



# AKD4184-A

## Evaluation Board Rev.0 for AK4184

### GENERAL DESCRIPTION

The AKD4184 is an evaluation board for Analog I/F IC which includes 4-wire resistive Touch Screen Controller, Keypad Scanner, GPIO Expander, LED Bias Controller and 12bit SAR ADC. It's easy to evaluate the Touch Screen function. The AKD4184 has also 6 x 5 Matrix Keypad, Switches on board configured GPIO pin as input, LEDs for GPIO Output Circuits and LED Driver with dimmer control.

■ **Ordering guide**

AKD4184-A --- Evaluation board for AK4184  
 (Control software is packed with this. This control software does not operate on Windows NT.)

### FUNCTION

- 4-wire resistive Touch Screen Controller I/F
- 6 x 5 Matrix Keypad I/F
- 10pin header and 25pin D-sub connector for serial control interface
- LED dimmer control
- GPIO function

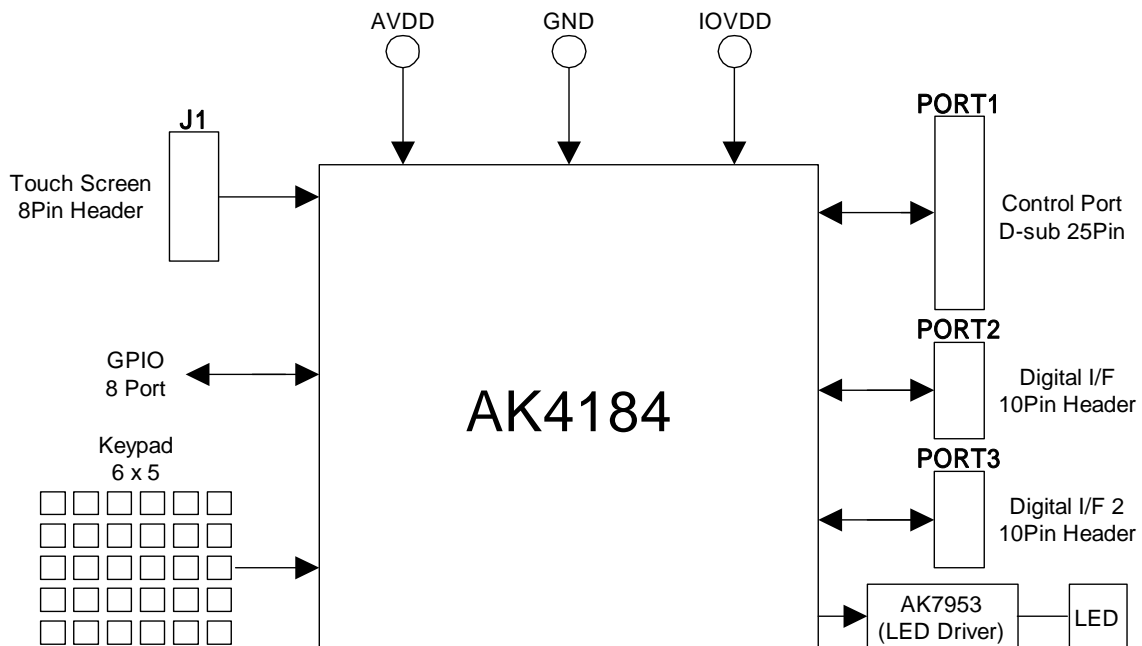


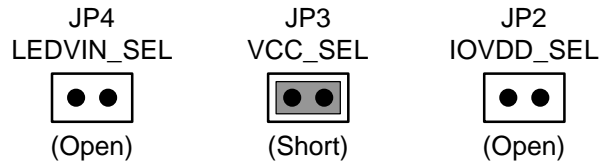
Figure 1. AKD4184 Block Diagram

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

## ■ Operation sequence

- (1) Set up the power supply lines.

Set up the jumper pins.



Set up the power supply lines.

[AVDD] (orange) = 2.5 ~ 3.6V : for AVDD of AK4184 (typ. 3.3V)

[IOVDD] (orange) = 1.6 ~ 3.6V : for IOVDD of AK4184 and logic (typ. 3.3V)  
\*IOVDD should be less than AVDD.

[IFVCC] (red) = 1.2 ~ 3.6V : for logic (typ. 3.3V)

[LEDVIN] (red) = 2.8 ~ 5.5V : for AK7953 (typ. 3.3V)

[AGND] (black) = 0V

[DGND] (black) = 0V

\* Each supply line should be distributed from the power supply unit.

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

- (3) Power on.

The AK4184 should be resets once bringing SW31 "L" upon power-up.

■ Evaluation mode

Applicable Evaluation Mode

- (1) Touch-position and touch-pressure measurement.
- (2) Keypad scan function.
- (3) GPIO control function.
- (4) LED dimmer control function.

(1) Touch-position and touch-pressure measurement.

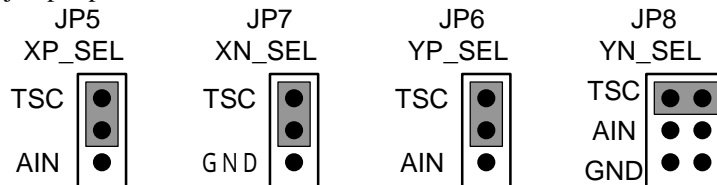
In case of evaluating a Touch Screen function of the AK4184, it is necessary to connect the Touch Panel with J1 terminal as shown Table 1. Regarding pin assignment of J1, refer to Table 1 or circuit diagram in this manual. As for the AK4184’s register definitions, refer to datasheet of the AK4184.

4-wire resistive touch screen should be connected to J1.  
The pin assignment of J1 is shown on Table 1.

No.	Name	Description
1	YN	Touch Screen Y – plate Voltage supply
2		
3	YP	Touch Screen Y + plate Voltage supply
4		
5	XN	Touch Screen X – plate Voltage supply
6		
7	XP	Touch Screen X + plate Voltage supply
8		

Table 1. J1 (8P Header) pin assign

Set up the jumper pins.



The AK4184’s register (Touch Screen Register) should be set to Touch Screen Operation.

**(2) Keypad scan function.**

It is possible to evaluate Keypad scan function with pushing SW1~SW30 with AKD4184. The circuit and the pin configuration for Keypad is shown on Figure 2.

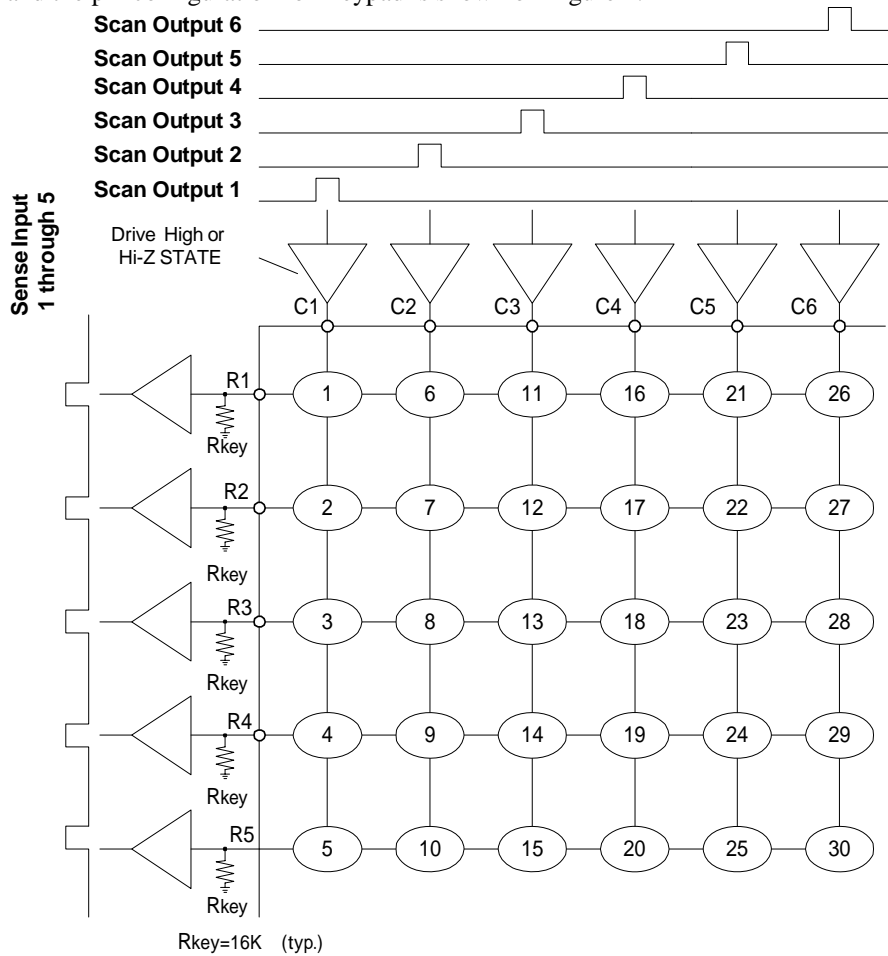


Figure 2. Keypad circuit and pin assign

Keypad Control Register in AKD4184 should be set to Keypad scan mode. Per pushing any SWs, the AK4184's register should be read the Keypad Data Register (KPDATA1, 2) after the key is pressed.

**(3) GPIO control function.**

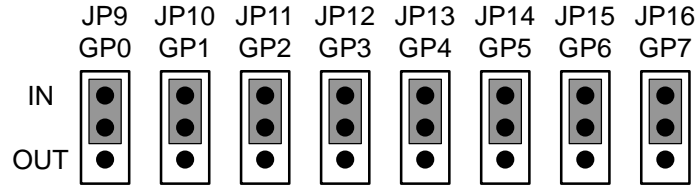
(3-1) GPIO pin as input port

The input level switches by S1 (L/H).



Figure 3. S1 input ports state setting

Set up the jumper pins.

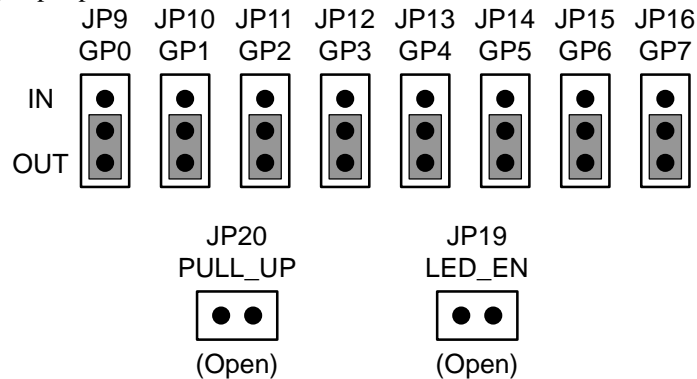


The AK4184's register (GPIO Pin Direction Register) should be set GPIO pins as input. Select "L" or "H" on S1, the AK4184's register should be read from the Pin Level Register. The pin state is detected.

**(3-2) GPIO pin as output port**

AKD4184 evaluates GPIO control function with LED (GP0~GP7).

Set up the jumper pins.

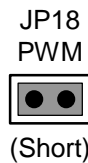


The AK4184's register (GPIO Pin Direction Register) should be set GPIO pins as output. The AK4184's register (GPIO Pin Set/Clear Register) should be set pin level to "H". Therefore, LED (GP0~GP7) turns on.

**(4) LED dimmer control function.**

AKD4184 evaluates LED dimmer control on LED9 and LED10.

Set up the jumper pin.



The AK4184's register (PWM Control Register) should be set to power up. The AK4184's register should be changed by Bright Control Value. Therefore, LED9 and LED10 dimmer is controlled.

## ■ Other jumper pins set up

- [JP1] (GND) : Analog ground and Digital ground  
 OPEN: Separated.  
 SHORT: Common. (The connector “DGND” can be open.) <Default>
- [JP2] (IOVDD\_SEL): IOVDD of the AK4184  
 OPEN: IOVDD is supplied from “IOVDD” jack. <Default>  
 SHORT: Supplied from “AVDD” (“IOVDD” jack should be open).
- [JP3] (VCC\_SEL): Logic block is selected supply line  
 OPEN: VCC is supplied from “VCC” jack.  
 SHORT: Supplied from “IOVDD” (“VCC” jack should be open). <Default>
- [JP4] (LEDVIN\_SEL): VIN of the AK7953  
 OPEN: LEDVIN is supplied from “LEDVIN” jack. <Default>  
 SHORT: Supplied from “IFVCC” (“LEDVIN” jack should be open).
- [JP5] (XP\_SEL): Connect XP of the AK4184  
 TSC: Connect the Touch Screen to J1. <Default>  
 AIN: Analog signal is input from J2.
- [JP6] (YP\_SEL): Connect YP of the AK4184  
 TSC: Connect the Touch Screen to J1. <Default>  
 AIN: Analog signal is input from J3.
- [JP7] (XN\_SEL): Connect XN of the AK4184  
 TSC: Connect the Touch Screen to J1. <Default>  
 GND: Connect the GND.
- [JP8] (YN\_SEL): Connect YN of the AK4184  
 TSC: Connect the Touch Screen to J1. <Default>  
 AIN: Analog signal is input from J2.  
 GND: Connect the GND.
- [JP17] (AIN\_SEL): J2 signal input  
 XP: Analog signal is input to XP. <Default>  
 YN: Analog signal is input to YN.
- [JP18] (PWM): Indication for White LEDs  
 OPEN: Disable.  
 SHORT: Enable. <Default>
- [JP19] (LED\_EN): Indication for GPO LEDs  
 OPEN: Enable.  
 SHORT: Disable. <Default>
- [JP20] (PULL\_UP): GPO Pull-up register  
 OPEN: Don't use.  
 SHORT: Use pull-up register. <Default>
- [JP21] (DOUT\_PD): DOUT Pull-down register  
 OPEN: Don't use.  
 SHORT: Use pull-down register. <Default>

**■ The function of the toggle SW**

\*Upper-side is “H” and lower-side is “L”.

[SW31] (RESETN): Power down of AK4184. Keep “H” during normal operation.

**■ Indication for LED**

[LED1~8] (GP0~7): Monitor GP0~7 pin of the AK4184. LEDs turn on when GP0~7 pin is “H” level.

[LED9, 10]: Monitor BRCONT pin for the AK4184. LED turns on when LED controller power up.

**■ Serial Control**

The AKD4184 can be connected via the printer port (parallel port) of IBM-AT compatible PC. Connect PORT1 (CTRL) with PC by D-sub 25pin parallel cable.

■ Input/Output Circuits

(1) Touch Screen Input Circuits

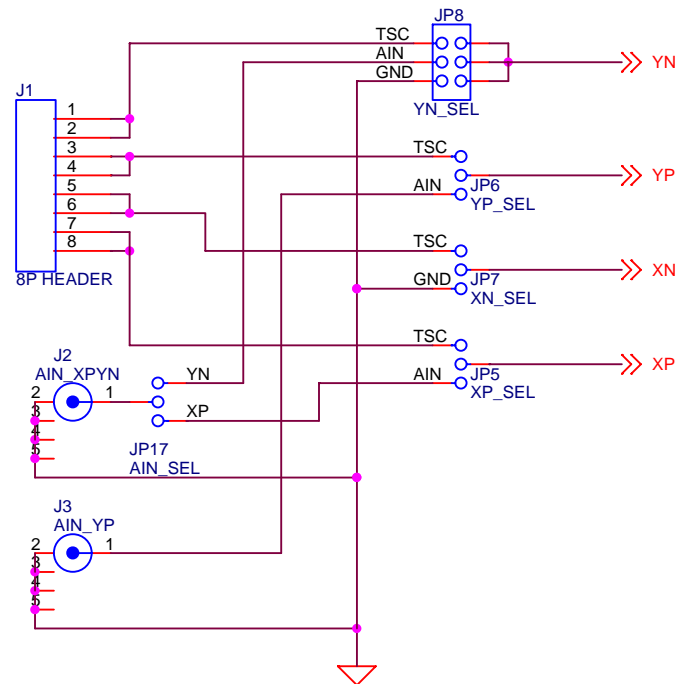


Figure 4. Touch Screen Input Circuits

(2) Keypad Input Circuits

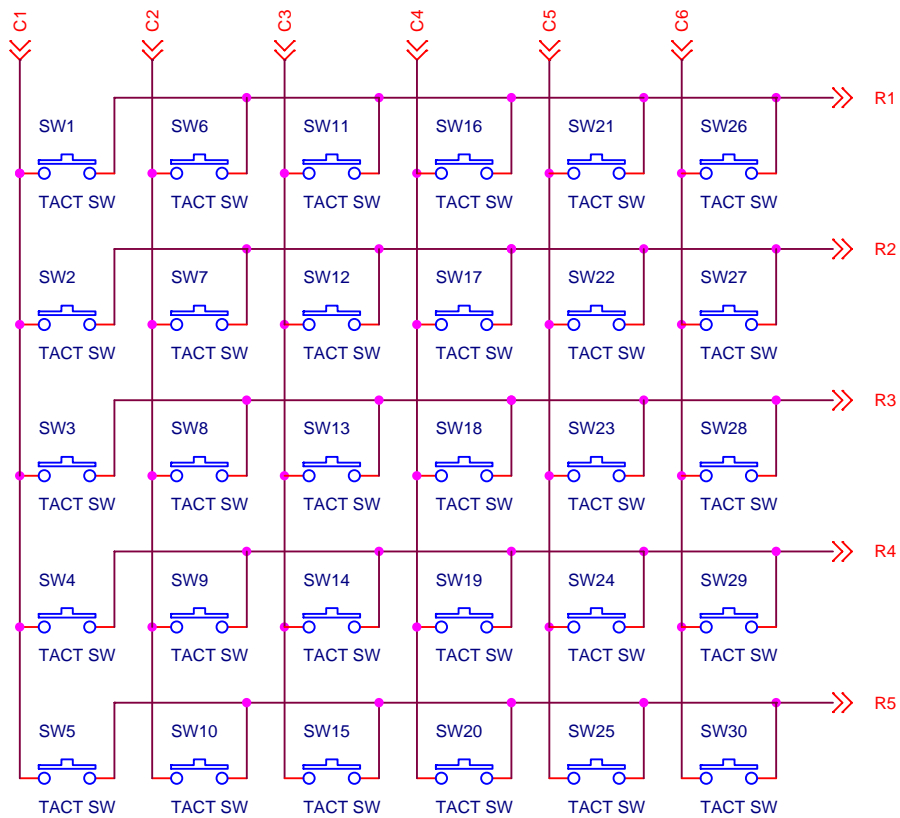


Figure 5. Keypad Input Circuit



(3) GPIO Input/Output Circuits

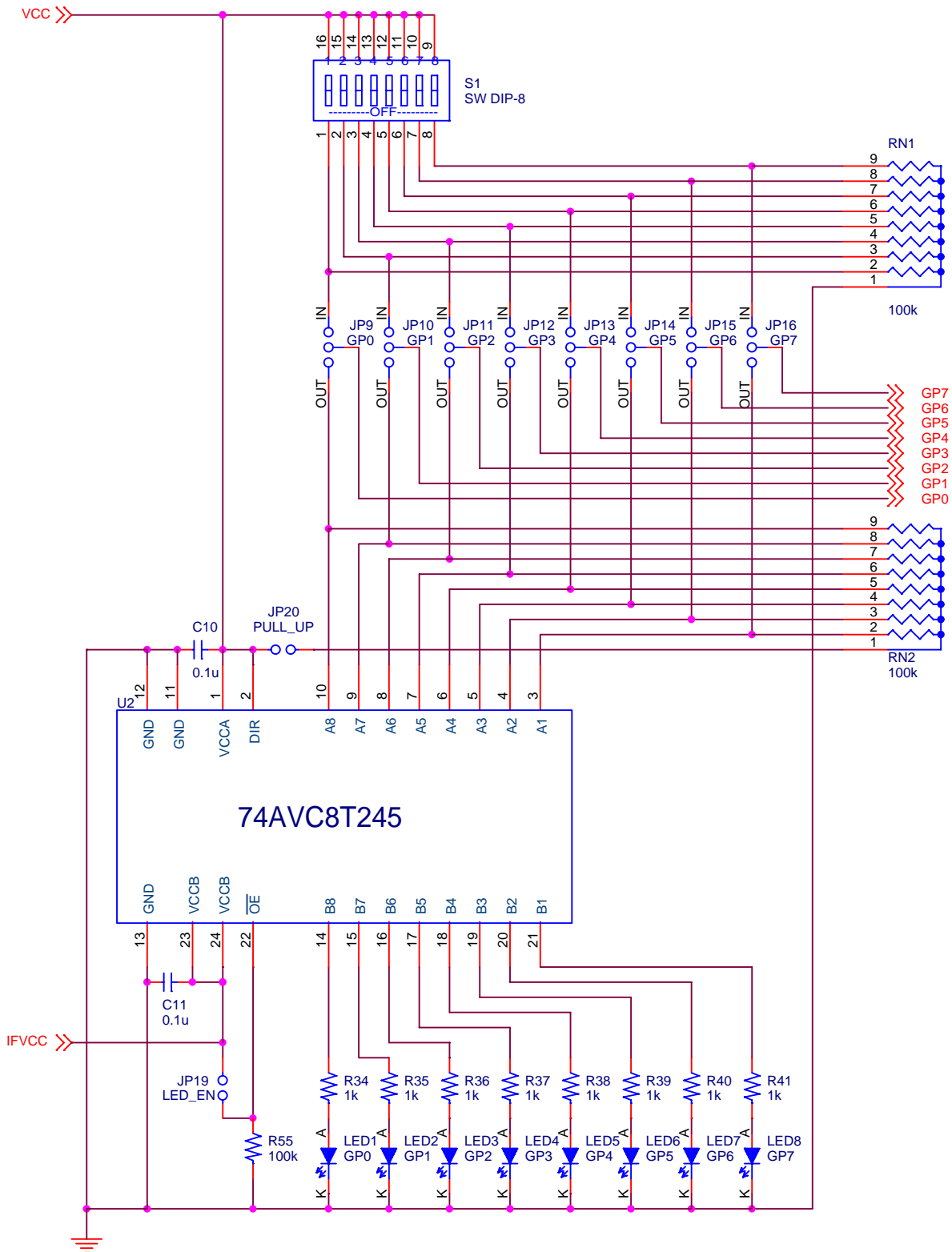


Figure 6. GPIO Input/Output Circuits

\* AKM assumes no responsibility for the trouble when using the above circuit examples.

**Control Software Manual**

■ **Set-up of the evaluation board and control software**

1. Set up the AKD4184 board.
2. Connect IBM-AT compatible PC with AKD4184 by printer cable (D-sub 25pin). (Please install the driver from 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. The AK4184 should be resets once bringing SW31 “L” upon power-up.
4. Insert the CD-ROM labeled “AK4184 Evaluation Kit” into the CD-ROM drive.
5. Access the CD-ROM drive and double-click the icon of “akd4184.exe” to set up the control program.
6. Then evaluate according to the follows.

■ **Explanation of main window**

When runs the control program, the window as shown in Figure 7 opens.

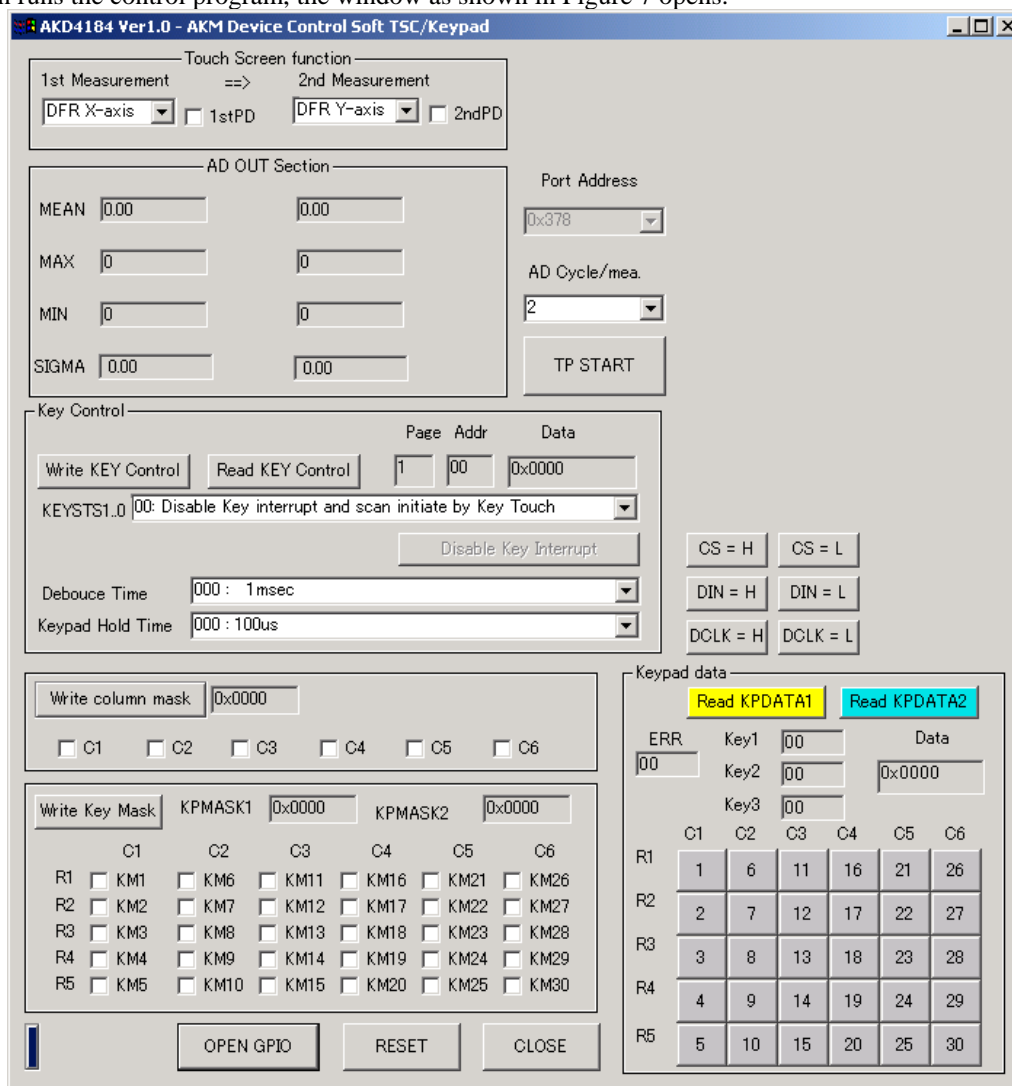


Figure 7. Control Soft window

## 1. Touch-position and touch-pressure measurement

- [TP START]: When select “Touch Screen Function” and click [TP START] button with pressing point by the status or finger. The number of measurement is set by “AD Cycle/mea” box, and then display measurement results at “AD OUT Section”. Display all data on an assistant window. The parameter on the “Touch Screen function” corresponds to A1-0 bits and PD bit of the AK4184’s register (Touch Screen Command).

<Example - Touch-position measurement>

- a. Select “DFR X-axis” from drop-down list of “1st Measurement”. Check the box of “1st PD”.
- b. Select “DFR Y-axis” from drop-down list of “2nd Measurement”. Check the box of “2nd PD”.
- c. Select “16” from drop-down list of “AD Cycle/mea”.
- d. Click [TP START] button with touching any position on Touch Screen, then start the measurement.
- e. Display MEAN, MAX, MIN and SIGMA from 16 times of measurement results “AD OUT Section”. (Left: X-axis measurement results, Right: Y-axis measurement results) The results are displayed in decimal, and maximum value is “4095”. Display data on sub window. Line up X-axis data at first, next is Y-axis.

## 2. Keypad scan

- [Write KEY Control]: Select drop-down list of “KEYSTS1..0”, “Debounce Time” and “Keypad Hold Time”, then click [Write KEY Control] button. “KEYSTS1..0”, “Debounce Time” and “Keypad Hold Time” corresponds to KST1-0 bits, DBN2-0 bits and HLD2-0 bits of the AK4184’s register (Keypad Control Register).
- [Read KEY Control]: Read current “Keypad Control Register” setting, then display it in “Page”, “Addr” and “Data”.
- [Key Scan]: When select “11” from drop-down list of “KEYSTS1..0” and click [Key Scan] button, initiate Keypad scan by Host instruction.
- [Write Column mask]: Check the box of “C1” – “C6”, mask the column which checked.
- [Write Key mask]: Check the box of “KM1” – “KM30”, mask the key which checked.
- [Read KPDATA1]: Read “Keypad Data Register 1” (Addr 00h), then display it in “Data” and virtual keys. (Don’t display keys masked in “Write Column mask”.)
- [Read KPDATA2]: Read “Keypad Data Register 2” (Addr 01h), then display it in “Data” and virtual keys. (Don’t display keys masked in “Write Column mask” and “Write Key mask”.)

<Example - Host Scan>

- a. Select “11: Manual Key Scan initiate by Host Scan command” from drop-down list of “KEYSTS1..0”.
- b. Select “000: 1msec” from drop-down list of “Debounce Time”.
- c. Select “000: 100us” from drop-down list of “Keypad Hold Time”. Click [Write KEY Control] button.
- d. Click [Key Scan] button while pushing any key of SW1 – SW30 on AKD4184.
- e. When click “Read KPDATA1” or “Read KPDATA2” button, display the key status on the screen.

<Example - Key Touch Scan>

- a. Select “10: Auto Key Scan initiate by Key Touch” from drop-down list of “KEYSTS1..0”.
- b. Select “000: 1msec” from drop-down list of “Debounce Time”.
- c. Select “000: 100us” from drop-down list of “Keypad Hold Time”. Click [Write KEY Control] button.
- d. Push any key of SW1 – SW30 on AKD4184.
- e. When click “Read KPDATA1” or “Read KPDATA2” button, display the key status on the screen.

\* If you check the box, data becomes “H” or “1”. If not, “L” or “0”.

■ Explanation of GPIO window

When click [OPEN GPIO] button on the main window, the window as shown in Figure 8 opens.

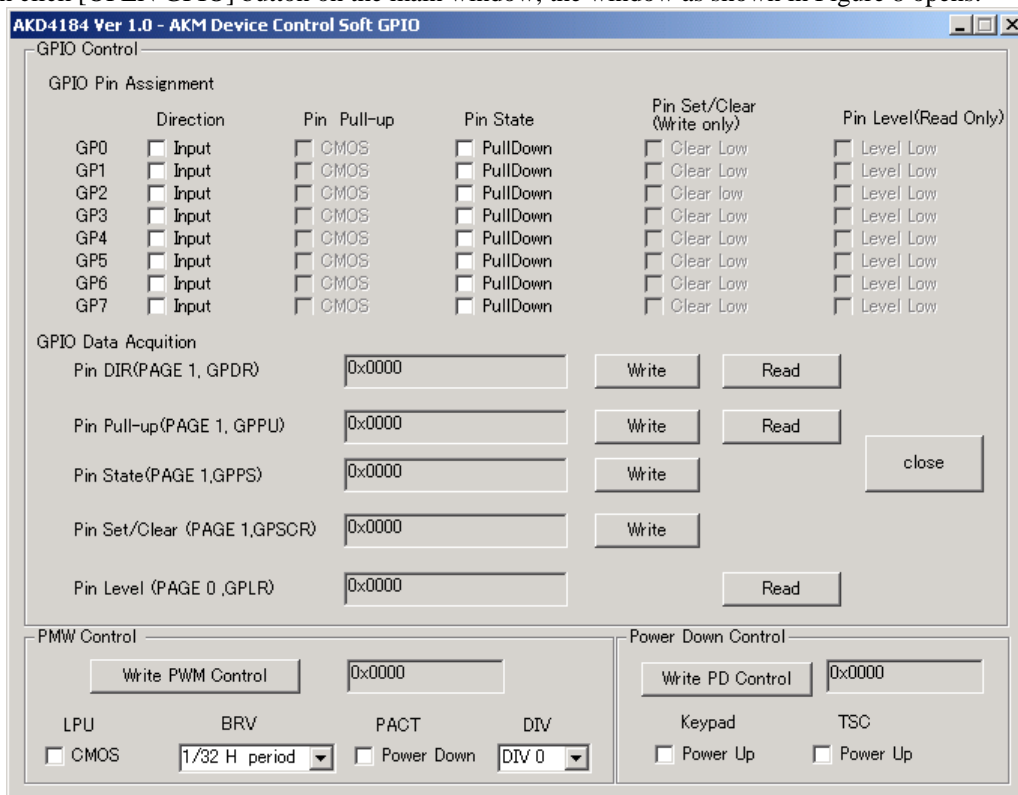


Figure 8. [GPIO Dialog] window

1 . GPIO Data Acquisition

- [Pin DIR(PAGE1,GPDIR)]: Check the box of “Direction” in the GPIO Pin Assignment, then click [Write] button. And click [Read] button, then display the current setting in Hex. [Pin DIR (PAGE1, GPDIR)] corresponds to “GPIO Pin Direction Register” of the AK4184’s register.
- [Pin Pull-up(PAGE1, GPPU)]: Check the box of “Pin Pull-up” in the GPIO Pin Assignment, then click [Write] button. And click [Read] button, then display the current setting. [Pin Pull-up (PAGE1, GPPU)] corresponds to “GPIO Pin Pull-up Register” of the AK4184’s register.
- [Pin State(PAGE1, GPPS)]: Check the box of “Pin State”, then click [Write] button. [Pin State (PAGE1, GPPS)] corresponds to “GPIO Pin State Register” of the AK4184’s register.
- [Pin Set/Clear(PAGE1, GPSCR)]: Check the box of “Pin Set/Clear” in the GPIO Pin Assignment, then click [Write] button. [Pin Set/Clear (PAGE1, GPSCR)] corresponds to “GPIO Pin State Register” of the AK4184’s register.
- [Pin Level(PAGE0, GPLR)]: Click [Read] button in the GPIO Pin Assignment, then read “GPIO Pin Level Register” status and display the input level in “Pin Level”

< Example - GPIO Input >

- Set the jumper pins of JP9~JP16 (GP0~GP7) to become “IN”.
- Check the box of “Direction” (GP0~GP7) to become “Input”, and click [Write] button of “Pin DIR (PAGE1, GPDIR)”.
- Set the DIP SW (S1) to become either “H” or “L”.
- Click [Read] button of “Pin Level (PAGE0, GPLR)”.
- Display the input level in “Pin Level”.

## &lt; Example - GPIO Output &gt;

- a. Set the jumper pins of JP9~JP16 (GP0~GP7) to become "OUT", and JP19, JP20 is "Open".
- b. Check the box of "Direction" (GP0~GP7) to become "Output", and click [Write] button of "Pin DIR (PAGE1, GPDIR)".
- c. Check the box of "Pin Set/Clear" (GP0~GP7) to become either "Set High" or "Clear Low", and click [Write] button of "Pin Set/Clear (PAGE1, GPSCR)".
- d. LED of GP0~GP7 turns on when pin level of GP0~GP7 set "High".

\* If you check the box, data becomes "H" or "1". If not, "L" or "0".

**2 . PWM control (LED Bias Control)**

- [Write PWM Control]: Check the box of "LPU", "PACT" and select drop down list of "BRV", "DIV", then click [Write PWM Control] button. "LPU", "BRV", "PACT" and "DIV" corresponds to LPU bit, BRV4-0 bits, PACT bit and DIV2-0 bits of AK4184's register (PWM Control Register).

## &lt; Example &gt;

- a. Check the box of "PACT" to become "Normal Mode", and "LPU" is "CMOS".
- b. Select any value from drop down list of "BRV" and "DIV". ("BRV" modulate PWM. If value is small, become dim. If large, become bright.)
- c. When click [Write PWM Control] button, white LED of LED9,10 turns on.

\* If you check the box, data becomes "H" or "1". If not, "L" or "0".

**3 . Power down control**

- [Write PD Control]: Check the box of "KeyPad PD" and "TSC PD", then click [Write PD Control] button. "KeyPad PD" and "TSC PD" corresponds to KPPD bit and TPPD bit of AK4184's register (Power Down Register).

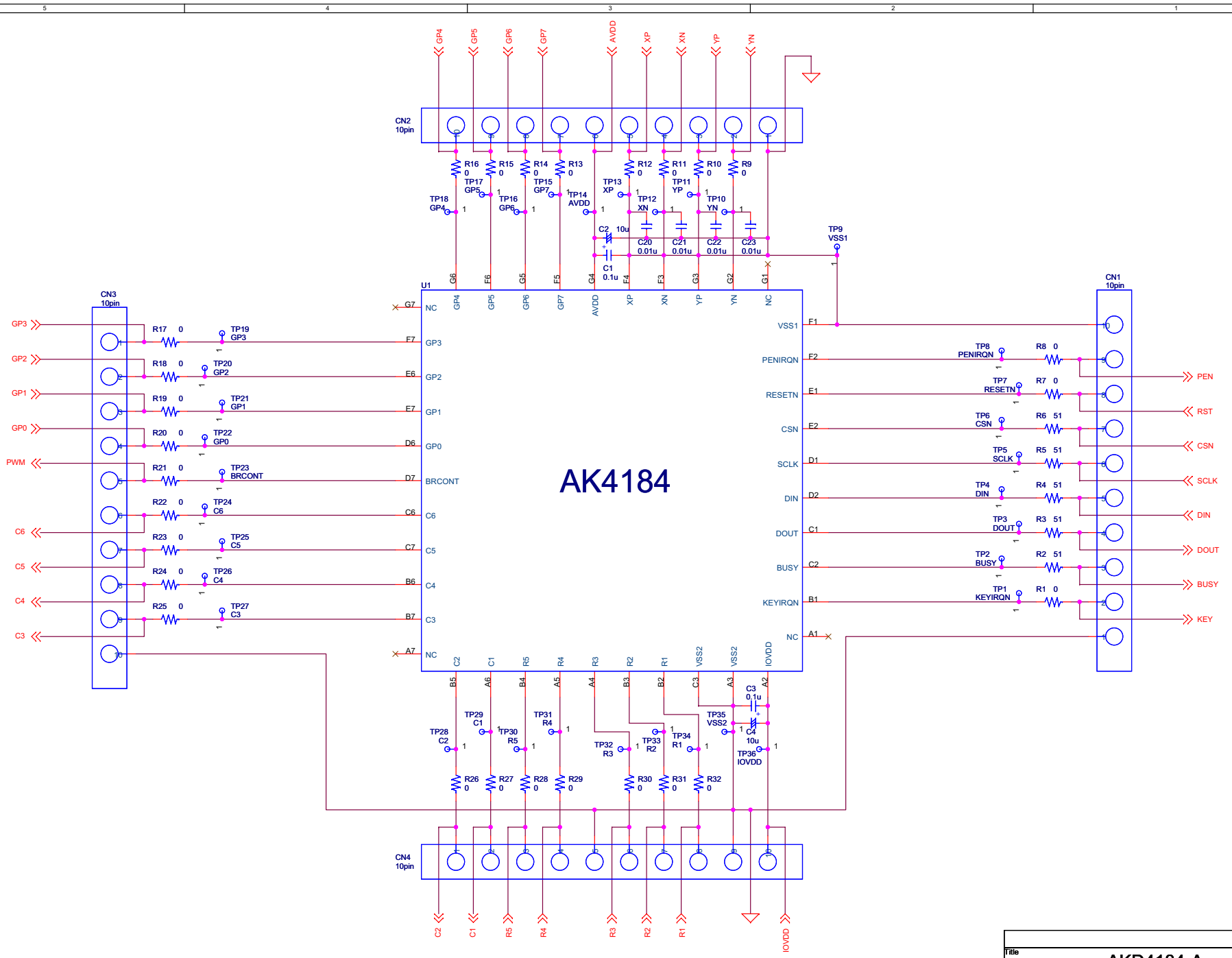
\* If you check the box, data becomes "H" or "1". If not, "L" or "0".

**Revision History**

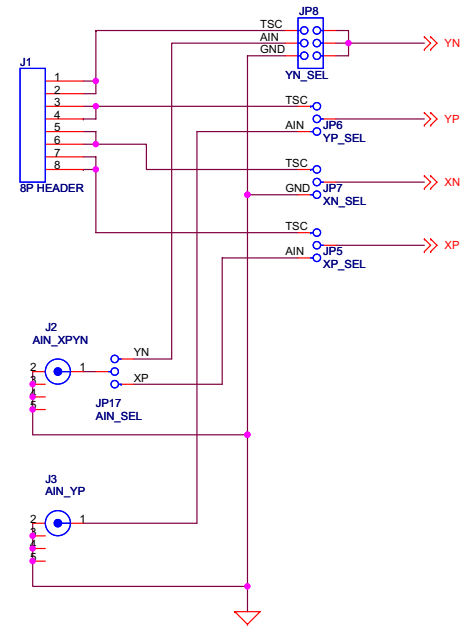
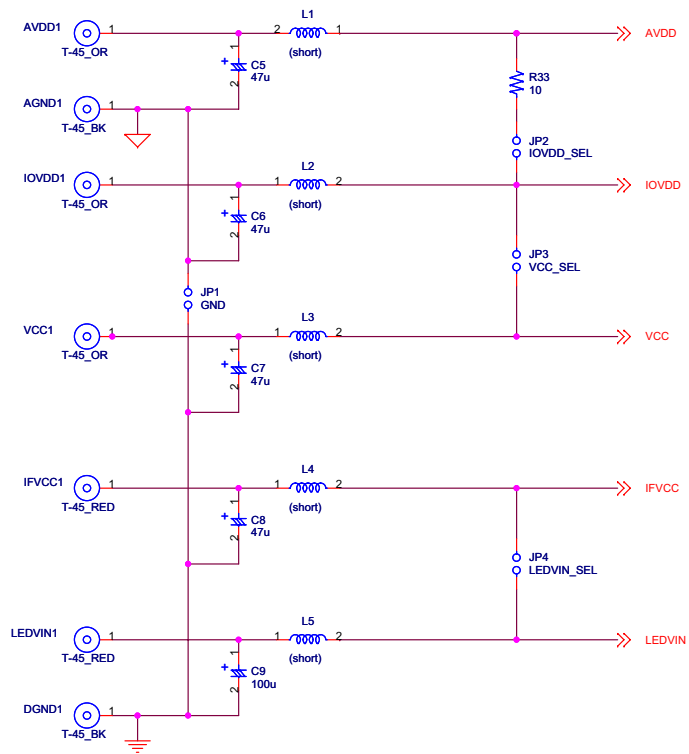
Date (YY/MM/DD)	Manual Revision	Board Revision	Reason	Contents
07/04/13	KM085900	0	First edition	

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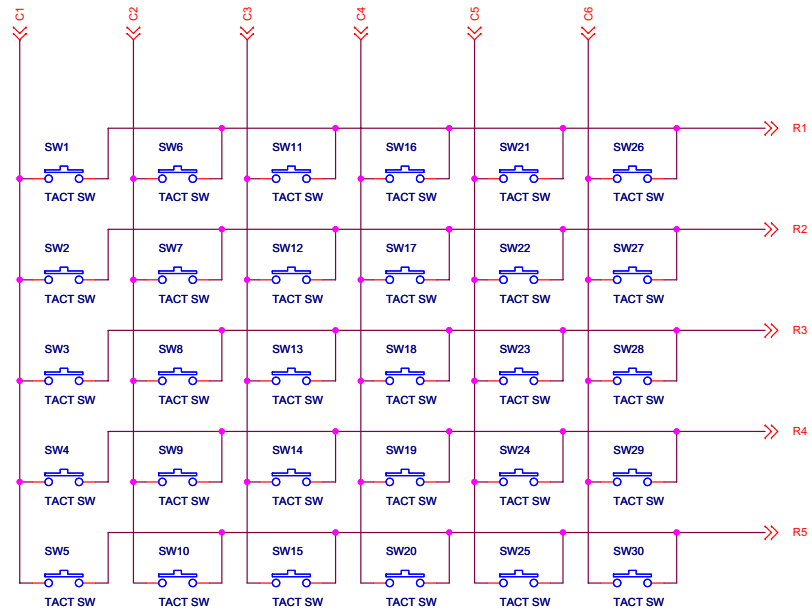
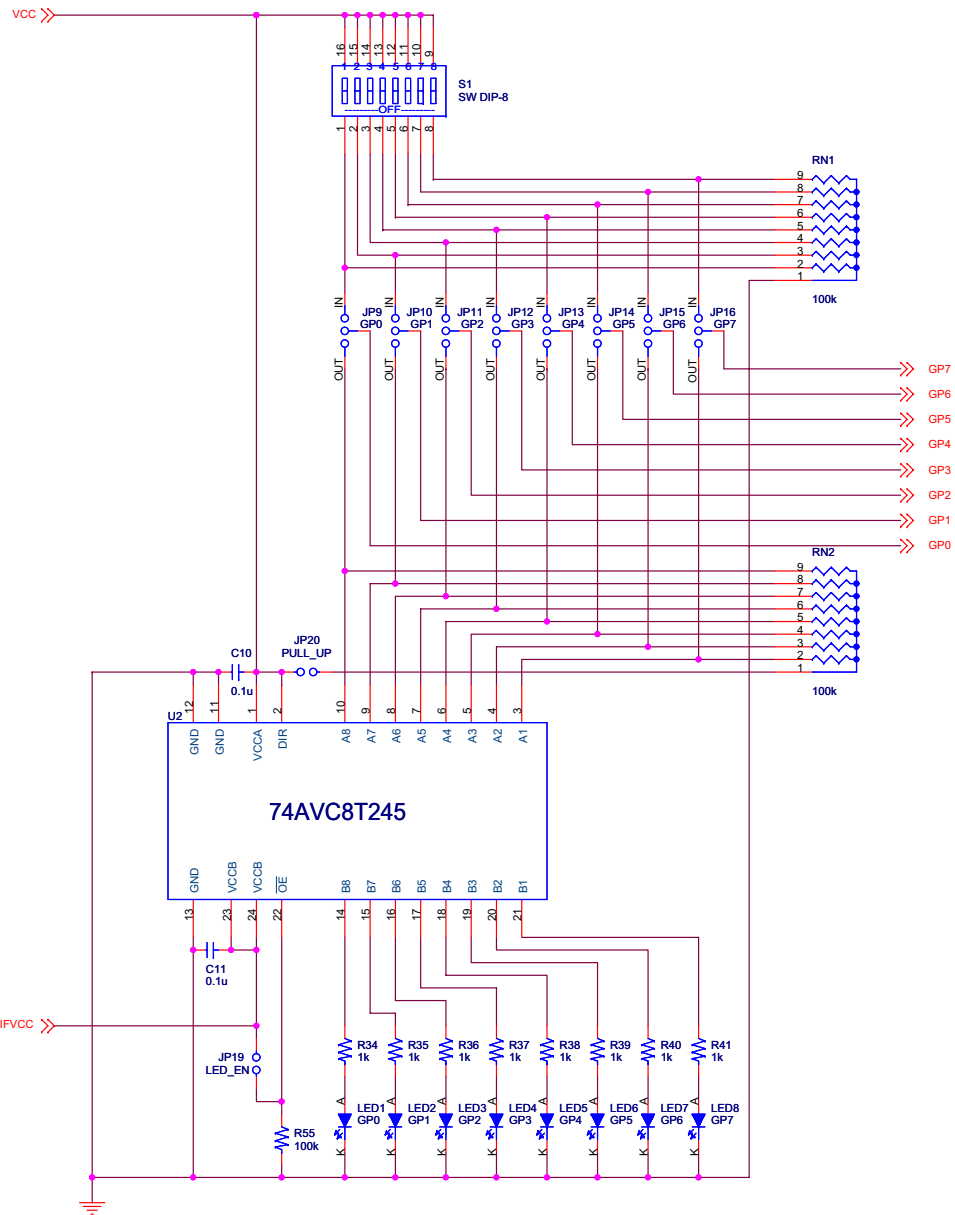


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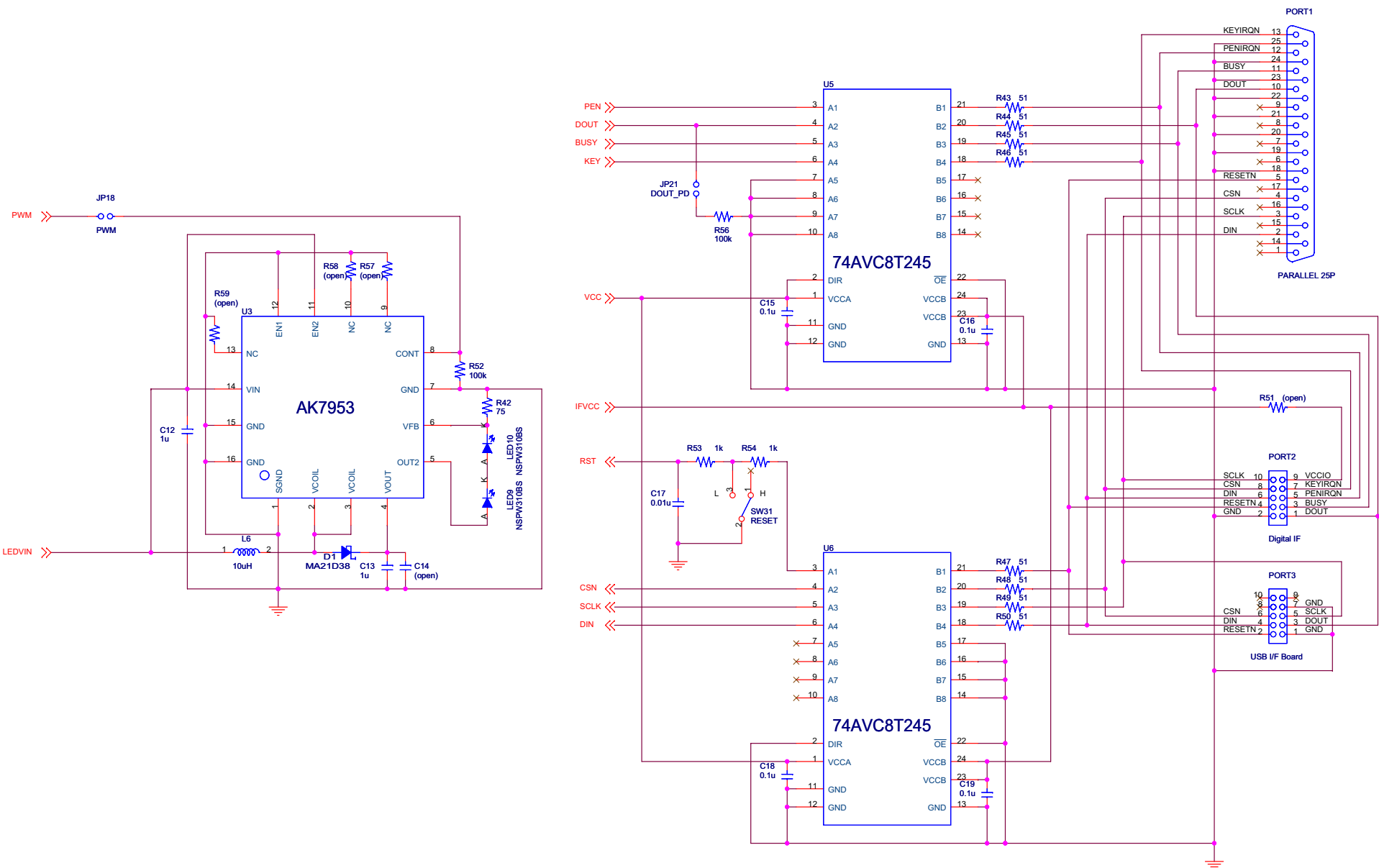


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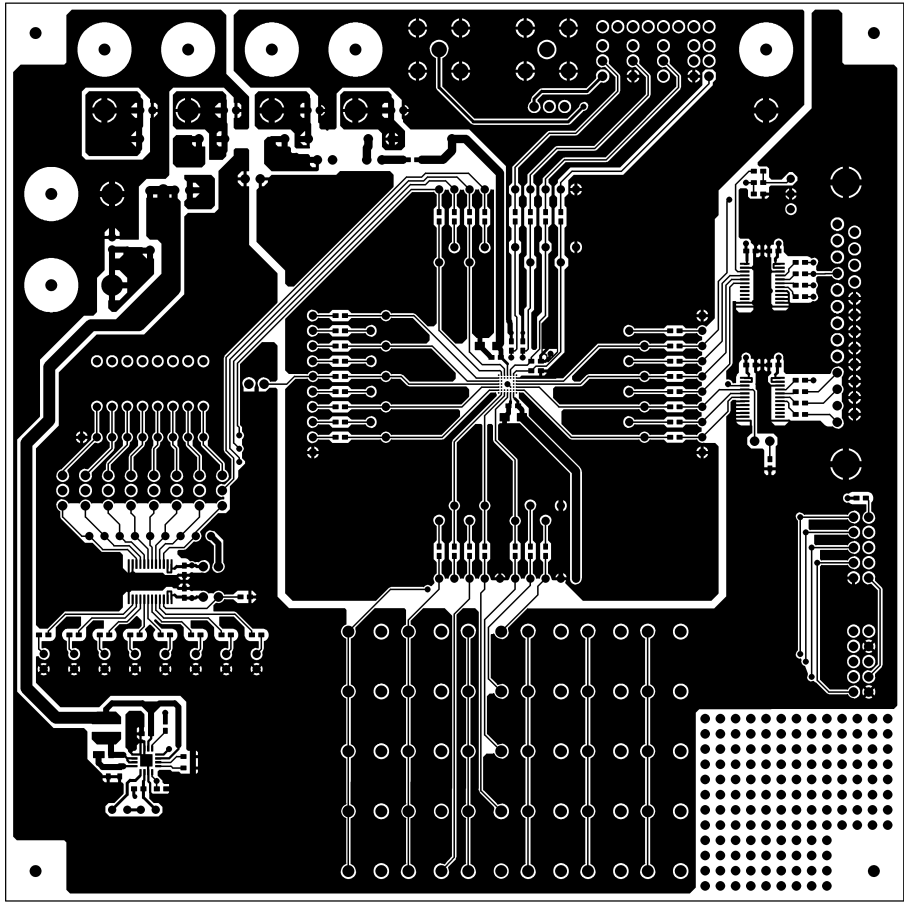




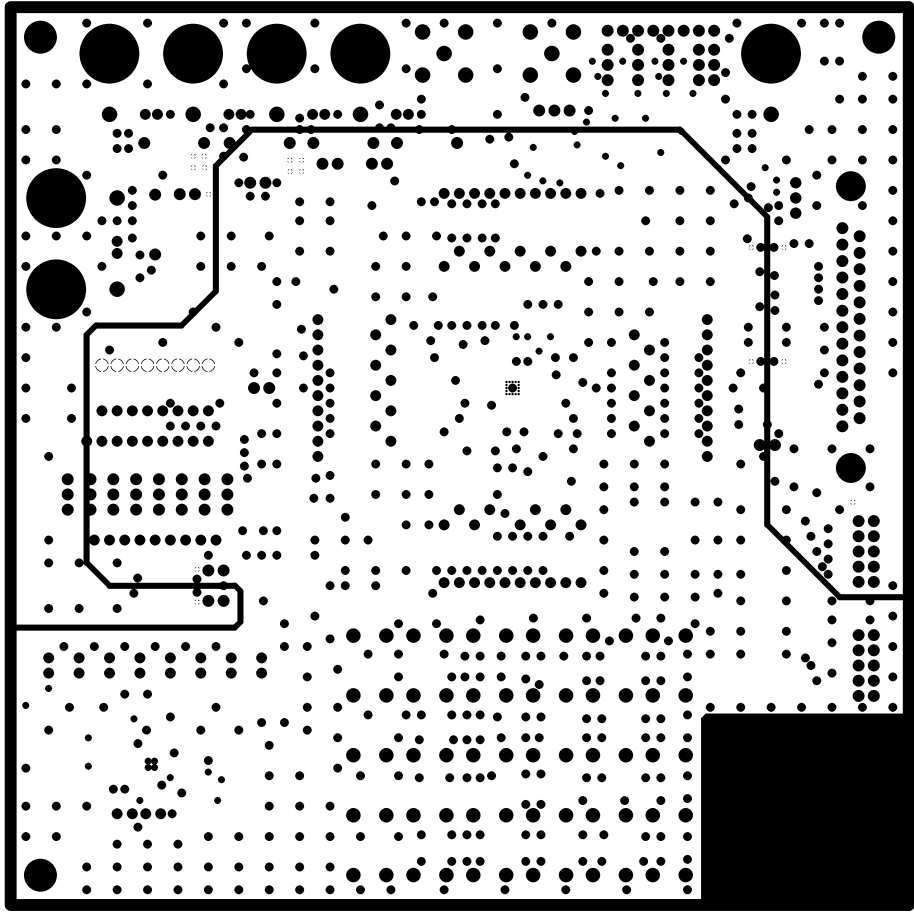
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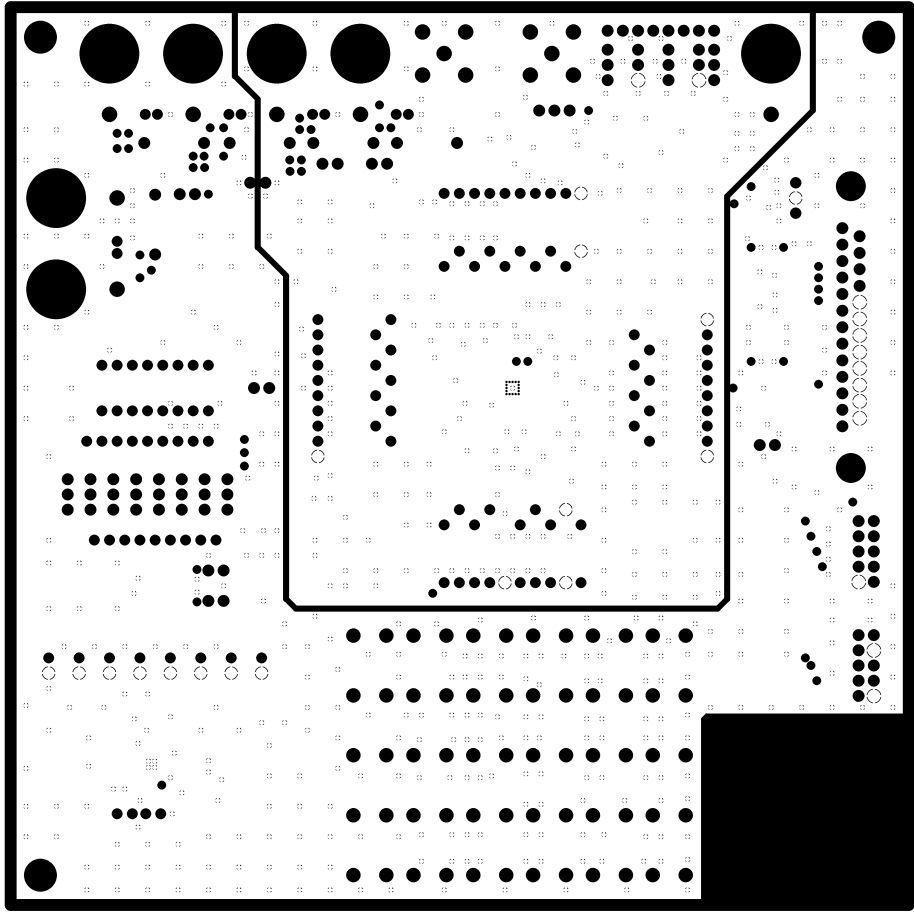
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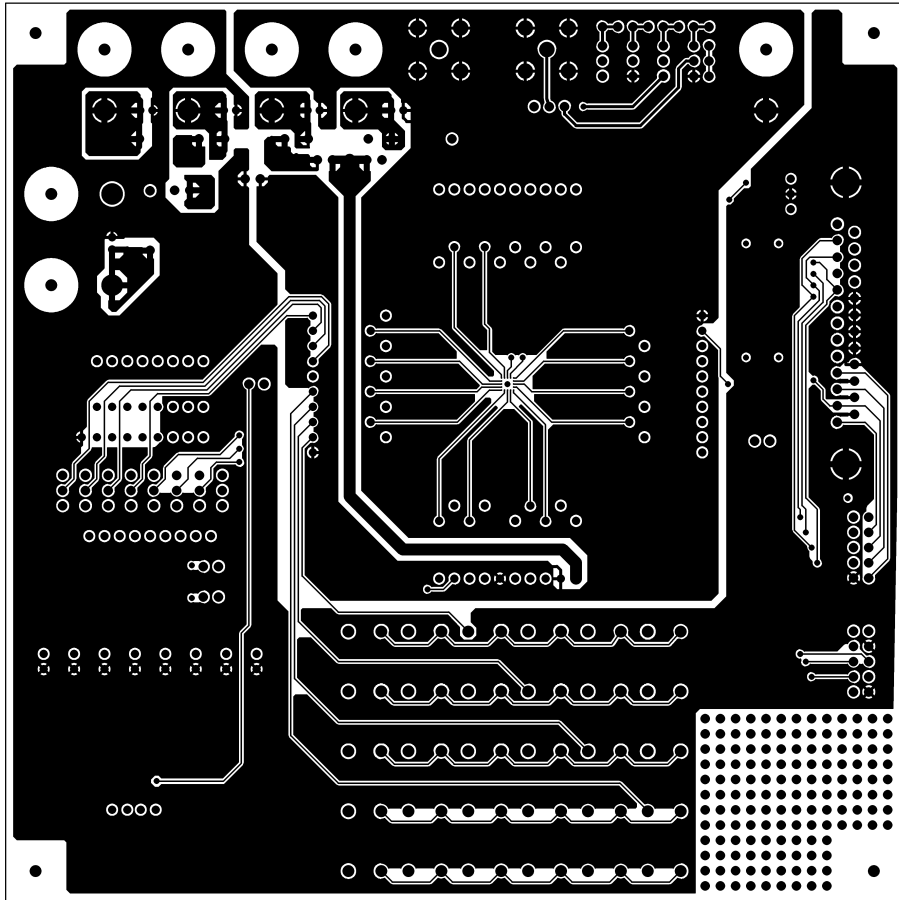
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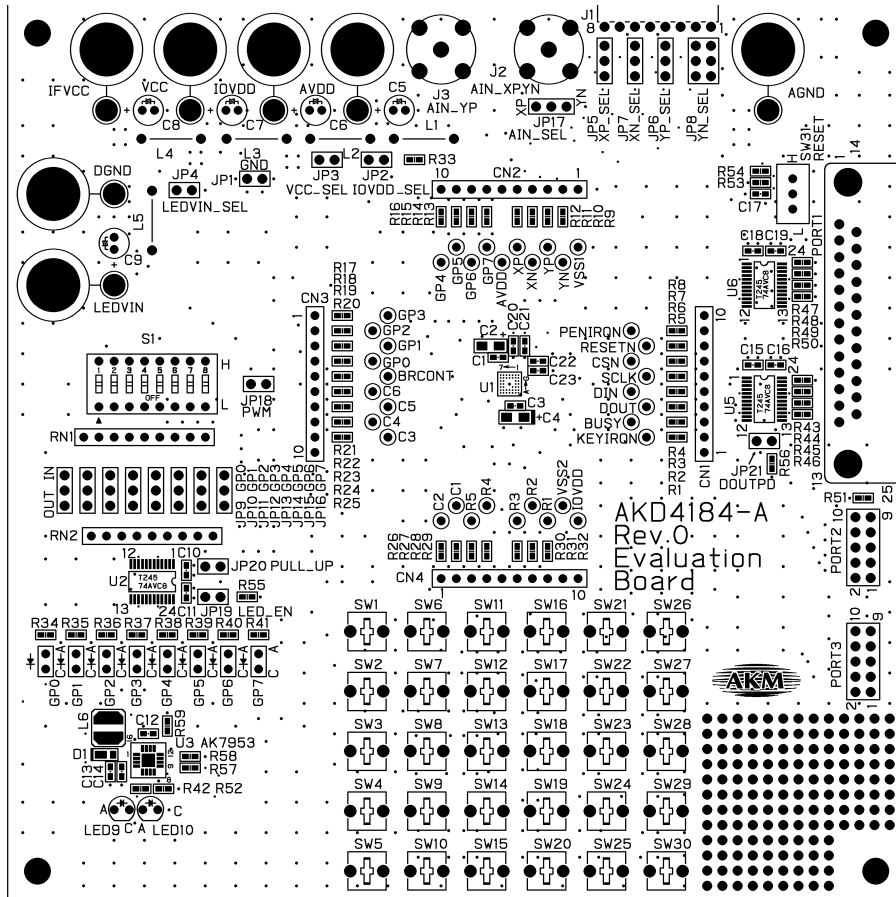
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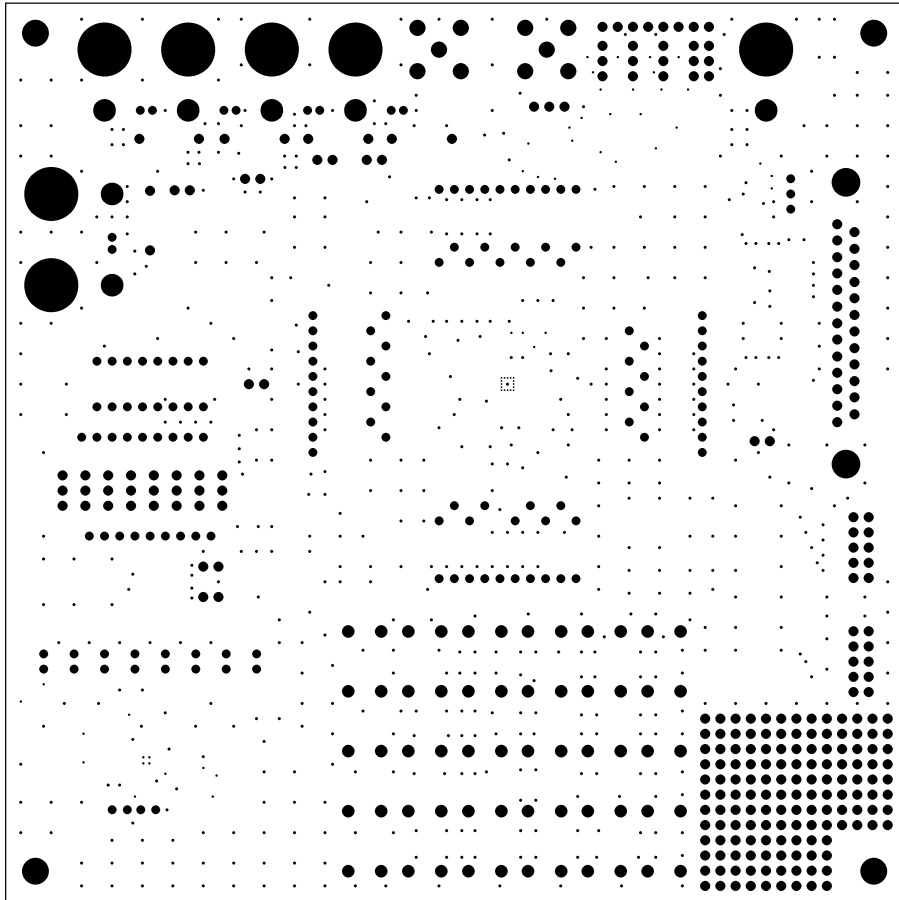
L3 Pattern



L4 Pattern



L1 Silk



L4 Silk