

## Features

- Operating voltage:2.4-5.5V
- standby current:3uA/3.3V,7uA/5V
- Can be touched under isolation and protection of media (glass, acrylic, plastic, etc.)
- The **brightness** can be adjusted at **will**, wide selection range, simple and convenient operation
- **Three-stage dimming** and stepless dimming can be **selected**
- Simple application **circuit** , few peripheral components
- PWM signal frequency 20KHz
- **Sensitivity adjustment** using an external capacitor(1-47nF) on CS pin
- Add a **capacitor ( 0-50pF )** to a **touch** key pin can fine tune the sensitivity for single key
- Chip level ESD up to  $\pm 4KV$  , EFT up to  $\pm 4KV$ .
- Package  
SOP8(4.9mm x 3.9mm PP=1.27mm)  
DIP8(9.2mm x 6.4mm PP=2.54mm)

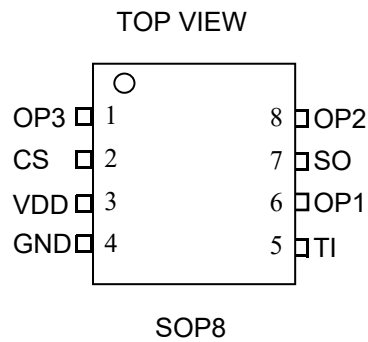
## 1 General Description

VK3601SS-1 is a single touch IC which integrates touch buttons, switches, LED dimming and brightness adjustment. The high level of device integration enable applications to be implemented with a minimum number of external components.

VK3601SS-1 has strong anti-interference ability. ESD is up to  $\pm 4\text{KV}$ , EFT is up to  $\pm 4\text{KV}$  or more. In the case of short-distance, multi-angle mobile phone interference, the sensitivity and reliability of touch response will not be affected.

## 2 Pinouts and pin description

### 2.1 VK3601SS-1 SOP8 Pin Assignment



## 2.2 VK3601SS-1 SOP8 Pin Description

Pin No.	Pin name	I/O	Function Description
1	OP3	IN	Option input pin
2	CS	IN	Capacitance detection,the larger the capacitance the higher the sensitivity(1-47nF)
3	VDD	VDD	Positive power supply
4	GND	GND	Negative power supply
5	TI	IN	Touch key input pin
6	OP1	IN	Option input pin
7	SO	OUT	Light control and touch key output pin
8	OP2	IN	Option input pin

### 3 Functional Description

#### 3.1 Output mode

The output pin of VK3601SS-1 is SO, and the output can be configured through 3 OPT pins. Control the switching and brightness changes of LED lights by modulating the duty cycle of the PWM output signal, PWM signal frequency is fixed at about 20KHz. There are 8 functions can be selected, it is determined by the input status of the three OPT pins before powered on.

The details are as follows :

OPT1	OPT2	OPT3	Output function
NC	NC	NC	LED touch stepless dimming without memory brightness and no brightness buffer
GND	NC	NC	LED touch stepless dimming with memory brightness, without brightness buffer
NC	GND	NC	LED 3-stage touch dimming, High-> Medium -> Low -> Off
GND	GND	NC	LED 3-stage touch dimming, Low-> Medium -> High -> Off
NC	NC	GND	Single touch button, output low level
NC	GND	GND	Single touch button, output high level
GND	NC	GND	Single touch switch, Power-on output high level
GND	GND	GND	Single touch switch, Power-on output low level

## 3.2 Functional Description

### 3.2.1 LED touch stepless dimming without memory brightness and no brightness buffer

Power on , SO pin outputs low level and LED off.

Short touch (touch duration is less than 550ms) to control the light on and off. One short touch , LED is on; short touch again, the light is off , follow this cycle. There is no brightness buffer when the light is on or off. And the duty of PWM signal is 90% when LED turn on.

Long touch ( touch duration is more than 550ms)can realize the stepless brightness adjustment of the light. After a long touch , the brightness of the light decreases gradually and stays at the current brightness when released , If the time is longer than 3S, the light brightness will not change after reaching the lowest ; Long touch again , the brightness of the light rises gradually and stays at the current brightness when released , If the time is longer than 3S, the light brightness will not change after reaching the highest. The duty cycle of the PWM signal is 100% when the brightness is the highest, and 2% when the brightness is the lowest. Long touch can also turn on the LED when LED is off , In this case, after the button is pressed, the light is first turned on with a 90% duty cycle brightness , If it is not released after more than 550ms, the stepless dimming starts downward.

Short touch and long touch can be used arbitrarily, without interference and restriction between each other.

### 3.2.2 LED touch stepless dimming with memory brightness , without brightness buffer

This function adds the brightness memory function on the basis of the LED touch stepless dimming function without brightness memory and no brightness buffer. That is, under the condition of constant power,the current brightness when the light is turned off by short touch each time will be memorized and saved , and the brightness will be used as the initial brightness when the light is turned on next time. If the brightness is greater than 50%, dimming is downward; if the brightness is less than 50%, dimming is upward.

After power on , the fixed brightness of the first light-on is fixed at 90% of the maximum brightness, and the direction of the first dimming is fixed to downward dimming.

### 3.2.3 LED 3-stage touch dimming , High-> Medium -> Low -> Off

After the initial power on,SO pin outputs low level, LED is off.

The first touch , the light is high brightness; the second touch, the light is mid-range brightness; the third touch, the light is low brightness; the fourth touch, the light is off.Press the key several times to cycle according to this.

The duty of the PWM signal corresponding to the high、 Medium and Low brightness levels are 100%,40% 10%.

### 3.2.4 LED 3-stage touch dimming , Low-> Medium -> High -> Off

After the initial power on,SO pin outputs low level, LED is off.

The first touch , the light is low brightness; the second touch, the light is mid-range brightness; the third touch, the light is high brightness; the fourth touch, the light is off.Press the key several times to cycle according to this.

The duty of the PWM signal corresponding to the high、 Medium and Low brightness levels are 100%,40% 10%.

### 3.2.5 Single touch button, output low level

After the initial power on, SO pin outputs high level.

After button is touched, SO pin output becomes low level; after the touch is released, the SO output returns to high level

### 3.2.6 Single touch button, output high level

After the initial power on, SO pin outputs low level.

After button is touched, SO pin output becomes high level; after the touch is released, the SO output returns to low level.

### 3.2.7 Single touch switch, Power-on output high level

After the initial power on, SO pin outputs low level.

Each time the button is touched, the SO output state is flipped once.

### 3.2.8 Single touch switch, Power-on output low level

After the initial power on, SO pin outputs high level.

Each time the button is touched, the SO output state is flipped once.

## 3.3 Sensitivity Adjustment

The touch PAD size and capacitance of connecting line on PCB can affect the sensitivity. The sensitivity adjustment must according to the practical application on PCB. The VK3601SS-1 offers some methods for adjusting the sensitivity outside:

#### I. Touch PAD Size

Under other conditions are fixed. Using a larger Touch PAD size can increase sensitivity. Otherwise it can decrease sensitivity. But the touch PAD size must use in the effective scope.

#### II. Panel Thickness

Under other conditions are fixed. Using a thinner panel can increase sensitivity. Otherwise it can decrease sensitivity. But the panel thickness must be below the maximum value.

#### III. Value of CS

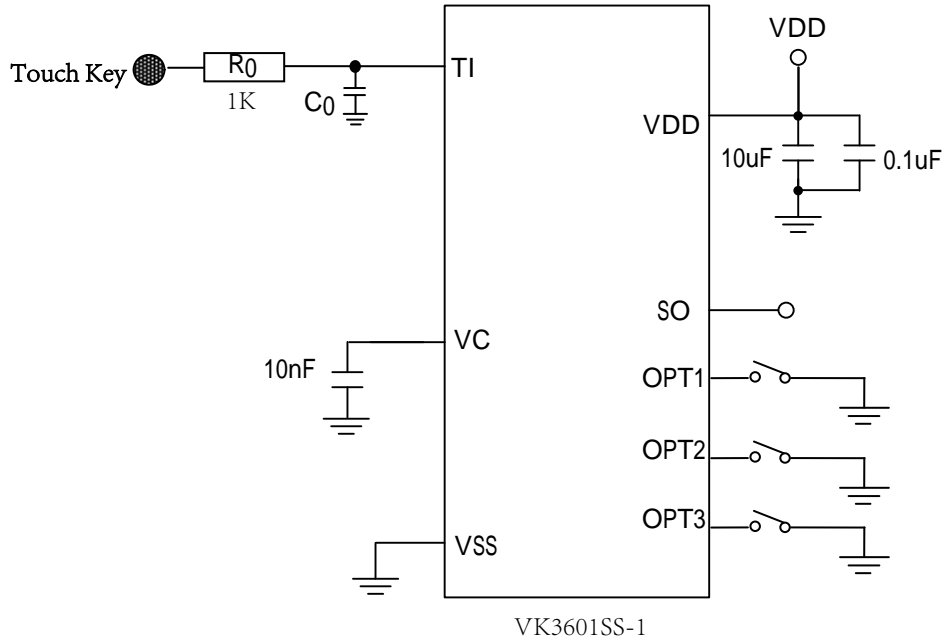
Under other conditions are fixed. CS pin to VSS capacitor Cs can adjust sensitivity, When adding the value of CS will increase sensitivity in the useful range (1nF-47nF).

#### IV. Capacitor to a touch key pin

Add a capacitor (0-50pF) to a touch key can fine tune the sensitivity for single key, When adding the value of capacitor will decrease sensitivity.

Panel Thickness (Acrylic or Glass)	CS value (only reference)
<3mm	10nF/25V
3-6mm	20nF/25V
6-10mm	47nF/25V

## 4 Application Circuits





## 5 Electrical characteristics

### 5.1 Absolute Maximum Ratings

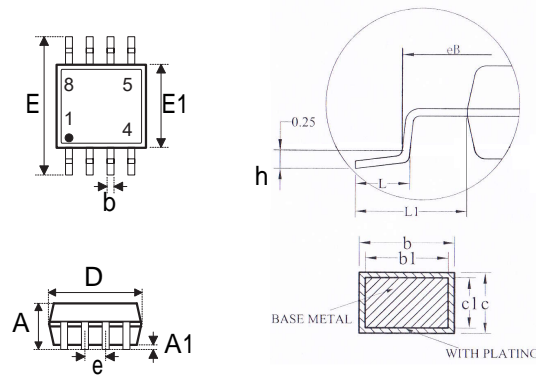
Item	Symbol	Ratings	Unit
Power voltage	VDD	-0.3 ~ 6.0	V
Input Voltage	VIN	VSS-0.3 ~ VDD+0.3	V
Storage Temperature	TSTG	-50 ~ +125	°C
Operating Temperature	TOTG	-40 ~ +85	°C
Human Body Mode	ESD	4	KV

### 5.2 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions (25 °C)	
						VDD	Conditions
Operating voltage	VDD	2.4	3.3	5.5	V	—	—
Operating current	I <sub>OP</sub>	—	630	—	μA	3V	CS=10nF
		—	1180	—		5.0V	
Standby current	I <sub>ST</sub>	—	3	—	μA	3V	CS=10nF
		—	7	—		5.0V	
Output Sink Current	I <sub>IL</sub>	—	6	—	mA	3V	V <sub>OL</sub> =0.5V
		—	11	—		5.0V	
Output Source Current	I <sub>OL</sub>	—	-3	—	mA	3V	V <sub>OH</sub> =2.5V
		—	-5	—		5.0V	V <sub>OH</sub> =4.5V
Input Low Voltage	V <sub>IL</sub>	—	—	0.2	VDD	VDD	Input Low Voltage
Input High Voltage	V <sub>IH</sub>	0.8	—	1	VDD	VDD	Input High Voltage
Output Response Time	T <sub>R</sub>	—	48	—	mS	3V	normal mode
		—	48	—		5.0V	normal mode
Output Response Time	T <sub>R</sub>	—	160	—	mS	3V	standby mode
		—	160	—		5.0V	standby mode
PWM frequency	F <sub>P</sub>	—	20	—	KHz	VDD	—

## 6 Package Information

### 6.1 SOP8(4.9mm x3.9mm PP=1.27m) :



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	1.35	1.45	1.55
A1	0.00	0.05	0.10
b	0.30	0.40	0.45
b1	0.28	0.38	0.42
c	0.18	0.20	0.22
c1	0.13	0.15	0.18
D	4.70	4.90	5.10
E	5.90	6.10	6.30
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.10	--	0.25
L	0.40	0.60	0.80
L1	1.05REF		

## 7 Revision history

No.	Version	Date	Modify the content	Check
1	1.0	2018-08-10	Original version	Yes
2	1.1	2020-02-11	Update content	Yes

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