AKD4113-B
AK4113-B Evaluation Board Rev.2

GENERAL DESCRIPTION

AKD4113-B is the evaluation board for AK4113, 192kHz digital audio receiver. This board has BNC connector to interface with other digital audio equipment.

■ **Ordering guide**

AKD4113-B   ---   Evaluation board for AK4113
                (Control software is included in this package.)

FUNCTION

□ **Digital interface**
   -S/PDIF :
      1 channel input (BNC)
      1 channel output (BNC)
   - Serial audio data I/F :
      1 output (for DIR data output. 10-pin port)
   -Serial control data I/F
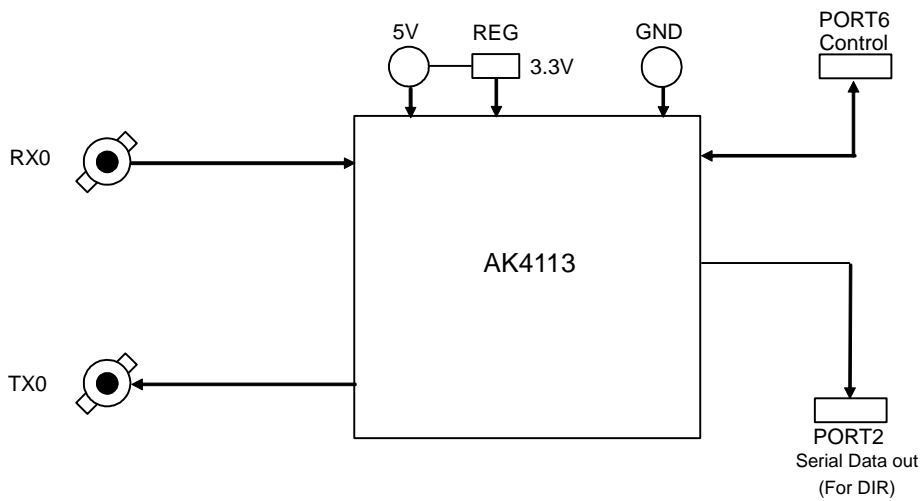   **1 input/output port (10-pin port)**

Figure 1. AKD4113-B Block Diagram
*Circuit diagram and PCB layout are attached at the end of this manual.

Evaluation Board Manual

■ **Operating sequence**

(1) **Set up the power supply lines.**
  [+ 5V]   (Red)   = 5V
  [GND]   (Black) = 0V

(2) **Set up the evaluation mode and jumper pins.** (Refer to the following item.)

(3) **Connect cables.** (Refer to the following item.)

(4) **Power on.**
  The AK4113 should be reset once bringing PDN(SW2) "L" upon power-up.

■ **Evaluation modes**

(1) Evaluation for DIR
    S/PDIF in (BNC) – AK4113 – Serial Data out (10pin port)
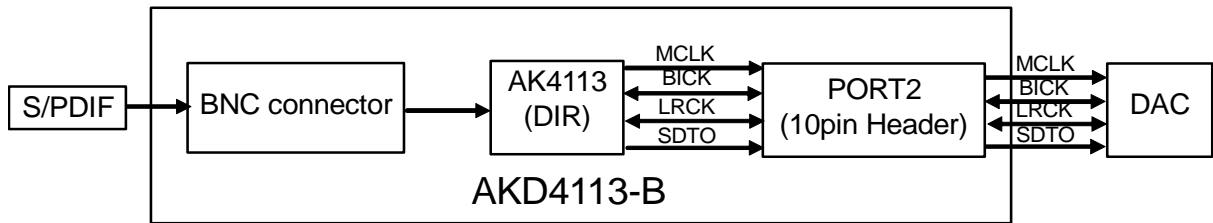
    The DIR generates MCLK, BICK and LRCK SDATA from the received data through BNC connector. The AKD4113-B can be connected with the AKM's DAC evaluation board via 10-line cable.

  a.   Set-up of Bi-phase Input

    RX1 and RX2-6 should not select BNC connector at the same time.

  a-1. RX1

Connector	JP2(RX1)
BNC (J2)	BNC

< Default >

    Table 1. Set-up of RX1

  a-2. RX2, 3, 4, 5 and 6 can be inputted from a BNC (J2) connector only.
    Only RX1 can be used in parallel mode.

  a-2-1. Set-up of the jumper on the sub board.

Mode	JP19	JP21	JP22	JP23	JP24	JP25	JP26
Serial mode	RX2	RX3	RX4	RX6	RX4	RX5	RX6
Parallel mode	DIF0	DIF1	DIF2	IPS	IPS	DIF0	DIF1

    Table 2. Set-up of the Jumper on the sub board

a-2-2. Set-up of the jumper on the main board.

Input	RX2	RX3	RX4	RX5	RX6
JP	JP5	JP6	JP7	JP8	JP9
	Short	Short	RX4	RX5	RX6

The jumper, which selects the Rx channel, should be Short.
Table 3. Set-up of RX2, 3, 4, 5 and 6

a-3. Set-up of AK4113 input path

It sets up IPS2-0 bit in serial mode. SW 1-1 (IPS pin) is fixed to "L"(RX1) in parallel mode.

IPS2 bit	IPS1 bit	IPS0 bit	INPUT Data	
0	0	0	RX1	Default
0	0	1	RX2	
0	1	0	RX3	
0	1	1	RX4	
1	0	0	RX5	
1	0	1	RX6	
1	1	0	No use	
1	1	1	No use	

Table 4. Recovery Data Select (Serial)

b.   Set-up of clock input and output

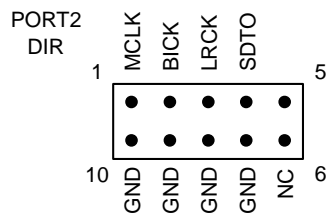The signal level outputted/inputted from PORT2 is 3.3V.

Figure 2. PORT2 pin layout

b-1. MCKO1/MCKO2

The output of MCKO1 pin or MCKO2 pin can be selected by JP12. The output frequency of MCKO1/MCKO2 is selected by OCKS 1-0.

Output signal	JP12
MCKO1	MCKO1
MCKO2	MCKO2

< Default >

Table 5. MCKO1/MCKO2 set-up

OCKS1 pin (SW3-2)	OCKS0 pin (SW3-3)	(X'tal)	MCKO1	MCKO2	fs (max)
OCKS1 bit	OCKS0 bit				
0	0	256fs	256fs	256fs	96 kHz
0	1	256fs	256fs	128fs	96 kHz
1	0	512fs	512fs	256fs	48 kHz
1	1	128fs	128fs	64fs	192 kHz

< Default > (for first data row)

Table 6. Master Clock Frequency Select

b-2. Set-up of BICK and LRCK input and output

Please select SW 2-7 (DIR-I/O) according to the setup of audio format of AK4113 (Refer to Table 7).

Output signal	SW3-7 (DIR-I/O)
Slave mode	0
Master mode	1

< Default > (for Slave mode)

Table 7. DIR-I/O set-up

c. Set-up of Audio data format

It sets up by SW 1-2, SW 1-3 and SW1-4 in parallel mode. Please set up DIF2-0 bit in serial mode.

Mode	DIF2 pin (SW1-4)	DIF1 pin (SW1-3)	DIF0 pin (SW1-2)	DAUX	SDTO	LRCK	I/O	BICK	I/O
	DIF2 bit	DIF1 bit	DIF0 bit						
0	0	0	0	24bit, Left justified	16bit, Right justified	H/L	O	64fs	O
1	0	0	1	24bit, Left justified	18bit, Right justified	H/L	O	64fs	O
2	0	1	0	24bit, Left justified	20bit, Right justified	H/L	O	64fs	O
3	0	1	1	24bit, Left justified	24bit, Right justified	H/L	O	64fs	O
4	1	0	0	24bit, Left justified	24bit, Left justified	H/L	O	64fs	O
5	1	0	1	24bit, I^2S	24bit, I^2S	L/H	O	64fs	O
6	1	1	0	24bit, Left justified	24bit, Left justified	H/L	I	64-128fs	I
7	1	1	1	24bit, I^2S	24bit, I^2S	L/H	I	64-128fs	I

< Default > (for Mode 6)

Table 8. Audio data format

d. Set-up of CM1 and CM0

The operation mode of PLL is selected by CM1 and CM0. In parallel mode, it can be selected by SW2-1 and JP18. In serial mode, it can be selected by CM1-0 bits.

CM1 pin (SW3-1)	CM0 pin (JP18)	(UNLOCK)	PLL	X'tal	Clock source	SDTO source	
CM1 bit	CM0 bit						
0	0 (CM0)	-	ON	ON (Note)	PLL (RX)	RX	< Default >
0	1 (CDTO/CM0=H)	-	OFF	ON	X'tal	DAUX	
1	0 (CM0)	0	ON	ON	PLL (RX)	RX	
		1	ON	ON	X'tal	DAUX	
1	1 (CDTO/CM0=H)	-	ON	ON	X'tal	DAUX	

ON: Oscillation (Power-up), OFF: STOP (Power-Down)
Note: When the X'tal is not used as clock comparison for fs detection (XTL0, 1= "1,1"), the X'tal is OFF.
Table 9. Clock Operation Mode Select

(2) Evaluation for DIT
   S/PDIF in (BNC) – AK4113 – S/PDIF out (BNC)

   a.   Set-up of a Bi-phase output signal

   As for TX, only the loop back mode of RX corresponds. In serial mode, it can be selected by OPS2-0 bits. This mode is not supported in parallel mode.

Connector	JP13 (TX)
BNC (J4)	BNC

< Default >

Table 10. Set-up of TX

■ Serial control

The AK4113 can be controlled via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT6 (uP-I/F) with PC by 10-line flat cable packed with the AKD4113-B. Take care of the direction of connector. There is a mark at pin#1. The pin layout of PORT6 is as Figure 3.

Mode	SW1-6	JP18	JP20
4 wire Serial	L	CDTO/CM0="H"	IIC
IIC	H	SDA and CM0="L"(Note)	IIC

Note: In IIC mode, the chip address is fixed to "01".
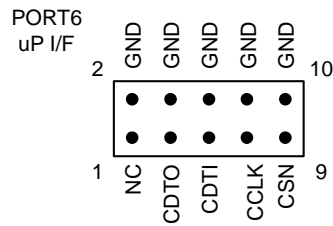Table 11. Set-up of parallel mode and serial mode

Figure 3. PORT6 pin layout

This evaluation board encloses control software. A software operation procedure is included in an evaluation board manual.

■ **Toggle switch set-up**

SW2	PDN	Reset switch for AK4113. Set to "H" during normal operation. Bring to "L" once after the power is supplied.

■ **LED indication**

LE1	INT0	Bright when INT0 pin goes to "H".
LE2	INT1	Bright when INT1 pin goes to "H".

■ **DIP switch (SW1) set-up: -off- means "L"**

No.	Switch Name	Function	Default
1	IPS0	Set-up of IPS0 pin. (always "L")	OFF
2	DIF0	Set-up of DIF0 pin. (in parallel mode)	OFF
3	DIF1	Set-up of DIF1 pin. (in parallel mode)	OFF
4	DIF2	Set-up of DIF2 pin. (in parallel mode)	OFF
5	IPS1/IIC	Set-up of IIC pin. (in serial mode) "L": 4 wire Serial, "H": IIC	OFF
6	P/SN	Set-up of P/SN pin. "L": Serial mode, "H": parallel mode	OFF
7	TEST	Don't care	OFF
8	ACKS	Don't care	OFF

■ **DIP switch (SW3) set-up: -off- means "L"**

No.	Switch Name	Function	Default
1	CM1	Set-up of CM1 pin. (in parallel mode)	OFF
2	OCKS1	Set-up of OCKS1 pin. (in parallel mode)	OFF
3	OCKS0	Set-up of OCKS0 pin. (in parallel mode)	OFF
4	PSEL	Don't care	OFF
5	XTL0	Don't care	OFF
6	XTL1	Don't care	OFF
7	DIR-I/O	Set-up of the transmission direction of 74AC245 "L": When inputting from PORT2, "H": When outputting from PORT2	ON
8	DIT-I/O	Don't care	OFF

■ **Jumper set up.**

No.	Jumper Name	Function

1	D3V/VD	Set-up of Power supply source for 74AC245.
		    D3V : D3V (default)
		    VD : VD

2	RX1	Set-up of RX1 input circuit.
		    OPT : Not to Use.
		    BNC : BNC < Default >

5,6	RX2-3	Set-up of RX2-3 input circuit.

7,8,9,10	RX4-7	RX4-7 set-up depending serial/parallel mode
		    RX4-7 : Serial mode < Default >
		    DIF2-0,IPS0 : Parallel mode

11,12	DIR MCLK ,
	DIT MCLK
		MCKO set-up for PORT5(DIT) and PORT2(DIR)
		    MCKO1 : MCKO1 of AK4113 < Default >
		    MCKO2 : MCKO2 of AK4113

13	TX0	Set-up of TX0 output circuit.
		    OPT : Not to use.
		    BNC : BNC < Default >

18	SDA/CDTO	Set-up of SDA/CDTO pin.
		    4 wire Serial : CDTO/CM0="H" < Default >
		    IIC : SDA and CM0="L"

19	RX2/DIF0	Set-up depending serial/parallel mode
		    RX2: Serial mode < Default >
		    DIF0: Parallel mode

20	IIC/FS96	Set-up depending serial/parallel mode
		    IIC: Serial mode < Default >
		    FS96: Parallel mode

21	RX3/DIF1	Set-up depending serial/parallel mode
		    RX3: Serial mode < Default >
		    DIF1: Parallel mode

22	RX4/DIF2	Set-up depending serial/parallel mode
		    RX4: Serial mode < Default >
		    DIF2: Parallel mode

23	RX6/IPS	Set-up depending serial/parallel mode
		    RX6: Serial mode < Default >
		    IPS: Parallel mode

24	RX4/IPS	Set-up depending serial/parallel mode
		    RX4: Serial mode < Default >
		    IPS: Parallel mode

25	RX5/DIF0	Set-up depending serial/parallel mode
		    RX5: Serial mode < Default >
		    DIF0: Parallel mode

26	RX6/DIF1	Set-up depending serial/parallel mode
		    RX6: Serial mode < Default >
		    DIF1: Parallel mode

Control Software Manual

■ Set-up of evaluation board and control software

1. Set up the AKD4113-B according to previous term.

2. Connect IBM-AT compatible PC with AKD4113-B by 10-line type flat cable (packed with AKD4113-B). Take care of the direction of 10pin header.

3. Insert the CD-ROM labeled "AKD4113-B Evaluation Kit" into the CD-ROM drive.

4. Access the CD-ROM drive and double-click the icon of "akd4113-b.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 "Write default" button.
3. Then set up the dialog and input data.

■ Explanation of each buttons

1.	[Port Setup] :	Set up the printer port.
2.	[Write default] :	Initialize the register of AK4113.
3.	[All Write] :	Write all registers that is currently displayed.
4.	[Read All] :	All the registers of AK4113 are read.
5.	[Function1] :	Dialog to write data by keyboard operation.
6.	[F3] :	Dialog of sequential writing.
7.	[SAVE] :	Save the current register setting.
8.	[OPEN] :	Write the saved values to all register.
9.	[Write] :	Dialog to write data by mouse operation.
10.	[Read] :	The data corresponding to each register is read.

■ 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 AK4113, click "OK" button. If not, click "Cancel" button.

2. [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 AK4113, 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.
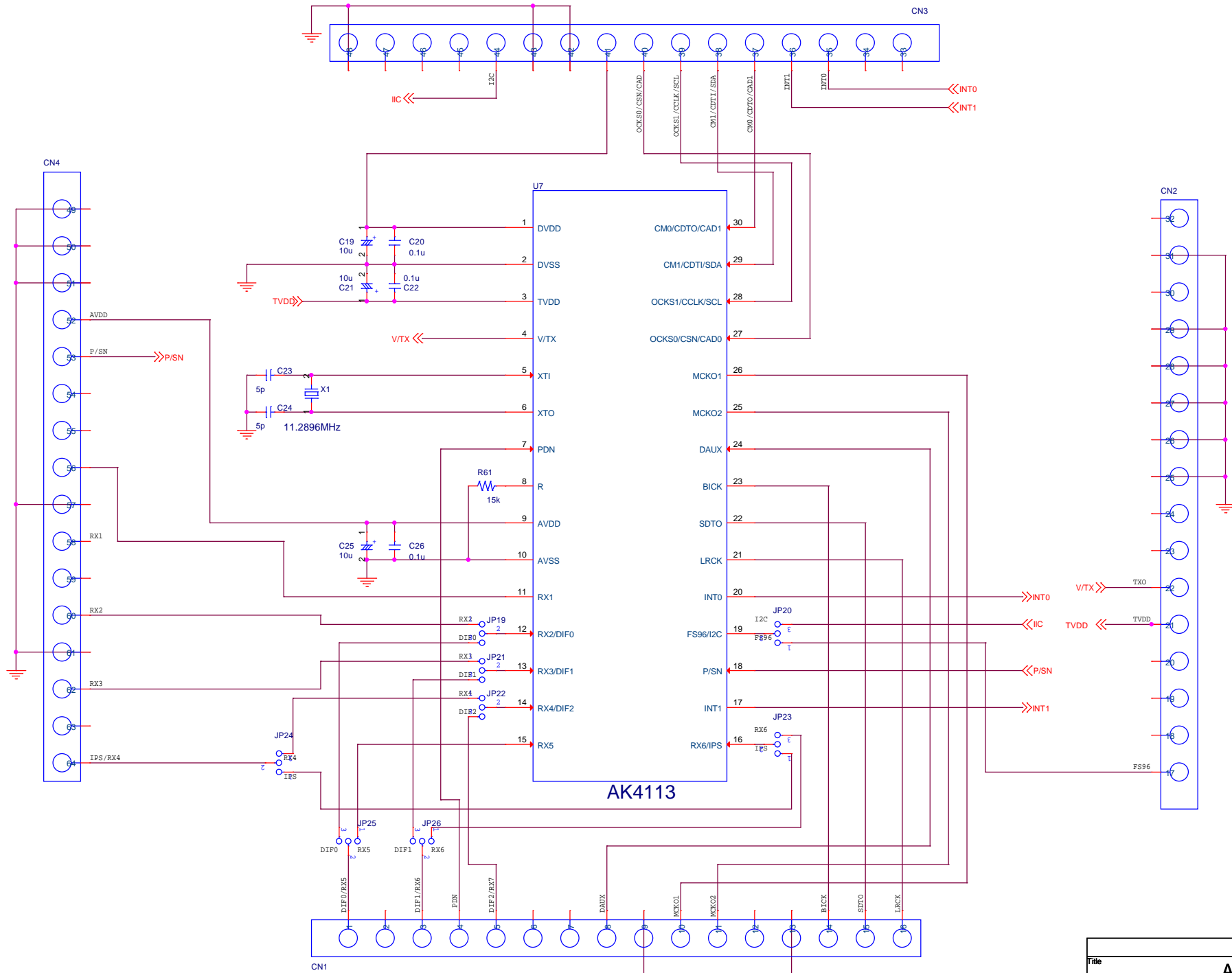
■ Attention on the operation

If you set up Function1 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.
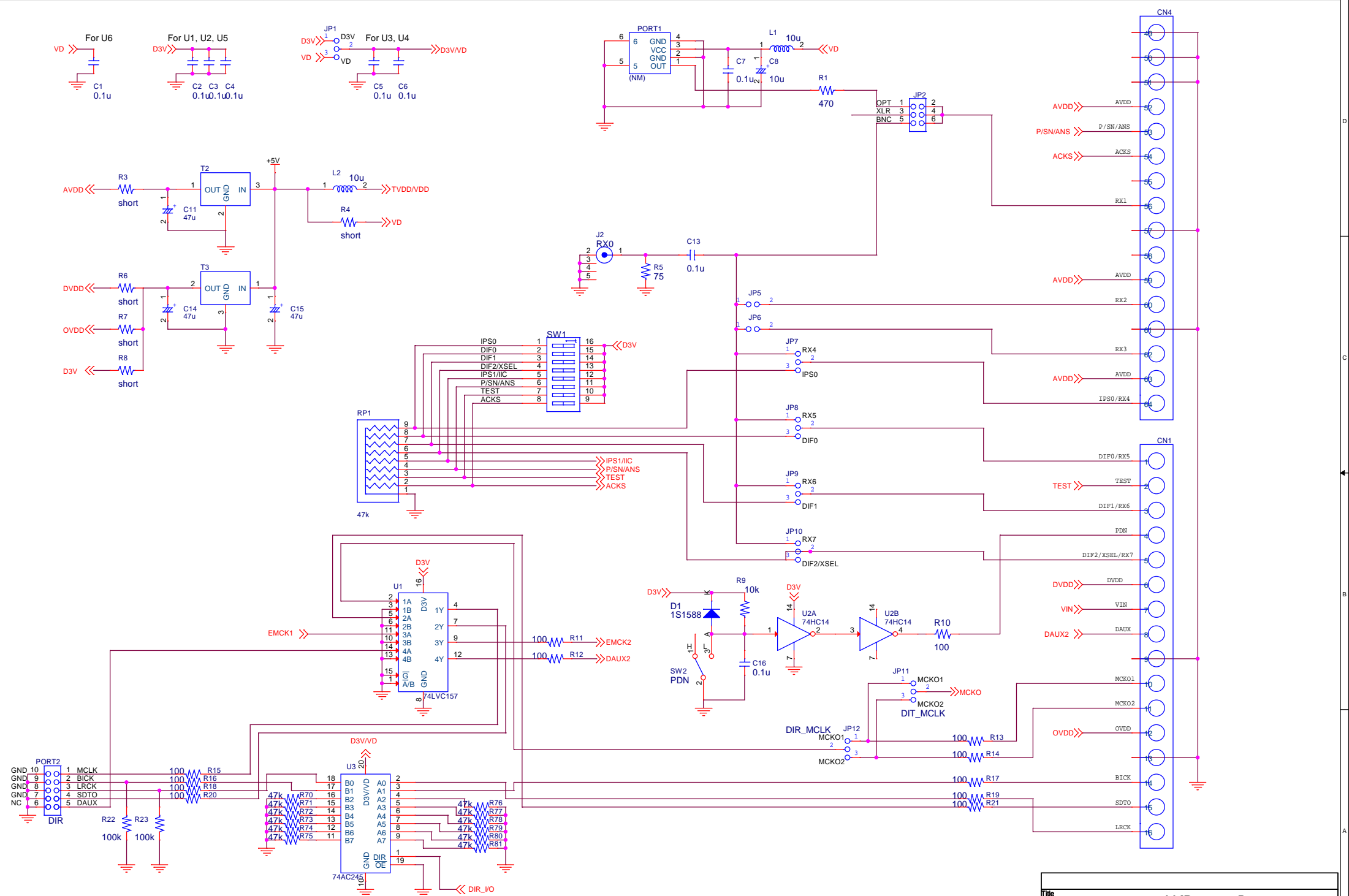
				Revision History	

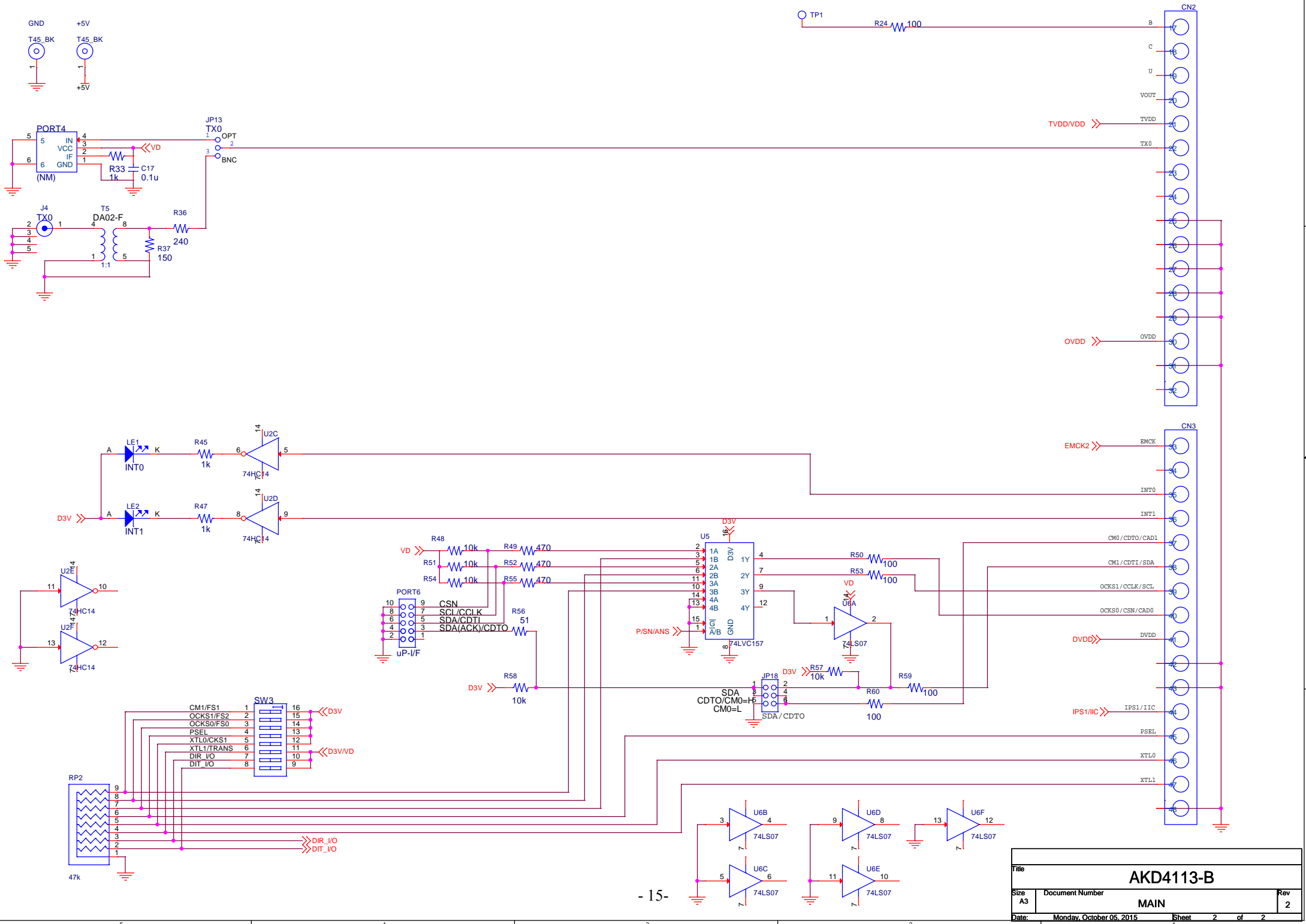| Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
04/11/11	KM076500	0	First Edtion	
04/11/30	KM076501	1	Modification	Circuit diagram (U1-15 pin and U1-1 pin) is changed
05/11/02	KM076502	1	Modification	Block diagram at DIR Evaluation is added.
06/01/16	KM076503	1	Error correct	Select RX input in parallel mode. RX1, RX5→RX1
15/11/12	KM076504	2	Change	Circuit diagram ware changed. PORT1 and PORT4: "Mount" -> "No Mount".

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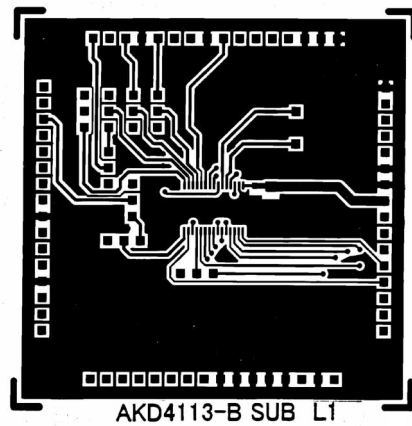
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Title		
	AKD4113-B	
Size A3	Document Number SUB	Rev 2
Date:	Monday, October 05, 2015	Sheet 1 of 1

For U6
VD
C1
0.1u

For U1, U2, U5
D3V
C2 C3 C4
0.1u 0.1u 0.1u

JP1
D3V 1 D3V
VD 3 VD 2

For U3, U4
D3V/VD
C5 C6
0.1u 0.1u

PORT1
6 6 GND 4
5 5 GND OUT 1
VCC 3
GND 2
(NM)

L1 10u
C7 C8
0.1u 10u
VD

R1
470

JP2
OPT 1 2 4
XLR 3 6
BNC 5

VD

AVDD AVDD
P/SN/ANS P/SN/ANS
ACKS ACKS

RX1

T2
OUT GND IN
C11
47u
+5V

L2 10u
TVDD/VDD

R4
VD
short

AVDD R3 short

J2 RX0
C13
0.1u
R5
75

AVDD AVDD
RX2

T3
OUT GND IN
C14
47u
C15
47u

DVDD R6 short
OVDD R7 short
D3V R8 short

JP5
JP6

RX3

AVDD AVDD

IPS0/RX4

SW1
IPS0 1 16
DIF0 2 15
DIF1 3 14
DIF2/XSEL 4 13
IPS1/IIC 5 12
P/SN/ANS 6 11
TEST 7 10
ACKS 8 9
D3V

JP7 RX4
IPS0

JP8 RX5
DIF0

JP9 RX6
DIF1

JP10 RX7
DIF2/XSEL

RP1
9
8
7
6
5
4
3
2
1
47k

IPS1/IIC
P/SN/ANS
TEST
ACKS

CN4

CN1
DIF0/RX5
TEST
DIF1/RX6
PDN
DIF2/XSEL/RX7
DVDD
VIN
DAUX
MCKO1
MCKO2
OVDD
BICK
SDTO
LRCK

U1
16 D3V
1A 1Y 4
1B 2Y 7
2A 3Y 9
2B 4Y 12
3A
3B
4A
4B
G
A/B GND
74LVC157

EMCK1
100 R11 EMCK2
100 R12 DAUX2

D3V
R9 10k
D1
1S1588
C16
0.1u
SW2
PDN

U2A 14
74HC14
U2B 14
74HC14
R10
100

JP11
MCKO1
MCKO2
MCKO
DIT_MCLK

JP12
DIR_MCLK
MCKO1
MCKO2
100 R13
100 R14

DVDD DVDD
VIN VIN
DAUX2 DAUX

OVDD OVDD

PORT2
GND 10 1 MCLK
GND 9 2 BICK
GND 8 3 LRCK
GND 7 4 SDTO
NC 6 5 DAUX
DIR

100 R15
100 R16
100 R18
100 R20

R22 R23
100k 100k

U3
20 D3V/VD
18 B0 A0 2
17 B1 A1 3
16 B2 A2 4
15 B3 A3 5
14 B4 A4 6
13 B5 A5 7
12 B6 A6 8
11 B7 A7 9
DIR 1
OE 19
GND
74AC245

47k R70 R71 R72 R73 R74 R75
47k R76 R77 R78 R79 R80 R81

DIR_I/O

100 R13
100 R14
100 R17
100 R19
100 R21

BICK
SDTO
LRCK

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Title: **AKD4113-B**

Size: A3
Document Number: **MAIN**
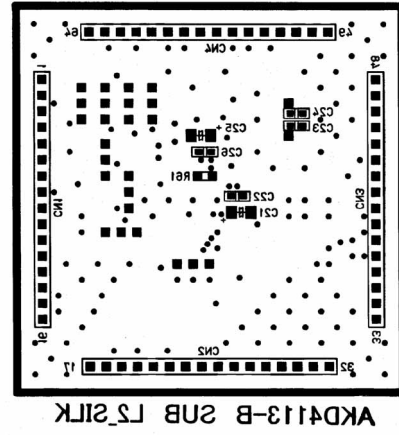Rev: 2

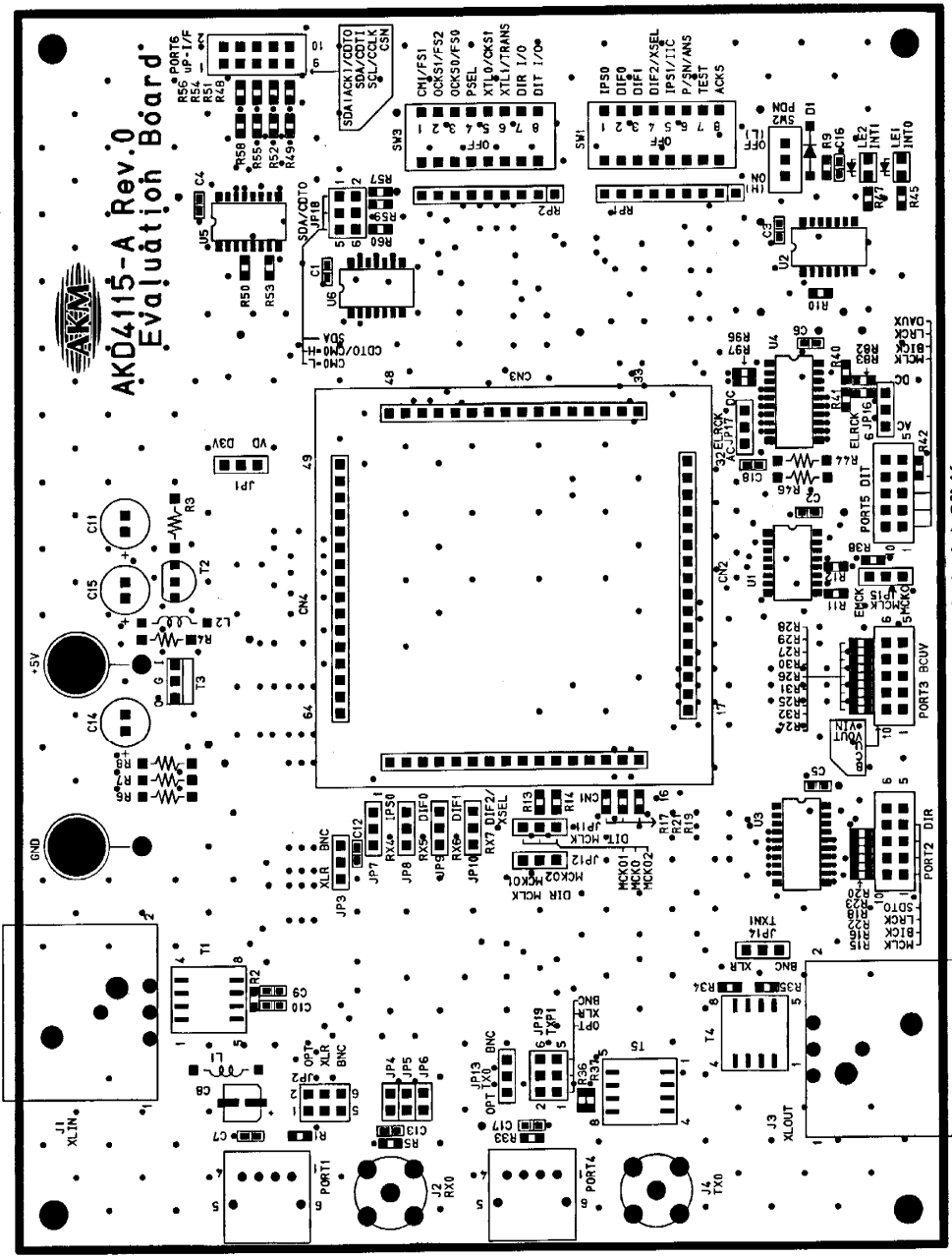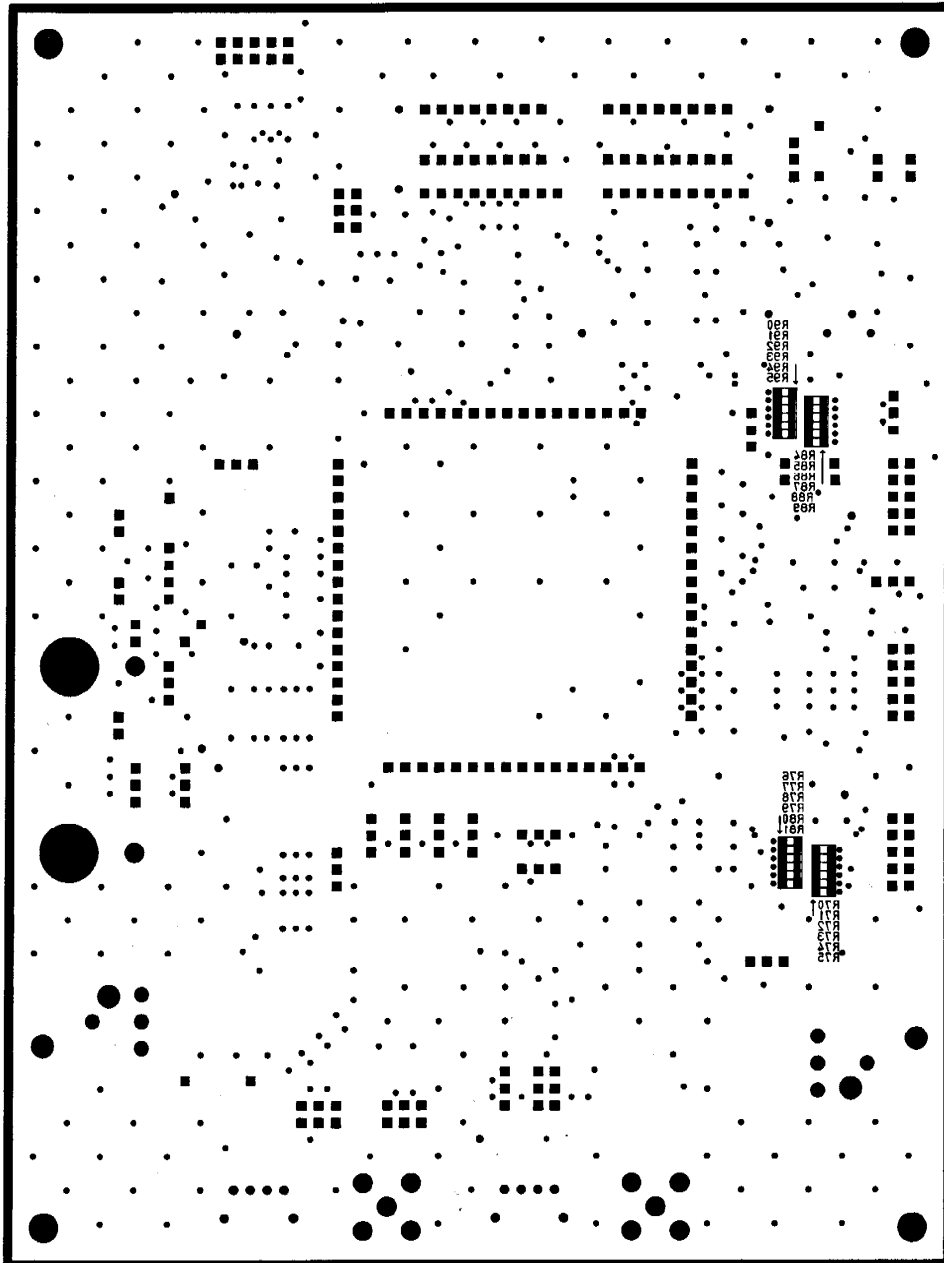Date: Monday, October 05, 2015   Sheet 2 of 2

AKD4113-B SUB L1

AKD4113-B SUB L2

AKD4113-B SUB L1_SILK

AKD4113-B SUB L2_SILK

AKD4115-A L1

AKD4115-A 52

- 21-
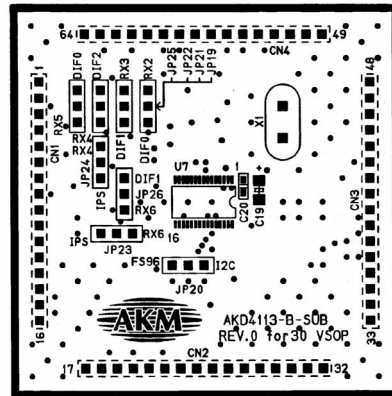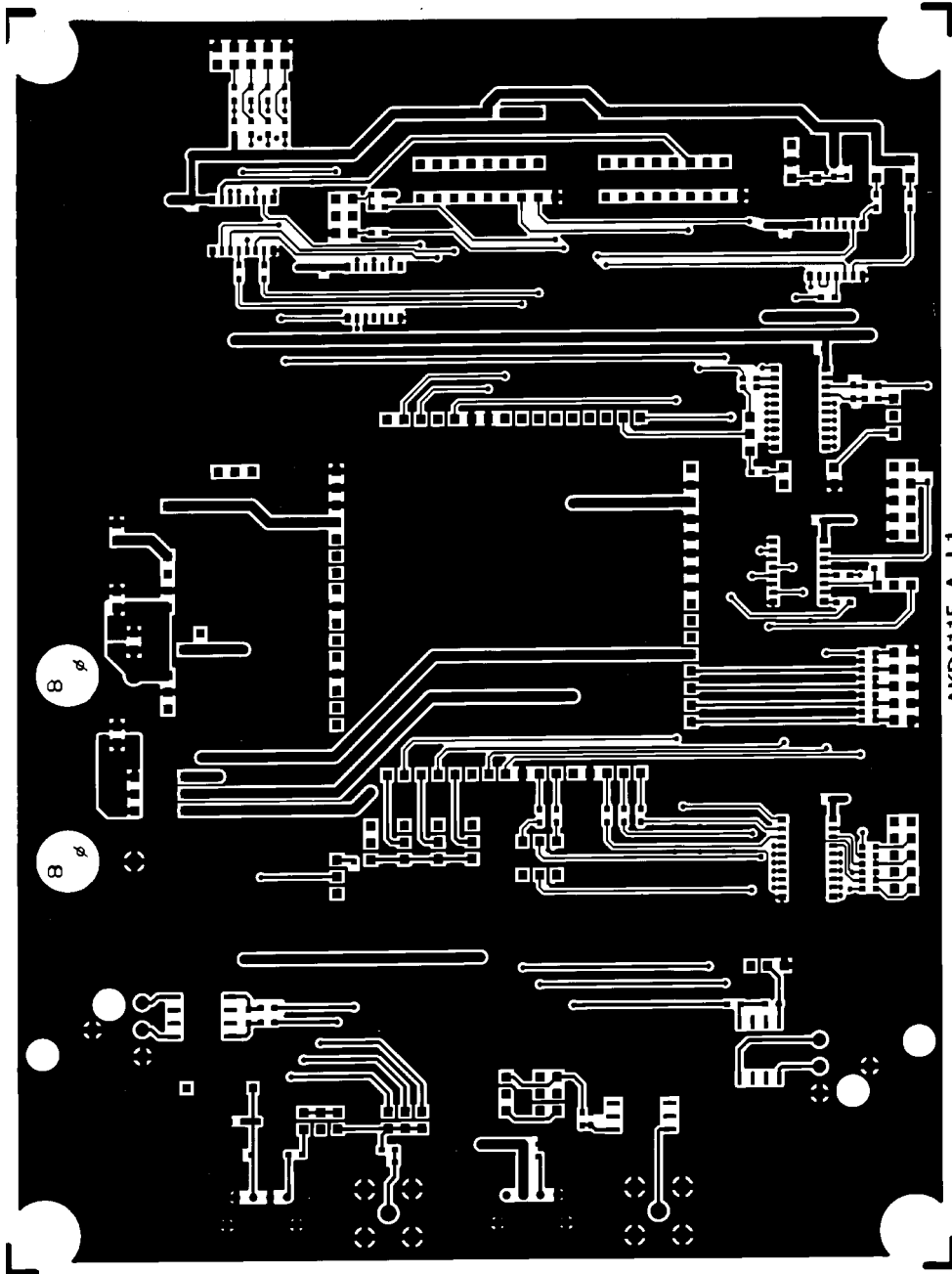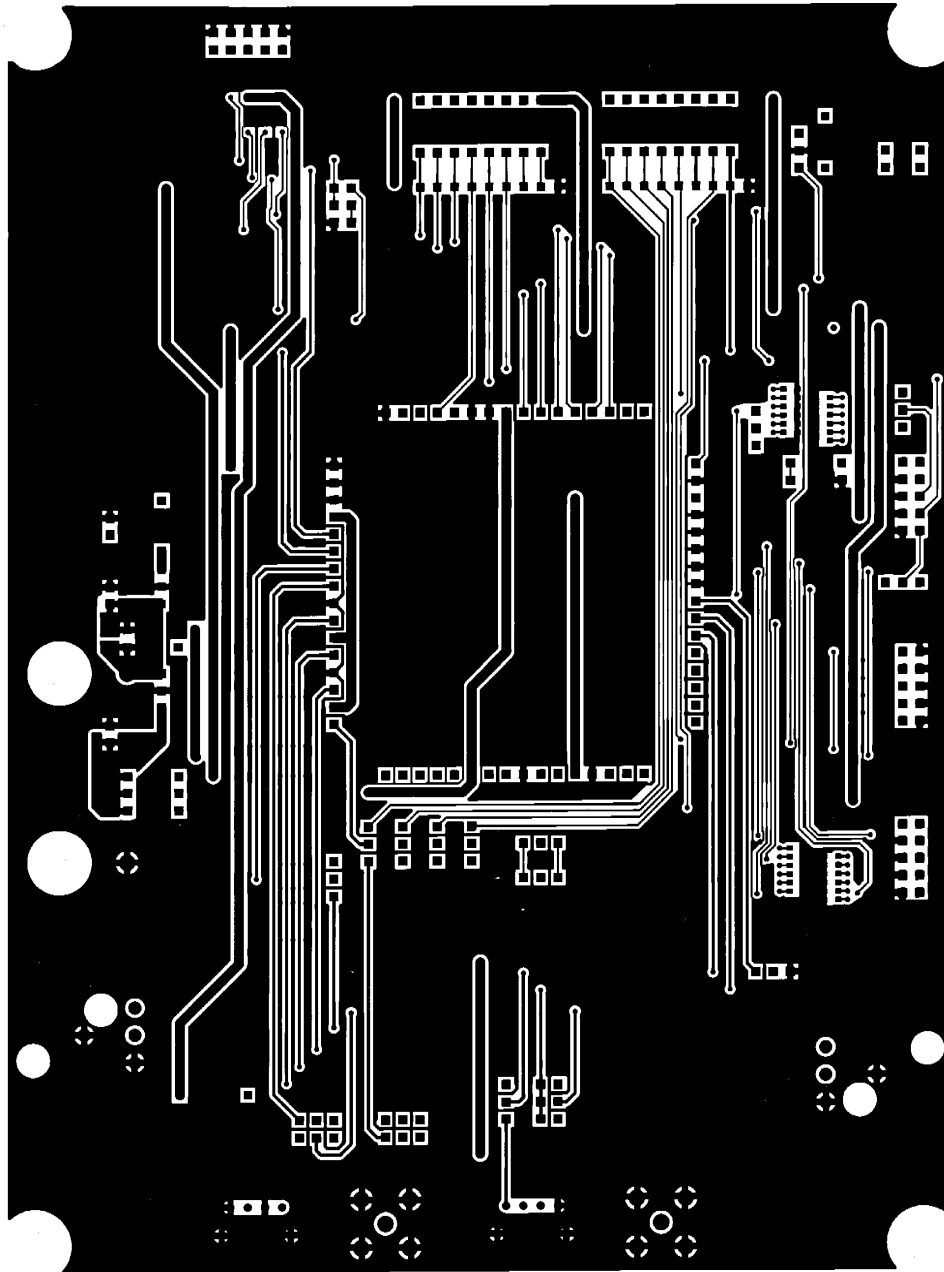
AKD4115-A Rev.0 Evaluation Board

AKD4115-A LS_SILK