AKD4482-SB
AK4482 Evaluation board Rev.0

General Description

The AKD4482-SB is an evaluation board for AK4482, which is 192kHz sampling 24Bit ΔΣ DAC. The AKD4482-SB includes a LPF which can add differential analog outputs from the AK4482 and also has a digital interface. Therefore, it is easy to evaluate the AK4482.

■ **Ordering Guide**

AKD4482-SB -- Evaluation board for AK4482

Function

■ On-board Analog output buffer circuit

■ On-board digital audio interface. (AK4118A)

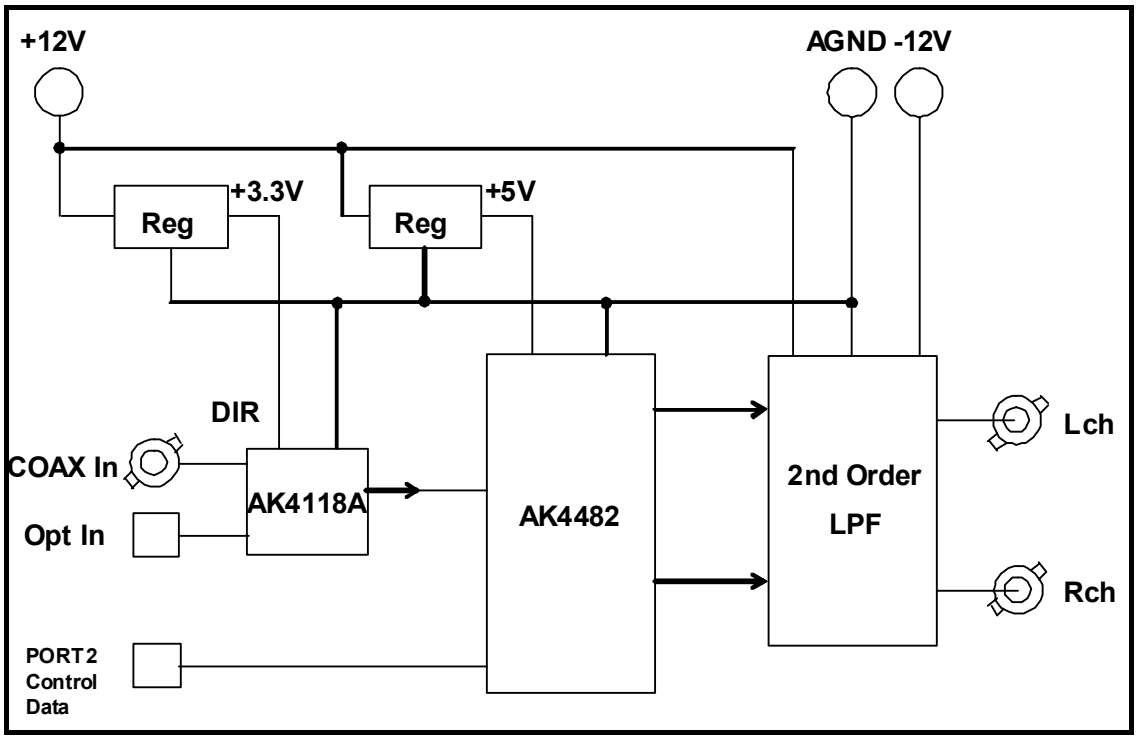


Figure 1. Block diagram

* Circuit diagram are attached at the end of this manual.

COAX is recommended for an evaluation of the Sound quality.

■ Operation sequence

1) Set up the power supply lines.

Name	Color	Voltage	Comments	Attention
+12V	Red	+12V	For regulator and op-amps.	This jack should be always connected to power supply.
-12V	Blue	-12V	For op-amps.	This jack should be always connected to power supply.
AGND	Black	0V	GND	This jack should be always connected to power supply.

Table 1. Set up of power supply lines

Each supply line should be distributed from the power supply unit.

2) Set-up the parts. (See the followings.)

3) Set-up the DIP switches. (See the followings.)

4) Power on

The AK4482 should be reset once by bringing SW2 (PDN) “L” upon power-up.

■ Evaluation mode

1. DIR (COAX) (default)

It is possible to evaluate the AK4482 by using CD disk. The DIR generates MCLK, BICK, LRCK and SDATA from the received data through RCA connector (J4). Setting of jumper is shown below.

COAX is recommended for an evaluation of the Sound quality.

R13	R14	
OPEN	SHORT	Default

Figure 2. Parts setting, when using DIR

2. DIR (Optical Link)

It is possible to evaluate the AK4482 by using CD disk. The DIR generates MCLK, BICK, LRCK and SDATA from the received data through optical connector (PORT1: TORX147). Setting of jumper is shown below.

R13	R14
SHORT	OPEN

Figure 3. Parts setting, when using DIR

■ DIP Switch setting

[SW1]: AK4118A setting

No.	Pin	OFF	ON	Default
1	OCKS1	AK4118A Master Clock setting Refer to Table 3		H
2	OCKS0			L

Table 2. SW1 setting

The frequency of the master clock output is set by OCKS0 and OCKS1 as shown in Table 3.

OCKS1	OCKS0	MCLK Frequency	
L	L	256fs @fs=88.2/96kHz	
H	L	512fs @32/44.1/48kHz	Default
H	H	128fs @176.4/192kHz	

Table 3. MCLK Clock

■ SW2 setting

[SW2](PDN): Reset of AK4482. Select "H" during operation.

■ External Analog Filter Circuit

The 2nd order LPF (fc=89.5kHz, Q=0.520) which adds differential outputs of the AK4482 is implemented on the board. When the further attenuation of the out-of-band noise is needed, some additional LPF is required. Analog signal is output through BNC connectors on the board. And the output level of the AK4482 is 5.6Vpp@5V.

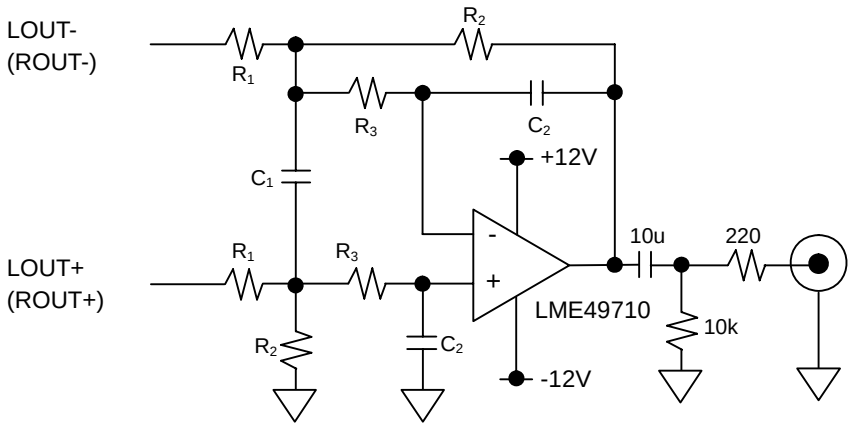


Figure 4. On-board analog filter

R_1	R_2	R_3	C_1	C_2
3.9k	4.7k	150	3300p	680p

Table 4. The value of R, C on this board

fin	20kHz	40kHz	80kHz
Frequency Response	-0.364dB	-1.397dB	-4.767dB

Table 5. Frequency Response of LPF

<Calculation>

$$\text{Amplitude} = 20 \log \frac{K}{\sqrt{[1-(f/fc)^2]^2+[(1/Q)(f/fc)]^2}} \text{ [dB]},$$

$$K = \frac{R_2}{R_1},$$

$$fc = \frac{\omega_0}{2\pi},$$

$$\omega_0 = \frac{1}{\sqrt{2C_1C_2R_2R_3}},$$

$$Q = \frac{2C_1\omega_0}{\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}}.$$

AK4482 Control Soft Manual

■ Evaluation Board and Control Soft Settings

1. Set an evaluation board properly.
2. Connect the evaluation board to an IBM PC/AT compatible PC by a 10wire flat cable. Be aware of the direction of the 10pin header. When running this control soft on the Windows 2000/XP, the driver which is included in the CD must be installed. Refer to the "Driver Control Install Manual for AKM Device Control Software" for installing the driver. When running this control soft on the windows 95/98/ME, driver installing is not necessary. This control soft does not support the Windows NT.
3. Then please evaluate according to the following descriptions.

■ Operation Screen

1. Start up the control program following the process above.
2. The operation screen is shown below.

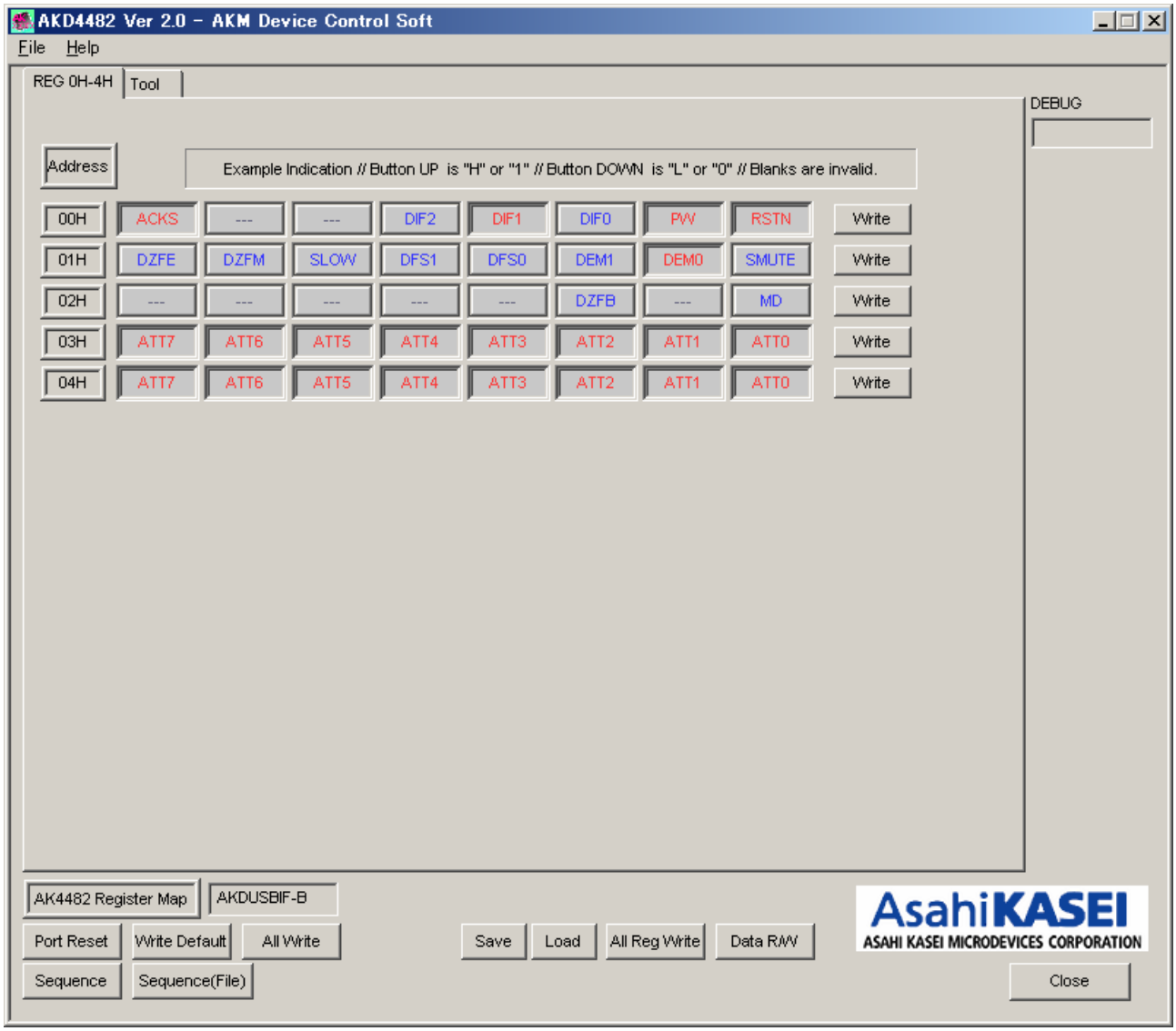


Figure 5. Window of Control Soft

■ Operation Overview

Function, register map and testing tool can be controlled by this control soft. These controls are selected by upper tabs.

Buttons which are frequently used such as register initializing button “Write Default”, are located outside of the switching tab window. Refer to the “■ Dialog Boxes” for details of each dialog box setting.

1. [Port Reset]: For when connecting to USB I/F board (AKDUSBIF-A)
   Click this button after the control soft starts up when connecting USB I/F board (AKDUSBIF-A).

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

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

4. [Save]: Saving current register settings to a file.

5. [Load]: Executing data write from a saved file.

6. [All Reg Write]: “All Reg Write” dialog box is popped up.

7. [Data R/W]: “Data R/W” dialog box is popped up.

8. [Sequence]: “Sequence” dialog box is popped up.

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

1. [REG]: Register Map

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)

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

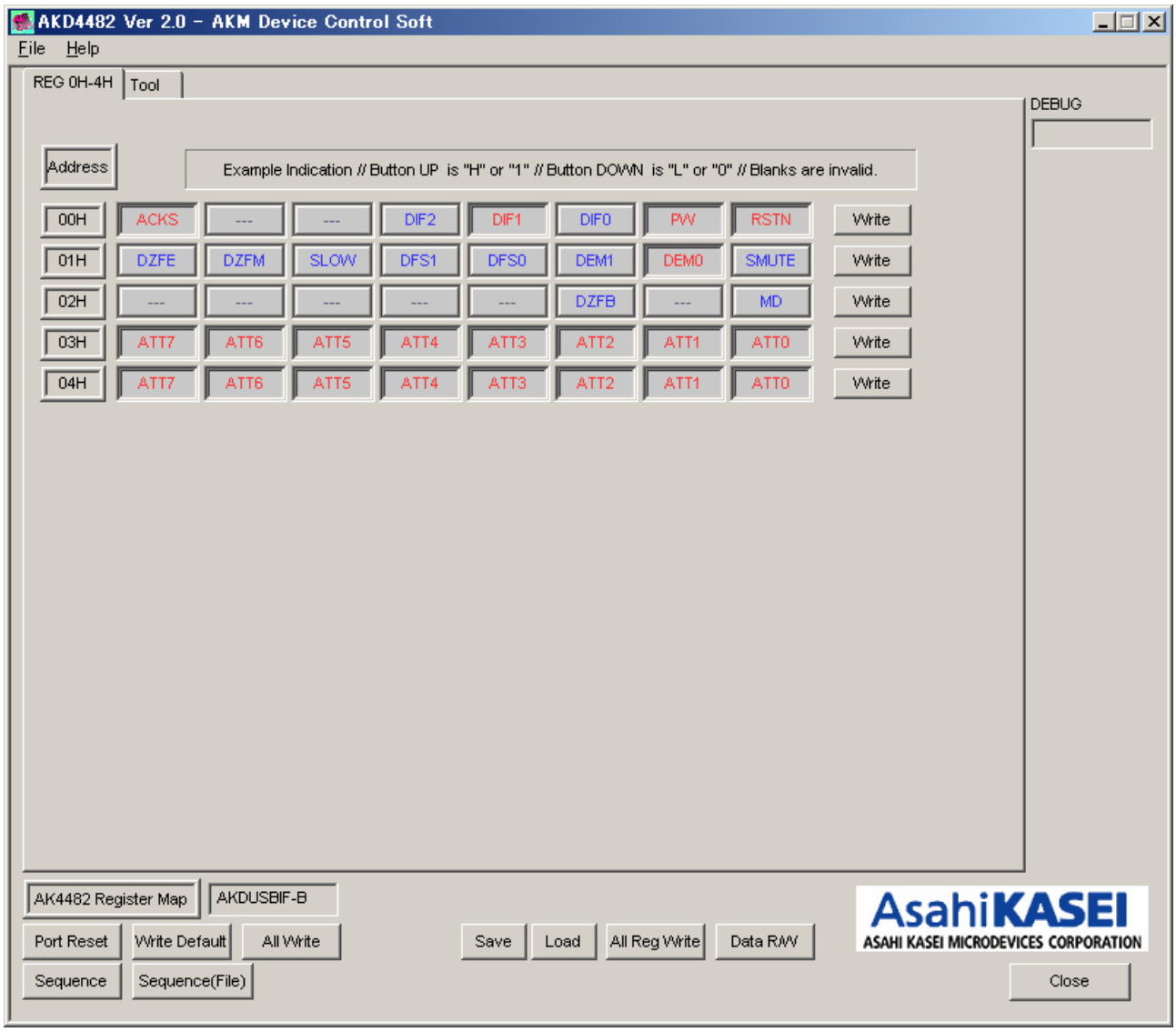


Figure 6.Window of [REG]

[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.

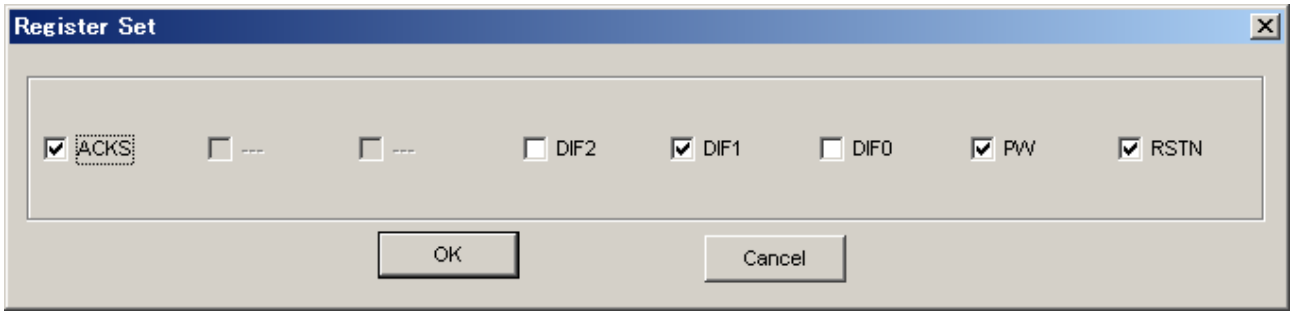


Figure 7. Window of [Register Set]

2. [Tool]: Testing Tools

This tab screen is for evaluation testing tool.
Click buttons for each testing tool.

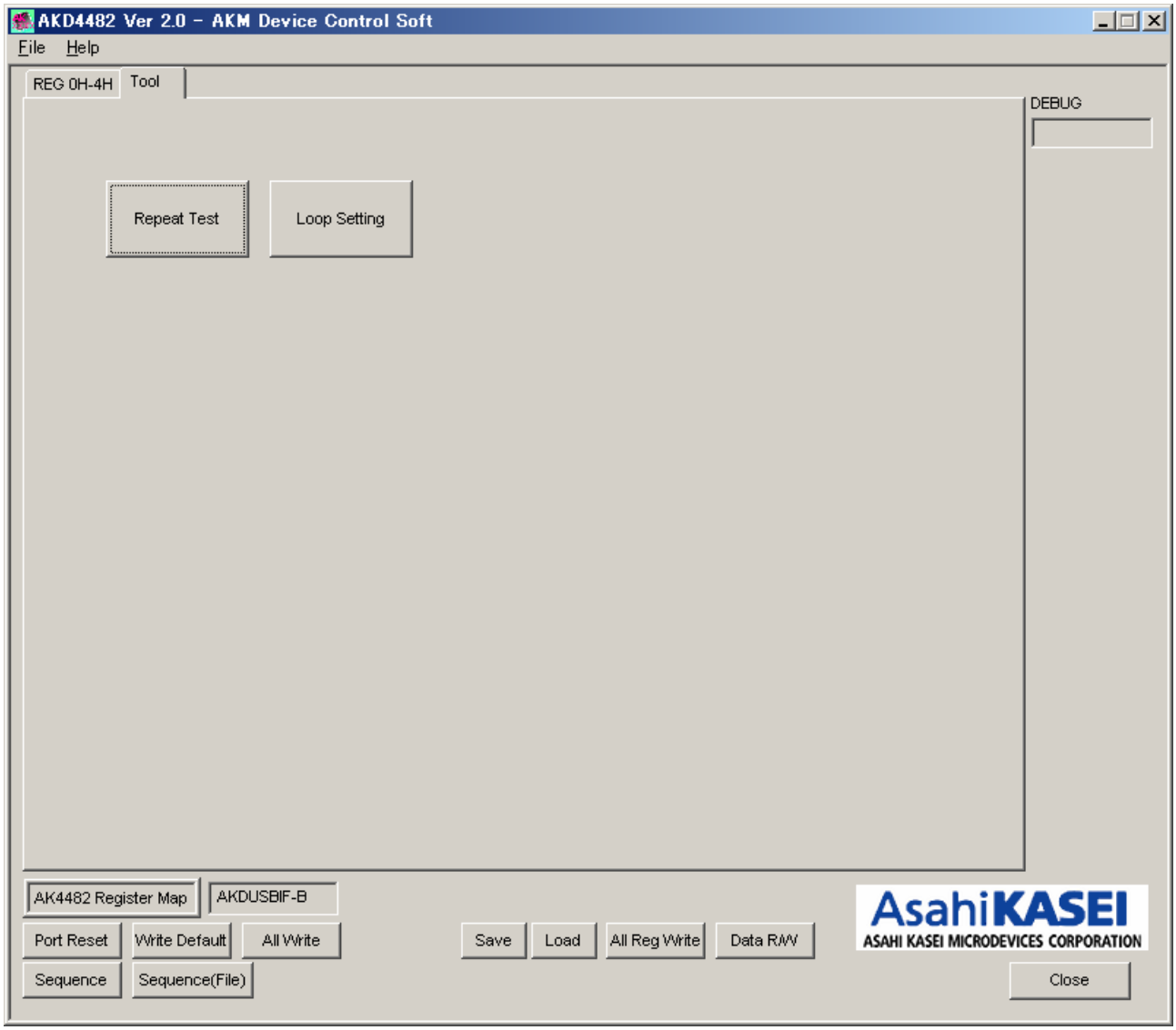


Figure 8.Window of [Tool]

■ Dialog Boxes

1. [All Reg Write]: All Reg Write dialog box

Click [All Reg Write] button in the main window to open register setting files.
Register setting files saved by [SAVE] button can be applied.

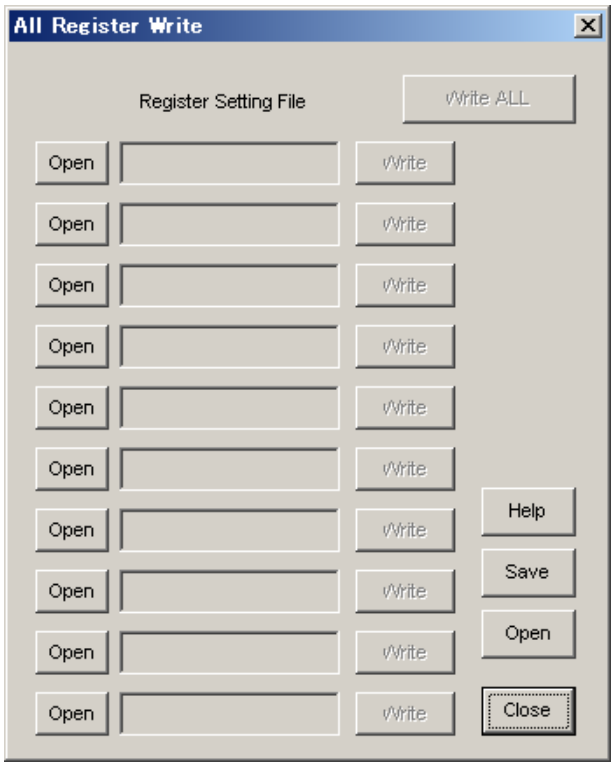


Figure 9. Window of [All Reg Write]

[Open (left)]	: Selecting a register setting file (*.akr).
[Write]	: Executing register writing.
[Write All]	: Executing all register writings. Writings are executed in descending order.
[Help]	: Help window is popped up.
[Save]	: Saving the register setting file assignment. The file name is "*.mar".
[Open (right)]	: Opening a saved register setting file assignment "*. mar".
[Close]	: Closing the dialog box and finish the process.

*Operating Suggestions

(1) Those files saved by [Save] button and opened by [Open] button on the right of the dialog "*.mar" should be stored in the same folder.

(2) When register settings are changed by [Save] button in the main window, re-read the file to reflect new register settings.

2. [Data R/W]: Data R/W Dialog Box

Click the [Data R/W] button in the main window for data read/write dialog box.
Data write is available to specified address.

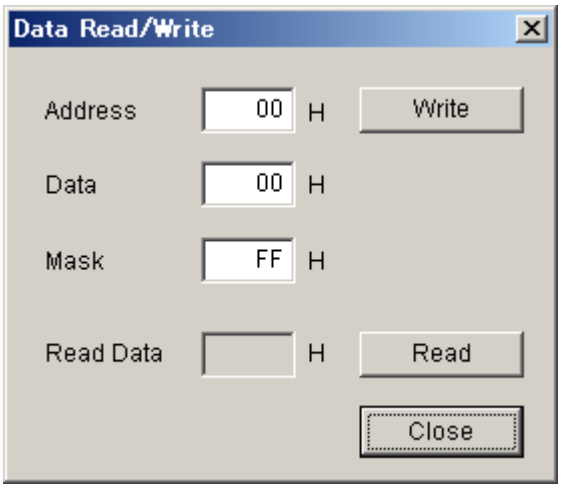


Figure 10. Window of [Data R/W]

Address Box: Input data address in hexadecimal numbers for data writing.
Data Box: Input data in hexadecimal numbers.
Mask Box: Input mask data in hexadecimal numbers.
This is "AND" processed input data.

[Write]: Writing to the address specified by "Address" box.

[Read]: Reading from the address specified by "Address" box.
The result will be shown in the Read Data Box in hexadecimal numbers.
(AKD4482-SA does not support READ function)

[Close]: Closing the dialog box and finish the process.
Data writing can be cancelled by this button instead of [Write] button.

3. [Sequence]: Sequence Dialog Box

Click [Sequence] button to open register sequence setting dialog box.
Register sequence can be set in this dialog box.

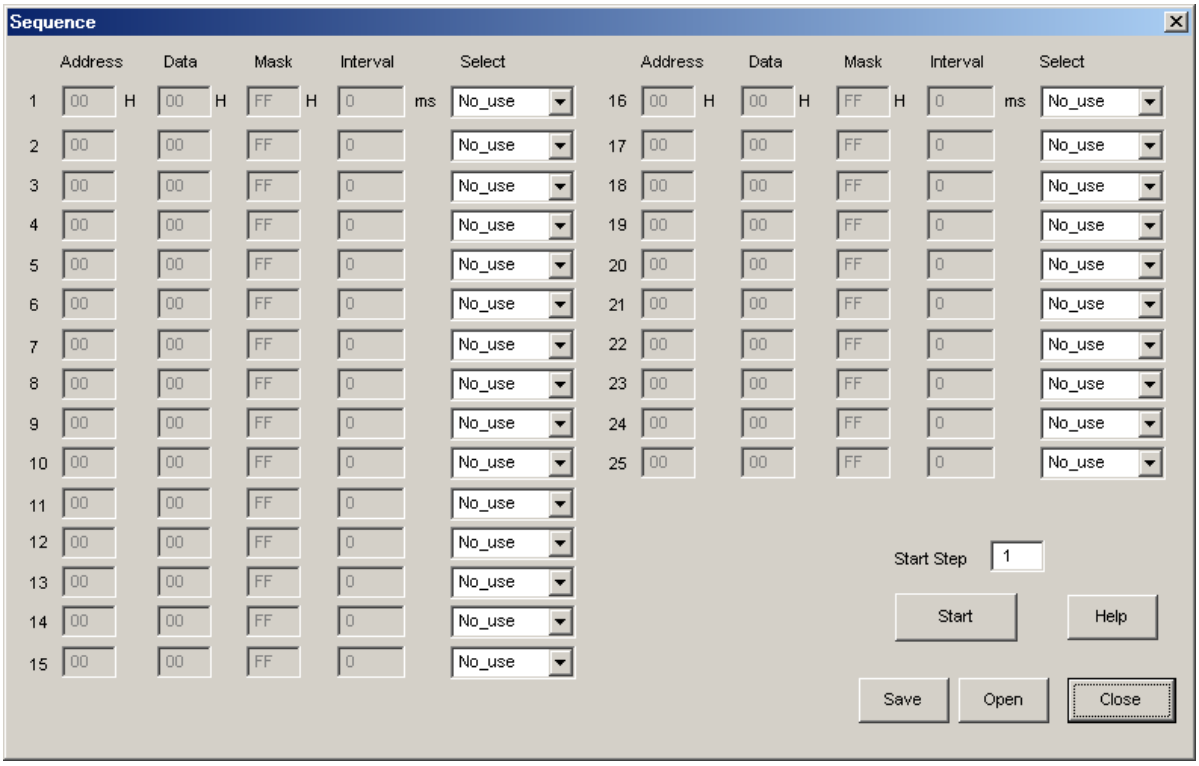


Figure 11. Window of [Sequence]

Sequence Setting

Set register sequence by following process bellow.

(1) Select a command
Use [Select] pull-down box to choose commands.
Corresponding boxes will be valid.
< Select Pull-down menu >
- No_use : Not using this address
- Register : Register writing
- Reg(Mask) : Register writing (Masked)
- Interval : Taking an interval
- Stop : Pausing the sequence
- End : Finishing the sequence

(2) Input sequence

[Address] : Data address
[Data] : Writing data
[Mask] : Mask
[Data] box data is ANDed with [Mask] box data. This is the actual writing data.
When Mask = 0x00, current setting is hold.
When Mask = 0xFF, the 8bit data which is set in the [Data] box is written.
When Mask =0x0F, lower 4bit data which is set in the [Data] box is written.
Upper 4bit is hold to current setting.
[Interval] : Interval time
Valid boxes for each process command are shown bellow.
· No_use : None
· Register : [Address], [Data], [Interval]
· Reg(Mask) : [Address], [Data], [Mask], [Interval]
· Interval : [Interval]
· Stop : None
· End : None

Control Buttons

The function of Control Button is shown bellow.

[Start] : Executing the sequence
[Help] : Opening a help window
[Save] : Saving sequence settings as a file. The file name is "*.aks".
[Open] : Opening a sequence setting file "*.aks".
[Close] : Closing the dialog box and finish the process.

Stop of the sequence

When "Stop" is selected in the sequence, processing is paused and it starts again when [Start] button is clicked. Restarting step number is shown in the "Start Step" box. When finishing the process until the end of sequence, "Start Step" will return to "1".

The sequence can be started from any step by writing the step number to the "Start Step" box.
Write "1" to the "Start Step" box and click [Start] button, when restarting the process from the beginning.

4. [Sequence(File)]: Sequence Setting File Dialog Box

Click [Sequence(File)] button to open sequence setting file dialog box.
Those files saved in the "Sequence setting dialog" can be applied in this dialog.

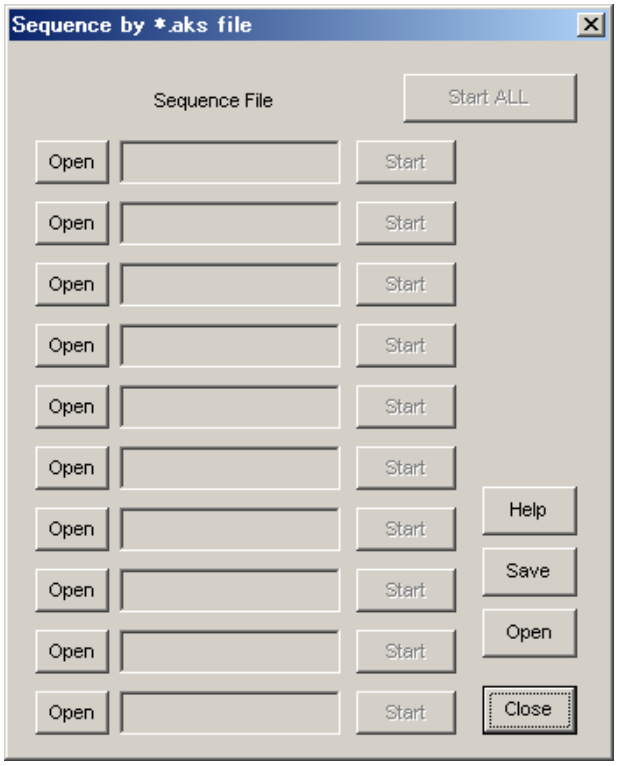


Figure 12. Window of [Sequence(File)]

[Open (left)] : Opening a sequence setting file (*.aks).
[Start] : Executing the sequence setting.
[Start All] : Executing all sequence settings.
Sequences are executed in descending order.
[Help] : Pop up the help window.
[Save] : Saving sequence setting file assignment. The file name is "*.mas".
[Open(right)] : Opening a saved sequence setting file assignment "*. mas".
[Close] : Closing the dialog box and finish the process.

*Operating Suggestions

(1) Those files saved by [Save] button and opened by [Open] button on the right of the dialog "*.mas" should be stored in the same folder.
(2) When "Stop" is selected in the sequence the process will be paused and a pop-up message will appear. Click "OK" to continue the process.

Figure 13.Window of [Sequence Pause]

Measurement Results

[Measurement condition]

- Measurement unit : Audio Precision System two Cascade (AP2)
- MCLK : 512fs (44.1kHz), 256fs (96kHz), 128fs (192kHz)
- BICK : 64fs
- fs : 44.1kHz, 96kHz, 192kHz
- Bit : 24bit
- Power Supply : VDD=5V
- Interface : Internal DIR (44.1kHz, 96kHz, 192kHz)
- Temperature : Room

fs=44.1kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	20kLPF	100.6	100.1
DR	1kHz, -60dB	22kLPF, A-weighted	109.5	109.5
S/N	"0" data	22kLPF, A-weighted	110.6	110.6

fs=96kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	40kLPF	100.3	99.6
DR	1kHz, -60dB	40kLPF	106.4	106.3
		22kLPF, A-weighted	110.9	110.5
S/N	"0" data	40kLPF	108.1	108.1
		22kLPF, A-weighted	110.9	110.9

fs=192kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	40kLPF	99.7	98.7
DR	1kHz, -60dB	40kLPF	107.6	107.5
		22kLPF, A-weighted	110.4	110.3
S/N	"0" data	40kLPF	107.5	107.5
		22kLPF, A-weighted	110.4	110.4

Plots

(fs=44.1kHz)

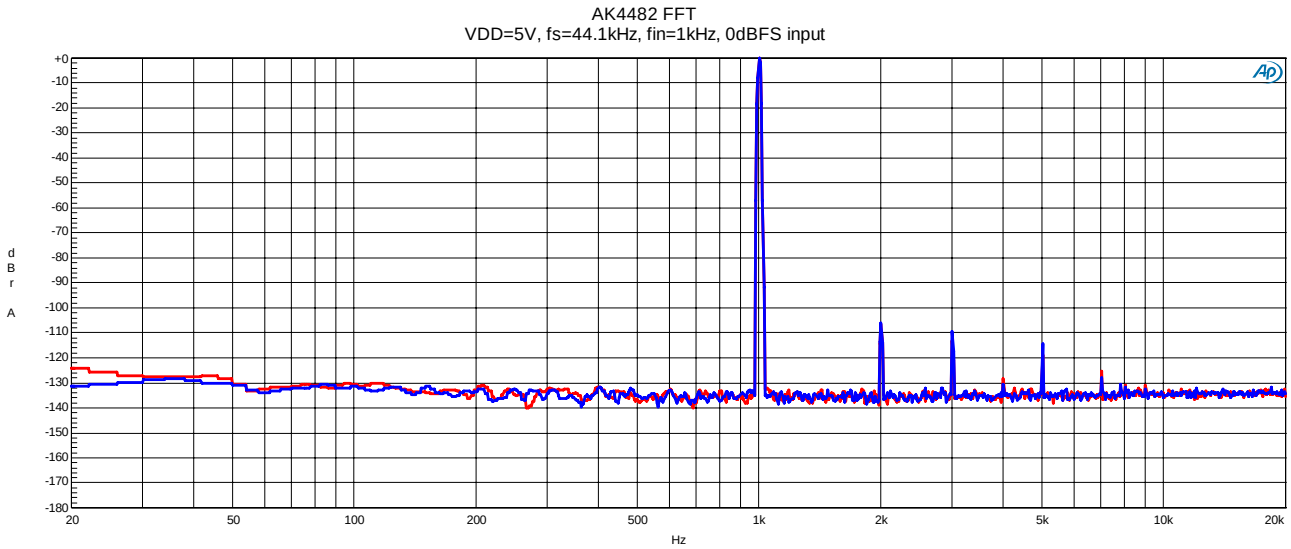


Figure 14. FFT (fin=1kHz, 0dBFS input)

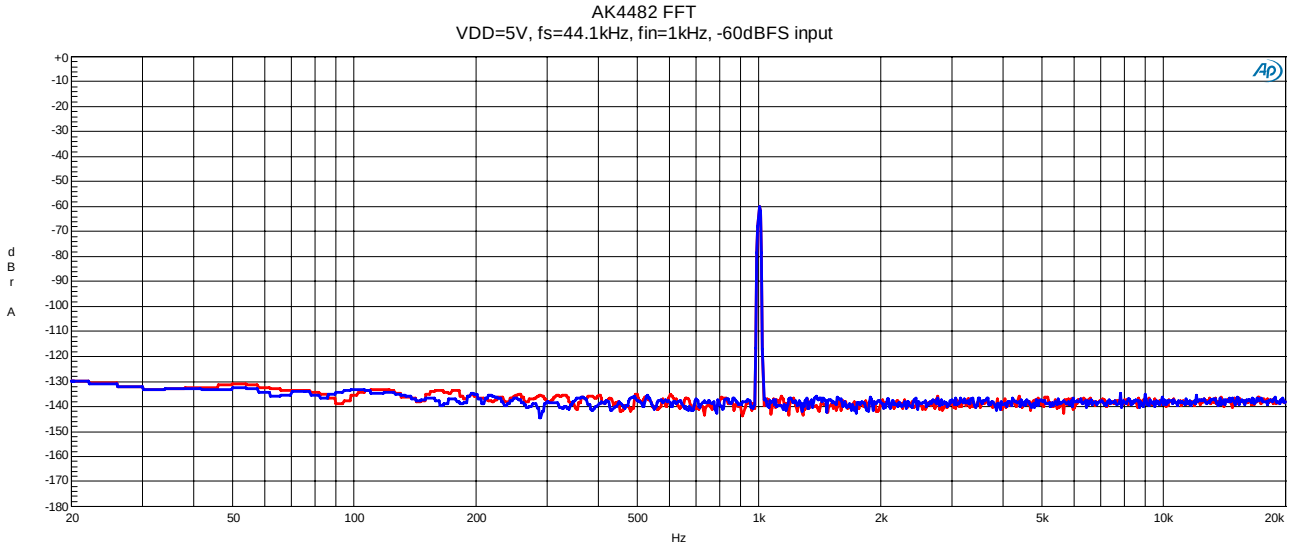


Figure 15. FFT (fin=1kHz, -60dBFS input)

(fs=44.1kHz)

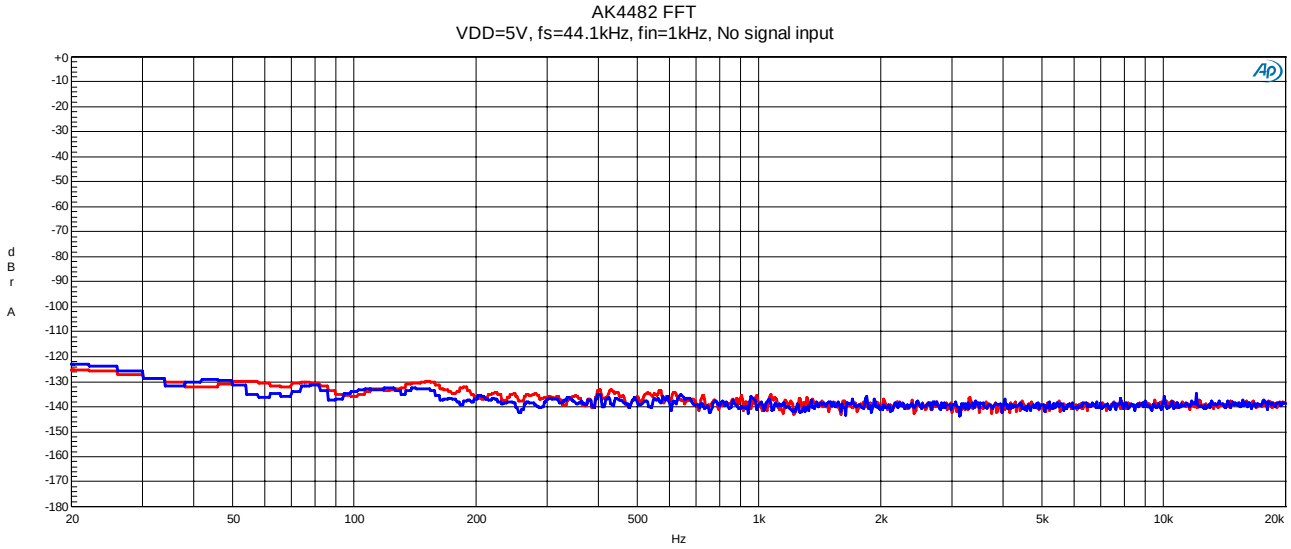


Figure 16. FFT (Noise Floor)

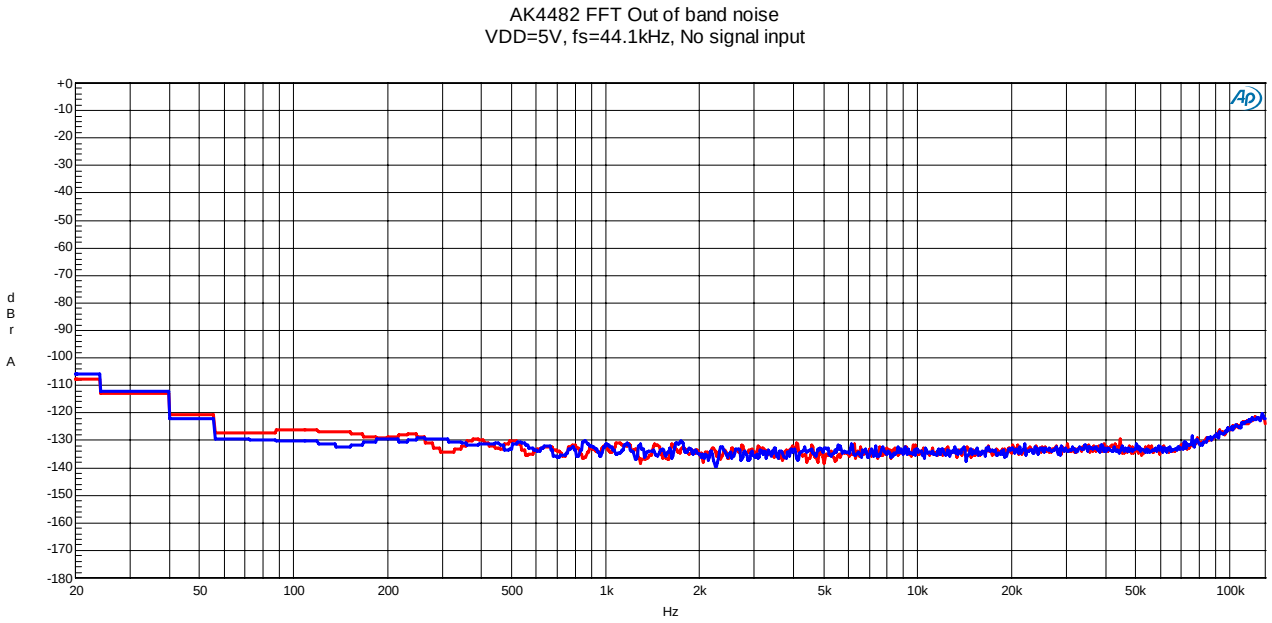


Figure 17. FFT (Out of band noise)

(fs=44.1kHz)

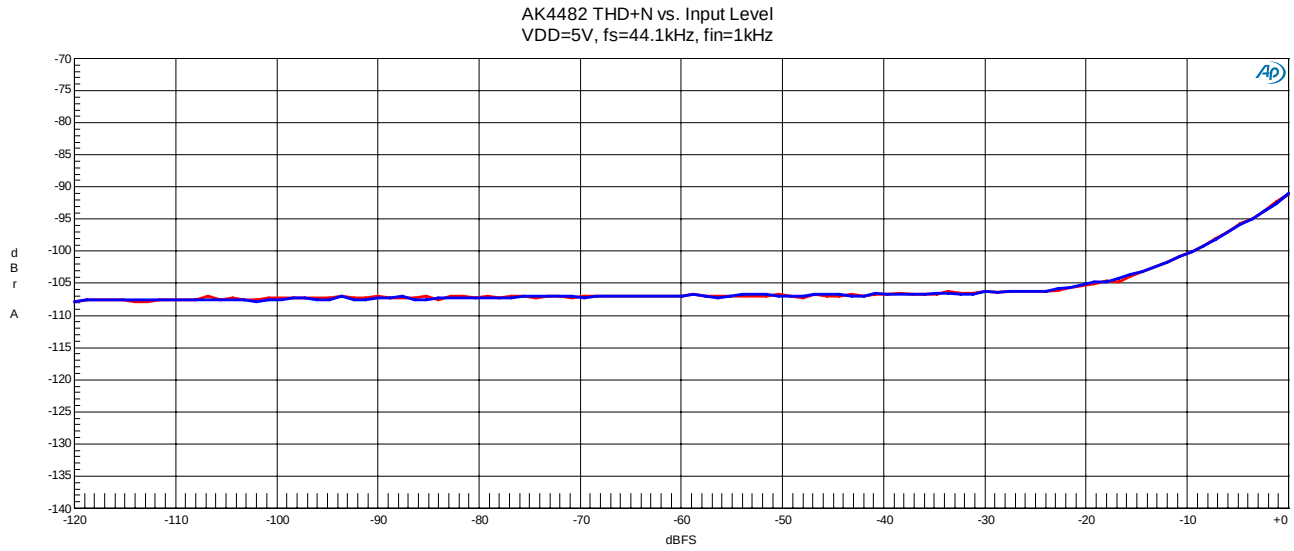


Figure 18 . THD+N vs. Input level (fin=1kHz)

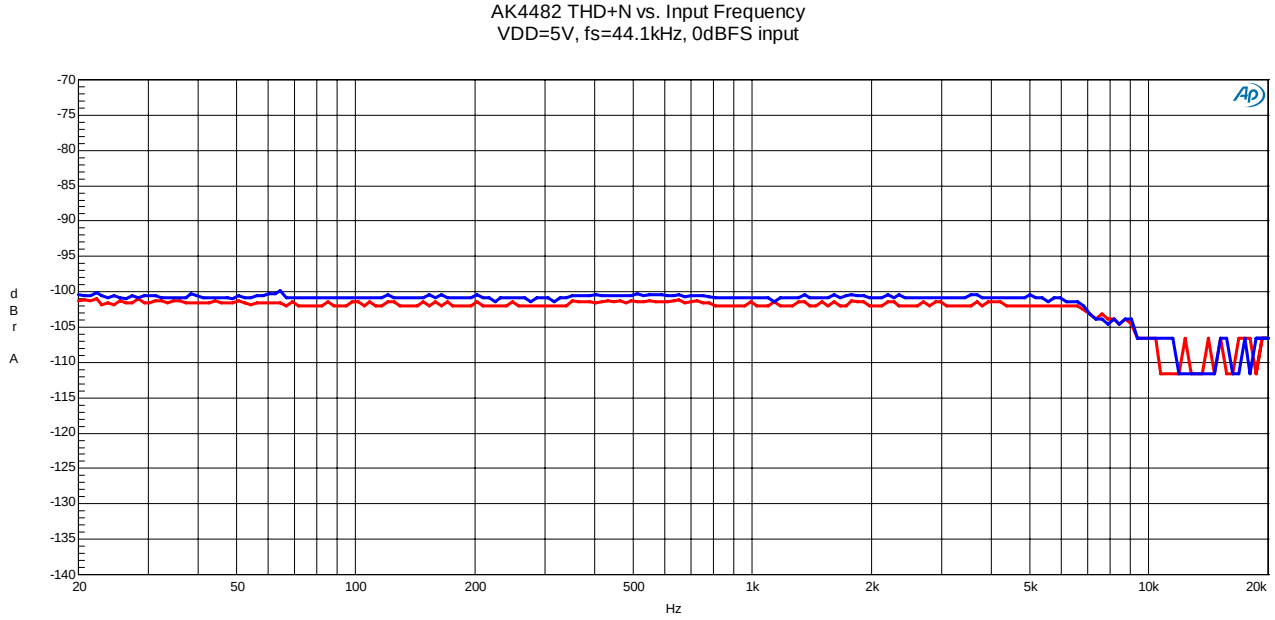


Figure 19 . THD+N vs. Input Frequency (0dBFS input)

(fs=44.1kHz)

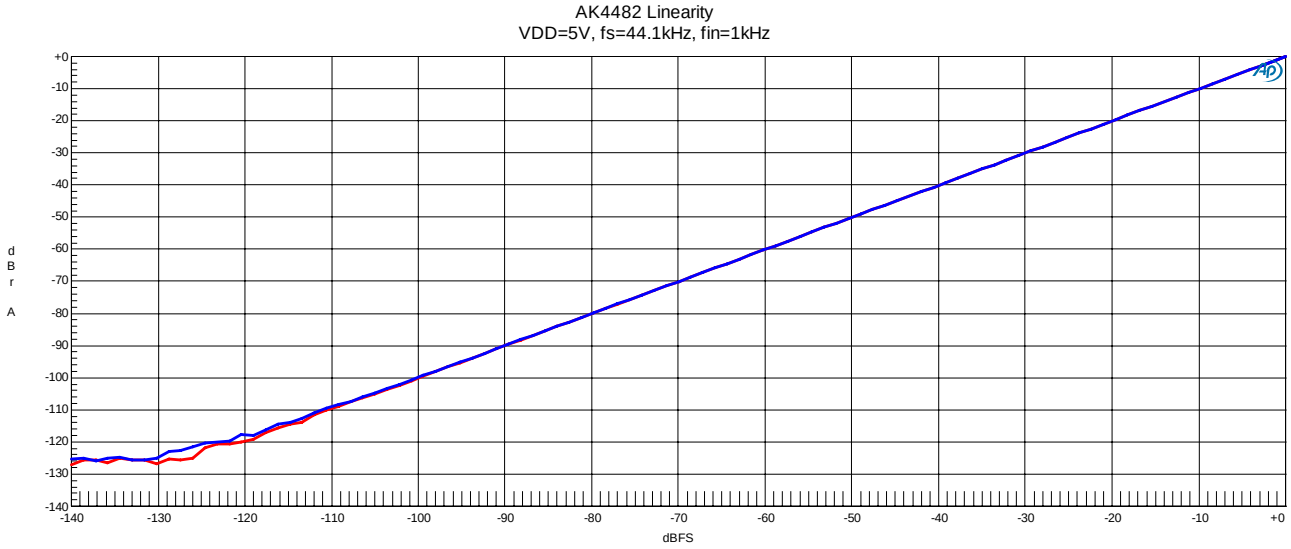


Figure 20. Linearity (fin=1kHz)

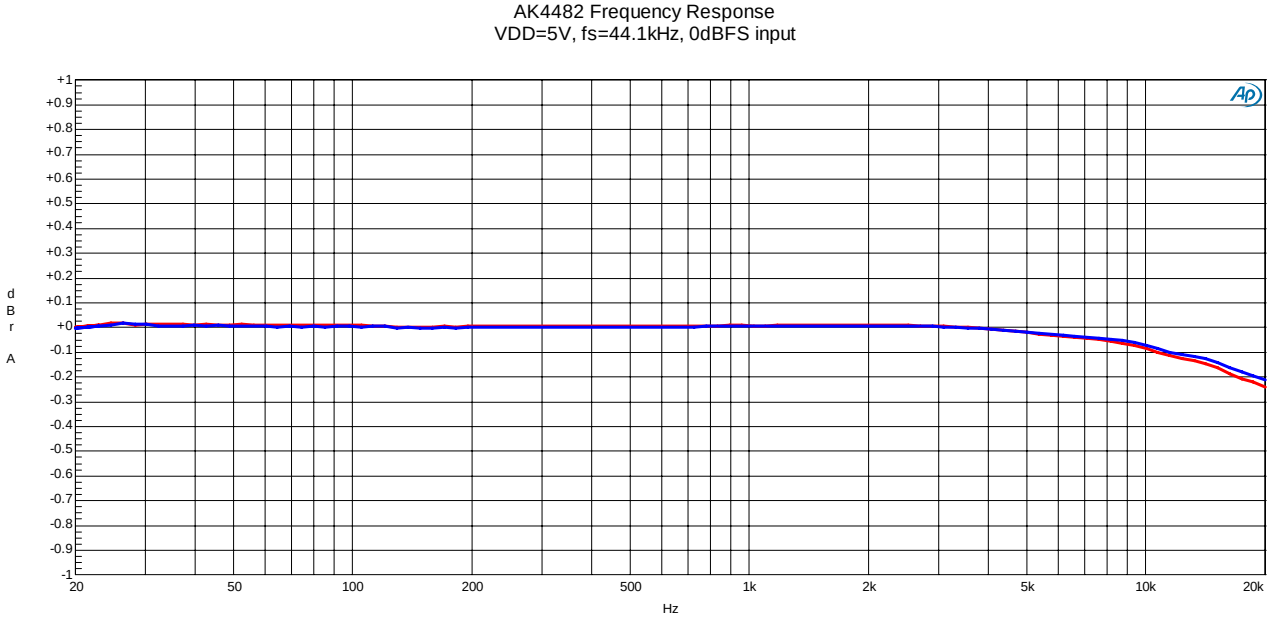


Figure 21. Frequency Response AOUTL+/-pin ／ AOUTR+/- pin (0dBFS input)

(fs=44.1kHz)

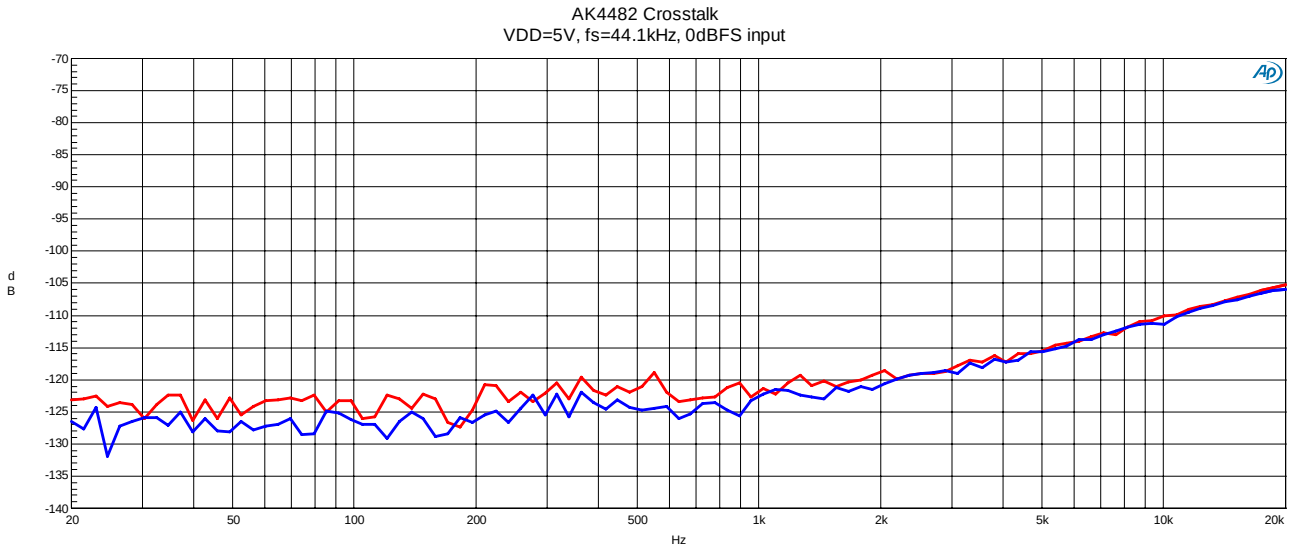


Figure 22. Crosstalk (0dBFS input)

(fs=96kHz)

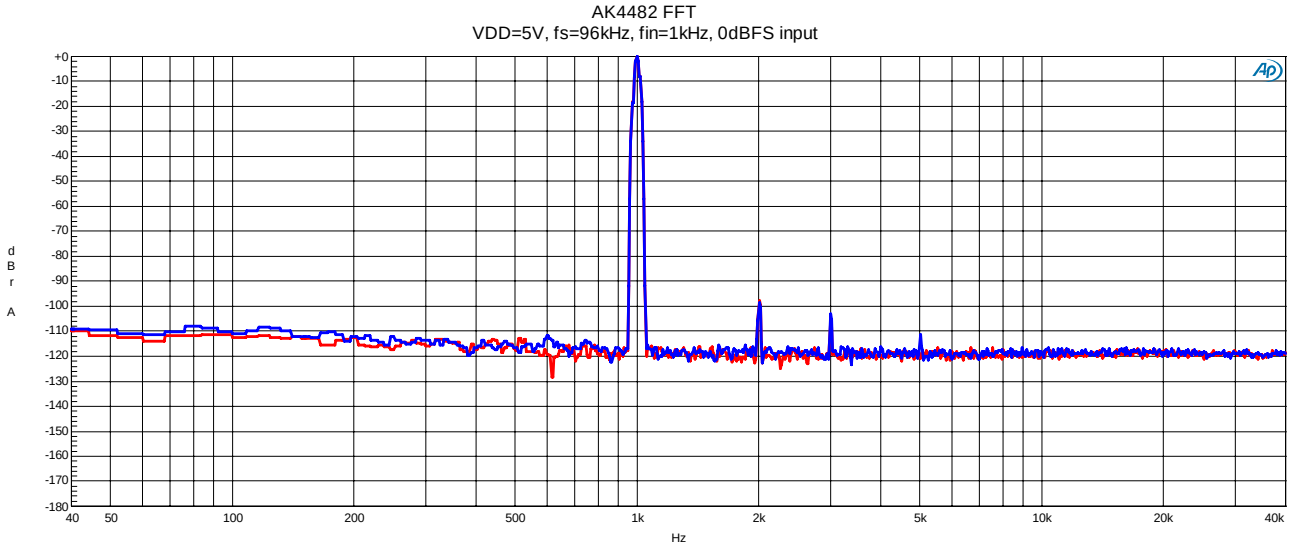


Figure 23. FFT (fin=1kHz, 0dBFS input)

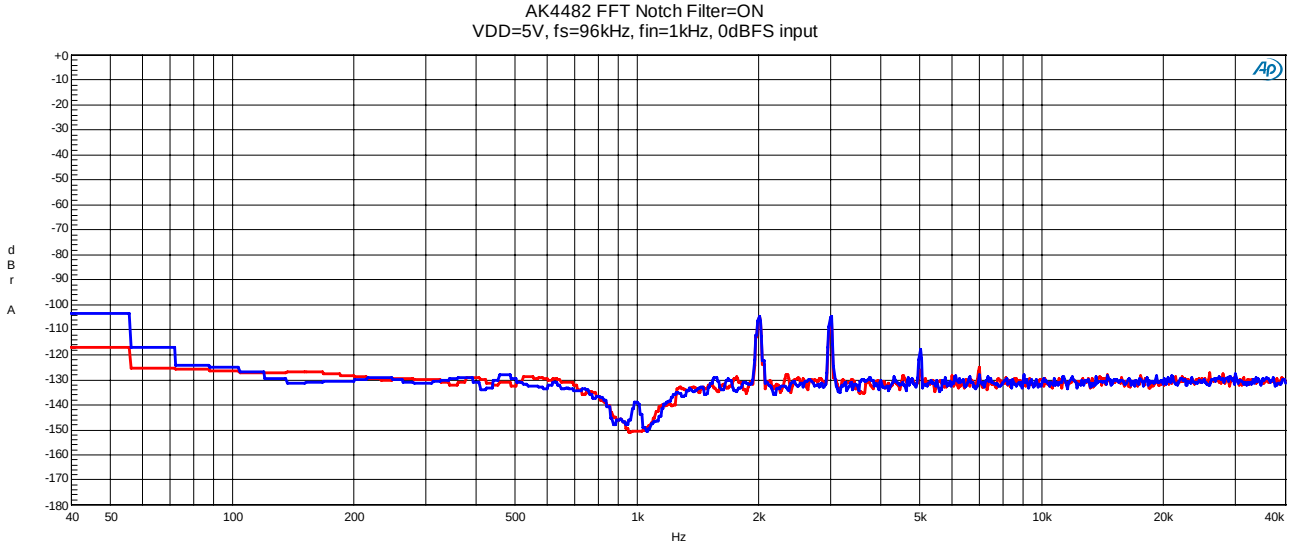


Figure 24. FFT(fin=1kHz, 0dBFS input, Notch)

(fs=96kHz)

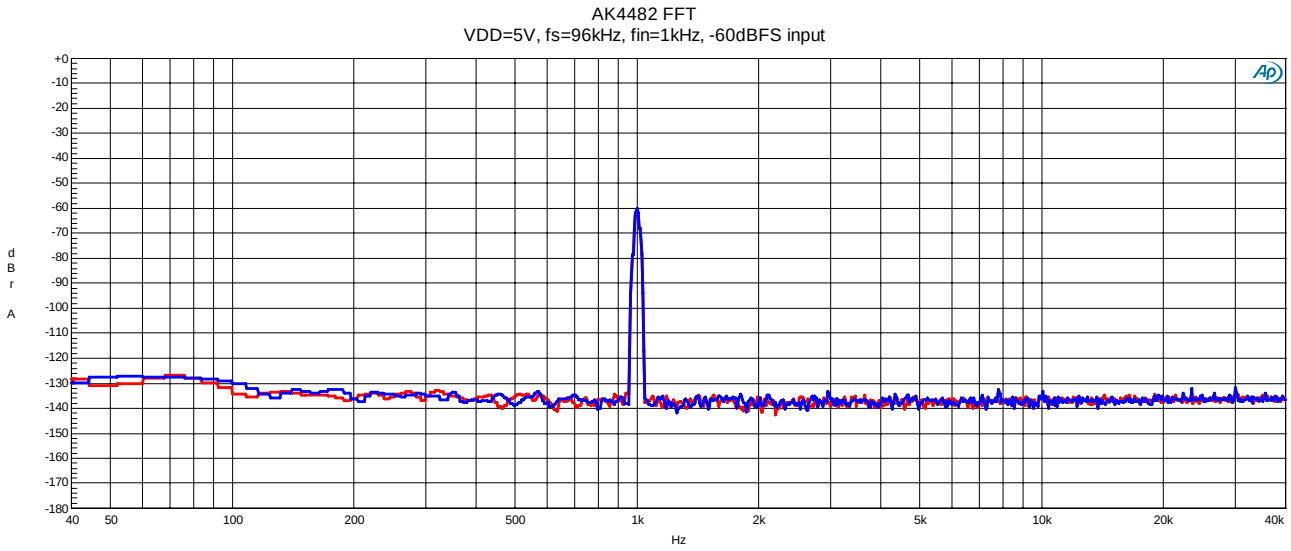


Figure 25. FFT (fin=1kHz, -60dBFS input)

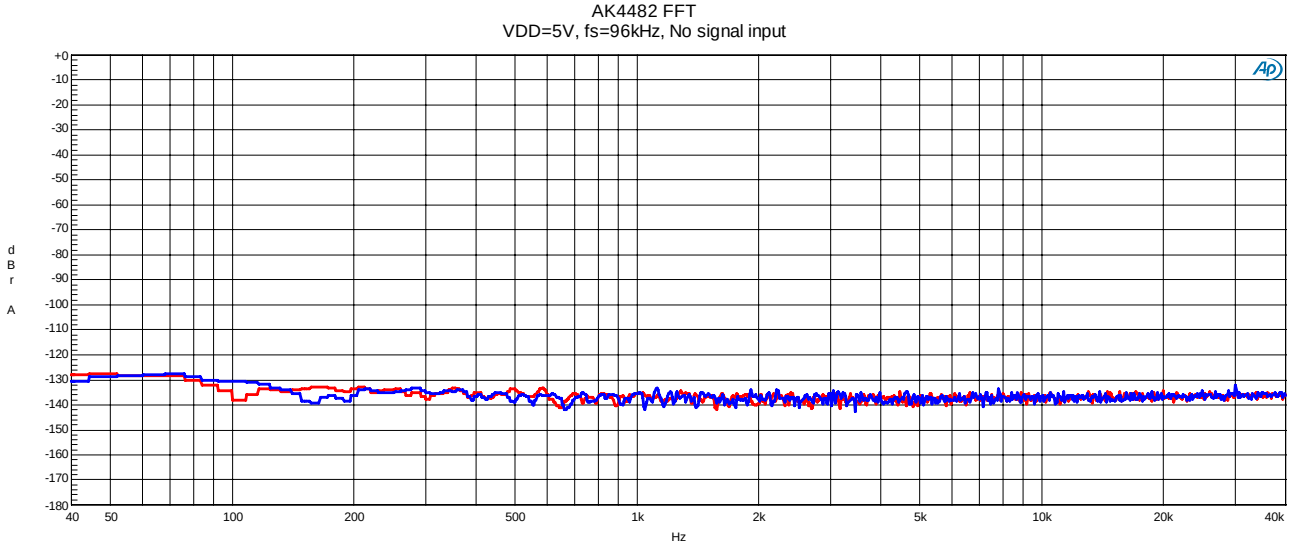


Figure 26. FFT (Noise Floor)

(fs=96kHz)

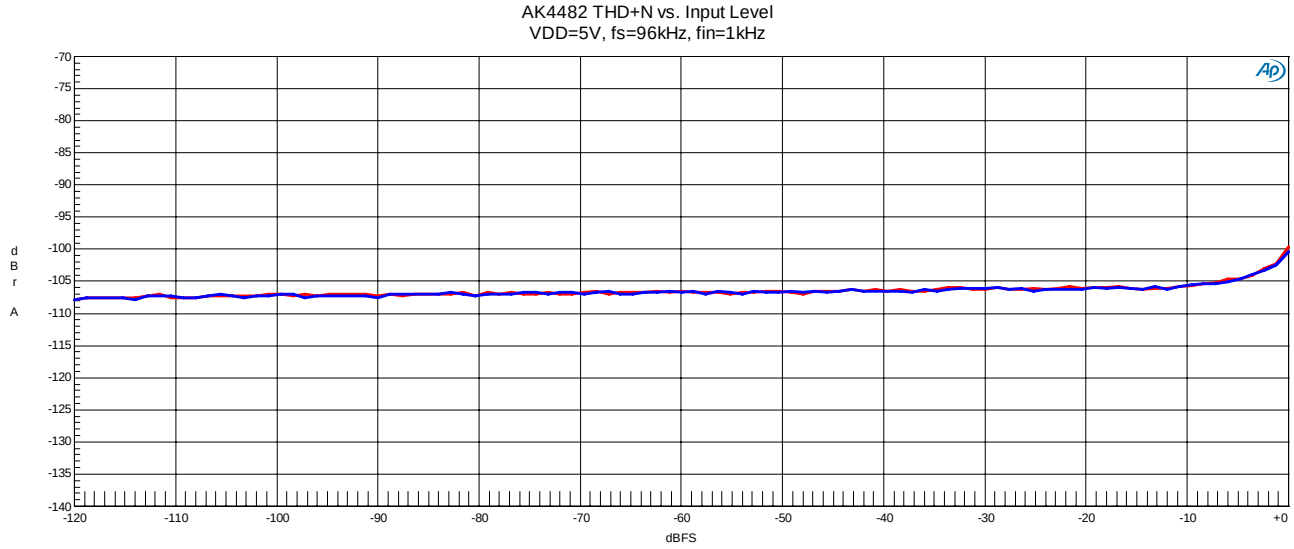


Figure 27. THD+N vs. Input level (fin=1kHz)

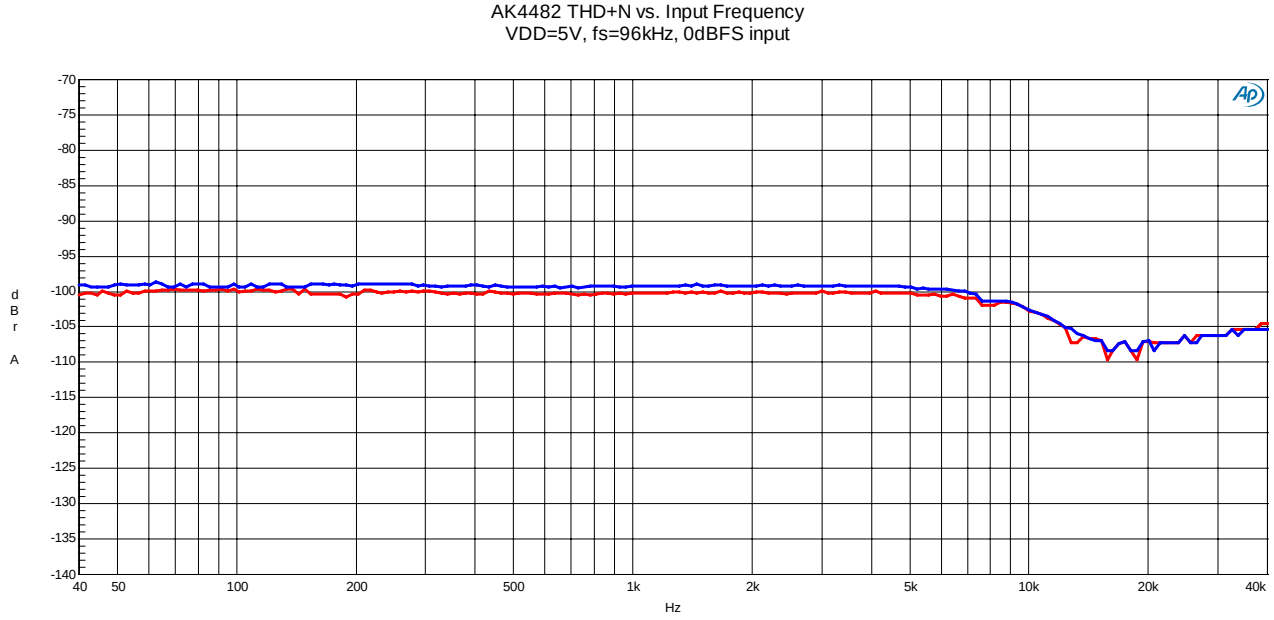


Figure 28. THD+N vs. Input Frequency (0dBFS input)

(fs=96kHz)

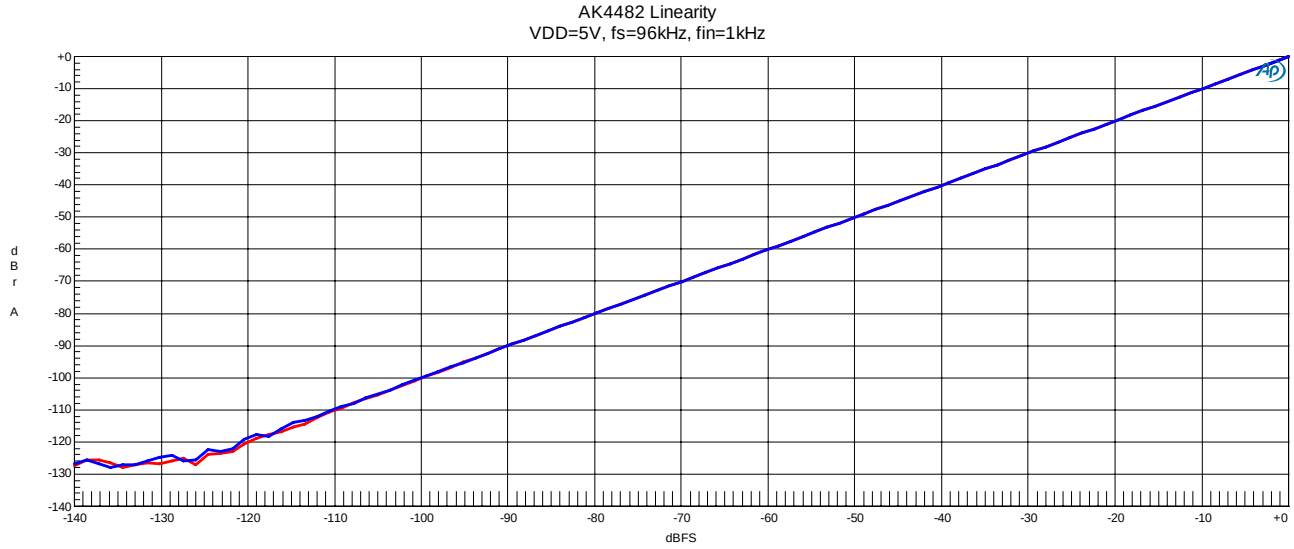


Figure 29. Linearity (fin=1kHz)

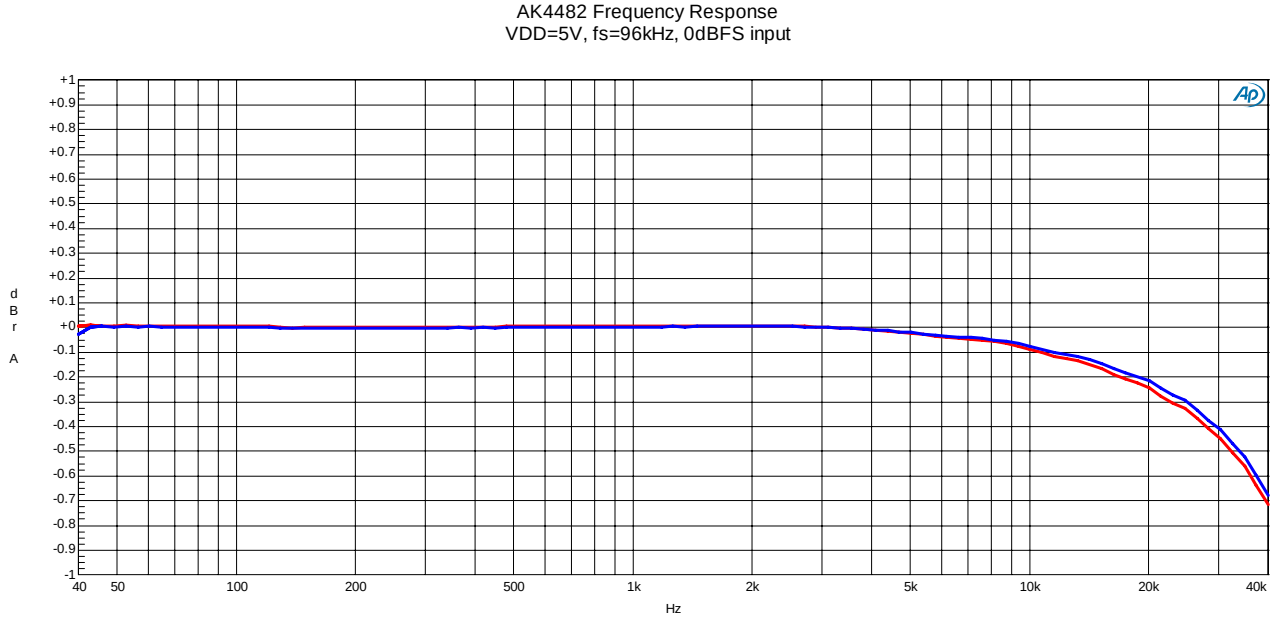


Figure 30. Frequency Response AOUTL+/-pin ／ AOUTR+/- pin (0dBFS input)

(fs=96kHz)

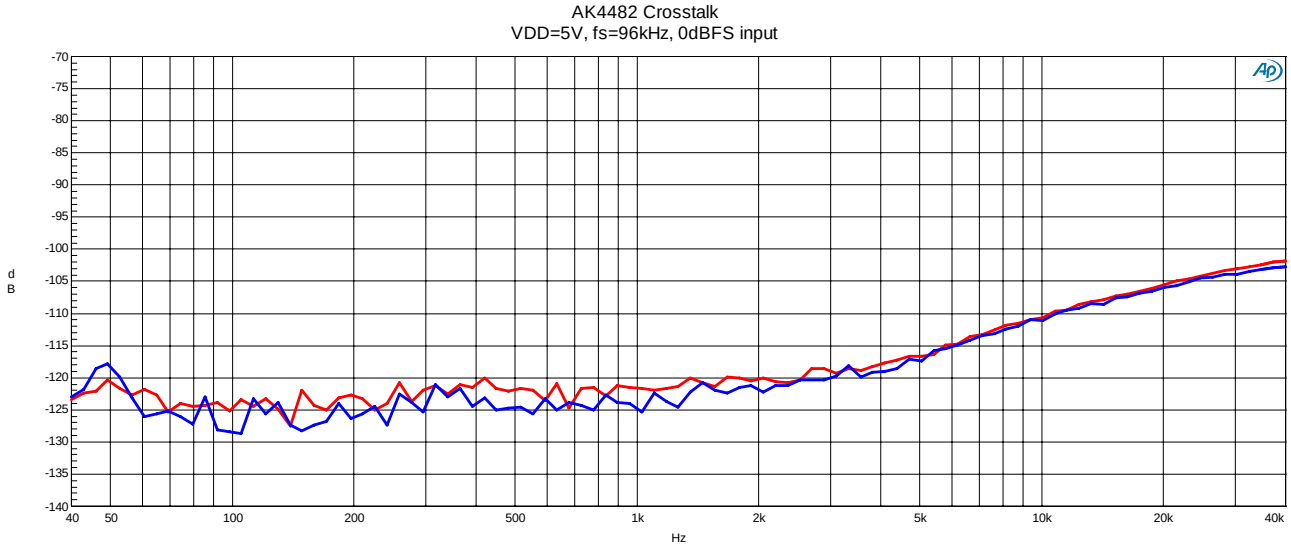


Figure 31. Crosstalk (0dBFS input)

(fs=192kHz)

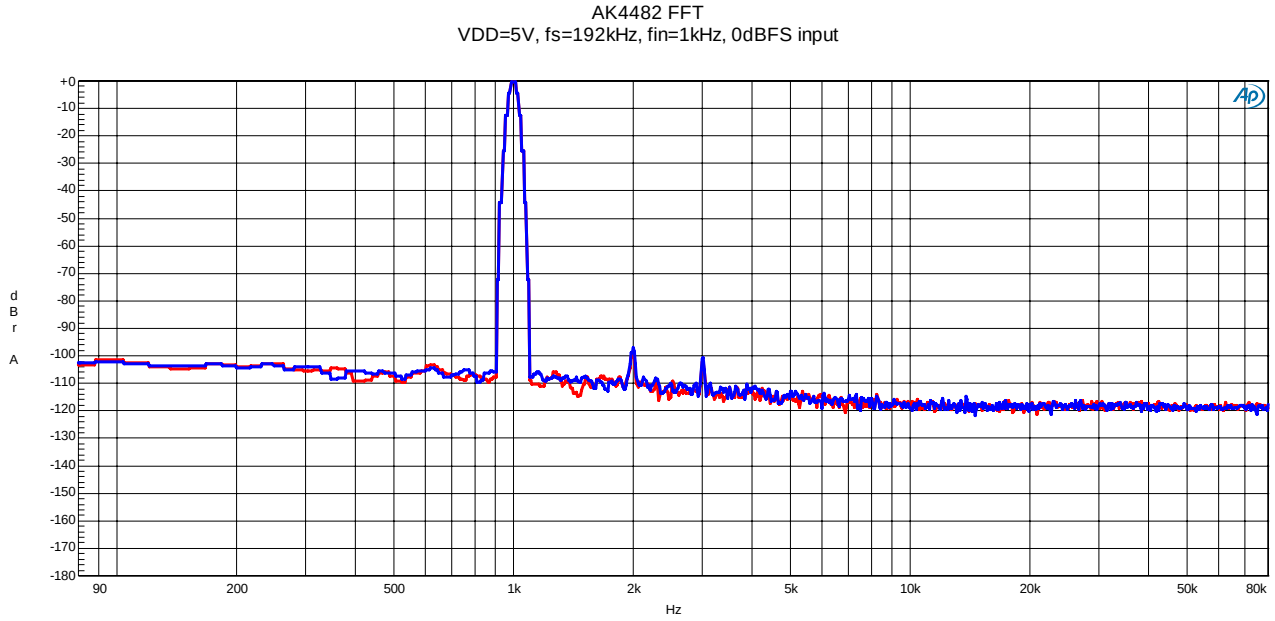


Figure 32. FFT (fin=1kHz, 0dBFS input)

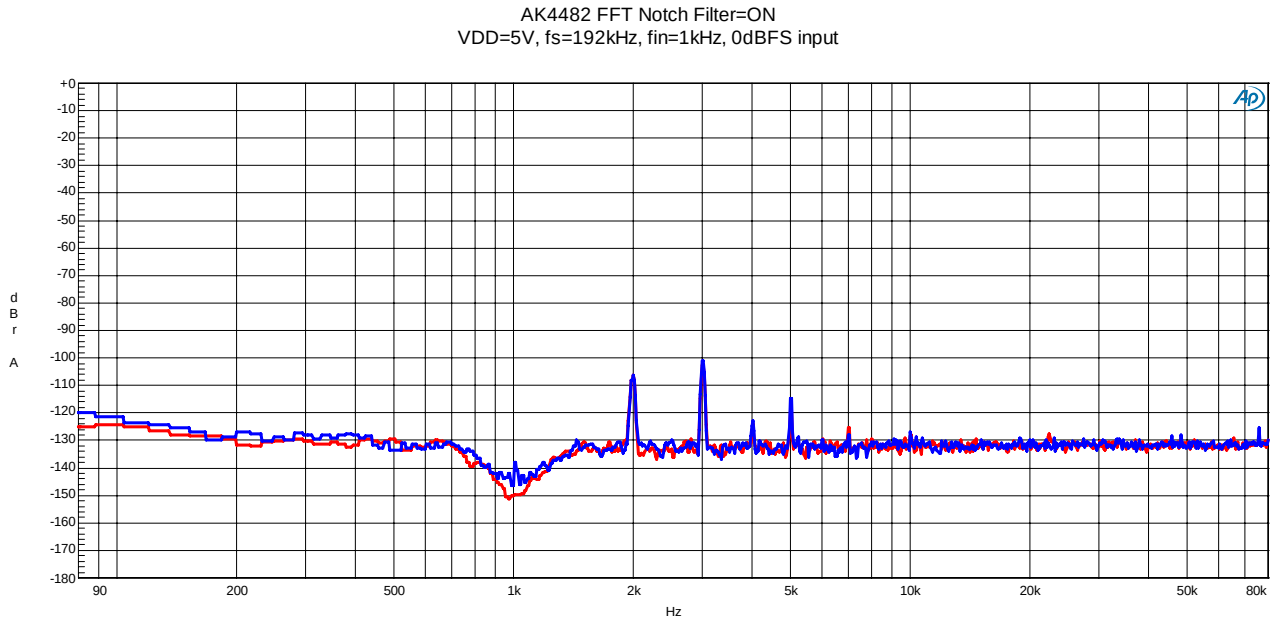


Figure 33. FFT(fin=1kHz, 0dBFS input, Notch)

(fs=192kHz)

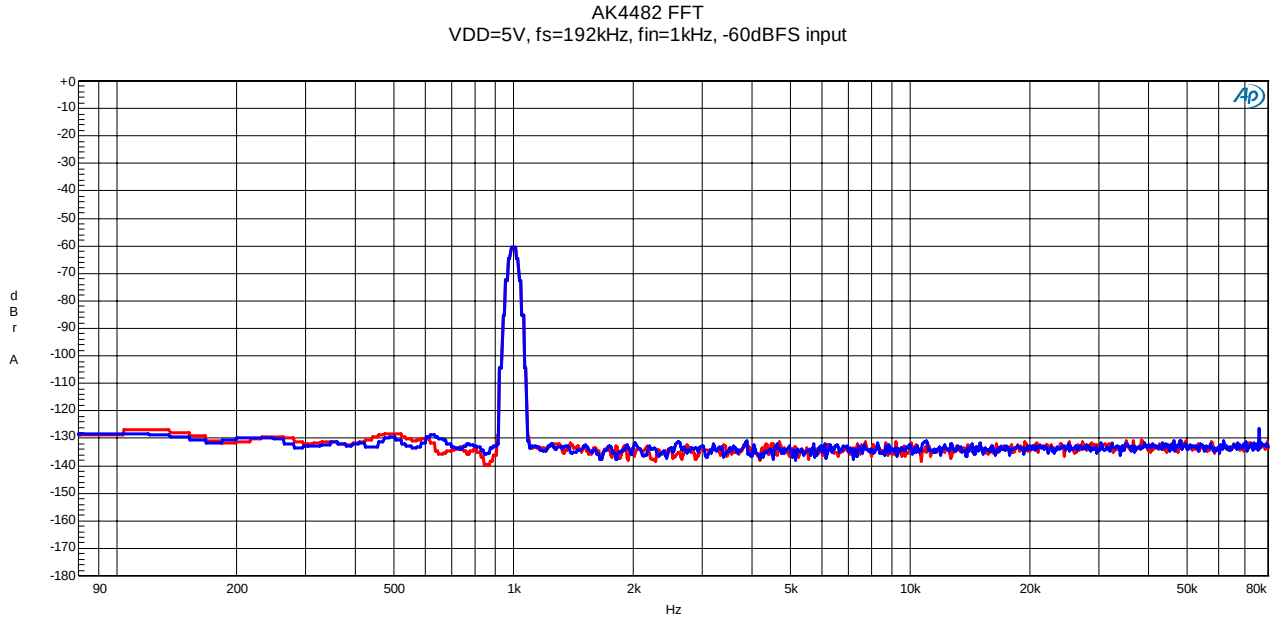


Figure 34. FFT (fin=1kHz, -60dBFS input)

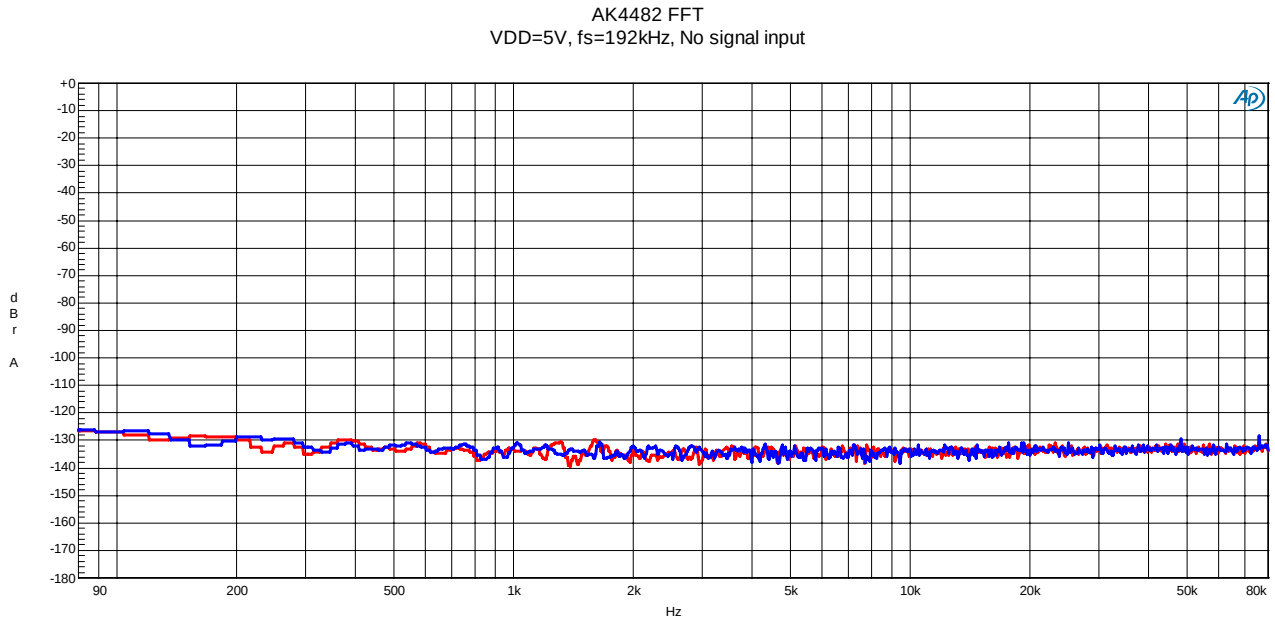


Figure 35. FFT (Noise Floor)

(fs=192kHz)

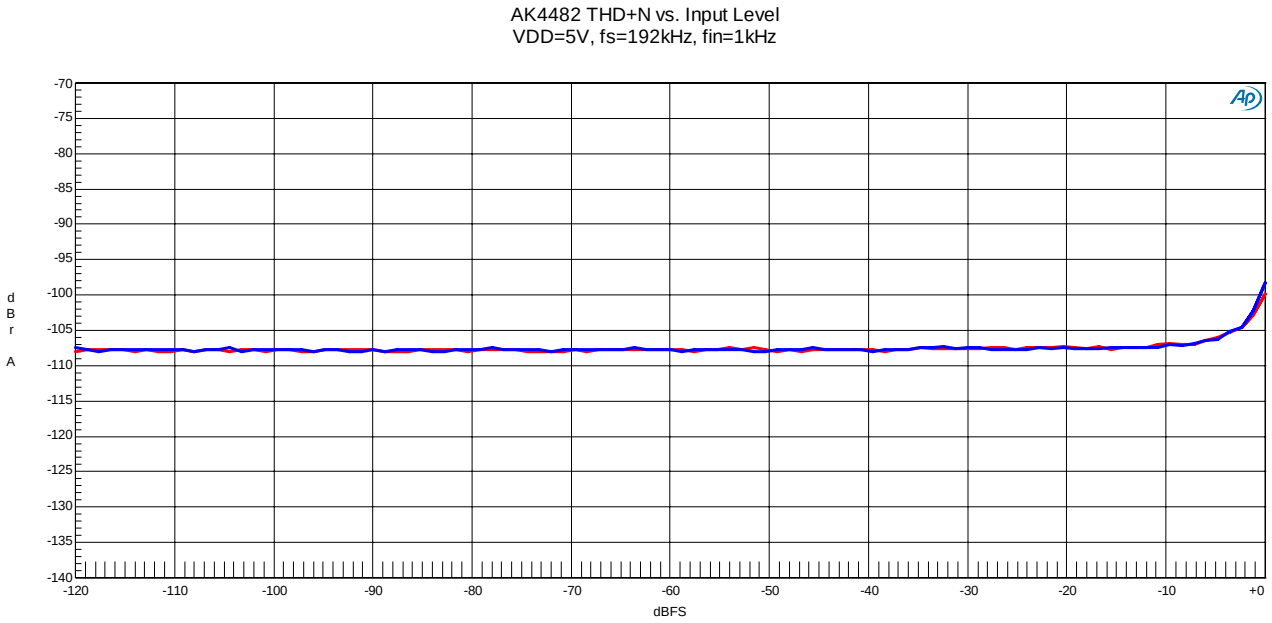


Figure 36. THD+N vs. Input level (fin=1kHz)

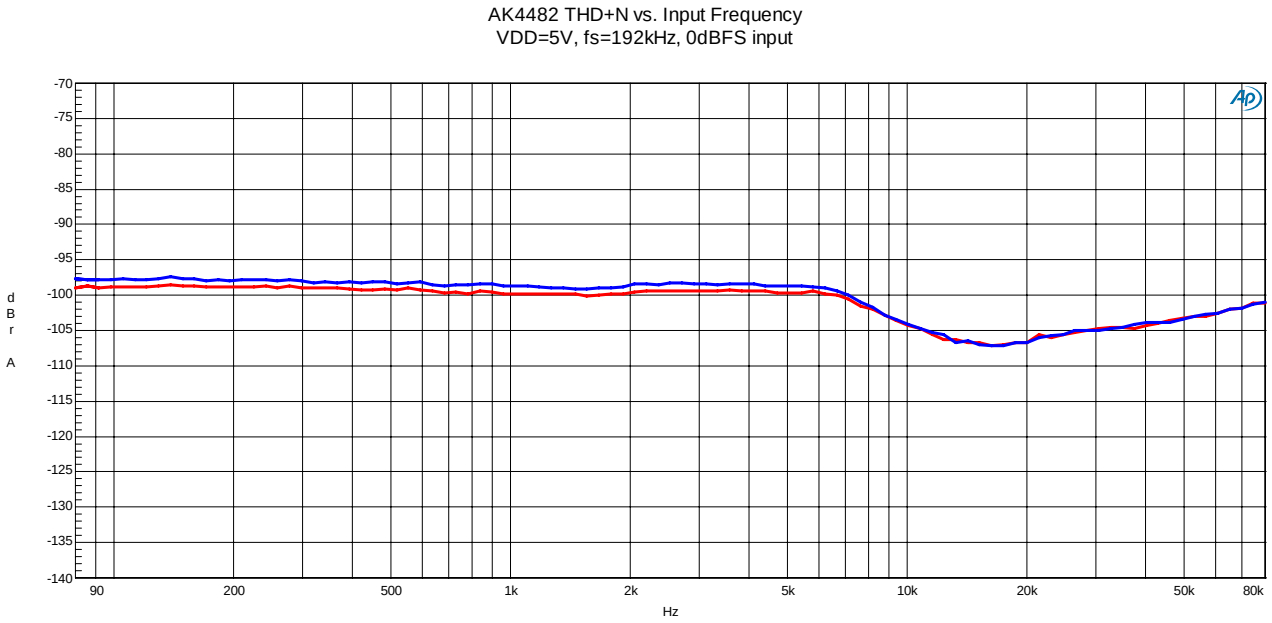


Figure 37. THD+N vs. Input Frequency (0dBFS input)

(fs=192kHz)

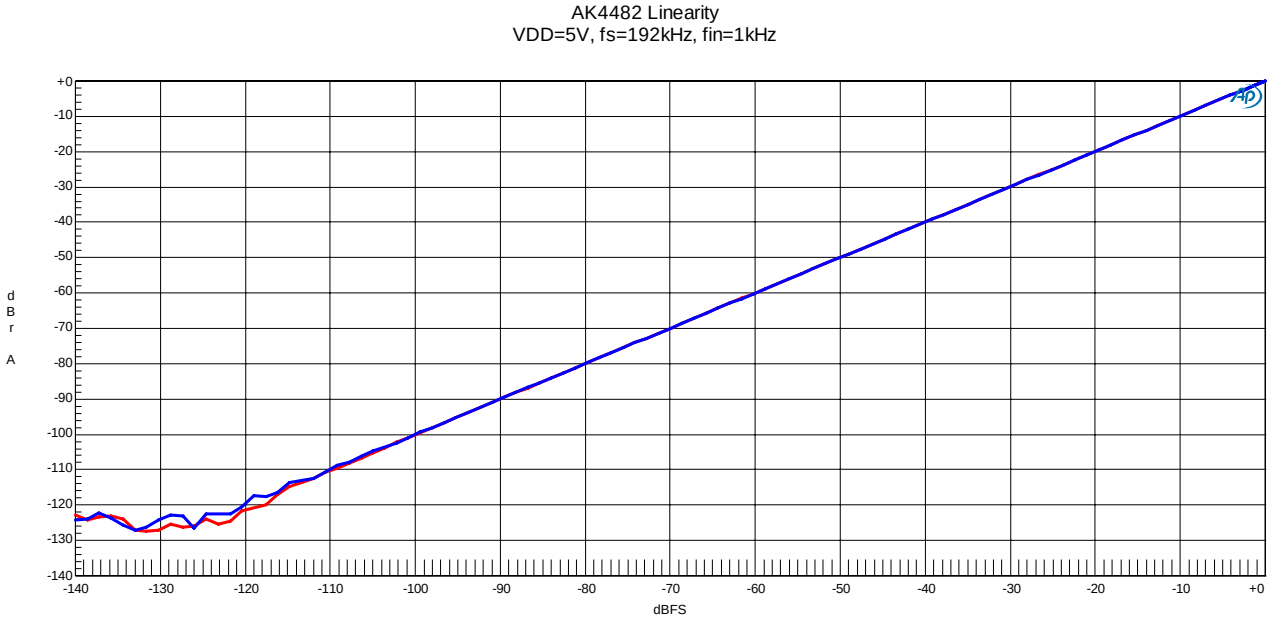


Figure 38. Linearity (fin=1kHz)

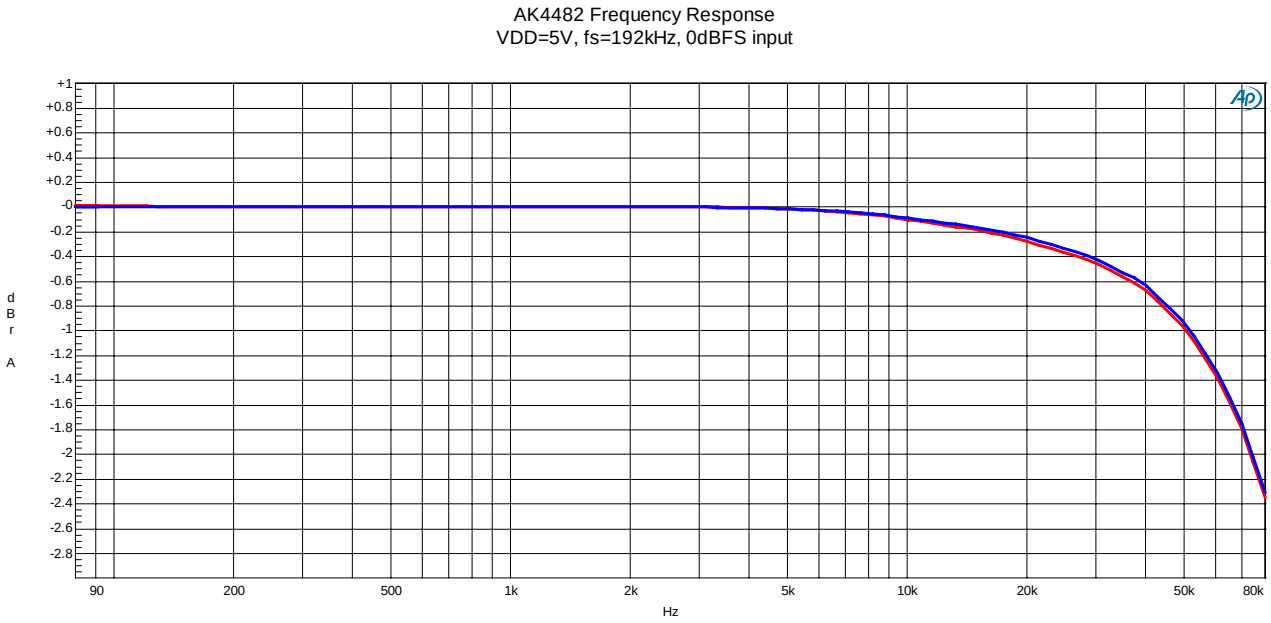


Figure 39. Frequency Response AOUTL+/-pin ／ AOUTR+/- pin (0dBFS input)

(fs=192kHz)

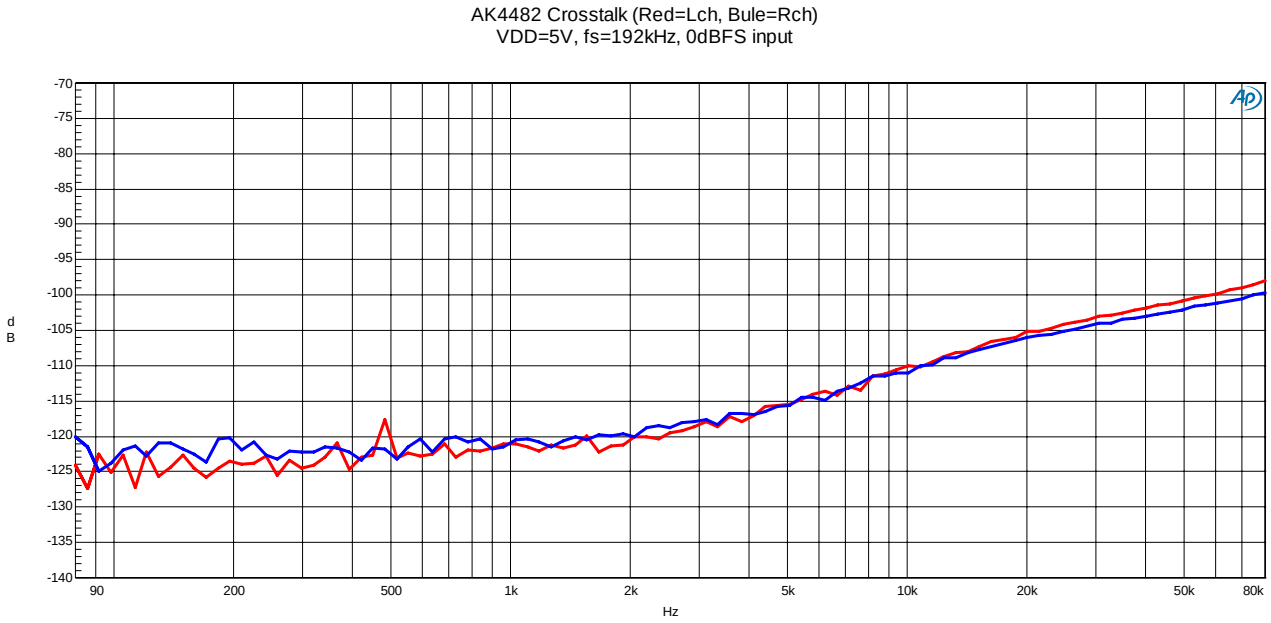
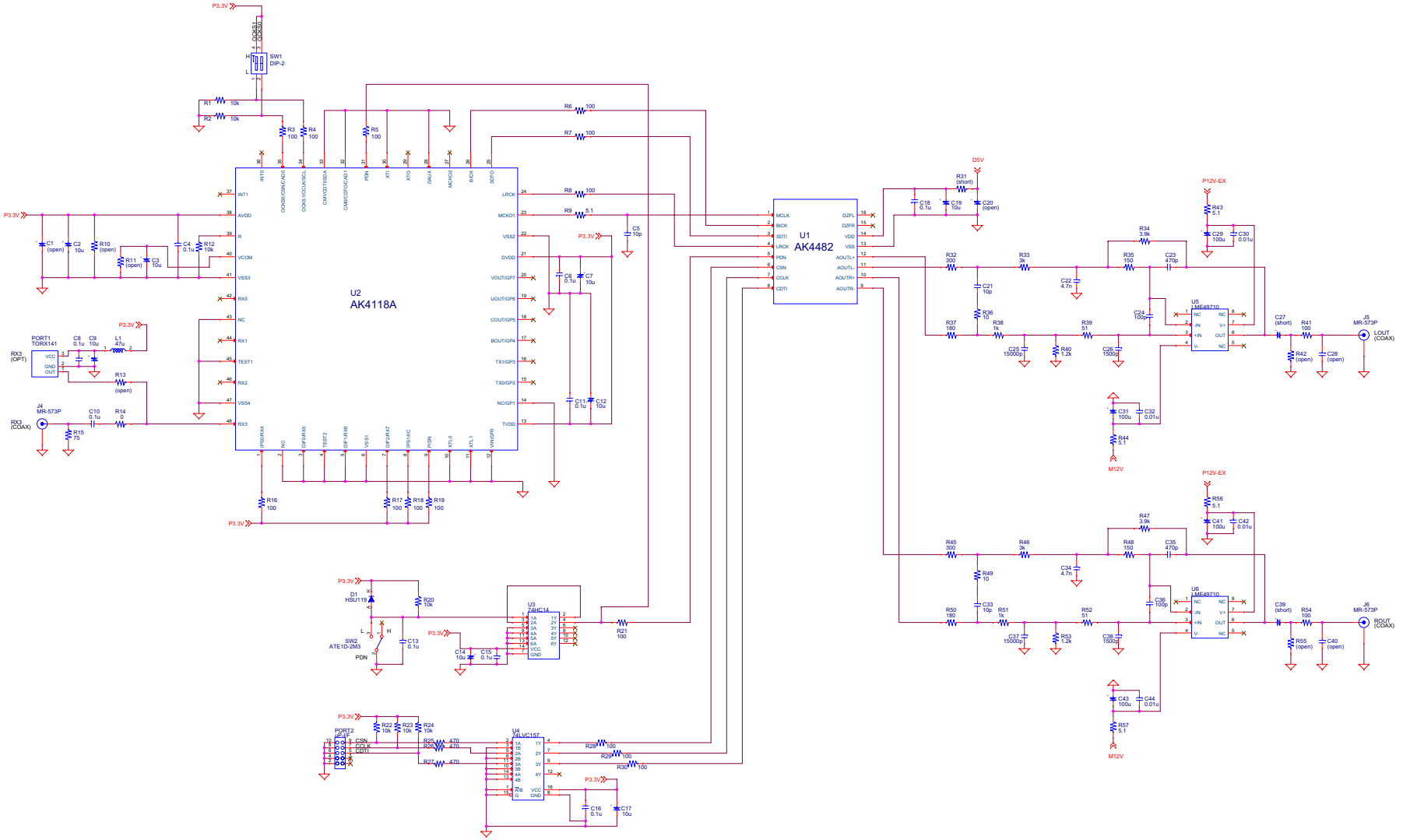


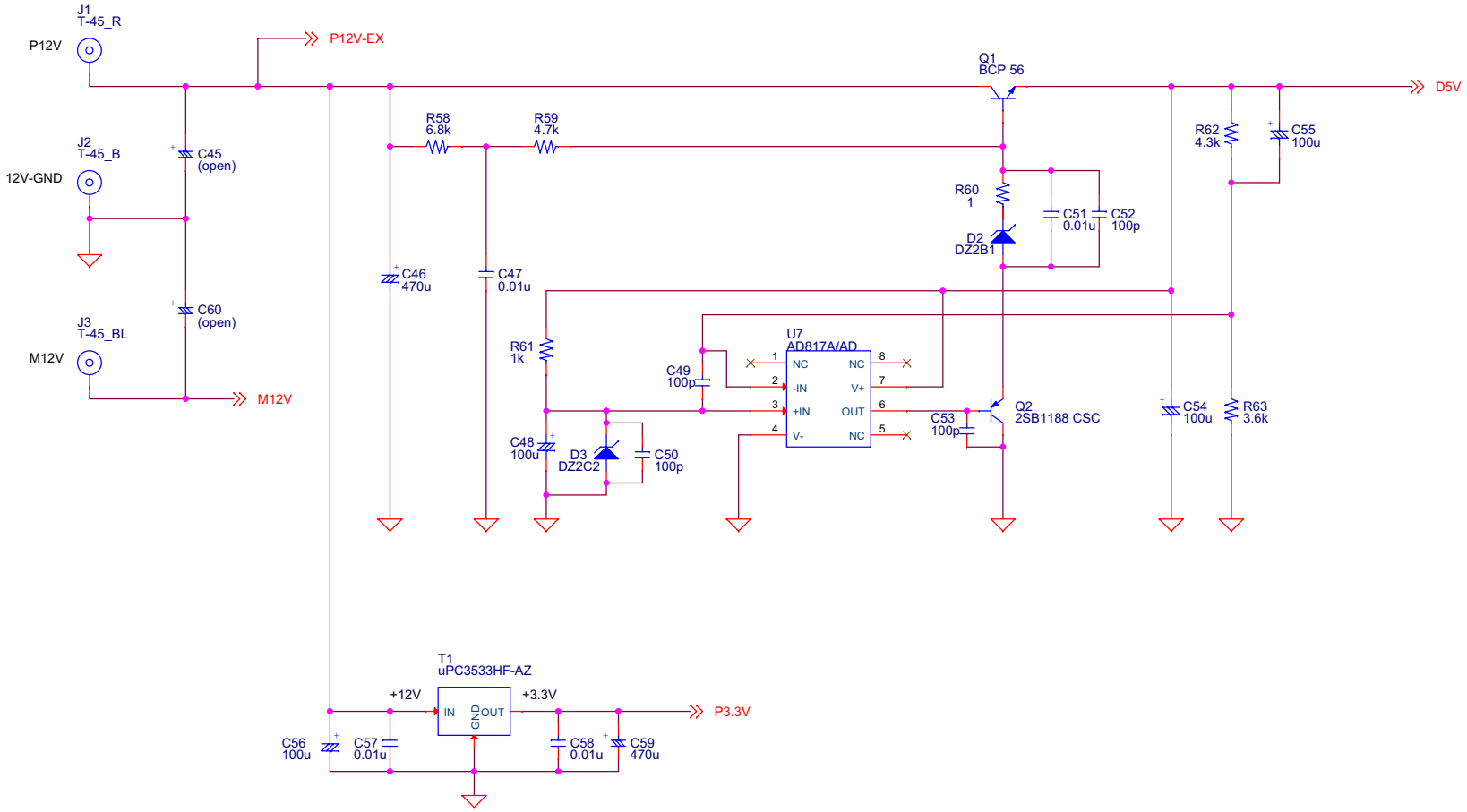
Figure 40. Crosstalk (0dBFS input)

Revision History

Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
11/12/01	KM109800	0	First edition	



Title	AKD4482-SB	
Size: A1	Document Number: AKD4482	Rev: 0
Date: Thursday, September 22, 2011	Sheet 1 of 2	



Title	AKD4482-SB	
Size A3	Document Number Power Supply	Rev 0
Date: Thursday, July 21, 2011	Sheet 2 of 2	