Features

- Operating voltage: 2.2-5.5V

- Standby current:10uA/3.0V

- Power-On Reset（POR）

- Low Voltage Reset（LVR）

- Key Response Time：
  > Normal Mode 48mS
  > Standby Mode160mS

- AHLB pin selects the output level on power-on: level- high or level- low

- TOG pin selects the output mode：Direct output or Latch output

- Output 5 one to one output and Touch status indicator pin

- Multi key output

- Maximum key on duration time：13S

- 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 0.3S stable-time, during the time do not touch the key

- Auto-calibration Function

- Anti-voltage fluctuation，High anti-interference

- Package
  SOP16(150mil)(9.9mm x 3.9mm PP=1.27mm)
 QFN16L(3.0mm x 3.0mm PP=0.5m)

1   General Description

VK36N5D is a touch pad detector IC which offers 5 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 5 one to one output pins，1 touch status output pin. The power-on output level,output mode can be selected through IO pin. 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 touch key + one to one output operations in a wide variety of applications.

2 Pinouts and pin description

## 2.1 VK36N5D   SOP16/QFN16L Pin Assignment
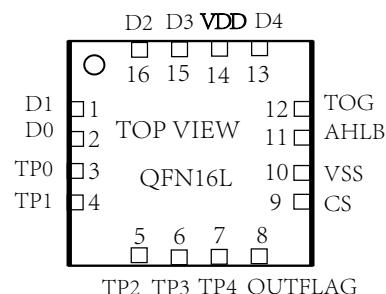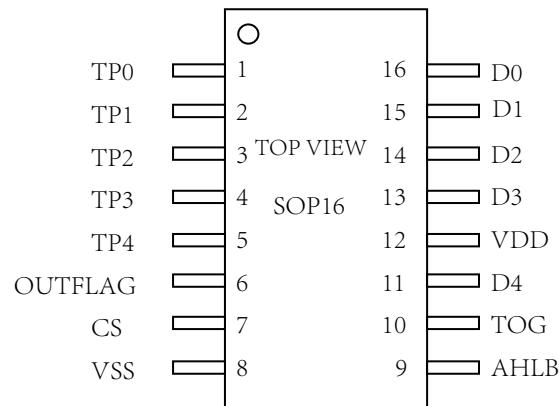
2.2　VK36N5D　SOP16/QFN16L Pin Description

Pin name		I/O	Function Description
SOP16	QFN16L		
1-TP0	3-TP0	IN	Touch key input pin，Add a capacitor（0-50pF）to a touch key pin can fine tune the sensitivity
2-TP1	4-TP1	IN	Touch key input pin，Add a capacitor（0-50pF）to a touch key pin can fine tune the sensitivity
3-TP2	5-TP2	IN	Touch key input pin，Add a capacitor（0-50pF）to a touch key pin can fine tune the sensitivity
4-TP3	6-TP3	IN	Touch key input pin，Add a capacitor（0-50pF）to a touch key pin can fine tune the sensitivity
5-TP4	7-TP4	IN	Touch key input pin，Add a capacitor（0-50pF）to a touch key pin can fine tune the sensitivity
6-OUTFLAG	8-OUTFLAG	OUT	Touch status output pin
7-CS	9-CS	IN	Capacitance detection,the larger the capacitance the higher the sensitivity(1-47nF)
8-VSS	10-VSS	VSS	Negative power supply
9-AHLB	11-AHLB	IN	Selects the output level：floating->Active level- low，VSS->Active level- high
10-TOG	12-TOG	IN	Selects the output mode：floating->Direct output，VSS->Latch output
11-D4	13-D4	OUT	Touch key output pin
12-VDD	14-VDD	VDD	Positive power supply
13-D3	15-D3	OUT	Touch key output pin
14-D2	16-D2	OUT	Touch key output pin
15-D1	1-D1	OUT	Touch key output pin
16-D0	2-D0	OUT	Touch key output pin

3   Functional Description

3.1 Block diagram
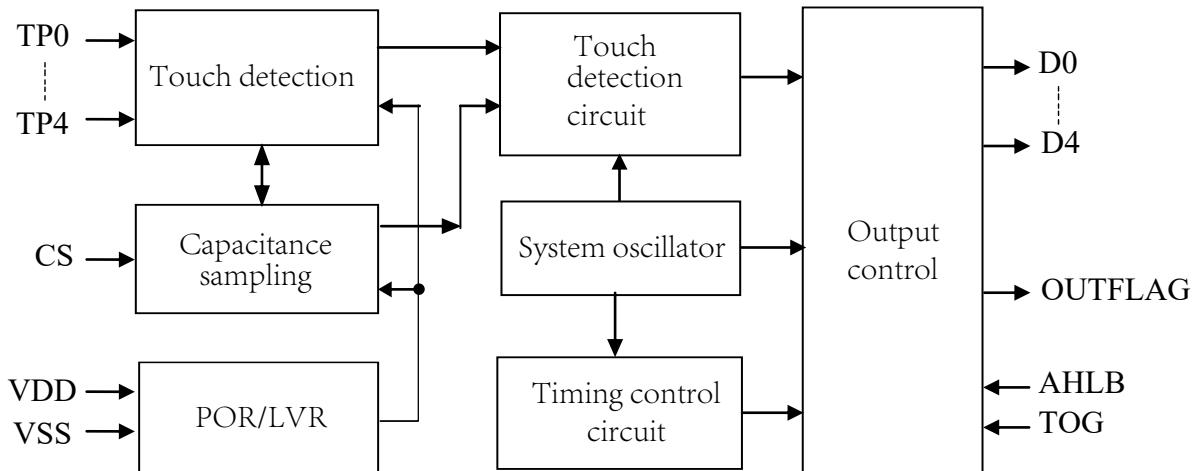
3.2 Auto-calibration Function

After power-on, the chip will be initialized to obtain the first reference value, If there is no touch，the chip will automatically calibrate the reference value，so that the reference value can be dynamically changed according to the external environment.

For example, reliable touch detection can be achieved through this mechanism when temperature changes or when there is environmental noise.

3.3 Max Key On Duration Time

To minimise the possibility of unintentional switch detections, such as undesired objects covering the sensing electrodes, the devices include a Maximum Key On duration time function. To implement this function the devices include an internal timer, which starts running after each switch detection. If the key on time of a touch key exceeds a value of about 13S, then the device will re-calibrate the key state, obtain a new reference value, while the output status is reset to the initial state.

3.4 Anti-Voltage Fluctuation

The chip has a built-in anti-voltage fluctuation function,which can prevent the touch button from malfunctioning caused by the external high current drive and the instantaneous drop of the working voltage.

3.5 Output mode

CMOS Direct output（D0~D4），Support Multi key output.
AHLB pin selects the output level on power-on，TOG pin selects the output mode.
OUTFLAG pin outputs touch status，When there is a touch, the output level changes, and the output level without touch returns to the power-on state.

AHLB	Output Function
VSS	active level- high,Power-on output 0
NC	active level- low,Power-on output 1

TOG	Output mode
VSS	Latch output
NC	Direct output

Data Format：OUTFLAG+One to one key value.

AHLB NC ON POWER-ON								
Touch pin	Output Pin		OUTFLAG	Touch pin	Output Pin		OUTFLAG
	TOG=VSS	TOG NC			TOG=VSS	TOG NC	
TP0 Touch	D0=0	D0=0	0	TP0 Release	D0=0	D0=1	1
TP1 Touch	D1=0	D1=0	0	TP1 Release	D1=0	D1=1	1
TP2 Touch	D2=0	D2=0	0	TP2 Release	D2=0	D2=1	1
TP3 Touch	D3=0	D3=0	0	TP3 Release	D3=0	D3=1	1
TP4 Touch	D4=0	D4=0	0	TP4 Release	D4=0	D4=1	1
Note：Output pin level when power on =1 OUTFLAG=1							

AHLB Connect VSS ON POWER-ON								
Touch pin	Output Pin		OUTFLAG	Touch pin	Output Pin		OUTFLAG
	TOG=VSS	TOG NC			TOG=VSS	TOG NC	
TP0 Touch	D0=1	D0=1	1	TP0 Release	D0=1	D0=0	0
TP1 Touch	D1=1	D1=1	1	TP1 Release	D1=1	D1=0	0
TP2 Touch	D2=1	D2=1	1	TP2 Release	D2=1	D2=0	0
TP3 Touch	D3=1	D3=1	1	TP3 Release	D3=1	D3=0	0
TP4 Touch	D4=1	D4=1	1	TP4 Release	D4=1	D4=0	0
Note：Output pin level when power on =0 OUTFLAG=0							

3.6 Operating Mode

There are two operating modes for VK36N5D, 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 VDD=5V ,at standby mode output response time is about 160ms, at detective mode output response time is about 48 ms.

Touch
TPx

~128ms ~16ms ~128ms ~16ms about 4s ~128ms
TOUCH Release TOUCH Release

D4-D0   D4-D0 output
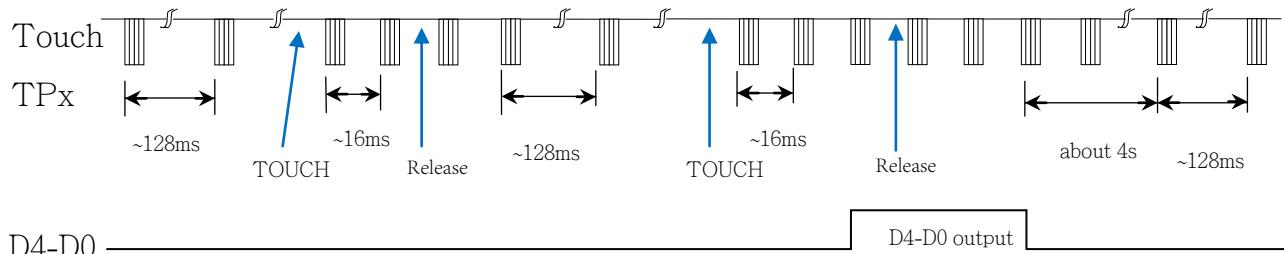
3.7 Sensitivity Adjustment

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 VK36N5D 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	6.8nF/25V
3-6mm	10nF/25V
6-10mm	22nF/25V

4   Application Circuits
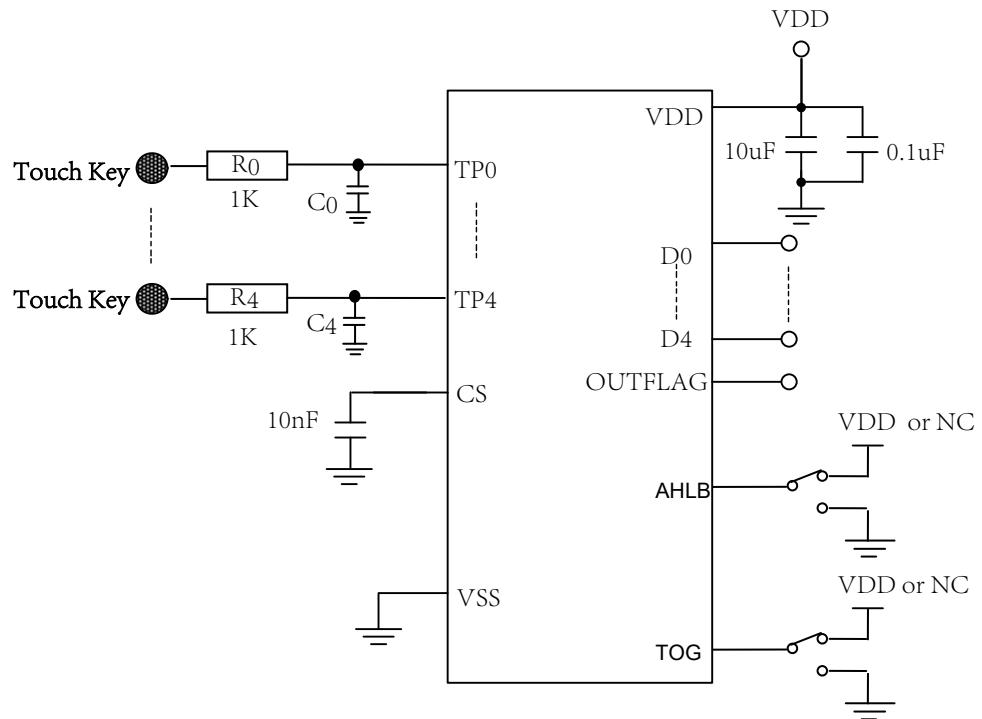
5   Electrical characteristics

5.1 Application Circuits

Item	Symbol	Ratings	Unit
Power voltage	VDD	-0.3～6.0	V
Input Voltage	VIN	V_{SS}-0.3～V_{DD}+0.3	V
Storage Temperature	T_{STG}	-50～+125	°C
Operating Temperature	T_{OTG}	-40～+85	°C
Human Body Mode	ESD	4KV-8KV(Class 3A)	KV

5.2 DC Characteristics

Item	Symbol	Min.	Typ.	Max	Unit	Test Conditions（25℃）	
						VDD	Conditions
Operating voltage	VDD	2.2	3.0	5.5	V	—	—
Low voltage Reset	LVR	—	2.0	2.1	V	—	—
Operating current	I_{OP}	—	1.3	—	mA	3.0V	CS=10nF
		—	2.2	—		5.0V	
Standby current	I_{ST}	—	10	—	μA	3.0V	CS=10nF
		—	33	—		5.0V	
Output Sink Current	I_{IL}	—	4	—	mA	3.0V	V_{OL}=0.6V
		—	8	—		5.0V	
Output Source Current	I_{OL}	—	-2	—	mA	3.0V	V_{OH}=2.6V
		—	-4	—		5.0V	V_{OH}=4.3V
Input Low Voltage	V_{IL}	—	—	0.3	VDD	VDD	Input Low Voltage
Input high Voltage	V_{IH}	0.7	—	1	VDD	VDD	Input High Voltage
Input pull-up resistor	R_{PH}	—	150k	—	ohm	3.0V	VDD=3V
Input pull-low resistor	R_{PL}	—	50k	—	ohm	3.0V	VDD=3V
Output Response Time	T_R	—	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):
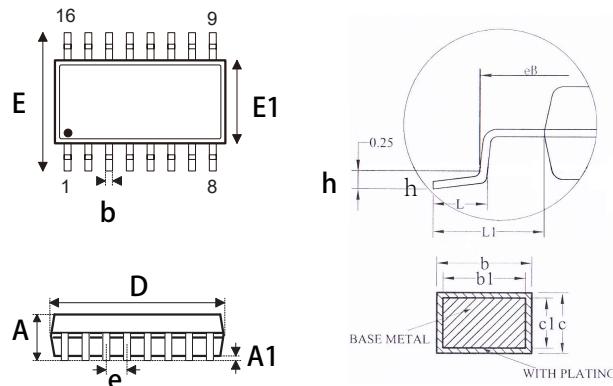
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.55
A1	0.10	---	0.225
b	0.39	---	0.47
b1	0.38	0.41	0.44
c	0.20	---	0.24
c1	0.19	0.20	0.21
D	9.80	9.90	10.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	---	0.50
L	0.50	---	0.80
L1	1.05REF		

6.2　QFN16L(3.0mm x 3.0mm PP=0.5mm)：
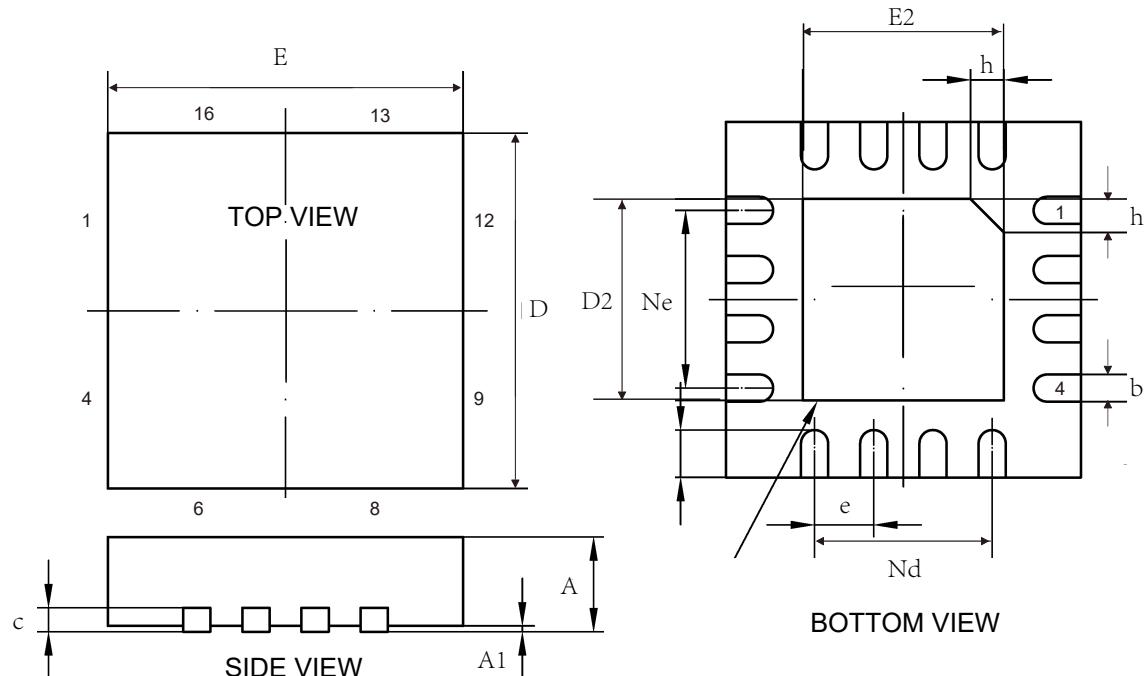
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	1.55	1.65	1.75
E	2.90	3.00	3.10
E2	1.55	1.65	1.75
Nd	1.50BSC		
Ne	1.50BSC		
e	0.50BSC		
L	0.35	0.40	0.45
h	0.20	0.25	0.30

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 version	Yes

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