AKD5356
Evaluation Board Rev.A for AK5356

GENERAL DESCRIPTION

AKD5356 is an evaluation board for the portable digital audio 20bit A/D converter with Pre-Amp and Analog Volume. The AKD5356 includes the analog input circuits (LINE and Pre-Amp) and also has a digital interface transmitter. Further, the AKD5356 can evaluate direct interface with AKM's D/A converter evaluation board.

■ Ordering Guide

AKD5356 --- Compatible with 2 types of interface
(Cable for connecting with printer port of IBM-AT, compatible PC and control software are packed with this. This control software does not support Windows NT/2000/XP.)

FUNCTION

- **Compatible with 2 types of interface**
  - **Direct interface with AKM's D/A converter evaluation boards**
  - **On-board AK4103 as DIT which transmits optical output**
- **BNC connectors for LINE / MIC inputs**
- **BNC connectors for Pre-Amp input / output**

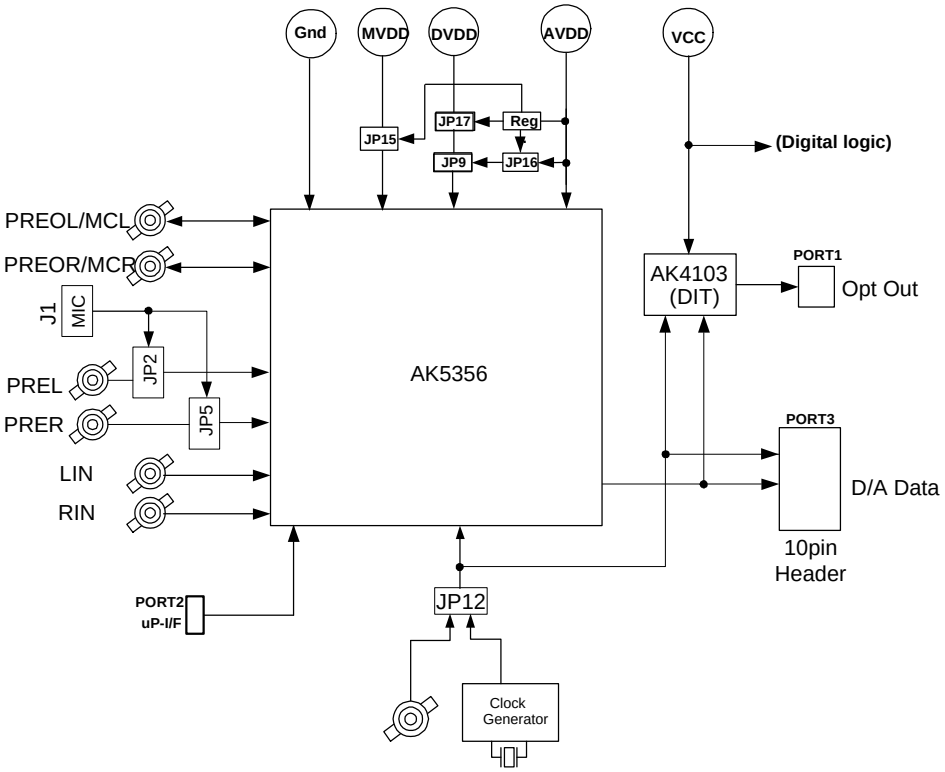


Figure 1. AKD5356 Block Diagram

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

EVALUATION BOARD MANUAL

■ Operation sequence

1) Set Up the power supply lines

[AVDD]	(Orange)	= 2.0 ~ 3.3V (typ. 2.5V, AVDD pin)
[DVDD]	(Orange)	= 1.8 ~ AVDD (typ. 2.5V, DVDD pin, U2:74LCV541, U5:74LCV07A)
[MVDD]	(Green)	= 2.4 ~ 3.3V (typ. 2.7V, MVDD pin)
[VCC]	(Red)	= 5.0V (for digital logic except the AK5356)
[AVSS]	(Black)	= 0V
[DVSS]	(Black)	= 0V
[MVSS]	(Black)	= 0V

Each supply line should be distributed from the power supply unit.
DVDD and AVDD must be the same voltage level.
When the regulator (3V output) is used, "AVDD" terminal supplies "5V".

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

3) Power on
The AK5356 and AK4103 should be reset once bringing SW1 = SW3 = "L" upon power-up.

■ Evaluation Mode

Applicable Evaluation Mode

(1) Evaluation of A/D using DIT (Optical Link) <Default Setting>
(2) All interface signals including master clock are fed externally.
(3) Evaluation of A/D using DIT at MCLK = 384fs

(1) Evaluation of A/D using DIT (Optical Link) <Default Setting)

PORT1 (DIT) is used. On board DIT (AK4103) converts A/D data to an audio biphase signal, which is output through optical connector (TOTX176). It is possible to connect AKM's D/A converter evaluation boards or the digital-amplifier that equips DIR input etc. Nothing should be connected to PORT3. When using an external clock through a BNC connector, select "EXT" on JP11 (CLK) and short JP14 (XTE).

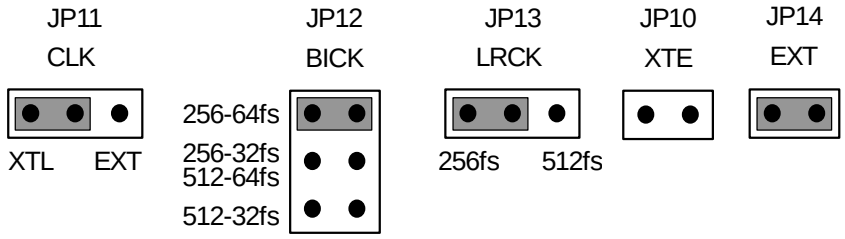


Figure 2. Jumper Setting

Audio I/.F fomat should be the same DIP switch setting (AK4103; DIT audio format) as the register control software (AK5356 audio I/F format). Audio I/F format is shown in Table 1.

AK5356 DIF bit	SDTO	JP12	SW2			
		BICK	4103-DIF1	4103-DIF0	CKS1	CKS0
0	16bit MSB justified	256-32fs or 512-32fs	OFF	OFF	0 or 1	1
	20bit MSB justified	256-64fs or 512-64fs	OFF	OFF	0 or 1	1
1	16bit I^2S	256-32fs or 512-32fs	OFF	ON	0 or 1	1
	20bit I^2S	256-64fs or 512-64fs	OFF	ON	0 or 1	1

Table 1. AK5356 Audio I/F Format

(2) All interface signals including master clock are fed externally.

All interface signals are provided to the AK5356 through PORT3. AKM's D/A converter evaluation boards can be also connected to PORT3.

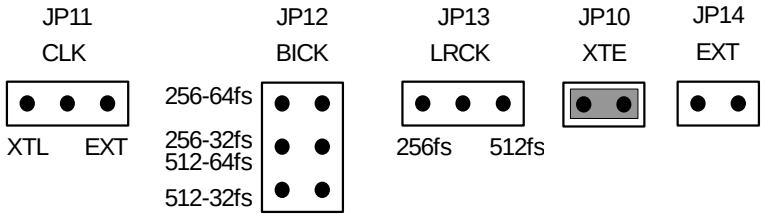


Figure 3. Jumper Setting

(3) Evaluation of A/D using DIT at MCLK=384fs.

PORT1 (DIT) is used. On board DIT (AK4103) is set to the master mode. The AK4103 provides BICK and LRCK to the AK5356 from an external master clock (MCLK). When using an external clock through a BNC connector (J8), select “EXT” on JP11 (CLK) and short JP10 (XTE). (Refer to Table 2, Table 3 and Table 4 for the set up of the DIP switches. The master mode should be selected in Table 2. The master clock (384fs) should be selected in Table 4.)

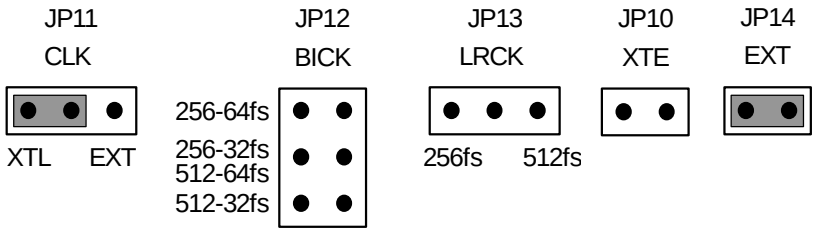


Figure 4. Jumper Setting

■ DIP Switch

[SW2]:AK4103 Mode Setting (For more detailed configurations, please refer to the AK4103 datasheet.)

No.	Pin	Default	Mode
1	4103_DIF1	L	See Table 3
2	4103_DIF0	L	
3	CKS1	L	See Table 4
4	CKS0	H	

Table 2. AK4103 Mode Setting

4103_DIF1	4103_DIF0	Mode	Clock Mode
OFF	OFF	24bit, Left justified	Slave Mode
OFF	ON	24bit, I^2S	
ON	OFF	24bit, Left justified	Master Mode
ON	ON	24bit, I^2S	

Table 3. AK4103 DIT Format Setting

CKS1	CKS0	MCLK
0	0	Don’t use
0	1	256fs
1	0	384fs
1	1	512fs

Table 4. AK4103 System Clock Setting

■ Serial Control

The AK5356 can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT2 (CTRL) with PC by 10 wire flat cable packed with the AKD5356.

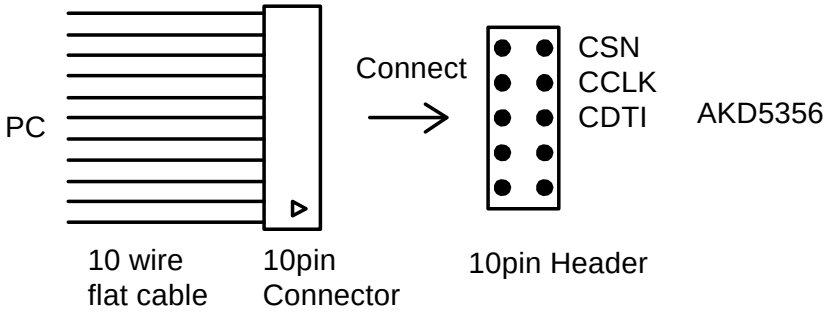


Figure 5. Connect of 10 wire flat cable

■ Other Jumper Pins

(1) JP9 (VD) : Select DVDD pin of the AK5356
VA: DVDD pin is supplied from AVDD pin via 10Ω.
VD: DVDD pin is supplied from JP17.

(2) JP15 (MVDD) : Select MVDD pin of the AK5356
TERM: MVDD pin is supplied from MVDD terminal.
REG : 3V is supplied to MVDD pin via the regulator.

(3) JP16 (AVDD): Select AVDD pin of the AK5356
TERM: AVDD pin is supplied from AVDD terminal.
REG : 3V is supplied to AVDD pin via the regulator.

(4) JP17 (DVDD): Select digital logics [DVDD pin, U2(74LCV541), U5(74LCV07A)]
TERM: The digital logics are supplied from DVDD terminal.
REG : 3V is supplied to the digital logics via regulator.

■ The function of the toggle SW

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

[SW1] (PDN): Reset the AK5356. Keep “H” during normal operation.

[SW3] (DIT): Reset the AK4103. Keep “H” during normal operation.

■ Input / Output Circuit and Jumper Setting

1. LIN/RIN Input circuit

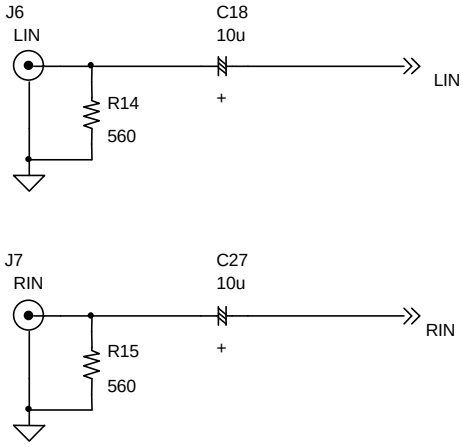


Figure 6. LIN/RIN Input Circuit

2. MICL/MICR Input and Pre-Amp Output Circuit

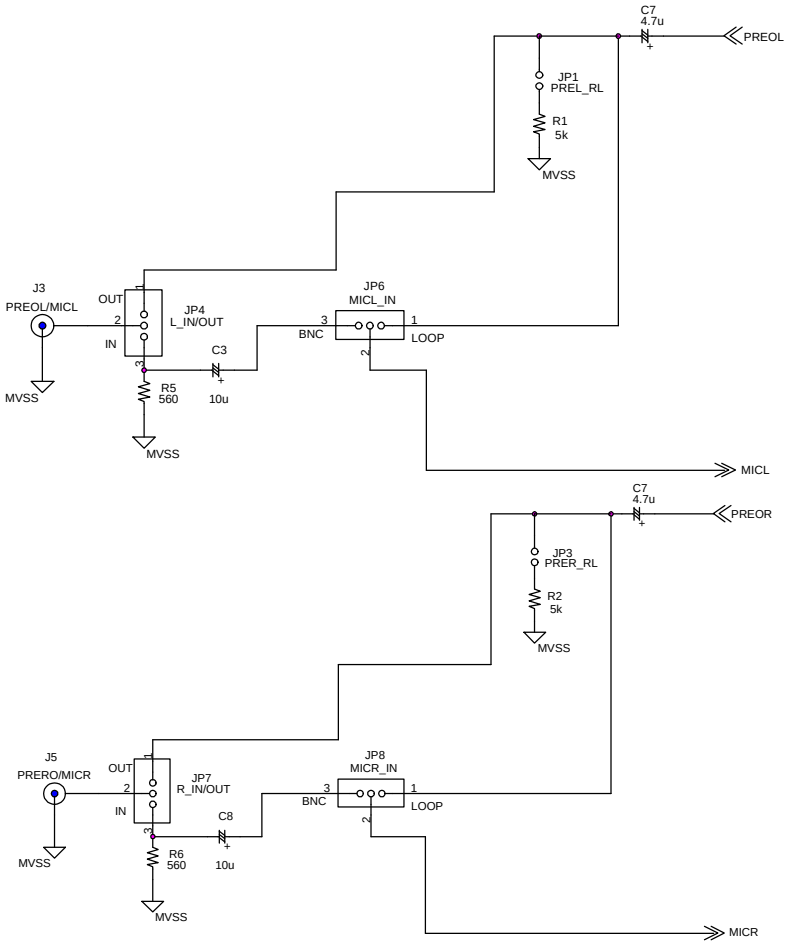


Figure 7. MICL/MICR Input and Pre-Amp Output Circuit

(1) Analog signals are output from PREOL/PREOR pins via J3/J5 connectors.

JP1(PREL_RL) : Short
JP3(PRER_RL) : Short
JP4(L_IN/OUT): OUT
JP7(R_IN/OUT): OUT
JP6(MICL_IN) : BNC
JP8(MICR_IN) : BNC

(2) MICL/MICR pins are input from BNC connectors (J3/J5).

JP4(L_IN/OUT): IN
JP7(R_IN/OUT): IN
JP6(MICL_IN) : BNC
JP8(MICR_IN) : BNC

(3) MICL/MICR pins are input from Pre-Amp output.

JP1(PREL_RL) : Open
JP3(PRER_RL) : Open
JP4(L_IN/OUT): Open
JP7(R_IN/OUT): Open
JP6(MICL_IN): LOOP
JP8(MICR_IN) : LOOP

3. Pre-Amp Input Circuit

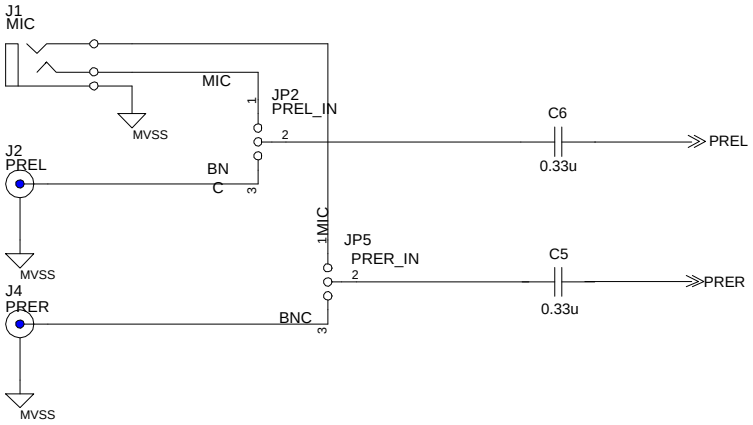


Figure 8. Pre-Amp Input Circuit

(1) Analog signals are input to PREL/PRER pins via J1(MIC) mini-jack.
JP2(PREL_IN): MIC
JP5(PRER_IN): MIC

(2) Analog signals are input to PREL/PRER pins via J2/J4 connectors.
JP2(PREL): BNC
JP5(PRER): BNC

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

Control Software Manual

■ Set-up of evaluation board and control software

1. Set up the AKD5356 according to previous term.

2. Connect IBM-AT compatible PC with AKD5356 by 10-line type flat cable (packed with AKD5356). Take care of the direction of 10pin header. (This control software does not operate on Windows NT/2000/XP, therefore please operate it on Windows 95/98/ME.)

3. Insert the floppy-disk labeled “AKD5356 Control Program ver 1.0” into the floppy-disk drive.

4. Access the floppy-disk drive and double-click the icon of “akd5356.exe” to set up the control program.

5. Then please evaluate according to the follows.

■ Operation flow

Keep the following flow.

1. Set up the control program according to explanation above.
2. Click “Port Setup” button.
3. Click “Write default” button.
4. Then set up the dialog and input data.

■ Explanation of each buttons

1. [Port Setup] : Set up the printer port.
2. [Reset] : Initialize the register of AK5356.
3. [Function1] : Dialog to write data by keyboard operation.
4. [Function2] : Dialog to evaluate IPGA.
5. [Write] : Dialog to write data by mouse operation.

■ Explanation of each dialog

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

   Address Box: Input register address in 2 figures of hexadecimal.
   Data Box: Input register data in 2 figures of hexadecimal.

   If you want to write the input data to AK5356, click “OK” button. If not, click “Cancel” button.

2. [Function2 Dialog] : Dialog to evaluate IPGA

This dialog corresponds to only addr=03H.

Address Box: Input register address in 2 figures of hexadecimal.
Start Data Box: Input start data in 2 figures of hexadecimal.
End Data Box: Input end data in 2 figures of hexadecimal.
Interval Box: Data is written to AK5356 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 AK5356, click “OK” button. If not, click “Cancel” button.

3. [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 “1”. If not, “L” or “0”.

If you want to write the input data to AK5356, click “OK” button. If not, click “Cancel” button.

■ 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.

■ Attention on the operation

If you set up Function1 or Function2 dialog, input data to all boxes. Attention dialog is indicated if you input data or address that is not specified in the datasheet or you click “OK” button before you input data. In that case set up the dialog and input data once more again. These operations does not need if you click “Cancel” button or check the check box.

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MEASUREMENT RESULTS EXAMPLE

[Measurement Condition]

- Measurement Units: Audio Precision, Cascade
- MCKI: 256fs
- Bit: 20bit
- Sampling Frequency: 44.1kHz
- Measurement Frequency: 10 ~ 20kHz
- Power Supply: MVDD = 2.7V, AVDD = DVDD = 2.5V
- Temperature: Room
- Input Frequency: 1kHz
- Interface: DIT

[Measurement Results]

1. Pre-Amp Characteristics (PREL/PRER → PREOL/PREOR)

Parameter	Pre-Amp Gain	Results	Additional Filter
S/(N+D) (Vout = –29.2dBV)	+33dB +28dB +18dB +13dB	60dB 65dB 74dB 78dB	
Output Noise Level (Rg = 600Ω)	+33dB +28dB +18dB +13dB	-91dBV -96dBV -105dBV -109dBV	A-weighted A-weighted A-weighted A-weighted

2. ADC Characteristics (LINE → ADC)

Parameter		Results		Additional Filter
		IPGA = 0dB	IPGA = +28dB	
S/(N+D)	(–0.5dBFS)	84dB	74dB	
DR	(–60dBFS)	89dB	79dB	A-weighted
S/N		89dB	79dB	A-weighted

[Plot]

1. Pre-Amp (PREL/PRER → PREOL/PREOR)

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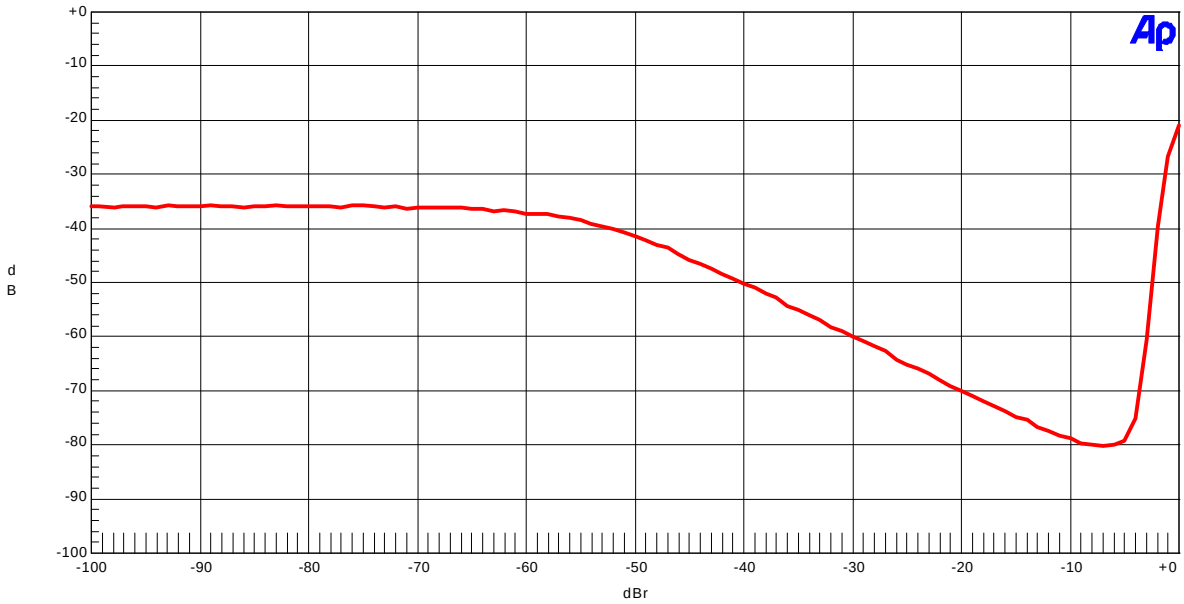


Figure 9. THD+N vs. Output Level (Gain = +33dB, fin = 1kHz, 0dBr = 0dBV)

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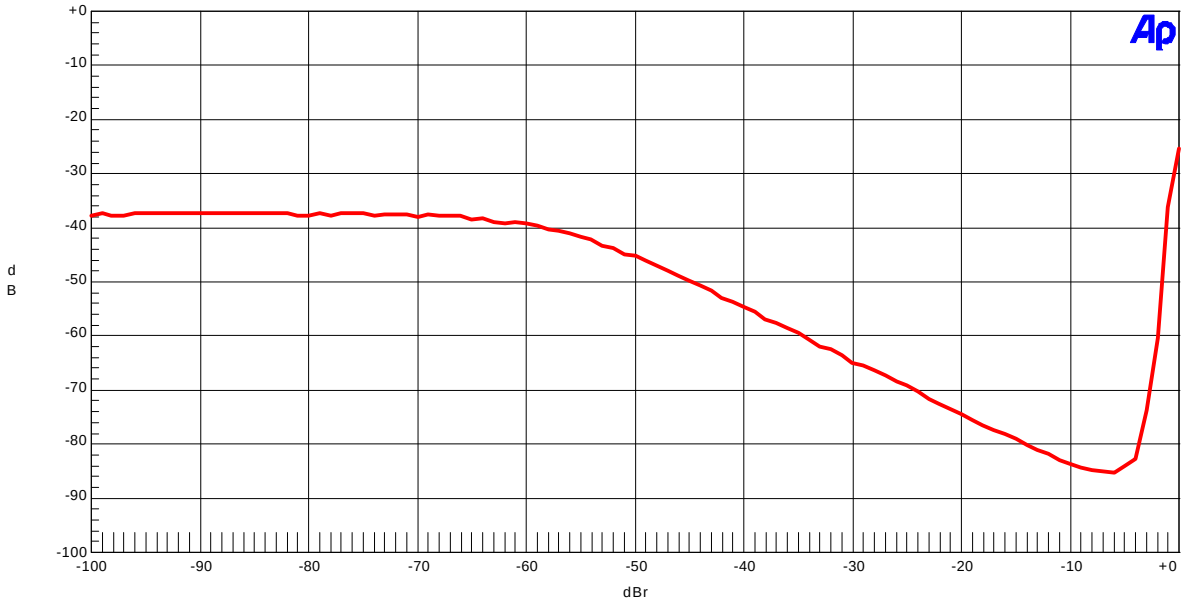


Figure 10. THD+N vs. Output Level (Gain = +28dB, fin = 1kHz, 0dBr = 0dBV)

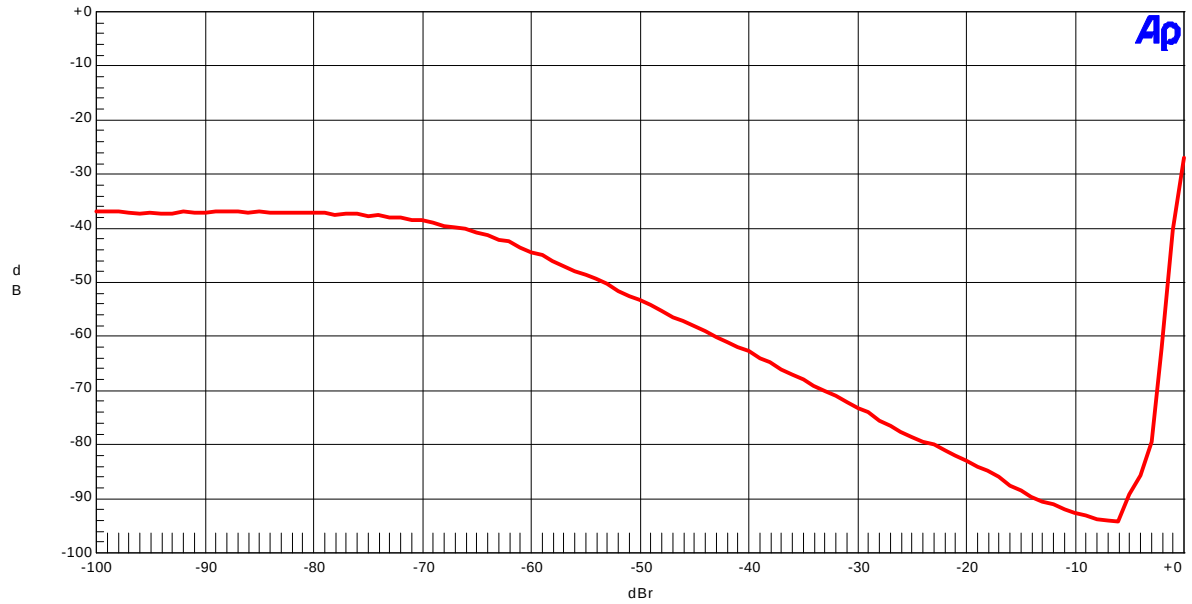


Figure 11. THD+N vs. Output Level (Gain = +18dB, fin = 1kHz, 0dBr = 0dBV)

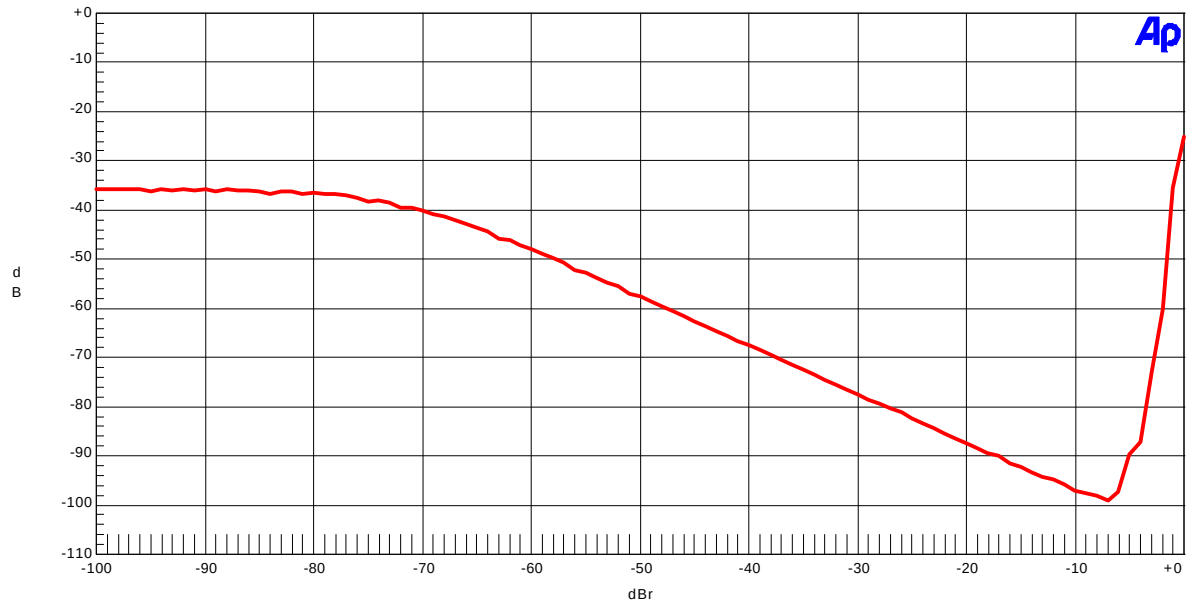


Figure 12. THD+N vs. Output Level (Gain = +13dB, fin = 1kHz, 0dBr = 0dBV)

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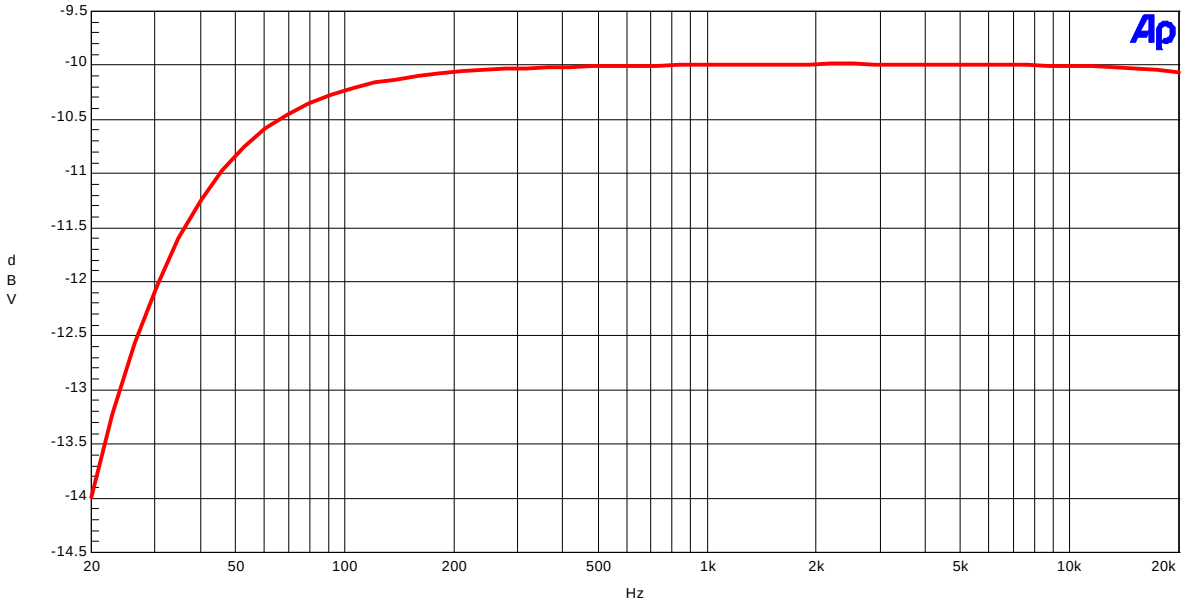


Figure 13. Frequency Response (Gain = +33dB, ref = -10dBV output @ 1kHz)

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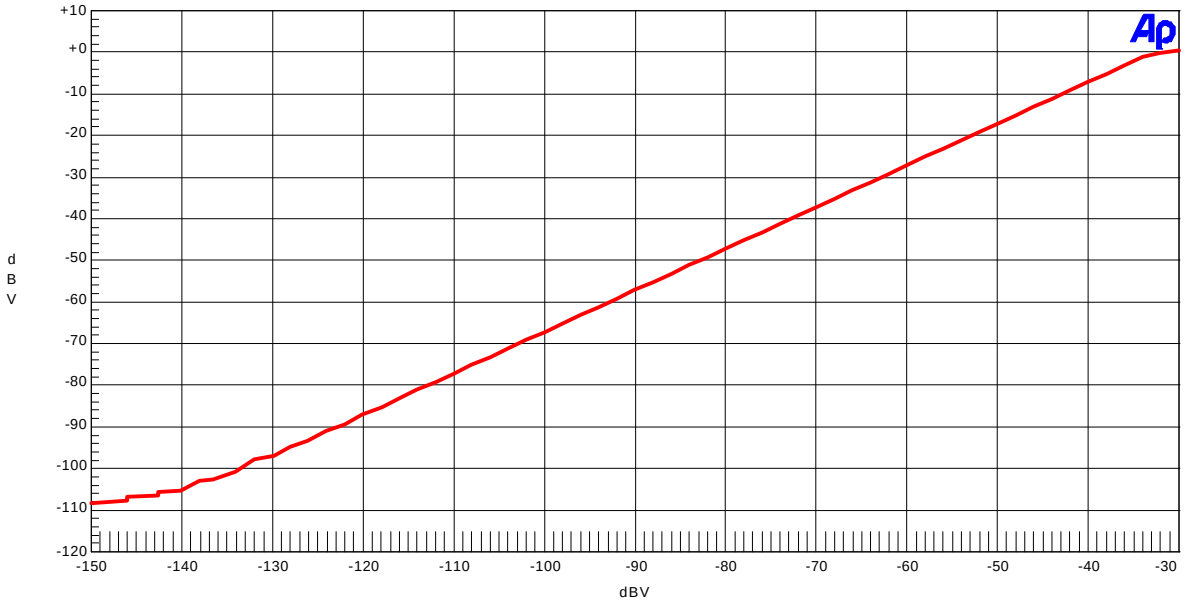


Figure 14. Linearity (Gain = +33dB, fin = 1kHz)

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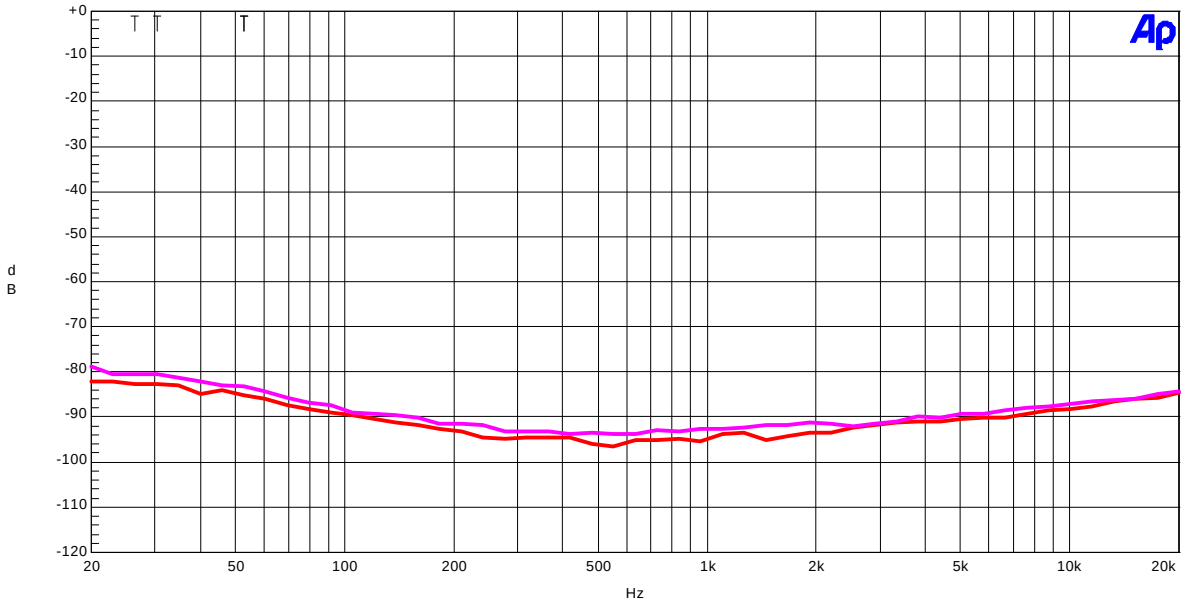


Figure 15. Crosstalk (Gain = +33dB)

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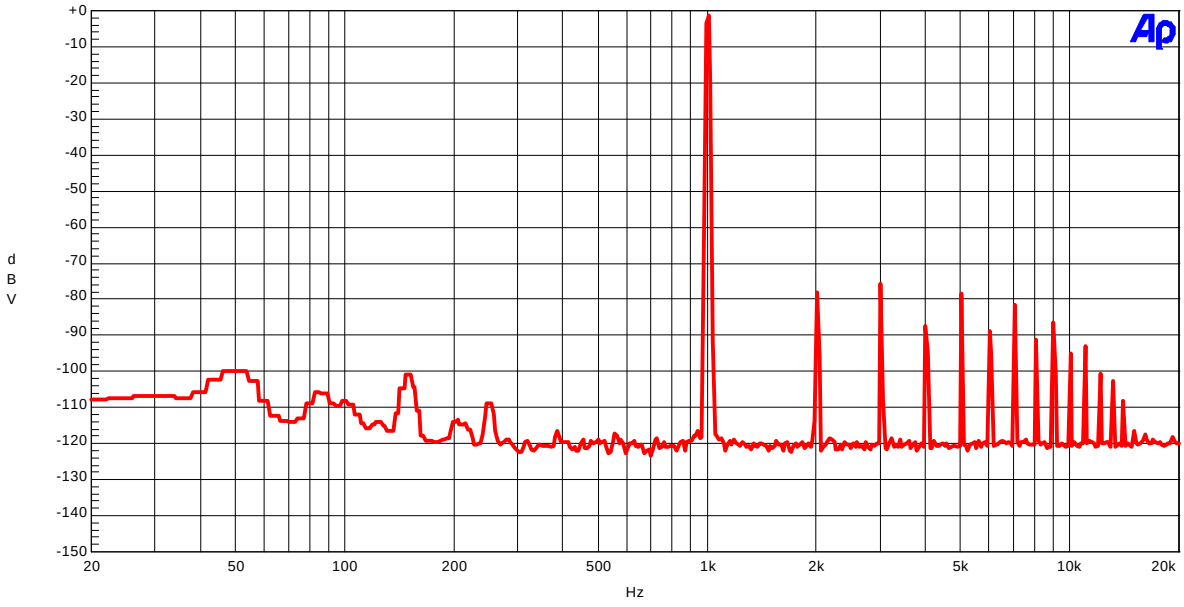


Figure 16. FFT plot (Gain = +33dB, Output Level = -1.5dBV)

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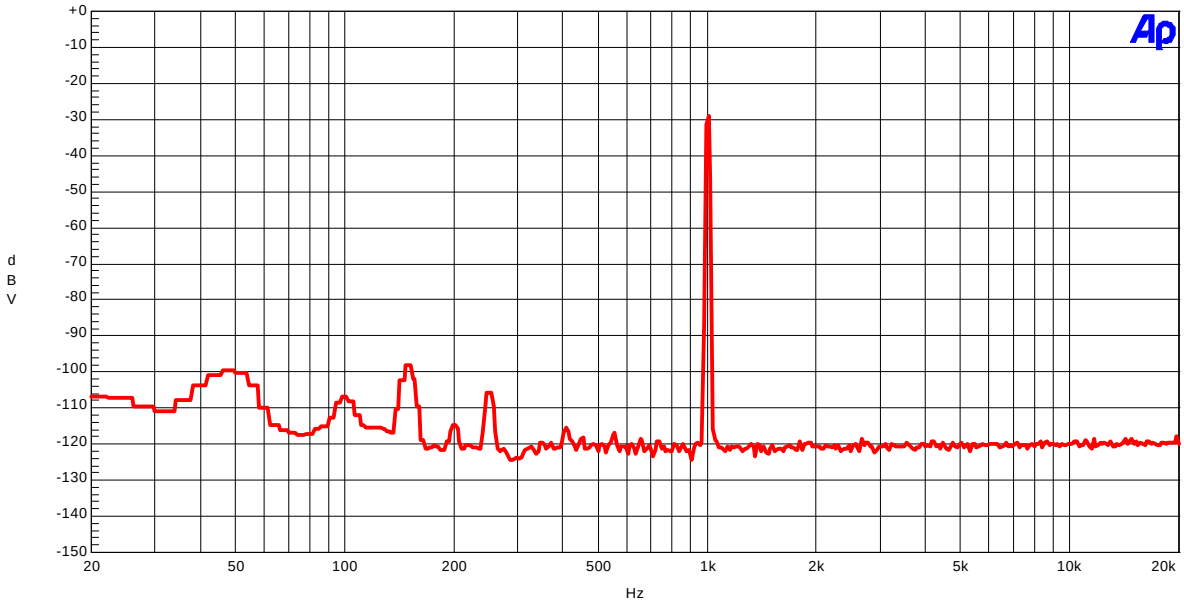


Figure 17. FFT plot (Gain = +33dB, Output Level = -29.2dBV)

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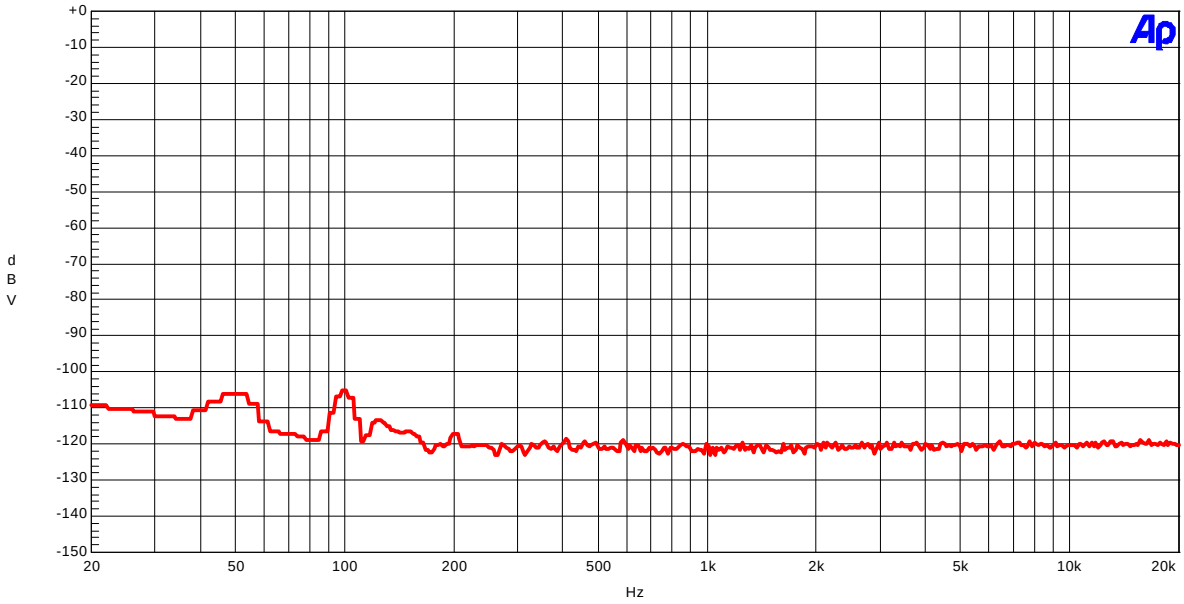


Figure 18. FFT plot (Gain = +28dB, No input signal, Rg=600Ω)

2. Line → ADC (IPGA = 0dB)

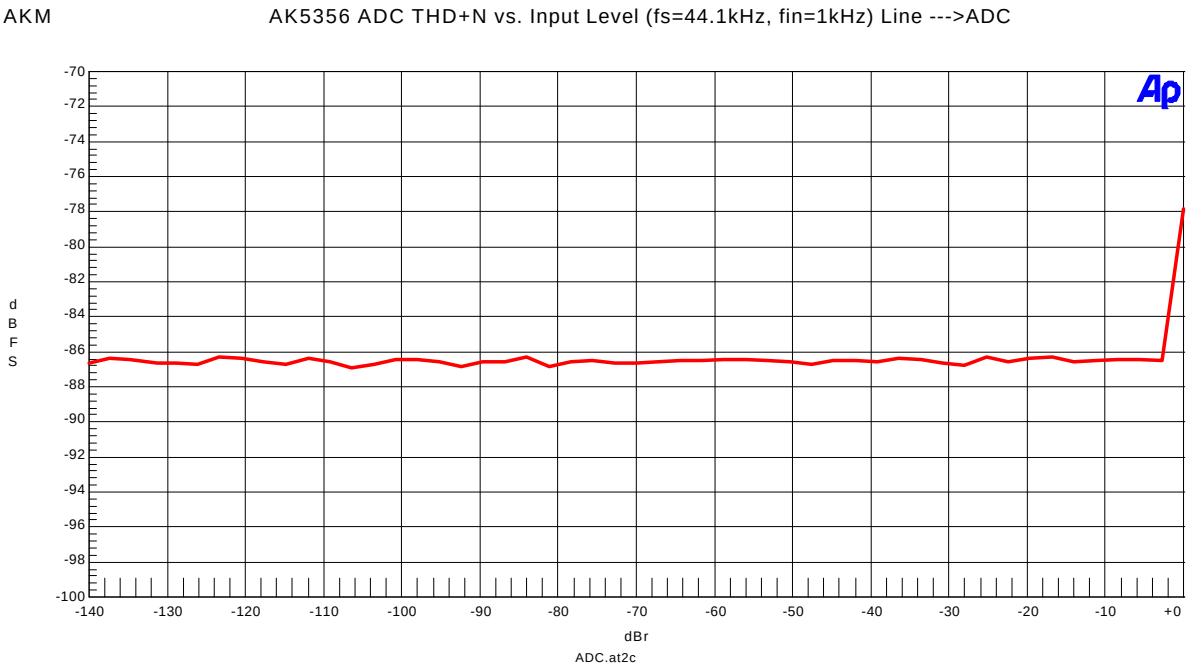


Figure 19. THD+N vs. Input Level

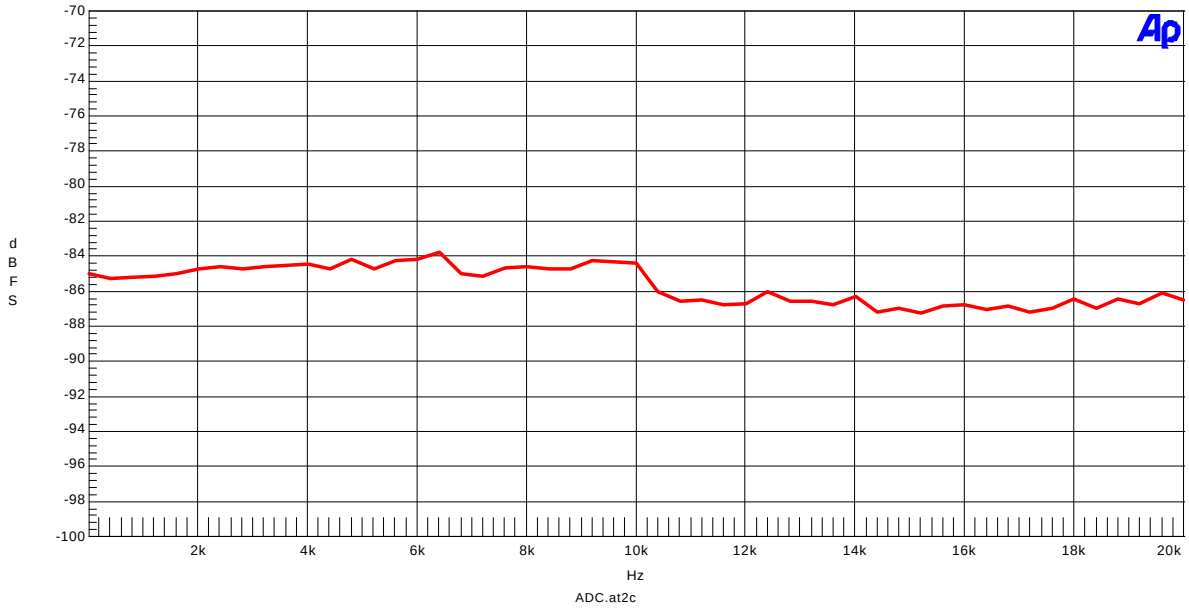


Figure 20. THD+N vs. Input Frequency (-0.5dBFS Input)

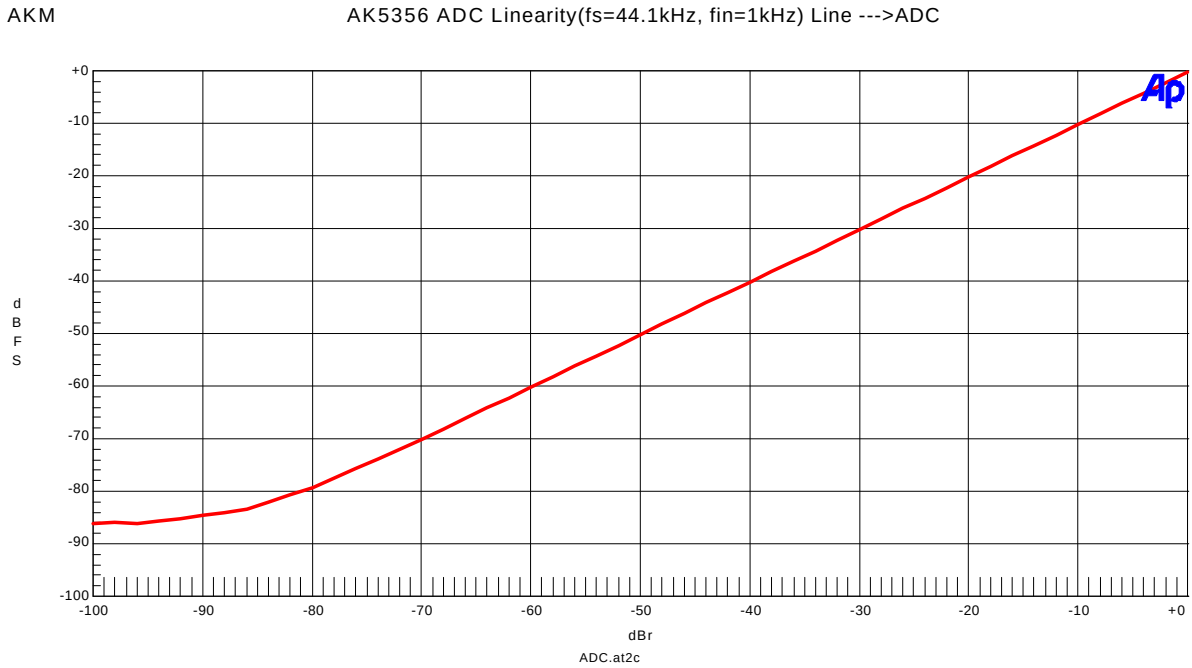


Figure 21. Linearity (fin=1kHz)

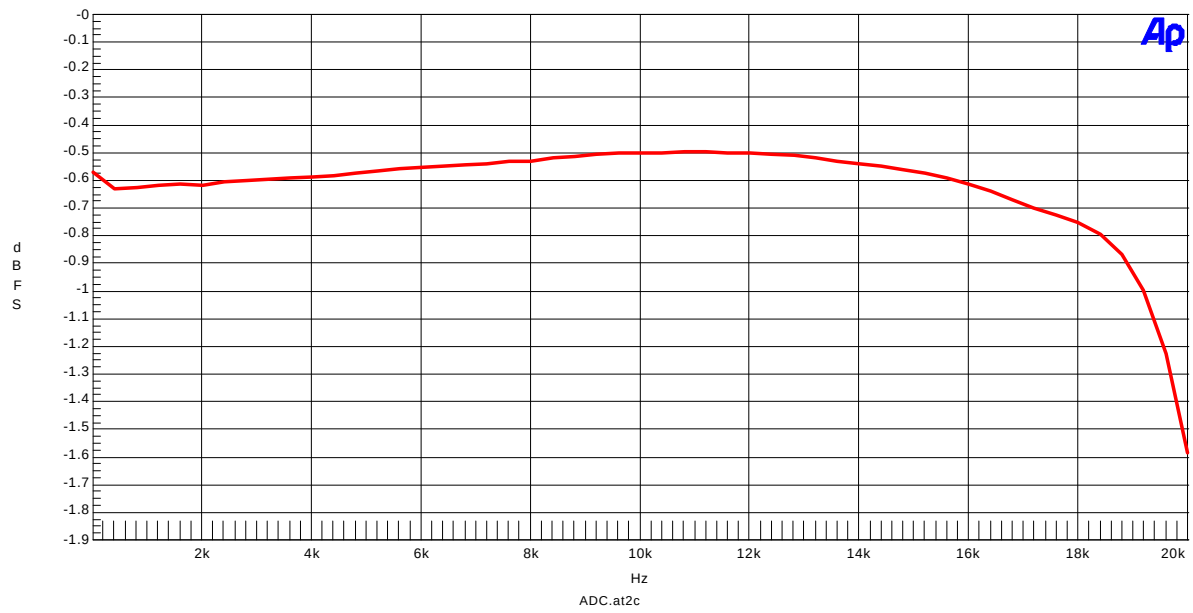


Figure 22. Frequency Response

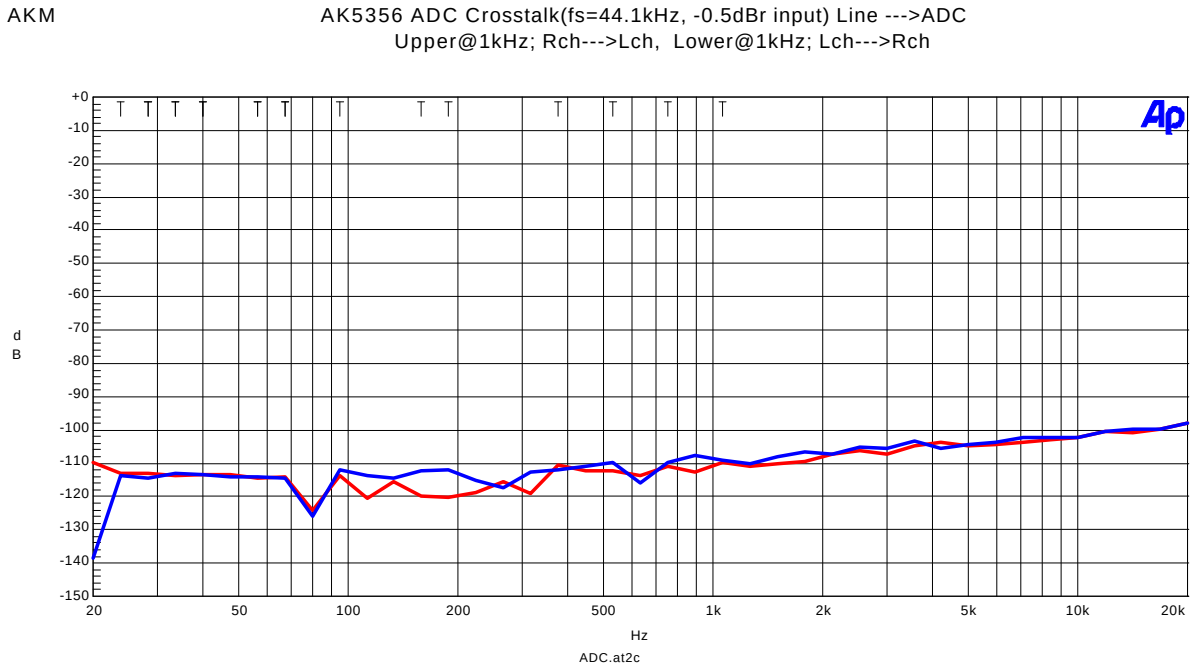


Figure 23. Crosstalk

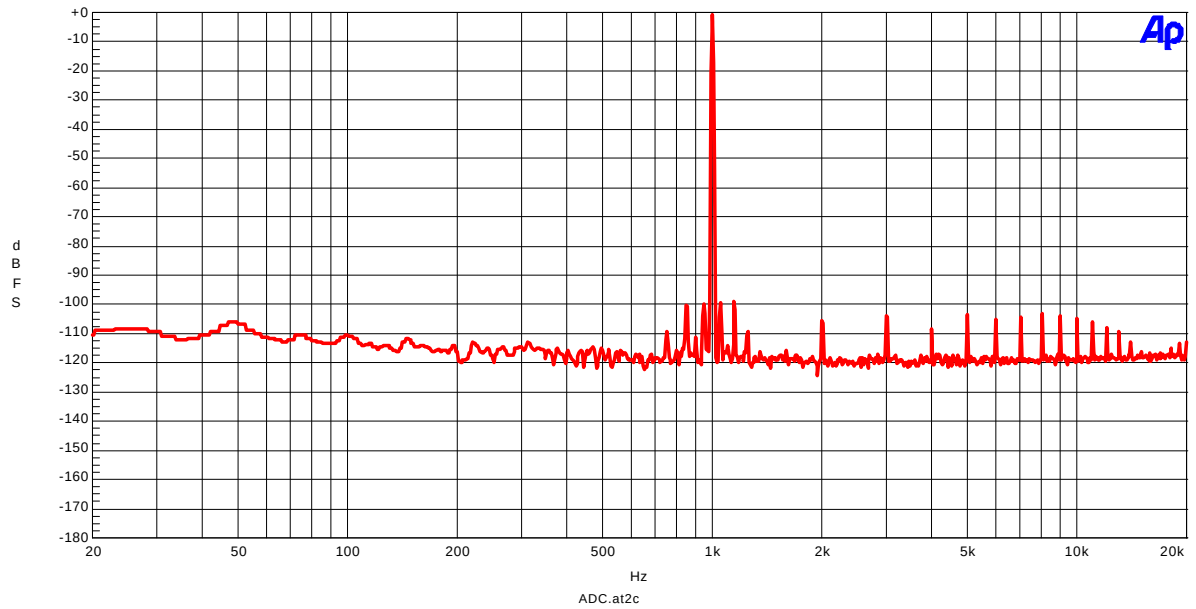


Figure 24. FFT plot (-0.5dBFS Input)

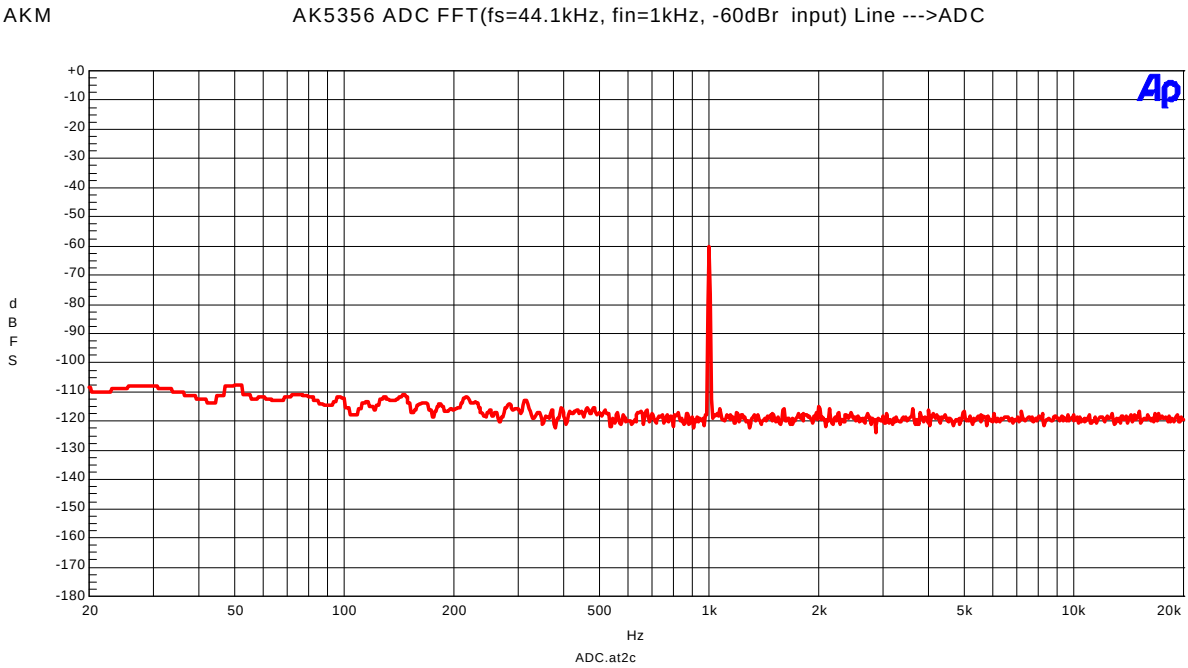


Figure 25. FFT plot (-60dBFS Input)

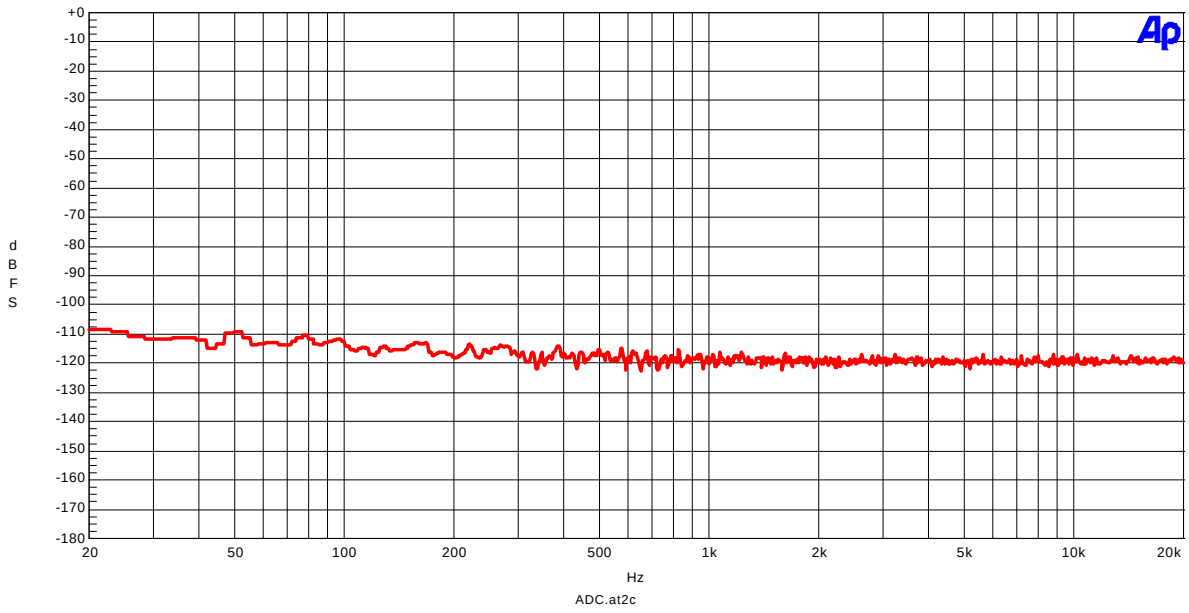
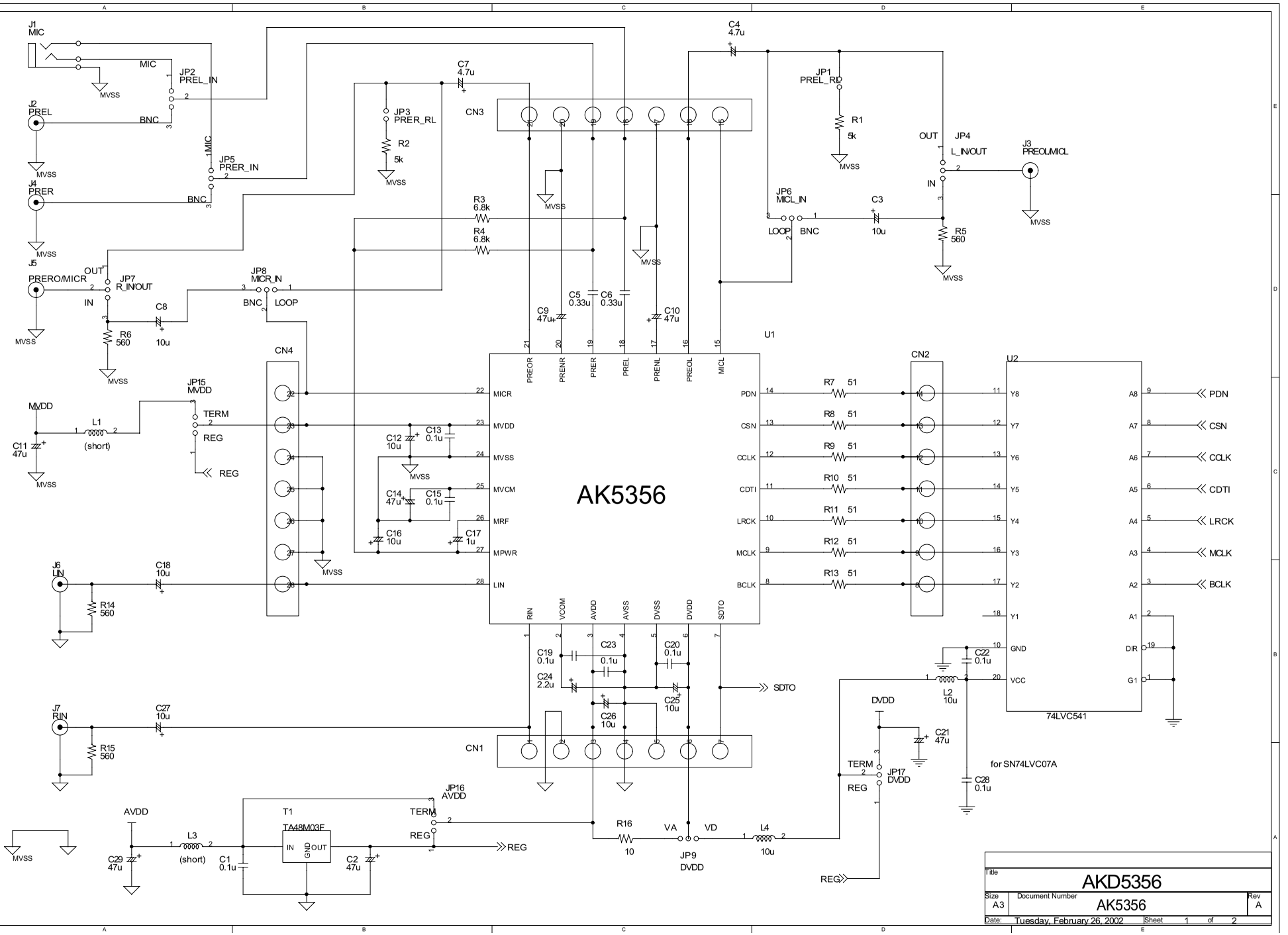
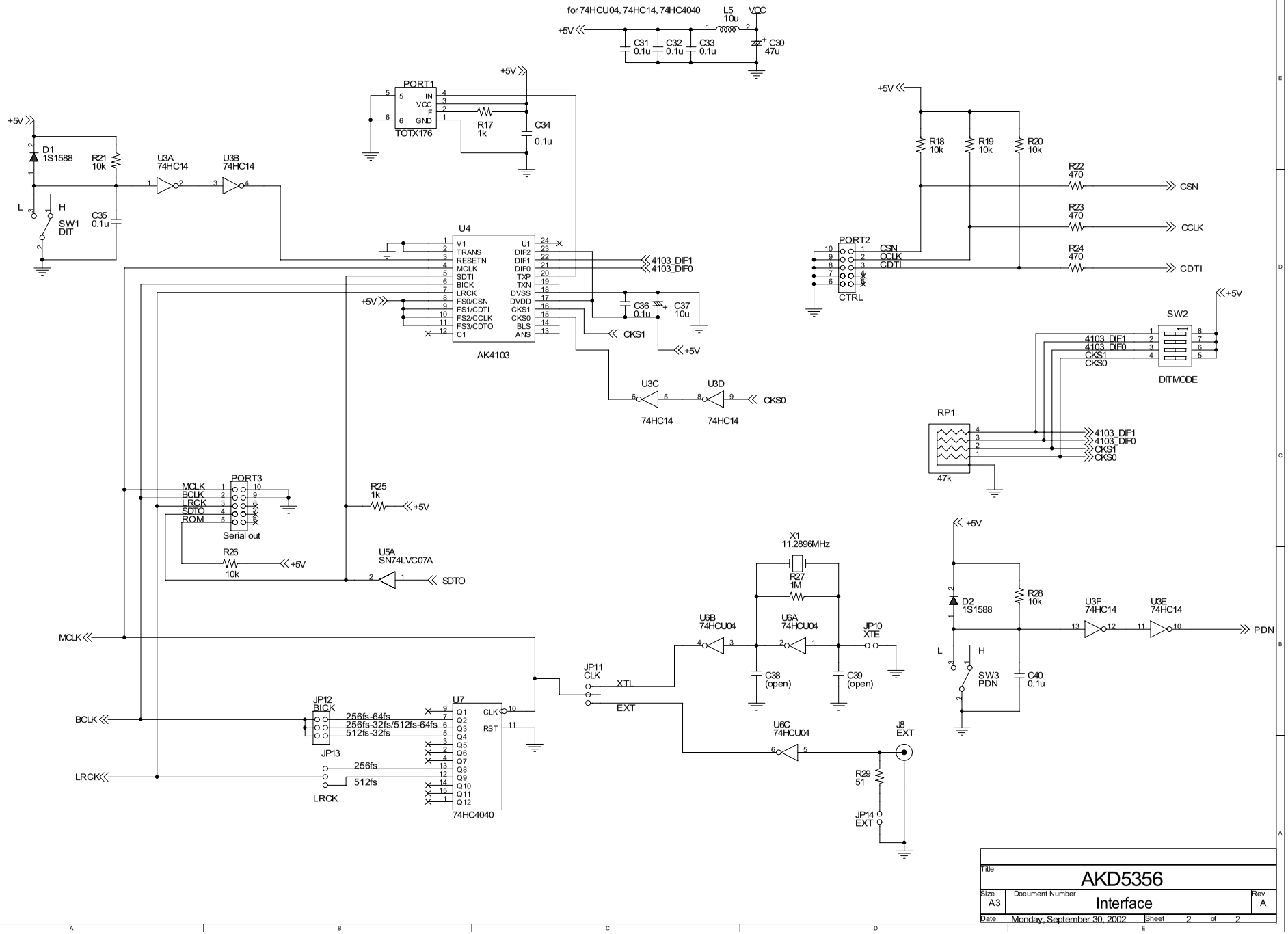
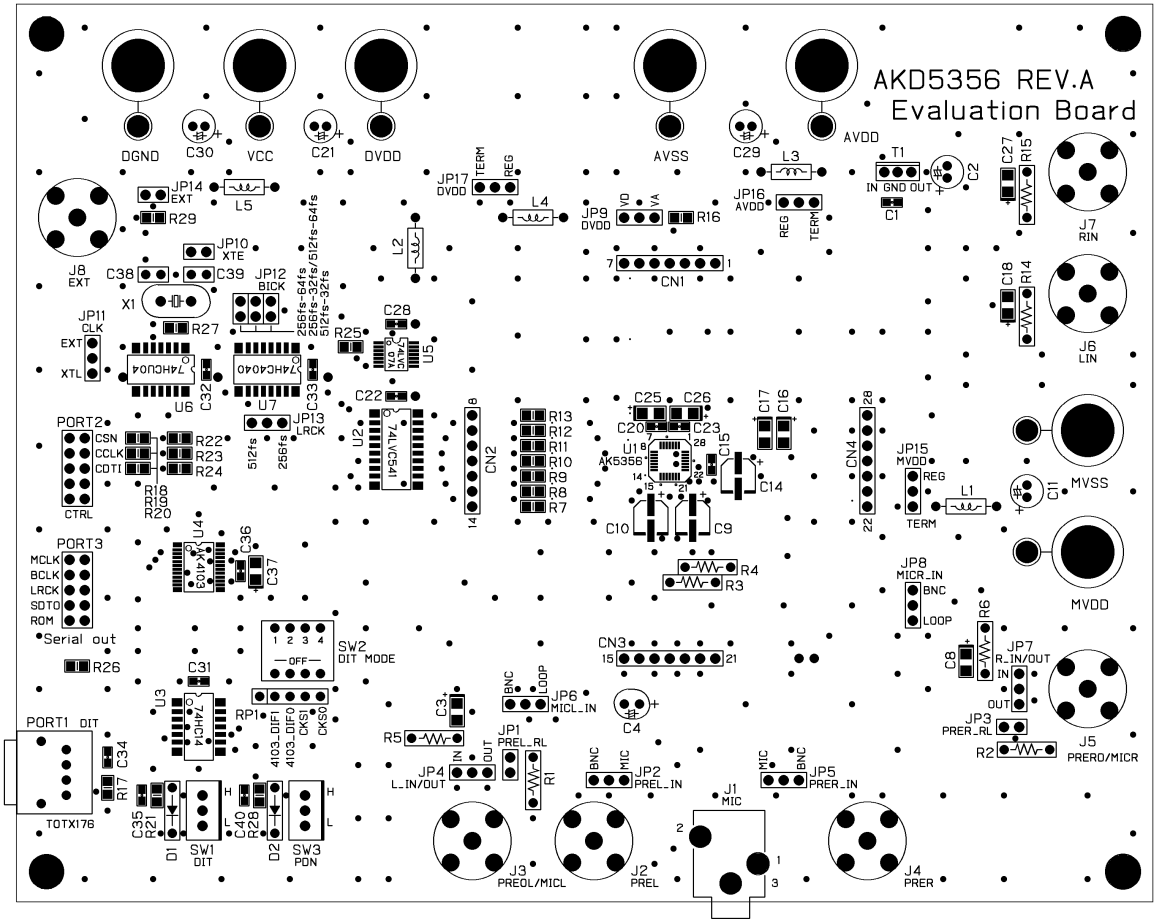


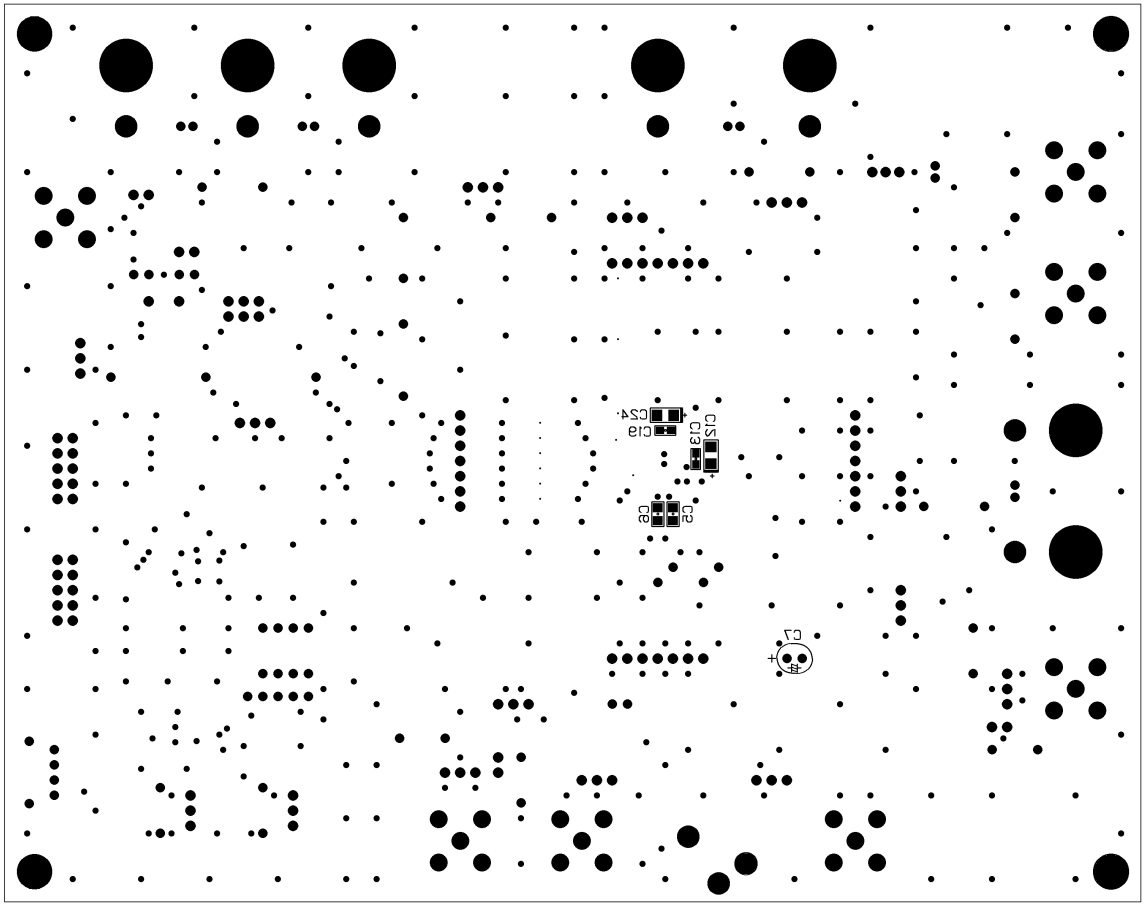
Figure 26. FFT plot (Noise Floor)


AK5356
U1
CN1
CN2
CN3
CN4
U2
74LVC541
J1 MIC
J2 PREL
J3 PREOL/MICL
J4 PRER
J5 PRERO/MICR
J6 LIN
J7 RIN
JP1 PREL_RL
JP2 PREL_IN
JP3 PRER_RL
JP4 L_IN/OUT
JP5 PRER_IN
JP6 MICL_IN
JP7 R_IN/OUT
JP8 MICR_IN
JP9 DVDD
JP15 MVDD
JP16 AVDD
JP17 DVDD
T1 TA48M03F
MVSS
MVDD
AVDD
DVDD
VA
VD
REG
TERM
SDTO
PDN
CSN
CCLK
CDTI
LRCK
MCLK
BCLK
for SN74LVC07A
Title
AKD5356
Size A3
Document Number AK5356
Rev A
Date: Tuesday, February 26, 2002
Sheet 1 of 2

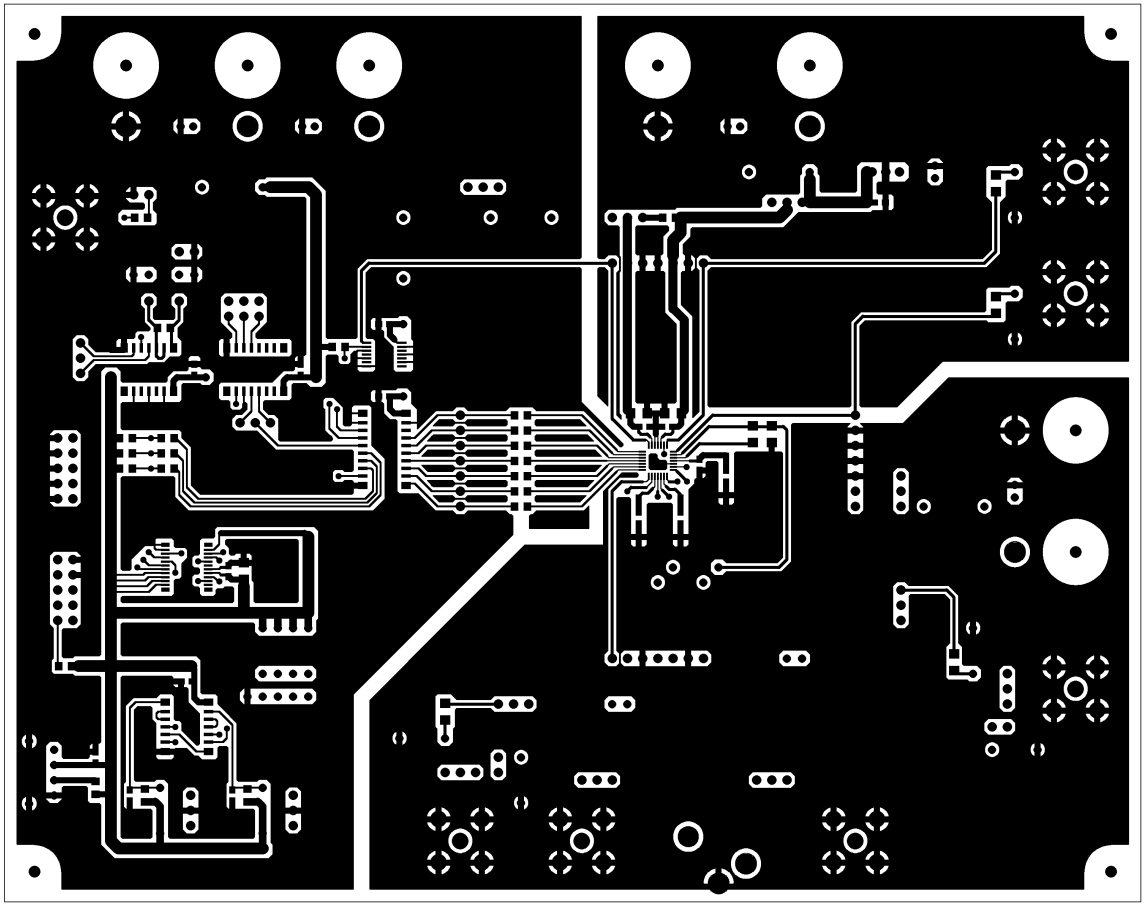

for 74HCU04, 74HC14, 74HC4040
L5
10u
VCC
+5V
C31
0.1u
C32
0.1u
C33
0.1u
C30
47u
PORT1
IN
VCC
IF
GND
TOTX176
R17
1k
C34
0.1u
D1
1S1588
R21
10k
U3A
74HC14
U3B
74HC14
L
H
SW1
DIT
C35
0.1u
U4
V1
TRANS
RESETN
MCLK
SDTI
BICK
LRCK
FS0/CSN
FS1/CDTI
FS2/CCLK
FS3/CDTO
C1
U1
DIF2
DIF1
DIF0
TXP
TXN
DVSS
DVDD
CKS1
CKS0
BLS
ANS
AK4103
4103_DIF1
4103_DIF0
C36
0.1u
C37
10u
CKS1
U3C
U3D
74HC14
74HC14
CKS0
R18
10k
R19
10k
R20
10k
R22
470
R23
470
R24
470
CSN
CCLK
CDTI
PORT2
CTRL
SW2
DITMODE
RP1
47k
PORT3
MCLK
BCLK
LRCK
SDTO
RQM
Serial out
R25
1k
R26
10k
U5A
SN74LVC07A
SDTO
X1
11.2896MHz
R27
1M
U6B
74HCU04
U6A
74HCU04
JP10
XTE
C38
(open)
C39
(open)
JP11
CLK
XTL
EXT
JP12
BICK
256fs-64fs
256fs-32fs/512fs-64fs
512fs-32fs
JP13
256fs
512fs
LRCK
U7
CLK
RST
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
74HC4040
U6C
74HCU04
J8
EXT
R29
51
JP14
EXT
D2
1S1588
R28
10k
U3F
74HC14
U3E
74HC14
PDN
SW3
PDN
C40
0.1u
MCLK
BCLK
LRCK
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AKD5356
Size
A3
Document Number
Interface
Rev
A
Date:
Monday, September 30, 2002
Sheet
2
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2



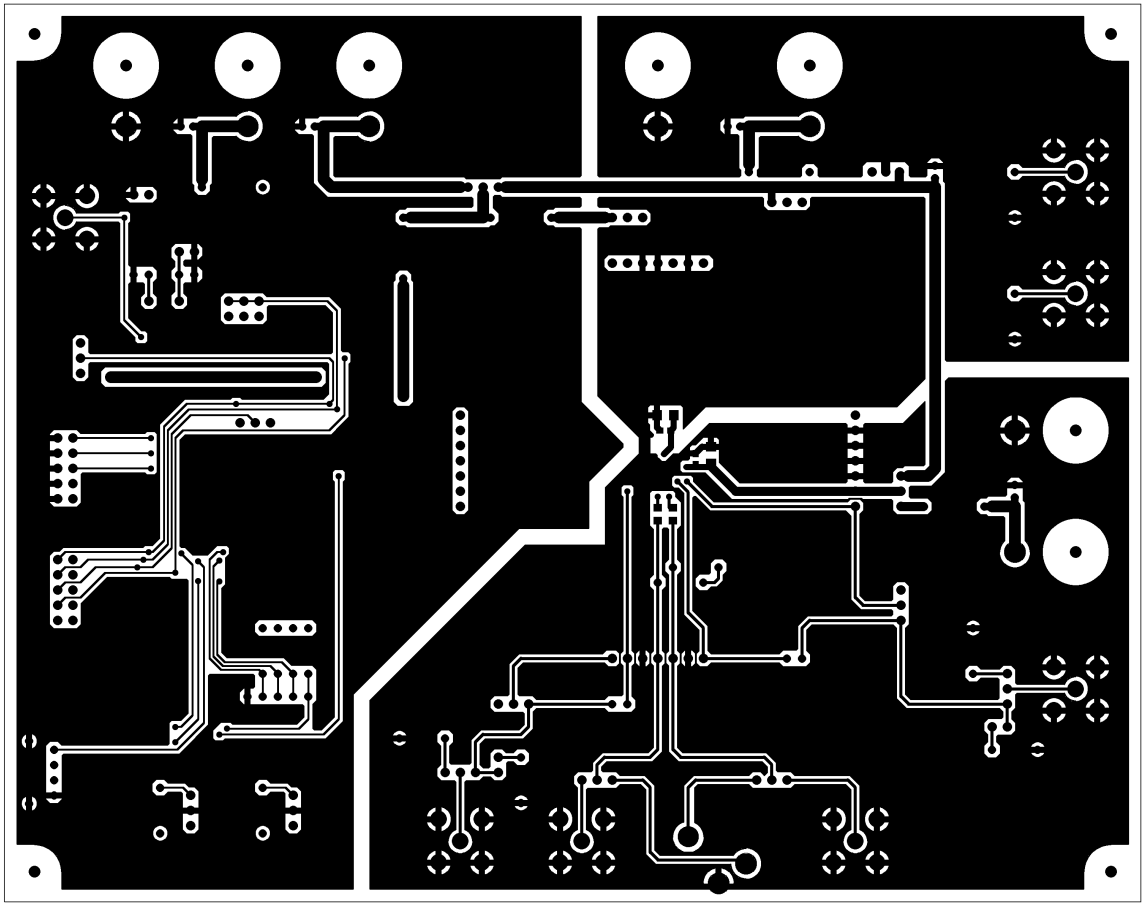
AKD5356 Rev.A L1 SR SILK



AKD5356 Rev.A L2 SR SILK



AKD5356 Rev.A L1



AKD5356 Rev.A L2