# AC6959A Datasheet

## Zhuhai Jieli Technology Co.,LTD

**Version：1.0**

**Date：2019.12.13**

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# AC6959A Features

## High performance 32-bit DSP

- 32-bit DSP support FPU
- DC-240MHz operation
- 64Vectored interrupts
- 4 Levels interrupt priorit

## Flexible I/O

- 6 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

## Peripheral Feature

- 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
- One full-duplex basic UART
- Two full-duplex advanced UART
- One IIC interface supports host and device mode
- One Quadrate decoder
- Watchdog
- 1Crystal Oscillator
- 1 16-bit differential DAC with headphone amplifier, SNR >= 95dB
- 1 channel MIC amplifier
- 4 channels 10-bit ADC
- 2 channels 8 levels Low Voltage Detector
- Power-on reset
- Embedded PMU support low power mode

## Bluetooth Feature

- CMOS single-chip fully-integrated radio and baseband
- Compliant with Bluetooth V5.1+BR+EDR+BLE specification
- Bluetooth Piconet and Scatternet support
- Meet class2 and class3 transmitting power requirement
- Support GFSK and π/4 DQPSK all paket types
- Provides +6dbm transmitting power
- receiver with -90dBm sensitivity
- Support a2dp\avctp\avdtp\avrcp\hfp\spp\smp\att\gap\gatt\rfcomm\sdp\l2cap profile



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## Power Supply

- VBAT is 2.2V to 5.5V
- VDDIO is 2.2V to 3.6V

## Package

- SOP16

## Temperature

- Operating temperature: -20℃ to +70℃
- Storage temperature range: -65℃ to +150℃

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# 1、Pin Definition

## 1.1 Pin Assignment

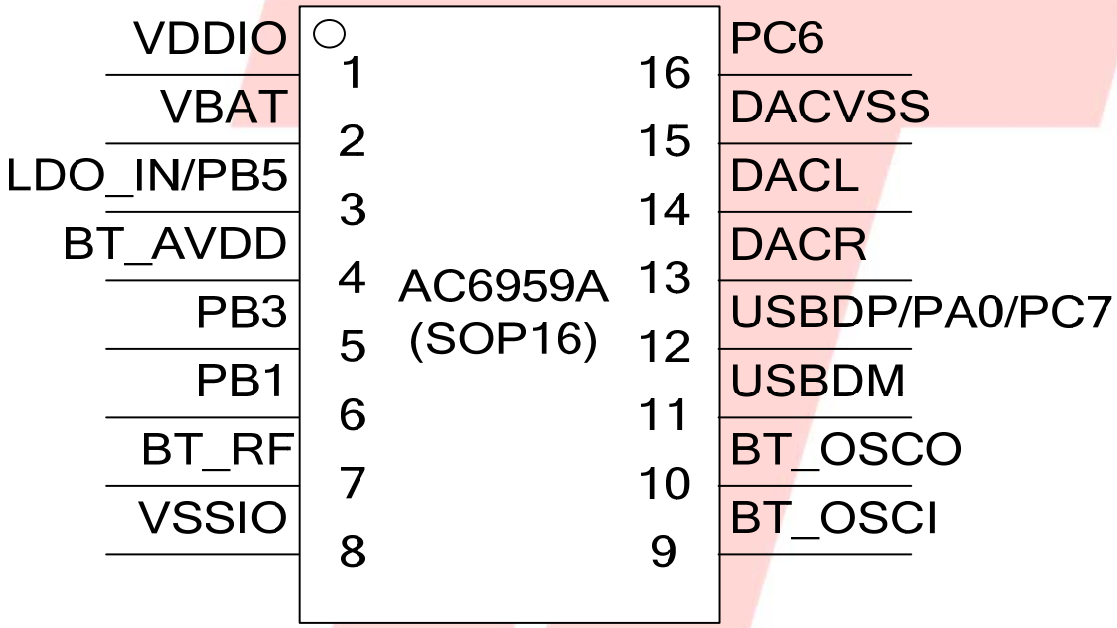



**Figure 1-1 AC6959A_SOP16 Package Diagram**



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## 1.2 Pin Description

**Table 1-1 AC6959A_SOP16 Pin Description**

| PIN NO. | Name | I/O Type | Drive (mA) | Function | Other Function |
|---|---|---|---|---|---|
| 1 | VDDIO | P | / | IO Power 3.3v | |
| 2 | VBAT | P | / | LDO Power | |
| 3 | LDO_IN | P | / | Charge Power 5v | |
| | PB5 | I/O | 8 | GPIO<br>(High Voltage Resistance) | PWM3：Timer3 PWM Output;<br>CAP1：Timer1 Capture;<br>UART0TXC：Uart0 Data Out(C);<br>UART0RXC：Uart0 Data In(C); |
| 4 | BT_AVDD | P | / | BT Power 1.3v | |
| 5 | PB3 | I/O | 24/8 | GPIO | PWM2：Timer2 PWM Output;<br>ADC6：ADC Input Channel 6; |
| 6 | PB1 | I/O | 24/8 | GPIO<br>(pull up) | Long Press Reset；<br>ADC5：ADC Input Channel 5;<br>TMR2：Timer2 Clock Input;<br>UART1RXA：Uart1 Data In(A); |
| 7 | BT_RF | P | / | | |
| 8 | VSSIO | P | / | Ground | |
| 9 | BT_OSCI | I | / | OSC In | |
| 10 | BT_OSCO | O | / | OSC Out | |
| 11 | USBDM | I/O | 4 | USB Negative Data<br>(pull down) | UART1RXD：Uart1 Data In(D);<br>IIC_SDA_A：IIC SDA(A); |
| 12 | USBDP | I/O | 4 | USB Positive Data<br>(pull down) | UART1TXD：Uart1 Data Out(D);<br>IIC_SCL_A：IIC SCL(A);<br>ADC12：ADC Input Channel 12; |
| | PA0 | I/O | 24/8 | GPIO | UART1TXC：Uart1 Data Out(C);<br>PWMCH0H：Motor PWM Channel0(H)； |
| | PC7 | I/O | / | GPIO | MIC_BIAS：Microphone Bias Output |
| 13 | DACR | O | / | | DAC Right Channel |
| 14 | DACL | O | / | | DAC Left Channel |
| 15 | DACVSS | P | / | Ground | |
| 16 | PC6 | I/O | 24/8 | GPIO | MIC：MIC Input Channel;<br>ADC11：ADC Input Channel 11; |



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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 | ℃ |
| Tstg | Storage temperature | -65 | +150 | ℃ |
| 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 |
|---|---|---|---|---|---|---|
| LDOIN | 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 Voltaget | -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 Voltaget | _ | _ | 0.33 | V | VDDIO = 3.3V |
| $V_{OH}$ | High-Level Output Voltaget | 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 PB3 PA0 PC6 | 8mA | 24mA | 10K | 10K | 1、PB1 default pull up<br>2、USBDM & USBDP default pull down<br>3、internal pull-up/pull-down resistance \| accuracy ±20% |
| PB5 | - | - | 10K | 10K | |
| PC7 | - | - | 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<br>10Kohm loading<br>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<br>10Kohm loading<br>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 2-8**

| 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 2-9**

| 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 2-10**

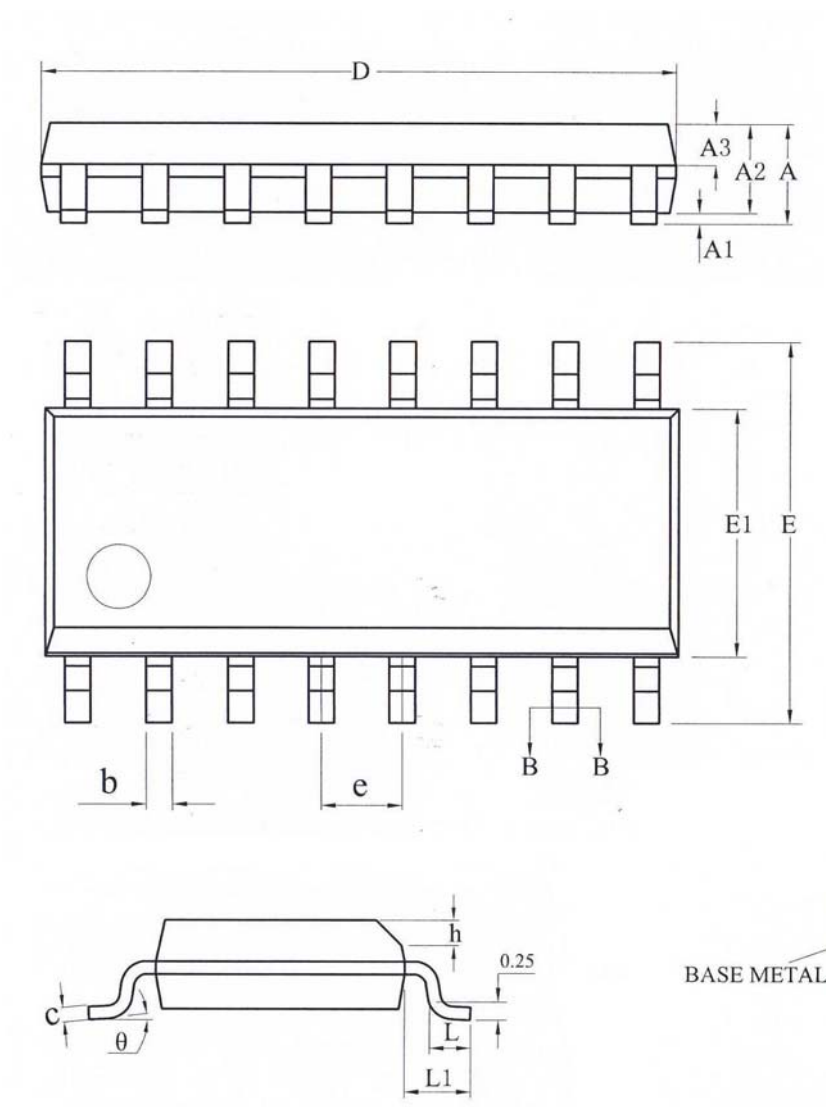
| Parameter | | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Sensitivity | | | -90 | | dBm | |
| Co-channel Interference Rejection | | | -13 | | dB | |
| Adjacent Channel Interference Rejection | +1MHz | | +5 | | dB | 25℃, Power Supply VBAT=5V 2441MHz |
| | -1MHz | | +2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



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# 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 AC6959A_SOP16 Package**



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# 4、Revision History

| Date | Revision | Description |
|---|---|---|
| 2019.12.13 | V1.0 | Initial Release |
| | | |

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