The AKD4490-SG is a sound evaluation board for the AK4490EN; AK4490EN is a new generation Premium 32-bit 2ch DAC. The AKD4490-SG can be applied to the solutions for the smartphone. This board has digital audio interfaces, enabling to interface to digital audio systems via optical or coaxial connector. A USB Connection is adopted for control interface.

### Ordering Guide

**AKD4490-SG** --- **Evaluation board for AK4490EN**

**Control Software**

### FUNCTION

- Three digital audio interfaces
  - Optical Input
  - Coaxial Input
  - 10-pin Header for External Interface
- USB Connector for control interface
- A 3.5 mm stereo mini jack connector for analog audio Output

![Figure 1. AKD4490-SG Block Diagram (SPDIF input)](image-url)
Figure 2. AKD4490-SG Block Diagram (EXT input)
Figure 3. AKD4490-SG Board View
Component explanation

(1) Battery Header (JP301 / +3.7V, GND)
Refer to (Table 2).

(2) SPDIF input connector (J101 / BNC connector, PORT101 / Optical connector)
SPDIF signal Inputs to the AK4118A.
(a) When using PORT101 (Optical connector), set to R114 = “open” and R112 = “0 ohm”.
(b) When using J101 (BNC connector), set to R114 = “0 ohm” and R112 = “open”.
The default setting is (b). Refer to the circuit diagram of Figure 4

Figure 4 . Circuit diagram of SPDIF input.

(3) Headphone Out (J401 / 3.5 mm stereo mini jack)
Connect to headphone

(4) EXT PORT (PORT201)
10 pin header for interfacing with external data sources, enabling to connect other audio systems.
When using PORT201 (EXT), set to R202, R203, R204 = “0 ohm” and R205 = “100 ohm”.
In addition, connect 1pin and 2pin of JP201.

<table>
<thead>
<tr>
<th>Pin</th>
<th>I/O</th>
<th>Function</th>
<th>pin</th>
<th>I/O</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I</td>
<td>MCLK</td>
<td>2</td>
<td>-</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>I</td>
<td>BICK</td>
<td>4</td>
<td>-</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>LRCK</td>
<td>6</td>
<td>-</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>I</td>
<td>SDATA</td>
<td>8</td>
<td>-</td>
<td>GND</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
<td>NC</td>
<td>10</td>
<td>-</td>
<td>GND</td>
</tr>
</tbody>
</table>

(5) External Clock In (J201 / BNC connector, X201 / Xtal Oscillator)
Input 9.6MHz clock when outputting audio clocks from AK8157A.
(a) When using J201(BNC connector), set to R201 = “0 ohm” and X201 = “open”.
(b) When using X201(Xtal Oscillator), set to R201 = “open”.

(6) AK4118A (U101)
AK4118A is Digital Audio I/F Transceiver.
When evaluating the sound quality, using AK4118A with SPDIF signal.

(7) AK8157A (U201)
AK8157A is Audio Clock Generator.
This device supplies BICK, LRCK and MCLK to AK4490EN when 9.6Mhz clock inputs.

(8) AK4490EN (U202)
AK4490EN is premium 32-bit 2ch DAC. It is the main device on this board.
OPERATION SEQUENCE

Set up the power supply lines

Connect the battery to the battery header (JP301).

Table 2. Set up of power supply lines

<table>
<thead>
<tr>
<th>Name</th>
<th>Color</th>
<th>Voltage</th>
<th>Comments</th>
<th>Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP301</td>
<td>White 1pin</td>
<td>+3.7V ~ +4.2V</td>
<td>Power supply</td>
<td>This is always needed. Power line</td>
</tr>
<tr>
<td>JP301</td>
<td>White 2pin</td>
<td>0V</td>
<td>GND</td>
<td>This is always needed.</td>
</tr>
</tbody>
</table>

Toggle SW Function

*Upper-side is “H” and lower-side is “L”.

Figure 5. SW201 Power-up/down switch direction

Power-down reset by SW201 (PDN) must be made once after power up the evaluation board. Put the SW201 to “L” for power-down reset of the AK4490EN, AK8157A and AK4118A, and the return it to “H” to release the power-down states.

[SW201] (PDN): Resets the AK4490EN, AK8157A and AK4118A (Keep “H” during normal operation).

This switch must be set to “L” once upon power up the evaluation board to reset the AK4490EN, AK8157A and AK4118A.

*Caution

When changing from power on (power off) to power off (power on), please remove the headphone from ear. Ear may be hurt, due to generate the noise.
Jumper setting

(1) Using SPDIF signal from optical connector or coaxial connector  
Default> JP201 is set as shown in Figure 5 when SPDIF signal from optical connector or coaxial connector use.

(2) Using External PCM signal
JP201 is set as shown in Figure 6 when the PCM signal from EXT PORT (Table 1) use.

*Default setting is (1).

Figure 6. Jumper setting for SPDIF  Default>

Figure 7. Jumper setting for external PCM

Board Control

The AKD4490-SG should be controlled via a USB port with a PC. Connect J501 (USB) connector to a PC with USB cable. The control software is included in the AK4490-SG package. Setting System is referred to following Figure 8.

Figure 8. Control System Setting

Audio playback

Connect the headphone or earphone to J401 (3.5mm stereo mini connector), and connect the optical cable to PORT101 or coaxial cable to J101 from the audio equipment. The volume can be adjusted by control software.
Setup of the Evaluation Board and Control Software

(1) Set an AKD4490-SG properly.

(2) Power supplies to battery header (JP301) for the Power ON of AKD4490-SG.

(3) Connect AKD4490-SG to PC with USB cable. USB control is recognized as HID (Human Interface Device) on the PC.

(4) AK4490EN, AK8157A and AK4118A must be reset once bring SW201 “L” to “H”.

* Direction of “H” is referred to Figure 5

(5) Double-click the icon “AKD4490-SG.exe” to open the control program.

When it can’t be recognized correctly, connect AKD4490-SG to PC with USB cable.

* When the screen does not display “AKDUSBIF-B” at bottom left, reconnect the PC and the USB cable, and push the [Port Reset] button.

(6) Begin evaluation by following the procedure below.

Figure 9. Window of Control Soft
Operation Overview

Function and Register map are controlled by this control software. These controls may be selected by the upper tabs.

Frequently used buttons, such as the register initializing button “Write Default”, are located outside of the switching tab window.

1. [Port Reset]: Resets the connection to PC.
   Click this button when connecting USB cable after the control software set up.

2. [Write Default]: Register Initialization.
   When the device is reset by a hardware reset, use this button to initialize the registers.

3. [All Write]: Executes write commands for all registers displayed.

4. [All Read]: Executes read commands for all registers displayed.

5. [Save]: “Save Address of Register” dialog box pops up.

6. [Load]: Executes data write from a saved file.

7. [All Reg Write]: “All Reg Write” dialog box pops up.

8. [Sequence]: “Sequence” dialog box pops up.

9. [Sequence (File)]: “Sequence (File)” dialog box pops up.

10. [Read]: Reads current register settings and displays to the register area (on the right of the main window).
    (Add: Address, R: Read value, W: Last Write value (= Register Map))
    This is different from [All Read] button as it does not reflect to the register map. It only displays register values in hexadecimal numbers.
■ Tab Functions

1. [Function] Tab: Function Control

Sequence operation and a setup of a register are executed with the function button arranged at the upper part, and each button in a block diagram.

Figure 10. Sound control window of Control Soft

◆ Sound control setting of AK4490

(1) The sound quality can be selected by changing radio buttons of the following digital filters setting and “Super Slow” check box. For more information about the digital filter characteristics, refer to the datasheet of the AK4490EN.

* Four filter below are not reflected when “Super Slow” check box is selected.

- Sharp roll-off filter
- Slow roll-off filter
- Short delay Sharp roll-off filter
- Short delay Slow roll-off filter
(2) Volume Control by Slider
The volume can also be changed by slider.
When a value is input in the edit box, the slider is moved to the value selected by the edit box.
Use the mouse or arrow keys on the keyboard for fine tuning.

![Image of Volume Control Block](image1)

**Figure 11. Volume Control Block**

◆ **Sampling Frequency(LRCK) setting of AK8157A**

(3) Sampling Frequency(LRCK) Select of AK8157A
The LRCK frequency can select at 44.1kHz, 48kHz, 96kHz, and 192kHz.

![Image of Sampling Frequency(LRCK)](image2)

**Figure 12. Sampling Frequency(LRCK)**

◆ **Power Supply setting of ISL98608IIHZ-T**

(4) VBST, VP and VN Control by Slider
VBST regulator can be programmed from +5.15V to +7.15V.
VP regulator can be programmed from +5V to +7V.
VN regulator can be programmed from -7V to -5V.

*VBST is VBST > VP and VBST > |VN|.*
2. **[Function] Tab: AK4490 00H-09H & AK8157 00H-01H & ISL98608IHZ-T**

This tab is for a register writing and reading.

Each bit on the register map is a push-button switch.
Button Down indicates “H” or “1” and the bit name is in red (when read only it is in deep red).
Button Up indicates “L” or “0” and the bit name is in blue (when read only it is in gray)

Grayout registers are Read Only registers. They can not be controlled.

The registers which is not defined in the datasheet are indicated as “---”.

![Register Map example](image)

**Figure 14. Register Map example**

**[Write]: Data Writing Dialog**

It is for when changing two or more bits on the same address at the same time.

Click [Write] button located on the right of the each corresponded address for a pop-up dialog box.

When checking the checkbox, the register will be “H” or “1”, when not checking the register will be “L” or “0”.
Click [OK] to write setting value to the registers, or click [Cancel] to cancel this setting.

![Register writing dialog example](image)

**Figure 15. Register writing dialog example**

**[Read]: Data Read**

Click [Read] button located on the right of the each corresponded address to execute register reading.

After register reading, the display will be updated regarding to the register status.
Button Down indicates “H” or “1” and the bit name is in red (when read only it is in deep red).
Button Up indicates “L” or “0” and the bit name is in blue (when read only it is in gray)

Please be care that button statuses will be changed by Read command.
Register setting of AK4490, AK8157A and ISL98608IIHZ-T

(1) Push the “Load” Button and select the program file (file name is “For checking sound quality.akr”). When program file is selected, it’s executed automatically.

Figure 16. Script Window of Control Soft

Figure 17. Program file select window (example)
# REVISION HISTORY

<table>
<thead>
<tr>
<th>Date (yy/mm/dd)</th>
<th>Manual Revision</th>
<th>Board Revision</th>
<th>Reason</th>
<th>Page</th>
<th>Contents</th>
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<td></td>
<td>14</td>
<td>Circuit diagram was changed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R112: 4.7Ω → open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R114: open → 0Ω</td>
</tr>
<tr>
<td>15/11/10</td>
<td>KM119701</td>
<td>2</td>
<td>Change</td>
<td>4</td>
<td>(2) SPDIF input connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>The default setting is (a) → The default setting is (b)</td>
</tr>
<tr>
<td>15/11/26</td>
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<td></td>
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Respective VSS should be shorted by the point near the 2pin of JP301.