

AC6966A Datasheet

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Version: V1.2

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AC6966A Features

CPU

- 32-bit DSP supports hardware Float Point Unit (FPU)
- Up to 160MHz programmable processor
- 64 Vectored 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
- 10-band EQ configuration for voice Effects

Audio Codec

- Two channels 16-bit DAC, SNR $\geq$ 95dB
- One channels 16-bit ADC, SNR $\geq$ 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
- Two channels Mono analog MUX

PMU

- Low voltage LDO for internal digital and analog circuit supply
- 3uA current consumption in the soft-off mode
- Built-in LDO for the core, I/O, Bluetooth and flash
- VBAT is 2.2V to 5V
- VDDIO is 2.2V to 3.6V

- 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 Q382031)
- Meet class2 and class3 transmitting power requirement
- Support GFSK and $\pi/4$ DQPSK all packet types
- Provides +6dbm transmitting power
- receiver with -90dBm sensitivity
- Fast AGC for enhanced dynamic range
- Supports a2dp\avctp\avdtp\avrcp\hfp\spp\smpt\att\gap\gatt\rfcomm\sdpl2cap 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\sdpcore 6.0\l2cap core 6.0

Peripherals

- One full speed USB 2.0 OTG controller
- Six multi-function 32-bit timers, support capture and PWM mode
- Three full-duplex basic UART, UART0 and UART1 supports DMA mode
- Three SPI interface supports host and device mode
- One hardware IIC interface supports host and device mode
- 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs

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Packages

- QFN32(4mm*4mm)

Temperature

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

Applications

- Bluetooth TWS Earphone

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1、 Pin Definition

1.1 Pin Assignment

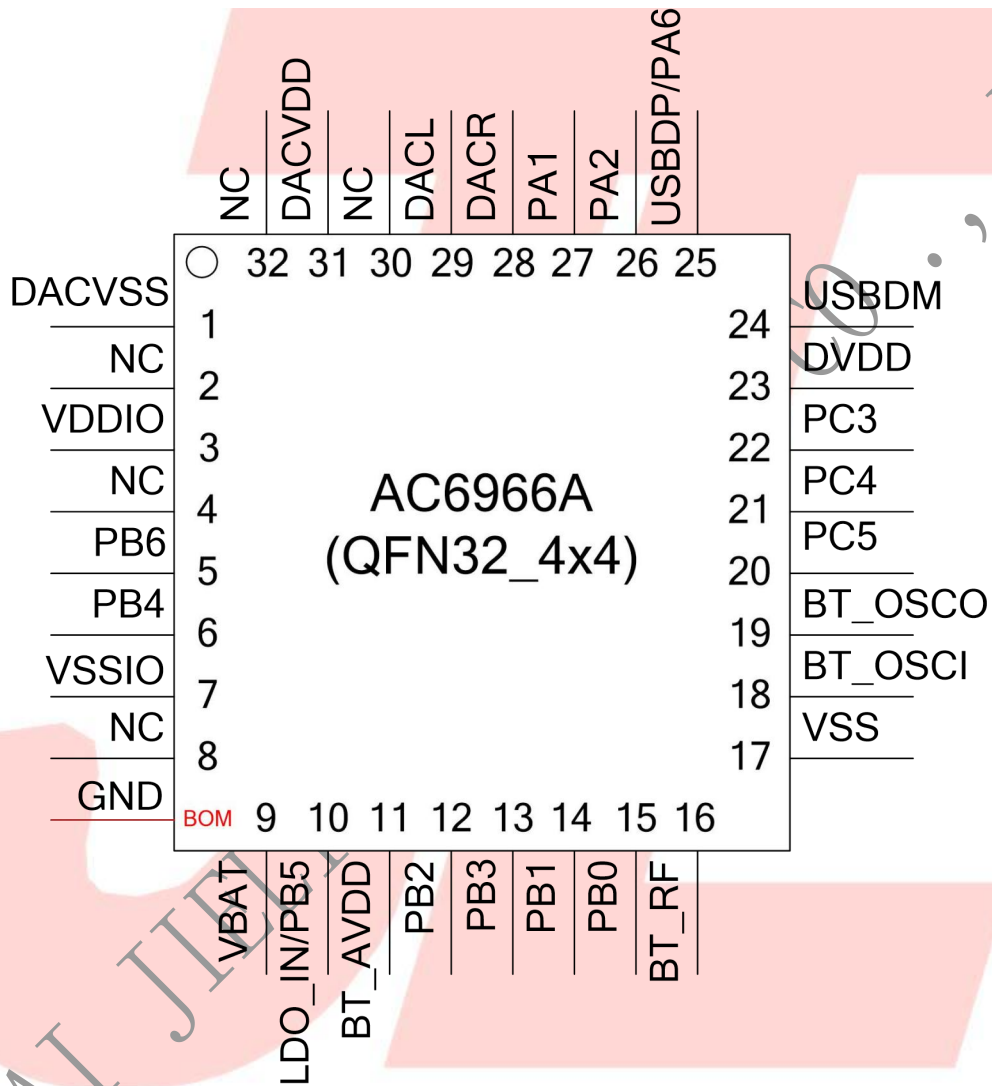


Figure 1-1 AC6966A_QFN32 Package Diagram

1.2 Pin Description

Table 1-1 AC6966A_QFN32 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	DACVSS	P	/		DAC Ground
2	NC				
3	VDDIO	P	/		IO Power 3.3v
4	NC				
5	PB6	I/O	24/8	GPIO	AMUX1L: Analog Channel 1 Left; SPI2CLKA: SPI2 Data Out(A); IIC_SCL_C: IIC SCL(C); ADC8: ADC Input Channel 8; TMR3: Timer3 Clock Input; UART1TXA: Uart1 Data Out(A);
6	PB4	I/O	24/8	GPIO	SPI0_DAT2A(2): SPI0 Data2 Out_A(2); ADC7: ADC Input Channel 7; CLKOUT1 UART2TXC: Uart2 Data Out(C); UART2RXC: Uart2 Data In(C);
7	VSSIO	P	/		Ground
8	NC				
9	VBAT	P	/		Battery Power Supply
10	LDO_IN	P	/		Battery Charger In
	PB5	I/O	8	GPIO (High Voltage Resistance)	SPI2DIA: SPI2 Data Input(A); PWM3: Timer3 PWM Output; CAP1: Timer1 Capture; UART0TXC: Uart0 Data Out(C); UART0RXC: Uart0 Data In(C);
11	BT_AVDD	P	/		BT Power
12	PB2	I/O	8	GPIO (High Voltage Resistance)	SPI1DIA: SPI1 Data In(A); CAP0: Timer0 Capture; UART2TXB: Uart2 Data Out (B);
13	PB3	I/O	24/8	GPIO	ADC6: ADC Input Channel 6; PWM2: Timer2 PWM Output; UART2RXB: Uart2 Data In(B);
14	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset; SPI1DOA: SPI1 Data Out(A); ADC5: ADC Input Channel 5;

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					TMR2: Timer2 Clock Input; UART0RXB: Uart0 Data In(B);
15	PB0	I/O	8	GPIO (High Voltage Resistance)	SPI1CLKA: SPI1 Clock(A); UART0TXB: Uart1 Data Out(B); TMR5: Timer5 Clock Input;
16	BT_RF	/	/		BT Antenna
17	VSSIO	P	/		Ground
18	BT_SOCI	I	/		BT OSC In
19	BT_SOCO	O	/		BT OSC Out
20	PC5	I/O	24/8	GPIO	SPI1DOB: SPI1 Data Out(B); IIC_SDA_B: IIC SDA(B); ADC12: ADC Input Channel 12; TMR1: Timer1 Clock Input; UART2RXD: Uart2 Data In(D);
21	PC4	I/O	24/8	GPIO	SPI0_DAT3AB(3): SPI0 Data3(AB); SPI1CLKB: SPI1 Clock(B); IIC_SCL_B: IIC SCL(B); ADC11: ADC Input Channel 11; PWM1: Timer1 PWM Output; UART2TXD: Uart2 Data Out (D);
22	PC3	I/O	24/8	GPIO	SPI0_DAT2B(2): SPI0 Data2(B); SPI1DIB: SPI1 Data In(B); CAP2: Timer2 Capture; UART0TXD: Uart0 Data Out (D); UART0RXD: Uart0 Data In(D);
23	DVDD	P	/		Core Power
24	USBDM	I/O	4	USB Negative Data (pull down)	SPI2DOB: SPI2 Data Out(B); IIC_SDA_A: IIC SDA(A); ADC14: ADC Input Channel 14; UART1RXD: Uart1 Data In(D);
25	USBDP	I/O	4	USB Positive Data (pull down)	SPI2CLKB: SPI2 Clock(B); IIC_SCL_A: IIC SCL(A); ADC13: ADC Input Channel 13; UART1TXD: Uart1 Data Output(D);
	PA6		24/8		IIC_SDA_D: IIC SDA(D); ADC4: ADC Input Channel 4; CAP4: Timer4 Capture; UART0RXA: Uart0 Data In(A);
26	PA2	I/O	24/8	GPIO	MIC_BIAS: Microphone Bias Output CAP3: Timer3 Capture;
27	PA1	I/O	24/8	GPIO	MIC: MIC Input Channel ; ADC1: ADC Input Channel 1;

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					PWM4: Timer4 PWM Output; UART1RX: Uart0 Data In(C);
28	DACR	O	/		DAC Right Channel
29	DACL	O	/		DAC Left Channel
30	NC				
31	DACVDD	P	/		DAC Power
32	NC				

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2、Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Tamb	Ambient Temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	5.5	V
V _{3.3IO}	3.3V IO Input Voltage	-0.3	VDDIO+0.3	V
LDO_IN	Charge Input Voltage	-0.3	6	V

2.2 PMU Characteristics

Table 2-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
LDO_IN	Loading current	—	—	300	mA	VBAT = 4.2V
VBAT	Voltage Input	2.2	3.7	5	V	
V _{DVDD}	Voltage output	0.9	1.2	1.25	V	VBAT = 4.2V, 30mA loading
V _{VDDIO}	Voltage output	—	3.3	—	V	VBAT = 4.2V, 100mA loading
V _{BT_AVDD}	Voltage output	—	1.3	—	V	VBAT=4.2V, 100mA loading
V _{DACVDD}	DAC Voltage	—	3.1	—	V	VBAT = 4.2V, 10mA loading

2.3 IO Input/Output Electrical Logical Characteristics

Table 2-3

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

2.4 Internal Resistor Characteristics

Table 2-4

Port	General Output	High Drive	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA1~PA6 PB1 PB4~PB7 PC0~PC5	8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、internal pull-up/pull-down resistance accuracy $\pm 20\%$
PA0,PB3	24	—	10K	10K	
PB0,PB2 PB5	8mA	—	10K	10K	
USBDP	4mA	—	1.5K	15K	
USBDM	4mA	—	180K	15K	

2.5 DAC Characteristics

Table 2-5

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	—	90	—	dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power	11	—	—	mW	32ohm loading

2.6 ADC Characteristics

Table 2-6

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range	—	80	—	dB	1KHz/-60dB
S/N	—	90	91	dB	1KHz/-60dB
THD+N	—	-70	—	dB	
Crosstalk	—	-90	—	dB	

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2.7 BT Characteristics

2.7.1 Transmitter

Basic Data Rate

Table 2-7

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			4	6	dBm	25°C, Power Supply VBAT=4.2V 2441MHz
RF Power Control Range			20		dB	
20dB Bandwidth			950		KHz	
Adjacent Channel	+2MHz		-40		dBm	
	-2MHz		-38		dBm	
Transmit Power	+3MHz		-44		dBm	
	-3MHz		-35		dBm	

Enhanced Data Rate

Table 2-8

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-1		dB	25°C, Power Supply VBAT=4.2V 2441MHz
$\pi/4$ DQPSK Modulation Accuracy	DEVM RMS		6		%	
	DEVM 99%		10		%	
	DEVM Peak		15		%	
Adjacent Channel	+2MHz		-40		dBm	
	-2MHz		-38		dBm	
Transmit Power	+3MHz		-44		dBm	
	-3MHz		-35		dBm	

2.7.2 Receiver

Basic Data Rate

Table 2-9

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25°C, Power Supply VBAT=4.2V 2441MHz
Co-channel Interference Rejection			-13		dB	
Adjacent Channel	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
Interference Rejection	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

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Enhanced Data Rate**Table 2-10**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25°C, Power Supply VBAT=4.2V 2441MHz
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

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3、 Package Information

3.1 QFN32(4mm*4mm)

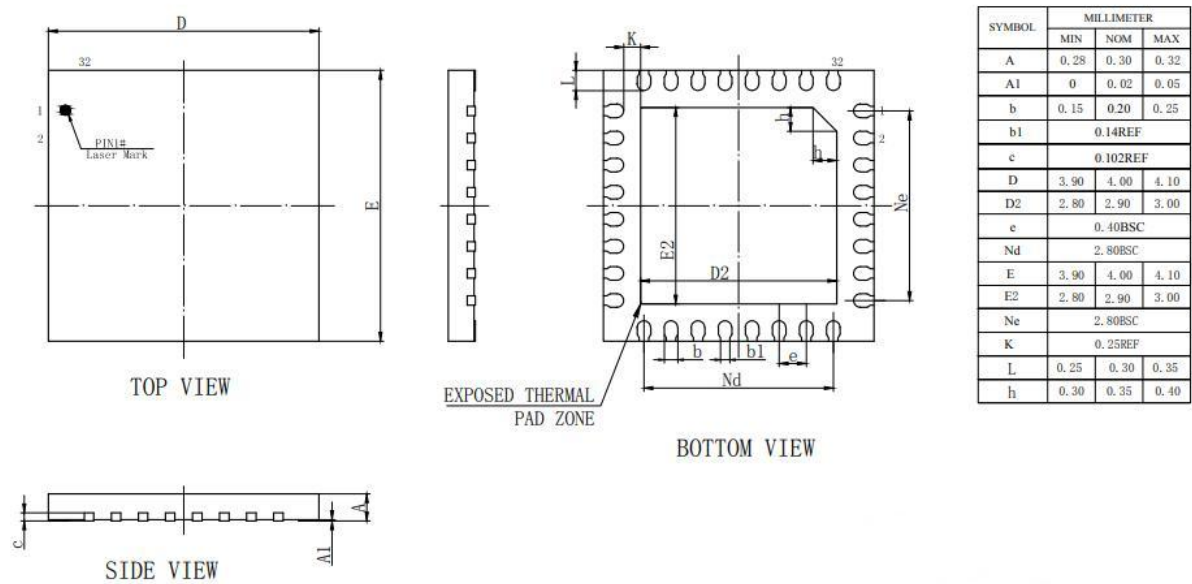


Figure 3-1. AC6966A_QFN32 Package

3、Revision History

Date	Revision	Description
2020.03.14	V1.0	Initial Release
2026.07.14	V1.1	Update Bluetooth Vision and profiles Update PMU Characteristic Update Temperature Characteristics
2026.08.04	V1.2	Update Bluetooth DN and PMU Characteristics

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