



**WTC1008BSI 8-Channel Capacitive-Sensing Touch Button Chip
Fast Browsing (V1.5)**

Number of keys	3-8 keys
Technical principle	Capacitive to digital conversion technology
Key response mode	The standard WTC1008BSI is the SHIFT mode, and the multi-key sequence respond. Any three keys of WTC1008BSI-M can simultaneously operate, respond and output at the same time
Dimension of key sense element	Minimum 3mm ×3mm, maximum 30mm ×30mm, to be determined according to actual demand and panel thickness
Clearance of the induction disk of the adjacent key	The minimum clearance of adjacent keys of the standard WTC1008BSI is 0.5 mm, which can be determined according to the actual needs. It can be used as the intensive keyboard. WTC1008BSI-M requires sufficient clearance and should not 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	Input/output one-to-one, the initial is high impedance, and output the low level when effectively touching.
Storage temperature range	—50°C—+125C
Chip sealing mode	SSOP24(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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WTC1008BSI 8-Channel Capacitive-Sensing Touch Button Chip

Specification (V1.5)

1. Product Introduction

1.1. Product Overview

WTC1008BSI series touch sensing IC is an integrated circuit designed to achieve human touch interface. It can replace the mechanical light touch key to realize waterproof and dustproof, seal isolation, with strong and artistic operation interface. A WTC1008BSI can achieve 3 to 8 independent keys. The user can use it flexibly according to the needs. It especially can be used to replace the display, TV set and other mechanical keys of wide applications of A/D key input mode.

1.2. Technical Principle

WTC1008BSI 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. Outwards directly output the indicating key action of the high impedance/low level or low/high level.

1.3. High production efficiency.

It is only needed to adjust one capacitor Csel that can change the sensitivity of all channels, with less peripheral component, and high production efficiency.

1.4. Adapt to different thickness panels

Through selecting the appropriate Csel capacitance value, appropriately adjusting the sensing area can make WTC1008BSI to adapt the insulation panel of the different thickness of 0-20mm.

1.5. Chip Package Type

WTC1008BSI is packaged with standard SSOP24(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 0.5mm)

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.

3. 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 100ms
- Operating temperature: -40°C—+85°C
- Storage temperature: -50°C—+125°C

4. 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. It especially applies to the displayer, TV and other electronic devices that use A/D key input

5. Definitions of Product Pins

5.1.Pin Configuration

WTC1008BSI pin configuration diagram is shown in the figure below :

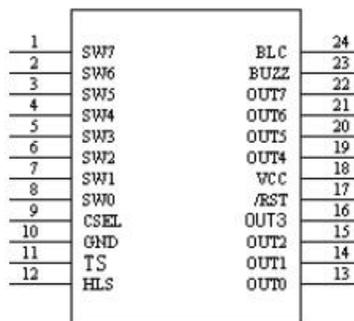


Figure 1: Pin Diagram Of WTC1008BSI

5.2 Definitions of Pins



The definitions of WTC1008BSI pins are as shown in the table below:

Pin No.	Pin Name	Usage	Function Description
1	SW7	I	Interface of touch key 7 (sense element 7)
2	SW6	I	Interface of touch key 6 (sense element 6)
3	SW5	I	Interface of touch key 5 (sense element 5)
4	SW4	I	Interface of touch key 4 (sense element 4)
5	SW3	I	Interface of touch key 3 (sense element 3)
6	SW2	I	Interface of touch key 2 (sense element 2)
7	SW1	I	Interface of touch key 1 (sense element 1)
8	SW0		Interface of touch key 0 (sense element 0)
9	CSEL	I	Capacitor interface for adjusting the sensitivity
10	GND	I	Power ground
11	TS	I	Internal test foot, usually fixed with VCC
12	HLS	I	The selection of the initial electrical level on the state output: the initial state of connecting VCC output is high impedance, and the initial of connecting GND output is low
13	OUT0	O	SW0 status output
14	OUT1	O	SW1 status output
15	OUT2	O	SW2 status output
16	OUT3	O	SW3 status output
17	/RST	I	IC reset pin
18	VCC	I	Power input
19	OUT4	O	SW4 status output
20	OUT5	O	SW5 status output
21	OUT6	O	SW6 status output
22	OUT7	O	SW7 status output
23	BUZZ	O	Buzzer control pin
24	BLC	O	Backlight LED control pin

6. Output Display

When the effective touch occurred on the sensor disc is detected, the WTC1008BSI outputs the state of the sensing disk channel being touched in 100ms, so that the user MCU can process it or directly drive to perform the circuit work. WTC1008BSI has two types of output. Select by HLS food of 1C connecting GND of VCC.

6.1. The output indication when HLS is connecting VCC.

When HLS is connecting VCC, the initial output state of the output signal is high impedance, and the output signal of the corresponding touch channel becomes low level when the touch occurs. The remaining output signals of the untouchable channel remain high. The output signal of the touch channel is restored as high impedance when the finger leaves. When the output signal becomes low electrical level, the current drive capacity of 10mA can be provided.

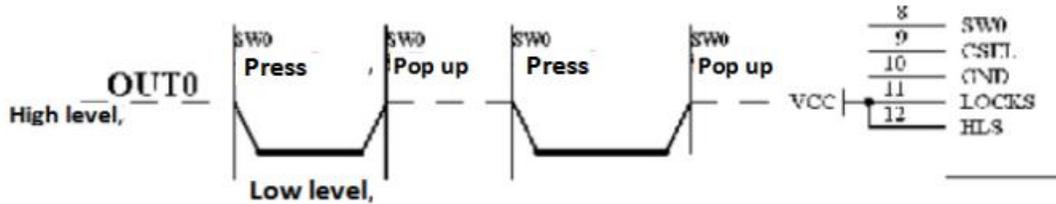


Figure 2: The sequence diagram when HLS is connecting VCC

6.2. The output indication when HLS is connecting GND

When HLS is connecting GND, the initial level of output signal is low level, and the output signal of corresponding touch channel becomes high level when the touch occurs.

The remaining untouchable output signals remain low level. **Pop up**

The output signal of the touch channel is restored to a low level when the finger leaves.

When the output signal outputs low power, it can provide 10 mA's current driving capability.

When outputting the high level, it can provide the current driving capability of 5mA.

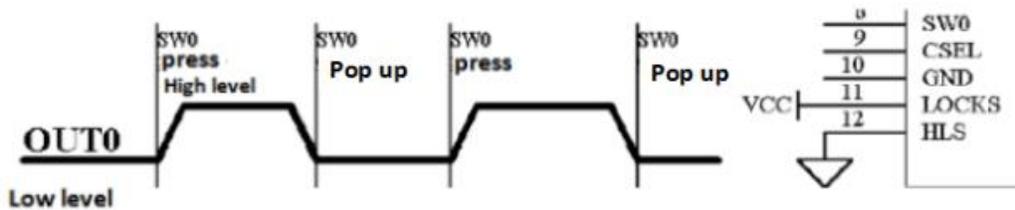


Figure 2: The sequence diagram when HLS is connecting GND

7. Composite key design

7.1. The multi-key combination (SHIFT) working mode of the standard WTC1008BSI

When using WTC1008BSI, if the user presses several keys one after another without release, then several keys can respond in turn. The system designer can design various key combination operation functions accordingly.

7.2. The WTC1008BSI-M can react with any three keys

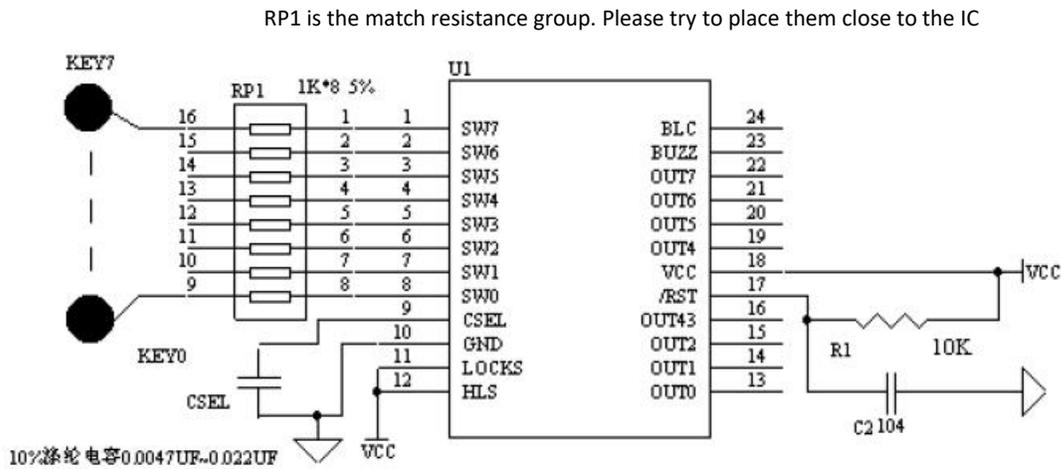
Using any three spaces of WTC1008BSI-M can simultaneously operate, respond and output at the same time. This feature enables the system designer to be about to use 2-3 keys to operate simultaneously to realize the combination key function.

8. Typical Application Circuit and Sensitivity Setting

8.1. Peripheral Circuit and Precautions

The peripheral circuit of WTC1008BSI is very simple, and only needs a few resistors and capacitors. The key component is capacitor CSEL for adjusting the sensitivity and 1K 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 is the application circuit diagram of WTC1008BSI working under the 8 key mode



10 % polyester capacitance 0.0047UF-0.022UF

Figure 4: WTC1008BSI Application Schematic Diagram

8.2. Sensitivity Setting

The sensitivity setting of WTC1008BSI enables the user to use isolated media of various thicknesses to implement reliable and flexible touch function.

The sensitivity setting of WTC1008BSI is achieved by selecting the appropriate capacitance 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 0.0047UF and 0.022UF from large to small. It is recommended 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.

8.3. Area of sense element

Increasing the area of the induction disc is beneficial to improve the penetration ability of touch sensing.

9. Backlight Control

The BLC leg of WTC1008BSI '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 5 seconds, BLC recovers low electrical level. BLC output level can normally provide 10mA source current drive. If the required electric current of LED backlight is more than 10mA, the drive circuit needed to be added to prevent the IC from damage.

10. Buzzer Control Signal

The BUZZ leg of WTC1008BSI can be used as the control signal output for the touchpad. After the finger is effectively touching key induction disk, BUZZ outputs 50MS low level pulse, which can be used as the control signal for the DC Buzzer, which generates the prompt tone under the key.

11. WTC1008BSI Power Supply

WTC1008BSI 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 4 should be adopted.

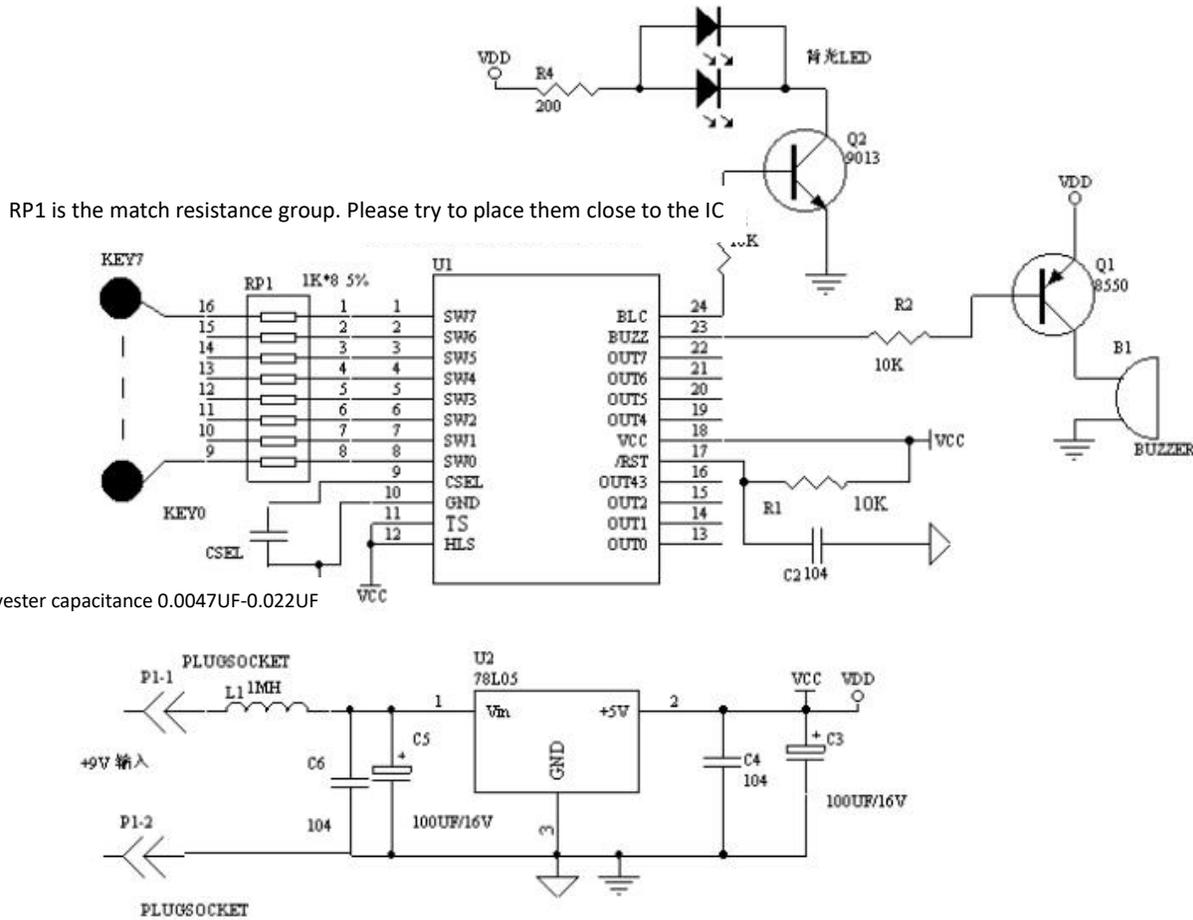


Figure 5: Full functional circuit of the power supply voltage circuit

11.1. DC Voltage Stabilizer

At PCB LAYOUT, such 78L05 power component must be close to WTC1008BSI Vcc pin.

11.2. Placement of Voltage Stabilizer Component

78L05, peripheral components and WTC1008BSI must be placed on the same circuit board centrally, to put an end to the noises caused by overlong power connection line.

11.3. 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)

11.4. 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.

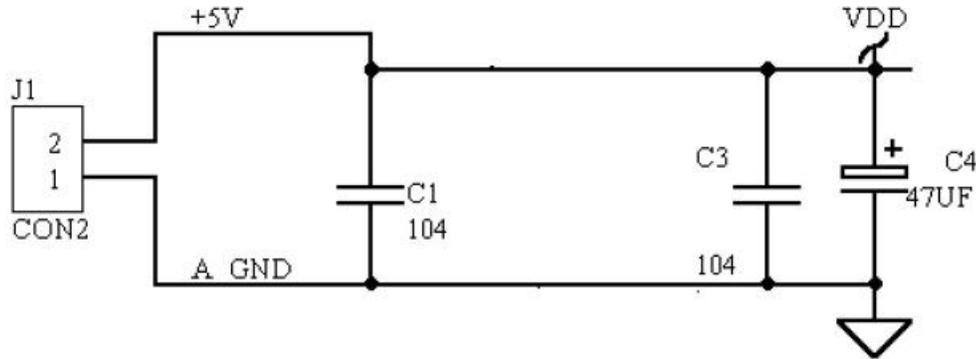
11.5. Power Filter

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.

11.6. 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 5. 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 6: Power Filter Circuit

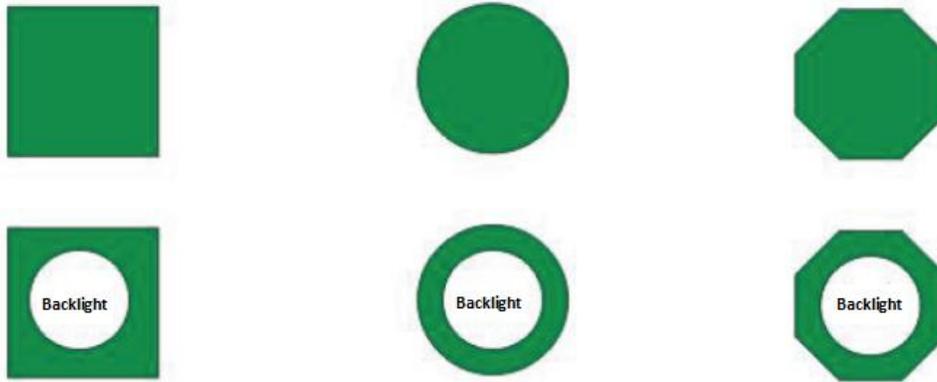
Precautions:

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.

12. WTC1008BSI used capacitive sensors

12.1. The material and shape of the capacitive sensors

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 12mm. The commonly used induction disks are copper foil, spring, thin film line and ITO glass, etc. on the PCB plate etc.



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

Figure 7: PCB Copper Foil sense element

12.2. The area of the sense element

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

12.3. Connection between Capacitive Sensor and Panel

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

12.4. The common elastic connection methods are:

The common elastic connection methods are:

Use the sense element with spring

Use cylindrical conductive rubber to conduct elastic connection

Paste the sense element onto the panel with imported super double-sided glue, and the double-sided glue layer cannot be too thick.

WTC1008BSI

WTC1008BSI-M



Figure 8: Spring sense element

12.5. 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.

12.6. The connection between the induction disc and the input pin of the induction disc of IC

The connection between the capacitance sensor and the pins of WTC1008BSI should be short and thin as far as possible (0.1~0.2mm wide). It is best that WTC1008BSI 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.

13. Processing of Vacant Sensor Channel

At least three touch keys must be used for WTC1008BSI, otherwise the chip won't work properly. When it is applied in the situation of less than 8 keys, SW7~SW0 will have empty and unused sensor input channels. The empty input channel must be suspended in midair, not to take any pulling up or pulling down resistance, capacitance and other components.

14. Ordering information

The WTC1008BSI has two types of key 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
WTC1008BSI	SHIFT mode that is multi-key sequence response.	It can be used as the intensive keyboard
WTC1008BSI-M	Any three keys can simultaneously operate, respond and output at the same time.	It cannot be used as the intensive keyboard

15. Package Dimension Drawing Of WTC1008BSI

Package Dimension Drawing Of WTC1008BSI

Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	228	—	244
B	150	—	157
C	8	—	12
C'	335	—	346
D	54	—	60
E	—	25	—
F	4	—	10
G	22	—	28
H	7	—	10
α	0°	—	8°

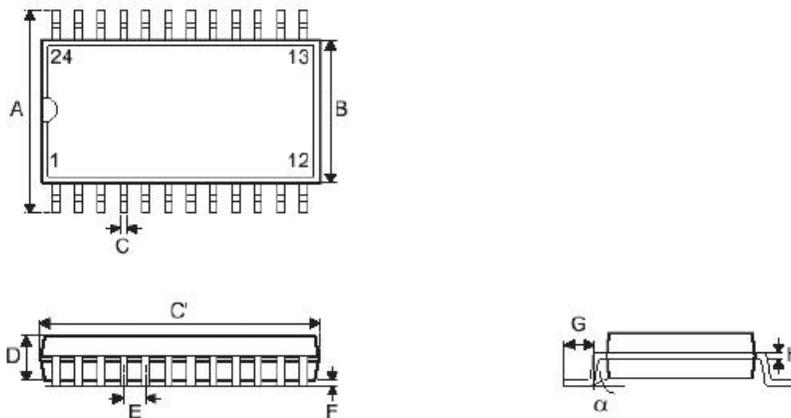


Figure 9: Package Dimension Drawing Of WTC1008BSI