AKD4220-A
AK4220 Evaluation Board Rev.0

GENERAL DESCRIPTION

AKD4220-A is an evaluation board for AK4220 that has various 7:3 audio and 6:3 video switches. This board can achieve the interface with AV systems via RCA connectors.

■ **Ordering guide**

AKD4220-A --- AK4220 Evaluation Board
10-wire flat cable for connection with printer port of PC (IBM-AT compatible machine), control software for AK4220, driver for control software on Windows 2000/XP are packed with this.
Control software does not work on Windows NT
Windows 2000/XP needs an installation of driver.
Windows 95/98/ME does not need an installation of driver.

FUNCTION

- **RCA connectors for analog audio: 7 inputs 3 outputs**
- **RCA connectors for video: 6 inputs, 3 outputs**
- **10-pin header for I²C/4-wire serial control**

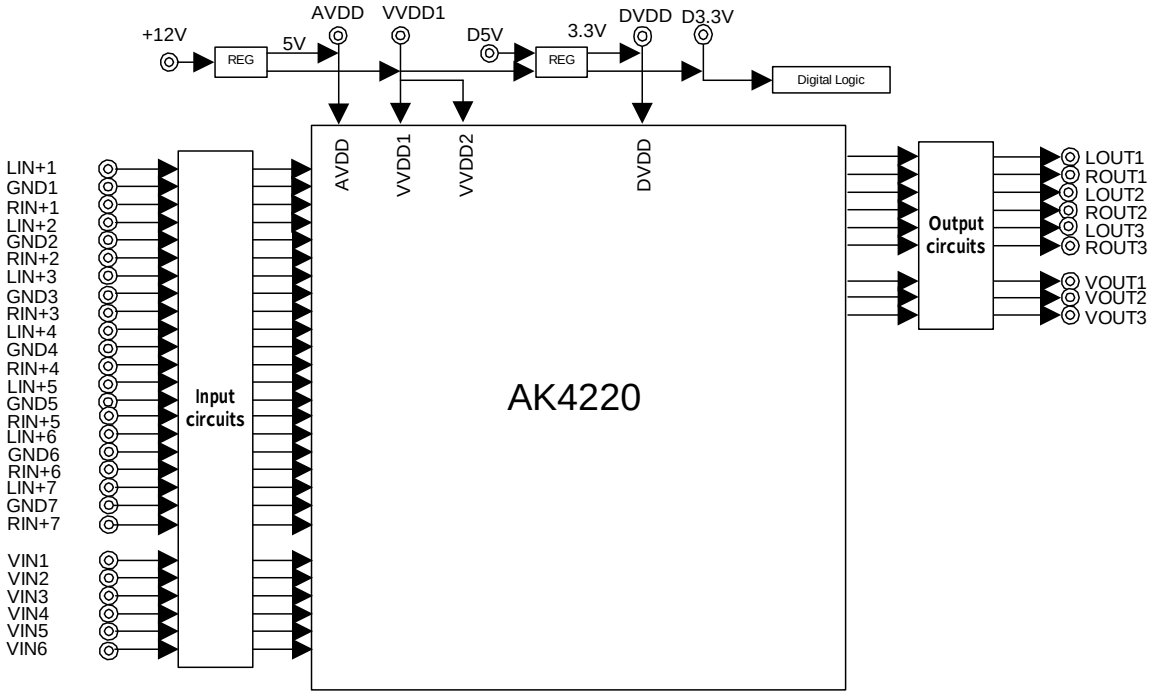


Figure 1. AKD4220-A Block Diagram
* Circuit diagram and PCB layout are attached at the end of this manual.

EVALUATION BOARD MANUAL

■ Operation sequence

1) Set up power supply lines.

Name of jack	Color of jack	Voltage	Used for	Open / connect	Default Setting
+12V	Green	+12V	Regulator (T1)	Should be always connected when power supply lines are supplied from regulator of T1. In this case "JP9 (REG)" is set to short.	+12V
AVDD	Red	+5V	AVDD of AK4220	Should be always connected when AVDD is not supplied from regulator of T1. In this case "JP9 (REG)" is set to open.	Open
VVDD1	Bule	+5V	VVDD1 of AK4220	Should be always connected when AVDD is not supplied from regulator of T1. In this case "JP10 (VVDD1)" is set to open.	Open
D5V	Red	+5V	Regulator (T2)	Should be always connected when JP2(DVDD_SEL) is set to DVDD side. Can be open when JP2(DVDD_SEL) is set to REG side.	Open
DVDD	Orange	+3.3V	DVDD of AK4220	Should be always connected when DVDD is not supplied from regulator of T1 and T2. In this case "JP15 (DVDD)" is set to open.	Open
D3.3V	Orange	+3.3V	Digital Logic	Should be always connected when D3.3V is not supplied from regulator of T1 and T2. In this case "JP13 (D3.3V)" is set to open.	Open
AGND	Black	0V	Analog Ground	Should be always connected.	0V
VVSS	Black	0V	Analog Ground	Should be always connected.	0V
DGND	Black	0V	Digital Ground	Should be always connected, when JP1 (GND) is set to open.	0V

Table 1. Set up the power supply lines

(Note) Each supply line should be distributed from the power supply unit.

2) Set-up jumper pins and DIP switches. (See the followings.)

3) Power on.
AK4220 should be reset once bringing SW2 (PDN) to "L" upon power-up.

■ Set up jumper pins

1. JP1 (GND) : Analog ground and Digital ground
   - OPEN : Separated.
   - SHORT : Common. (The connector “DGND” can be open.) <Default>

2. JP9 (REG) : AVDD, VVDD1 of the AK4220, and regulator of T2 (TA48M033F)
   - OPEN : AVDD is supplied from “AVDD ” jack. (“+12V” jack should be open)
   - SHORT : AVDD is supplied from regulator of T1 (NJM78M05FA). < Default >

3. JP16 (AVDD) : AVDD of the AK4220
   - OPEN : AVDD is supplied from “AVDD ” jack.
   - SHORT : AVDD is supplied from regulator of T1 (NJM78M05FA). (“AVDD” jack should be open) < Default >

4. JP10 (VVDD1) : VVDD1 of the AK4220
   - OPEN : VVDD1 is supplied from “VVDD1 ” jack.
   - SHORT : VVDD1 is supplied from regulator of T1 (NJM78M05FA). (“VVDD1” jack should be open) < Default >

5. JP11 (D-A) : Regulator of T2 (TA48M033F)
   - OPEN : Regulator of T2 (TA48M033F) is supplied from “D5V ” jack.
   - SHORT : Regulator of T2 (TA48M033F) is supplied from regulator of T1 (NJM78M05FA). (“D5V” jack should be open) < Default >

6. JP15 (DVDD) : DVDD of the AK4220
   - OPEN : DVDD is supplied from “DVDD ” jack.
   - SHORT : DVDD is supplied from regulator of Regulator of T2 (TA48M033F). (“DVDD” jack should be open) < Default >

7. JP13 (D3.3V) : Power of digital logic
   - OPEN : D3.3V is supplied from “D3.3V ” jack.
   - SHORT : D3.3V is supplied from regulator of Regulator of T2 (TA48M033F). (“D3.3V” jack should be open) < Default >

8. JP12 (VVDD2) : Should be open.

■ Set up DIP switches

SW1 Setting for I2C of AK4220

Pin No.	Pin Name	ON (“H”,“1”) / OFF (“L”,“0”)	Default
1	I2C	Control mode Select	ON (“H”, “1”)
2	CAD1	Chip Address Select (Note1)	OFF (“L”, “0”)
3	CAD0	Chip Address Select (Note1)	OFF (“L”, “0”)

Table 2. SW1 Setting for I2C of AK4220

(Note1) Chip Address is selected by CAD1, CAD0 pin (CAD10=”00”,”01”,”10”,”11”)

■ The function of the toggle SW

[SW2] (PDN): Resets the AK4220. Keep “H” during normal operation.

■ Indication for LED

[LE1] (INT): Monitor INT0 pin of the AK4220. LED turns on when channel dependent audio input detect circuit and video signal detect circuit of the AK4220.

[LE2 ~ 6] (Q0 ~ 4): Monitor Q0 ~ 4 pin of the AK4220.

■ Serial Control

The AK4220 can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect printer port (parallel port) of PC and PORT2 (CTRL) of AKD4220-A by 10-wire flat cable (packed with AKD4220-A). Take care of the direction of 10-pin connector and 10-pin header.

The control software packed with this evaluation board supports 4-wire serial control only.

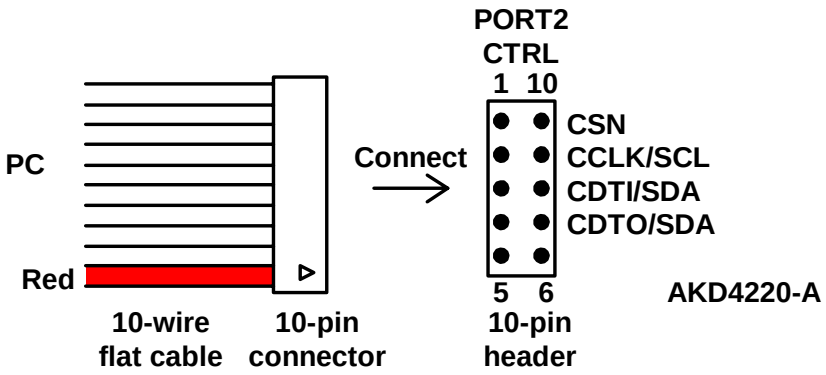
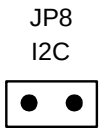


Figure 2. 10-wire flat cable, 10-pin connector, and 10-pin header

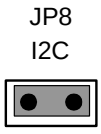
(1) 4-wire Serial Control Mode

The jumper pins should be set to the following.



(2) I²C-bus Control Mode

The jumper pins should be set to the following. <Default>



■ Input / Output circuit & Set-up jumper pin for Input / Output circuits

(1) Audio Input Circuit

GND1, LIN+1, RIN+1~ GND7, LIN+7, RIN+7 Input circuits

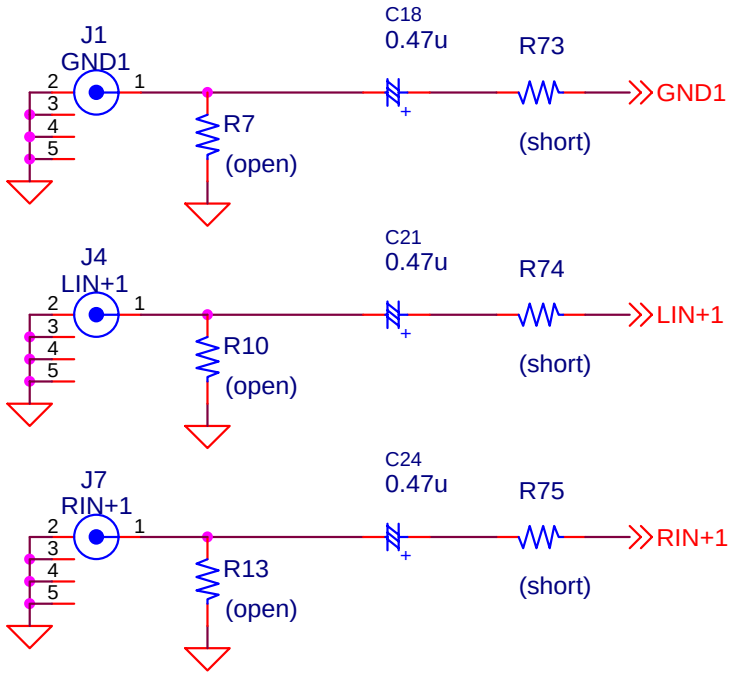


Figure 3. GND, LIN+, RIN+ Input circuit

(2) Audio Output Circuit

LOUT1/ROUT1 ~ LOUT3/ROUT3 Output circuits

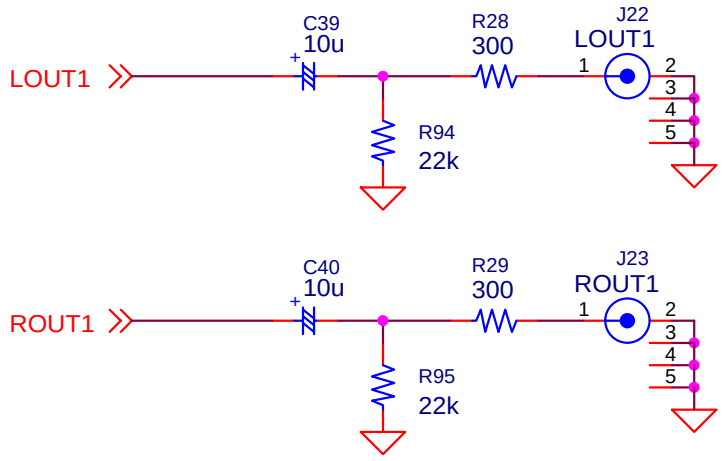


Figure 4. LOUT/ROUT Output circuit

(3)Video Input Circuit

VIN1 ~ VIN6 Input circuits

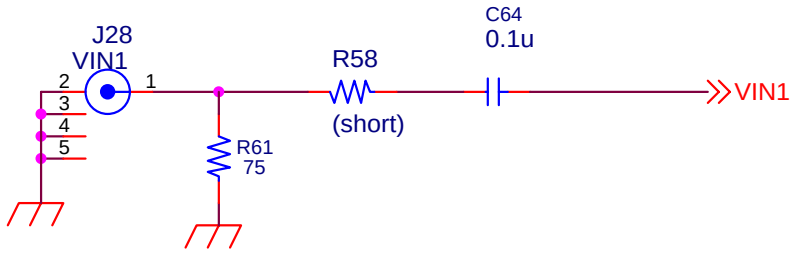


Figure 5. VIN Input circuit

(4)Video Output Circuit

VOUT1 ~ VOUT3 Output circuits

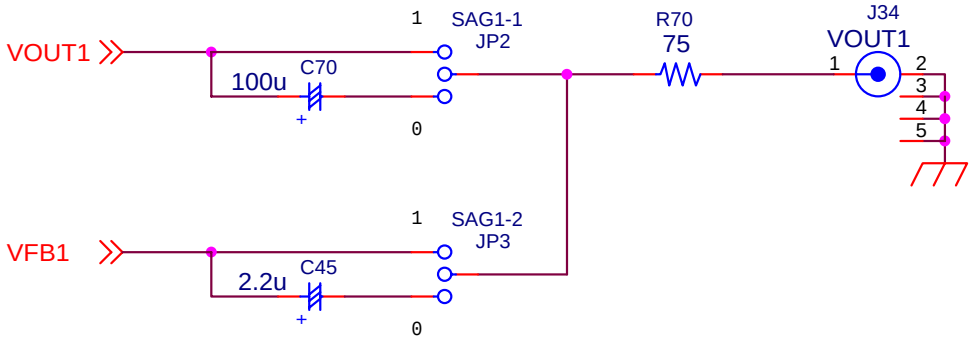
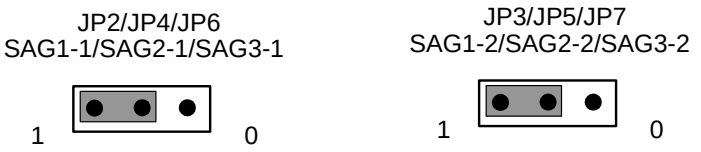
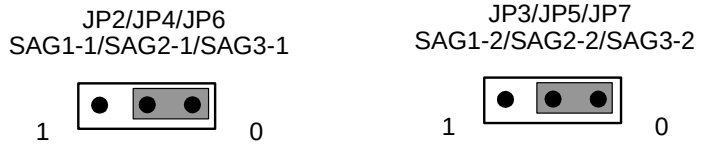


Figure 6. VOUT Output circuit

(4-1) “DC Output” is output from J34, J35 and J36 connector. (SAGN bit = 1) <Default>



(4-2) “SAG Trimming Circuit ” is output from J34, J35 and J36 connector. (SAGN bit = 0)



Control Software Manual

■ Set-up of evaluation board and control software

1. Set up the AKD4220-A according to previous term.

2. Connect IBM-AT compatible PC with AKD4220-A by 10-line type flat cable (packed with AKD4220-A). 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 “AKD4220-A Evaluation Kit” into the CD-ROM drive.

4. Access the CD-ROM drive and double-click the icon of “akd4220-a.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 Reset” button.

■ Explanation of each buttons

1. [Port Reset]: Set up the USB interface board (AKDUSBIF-A).
2. [Write default]: Initialize the register of AK4220.
3. [All Write]: Write all registers that is 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 “1”. If not, “L” or “0”.

When writing the input data to AK4220, 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.

When writing the input data to AK4220, click [OK] button. If not, click [Cancel] button.

3. [Function2 Dialog]: Dialog to evaluate ATT of VOL Control

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 AK4220 by this interval.
Step Box: Data changes by this step.
Mode Select Box:

With checking 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

Without checking 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

When writing the input data to AK4220, click [OK] button. If not, click [Cancel] button.

4. [Save] and [Open]

4-1. [Save]

Save the current register setting data. The extension of file name is “akr”.

(Operation flow)
(1) Click [Save] Button.
(2) Set the file name and push [Save] Button. The extension of file name is “akr”.

4-2. [Open]

The register setting data saved by [Save] is written to AK4220. 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”.

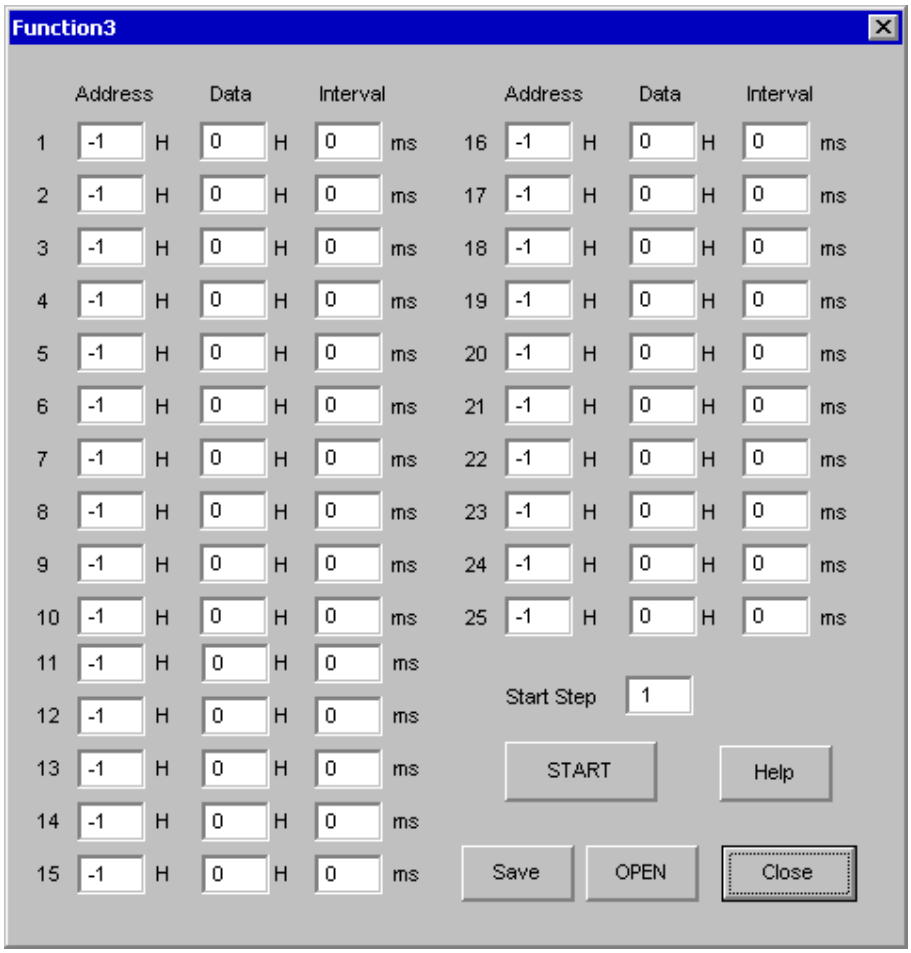


Figure 1. Window of [F3]

6. [Function4 Dialog]

The sequence that is created on [Function3] can be assigned to buttons and executed. When [F4] button is clicked, the window as shown in **Figure 2** opens.

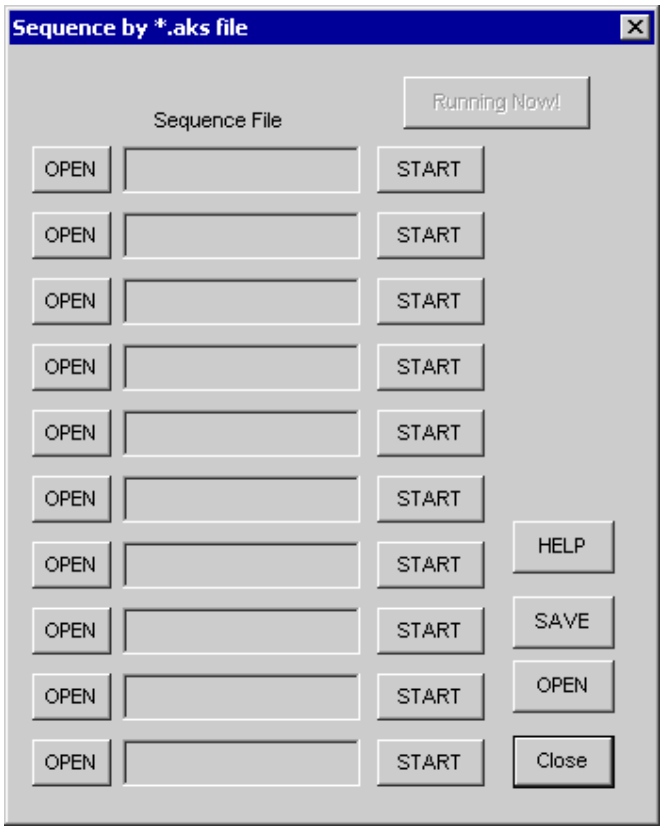


Figure 2. [F4] window

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

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

The sequence file name is displayed as shown in Figure 3.

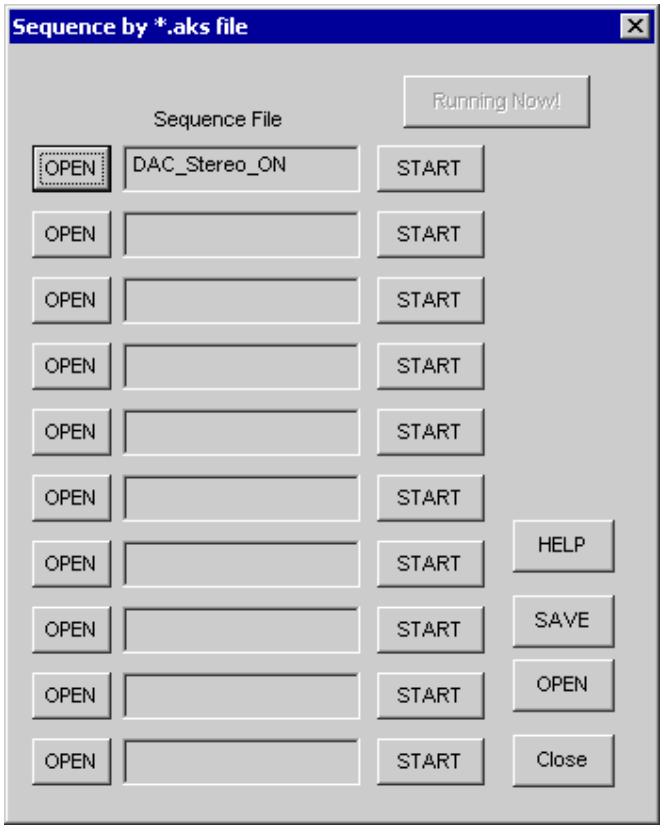


Figure 3. [F4] window(2)

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

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

[SAVE]: The sequence file names can assign be saved. The file name is *.ak4.

[OPEN]: The sequence file names assign that are saved in *.ak4 are loaded.

6-3. Note

(1) [Function4] doesn't support the pause function of sequence function.

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

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

7. [Function5 Dialog]

The register setting that is created by [SAVE] function on main window can be assigned to buttons and executed. When [F5] button is clicked, the following window as shown in **Figure 4**opens.

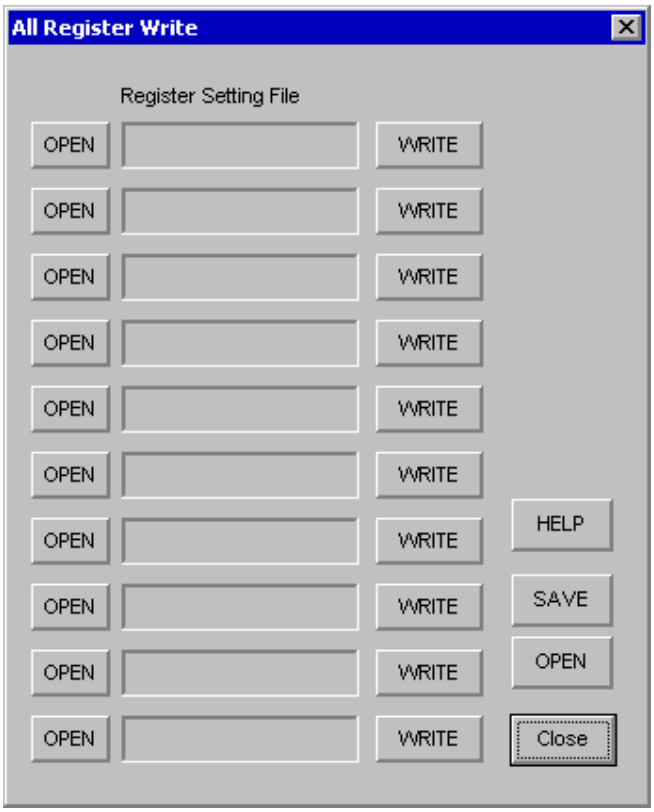


Figure 4. [F5] window

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 register setting file names assign can be saved. The file name is *.ak5.

[OPEN]: The register setting file names assign that are saved in *.ak5 are loaded.

7-3. Note

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

(2) When the register setting is changed by [Save] Button in main window, the file should be loaded again in order to reflect the change.

MEASUREMENT RESULTS

■ Audio

[Measurement condition]

- Measurement unit : Audio Precision System two Cascade
- BW : 10Hz~20kHz
- Power Supply : AVDD=5V, VVDD1=5V, VVDD2=5V, DVDD=3V
- Temperature : Room
- Measurement signal line path: LIN+1/RIN+1 → LOUT/ROUT

Parameter	Input signal	Measurement filter	Results [dB]
S/(N+D) at 1Vrms Output	1kHz, 0dBV	20kLPF	93.2 / 93.1
DR	1kHz, -60dBV	22kLPF, A-weighted	96.2 / 96.2
S/N	Off	22kLPF, A-weighted	96.2 / 96.1

Plots

Figure 1-1. FFT (1kHz, 0dBV input) at 1Vrms output
Figure 1-2. FFT (1kHz, -60dBV input)
Figure 1-3. FFT (Noise floor)
Figure 1-4. THD+N vs. Input Level (fin=1kHz)
Figure 1-5. THD+N vs. fin (Input Level=0dBFS)
Figure 1-6. Linearity (fin=1kHz)
Figure 1-7. Frequency Response (Input Level=0dBV)
Figure 1-8. Crosstalk (Input Level=0dBV)

■ Video

[Measurement condition]

- Signal Generator : Sony Tectonics TG2000
- Measurement unit : Sony Tectonics VM700T
- Power Supply : AVDD=5V, VVDD1=5V, VVDD2=5V, DVDD=3V
- Temperature : Room
- Measurement signal line path: VIN1 → VOUT1

Parameter	Measurement conditions	Results	Unit
S/N	Input = 0% flat field Filter = Uni-weighted, BW= 15kHz to 5MHz SAG = 1	72.4	dB
Crosstalk	Input = 100%red(ENCRC), Measured at VOUT	-74.0	dB
DG	Input = Modulated Lamp SAG = 1	0.22	%
DP	Input = Modulated Lamp SAG = 1	0.91	deg.

Plots

Figure 2-1. Noise spectrum (Input=0%flat field, BW=15kHz to 5MHz, uni weighted, SAG=1)
Figure 2-2. Frequency Response (Input= Multi Burst, SAG=1)
Figure 2-3 Crosstalk (Input= 100% red (VIN1), measured at VOUT1)
Figure 2-4 Crosstalk (Input= 100% red (VIN2), measured at VOUT1)
Figure 2-5 DG, DP (Input= Modulated Lamp, SAG=1)

Plots (Audio)

AKM AK4220 FFT LIN1/RIN1-->LOUT1/ROUT1 input=0dBV 11/17/05 10:47:28

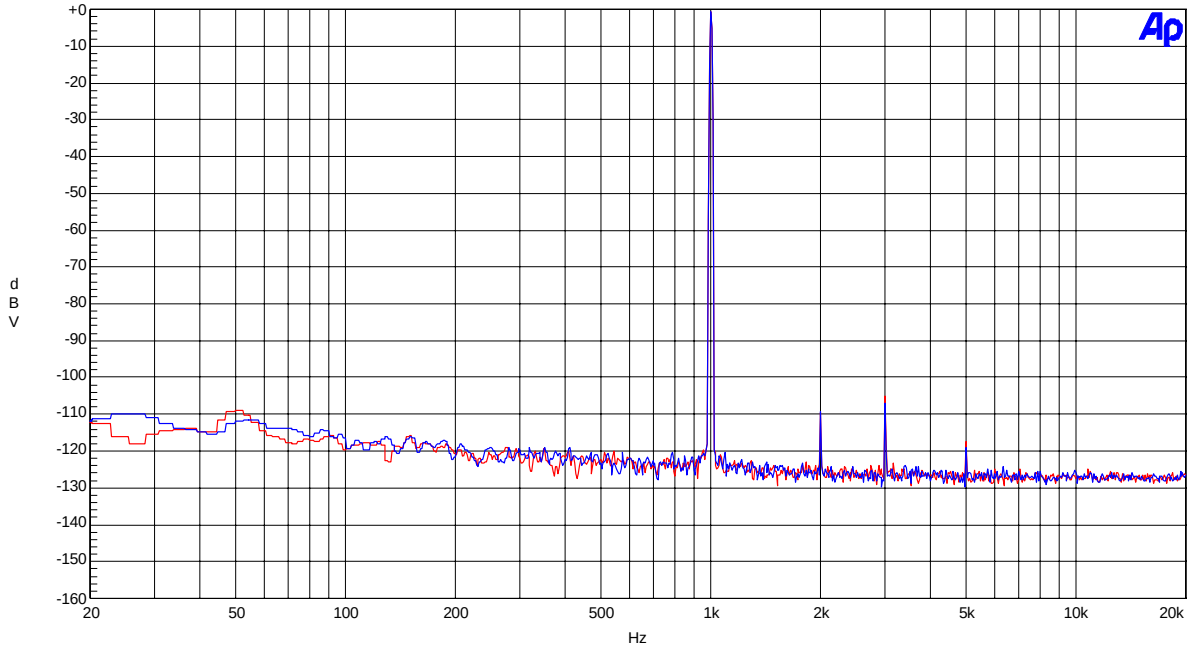


Figure1-1. FFT (fin=1kHz Input Level=0dBV)

AKM AK4220 FFT LIN1/RIN1-->LOUT1/ROUT1 input=-60dBV 11/17/05 10:55:52

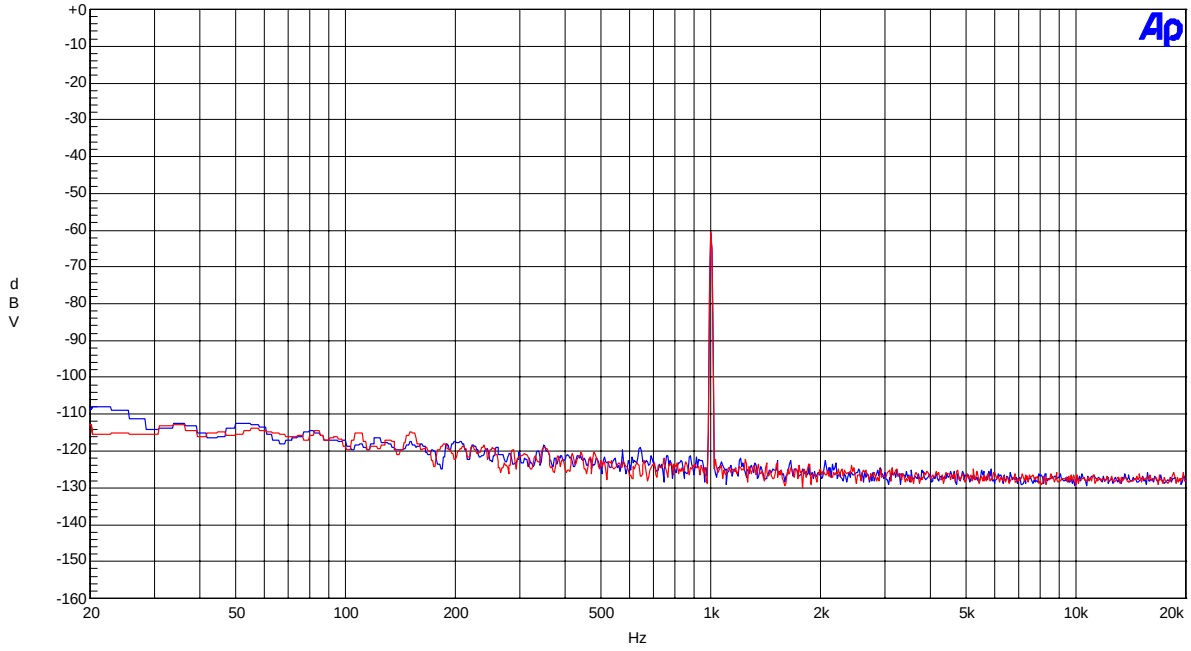


Figure-1-2. FFT (fin=1kHz Input Level=-60dBV)

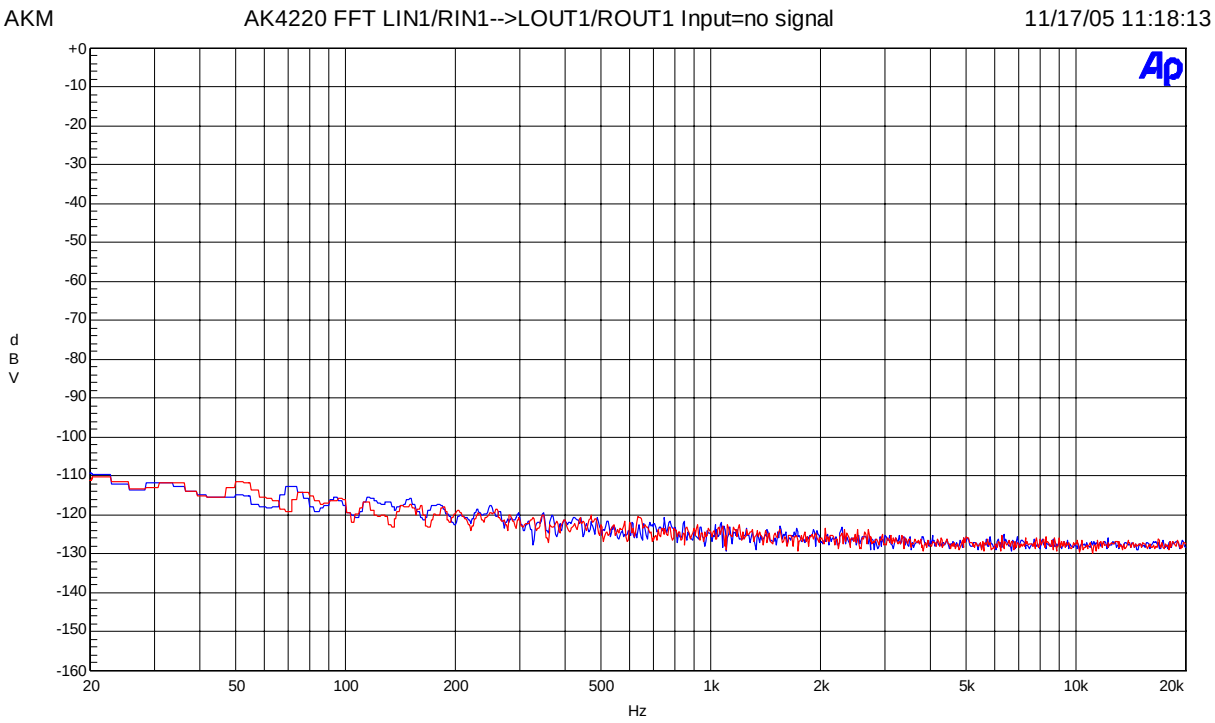


Figure1-3. FFT (Noise Floor)

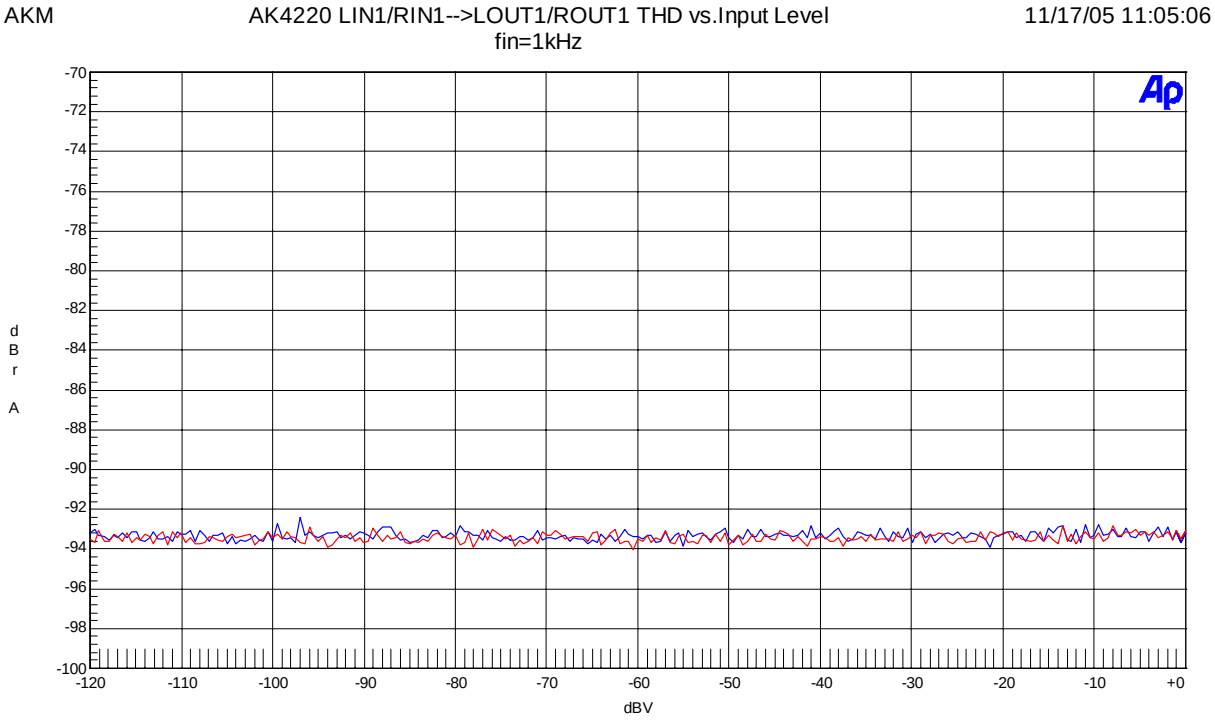


Figure1-4. THD+N vs. Input level (fin=1kHz)

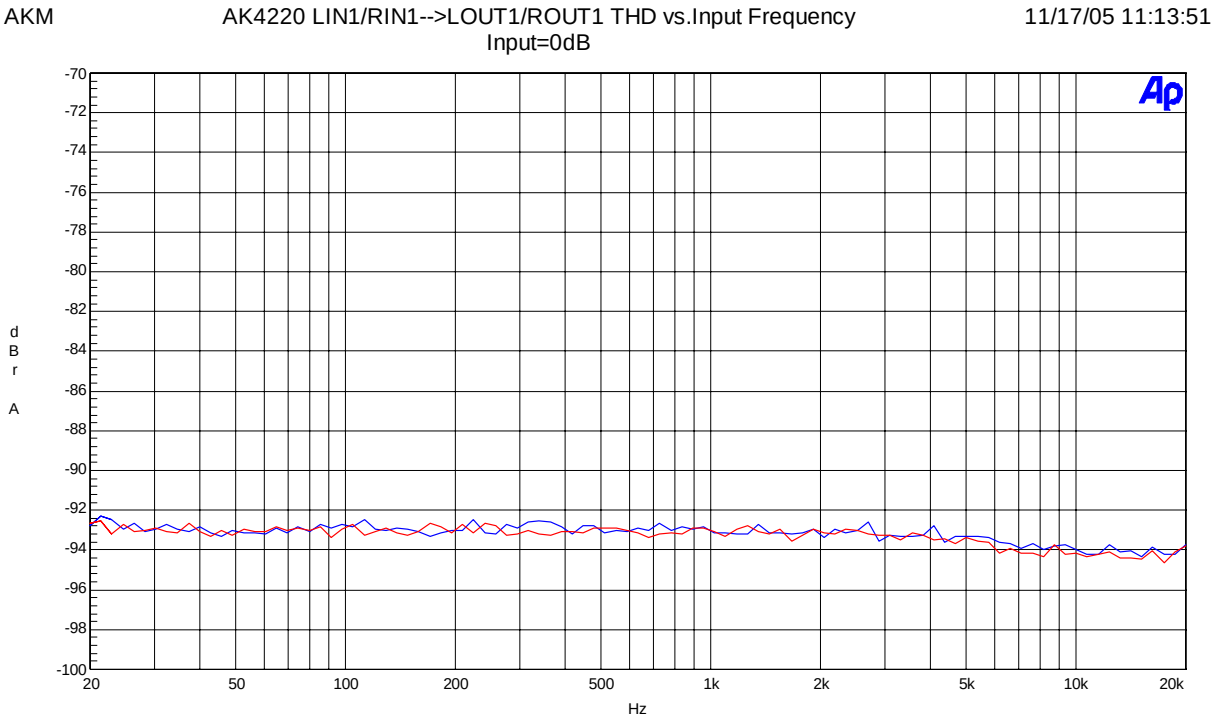


Figure1-5. THD+N vs. Input Frequency (Input level=0dBV)

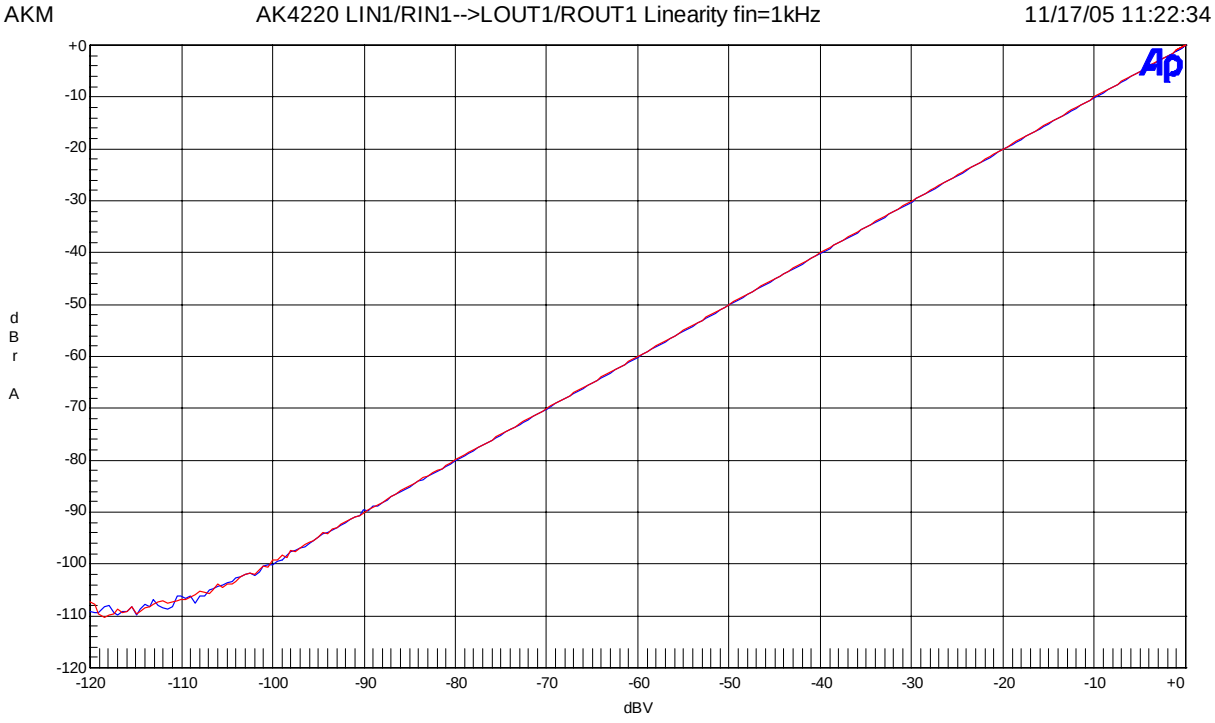


Figure1-6.Linearity (fin=1kHz)

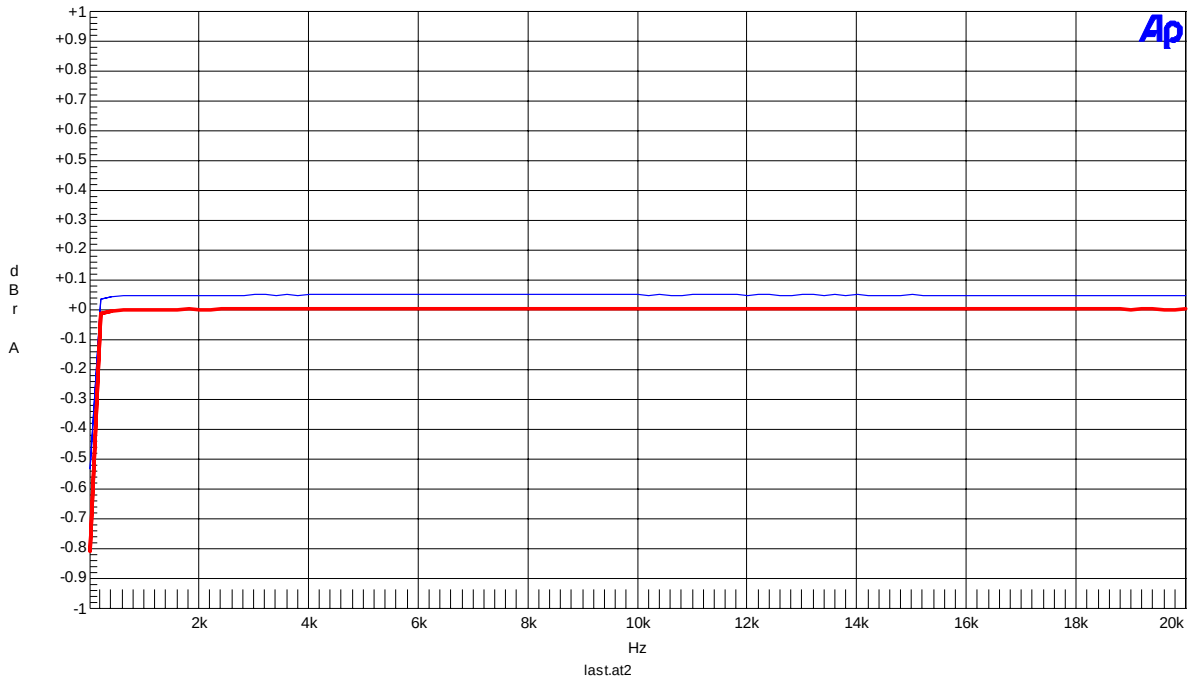


Figure1-7. Frequency Response (Input level=0dBV)

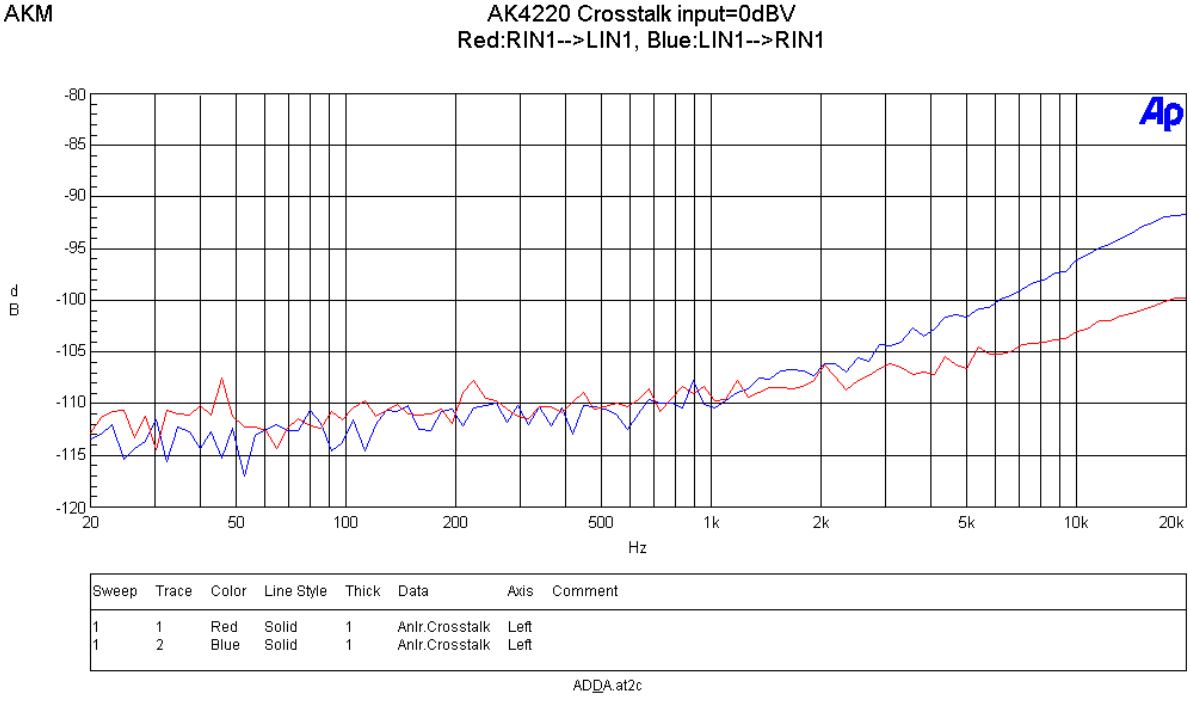


Figure1-8. Crosstalk (Input level=0dBV)

Plots(Video)

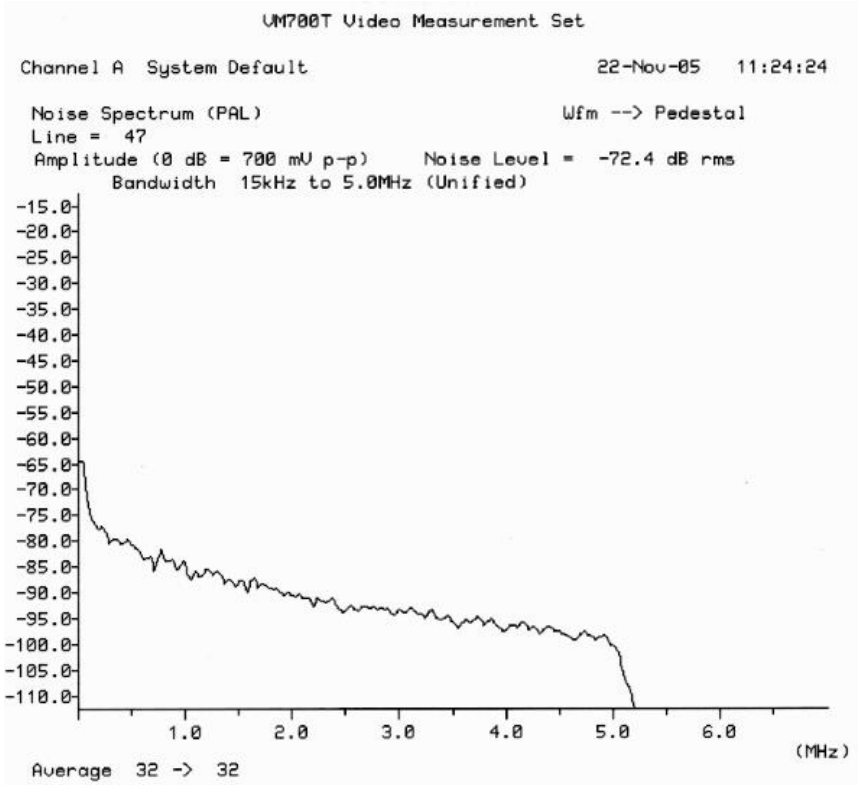


Figure 2-1. Noise spectrum (Input=0%flat field, BW=15kHz to 5MHz, uni weighted, SAG=1)

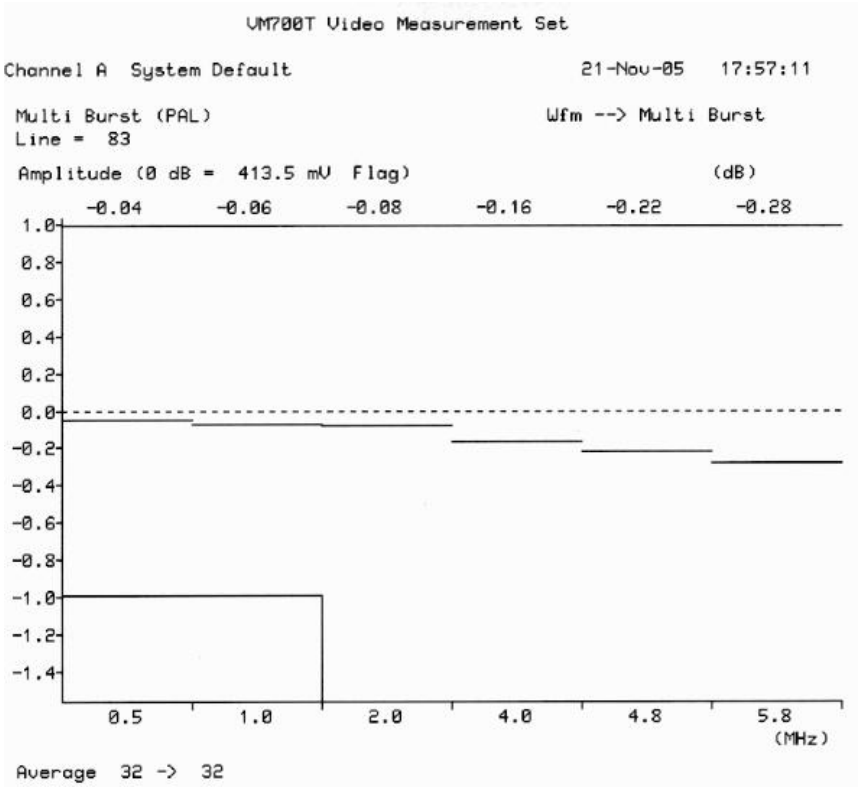


Figure 2-2. Frequency Response (Input= Multi Burst, SAG=1)

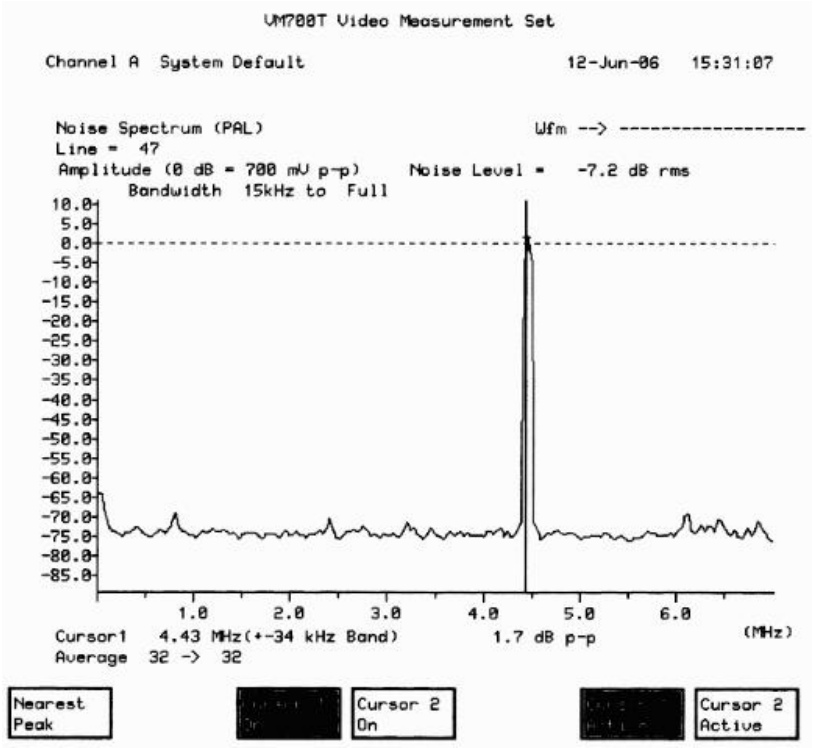


Figure 2-4 Crosstalk (Input= 100% red (VIN1), measured at VOUT1)

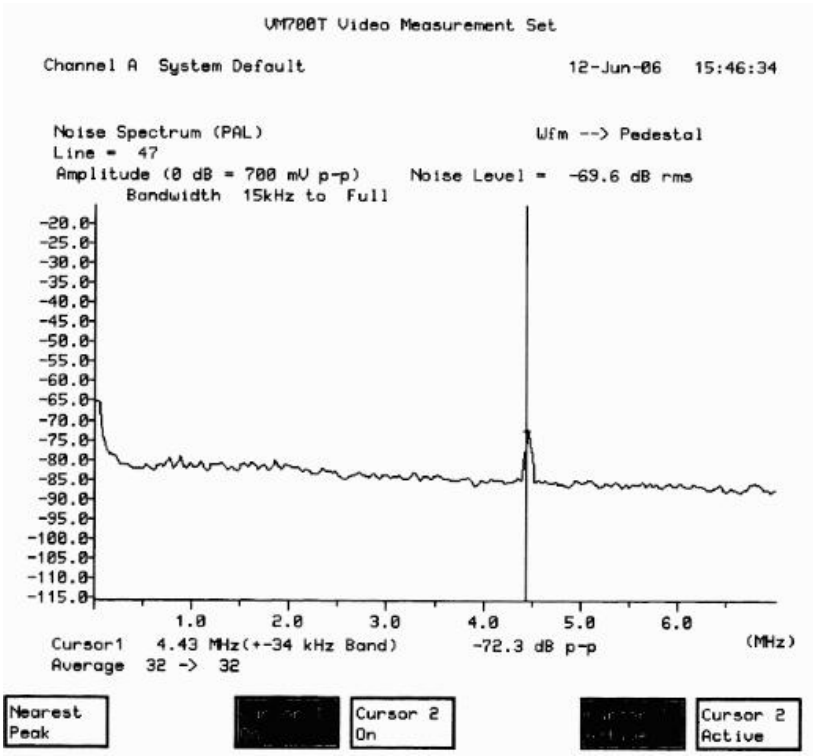


Figure 2-4 Crosstalk (Input= 100% red (VIN2), measured at VOUT1)

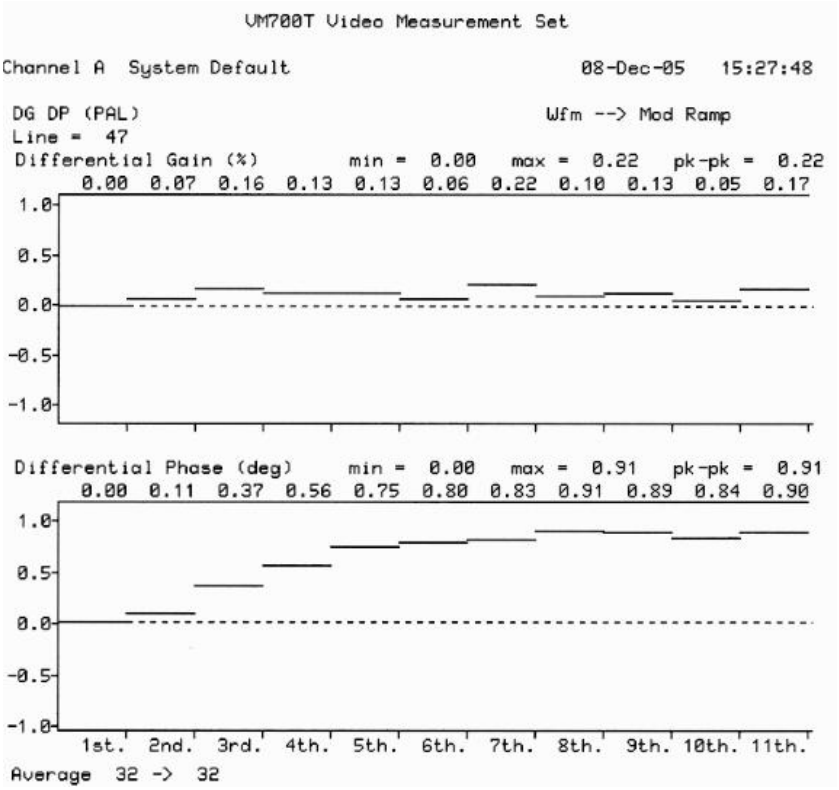


Figure 2-5 DG, DP (Input= Modulated Lamp, SAG=1)

Revision History

Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
06/06/12	KM083400	0	First Edition	

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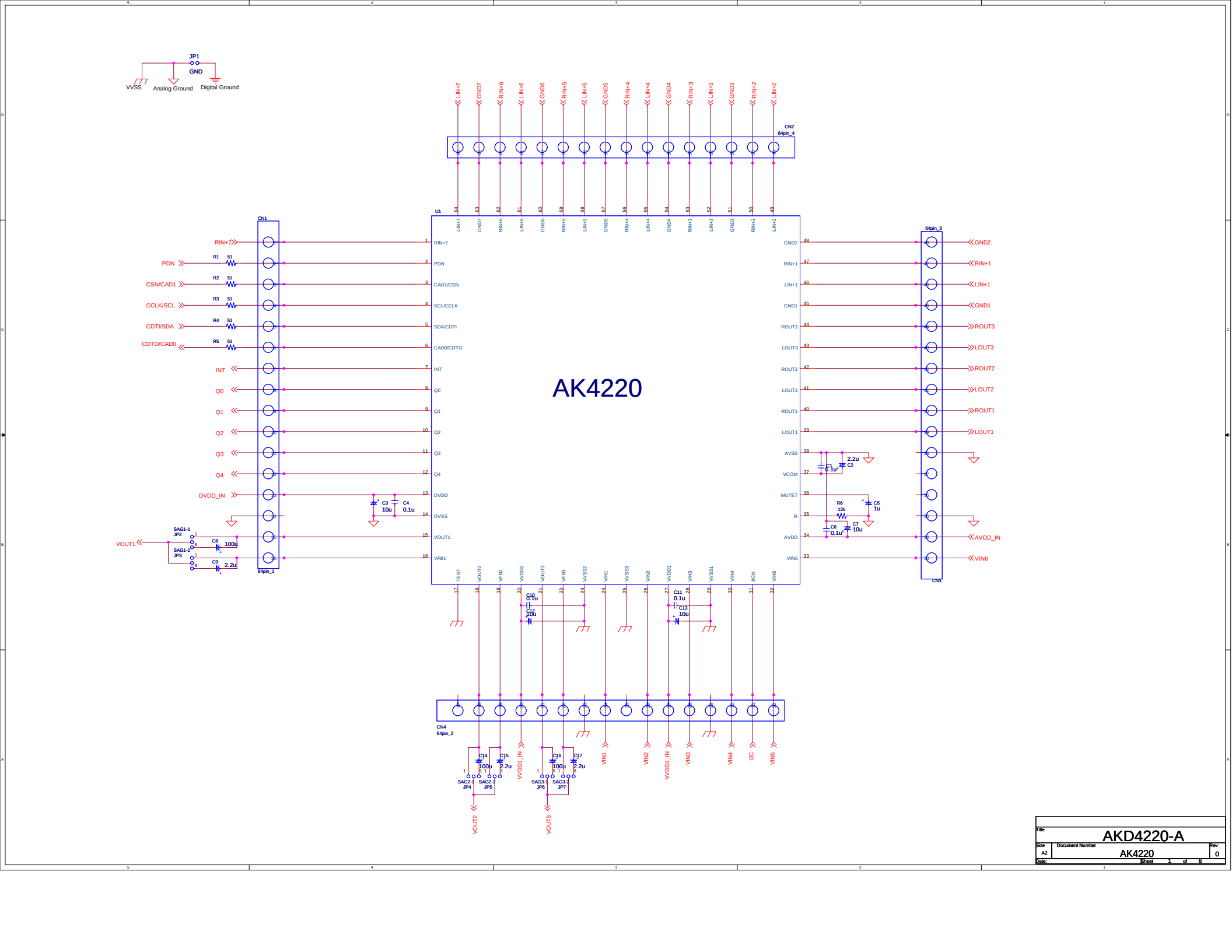

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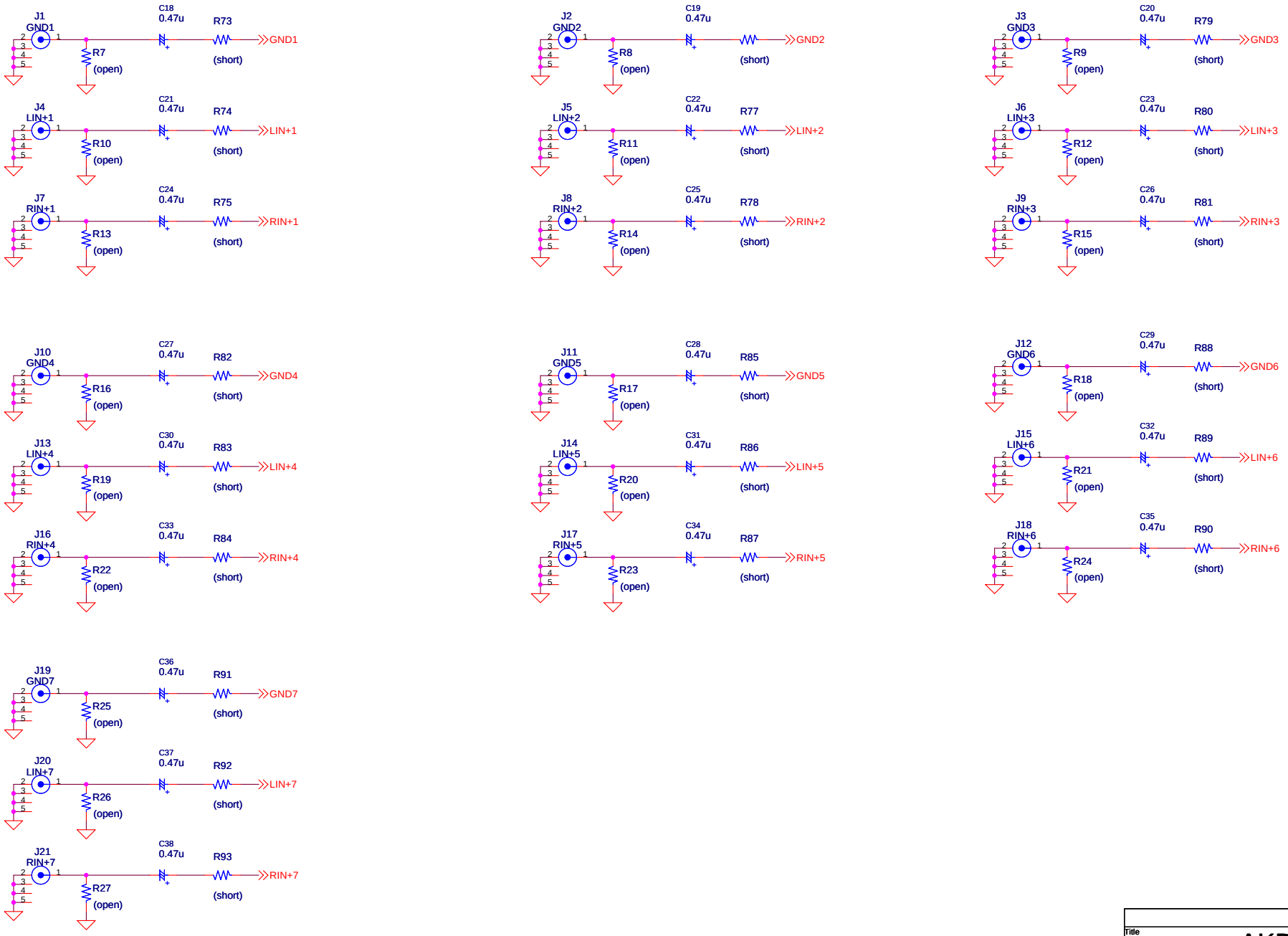
Date:	Sheet 1 of 6	



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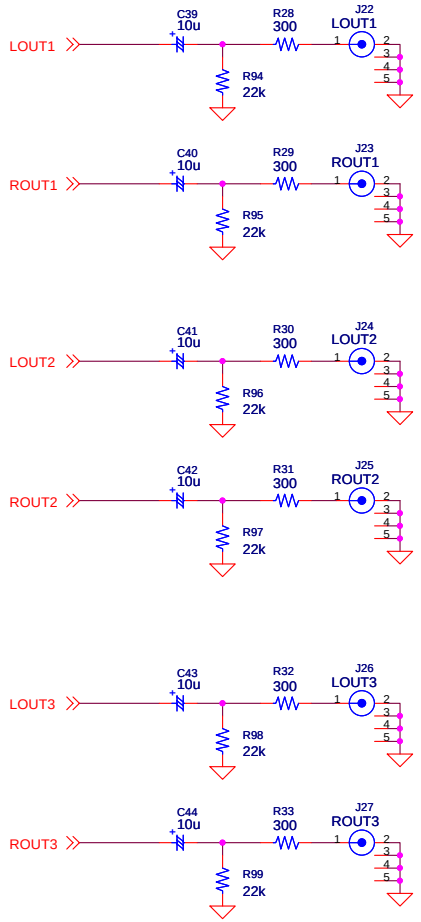
Date: Tuesday, September 13, 2005	Sheet 2 of 6	



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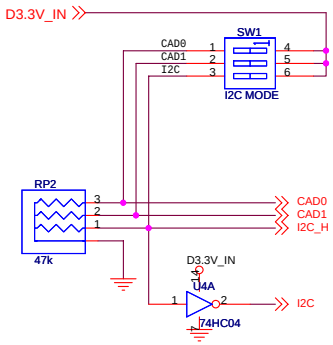

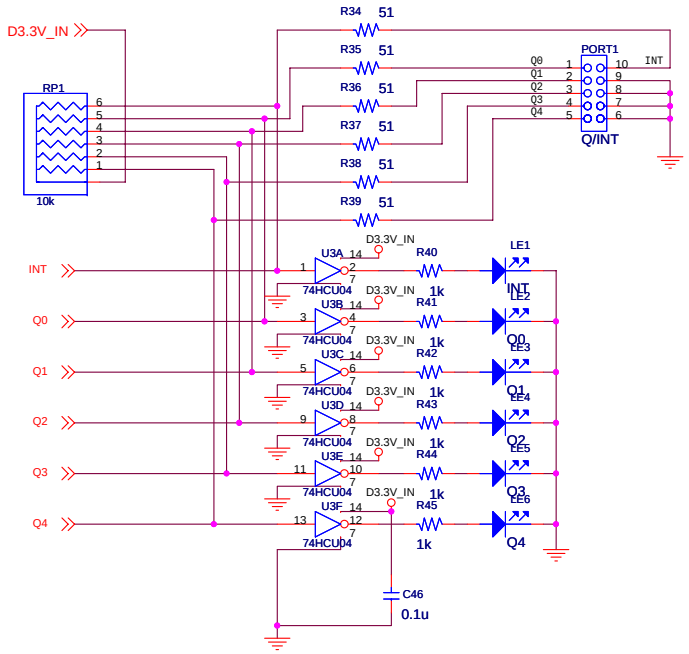

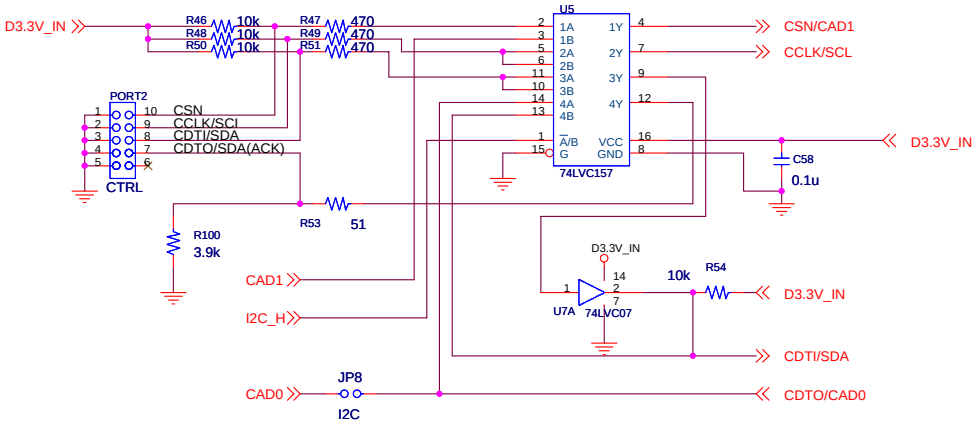

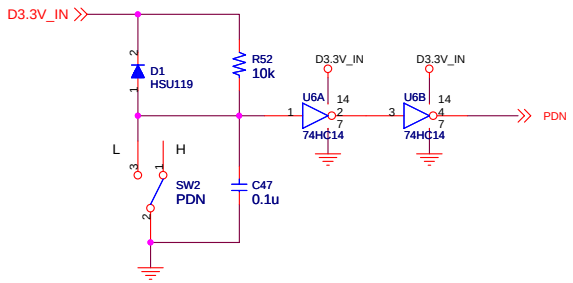

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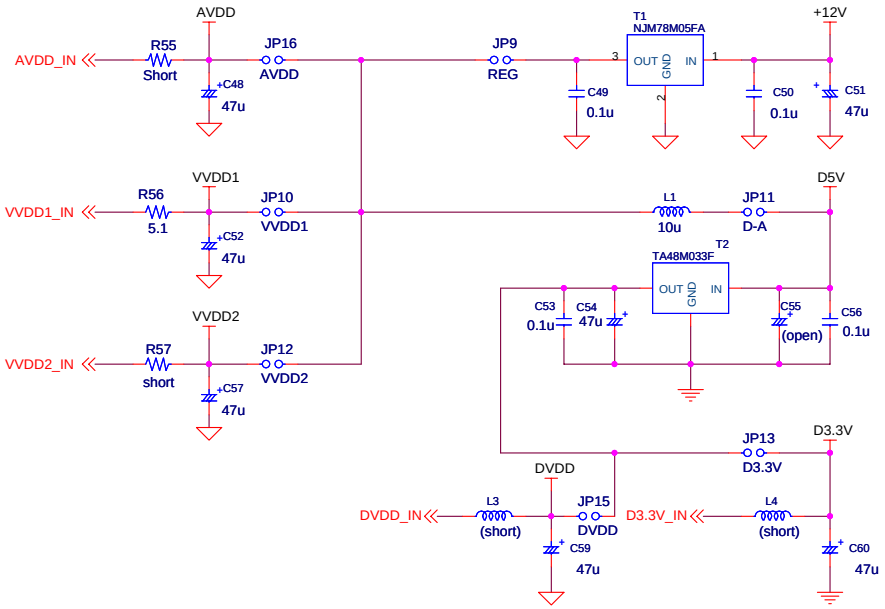
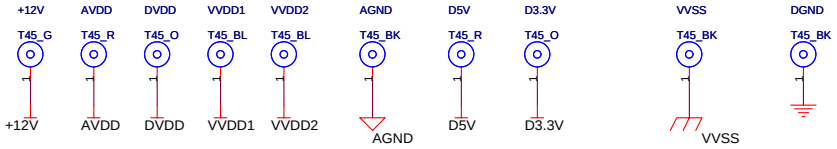
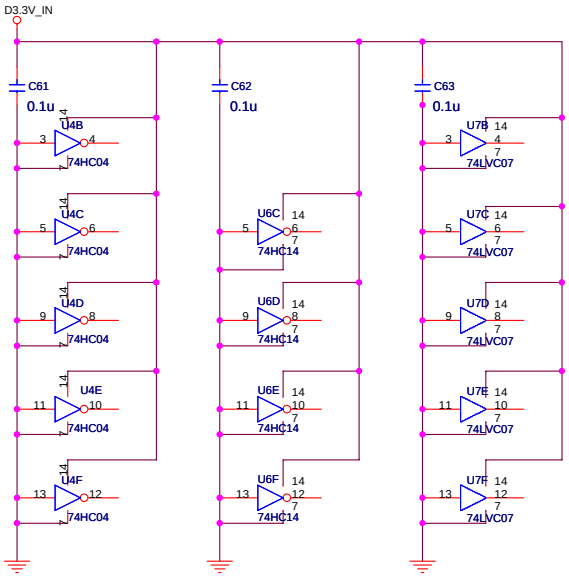
Date: Friday, May 19, 2006	Sheet 4 of 6	







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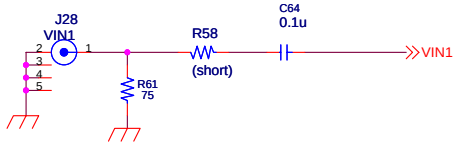

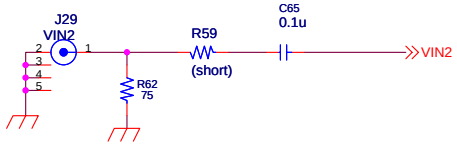

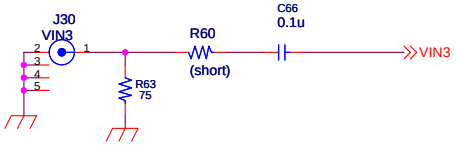

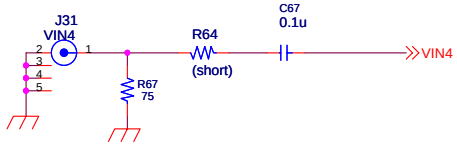

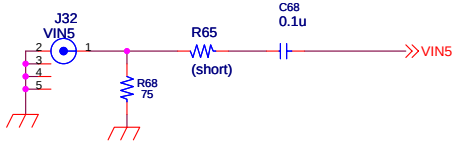

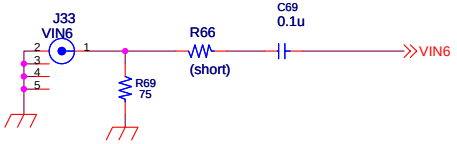

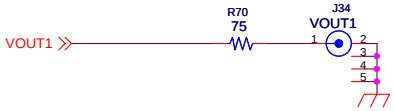

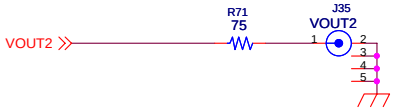

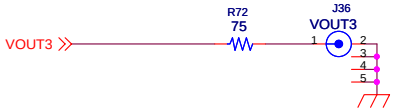

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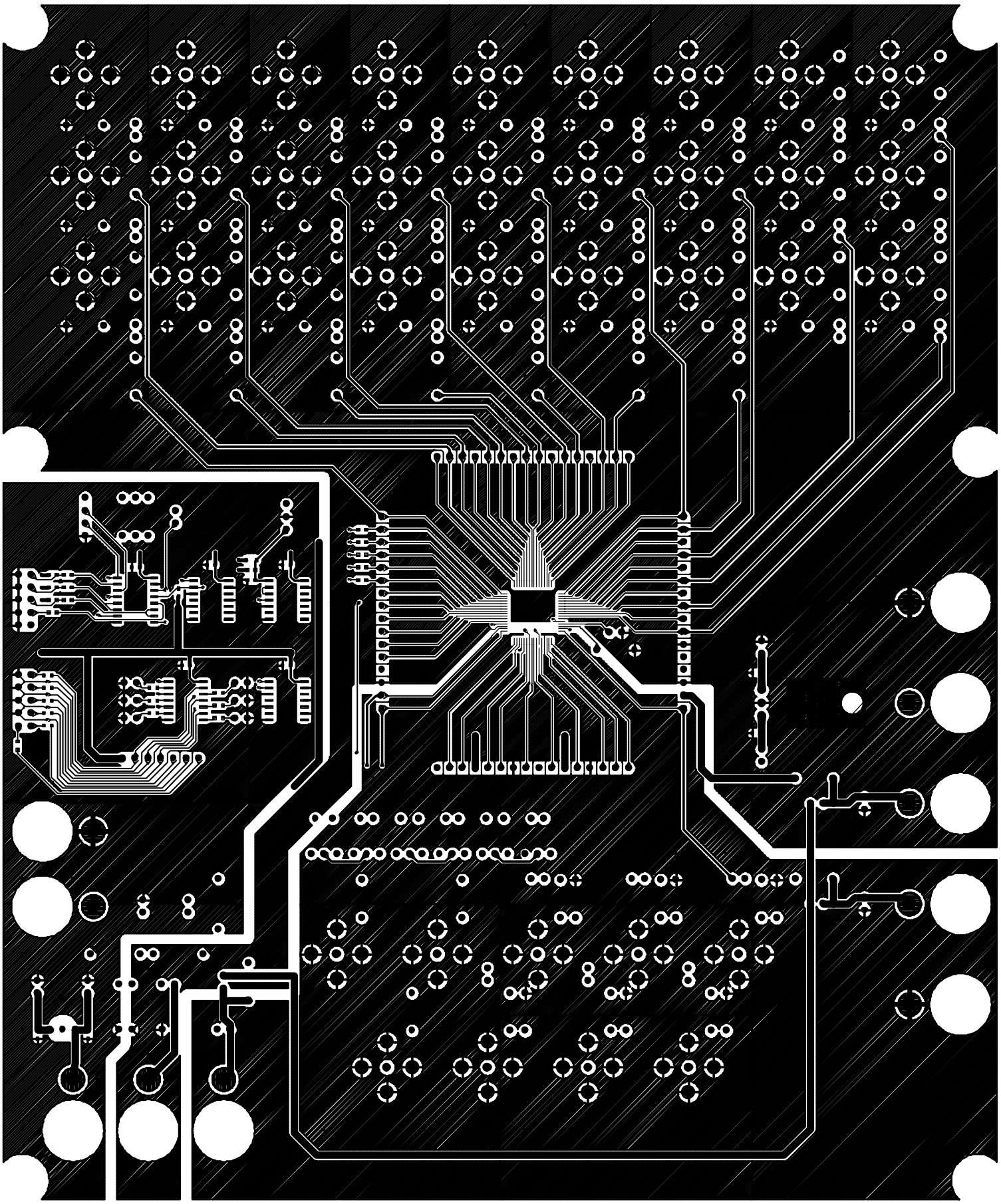

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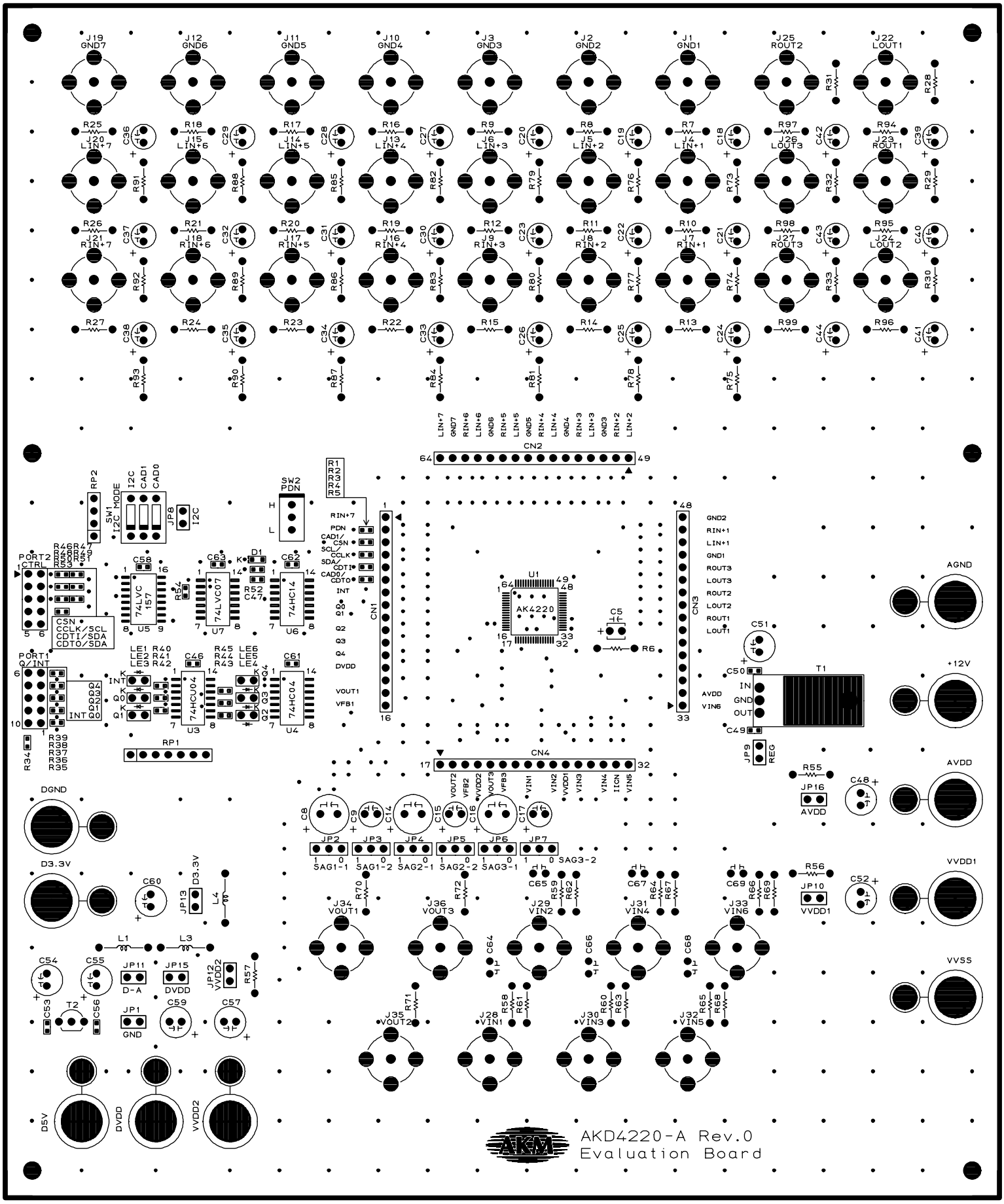

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