loading
V_{BT_AVDD}	Voltage output	_	1.3	_	V	VBAT=4.2V, 100mA loading
$I_{L3.3}$	Loading current	_	_	150	mA	VBAT = 4.2V

2.3 Battery Charge

Table 2-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
LDO_IN	Charge Input Voltage	4.5	5	5.5	V	_
V_{Charge}	Charge Voltage	4.15	4.2	4.25	V	LDO_IN＞4.5V
I_{Charge}	Charge Current	20		320	mA	Charge current at fast charge mode
I_{Trikl}	Trickle Charge Current	20	45	70	mA	V_{BAT}<V_{Trikl}

2.4 IO Input/Output Electrical Logical Characteristics

Table 2-4

IO input characteristics						
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* VDDIO	V	VDDIO = 3.3V
V_{IH}	High-Level Input Voltage	0.7* VDDIO	_	VDDIO+0.3	V	VDDIO = 3.3V
IO output characteristics						
V_{OL}	Low-Level Output Voltage	_	_	0.33	V	VDDIO = 3.3V
V_{OH}	High-Level Output Voltage	2.7	_	_	V	VDDIO = 3.3V

2.5 Internal Resistor Characteristics

Table 2-5

Port		**General Output**	**High Drive**	**Internal Pull-Up Resistor**	**Internal Pull-Down Resistor**	**Comment**
PA0、PA1 PA9、PA10 PB1、PB3 PB8~PB10 PC0~PC3		8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、PB0, PB2, PB5 can pull-up resistance to 5V 4、internal pull-up/pull-down resistance | accuracy ±20% 5、PRx supply by RTCVDD
PB11 PC7	Output 0	8mA	24mA	10K	10K	
	Output 1	8mA	64mA			
PB0、PB2、PB5		8mA	_	10K	10K	
USBDP		4mA	_	1.5K	15K	
USBDM		4mA	_	180K	15K	

2.6 DAC Characteristics

Table 2-6

Parameter	**Min**	**Typ**	**Max**	**Unit**	**Test Conditions**
Frequency Response	20	_	20K	Hz	1KHz/0dB 10Kohm loading With A-Weighted Filter
THD+N	_	-75	_	dB	
S/N	_	95	_	dB	
Crosstalk	_	-90	_	dB	
Output Swing		1		Vrms	
Dynamic Range		95		dB	1KHz/-60dB 10Kohm loading

					With A-Weighted Filter
DAC Output Power		20	_	mW	16ohm loading

2.7 ADC Characteristics

Table 2-7

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range		80		dB	Fsample=44.1kHz Fin=1KHz 2mVpp Input
S/N	_	90	91	dB	Fsample=44.1kHz Fin=1KHz 1.2Vpp Input
THD+N	_	-70	_	dB	
Crosstalk	_	-90	_	dB	

2.8 BT Characteristics

2.8.1 Transmitter

Basic Data Rate **Table 2-8**

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			4	6	dBm	25℃, Power Supply VBAT=3.7V 2441MHz
RF Power Control Range			20		dB	
20dB Bandwidth			950		KHz	
Adjacent Channel Transmit Power	+2MHz		-40		dBm	
	-2MHz		-38		dBm	
	+3MHz		-44		dBm	
	-3MHz		-35		dBm	

Enhanced Data Rate **Table 2-9**

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-1		dB	25℃, Power Supply VBAT=3.7V 2441MHz
π/4 DQPSK Modulation Accuracy	DEVM RMS		6		%	
	DEVM 99%		10		%	
	DEVM Peak		15		%	
Adjacent Channel Transmit Power	+2MHz		-40		dBm	
	-2MHz		-38		dBm	
	+3MHz		-44		dBm	
	-3MHz		-35		dBm	

2.8.2 Receiver

Basic Data Rate **Table 2-10**

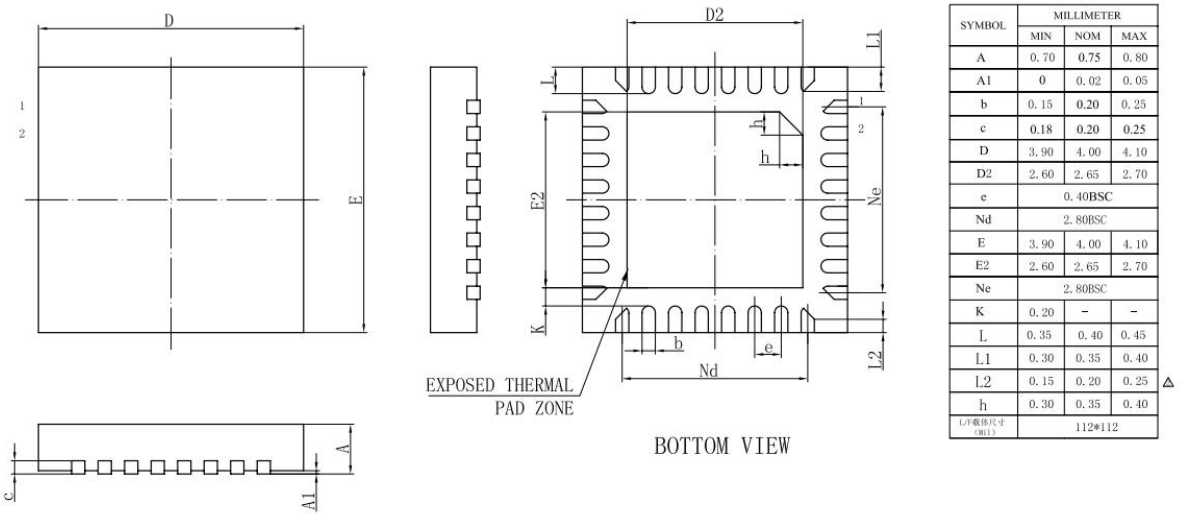
Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	25℃, Power Supply VBAT=3.7V 2441MHz
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

Enhanced Data Rate **Table 2-11**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	25℃, Power Supply VBAT=3.7V 2441MHz
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

3、 Package Information

3.1 QFN32_4x4



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
L/F载体尺寸 (mil)	112*112		

Figure 3-1 AC6956M Package

4、Revision History

Date	Revision	Description
2023.09.11	V1.0	Initial Release
2023.12.12	V1.1	Update Bluetooth Vision and profiles
2025.01.09	V1.2	Update Bluetooth Vision and profiles