

# **AC6969D Datasheet**

**Zhuhai Jieli Technology Co.,LTD**

**Version: V1.0**

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# AC6969D 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)
- Single/Dual MIC Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- 10-band EQ configuration for voice Effects

## Audio Codec

- One channel 16-bit DAC, SNR >= 95dB
- One channel 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
- One channel analog MUX
- Supports cap-less, single-ended, and differential mode at the DAC path
- Supports 16ohm and 32ohm Speaker loading

## Bluetooth

- Compliant with Bluetooth V5.1+BR+EDR+BLE specification

- Meet class1 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\smp\att\gap\gatt\rfcomm\sdp\l2cap profile ●

## 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: -20°C to +70°C
- Storage temperature: -65°C to +150°C

## Applications

- Bluetooth speaker

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# 1、 Pin Definition

## 1.1 Pin Assignment

LDO_IN/PB5	○			16	DAACL
VBAT	1			15	VCOM
VDDIO	2			14	VSSIO
PB1	3			13	PA1/PA0
FMIP	4	AC6969D		12	USBDP/PA4
BT_RF	5	(SOP16)		11	USBDM/PC3
BT_OSCI	6			10	PC4
BT_OSCO	7			9	PC5
	8				

Figure 1-1 AC6969D Package Diagram

## 1.2 Pin Description

Table 1-1 AC6969D Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	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);
2	VBAT	P	/		Battery Power Supply
3	VDDIO	P	/		IO Power 3.3v
4	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);
5	FMIP	I	/		FM Antenna
6	BT_RF	/	/		BT Antenna
7	BT_SOCI	I	/		BT OSC In
8	BT_SOCO	O	/		BT OSC Out
9	PC5	I/O	24/8	GPIO	SD0CLKA: SD0 Clock(A); 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);
10	PC4	I/O	24/8	GPIO	SD0CMDA: SD0 Command(A); 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);
11	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);
	PC3	I/O	24/8	GPIO	SD0DAT0A: SD0 Data0(A); SPI0_DAT2B(2): SPI0 Data2(B); SPI1DIB: SPI1 Data In(B);

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					CAP2: Timer2 Capture; UART0TXD: Uart0 Data Out (D); UART0RXD: Uart0 Data In(D);
12	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);
	PA4	I/O	24/8	GPIO	SD0CMDC: SD0 Command(C) AMUX0R: Analog Channel0 Right; UART1_RTS: Uart1 Request to send; ADC3: ADC Input Channel 3; TMR4: Timer4 Clock Input; UART2RXA: Uart2 Data In(A);
13	PA1	I/O	24/8	GPIO	MIC: MIC Input Channel ; ADC1: ADC Input Channel 1; PWM4: Timer4 PWM Output; UART1RXC: Uart0 Data In(C);
	PA0	I/O	/	GPIO	SDPG: SD Power Supply ADC0: ADC Input Channel 0; CLKOUT0 UART1TXC: Uart1 Data Output(C);
14	VSSIO	P	/		Ground
15	VCOM	/	/		
16	DACL	O	/		DAC Left Channel

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## 2、Electrical Characteristics

### 2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Tamb	Ambient Temperature	-20	+70	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	2.2	5.5	V
V <sub>3.3IO</sub>	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 <sub>DVDD</sub>	Voltage output	0.9	1.2	1.25	V	VBAT = 4.2V, 30mA loading
V <sub>VDDIO</sub>	Voltage output	—	3.3	—	V	VBAT = 4.2V, 100mA loading
V <sub>BT_AVDD</sub>	Voltage output	—	1.3	—	V	VBAT=4.2V, 100mA loading

### 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 <sub>Charge</sub>	Charge Voltage	4.15	4.2	4.25	V	—
I <sub>Charge</sub>	Charge Current	20	—	300	mA	Charge current at fast charge mode
I <sub>Trickl</sub>	Trickle Charge Current	20	45	70	mA	V <sub>BAT</sub> < V <sub>Trickl</sub>

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## 2.4 IO Input/Output Electrical Logical Characteristics

Table 2-4

IO input characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V <sub>IL</sub>	Low-Level Input Voltage	-0.3	–	0.3* VDDIO	V	VDDIO = 3.3V
V <sub>IH</sub>	High-Level Input Voltage	0.7* VDDIO	–	VDDIO+0.3	V	VDDIO = 3.3V
IO output characteristics						
V <sub>OL</sub>	Low-Level Output Voltage	–	–	0.33	V	VDDIO = 3.3V
V <sub>OH</sub>	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
PA1,PA4 PC3~PC5 PB1	8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、internal pull-up/pull-down resistance   accuracy ±20%
PA0	Output 0	8mA	10K	10K	
	Output 1	8mA	10K	10K	
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	–	V <sub>rms</sub>	
Dynamic Range	–	90	–	dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power	11	–	–	mW	32ohm loading

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## 2.7 ADC Characteristics

Table 2-7

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	

## 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°C, Power Supply VBAT=5V 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 2-9

Parameter	Min	Typ	Max	Unit	Test Conditions
Relative Power		-1		dB	25°C, Power Supply VBAT=5V 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	

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## 2.8.2 Receiver

### Basic Data Rate

Table 2-10

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25°C, Power Supply VBAT=5V 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	

### Enhanced Data Rate

Table 2-11

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25°C, Power Supply VBAT=5V 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	

## 2.9 FM Receiver Characteristics

Table 2-12

Parameter	Min	Typ	Max	Unit	Test Conditions
Input Frequency	76		108	MHz	
Usable Sensitivity	3	4	8	dB $\mu$ V EMF	(S+N)/N=26dB
Adjacent Channel Selectivity		48		dB	$\pm$ 200kHz
IIP3		88		dB $\mu$ V EMF	$\Delta$ f1=200 kHz, $\Delta$ f2=400 kHz
Audio Output Voltage	0		3	V	Empty Load
Audio Frequency Response	20		20k	Hz	DacTest
Audio (S+N)/N		58		dB	
Stereo Separation		40		dB	
Audio Total Harmonic Distortion (THD)		0.4		%	

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### 3、 Package Information

#### 3.1 SOP16

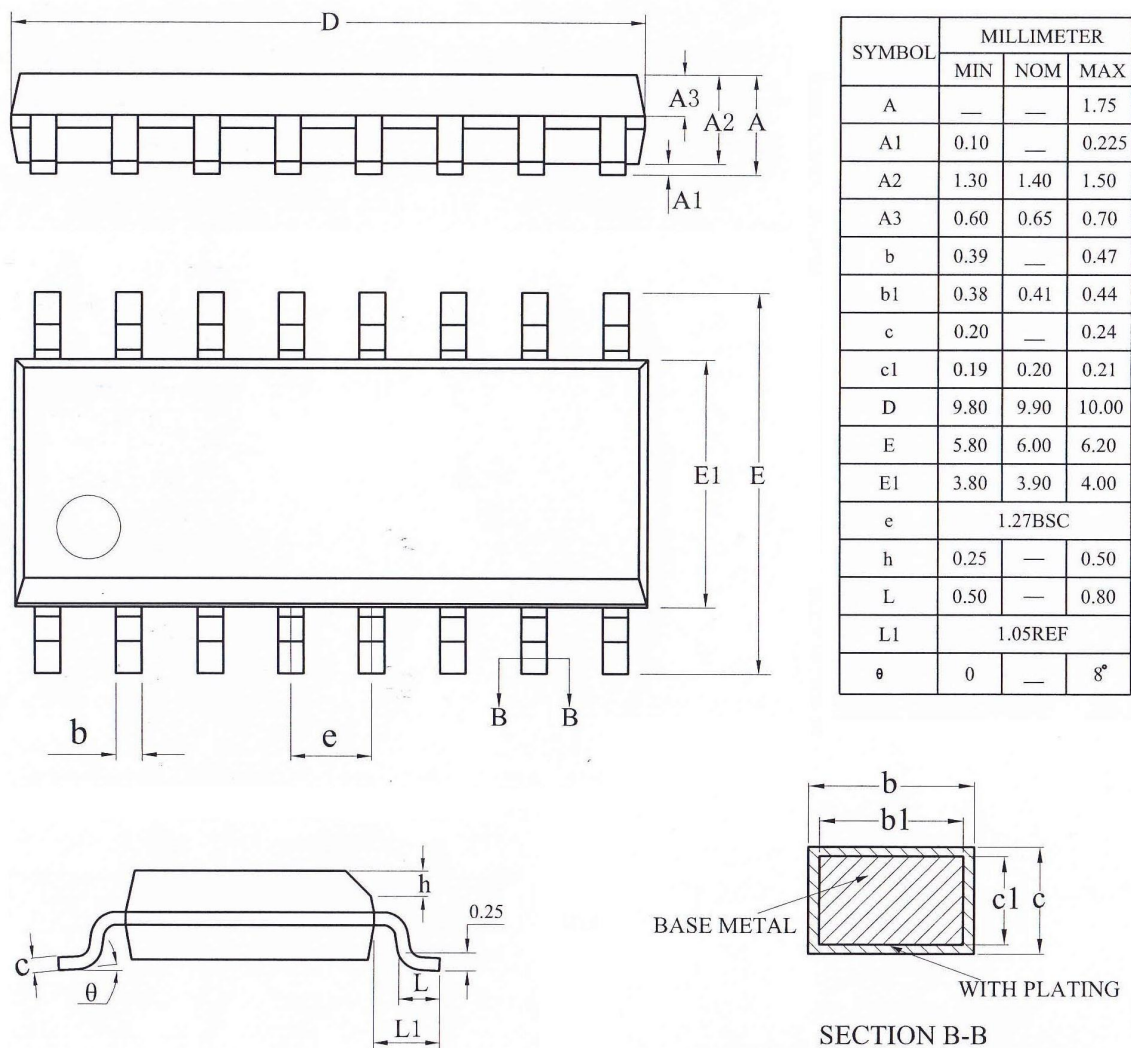


Figure 3-1. AC6969D\_SOP16 Package

### 3、 Revision History

Date	Revision	Description
2020.06.01	V1.0	Initial Release

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