

**AsahiKASEI**  
ASAHI KASEI EMD

# AKD4628A-B

## AK4628A Evaluation Board Rev.1

### GENERAL DESCRIPTION

The AKD4628A-B is an evaluation board for the AK4628A, a single chip CODEC that includes two channels of ADC and eight channels of DAC. The AKD4628A-B also has the digital audio interface and can achieve the interface with digital audio systems via opt-connector or BNC connector.

### ■ Ordering guide

AKD4628A-B --- AK4628A Evaluation Board  
(Cable for connecting with printer port of IBM-AT compatible PC and control software are packed with this.) This control software can't operate on Windows NT.

### FUNCTION

- On-board analog input buffer circuit
- Compatible with 2 types of interface
  - DIT (AK4103A)/DIR (AK4112B) with optical output/input and BNC input
  - Direct interface with AC3 decoder by 10pin header
- 10pin header for serial control interface

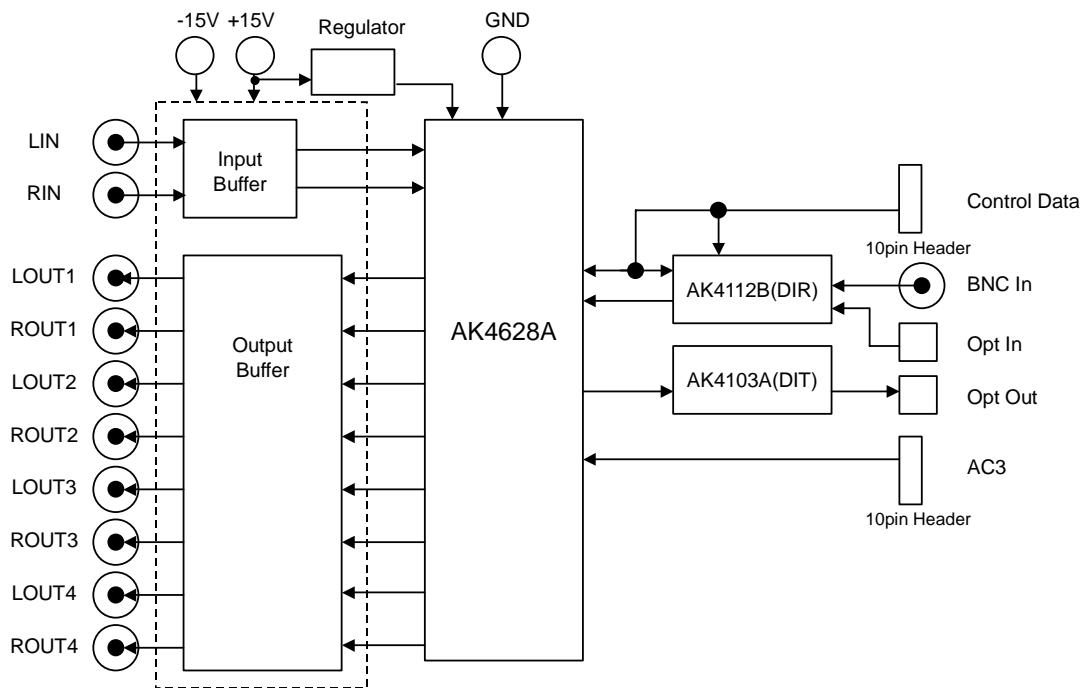


Fig 1. AKD4628A-B Block Diagram

\*Circuit diagram and PCB layout are attached at the end of this manual.

## ■ Operation sequence

### (1) Set up the power supply lines.

[+12V]	(Orange jack)	= +12 ~ +15V
[-12V]	(Blue jack)	= -12 ~ -15V
[AGND]	(Black jack)	= 0V
[DGND]	(Black jack)	= 0V

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

±12V are supplied to analog interface.

+12V is regulated to +5V and +3.3V by regulators (T1, T2).

+5V is supplied to digital interface, AK4628A and TVDD of AK4112B.

+3.3V is supplied to AVDD and DVDD of AK4112B and TVDD of AK4628A.

### (2) Set up the evaluation mode and jumper pins. (See p.6.)

### (3) Power on.

The AK4628A, AK4112B and AK4103A should be reset once bringing PDN (SW1) “L” upon power-up.

### (4) Set up software.

The control mode of AK4628A and AK4112B is fixed to “serial”.

The AKD4628A-B can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT1 (uP-I/F) with PC by 10-line flat cable packed with the AKD4628A-B.

Take care of the direction of connector. There is a mark at pin#1.

The pin layout of PORT1 is as Figure 2.

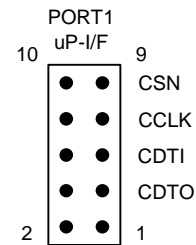


Figure 2. PORT1 pin layout

## ■ Evaluation mode

### 1) Evaluation of ADC

TOTX176 is used for digital output. Clock mode of the AK4112B should be set to PLL mode or X'tal mode.

### 2) Evaluation of DAC

TORX176 or BNC is used for digital input. Clock mode of the AK4112B should be set to PLL mode. "4112B" should be selected on JP4, 5, 6 and 7.

### 3) Loop back mode

Clock mode of the AK4112B should be set to PLL mode or X'tal mode. "4112B" should be selected on JP4,5,6 and 7.

### 4) Evaluation of DAC using DSP

"DSP" should be selected on JP4, 5, 6 and 7.

Evaluation mode	AK4112B clock set-up	JP4, 5, 6, 7	Used I/F
ADC	CM1="0", CM0="0"(PLL mode) or CM1="0", CM0="1"(X'tal mode)	Don't care	TOTX176 optical output
DAC	CM1="0", CM0="0"(PLL mode)	"4112B"	
Loop back	CM1="0", CM0="1"(X'tal mode)	"4112B"	
Using DSP	CM1="0", CM0="0"(PLL mode)	"DSP"	PORT5 (10-pin Header)

(Note.) 1. Software "akd4628a-b-ak4112b.exe" packed with the AKD4628A-B is used for set-up of the AK4112B.

2. CM1 and CM0 bits are D5 and D4 of Addr=00H, respectively

Table 2.Evaluation mode

## ■ DIP Switch set up. (See the datasheet of AK4628A and AK4103A)

1.DFS\_4628A (SW2-1) set up of AK4628A Sampling speed (fs).

DFS_4628A	Sampling Speed (fs)		Default
OFF	Normal Speed Mode	32kHz~48kHz	
ON	Double Speed Mode	64kHz~96kHz	

Table 3. Set up of Sampling Speed (fs)

2.V (SW2-2) set up of AK4103A Validity detect.

V	Validity	Default
OFF	Valid	
ON	Invalid	

Table 4. Set up of Validity

3.FS3 (SW2-3), FS2 (SW2-4) set up of AK4103A Sampling frequency setting.

FS3	FS2	Sampling frequency setting	Default
OFF	OFF	44.1kHz	
OFF	ON	48kHz	
ON	OFF	Reserved	
ON	ON	32kHz	

Table 5. Set up of sampling frequency setting

4.CKS0 (SW2-5) set up of AK4103A System Clock.

CKS1	MCLK	fs	Default
OFF	256fs	28k-108kHz	
ON	512fs	28k-54kz	

Table 6.Set up of System Clock

5.DIF0 (SW2-6) set up of AK4103A Audio Serial Interface Format.

DIF0	Audio Serial Interface Format	LRCK	BICK	
OFF	24bit, Left justified	H/L	48fs-128fs	Default
ON	24bit, I <sup>2</sup> S	L/H	48fs-128fs	

Table 7. Set up of Audio Serial Interface Format

### ■ Jumper pin set up

[JP1] (GND) --- Analog GND and Digital GND

[JP4, 5, 6, 7]

(SDTI1, 2, 3, 4) --- AK4628A SDTI1, 2, 3, 4 input source select

<DSP> : Serial Data is input from DSP via PORT4.

<4112A> : Serial Data is input from AK4112B SDTO. <default>

[JP3] (V/TX) --- AK4112B V/TX output select.

<V> : Validity. <default>

<TX> : Transmit channel (through data)

[JP2](OPT/COAX) --- The source of the biphasic signal input to the AK4112B

<OPT\_IN> : Optical input to RX1 of AK4112B <default>

<RX2> : BNC input to RX1 of AK4112B

### ■ The function of the toggle SW.

[SW1]: Resets the AK4628A, AK4112B and AK4103A. Keep “H” during normal operation.

### ■ The indication content for LED.

[LE1] (DZF1) : Zero detection

[LE2] (DZF2\_OVF) : Zero detection or Overflow Detection

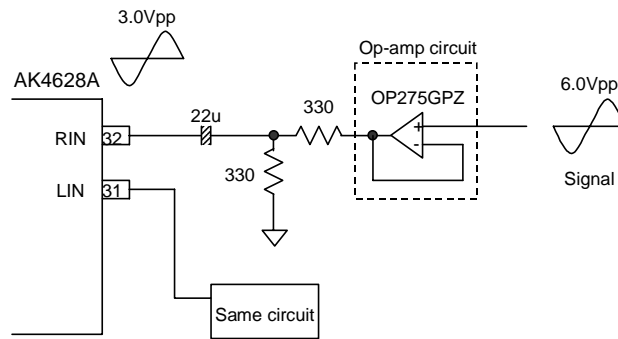
[LE3] (ERF) : AK4112B unlock and parity error output.

[LE4] (FS96) : AK4112B 96kHz sampling detect.

[LE5] (AUTO) : AK4112B AC-3/MPEG detect.

[LE6] (V) : AK4112B Validity detect

■ Analog input circuit



1) Gain

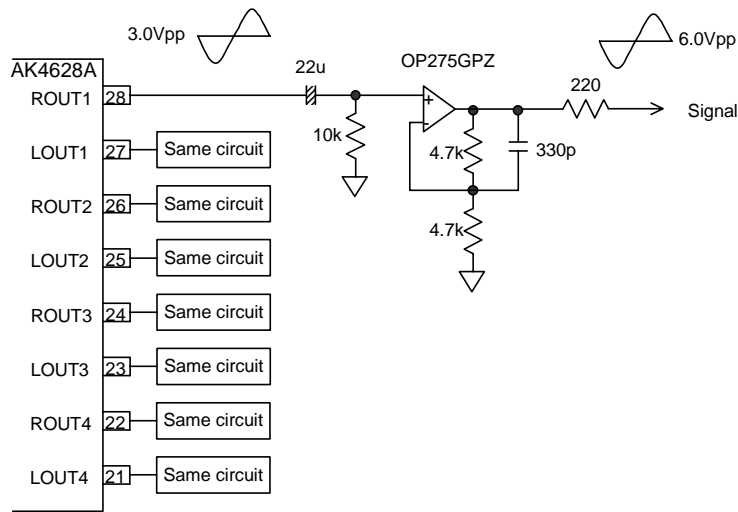
Gain of analog input circuit is

$$330/(330+330) = -6.02\text{dB}$$

Therefore input level for this board is

$$\begin{aligned} &+0.51\text{dBV}(=3.0\text{Vpp})+6.02\text{dB} \\ &= +6.53\text{dBV} = 6.00\text{Vpp} = 2.12\text{Vrms}. \end{aligned}$$

## ■ Analog output circuit



1st order LPF on this board

### 1) Frequency response of HPF

The HPF is implemented on board to cancel the DC offset of analog output of AK4628A.

Frequency response of 1st-order HPF

$$|\text{Amplitude}|^2 = 1 / \{1 + (fc/f)^2\}; fc = 1/2\pi RC = \mathbf{0.7Hz} @ R=10k, C=22u$$

fin	20Hz
Frequency Response	<b>-0.006dB</b>

### 2) Gain, S/N and frequency response of op-amp circuit

1st-order filter with non-inverting amp is implemented on board to double the analog output level and attenuate out-of-band noise.

#### a) Gain

The gain is

$$1 + 4.7k/4.7k = +6.02dB.$$

Therefore the output level of this board is

$$\begin{aligned} &0.51dBV (=3.0Vpp) + 6.02dB \\ &= \mathbf{6.53dBV = 6.00Vpp = 2.12Vrms.} \end{aligned}$$

## c) Frequency response of filter

Frequency response of the 1st-order filter

$$| \text{Amplitude} |^2 = K * \{ 1 + (f/fc_2)^2 \} / \{ 1 + (f/fc_1)^2 \};$$

$$K = 1 + 4.7k/4.7k = 2,$$

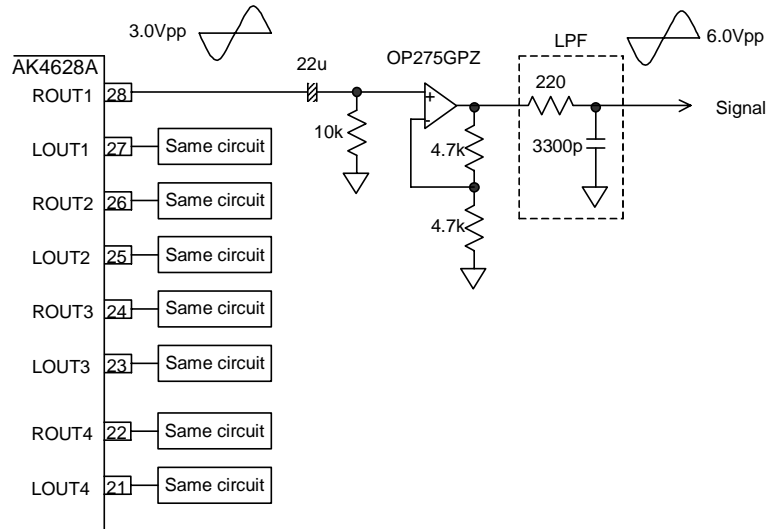
$$fc_1 = 1/2\pi RC = 102.7kHz @ R=4.7k, C=330p,$$

$$fc_2 = K * fc_1 = 205.3kHz$$

Frequency response referenced to output level of this board is as following table:

fin	DC	20kHz	40kHz	80kHz	145kHz	∞
Frequency Response	0dB	<b>-0.121dB</b>	<b>-0.452dB</b>	<b>-1.448dB</b>	-3dB	-6dB

If the frequency response of filter influences the system, 1st-order LPF is also available as the following figure:



Example of LPF with flat response.

Frequency response of this LPF

$$| \text{Amplitude} |^2 = 1 / \{ 1 + (f/fc)^2 \};$$

$$fc = 1/2\pi RC = 219kHz @ R=220, C=3300p$$

Frequency response referenced to output level of this board is as following table:

fin	DC	20kHz	40kHz	80kHz	219kHz	∞
Frequency Response	0dB	<b>-0.036dB</b>	<b>-0.142dB</b>	<b>-0.543dB</b>	-3dB	-∞dB

The total frequency response of this board is sum of the external filter and internal LPF of AK4628A.

These filters are effective to attenuate the high frequency noise since some measurement units is sensitive for out-of-band noise.

## CONTROL SOFTWARE MANUAL

### ■ Set-up of evaluation board and control software

1. Set up the AKD4628A-B according to previous term.
2. Connect IBM-AT compatible PC with AKD4628A-B by 10-line type flat cable (packed with AKD4628A-B). Take care of the direction of 10pin header. (Please install the driver in the CD-ROM when this control software is used on Windows 2000/XP. Please refer "Installation Manual of Control Software Driver by AKM device control software". In case of Windows95/98/ME, this installation is not needed. This control software does not operate on Windows NT.)
3. Insert the CD-ROM labeled "AKD4628A-B Evaluation Kit" into the CD-ROM drive.
4. Access the CD-ROM drive and double-click the icon of the control files as following to set up the control program.  
 "akd4628a-b-ak4628a.exe" – AK4628A control program  
 "akd4628a-b-ak4112b.exe" – AK4112B control program
5. Then please evaluate according to the follows.

(Note) This board is used AK4112B as "DIR". This software must set up when Evaluation of DAC using DSP and Clock Mode selected X'tal.(See P3. (4)).

**This evaluation board and the control software packed with this do not correspond to I<sup>2</sup>C control.**

### ■ Operation flow

Keep the following flow.

1. Set up the control program according to explanation above.
2. Click "Port Reset" button.
3. Click "Write default" button

### ■ Explanation of each buttons

- |                     |   |
|---------------------|---|
| 1. [Port Reset]:    | Set up the USB interface board (AKDUSBIF-A) when using the board.   |
| 2. [Write default]: | Initialize the register of the AK4628A, AK4112B.  |
| 3. [All Write]:     | Write all registers that are currently displayed.   |
| 4. [Function1]:     | Dialog to write data by keyboard operation.   |
| 5. [Function2]:     | Dialog to write data by keyboard operation.   |
| 6. [Function3]:     | The sequence of register setting can be set and executed.   |
| 7. [Function4]:     | The sequence that is created on [Function3] can be assigned to buttons and executed.                            |
| 8. [Function5]:     | The register setting that is created by [SAVE] function on main window can be assigned to buttons and executed. |
| 9. [SAVE]:          | Save the current register setting.  |
| 10. [OPEN]:         | Write the saved values to all register.   |
| 11. [Write]:        | Dialog to write data by mouse operation.  |

### ■ Indication of data

Input data is indicated on the register map. Red letter indicates "H" or "1" and blue one indicates "L" or "0". Blank is the part that is not defined in the datasheet.



## ■ Explanation of each dialog

### 1. [Write Dialog]: Dialog to write data by mouse operation

There are dialogs corresponding to each register.

Click the [Write] button corresponding to each register to set up the dialog. If you check the check box, data becomes “H” or “L”. If not, “0” or “1”.

If you want to write the input data to the AK4628A, AK4112B, click [OK] button. If not, click [Cancel] button.

### 2. [Function1 Dialog]: Dialog to write data by keyboard operation

Address Box: Input registers address in 2 figures of hexadecimal.

Data Box: Input registers data in 2 figures of hexadecimal.

If you want to write the input data to the AK4628A, AK4112B, click [OK] button. If not, click [Cancel] button.

### 3. [Function2 Dialog]: Dialog to evaluate DATT

There are dialogs corresponding to register of 03h and 04h.

Address Box: Input registers address in 2 figures of hexadecimal.

Start Data Box: Input starts data in 2 figures of hexadecimal.

End Data Box: Input end data in 2 figures of hexadecimal.

Interval Box: Data is written to the AK4628A, AK4112B by this interval.

Step Box: Data changes by this step.

Mode Select Box:

If you check this check box, data reaches end data, and returns to start data.

[Example] Start Data = 00, End Data = 09

Data flow: 00 01 02 03 04 05 06 07 08 09 09 08 07 06 05 04 03 02 01 00

If you do not check this check box, data reaches end data, but does not return to start data.

[Example] Start Data = 00, End Data = 09

Data flow: 00 01 02 03 04 05 06 07 08 09

If you want to write the input data to the AK4628A, AK4112B, click [OK] button. If not, click [Cancel] button.

#### 4. [SAVE] and [OPEN]

##### 4-1. [SAVE]

All of current register setting values displayed on the main window are saved to the file. The extension of file name is “akr”.

<Operation flow>

- (1) Click [SAVE] Button.
- (2) Set the file name and click [SAVE] Button. The extension of file name is “akr”.

##### 4-2. [OPEN]

The register setting values saved by [SAVE] are written to the AK4628A, AK4112B. The file type is the same as [SAVE].

<Operation flow>

- (1) Click [OPEN] Button.
- (2) Select the file (\*.akr) and Click [OPEN] Button.

## 5. [Function3 Dialog]

The sequence of register setting can be set and executed.

(1) Click [F3] Button.

(2) Set the control sequence.

Set the address, Data and Interval time. Set “-1” to the address of the step where the sequence should be paused.

(3) Click [START] button. Then this sequence is executed.

The sequence is paused at the step of Interval= “-1”. Click [START] button, the sequence restarts from the paused step.

This sequence can be saved and opened by [SAVE] and [OPEN] button on the Function3 window. The extension of file name is “aks”.

	Address	Data	Interval		Address	Data	Interval
1	-1	H 0	H 0 ms	16	-1	H 0	H 0 ms
2	-1	H 0	H 0 ms	17	-1	H 0	H 0 ms
3	-1	H 0	H 0 ms	18	-1	H 0	H 0 ms
4	-1	H 0	H 0 ms	19	-1	H 0	H 0 ms
5	-1	H 0	H 0 ms	20	-1	H 0	H 0 ms
6	-1	H 0	H 0 ms	21	-1	H 0	H 0 ms
7	-1	H 0	H 0 ms	22	-1	H 0	H 0 ms
8	-1	H 0	H 0 ms	23	-1	H 0	H 0 ms
9	-1	H 0	H 0 ms	24	-1	H 0	H 0 ms
10	-1	H 0	H 0 ms	25	-1	H 0	H 0 ms
11	-1	H 0	H 0 ms				
12	-1	H 0	H 0 ms	Start Step	1		
13	-1	H 0	H 0 ms				
14	-1	H 0	H 0 ms				
15	-1	H 0	H 0 ms				

START      Help

Save      OPEN      Close

Figure 1. Window of [F3]

## 6. [Function4 Dialog]

The sequence file (\*.aks) saved by [Function3] can be listed up to 10 files, assigned to buttons and then executed. When [F4] button is clicked, the window as shown in Figure 2 opens.

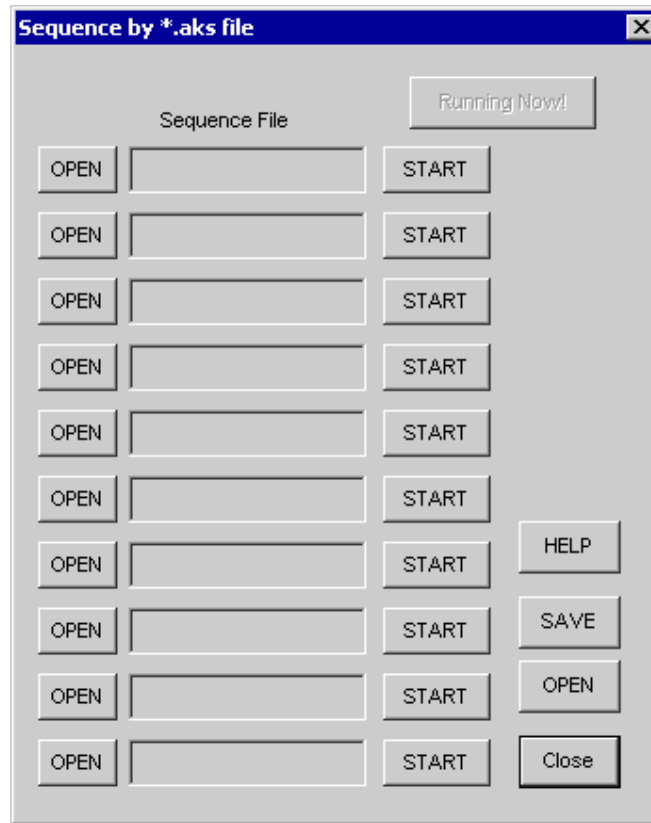
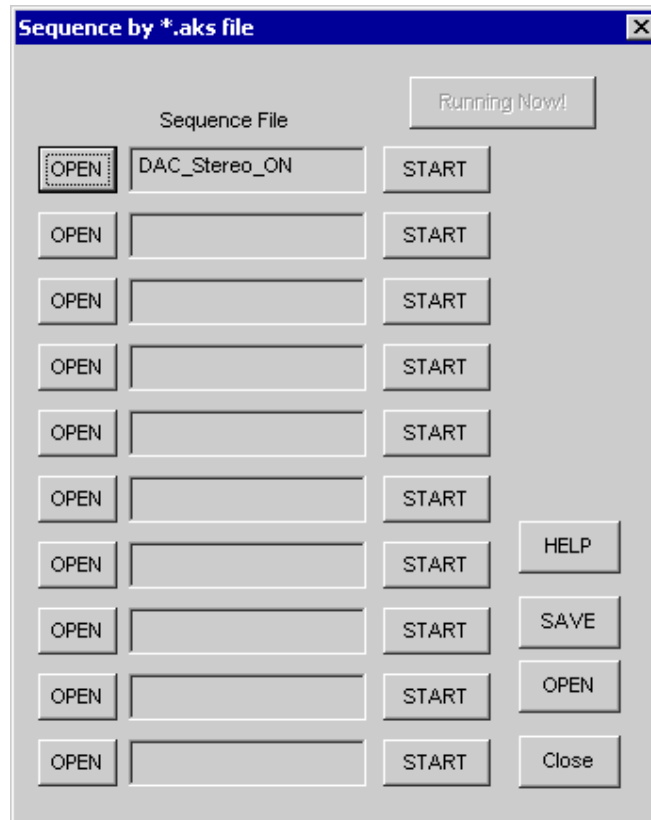


Figure 2. [F4] window

### 6-1. [OPEN] buttons on left side and [START] buttons

(1) Click [OPEN] button and select the sequence file (\*.aks) saved by [Function3].

The sequence file name is displayed as shown in Figure 3. ( In case that the selected sequence file name is “DAC\_Stereo\_ON.aks”)



**Figure 3. [F4] window(2)**

(2) Click [START] button, then the sequence is executed.

### 6-2. [SAVE] and [OPEN] buttons on right side

[SAVE] : The name assign of sequence file displayed on [Function4] window can be saved to the file. The file name is “\*.ak4”.

[OPEN] : The name assign of sequence file(\*.ak4) saved by [SAVE] is loaded.

### 6-3. Note

(1) This function doesn't support the pause function of sequence function.

(2) All files used by [SAVE] and [OPEN] function on right side need to be in the same folder.

(3) When the sequence is changed in [Function3], the sequence file (\*.aks) should be loaded again in order to reflect the change.

## 7. [Function5 Dialog]

The register setting file(\*.akr) saved by [SAVE] function on main window can be listed up to 10 files, assigned to buttons and then executed. When [F5] button is clicked, the window as shown in Figure 4 opens.

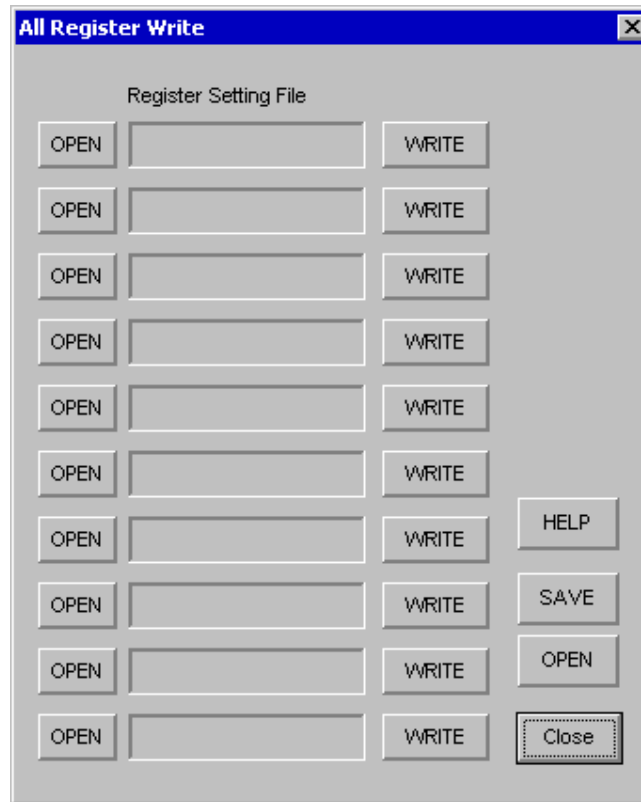


Figure 4. [F5] window

### 7-1. [OPEN] buttons on left side and [WRITE] button

- (1) Click [OPEN] button and select the register setting file (\*.akr).
- (2) Click [WRITE] button, then the register setting is executed.

### 7-2. [SAVE] and [OPEN] buttons on right side

[SAVE] : The name assign of register setting file displayed on [Function5] window can be saved to the file. The file name is "\*.ak5".

[OPEN] : The name assign of register setting file(\*.ak5) saved by [SAVE] is loaded.

### 7-3. Note

- (1) All files used by [SAVE] and [OPEN] function on right side need to be in the same folder.
- (2) When the register setting is changed by [SAVE] Button on the main window, the register setting file (\*.akr) should be loaded again in order to reflect the change.

<b>MEASUREMENT RESULTS</b>
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## 1) ADC part

## [Measurement condition]

- Measurement unit: Audio Precision, System two, Cascade
- MCLK : 256fs
- BICK : 64fs
- fs : 48kHz, 96kHz
- BW : 10Hz~20kHz(fs=48kHz), 10Hz~48kHz(fs=96kHz)
- Bit : 24bit
- Power Supply : AVDD=DVDD= TVDD=5V
- Interface : DIT(AK4103)
- Temperature : Room

fs=48kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, -0.5dB	20kLPF	95.6dB	95.7dB
DR	1kHz, -60dB	20kLPF	99.3dB	99.0dB
		20kLPF+A-weighted	101.8dB	101.2dB
S/N	No signal	20kLPF	99.5dB	99.4dB
		20kLPF+A-weighted	101.8dB	101.2dB

fs=96kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, -0.5dB	fs/2	91.7dB	92.2dB
DR	1kHz, -60dB	fs/2	96.3dB	95.9dB
		fs/2+A-weighted	99.0dB	98.1dB
S/N	No signal	fs/2	96.3dB	95.9dB
		fs/2+A-weighted	99.1dB	98.1dB

## 2) DAC part

## [Measurement condition]

- Measurement unit: Audio Precision, System two, Cascade(fs=48kHz, 96kHz)
- MCLK : 256fs
- BICK : 64fs
- fs : 48kHz, 96kHz
- BW : 10Hz~22kHz (fs=48kHz), 10Hz~40kHz (fs=96kHz)
- Bit : 24bit
- Power Supply : AVDD=DVDD= TVDD=5V
- Interface : DIR(AK4112B)
- Temperature : Room

fs=48kHz

Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	20kLPF	97.7dB	97.4dB
DR	1kHz, -60dB	20kLPF	102.6dB	102.6dB
		22kLPF+A-weighted	105.7dB	105.5dB
S/N	No signal	20kLPF	102.5dB	102.5dB
		22kLPF+A-weighted	105.9dB	105.9dB

fs=96kHz

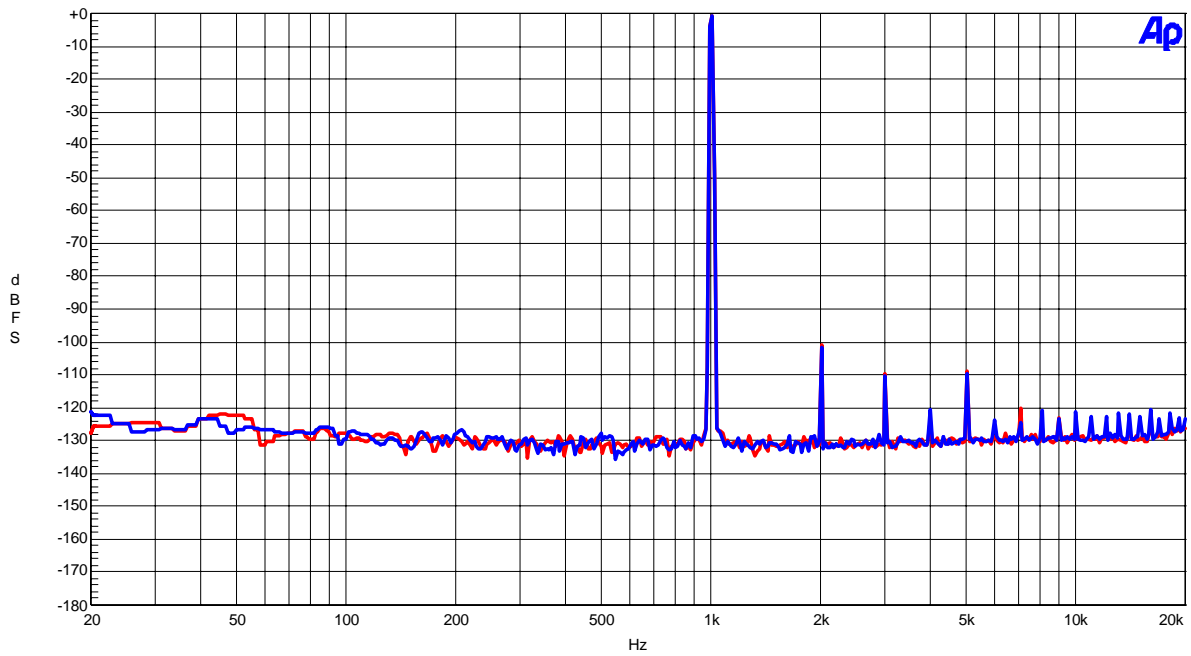
Parameter	Input signal	Measurement filter	Lch	Rch
S/(N+D)	1kHz, 0dB	40kHzLPF	92.7dB	92.7dB
DR	1kHz, -60dB	40kHzLPF	100.3dB	100.3dB
		40kHz +A-weighted	105.7dB	105.9dB
S/N	No signal	40kHz	100.7dB	100.8dB
		40kHz +A-weighted	106.1dB	106.3dB



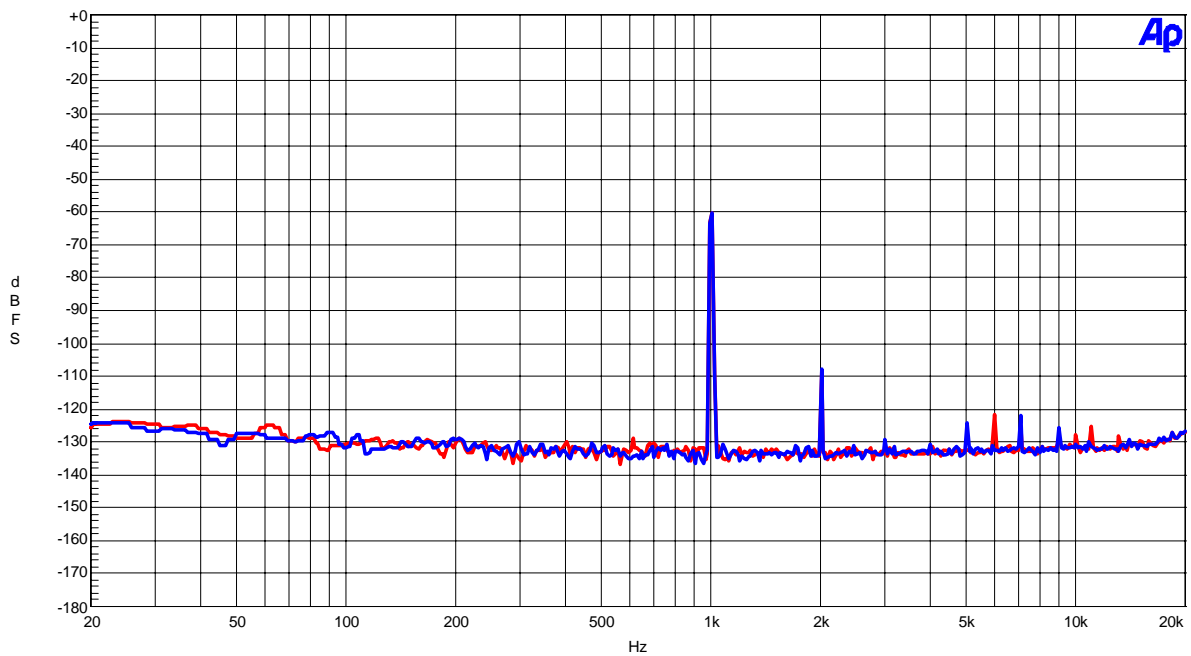
## 1.ADC

(ADC fs=48kHz)

AKM

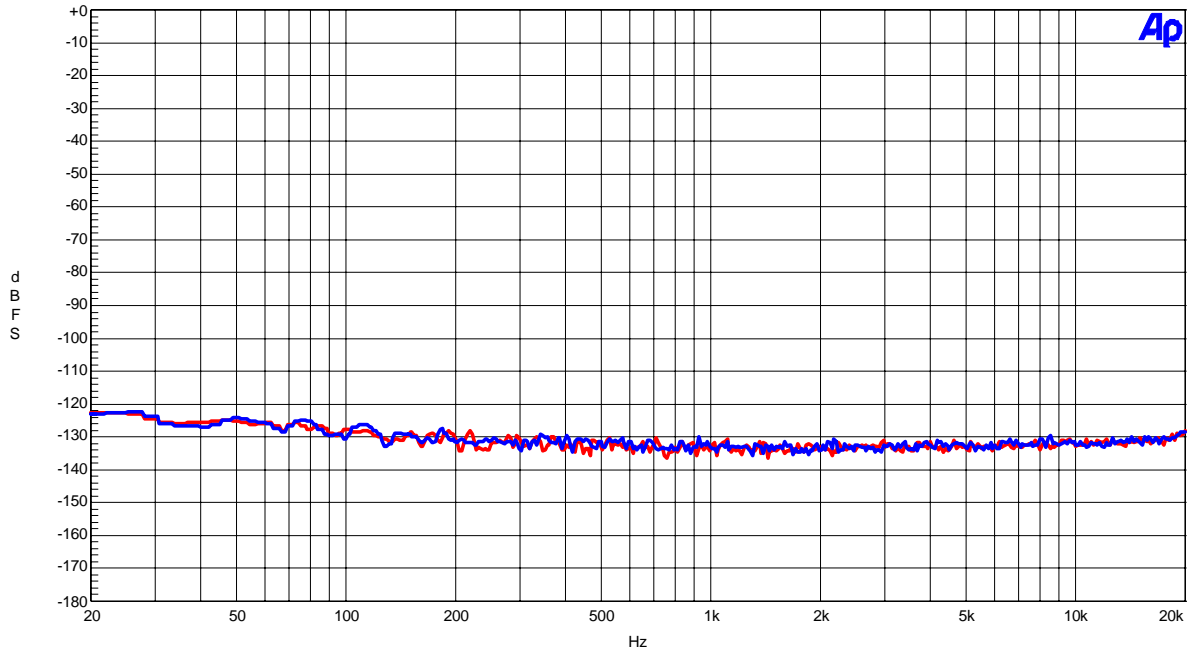
AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, -0.5dB<sub>r</sub> input, fin=1kHzFFT (Input=-0.5dB<sub>r</sub>, fin=1kHz)

AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, -60dB<sub>r</sub> input, fin=1kHzFFT (Input=-60dB<sub>r</sub>, fin=1kHz)

(ADC fs=48kHz)

AKM

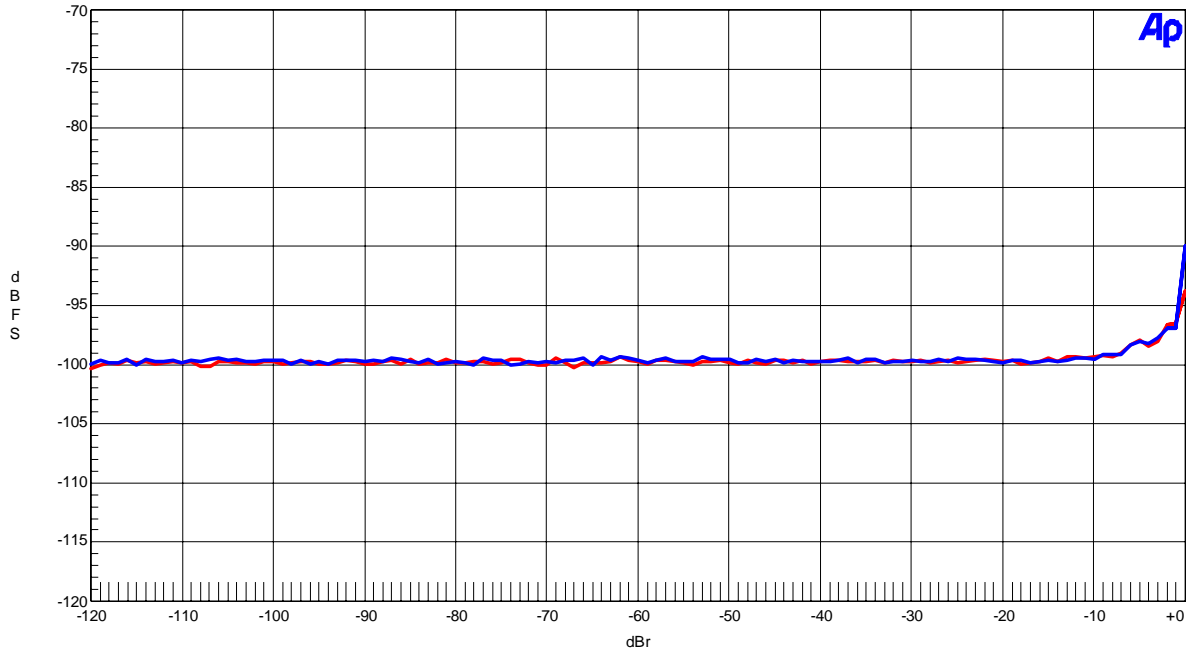
AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, No signal input, fin=1kHz

FFT (noise floor)

(ADC fs=48kHz)

AKM

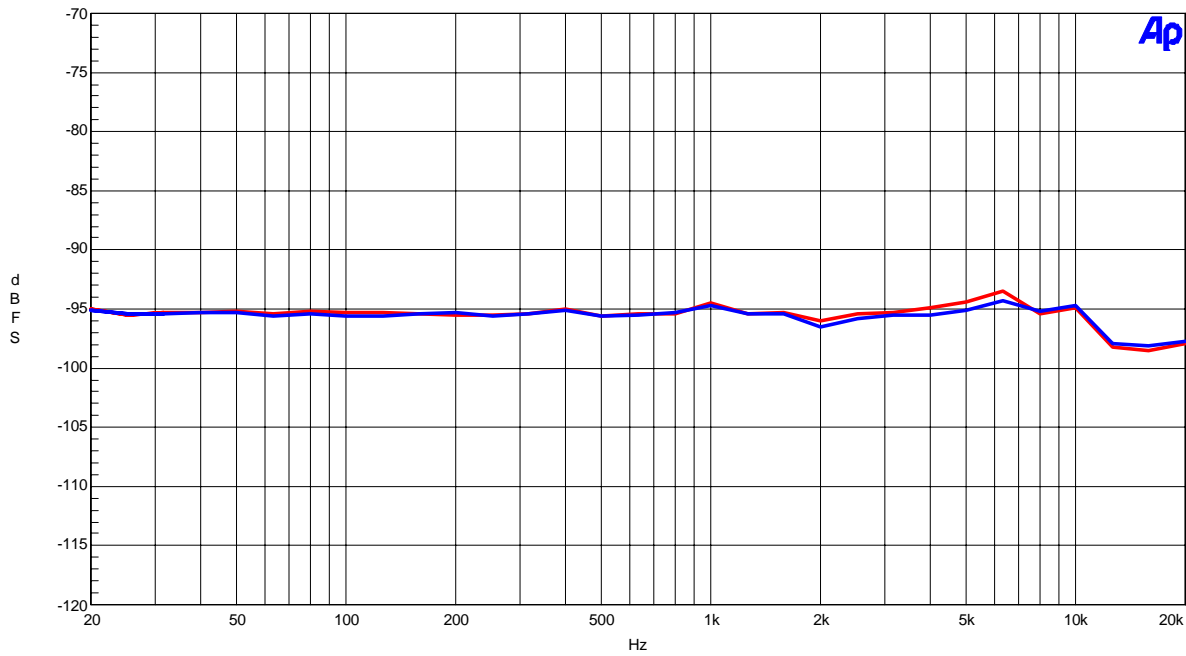
AK4628A THD+N vs. Input Level  
 AVDD=DVDD=5V, fs=96kHz, fin=1kHz



THD + N vs Amplitude (fin=1kHz)

AKM

AK4628A THD+N vs. Input Frequency  
 AVDD=DVDD=5V, -0.5dBr input, fs=48kHz

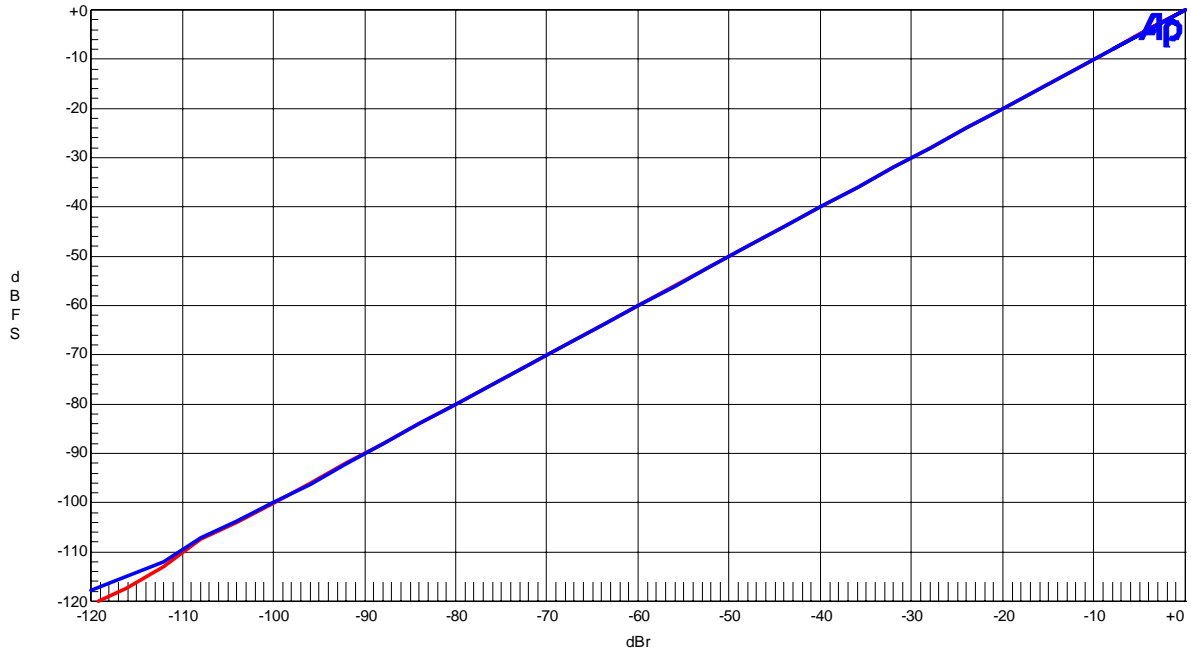


THD + N vs Input Frequency (Input=-0.5dBr)

(ADC fs=48kHz)

AKM

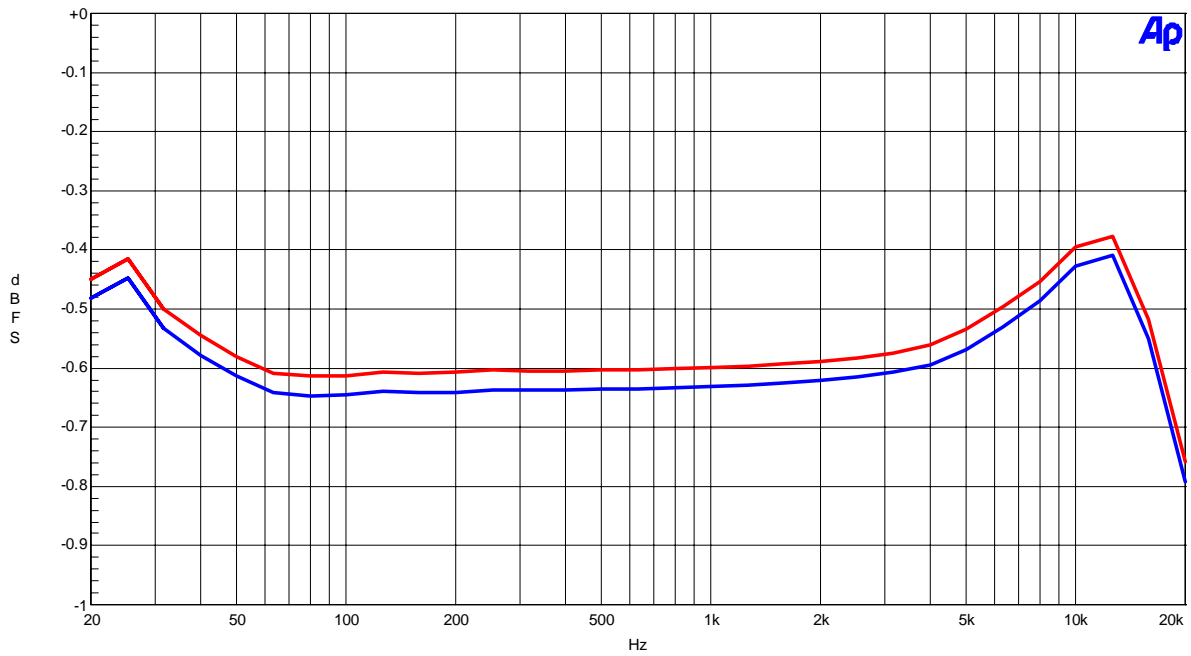
AK4628A Linearity  
AVDD=DVDD=5V, fs=48kHz, fin=1kHz



Linearity(fin=1kHz)

AKM

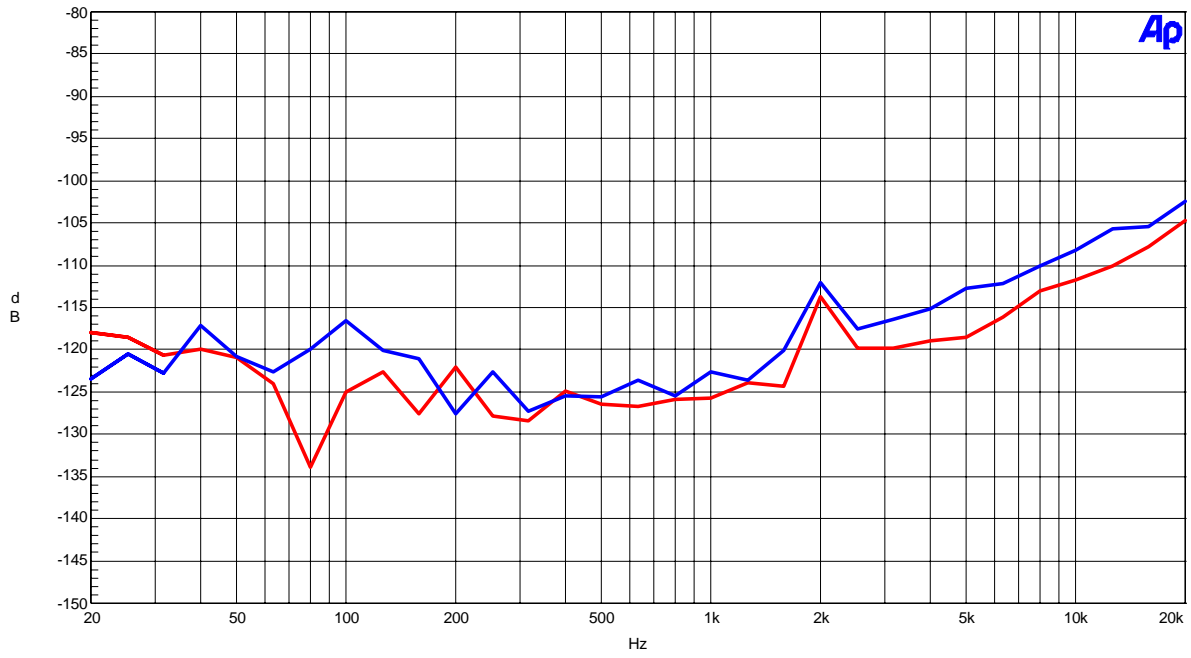
AK4628A Frequency Response  
AVDD=DVDD=5V, -0.5dBr input, fs=48kHz



Frequency Response(Input Level=-0.5dBr)  
(including input RC filter)

(ADC fs=48kHz)

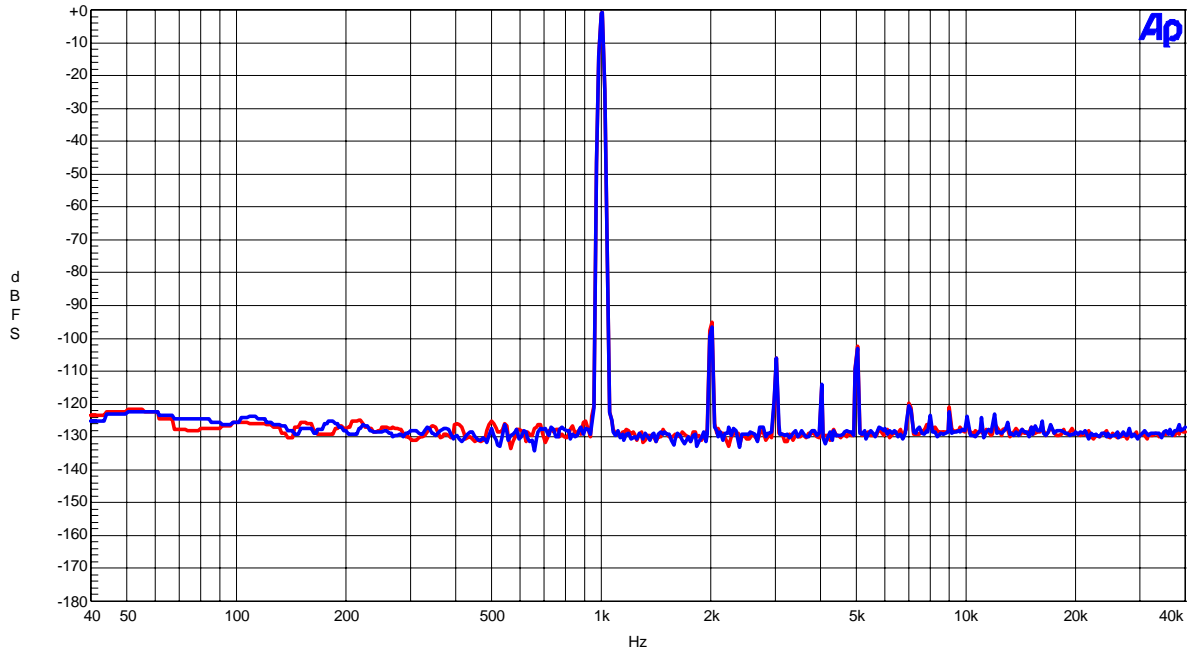
AKM

AK4628A Crosstalk  
DVDD=AVDD=5V, -0.5dB<sub>r</sub> input, fs=48kHz

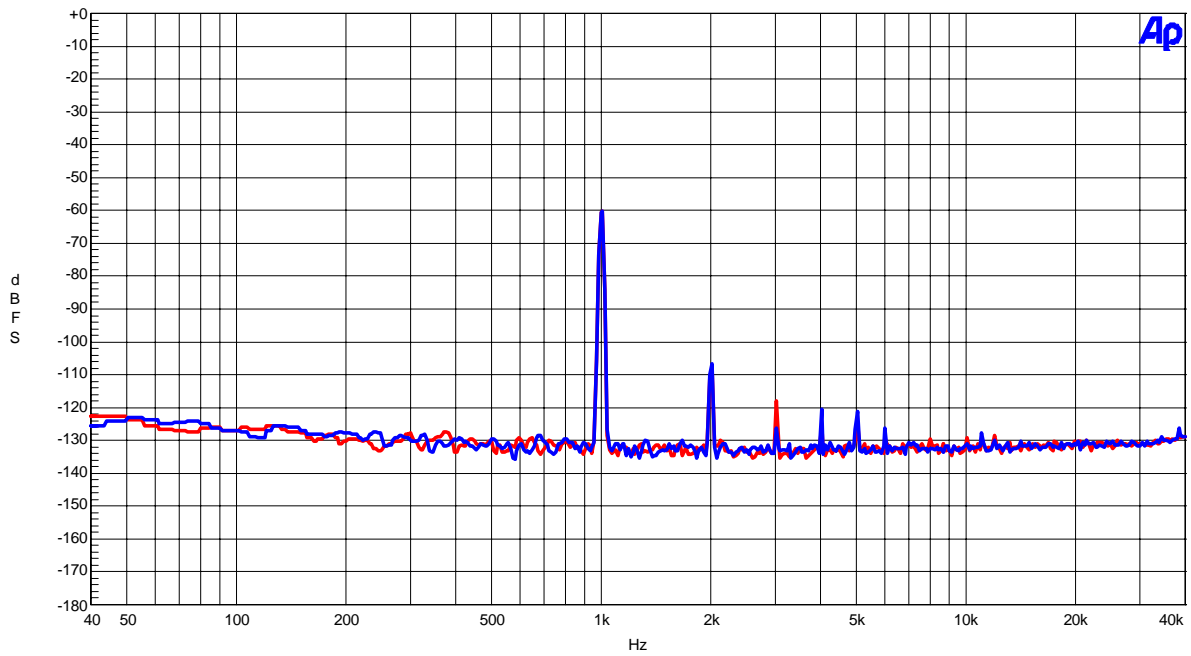
Crosstalk (Blue= Rch, Red = Lch)

(ADC fs=96kHz)

AKM

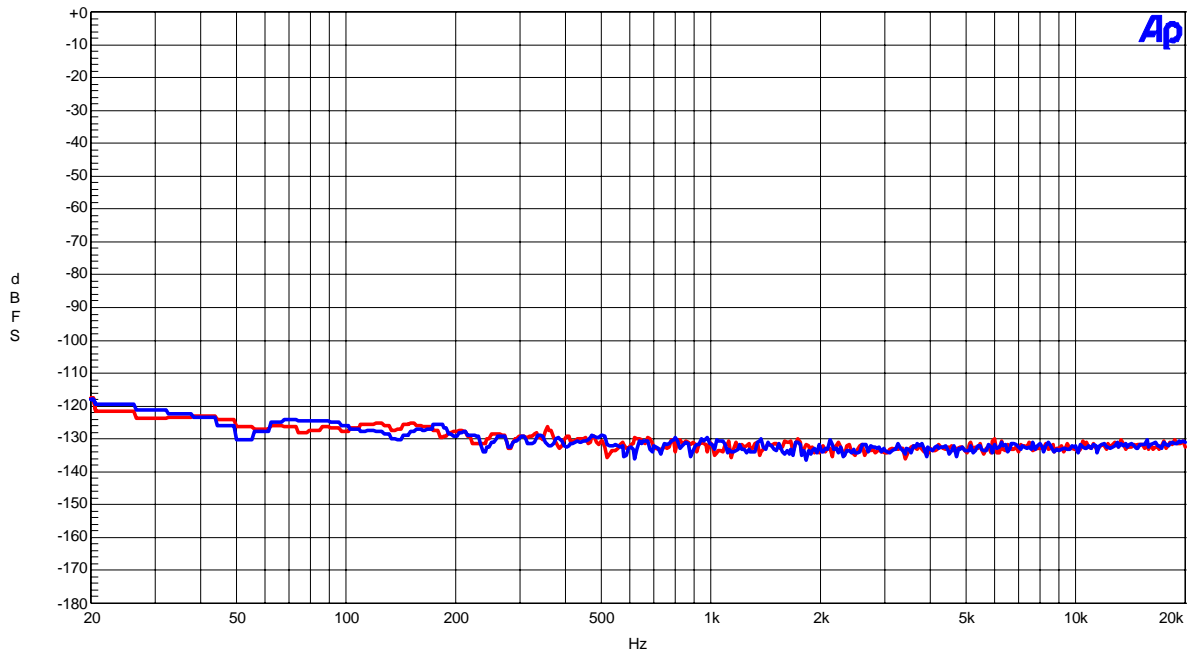
AK4628A FFT  
AVDD=DVDD=5V, fs=96kHz, -0.5dB<sub>r</sub> input, fin=1kHzFFT(Input=-0.5dB<sub>r</sub>, fin=1kHz)

AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=96kHz, -60dB<sub>r</sub> input, fin=1kHzFFT(Input=-60dB<sub>r</sub>, fin=1kHz)

(ADC fs=96kHz)

AKM

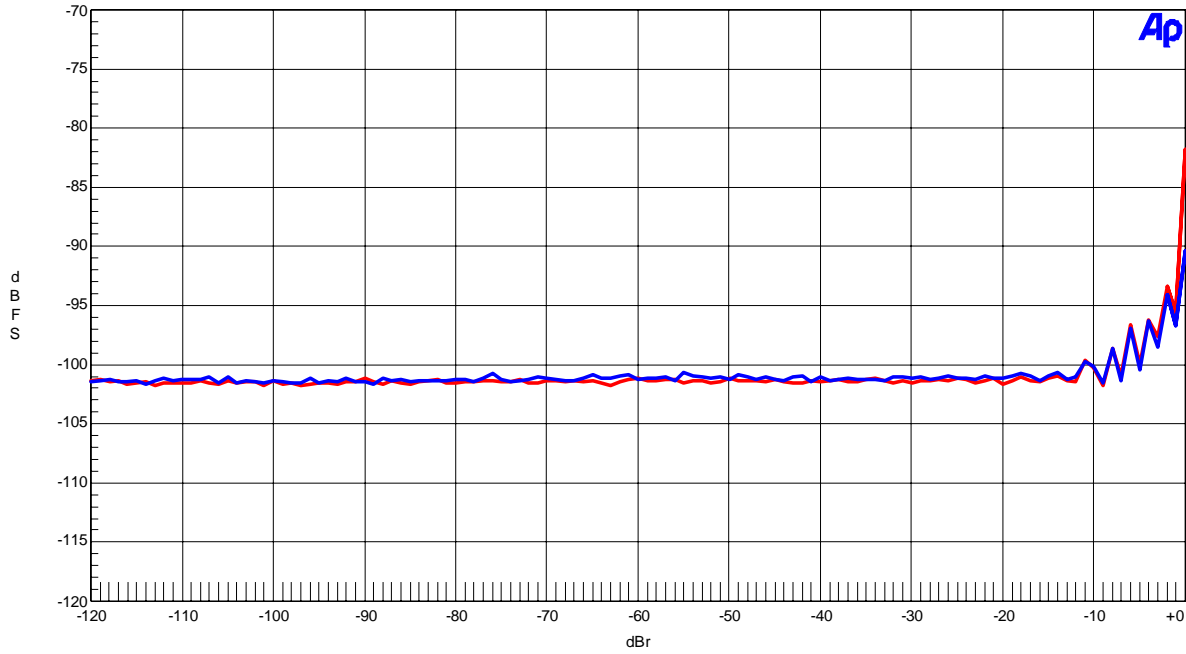
AK4628A FFT  
AVDD=DVDD=5V, fs=96kHz, No signal input, fin=1kHz

FFT(Noise floor)

(ADC fs=96kHz)

AKM

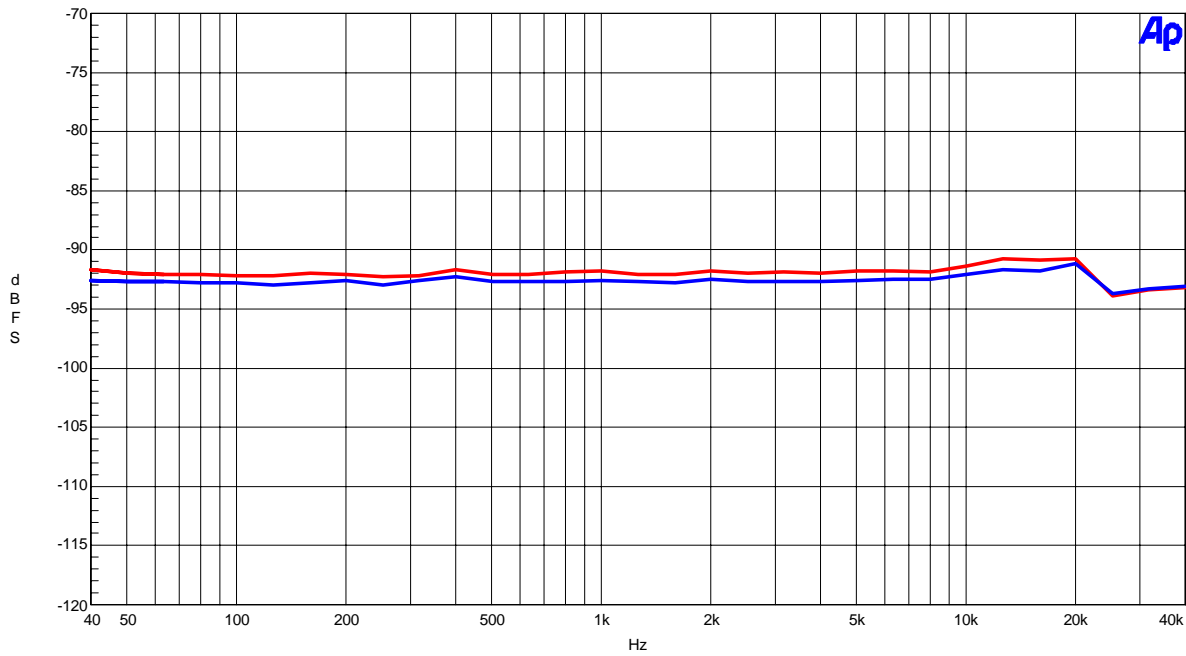
AK4628A THD+N vs. Input Level  
 AVDD=DVDD=5V, fs=96kHz, fin=1kHz



THD + N vs Amplitude(fin=1kHz)

AKM

AK4628A THD+N vs. Input Frequency  
 AVDD=DVDD=5V, -0.5dBr input, fs=96kHz



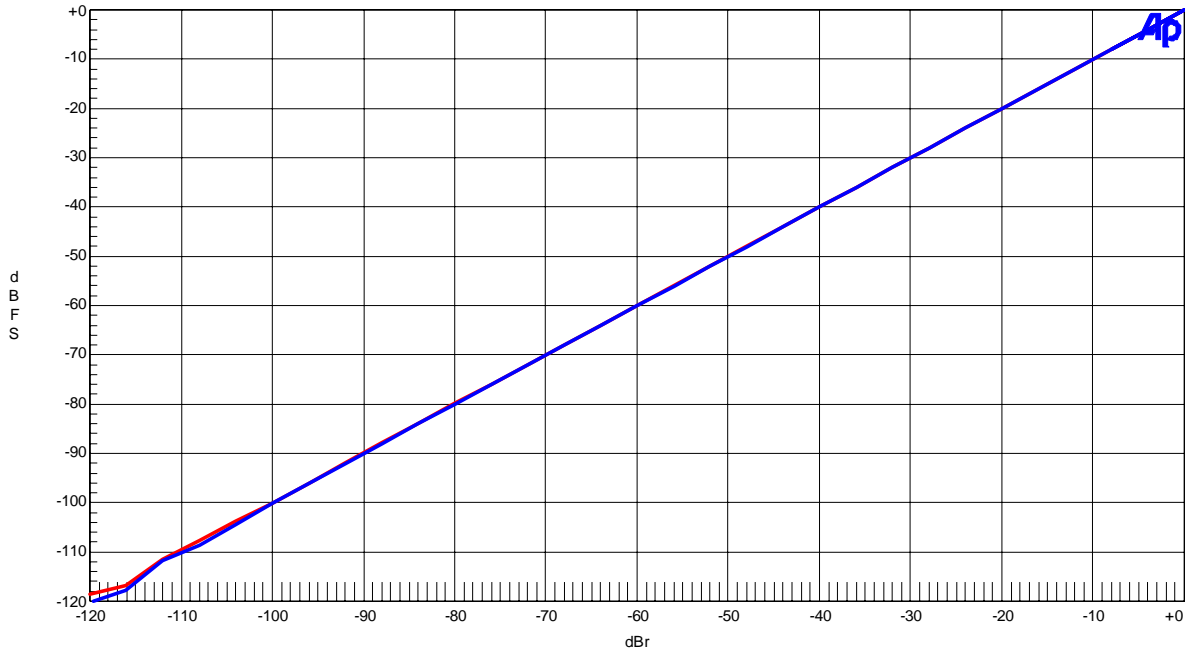
THD + N vs Input Frequency(Input Level=-0.5dBr)



(ADC fs=96kHz)

AKM

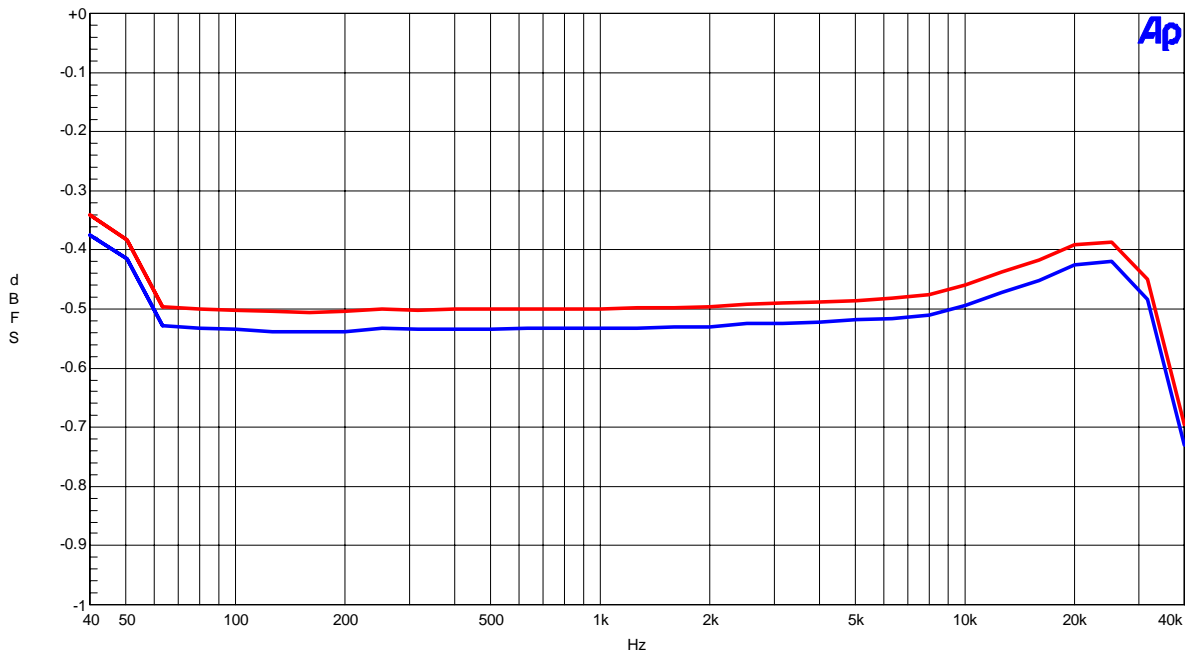
AK4628A Linearity  
AVDD=DVDD=5V, fs=96kHz, fin=1kHz



Linearity(fin=1kHz)

AKM

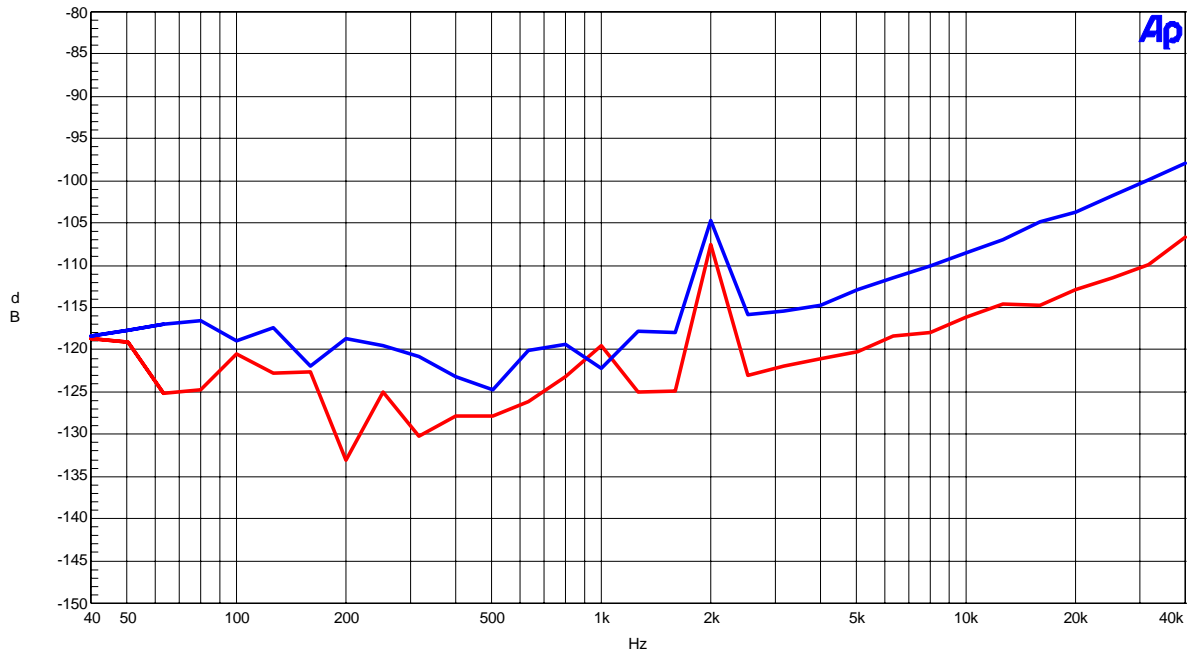
AK4628A Frequency Response  
AVDD=DVDD=5V, -0.5dBr input, fs=96kHz



Frequency Response(Input Level=-0.5dBr)  
(including input RC filter)

(ADC fs=96kHz)

AKM

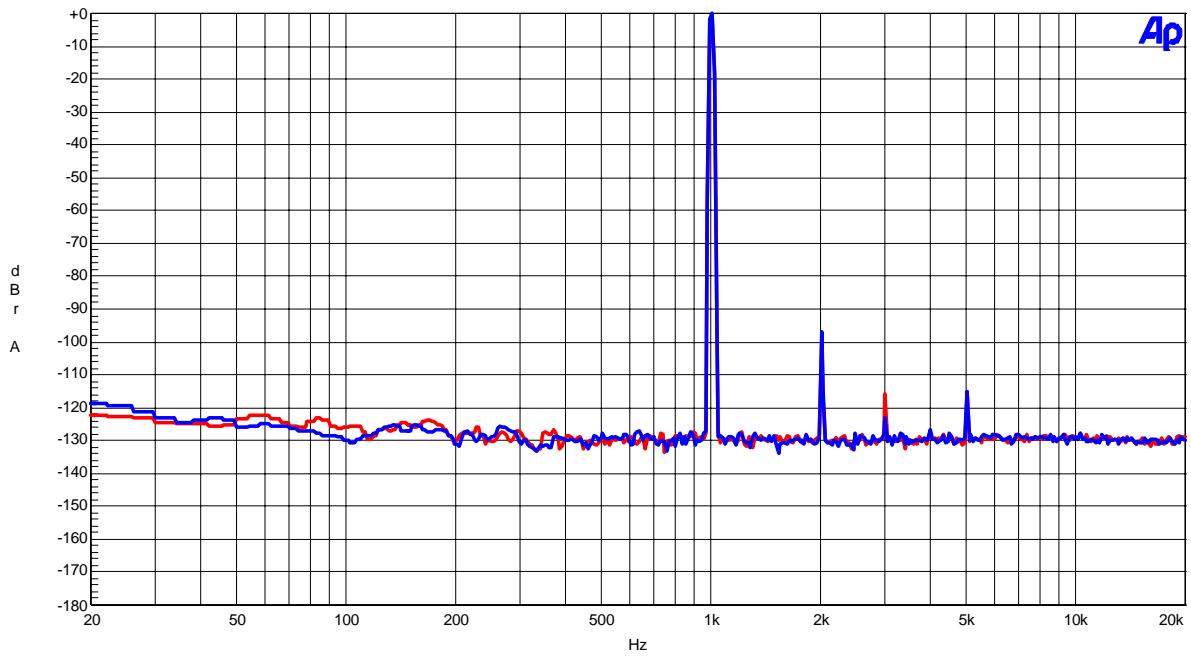
AK4628A Crosstalk  
DVDD=AVDD=5V, -0.5dB<sub>r</sub> input, fs=96kHz

Crosstalk (Blue= Rch, Red = Lch)

## 2.DAC

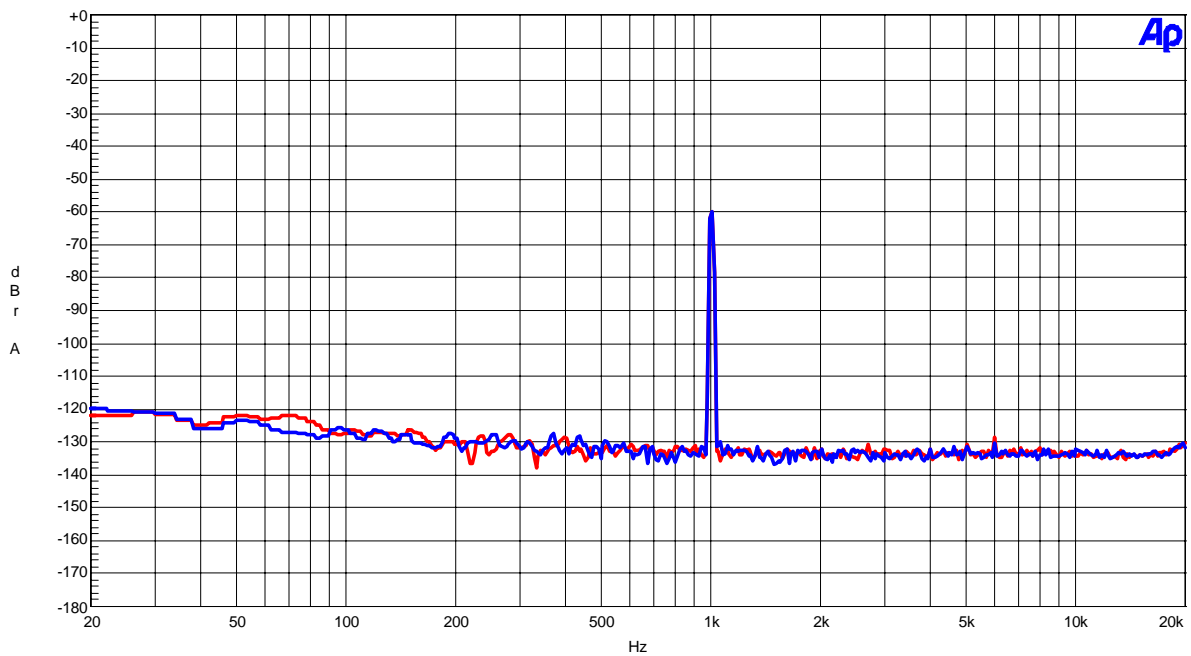
(DAC fs=48kHz)

AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, MCLK=512, 0dBFS input, fin=1kHz

FFT (Input=0dBFS, fin=1kHz)

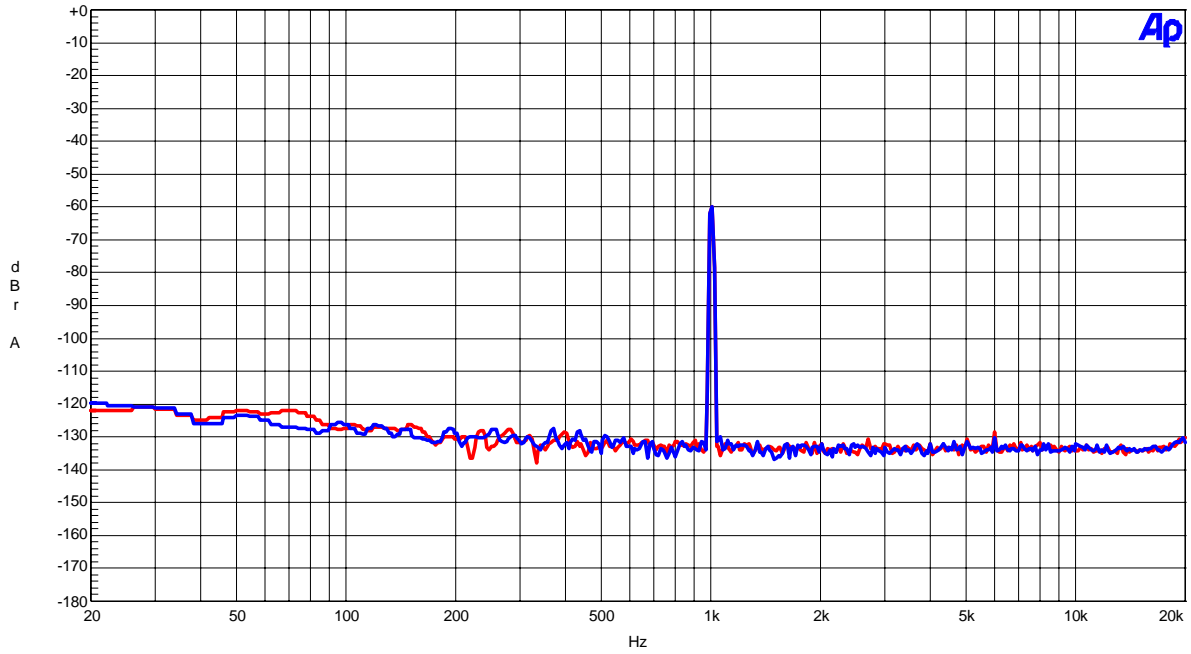
AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, MCLK=512, -60dBFS input, fin=1kHz

FFT (Input=-60dBFS, fin=1kHz)

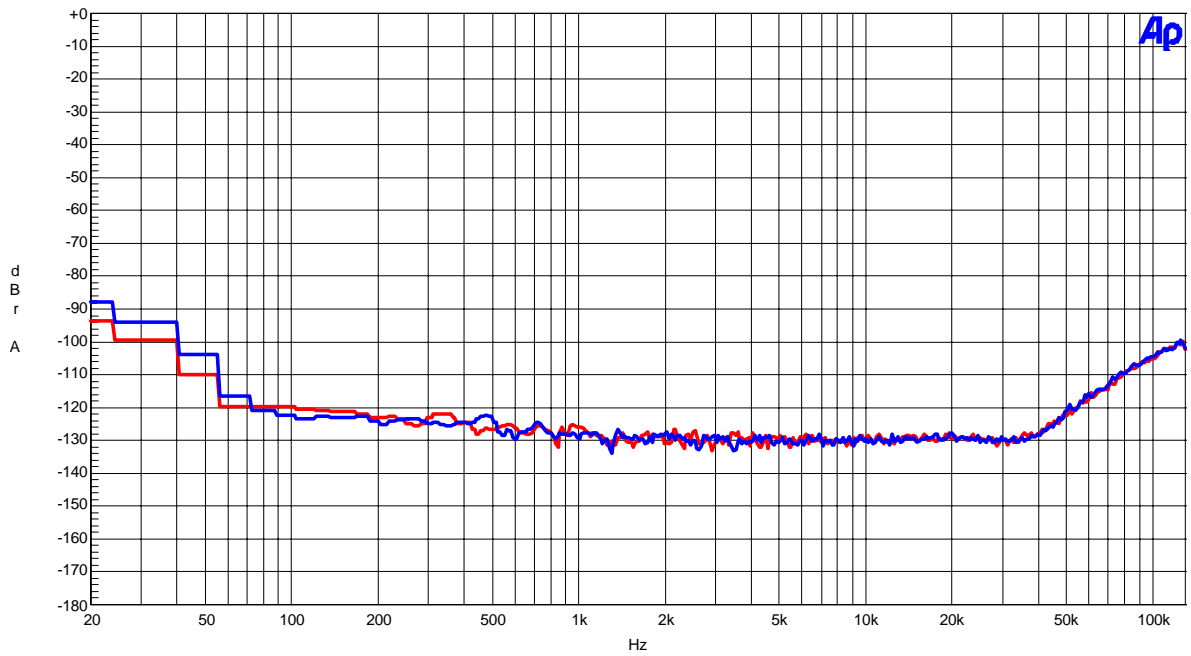
(DAC fs=48kHz)

AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=48kHz, fin=No signal

FFT (Noise floor)

AKM

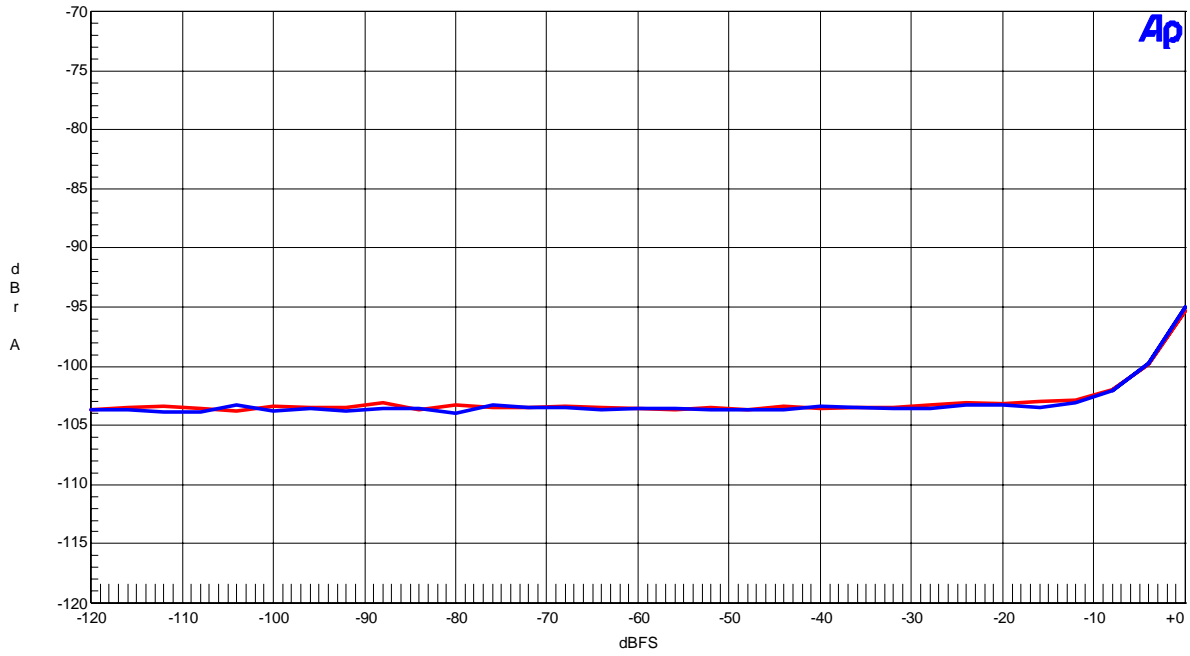
AK4628A FFT Out-of-band noise  
AVDD=DVDD=5V, fs=48kHz, MCLK=512fs, fin=No signal

FFT (Out-of-band noise)

(DAC fs=48kHz)

AKM

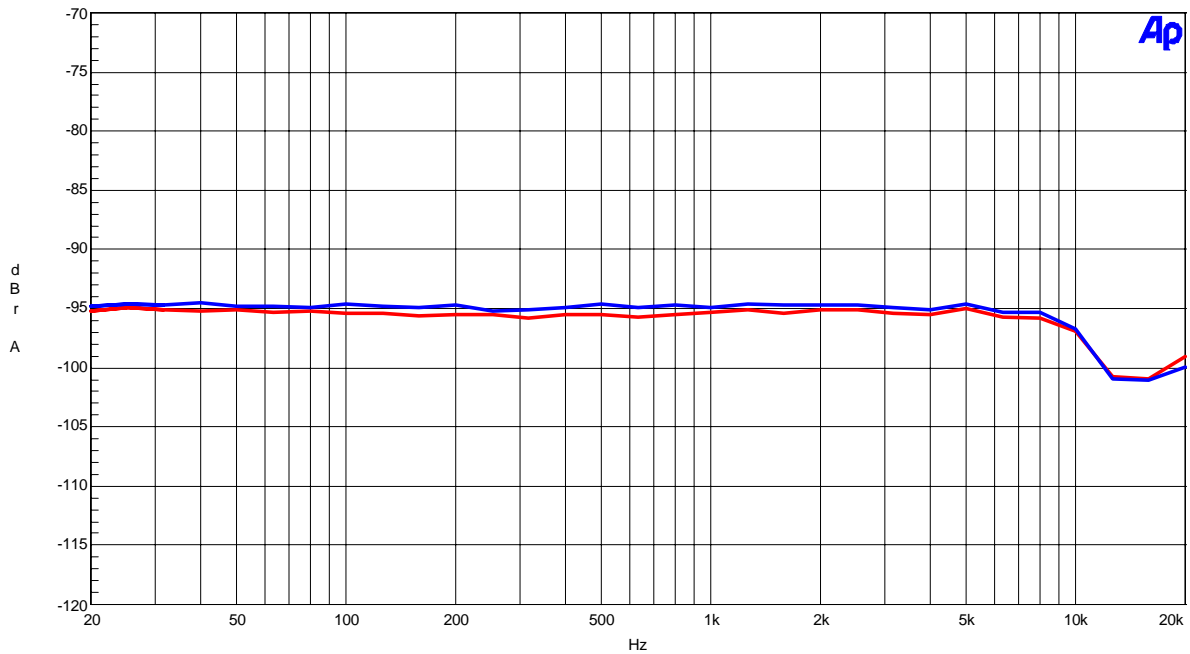
AK4628A THD+N vs. Input Level  
 AVDD=DVDD=5V, fs=48kHz, MCLK=512fs, fin=1kHz



THD + N vs Amplitude(fin=1kHz)

AKM

AK4628A THD+N vs. Input Frequency  
 AVDD=DVDD=5V, fs=48kHz, MCLK=512fs, 0dBFS input

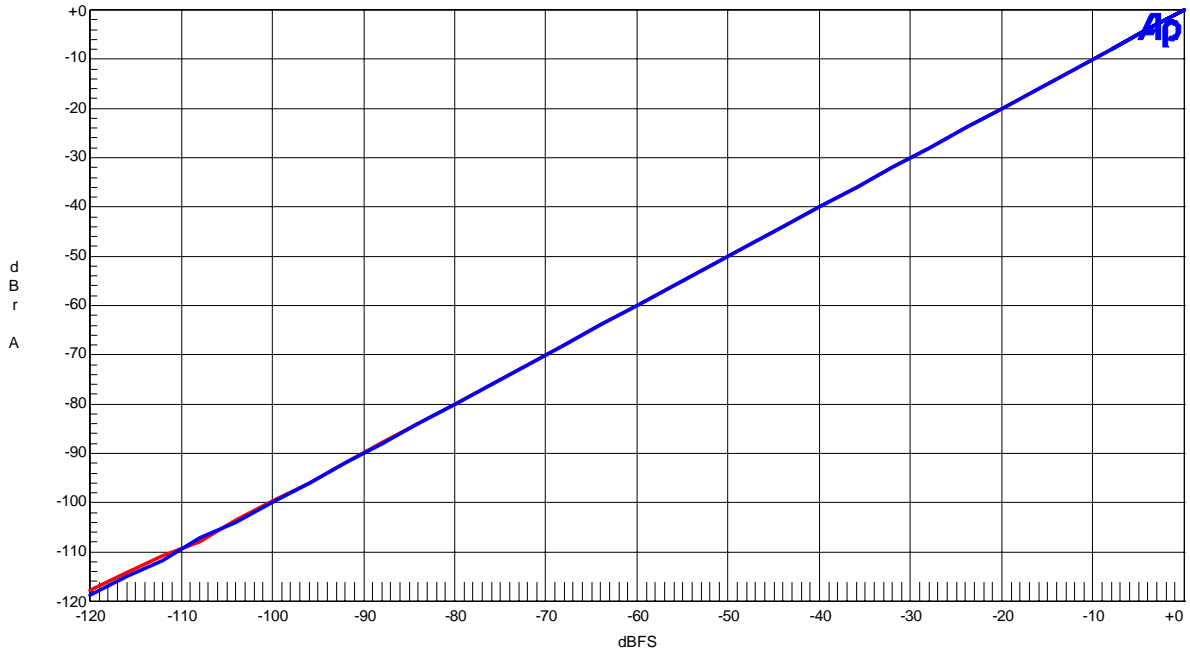


THD + N vs Input Frequency (Input=0dBFS)

(DAC fs=48kHz)

AKM

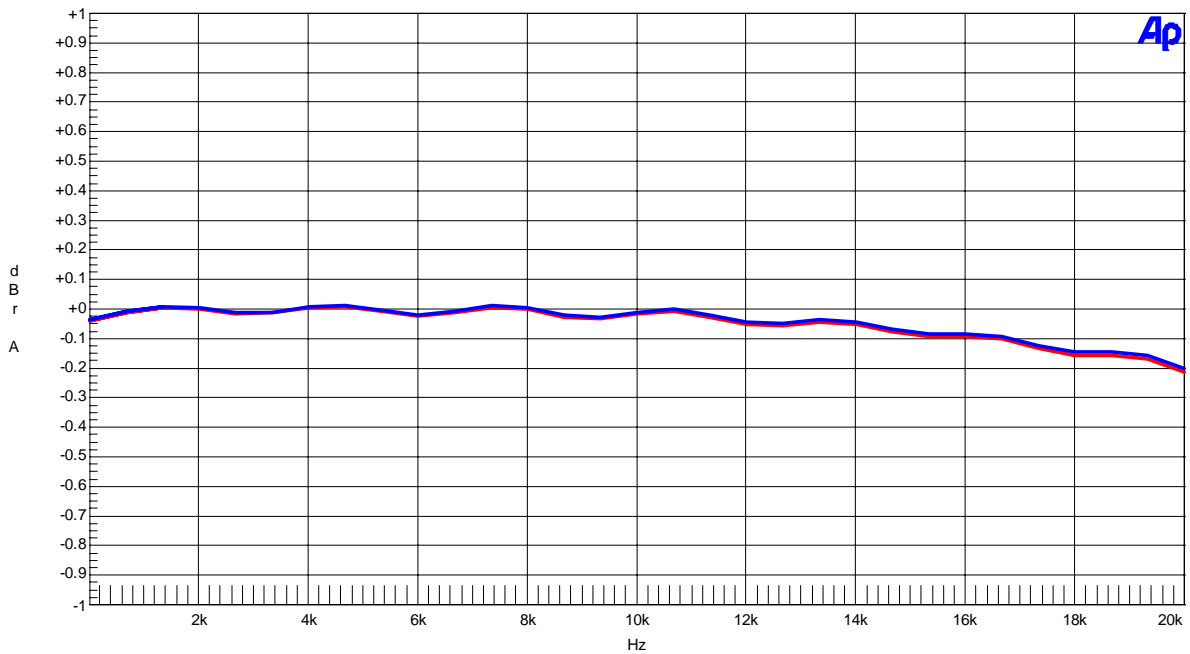
AK4628A Linearity  
 AVDD=DVDD=5V, fs=48kHz, MCLK=512fs, fin=1kHz



Linearity(fin=1kHz)

AKM

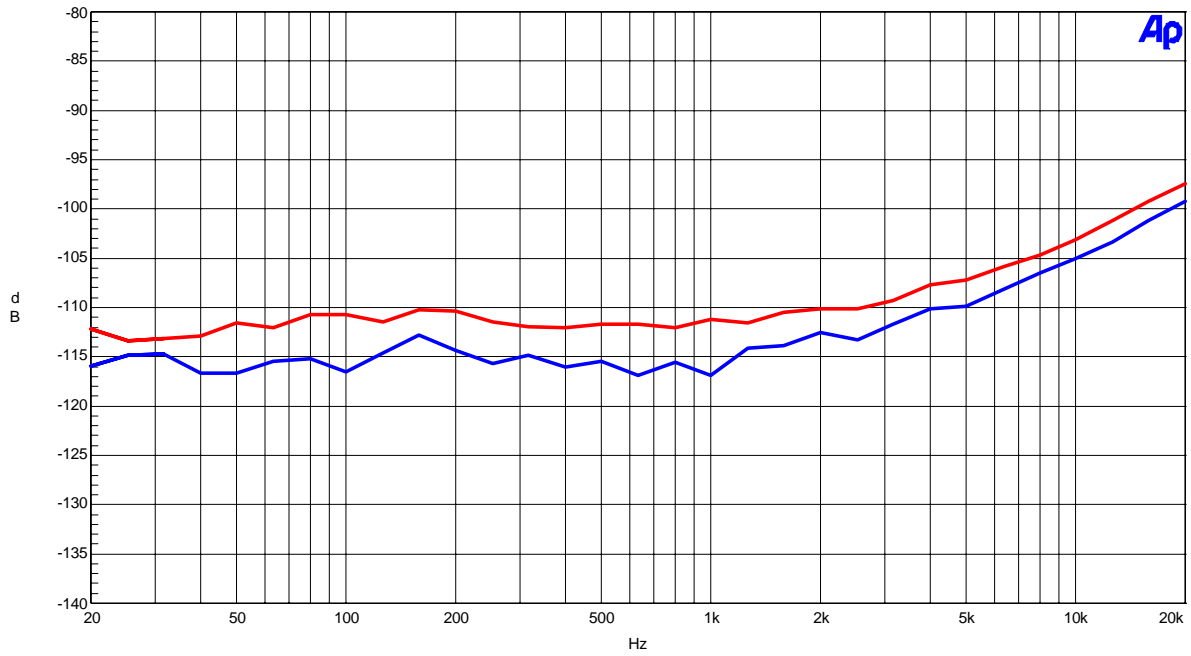
AK4628A Frequency Response  
 AVDD=DVDD=5V, fs=48kHz, MCLK=512fs, 0dBFS input



Frequency Response(Input Level=0dBFS)  
 (including external RC filter)

(DAC fs=48kHz)

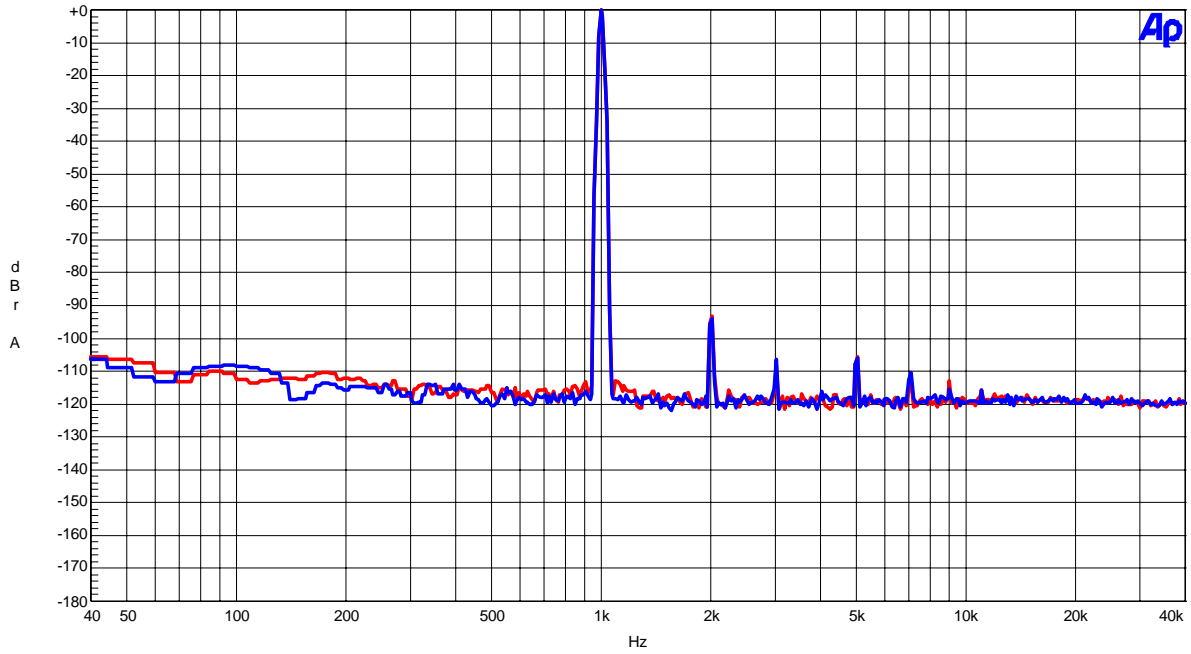
AKM

AK4628A Crosstalk (Red=Lch, Blue=Rch)  
AVDD=DVDD=5V, fs=8kHz, MCLK=512fs, 0dBFS input

Crosstalk(Red=Rch, Blue=Lch)

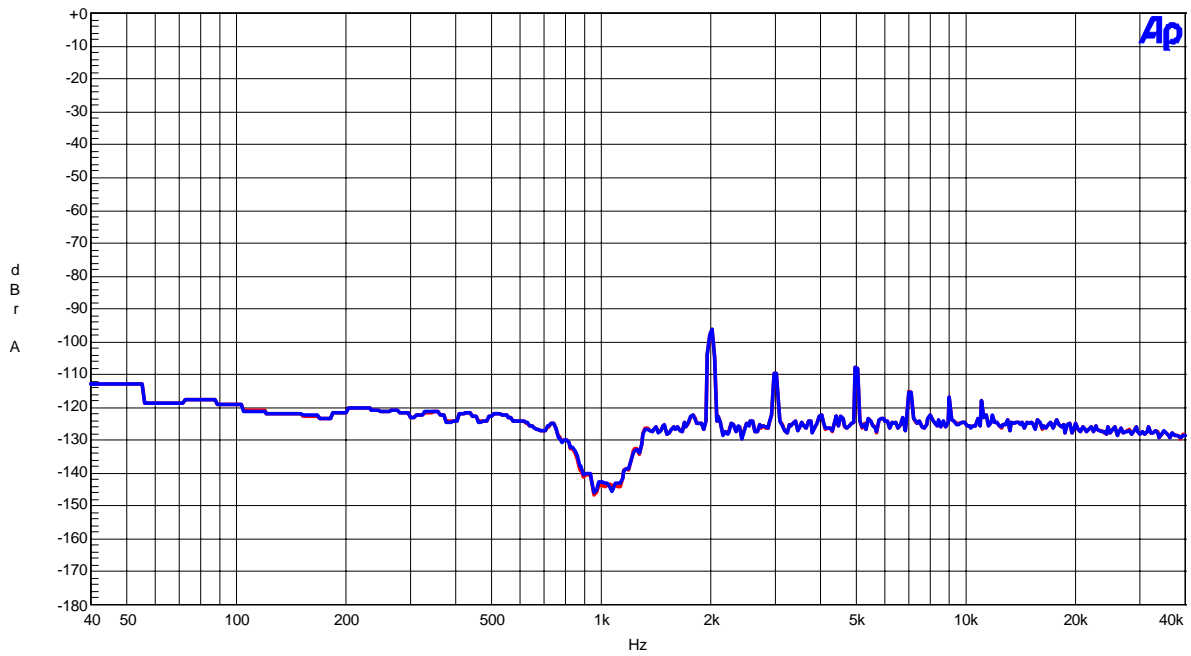
(DAC fs=96kHz)

AKM

AK4628 FFT  
AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, 0dBFS input, fin=1kHz

FFT (Input=0dBFS, fin=1kHz)

AKM

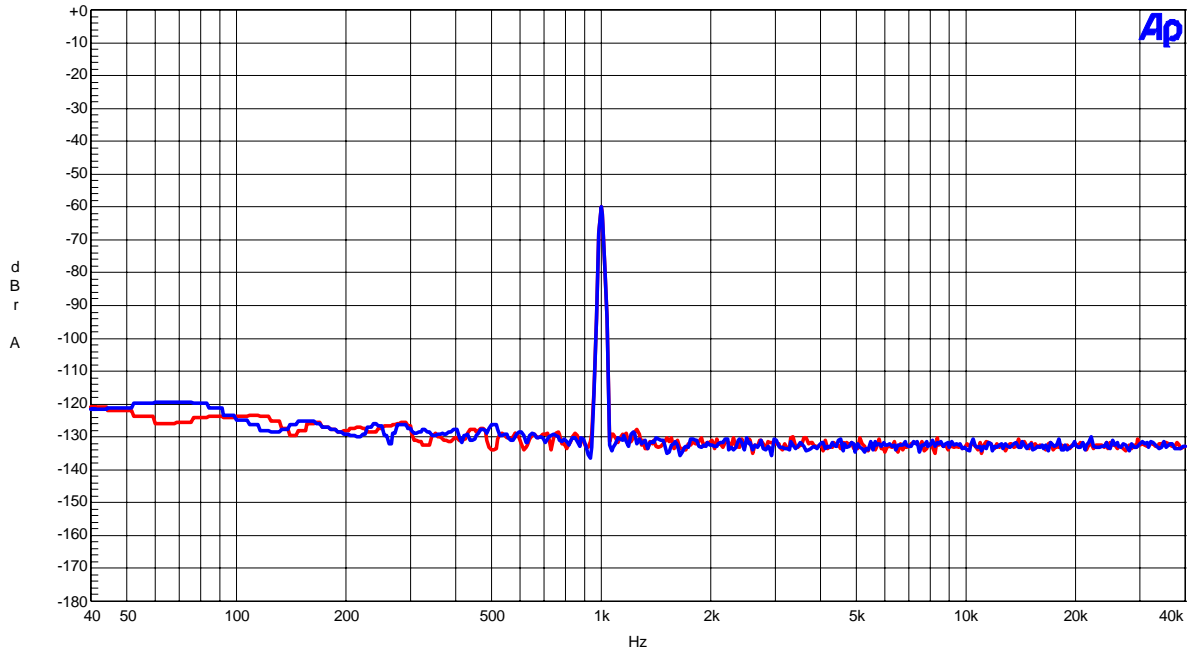
AK4628A FFT  
fs=96kHz, MCLK=256fs, fin=1kHz, 0dBFS input, Notch=ON

FFT (Input=0dBFS, fin=1kHz, Notch)



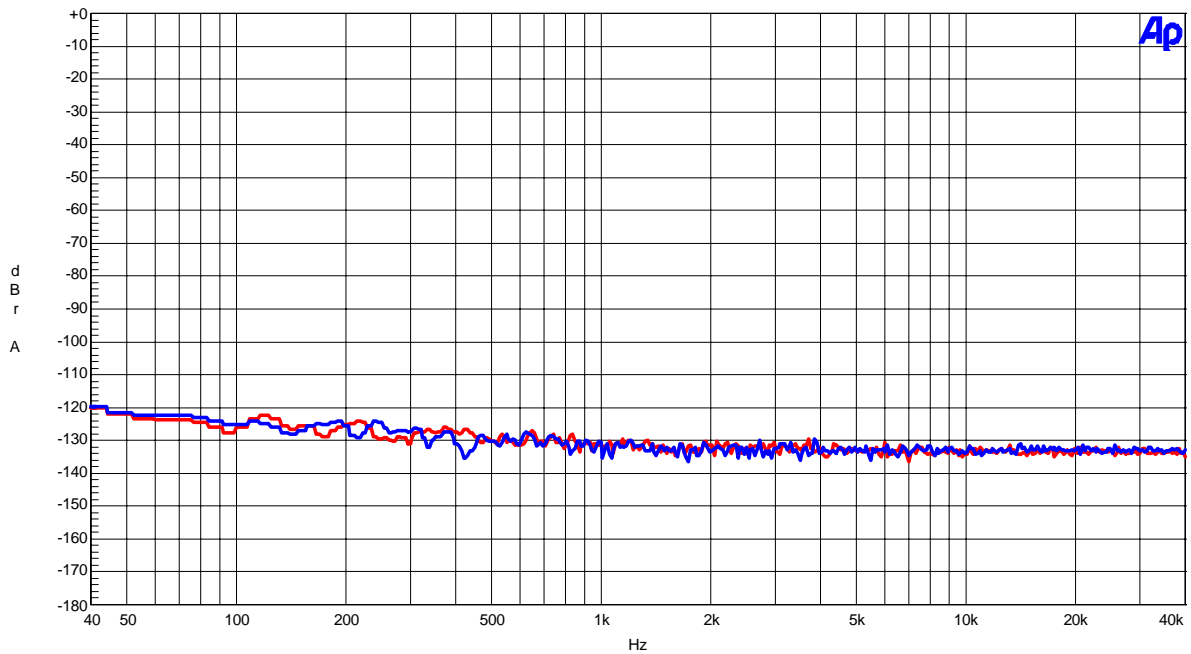
(DAC fs=96kHz)

AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, 0dBFS input, fin=1kHz

FFT (Input=-60dBFS,fin=1kHz)

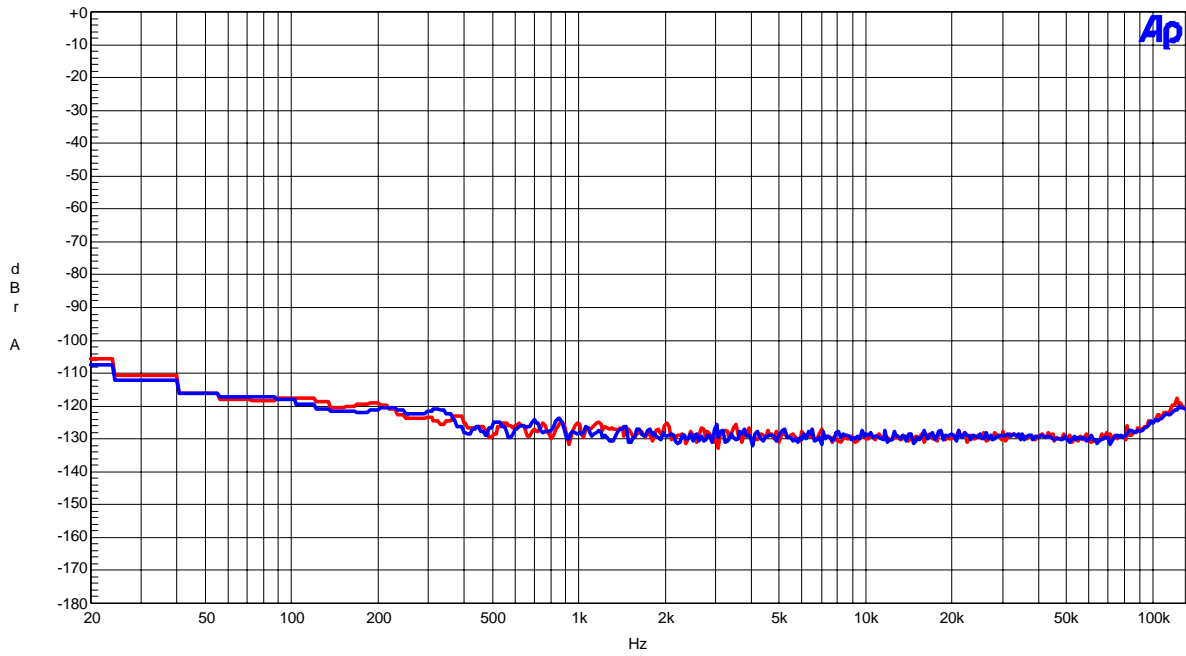
AKM

AK4628A FFT  
AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, fin=No signal input

FFT (Noise floor)

(DAC fs=96kHz)

AKM

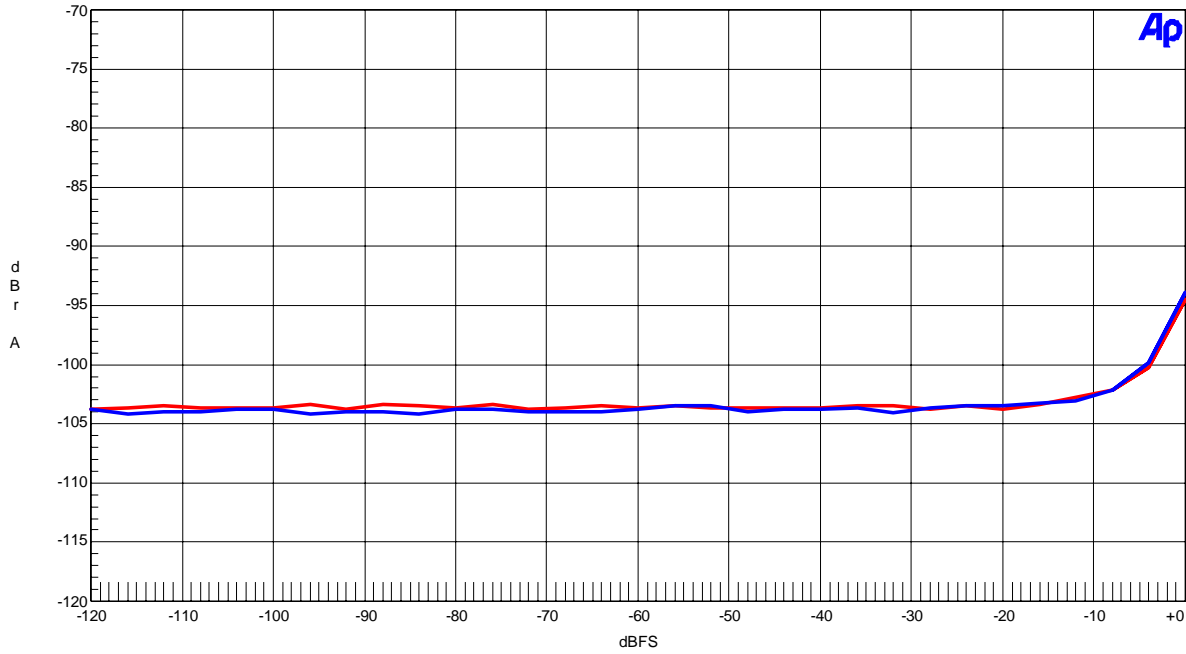
AK4626A FFT Out-of-band noise  
AVDD=DVDD=5V, fs=44.1kHz, MCLK=512fs, fin=No signal

FFT (Out-of-band noise)

(DAC fs=96kHz)

AKM

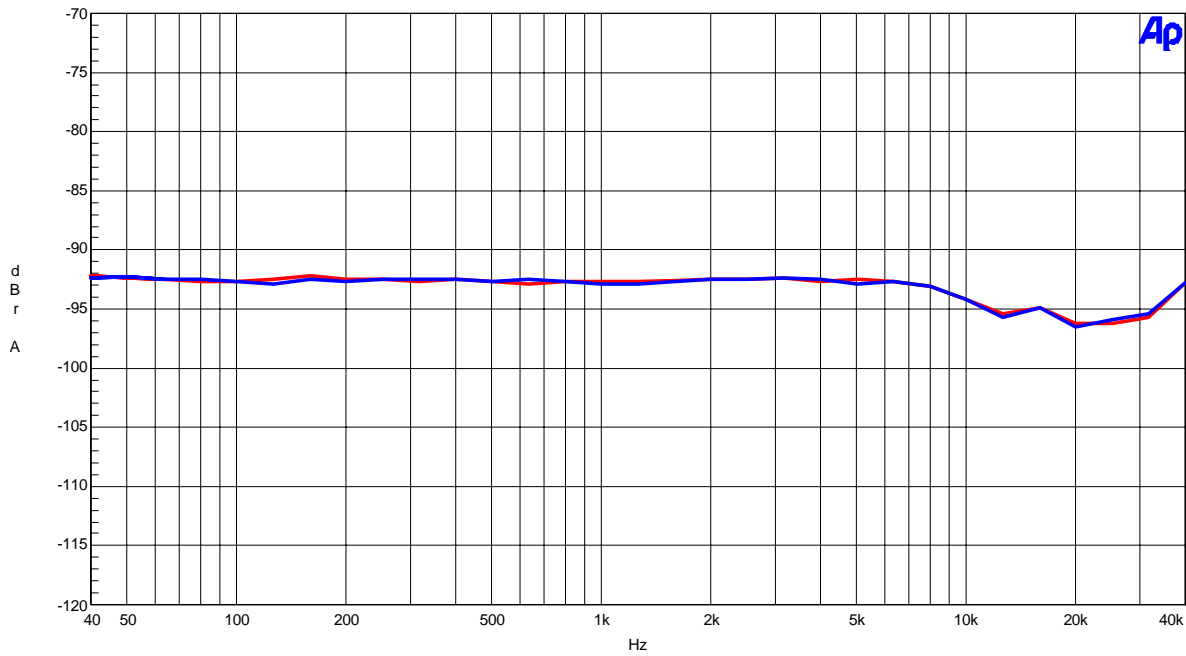
AK4626A THD+N vs. Input Level  
 AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, fin=1kHz



THD + N vs Amplitude (fin=1kHz)

AKM

AK4628A THD+N vs. Input Frequency  
 VDD=5V, fs=96kHz, MCLK=256fs, 0dBFS input

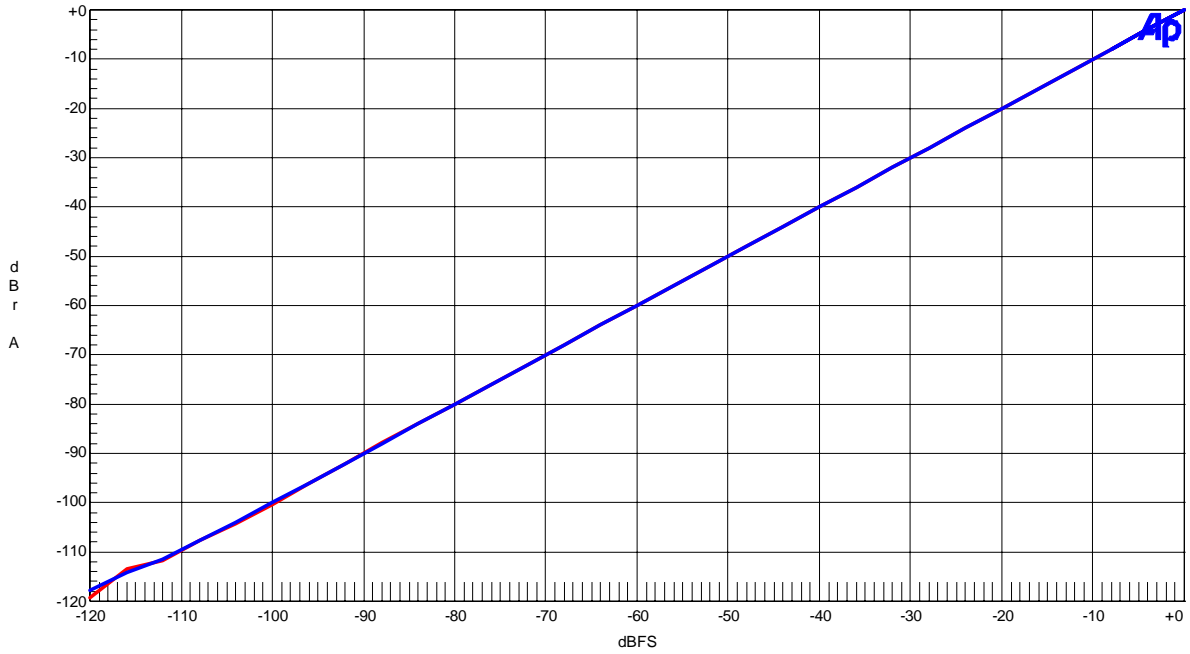


THD + N vs Input Frequency (Input=0dBFS)

(DAC fs=96kHz)

AKM

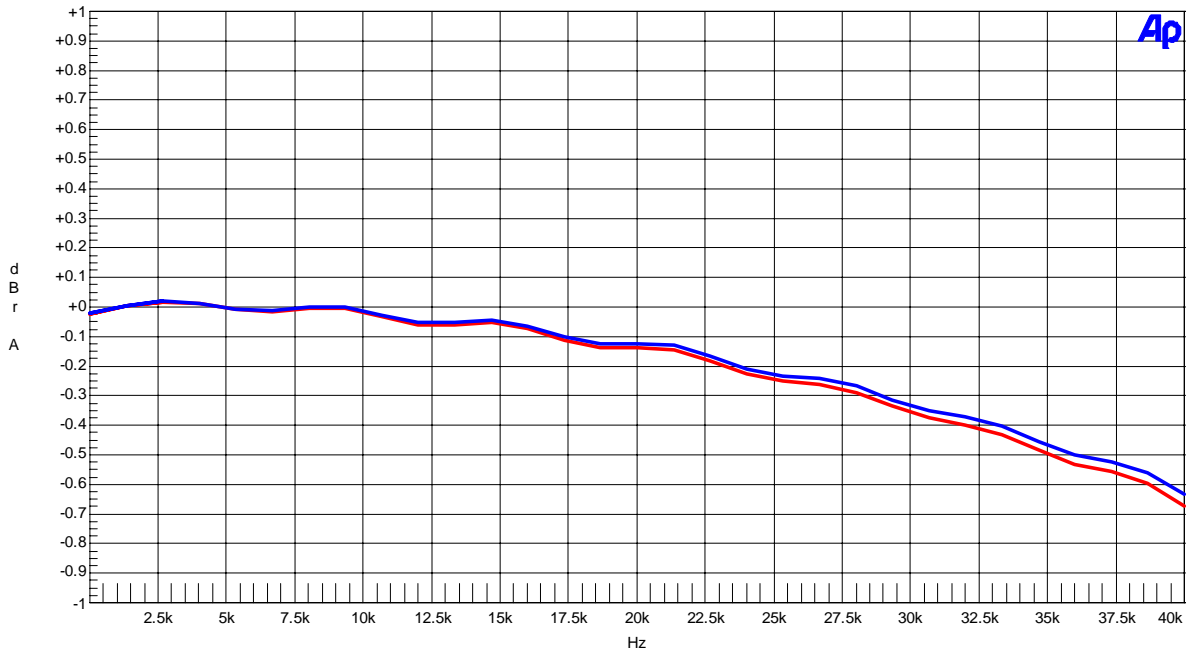
AK4628A Linearity  
 AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, fin=1kHz



Linearity(fin=1kHz)

AKM

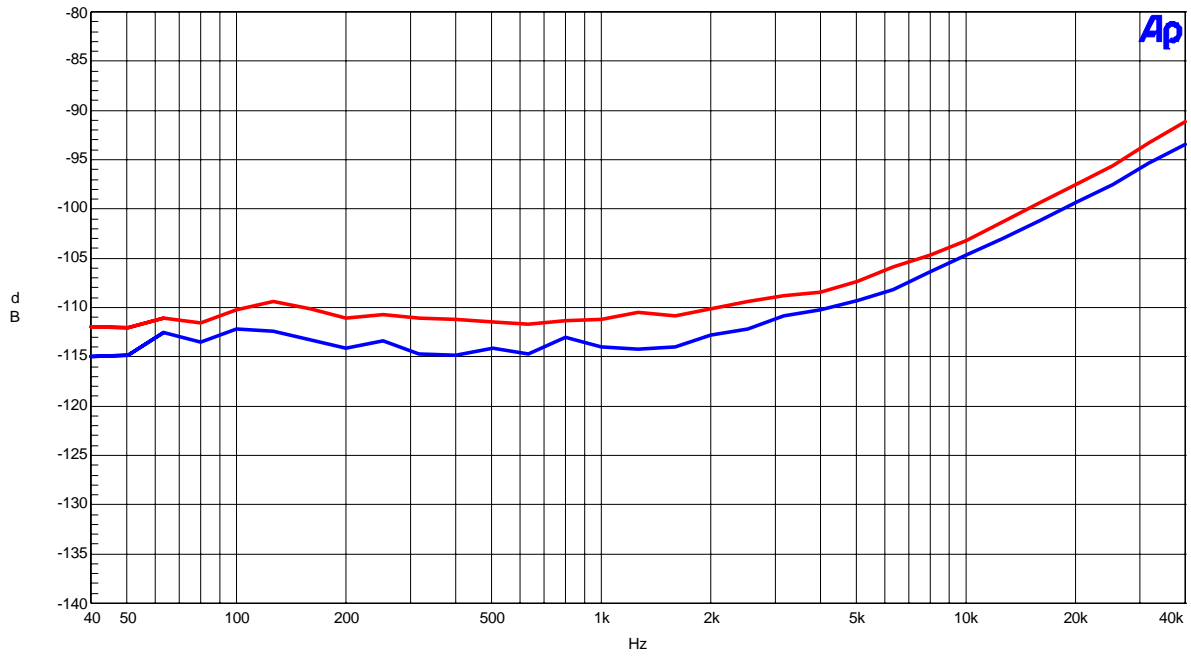
AK4628A Frequency Response  
 AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, 0dBFS input



Frequency Response(Input Level=0dBFS)  
 (including external RC filter)

(DAC fs=96kHz)

AKM

AK4628A Crosstalk (Red=Lch, Blue=Rch)  
AVDD=DVDD=5V, fs=96kHz, MCLK=256fs, 0dBFS input

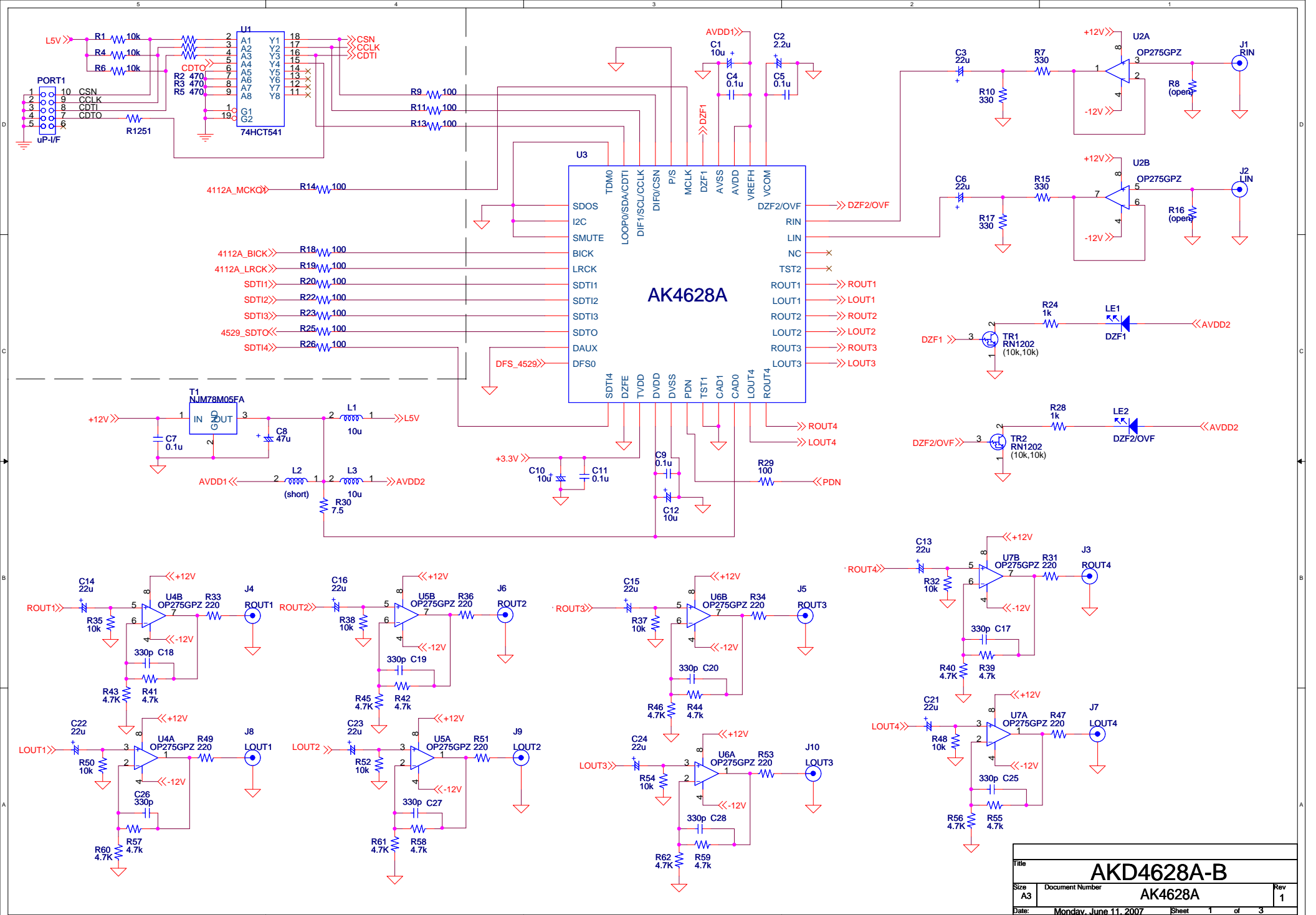
Crosstalk (Red=Rch, Blue=Lch)

<b>Revision History</b>
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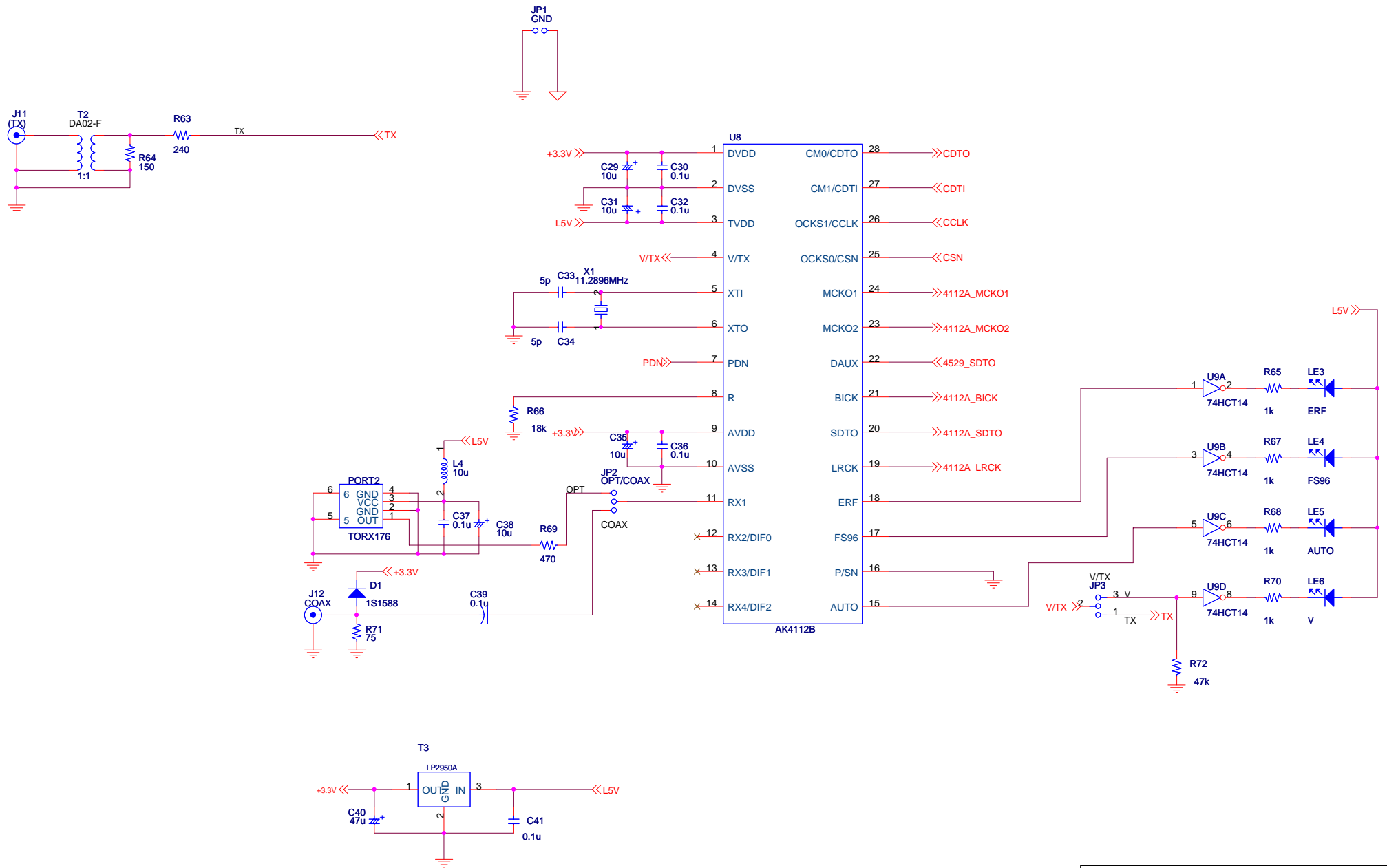
Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
06/08/29	KM084900	0	First Edition	
07/07/03	KM084901	1	Circuit Change	U2, U4, U5, U6, U7: OPamp Change: NJM4580→OP275GPZ

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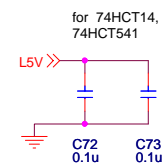
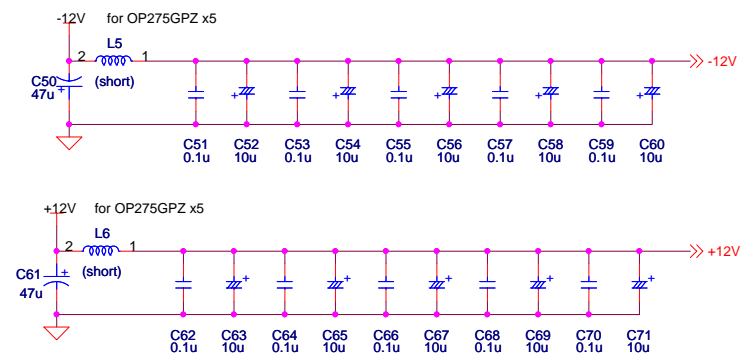
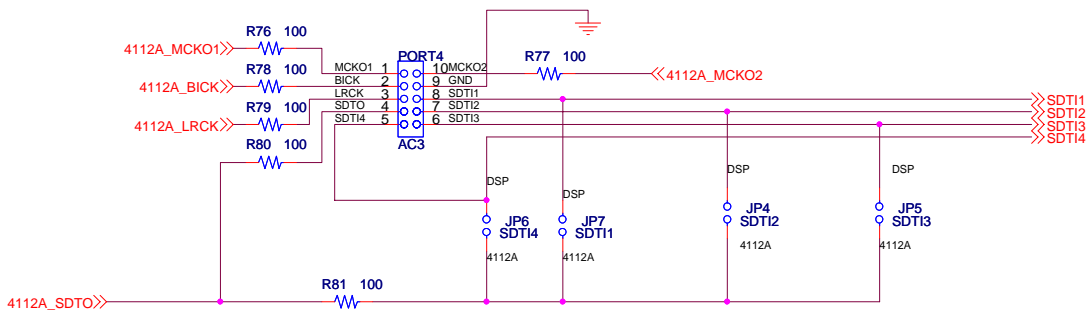
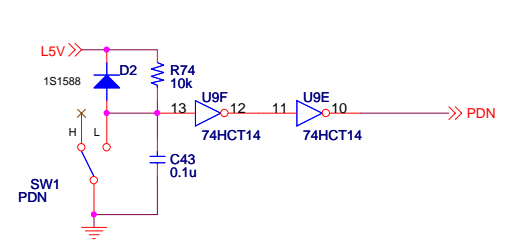
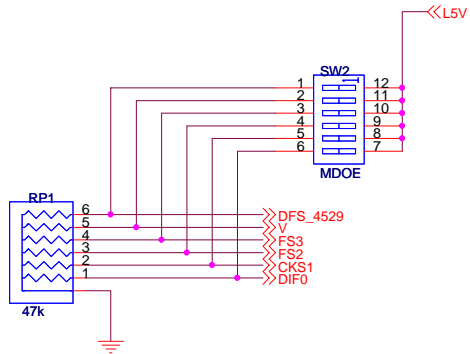
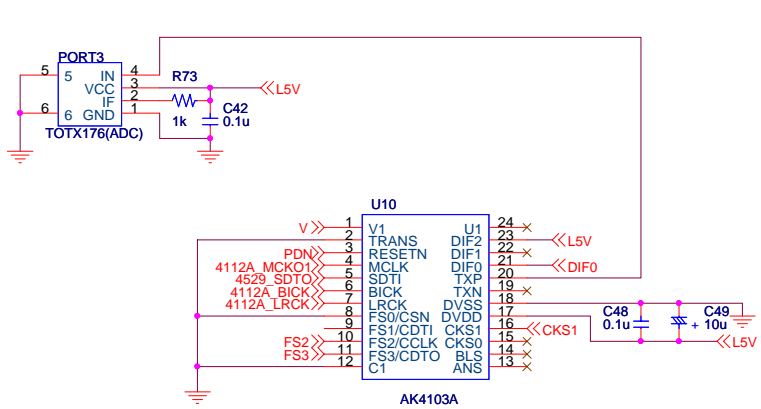


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Size	Document Number	AK4628A			Rev
A3					1
Date:	Monday, June 11, 2007	Sheet	1	of	3

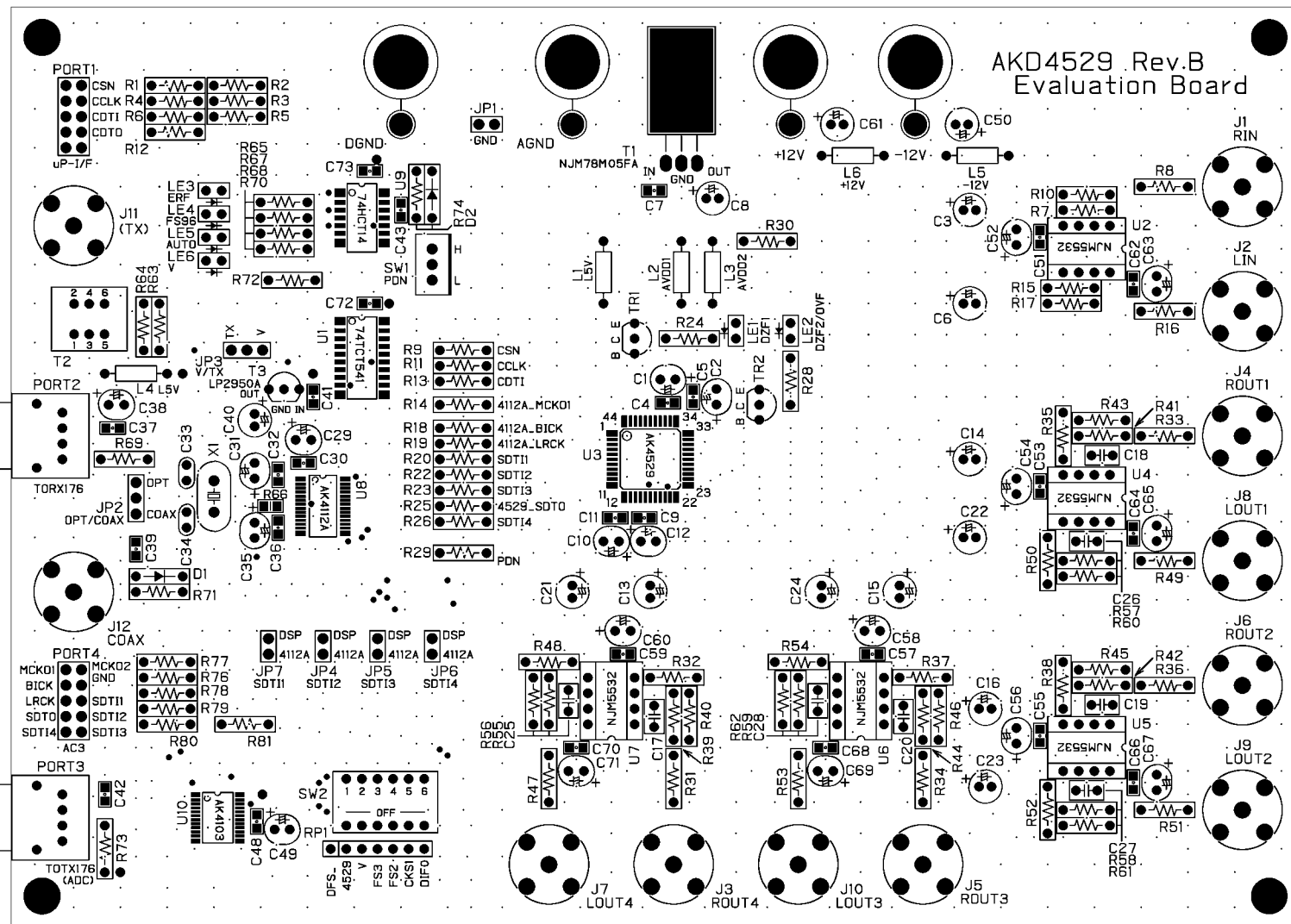


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Size	Document Number		AK4112B		
A3			Rev 1		
Date:	Monday, June 11, 2007	Sheet	2	of	3

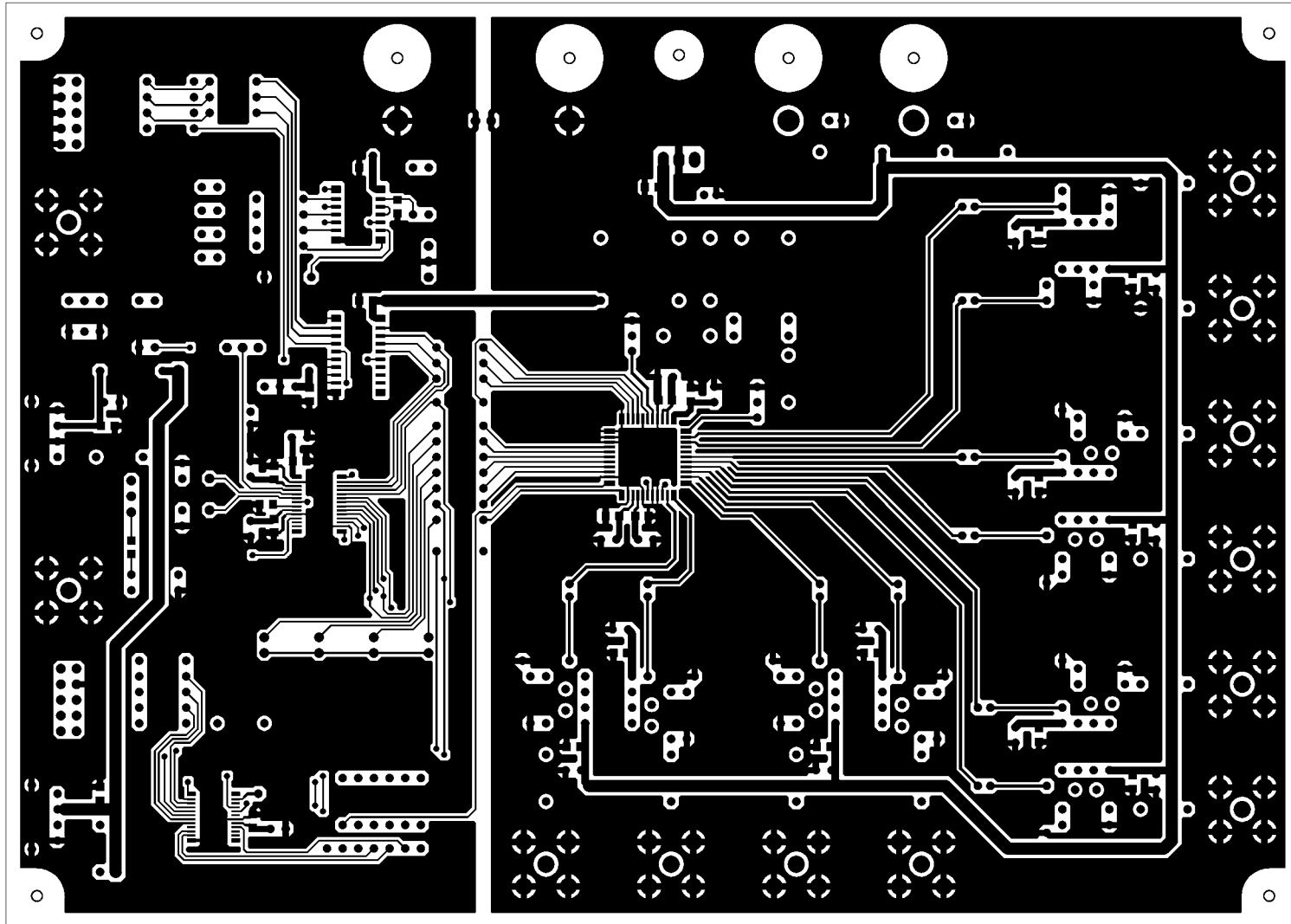




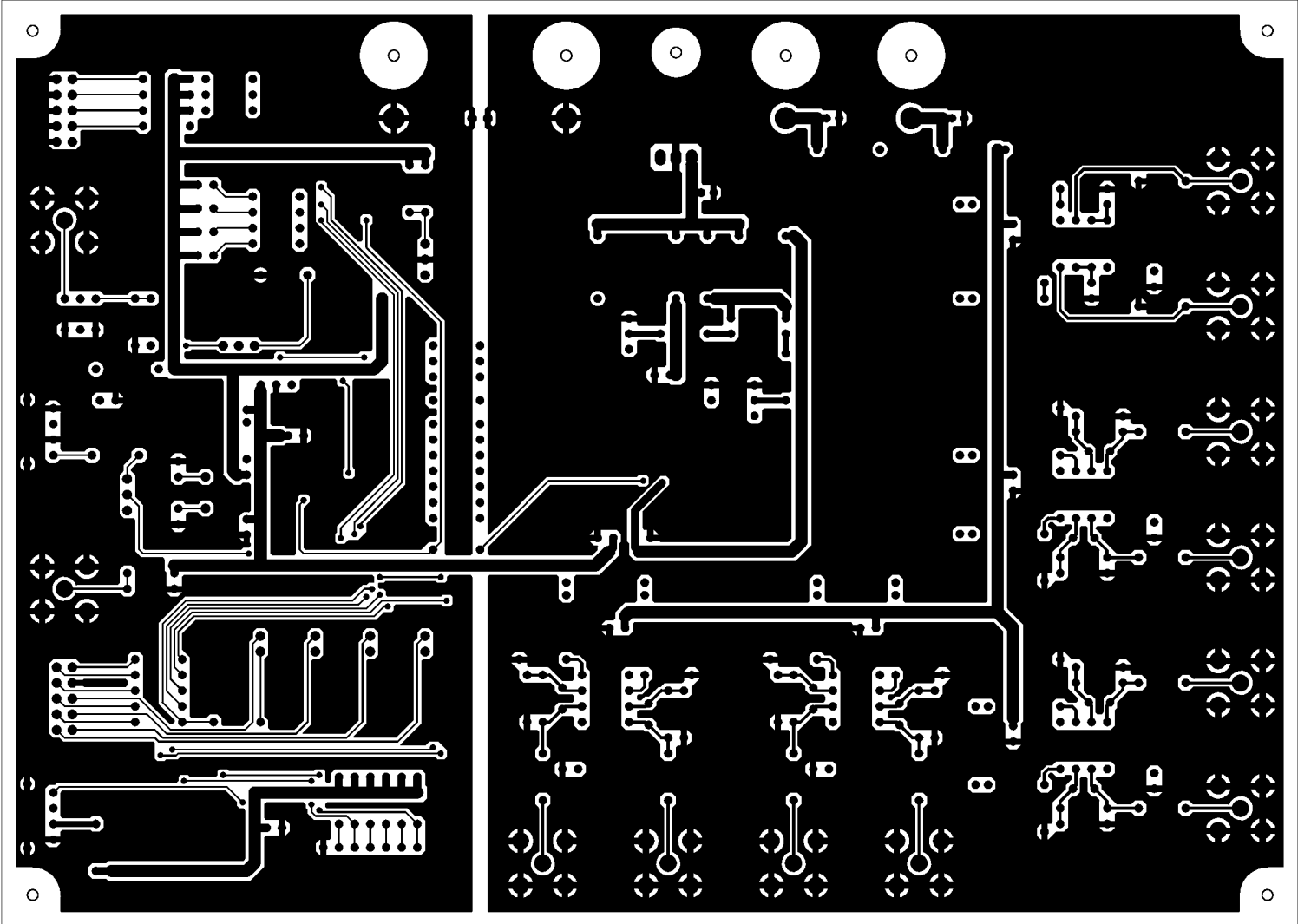
Title			AKD4628A-B		
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A3					1
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AKD4529 Rev.B L1 SR SILK



AKD4529 Rev.B L1



AKD4258 Rev.B LS