

## Features

- Operating voltage: 2.4-5.5V
- standby current: 7uA/3.0V, 14uA/5V
- Power-On Reset (POR)
- Low Voltage Reset (LVR)
- Key Response Time :
  - Normal Mode 48mS
  - Standby Mode 160mS
- Provide active High or active Low by AHLB pin option
- Provide Direct mode or Toggle mode by TOG pin option
- Provide CMOS output or Open Drain output by SOD pin option
- Provide Multi-key or Single-key effective output mode by SM pin option
- Provide the maximum key on duration time Infinite or 16S by MOT pin option
- Auto-calibration Function
- 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
- After power-on have about 0.25S stable-time, during the time do not touch the key .
- Package:
  - VK3604A-SOP16(150mil)(9.9mm x 3.9mm PP=1.27mm)
  - VK3604B-SSOP16(150mil)(4.9mm x 3.9mm PP=0.635mm)

# 1 General Description

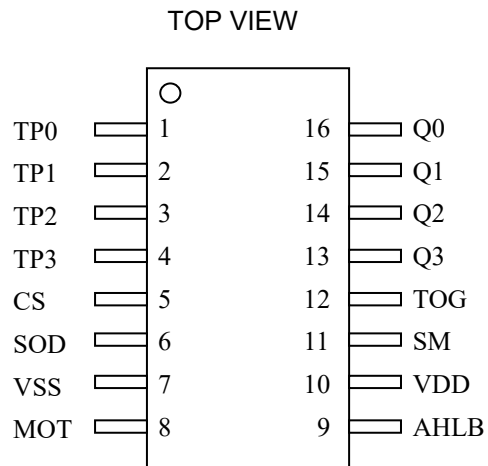
VK3604 is a touch pad detector IC which offers 4 touch keys, It can detect human body contact using external touch pads. The high level of device integration enable applications to be implemented with a minimum number of external components.

It provides Direct mode or Toggle mode、 CMOS output or Open Drain output、 active High or active Low by TOG/SOD/AHLB pin option . Provide Multi-key or Single-key effective output mode by SM pin option. Provide the maximum key on duration time Infinite or 16S by MOT pin option. Special internal circuitry is also employed to ensure excellent power noise rejection to reduce the possibility of false detections, increasing the touch switch application reliability under adverse environmental conditions.

With auto-calibration, low standby current, excellent resistance to voltage fluctuation and other features, this range of touch key devices provide a simple and effective means of implementing 4 touch key + IO operation in a wide variety of applications.

## 2 Pinouts and pin description

### 2.1 VK3604SOP16/TSSOP16 Pin Assignment



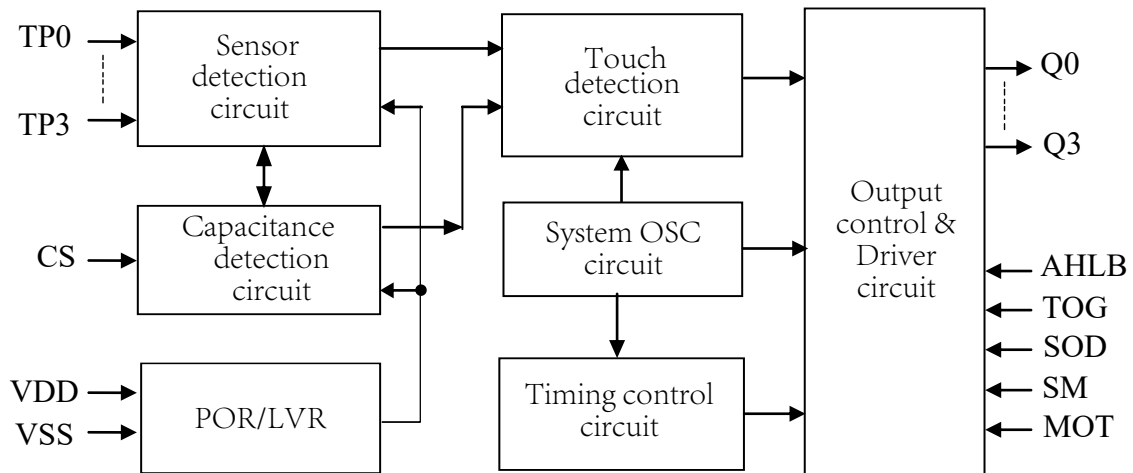
VK3604A-SOP16  
VK3604B-TSSOP16

## 2.2 VK3604SOP16/TSSOP16 Pin Description

Pin No.	Pin name	I/O	Function Description
1	TP0	IN	Touch key input pin
2	TP1	IN	Touch key input pin
3	TP2	IN	Touch key input pin
4	TP3	IN	Touch key input pin
5	CS	IN	Capacitance detection,the larger the capacitance the higher the sensitivity(1-47nF)
6	SOD	IN	Built in pull-up resistor ,Output mode selection: 1->CMOS output(default) 0->Open Darin output
7	VSS	VSS	Negative power supply
8	MOT	IN	Built in pull-up resistor ,maximum on duration time selection: 1->Infinite(default)) 0->16S
9	AHLB	IN	Built in pull-down resistor ,Output level selection: 1->active Low, 0->active High (default)
10	VDD	VDD	Positive power supply
11	SM	IN	Built in pull-down resistor , operating mode selection: 1->Single key, 0->Multi key(default)
12	TOG	IN	Built in pull-down resistor ,Output mode selection: 1->Toggle, 0->Directdefault)
13	Q3	OUT	Touch key output pin
14	Q2	OUT	Touch key output pin
15	Q1	OUT	Touch key output pin
16	Q0	OUT	Touch key output pin

## 3 Functional Description

### 3.1 Block diagram



### 3.2 Auto-calibration Function

The re-calibration period is about 64 mS within 4S after power-on. Power on after 4S then it returns to standby mode, then the re-calibration period change to about 1S

### 3.3 Output mode

VK3604 has 4 output pin(Q0~Q3) ,output function selection by option pins.

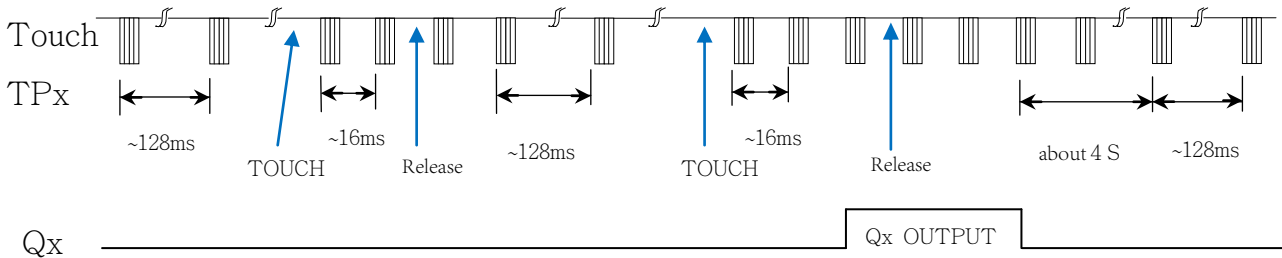
TOG	SOD	AHLB	output option features
NC	NC	NC	Direct mode, CMOS active high output
NC	NC	VDD	Direct mode, CMOS active low output
NC	VSS	NC	Toggle mode, open drain active high output
NC	VSS	VDD	Toggle mode, open drain active low output
VDD	NC	NC	Toggle mode, COMS output, power on state=0
VDD	NC	VDD	Toggle mode, COMS output, power on state=1
VDD	VSS	NC	Toggle mode, power on state high-Z, active high output
VDD	VSS	VDD	Toggle mode, power on state high-Z, active low output

SM	operating mode selection
NC	Multi key mode
VDD	Single key mode

MOT	Max. on duration time selection
NC	Infinite (Disable maximum on time)
VSS	Maximum on time 16 seconds

### 3.4 Operating Mode

There are two operating modes for VK3604, the normal mode and the standby mode. If any key is pressed, the device will be waken up and will then enter the normal mode. If no key press, After 4S, the system will then return to the standby mode again, it will be saving power. When  $V_{DD}=5V$ , at standby mode output response time about 160ms, at detective mode output response time about 48 ms.



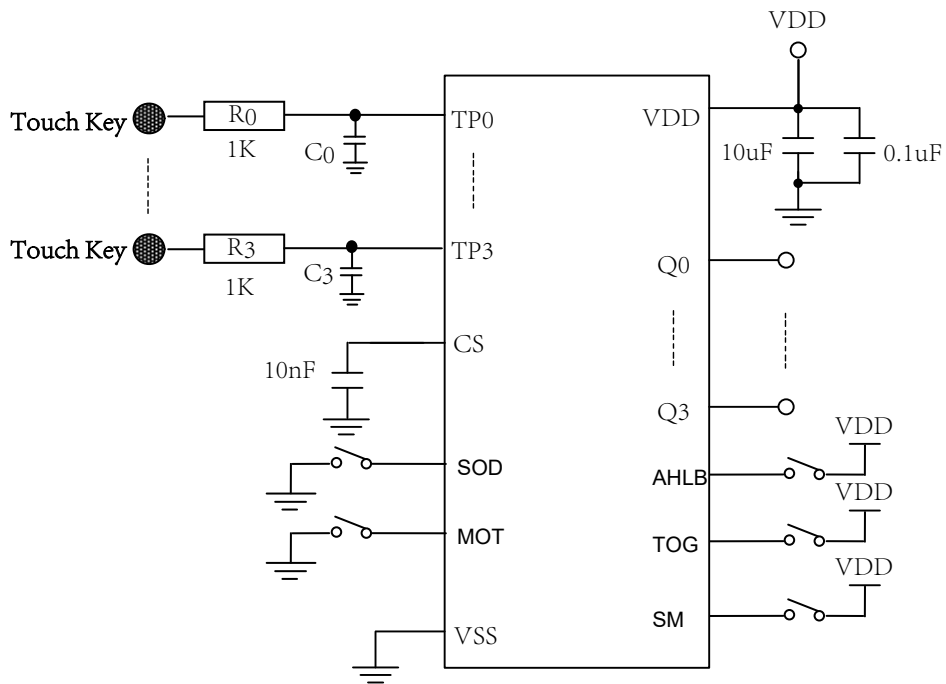
### 3.5 Sensitivity Adjustment

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 VK3604 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  $C_s$  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	6.8nF/25V
3-6mm	10nF/25V
6-10mm	22nF/25V

## 4 Application Circuits





## 5 Electrical characteristics

### 5.1 Absolute Maximum Ratings

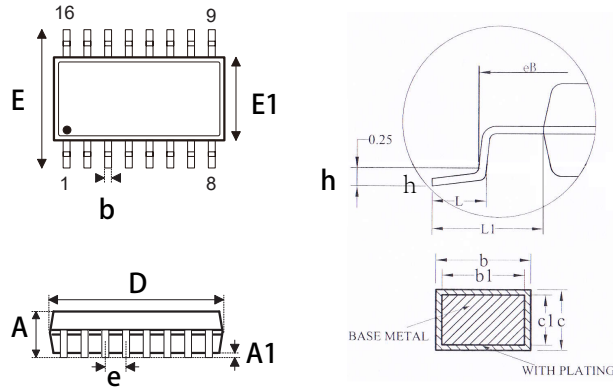
Item	Symbol	Ratings	Unit
Power voltage	VDD	-0.3~5.5	V
Input Voltage	VIN	$V_{SS}-0.3 \sim V_{DD}+0.3$	V
Storage Temperature	TSTG	-50~+125	°C
Operating Temperature	TOTG	-40~+85	°C
Human Body Mode	ESD	$\geq 4$	KV

### 5.2 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Test Conditions (25 °C)	
						VDD	Conditions
Operating voltage	VDD	2.4	3.0	5.5	V	—	—
Operating current	I <sub>OP</sub>	—	20	40	μA	3.0V	CS=10nF
		—	30	60		5.0V	
Standby current	I <sub>ST</sub>	—	7	14	μA	3.0V	CS=10nF
		—	14	28		5.0V	
Output Sink Current	I <sub>IL</sub>	—	10	—	mA	3.0V	V <sub>OL</sub> =0.5V
		—	14	—		5.0V	
Output Source Current	I <sub>OL</sub>	—	-6	—	mA	3.0V	V <sub>OH</sub> =2.8V
		—	-9	—		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
Input pull-up resistor	R <sub>PH</sub>	—	30k	—	ohm	3.0V	VDD=3V
Input pull-down resistor	R <sub>PL</sub>	—	25k	—	ohm	3.0V	VDD=3V
Output Response Time	T <sub>R</sub>	—	45	—	mS	3.0V	normal mode
		—	48	—		5.0V	normal mode
		—	150	—	mS	3.0V	standby mode
		—	160	—		5.0V	standby mode

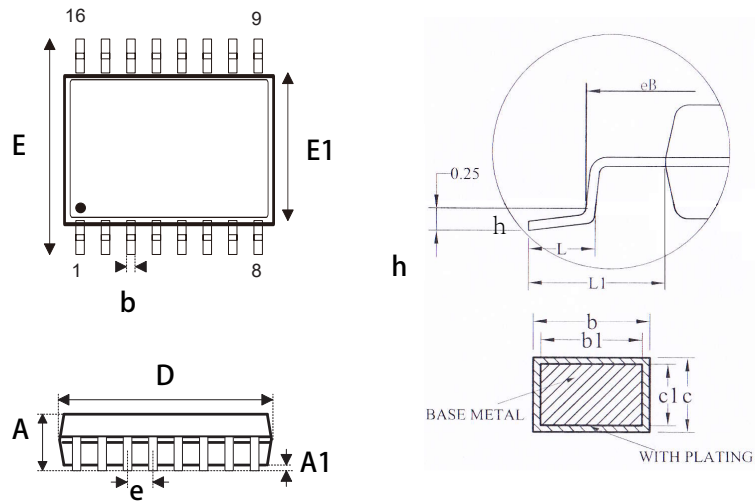
## 6 Package Information

### 6.1 SOP16(9.9mm x3.9mm PP=1.27mm):



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.55
A1	0.10	---	0.225
b	0.39	---	0.47
b1	0.38	0.41	0.44
c	0.20	---	0.24
c1	0.19	0.20	0.21
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	---	0.50
L	0.50	---	0.80
L1	1.05REF		

## 6.2 TSSOP16(4.9mm x3.9mm PP=0.635mm):



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.75
A1	0.10	---	0.225
b	0.23	---	0.31
b1	0.22	0.25	0.28
c	0.20	---	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	0.635BSC		
h	0.25	---	0.50
L	0.50	---	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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