

AKM

AKD4702

Evaluation board Rev.A for AK4702

GENERAL DESCRIPTION

AKD4702 is an evaluation board for quickly evaluating the AK4702, 2ch DAC with AV SCART switch. Evaluation requires a audio/video analog analyzer, an analog video signal source, a digital audio signal source, and a power supply. AKM's ADC evaluation board can be also used for the audio source. Also included is a AK4112B digital audio interface receiver which receives SPDIF compatible audio data. The digital audio data is available via optical connector or BNC.

AKD4702 --- Evaluation board for AK4702
(Cable for connecting with printer port of IBM-AT compatible PC and control software are enclosed with board.)

FUNCTION

- BNC connectors for analog audio input/output
- BNC connectors for analog video input/output
- On-board clock generator
- BNC connector for an external clock input
- Compatible with 2 types of digital interface
 1. Serial interface: Direct interface with evaluation boards for AKM's A/D converter evaluation boards.
 2. S/PDIF: On-board AK4112BVF as DIR that accepts optical input or BNC input
- 10pin header for serial control interface

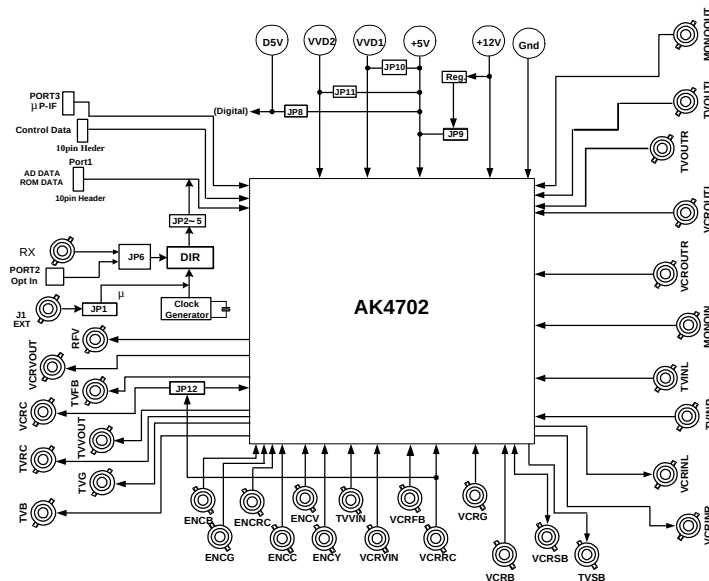


Figure 1. AKD4702 Block Diagram

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

■ Operation sequence

- 1) Set up the power supply lines. (Note 1)

[+12V]	(Orange)	= +11.4 ~ +12.6V
[+5V]	(Red)	= +4.75 ~ +5.25V (Note 2)
[D5V]	(Red)	= +4.75 ~ +5.25V (Note 3)
[VVD1]	(Red)	= +4.75 ~ VVD2 (Note 4)
[VVD2]	(Blue)	= VDD1 ~ +5.25V (Note 4)
[AGND]	(Black)	= 0V
[DGND]	(Black)	= 0V
[VSS2]	(Black)	= 0V

Note: 1. Each supply line should be distributed from the power supply unit.

2. JP9 (REG) should be open when the “+5V” jack is used.

3. JP8 (D-A) should be open when the “D5V” jack is used.

4. JP10 (VDD1) / JP11 (VDD2) should be open when the “VDD1” jack / “VDD2” jack are used respectively.

- 2) Set-up the evaluation modes, jumper pins and DIP-switches. (Refer following sections.)
- 3) Connect the PORT3 (=μP-I/F) with PC by the enclosed 10-wire flat cable.
- 4) Set up the PC and execute the enclosed control software. (See “CONTROL SOFTWARE MANUAL”.)
- 5) Turn the power on.
- 6) Reset the AK4702 once by bringing the SW1 (PDN) “L”, and turn it to “H”.

■ Evaluation mode

1) S/PDIF mode (Optical Link or BNC: default)

When the CM0 (DIP-switch S1_1 on board) is “L”, the AK4112B (DIR) generates MCLK, BICK, LRCK and SDATA from the received bitstream through PORT2 (TORX176: optical link) or J2 (BNC). This mode is used for the evaluation using CD test disk. The PORT1 (EXT) should be open.

1)-1. DIP-switch set-up

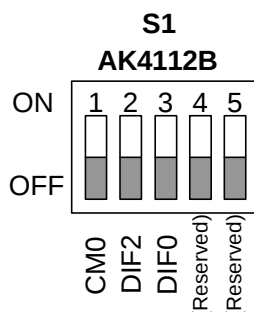
No.	CM0	DIF1	DIF0	Audio Data Format of AK4112B	Notes
1	“L”	“L”	“L”	16bit LSB justified	1
2	“L”	“L”	“H”	18bit LSB justified	2
3	“L”	“H”	“L”	MSB justified	3
4	“L”	“H”	“H”	I ² S	4

Table 1. DIP-switch set-up

Please match the data format of AK4702 via I²C-bus control as following notes.

Note 1. 16bit LSB justified

Set up the DIP-switch as follows.

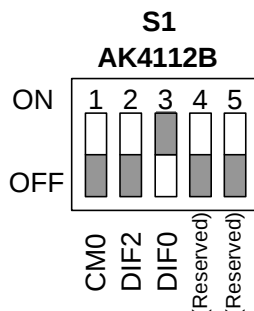


Set up the control registers DIF1/0 of AK4702 by enclosed software as follows.



Note 2. 18bit LSB justified

Set up the DIP-switch as follows.

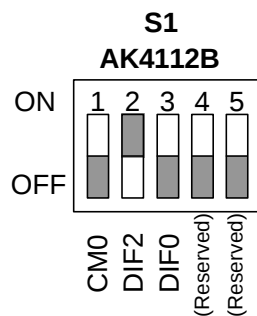


Set up the control registers DIF1/0 of AK4702 by enclosed software as follows.



Note 3. MSB justified

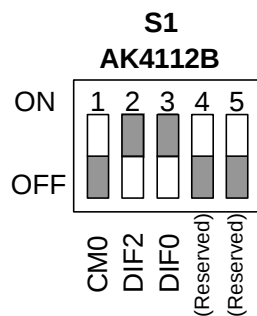
Set up the DIP-switch as follows.



Set up the control registers DIF1/0 of AK4702 by enclosed software as follows.

Note 4. I²S

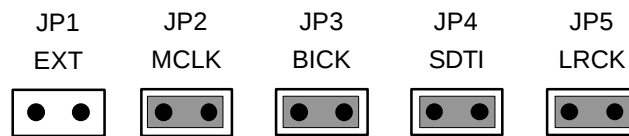
Set up the DIP-switch as follows.



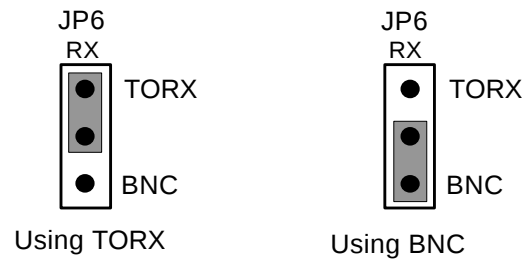
Set up the control registers DIF1/0 of AK4702 by enclosed software as follows.



1)-2. Jumper pins set up



The JP6 selects the input port of S/P DIF bitstream form Port2 (TOTX176) or J2 (BNC RX).



2) On-board X'tal mode/ Feeding external MCLK via BNC

When the CM0 (DIP-switch S1_1 on board) is “H”, the AK4112B generates MCLK, BICK and LRCK from on-board X'tal or external clock form J1. SDATA should be fed via PORT1.

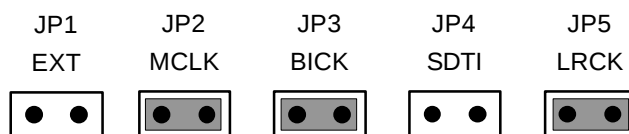
2)-1. DIP-switch set-up

No.	CM0	DIF1	DIF0
1	“H”	Don't care	Don't care

Table 2. DIP-switch set-up

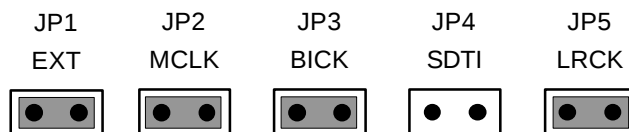
2)-2. Jumper pins set up

2)-2-a. Using on-board X'tal



JP6: Don't care.

2)-2-b. Using external clock via BNC connector J1



JP6: Don't care.

Remove the on-board X'tal.

3) Feeding all clocks from external

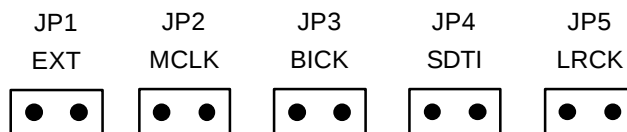
Under the following set-up, all external signals can be fed to AK4702 through POTR1 (EXT).
The AKM's evaluation board for ADC can be used.

3)-1. DIP-switch set-up

No.	CM0	DIF1	DIF0
1	Don't care	Don't care	Don't care

Table 3. DIP-switch set-up

3)-2. Jumper pins set up



JP6: Don't care.

■ Other jumper pins set up

[JP12](VCRRC): Input Jack selection for the VCRRC pin of AK4702

When the VCRC pin of AK4702 outputs 0V by setting CIO bit to "1", the signal can be fed through the J27 (VCRRCOUT) to VCRRC pin.

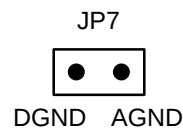
"I": The signal is fed through the J18(VCRRC) to VCRRC pin. (Default)

"I/O": The signal is fed through the J27(VCRRCOUT) to VCRRC pin. The CIO bit of AK4702 should be set to "1".

[JP7](GND): Analog ground and digital ground

Open: separated. (Default)

Short: connected. (The jack "DGND" can be open.)



■ DIP-switch (S1) List

No.	Switch Name	Default	Function
1	CM0	OFF	Refer the “ ■ Evaluation mode ”
2	DIF0	OFF	
3	DIF2	OFF	
4	-	OFF	(Reserved)
5	-	OFF	(Reserved)

Table 4. DIP-switch list

■ Jumper List

No.	Jumper Name	Function
1	EXT	MCLK source set-up when CM0=”H”. Short: X’tal (default). Open: External clock via BNC (J1). Remove the on-board X’tal.
2,3, 4,5	MCLK, BICK, LRCK, SDTI	Clock source set-up Short: Connect the DIR (AK4112B). (default) Open: Separate the DIR. Supply clocks via Port1.
6	RX	S/PDIF’s port set-up when CM0=”L”. TORX: Optical connector PORT2. (default) BNC: BNC connector J2.
7	GND	Analog ground and digital ground Open: separated (default). Short: connected (The connector “DGND” can be open.).
8	D-A	Power supply source set-up for digital section of AKD4702. Open: from the “D5V” Jack. (default) Short: from the regulator or the “+5V” Jack. Don’t connect anything to the “D5V” Jack.(default)
9	REG	Power supply source set-up for VD of AK4702. Open: from the “+5V” Jack. Short: from the regulator. Don’t connect anything the “+5V” Jack. (default)
10	VVD1	Power supply source set-up for VVD1 of AK4702. Open: from the “VVD1” Jack. Short: from the regulator or the “+5V” Jack. Don’t connect anything to the “VVD1” Jack. (default)
11	VVD2	Power supply source set-up for VVD1 of AK4702. Open: from the “VVD2” Jack. Short: from the regulator or the “+5V” Jack. Don’t connect anything to the “VVD2” Jack. (default)
12	VCRRC	Input Selection for VCRRC “I” side: Input to VCRRC from VCRRC jack. “I/O” side: Input to VCRC from VCRC jack. (Note: Refer CIO bit of AK4702)

Table 5. Jumper list

■ Serial Control

The AK4702 can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT3 (μP-IF) with PC by 10 wire flat cable packed with the AKD4702.

Be careful connector direction. Flat cable should be connected 10-pin header, red line put on 10pin header 5 and 6 pin.

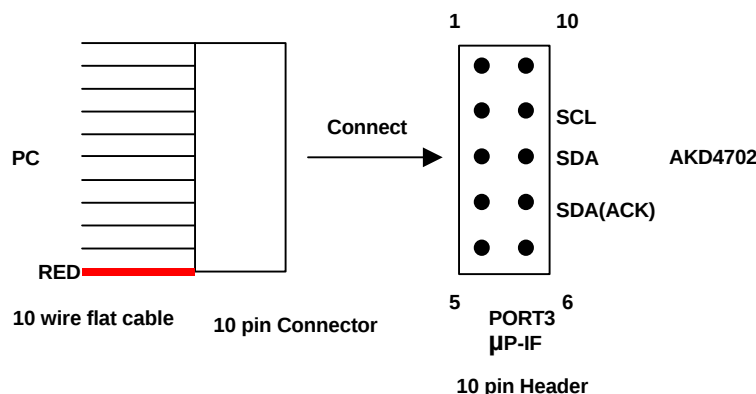


Figure 2. Connection of 10 pin flat cable for PORT3

■ Input/Output port List

Table 6. Input/Output port List

		Signal Name	Notes
Audio	Input	J5 (VCRINL), J3 (VCRINR), J9 (TVINL), J8 (TVINR)	Max: 2Vrms
		J11 (MONOIN)	Max: 1Vrm
	Output	J12 (VCROUTL), J10 (VCROUTR), J6 (TVOUTL), J7 (TVOUTR), J4 (MONOOUT)	Max: 3Vrm
Digital	Input	Port2 (TORX176) or J2 BNC (RX)	Max: D5V+0.3V
Video	Input	J13 (ENCB), J15 (ENCG), J17 (ENCRC), J19 (ENCC), J21 (ENCV), J23(ENCY), J25(TVVIN), J14(VCRVIN), J18(VCRRC; Note), J20(VCRG), J22(VCRB)	Max: 1.5Vp-p
	Output	J27 (VCRROUT; Note), J29 (TVVOUT), J30 (TVRC), J31 (TVG), J32 (TVB), J33 (RFV), J34 (VCRVOUT)	Max: 3Vp-p
Slow Blanking	Input	J24 (VCRSB)	Max: VP+0.3V
	Output	J24 (VCRSB) , J28 (TVSB)	Max: VP
Fast Blanking	Input	J16 (VCRFB)	Max: VVD1+0.3V
	Output	J26 (TVFB)	Max: VVD2

Note: Refer JP12 and CIO bit of AK4702.

■ The indication content for LED

LED turns on during each output is “H”.

[LE1] (Unlock and Parity Error on S/P DIF): ERF of DIR (AK4112B). Normally off.

[LE2] (Validity Flag): V of DIR (AK4112B). Normally off.

■ Toggle switch (SW1 on board) operation

“H”: AK4702 is Active.

“L”: AK4702 is Powered Down .

(Note; When the power of AKD4702 is ON at first, SW1 should be switched from “L” to “H”).

MEASUREMENT RESULTS

■ Audio

[Measurement condition]

- Measurement unit: Audio Precision System two Cascade
- MCLK : 256fs
- BICK : 64fs
- fs : 48kHz
- BW : 10Hz~20kHz
- Bit : 18bit
- Power Supply : VD=5V, VDD1=5V, VDD2=5V, VP=12V
- Interface : DIR
- Temperature : Room
- Volume#0=Volume#1=0dB
- Measurement signal line path: DAC → Volume#0 → Volume#1 → TVOUTL/R

Parameter	Input signal	Measurement filter	Results [dB]
S/(N+D) at 2Vrms Output	1kHz, 0dBFS	20kLPF	91.5
DR	1kHz, -60dBFS	22kLPF, A-weighted	96.0
S/N	“0” data	22kLPF, A-weighted	96.0

Plots

- Figure 1-1. FFT (1kHz, 0dBFS input) at 2Vrms output
- Figure 1-2. FFT (1kHz, -60dBFS input)
- Figure 1-3. FFT (Noise floor)
- Figure 1-4. FFT (Out-of band noise)
- Figure 1-5. THD+N vs. Input Level (fin=1kHz)
- Figure 1-6. THD+N vs. fin (Input Level=0dBFS)
- Figure 1-7. Linearity (fin=1kHz)
- Figure 1-8. Frequency Response (Input Level=0dBFS)
- Figure 1-9. Crosstalk (Input Level=0dBFS)

■ Video

[Measurement condition]

- Signal Generator : Sony Tectonics TG2000
- Measurement unit : Sony Tectonics VM700T
- Power Supply : VD=5V, VDD1=5V, VDD2=5V, VP=12V
- Interface : BNC
- Temperature : Room
- Measurement signal line path: ENCV → TVVOUT, ENCRC → TVRC

Parameter	Measurement conditions	Results	Unit
S/N	Input = 0% flat field Filter = Uni-weighted, BW= 15kHz to 5MHz	75.8	dB
Crosstalk	Input = 100%red(ENCRC), Measured at TVVOUT	-52	dB
DG	Input = Modulated Lamp	-0.1 to +0.24	%
DP	Input = Modulated Lamp	0 to +0.40	deg.

Plots

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

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

Figure 2-3 Crosstalk (Input= 100% red (ENCRC), measured at TVVOUT)

Figure 2-4 DG, DP (Input= Modulated Lamp)

Plots (Audio)

AKM

AK4702 FFT (DAC->TVOUT: fs=48kHz, sigal = 1kHz/0dB)

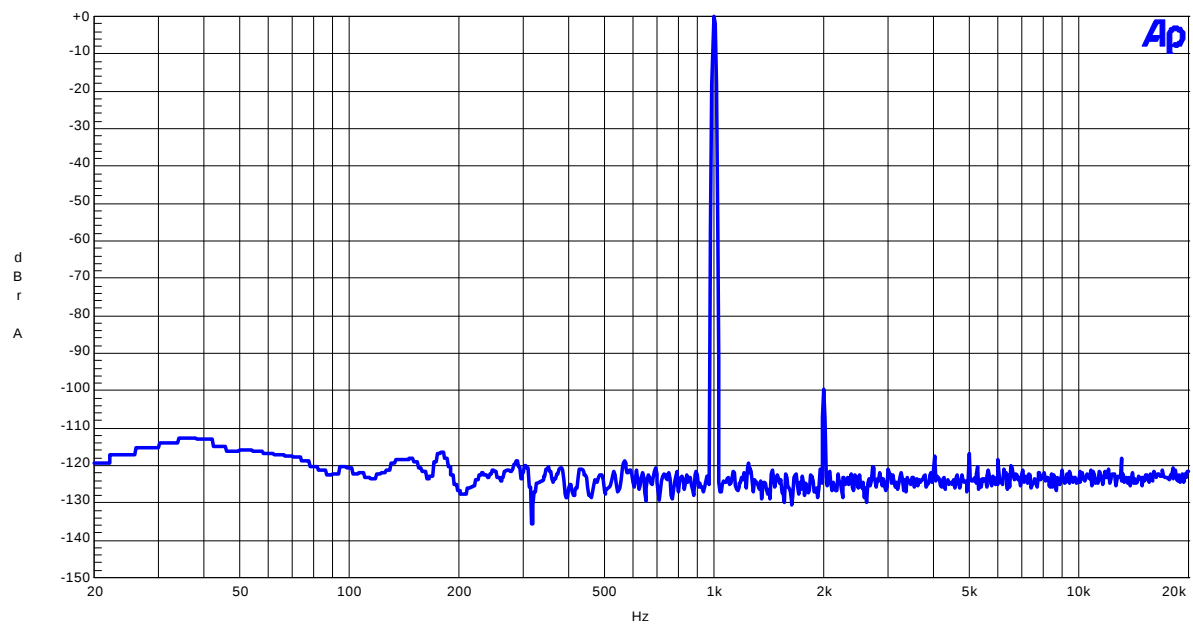


Figure1-1. FFT (fin=1kHz Input Level=0dBFS)

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AK4702 FFT (DAC->TVOUT: fs=48kHz, sigal = 1kHz/-60dB)

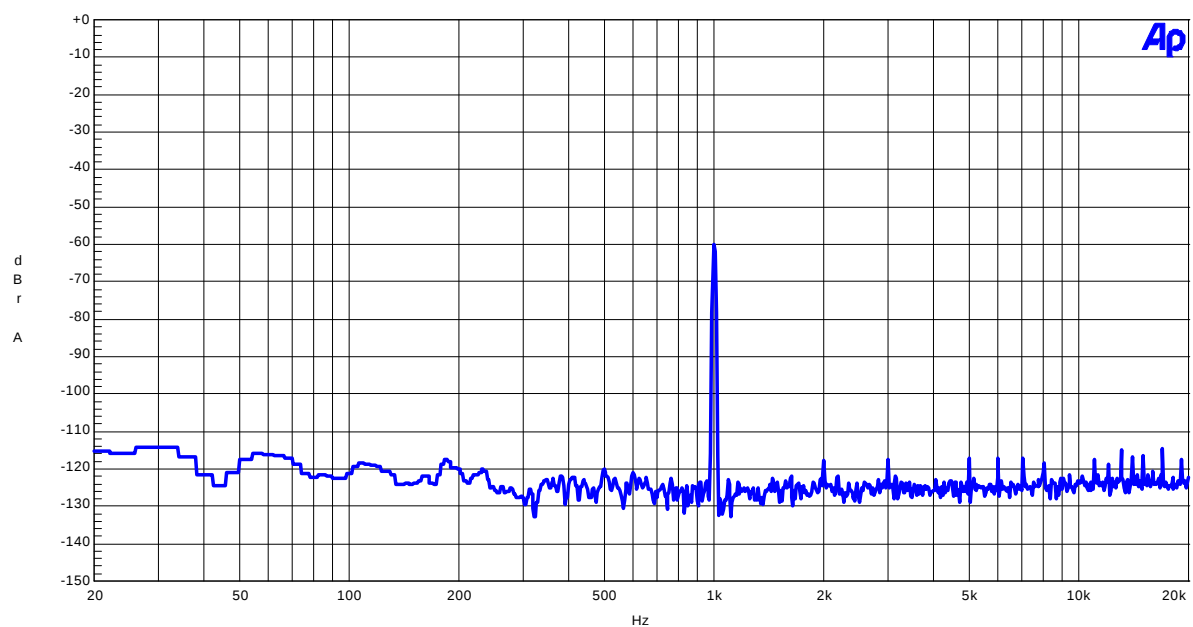


Figure1-2. FFT (fin=1kHz Input Level=-60dBFS)

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AK4702 FFT (DAC->TVOUT: fs=48kHz, no sigal)

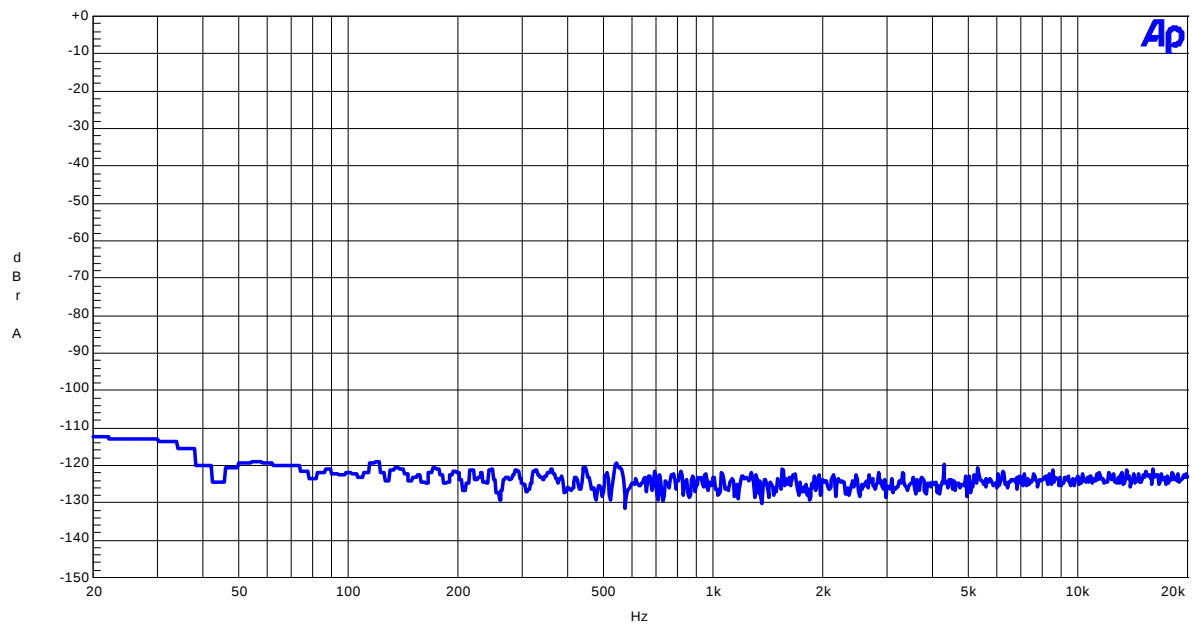


Figure1-3. FFT (Noise Floor)

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AK4702 FFT (DAC->TVOUT: fs=48kHz, no sigal, out of band)

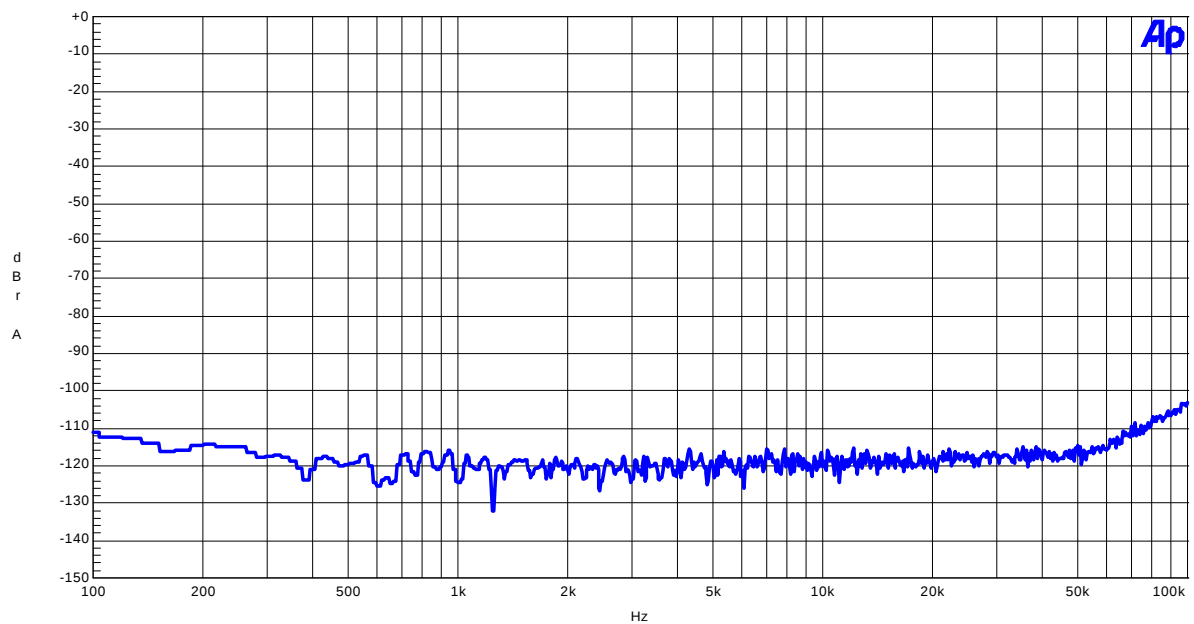


Figure1-4. FFT (Outband Noise)

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AK4702 THD+N vs. Level (DAC->TVOUT: fs=48kHz, signal= 1kHz)

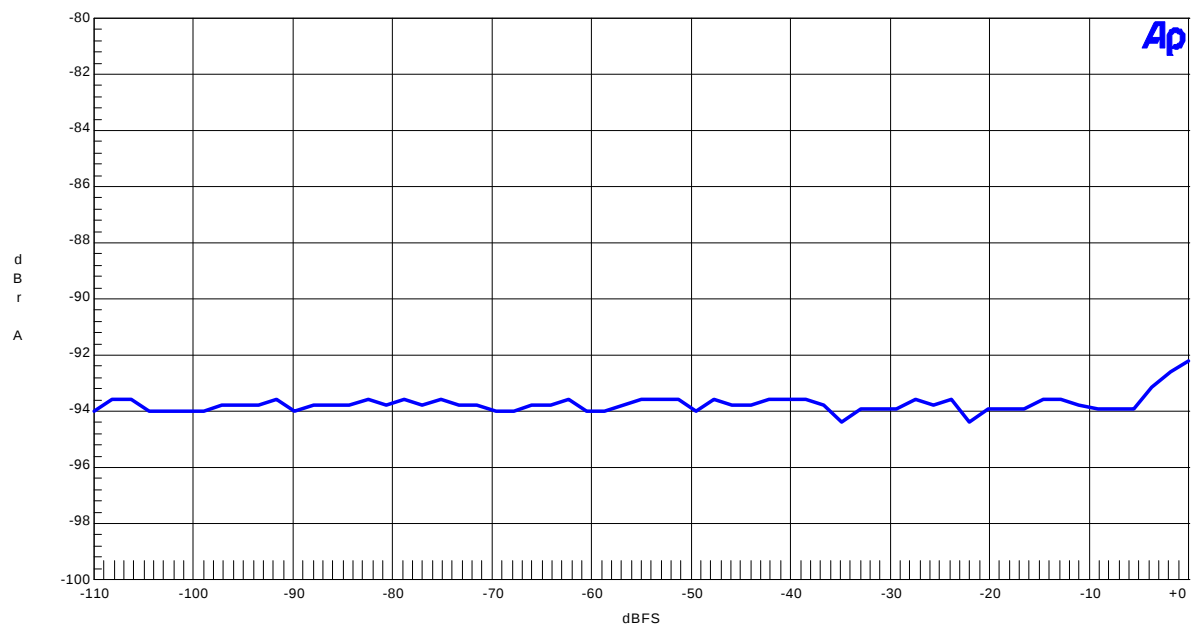


Figure1-5. THD+N vs. Input level (fin=1kHz)

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AK4702 THD+N vs. Input Frequency (DAC->TVOUT: fs=48kHz, signal= 0dB)

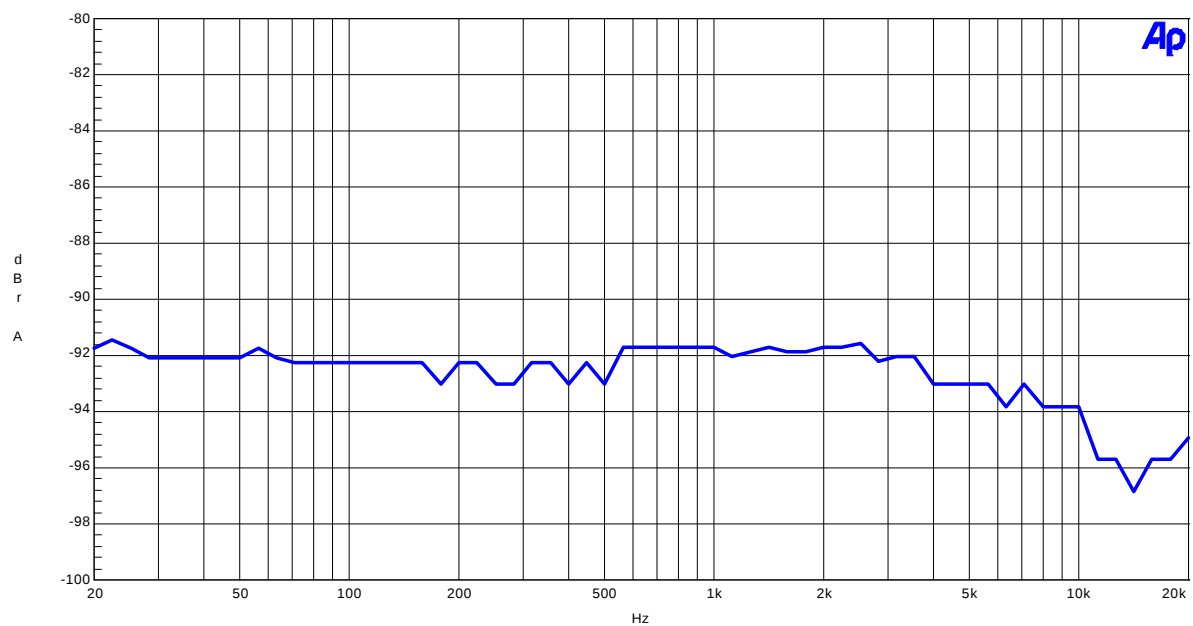


Figure1-6. THD+N vs. Input Frequency (Input level=0dBFS)

AKM

AK4702 Linearity (DAC->TVOUT: fs=48kHz, signal= 1kHz)

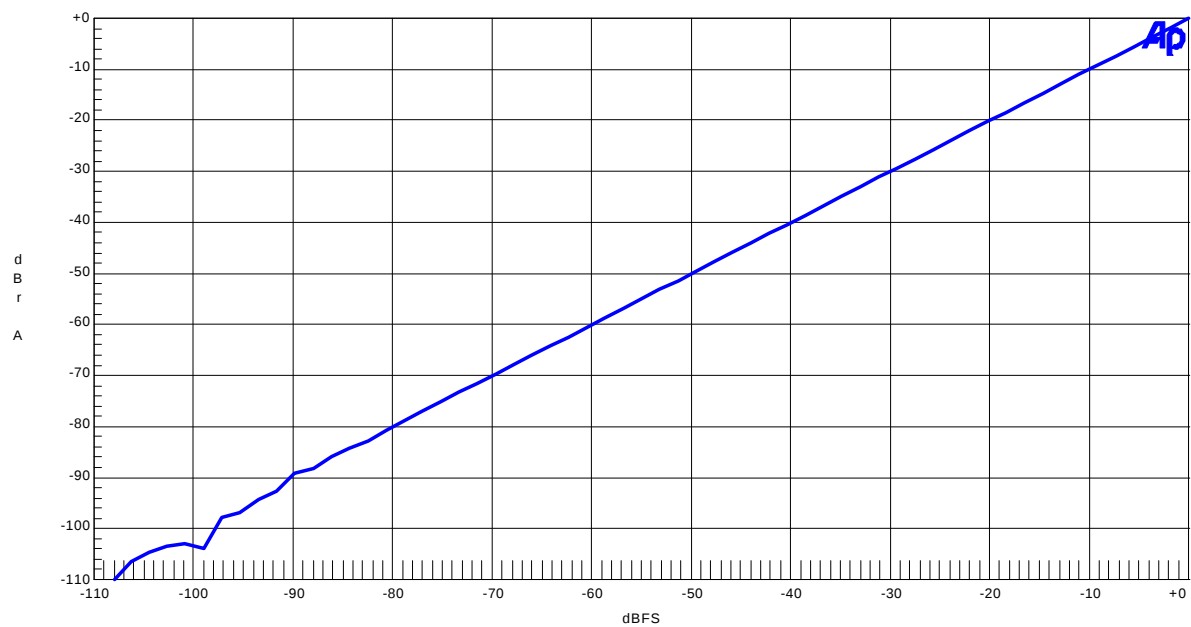


Figure1-7.Linearity (fin=1kHz)

AKM

AK4702 Frequency response (DAC->TVOUT: fs=48kHz, signal= 0dB)

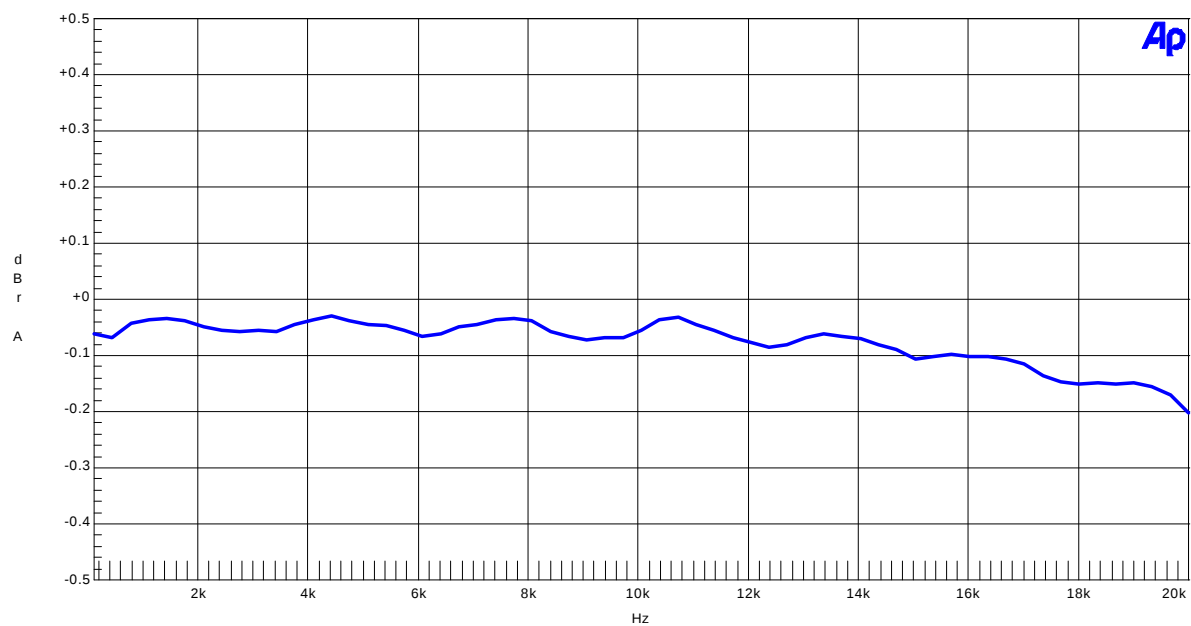


Figure1-8. Frequency Response (Input level=0dBFS)

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AK4702 Crosstalk (DAC->TVOUT: fs=48kHz, signal= 0dB)

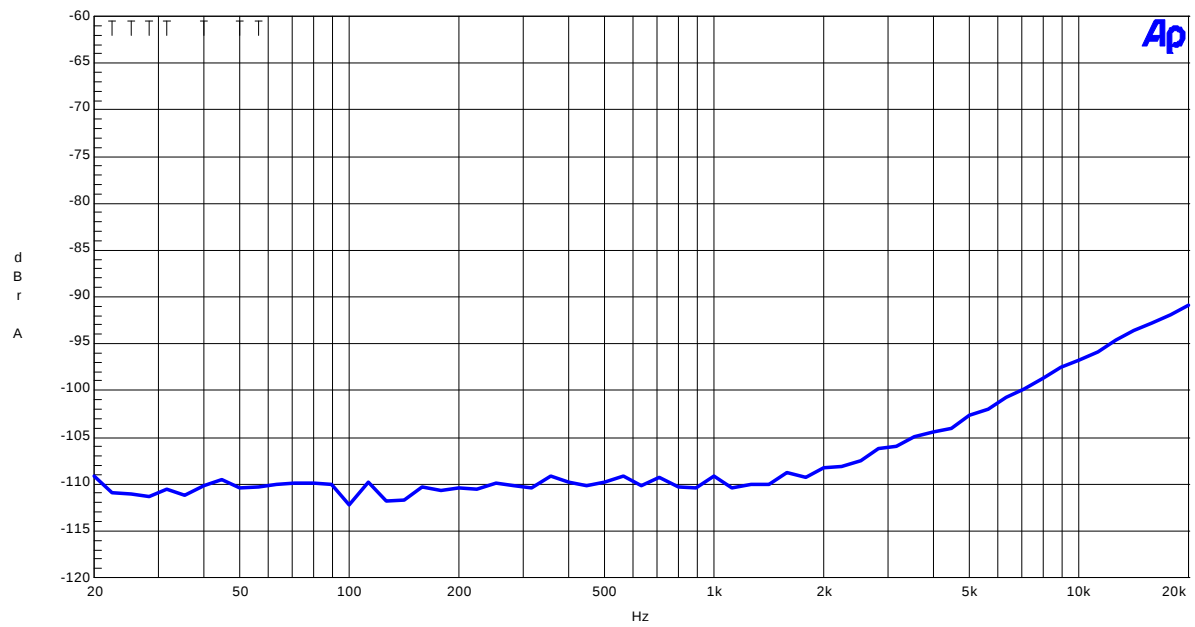


Figure1-9. Crosstalk (Input level=0dBFS)

Plots(Video)

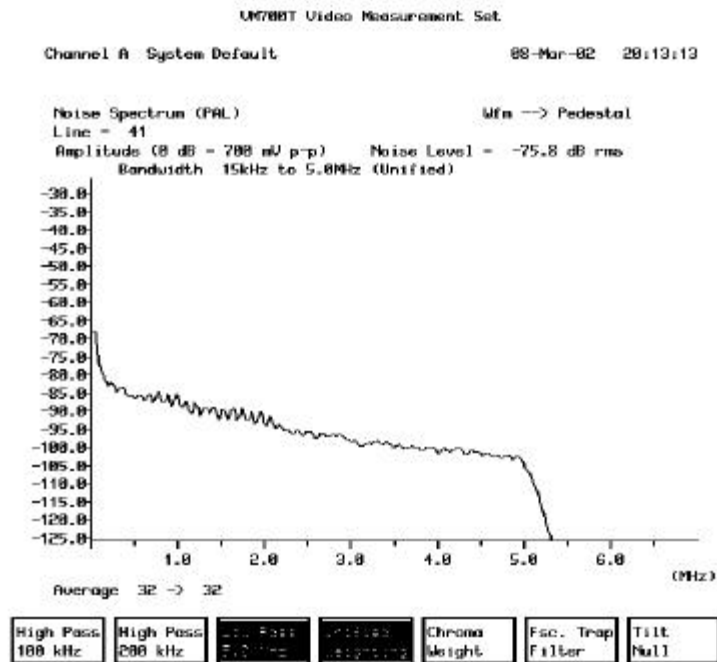


Figure 2-1. Noise spectrum (Input=0%flat field, BW=15kHz to 5MHz, uni weighted)

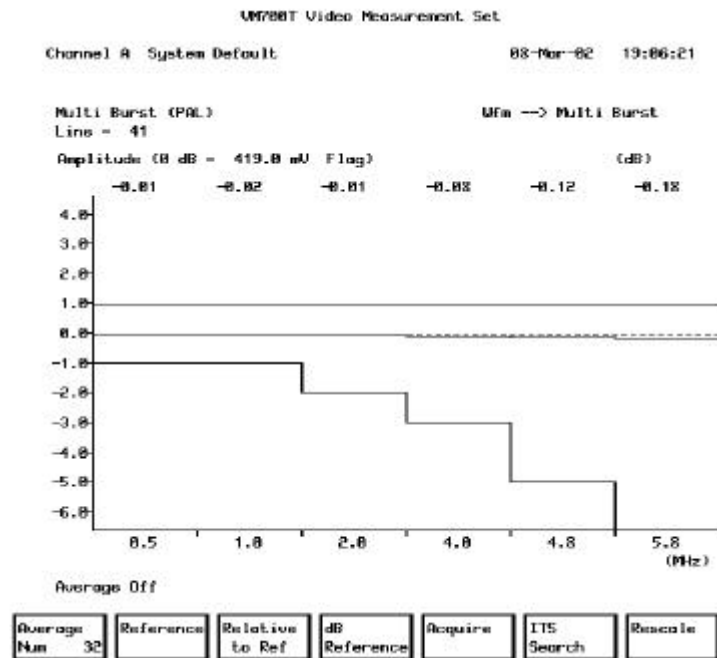


Figure 2-2. Frequency Response (Input= Multi Burst)

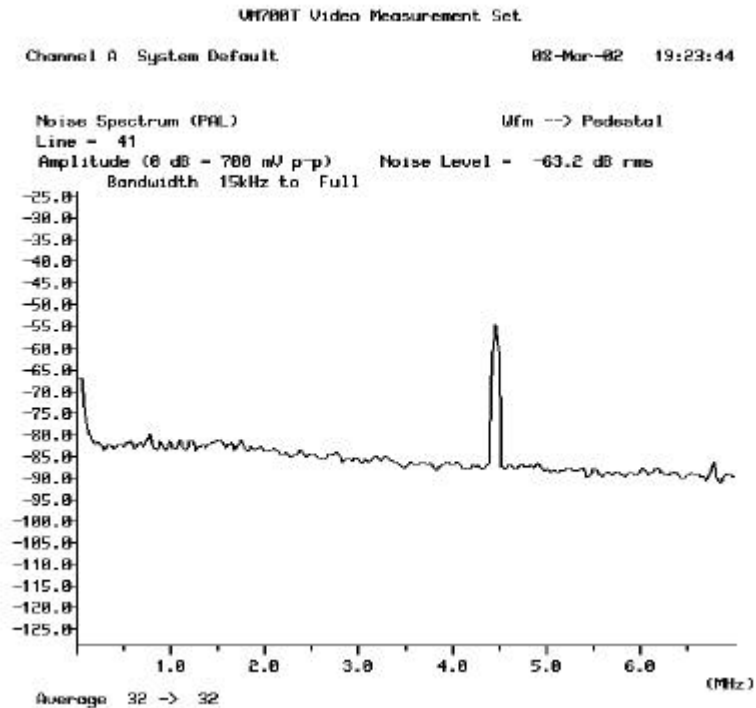


Figure 2-3 Crosstalk (Input= 100% red (ENCRC), measured at TVVOUT)

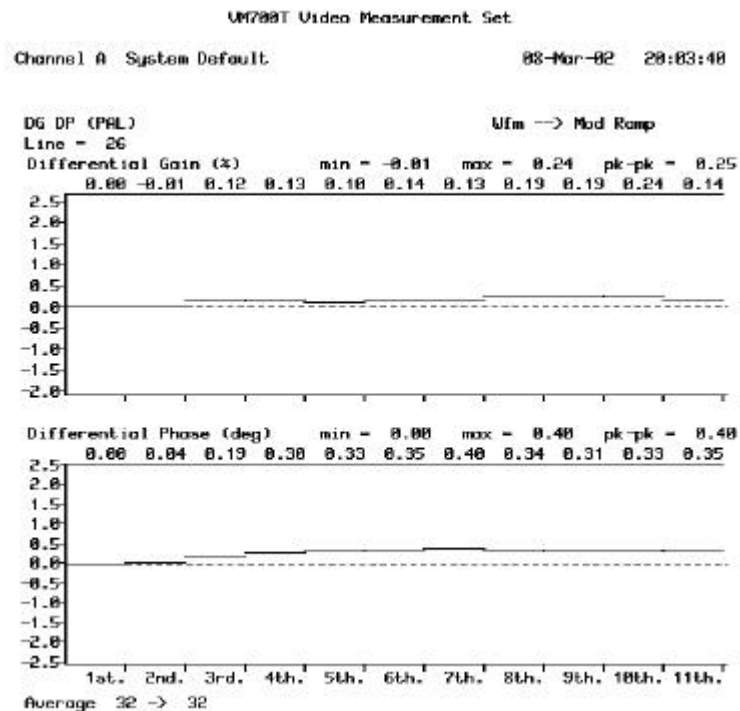


Figure 2-4 DG, DP (Input= Modulated Lamp)

CONTROL SOFTWARE MANUAL

■ Introduction

This is a manual of software that controls the AK4702, 2ch DAC with AV SCART switch.
The enclosed software AKD4702.exe can control the registers of AK4702 using I2C control I/F.

■ System Requirements

To use this software, the followings are required for PC.:

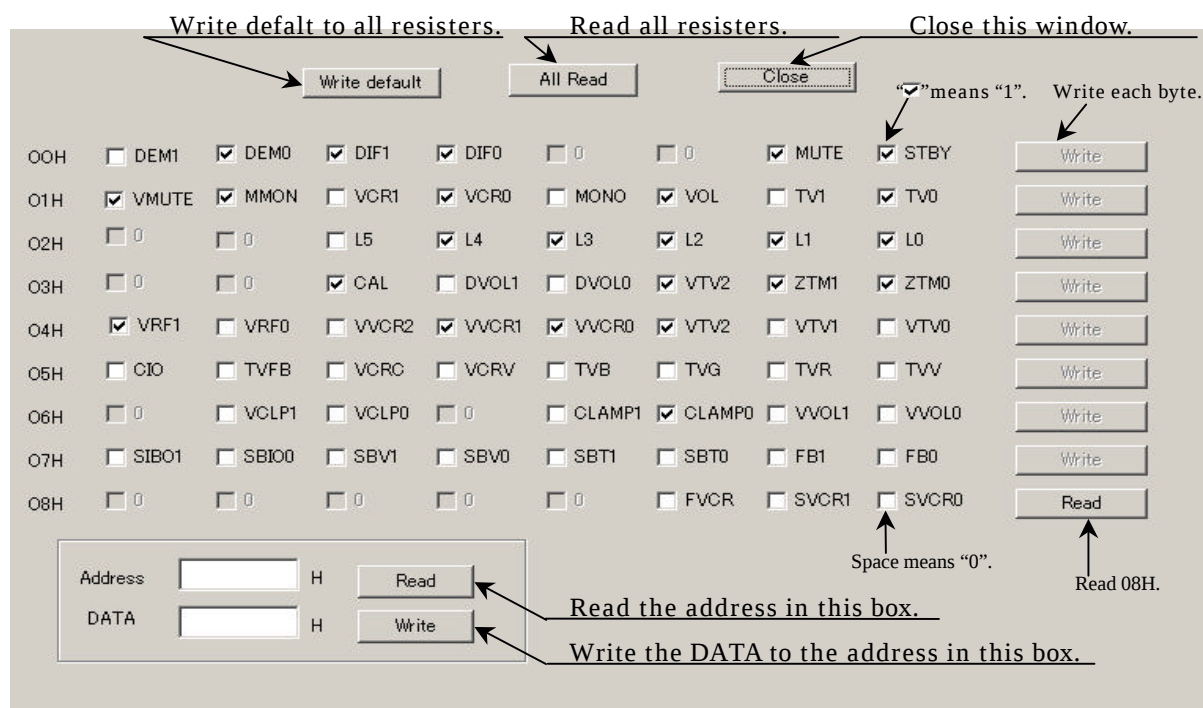
- Windows 95/98/ME/2000/XP. (This software does not operate on Windows NT.)
- Printer port

■ Set-up of evaluation board and control software

1. Set up the AKD4702.
2. Insert Connect IBM-AT compatible PC with AKD4702 by 10-line type flat cable (packed with AKD4702).
Take care of the direction of 10pin header. (Please install the driver in the CD-ROM disk 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. The CD-ROM disk labeled "AKD4702 Control Program ver 1.0" into the CD-ROM disk drive.

■ Operations

- [1] Execute the AKD4702.exe. Then the following window opens. The function of each button is shown below.
Clicking the button does each operation in the alone.



[2] Write/Read Register

There are two ways to Write/Read register.

(1) Check box

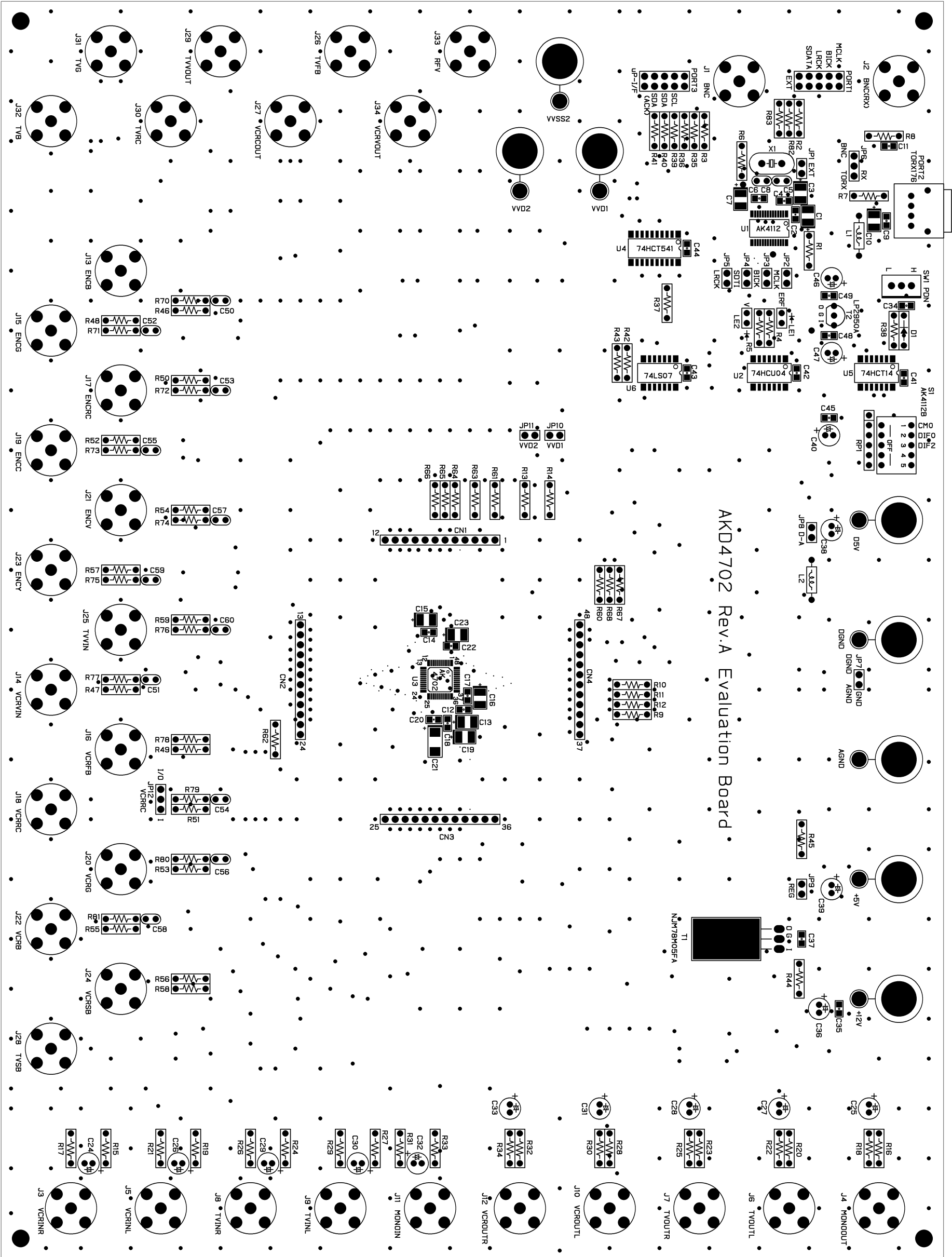
After checking each box of each bit, click the “Write” or “Read” button in the right end. “☑” in each check box means “1” and no check means “0”. Each check mark toggles by clicking. The address 08H is Read-only.

(2) Edit box

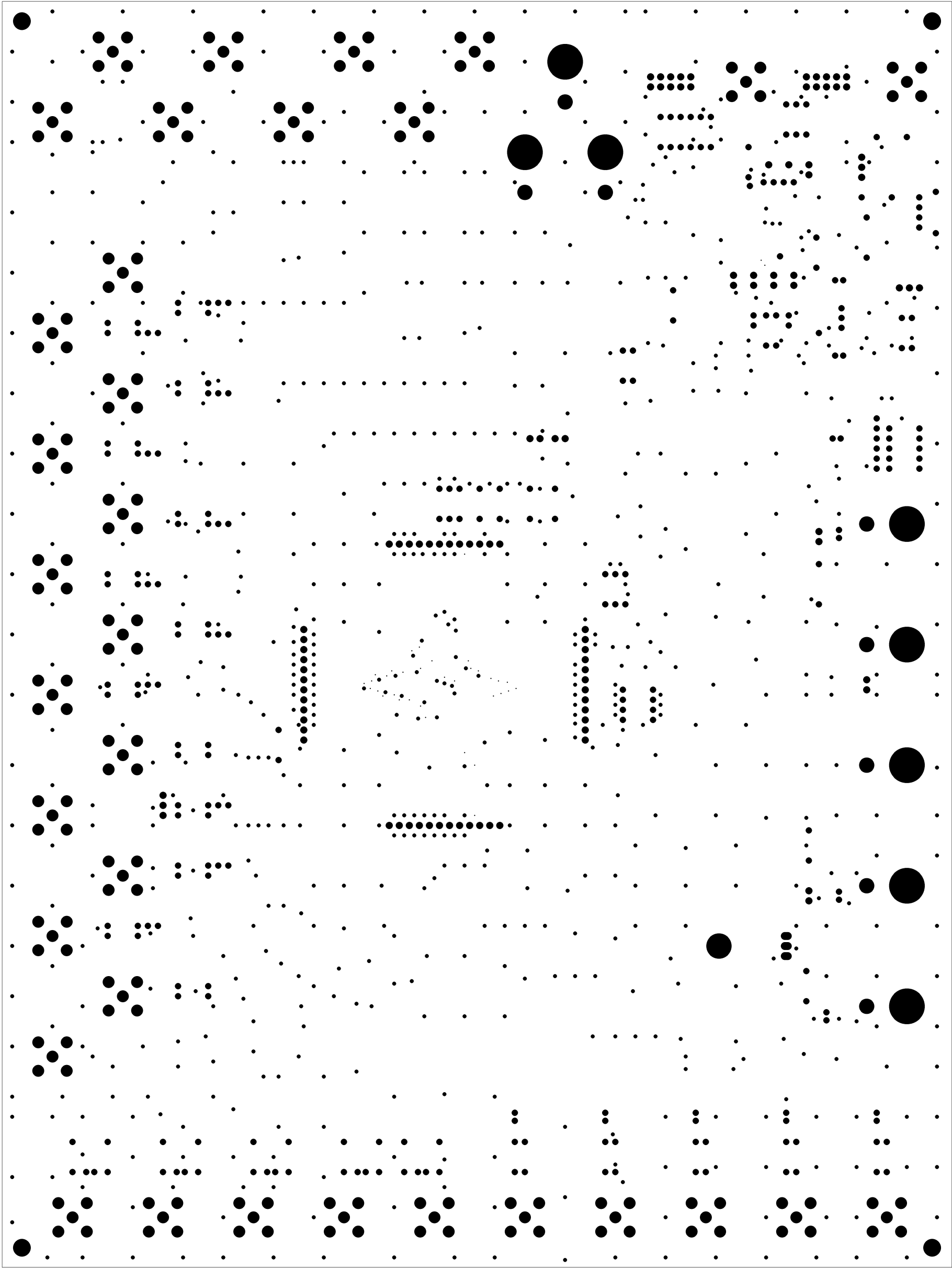
There is an edit box in the left bottom. All register can be written and read using the edit box. When writing register, input the DATA and the Address in the box and click “Write” button. When reading register, input the Address in the box and click “Read” button.

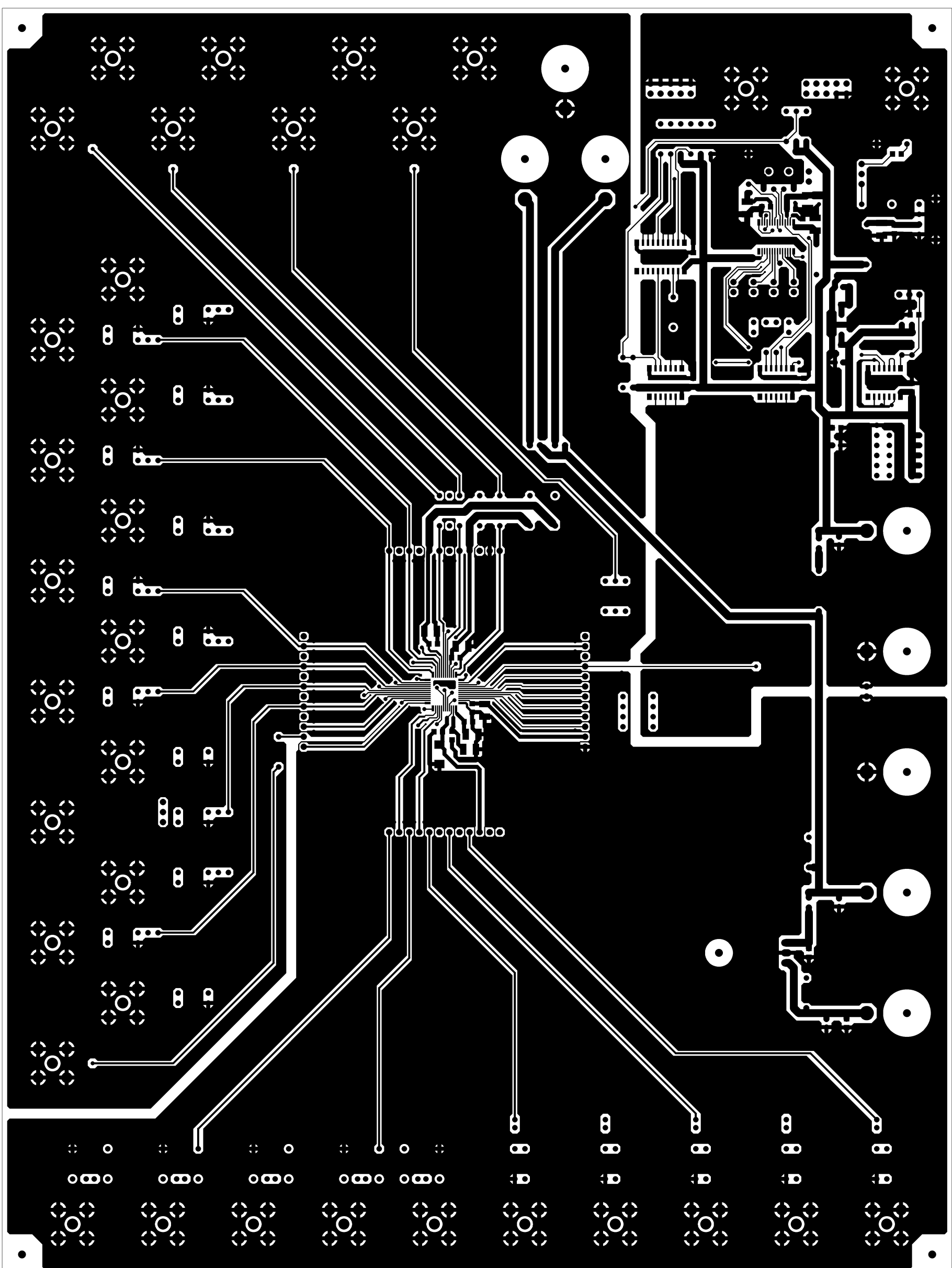
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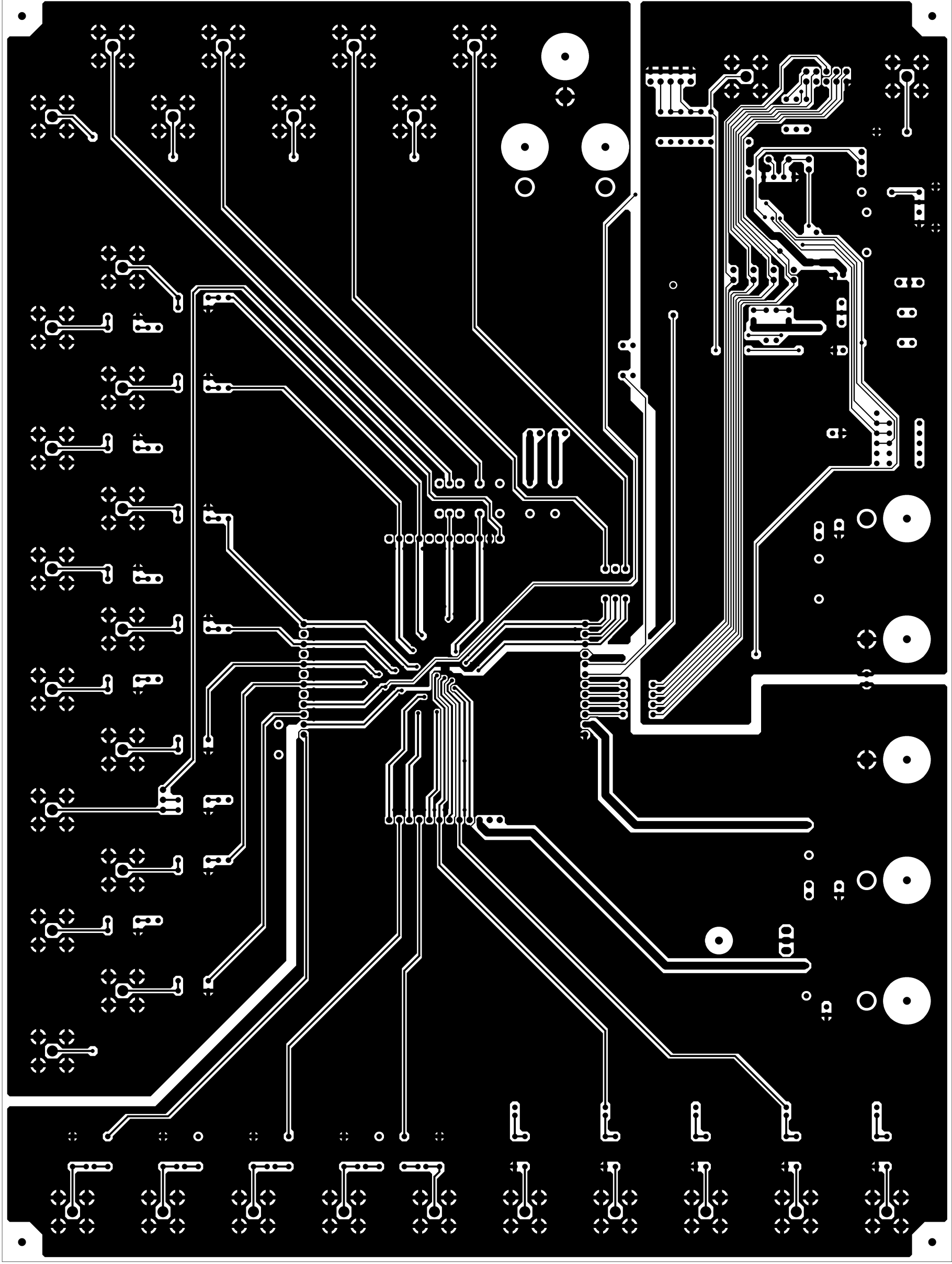


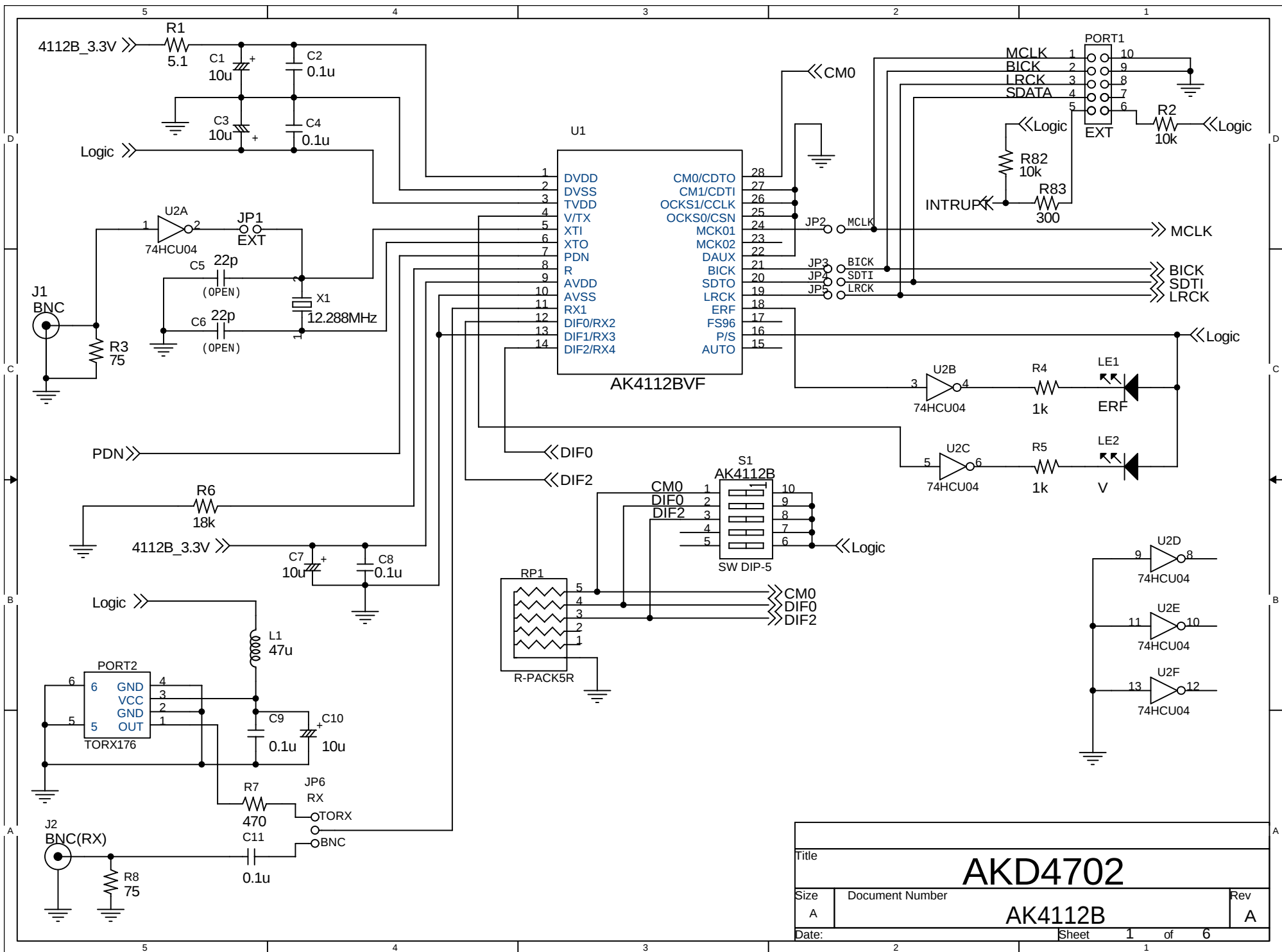
AKD4702 Rev.A Evaluation Board



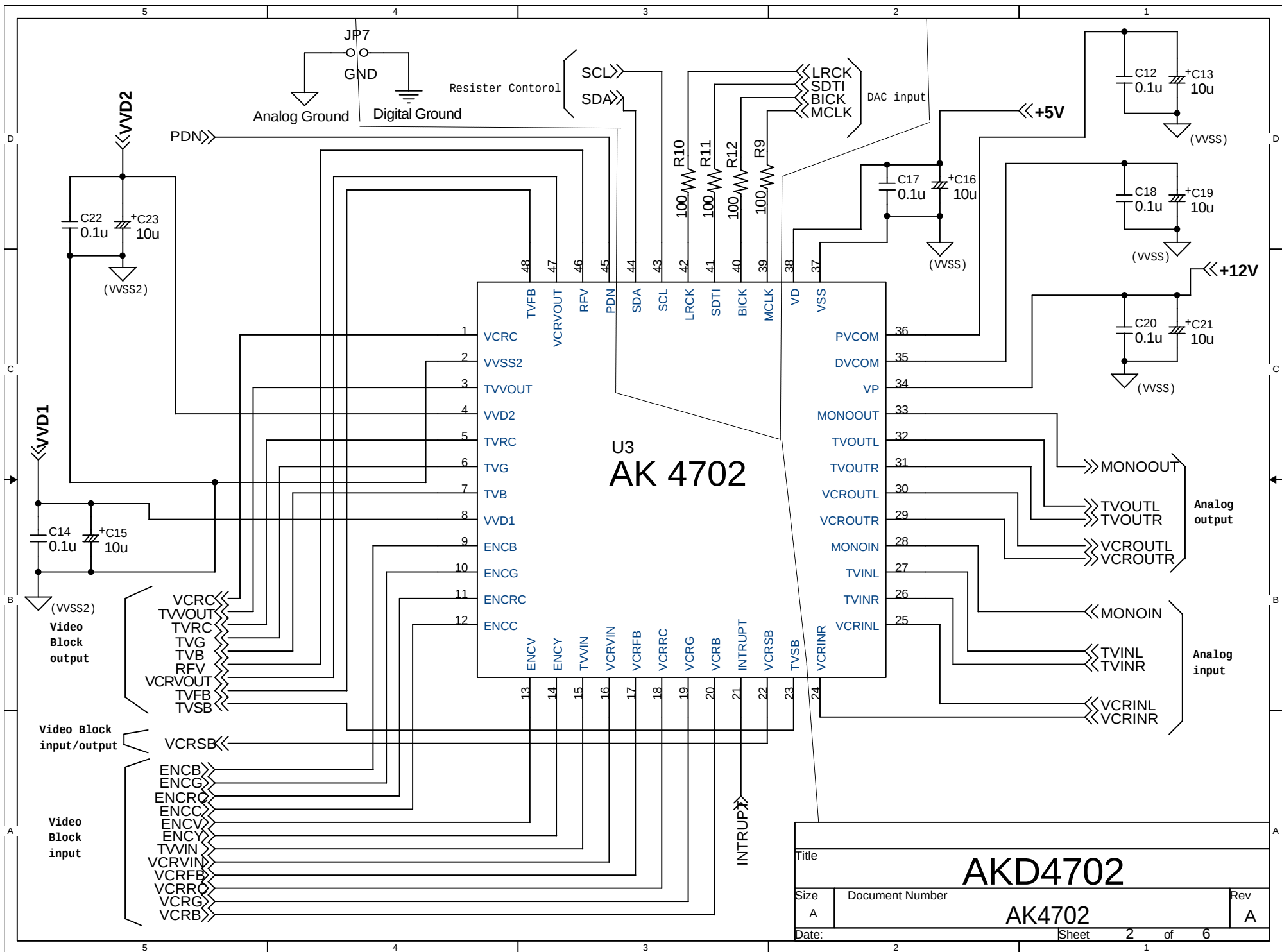


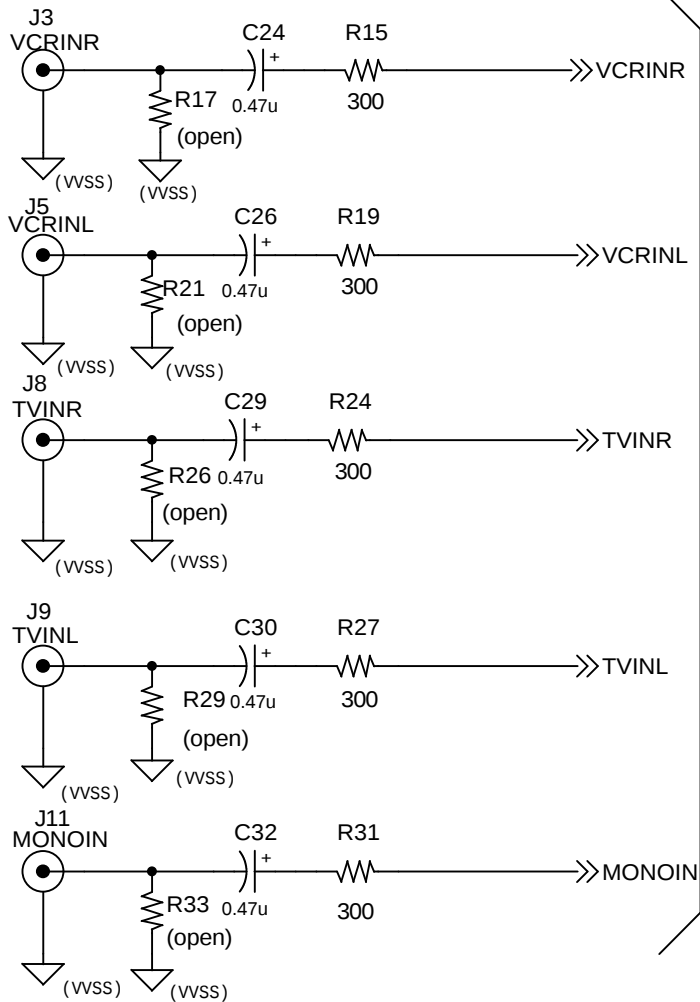
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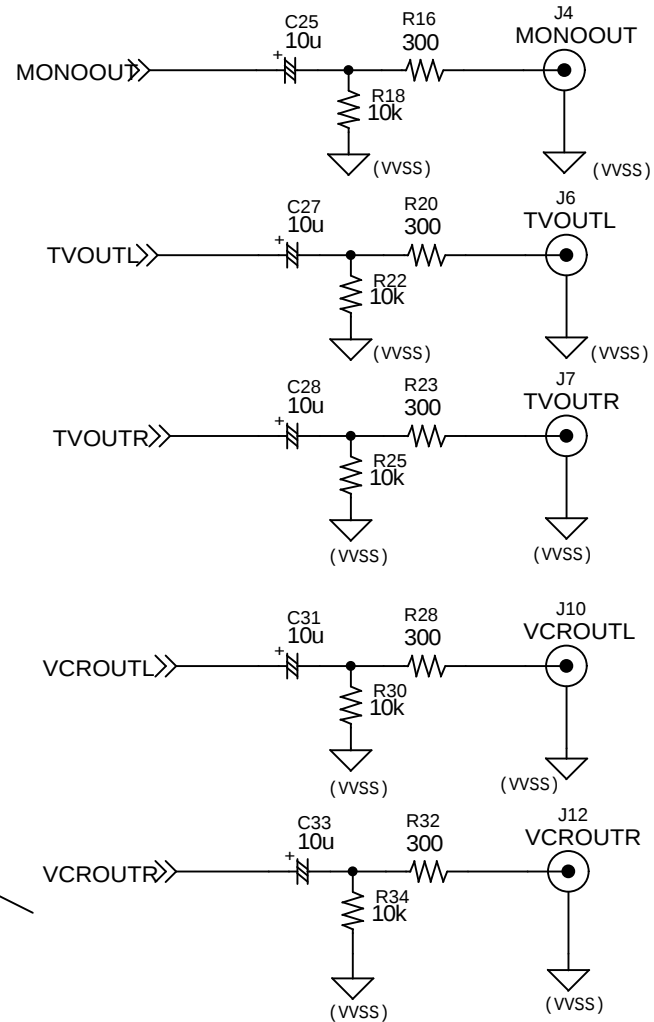
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AKD4702		
Size	Document Number	Rev
A	AK4112B	A
Date:	Sheet	1 of 6



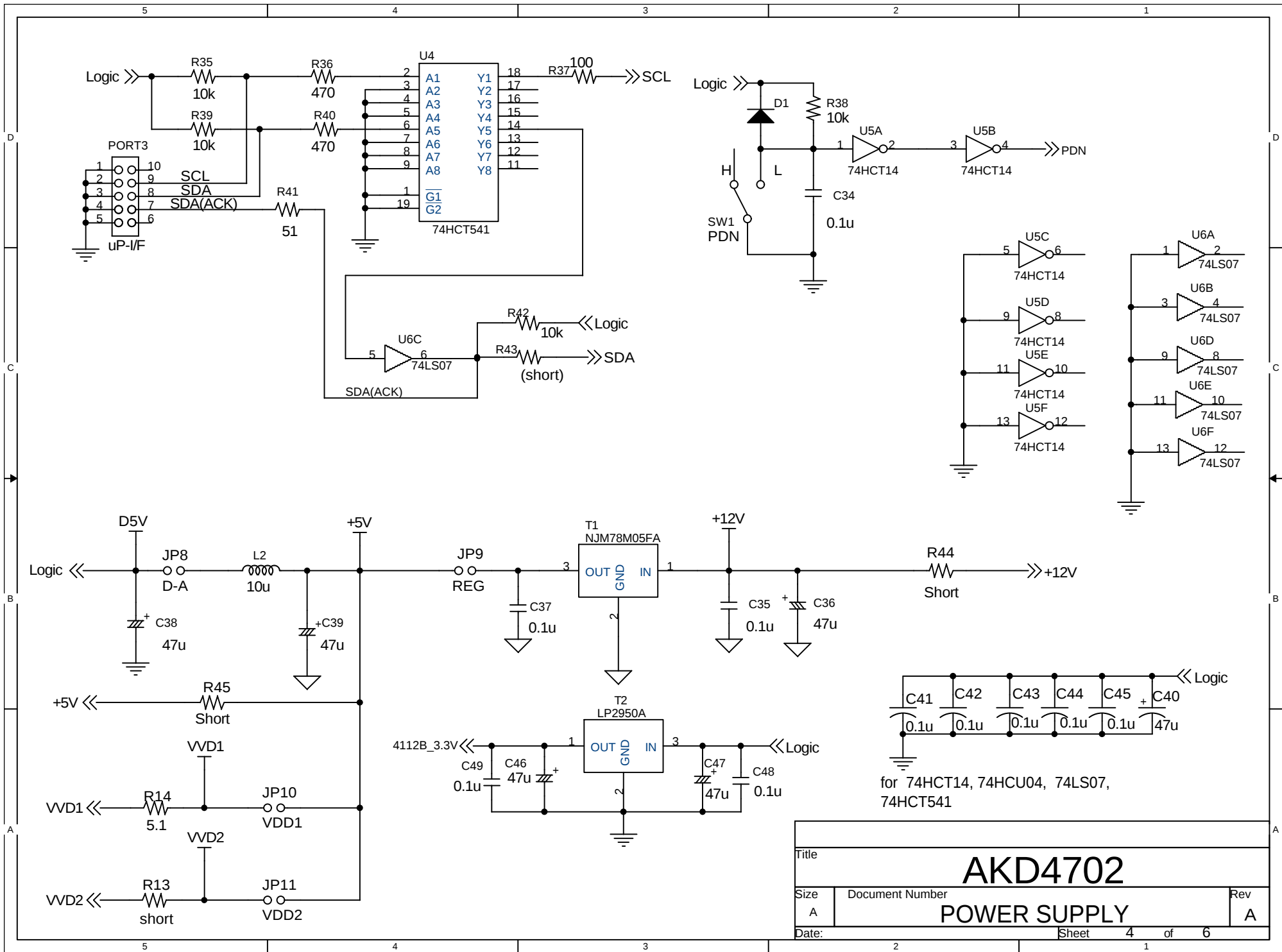


FOR Analog
input

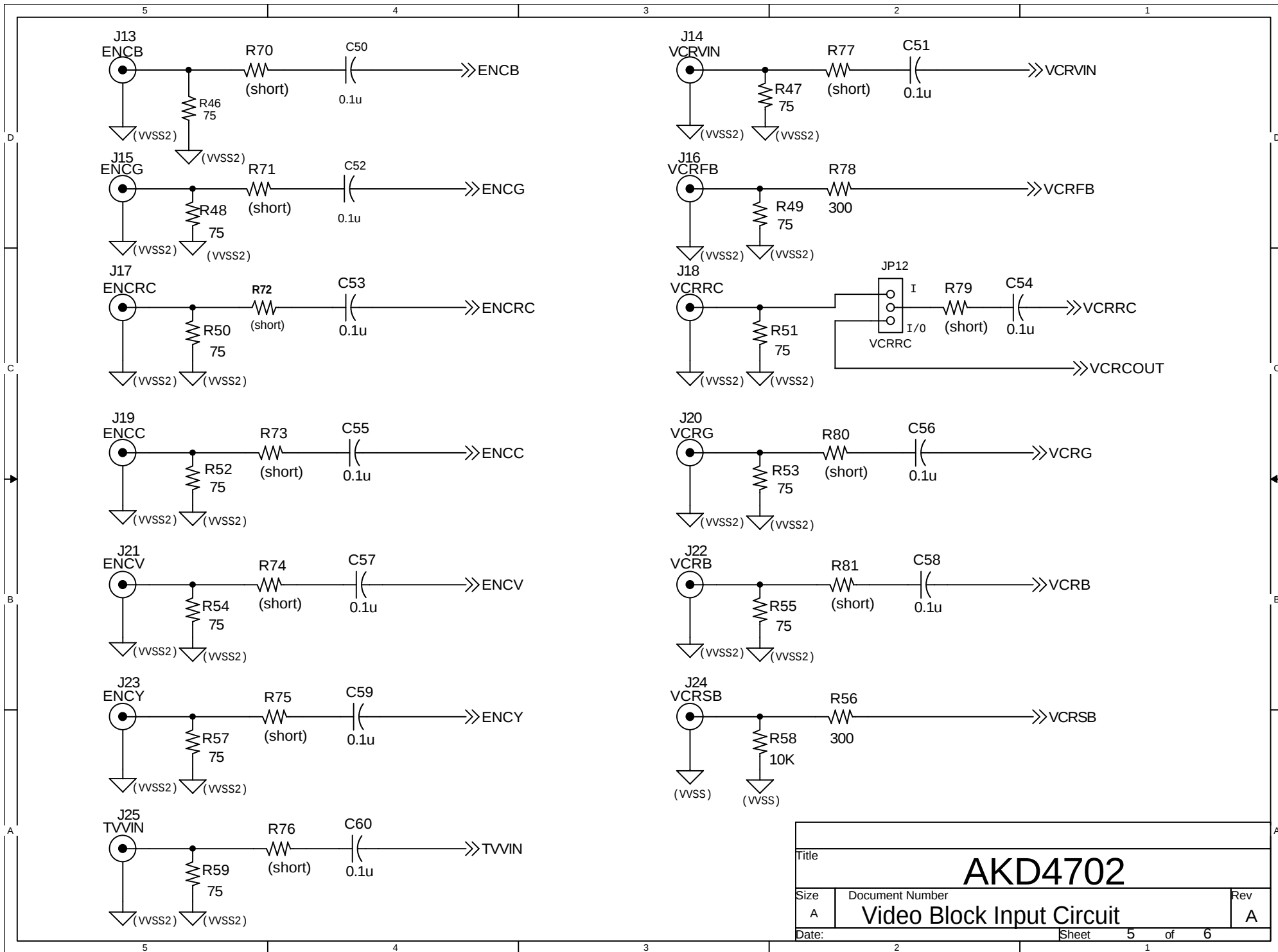
From
Analog
output



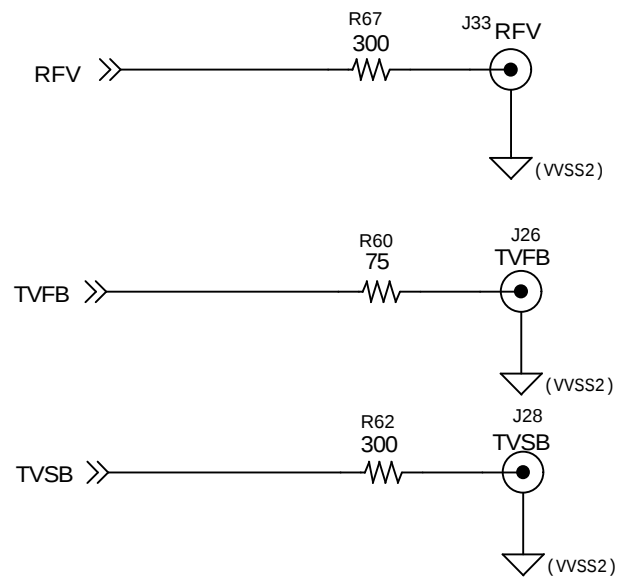
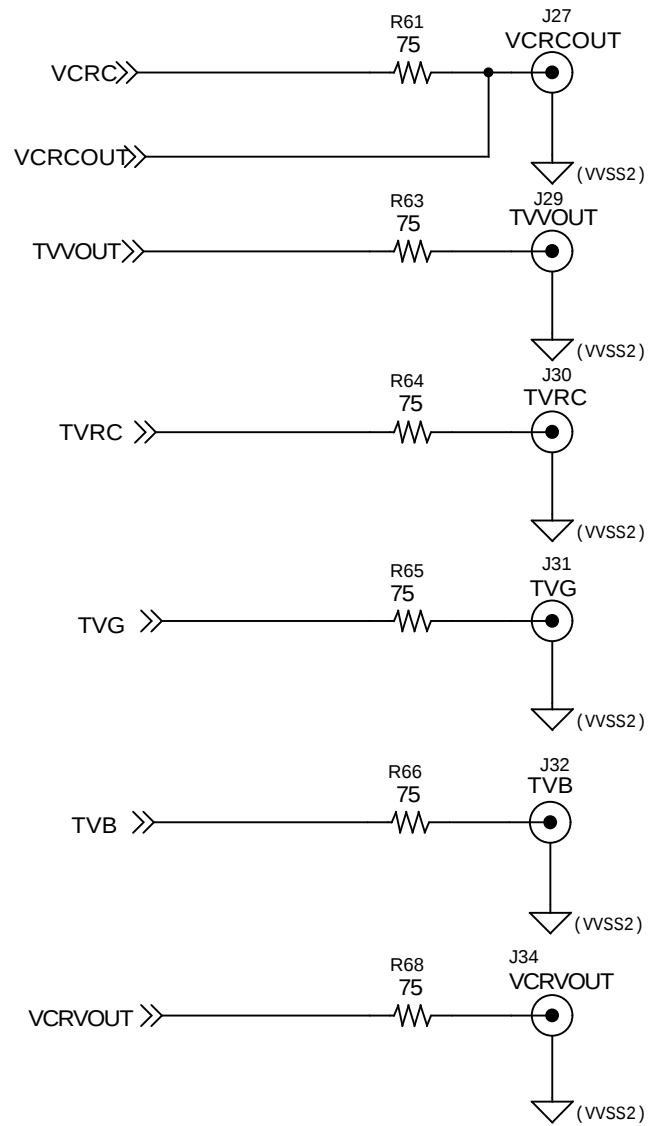
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