AC6969T Datasheet

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Version：V1.2

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AC6969T 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 codec 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 analog Environmental Noise Cancellation (ENC)
- Multi-band DRC limiter
- 10-band EQ configuration for voice Effects

Audio Codec

- One 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 channel analog MUX
- Supports cap-less, single-ended 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 +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
- 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 SPI interface supports host and device mode
- One SD Card Host controller
- 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
- IOVDD is 2.2V to 3.6V

Packages

- SOP16

Temperature

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

Applications

- Bluetooth speaker

1、Pin Definition

1.1 Pin Assignment

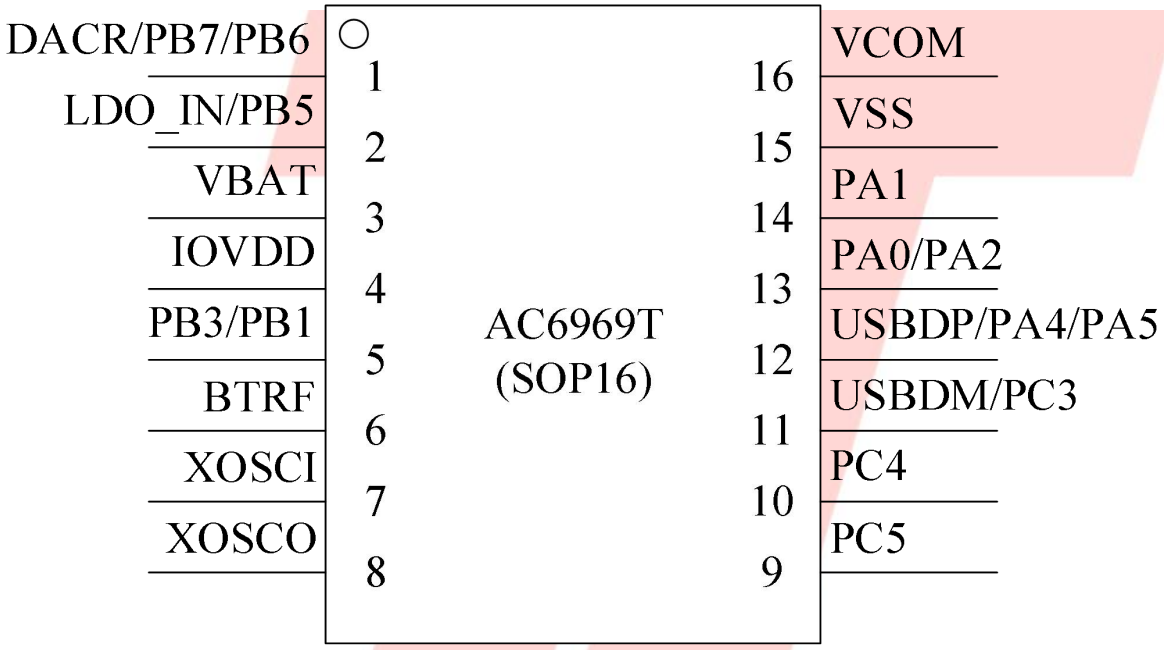


Figure 1-1 AC6969T_SOP16 Package Diagram

1.2 Pin Description

Table 1-1 AC6969T_SOP16 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	DACR	O	/		DAC Right Channel
	PB7	I/O	24/8	GPIO	AMUX1R：Analog Channel1Right; IIC_SDA_C：IIC DAT(C); ADC9：ADC Input Channel 9; PWM5：Timer5 PWM Output； UART1RXA：Uart1 Data In(A);
	PB6	I/O	24/8	GPIO	AMUX1L：Analog Channel1 Left; IIC_SCL_C：IIC SCL(C); ADC8：ADC Input Channel 8; TMR3：Timer3 Clock Input; UART1TXA：Uart1 Data Out(A);
2	LDO_IN	P	/		Battery Charger Power In
	PB5	I/O	/	GPIO (High Voltage Resistance)	PWM3：Timer3 PWM Output; CAP1：Timer1 Capture; UART0TXC：Uart0 Data Out(C); UART0RXC：Uart0 Data In(C);
3	VBAT	P	/		Power Supply
4	IOVDD	P	/		IO Power 3.3v
5	PB3	I/O	24/8	GPIO	PWM2：Timer2 PWM Output; ADC6：ADC Input Channel 6;
	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset； ADC5：ADC Input Channel 5; TMR2：Timer2 Clock Input;
6	BT_RF	/	/		BT Antenna
7	BT_OSCI	I	/		BT OSC In
8	BT_OSCO	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); 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)	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); SPI1DIB：SPI1 Data In(B); CAP2：Timer2 Capture; UART0TXD：Uart0 Data Out (D)； UART0RXD：Uart0 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)；
	PA5	I/O	24/8	GPIO	PWM0：Timer0 PWM Output；
	PA4	I/O	24/8	GPIO	AMUX0R：Analog Channel0 Right; ADC3：ADC Input Channel 3; TMR4：Timer4 Clock Input;
13	PA2	I/O	24/8	GPIO	MIC_BIAS：Microphone Bias Output CAP3：Timer3 Capture;
	PA0	I/O	/	GPIO	SDPG：SD Power Supply ADC0：ADC Input Channel 0; CLKOUT0 UART1TXC：Uart1 Data Output(C)；
14	PA1	I/O	24/8	GPIO	MIC：MIC Input Channel ; ADC1：ADC Input Channel 1; PWM4：Timer4 PWM Output； UART1RXC：Uart1 Data In(C);
15	VSS	P	/		Ground
16	VCOM	/	/		DAC Reference Output

2、Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Tamb	Operating Temperature	-40	+85	℃
Tstg	Storage temperature	-65	+150	℃
VBAT	Supply Voltage	-0.3	5.5	V
LDO_IN	Charger Voltage	-0.3	5.5	V
$V_{3.3IO}$	3.3V IO Input Voltage	-0.3	IOVDD+0.3	V

Note : The chip can be damaged by any stress in excess of the absolute maximum ratings listed below

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	VBAT = 4.2V
LDO_IN	Charger Voltage	-	-	300	mA	
$V_{3.3IO}$	Voltage output		3.3		V	VBAT = 4.2V, 100mA loading

2.3 Battery Charge

Table 2-3

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
LDO_IN	Voltage Input	4.5	5	5.5	V	-
V_{Charge}	Charger 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	VBAT<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* IOVDD	V	IOVDD = 3.3V
V_{IH}	High-Level Input Voltage	0.7* IOVDD	_	IOVDD+0.3	V	IOVDD = 3.3V
IO output characteristics						
V_{OL}	Low-Level Output Voltage	_	_	0.33	V	IOVDD = 3.3V
V_{OH}	High-Level Output Voltage	2.7	_	_	V	IOVDD = 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, PA5 PB1, PB3, PB5~PB7 PC3~PC5		8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、PB5 can pull-up resistance to 5V 4、internal pull-up/pull-down resistance | accuracy ±20%
PB3 PA0	Output0	8mA	24mA	10K	10K	
	Output1	8mA	64mA			
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	
Output Swing		1		Vrms	
Dynamic Range		95		dB	1KHz/-60dB 10Kohm loading With A-Weighted Filter
DAC Output Power		20	_	mW	32ohm loading

2.7 ADC Characteristics

Table 2-7

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range		80		dB	Fsample=44.1kHz Fin=1KHz 2mVpp Input
S/N	_	90	91	dB	Fsample=44.1kHz
THD+N	_	-70	_	dB	Fin=1KHz 1.2Vpp Input

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=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 2-9**

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	

2.8.2 Receiver

Basic Data Rate **Table 2-10**

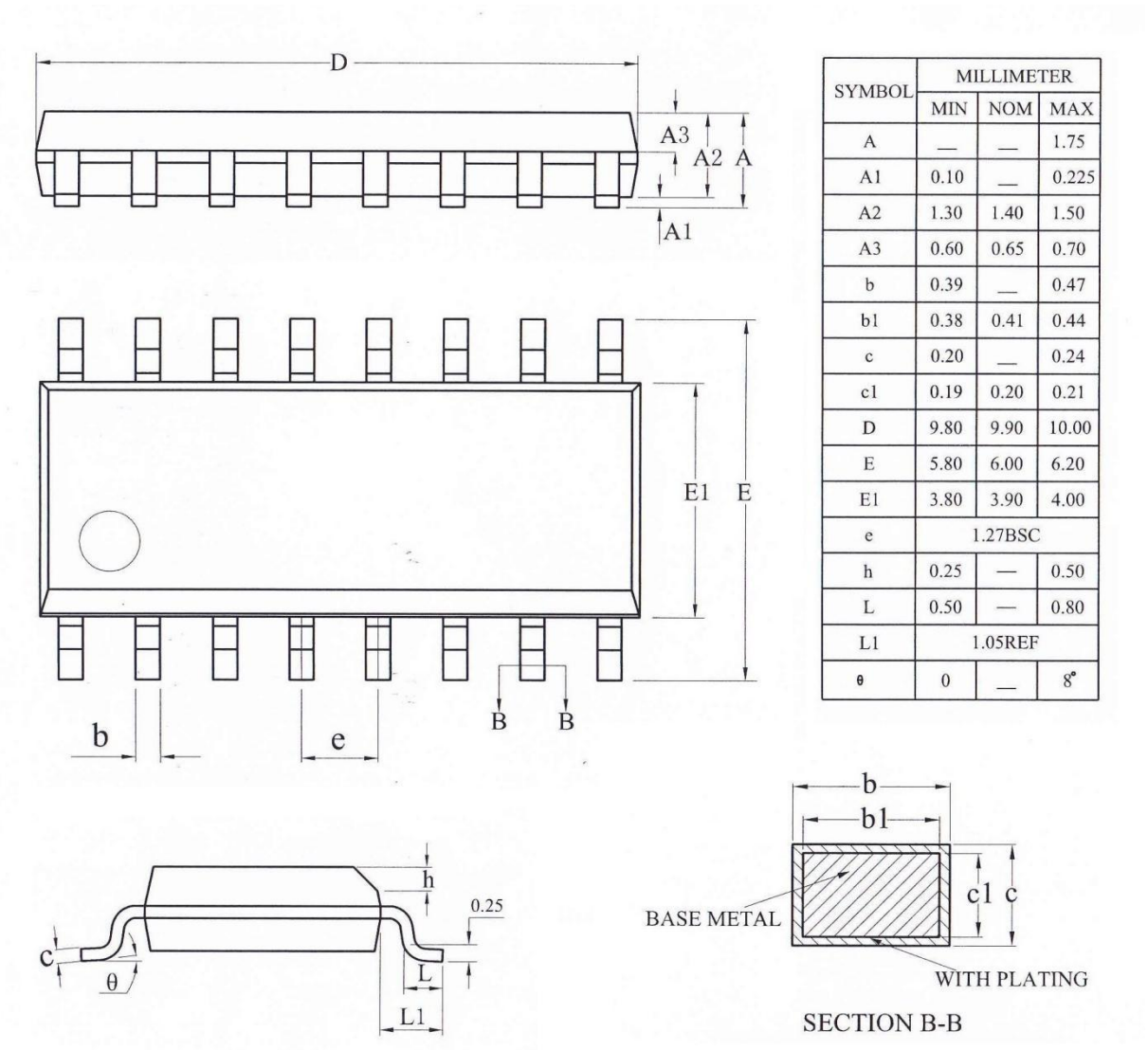
Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-90		dBm	25℃, Power Supply VBAT=4.2V 2441MHz
Co-channel Interference Rejection			-13		dB	
Adjacent Channel Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

Enhanced Data Rate **Table 2-11**

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	

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. AC6969T_SOP16 Package

4、Revision History

Date	Revision	Description
2025.12.15	V1.0	Initial Release
2026.03.21	V1.1	Update PMU Characteristics
2026.04.03	V1.2	Update Pin Description and PMU Characteristics