



# AK4961

## Low-Power CODEC with Audio/Voice DSP

### 1. General Description

The AK4961 is four channels 24-bit ADC, stereo advanced 32-bit high sound quality audio DAC and stereo 24-bit DAC with a built-in microphone amplifier, mono receiver amplifier, ground-referenced headphone amplifier, lineout, and a high feature Audio/Voice DSP. The AK4961 features AKM's DSP core that enables various kinds of voice processing such as voice wakeup, dual mic Tx noise suppression, Rx noise suppression, echo cancellation, and hands free functions. The AK4961 has five audio I/F and SLIMbus I/F to communicate with an Application processor, up to two Baseband processors, a Bluetooth module and a digital input class-D amplifier simultaneously, and mixes asynchronous signal with built-in SRCs.

### 2. Features

1. **Recording Function**
  - **4ch Low Power 24-bit ADC**
    - 3-types Digital Filter for Sound Color Selection
  - **3 Stereo Input Selectors**
  - **3 Stereo Inputs (Single-ended) or 6 Mono Inputs (Full-differential)**
  - **MIC-Amp Gain: +30dB ~ 0dB, 3dB step**
  - **4 MIC Power Supplies: 2.8 / 2.5 / 1.8V Selectable**
  - **ADC Characteristics:**
    - **Single-ended Mode**
      - S/(N+D): 88dB, DR, S/N: 95dB (MIC-Amp=+18dB)
      - S/(N+D): 84dB, DR, S/N: 100dB (MIC-Amp=+6dB)
    - **Full-Differential Mode:**
      - S/(N+D): 90dB, DR, S/N: 95dB (MIC-Amp=+18dB)
      - S/(N+D): 90dB, DR, S/N: 102dB (MIC-Amp=0dB)
  - **4-Channel Digital MIC Interface**
2. **Playback Function**
  - **Stereo High Sound Quality Low Power Advanced 32-bit DAC for Headphone**
    - 4 types of Digital Filter for Sound Color Selection
  - **Low Power 24-bit Stereo DAC for LINEOUT/ Receiver / External Speaker Amp**
  - **Ground-referenced Class-G Stereo Headphone-Amp**
    - **Output Power: 25mW @ 32Ω, 40mW @ 16Ω, THD+N = 0.1%**
    - **S/(N+D): 99dB**
    - **S/N: 110dB**
    - **Output Noise Level: -119dBV (Analog Volume ≤ -14dB)**
    - **Analog Volume: +6 ~ -40dB & Mute, 2dB Step**
    - **Ground Loop Noise Cancellation**
  - **Ground-referenced Stereo Line Outputs**
    - **S/(N+D): 86dB, DR, S/N: 100dB**
    - **Analog Volume: +3 ~ -7.5B, 1.5dB Step**
  - **Mono Receiver-Amp**
    - **BTL Output**
    - **Output Power: 100mW @ 32Ω, THD+N = 1%**
    - **S/(N+D): 87dB @ 32Ω, Po=30mW**
    - **S/N: 100dB @ Po = 30mW**
    - **Analog Volume: + 3 ~ -7.5dB, 1.5dB Step**

- Ground-referenced stereo Line Outputs for External Speaker-Amp
  - 2ch Single-ended or Full Differential Outputs
  - S/(N+D): 86dB, DR, S/N: 100dB
  - Analog Volume: +3 ~ -7.5B, 1.5dB Step
- 3. Five Digital Audio interface
  - Master/Slave mode
  - Sampling Frequency (ADC):  
8k, 11.025k, 12k, 16k, 22.05k, 24k, 32k, 44.1k, 48k, 64k, 88.2k, 96k
  - Sampling Frequency (DAC):  
8k, 11.025k, 12k, 16k, 22.05k, 24k, 32k, 44.1k, 48k, 64k, 88.2k, 96k, 128k, 176.4k, 192kHz
  - Interface Format  
SDTOx: 24/16-bit I<sup>2</sup>S/MSB justified, 16-bit PCM Short/Long Frame  
SDTIx: 32/24/16-bit I<sup>2</sup>S/MSB justified, 16-bit PCM Short/Long Frame
- 4. SLIMbus Interface
- 5. Five Asynchronous Sample Rate Converters:
  - Up sample: up to x6
  - Down sample: down to x1/6
  - 4 types of Digital Filter for Sound Color Selection (Only SRCE)
- 6. Power Management
- 7. Dual PLL
- 8. X'tal Oscillator
- 9. Jitter Cleaner with a built-in SRC
- 10. Accessories
  - Jack Detection
  - Headset Detection
  - Button Detection
- 11. Embedded Audio/ Hands Free DSP
  - Flexible programming with built-in program and data memories
  - Pre-processing for Voice Wakeup
  - Hardware accelerator
  - Processing features (example)
    - Single/Dual Microphone Noise suppression
    - Echo cancellation
    - Rx Voice Clarity Enhancement
    - 5-Band Parametric EQ, Dynamic Range Control
- 12.  $\mu$ P I/F: SPI / I<sup>2</sup>C(1MHz) and SLIMbus
- 13. Operation Temperature Range: Ta = -40 ~ 85°C
- 14. Power Supply:
  - AVDD1, 2 (CODEC, MIC, PLL): 1.7 to 1.9V
  - CVDD (HP/LINE/RCV-Amps, Charge Pump): 1.7 to 1.9V
  - LVDD (LDO2 for Digital Core): 1.7 to 1.9V (built-in LDO)
  - VDD12 (Digital Core): 1.14 to 1.26V (direct supply)
  - TVDD1, 2, 3(Host & Audio I/F): 1.65 to 3.6V
- 15. Package: 116 pin CSP (4.522 x 4.774mm, 0.4mm pitch)

Thank you for your access to AKM product information.  
More detail product information is available, please contact our  
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