



WTC6508BSI 8-Channel Capacitive Sensor Touch-Sensitive Key Chip Fast Browsing (V1.5)

Number of keys	3-8 keys
Technical principle	Capacitive to digital conversion technology
Key response mode	The standard WTC6508BSI is SHIFT mode, and when it is the multi-key touch, it responds in proper order. Any three keys of WTC6508BSI-M can be pressed simultaneously, and the data can be changed simultaneously.
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	The minimum clearance of the adjacent key of the standard WTC6508BSI is 0.5mm, which is determined according to the actual needs, can be used as the intensive keyboard. WTC6508BSI-M requires that there is sufficient clearance between the keys, which cannot be used as the Intensive keyboard.
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 80 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	Effectively suppress RFI (radio frequency interference) caused when GSM cell phone is used to make a call or answer a call next to the panel or a talk proceeds next to the panel over high-power walkie-talkie.
Operating voltage range	3.3V-5.5V
Operating temperature range	–40°C—+85°C
Data transmission interface	Two line serial port (one is a clock line, and one is a data line)
Storage temperature range	–50°C—+125C
Chip sealing mode	NSOP16(150MIL)
Typical application	Various home appliances, security equipment, communication equipment, industrial control equipment & instruments, entertainment equipment, medical equipment, sport facilities, toy,etc.



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WTC6508BSI 8-Channel Capacitive Sensor Touch-Sensitive Key Chip

Specification (V1.5)

1. Product Introduction

WTC6508BSI is a kind of touch-sensitive key chip。The interior of this chip integrates the 8 channel capacitance measurement circuit, the calibration circuit and RISC processor of the independent design, provides the users with 8 man-machine interface scheme of capacitive touch sensitive key.

1.1 Technical Parameters

Operating voltage: 3.3V<Vcc<5.5V

Output voltage range: GND<Vout<Vcc

Sensing thickness (insulating medium): 0-20mm

Response time of effective touch: Less than 80ms

Operating temperature: -40°C—+85°C

Storage temperature: -50°C—+125°C

1.2 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.

1.3. Chip Package Type

WTC6508BSI is packaged with standard 16PIN NSOP16(150mil).

1.4. Definitions of WTC6508BSI Pins And Pin Configuration Diagram

WTC6508BSI pin configuration diagram is shown in the figure 1 below :

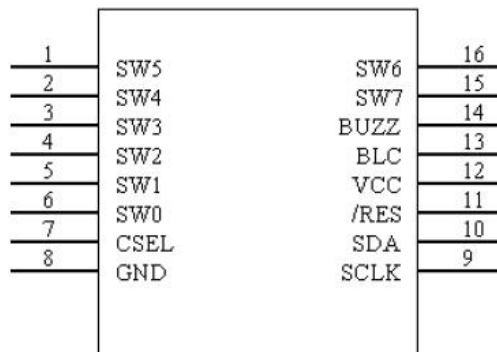


Figure 1: pin configuration diagram of WTC6508BSI



The definitions of WTC6508BSI pins are as shown in the table1 below:

Table1

Pin No.	Pin Name	Usage	Function Description
1	SW5	I	Capacitive sensor (sensitive key) interface 5
2	SW4	I	Capacitive sensor (sensitive key) interface 4
3	SW3	I	Capacitive sensor (sensitive key) interface 3
4	SW2	I	Capacitive sensor (sensitive key) interface 2
5	SW1	I	Capacitive sensor (sensitive key) interface 1
6	SW0	I	Capacitive sensor (sensitive key) interface 0
7	CSEL	I	Capacitor interface for adjusting the sensitivity
8	GND	I	Power ground
9	SCLK	I	Clock input foot transmitted by the date
10	SDA	I/O	Clock output foot transmitted by the date
11	/RST	I	Chip reset pin
12	VCC	I	positive power supply output
13	BLC	O	Close to the backlight control foot
14	BUZZ	O	Buzzer control pin
15	SW7	I	Capacitive sensor (sensitive keyn) interface 7
16	SW6	I	Capacitive sensor (sensitive key) interface 6

2. The touch-sensitive key

2.1 WTC6508BSI Technical features of the touch-sensitive key

Through 8 independent of the capacitance sensor input channel, WTC6508BSI detects capacitance change on the touch-key sense element, and through a series of efficient algorithms, identifies the effective touch of the finger. The user can read the key data through the standard 2 line IIC interface

The use of special waterproof design: The keyboard not only can splash-proof and splash-proof, but also can be commonly used after completely flooded. It is different from the general induction key panel that when splashing water, flood water, it easily false action, and is lags in response after waterlogging. Or after the finger is pressed, the undesired key value is false action.

Excellent anti-electromagnetic interference: When it is used in the home appliances and general application products. The user can obtain good radio-frequency signal interference ability by using single-sided PCB board, and can easily withstand the interference of most RF interferer sources, including GSM mobile phones.

Unique line length correction function: similar products currently on the market, there is a large difference phenomenon due to the sensitivity of the sensor is different from the length of the wire to the IC pin. Our original wire length self-correction technique can automatically correct this difference. The user does not need the complicated adjustment to obtain the almost universal sensitivity of each key of the entire panel

2.2 Working circuit diagram of WTC6508BSI

The peripheral circuit of WTC6508BSI is simple and requires only a small amount of resistance.

Figure 2 has WTC6508BSI application circuit diagram with the recommended serial interface circuit.

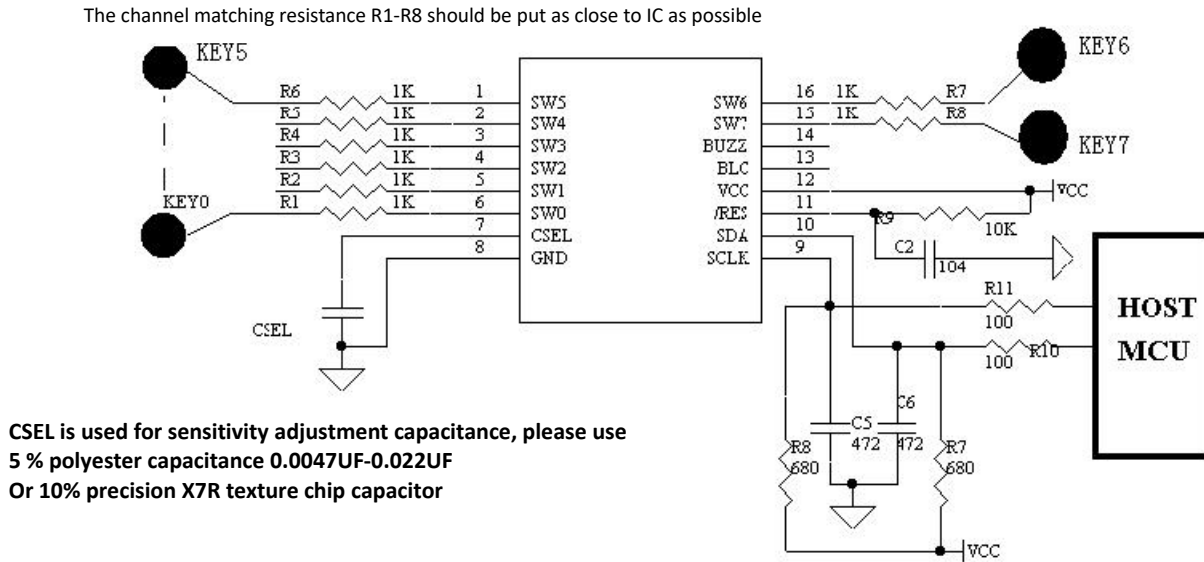


Figure 3: Working circuit diagram of WTC6508BSI

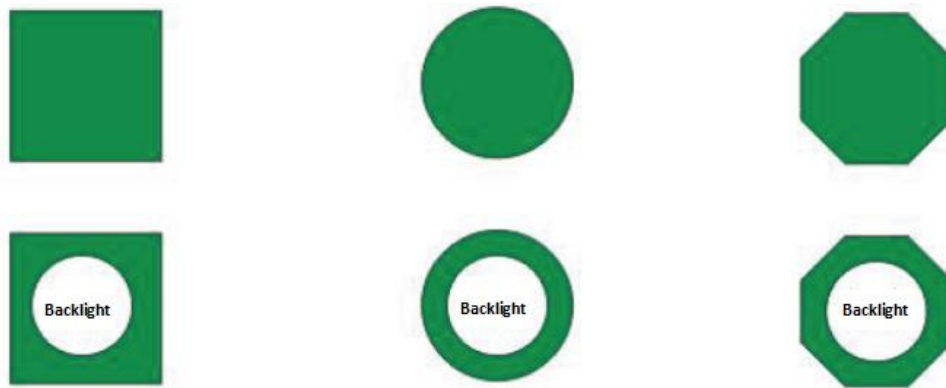
2.3. The capacitive sensor (key induction: disk)

2.3.1 The material, shape and area of the capacitive sensor (key induction: disk)

There are certain conductive objects of the plane surface, such as metal foil, sheet metal, conductive ink, metal cotton, conductive rubber and the ITO coating on the conductive glass, etc., which can be used as a key sense element, and the Metal spring (FIG. 3) or the copper foil on PCB (FLG. 4) key sense element commonly used in household appliances can be round, oval, polygons, or any geometric figure with certain area. in general situation, the area of each sense element should remain the same as far as possible, to ensure the same sensitivity. Increasing the area of the sense element can increase the capacity of capacitance induction and increase the sensitivity



Figure 3: capacitance sensor for metal spring (key sense element)



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

Figure 4: PCB Copper Foil sense element

2.3.2. The clearance of adjacent capacitance sensor (keypad induction disc)

WTC6508BSI is used for 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 1mm)

2.3.3 Capacitance sensor (key sense element) to the pin connection of WTC6508BSI

The connection between the capacitance sensor and the pins of WTC6508BSI should be short and thin as far as possible (0.~0.3 mm). It is best that WTC6508BSI 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.

2.3.4. WTC6508BSI of Vacant Sensor Channel



WTC6508BSI requires that at least three touch keys 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 is simply suspend in midair. Do not add any pulling-up or dropping-down resistance and capacitance.

2.3.5. The material and thickness of the panel

The panel must be made of insulating materials such as glass, plastic, acrylic, etc. The different panel materials with different dielectric constants, in the general situation, for the panel of the same thickness made of different materials, the greater dielectric constant, the higher sensitivity of the touch- induction, and the smaller the dielectric constant, the lower the sensitivity.

The following is the dielectric constant of several common panels, common glass (or toughened glass): 7, acrylic (plexiglass); 3.5.

Air: 1.

This is why the air gap must be removed when the touch panel is installed.

For the same kind of material panel, the thicker the panel is, the lower the sensitivity of the key is. The thinner the panel is, the higher the sensitivity is.

2.3.6 The installation of the touch key board

The gap of the capacitance sensor (key sense element) and the back of panel, must be eliminated with strong joint clearance, if the junction of the back of panel and key has concave and convex, the insulation colloidal fillings, such as insulating silicone can be used for it to fill and level up the contact surface, to ensure that the junction surface between the panel and key sense element is no air gap between.

2.3.7 The setting of the sensitivity and setting capacitance CSEL of the sensitivity

After the touch induction key plate is designed well, and the material and thickness of the panel is selected, and the installation way is determined, one adjusting one capacitance Csel value, it can change all channel sensitivity to adapt the different thickness of the panel, to reach the optimum touch-sensitive effect. Through choosing appropriate Csel capacitance values, it can make the WTC6508BSI to adapt to the different thickness of 0 to 2 mm insulation panels. 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

CSEL is the benchmark of sensitivity. The material and precision of CSEL are very important for the working stability. Please always remember to use the capacitance of poor stability and excessive temperature. The CSEL of WTC6508BSI requires the use of the accuracy of 5% or above of the precision of the polyester capacitance, NPO material or 10% and above precision X7R material. Increasing the area of the sense element can improve the penetrating power of capacitance induction and improve the sensitivity.



2.3.8. The software assistant of the touch induction sensitivity

When it is applied to the situation which has the strict requirements for the sensitivity, if the most satisfactory CSEL cannot be founded to implement the required sensitivity, after fixing the CSEL value, the software can be used through serial interface to make the auxiliary adjustment to the sensitivity of touch key, to achieve the best touch-sensitive sensitivity. For the method of using software to assist in adjusting the sensitivity of touch keys, please read the relevant content of chapter 4.

The assistant software of touch key induction sensitivity has 32 sensitivity series. The corresponding series data is 0 ~31, which is written by the master control grounding serial interface and the sensitivity series buffer of WTC6508BSI. The higher the series is, the higher the sensitivity of the touch key is. However, the high-determined series data will be invalid if it exceeds 31. The previous sensitivity parameter will still be used.

After WTC6508BSI is electrified for the first time, the interior of the sensitivity level will automatically set to 29. In the most situations, the user does not have to use the software sensitivity to make the assisted adjustment, and only needs to adjust the size of the CSEL that can get satisfactory sensitivity.

2.3.9 Matched resistance of the channel

1K resistance concatenated by each capacitance sensor channel can make WTC6508BSI work in the best of the most stable state of capacitance measurement. When it is the PCB layout, the CSEL must make CSEL and the matching resistor close to the IC as close as possible. Generally it does not need to adjust the matching resistance value. In some special cases, it can adjust the matched resistance value on one measurement channel, to change the channel touch-sensitive sensitivity, to increase matching resistance, and can reduce the sensitivity, to reduce the matching resistance, may be increased sensitivity. Special attention: through adjusting the capacitance of CSEL, the optimum sensitivity of touch sensitivity can be obtained. Therefore, it is not necessary to adjust the sensitivity by changing the matching resistance value

2.3.10 Exempt from debugging for the volume production

The system is not calibrated after the value of sensitivity capacitance Csel is determined in the research and development and experimental phase. The system can automatically control the interference caused by electrostatic discharge, electromagnetic interference, temperature change, moisture and pollutants on the surface, provides the good accuracy and operational consistency in various environments. Products can be transported in long distances and can be used in a variety of environments. The unique compensation algorithm and high-strength anti-jamming design can guarantee that the product will not be misused in the long term. The production is exempt from debugging, with extremely high production efficiency.

3. Buzzer And Backlight Control Signal

3.1 Backlight Control Signal

The BLC leg of WTC6508BSI's can be used as the backlight control signal output of the touchpad. When the finger is close to any sensor disc, the BLC outputs the electrical level. After the finger has left the touchpad or 9 seconds, BLC recovers low electrical level. BLC output level can normally provide 4mA source current drive. If the required electric current of LED backlight is more than 4mA, the drive circuit needed to be added to prevent the IC from damage.

3.2 Buzzer Control

When it is detected that the effective touch on the sense element occurred in BUZZ foot of WTC6508BSI in 80ms outputs the low level signal of 50ms, the customer can use this signal to achieve the key awakening function, and can also connect a triode to push a DC buzzer to realize touch-key voice instructions.

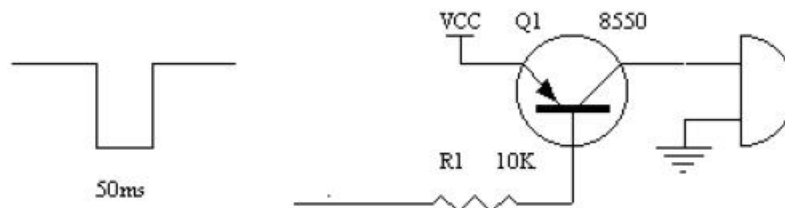


Figure 5

BUZZ is an indication pulse that is output after the touch key is touched, but it does not indicate the touch time of the key. The key value of the touch key will be kept on the finger all the time until the finger is left, and can be continually read and judged in the program.

4. Input and output interface

4.1 Brief introduction of two-wire serial interface

WTC6508BSI uses a two-wire serial interface to communicate with the master control MCU. The master control MCU can pass the SCLK and SDA. Read the switch information of the touch key and set the sensitivity of the touch key which can pass the serial interface. SCLK is the clock signal of serial interface, and SDA is the data signal of serial interface.

The speed of SCLK

Due to the touch chip processing serial data requires a certain delay time, and in order to have the occasional noise pulse on the bus, WTC6508BSI can have automatic bus reset capability. It is recommended that the SCLK square wave generated by MCU will be 20KHZ~2KHz and operate at least once every 15ms. This allows for accurate and stable reading the serial bus of writing the touch chip

It is recommended that the serial interface of MCU and WTC6508BSI should use the following circuit, as shown in figure 6, to minimize the noise on the serial interface, especially if the signal line is longer.

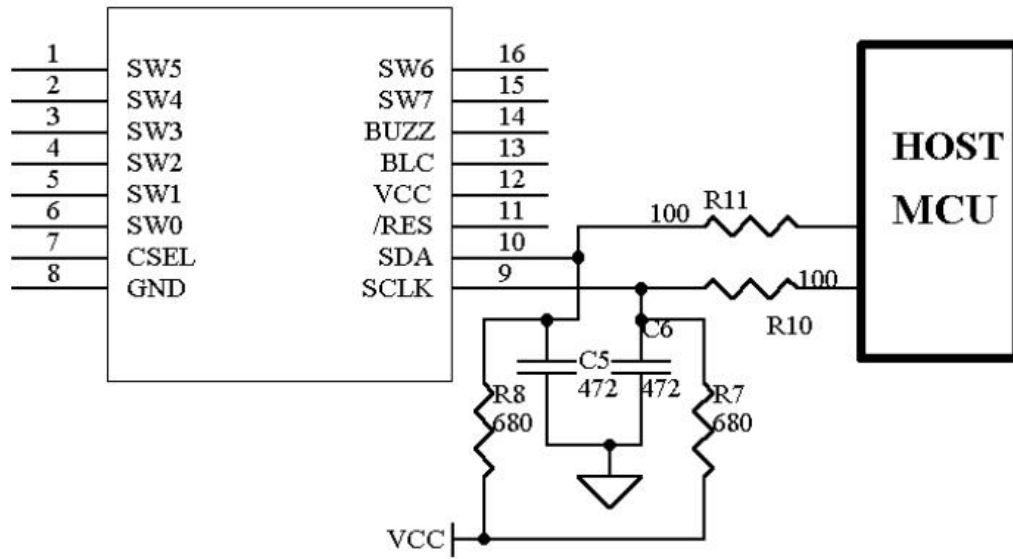


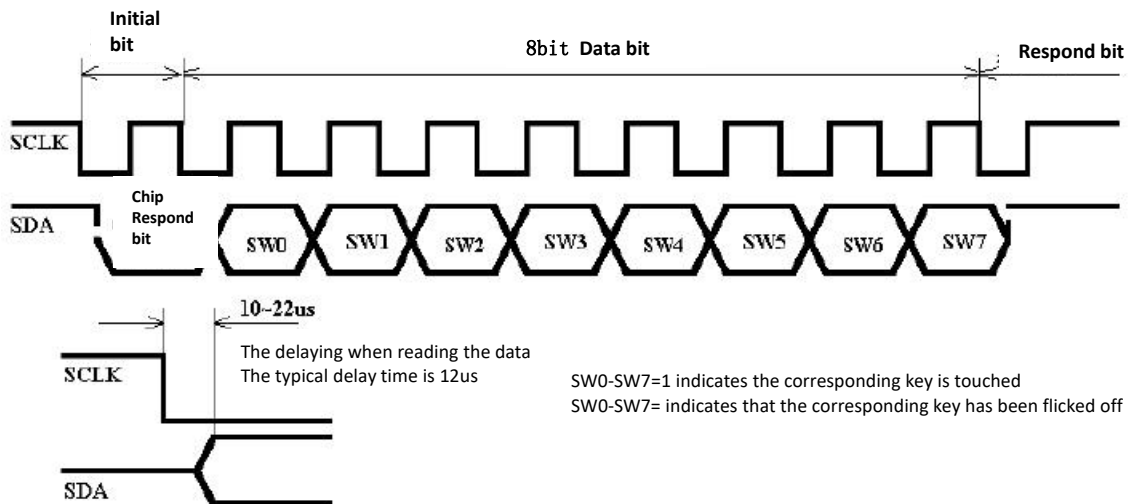
Figure 6: Serial interface circuit of MCU and WTC6508BSI

R7, R8 is the upper pulling resistance of the serial bus, because the SCLK and SDA of the touch chip are normally high impedance input states, the external needs adding the pulling resistance.

R9, R10 and C5, C6 are made up two RC filters that is used for filtering the "burr" noises on SCLK and SDA. The SCLK foot of the touch chip always keeps the high resistance input state. When the SDA foot of the touch chip read the t output state in the master control MCU, the input state of the high resistance is maintained at all any other times.

4.2 Read the touch key information

Figure 7 is the output sequence diagram of the touch chip when the master control MCU reads the key information



The master control MCU reads the key information

For completing a whole reading key information operation, the master control MCU needs to generate 10 low level pulses on SCLK, which can be divided into 1 starting position, 8 touching key data bits and 1 end bit.

1:Generate the start bit

The SDA foot of the touch chip usually is the high impedance input status. When the master MCU SDA will also be set for the input state, the external pull-up resistor pulls the SDA to be high level. The master control MCU sets SCLK to be low level, and delays at 10~22us after the post-touch chip sets the SDA foot as the output state and outputs low level as a response signal of the start transmitting key information. The master control MCU sets the SCLK high to complete the starting position setting

2: Read 8 bit touch key information bit

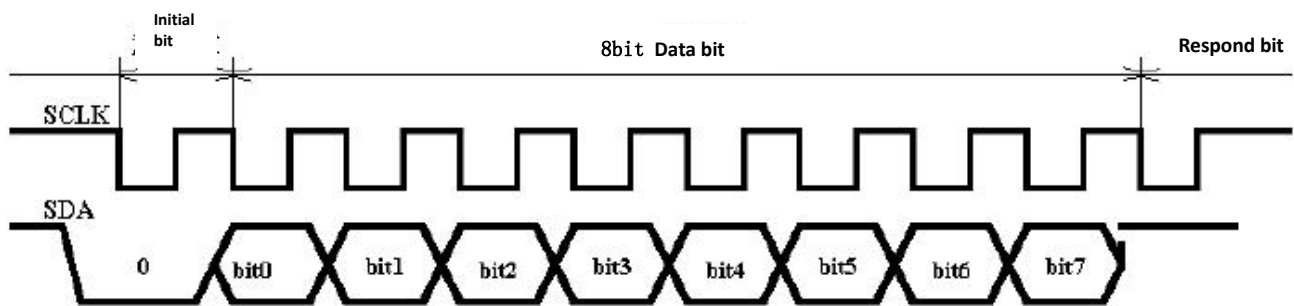
The master control MCU once again sets the SCLK to a low level. After the delay of 10 ~ 22us, the touch chip will put the state of the connected activated key on SW0 to SDA. If the sensor key is not touched or has flicked the SDA as "0", the sensing key is touched the SDA as the "1" master control MCU and after reading the SDA state, it sets the SCLK high

And so on, 8 square waves generated by the master control MCU on SCLK reads the touch key information of 8bit

3: Generate one end bit

After the MCU reads 8bit of the touch key information, a pulse will be generated to generate one end bit. After the touch chip receives the end, the SDA leg will be restored to high impedance input state. The master control MCU completes a read operation.

4.3 The sensitivity of setting the touch key



Bit - bit7 is the sensitivity data to be set to 0 ~ 7 bits
 Subtle must be less than or equal to 1FH

Figure8: the master control MCU sets the sensitivity operation of touch key

For completing a touch key sensing sensitivity operation by using software once, the master control MCU needs to generate 10 low level pulse on the SCLK, which is divided into one start bit, 8 data bits of sensitivity, and one end bit .



1: Start bit

SDA feet touch chips for the high impedance input status at ordinary times, when the master MCU SDA set to low level first, and then the SCLK as low level, at 10 to 22 us delay after touching chips are to receive the data read readiness. The master control MCU sets the SCLK high to complete the starting position setting

2:A temporary storage area of the sensitivity series that is to be set

Master MCU will first need to set the sensitivity of 1 of the series on the SDA, then SCLK set to low electric flat, after 10 to 22 us delay will touch the chip reads the data on the SDA staging area first.

Master control MCU sets SCLK high

By analogy, the master MCU puts the next seven bits of data on SDA and then produces seven low-level pulses on SCLK to complete the operation of the data into the staging area.

3:Generate one end bit

After completing the above transmission, the master control MCU sets the SDA as the input state, and at the same time, generates a low level pulse on SCLK to complete the setting of the end bit.

The double buffer structure is used for the WTC6508BSI serial input circuit. During the master control MCU is written into 8bit, the data input by the circuit serial is f loaded into the separate string staging area, the sensitivity of the touch chip will not change. Only when the master MCU generates an end bit on SCLK will reset the touch chip and use this set of sensitivity series to reset the internal parameters.

4.4 Matters needing attention the sensitivity of the touch key induction set by the software

After the master control MCU will reset the sensitivity every time, the touch chip will reset, which needs the time of 50ms. In the 50ms time when the touch chip is reset, regardless of whether it is reading or writing, it will get the correct result. Therefore, after the master control MCU completes the setting sensitivity, it must wait for the time of more than 50ms to read and write to the serial interface of WTC6508BSI.

It is recommended that MCU should not frequently set the sensitivity of touch chip in the program. Just set it once when the program is initialized.

The sensitivity of touch key is divided into 32 series and the corresponding series data is 1 ~ 32. The higher the series is, the higher the sensitivity of the touch key is. But if the set series data is more than 32 or is 0, this setting will be Invalid. After the invalid set is end to transmit, the touch chip will not reset, also won't to adjust internal parameters, can still be used, the previous sensitivity parameters.

After the touch chip is electrified for the first time, the interior of the sensitivity is automatically set to 29 series, and the user can be no using the software to adjust the sensitivity, and use the chip default parameters directly.

For a detailed DEMO, please refer to the content of chapter 7 and refer to the C language DEMO program source code provided by us

5 Composite key design

5.1 Multi-key combination (SHIFT) working mode of the standard WTC6508BSI

When using WTC6508BSI, if the user presses multiple keys without release, the multiple keys can respond in turn. The system designer can design various key combination operation functions accordingly.

5.2 WTC6508BSI-M can react with any three keys at the same time

Any three keys of WTC6508BSI-M can be used to operate at the same time, and the data can be output synchronously. This feature enables the system designer able to meet the customer requirements of achieving combination key by touching the 2-3 key operation simultaneously.

6. WTC6508BSI Power Supply

6.1 DC Voltage Stabilizer

WTC6508BSI 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. Figure 9 is the interface circuit of WTC6508BSI and 8051. It is suggested that the voltage stabilizing circuit constituted by 78L05 as shown in the figure 4 should be adopted. The capacity of C2 will affect the discharge time after power failure. The large capacity requires a longer reset time. In the circle, it is the recommended values. The different applications can be flexibly adjusted. Figure 9 is the power supply voltage circuit

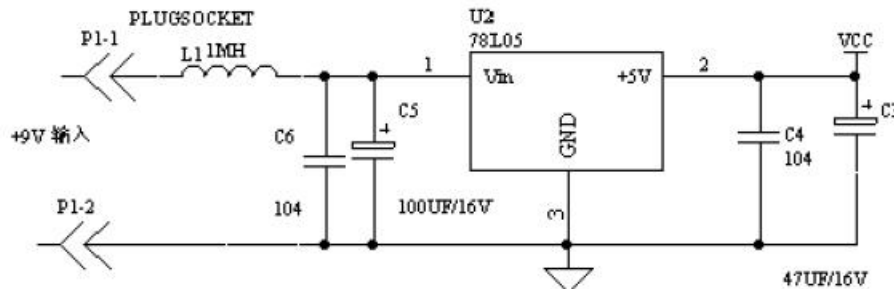


Figure 9: Voltage regulator circuit

6.2. Placement of Voltage Stabilizer Component

At PCB LAYOUT, such 78L05 power component must be close to WTC6508BSI Vcc pin.

78L05, peripheral components and WTC6508BSI must be placed on the same circuit board centrally, to put an end to the noises caused by overlong power connection line.

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)

6.3. 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.

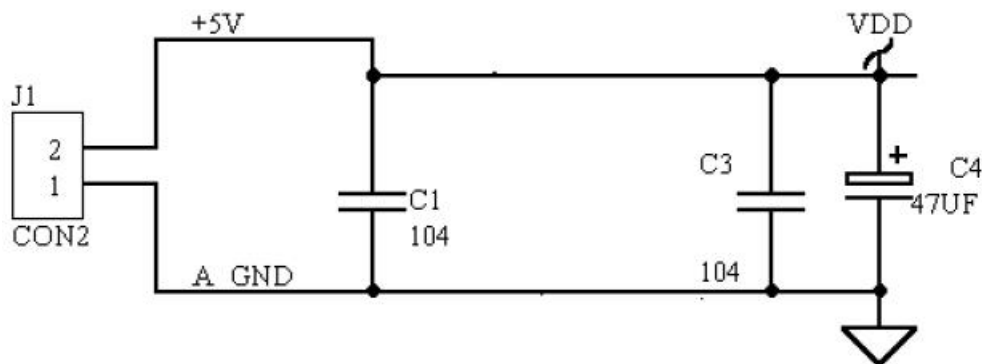
6.4. Power Filter

When typesetting in PCB, it is recommended to reserve the inductor L1 (1MH) welding disc, but the general and the non-special applications do not need this inductance. The users can also cancel it.

When inputting 78L05 power supply, it needs to pay attention to ripple size. Please don't make the trough of ripple wave lower than DC 9V.

6.5. 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. 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 10: Power Filter Circuit



Precautions:

The above circuit should connect the 104 capacitors and electrolytic capacitors of the filter circuit according to the order in the chart, and 104 capacitors should be in front of the electrolytic capacitance that can better suppresses the high frequency noise.

7. Ordering information

The WTC6508BSI has two types response modes, which can be distinguished from the model. The user should provide the complete model when ordering

Product model	Key response mode	Application notice
WTC6508BSI	SHIFT mode that is multi-key sequence response.	It can be used as the intensive keyboard
WTC6508BSI -M	Any three keys can simultaneously operate, respond and output at the same time.	It cannot be used as the intensive keyboard

8. Package Dimension Drawing of WTC6508BSI

Symbol	Dimensions in mm		
	Min.	Nom.	Min.
A	1.35	1.60	1.75
A1	0.10	—	0.25
A2	—	1.45	—
B	0.33	—	0.51
C	0.19	—	0.25
D	9.80	—	10.00
E	3.80	—	4.00
c	—	1.27	—
H	5.80	—	6.20
L	0.40	—	1.27
θ	0.00	—	8.00

**Typical operating procedures of the 8051 and WTC6508BSI interfaces**

```

/*
Project description:
    The supporting program DEMO board functions of the touch chip WTC6508BSI:
DEMO board function:
Detect the output information of the touch chip and light the corresponding LED completion display
MCU: AT89C51
Vibration frequency: 12MHz
Version information: V1.0
*/

```

```

#include    <reg51.h>
#include    <INTRINS.H>
#define    uchar unsigned char
#define    uint   unsigned int
#define    TIMER1_H    0xFC //1ms Starting value of the timer
#define    TIMER1_L    0x17

//-----Interface of the host and touch chip-----
Sbit  sda    =    P1^1; //Data cable
Sbit  sclk   =    P1^0; //Clock signal
Sbit  LED0   =    P0^1    //Touch the state LED lamp corresponding to the key, low power light
Sbit  LED0   =    P0^2
Sbit  LED0   =    P0^3
Sbit  LED0   =    P0^4
Sbit  LED0   =    P0^5
Sbit  LED0   =    P0^6
Sbit  LED0   =    P0^7

```

```

//-----the register define-----
void  init(void);          //89C51 Initialized program
void  delay_24us(void);    //Delay procedure (delay 24us)
uchar read_key_data(void); //Read the touch key information
void  set_subtle_SP(uchar subtle); //Use the software to set the touch sensitivity of the touch chip

void  disp_key_led(uchar KeyValue); //Use the LED to display the switch state of the corresponding touch key

//-----the register define-----
uchar  i,j;                //Intermediate variables used in the program
uint  Counter1ms;         //Timer1 interrupts once per 1ms to Counter1ms adding 1
uchar  KeyValue;          //Key information read from touch chip

```



```
//-----  
//Main program  
//-----  
void main(void)  
{  
init();  
Counter1ms = 0;  
do  
{  
} while(Counter1ms <= 100) //Wait for 100ms to ensure the touch chip is reset  
Set_subtle_SP(28); //The touch sensitivity of the touch chip is set as 28 series  
  
Counter1ms = 0;  
do  
{  
} while(Counter1ms <= 50); //Wait for 50ms to ensure the touch chip completes the reset  
while(1)  
{  
while(Counter1ms >= 15) //Read the key value every 15ms and complete the display  
{  
Counter1ms = 0; //Counter makes zero  
  
KeyValue = read_key_data(); //Read the key information of the touch key  
  
disp_key_led(KeyValue); //Display the corresponding LED  
}  
}  
}  
//-----  
//Function: read the touch key information from touch chip  
//Inlet: No  
//Return value: the touch key switch information that is read from the touch chip  
//-----  
uchar read_key_data(void)  
{  
uchar KeyValue;  
TR1 =0; i = 0;  
  
//-----Start bit setting-----
```



```
SDA = 1;      //The SDA is set to the input state, and the upper pulling resistor sets the SDA up to 1, which
              //indicates that the key information of the touch key is read from the touch chip
SCLK = 0;     //Generate downward delay signal of the serial clock
delay_24us();
if(SDA == 1)  //After transmitting the start bit, detect whether the touch chip has transmitted the
confirmation signal
{
    //The touch chip does not set SDA to "0", which indicates that the touch chip is not ready to transmit
    SCLK = 1;          //SCLK resets to high level
    return(0);        //The function returns 0 directly, which indicate that no valid key value is read
}
SCLK = 1;     //Generate the upward delay signal of the serial clock
delay_24us();
//-----Read the switch information of touch key (8 bit)-----
do
{
    KeyValue >>= 1;
    SCLK = 0;    //Generate the downward signal of the serial clock
    delay_24us();
    if(SDA == 1) //Read the data on the SDA
    {
        KeyValue |= 0x80;
    }
    else
    {
        KeyValue &= 0x7F;
    }
    SCLK = 1;    //Generate the upward delay signal of the serial clock
    delay_24us();
    i++;
}
while(i < 8);  //Read the 8 bit data
//-----//Transmit the end bit (bus recovery)
SCLK = 0;     //Generate the downward delay signal of the serial clock
delay_24us();
SCLK = 1;     //Generate the upward delay signal of the serial clock
delay_24us();
TR1 = 1;
return(KeyValue); // Return to read the touch key information
}
/*-----
//Function: set touch sensitivity of touch chip
```



```

//Inlet, subtle: the touch sensitivity series (1 ~ 32) prepared to set
//The higher the subtle value in 1~32, the higher the sensitivity
//If this time setting of subtle > 32 is not valid, the touch chip remains sensitive
// return value: no
*/-----
void set_subtle_SP(uchar subtle) //Use the software to set the touch sensitivity of the touch chip
{
TR1 = 0;
//-----//Transmit the start bit of the writing data of DA bus -----
SDA = 0; //Initial position 0 indicates that the sensitivity data is written to the touch chip
SCLK = 0; //Generate the downward delay signal of the serial clock
delay_24us();
SCLK = 1; //Generate the upward delay signal of the serial clock
delay_24us();
//-----Write the sensitivity data needed to be set to the touch chip-----
i = 0;
do
{
if((subtle & 0x01) == 0) {SDA = 0;} //The data prepared to write in
else {SDA = 1;}
SCLK = 0; //Generate the downward delay signal of the serial clock
delay_24us();
SCLK = 1; //Generate the upward delay signal of the serial clock
delay_24us();
subtle >>= 1;
i++;
}
while(i < 8); //Write in 8-bit data
//-----Generate the end bit, and the touch chip resets the parameters and resets by using the new sensitivity series-----
SDA = 1; //et SDA as the input state
SCLK = 0; //generate the downward delay signal of the serial clock
delay_24us();
SCLK = 1; //delay_24us(); TR1 = 1; generate the upward delay signal of the serial clock
}

/*-----
//Function: When the finger touches the key, it lightens the lit by touching the indicator LED at the top of the
key. After the finger removes from the touching the key to put out the indicator LED at the top of the
corresponding key
// entry: read the key information from touch chip
// return value: none
-----*/

```



```
void disp_key_led(uchar KeyValue)
{
if((KeyValue & 0x01) != 0) {LED0 = 0;} //EY0 is pressed the next point
//Brighten the relevant LED
else { LED0 = 1;} //KEY0 Flicked, extinguished
if((KeyValue & 0x02) != 0){LED1 = 0;} //KEY1 Pressed
else {LED1 = 1;} //KEY1 Flicked

if((KeyValue & 0x04) != 0){LED2 = 0;} //KEY2 Pressed
else {LED2 = 1;} //KEY2 Flicked

if((KeyValue & 0x08) != 0){LED3 = 0;} //KEY3 Pressed
else {LED3 = 1;} //KEY3 Flicked

if((KeyValue & 0x10) != 0){LED4 = 0;} //KEY4 Pressed
else {LED4 = 1;} //KEY4 Flicked

if((KeyValue & 0x20) != 0){LED5 = 0;} //KEY5 Pressed
else {LED5 = 1;} //KEY5 Flicked

if((KeyValue & 0x40) != 0){LED6 = 0;} //KEY6 Pressed
else {LED6 = 1;} //KEY6 Flicked

if((KeyValue & 0x80) != 0){LED7 = 0;} //KEY7 Pressed
else {LED7 = 1;} //KEY7 Flicked

}
//-----
void init(void)
{
EA = 1; //open the gloabe interrupt enable
EX0 = 0; //disable expend 0 interrupt
EX1 = 1; //enable expend 1 interrupt for rem
ET0 = 1;
ET1 = 1;
ES = 0;
//IT0 = 0; //level tigger
//IT1 = 0; //level tigger
IT0 = 1; //edge tigger
IT1 = 1; //edge tigger
//TMOD &= 0xF0;
//TMOD = 0x11; //timer0, timer1 work as 16 bit timer
```

