

AC6951B Datasheet

Zhuhai Jieli Technology Co.,LTD

Version: V1.1

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AC6951B 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

- Four 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
- 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\sdpl2cap profile

Peripherals

- One full speed USB 2.0 OTG controller
 - Two PCM/IIS for external digital Audio code, supports host and device mode
 - 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
 - Three SPI interface supports host and device mode
 - Two SD Card Host controller
 - One hardware IIC interface supports host and device mode
 - Four SPDIF receiving interface without analog amplify
 - Supports HDMI ARC (Audio Return Channel) receiving
 - Segment LCD panels
 - Digital matrix LED panels
 - Built-in Cap Sense Key controller
 - 13 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
 - 3uA current consumption in the soft-off mode
 - Built-in LDO for the core, I/O, Bluetooth and flash

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- Built-in Li-Ion battery charger with up to 200mA charger current capability
- VBAT is 2.2V to 5.5V
- VDDIO is 2.2V to 3.6V
- RTCVDD is 2.2V to 3.6V

Packages

- LQFP48(7mm*7mm)

Temperature

- Operating temperature: -40°C to +85°C
- Storage temperature: -65°C to +150°C

Applications

- Bluetooth Stereo speaker
- Bluetooth soundbar
- Bluetooth car speaker
- Bluetooth TWS speaker
- Bluetooth alarm clock speaker
- Bluetooth Rod speaker

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1、 Pin Definition

1.1 Pin Assignment

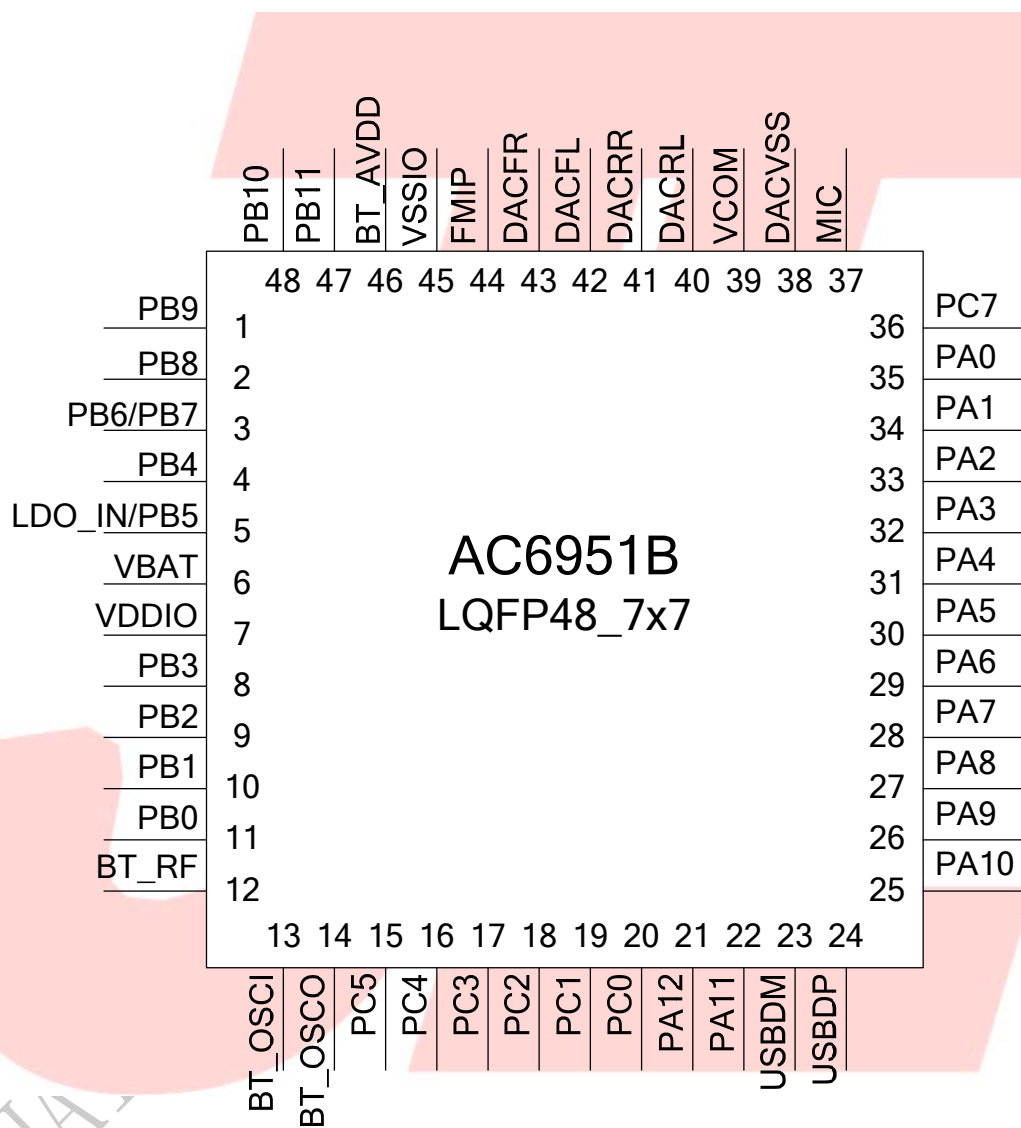


Figure 1-1 AC6951B_LQFP48 Package Diagram

1.2 Pin Description

Table 1-1 AC6951B_LQFP48 Pin Description

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	PB9	I/O	24/8	GPIO	AMUX2L: Analog Channel2 Left; SD0CLKB: SD0 Clock(B); SPI2CLKA: SPI2 Clk(A); SD1DAT2B: SD1 Data2(B); CAP0: Timer0 Capture; UART2TXC: Uart2 Data Out(C); PWMCH3H: Motor PWM Channel3(H);
2	PB8	I/O	24/8	GPIO	AMUX1R: Analog Channel1 Right; SD0DAT0B: SD0 Data0(B); SPI2_DIA: SPI2 Data In(A); SD1DAT1B: SD1 Data1(B); ADC8: ADC Input Channel 8; CLKOUT1: Clk Out1;
3	PB7	I/O	24/8	GPIO	AMUX1L: Analog Channel1 Left;
	PB6	I/O	24/8	GPIO	SD1CLKB: SD1 Clock(B); SD0DAT1B: SD0 Data1(B); IIC_SDA_C: IIC SDA(C); TMR3: Timer3 Clock Input; UART0RXB: Uart0 Data In(B); PWMCH2L: Motor PWM Channel2 (L);
4	PB4	I/O	24/8	GPIO	SD1DAT0B: SD1 Data0(B); SD0DAT3B: SD0 Data3(B); 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);
5	PB5	I/O	/	GPIO (High Voltage Resistance)	SD1CMDB: SD1 Command(B); SD0DAT2B: SD1 Data2(B); PWM3: Timer3 PWM Output; CAP1: Timer1 Capture; UART0TXC: Uart0 Data Out(C); UART0RXC: Uart0 Data In(C);
	LDO_IN	P	/		Battery Charger Power In
6	VBAT	P	/		Power Supply

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7	VDDIO	P	/		IO Power 3.3v
8	PB3	I/O	24/8	GPIO	PWM2: Timer2 PWM Output; ADC6: ADC Input Channel 6;
9	PB2	I/O	/	GPIO (High Voltage Resistance)	SPI1DIA: SPI1 Data In(A); PWMCH1L: Motor PWM Channel1 (L);
10	PB1	I/O	24/8	GPIO (pull up)	Long Press Reset; SPI1DOA: SPI1 Data Out(A); ADC5: ADC Input Channel 5; TMR2: Timer2 Clock Input; UART1RXA: Uart1 Data In(A); SPDIF_IN_D: Sony/Philips Digital Interface Input(D)
11	PB0	I/O	/	GPIO (High Voltage Resistance)	SPI1CLKA: SPI1 Clock(A); ALNK1_MCLK: ALNK1 Master Clock; SPDIF_IN_C: Sony/Philips Digital Interface Input(C) UART1TXA: Uart1 Data Out(A); PWMCH1H: Motor PWM Channel1(H);
12	BT_RF	/	/		BT Antenna
13	BT_OSCI	I	/		BT OSC In
14	BT_OSCO	O	/		BT OSC Out
15	PC5	I/O	24/8	GPIO	SD1CLKA: SD1 Clock(A); SPI1DOB: SPI1 Data Out(B); UART2RXD: Uart2 Data In(D); IIC_SDA_B: IIC SDA(B); ALNK1_DAT3: Audio Link Data3; ADC13: ADC Input Channel 13; COM0: LCD COM Output 0; PAPD7: PAP Data 7; Touch15: Touch Input Channel 15; PWMCH5L: Motor PWM Channel5(L);
16	PC4	I/O	24/8	GPIO	SD1CMDA: SD1 Command(A); SPI1CLKB: SPI1 Clock(B); UART2TXD: Uart2 Data Out(D); IIC_SCL_B: IIC SCL(B); ALNK1_DAT2: Audio Link Data2; ADC10: ADC Input Channel 10; COM1: LCD COM Output 1; PAPD6: PAP Data 6; Touch14: Touch Input Channel 14; PWMCH5H: Motor PWM Channel5(H);
17	PC3	I/O	24/8	GPIO	SD1DAT0A: SD1 Data0(A);

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					SPI1DIB: SPI1 Data In(B); ALNK1_DAT1: Audio Link Data1; COM2: LCD COM Output 2; PAPD5: PAP Data 5; Touch13: Touch Input Channel 13;
18	PC2	I/O	24/8	GPIO	SD1DAT1A: SD1 Data1(A); ALNK1_DAT0: Audio Link Data0; COM3: LCD COM Output 3; SEG18: LCD SEG Output18; PAPD4: PAP Data 4; Touch12: Touch Input Channel 12; FPIN5: Motor Auto-Stop Protective Pin5;
19	PC1	I/O	24/8	GPIO	SD1DAT2A: SD1 Data2(A); ALNK1_LRCK: Audio Link Word Select; COM4: LCD COM Output 4; SEG17: LCD SEG Output17; PAPD3: PAP Data 3; Touch11: Touch Input Channel 11; UART1RXB: Uart1 Data In(B); FPIN4: Motor Auto-Stop Protective Pin4;
20	PC0	I/O	24/8	GPIO	SD1DAT3A: SD1 Data3(A); ALNK1_SCLK: Audio Link Serial Clock; COM5: LCD COM Output 5; SEG16: LCD SEG Output16; PAPD2: PAP Data 2; Touch10: Touch Input Channel 10; UART1TXB: Uart1 Data Out(B); FPIN3: Motor Auto-Stop Protective Pin3;
21	PA12	I/O	24/8	GPIO	PWM1: Timer1 PWM Output; ALNK0_DAT1B: Audio Link Data1(B); ADC4: ADC Input Channel 4; SEG12: LCD SEG Output12; PAPWR: PAP Write; UART0RXD: Uart0 Data In(D);
22	PA11	I/O	24/8	GPIO	ALNK0_DAT0B: Audio Link Data0(B); SEG11: LCD SEG Output11; PAPRD: PAP Read; UART0TXD: Uart0 Data Out(D);
23	USBDM	I/O	4	USB Negative Data (pull down)	UART1RXD: Uart1 Data In(D); SPI2DOB: SPI2 Data Out(B); IIC_SDA_A: IIC SDA(A);
24	USBDP	I/O	4	USB Positive Data	UART1TXD: Uart1 Data Out(D); SPI2CLKB: SPI2 Clock(B);

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				(pull down)	IIC_SCL_A: IIC SCL(A); ADC12: ADC Input Channel 12;
25	PA10	I/O	24/8	GPIO	SD0CLKA: SD0 Clock(A); ALNK0_LRCKB: Audio Link Word Select(B); ADC3: ADC Input Channel 3; SPDIF_IN_B: Sony/Philips Digital Interface Input(B) TMR1: Timer1 Clock Input; SEG10: LCD SEG Output10; PAPD1: PAP Data 1; Touch9: Touch Input Channel 9; UART2RXB: Uart2 Data In(B); PWMCH4L: Motor PWM Channel4(L);
26	PA9	I/O	24/8	GPIO	SD0CMA: SD0 Command(A); ALNK0_SCLKB: Audio Link Serial Clock(B); SPDIF_IN_A: Sony/Philips Digital Interface Input(A) SEG9: LCD SEG Output9; PAPD0: PAP Data 0; Touch8: Touch Input Channel 8; UART2TXB: Uart2 Data Out(B); PWMCH4H: Motor PWM Channel4(H);
27	PA8	I/O	24/8	GPIO	SD0DAT3A: SD0 Data3(A); ALNK0_MCLKA: ALNK Master Clock(A); SEG8: LCD SEG Output8; BT_Freq FPIN2: Motor Auto-Stop Protective Pin2;
28	PA7	I/O	24/8	GPIO	SD0DAT2A: SD0 Data2(A); ALNK0_DAT3A: Audio Link Data3(A); SEG7: LCD SEG Output7; BT_priority TMR0: Timer0 Clock Input; Touch7: Touch Input Channel 7;
29	PA6	I/O	24/8	GPIO	SD0DAT1A: SD0 Data1(A); ALNK0_DAT2A: Audio Link Data2(A); ADC2: ADC Input Channel 2; Wlan_Active: IIC_SDA_D: IIC SDA(D); SEG6: LCD SEG Output6; Touch6: Touch Input Channel 6; UART0RXA: Uart0 Data In(A);
30	PA5	I/O	24/8	GPIO	SD0DAT0A: SD0 Data0(A); ALNK0_DAT1A: Audio Link Data1(A); ADC1: ADC Input Channel 1;

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					BT_Active; IIC_SCL_D: IIC SCL(D); SEG5: LCD SEG Output5; Touch5: Touch Input Channel 5; PWM0: Timer0 PWM Output; UART0TXA: Uart0 Data Out(A);
31	PA4	I/O	24/8	GPIO	ALNK0_DAT0A: Audio Link Data0(A); SEG4: LCD SEG Output4; Touch4: Touch Input Channel 4;
32	PA3	I/O	24/8	GPIO	PLNK_DAT1: PLNK Data1; ALNK0_LRCKA: Audio Link Word Select(A); SEG3: LCD SEG Output3; Touch3: Touch Input Channel 3; UART2RXA: Uart2 Data In(A);
33	PA2	I/O	24/8	GPIO	PLNK_SCLK: PLNK Serial Clock; ALNK0_SCLKA: Audio Link Serial Clock(A); SEG2: LCD SEG Output2; Touch2: Touch Input Channel 2; UART2TXA: Uart2 Data Out(A); CAP3: Timer3 Capture;
34	PA1	I/O	24/8	GPIO	AMUX0R: Analog Channel0 Right; SEG1: LCD SEG Output1; Touch1: Touch Input Channel 1; ADC0: ADC Input Channel 0; UART1RXC: Uart1 Data In(C); PWMCH0L: Motor PWM Channel0(L);
35	PA0	I/O	24/8	GPIO	AMUX0L: Analog Channel0 Left; SEG0: LCD SEG Output0; Touch0: Touch Input Channel 0; CLKOUT0: UART1TXC: Uart1 Data Out(C); PWMCH0H: Motor PWM Channel0(H);
36	PC7	I/O	/	GPIO	MIC_BIAS: Microphone Bias Output SEG21: LCD SEG Output21;
37	MIC				MIC: MIC Input Channel;
38	DACVSS	P	/		DAC Ground
39	VCOM	P	/		DAC Reference
40	DACRL	O	/		DAC Rear Left Channel
41	DACRR	O	/		DAC RearRight Channel
42	DACFL	O	/		DAC Front Left Channel
43	DACFR	O	/		DAC FrontRight Channel
44	FMIP	I	/		FM Single Input

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45	VSSIO	P	/		Ground
46	BT_AVDD	P	/		BT Power
47	PB11	I/O	/	GPIO	SDPG:SDC Power Gate;
48	PB10	I/O	24/8	GPIO	AMUX2R: Analog Channel2 Right; SD0CMB: SD0 Command(B); SPI2DOA: SPI2 Data Out(A); SD1DAT3B: SD1 Data3(B); ADC9: ADC Input Channel 9; UART2RXC: Uart2 Data In(C); PWMCH3L: Motor PWM Channel3(L);

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2、Electrical Characteristics

2.1 Absolute Maximum Ratings

Table 2-1

Symbol	Parameter	Min	Max	Unit
Topt	Operating Temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VBAT	Supply Voltage	-0.3	5.5	V
LDO_IN	Charger Voltage	-0.3	6	V
V _{3.3IO}	3.3V IO Input Voltage	-0.3	3.6	V

2.2 PMU Characteristics

Table 2-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.2	3.7	5	V	
LDO_IN	Charger Voltage	4.5	5.0	5.5	V	
V _{3.3}	Voltage output	2.2	3.0	3.4	V	VBAT = 5V, 100mA loading
V _{BT_AVDD}	Voltage output	1.2	1.25	1.35	V	VBAT=5V, 100mA loading
V _{DACVDD}	DAC Voltage	2.2	3.7	5	V	VBAT = 5V, 10mA loading
I _{L3.3}	Loading current	–	–	150	mA	VBAT = 5V

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

2.4 Internal Resistor Characteristics

Port		General Output	High Drive	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA0~PA12 PB1, PB3, PB4, PB6~PB10 PC0~PC5		8mA	24mA	10K	10K	1、PB1 default pull up 2、USBDM & USBDP default pull down 3、PB0, PB2, PB5 can pull-up resistance to 5V 4、internal pull-up/pull-down resistance accuracy $\pm 20\%$ 5、PRx supply by RTCVDD
PB11 PC7	Output 0	8mA	24mA	10K	10K	
	Output 1	8mA	64mA			
PB0, PB2, PB5		8mA	–	10K	10K	
PR0-PR1		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	–	-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

2.6 ADC Characteristics

Table 2-6

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	

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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°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 2-8

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	

2.7.2 Receiver

Basic Data Rate

Table 2-9

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 Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
Interference Rejection	-2MHz		+36		dB	
	+3MHz		+40		dB	
			+35		dB	

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Enhanced 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 Interference Rejection	+1MHz		+5		dB	
	-1MHz		+2		dB	
	+2MHz		+37		dB	
	-2MHz		+36		dB	
	+3MHz		+40		dB	
	-3MHz		+35		dB	

2.8 FM Receiver Characteristics

Table 2-11

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 LQFP48(7mm*7mm)

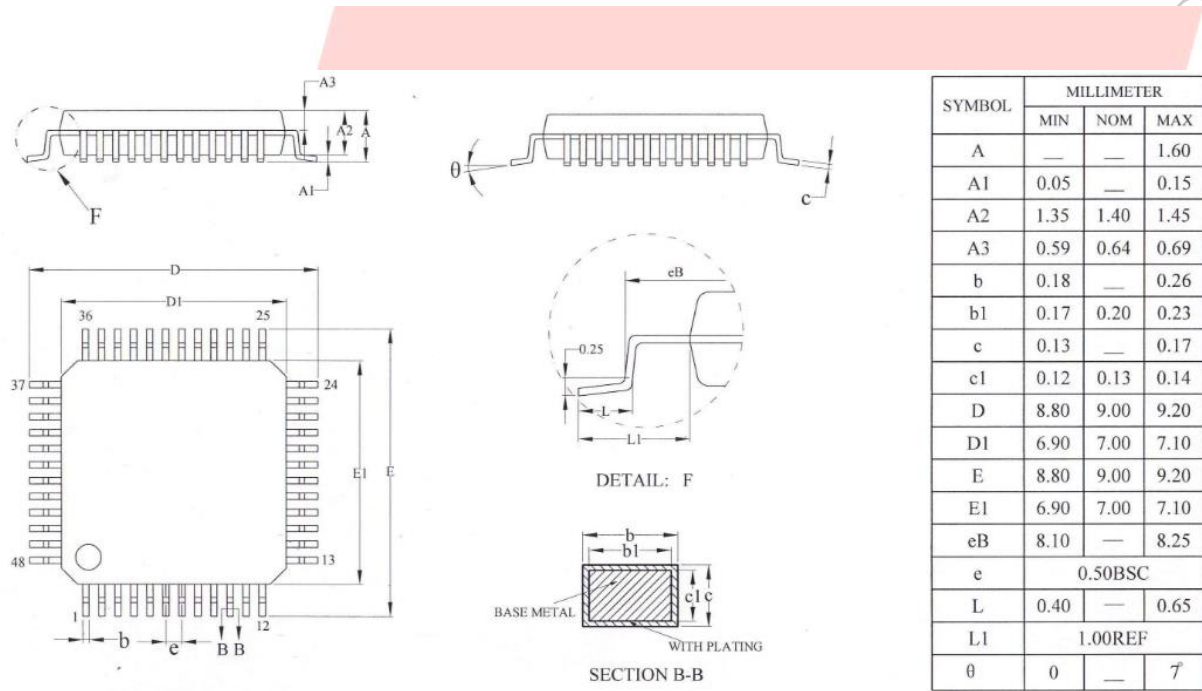


Figure 3-1. AC6951B_LQFP48 Package

4、Revision History

Date	Revision	Description
2020.05.18	V1.0	Initial Release
2020.06.15	V1.1	Update Power Characteristics

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