AC6953A Datasheet

Zhuhai Jieli Technology Co.,LTD

Version：1.2

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AC6953A 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

- Two 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 V5.1+BR+EDR+BLE specification
- Storage temperature: -65℃ to +150℃
- Meet class1 class2 and class3 transmitting power requirement
- Support GFSK and π/4 DQPSK all paket 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
- 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
- One hardware IIC interface supports host and device mode
- Built-in Cap Sense Key controller
- 5 channels 10-bit ADC for analog sampling
- External wake up/interrupt on all GPIOs

PMU

- Low voltage LDO for internal digital and analog circuit supply
- 1uA 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
- RTCVDD is 2.2V to 3.6V

Packages

- QFN20(3mm*3mm)

Temperature

- Operating temperature: -20℃ to +70℃

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Applications

- Bluetooth Stereo headset
- Bluetooth Mono headset
- Bluetooth TWS headset

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1、Pin Definition

1.1 Pin Assignment

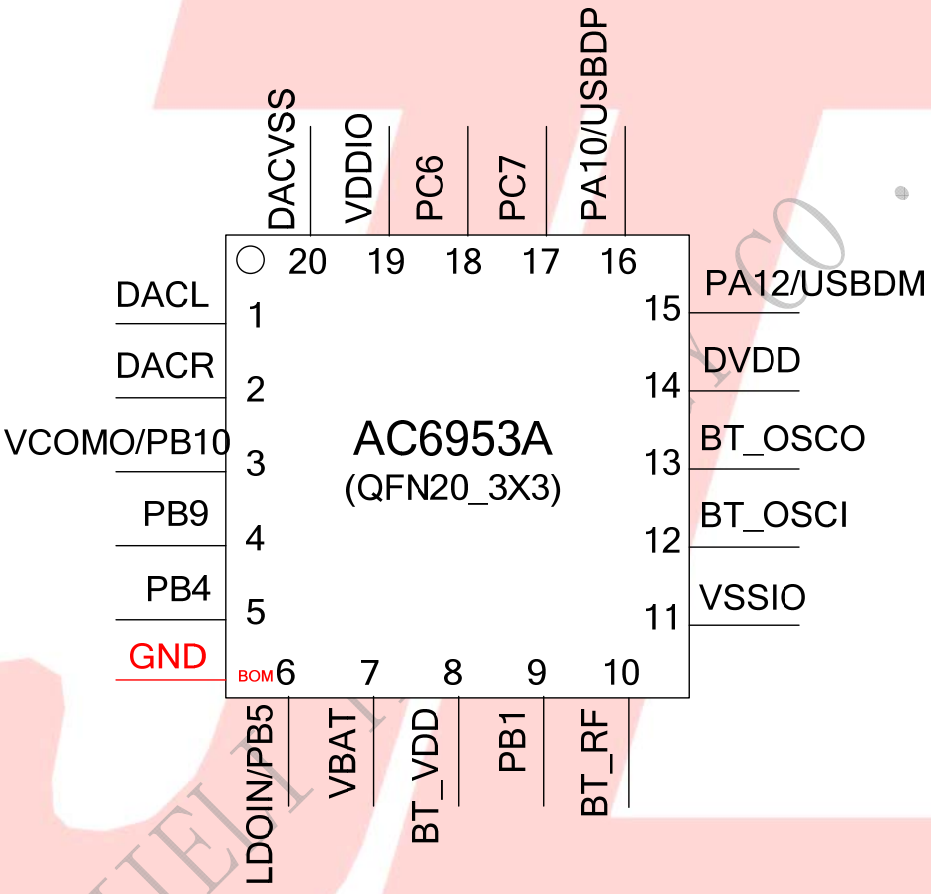


Figure 1-1 AC6953A_QFN20_3x3 Package Diagram

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1.2 Pin Description

Table 1-1 AC6953A_QFN20_3x3 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	DACL	O	/		DAC Left Channel
2	DACR	O	/		DAC Right Channel
3	VCOMO	/	/		DAC Reference Output
	PB10	I/O	24/8	GPIO	AMUX2R：Analog Channel2 Right; ADC9：ADC Input Channel 9; UART2RXC：Uart2 Data In(C); PWMCH3L：Motor PWM Channel3(L);
4	PB9	I/O	24/8	GPIO	AMUX2L：Analog Channel2 Left; CAP0：Timer0 Capture; UART2TXC：Uart2 Data Out(C); PWMCH3H：Motor PWM Channel3(H);
5	PB4	I/O	24/8	GPIO	IIC_SCL_C：IIC SCL(C); ADC7：ADC Input Channel 7; UART0TXB：Uart0 Data Out(B); LVD：Low Voltage Detect Input; PWMCH2H：Motor PWM Channel2 (H);
6	LDO_IN	P	/	Charge Power 5v	
	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);
7	VBAT	P	/	LDO Power	
8	BT_AVDD	P	/	BT Power 1.3v	
9	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset; ADC5：ADC Input Channel 5; TMR2：Timer2 Clock Input; UART1RXA：Uart1 Data In(A);
10	BT_RF	/	/		
11	VSSIO	P	/	Ground	
12	BT_OSCI	I	/	OSC In	
13	BT_OSCO	O	/	OSC Out	

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14	DVDD	P	/	Core Power	
15	USBDM	I/O	4	USB Negative Data (pull down)	UART1RXD：Uart1 Data In(D); IIC_SDA_A：IIC SDA(A);
	PA12	I/O	24/8	GPIO	PWM1：Timer1 PWM Output; ADC4：ADC Input Channel 4; UART0RXD：Uart0 Data In(D);
16	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;
	PA10	I/O	24/8	GPIO	ADC3：ADC Input Channel 3; TMR1：Timer1 Clock Input; Touch9：Touch Input Channel 9; UART2RXB：Uart2 Data In(B); PWMCH4L：Motor PWM Channel4(L)；
17	PC7	I/O	/	GPIO	MIC_BIAS：Microphone Bias Output
18	PC6	I/O	24/8	GPIO	MIC：MIC Input Channel; ADC11：ADC Input Channel 11;
19	VDDIO	P	/		IO Power 3.3v
20	DACVSS	P	/		DAC Ground

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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
LDO_IN	Charger Voltage	4.5	5.5	V
$V_{3.3IO}$	3.3V IO Input Voltage	-0.3	VDDIO+0.3	V

2.2 PMU Characteristics

Table 2-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.2	3.7	5.5	V	
LDO_IN	Charger Voltage	4.5	5.0	5.5	V	
$V_{3.3}$	Voltage output	_	3.3	_	V	VBAT = 5V, 100mA loading
V_{BT_AVDD}	Voltage output		1.3		V	VBAT=5V, 100mA loading
$I_{L3.3}$	Loading current	_	_	150	mA	VBAT = 5V

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	_
I_{Charge}	Charge Current	20		320	mA	Charge current at fast charge mode
I_{Trikl}	Trickle Charge Current	20	45	70	mA	$V_{BAT}<V_{Trikl}$

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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_{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**
PB1~PB10 PC4 PC6 PA10 PA12	8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、internal pull-up/pull-down resistance | accuracy ±20%
PC7			10K	10K	
PB5			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	_	-80	_	dB	
Output Swing		1		Vrms	
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	_	-80	_	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=5V 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=5V 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	

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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=5V 2441MHz
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

Enhanced Data Rate **Table 2-11**

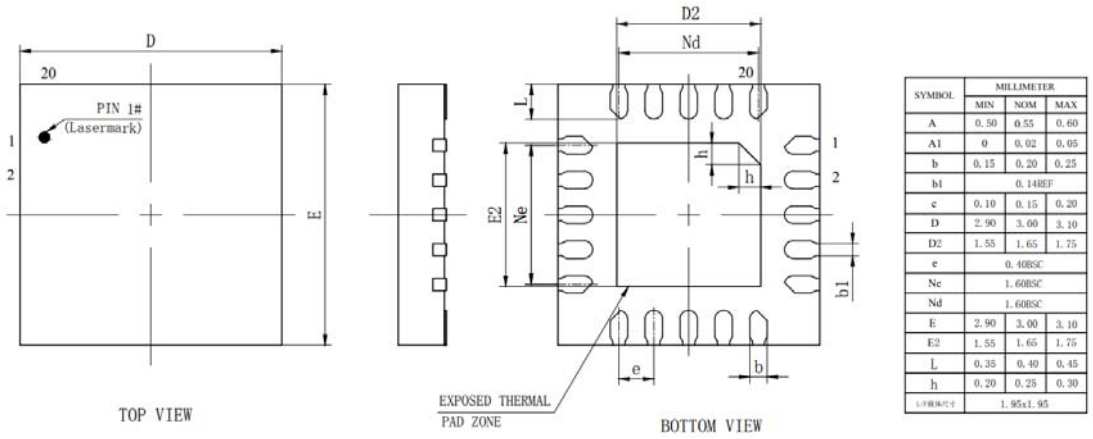
Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	25℃, Power Supply VBAT=5V 2441MHz
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

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3、 Package Information

3.1 QFN20_3x3



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0	0.02	0.05
b	0.15	0.20	0.25
b1		0.14REF	
c	0.10	0.15	0.20
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
上/下防水尺寸		1.95x1.95	

Figure 3-1 AC6953A_QFN20_3x3 Package

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4、Revision History

Date	Revision	Description
2019.11.28	V1.0	Initial Release
2020.01.03	V1.1	Updata MCU packaging and Featrues
2020.02.28	V1.2	Updata Pin Assignment

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