

AC4601 芯片规格书

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AC4601 Features

High performance 32-bit RISC CPU

- RISC CPU
- DC-160MHz operation
- Support DSP instructions
- 32 Vectored interrupts
- 4 Levels interrupt priority

Flexible I/O

- 28 GPIO pins
- All GPIO pins can be programmable as input or output individually
- All GPIO pins are internal pull-up/pull-down selectable individually
- CMOS/TTL level Schmitt triggered input
- External wake up/interrupt on all GPIOs

Digital Peripheral Feature

- Bluetooth V2.1+EDR baseband and modem
- FM receiver with stereo decoder and 50uS deemphasis
- Four multi-function 16-bit timers, support capture and PWM mode
- One 16-bit active parallel port
- One full-duplex basic UART
- Two full-duplex advanced UART
- Two SPI interface supports host and device mode
- Two SD Card Host controller
- One audio interface supports IIS, left adjusted, right adjusted and DSP mode
- One full speed USB 2.0 OTG controller
- Watchdog

Analog Peripheral Features

- Bluetooth RF with frequency synthesizer
- FM RF with frequency synthesizer, 76-108MHz, 100KHz step
- Three Crystal Oscillator
- Full speed USB 2.0 PHY
- 160MHz PLL-based clock generator
- 16-bit Stereo DAC, SNR > 93dB
- 4 channels Stereo ADC with 1 channel MIC amplifier, SNR>72dB
- Embedded headphone amplifier
- 2 channels analog MUX
- 8 channels 10-bit ADC
- 2 channels 4 levels Low Voltage Detector
- Built in Cap Sense Key controller

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- Power-on reset
- Two LDO: 5V to 1.8V, 5V to 3.3V

Bluetooth Feature

- CMOS single-chip fully-integrated radio and baseband
- Compliant with Bluetooth 2.1 + EDR specification
- Bluetooth Piconet and Scatternet support
- Meet class2 and class3 transmitting power requirement
- Provides +4dbm transmitting power
- receiver with -85dBm sensitivity

FM Tuner

- Support worldwide frequency band 76-108MHz
- Digital low-IF tuner
- Fully integrated digital frequency synthesizer
- Autonomous search tuning
- Digital auto gain control (AGC)
- Digital adaptive noise cancellation
- Programmable de-emphasis (50/75 ms)
- Receive signal strength indicator (RSSI)
- Bass boost
- Volume control

Power Supply

- VDDLDO is 3.3V to 5.5V
- VDDIO is 3.0V to 3.6V

Packages

- LQFP48 7x7
- DIE form

Temperature

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

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一、引脚定义

1.1 引脚分配

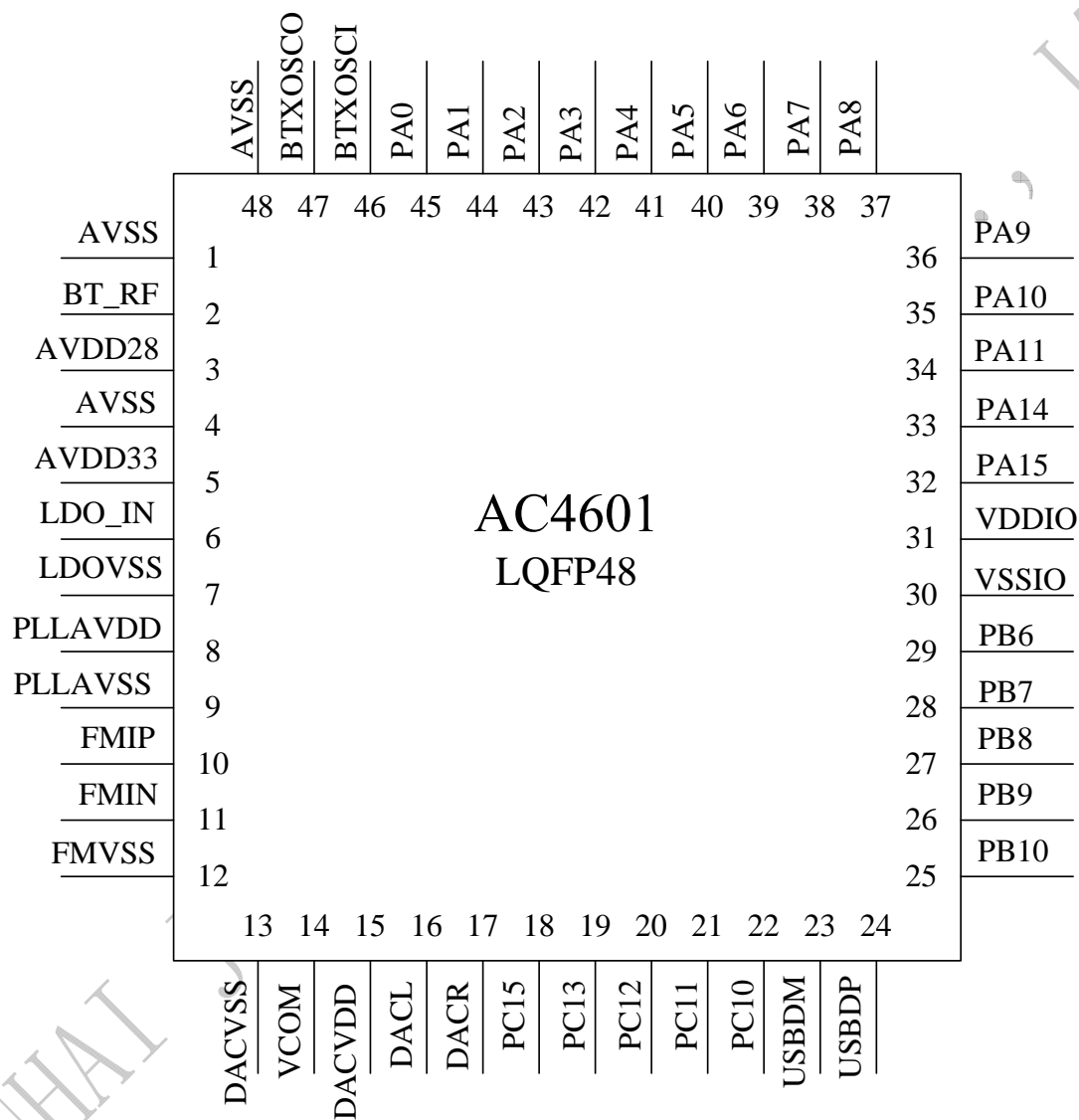


图 1-1 AC4601_LQFP48 引脚分配图

1.2 引脚描述

表 1-1 AC4601_LQFP48 引脚描述

PIN NO.	Name	I/O Type	Drive (mA)	Function	Other Function
1	AVSS	P	/	Analog Ground	
2	BT_RF	P	/		
3	AVDD28	P	/	Analog Power 2.8v	
4	AVSS	P	/	Analog Ground	
5	AVDD33	P	/	Analog Power 3.3v	
6	LDO_IN	P	/	LDO Power 5v	
7	LDOVSS	P	/	LDO Ground	
8	PLLAVDD	P	/		
9	PLLAVSS	P	/		
10	FMIP	I	/		
11	FMIN	I	/		
12	FMVSS	P	/	FM Analog Ground	
13	DACVSS	P	/	DAC Ground	
14	VCOM	P	/	DAC Reference	
15	DACVDD	P	/	DAC Power	
16	DACL	O	/	DAC Left Channel	
17	DACR	O	/	DAC Right Channel	
18	PC15	I/O	16	GPIO	MIC; AMUX2R: Simulator Channel2 Right; 12BitADC;
19	PC13	I/O	16	GPIO	AMUX1R: Simulator Channel1 Right; 12BitADC; UART2RXD: Uart2 Data Out(D);
20	PC12	I/O	16	GPIO	AMUX1L: Simulator Channel 1 Left; 12BitADC; UART2TXD: Uart2 Data In(D); ALNK_MCLKB: Audio Link Master Clk(B);
21	PC11	I/O	16	GPIO	SD1DAT2A: SD1 Data2(A); AMUX0R: Simulator Channel0

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					Right; ALNK_LRCKB: Audio Link Clk(B);
22	PC10	I/O	16	GPIO	SD1DAT3A: SD1 Data3(A); AMUX0L: Simulator Channel0 left; ALNK_SCLKB: Audio Link Clk(B);
23	USBDM	I/O	4	USB Negative Data	
24	USBDP	I/O	4	USB Positive Data	
25	PB10	I/O	16	GPIO	Wakeup12: Port Interrupt/Wakeup12; CAP2: Timer2 Capture; UART0TXB: Uart0 Data Out(B); DACL: DAC Left Channel; COM4: LCD COM Output 4;
26	PB9	I/O	16	GPIO	TMR3: Timer3 Clock Input; UART2RXC: Uart2 Data In(C); DACCK: DAC Clk; COM3: LCD COM Output 3;
27	PB8	I/O	16	GPIO	UART2TXC: Uart2 Data Out(C); COM2: LCD COM Output 2;
28	PB7	I/O	16	GPIO	UART1RXC: Uart1 Data In(C); SPI1DOB: SPI1 Data Out(B); IIC_SDA_B: IIC SDA(B); COM1: LCD COM Output 1;
29	PB6	I/O	16	GPIO	PWM0: Timer0 PWM Output; UART1TXC: Uart1 Data Out(C); SPI1CLKB: SPI1 Clk(B); IIC_SCL_B: IIC SCL(B); COM0: LCD COM Output 0;
30	VSSIO	P	/	IO Ground	
31	VDDIO	P	/	IO Power 3.3v	
32	PA15	I/O	16	GPIO	TMR1: Timer1 Clock Input; SPI1DOA: SPI1 Data Out(A); PAPD15: PAP Data 15; SEG15: LCD SEG Output15;
33	PA14	I/O	16	GPIO	Wakeup13: Port Interrupt /Wakeup 13; ADC7: ADC Input Channel 7; SPI1CLKA: SPI1 Clk(A); PAPD14: PAP Data(14);

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					ALNK_MCLKA: Audio Link Master Clk(A); SEG14: LCD SEG Output14;
34	PA11	I/O	16	GPIO	ADC6: ADC Input Channel 6; UART2RXB: Uart2 Data In(B); PAPD11: PAP Data11; ALNK_DAT3A: Audio Link Data3(A); SEG11: LCD SEG Output11;
35	PA10	I/O	16	GPIO	Wakeup10: Port Interrupt /Wakeup 10; CAP3: Timer3 Capture; UART2TXB: Uart2 Data Out(B); PAPD10: PAP Data10; ALNK_DAT2A: Audio Link Data2(A); SEG10: LCD SEG Output10;
36	PA9	I/O	16	GPIO	UART0RX: Uart0 Data In(A); PAPD: PAP Data9; ALNK_DAT1A: Audio Link Data1(A); SEG9: LCD SEG Output9;
37	PA8	I/O	16	GPIO	Wakeup3: Port Interrupt /Wakeup 3; ADC5: ADC Input Channel 5; UART0TXA: Uart0 Data Out(A); PAPD8: PAP Data8; ALNK_DAT0A: Audio Link Data0(A); SEG8: LCD SEG Output8;
38	PA7	I/O	16	GPIO	UART1RXA: Uart1 Data In(A); PAPD7: PAP Data7; SEG7: LCD SEG Output7;
39	PA6	I/O	16	GPIO	Wakeup9: Port Interrupt /Wakeup 9; TMR0: Timer0 Clock Input; UART1TXA: Uart1 Data Out(A); PAPD6: PAP Data6; SEG6: LCD SEG Output6;
40	PA5	I/O	16	GPIO	ADC4: ADC Input Channel 4; CAP0: Timer0 Capture; SD0DAT2B: SD0 Data2(B); PAPD5: PAP Data5; CLKOUT1: Clk Out1; UART2RXA: Uart2 Data In(A);

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					SEG5: LCD SEG Output5;
41	PA4	I/O	16	GPIO	Wakeup8: Port Interrupt /Wakeup 8; SD0DAT3B: SD0 Data3(B); PAPD4: PAP Data4; CLKOUT0: Clk Out0; UART2TXA: Uart2 Data Out(A); SEG4: LCD SEG Output4;
42	PA3	I/O	16	GPIO	ADC3: ADC Input Channel 3; SD0CLKB:SD0 Clk(B); PAPD3: PAP Data3; SEG3: LCD SEG Output3;
43	PA2	I/O	16	GPIO	ADC2: ADC Input Channel 2; SD0CMDDB: SD0 Command(B); PAPD2: PAP Data1; SEG2: LCD SEG Output2;
44	PA1	I/O	16	GPIO	ADC1: ADC Input Channel 1; PWM3: Timer3 PWM Output; SD0DAT0B: SD0 Data0(B); PAPD1: PAP Data1; SEG1: LCD SEG Output1;
45	PA0	I/O	16	GPIO	Wakeup2: Port Interrupt /Wakeup 2; ADC0: ADC Input Channel 0; CAP1: Timer1 Capture; SD0DAT1B: SD0 Data1(B); PAPD0: PAP Data0; SEG0: LCD SEG Output0;
46	BTXOSCI			OSC In	
47	BTXOSCO			OSC Out	
48	AVSS	P	/	Analog Ground	

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二、电气特性

2.1 LDO 电压、电流特性

表 2-1

符号	参数	最小	典型	最大	单位	测试条件
LDO5V	Voltage Input	3.3	4.6	5.5	V	-
$V_{3.3}$	Voltage output	-	3.3	-	V	LDO5V = 5V, 100mA loading
$V_{1.8}$		-	1.8	-	V	LDO5V = 5V, 50mA loading
V_{DACVDD}	DAC Voltage	-	3.1	-	V	LDO5V = 5V, 10mA loading
$I_{L3.3}$	Loading current	-	-	150	mA	LDO5V = 5V

2.2 IO 输入、输出高低逻辑特性

表 2-2

IO 输入特性						
符号	参数	最小	典型	最大	单位	测试条件
V_{IL}	Low-Level Input Voltage	-0.3	-	$0.3 * V_{DDIO}$	V	$V_{DDIO} = 3.3V$
V_{IH}	High-Level Input Voltage	$0.7 * V_{DDIO}$	-	$V_{DDIO} + 0.3$	V	$V_{DDIO} = 3.3V$
IO 输出特性						
V_{OL}	Low-Level Output Voltage	-	-	0.33	V	$V_{DDIO} = 3.3V$
V_{OH}	High-Level Output Voltage	2.7	-	-	V	$V_{DDIO} = 3.3V$

2.3 IO 输出能力、上下拉电阻特性

表 2-3

Port 口	普通输出	强输出	上拉电阻	下拉电阻	备注
PA0~PA15、 PB0~PB15、 PR0~PR3	串接 250 欧 电阻（寄存器可控制）	16mA	10K	60K	PA8 default pulldown
PC0~PC15、 PD0~PD7	8mA	24mA	10K	60K	

DAC 特性

表 2-4

参数	最小	典型	最大	单位	测试条件
Frequency Response	20	-	200000	Hz	-
THD+N	-	0.014	-	%	1KHz out = 1V RMS
S/N	-	93	-	dB	1KHz out = 1V RMS
Channel Separation	-	80	-	dB	-
DAC Output Power	-	>15	-	mW	32ohm loading

BT 特性

表 2-5

参数	最小	典型	最大	单位	测试条件
Maximum Output Power	-	4	-	dBm	-
RMS DEVM	-	5.3	-	%	Maximum output power
PEAK DEVM	-	12	-	%	
99% DEVM	-	8	-	%	
EDR Relative Power	-	-1.4	-	dB	
BDR Sensitivity	-	-84	-	dBm	BER=0.001
EDR Sensitivity	-	-85	-	dBm	BER=0.0001

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三、封装

3.1 LQFP48_7*7

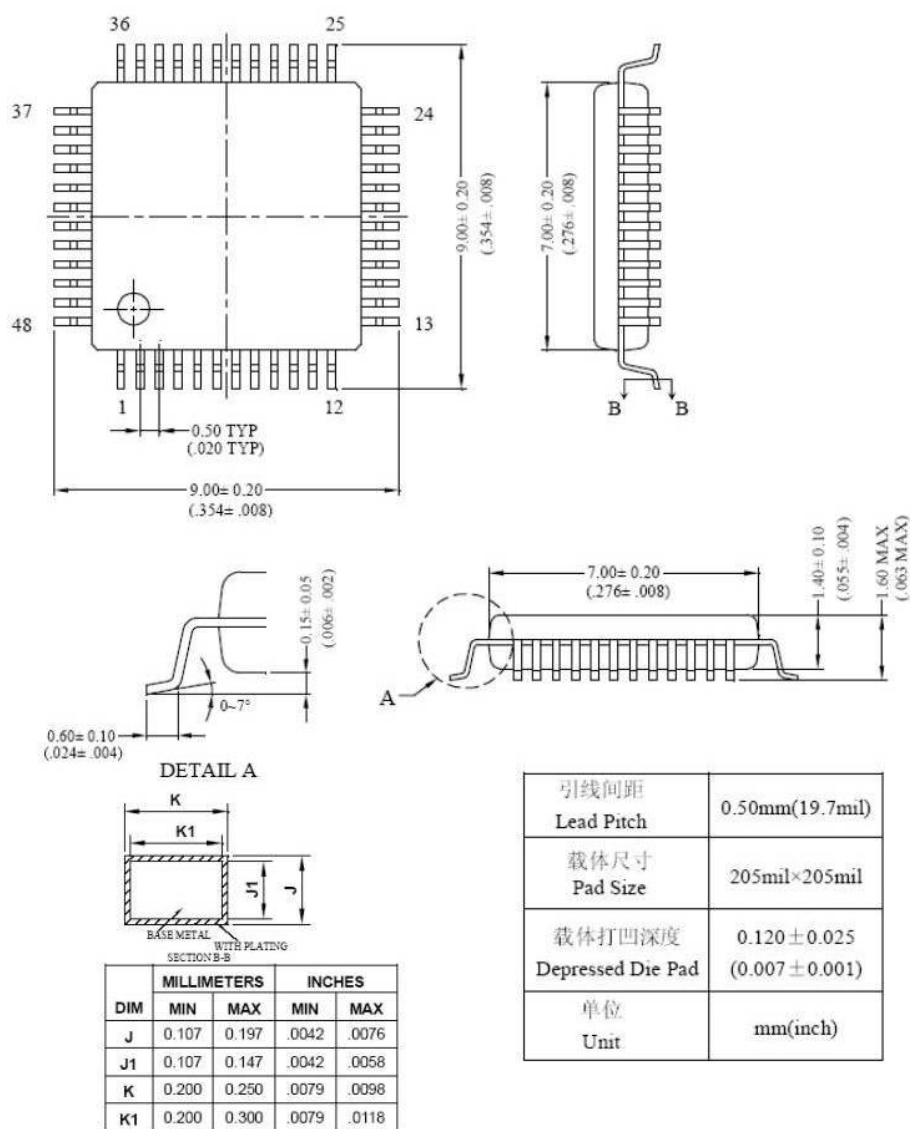


图 3-1 AC4601_LQFP48 封装图