



AKD4223-A

AK4223 Evaluation Board Rev.2

GENERAL DESCRIPTION

AKD4223-A is an evaluation board for AK4223 that has various 6:2 audio and 6:2 video switches. This board can achieve the interface with AV systems via RCA connectors.

■ Ordering guide

- AKD4223-A --- AK4223 Evaluation Board
 - 10-wire flat cable for connection with printer port of PC (IBM-AT compatible machine), control software for AK4223, 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: 6 inputs 2 outputs
- RCA connectors for video: 6 inputs, 2 outputs
- 10-pin header for I²C serial control

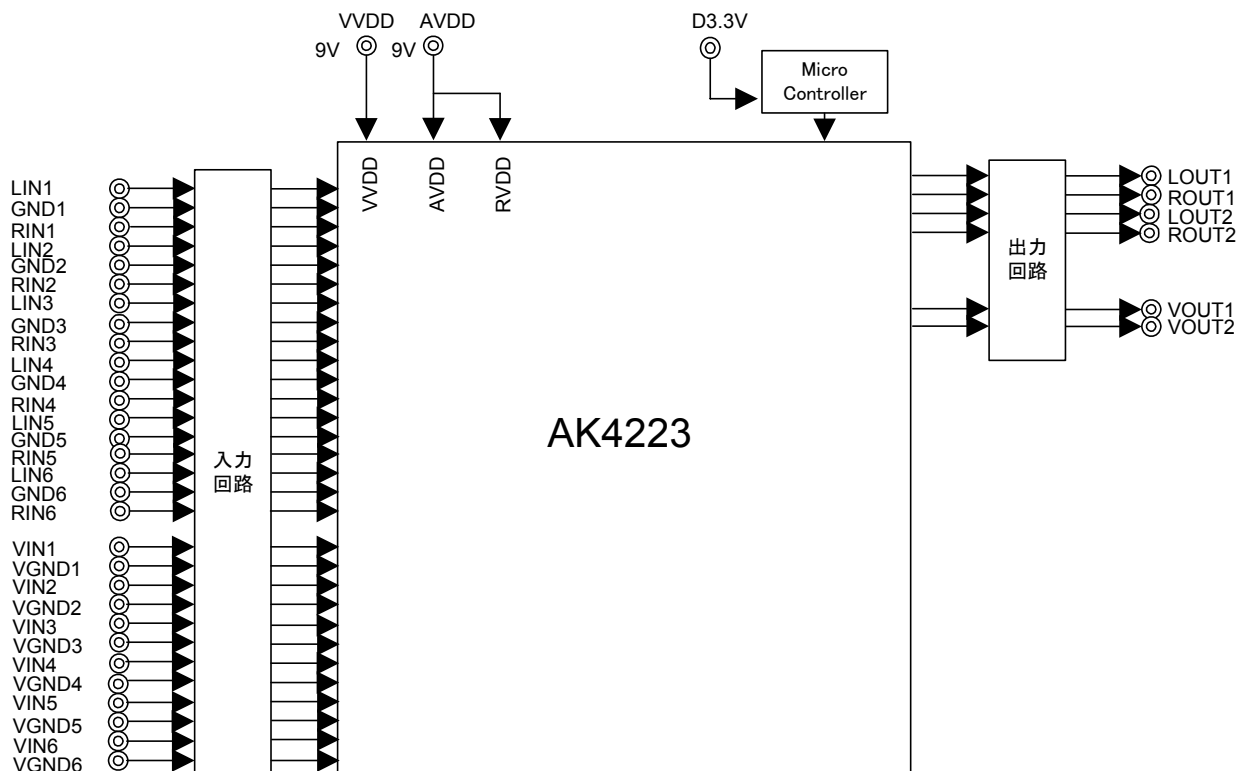


Figure 1. AKD4223-A Block Diagram

* 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
VVDD	Orange	+9V	AK4223 of VVDD	Should be always connected.	+9V
AVDD	Red	+9V	AK4223 of AVDD	Should be always connected.	+9V
D3.3V	Red	+3.3V	Digital Logic	Should be always connected.	+3.3V
AVSS	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 and JP2 (GND) is set to open.	0V

Table 1. 電源の配線

(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.

AK4223 should be reset once bringing SW1 (PDN) to “L” upon power-up.

■ Set up jumper pins

- 1) JP1 (GND) : AVSS and Digital ground.
OPEN : Separated.
SHORT : Common. <Default>
- 2) JP2 (GND) : VVSS and Digital ground.
OPEN : Separated.
SHORT : Common. <Default>
- 3) JP3~8 (GND): Differential input and the Single-end input
OPEN : Differential input
SHORT : Single-end input. <Default>
- 4) JP9~14 (GND): Differential input and the Single-end input
OPEN : Differential input
SHORT : Single-end input . <Default>

■ The function of the toggle SW

[SW1] (PDN): Resets the AK4223. Keep “H” during normal operation.

■ **Serial Control**

The AK4223 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 AKD4223-A by 10-wire flat cable (packed with AKD4223-A). Take care of the direction of 10-pin connector and 10-pin header.

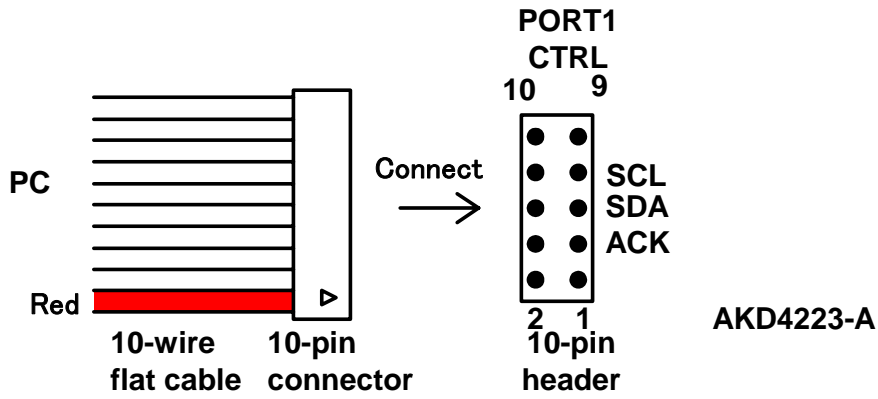


Figure 2. 10-wire flat cable, 10-pin connector, and 10-pin header

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

(1) Audio Input Circuit

GND1, LIN1, RIN1 ~ GND6, LIN6, RIN6 Input circuits

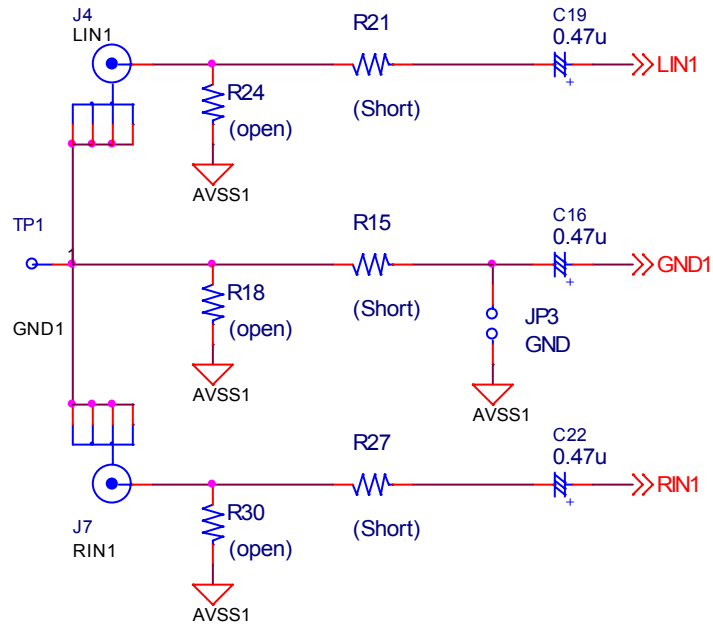


Figure 3. GND1, LIN1, RIN1 Input circuit

(2) Audio Output Circuit

LOUT1/ROUT1 ~ LOUT2/ROUT2 Output circuits

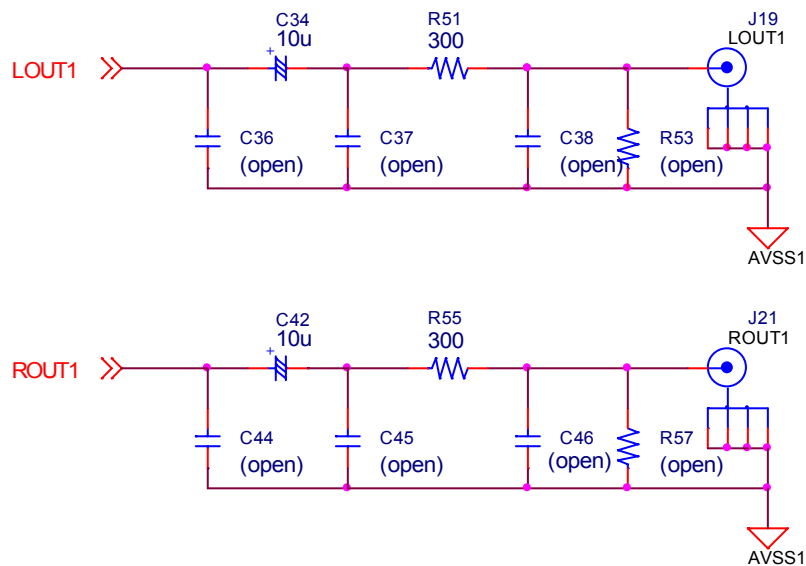


Figure 4. LOUT1/ROUT1 Output circuit

(3) Video Input Circuit

VIN1, VGND1 ~ VIN6, VGND6 Input circuits

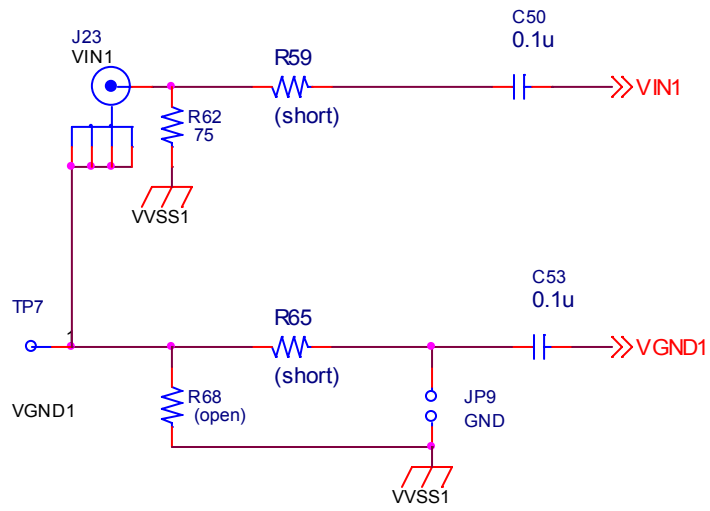


Figure 5. VIN1 Input circuit

(4) Video Output Circuit

VOUT1 ~ VOUT2 Output circuits

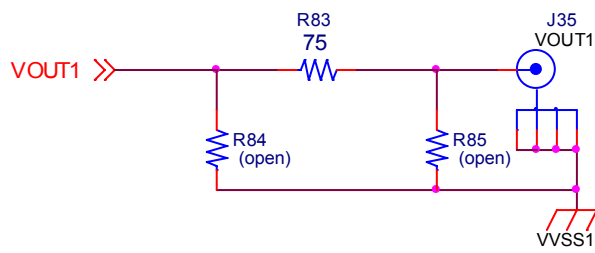


Figure 6. VOUT1 Output circuit

Control Soft Manual

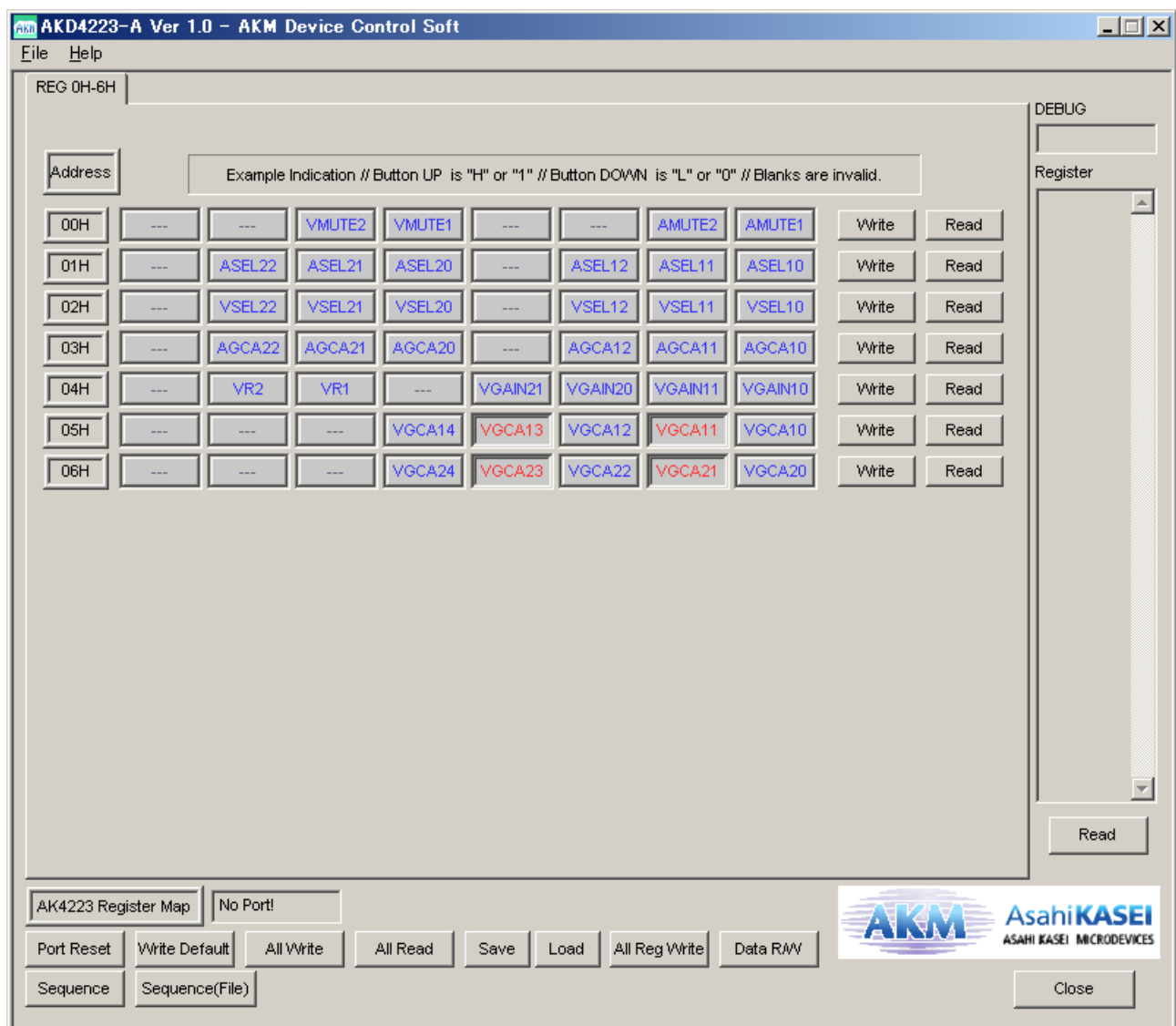
■ **Evaluation Board and Control Soft Settings**

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.



■ 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. [All Read]: Executing read commands for all registers displayed.
5. [Save]: Saving current register settings to a file.
6. [Load]: Executing data write from a saved file.
7. [All Reg Write]: [All Reg Write] dialog box is popped up.
8. [Data R/W]: [Data R/W] dialog box is popped up.
9. [Sequence]: [Sequence] dialog box is popped up.
10. [Sequence(File)]: [Sequence(File)] dialog box is popped up.
11. [Read]: Reading current register settings and display on to the Register area (on the right of the main window).
This is different from [All Read] button, it does not reflect to a register map, only displaying hexadecimal.

1. [REG]: Register Map

This tab is for a register writing and reading.

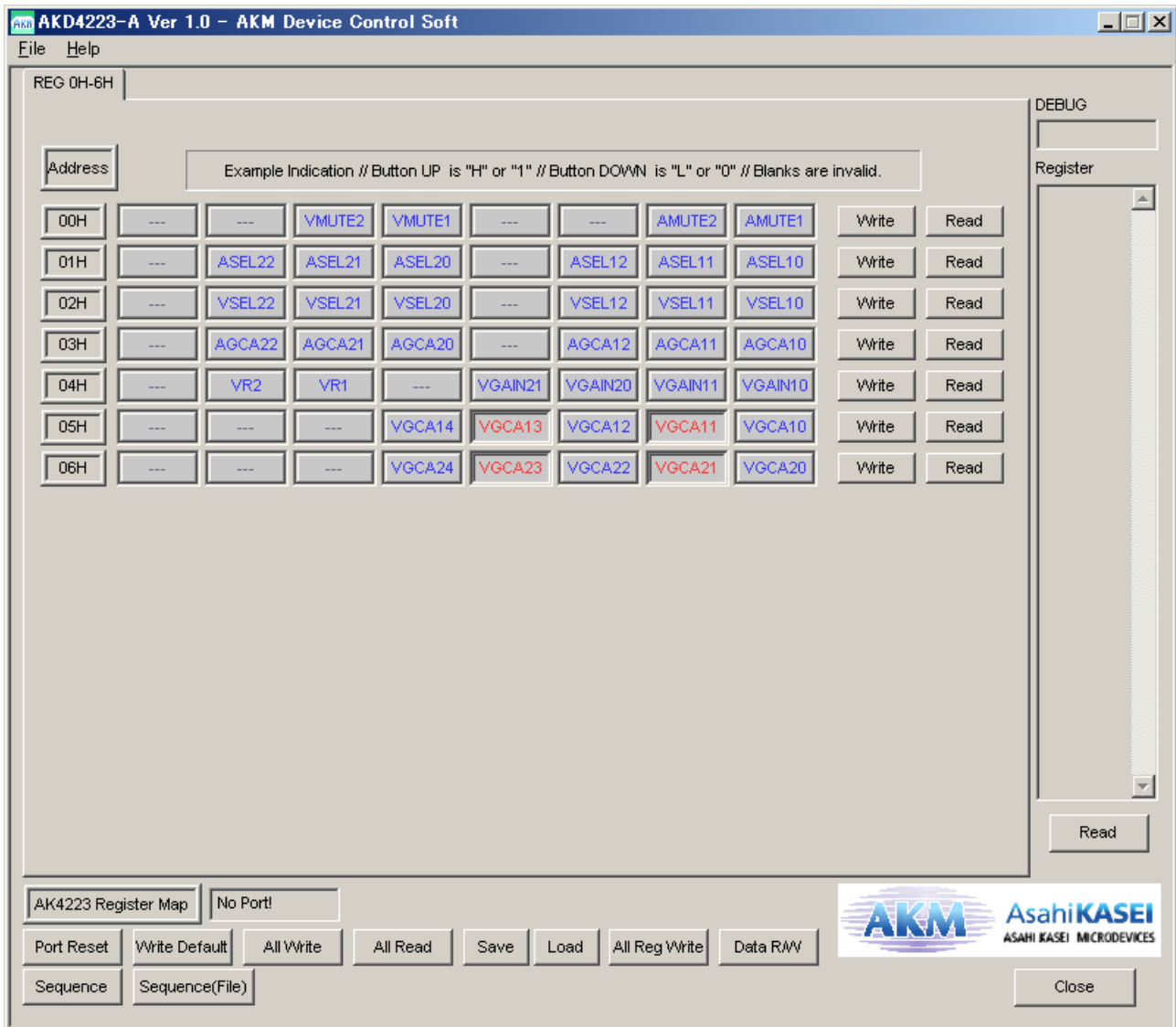
Each bit on the register map is a push-button switch.

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 “---”.

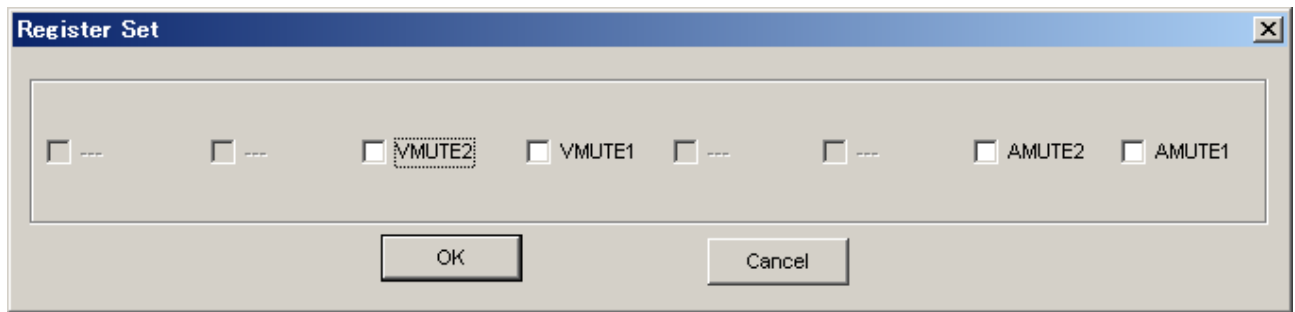


[Write]: Data Writing Dialog

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.



[Read]: Data Read

Click [Read] button located on the right of the each corresponded address to execute register reading.

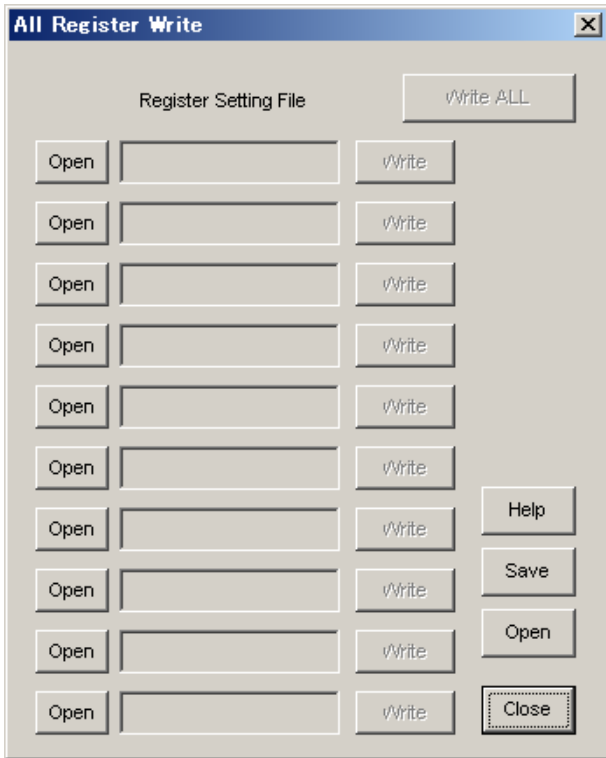
After register reading, the display will be updated regarding to the register status.
Button Down indicates “H” or “1” and the bit name is in red (when read only it is in deep red).
Button Up indicates “L” or “0” and the bit name is in blue (when read only it is in gray)

Please be aware that button statuses will be changed by Read command.

■ Dialog Boxes

1. [All Reg Write]: All Reg Write dialog box

Click [All Reg Write] button in the main window to open register setting files.
 Register setting files saved by [SAVE] button can be applied.



[Open (left)]: Selecting a register setting file (*.akr).

[Write]: Executing register writing.

[Write All]: Executing all register writings.

Writings are executed in descending order.

[Help]: Help window is popped up.

[Save]: Saving the register setting file assignment. The file name is “*.mar”.

[Open (right)]: Opening a saved register setting file assignment “*. mar”.

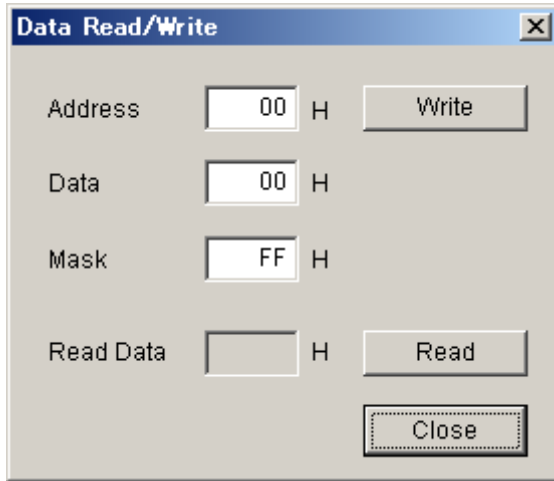
[Close]: Closing the dialog box and finish the process.

*Operating Suggestions

- (1) Those files saved by [Save] button and opened by [Open] button on the right of the dialog “*.mar” should be stored in the same folder.
- (2) When register settings are changed by [Save] button in the main window, re-read the file to reflect new register settings.

2. [Data R/W]: Data R/W Dialog Box

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



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.

[Read]: Reading from the address specified by "Address" box.

The result will be shown in the Read Data Box in hexadecimal numbers.

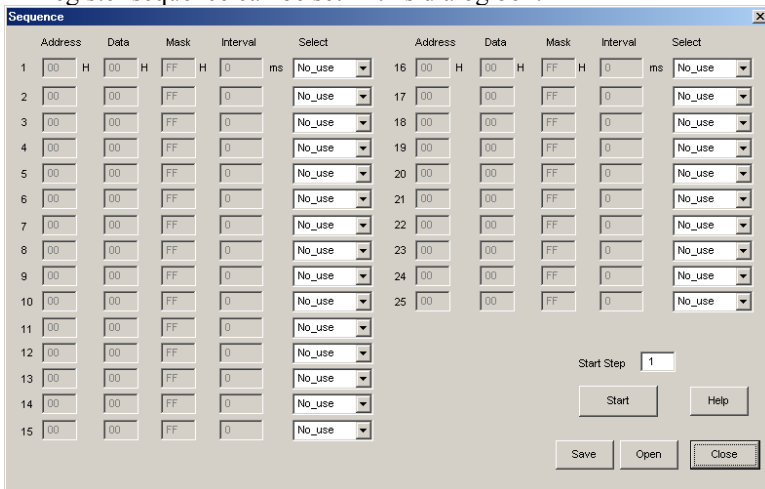
[Close]: Closing the dialog box and finish the process.

Data writing can be cancelled by this button instead of [Write] button.

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

3. [Sequence]: Sequence Dialog Box

Click [Sequence] button to open register sequence setting dialog box.
 Register sequence can be set in this dialog box.



Sequence Setting

Set register sequence by following process bellow.

(1) Select a command

Use [Select] pull-down box to choose commands.

Corresponding boxes will be valid.

< Select Pull-down menu >

- No_use: Not using this address
- Register: Register writing
- Reg(Mask): Register writing (Masked)
- Interval: Taking an interval
- Stop: Pausing the sequence
- End: Finishing the sequence

(1) Input sequence

[Address]: Data address

[Data]: Writing data

[Mask]: Mask

[Data] box data is ANDed with [Mask] box data. This is the actual writing data.

When Mask = 0x00, current setting is hold.

When Mask = 0xFF, the 8bit data which is set in the [Data] box is written.

When Mask = 0x0F, lower 4bit data which is set in the [Data] box is written.

Upper 4bit is hold to current setting.

[Interval]: Interval time

Valid boxes for each process command are shown bellow.

- No_use: None
- Register: [Address], [Data], [Interval]
- Reg(Mask): [Address], [Data], [Mask], [Interval]
- Interval: [Interval]
- Stop: None
- End: None

Control Buttons

The function of Control Button is shown bellow.

[Start]: Executing the sequence

[Help]: Opening a help window

[Save]: Saving sequence settings as a file. The file name is "*.aks".

[Open]: Opening a sequence setting file "*.aks".

[Close]: Closing the dialog box and finish the process.

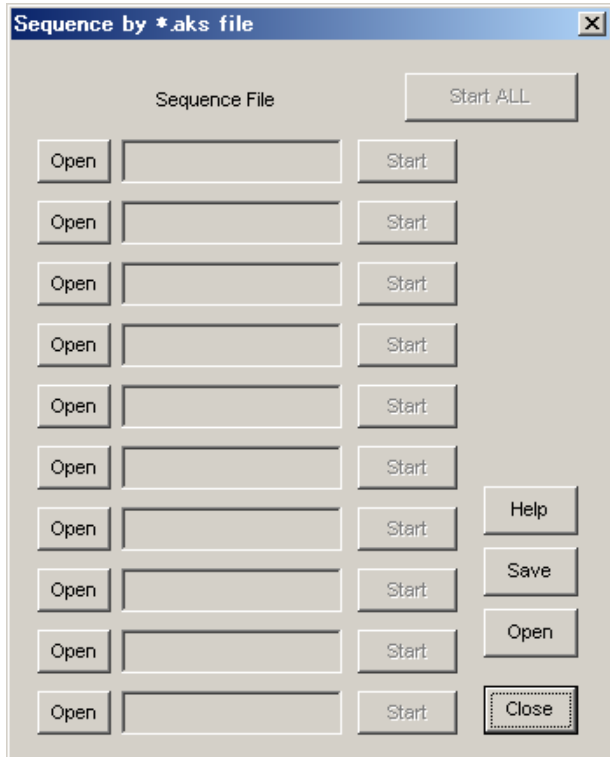
Stop of the sequence

When "Stop" is selected in the sequence, processing is paused and it starts again when [Start] button is clicked. Restarting step number is shown in the "Start Step" box. When finishing the process until the end of sequence, "Start Step" will return to "1".

The sequence can be started from any step by writing the step number to the "Start Step" box. Write "1" to the "Start Step" box and click [Start] button, when restarting the process from the beginning.

4. [Sequence(File)]: Sequence Setting File Dialog Box

Click [Sequence(File)] button to open sequence setting file dialog box.
 Those files saved in the “Sequence setting dialog” can be applied in this dialog.



[Open (left)]: Opening a sequence setting file (*.aks).

[Start]: Executing the sequence setting.

[Start All]: Executing all sequence settings.

Sequences are executed in descending order.

[Help]: Pop up the help window.

[Save]: Saving sequence setting file assignment. The file name is “*.mas”.

[Open(right)]: Opening a saved sequence setting file assignment “*. mas”.

[Close]: Closing the dialog box and finish the process.

*Operating Suggestions

- (1) Those files saved by [Save] button and opened by [Open] button on the right of the dialog “*.mas” should be stored in the same folder.
- (2) When “Stop” is selected in the sequence the process will be paused and a pop-up message will appear. Click “OK” to continue the process.



MEASUREMENT RESULTS

■ **Audio**

[Measurement condition]

- Measurement unit : Audio Precision System two Cascade
- BW : 10Hz~20kHz
- Power Supply : AVDD=9V, VVDD=9V, RVDD=9V,
- Temperature : Room
- Measurement signal line path: LIN1/RIN1 → LOUT1/ROUT1

Parameter	Input signal	Measurement filter	LOUT	ROUT	Unit
S/(N+D) at 1Vrms Output	1kHz, 0dB	20kHz Brick-wall lowpass	90.8	89.2	dB
DR	1kHz, -60dB	20kLPF, A-weighted	94.6	94.6	dB
S/N	Off	20kLPF, A-weighted	94.6	94.6	dB

■ **Video**

[Measurement condition]

- Signal Generator : Sony Tectonics TG2000
- Measurement unit : Sony Tectonics VM700T
- Power Supply : AVDD=9V, VVDD=9V, RVDD=9V
- Temperature : Room
- Measurement signal line path : VIN1 → VOUT1

Parameter	Measurement conditions	Results	Unit
S/N	Input = 0% flat field BW= 100kHz to 6MHz	66.7	dB
Crosstalk	Input = 100%red(VIN), f=4.43MHz VOUT1->VOUT2	58.5	dB
DG	Input = 5step Modulated	0.16	%
DP	Input = 5step Modulated	0.96	deg

Plots (Audio)

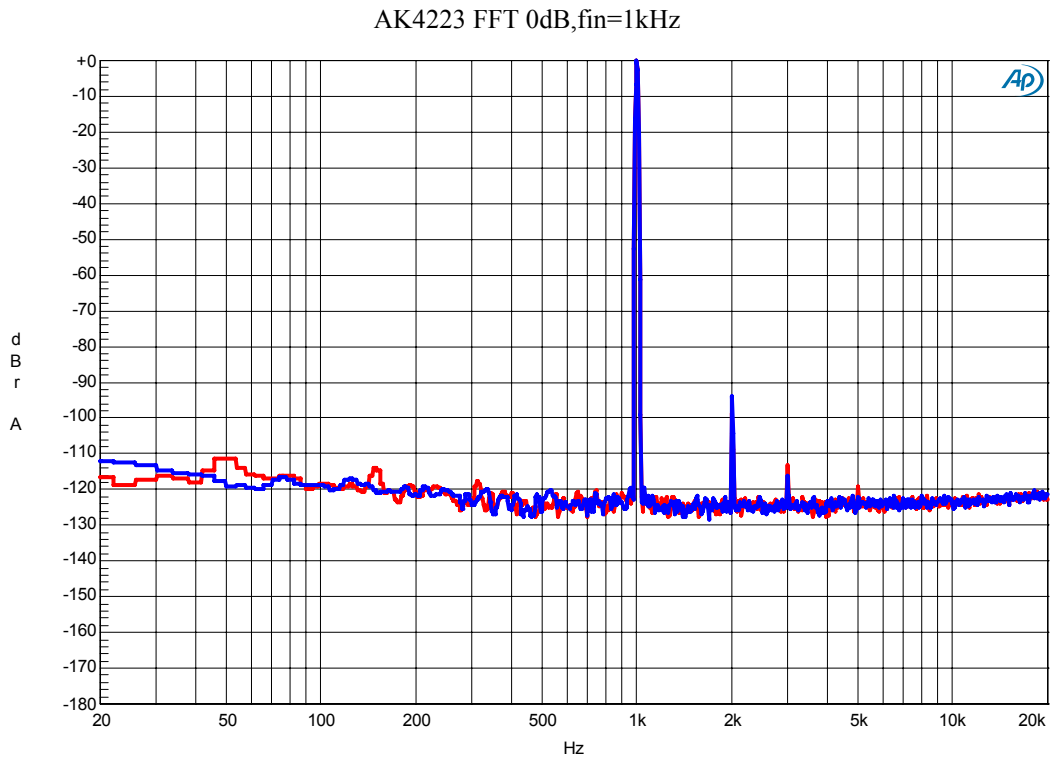


Figure 7. FFT (fin=1kHz Input Level=0dB)

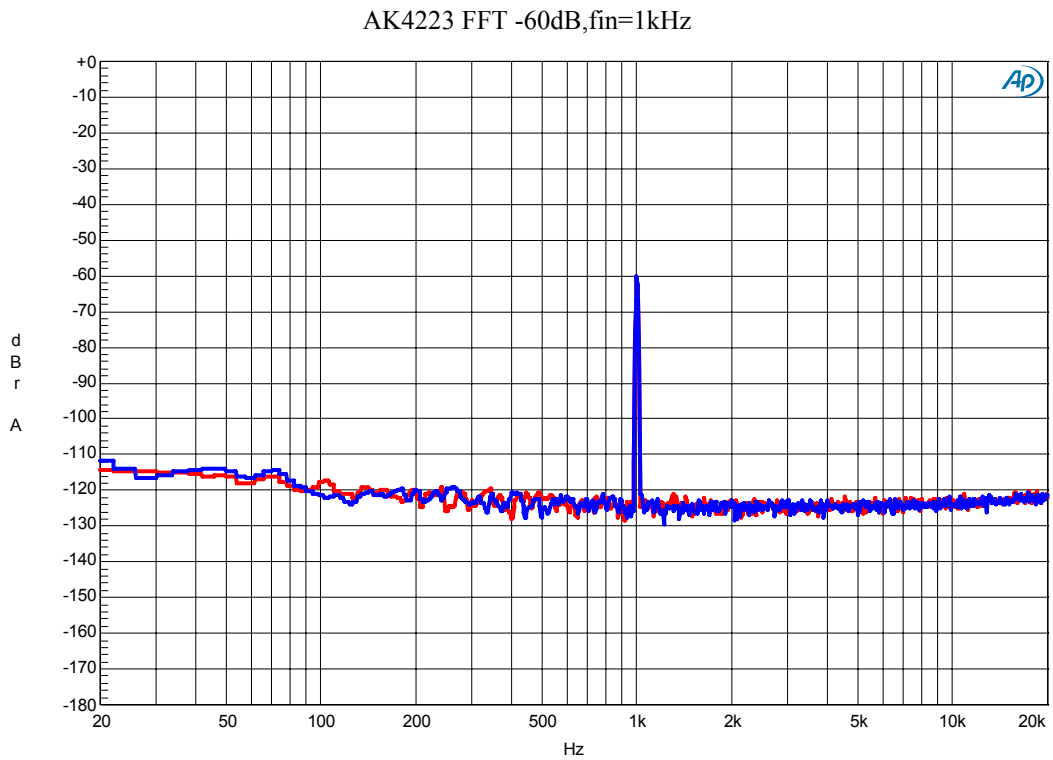


Figure 8. FFT (fin=1kHz Input Level=-60dB)

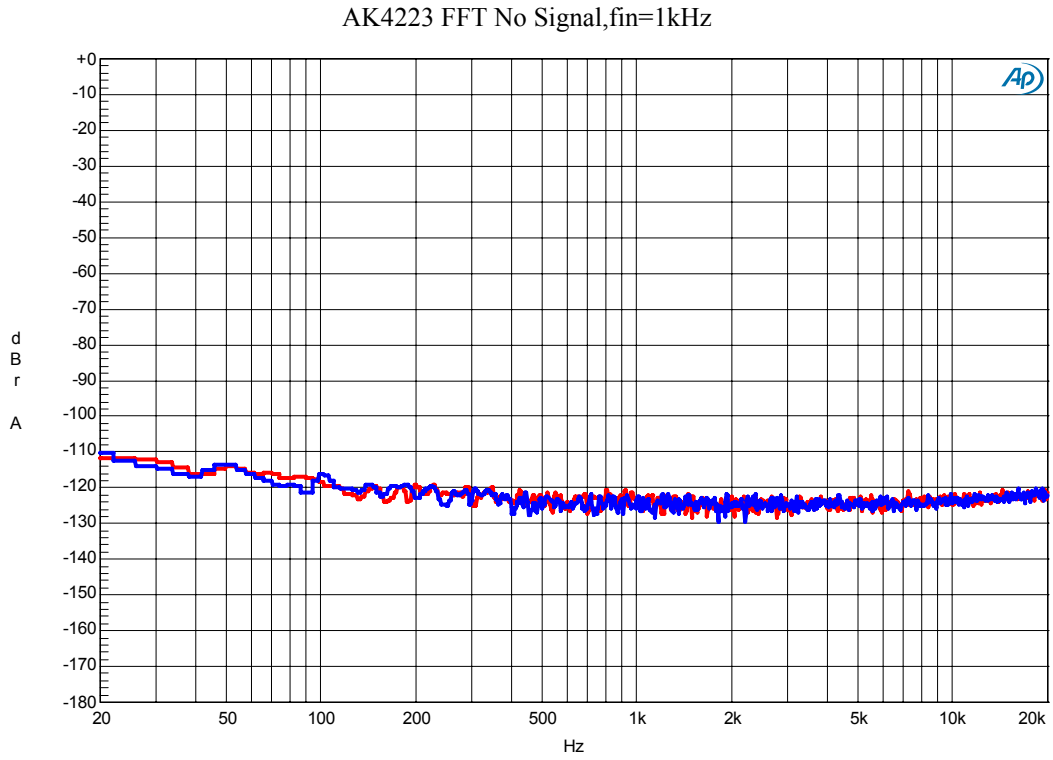


Figure 9. FFT (Noise Floor)

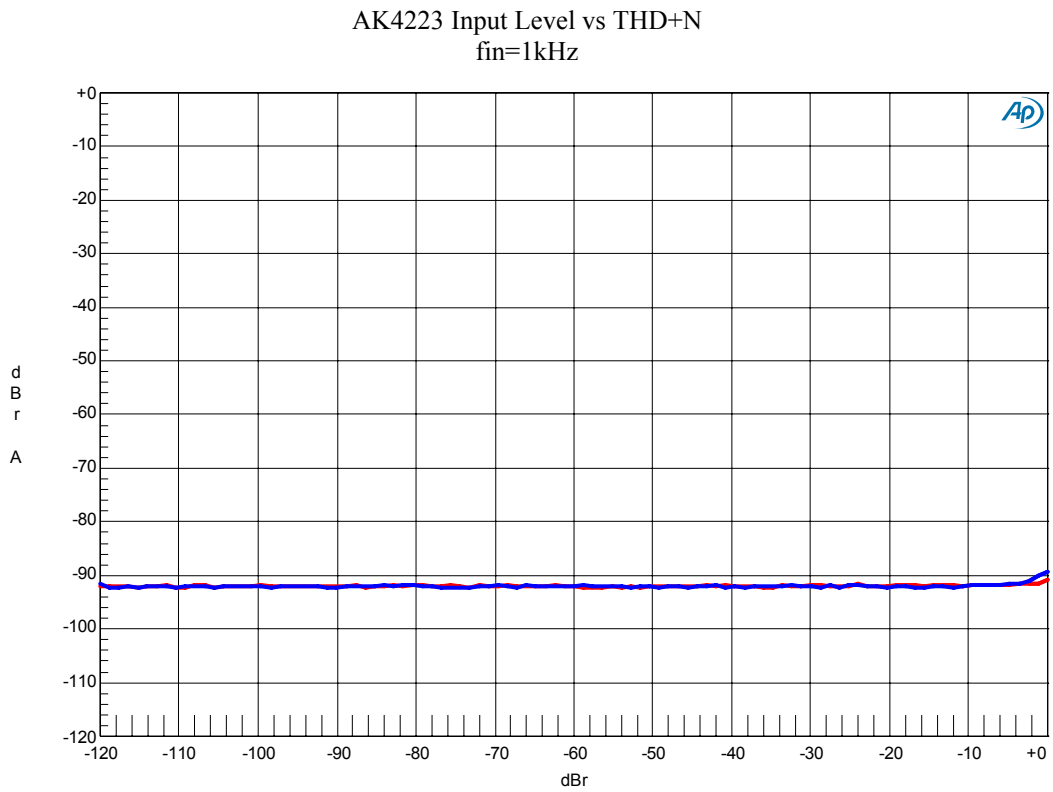


Figure 10. THD+N vs. Input level (fin=1kHz)

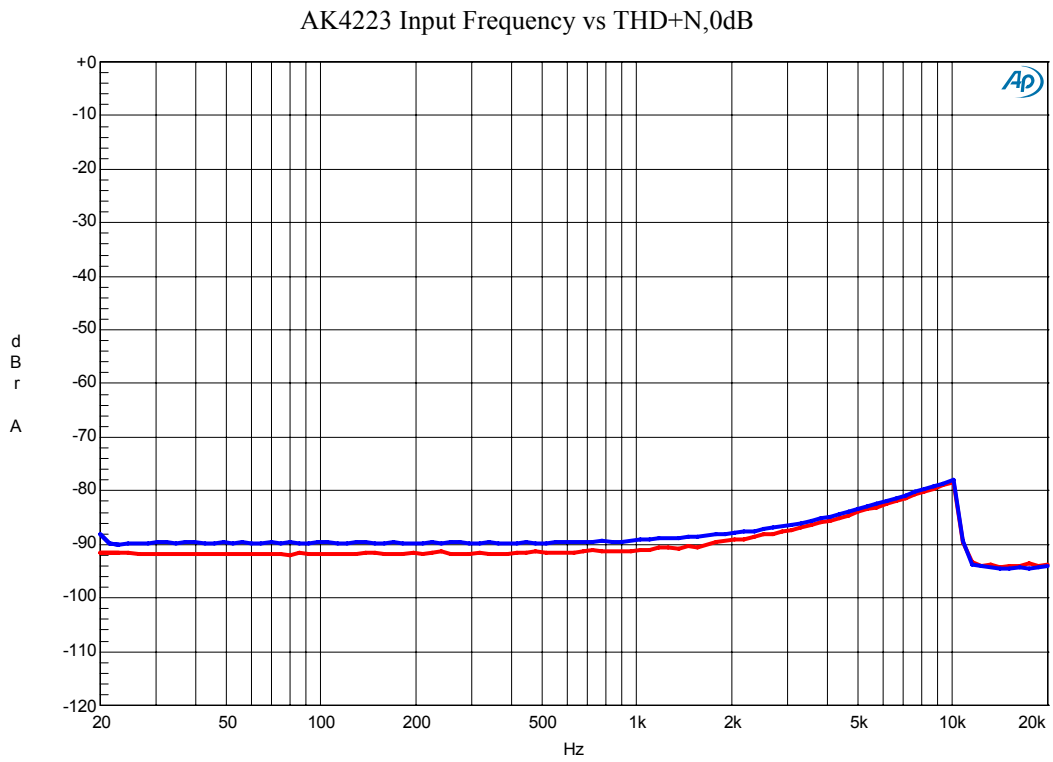


Figure 11. THD+N vs. Input Frequency (Input level=0dB)

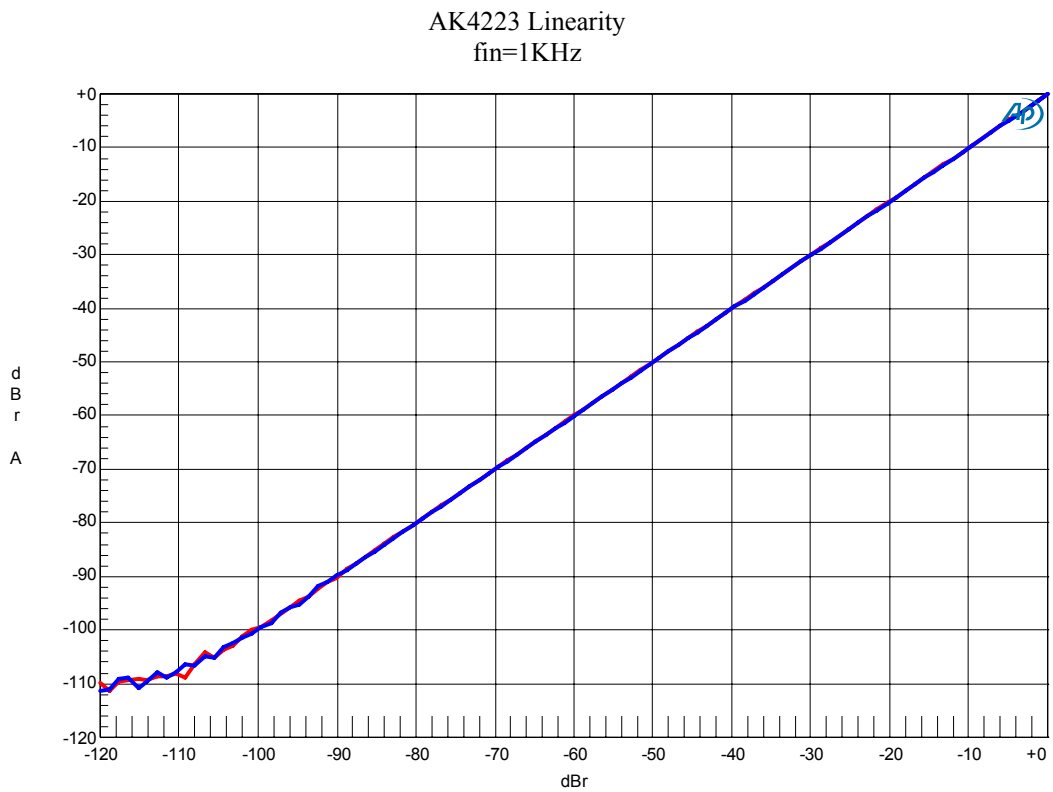


Figure 12. Linearity (fin=1kHz)

AK4223 Frequency Response
0dB

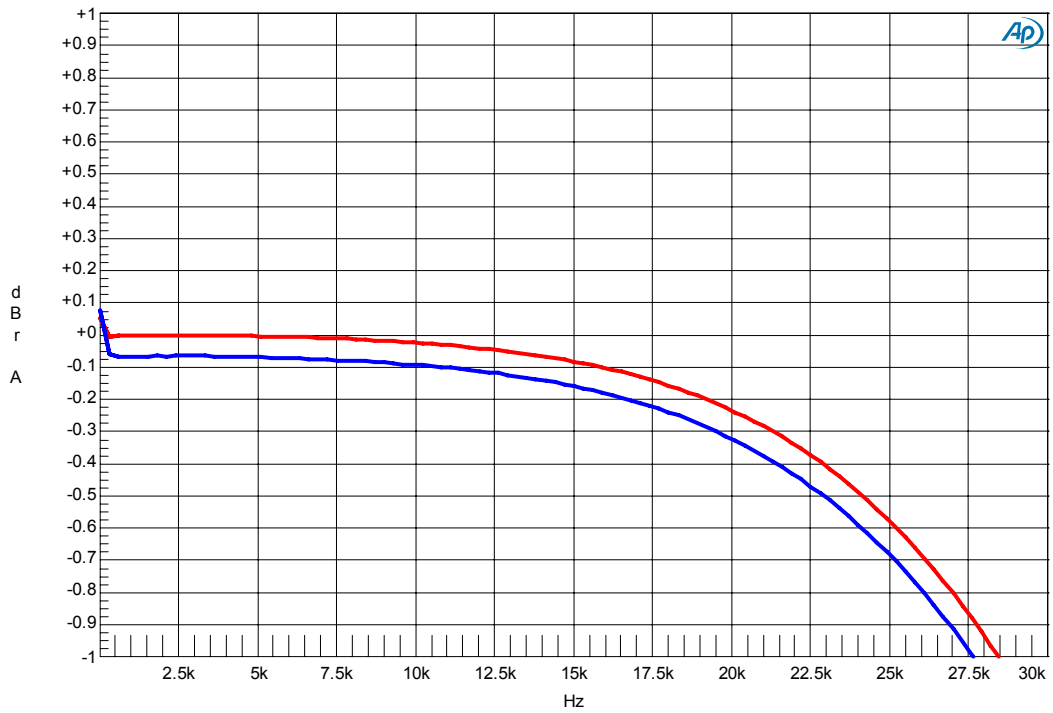


Figure 13. Frequency Response (Input level=0dB)

AK4223 Crosstalk
0dB

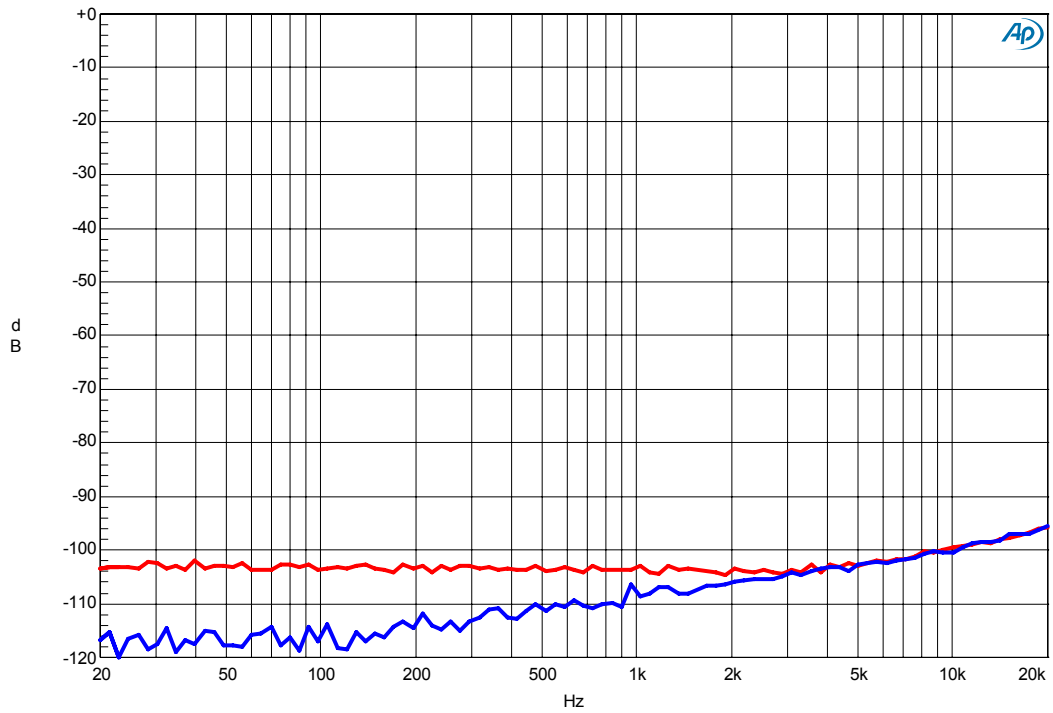


Figure 14. Crosstalk (Input level=0dB)

Plots(Video)

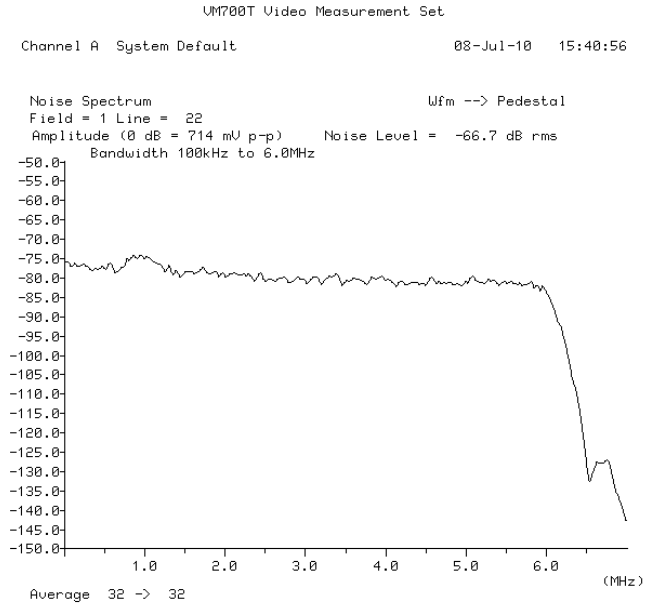


Figure 15. Noise spectrum (Input=0%flat field, BW=100kHz to 6MHz,)

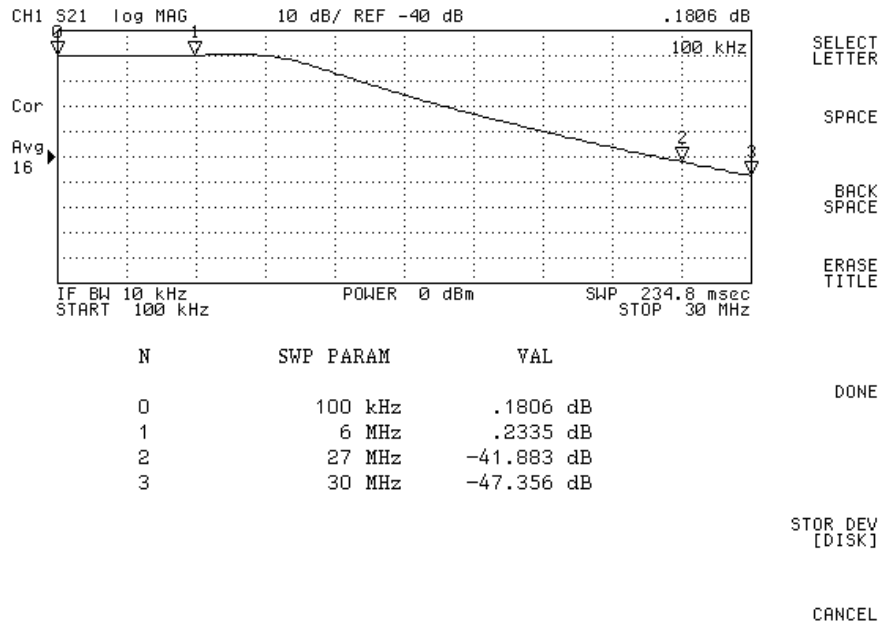


Figure 16. Frequency Response

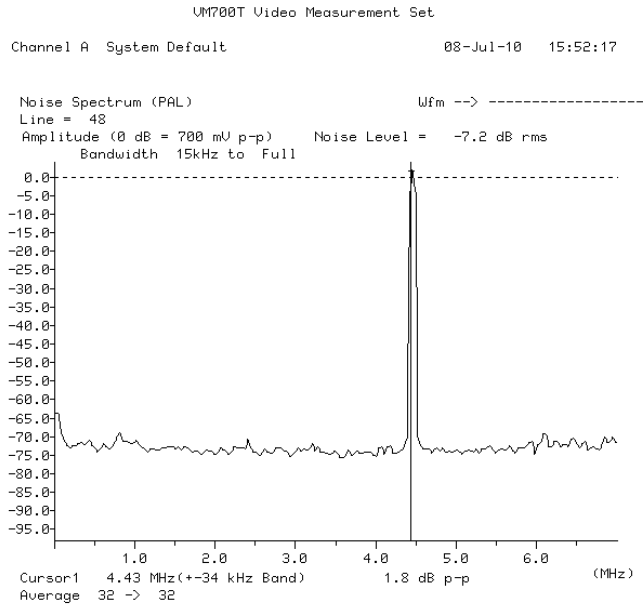


Figure 17. Crosstalk (Input= 100% red (VIN1), measured at VOUT1)

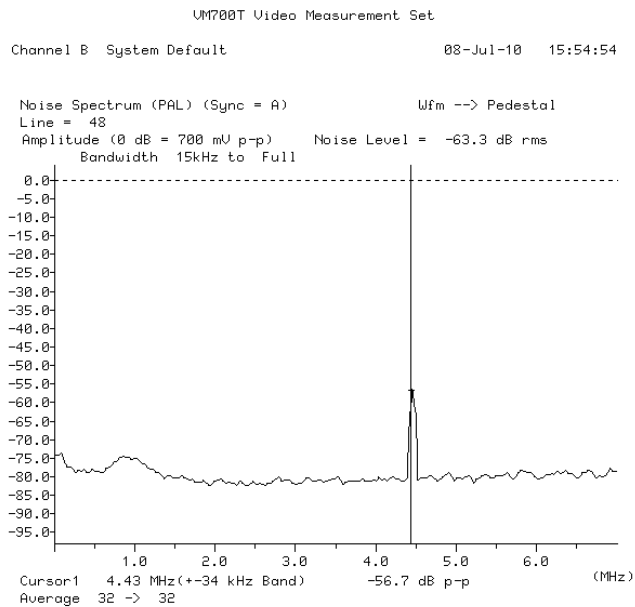


Figure 18. Crosstalk (Input= 100% red (VIN1), measured at VOUT2)

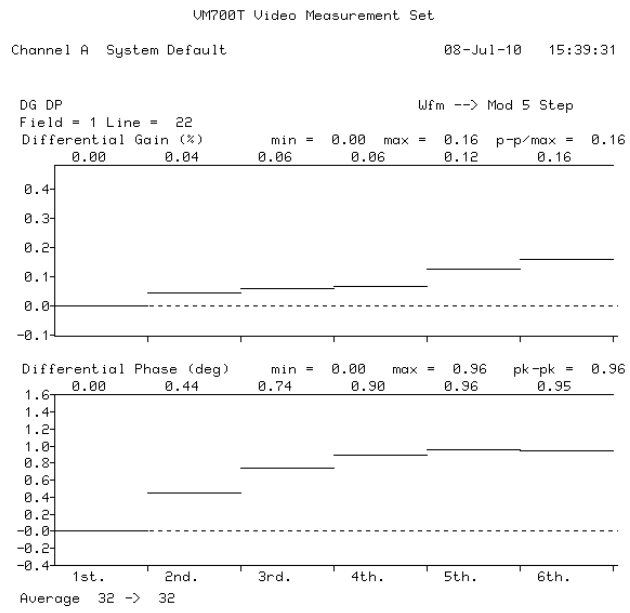


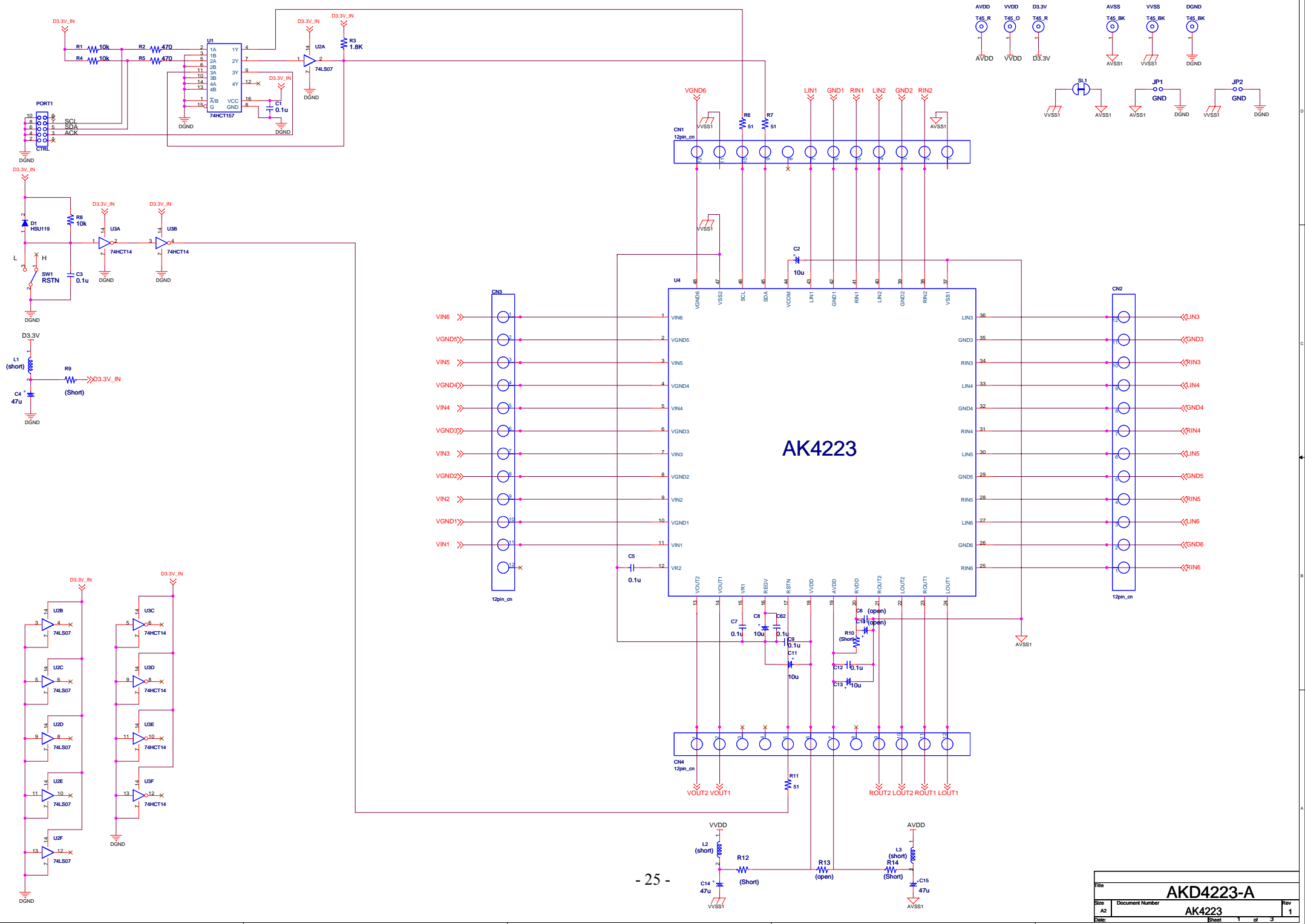
Figure 19. DG, DP (Input= 5Step Modulated Lamp)

Revision History

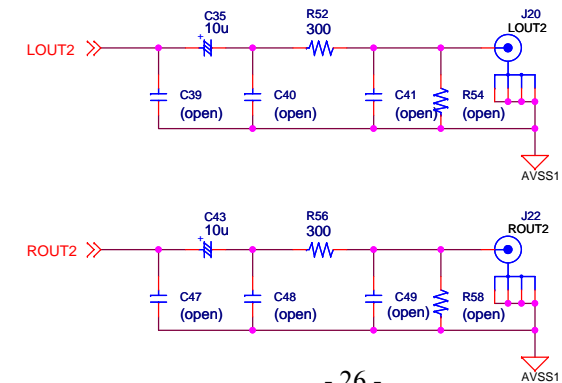
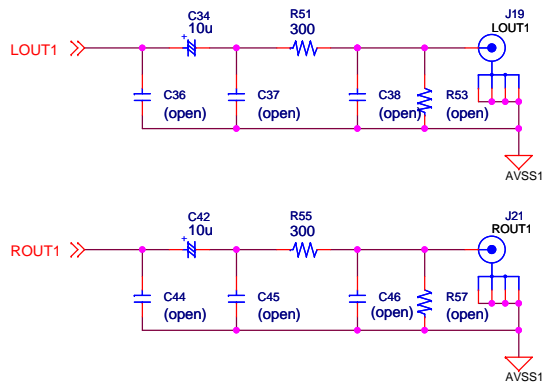
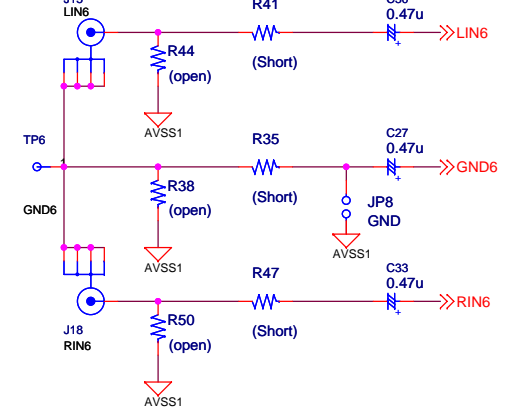
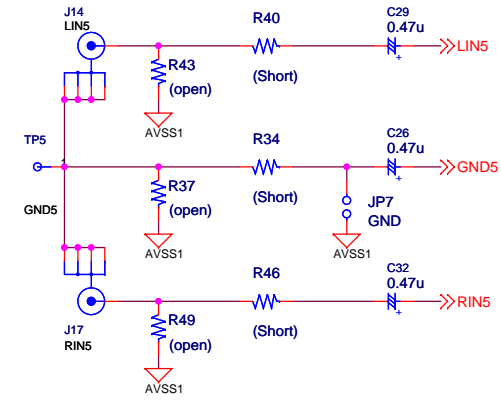
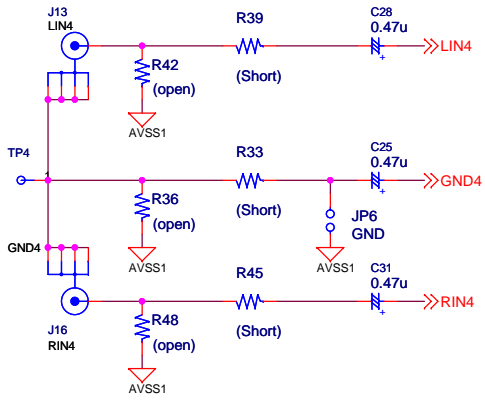
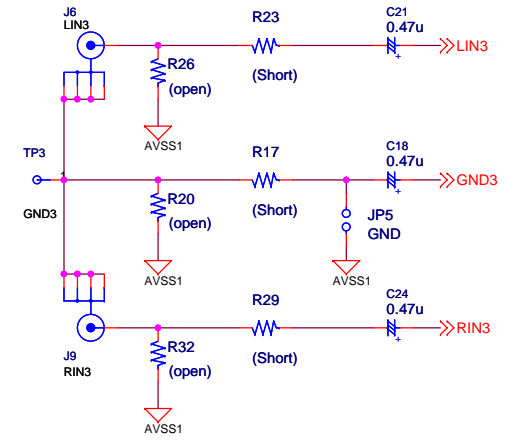
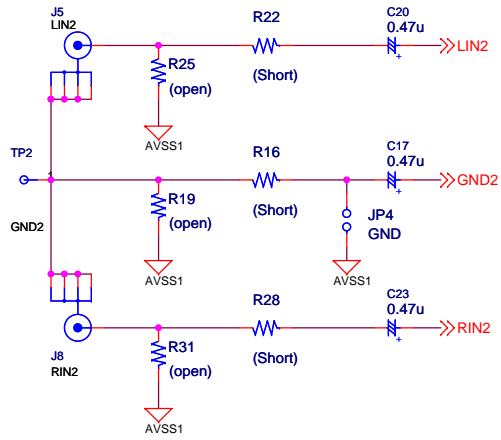
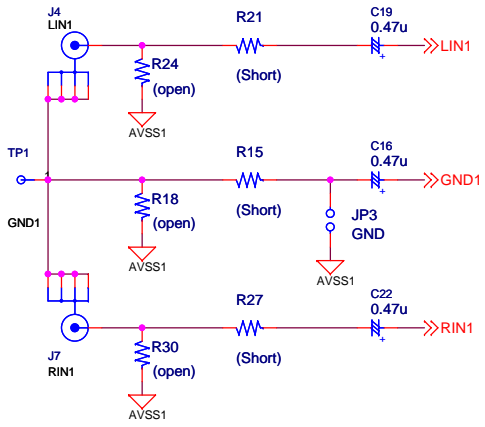
Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
10/08/20	KM101302	2	First Edition	

IMPORTANT NOTICE

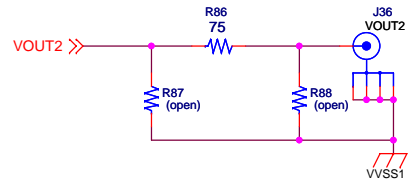
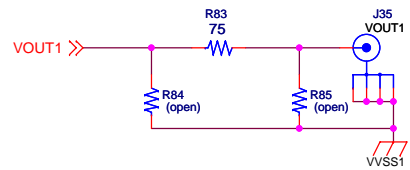
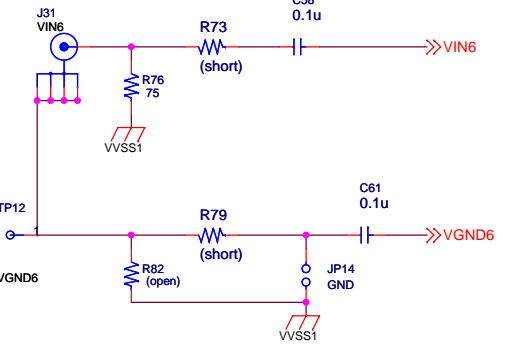
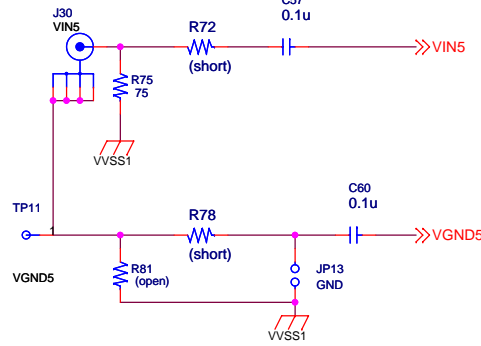
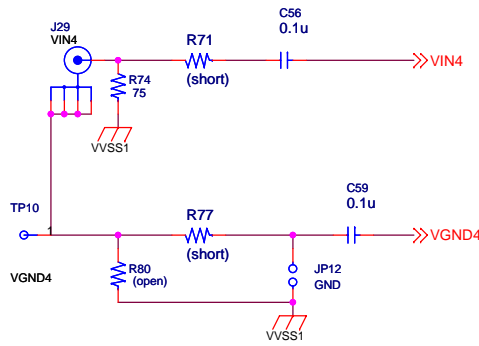
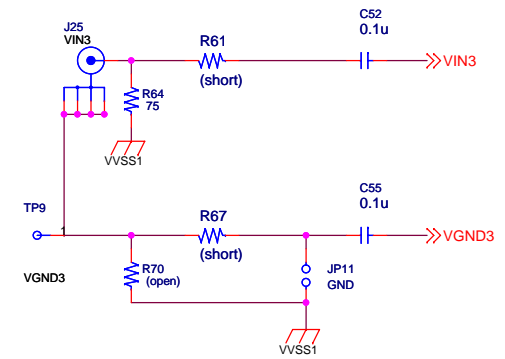
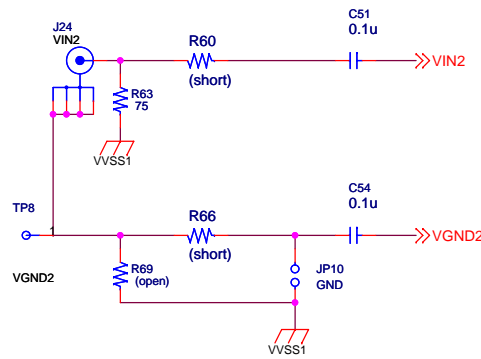
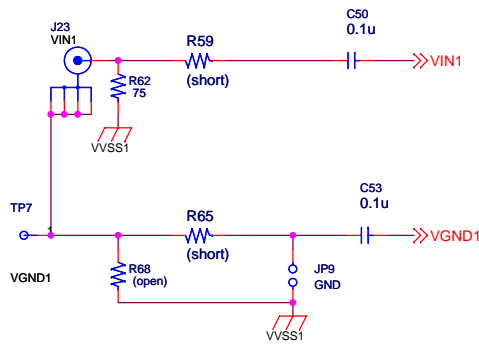
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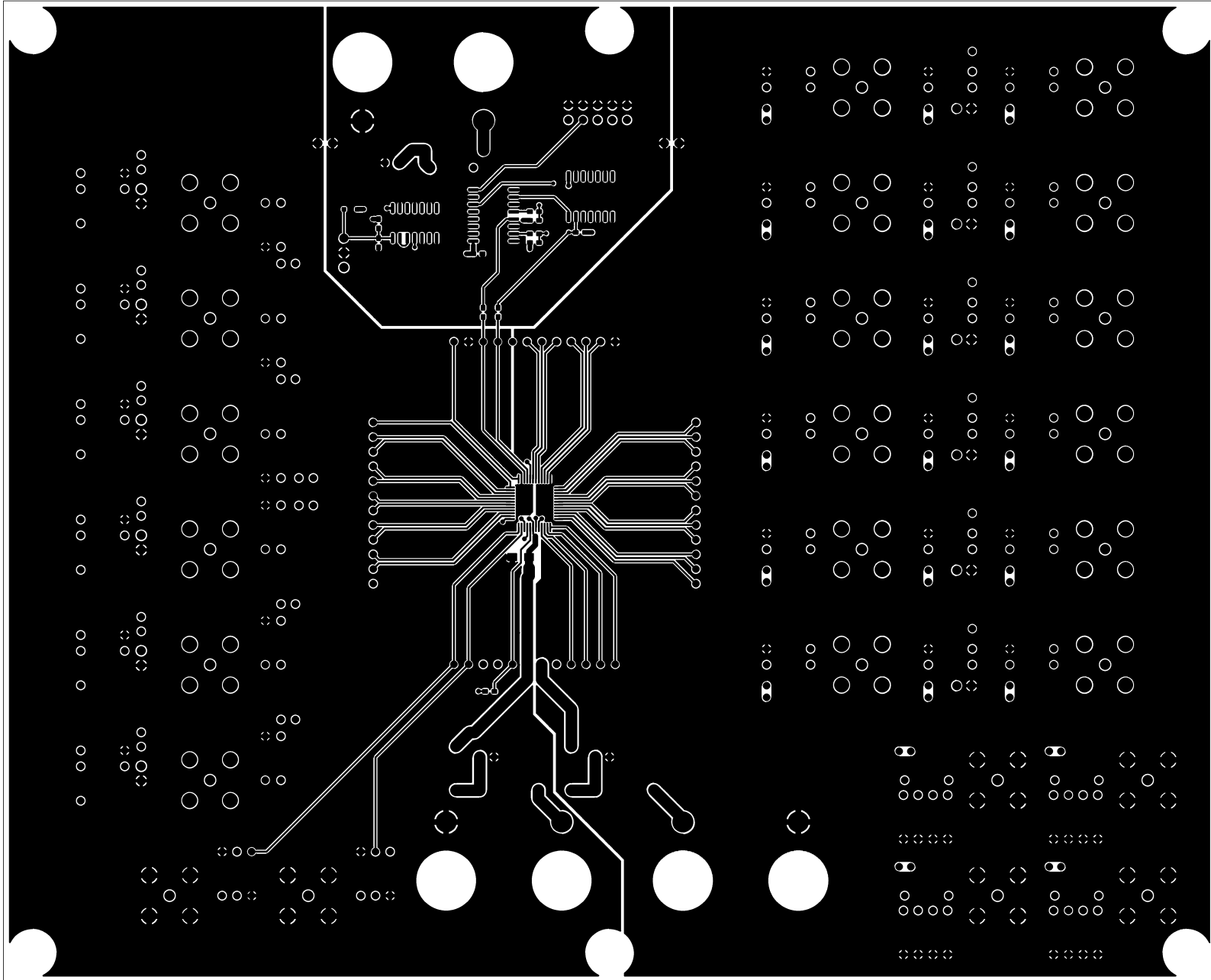
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Size	Document Number	AK4223	Sheet	1 of 3

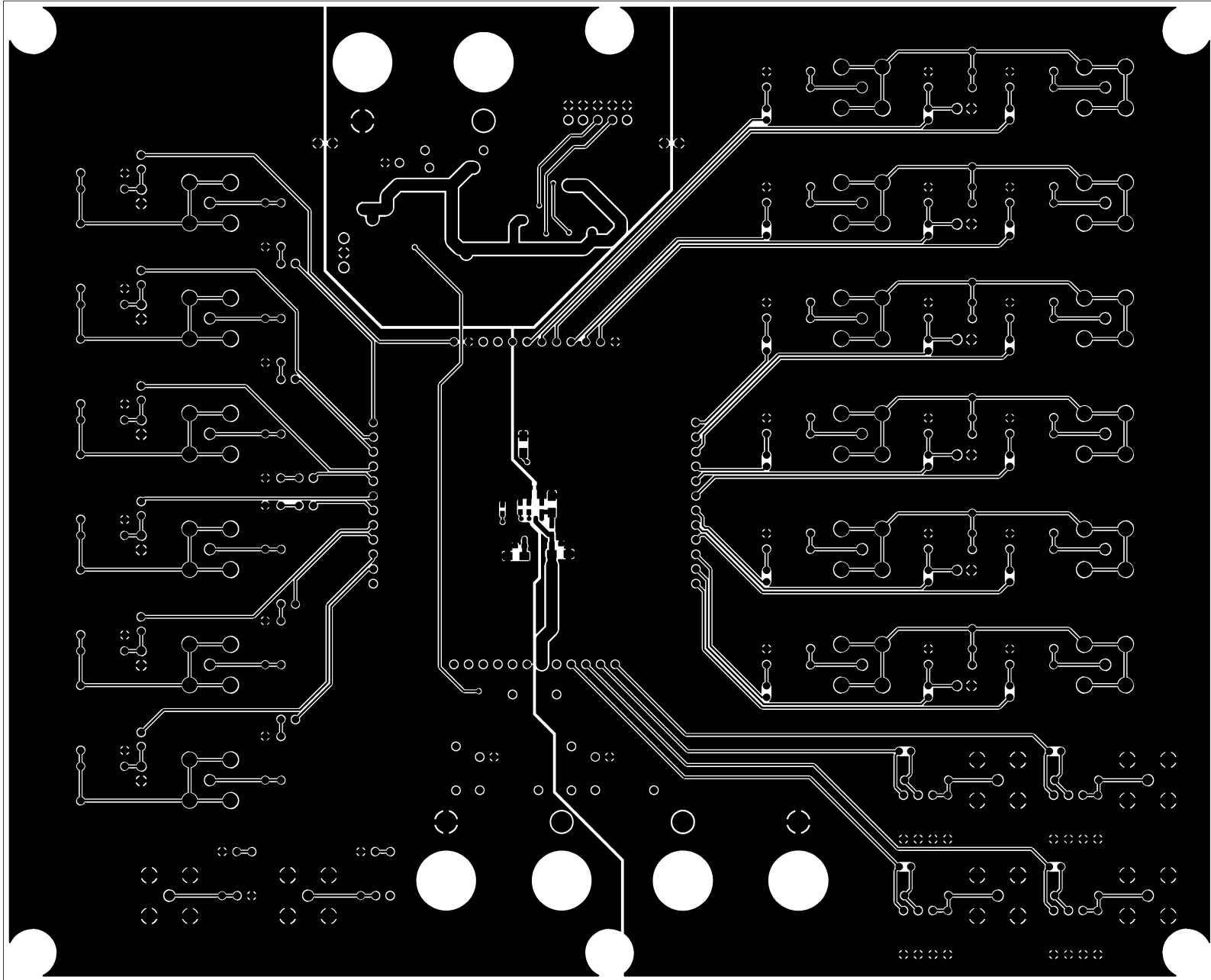


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Evaluation Board

