AC6969D Datasheet

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AC6969D 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
- 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 π/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℃ to +70℃
- Storage temperature: -65℃ to +150℃

Applications
- Bluetooth speaker

1、 Pin Definition

1.1 Pin Assignment

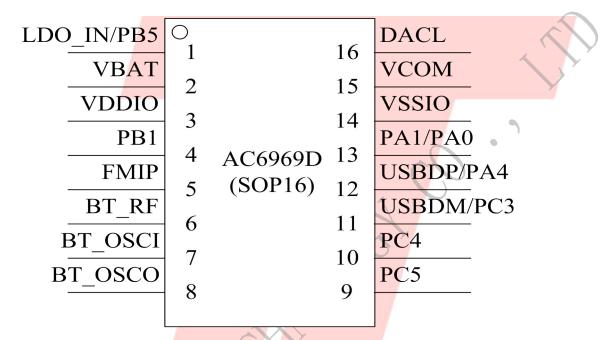| Left Pin	#		#	Right Pin
LDO_IN/PB5	1		16	DACL
VBAT	2		15	VCOM
VDDIO	3	AC6969D	14	VSSIO
PB1	4	(SOP16)	13	PA1/PA0
FMIP	5		12	USBDP/PA4
BT_RF	6		11	USBDM/PC3
BT_OSCI	7		10	PC4
BT_OSCO	8		9	PC5

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

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
$V_{3.3IO}$	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_{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

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		300	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**
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	24mA	10K	10K	
	Output 1	8mA	64mA	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	
THD+N	_	-75	_	dB	1KHz/0dB
S/N	_	95	_	dB	10Kohm loading
Crosstalk	_	-90	_	dB	With A-Weighted Filter
Output Swing		1		Vrms	
Dynamic Range		90		dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power	11		_	mW	32ohm loading

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	
THD+N	_	-70	_	dB	1KHz/-60dB
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=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	

2.8.2   Receiver

Basic Data Rate   Table 2-10

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

Enhanced Data Rate   Table 2-11

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

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	dBμV EMF	(S+N)/N=26dB
Adjacent Channel Selectivity		48		dB	± 200kHz
IIP3		88		dbμV EMF	Δf1=200 kHz,Δf2=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		%	

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. AC6969D_SOP16 Package

3、Revision History

Date	Revision	Description
2020.06.01	V1.0	Initial Release