AC6969A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version：V1.5

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ZHUHAI JIELI TECHNOLOGY CO.,LTD

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AC6969A Features

CPU

- 32-bit DSP supports hardware Float Point Unit (FPU)
- Up to 160MHz 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)
- One analog MIC Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- 10-band EQ configuration for voice Effects

Audio Codec

- Two channels 16-bit DAC, SNR >= 95dB
- One 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
- Two channels Mono 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 paket 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
- Six multi-function 32-bit timers, support capture and PWM mode
- Three full-duplex basic UART, UART0 and UART1 supports DMA mode
- One hardware IIC interface supports host and device mode
- 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs

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 5.5V
- VDDIO is 2.2V to 3.6V

Packages

- SOP16

Temperature

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

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Applications

- Bluetooth TWS Earphone

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1、Pin Definition

1.1 Pin Assignment

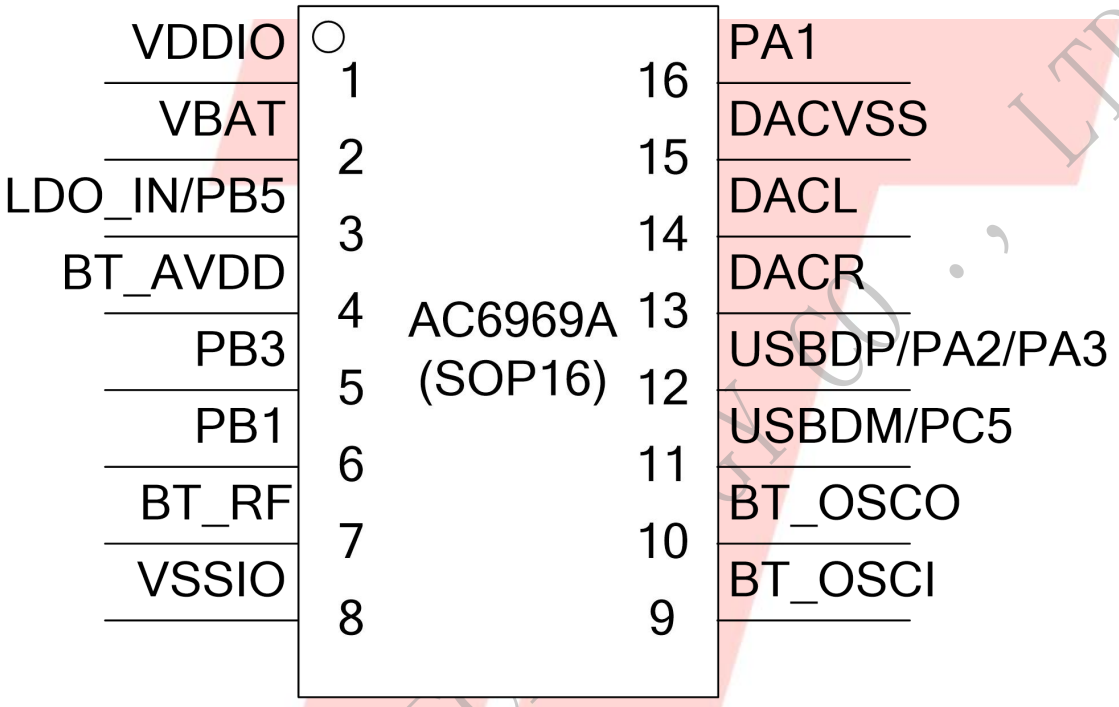


Figure 1-1 AC6969A_SOP16 Package Diagram

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1.2 Pin Description

Table 1-1 AC6969A_SOP16 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	VDDIO	P	/		IO Power 3.3v
2	VBAT	P	/		Battery Power Supply
3	LDO_IN	P	/		Battery Charger In
	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);
4	BT_AVDD	P	/		BT Power
5	PB3	I/O	24	GPIO	ADC6：ADC Input Channel 6; PWM2：Timer2 PWM Output； UART2RXB：Uart2 Data In(B);
6	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset； ADC5：ADC Input Channel 5; TMR2：Timer2 Clock Input; UART0RXB：Uart0 Data In(B);
7	BT_RF	/	/		BT Antenna
8	VSSIO	P	/		Ground
9	BT_SOCI	I	/		BT OSC In
10	BT_SOCO	O	/		BT OSC Out
11	USBDM	I/O	4	USB Negative Data (pull down)	IIC_SDA_A：IIC SDA(A); ADC14：ADC Input Channel 14; UART1RXD：Uart1 Data In(D);
	PC5	I/O	24/8	GPIO	IIC_SDA_B：IIC SDA(B); ADC12：ADC Input Channel 12; TMR1：Timer1 Clock Input; UART2RXD：Uart2 Data In(D);
12	USBDP	I/O	4	USB Positive Data (pull down)	IIC_SCL_A：IIC SCL(A); ADC13：ADC Input Channel 13; UART1TXD：Uart1 Data Output(D)；
	PA3	I/O	24/8		UART1_CTS：Uart1 Clear to send； ADC2：ADC Input Channel 2; PWM5：Timer5 PWM Output； UART2TXA：Uart1 Data Output(D)；
	PA2	I/O	24/8	GPIO	MIC_BIAS：Microphone Bias Output

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					CAP3：Timer3 Capture;
13	DACR	O	/		DAC Right Channel
14	DACL	O	/		DAC Left Channel
15	DACVSS	P	/		DAC Ground
16	PA1	I/O	24/8	GPIO	MIC：MIC Input Channel ; ADC1：ADC Input Channel 1; PWM4：Timer4 PWM Output; UART1RXC：Uart0 Data In(C);

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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	℃
Tstg	Storage temperature	-65	+150	℃
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	5.5	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	5.5	V	
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

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

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2.4 Internal Resistor Characteristics

Table 2-4

Port	General Output	High Drive	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA1~PA3 PB1 PC5	8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、internal pull-up/pull-down resistance | accuracy ±20%
PB3	24mA	_	10K	10K	
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		95		dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power		20	_	mW	32ohm loading

2.6 ADC Characteristics

Table 2-6

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range		90		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	

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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℃, Power Supply VBAT=4.2V 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 2-8**

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-1		dB	25℃, Power Supply VBAT=4.2V 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	

2.7.2 Receiver

Basic Data Rate **Table 2-9**

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25℃, 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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Enhanced Data Rate **Table 2-10**

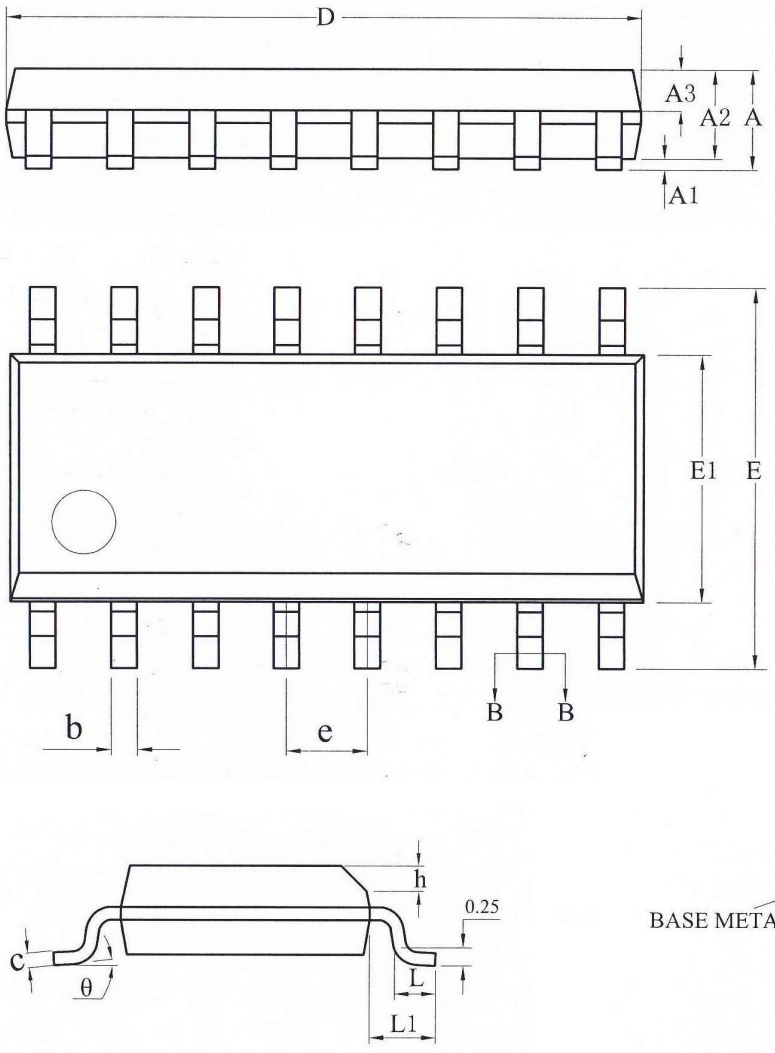
Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25℃, Power Supply VBAT=4.2V 2441MHz
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

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3、 Package Information

3.1 SOP16



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

Figure 3-1. AC6969A_SOP16 Package

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3、Revision History

Date	Revision	Description
2020.03.14	V1.0	Initial Release
2021.11.22	V1.1	Update Bluetooth Vision and profiles，Update Audio characters
2023.12.11	V1.2	Update Bluetooth Vision and profiles
2025.01.09	V1.3	Update Bluetooth Vision and profiles
2026.03.21	V1.4	Update PMU Characteristics
2026.04.03	V1.5	Update Pin Description and PMU Characteristics

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