

AKD4730-100W

AK4730-100W Evaluation Board Rev.4

GENERAL DESCRIPTION

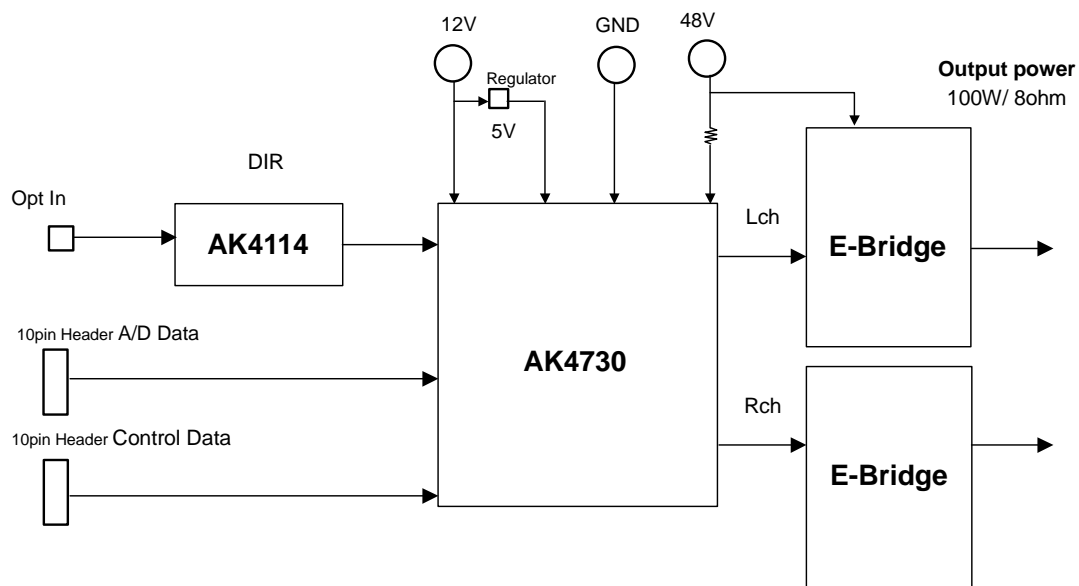
The AKD4730-100W is the evaluation board of AK4730, which is one chip modulator built in two channel PWM Modulators and Pre-Drivers of MOSFETs for Class-D Amplifier. It has the interface of the evaluation board of AKM's ADC, it is possible to evaluate it easily. The AKD4730 also has the digital audio interface and can achieve the interface with digital audio systems via opt-connector.

■ **Ordering guide**

AKD4730-100W --- AK4730-100W Evaluation Board
 (Cable for connecting with printer port of IBM-AT compatible PC and control software are packed with this.) This control software can't operate on Windows NT.

FUNCTION

- MOSFET drivers is built in
- Compatible with 2 types of interface
 - The optical input
 - Direct interface with AC3 decoder by 10pin header
- 10pin header for serial control interface



AKM recommend MOSFETs of IRF9Z34N, IRFZ24N in International Rectifier products for E-Bridge.

The inductance for LPF is TRTT14-J026 of TDK's product.

Figure 1. AKD4730-100W Block Diagram

■ Operation sequence

- 1) Set up the power supply lines (Please refer the wiring of “ set up other jumper ”)

Terminal		Supply Voltage	Items	Note
Name	Color			
Vp	Red	48V	VP1, 2,3 pins of AK4730	Should be connected
+12V	Orange	12V	MVDD pin of AK4730, the regulator and so on.	Should be connected
GND	Black	0V	All GND of AK4730	Should be connected

Table 1. Wiring of the power supply

Please wire the power supply carefully. (Divide wiring from each power supply)

- 2) Setup of each clocks to AK4730

The input method of the clocks to AK4730 has two kinds of methods. One method is from the mounted AK4114, another is from the external inputs. These setting is selected by the jumpers of JP1(MCLK), JP2(BICK), JP3(LRCK), JP4(SDATA).

(see the following Figures)

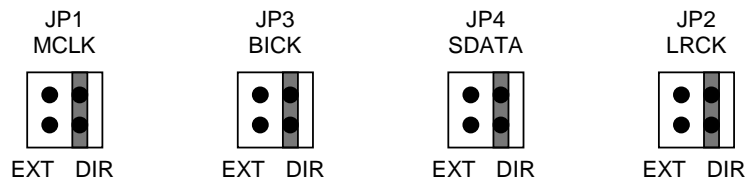


Figure 2 Clocks input from AK4114

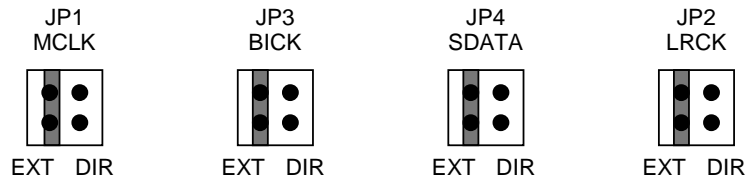
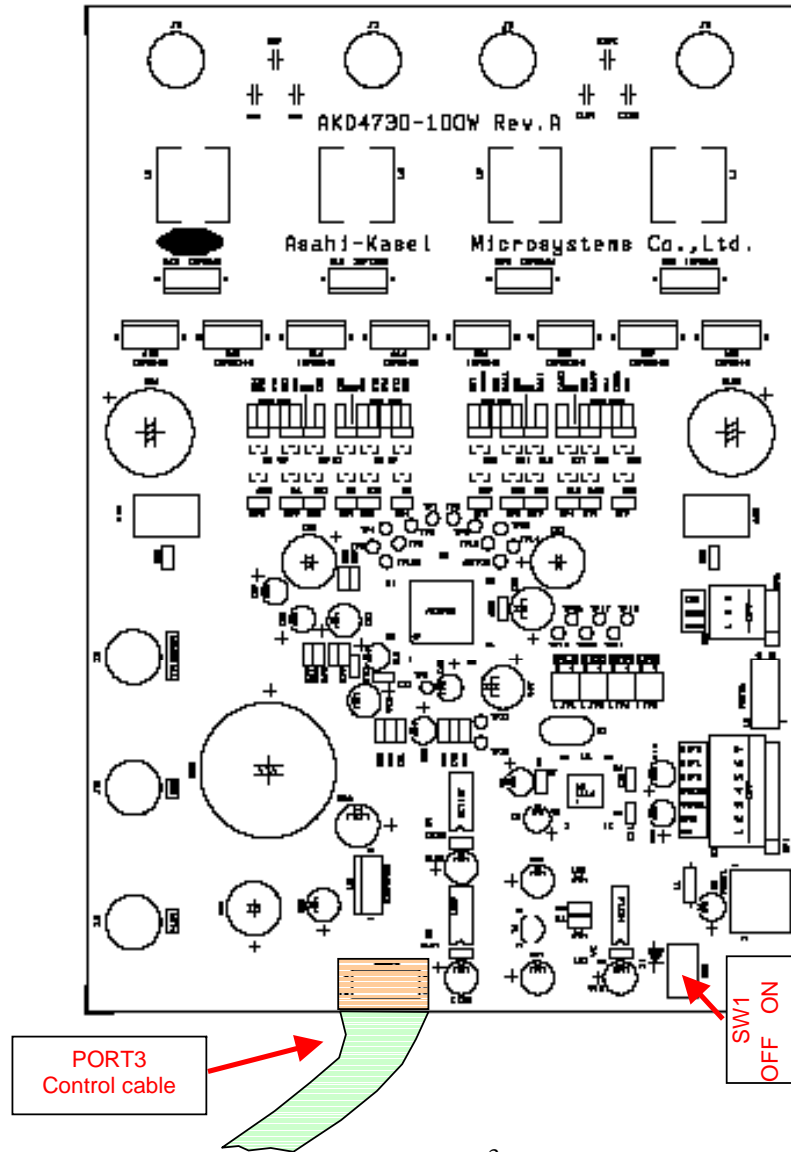


Figure 3. Clock input from the external

- 3) The connections of the outputs

Analog signals are outputted to J1(Lch hot), J2(Lch cold), J6(Rch hot), J7(Rch cold). Connect each terminal to speakers or the measurement equipment.



Setup sequence

1, SW1 is the switch for power-off of AK4730, AK4114. SW1 should be switched on off-side at the time of power supply on.
Turn on SW1 after power on.

2, Next, write the control registers.

Connect a control cable and a power supply as the figure.

■ Setup of the DIP switch

[S2]: Setup of AK4730

No.	Pin	OFF	ON	Default
1	CAD1	Set the chip address up. Default is "00"		OFF
2	CAD0			OFF
3	I2C	4-wire Serial	Don't turn it on.	OFF

Table 2. Setup of S2

[S1]: Setup of AK4114

No.	Pin	OFF	ON	Default
1	NC	It isn't connected.		OFF
2	CM0	PLL mode	X'tal mode	OFF
3	OCKS1	Setting of MCLK output Default is "00"(256fs)		OFF
4	OCKS0			OFF
5	DIF0	Setting of Audio interface Default is "101"(I ² S)		ON
6	DIF1			OFF
7	DIF2			ON

Table 3. Setup of S1

■ The function of toggle SW

[SW1](4730_PDN): Resets AK4730, AK4114. Leave SW to "H" during normal operation.

■ The indication content of LED

LED is turned on when each pin output is "H".

[LE1] (INT1): it is the output of INT0 pin of AK4114 (the detection of AUTO DTSCD, AUDION)

[LE2] (INT0): it is the output of INT1 pin of AK4114 (the detection of UNLOCK, PAR)

■ **Serial Control**

AKD4730-100W can be controlled through the printer port (a parallel port) of the IBM-AT interchange machine. Connect PORT3 and a PC with 10 line flat cable of packing together.

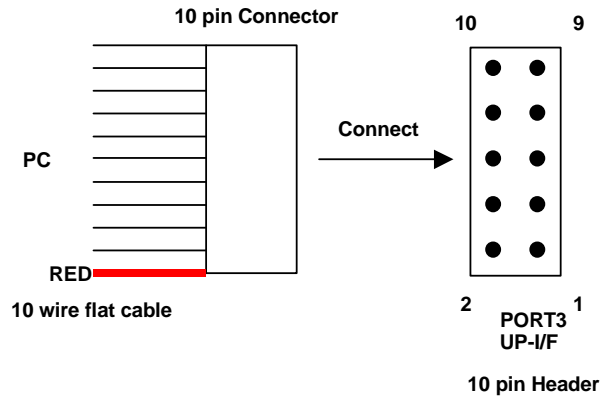


Figure 4. The connection of 10 line flat cable

AKD4730-100W Control Program operation manual

■ Set-up of evaluation board and control software

This evaluation board does not correspond to I²C control.

1. Set up the AKD4730-100W according to above mentioned setting.
2. Connect IBM-AT compatible PC with AKD4730-100W by 10-line type flat cable (packed with AKD4730). 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. Insert the CD-ROM-disk labeled "AKD4730-100W Evaluation Kit" into the CD-ROM-disk drive.
4. Access the CD-ROM-disk drive and double-click the icon of "akd4730_3.exe" to set up the control program.
5. Then please evaluate according to the followings.

■ Operation flow

Keep the following flow.

1. Start a control program in accordance with the above.
2. Next, it should input and output data properly, and evaluate it.

■ Explanation of each buttons

1. [Write default] : initialize the registers of AK4730
2. [All write] : The setting data of all registers on PC display is written to the AK4730 at the same time.
3. [All Read] : The setting data of all registers of the AK4730 is read out at same time.
4. [F1] : Dialog to write data by keyboard operation.
5. [F2] : Dialog to evaluate ATTL/ATTR
6. [Volume] : Volume and Tone can be changed by the slider buttons
7. [Read] : The setting data of each register is read
8. [Write] : The setting data of each register is written. "ON"/"OFF" at each bit are set up by click.

If you want to write the input data to AK4730, click "OK" button. If not, click "Cancel" button.

■ The indication of the data

The inputted data is indicated at the register map. Red character means "H" and "1", Blue character means "L" and "0". The blank part is the part which is not defined by the datasheet.

■ 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 AK4730, click "OK" button. If not, click "Cancel" button.

2. [Function2 Dialog] : Dialog to evaluate ATTL/ATTR

This dialog corresponds to only addr=02H, 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 AK4730 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 AK4730, click "OK" button. If not, click "Cancel" button.

3. [Volume Dialog] : Dialog to write the data by the mouse operation

This dialog corresponds to only addr=02H, 03H, 04H, 05H

4. [Write Dialog] : Dialog to write data by the 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 AK4730, click "OK" button. If not, click "Cancel" button.

■ Attention on the operation

In the case that the function of “Output-Short Protection” is used
Write “1” to PW bit after PROT bit was written “1”.

In the case that the function of “Adaptive Dead-Time Control” is used
Write “1” to ADTC bit after PW bit was written “1”.

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.

■ AK4730 register map

Addr	Register Name	D7	D6	D5	D4	D3	D2	D1	D0
00H	PW & Mode	DEM1	DEM0	DIF2	DIF1	DIF0	DFS1	DFS0	PW
01H	Vol. Gain Control	0	SCALE1	SCALE0	GAIN2	GAIN1	GAIN0	SMUTER	SMUTEL
02H	Lch Volume	L7	L6	L5	L4	L3	L2	L1	L0
03H	Rch Volume	R7	R6	R5	R4	R3	R2	R1	R0
04H	TONE-Bass Control	TFS	TLIM	TONE	B4	B3	B2	B1	B0
05H	TONE-Treble Control	0	0	0	T4	T3	T2	T1	T0
06H	Dead Time Lch 1	0	DR1L2	DR1L1	DR1L0	0	DF1L2	DF1L1	DF1L0
07H	Dead Time Lch 2	0	DR2L2	DR2L1	DR2L0	0	DF2L2	DF2L1	DF2L0
08H	Dead Time Rch 1	0	DR1R2	DR1R1	DR1R0	0	DF1R2	DF1R1	DF1R0
09H	Dead Time Rch 2	0	DR2R2	DR2R1	DR2R0	0	DF2R2	DF2R1	DF2R0
0AH	Dead Time Lch Status 1	0	DR1LO2	DR1LO1	DR1LO0	0	DF1LO2	DF1LO1	DF1LO0
0BH	Dead Time Lch Status 2	0	DR2LO2	DR2LO1	DR2LO0	0	DF2LO2	DF2LO1	DF2LO0
0CH	Dead Time Rch Status 1	0	DR1RO2	DR1RO1	DR1RO0	0	DF1RO2	DF1RO1	DF1RO0
0DH	Dead Time Rch Status 2	0	DR2RO2	DR2RO1	DR2RO0	0	DF2RO2	DF2RO1	DF2RO0
0EH	Option	0	0	0	0	FIR	ADTC	PROT	PSRON
0FH	Protection Status	0	0	0	0	0	0	0	OVRL

Note: **When PDN pin is "L", it is impossible to write the data to all registers. It is initialized.**
Do not write the data to Addr.10H~1FH.

• **The setting of the registers of Red character as the above Addr."06H-09H" is recommended to Dead-Time (for MOSFET Array SLA5097) on the AKD4730-100W evaluation board.**

• **When the function of ADTC is evaluated, set up the power supply (Vp) to 48V.**

■ Plots

[Measurement condition]

- Measurement unit: Audio Precision, System two, Cascade
- MCLK : 256fs
- BICK : 64fs
- fs : 48kHz, 44.1kHz
- BW : 10Hz~20kHz
- Bit : 24bit
- Power Supply : AVDD=DVDD=TVDD=PVDD=5V, MVDD=1.2V, VP=48V(VP1=VP2=VP3 <28V)
- Interface : AK4114
- Temperature : Room
- Load : 8Ω

Figure 5. THD+N vs Input Level (fin=1kHz)

Figure 6. FFT (Noise floor)

Figure 7. Linearity (fin=1kHz)

Figure 8. Triangle -80dBFS input

Figure 8. Tone control FR

AKM

AK4730 Vp=48V
THD+N vs Input level

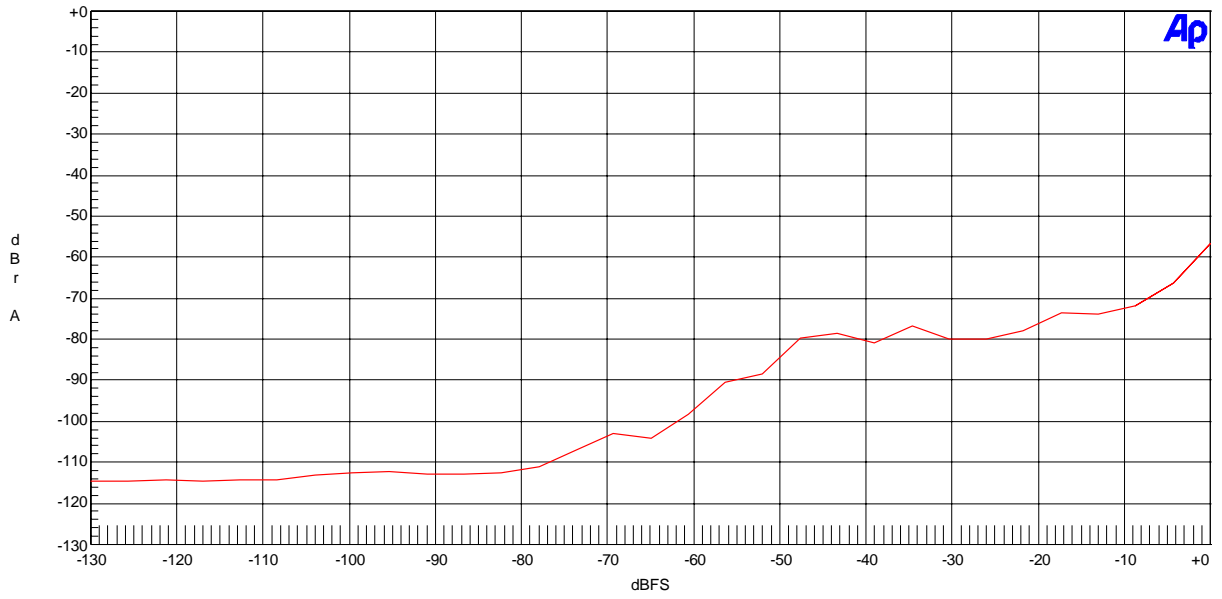


Figure 5. THD+N vs Input Level (fin=1kHz)

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AK4730 Vp=48V
Out of band noise

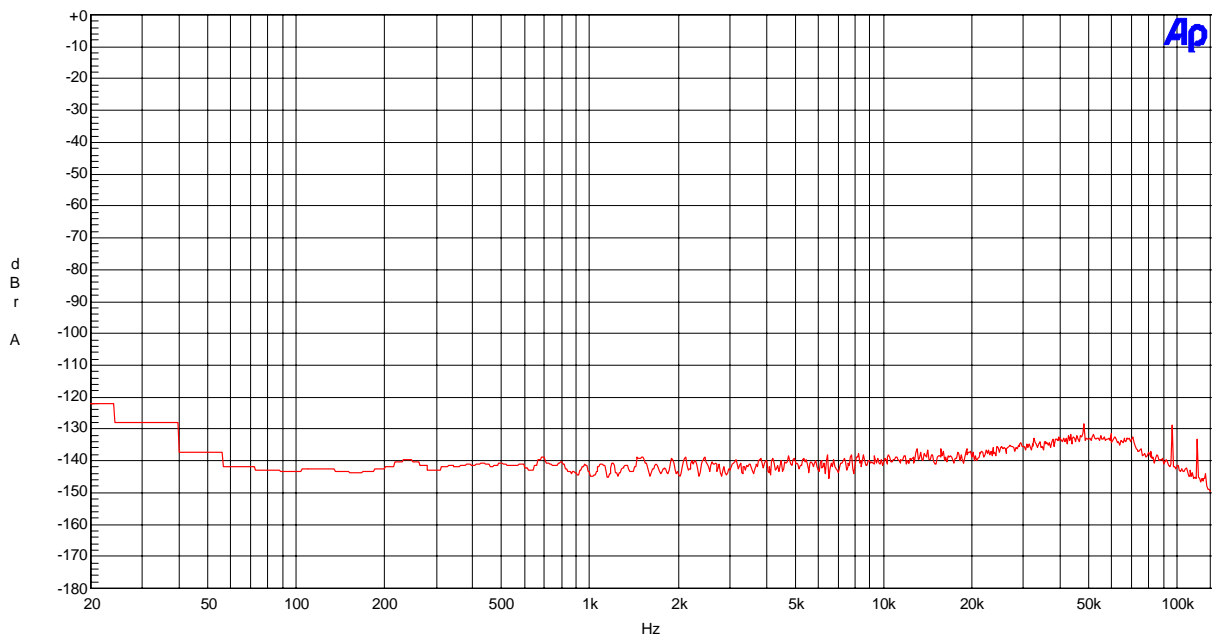


Figure 6. FFT (Out of band noise)
FFT points=16384, Avg=8, Window=Equiripple

AKM

AK4730 VP=48V
Linearity

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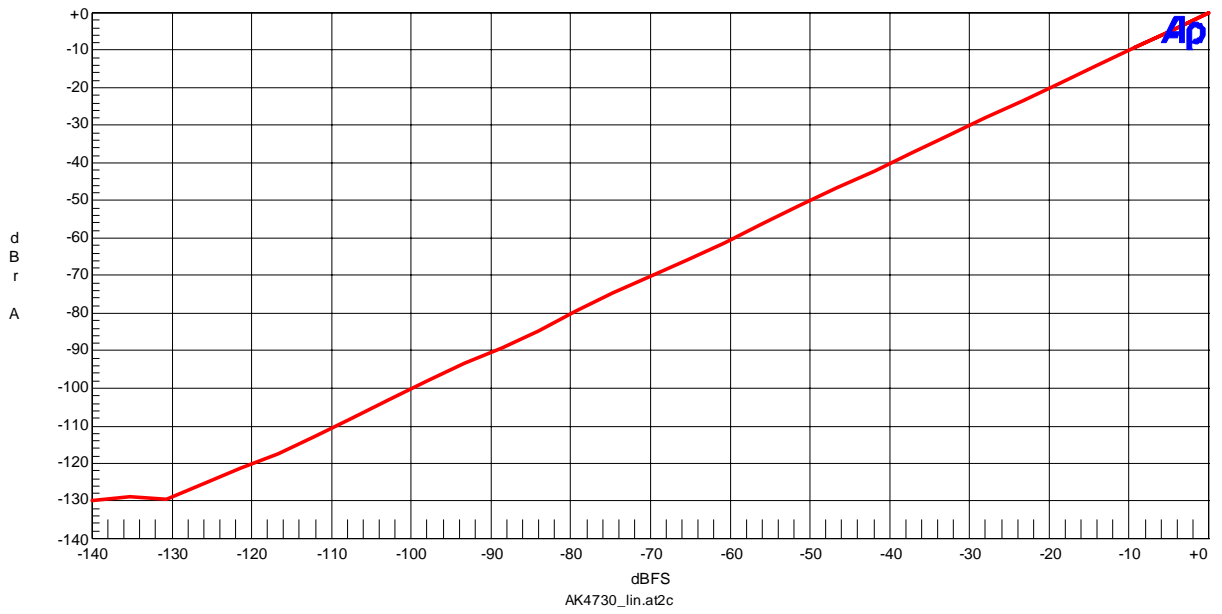


Figure 7. Linearity (fin=1kHz)

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AK4730 VP=48V
-80dBFS Triangle Wave

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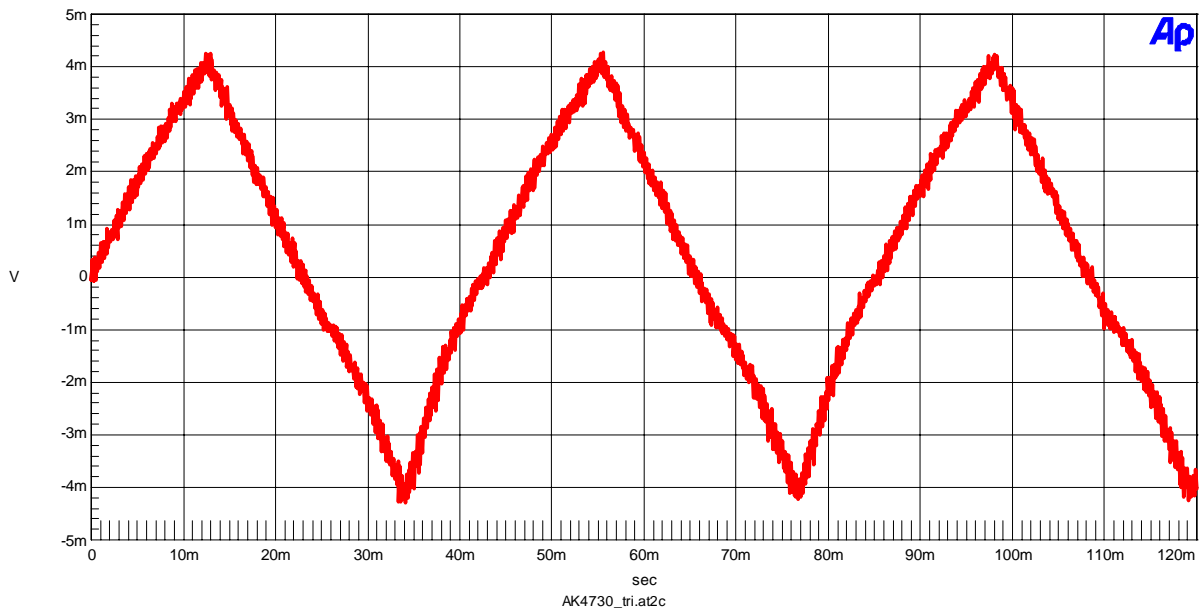


Figure 8. Triangle -80dBFS input

AKM

AK4730 $V_p=48V$, $f_s=44.1kHz$

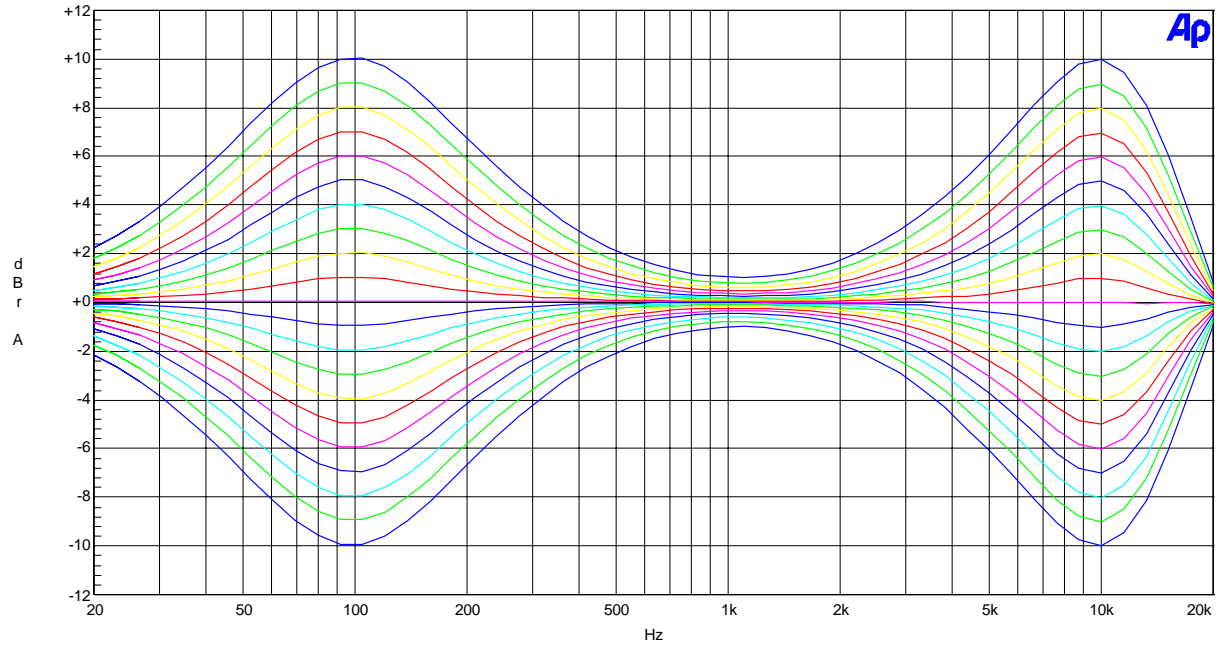


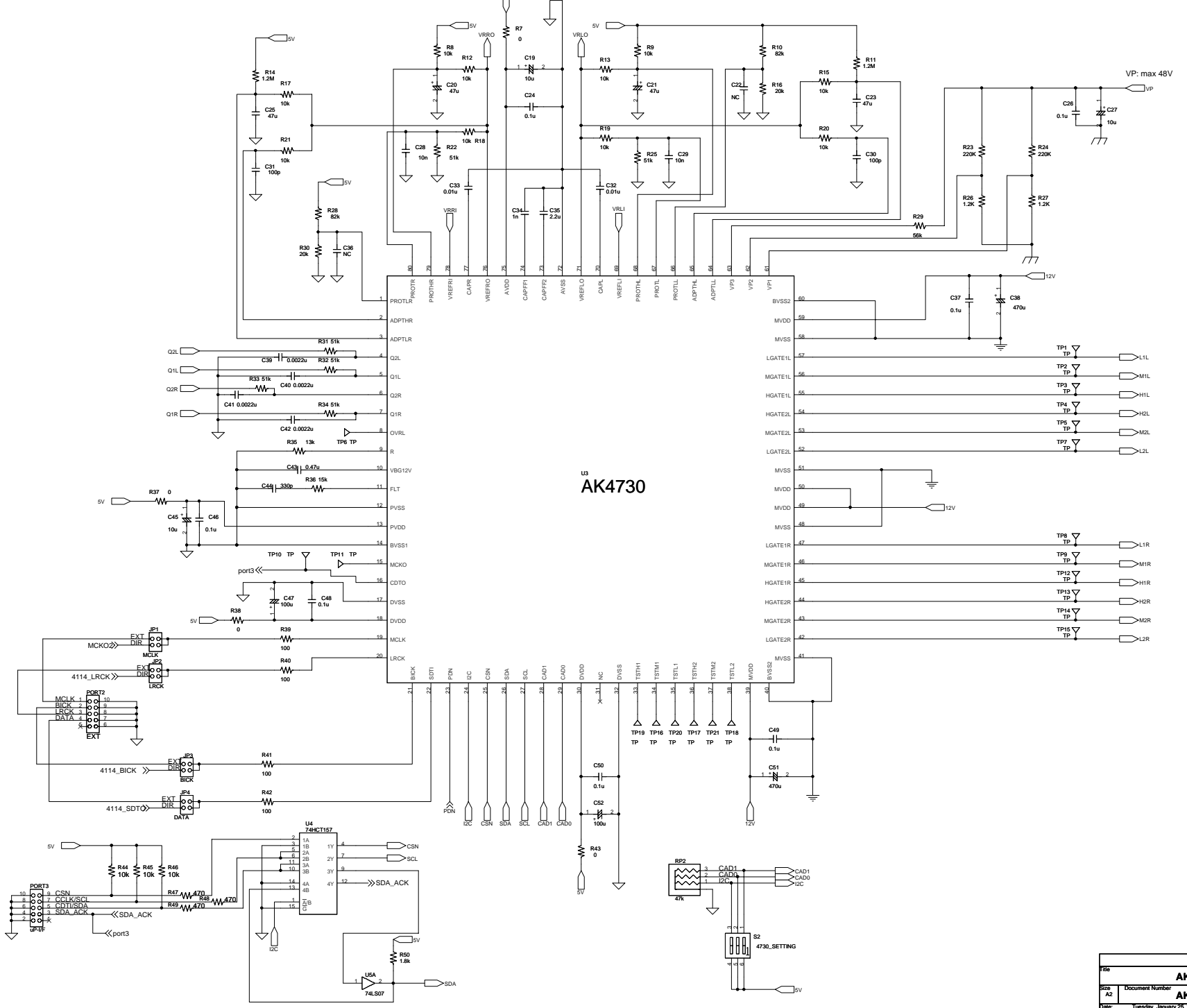
Figure 9. Tone control FR

Revision History

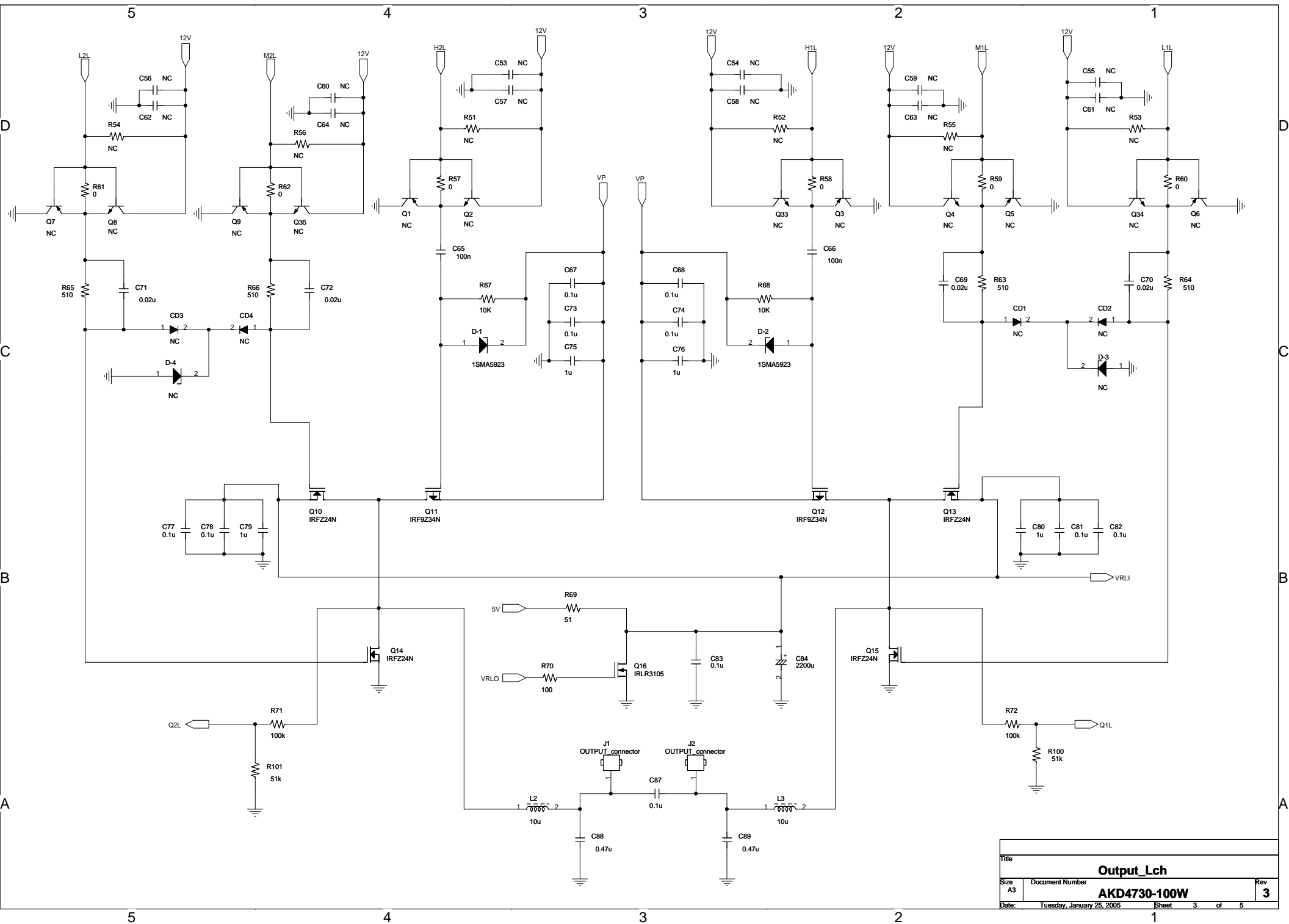
Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
04/05/20	KM074900	0	First Edition	
04/12/14	KM074901	1	Circuit Change	<p>Additions and changes of parts number due to changes of parts of npn transistors of Output Lch and Output Rch from 2 in 1 package to discrete. Added parts number Q33, Q34, Q35, Q36, Q37, Q38 due to this changes. Defined new parts number.</p> <p>Changes of parts number: Output Lch : Output Rch Q2A → Q2 : Q18A → Q18 Q2B → Q33 : Q18B → Q36 Q4A → Q4 : Q20A → Q20 Q4B → Q34 : Q20B → Q37 Q8A → Q8 : Q24A → Q24 Q8B → Q35 : Q24B → Q38</p> <p>Changes of parameters of circuit around AK4730: C23, C25 : 10u → 47u R4, R11 : 1M → 1.2M</p> <p>Changes of parameters of circuit around Output Lch and Output Rch: C87, C132 : 0.33u → 0.1u R69, R92 : 200 → 51</p>
05/01/25	KM074902	3	Board Revision Change	Rev.A → Rev.3
05/04/04	KM074903	3	Control Software Version Change Control Software File Name Change	Ver.1.0 → Ver.3.0 akd4730.exe → akd4730_3.exe
05/07/19	KM074904	4	Board Revision Change Parts ID Change	Rev.3 → Rev.4 Inductance for LPF: Parts ID Change RLF12560-100M7R5 → TRTT14-J026

IMPORTANT NOTICE

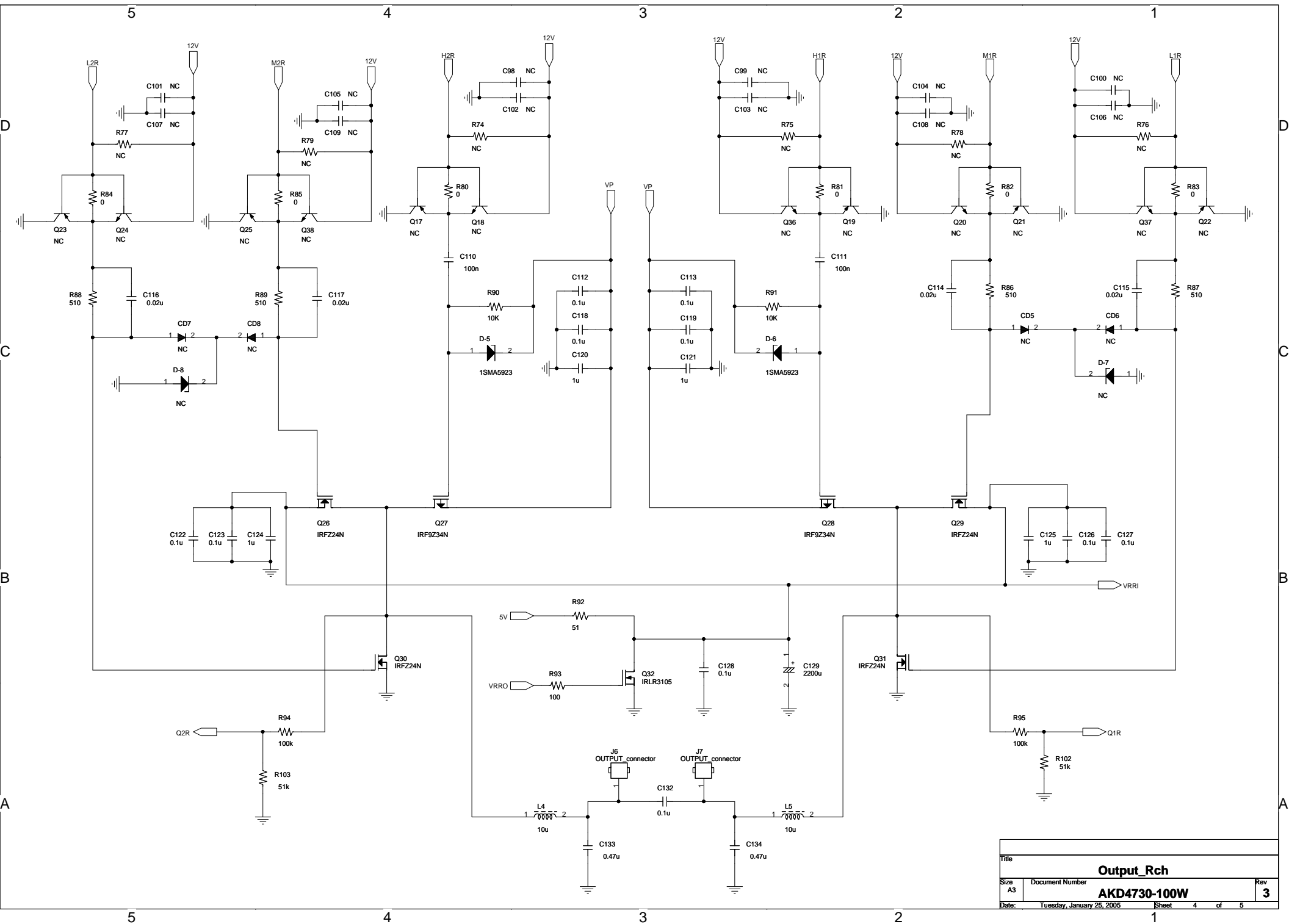
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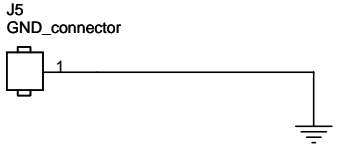
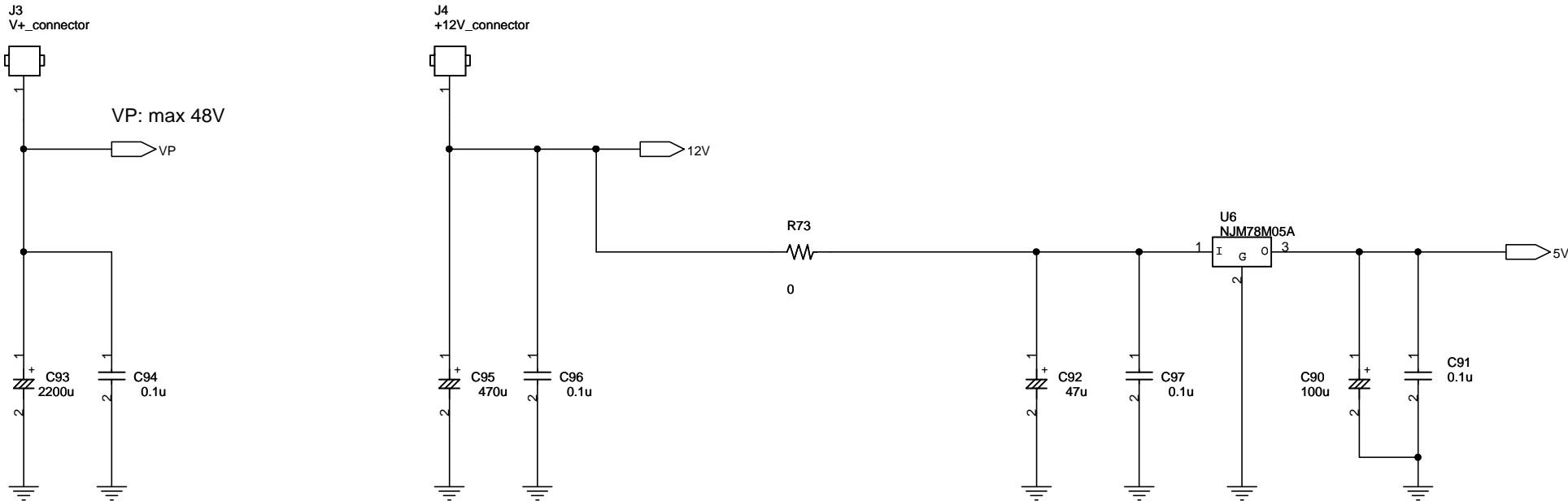
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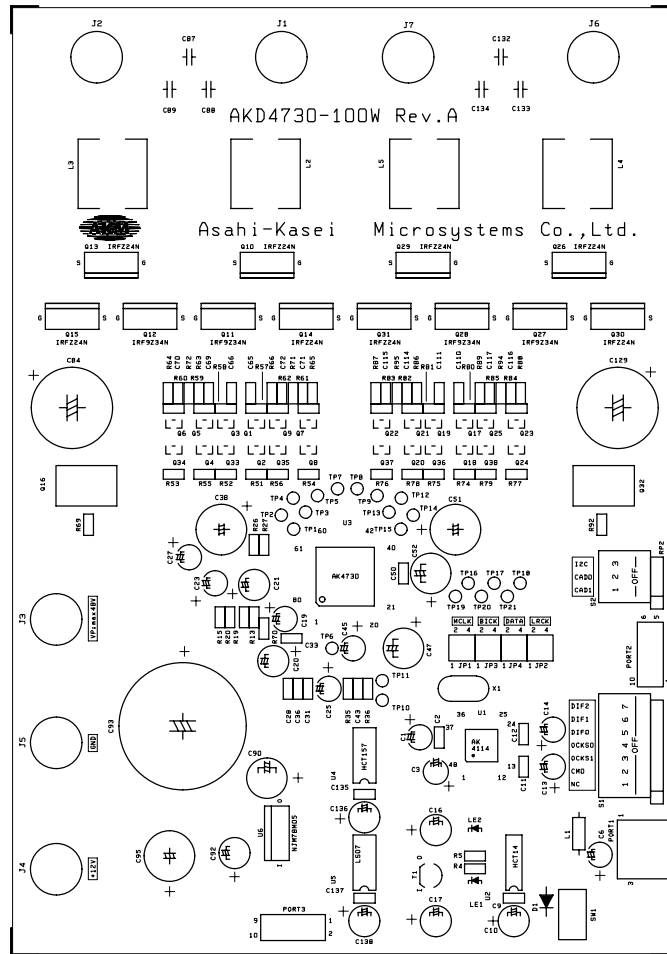
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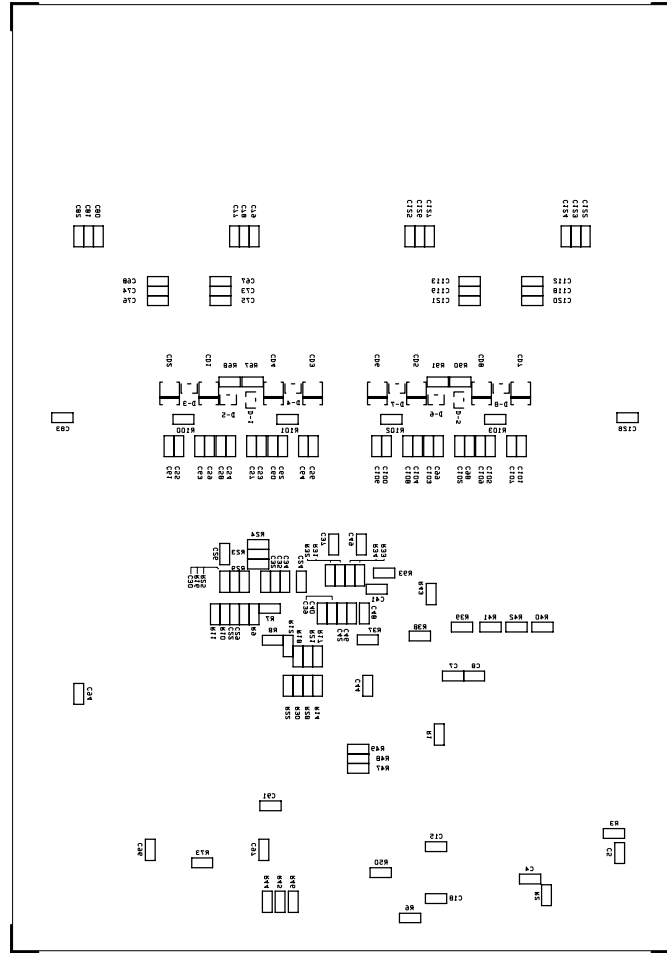


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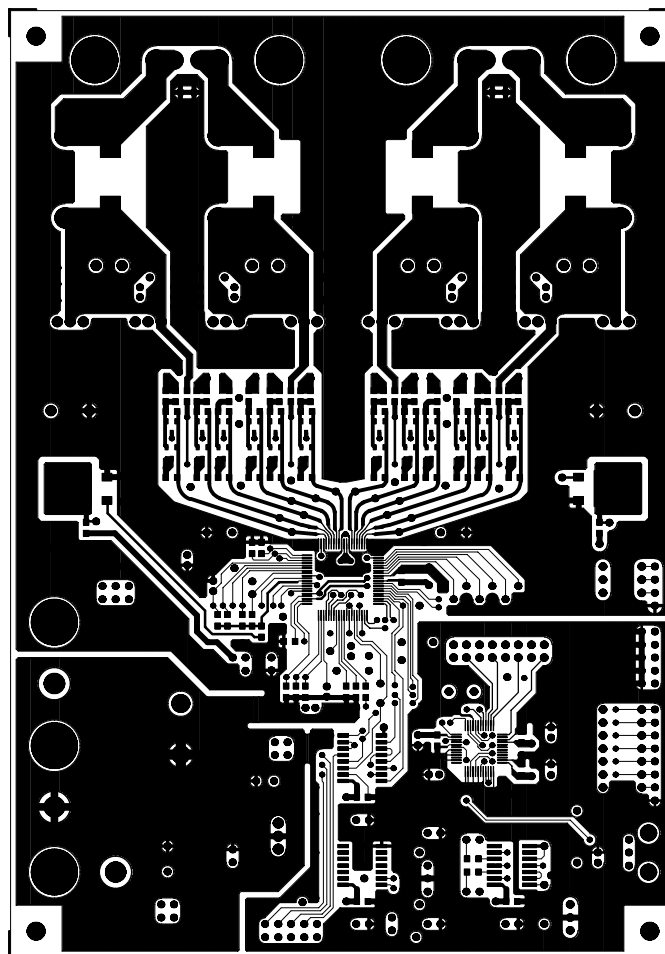
部品面シルク

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品名	AKD4730-100W Rev.A		
年月日	分	類	
製図法	部品面透視図	尺 度	1/1



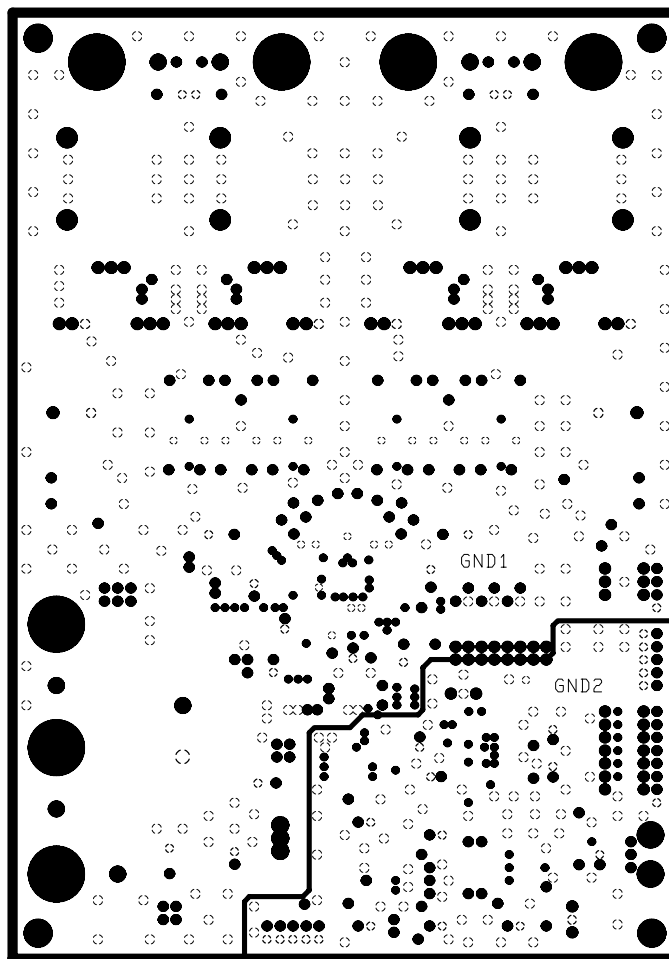
株式会社 堀田半

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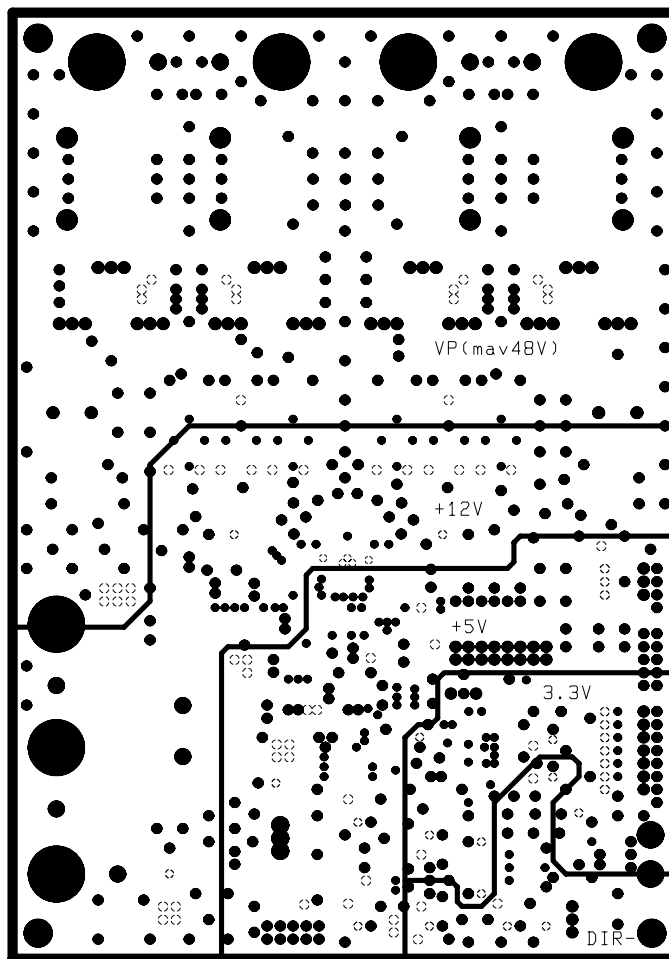
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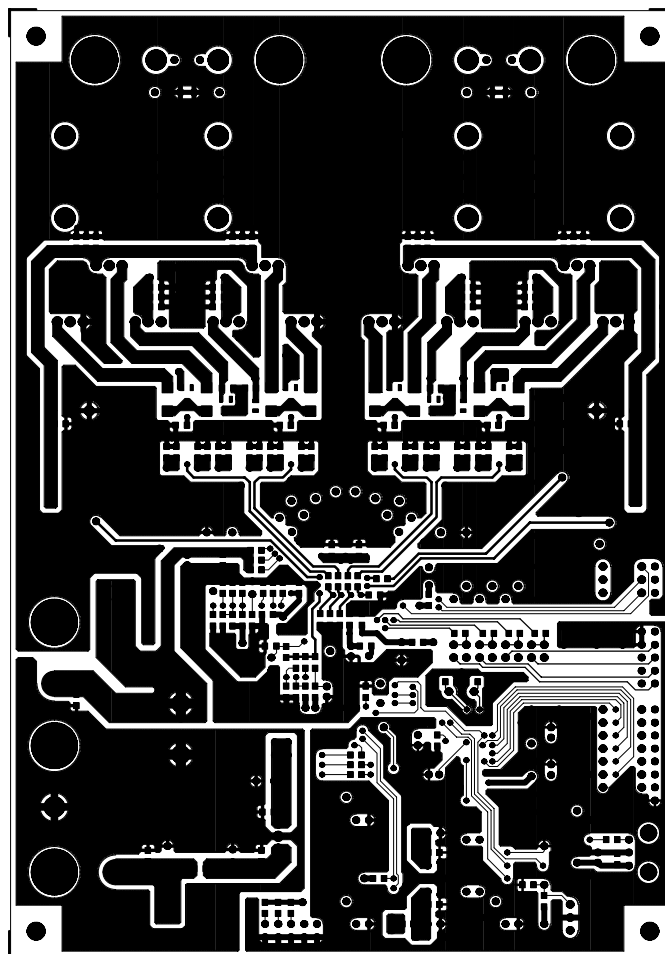
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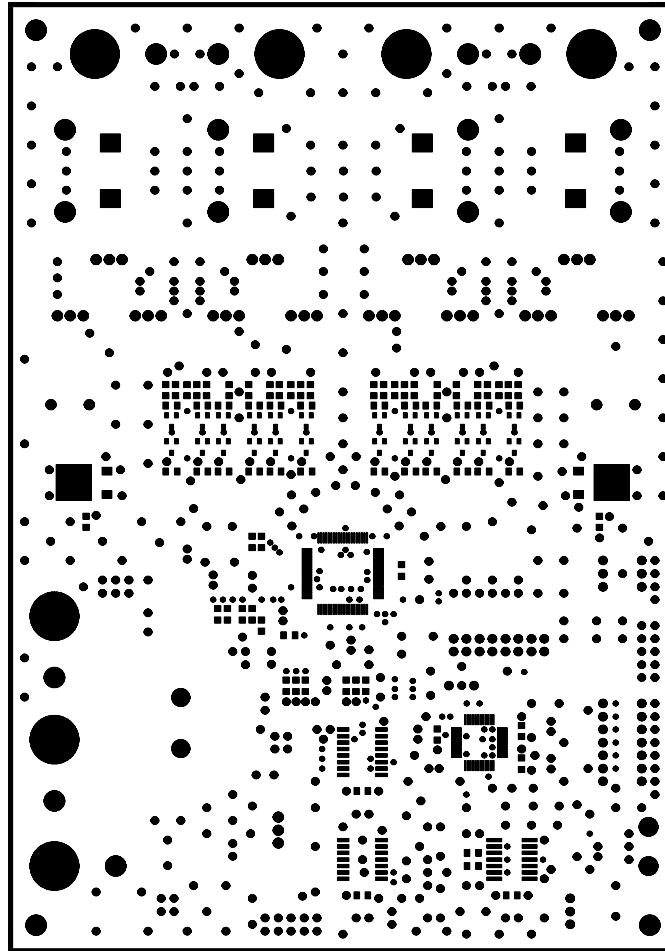
(EJ) 製図室

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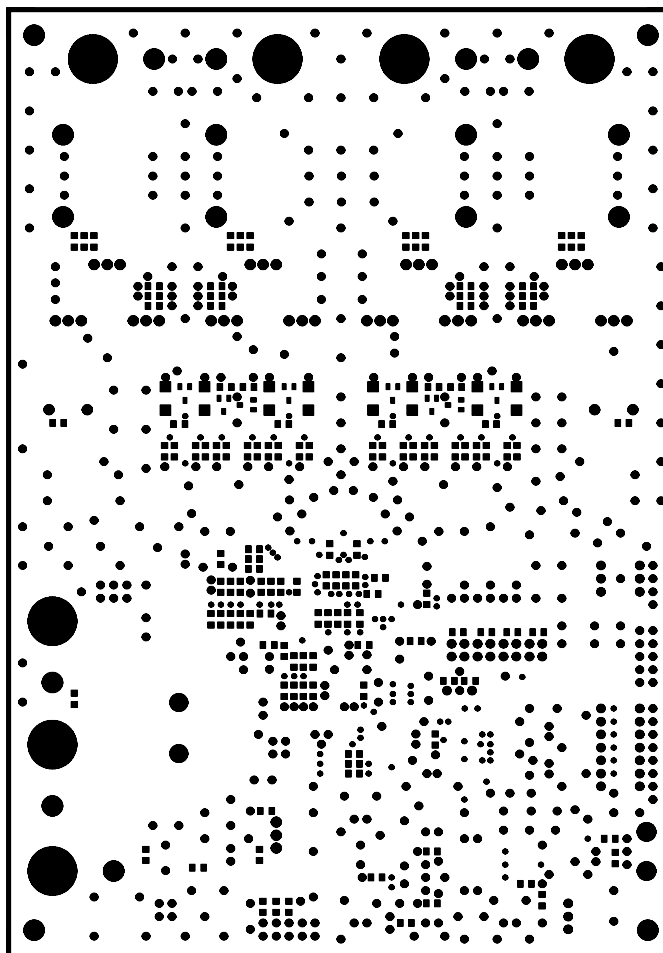
(D) ベーザン電機

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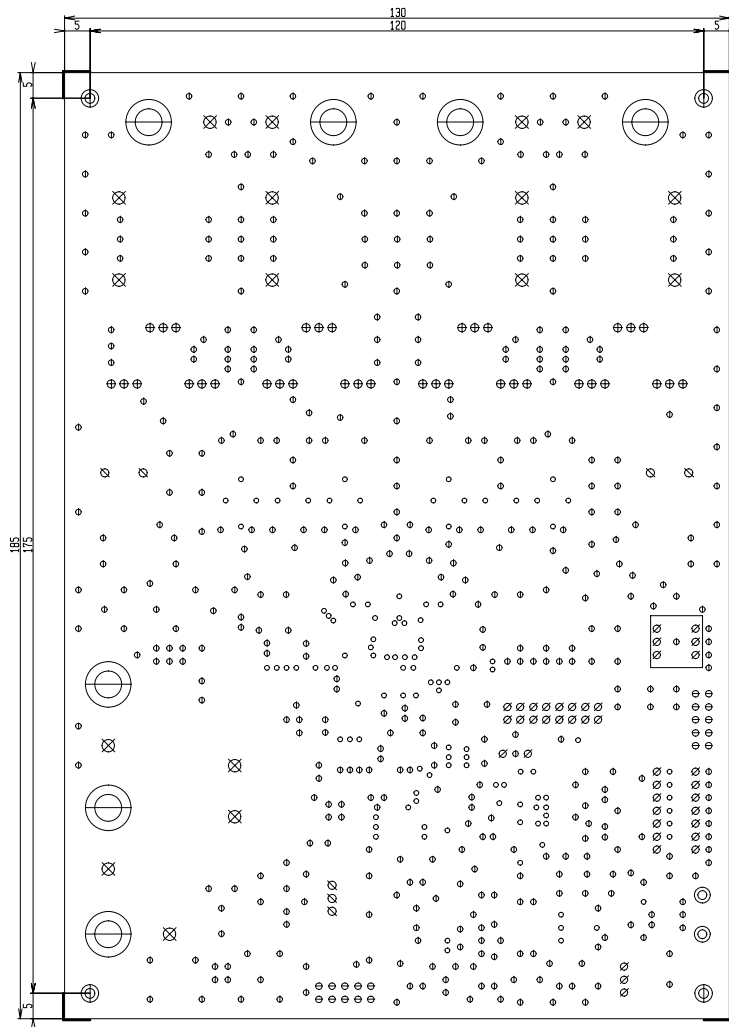
部品面レジスト

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⊕	TH	475-0.800
⊖	TH	20-0.900
⊗	TH	41-1.000
⊙	TH	7-1.200
⊕	TH	36-1.300
⊗	TH	17-2.000
⊙	NT	2-3.300
⊕	NT	4-3.500
⊗	NT	7-9.000

外形寸法・穴種示

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