



# AKD5385A

## Evaluation board Rev.A for AK5385A

GENERAL DESCRIPTION

AKD5385A is an evaluation board for the digital audio 24bit 192kHz A/D converter, AK5385A. The AKD5385A includes the input circuit and also has a digital interface transmitter. Further, the AKD5385A can achieve the interface with digital audio systems via opt-connector.

■ **Ordering guide**

AKD5385A --- Evaluation board for AK5385A

FUNCTION

- **DIT with optical output**
- **BNC connector for an external clock input**

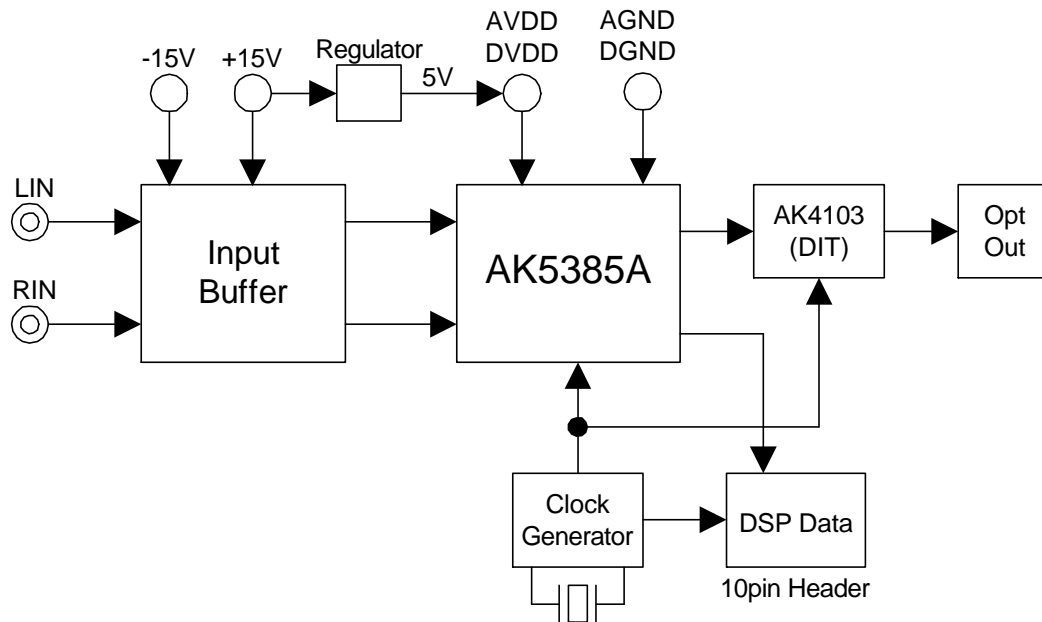


Figure 1. AKD5385A Block Diagram

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

## ■ Operation sequence

### 1) Set up the power supplies lines.

[AVDD]	(red)	= 4.75 ~ 5.25V	: for AVDD of AK5385A (typ. 5.0V)
[DVDD]	(red)	= 3.0 ~ 5.25V	: for DVDD of AK5385A (typ. 3.3V)
[+15V]	(green)	= +15V	: for Op-amp
[-15V]	(blue)	= -15V	: for Op-amp
[VCC]	(red)	= 5V	: for logic
[AGND]	(black)	= 0V	: for analog ground
[DGND]	(black)	= 0V	: for logic ground

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

### 2) Set up the evaluation mode, jumper pins and DIP switches. (See the followings.)

### 3) Power on.

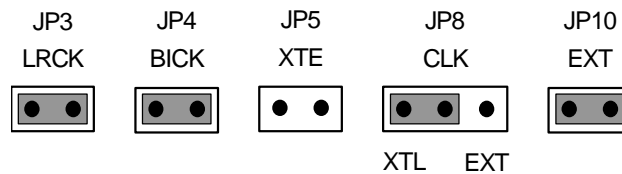
The AK5385A and AK4103 should be reset once bringing SW1 = "L" upon power-up.

## ■ Evaluation mode

### (1) Slave Mode

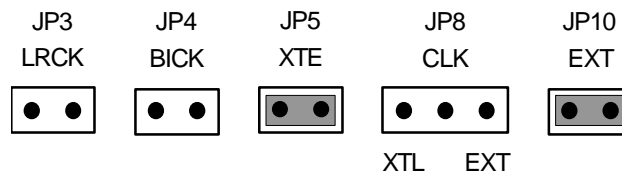
#### (1-1) A/D evaluation using DIT function of AK4103

PORT1 (DIT) is used. DIT generates audio bi-phase signal from received data and which is output through optical connector (TOTX176). It is possible to connect AKM's D/A converter evaluation boards on the digital-amplifier which equips DIR input. Nothing should be connected to PORT2 (DSP). In case of using external clock through a BNC connector (J3), select EXT on JP8 (CLK) and short JP5 (XTE) and open JP10 (EXT).



#### (1-2) Feeding all clocks from PORT2 (DSP)

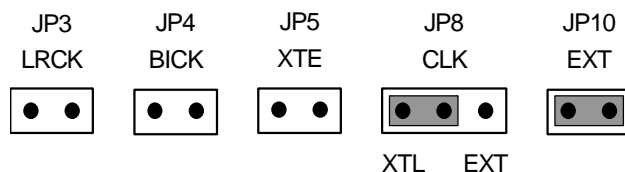
Under the following set-up, all external clocks (MCLK, BICK, LRCK) can be fed through PORT2 (DSP). The A/D converted data is output from SDTO of PORT2 (DSP). Also, the A/D converted data is output through optical connector (TOTX176).



## (2) Master Mode

## (2-1) A/D evaluation using DIT function of AK4103

PORT1 (DIT) is used. DIT generates audio bi-phase signal from received data and which is output through optical connector (TOTX176). It is possible to connect AKM's D/A converter evaluation boards on the digital-amplifier which equips DIR input. Nothing should be connected to PORT2 (DSP). In case of using external clock through a BNC connector (J3), select EXT on JP8 (CLK) and short JP5 (XTE) and open JP10 (EXT).



### ■ Other jumper pins set up

1. JP1 (GND) : Analog ground and Digital ground  
 OPEN : Separated.  
 SHORT : Common. (The connector "DGND" can be open.) <Default>
2. JP2 (AVDD) : Select AVDD for AK5385A  
 AVDD : Supply from AVDD connector <Default>  
 REG : Supply from regulator. AVDD connector should be supplied +15V.
3. JP6 (BCFS) : Select BICK frequency  
 256 : In case of MCLK=256fs/512fs <Default>  
 384 : In case of MCLK=128fs/384fs
4. JP7 (MCLK) : Supply MCLK frequency for 74HC4040  
 256 : In case of MCLK=128fs/256fs  
 512 : In case of MCLK=512fs <Default>  
 384/768 : In case of MCLK=384fs
5. JP9 (LRFS) : Select LRCK frequency  
 256 : In case of MCLK=256fs/512fs <Default>  
 384 : In case of MCLK=128fs/384fs

■ Clock Setting

Mode	fs	MCLK	JP6(BCFS)	JP7(MCLK)	JP9(LRFS)
Normal Speed	8kHz	256fs = 2.048MHz	256	256	256
		384fs = 3.072MHz	384	384/768	384
		512fs = 4.096MHz	256	512	256
	32kHz	256fs = 8.192MHz	256	256	256
		384fs = 12.288MHz	384	384/768	384
		512fs = 16.384MHz	256	512	256
	44.1kHz	256fs = 11.2896MHz	256	256	256
		384fs = 16.9344MHz	384	384/768	384
		512fs = 22.5792MHz	256	512	256
	48kHz	256fs = 12.288MHz	256	256	256
		384fs = 18.432MHz	384	384/768	384
		512fs = 24.576MHz	256	512	256
Double Speed	88.2kHz	256fs = 22.5792MHz	256	256	256
		384fs = 33.8688MHz	384	384/768	384
	96kHz	256fs = 24.576MHz	256	256	256
		384fs = 36.864MHz	384	384/768	384
Quad Speed	176.4kHz	128fs = 22.5792MHz	384	256	384
	192kHz	128fs = 24.576MHz	384	256	384

Default

Table 1. Clock Setting

## ■ DIP Switch set up

[SW2] (MODE): Setting the evaluation mode for AK5385A and AK4103  
ON is “H”, OFF is “L”.

No.	Name	OFF (“L”)	ON (“H”)	Default
1	CKS0	See Table 3		OFF (“L”)
2	CKS1			ON (“H”)
3	DIF	MSB justified	I <sup>2</sup> S Compatible	OFF (“L”)
4	M/S	Slave mode	Master mode	OFF (“L”)
5	DFS0	See Table 4		OFF (“L”)
6	DFS1			OFF (“L”)
7	HPFE	HPF Disable	HPF Enable	ON (“H”)
8	DIT1	See Table 5		ON (“H”)
9	DIT0			OFF (“L”)
10	-	N/A	N/A	OFF (“L”)

Table 2. Mode Setting

CKS1	CKS0	MCLK Frequency	Default
L	L	256fs	
L	H	128fs	
H	L	512fs	
H	H	384fs	

Table 3. MCLK Frequency

DFS1	DFS0	LRCK Frequency	Default
L	L	8kHz ≤ fs ≤ 54kHz	
L	H	54kHz < fs ≤ 108kHz	
H	L	108kHz < fs ≤ 216kHz	
H	H	N/A	

Table 4. Sampling Speed

Mode	DIT1	DIT0	MCLK	fs	Default
0	L	L	256fs	~ 108kHz	
1	L	H	128fs	~ 216kHz	
2	H	L	512fs	~ 54kHz	
3	H	H	384fs	~ 54kHz	

Table 5. MCLK Frequency Setting of AK4103

## ■ The function of the toggle SW

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

[SW1] (PDN): Resets the AK5385A and AK4103. Keep “H” during normal operation.

■ Input Circuit

Analog signal is input to LIN/RIN pins via J1, J2 connectors.

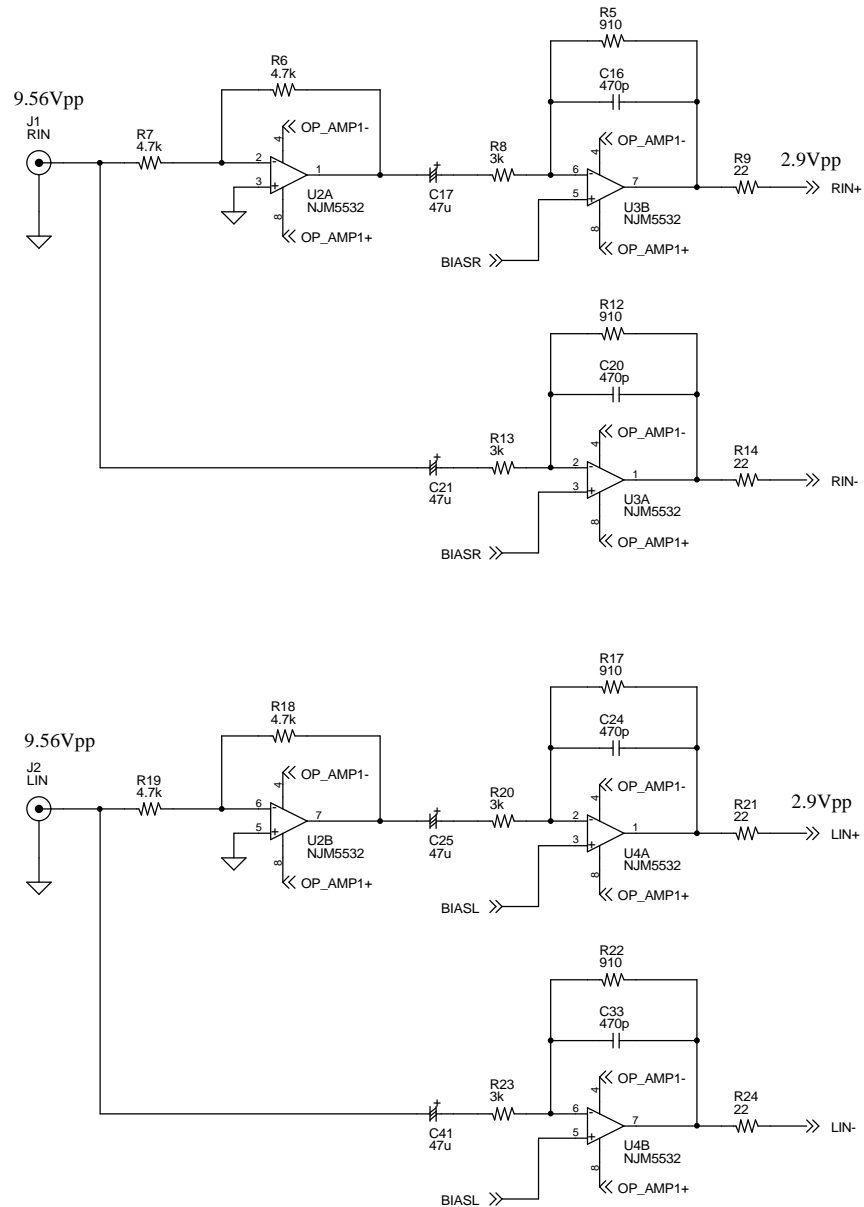


Figure 2. LIN/RIN Input circuits

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

<b>MEASUREMENT RESULTS</b>
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## [Measurement condition]

- Measurement unit : Audio Precision, System Two Cascade
- MCLK : 256fs@fs=48kHz/96kHz, 128fs@fs=192kHz
- BICK : 64fs
- fs : 48kHz, 96kHz, 192kHz
- Band width : 10Hz ~ 20kHz@fs=48kHz, 10Hz ~ 40kHz@fs=96kHz/192kHz
- Bit : 24bit
- Power Supply : AVDD = 5.0V, DVDD = 3.3V
- Interface : DIT@fs=48kHz/96kHz, Serial port@fs=192kHz
- Temperature : Room

## [Measurement Results]

Parameter	Result (Lch/Rch)	Unit
<b>ADC Analog Input Characteristics:</b>		
S/(N+D)		
(fs=48kHz, -1dBFS, BW=20kHz)	101.3 / 101.4	dB
(fs=48kHz, -1dBFS, BW=20kHz, VREF Cap=100μF, Note)	103.5 / 104.1	dB
(fs=96kHz, -1dBFS, BW=40kHz)	99.5 / 100.2	dB
(fs=192kHz, -1dBFS, BW=40kHz)	99.4 / 100.2	dB
D-Range		
(fs=48kHz, -60dBFS, A-weighted)	114.0 / 114.0	dB
(fs=96kHz, -60dBFS, BW=40kHz)	106.1 / 107.2	dB
(fs=192kHz, -60dBFS, BW=40kHz)	105.6 / 107.2	dB
S/N		
(fs=48kHz, A-weighted)	114.0 / 114.0	dB
(fs=96kHz, BW=40kHz)	106.1 / 107.2	dB
(fs=192kHz, BW=40kHz)	105.6 / 107.2	dB
Interchannel Isolation		
(fs=48kHz)	125.1 / 123.3	dB
(fs=96kHz)	121.6 / 123.3	dB
(fs=192kHz)	117.6 / 123.6	dB

Note. 10μF is mounted on the VREFL and VREFR pins on the evaluation board.

[ADC Plot : fs=48kHz]

AKM

AK5385A THD+N vs. Input Level  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, fin=1kHz

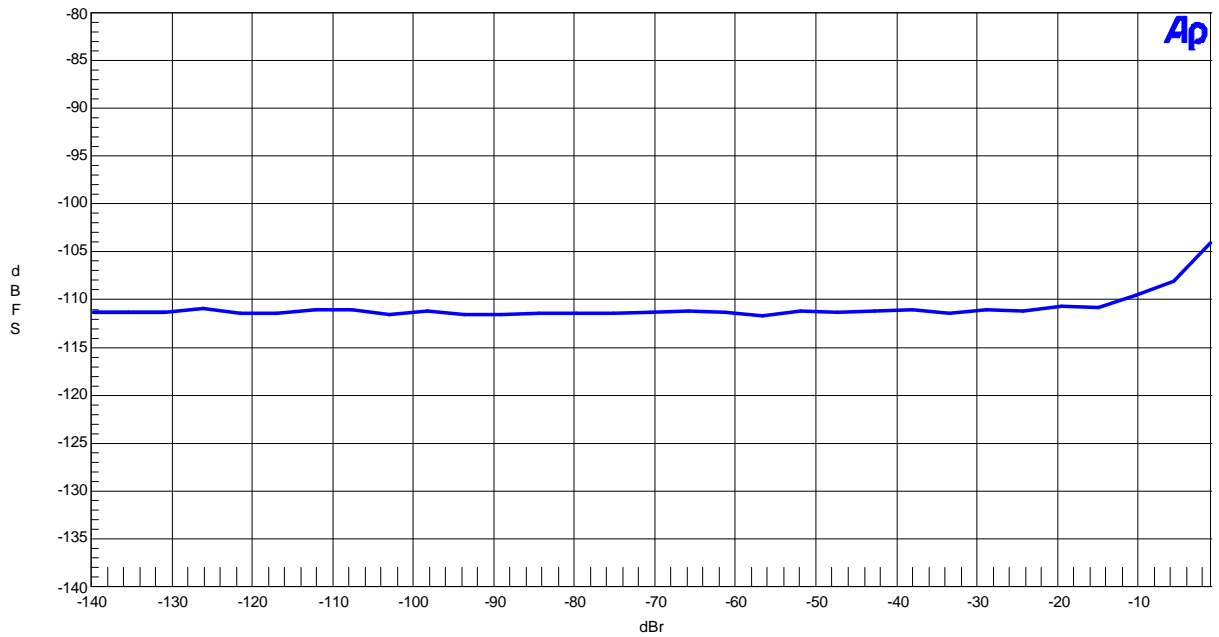


Figure 1. THD+N vs. Input Level

AKM

AK5385A THD+N vs. Input Frequency  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, Input=-1.0dBr

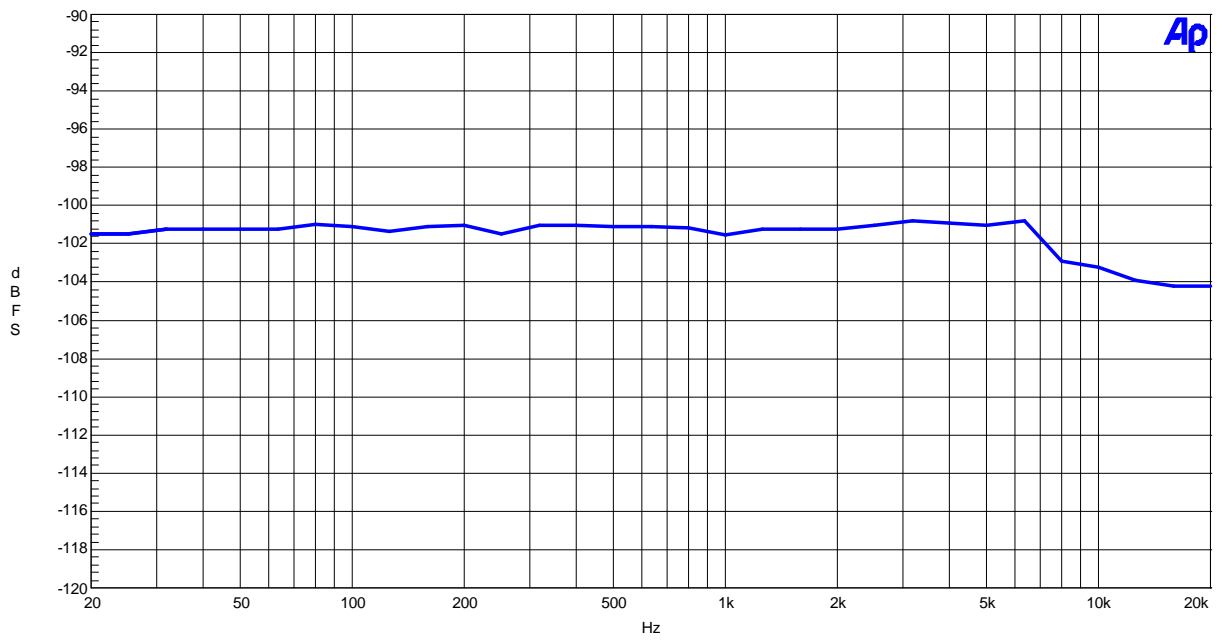


Figure 2. THD+N vs. Input Frequency



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AK5385A Linearity  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, fin=1kHz

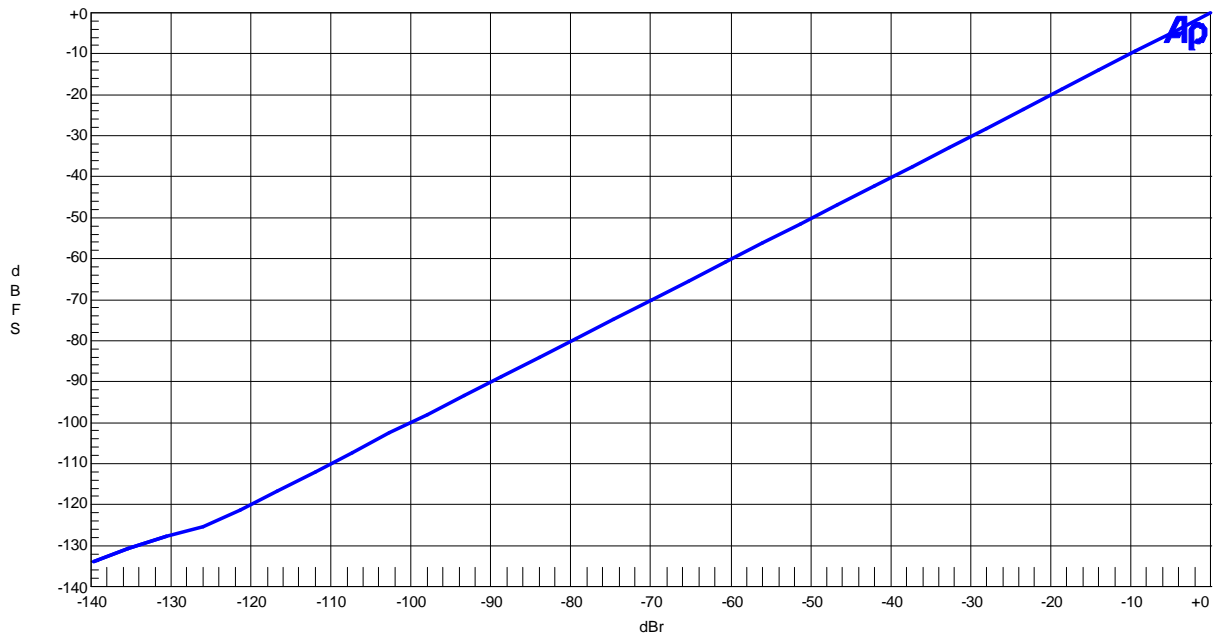


Figure 3. Linearity

AKM

AK5385A Frequency Response  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, Input=-1.0dBr

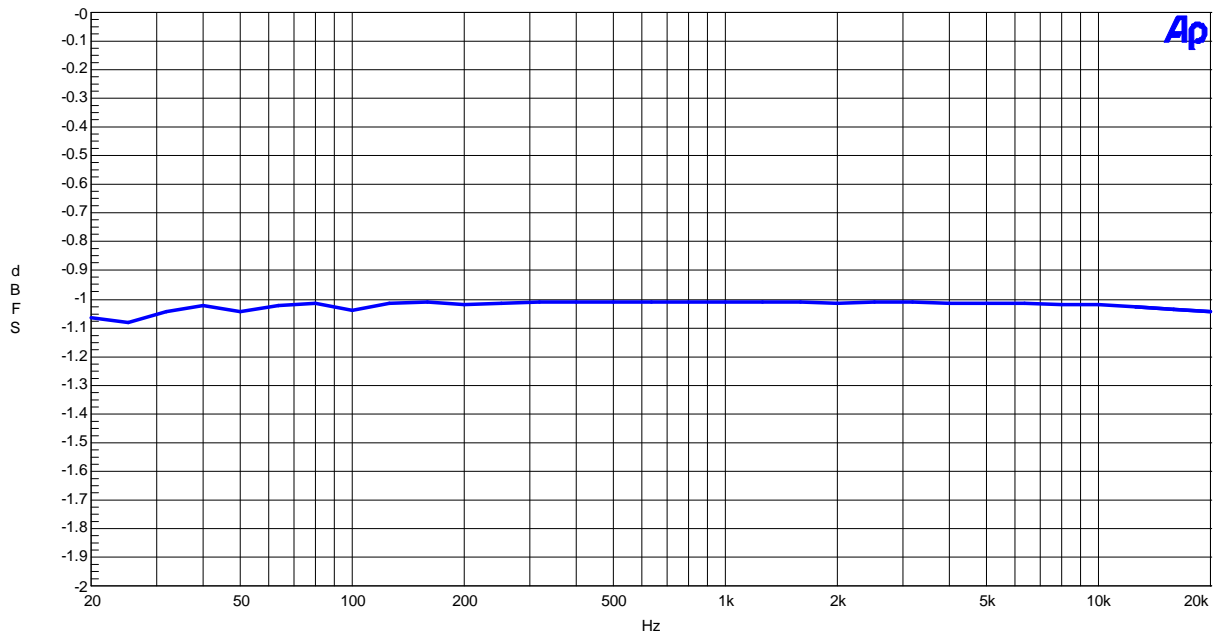


Figure 4. Frequency Response

AKM

AK5385A Crosstalk  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, Input=-1.0dB

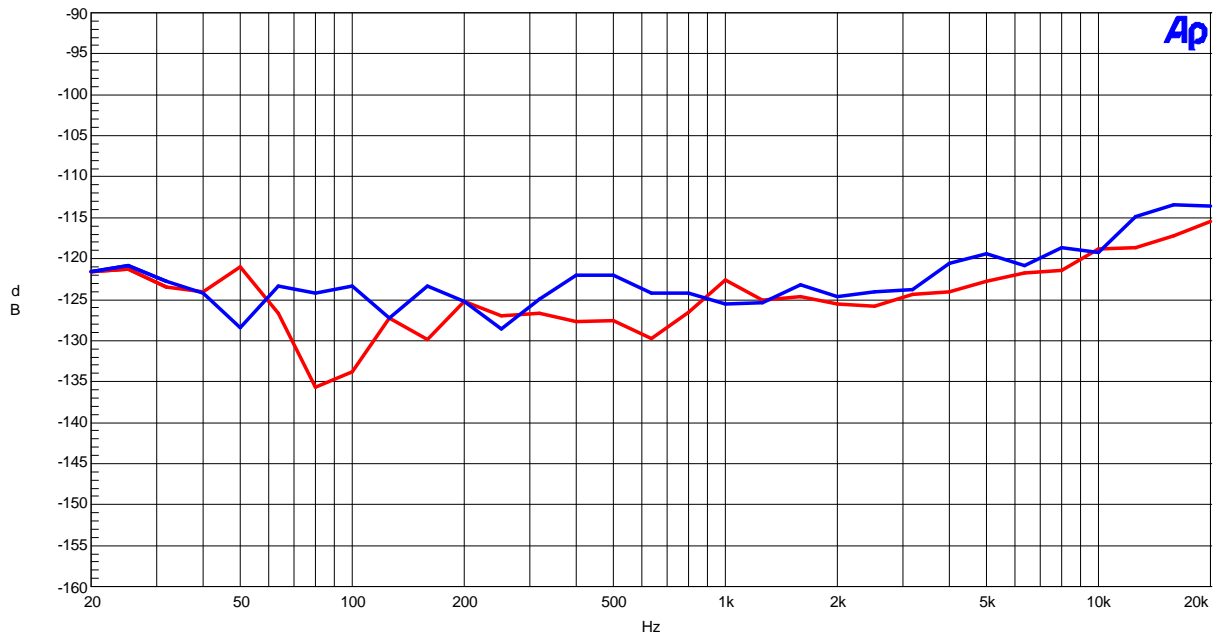


Figure 5. Crosstalk

AKM

AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, Input=-1.0dB, fin=1kHz

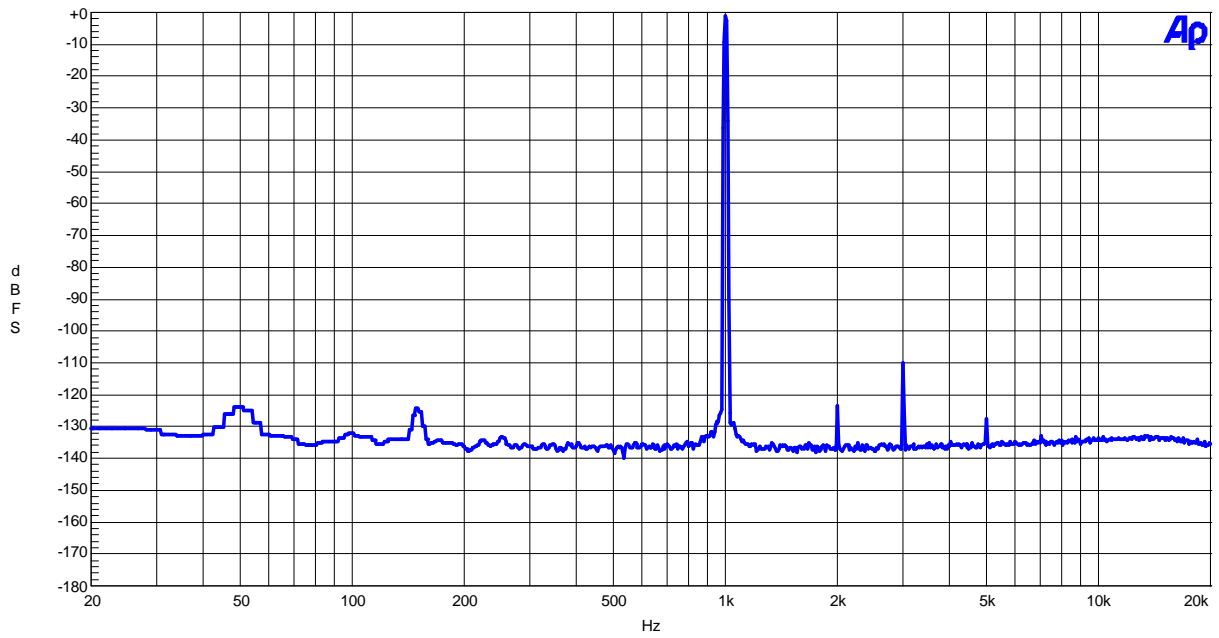


Figure 6. FFT Plot

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, Input=-60dB, fin=1kHz

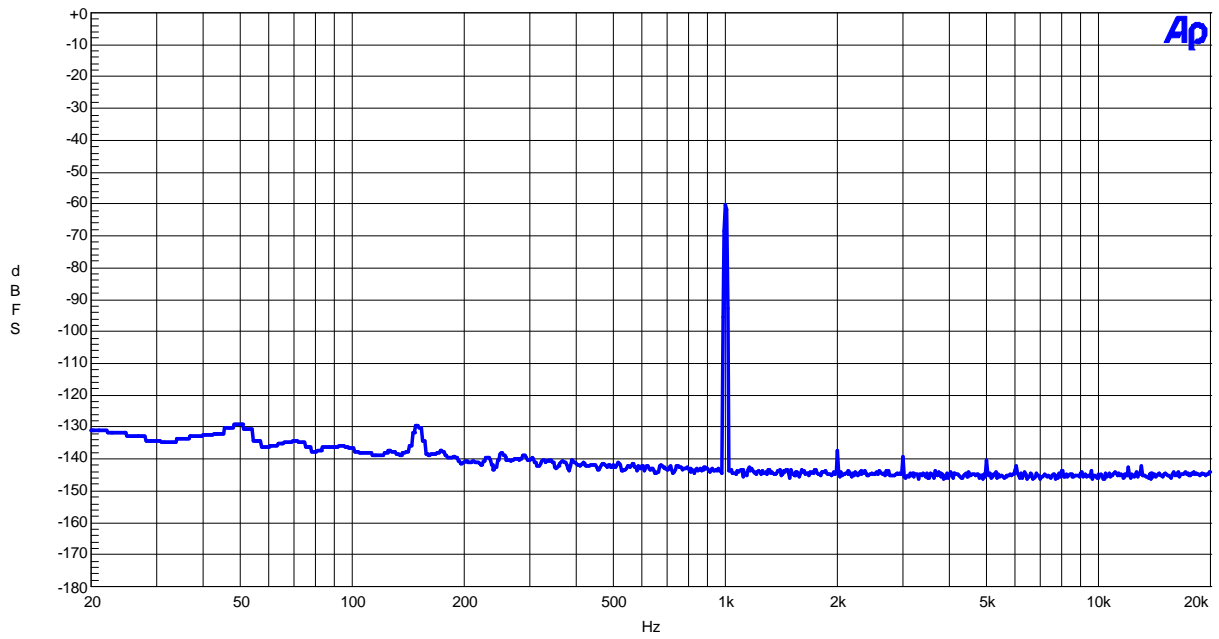


Figure 7. FFT Plot

AKM

AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=48kHz, fin=None

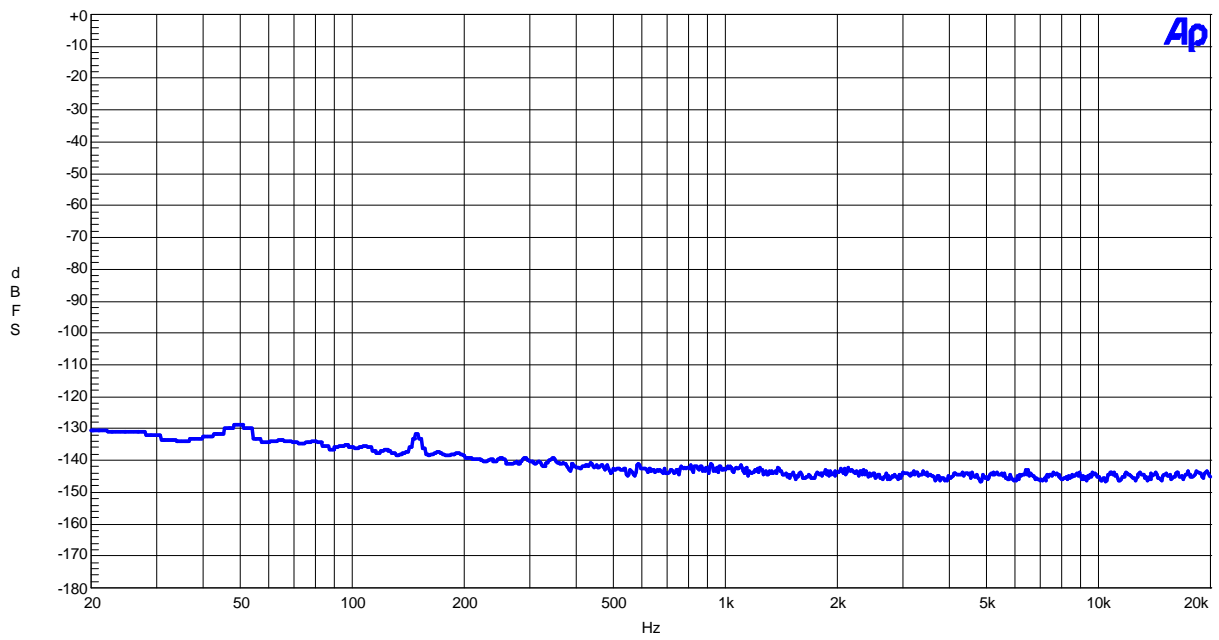


Figure 8. FFT Plot

[ADC Plot : fs=96kHz]

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AK5385A THD+N vs. Input Level  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, fin=1kHz

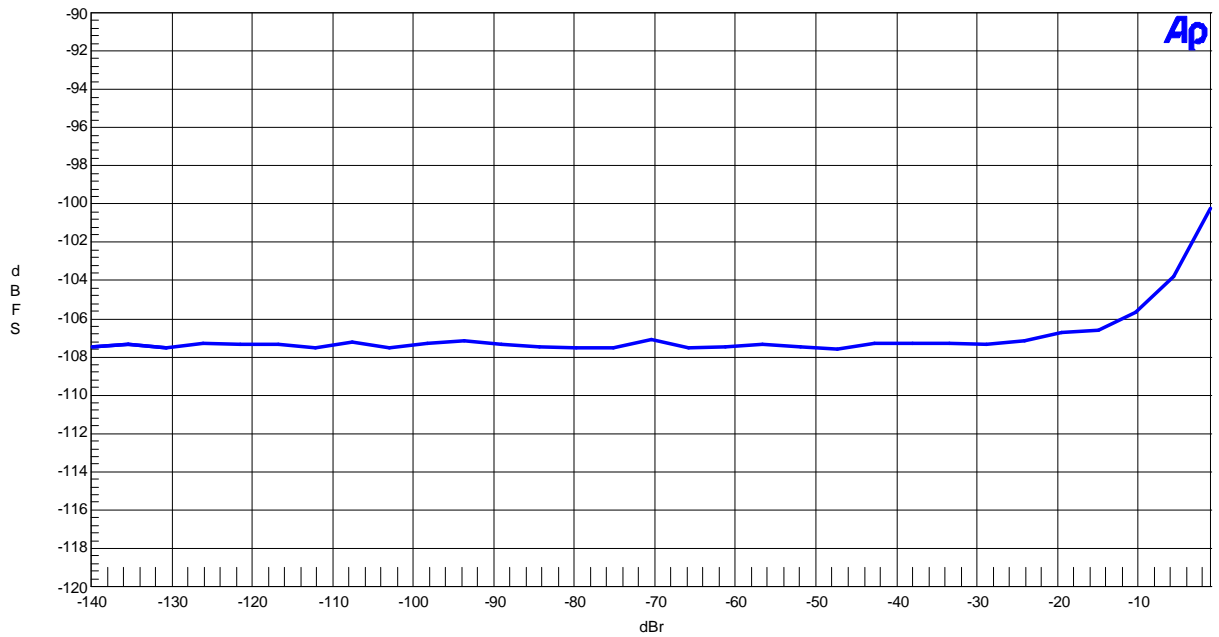


Figure 9. THD+N vs. Input Level

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AK5385A THD+N vs. Input Frequency  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, Input=-1.0dBr

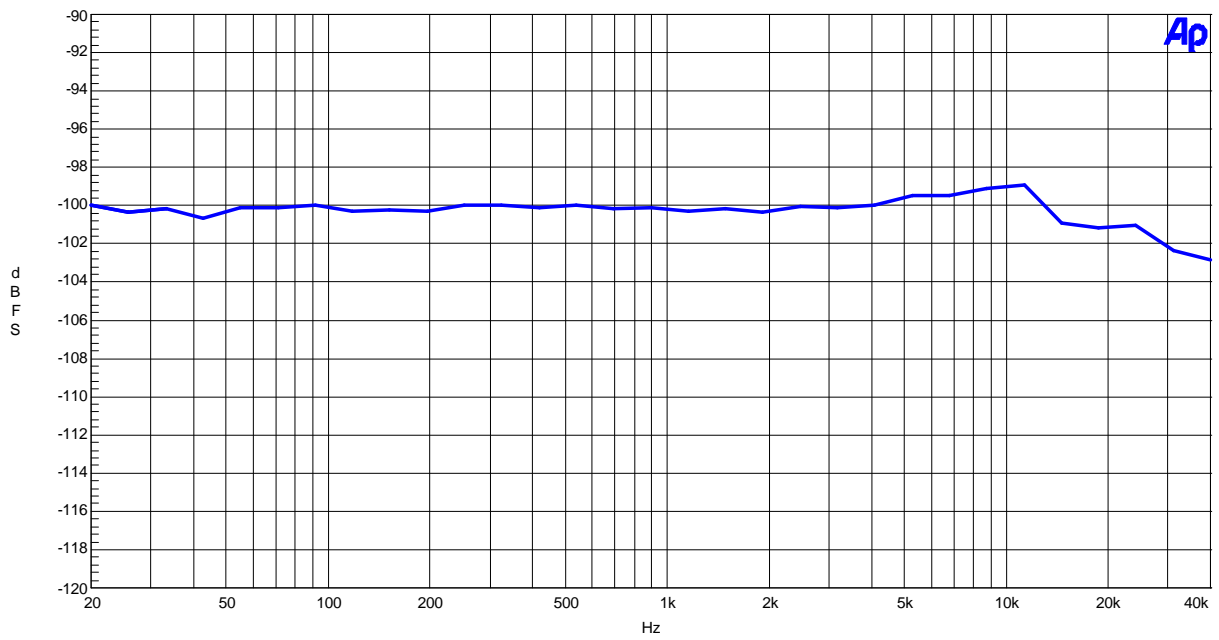


Figure 10. THD+N vs. Input Frequency

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AK5385A Linearity  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, fin=1kHz

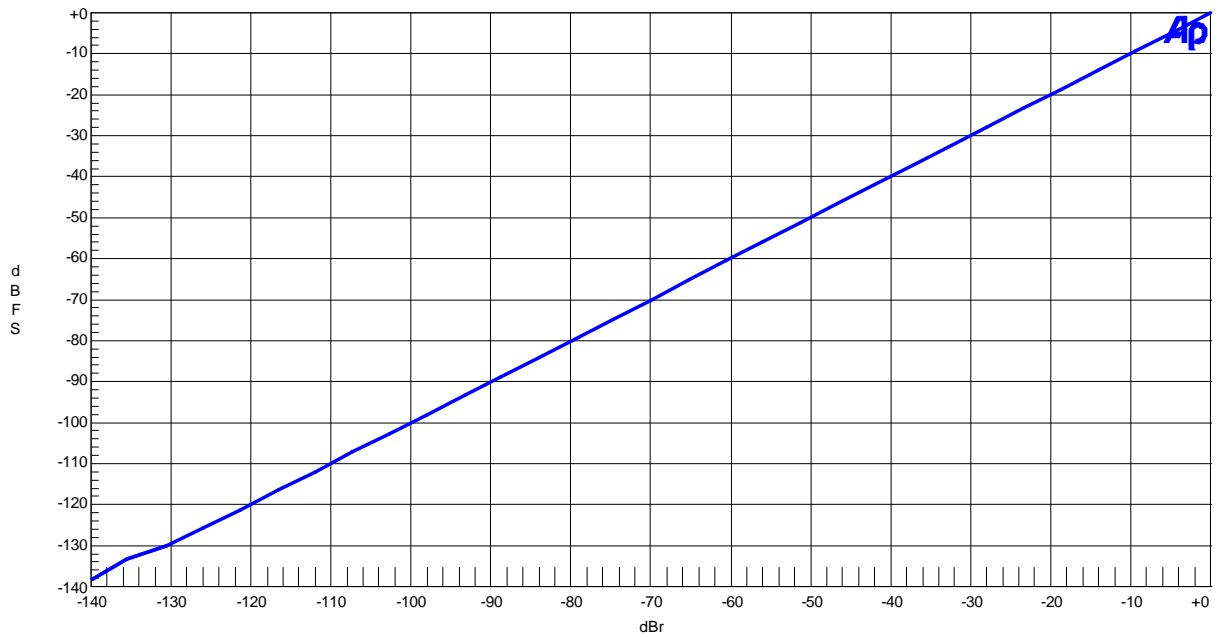


Figure 11. Linearity

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AK5385A Frequency Response  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, Input=-1.0dBr

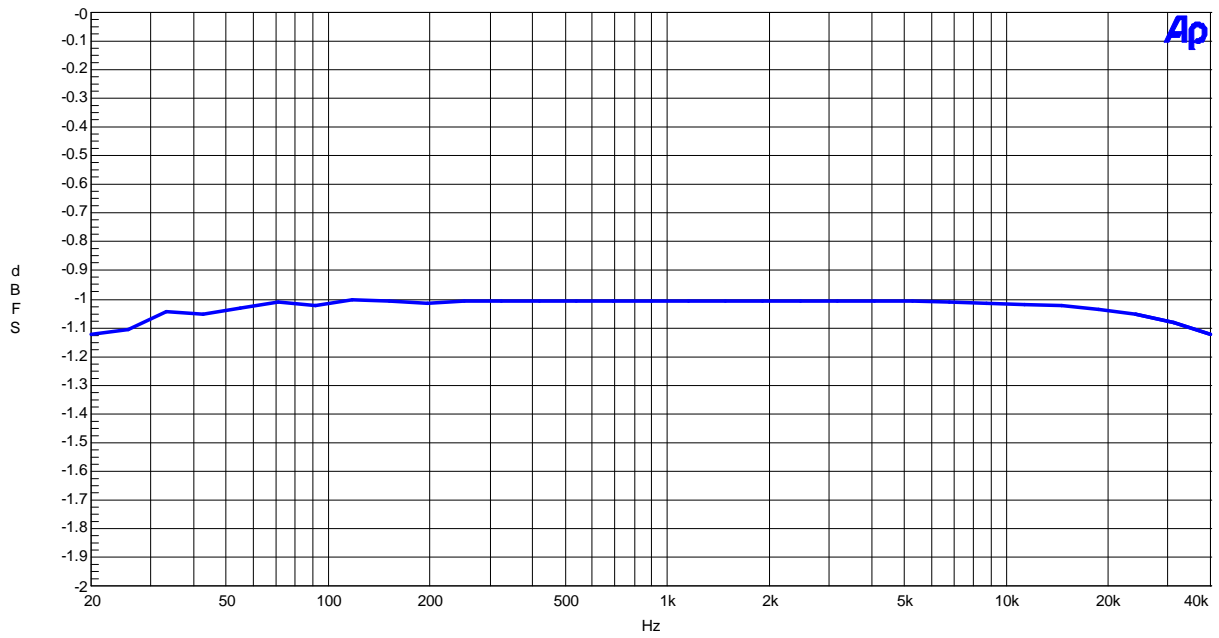


Figure 12. Frequency Response

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AK5385A Crosstalk  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, Input=-1.0dB

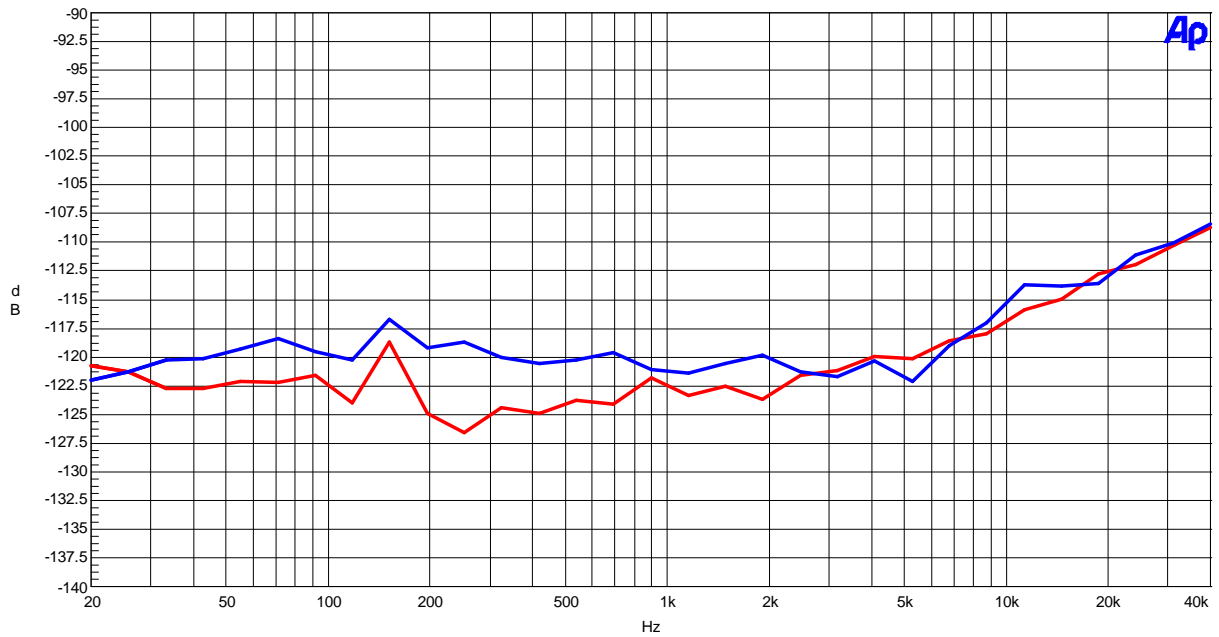


Figure 13. Crosstalk

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, Input=-1.0dB, fin=1kHz

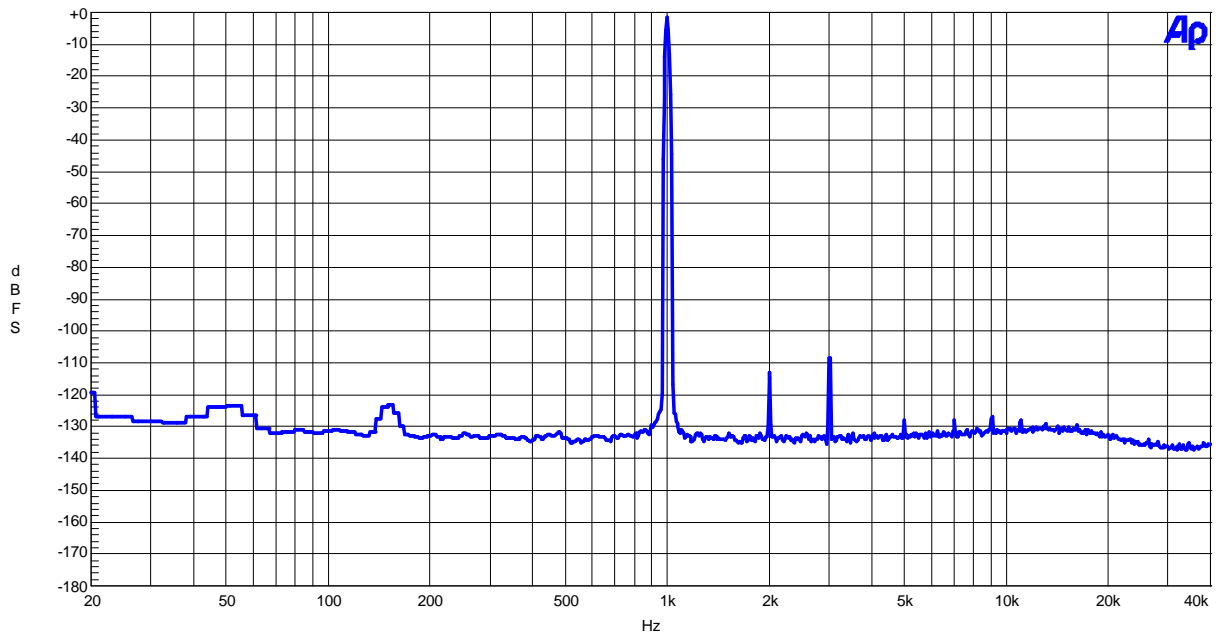


Figure 14. FFT Plot

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, Input=-60dB, fin=1kHz

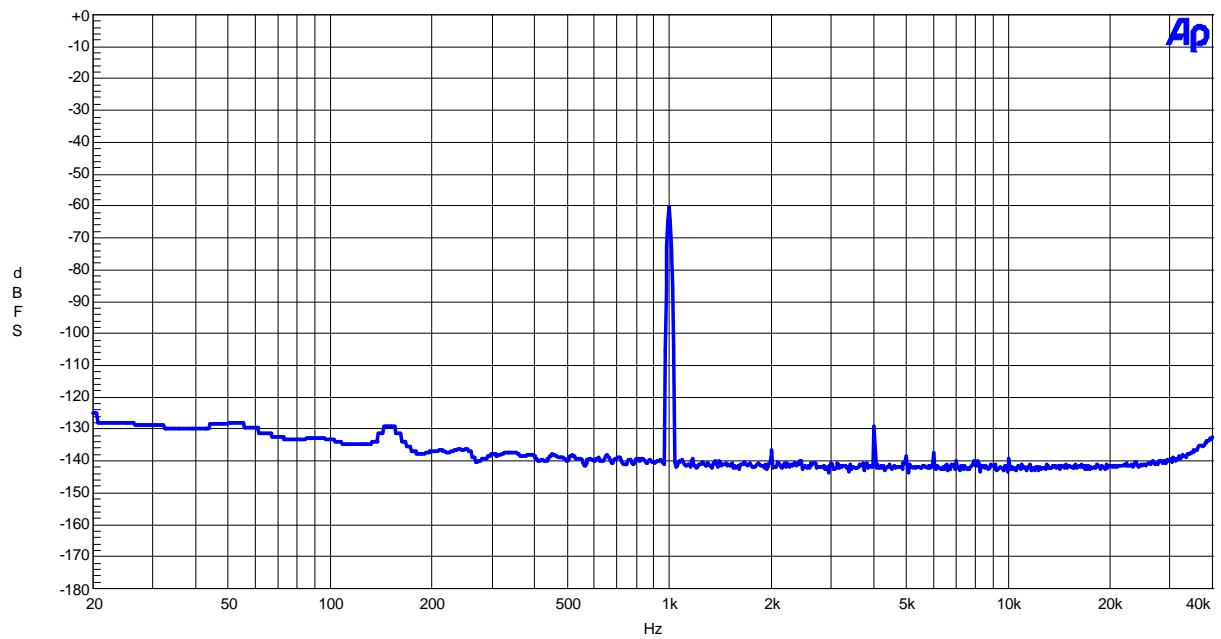


Figure 15. FFT Plot

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=96kHz, fin=None

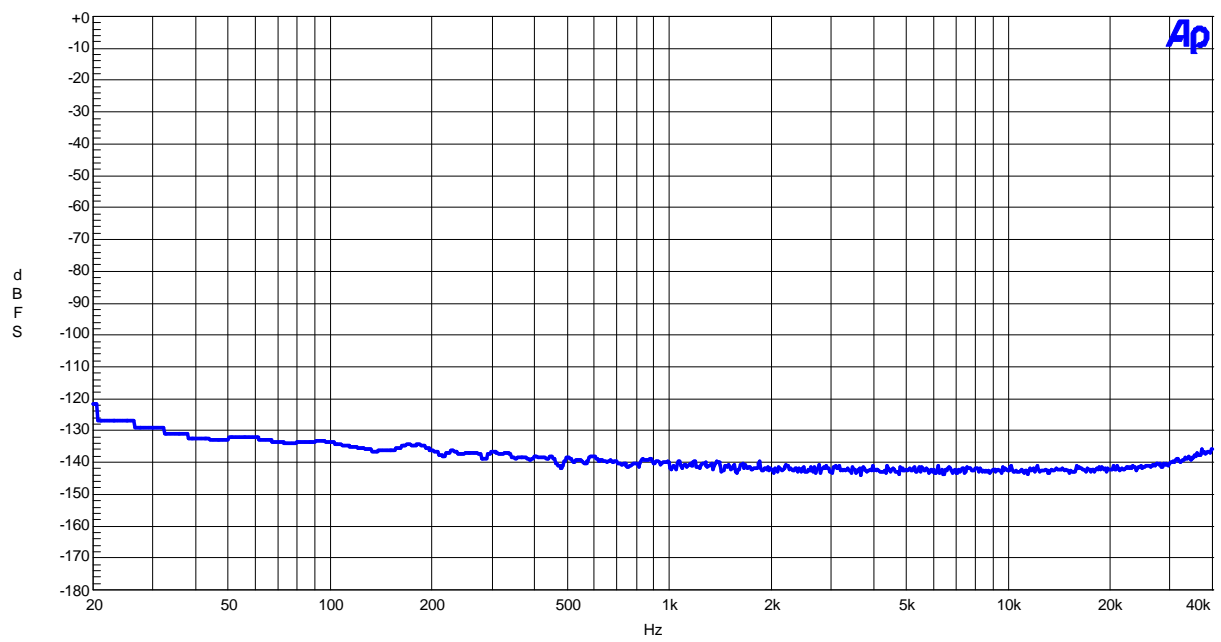


Figure 16. FFT Plot

[ADC Plot : fs=192kHz]

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AK5385A THD+N vs. Input Level  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, fin=1kHz

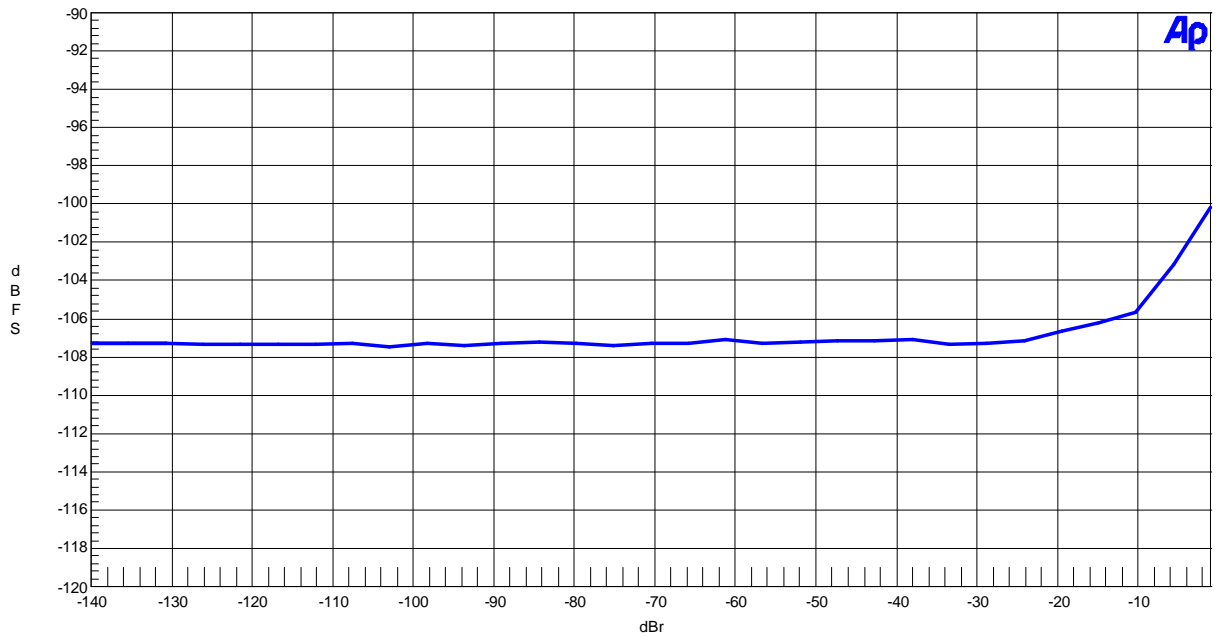


Figure 17. THD+N vs. Input Level

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AK5385A THD+N vs. Input Frequency  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, Input=-1.0dBr

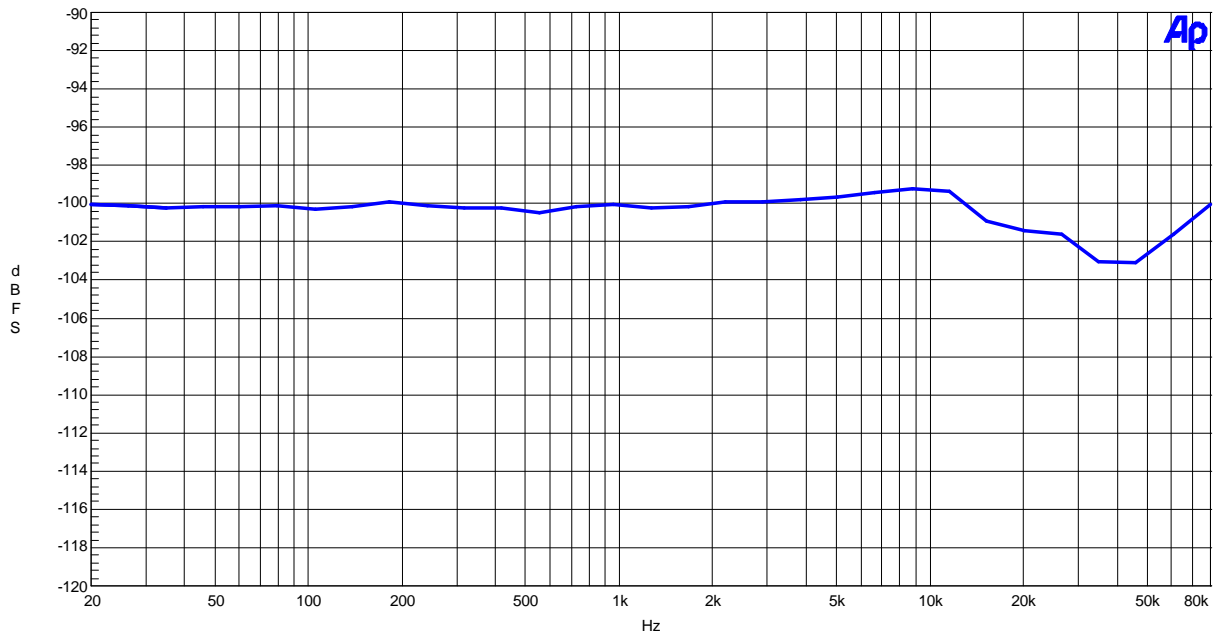


Figure 18. THD+N vs. Input Frequency (BW=40kHz)



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AK5385A Linearity  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, fin=1kHz

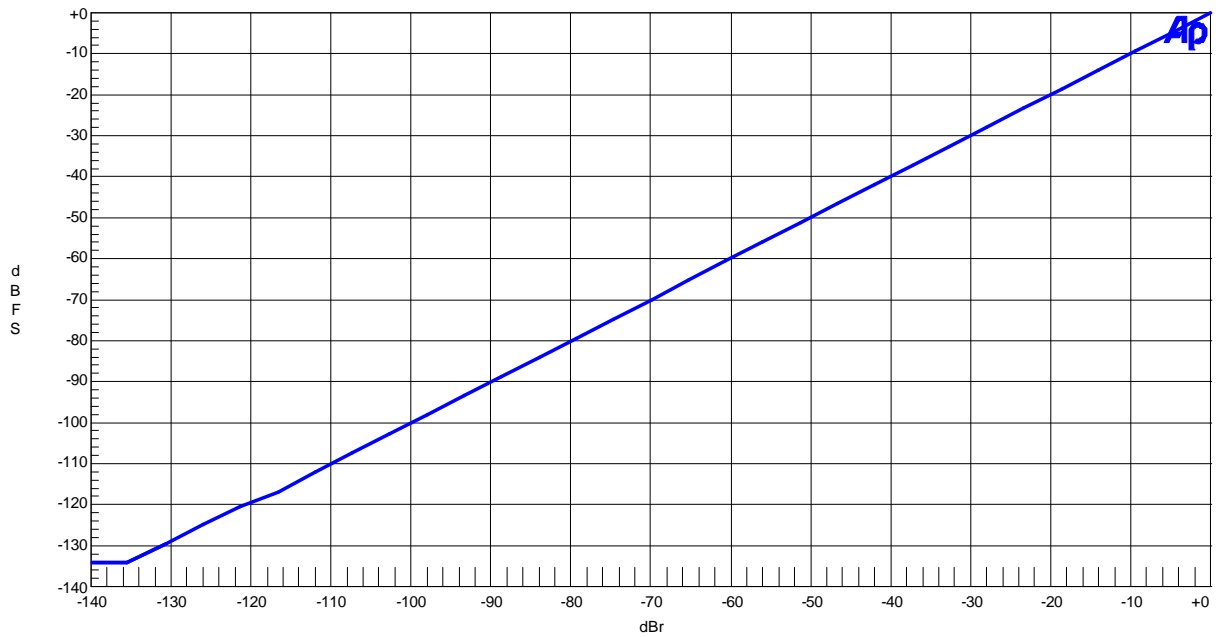


Figure 19. Linearity

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AK5385A Frequency Response  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, Input=-1.0dBr

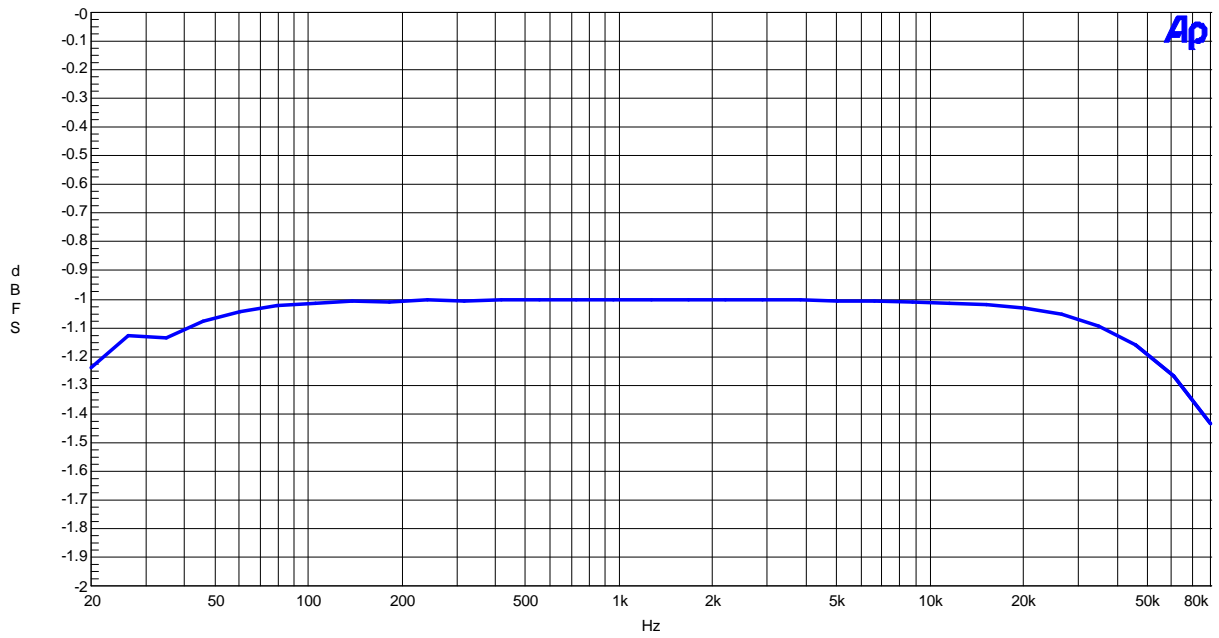


Figure 20. Frequency Response

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AK5385A Crosstalk  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, Input=-1.0dB

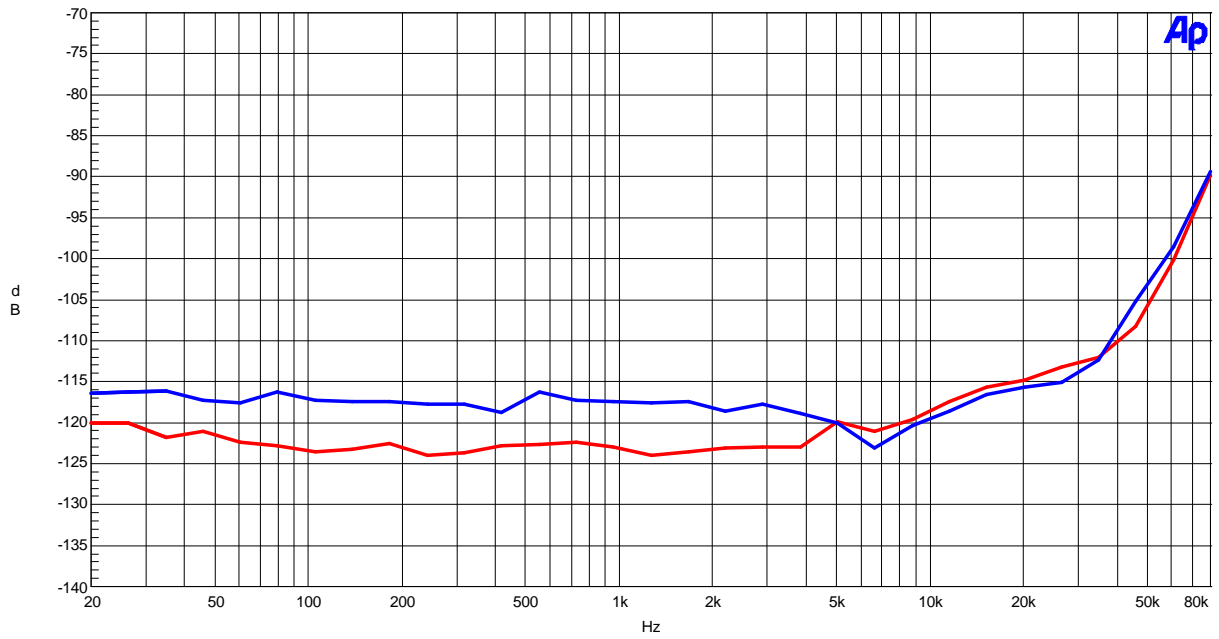


Figure 21. Crosstalk

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, Input=-1.0dB, fin=1kHz

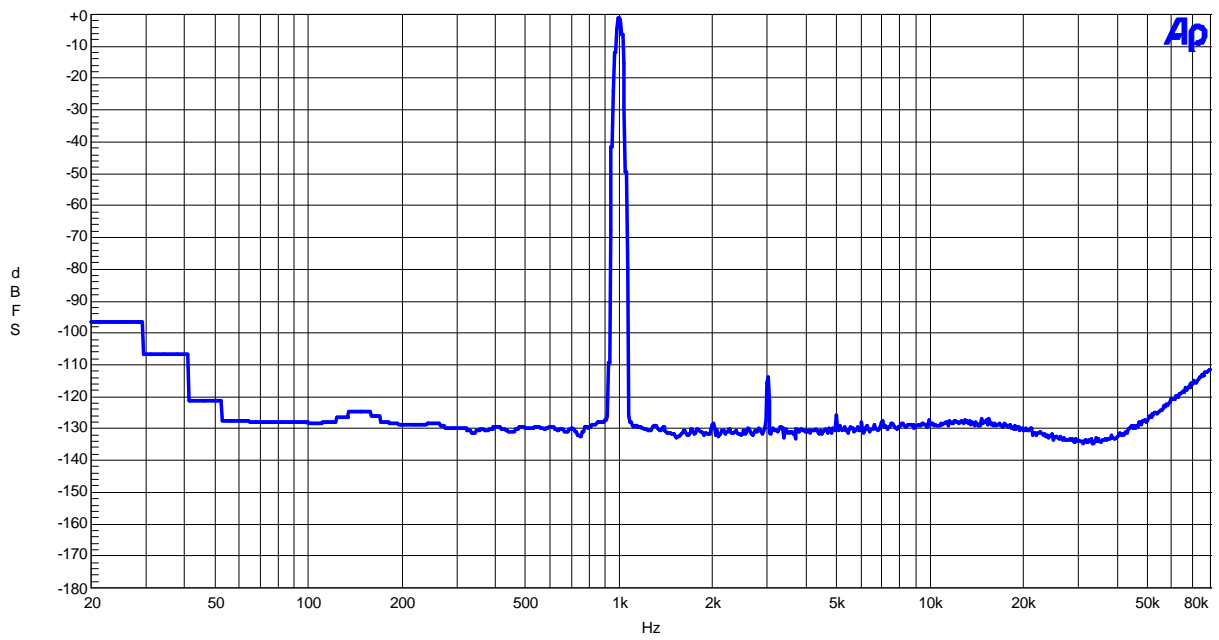


Figure 22. FFT Plot

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, Input=-60dB, fin=1kHz

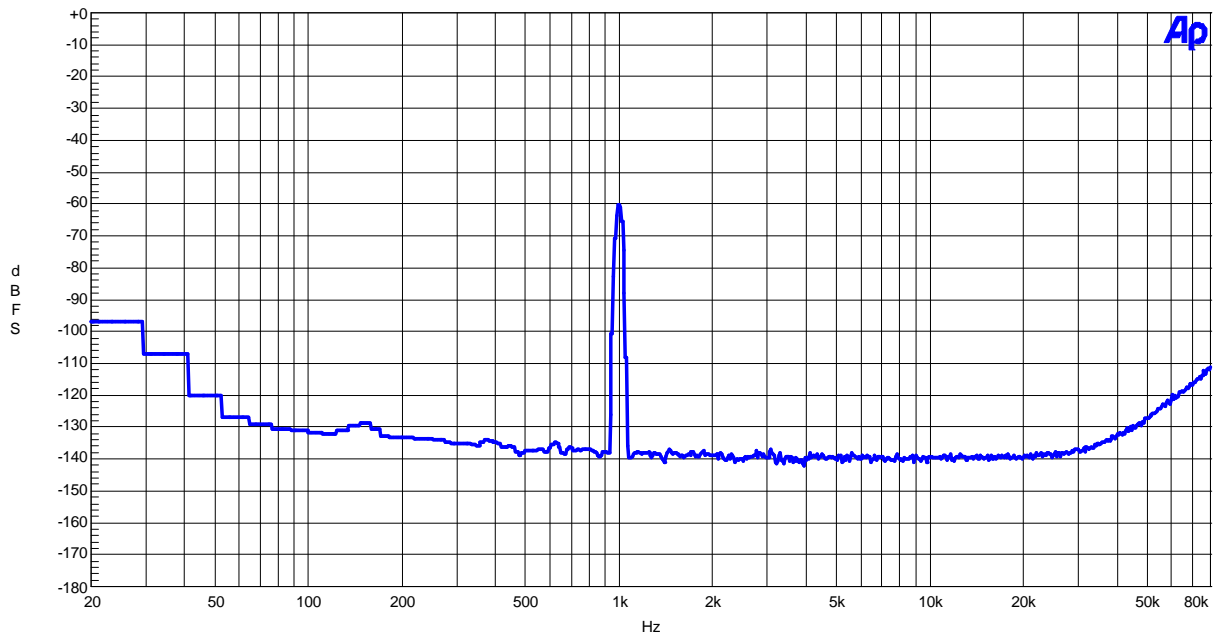


Figure 23. FFT Plot

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AK5385A FFT Plot  
AVDD=5.0V, DVDD=3.3V, fs=192kHz, fin=None

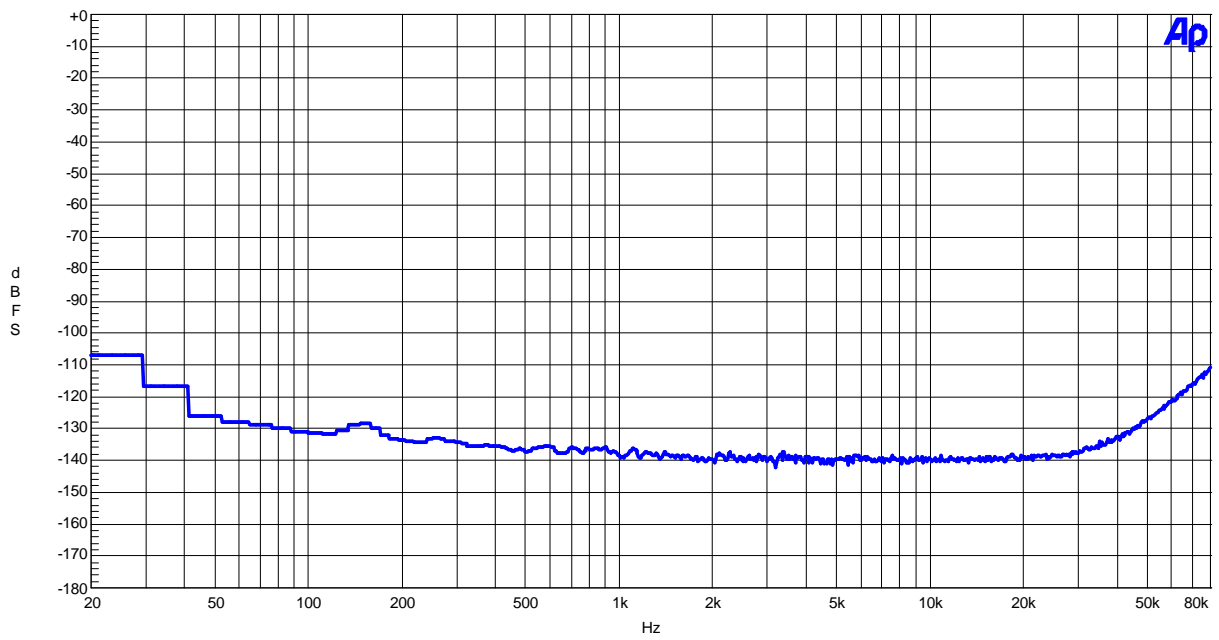
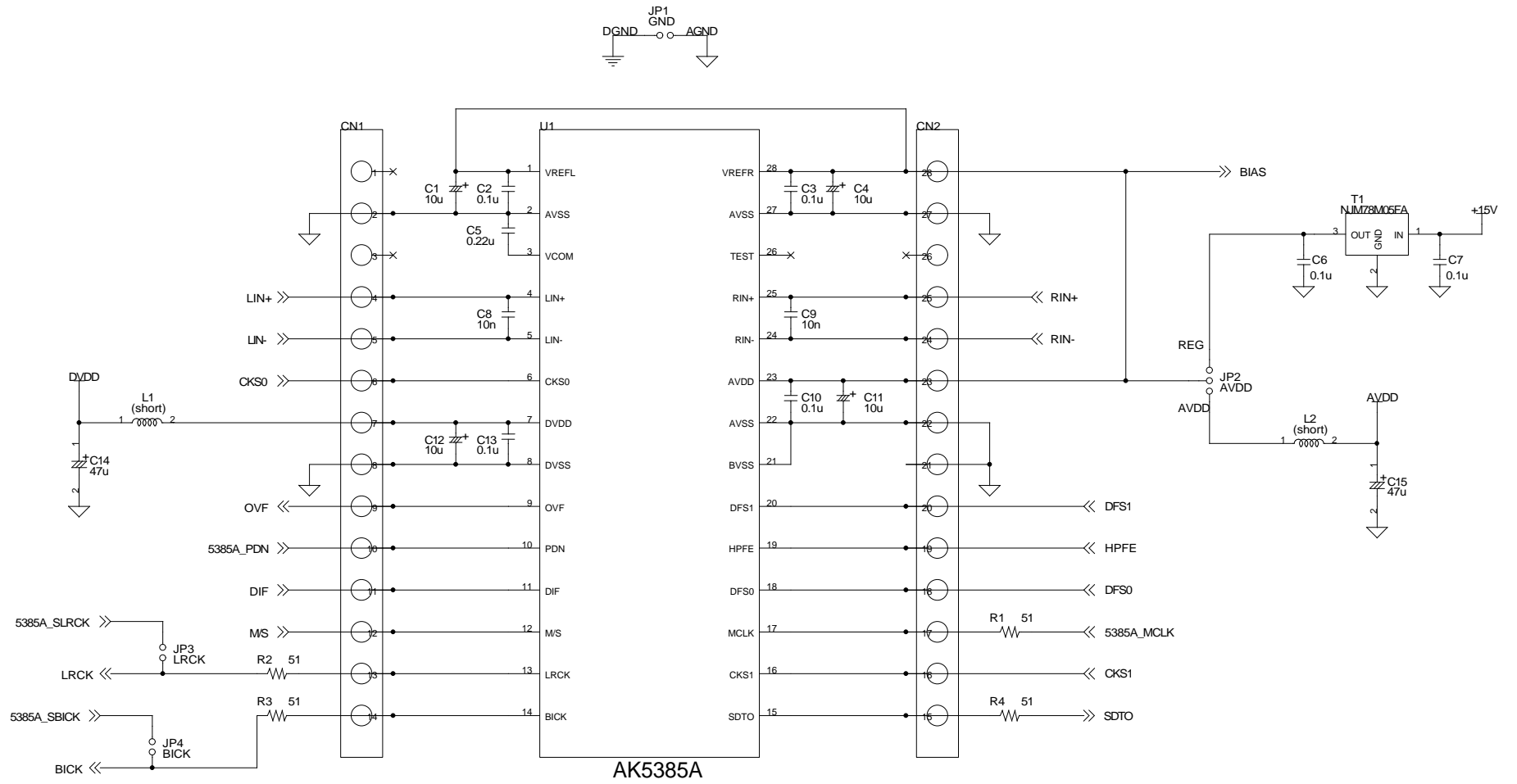


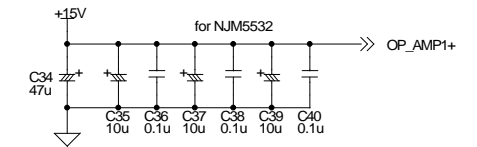
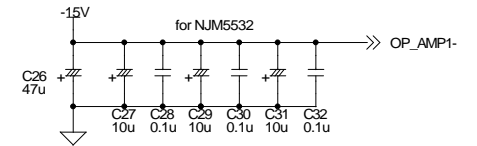
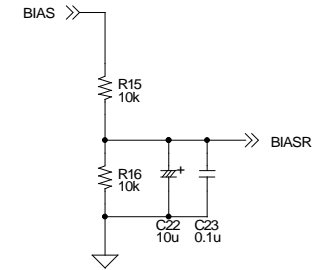
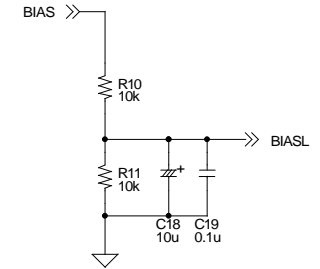
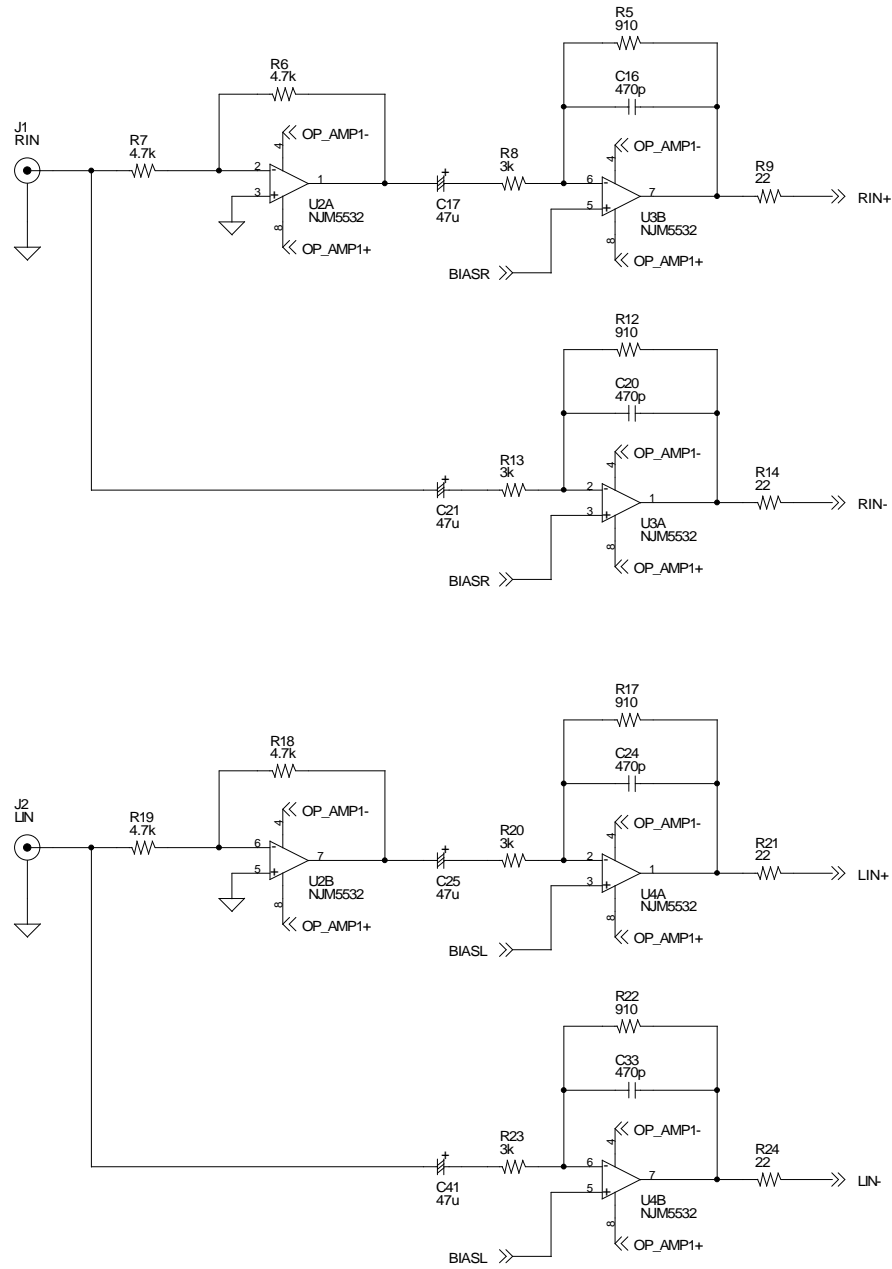
Figure 24. FFT Plot

IMPORTANT NOTICE

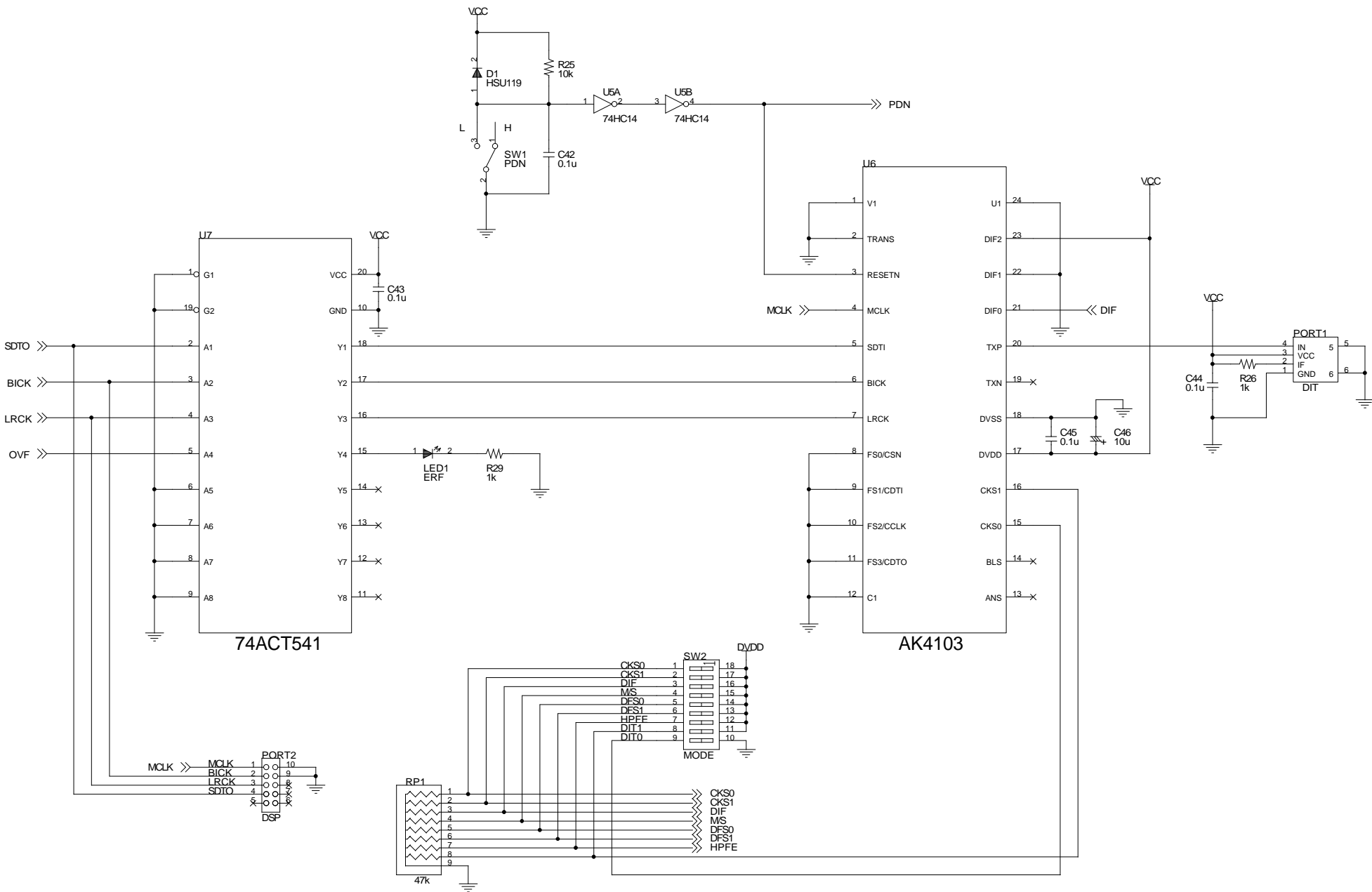
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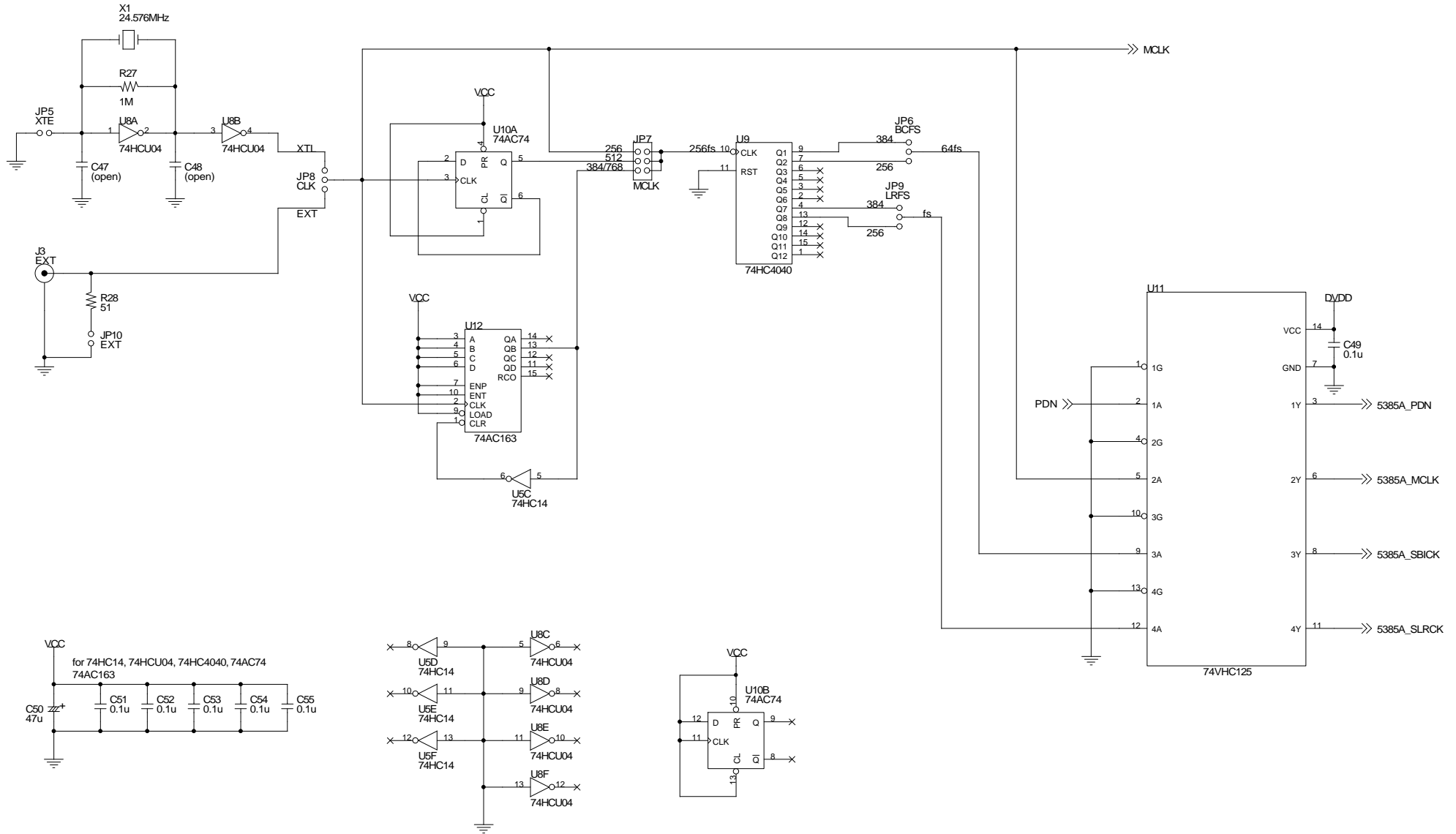
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Size	Document Number	Rev
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Date:	Thursday, July 10, 2003	Sheet 1 of 4



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Date:	Thursday, July 10, 2003	Sheet	2 of 4

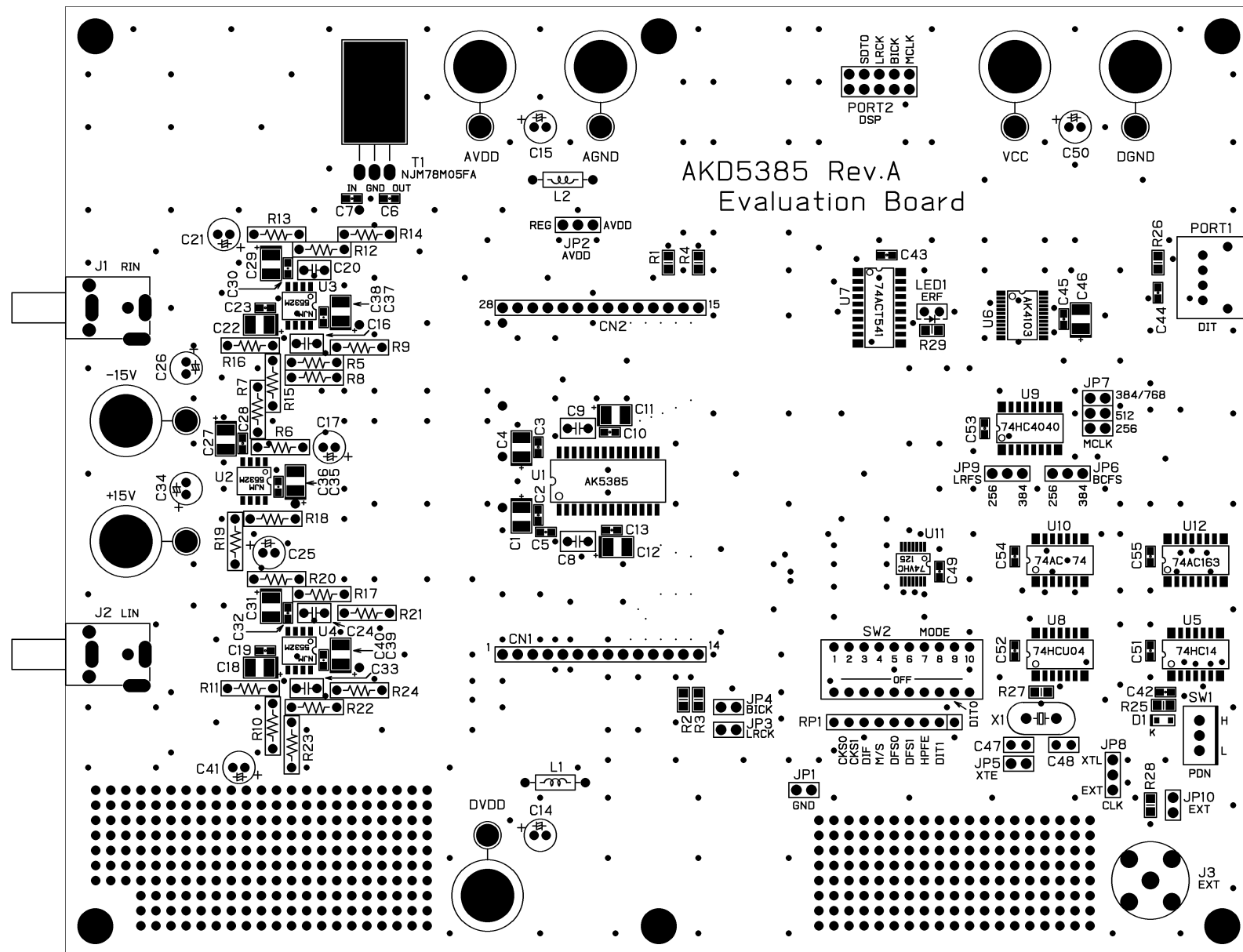


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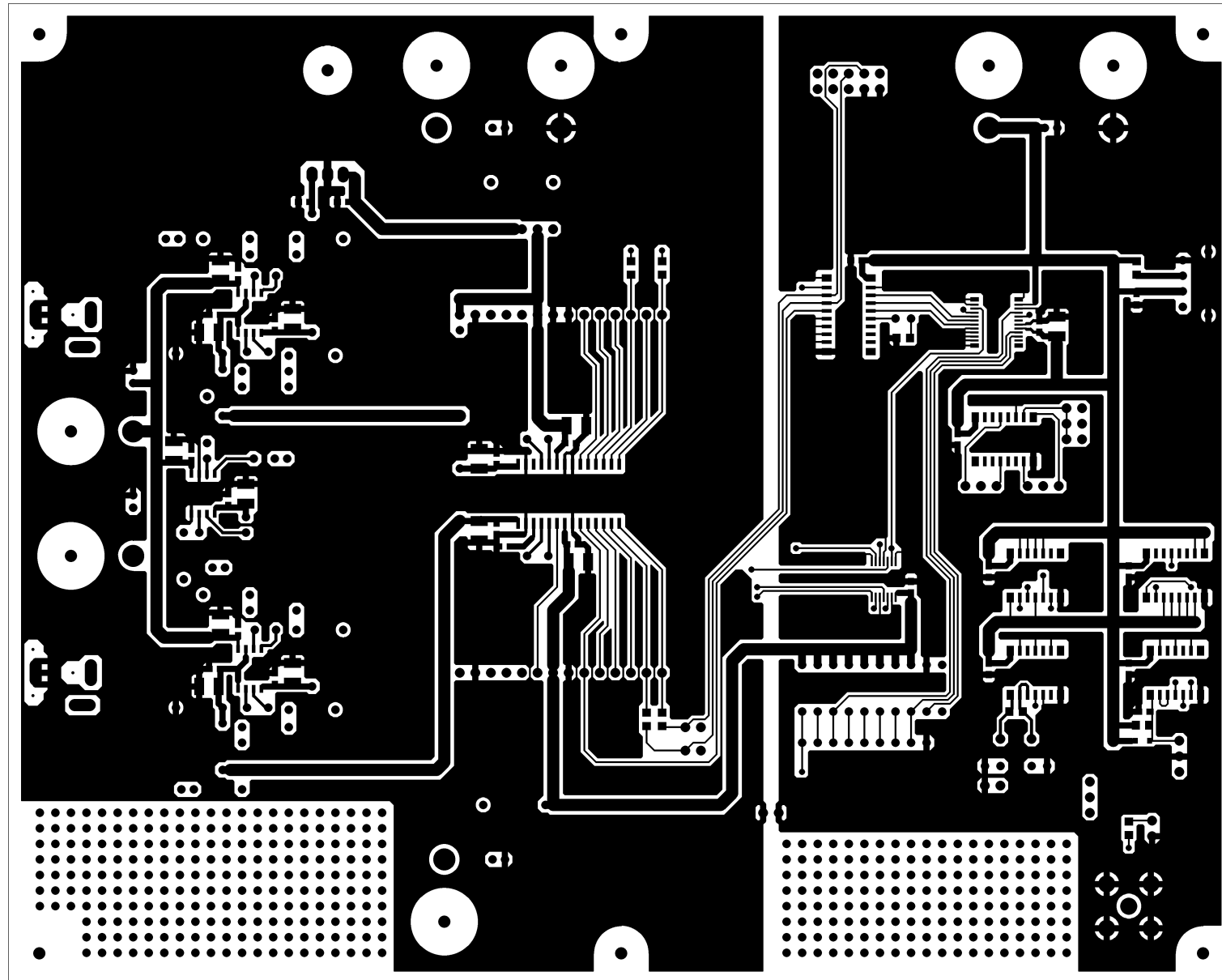


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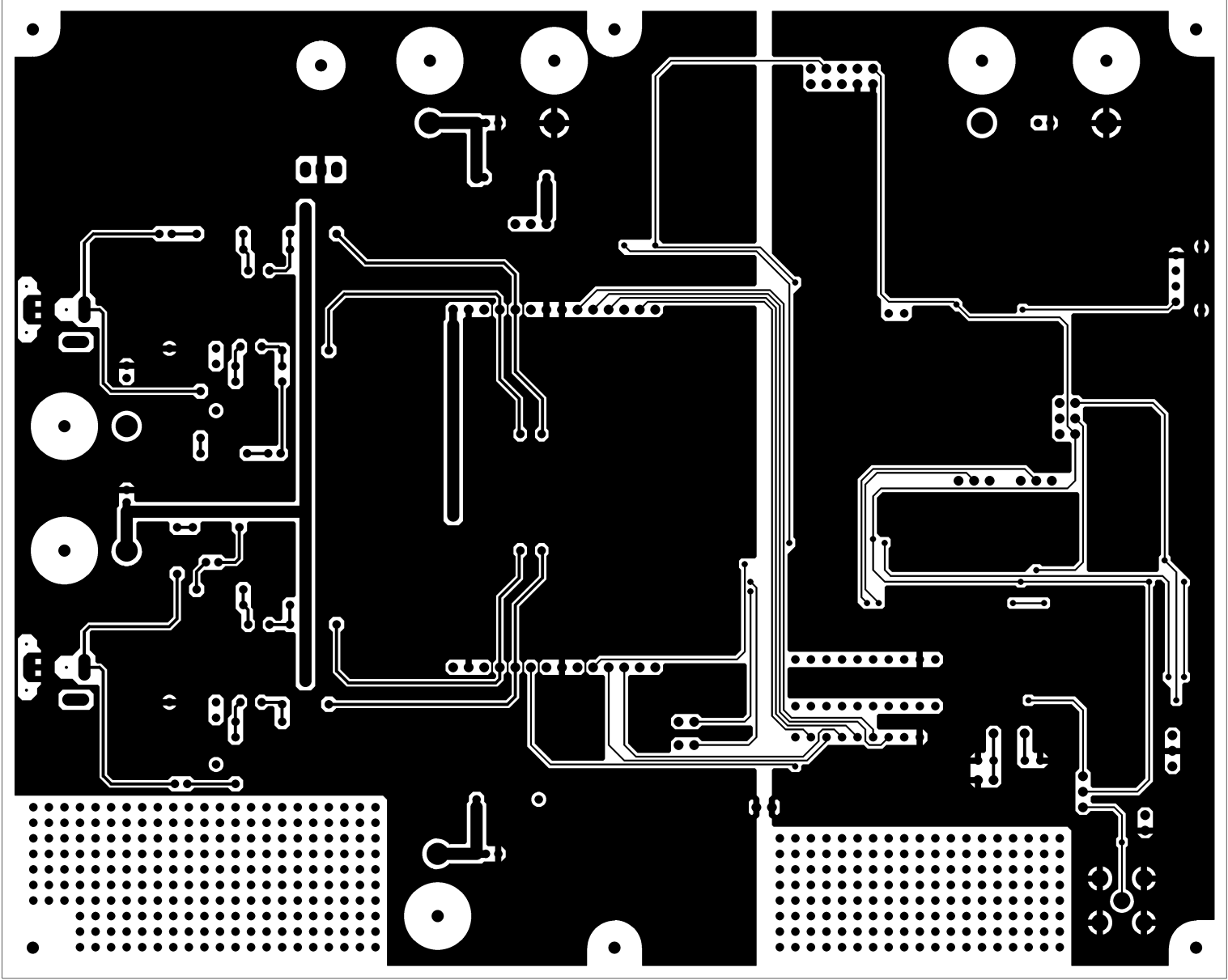




AKD5385 Rev.A L1 SR SILK



AKD5385 Rev.A L1



AKD2382 Rev.A LS