# WTC68K1R Type 8 keys + 1 encoder capacitive touch sensitive chip
# Fast Browsing

| | |
|---|---|
| Number of keys | 3 -8 keys |
| Number of slide bar / roller | 1 encoder(slide bar/roller) |
| Key response mode | Single key reaction mode |
| Technical principle | Capacitive to digital conversion technology |
| Dimension of key sense element | Minimum 3mm ×3mm, maximum 30mm ×30mm, to be determined according to actual demand and panel thickness |
| Spacing of key sense element | Minimum spacing 2mm, to be determined according to actual demand |
| Shape of key sense element | Arbitrary polygon, rotundity or ellipse, either panel with hole in the middle or hollow panel (optional) |
| Material of key sense element | PCB copper coil, sheet metal, flat-top cylinder spring, conductive rubber, conductive ink, ITO layer of conductive glass, etc. |
| Requirements for PCB | Single-sided PCB and double-sided PCB |
| Panel material | Insulating materials, such as organic glass, ordinary glass, tempered glass, plastic, wood timber, paper, ceramics and stone |
| Panel thickness | 0 – 20 mm |
| Adjustment method of key sensitivity | Key sensitivity can be adjusted by changing value of base capacitance CSEL. |
| Effective touch response time | Less than 150 ms |
| Water resistance | Watering or spraying water on the panel will not cause malfunction of keys; when flooded or with water accumulation, no abnormal response occurs by touching the panel. |
| RFI resistance | It can effectively eliminate the radio-frequency interference caused when GSM mobile phone is close the panel to dial or to answer the phone, and when the high-power intercom is close the panel to make the talkback operation. |
| Operating voltage range | 3.3V-5.5V |
| Operating temperature range | —40°C—+85°C |
| Data transmission interface | The output of the key is BCD (8421)interface, and the slide bar/roller output is standard encoder square wave. |
| Storage temperature range | —50°C—+125C |
| Chip sealing mode | SSOP28(150MIL) |
| Typical application | Various home appliances, security equipment, communication equipment, industrial control equipment & instruments, entertainment equipment, medical equipment, sport facilities, It needs to continuously adjust the application case of the physical quantities |


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Table of Contents

# WTC68K1R Capacitive sensitive touch switch & roller encoder chip

# Specification (V1. 5)

## 1. Product Introduction

### 1.1. Product Overview

WTC68K1R series touch sensing IC is an integrated circuit designed to achieve human touch interface. It can replace mechanical light touch and mechanical rotary encoder, to realize waterproof and dustproof, seal isolation, solid and beautiful operation interface. A WTC68K1R can achieve3 ~ 8 independent touch key and a touch roller encoder. It can provide user with a low-cost human-computer interaction interface. The operation and signal output of the touch roller coder is the same as the mechanical wheel coder. But there are no burrs for the output pulse of the mechanical code. The user does not have to handle the soft and hardware aiming at the burr, and only needs to adjust one capacitor Csel that can change the sensitivity of all channels, with high production efficiency.

### 1.2. Technical Principle

WTC68K1R uses the change of capacitance on the 16 bit high precision of CDC (digital capacitance transducer) IC detection induction disk (capacitance sensor) to identify the touch action of the human finger. The data of CDC output is processing by the embedded RISC with efficient and reliable algorithms. The direct output of high and low level indicates the key action. The pulse of 90-degree phase difference the same as the mechanical encoder is used to output the roller action.

### 1.3 Adapt to different thickness of panel

Through selecting the appropriate Csel capacitance value and properly adjusting the sensing disk area, it can make WTC68K1R to adapt the Insulation panels of different thickness of 0—10mm.

### 1.4. Chip Package

WTC68K1R is packaged with standard SSOP28A(150mil).

## 2. Technical Features and Parameters

### 2.1. Technical Features

### 2.1.1. Simple Peripheral Circuits, and A Few Peripheral Components

With independently designed special test circuit, self-calibration circuit and RISC processor integrated inside the IC, there are a few peripheral components.

### 2.1.2. ebugging-free Production and Excellent Long-time Working Stability

Calibration is not necessary for the system after the set value for capacitor Csel of sensitivity is determined. The system can automatically overcome the interference caused by electrostatic discharge, electromagnetic interference, temperature variation and accumulation of moisture and pollutants on the surface, and provide good precision and operation consistency in various environments, so the product can suffer long-distance transportation and be used in various environments. The unique compensation algorithm and high-strength anti-interference design can guarantee no occurrence of malfunction during long-time work of the product.

### 2.1.3. The user can use the compact keyboard of smaller spacing

Adjacent key suppression function can prevent the wrong action of adjacent keys.The user can use the compact keyboard of smaller spacing
(the spacing is not less than 2mm)

### 2.1.4. Excellent Water Resistance

The special waterproof design is used for it. The keyboard not only can be splash proof, flood water proof, but also can be normal use after completely flooded, is different from the general induction at present which when the splashing water, flood water of key panel, it is easily getting false action and is unresponsive after waterlogging, or is occurring false action after pressing it by finger.

### 2.1.5. Excellent Electromagnetic Immunity

When applying to home apparatuses and ordinary application products, the user may get good immunity to radio frequency signals by using single-sided PCB, and easily resist the interference of most of radio frequency sources including GSM cell phone to the sensitive keys.

When applying to military and other special situations, it is suggested that double-sided PCB should be designed according to the layout requirements provided by us.

### 2.1.6. Unique Line Length Self-correction Function

It is common for the current similar products on the market that, the sensitivity largely differs according to the length of line from sensing key to IC pin. Our original line length self-correction technology can automatically correct

such difference. The user can obtain almost uniform sensitivity for all keys of the whole sense element without complex adjustment

.

### 2.1.7. Compliance with Industrial Application Specifications & Requirements

More reliable performance and wider application range is available for users.

### 2.2 Technical Parameters

Operating voltage: 3.3V<Vcc<5.5V
Output voltage range: GND<Vout<Vcc
Sensing thickness (insulating medium): 0-10mm
Response time of effective touch: Less than 200ms
Operating temperature: -40°C—+85°C
Storage temperature: -50°C—+125°C

## 3. Typical Application

Be applicable to various kitchen apparatuses, audio and video devices, air conditioners, sanitary electrical apparatuses, lights and switches, security equipment, instruments, portable player, mobile phones, electronic toys and learning machines.

## 4. Definitions of WTC68K1R Pins

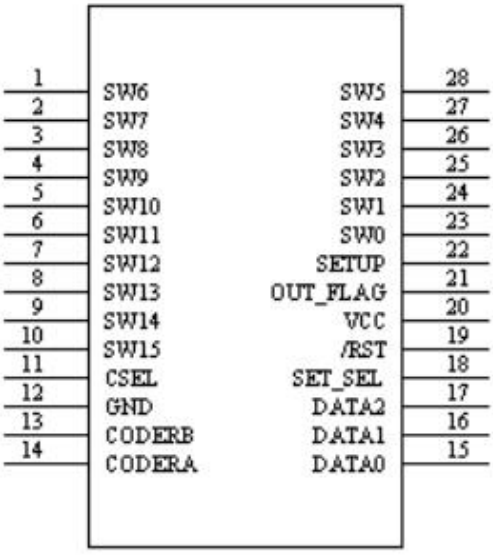



Figure 1

Table 1: Definitions of WTC68K1R Pins

| Pin No. | Pin Name | Usage | Function Description |
|---|---|---|---|
| 1 | SW6 | I | Touch key (induction disc) interface 6 |
| 2 | SW7 | ! | Touch key (induction disc) interface 7 |
| 3 | SW8 | I | Roller induction disc unit interface |
| 4 | SW9 | I | Roller induction disc unit interface |
| 5 | SW10 | I | Roller induction disc unit interface |
| 6 | SW11 | I | Roller induction disc unit interface |
| 7 | SW12 | I | Roller induction disc unit interface |
| 8 | SW13 | I | Roller induction disc unit interface |
| 9 | SW14 | I | Roller induction disc unit interface |
| 10 | SW15 | I | Roller induction disc unit interface |
| 11 | DSEL | I | Sensitivity adjustable capacitor interface |
| 12 | GND | I | Power ground |
| 13 | CODERB | O | Roller encoder pulse output A |
| 14 | CODERA | O | Roller encoder pulse output B |
| 15 | DATA0 | I/O | The output of BCD code and the input of the fine tuning, and the output of the roller encoder pulse is 0 |
| 16 | DATA1 | I/O | The output of BCD code and the input of the fine tuning, and the output of the roller encoder pulse is 1 |
| 17 | DATA2 | I/O | The output of BCD code and the input of the fine tuning, and the output of the roller encoder pulse is 2 |
| 18 | SET_SEL | I | Sensitivity setting selection (1 is roller, and, 0 is key ) |
| 19 | /RST | I | Chip reset pin |
| 20 | VCC | I | Positive power supply output |
| 21 | OUT FLAG | I | The Key state indicator: 1 indicates that there is no key pressed in the key; 0 indicates that there is key pressed |
| 22 | SETUR | I | The input signal of the sensitivity adjustment: setting 0 indicates that the user input the set sensitivity; when setting 1, it indicates that the module performs the test work normally |
| 23 | SW0 | I | Touch key (induction disc) interface 0 |
| 24 | SW1 | I | Touch key (induction disc) interface 1 |
| 25 | SW2 | I | Touch key (induction disc) interface 2 |
| 26 | SW3 | I | Touch key (induction disc) interface 3 |
| 27 | SW4 | I | Touch key (induction disc) interface 4 |
| 28 | SW5 | I | Touch key (induction disc) interface 5 |

### 4.1. Output Display

#### 4.1.1. The output of the touch key

After the effective touch occurred is detected, WTC68K1R in 200ms will set the OUT FLAG leg in low indicator state. At this time, the external MCU of the customer can read the key value of the touch through the module BCD code data port. After the user's finger leaves the touch key, the OUT FLAG leg is automatically setting high.

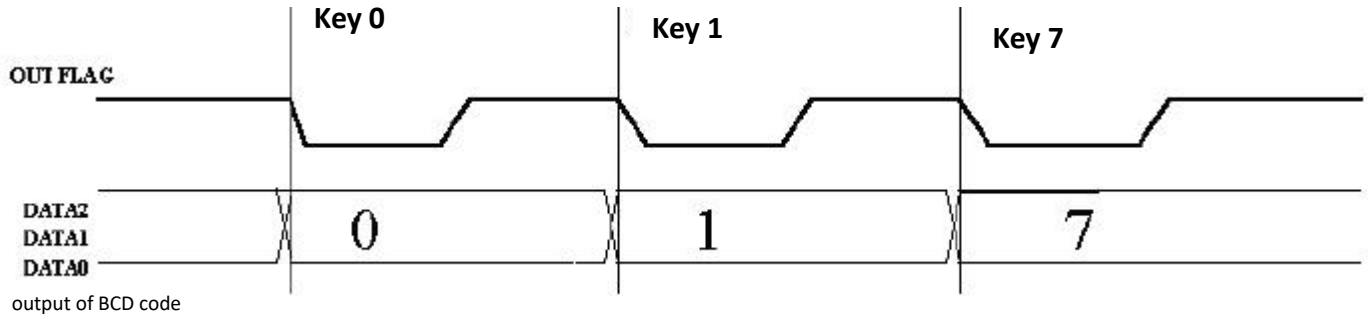
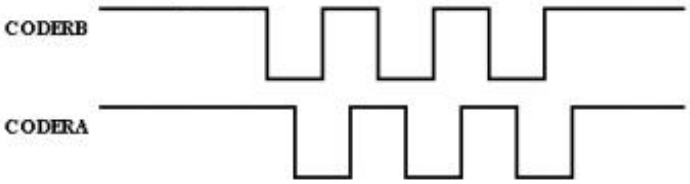


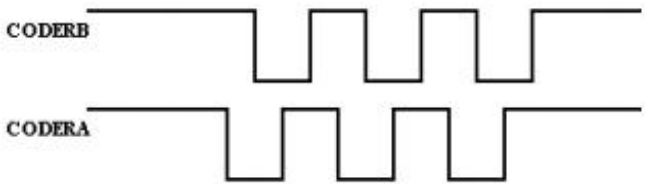

Figure 2: Sequence diagram of the output of the key

#### 4.1.2.Touch rotary encoder output

The operation mode and output signal of the touch roller are consistent with the common mechanical roller encoder. But there is no the burr of mechanical output pulse. The user does not have to handle the soft and hardware aiming at the burr




The clockwise rotation of the roller




The anticlockwise rotation of the roller

Figure 3: Sequence diagram of touch roller output

The rotation of roller gives 30 pulses a week.

The phase difference between the two pulses is around 6ms.

### 5. Peripheral Circuit

The peripheral circuit of WTC68K1R is very simple, and only needs a few resistors and capacitors. The key component is capacitor CSEL for adjusting the sensitivity and IK resistance group for measuring the matched impedance of circuit. CSEL should use 10%-precision polyester capacitor, capacitor made of NOP material or capacitor made of X7R material . 1K resistance group can provide you with the best and most stable measurement effect, and CSEL and matched resistance shall be placed as close as possible to IC at PCB layout.

Figure 4 below shows the peripheral circuit diagram of WTC68K1R application

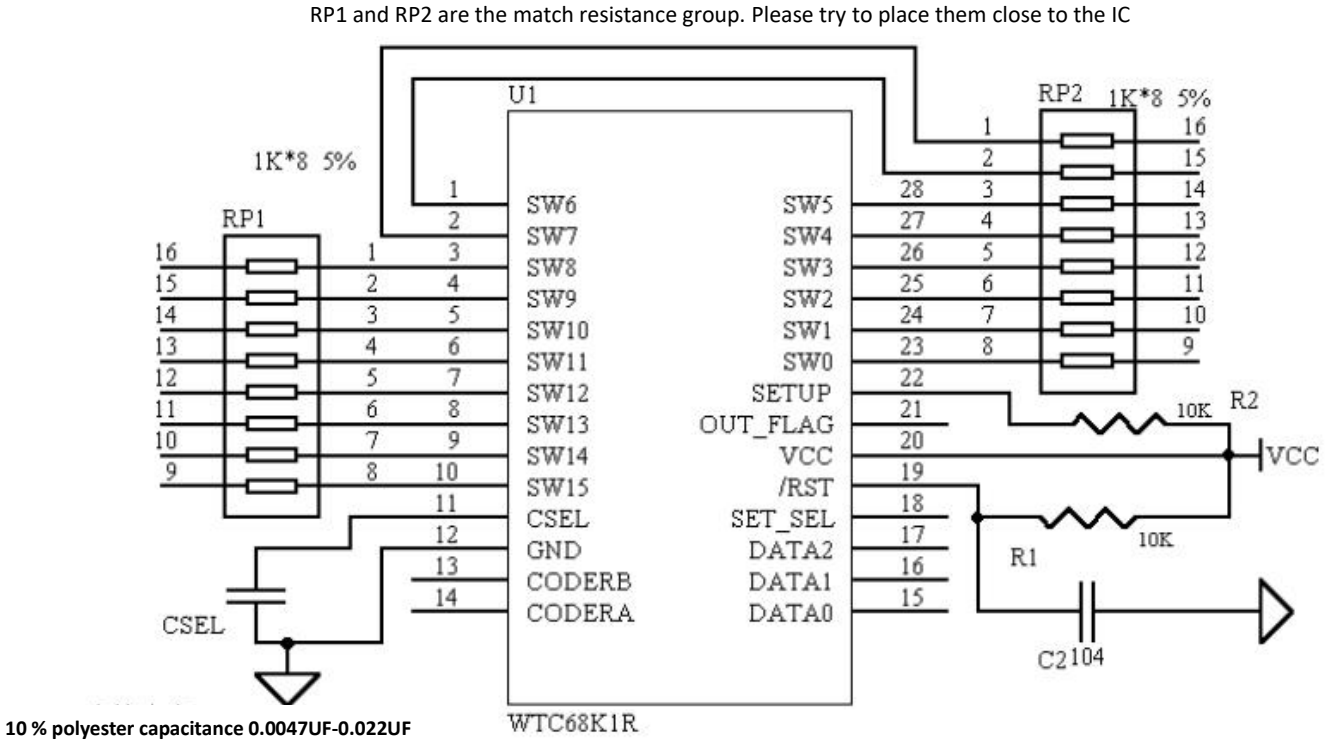



Figure 4: WTC68K1R Application Schematic Diagram

**6. Sensitivity Setting**

The sensitivity setting of WTC68K1R enables the user to use isolated media of various thicknesses to implement reliable and flexible touch function.
The sensitivity of WTC68K1R is set by using the double setting of soft and hardware.
WTC68K1R can make the sensitive setting to the key and slide bar respectively.

**6.1. Hardware sensitivity adjustment**

The sensitivity setting of WTC68K1R is achieved by selecting the appropriate capacitance Csel and adjusting the matching resistance value of the tandem connection in the induction channel. The user can adjust the sensitivity of the touch panel by not using the software sensitivity adjustment and only by using the hardware, so that the user can save the interface of the MCU with the SETUP (22 pin) and SET_SEL (18 pin) of WTC68K1R, then it must be WTC68K1R SETUP (22 pin) and SET_SEL (18 pin) fixed to meet high level (VCC)

### 6.1.1. Selection of Suitable Capacitor CSEL

The user can select the appropriate capacitance Csel according to the own use case. The larger the separation medium is, the larger the Csel capacity is. It is generally recommended to choose the appropriate capacitance between 0.0047 UF and 0.022 UF from large to small. It is recommends that it is best to use the A 5 % precision polyester capacitor with a small temperature coefficient for Csel. 10 percent accuracy of polyester capacitance can also be used. If needing use of patch capacitors, 10% or higher precision NPO material or X7R capacitance needs to be used. It is recommended that the user places more than two solder plates on the Csel to exquisitely adjust the Csel.

### 6.1.2. Area of sense element

Increasing the area of the induction disk can improve the sensitivity of the corresponding induction channel.

### 6.1.3. The equilibrium of the sensitivity of key and slide bar/roller

If the sensitivity of the sensor key and the induction pulley is not consistent, it can be adjusted through the matched resistance value of the tandem connection on the interaction channel. The great the matched resistance value is, the larger the sensitivity of the corresponding induction channel is. But the value of the matching resistance is not less than 1K. The matched resistance value of the tandem connection on the pulley induction channel must be consistent.

## 6.2. Software sensitivity adjustment

After specifying the value of the Csel by making the fine-tuning to the key and roller with software sensitivity through the BCD data interface, to ensure that each key to gain good effect, and can adjust Csel without necessary to make the refined adjustment to Csel.

### 6.2.1. The series of the sensitivity adjusted by software

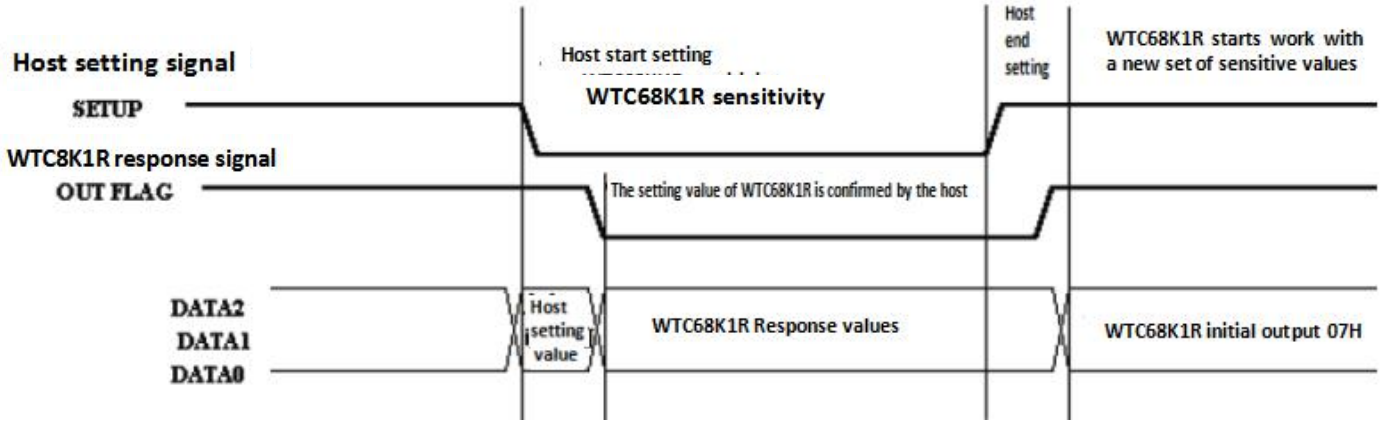
WTC68K1R provides 8-level software sensitivity adjustment of 7-0. The higher the level is, the more sensitive the touch is.
The initial value of the sensitivity series key and initial value of the roller of leave factory of WTC68K1R is 7. The user adjusts it by not using the hardware sensitivity adjustment function but only by using the software. The SETUP (22 pin) and SET and (18 pin) of WTC68K1R here must be fixed to the high level (VCC).

### 6.2.2. The method of sensitivity set by software

After the user MCU has set the sensitivity series with the BCD code interface, the SETUP leg will be set low and 2MS will be maintained. After receiving the data, WTC68K1R will set the OUT FLAG low, and send the received data from the DATA2~DATA0, so that the user MCU can confirm whether the setting is successful. After MCU confirms that the setting is success, the SETUP will be restored to high level. WTC68K1R uses the new set sensitivity series to work.

### 6.2.3. The sequence diagram of the sensitivity set by the software

The sequence diagram of the sensitivity setting is as shown in following figure. SET_SEL is the sensitivity of the roller set when it is high, and SET_SEL is the sensitivity of the key set when it is low




**Input and output of BCD code**

**Figure 5: Sequence diagram of sensitivity setting**

## 7. WTC68K1R Power Supply

WTC68K1R measures small change in capacitance, so it is required that the power ripple and noise should be small and the external strong interference involved from power supply shall be avoided. Particularly when it is applied to induction cooker and microwave oven, the external interference and voltage leap must be effectively isolated, and the power supply must have high stability. It is suggested that the voltage stabilizing circuit constituted by 78L05 as shown in the figure should be adopted.

RP1 and RP2 are the match resistance group. Please try to place them close to the IC

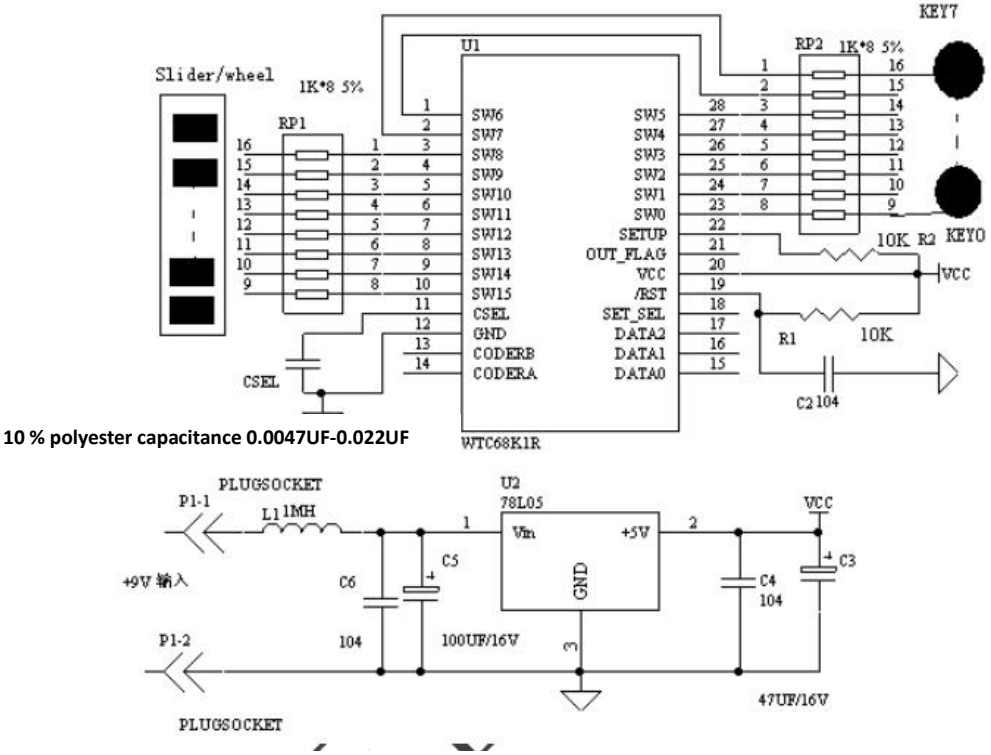


Figure 7： Power supply voltage regulator circuit

### 7.1. DC Voltage Stabilizer

At PCB LAYOUT, such 78L05 power component must be close to WTC68K1R Vcc pin.

### 7.2. Placement of Voltage Stabilizer Component

78L05, peripheral components and WTC68K1R must be placed on the same circuit board centrally, to put an end to the noises caused by overlong power connection line.

### 7.3.Grounding

The common ground of the components as shown in the figure shall be separately connected into an independent group and then it shall be connected to the common ground of the whole machine from one point of it. (Use one point of star shape to connect the ground), The capacity of C2 capacity will affect the discharge time after power failure, and the too large capacity requires a longer reset time. It is the recommended values in the circle. The different applications can be flexibly adjusted

**10 % polyester capacitance 0.0047UF-0.022UF**

### 7.4. Precautions for High Noise Condition

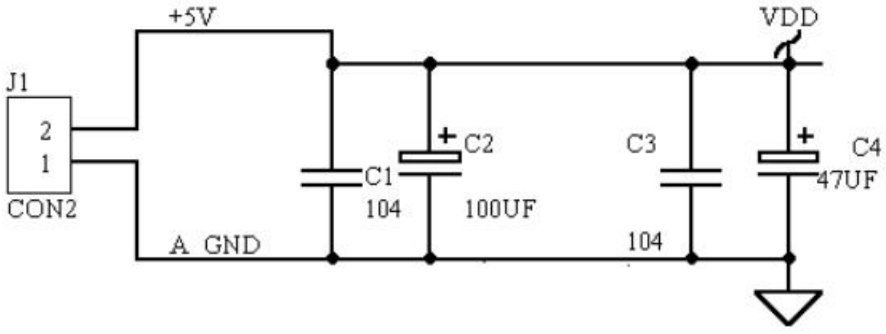
In case of application in a high-noise environment, up and down overlapped placement shall be avoided between high-voltage (220V), high-current, and high-frequency-operation main board and the touch circuit board. If such overlapped placement is unavoidable, try to keep far away from high-voltage, high-current components area or add shield on the main board.

### 7.5. Power Filter

When PCB composing type, it is recommended to reserve the inductance L1 (1MH) welding disc. The different applications may not need this inductance.

### 7.6. Use of +5V Power Supply of the Host

If the user directly uses 5V power supply of the main engine, it needs adding the power supply filter circuit in the front of the power supply of the modules or sensing power chips as shown in the figure below. The requirement for PCB layout is the same as the above circuit




The analog and digital powers of circuit shall be connected separately to the ground in Y-connection method.

The capacitors shall be arranged in the sequence indicated in the schematic diagram and shall not be arranged arbitrarily.

Figure 8: Power Filter Circuit

**Precautions:**

This circuit is good for suppressing the power noise, but the larger load is easy to generate self - excitation.
It is recommended that the user should not receive any other load except the touch module or touch chipset.
LED lights, relays and other IC loads need to be connected to the front of the circuit and other filter stabilized circuit shall be added

## 8. WTC68K1R used capacitive sensors

### 8.1. Induction key

#### 8.1.1. The material and shape of the key sense element

The capacitive sensors can be any type of conductor, but certain flat surface should be ensured. It is recommended to use a round metal sheet or other conductor with a diameter greater than 10mm. The commonly used sense element are copper foil, spring, thin film line and ITO glass, etc. on the PCB plate

#### 8.1.2. The area of the key sense element

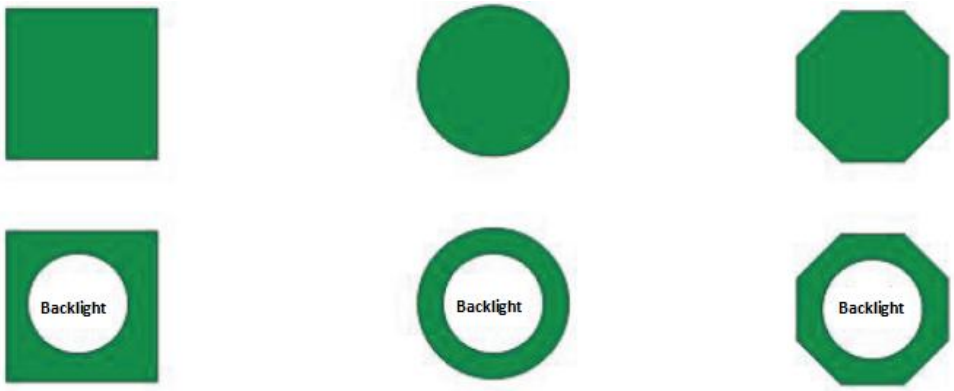
The area of each sense element should be kept as same as possible to ensure the same sensitivity.

#### 8.1.3. Connection between Capacitive Sensor and Panel

The capacitive sensor shall cling to glass and other insulated panel, and elastic connection shall apply between them.

#### 8.1.4. The common elastic connection methods are:

A. Use the sense element with spring
B. Use cylindrical conductive rubber to conduct elastic connection
C. Paste the sense element onto the panel with imported super double-sided glue, and the double-sided glue layer cannot be too thick.



The key sense element can be solid or hollow rectangle, circle or polygon.

Figure 10:Spring sense element

Figure 9: PCB Copper Foil sense element

### 8.1.5. Requirements for sense element and Panel Contact Surface

The surface of the induction plate must be levelled off, and is no clearance between the panels. If the contact surface cannot be achieved closeness, please use the thermally conductive silicone grease to seal it, to ensure the air gap between the junction surfaces of the panel.

The connection between the capacitance sensor and the pins should be short and thin as far as possible (5-8 mil). It is best that WTC68K1R can be placed on the keypad and that the back and around 0.5 mm of the connection is not placed other circuit, to ensure that the sensor has good sensitivity and to avoid false triggering.

### 8.2. Touch slide bar/pulley

The shape and size of the touch sensitive slide bar are shown in Figure 10. The size of the slide bar sensor unit can be appropriately scaled in proportion according to the panel design requirements.
The slide bar - The arrangement order of the interaction unit of the slide bar in sequence from left to right is:
SW13,SW10.SW15,SW12,SW9,SW14,SW11,SW8,SW15.SW14,SW13,SW12,SW11,SW10, SW9,SW8

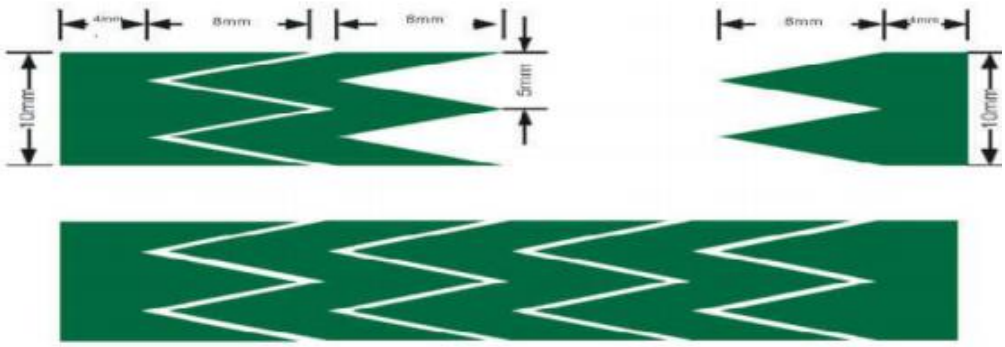


Figure 11： Geometry and dimension of touch slide bar

The shape of the induction unit of the touch-sensitive roller is as shown in figure 11. The clearance between the induction units is 0.2 0.5 mm, and the inside and outside diameter of the roller is 18mm and 36m respectively. The size of the roller can be appropriately scaled in proportion according to the panel design requirements.

The arrangement order of the touch induction roller induction unit clockwise starting from left is:
SW13,SW10.SW15,SW12,SW9,SW14,SW11,SW8,SW15.SW14,SW13,SW12,SW11,SW10, SW9,SW8
(For the specific details, please refer to the application schematic diagram and the PCB diagram of the DEMO board provided by us)

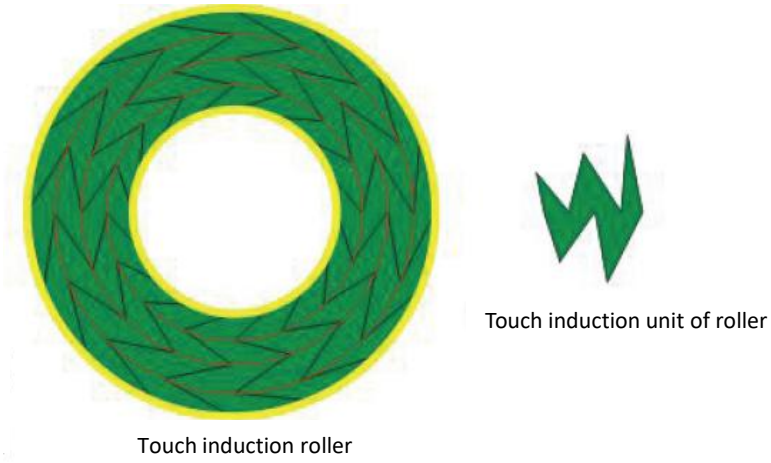



Figure 12: Geometry and dimensions of the Touch roller

**9. Processing of Vacant Sensor Channel**

WTC68K1R requires that at least three touch key must be used; otherwise the chip will not work properly.
When using it in the case of less than 8 keys, SW7 ~ SW0 will have empty and unused sensor input channel. The empty input channel cannot be suspended, and the empty input channel must be connected to the power supply of WTC68K1R with a 20K pull-up resistor and WTC68K1R.

If the user must use three or less sensitive keys, please be sure to contact us for the corresponding technical support.

## 10. Package Dimension Drawing of WTC68K1R

| Symbol | Dimensions in mil | | |
|---|---|---|---|
| | Min. | Nom. | Max. |
| A | 228 | — | 244 |
| B | 150 | — | 157 |
| C | 8 | — | 12 |
| C' | 386 | — | 394 |
| D | 54 | — | 60 |
| E | — | 25 | — |
| F | 4 | — | 10 |
| G | 22 | — | 28 |
| H | 7 | — | 10 |
| α | 0° | — | 8° |

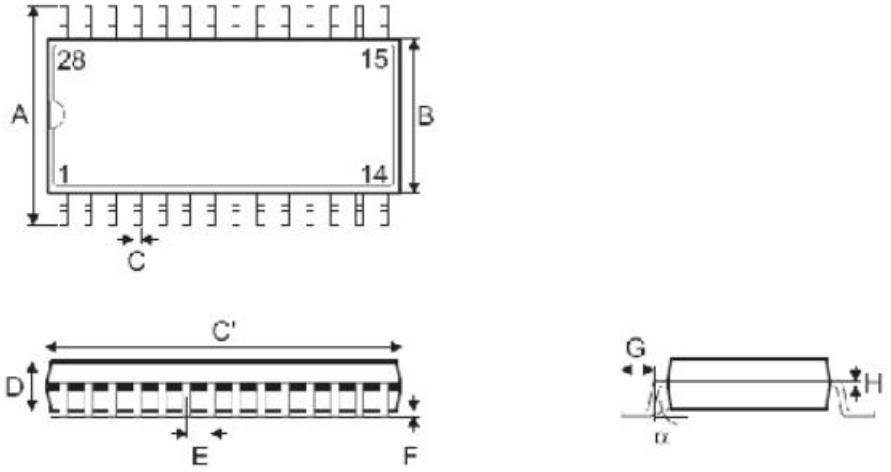



Figure 13: Package Dimension Drawing of WTC68K1R

## 11. Appendix

### 11.1. Typical application circuit and interface operation of WTC68K1R and 8051 interface

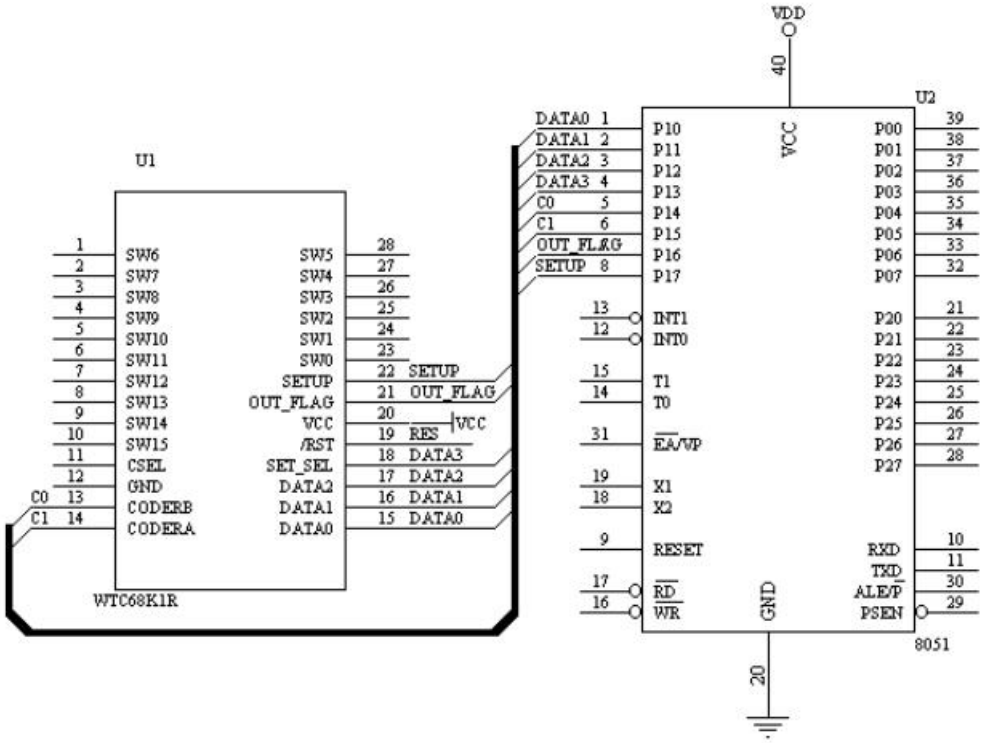



Figure 6: interface circuit of WTC68K1R and 8051

Typical operational program of the 8051 and WTC68K1R interface

```
#include <rea51.h>
#define          uchar          unsigned char
#define          uint       unsigned int

#define          DaPort         P1
Sbit          SetUp           =P1^7;
//-----------------------------------------Key status indication--------------------------------
Sbit          Out_Flag=     P1^6;
//-----------------------------------------Sensitivity settings selection ----------------------------
Sbit           SET_SEL              =P1^3;
//-----------------------------------------Data cable-------------------------------
Sbit          CODERB                = P1^4;
Sbit          CODERA                =P1^5;

//-----------------------------------------Data cable-------------------------------
Sbit          DATA2                 =P1^2;
Sbit          DATA1                 =P1^1;
```

```
Sbit        DATA0                =P1^0;

//-------------------------------------------Function definition----------------------------
Void        init(void);                              //Variable  initialization
Void        set_Subtle(uchar channel, uchar    subtle); Setthe sensitivity of the key or roller

//-------------------------------------------Variable definition----------------------------
Uchar       CetKey                 //Key value of the key

Uchar       RollData;              //The value of the roller counter
Uchar       RollLast;              //Detect the intermediate variables along the rising edge of the roller coding
//-----------------------------------------------------------------------------------------
//
//-----------------------------------------------------------------------------------------
Void main(void)
{
  Init();
Set_Subtle(0,7);        //Set the sensitivity of the key to the highest
Set_Subtle(1,7);        //Set the sensitivity of the roller to the highest
While(1)
{

        //DaPort= 0xff
        If(~Out_Flag)
        {               //out)flag Is low and indicated that there is key pressed
                        GetKey=Daport;
                        GetKey=0×07;     //Read-inthe key value of the key

                        RoIILast =0xff;          //The intermediate variable of the roller encoder is reset
                }
                 else
                {
                    RollKey=Daport;
                    RollKey=0×30;          //Read-in the output status of the roller encoder
                    if(RollKey==0×30）
                     {                     //Detect the 360-degree phase of the output pulse pairs of the encoder
                        if(RollLast==0×10)
                        {                        //CODERB is 90 degrees behind CODERA
                                    RollData++; //Roller counter value is added one
                        }
                       Else if(RollLast==0×20)
                       {                      //CODERB is 90 degrees ahead of CODERA
                                  RollData--;     //The roller counter is reduced one
                       }
                    }
                    RollLast= RollKey;       //Update the intermediate variable of the roller encoder
```

```
        }
    }


//-------------------------------------------------------------------------------------------------
Void            set_Subtle(uchar channel, uchar    subtle)
{
        Uchar    etPortImage;
        SetPortImage=subtle;
        if(Channel==0)
        {                       //The channel is the key sensitivity channel,
            SetPortImage &=0×F7;//Set the SET_SEL low
        }
        Else
                                //Other channels are roller sensitivity channels

            SetPortImage |=0×08;//Set the SET_ SEL high
        }
            SetPortImage |=0×C0;          //Output sensitivity data on DATA2 ~ DATA0
        DaPort=SetPortImage;
        SetPortImage &=07F;             //Set the SETUP high
        DaPort=    SetPortImage ;
       While(Out_Flag==1){};          //Wait for the OUT_FLAG to be set low by touch module
        j=DaPort;                       //Set the DATA2~DATA0 as input
        j&=0×07;                        //Read-in the data on DATA2 ~ DATA0
        SetPortImage =0FF;
        DaPort= SetPortImage ;          //Set the SETUP high,
        While(Out_Flag==0){};          //Wait for OUT_FLAG to be set high end sensitivity by the touch module
        }                              //If you get the response data of the module
                                       //The data that should be set is  unconformity, that it can be firstly setting the STUP high and after waiting 1MS
                                       //Re-enter the set Subtle to make the sensitivity setting


//-------------------------------------------------------------------------------------------------------------
Void            init(void)
{
  GetKey=0;
  RollData =0×07F;                      //The initial value of the roller counter
  SpGetFirst=1;
  RollData=0×3F;
  RollLast=0×ff;
}
```

**11.2. Appendix 2: < the recommendation for PCB Layout of touch slide bar and roller >**

Recommendation for PCB Layout of touch slide bar and roller

The principles of the layout:

Slide bar and touch key and connection line of their touch sensing chip constitute the capacitance sensor. When it is Layout, the parasitic capacitance of the connection line should be reduced, and the parasitic capacitance of the slide bar and touch key should be increased to ensure that the parasitic TV of each sensor unit of the each key or slide bar is consistent, so we can get good effect of touch.

Specific measures

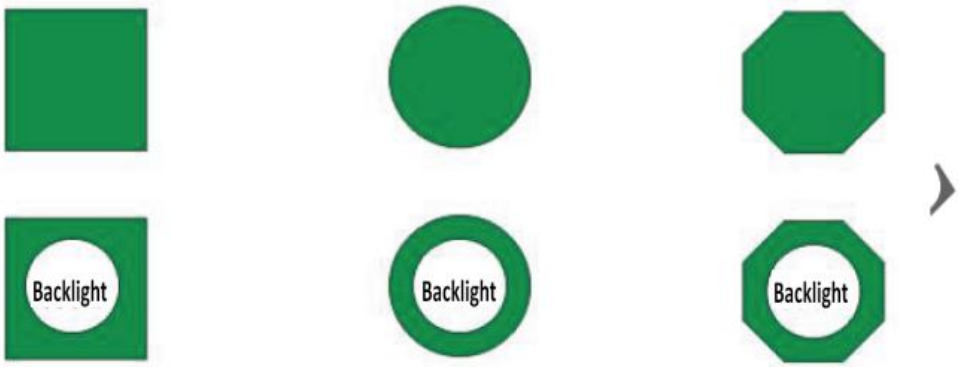
1: PCB material

It is recommended that the user should use two panels of more than 1.2mm thick, to avoid the contact with the back of the panel not tightened due to PCB distortion.

2：Key induction disk and slide bar sensor unit

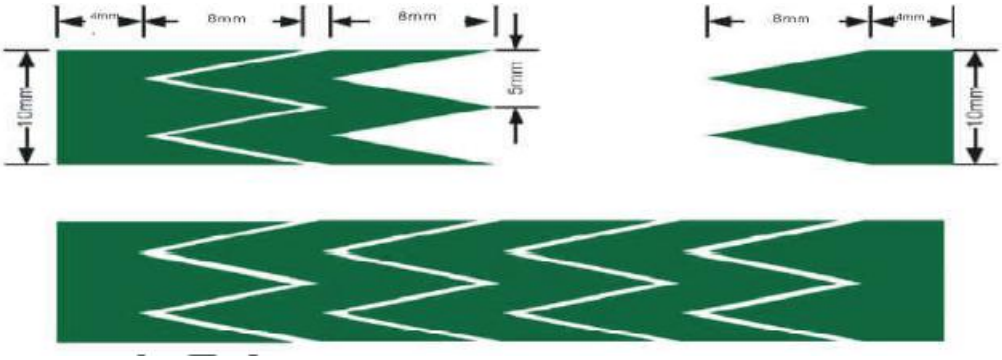
2.1 The shape of the key induction disk

The key induction disk can be round or polygonal copper foil. It can also be opened pore in the middle of the copper foil, through the keys back light slide bar induction unit order, from left to right, it is SW13, SW10. SW15, SW12, SW9, SW14, SW11, SW8, SW15. SW14, SW13, SW12, SW11, SW10, SW9, SW8




The key sense element can be solid or hollow rectangle, circle or polygon.

2.2. The shape of slide bar:




The arrangement order of the induction roller induction unit clockwise starting from left is:
SW13,SW10.SW15,SW12,SW9,SW14,SW11,SW8,SW15.SW14,SW13,SW12,SW11,SW10,SW9 ,SW8
(For the specific details, please refer to the application schematic diagram and the PCB diagram of the DEMO board provided by us)

2.3. Roller

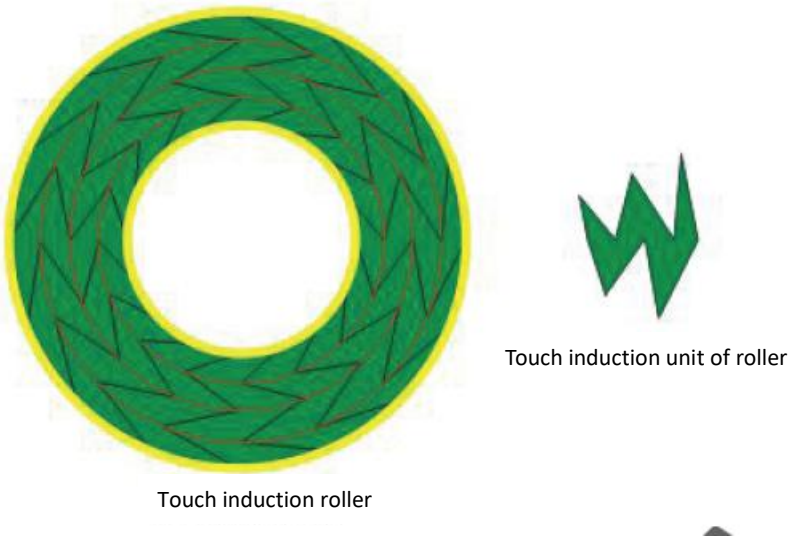



Figure 12: the geometry and dimensions of the touch roller

The shape and size of the sensing unit of the touch induction roller, the inner diameter of the roller is 18mm, and the outer diameter is 36mm. The size of the sensor unit is proportionally scaled according to the panel design requirements.
The touch induction roller induction unit is arranged clockwise from left:
SW13,SW10.SW15,SW12,SW9,SW14,SW11,SW8,SW15.SW14,SW13,SW12,SW11,SW10,SW9,SW8
(For the specific details, please refer to the application schematic diagram and the PCB diagram of the DEMO board provided by us)

According to the requirements of panel aesthetic design, the width of the touch-sensitive slide bar and roller can be scaled appropriately. In order to make operation sensitive and smooth, between the units of induction, it needs to have occlusion according to certain angle, in principle, when the width of slide bar is 5 mm, the induction unit is designed as

an arrow, and when the width of the slide bar is increased 5 mm, the induction unit is increased 5 millimeters, and the induction unit is increased one arrow. The slider bar and roller can be designed as curved segment, and roller can be designed to be elliptical.

2.4. The placement of sensor key and slide bar

The key induction disk and slide bar are placed on the top layer of PCB and distributed according to the panel plane design requirements

3：Component placement

The touch chip is placed in the appropriate position at the bottom of the PCB, to make it as close as possible to the slide bar and roller. When placing the roller, it should firstly ensure the effect of the slide bar. When designing the roller, please try to put the touch sensing chip in the center of the roller.

4：Routing

4.1 The connection between the sensor channel of the touch-sensitive chip and the sensor plate and the slide bar sensing unit should be as far as possible to the bottom of the PCB.

4.2 The length of the sensing channel of the touch sensitive chip to the connection like of each sensing unit of the key and slide bar should be close as long as possible. If needing passing by the hole, it should try to make the line segment of the top layer to be shortest. Under the routing is not allowed under the key induction disk and slider induction unit

4.3 The sensing channel pin of the touch sensing chip should be far away from the pulse signal and not in parallel with other signal line, and avoid distractions and mutual inductance as possible.

4.4 Reduce as far as possible the area of the connection line between the sensing channel pin of the touch sensing chip and the key induction disk. The width of the connection line is recommended to use 5mil (0.127 mm). This can improve the touch effect of the key and slide bar.

5：Measures of reducing the noise interference

5.1 The connection between the Induction channel pin of the touch induction disk and the slide bar induction unit should keep away from the pulse signal and the power line, and should not parallel with the other signal line, and as far as possible avoid interference and mutual inductance.

5.2 Except for the key sense element or the outer space of the slide bar induction unit, the PCB of the top layer is all paved the “gridding ground". The distance between the key induction disk and “gridding ground” shall be 0.5mm-1mm

40%

The effect of the copper sheet area in the gridding ground which accounts for 40% of the gridding area is better. If the copper sheet area occupies too large, it will affect sensitive charge. It is also easy to create the mutual inductance of the keys.