



# AKD4425A-SA

## AK4425A Evaluation Board Rev.0

**General Description**

AKD4425A-SA is an evaluation board for AK4425A (192kHz sampling 24Bit Stereo  $\Delta \Sigma$  DAC with 2Vrms Output). AKD4425A-SA has a digital audio interface (AK4118) of Optical input and can easily achieve the interface with digital audio system. Therefore, it is easy to evaluate the sound quality of AK4425A.

■ **Ordering Guide**

AKD4425A-SA ---- AK4425A Evaluation Board

**Function**

- **Compatible with 2 types of interface**  
**DIR with optical input and BNC input**  
**Direct interface with 10pin header**
- **BNC connector for Analog Output**

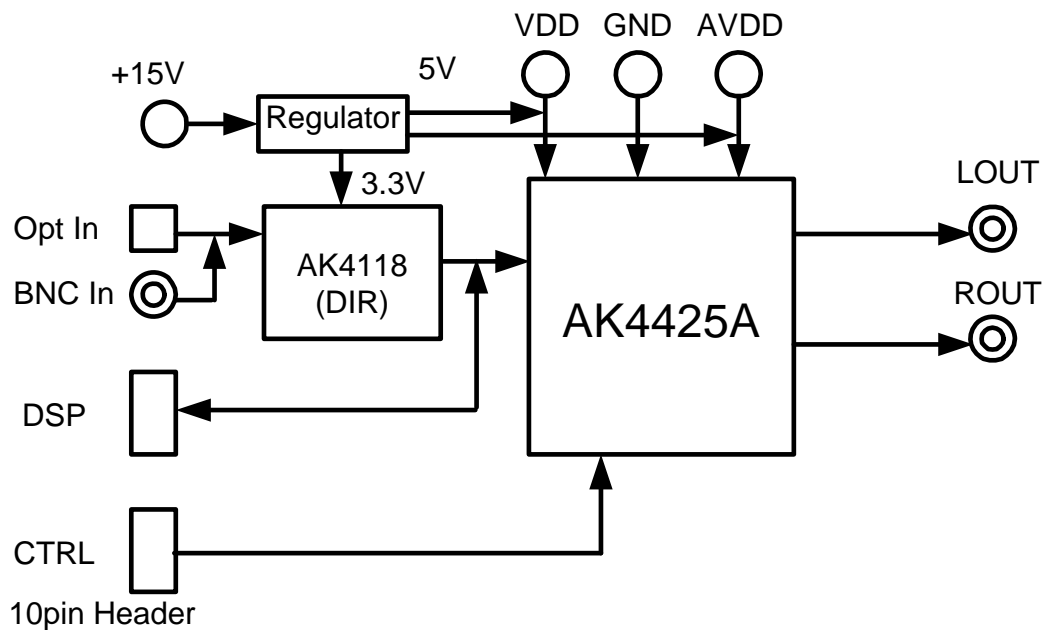


Figure 1. AKD4425A-SA Block diagram  
 (\* Circuit diagram are attached at the end of this manual.)

## ■ Operation sequence

- 1) Set up the power supply lines.  
Each supply line should be distributed from the power supply unit.

Name of jack	Color of jack	Voltage Range	Using	Default Setting	Default
+15V	Red	+7~+20V	Regulator : VDD and AVDD for AK4425A. The power supply for AK4118, 74LVC541 and other logic circuit.	Should be connected.	+15V
VDD	Orange	+4.5~+5.5V	VDD of AK4425A	Should be connected. (Default, Note1)	+5V
AVDD	Orange	+4.5~+5.5V	AVDD of AK4425A	Should be connected. (Default, Note2)	+5V
GND	Black	0V	Ground	Should be connected.	0V

Table 1. Set up of power supply lines

Note 1) VDD for AK4425A can supply to connect Regulator. In this case, should be to “short” of R58 and no connected “VDD” of jack.

Note 2) AVDD for AK4425A can supply to connect Regulator. In this case, should be to “short” of R59 and no connected “AVDD” of jack.

- 2) DIP Switch setting:  
Refer to Table 2, Table 3 and Table 4.
- 3) Power Down:  
The AK4118 should be reset once by bringing SW2 (AK4118 PDN) “L” upon power-up.

## ■ Evaluation mode

### 1. Using DIR (COAX) (Default)

The DIR generates MCLK, BICK, LRCK and SDATA from the received data through BNC connector (J3). It is possible to evaluate the AK4425A by using CD disk. Should be no connected to PORT1 (DSP).

Setting: R41: short (0Ω); R42: open

\* COAX is recommended for an evaluation of the Sound quality.

### 2. Using DIR (Optical Link)

The DIR generates MCLK, BICK, LRCK and SDATA from the received data through optical connector (PORT2: TORX141). It is possible to evaluate the AK4425A by using CD disk. Should be no connected to PORT1 (DSP).

Setting: R41: open; R42: short (0Ω)

### 3. Supply all interface signals that include master clock via PORT1 from external equipments..

Setting: R43, R44, R45, R46: open  
R47, R48, R49, R50: short (0Ω)

Note) The above work of removing (open) or shorting resistors need to modify the connection by soldering.

### ■ Setting of DIP switch

[S1]: AK4118 setting (ON = “H”, OFF = “L”)

No.	Pin	OFF	ON	Default
1	DIF1	AK4118's Audio Data Format setting Refer to Table 3		L
2	DIF0			L
3	OCKS1	AK4118's Master Clock setting Refer to Table 4		H
4	OCKS0			L

Table 2. S1 setting

Mode	DIF2	DIF1	DIF0	SDTO	Default
4	H	L	L	24bit, Left justified	Default
5		L	H	24bit, I <sup>2</sup> S	

Table 3. Audio Data Format setting

OCKS1	OCKS0	MCKO1	fs (max.)	Default
L	L	256fs	96kHz	Default
H	L	512fs	48kHz	
H	H	128fs	192kHz	

Table 4. MCLK clock setting

### ■ Setting of SW1 and SW2 switch

[SW1](SMUTE): Don't use. SW1 must be always “L”.

[SW2](PDN): Reset of AK4118. Keep “H” during normal operation.

■ Serial Control (I<sup>2</sup>C-bus Control Mode)

The AK4425A can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT3 (CTRL) with PC by 10 wire flat cable packed with the AKD4425A-SA

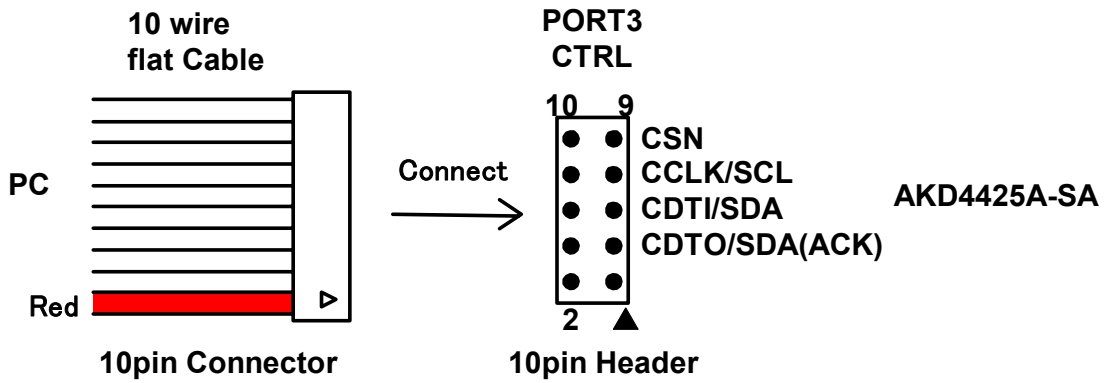


Figure 2. Connect of 10 wire flat cable

■ Analog Output Circuit

AOUTL and AOUTR pins are outputted from J1 (LOUT) and J2 (ROUT).

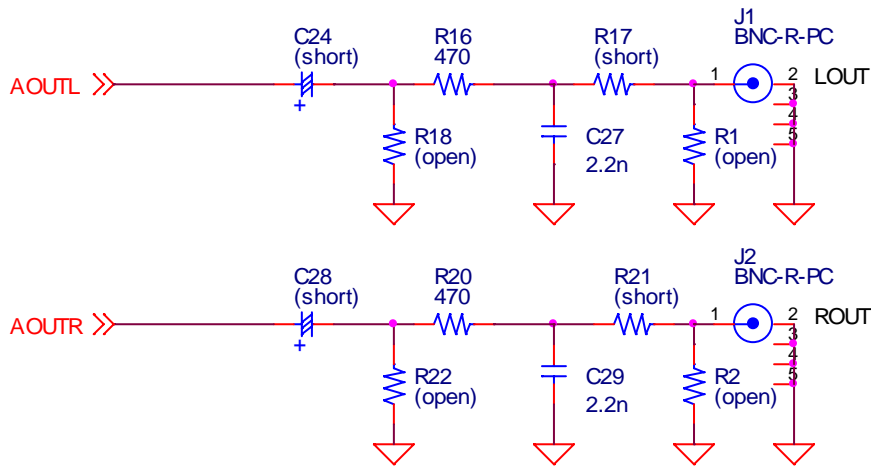


Figure 3. AOUTL / AOUTR Output Circuit

\* AKM assumes no responsibility for the trouble when using the above circuit examples.

## 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. Proceed evaluation by following the process below.

### ■ Operation Screen

1. Start up the control program following the process above.

The operation screen is shown below.

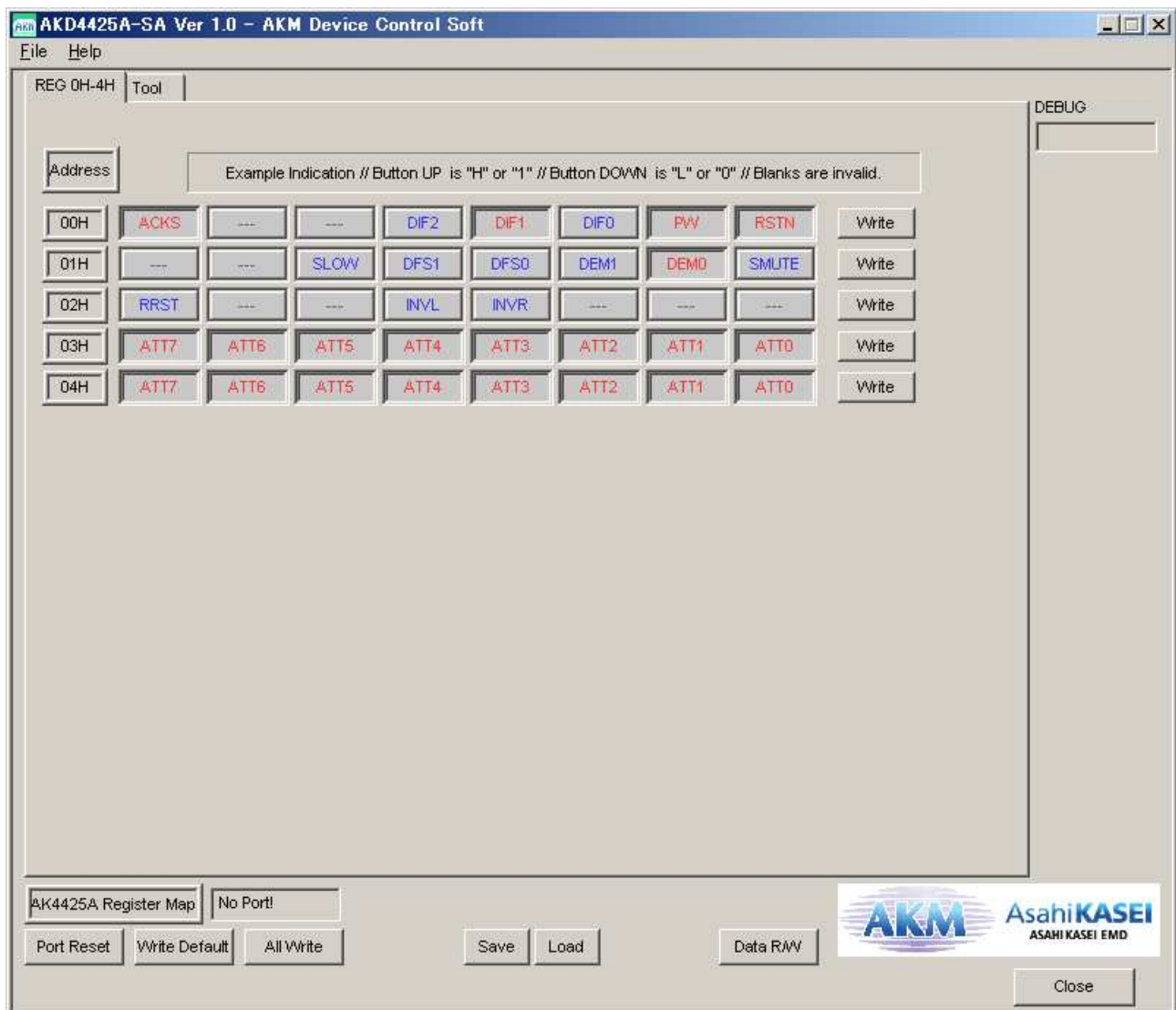


Figure 4. Window of [ FUNCTION ]

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

## ■ Tab Functions

### [Data R/W]

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

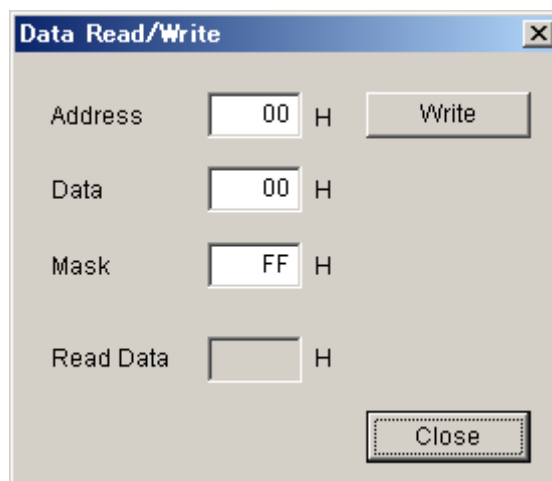


Figure 5. Window of [ Data R/W ]

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

\*The register map will be updated after executing [Write] or [Read] commands.

**[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)

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

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

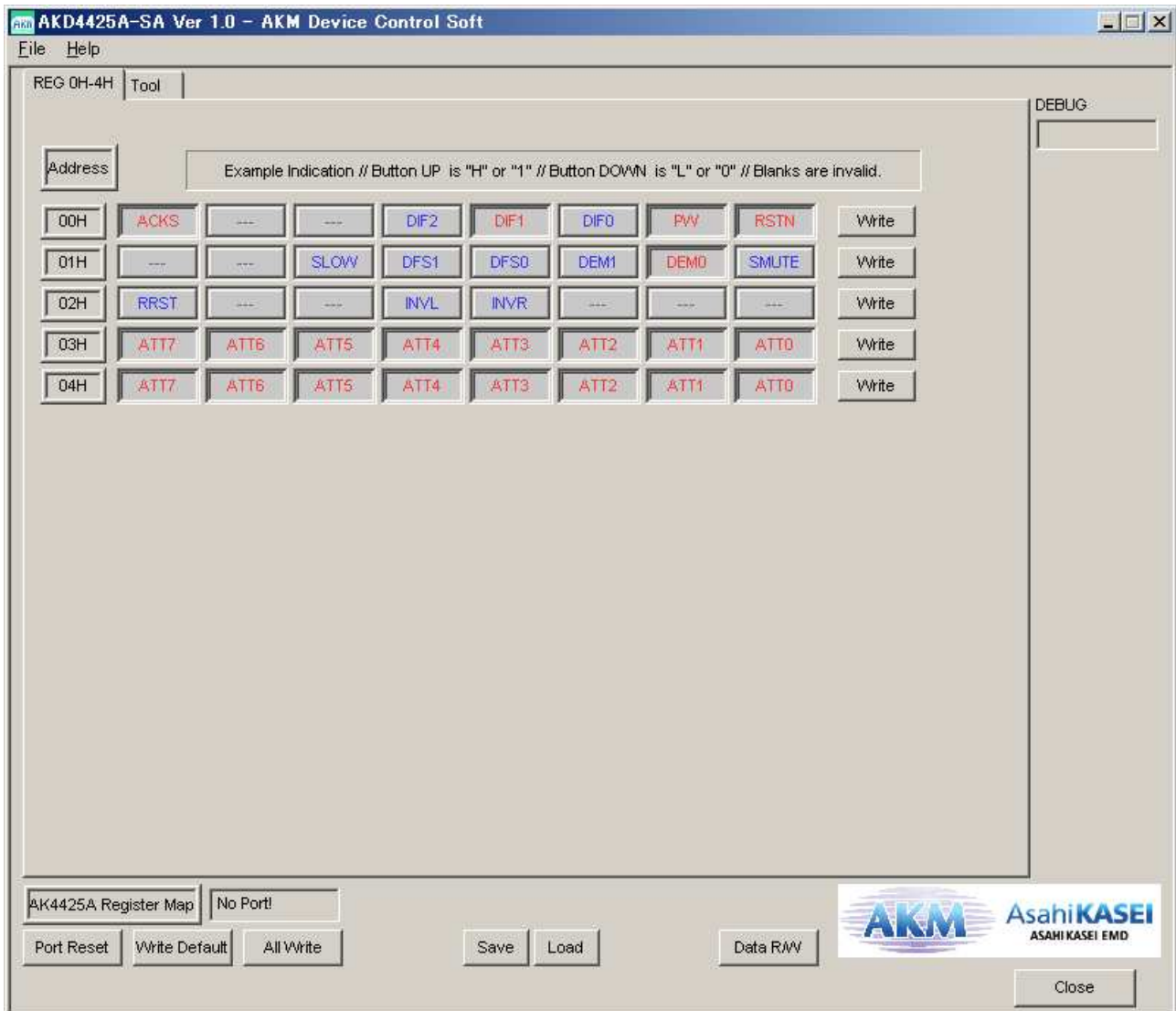


Figure 6. Window of [ REG]

**[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.

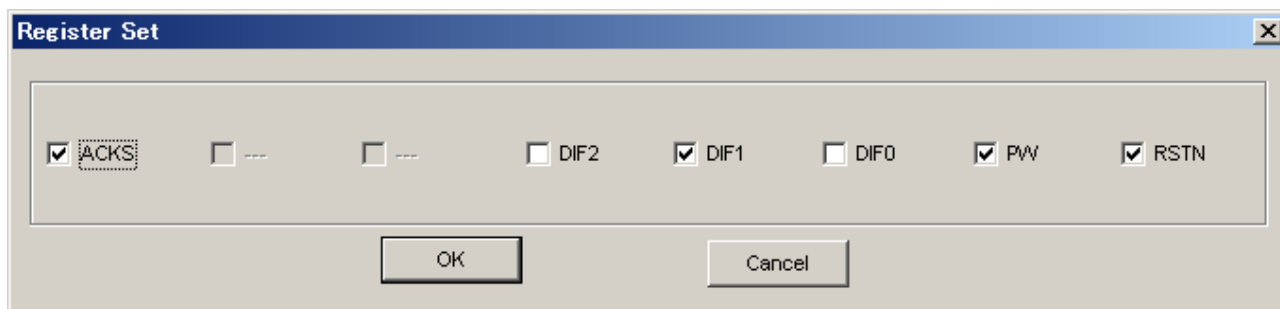


Figure 7. Window of [ Register Set ]

**[Tool]: Testing Tools**

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

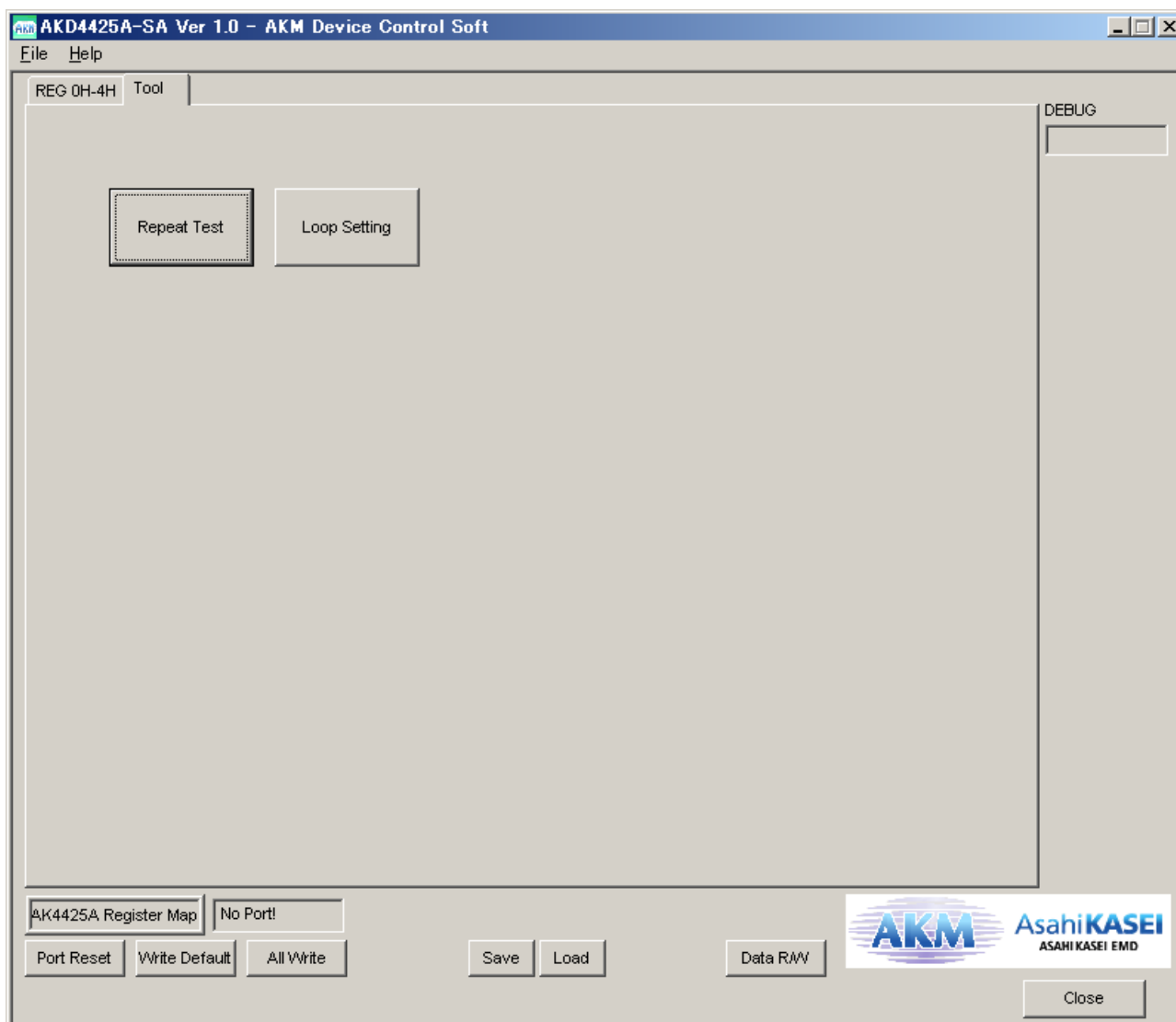


Figure 8. Window of [ Tool]

**[Repeat Test]: Repeat Test Dialog**

Click [Repeat Test] button to open repeat test setting dialog box.

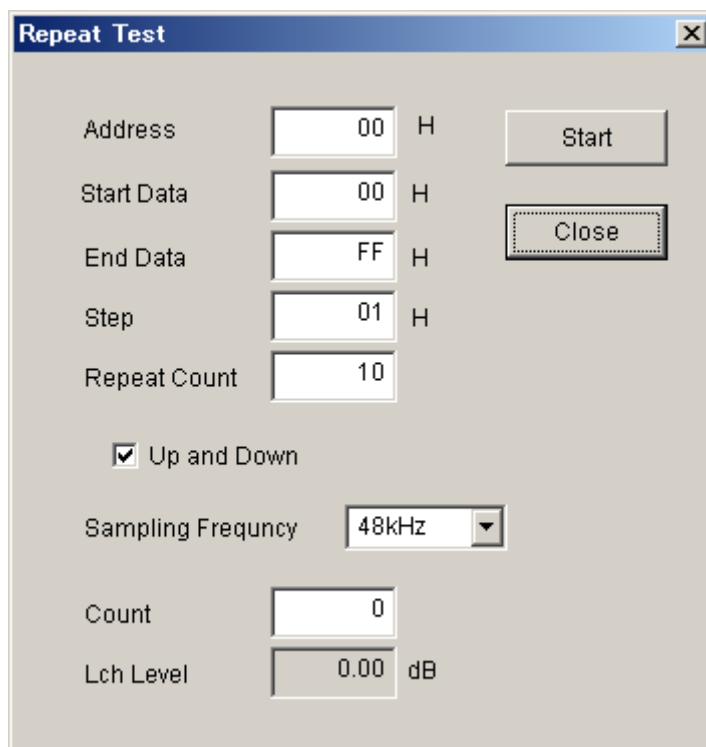


Figure 9. Window of [ Repeat Test]

**[Loop Setting]: Loop Setting Dialog**

Click [Loop Setting] button to open loop setting dialog box.

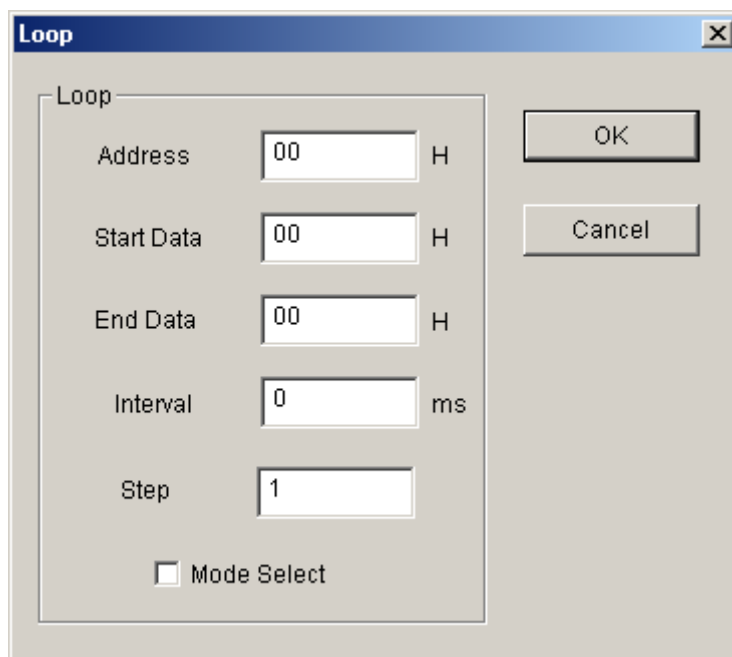


Figure 10. Window of [ Loop]

<b>Measurement Results</b>
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## [Measurement condition]

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

**Table Data**

fs=44.1kHz

Parameter	Input signal	Filter condition	Lch	Rch	Unit
S/(N+D)	1kHz, 0dB	20kHz SPCL, 20kHz Brick-wall LPF	91.6	91.1	dB
DR	1kHz, -60dB	20kHz SPCL, A-weighted	106.1	106.0	dB
S/N	"0" data	20kHz SPCL, A-weighted	106.5	106.3	dB

fs=96kHz

Parameter	Input signal	Filter condition	Lch	Rch	Unit
S/(N+D)	1kHz, 0dB	40kHz SPCL, 40kHz Brick-wall LPF	91.6	91.1	dB
DR	1kHz, -60dB	40kHz SPCL, A-weighted	106.2	106.0	dB
S/N	"0" data	40kHz SPCL, A-weighted	106.4	106.3	dB

fs=192kHz

Parameter	Input signal	Filter condition	Lch	Rch	Unit
S/(N+D)	1kHz, 0dB	40kHz SPCL, 40kHz Brick-wall LPF	91.5	91.0	dB
DR	1kHz, -60dB	40kHz SPCL, A-weighted	106.3	106.1	dB
S/N	"0" data	40kHz SPCL, A-weighted	106.4	106.3	dB

Plot Data

(1) fs = 44.1kHz (MCLK=512fs)

0dBFS FFT@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

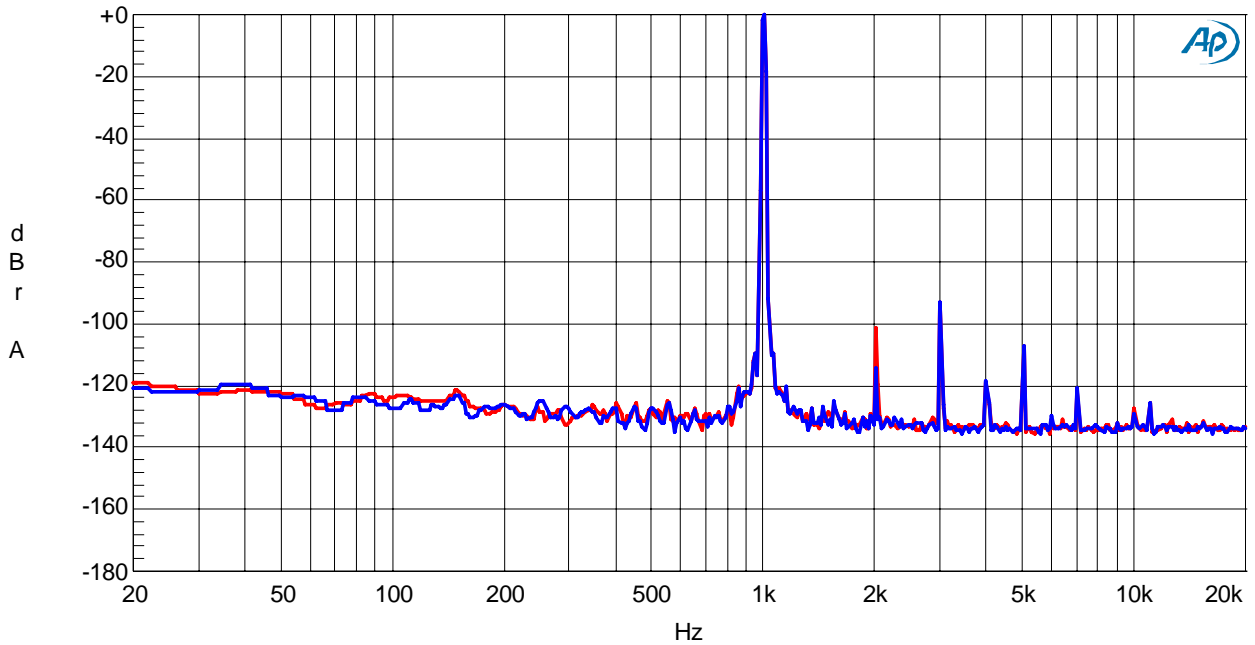


Figure 11. FFT (fin=1kHz, Input Level=0dBFS)

-60dBFS FFT@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

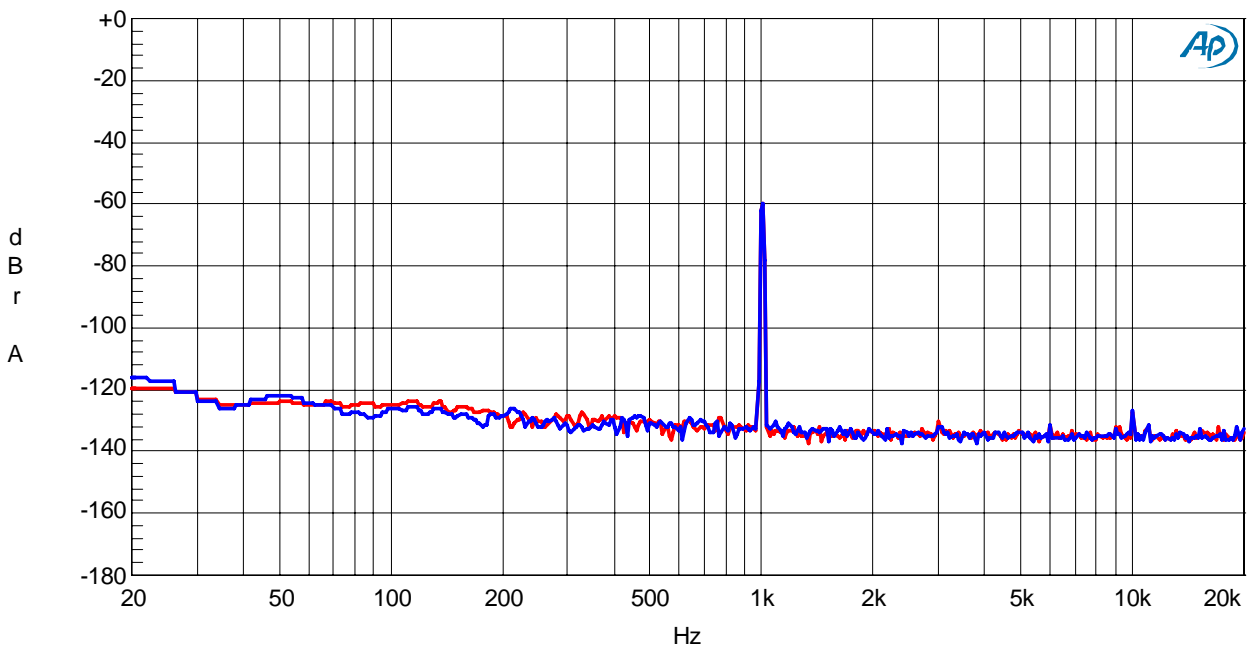


Figure 12. FFT (fin=1kHz, Input Level=-60dBFS)

No Signal FFT @fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

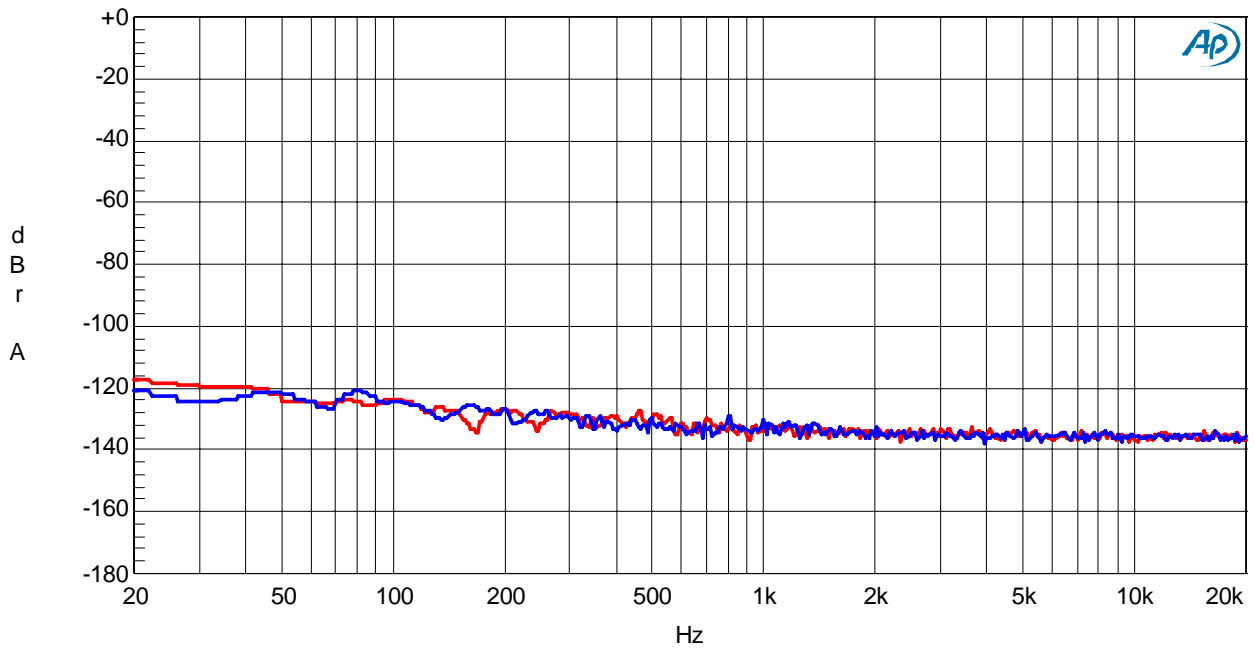


Figure 13. FFT (No Signal)  
Out of band Noise @fs=44.1 kHz  
[Blue:LOUT, Red:ROUT]

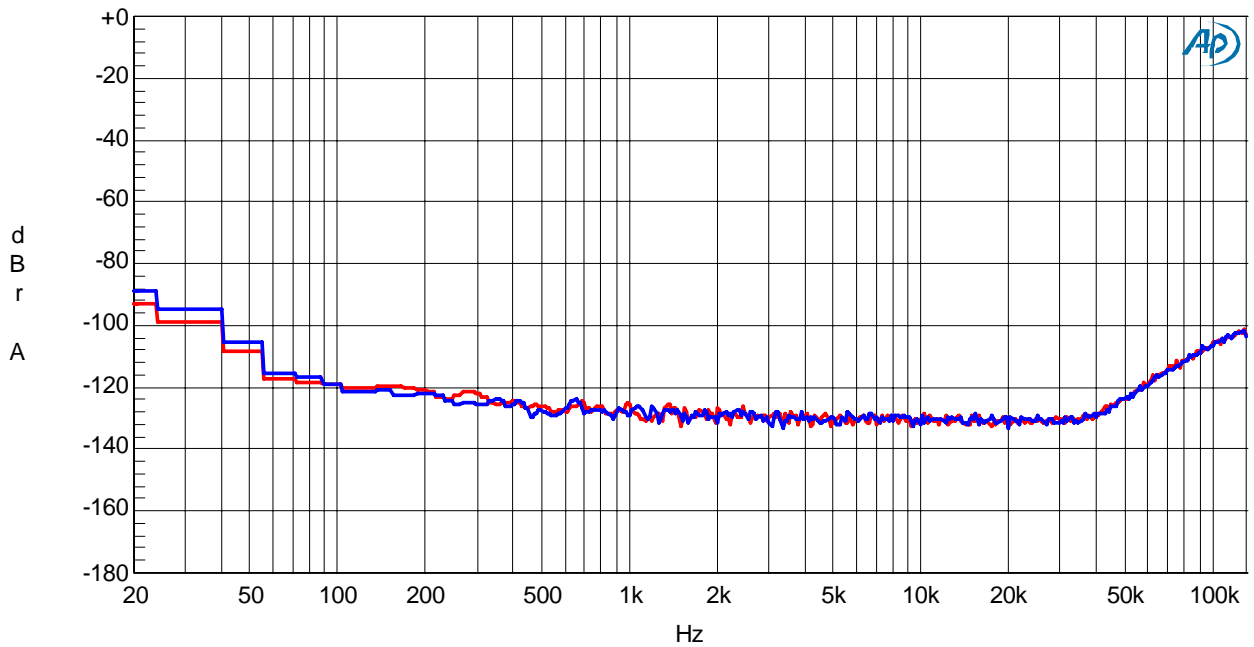


Figure 14. FFT (Out of band noise)

THD+N vs. Input Level@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

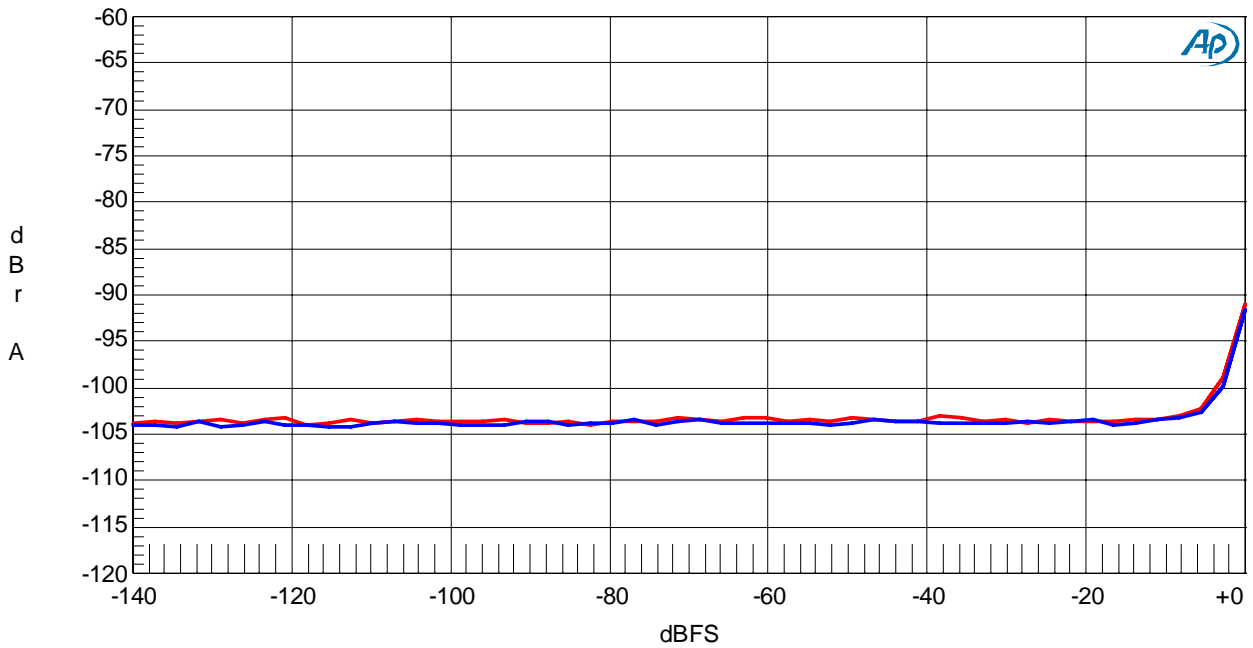


Figure 15. THD+N vs. Input level (fin=1kHz, 20kHz SPCL)

THD+N vs. Input Frequency@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

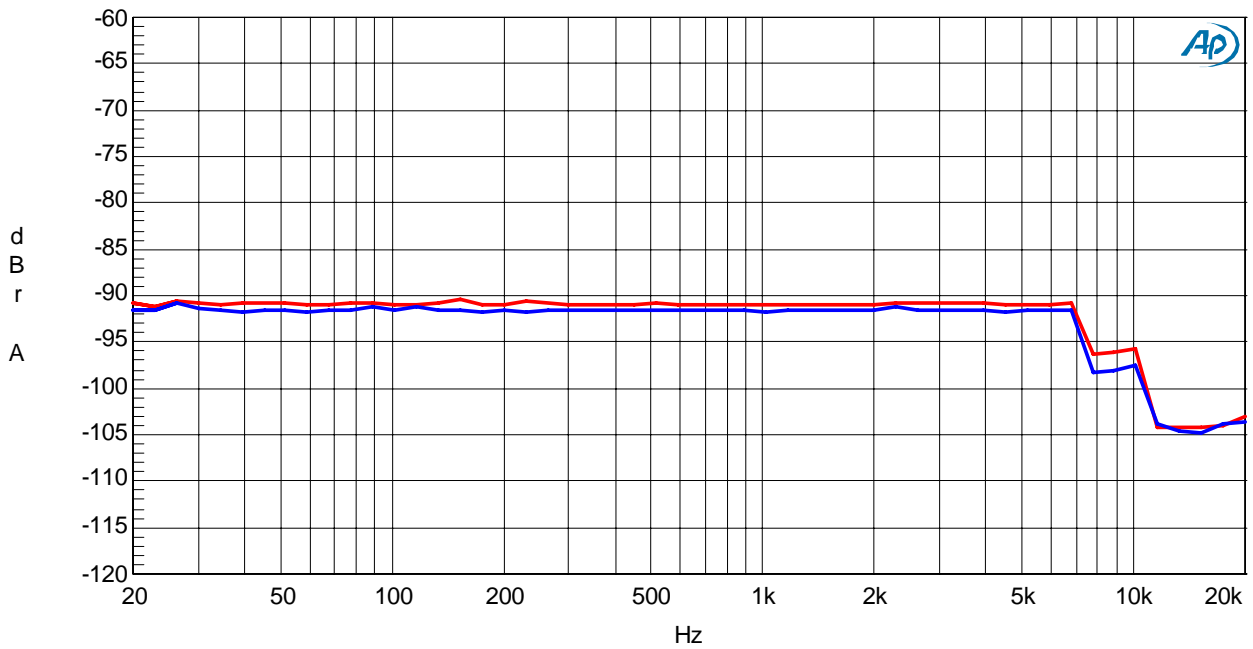


Figure 16. THD+N vs. Input Frequency (Input level=0dBFS, 20kHz SPCL)

Linearity@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

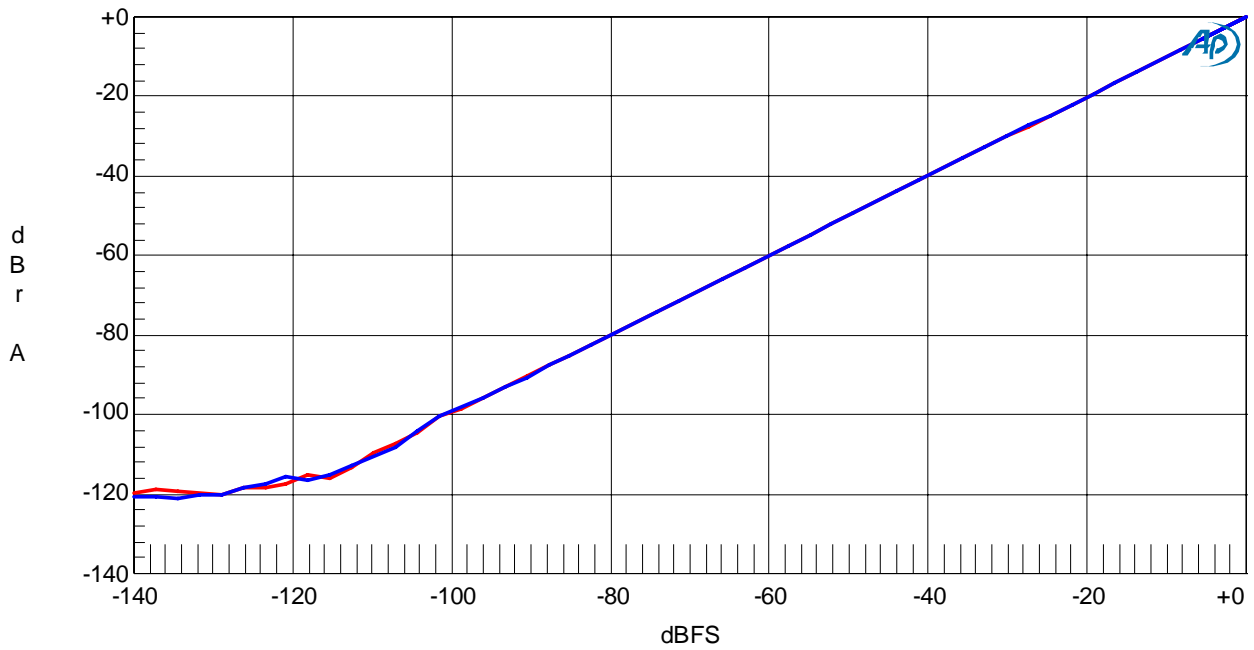


Figure 17. Linearity (fin=1kHz)

Frequency Response@fs=44.1kHz  
[Blue:LOUT, Red:ROUT]

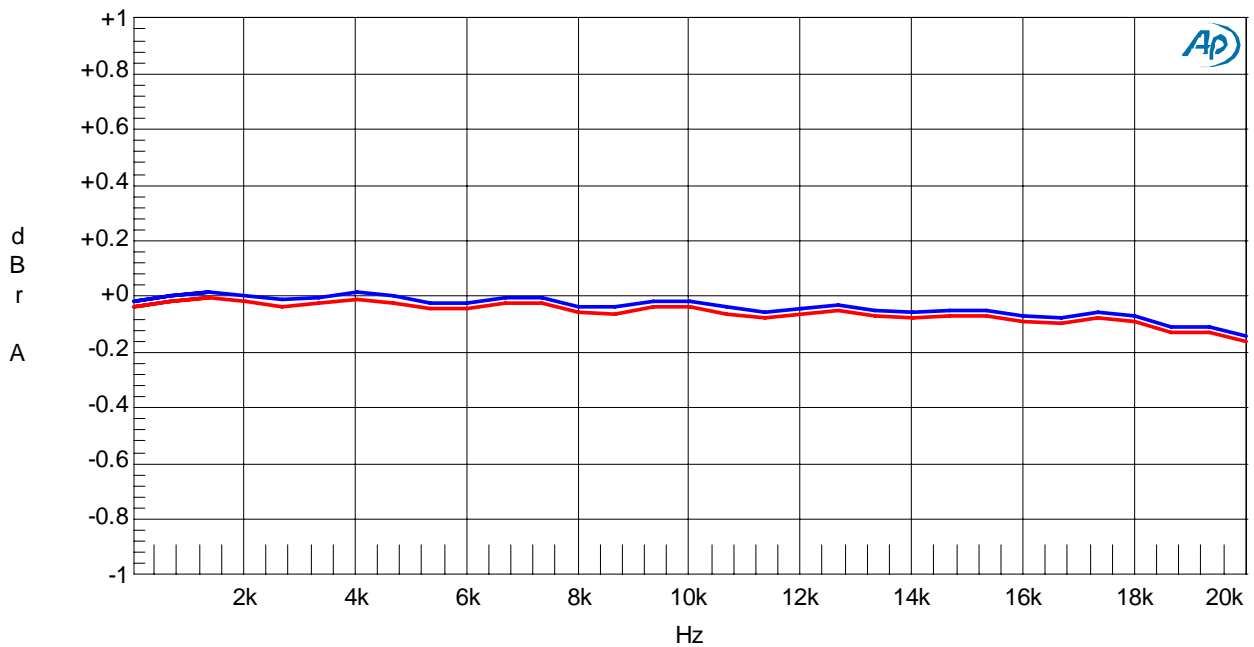


Figure 18. Frequency Response (Input level=0dBFS)

### Crosstalk@fs=44.1kHz

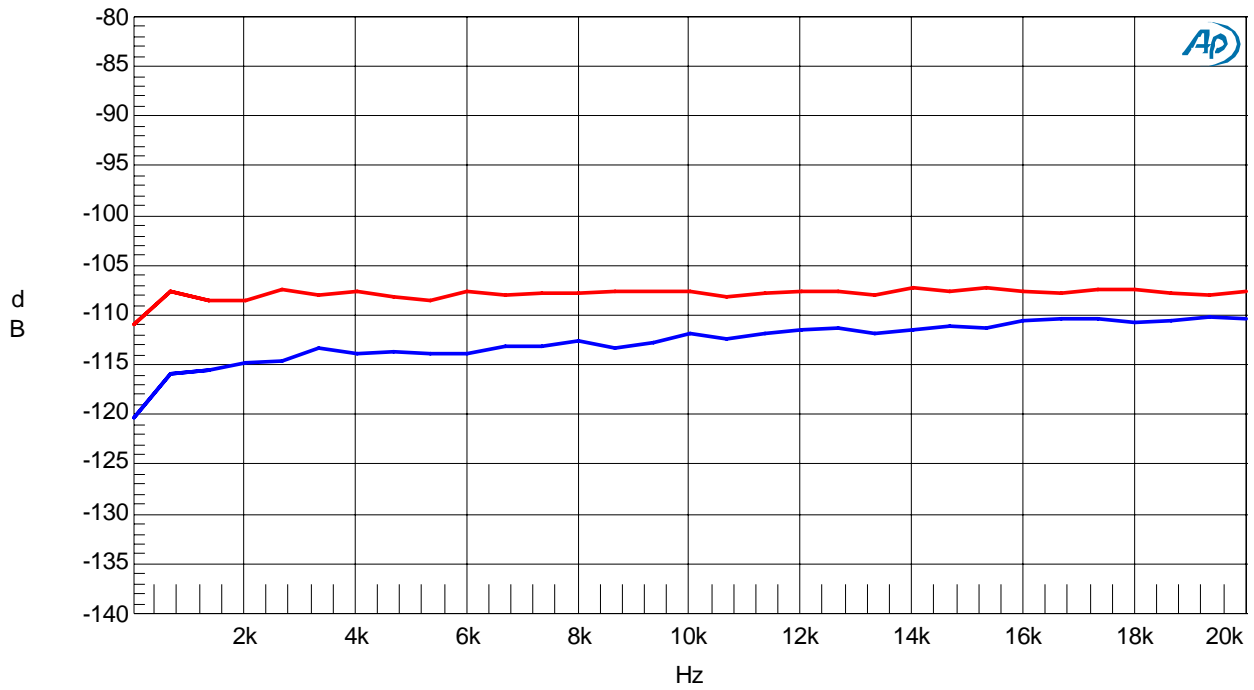


Figure 19. Crosstalk (Input level=0dBFS)  
Red: Lch ← Rch, Blue: Rch ← Lch

(2) fs = 96kHz (MCLK=256fs)

0dBFS FFT@fs=96kHz  
[Blue:LOUT, Red:ROUT]

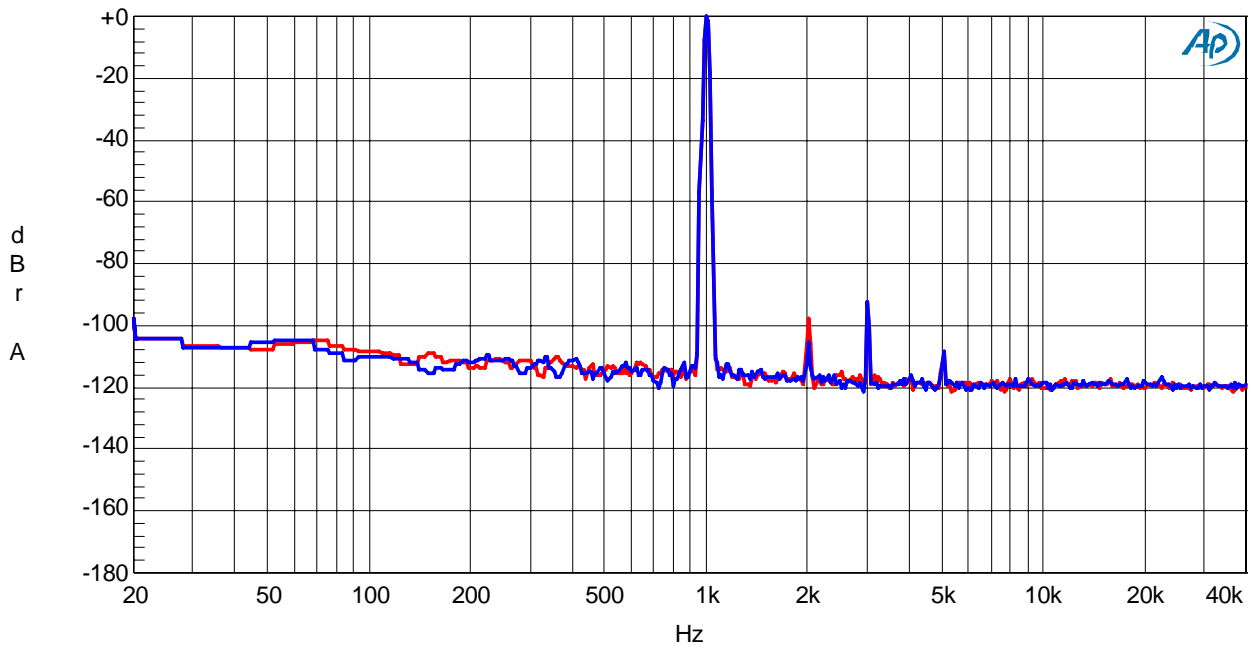


Figure 20. FFT (fin=1kHz, Input Level=0dBFS)

-60dBFS FFT@fs=96kHz  
[Blue:LOUT, Red:ROUT]

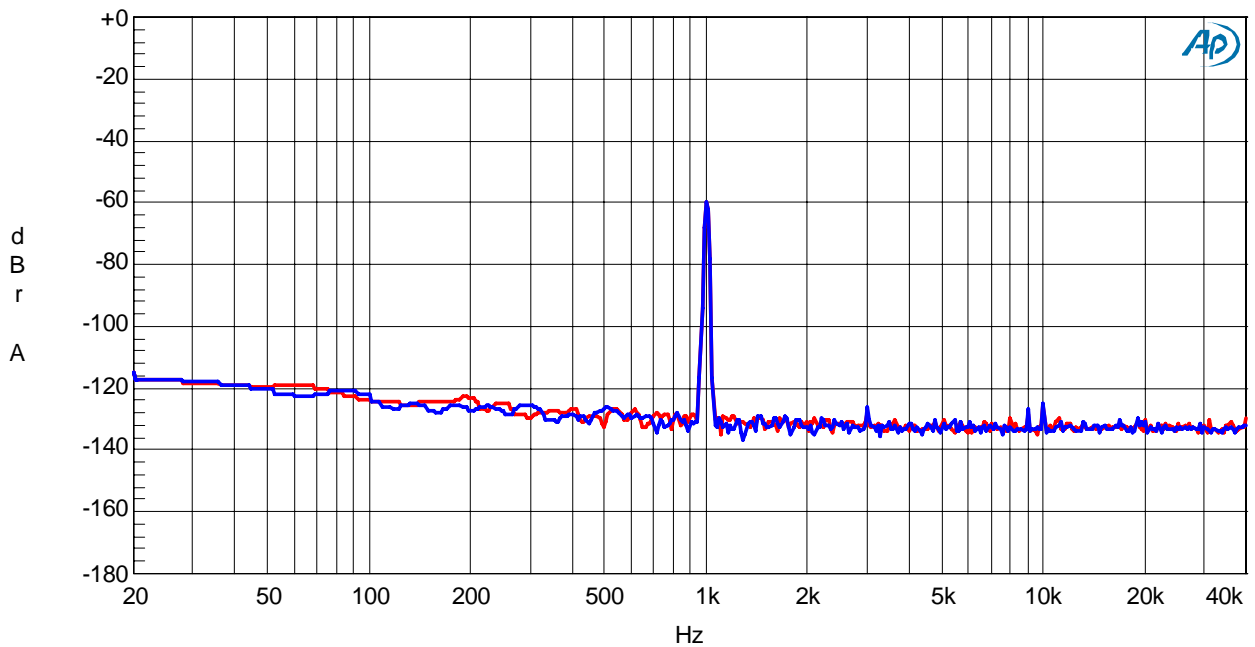


Figure 21. FFT (fin=1kHz, Input Level=-60dBFS)

No Signal FFT @fs=96kHz  
[Blue:LOUT, Red:ROUT]

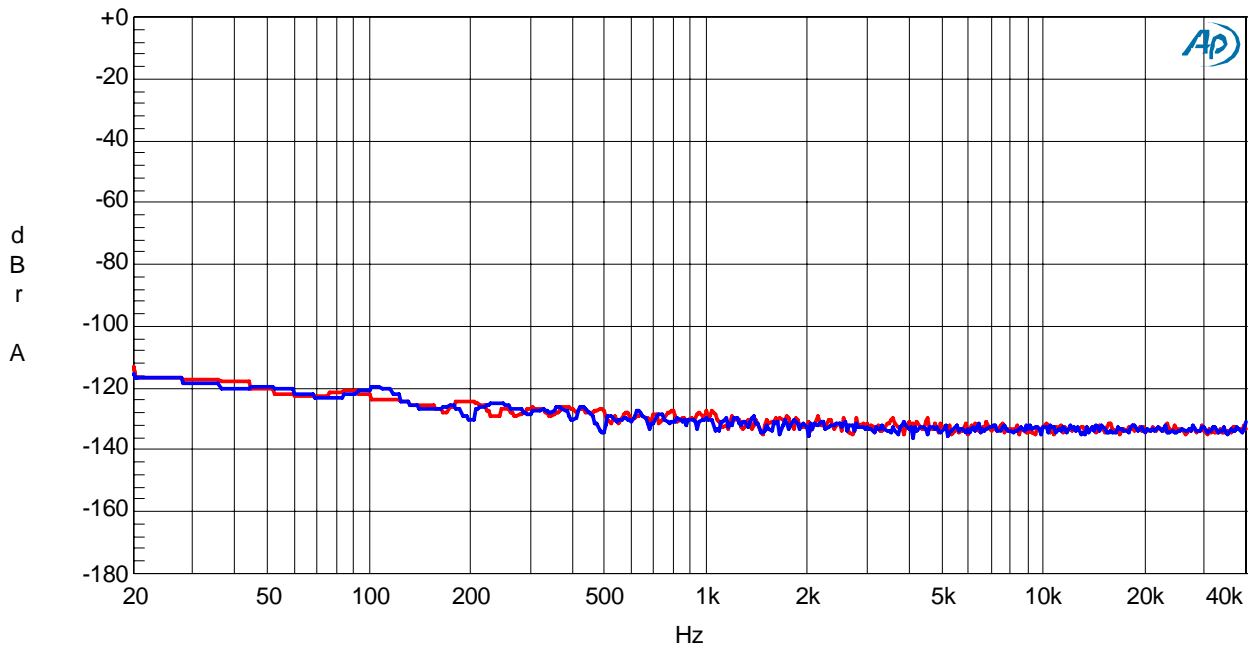


Figure 22. FFT (No Signal)

Out of band Noise @fs=96kHz  
[Blue:LOUT, Red:ROUT]

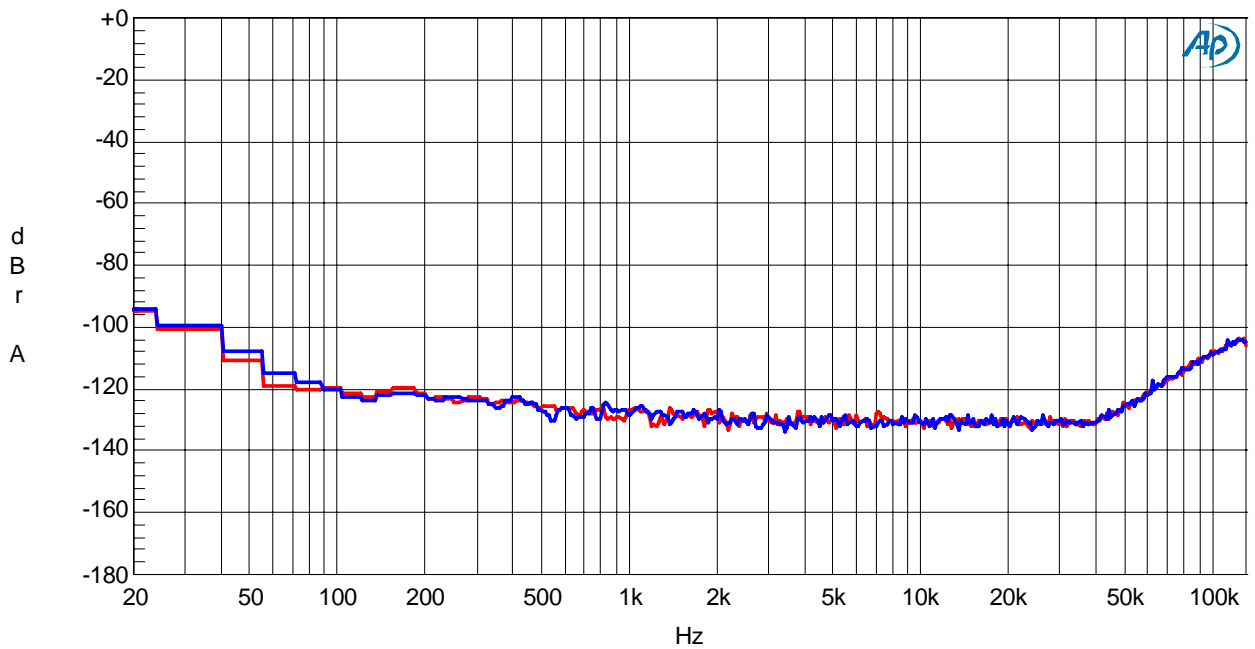


Figure 23. FFT (Out of band noise)

THD+N vs. Input Level@fs=96kHz  
[Blue:LOUT, Red:ROUT]

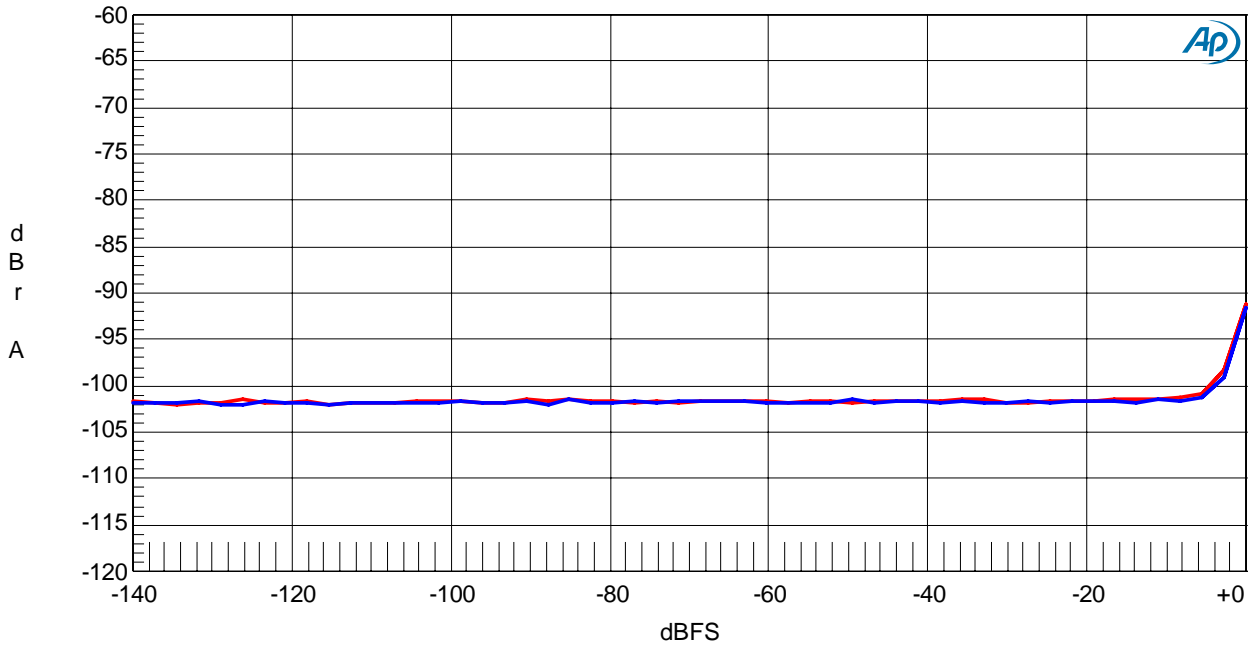


Figure 24. THD+N vs. Input level (fin=1kHz)

THD+N vs. Input Frequency@fs=96kHz  
[Blue:LOUT, Red:ROUT]

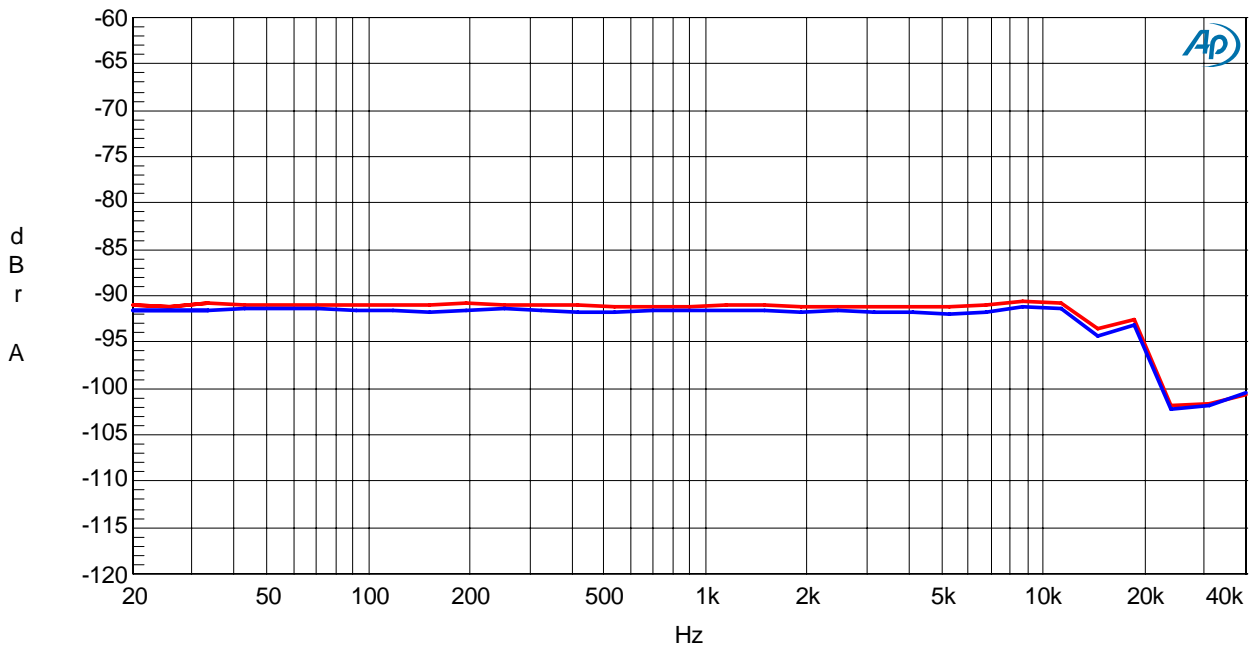


Figure 25. THD+N vs. Input Frequency (Input level=0dBFS)

Linearity@fs=96kHz  
[Blue:LOUT, Red:ROUT]

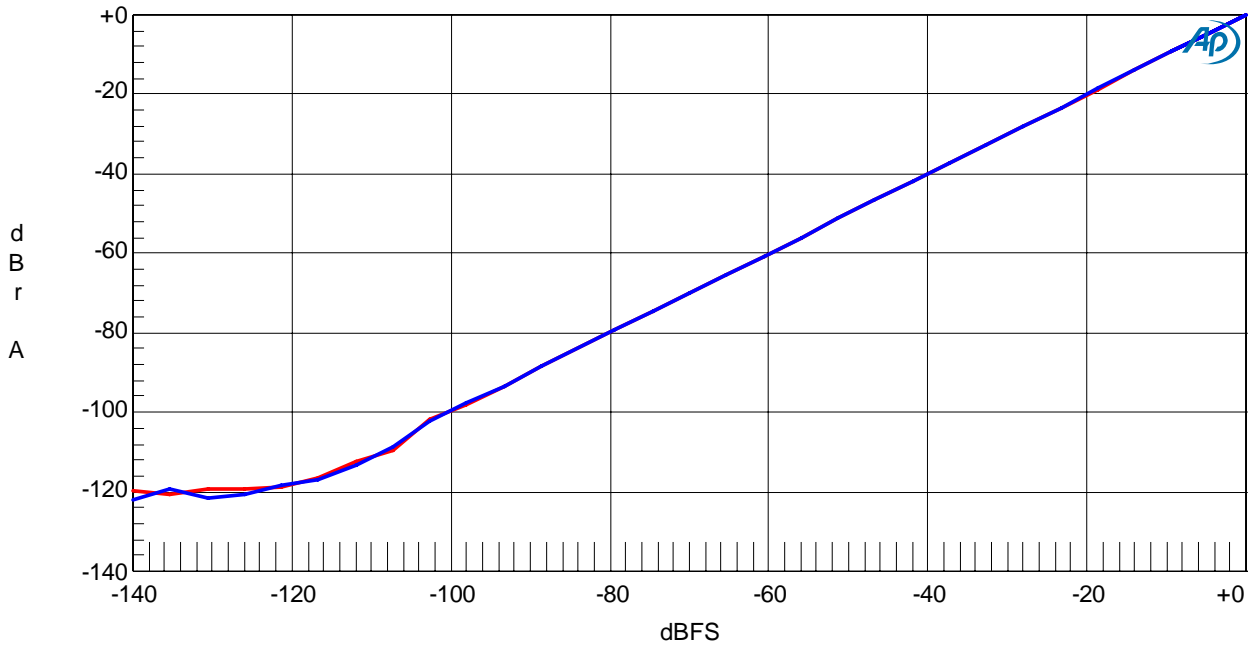


Figure 26. Linearity (fin=1kHz)

Frequency Response@fs=96kHz  
[Blue:LOUT, Red:ROUT]

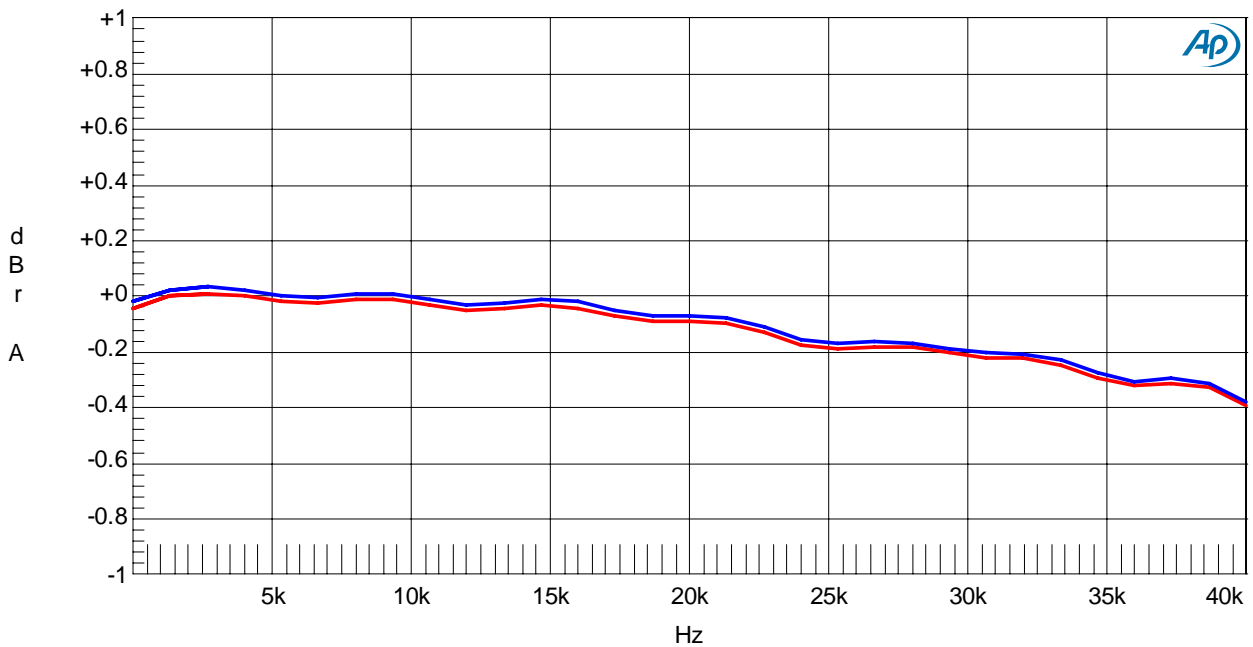


Figure 27. Frequency Response (Input level=0dBFS)

### Crosstalk@fs=96kHz

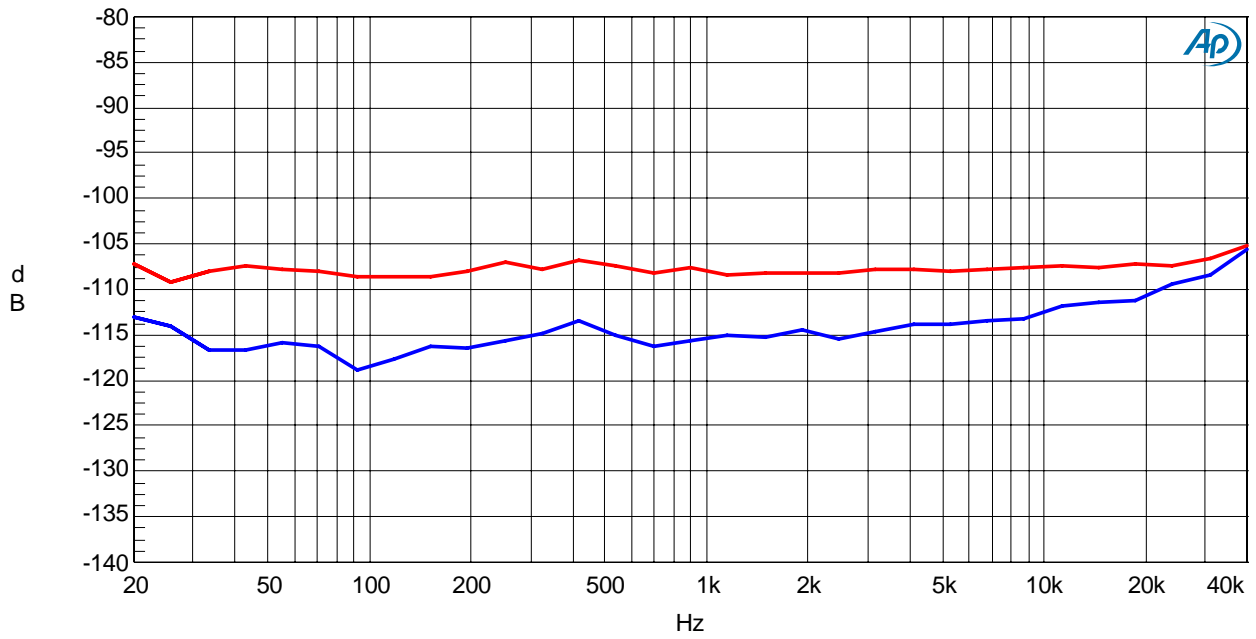


Figure 28. Crosstalk (Input level=0dBFS)  
Red: Lch ← Rch, Blue: Rch ← Lch

(3)  $f_s = 192\text{kHz}$  (MCLK=128fs)

0dBFS FFT @  $f_s=192\text{kHz}$   
[Blue:LOUT, Red:ROUT]

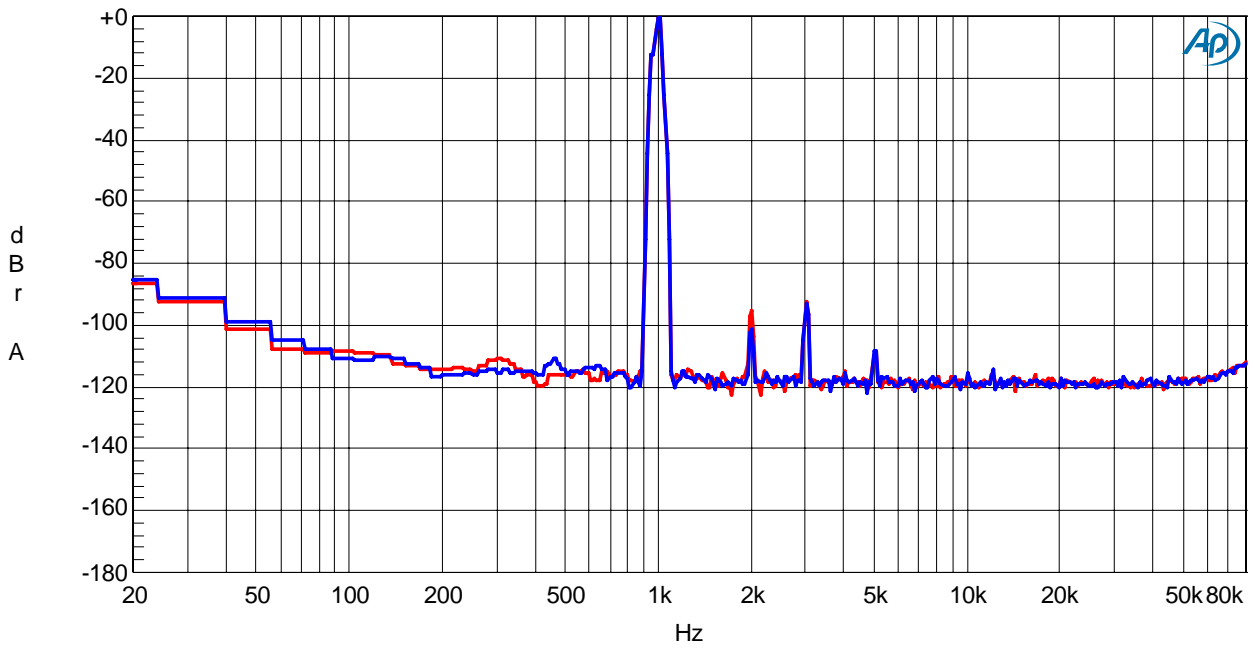


Figure 29. FFT ( $f_{in}=1\text{kHz}$ , Input Level=0dBFS)

-60dBFS FFT @  $f_s=192\text{kHz}$   
[Blue:LOUT, Red:ROUT]

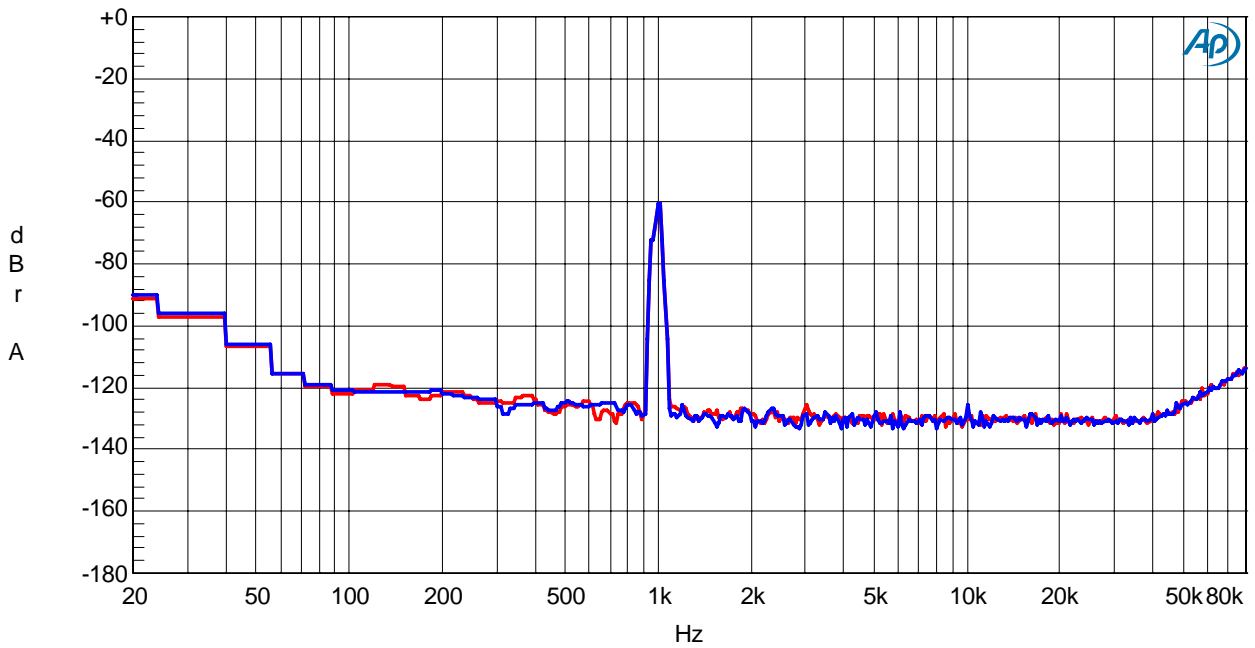


Figure 30. FFT ( $f_{in}=1\text{kHz}$ , Input Level=-60dBFS)

No Signal FFT@fs=192kHz  
[Blue:LOUT, Red:ROUT]

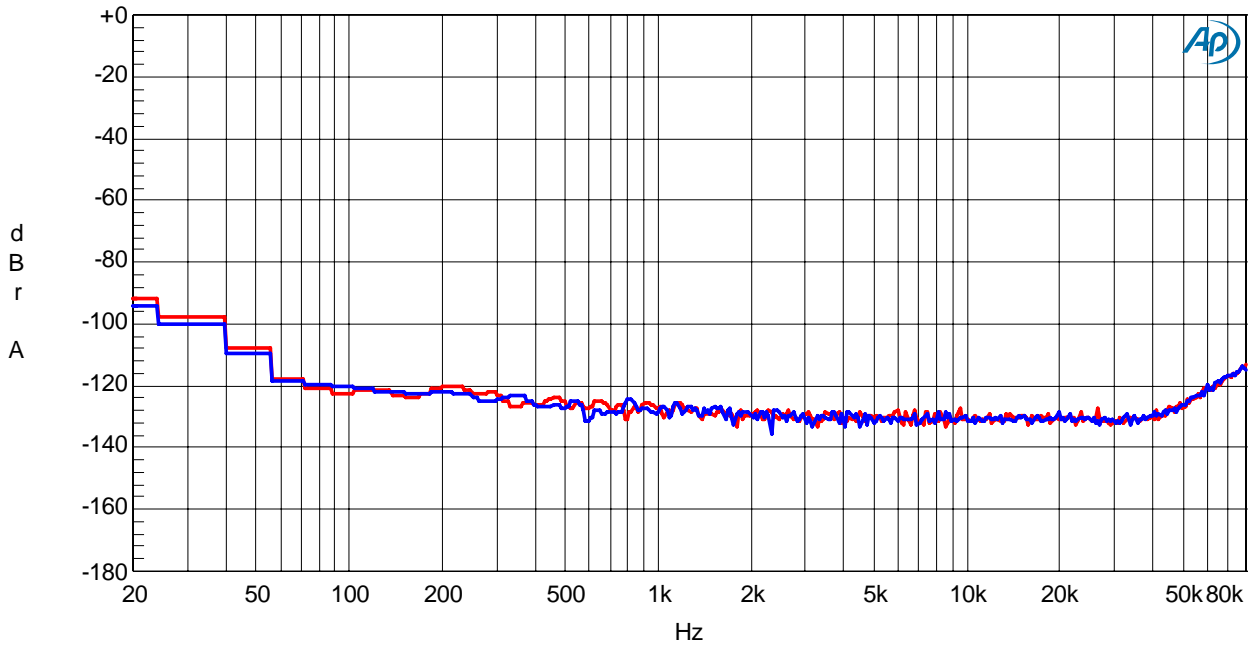


Figure 31. FFT (No Signal)

Out of band Noise@fs=192kHz  
[Blue:LOUT, Red:ROUT]

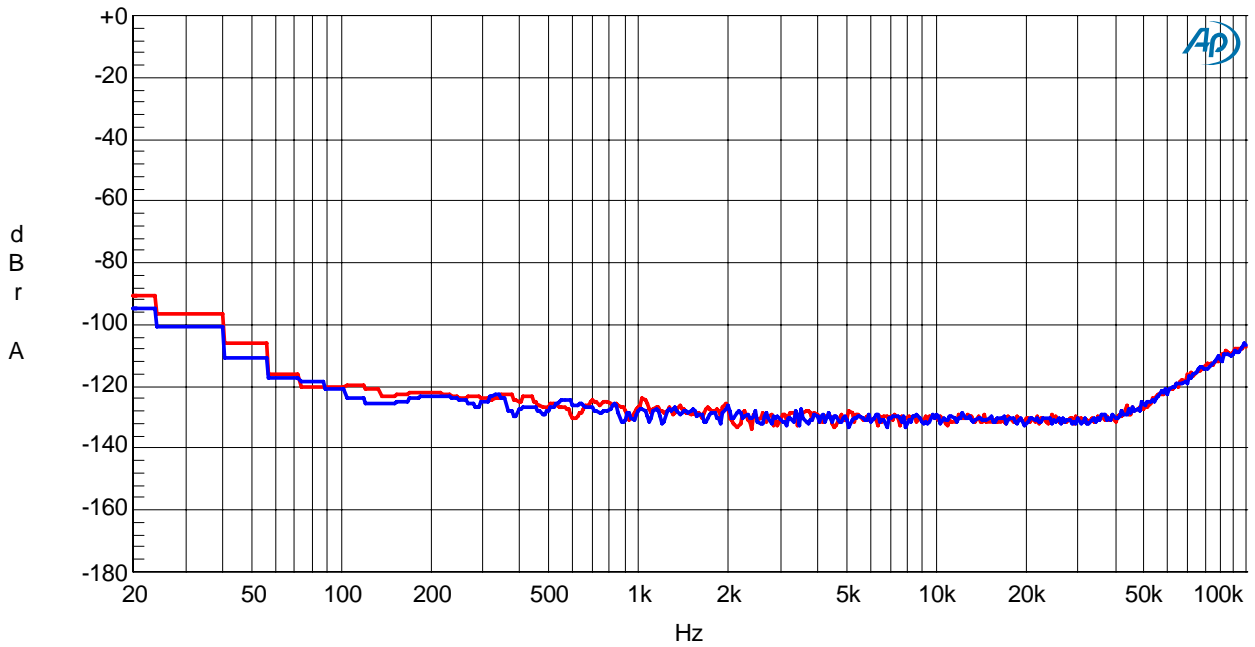


Figure 32. FFT (Out of band noise)

THD+N vs. Input Level@fs=192kHz  
[Blue:LOUT, Red:ROUT]

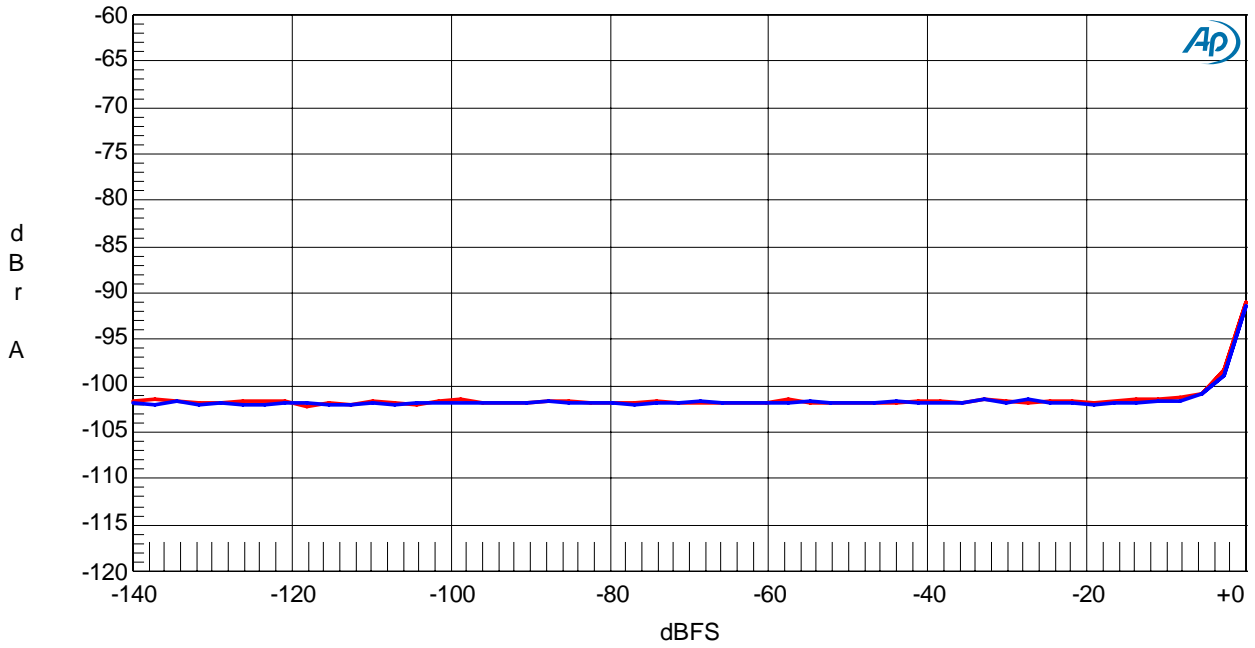


Figure 33. THD+N vs. Input level (fin=1kHz)

THD+N vs. Input Frequency@fs=192kHz  
[Blue:LOUT, Red:ROUT]

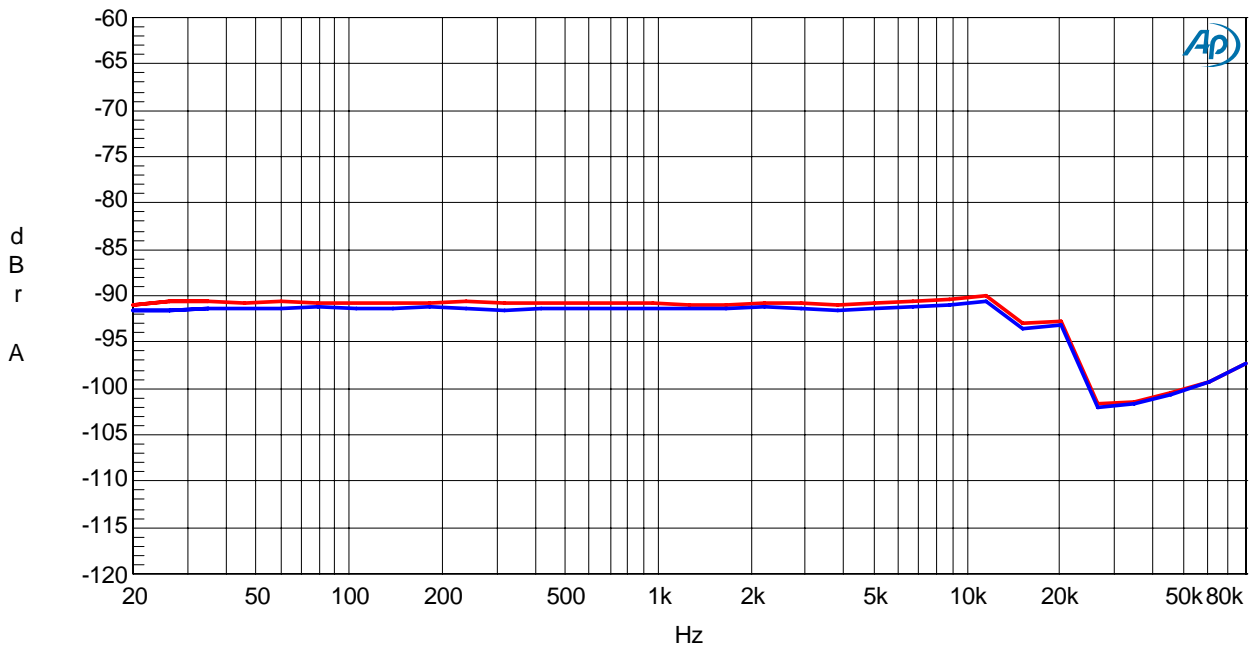


Figure 34. THD+N vs. Input Frequency (Input level=0dBFS)

Linearity@fs=192kHz  
[Blue:LOUT, Red:ROUT]

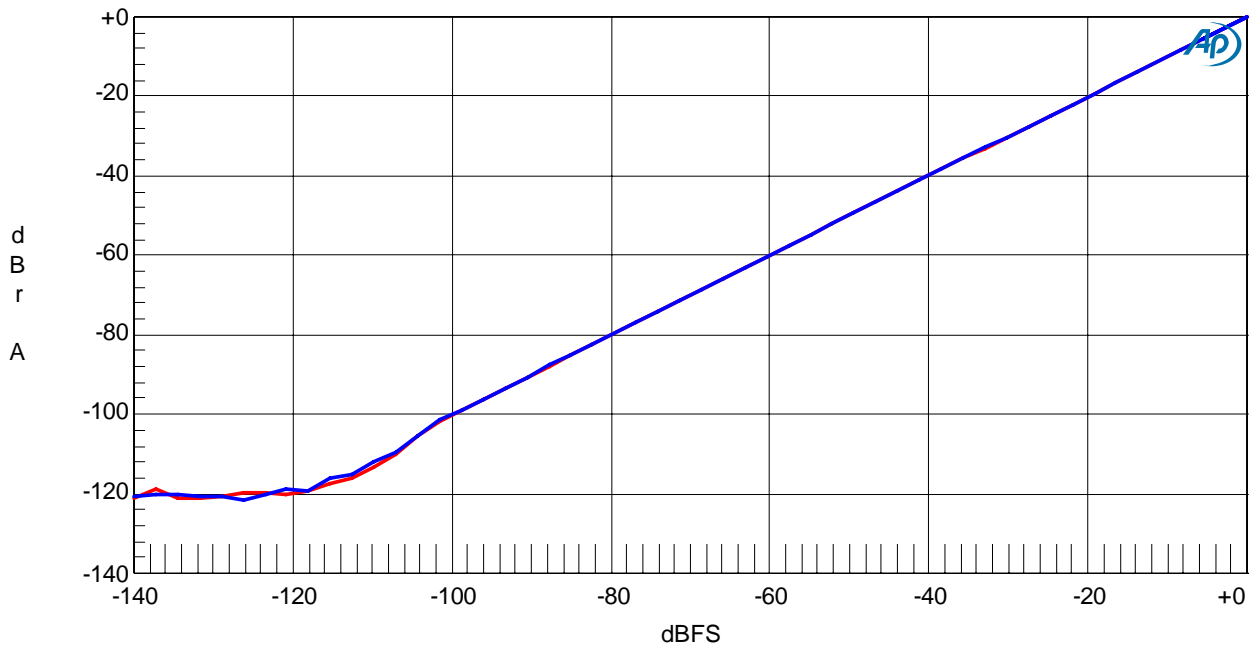


Figure 35. Linearity (fin=1kHz)

Frequency Response@fs=192kHz  
[Blue:LOUT, Red:ROUT]

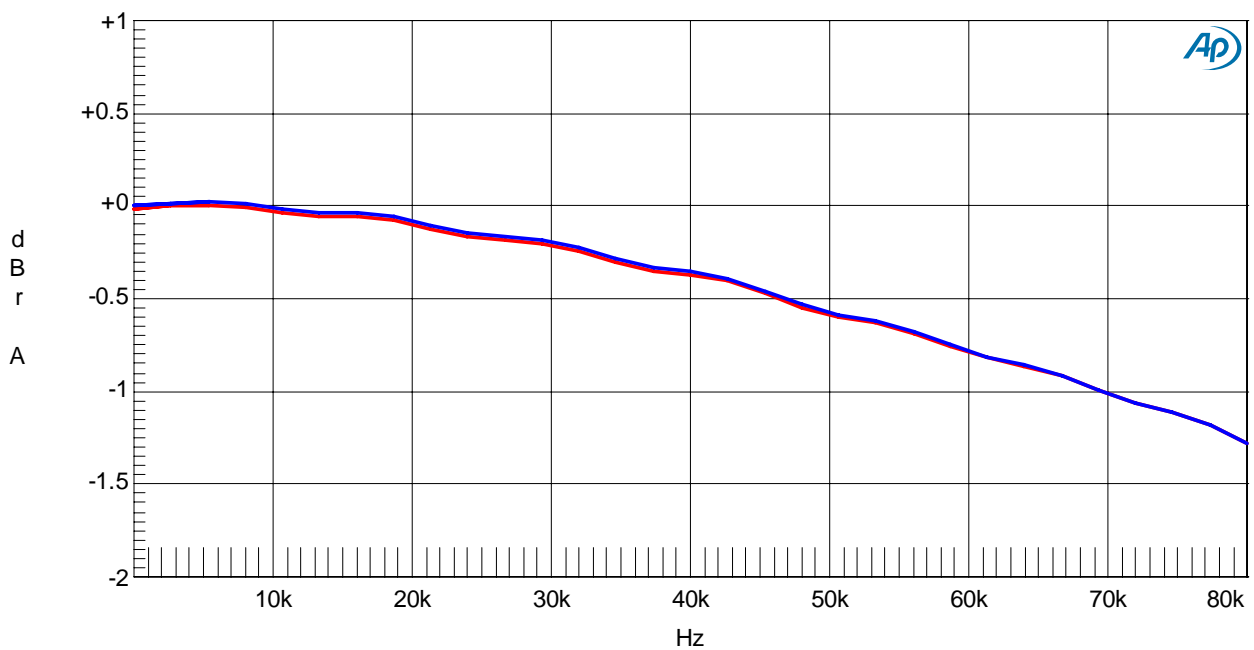


Figure 36. Frequency Response (Input level=0dBFS)

Crosstalk@fs=192kHz

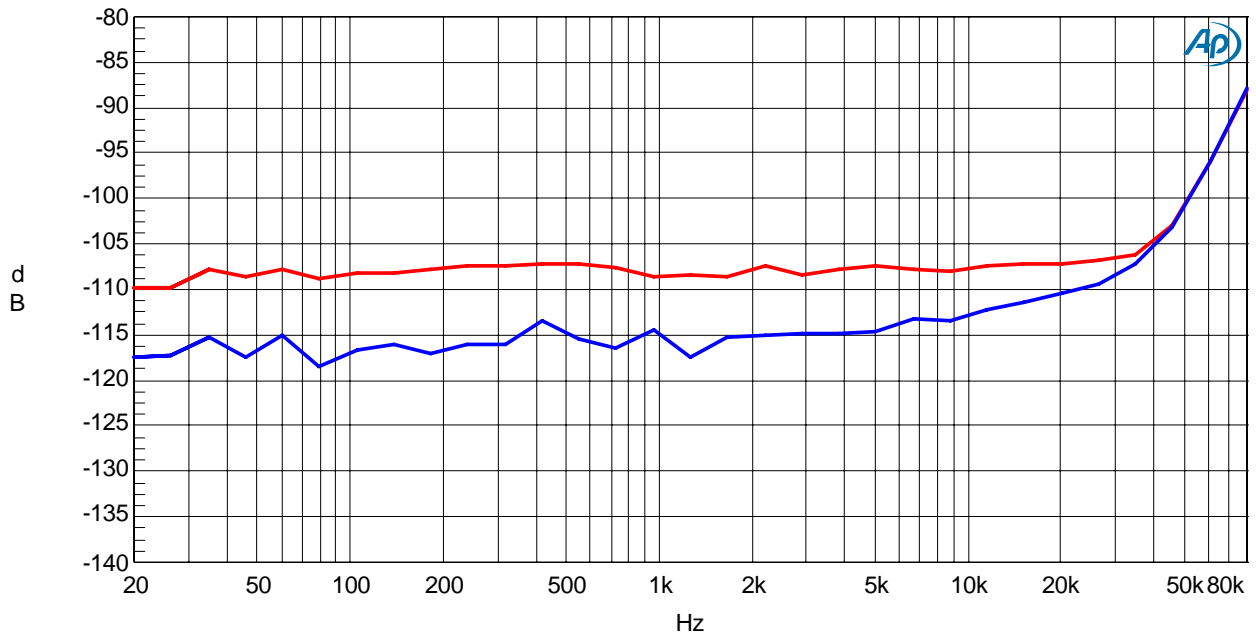


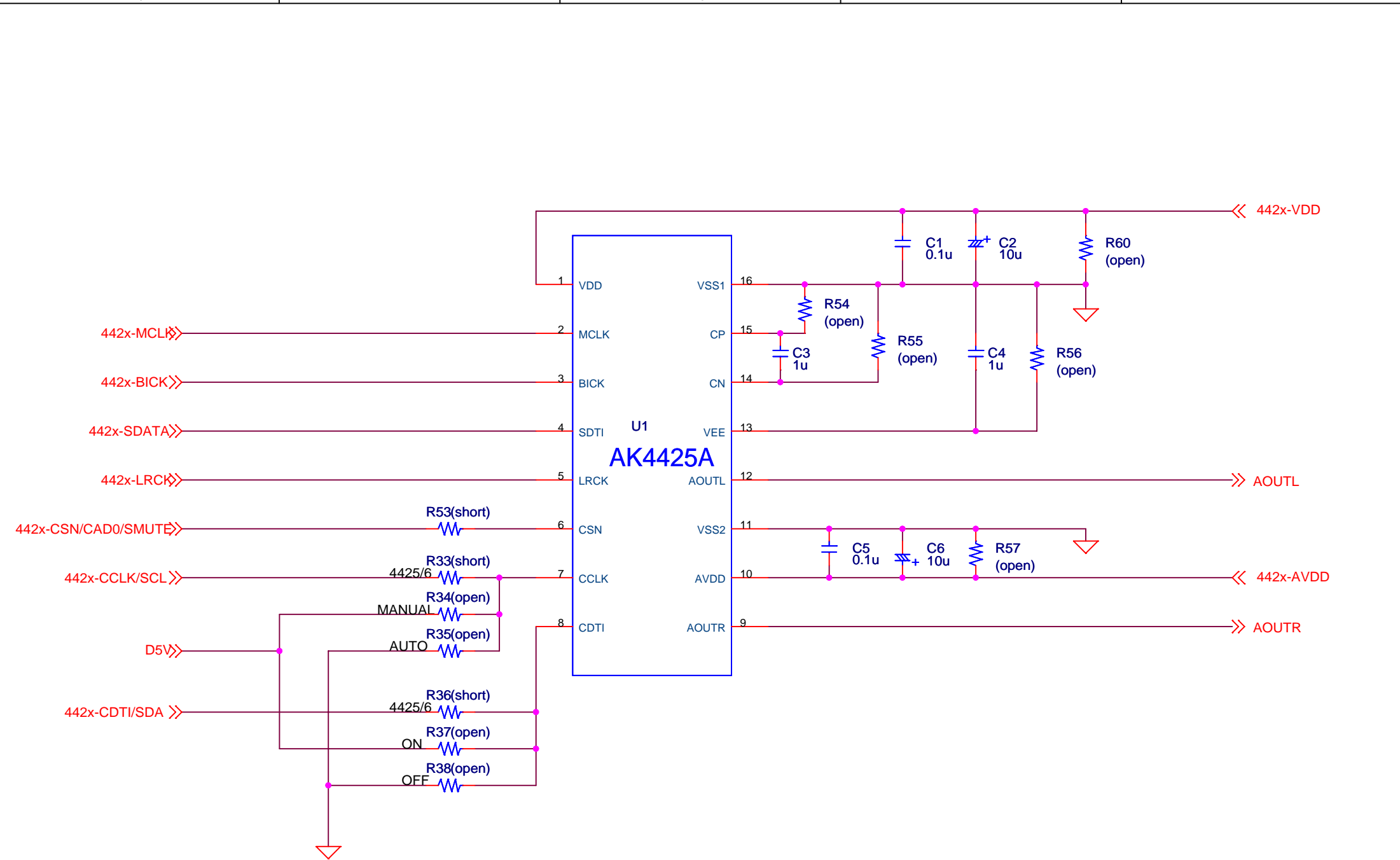
Figure 37. Crosstalk (Input level=0dBFS)  
Red: Lch ← Rch, Blue: Rch ← Lch

<b>REVISION HISTORY</b>
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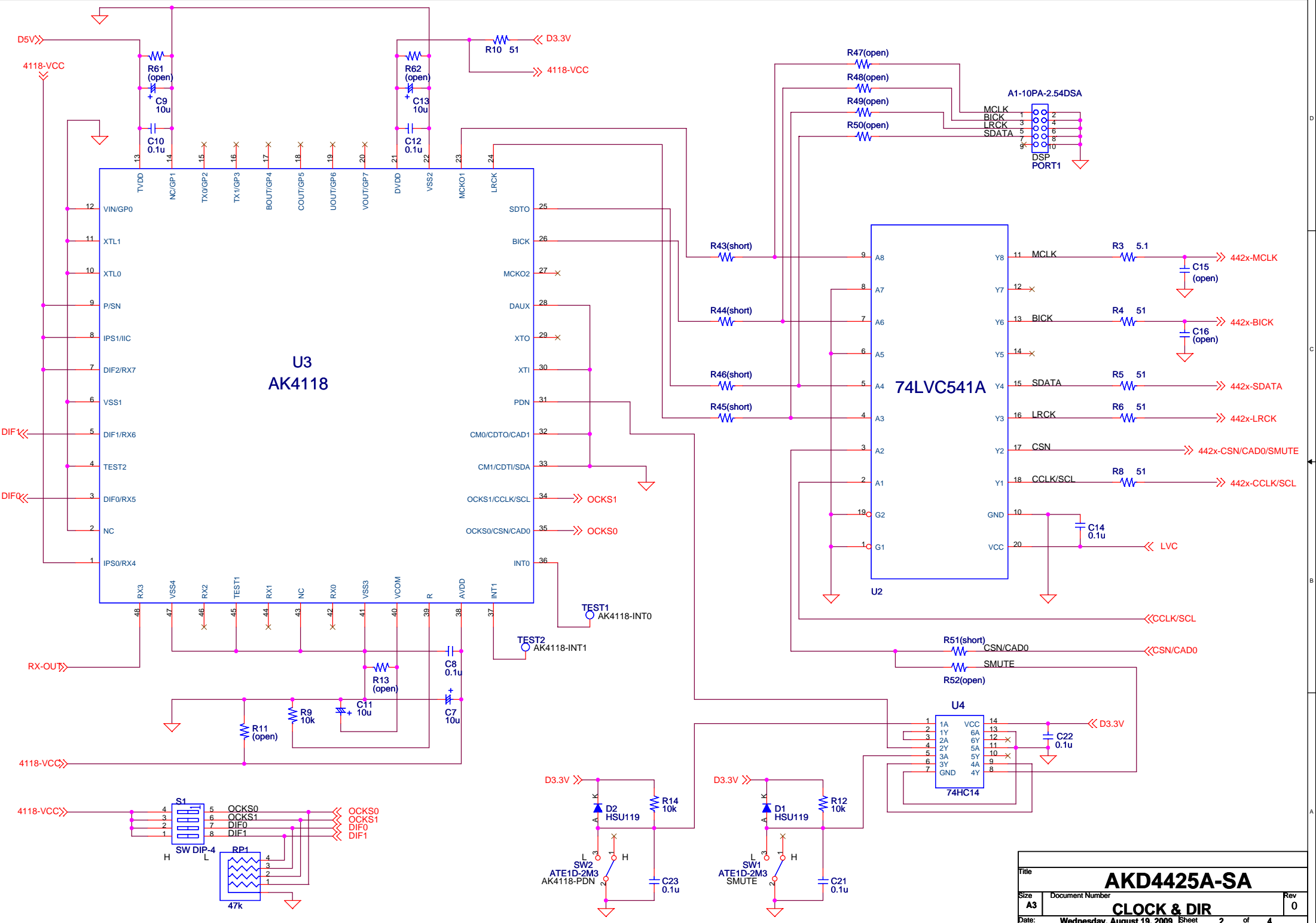
Date (yy/mm/dd)	Manual Revision	Board Revision	Reason	Page	Contents
09/09/02	KM100600	0	First Edition		

IMPORTANT NOTICE

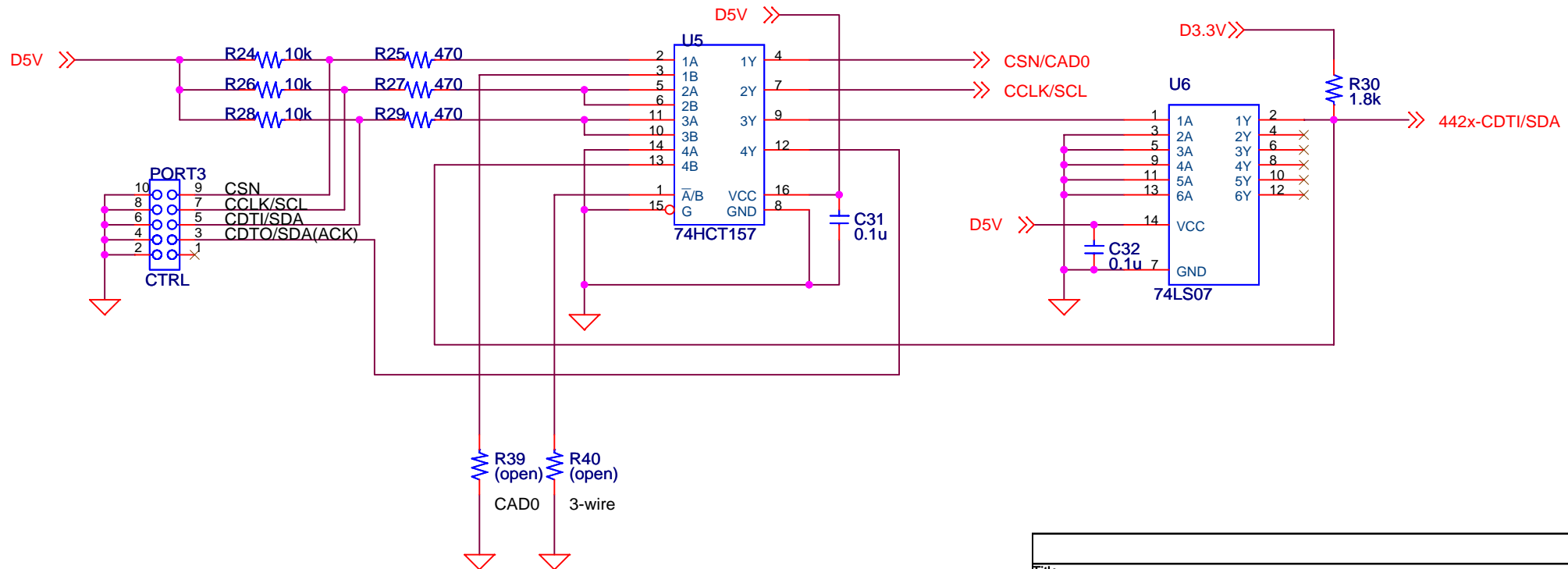
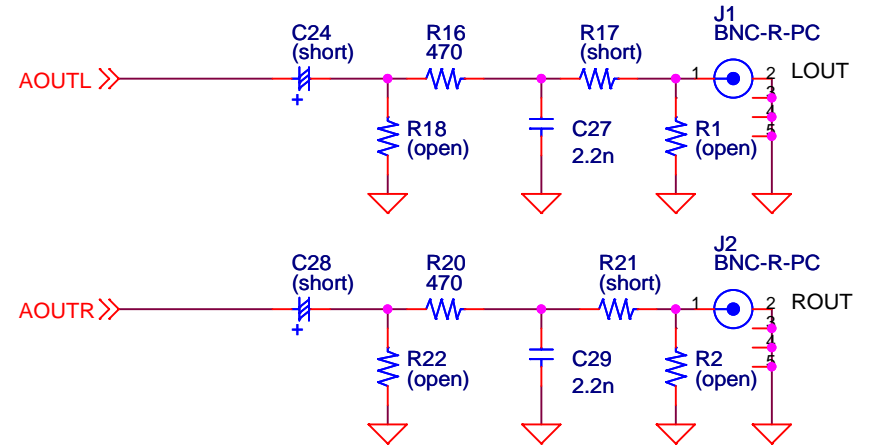
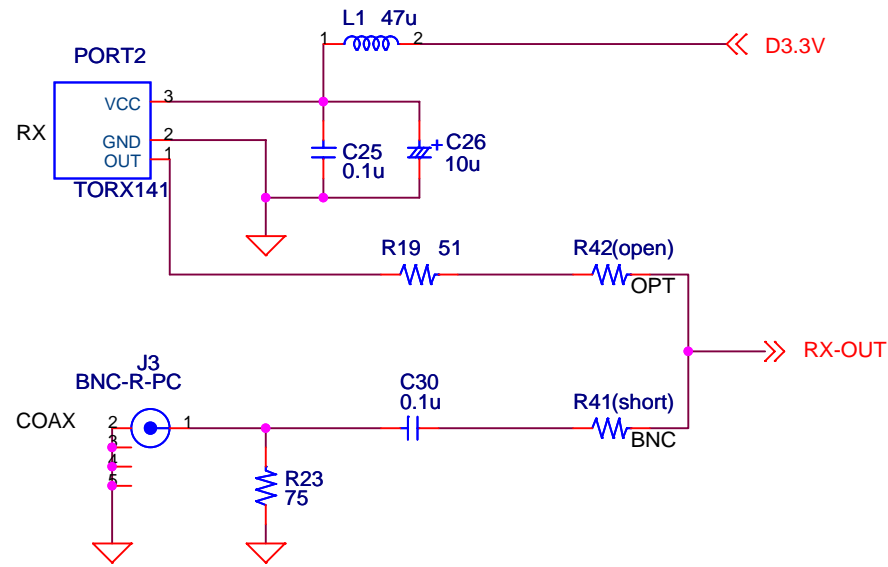
- These products and their specifications are subject to change without notice.  
When you consider any use or application of these products, please make inquiries the sales office of Asahi Kasei Microdevices Corporation (AKM) or authorized distributors as to current status of the products.
- AKM assumes no liability for infringement of any patent, intellectual property, or other rights in the application or use of any information contained herein.
- Any export of these products, or devices or systems containing them, may require an export license or other official approval under the law and regulations of the country of export pertaining to customs and tariffs, currency exchange, or strategic materials.
- AKM products are neither intended nor authorized for use as critical components<sub>Note1</sub>) in any safety, life support, or other hazard related device or system<sub>Note2</sub>), and AKM assumes no responsibility for such use, except for the use approved with the express written consent by Representative Director of AKM. As used here:
  - Note1) A critical component is one whose failure to function or perform may reasonably be expected to result, whether directly or indirectly, in the loss of the safety or effectiveness of the device or system containing it, and which must therefore meet very high standards of performance and reliability.
  - Note2) A hazard related device or system is one designed or intended for life support or maintenance of safety or for applications in medicine, aerospace, nuclear energy, or other fields, in which its failure to function or perform may reasonably be expected to result in loss of life or in significant injury or damage to person or property.
- It is the responsibility of the buyer or distributor of AKM products, who distributes, disposes of, or otherwise places the product with a third party, to notify such third party in advance of the above content and conditions, and the buyer or distributor agrees to assume any and all responsibility and liability for and hold AKM harmless from any and all claims arising from the use of said product in the absence of such notification.



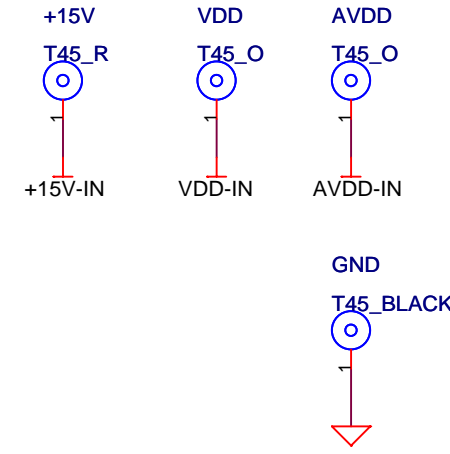
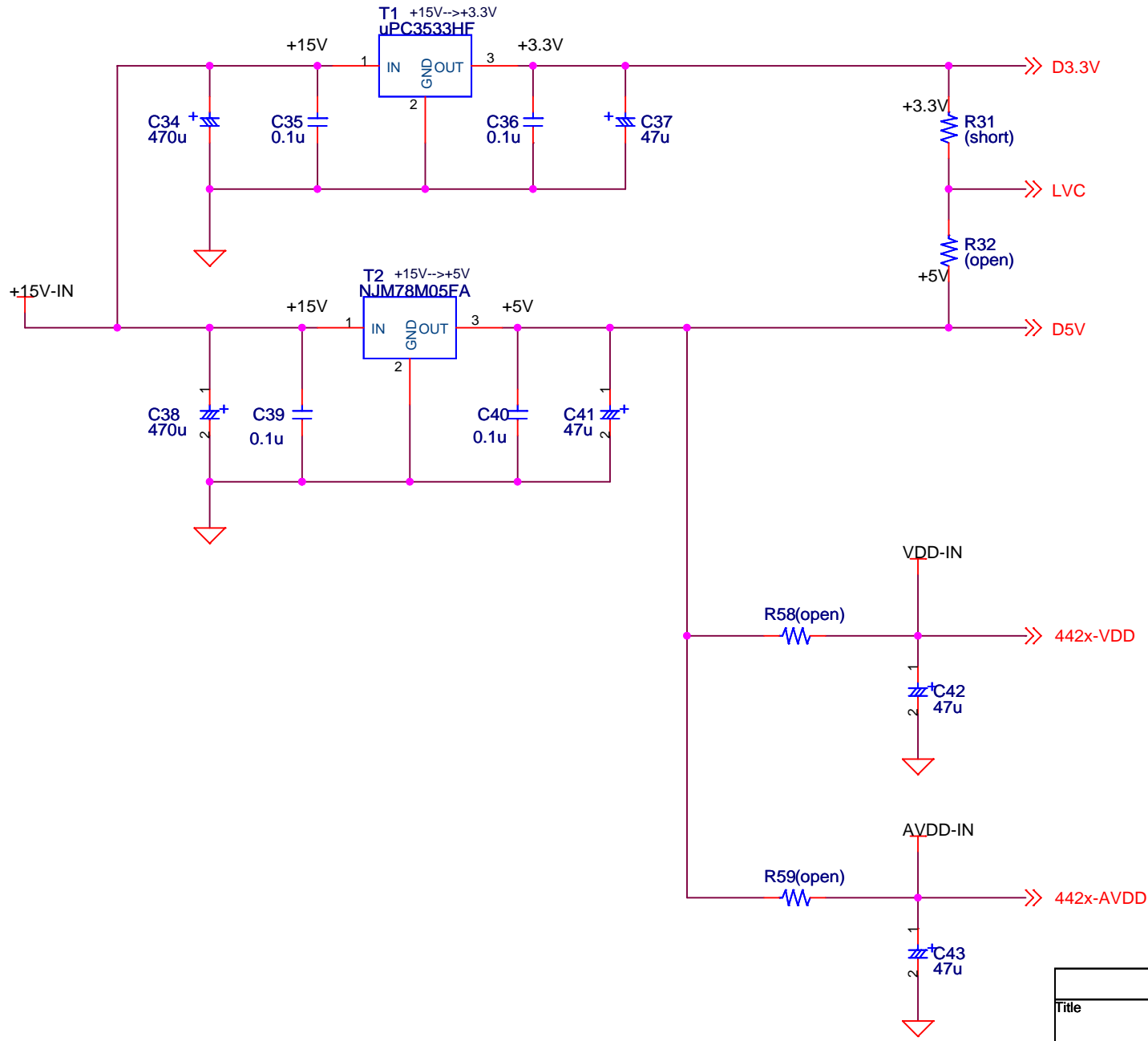
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