AKD4385-B
Evaluation board for AK4385

General Description

The AKD4385 -B is an evaluation board for AK4385, which is 192kHz sampling 24Bit ΔΣ DAC. The AKD4385 -B includes a LPF which can add differential analog outputs from the AK4385 and also has a digital interface. Therefore, it is easy to evaluate the AK4385.

■ Ordering Guide

AKD4385-B
--- Evaluation board for AK4385

Function

■ On-board Analog output buffer circuit

■ On –board digital audio interface (AK4113)

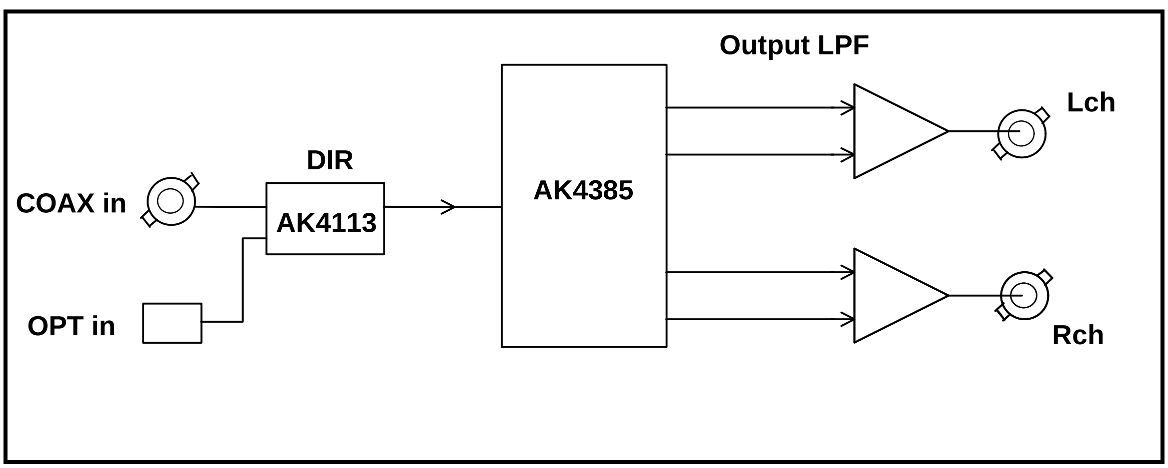

Figure 1. Block diagram

- Circuit diagram and PCB layout 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. (See “Other jumpers set-up”.)

Name	Color	Voltage	Comments	Attention
+12V	Red	+12~+15V	Regulator, Power supply for Op-amp.	This jack is always needed. Power line
-12V	Blue	-12~-15V	Regulator, Power supply for Op-amp.	This jack is always needed. Power line
AGND	Black	0V	GND	This jack is always needed.

Table 1. Set up of power supply lines

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

2) Set-up the jumper for power supply

[JP2 (AVDD)] selects power supply for DVDD pin of AK4385.

short: 5V is supplied from T3.
In the case, JP1 should be open.

open: 5V is supplied from T2. (default)

[JP1(DVDD)] selects power supply for DVDD pin of AK4385.

open: 5V is supplied from T2.
In the case, JP1 should be short.

short: 5V is supplied from T2. (default)

3) Set-up the jumper pins

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

5) Power on

The AK4385 should be reset once bringing SW1 (PDN) “L” upon power-up.

■ Evaluation mode

1. DIR(COAX Link) (default)
J1 is used for the evaluation using such as CD test disk. The DIR generates MCLK, BICK and LRCK SDATA from the received data through BNC connector (J1). Setting of jumper is shown below.

• COAX is recommended for an evaluation of the sound quality.

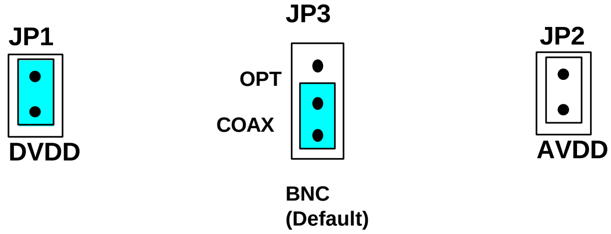

Figure 2. Jumper setting, when using DIR

2. DIR(Optical Link)
J1 is used for the evaluation using such as CD test disk. The DIR generates MCLK, BICK and LRCK SDATA from the received data through optical connector (PORT2: TORX176). Setting of jumper is shown below.

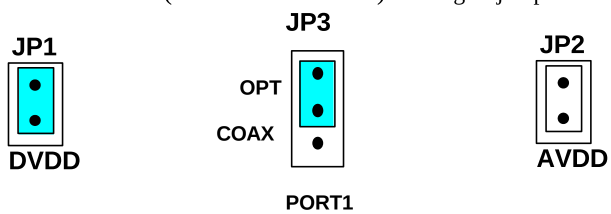

Figure 3. Jumper setting, when using DIR

■ DIP Switch setting

[SW2]: AK4113 setting

No.	Pin	OFF	ON	Default
1	OCKS1	AK4113 Master Clock setting Refer to Table3		ON
2	OCKS0			OFF

Table 2. SW2 setting

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

OCKS1	OCKS0	MCLK Frequency	
0	0	256fs @fs=88.2/96kHz	
1	0	512fs @32/44.1/48kHz	Default
1	1	128fs @176.4/192kHz	

Table 3. MCLK Clock

■ SW1 setting

[SW1](PDN): Reset of AK4385. Select "H" during operation.

■ External Analog Circuit

The 2nd order LPF (fc=93.2kHz, Q=0.712) which adds differential outputs of the AK4385 is implemented on the board. When the further attenuation of the out-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 AK4385 is 5.5Vpp@5V.

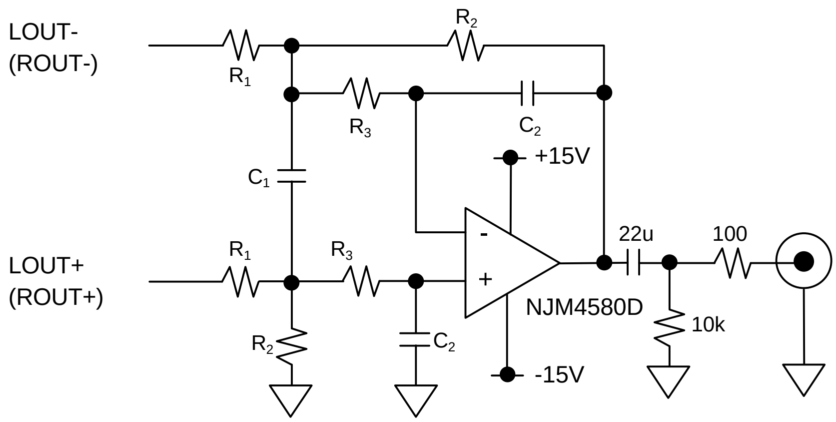

Figure 4. On-board analog filter

R_1	R_2	R_3	C_1	C_2
4.7k	4.7k	200	3300p	470p

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

fin	20kHz	40kHz	80kHz
Frequency Response	-0.003dB	-0.122dB	-1.821dB

Table 5. Frequency Response of LPF

<Calculation>

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

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

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

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

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

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 (48kHz, 96kHz, 192kHz)
- Temperature : Room

fs=44.1kHz

Parameter	Input signal	Measurement filter	Results
S/(N+D)	1kHz, 0dB	20kLPF	95.2 dB
DR	1kHz, -60dB	22kLPF, A-weighted	107.9 dB
S/N	"0" data	22kLPF, A-weighted	109.0 dB

fs=96kHz

Parameter	Input signal	Measurement filter	Results
S/(N+D)	1kHz, 0dB	40kLPF	92.2 dB
DR	1kHz, -60dB	40kLPF	102.7 dB
DR	1kHz, -60dB	22kLPF, A-weighted	107.6 dB
S/N	"0" data	40kLPF	103.1 dB
S/N	"0" data	22kLPF, A-weighted	108.5 dB

fs=192kHz

Parameter	Input signal	Measurement filter	Results
S/(N+D)	1kHz, 0dB	40kLPF	91.7 dB
DR	1kHz, -60dB	40kLPF	101.2 dB
DR	1kHz, -60dB	22kLPF, A-weighted	106.1 dB
S/N	"0" data	40kLPF	102.4 dB
S/N	"0" data	22kLPF, A-weighted	107.6 dB

Plots

(fs=44.1kHz)

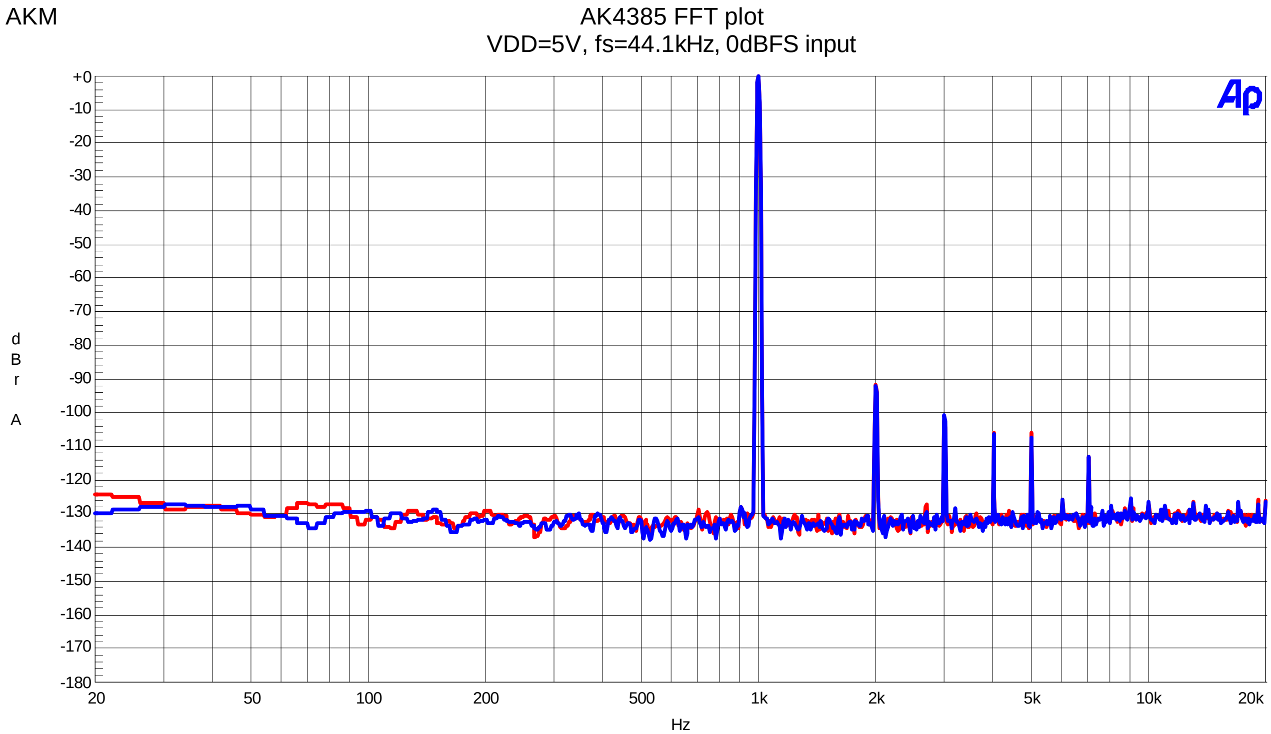

Figure 5. FFT (fin=1kHz, Input Level=0dBFS)

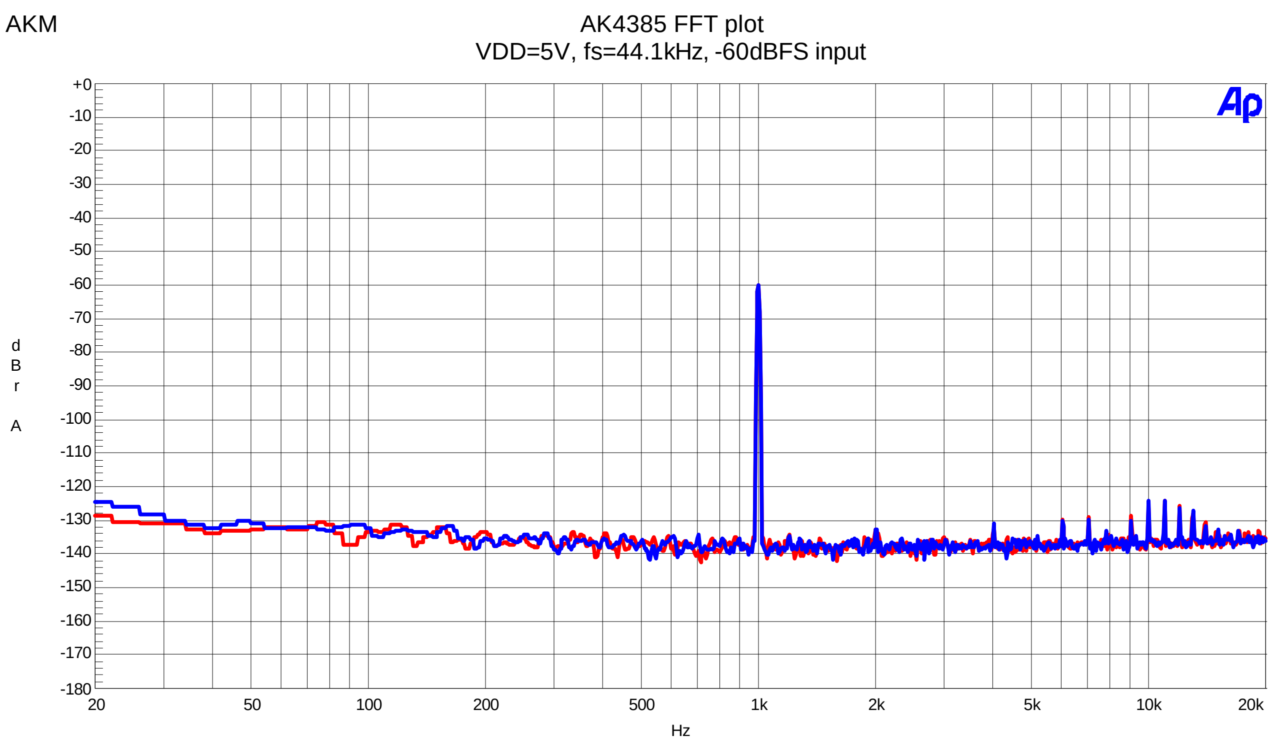

Figure 6. FFT (fin=1kHz, Input Level=-60dBFS)

(fs=44.1kHz)

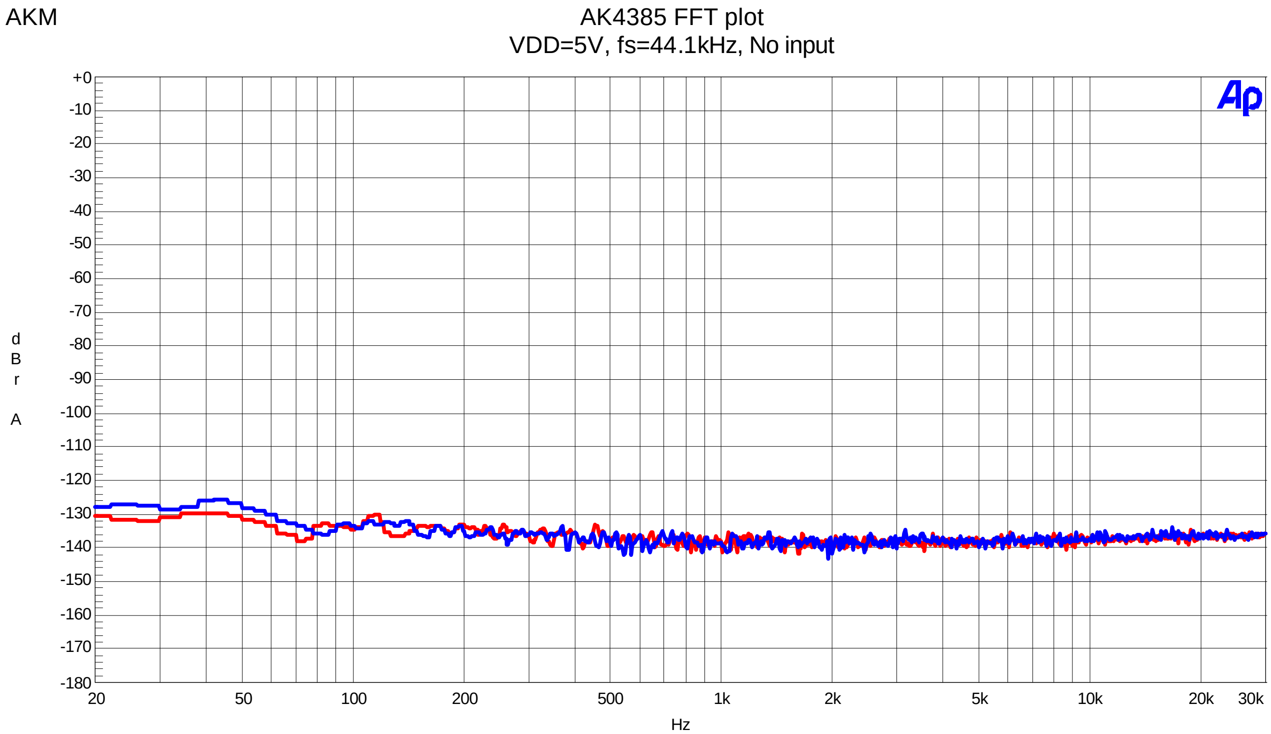

Figure 7. FFT (Noise Floor)

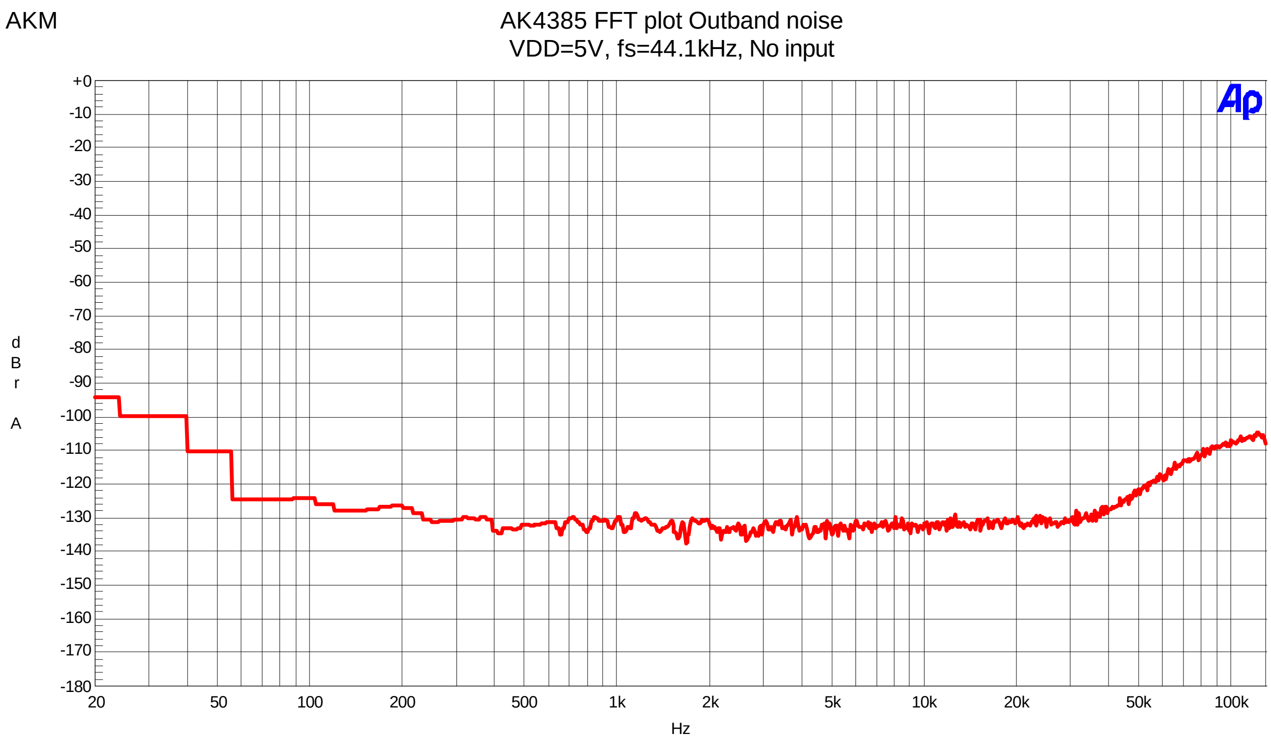

Figure 8. FFT (Outband noize)

(fs=44.1kHz)

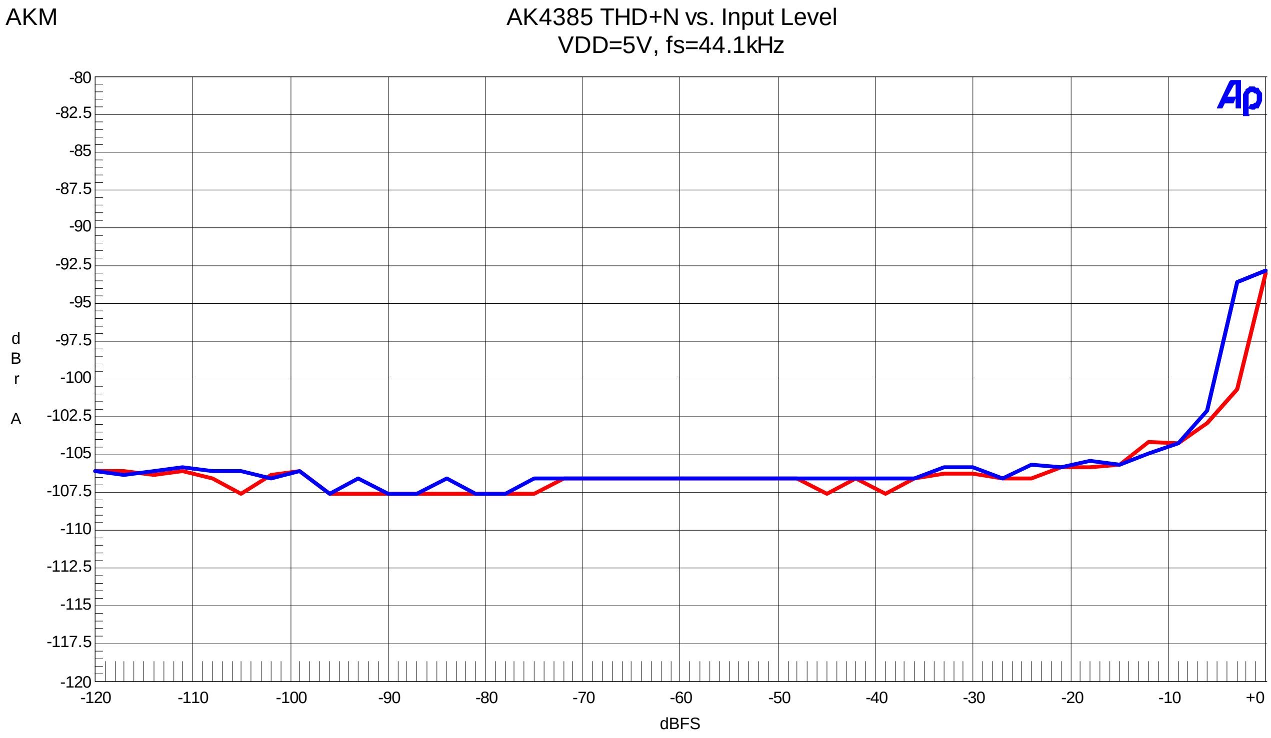

Figure 9. THD+N vs. Input level (fin=1kHz)

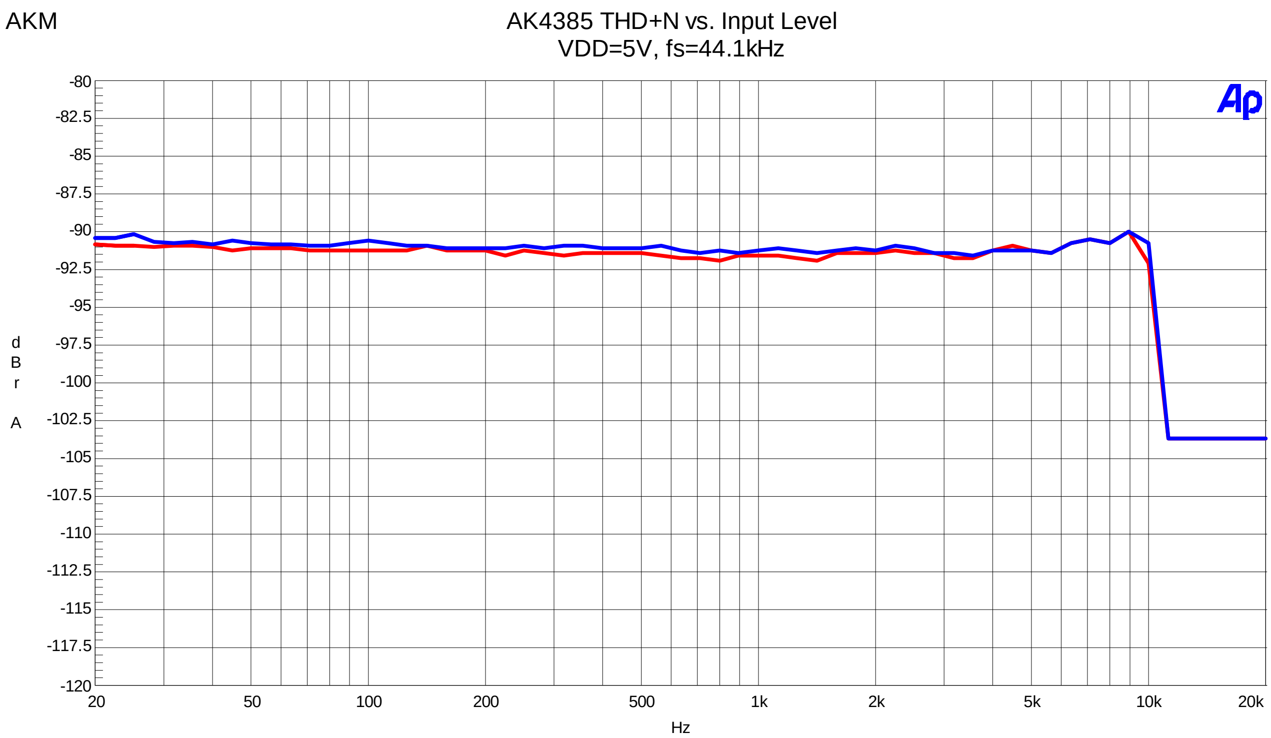

Figure 10. THD+N vs. Input Frequency (Input level=0dBFS)

(fs=44.1kHz)

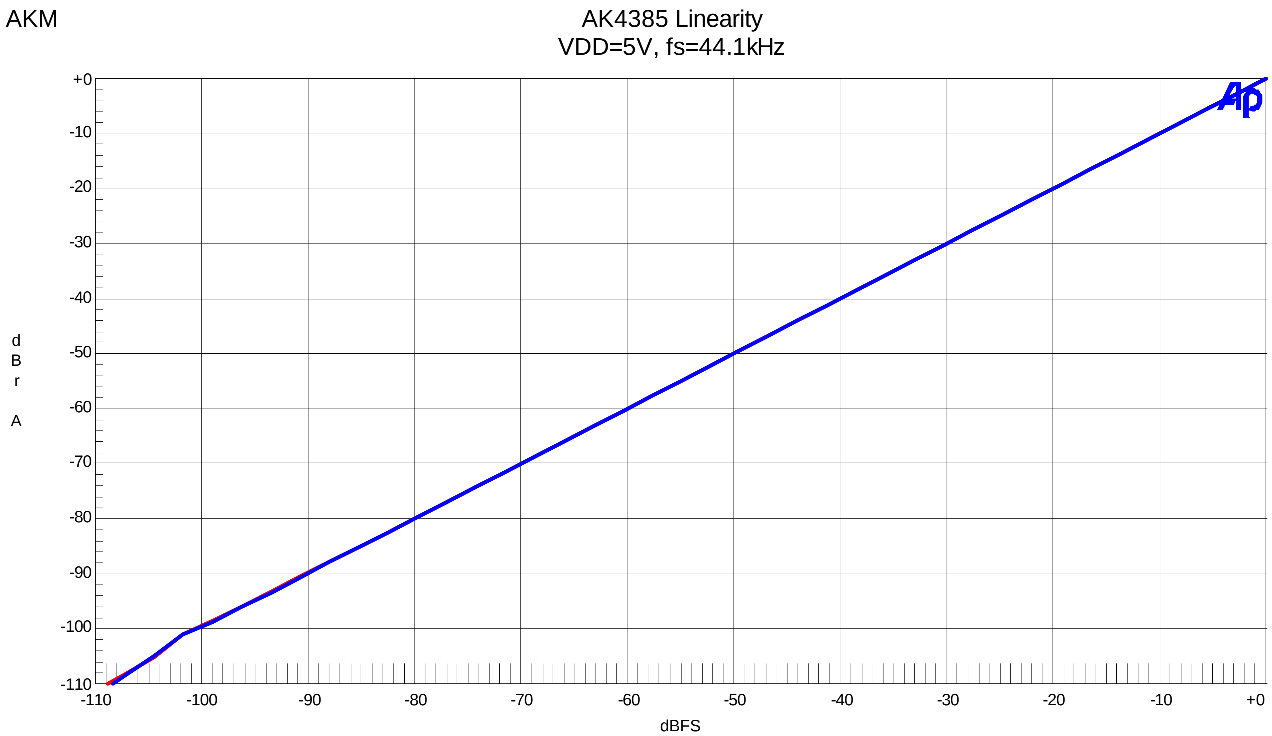

Figure 11. Linearity (fin=1kHz)

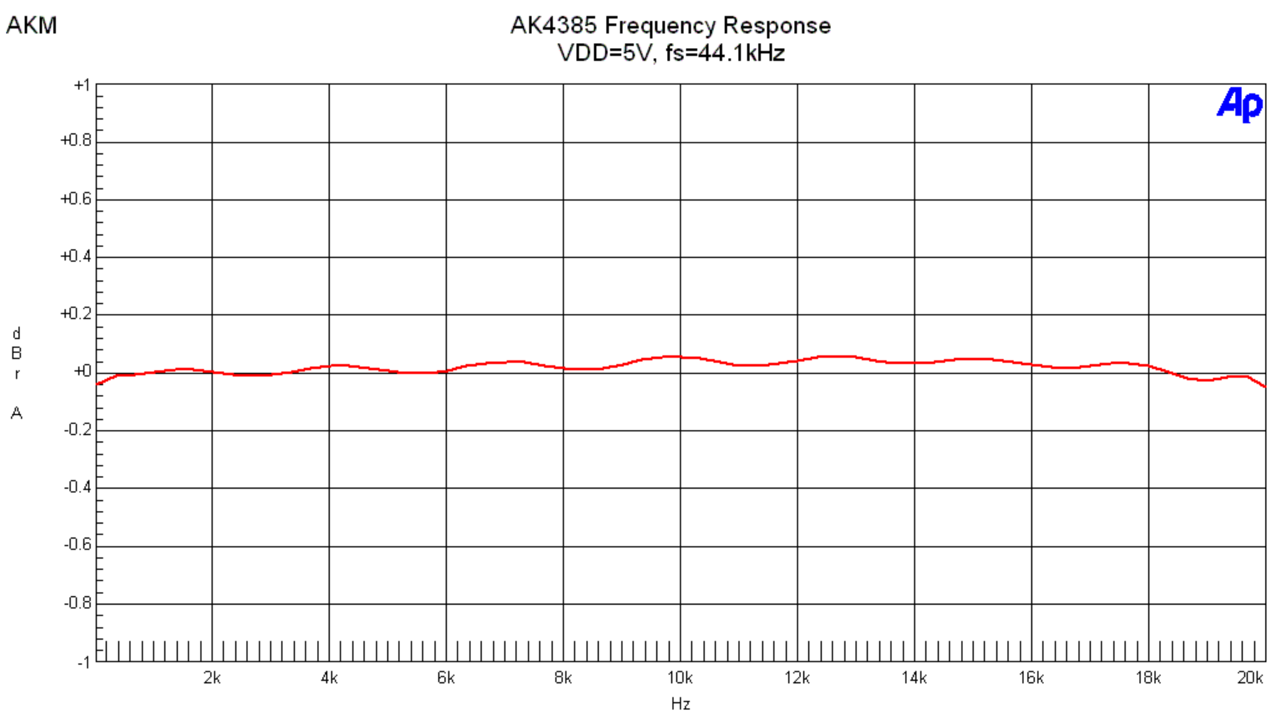

Figure 12. Frequency Response (Input level=0dBFS)

(fs=44.1kHz)

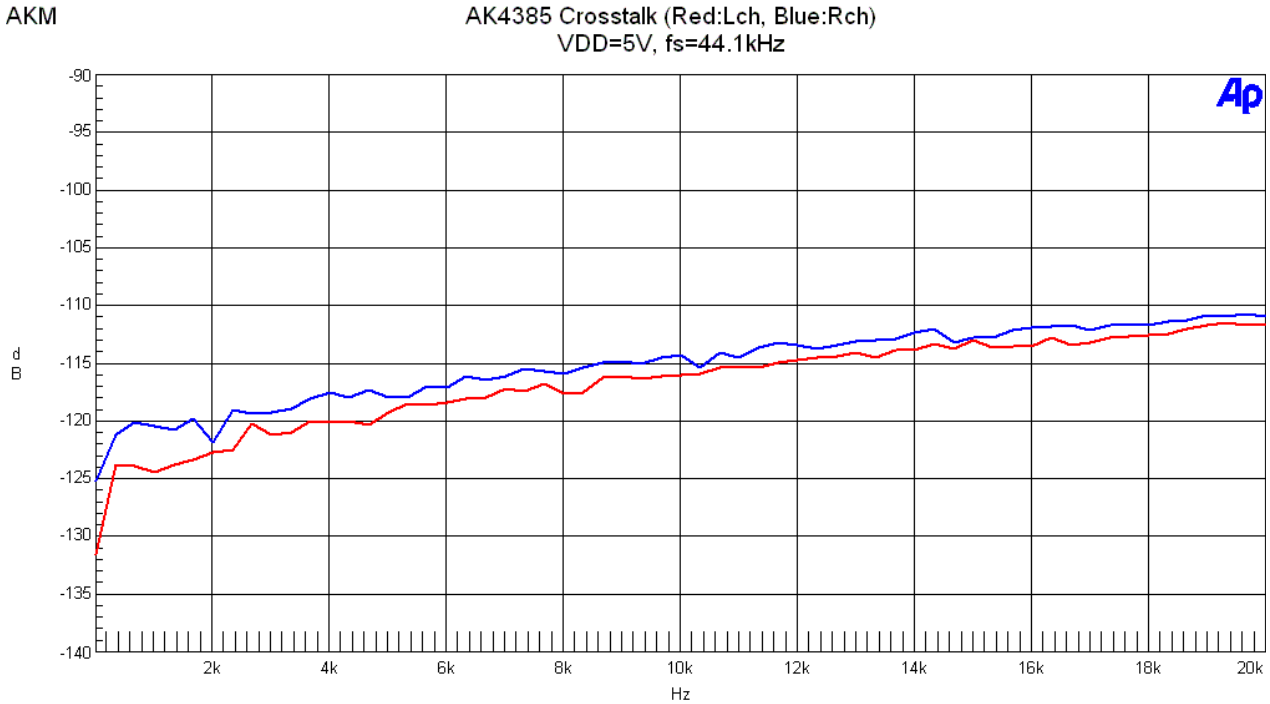

Figure 13. Crosstalk (Input level=0dBFS)

(fs=96kHz)

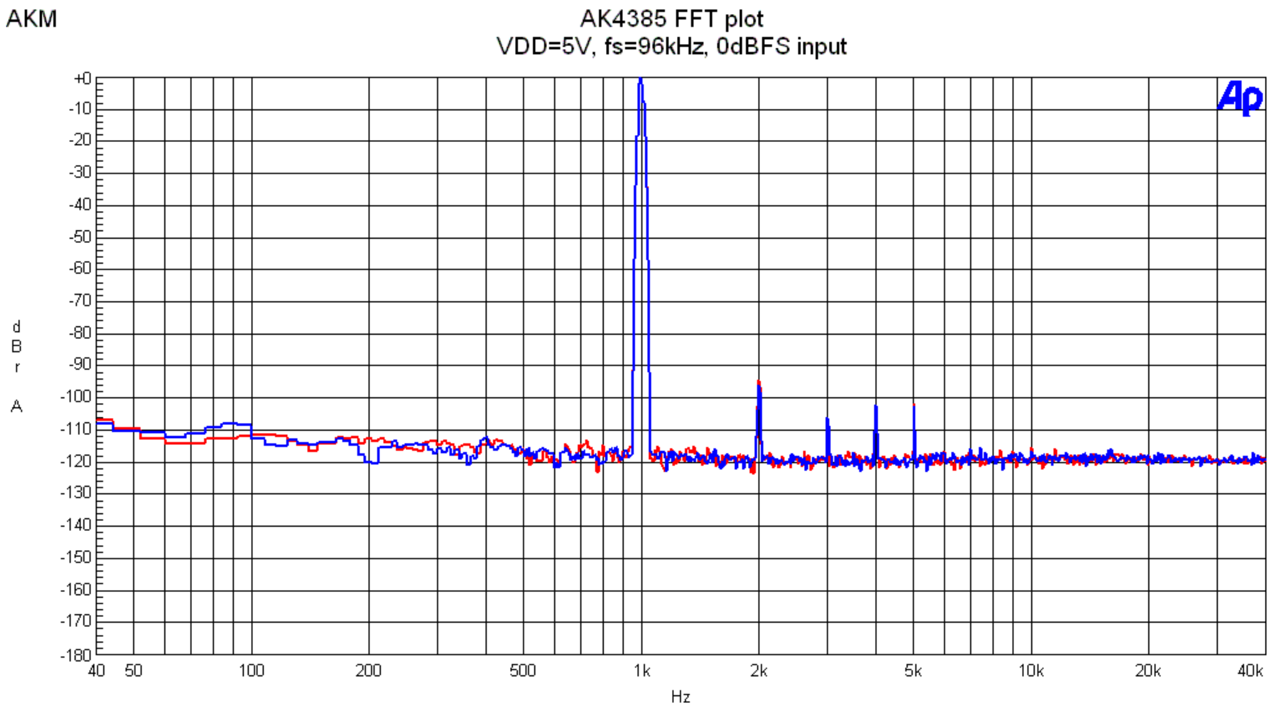

Figure 14. FFT (fin=1kHz, Input Level=0dBFS)

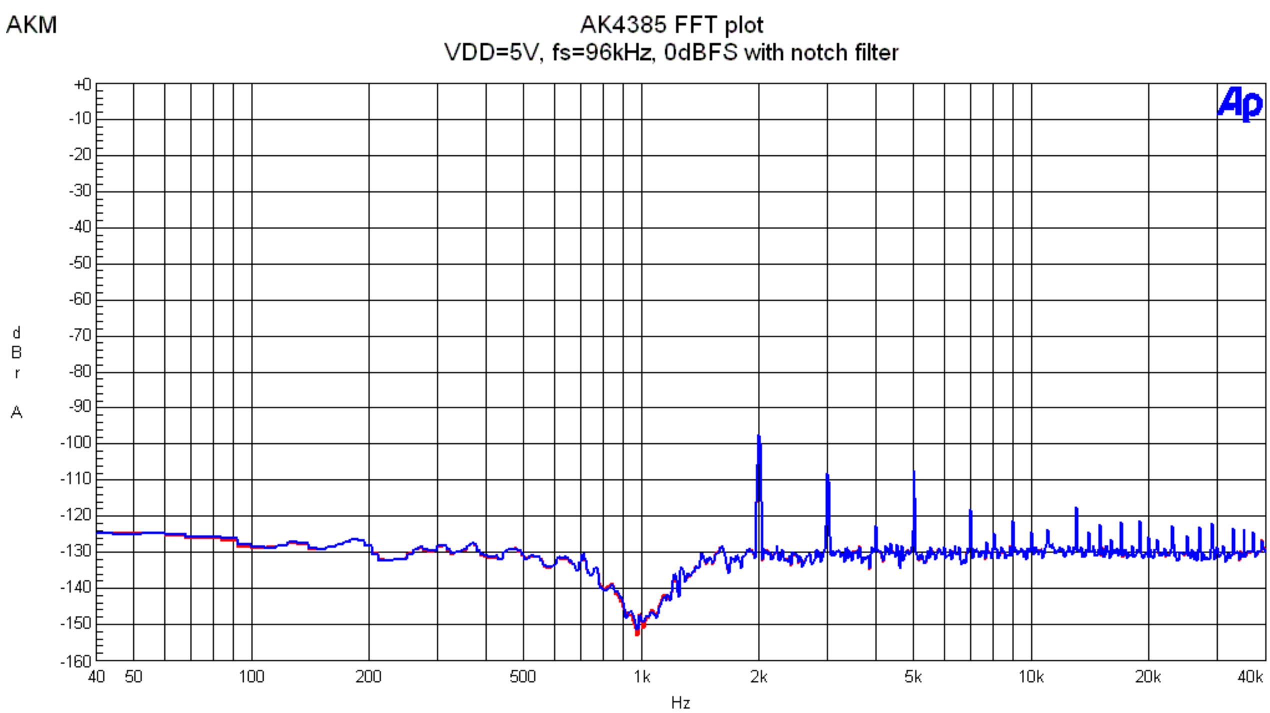

Figure 15. FFT (fin=1kHz, Input Level=0dBFS, Notch)

(fs=96kHz)

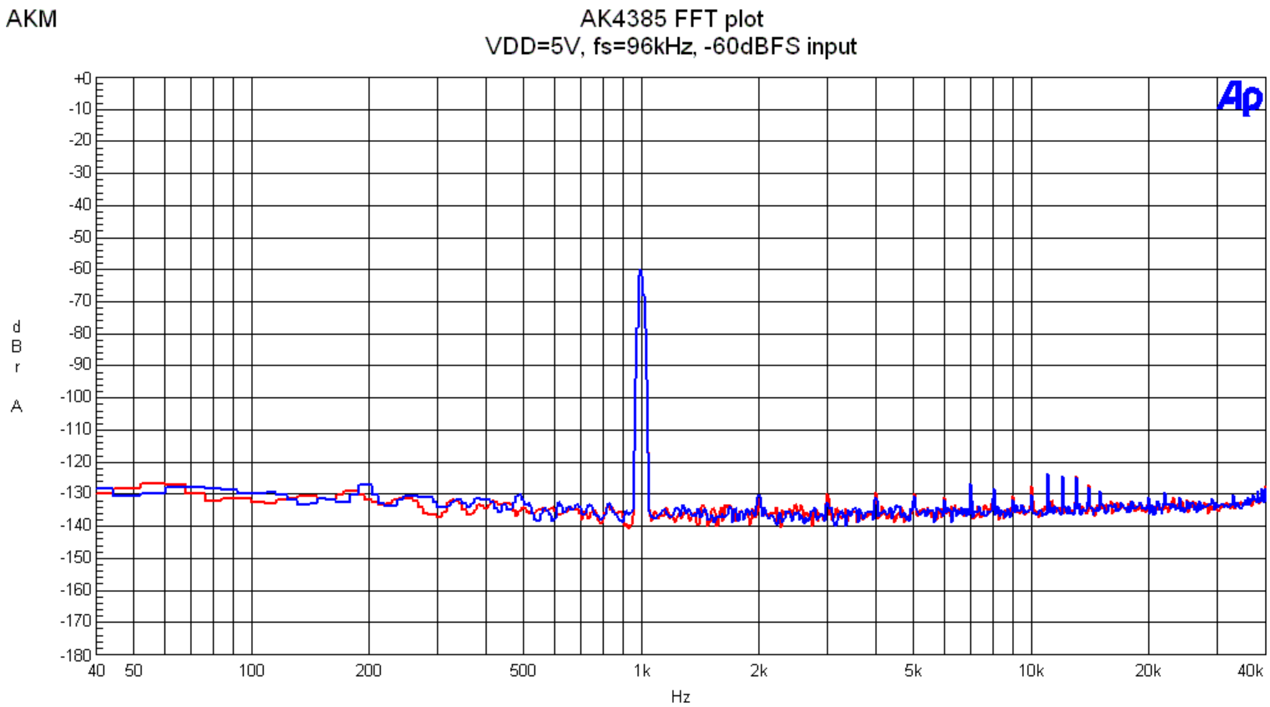

Figure 16. FFT (fin=1kHz, Input Level=-60dBFS)

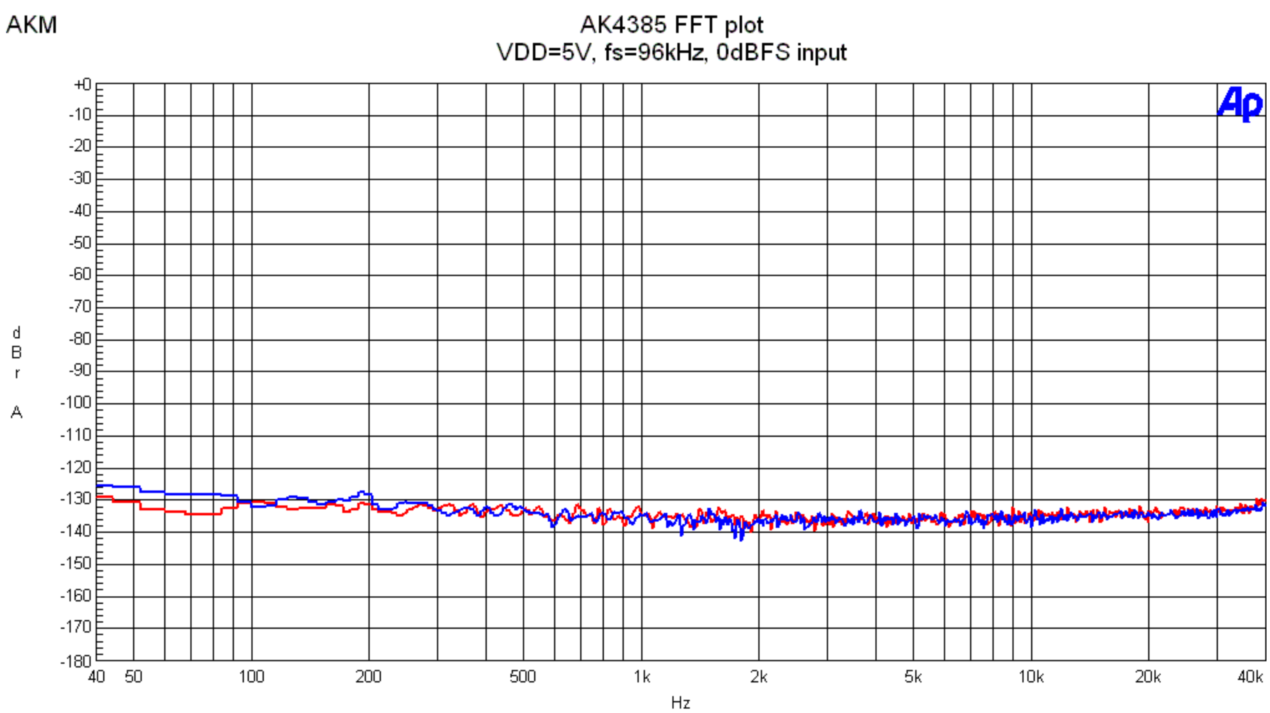

Figure 17. FFT (Noise Floor)

(fs=96kHz)

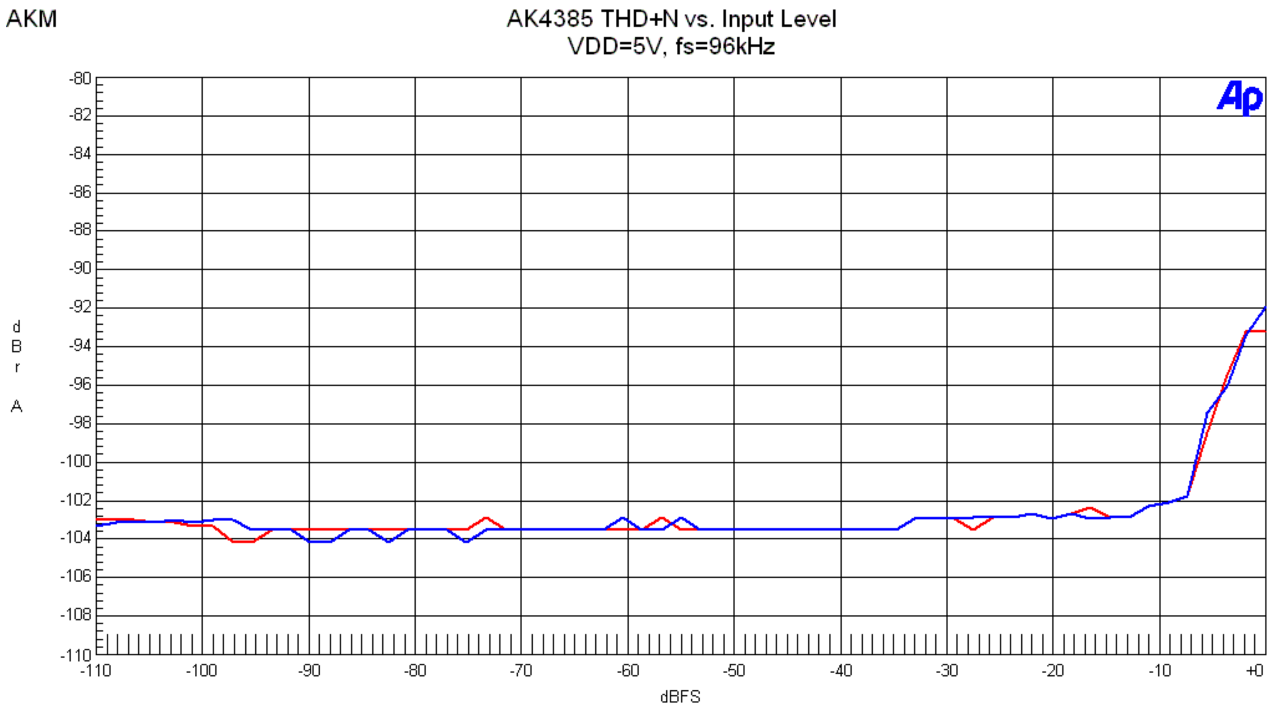

Figure 18. THD+N vs. Input level (fin=1kHz)

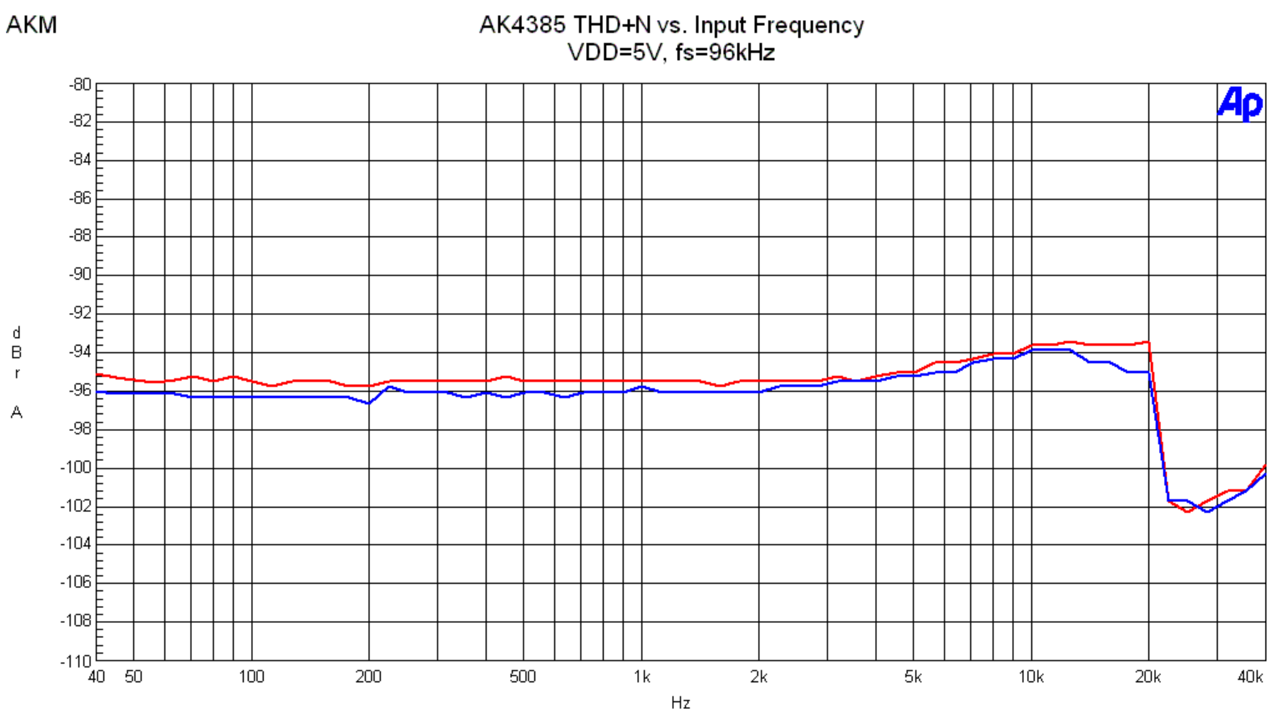

Figure 19. THD+N vs. Input Frequency (Input level=0dBFS)

(fs=96kHz)

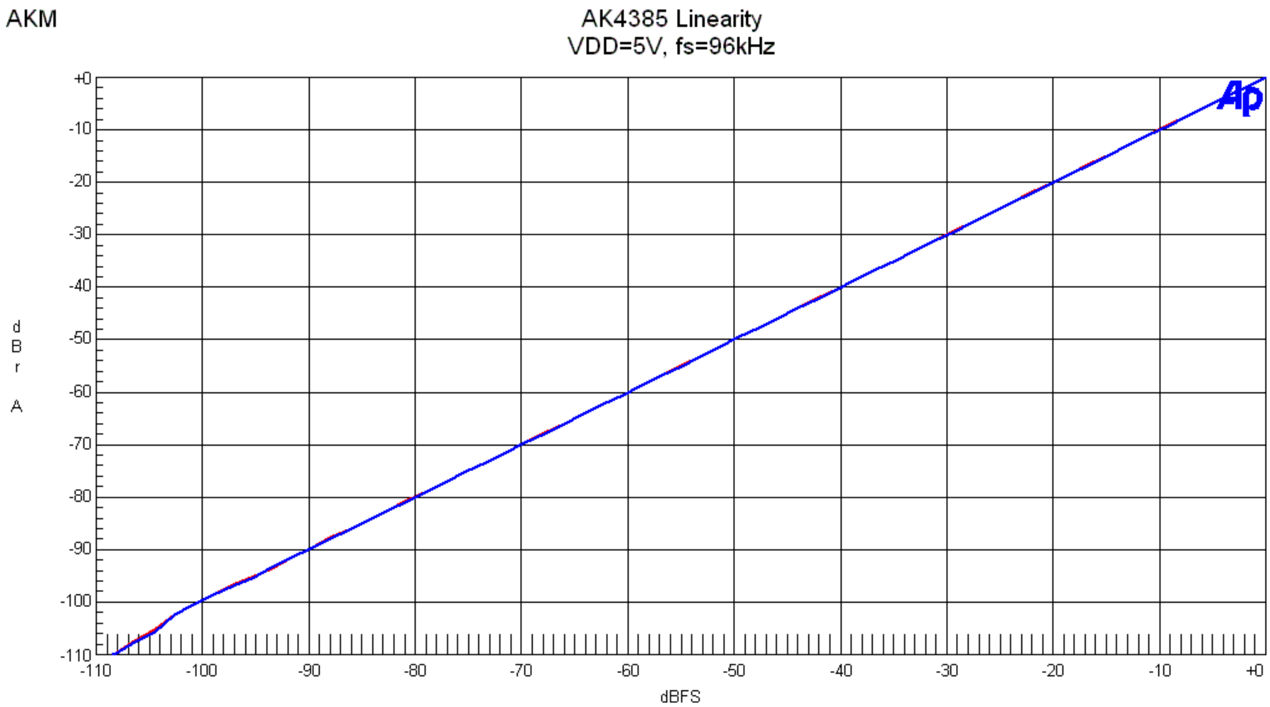

Figure 20. Linearity (fin=1kHz)

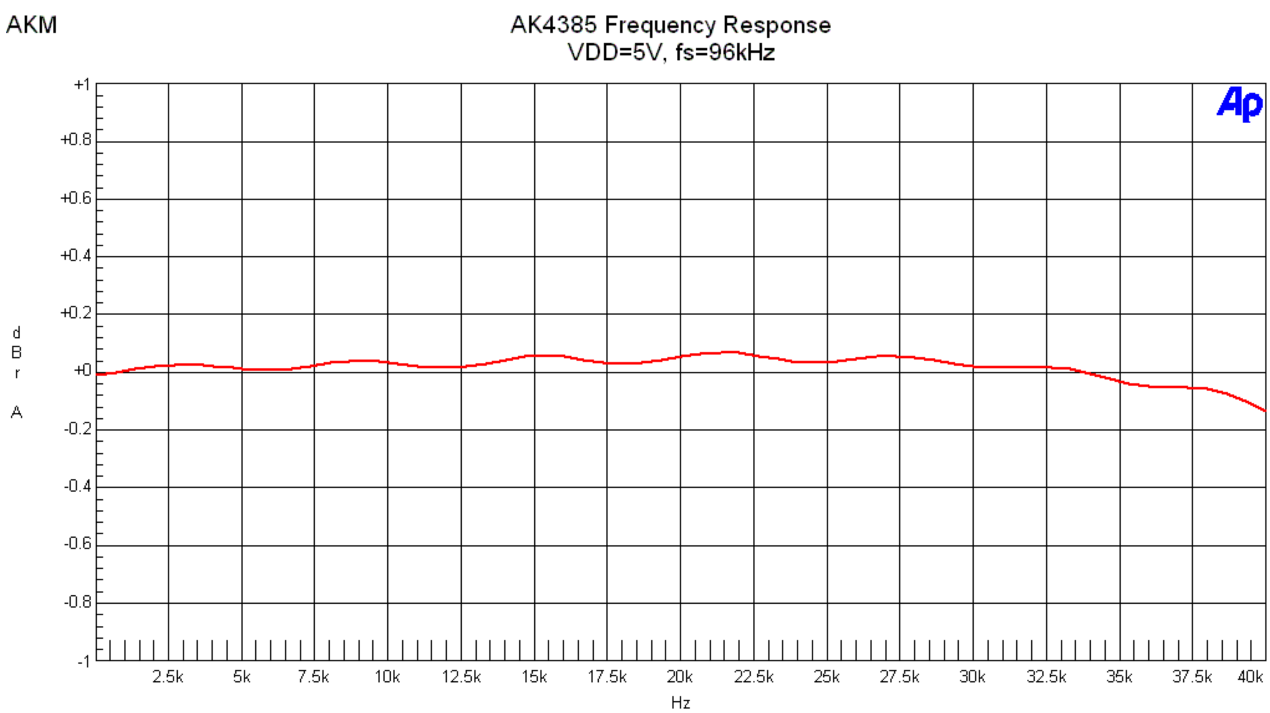

Figure 21. Frequency Response (Input level=0dBFS)

(fs=96kHz)

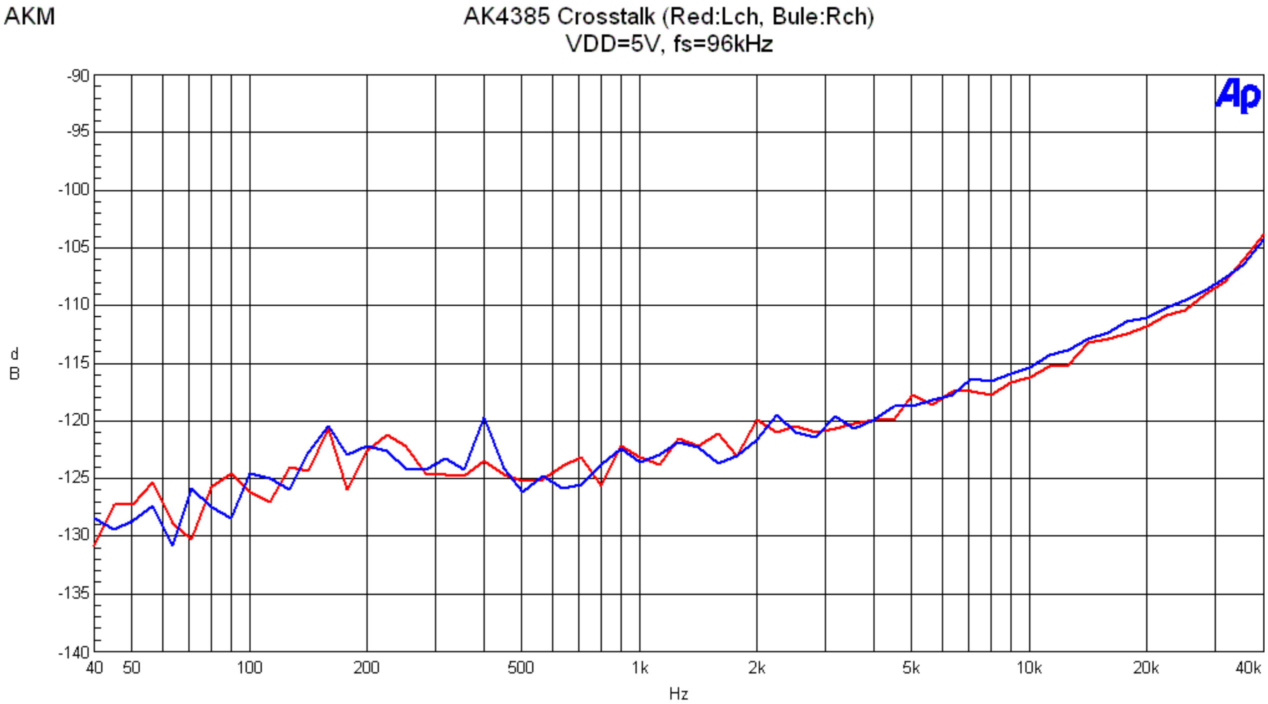

Figure 22. Crosstalk (Input level=0dBFS)

(fs=192kHz)

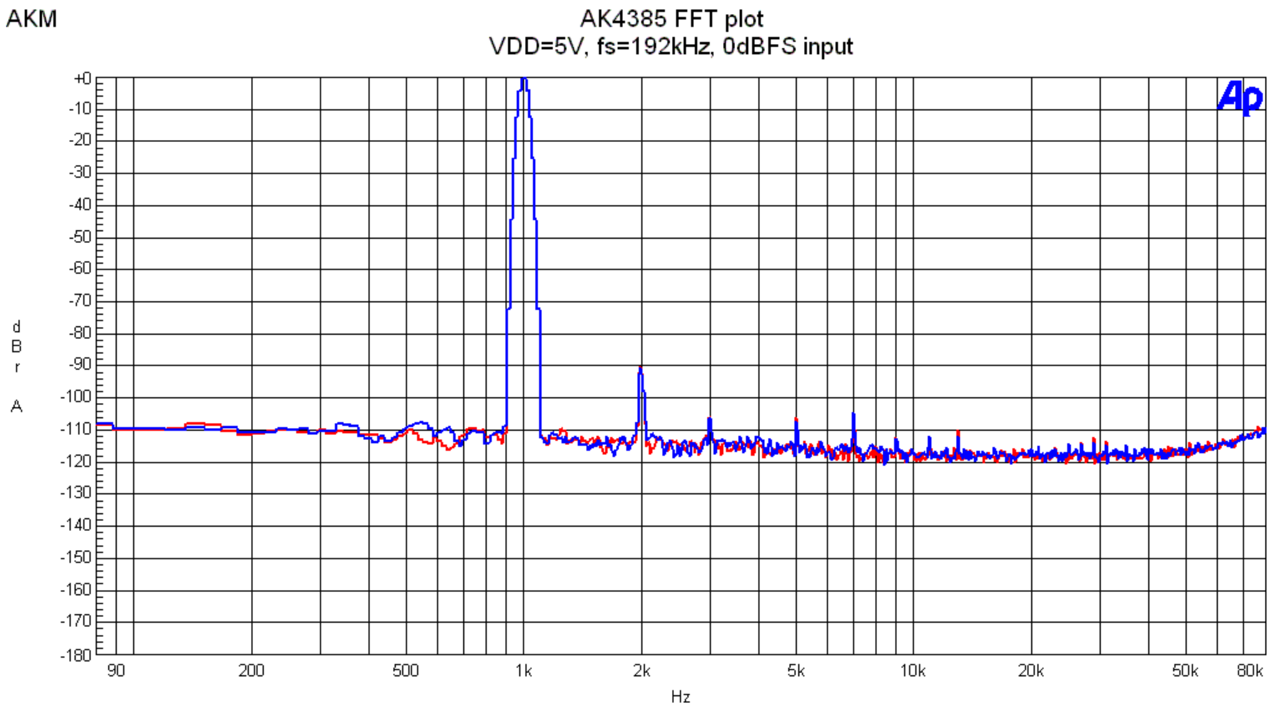

Figure 23. FFT (fin=1kHz, Input Level=0dBFS)

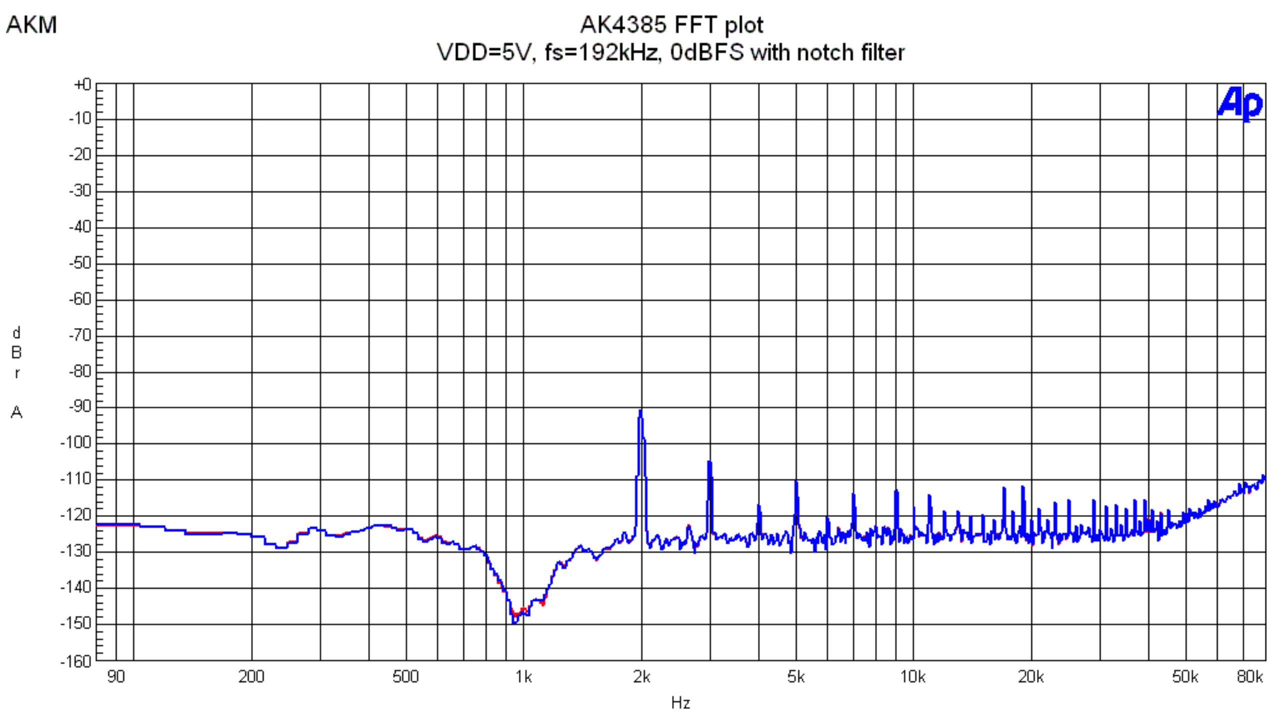

Figure 24. FFT (fin=1kHz, Input Level=0dBFS, Notch)

(fs=192kHz)

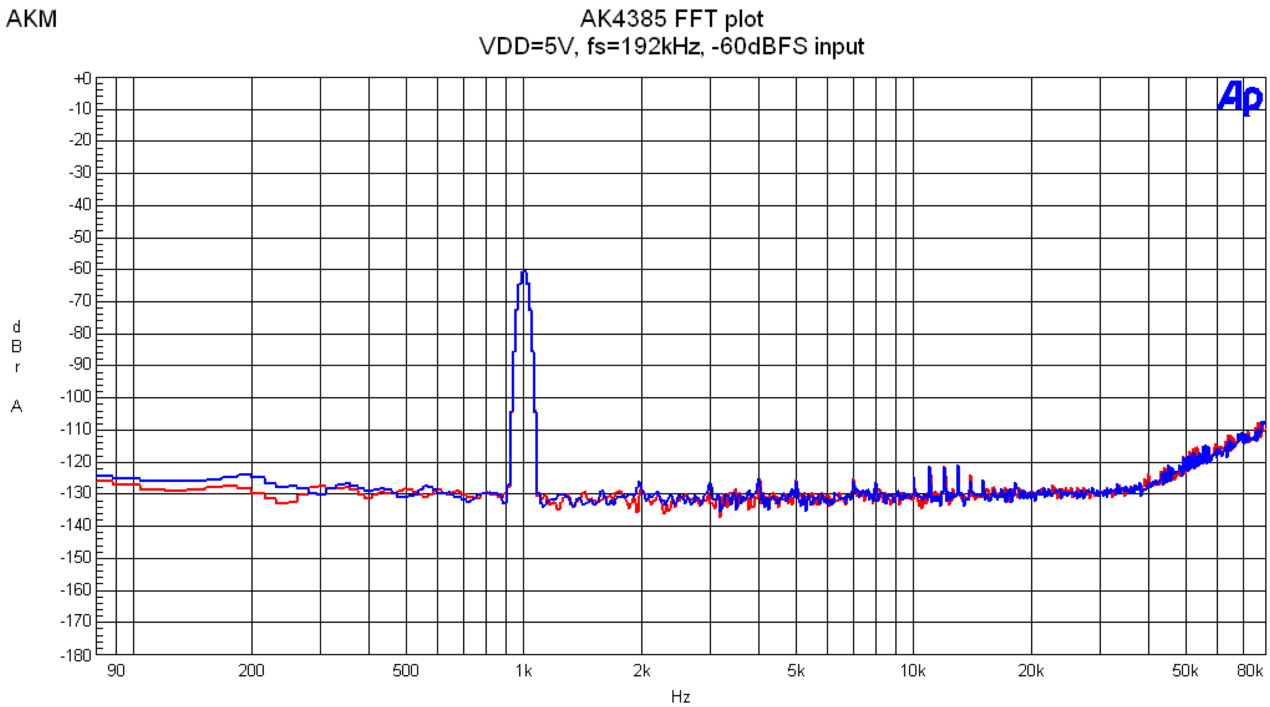

Figure 25. FFT (fin=1kHz, Input Level=-60dBFS)

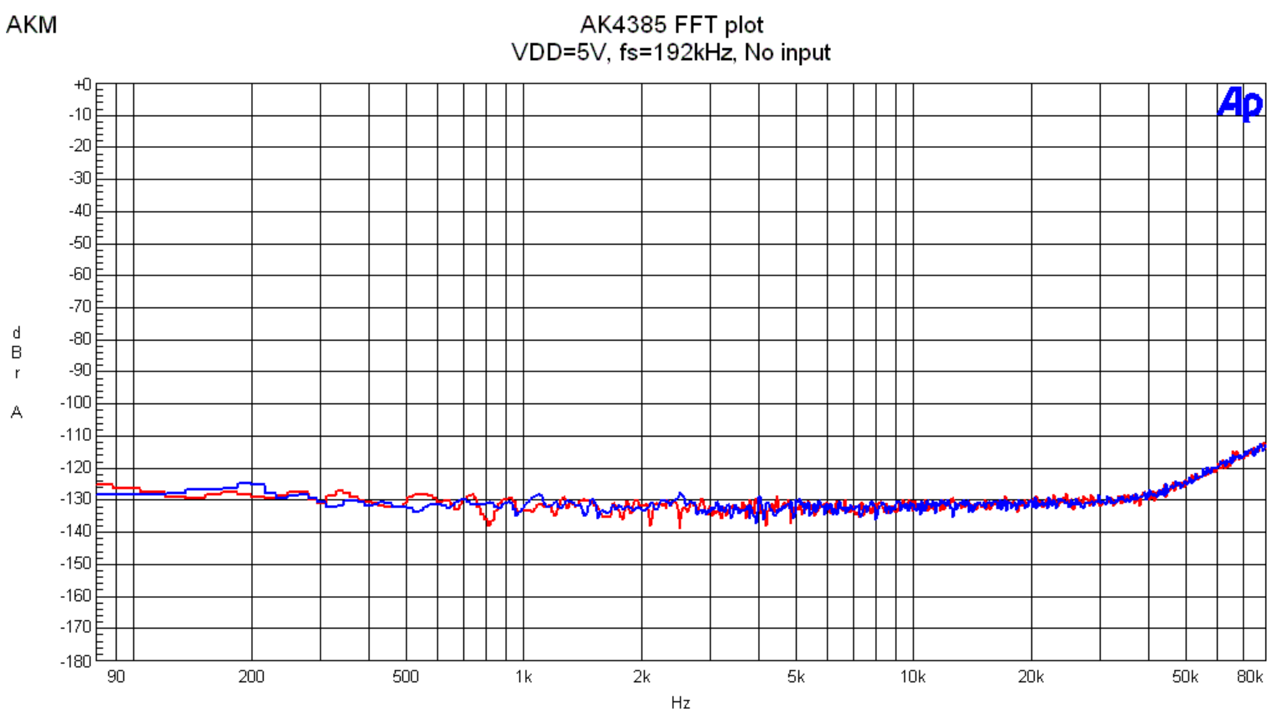

Figure 26. FFT (Noise Floor)

(fs=192kHz)

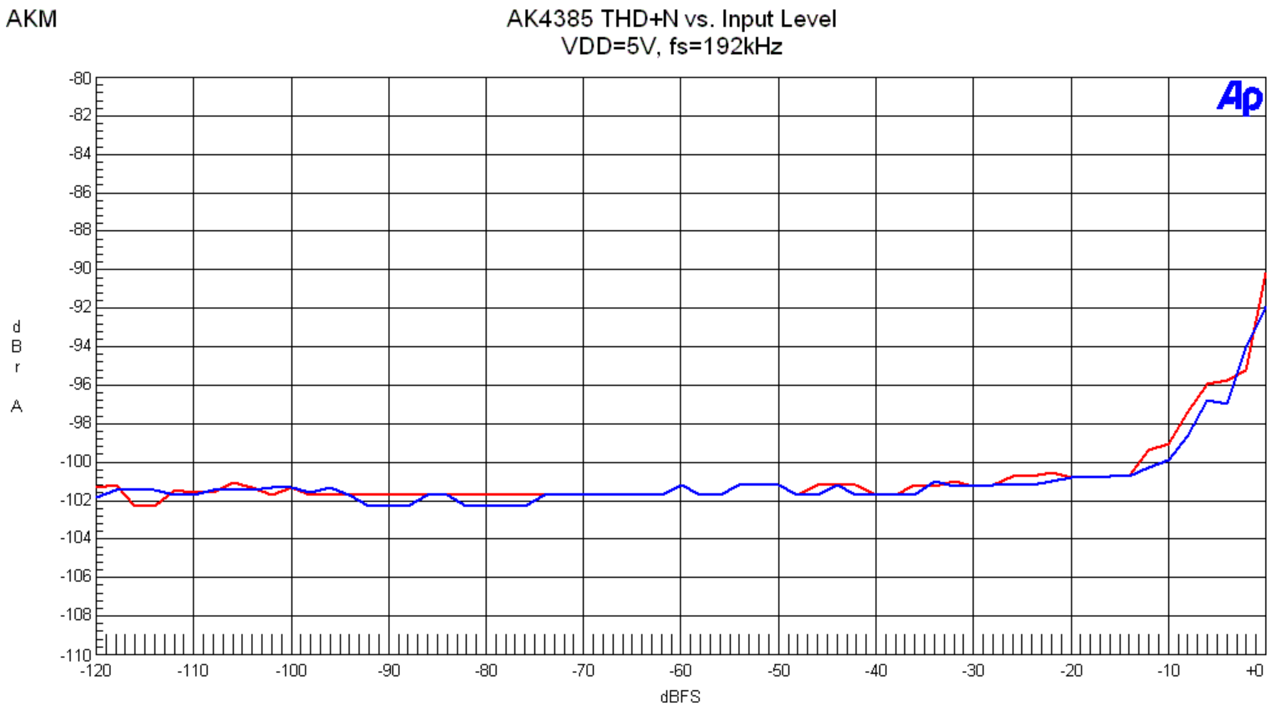

Figure 27. THD+N vs. Input level (fin=1kHz)

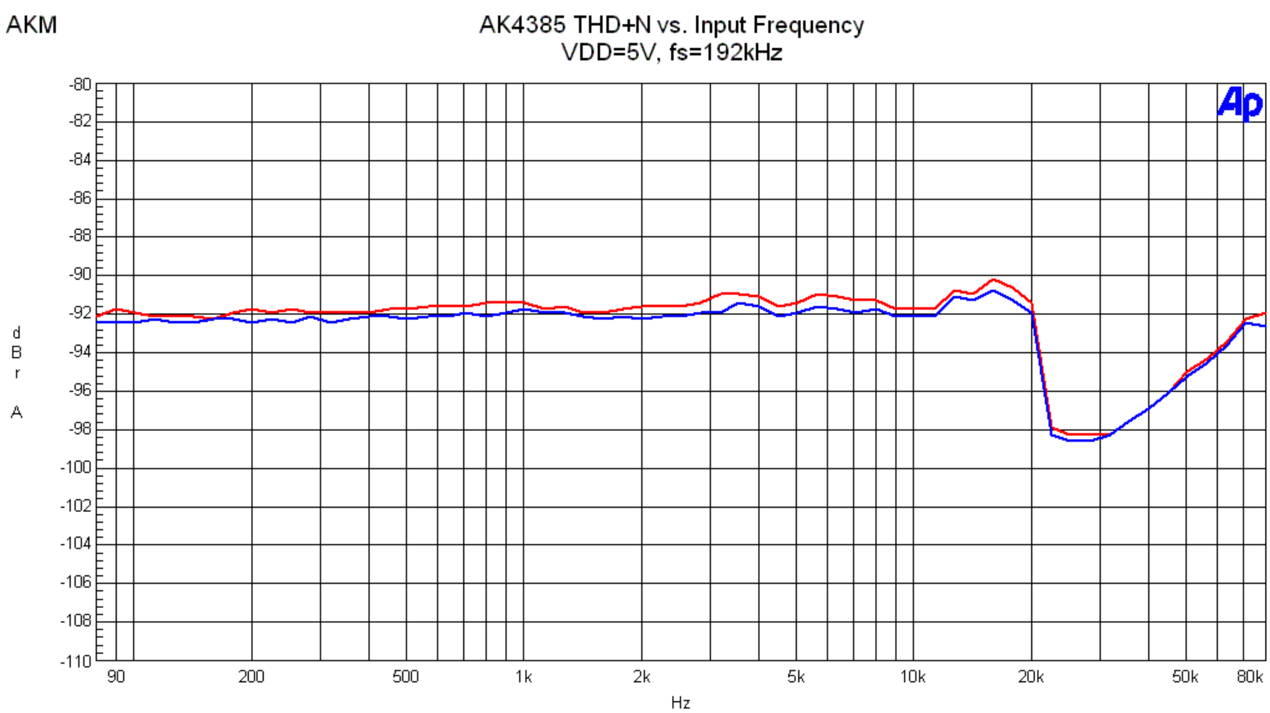

Figure 28. THD+N vs. Input Frequency (Input level=0dBFS)

(fs=192kHz)

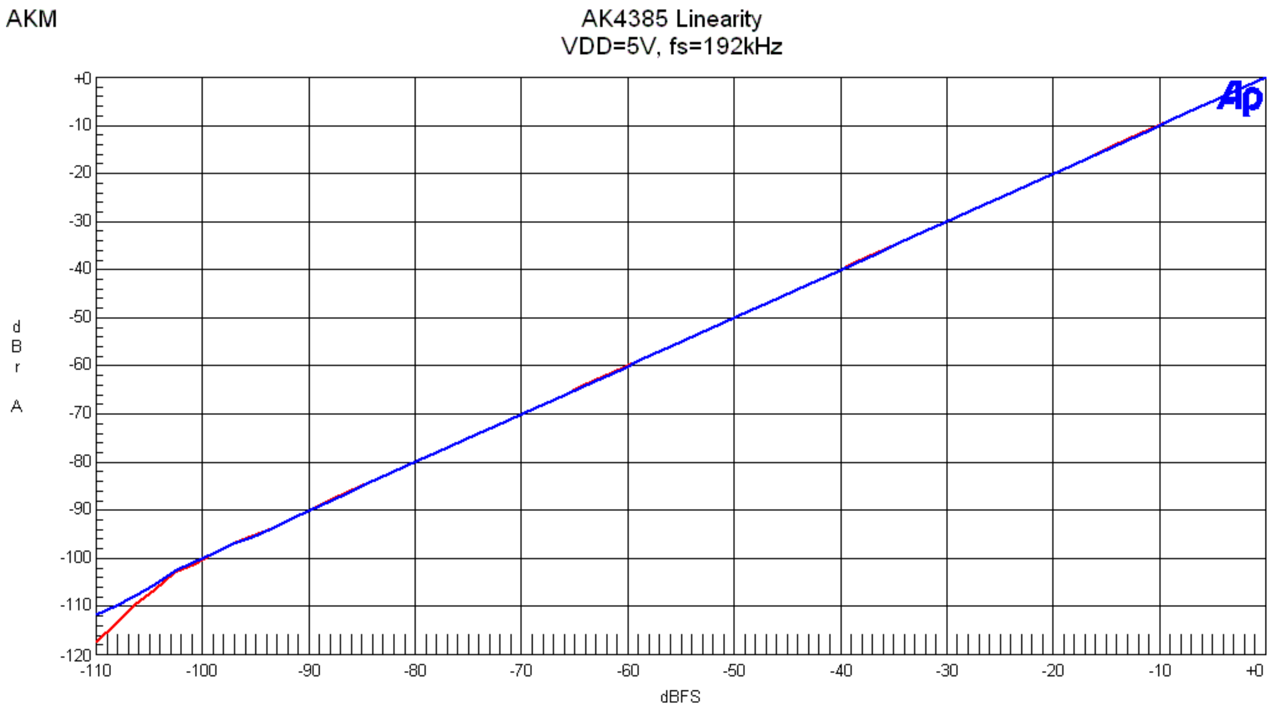

Figure 29. Linearity (fin=1kHz)

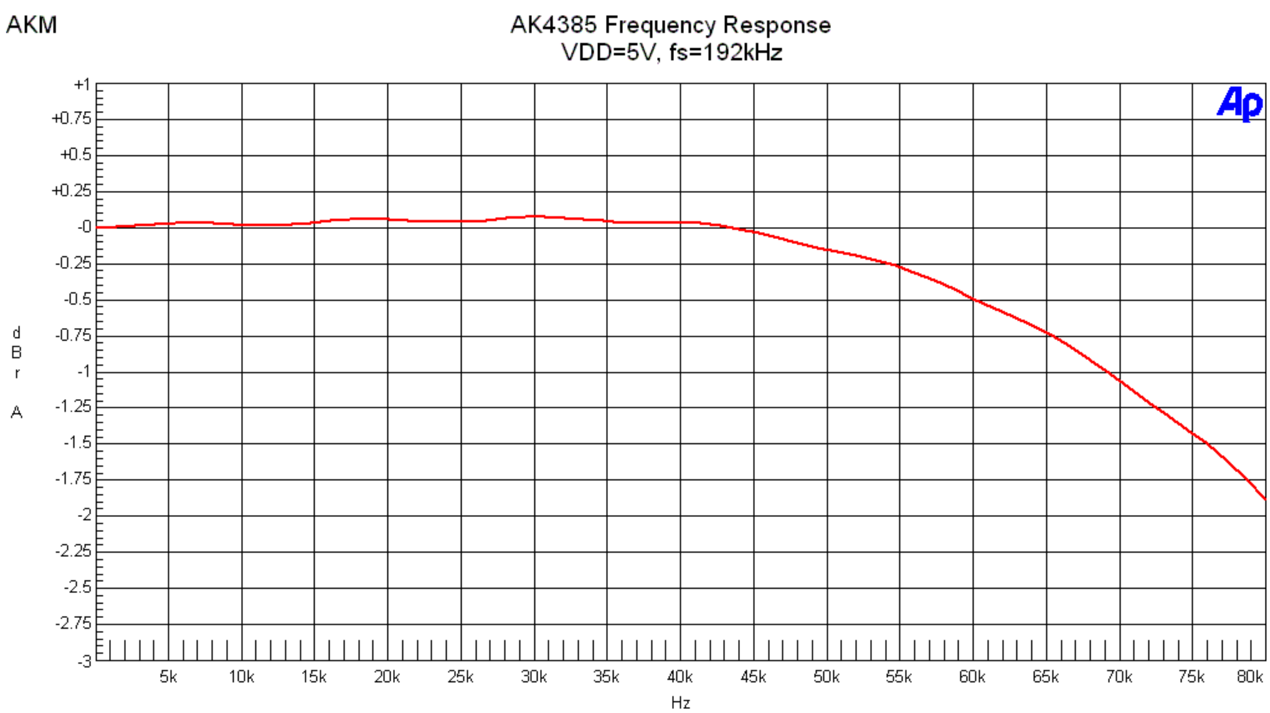

Figure 30. Frequency Response (Input level=0dBFS)

(fs=192kHz)

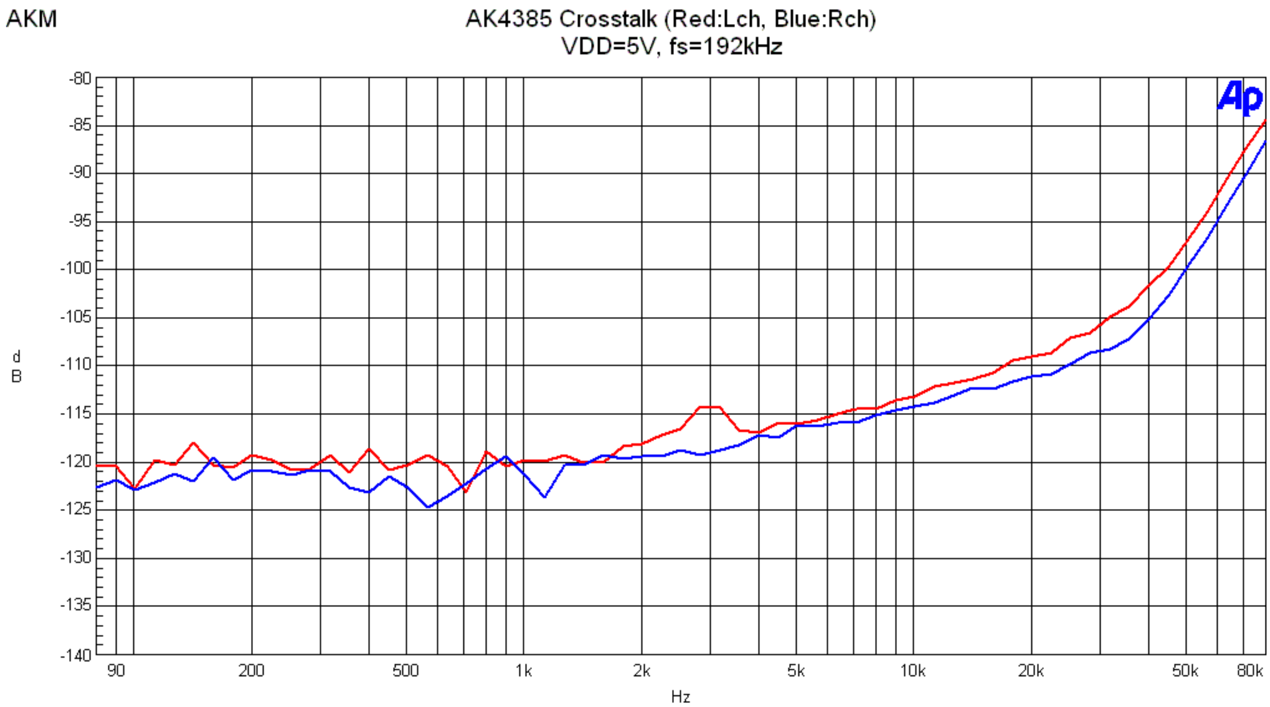

Figure 31. Crosstalk (Input level=0dBFS)

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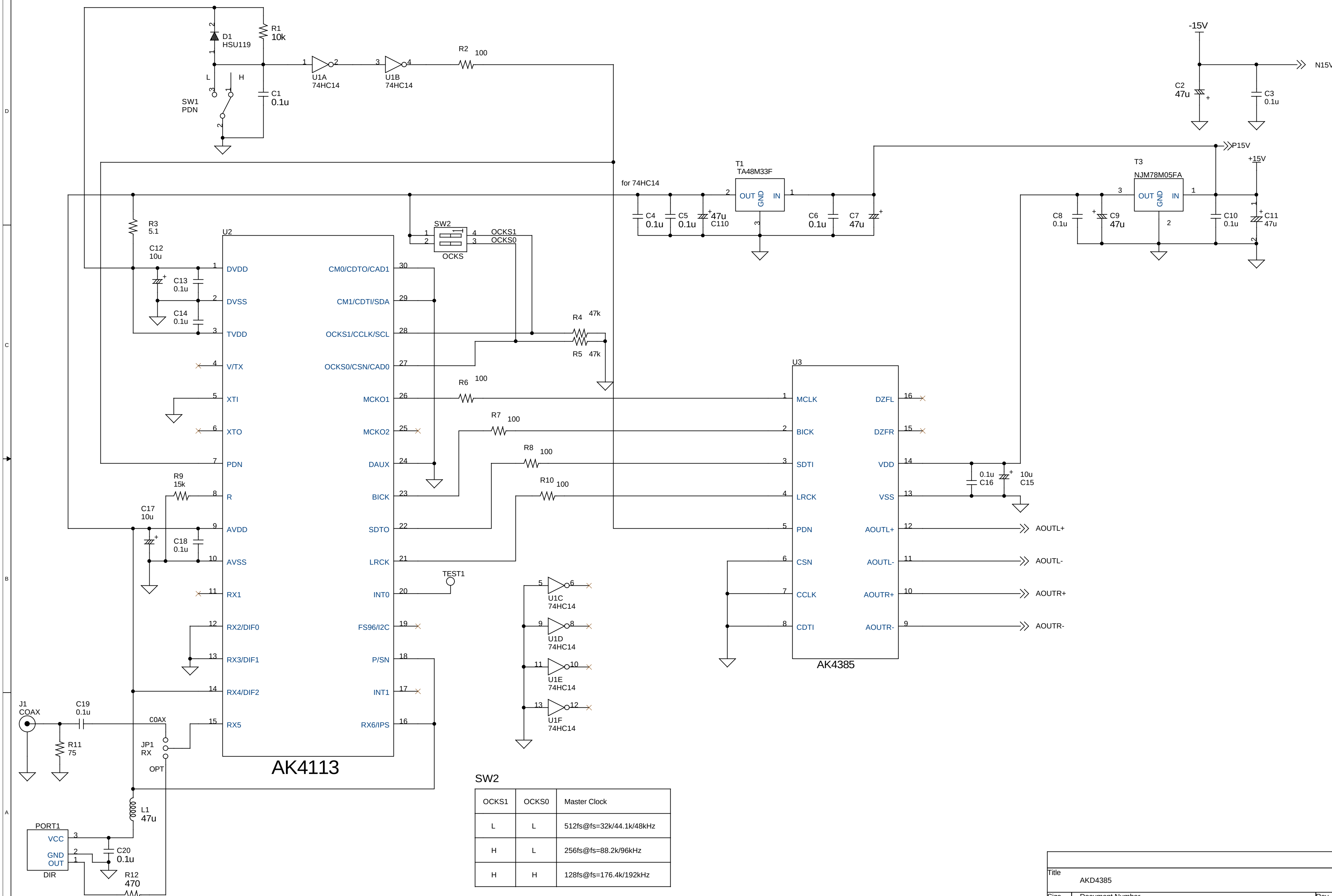

SW2

OCKS1	OCKS0	Master Clock
L	L	512fs@fs=32k/44.1k/48kHz
H	L	256fs@fs=88.2k/96kHz
H	H	128fs@fs=176.4k/192kHz

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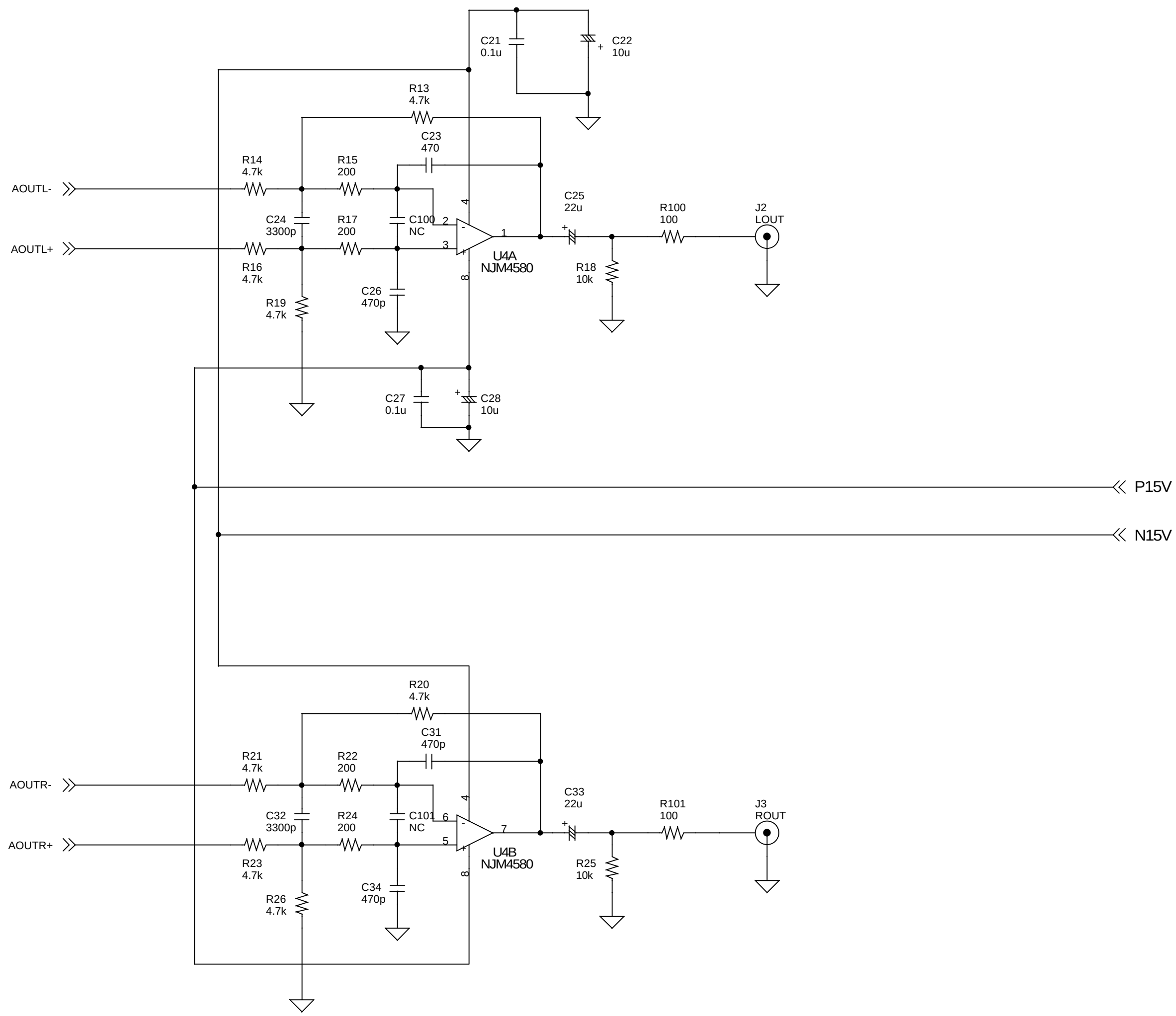

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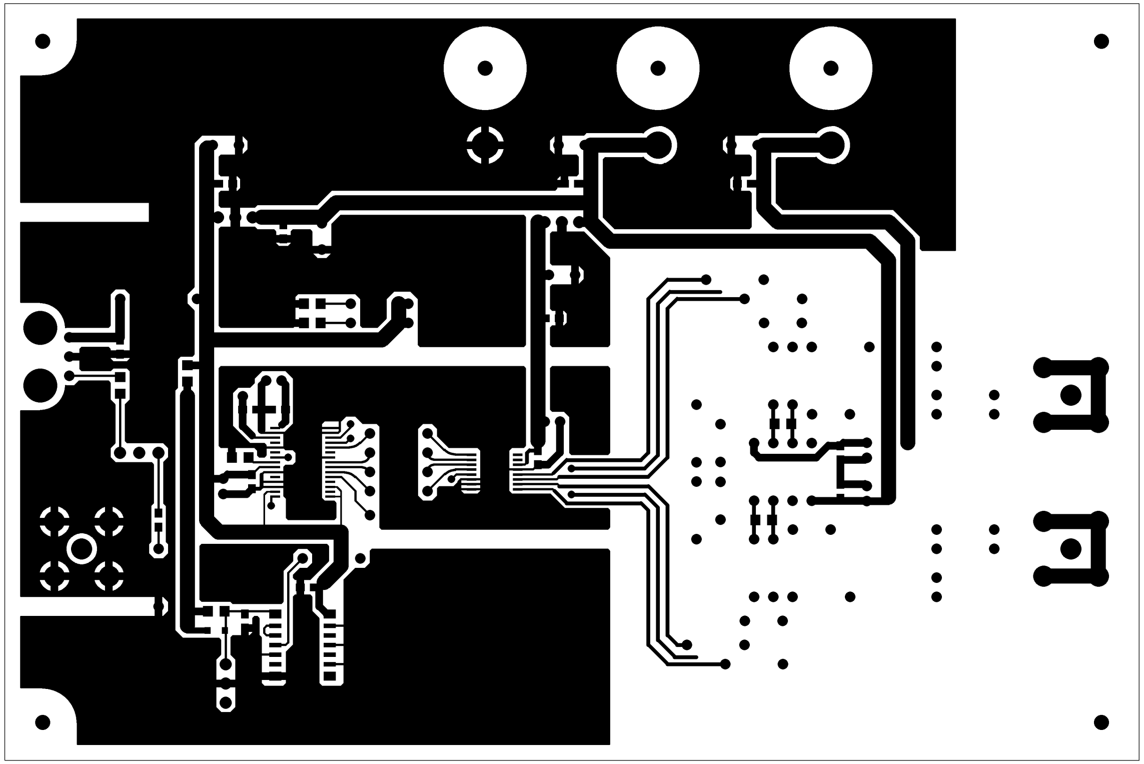
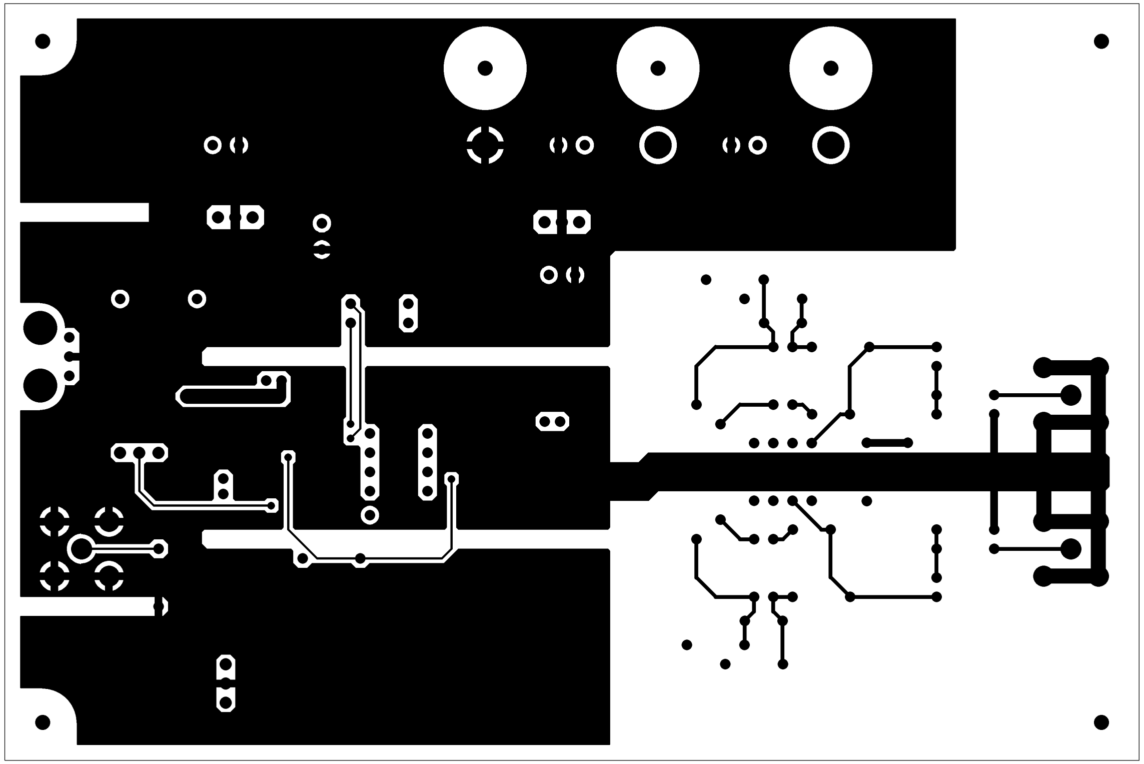


AKD4385 Rev.B L1



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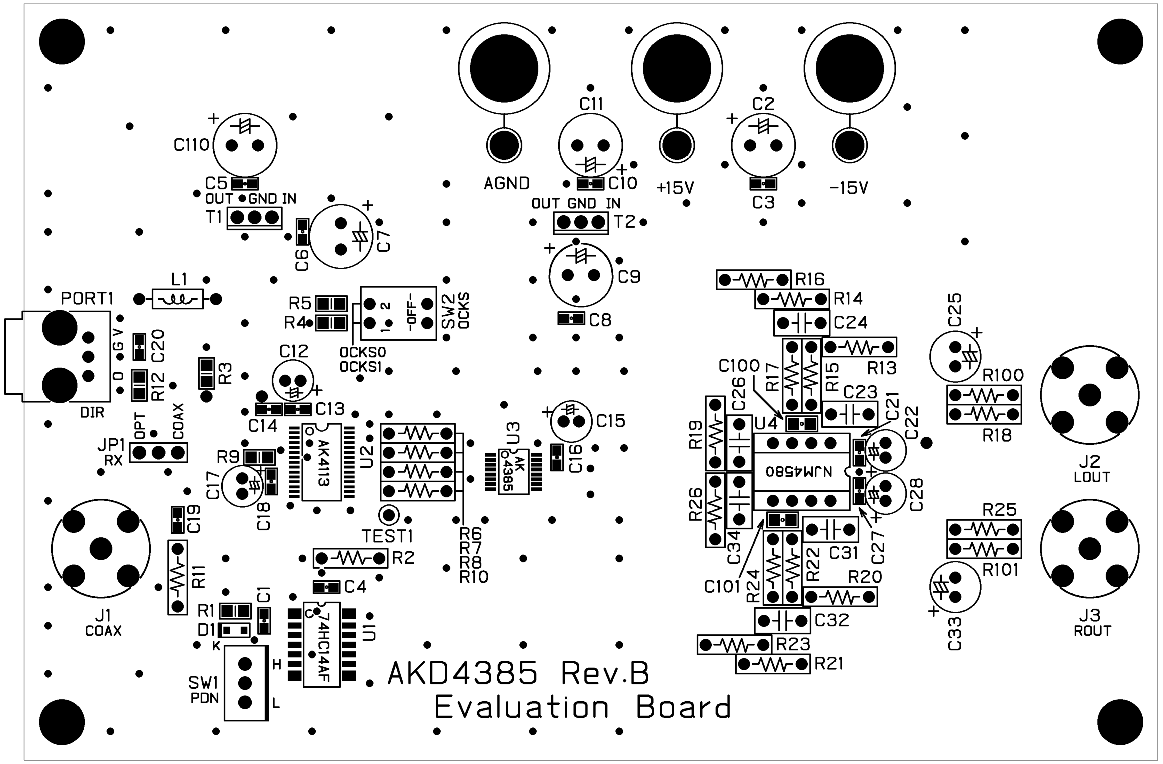

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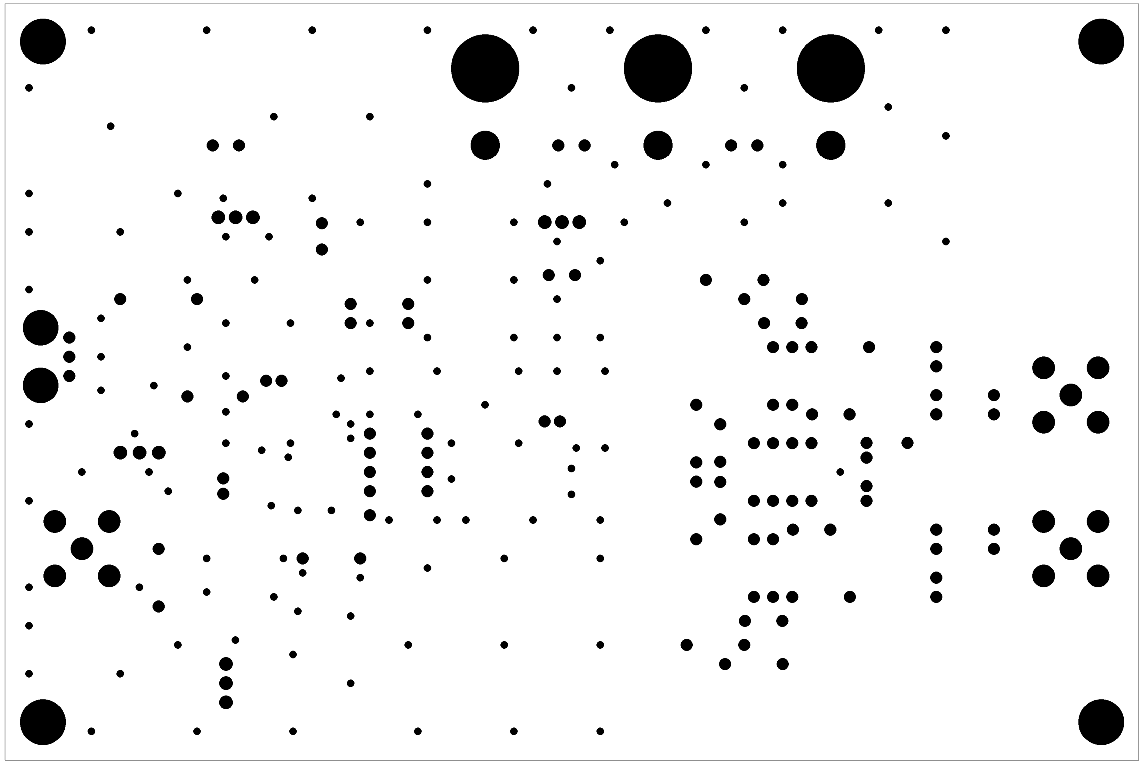

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