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VK36N1D Datasheet

1-channel touch 1-to-1 output

Rev.1.2

1 General Description

The VK36N1D has one touch channel, which can be used to detect the touch actions of human hands on the external touch button. This chip has a high degree of integration and only requires a few external components to achieve the detection of the touch button.

It provides 1 one-to-one output pin. The power-on output level can be selected through the IO pin. There are two types available for direct output and latch output. The chip uses a special integrated circuit, which has a high power supply voltage suppression ratio. This can reduce the occurrence of key detection errors. This feature ensures that the chip still has high reliability in applications under adverse environmental conditions.

This touch chip features automatic calibration function, low standby current, and voltage stability resistance. It provides a simple and effective solution for various applications involving touch keys with 1:1 direct output.

2 Key Features

- Operating voltage: 2.2-5.5V
- Standby current 10μA/3.0V
- Power-on reset function（POR）
- Low-voltage reset function（LVR）
- Touch output response time: 48ms in operating mode, 160ms in standby mode
- Output active-high or active-low configurable via the AHLB pin on power-up
- Output is a 1-to-1 output port
- Anti-fraud function, maximum output time of the effective key: 13 seconds
- Touchless 4S enters standby mode
- The overall sensitivity (1-47nF) is adjusted by connecting the CS terminal to the ground capacitor.
- Each touch channel is individually connected to a small ground capacitor for fine-tuning the sensitivity (0-50pF)
- The power-on period of 0.3 seconds is the stabilization time. Do not touch during this period.
- When the power is turned on and no touch is detected, the environmental changes will automatically calibrate the reference value.
- Resistant to voltage fluctuations and has good anti-interference performance
- Model number
  VK36N1DD Direct output
  VK36N1DT Latched output
- Available Packages:
  SOT23-6L(3mm x 3mm PP=0.95mm)

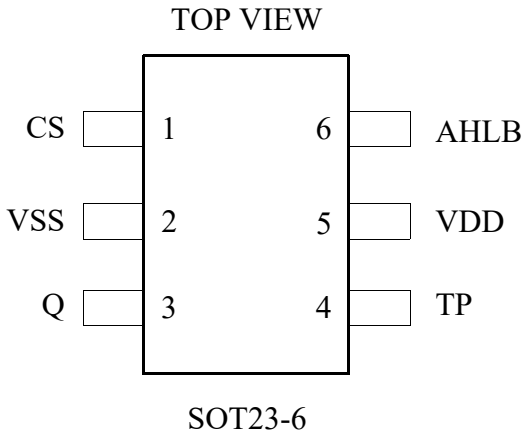
3 Product Selection

Part No.	Voltage/Standby Current	Output	Packaging
VK36N1D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOT23-6
VK36N2D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOP8
VK36N3D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOP16/QFN16L
VK36N4D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOP16/QFN16L
VK36N5D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOP16/QFN16L
VK36N6D	2.2V-5.5V/10μA(3.0V)	Direct/Latch/Open Drain Output	SOP16/QFN16L

4 Ordering Information

Part No.	Packaging	Tube Qty	Tray(reel)Qty	Box Qty	Total Qty	Notes
VK36N1D	SOT23-6		3000/reel	30000/box	120000 PCS	
VK36N2D	SOP8	100/tube		10000/box	100000 PCS	
VK36N3D	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N4D	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N5D	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N6D	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	

5 Package Pinout Information(SOT23-6)



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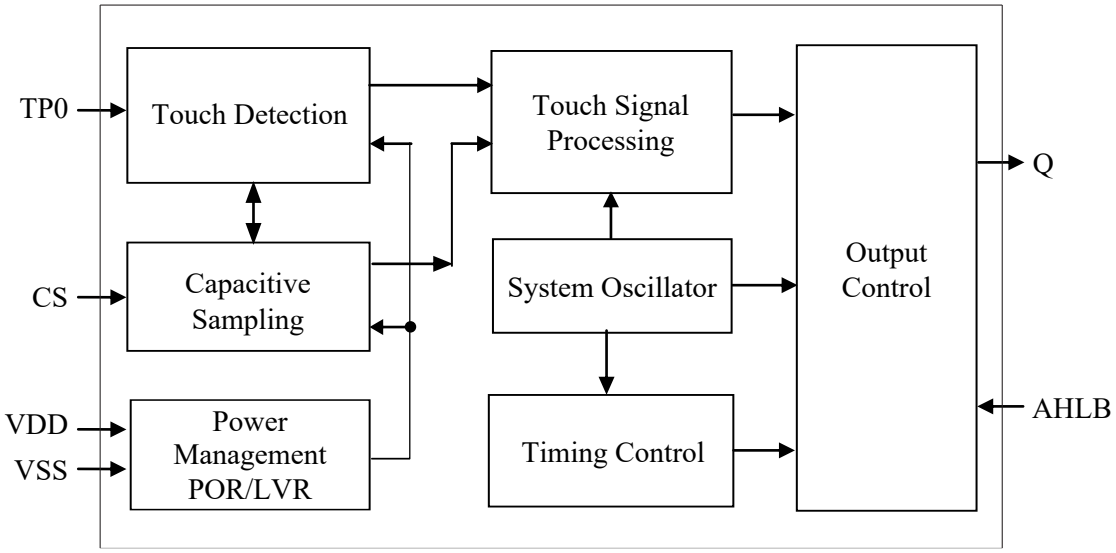
5.1 VK36N1D/SOT23-6L Pin Description

Pin Names	I/O	Function Description
1-CS	I	Sensitivity adjustment, connecting ground capacitor (1-47nF)
2-VSS	VSS	Negative power supply
3-Q	O	Touch output
4-TP	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
5-VDD	VDD	Positive power supply
6-AHLB	I	Select output level (must not be left floating): VDD > low level is valid, VSS - > high level is valid

6 Functional Description

6.1 Block Diagram



6.2 Auto-calibration Function

After power-on, the chip will perform initialization and obtain the first reference value. Subsequently, when there is no touch, the touch chip will automatically calibrate the reference value, enabling the reference value to dynamically change according to the external environment.

For example, this mechanism can achieve reliable touch detection when there is a temperature change or environmental noise.

6.3 Anti-Calcification Function

To minimize unintended key detection situations such as accidental contact with the sensing pad, a maximum key duration function is set within the chip. When a touch key is pressed, the internal timer starts timing. If the pressing time exceeds approximately 13 seconds, the touch chip will ignore the state of the touched key, recalibrate, obtain a new reference value, and simultaneously reset the status to the initial state upon power-on.

6.4 Resistance To Voltage Fluctuations

The chip is equipped with an anti-voltage fluctuation function, which can prevent the occurrence of touch button malfunction caused by the sudden drop in working voltage due to the large current drive from the peripheral devices.

6.5 Output Mode

The output of VK36N1D is Q, in CMOS format.

The valid output level can be selected by the state of the AHLB pin during power-on, and the AHLB pin must not be left floating.

AHLB	Select the output of the valid level
VSS	High level is valid. Power-on output is 0.
VDD	Low level is valid. Power-on output is 1.

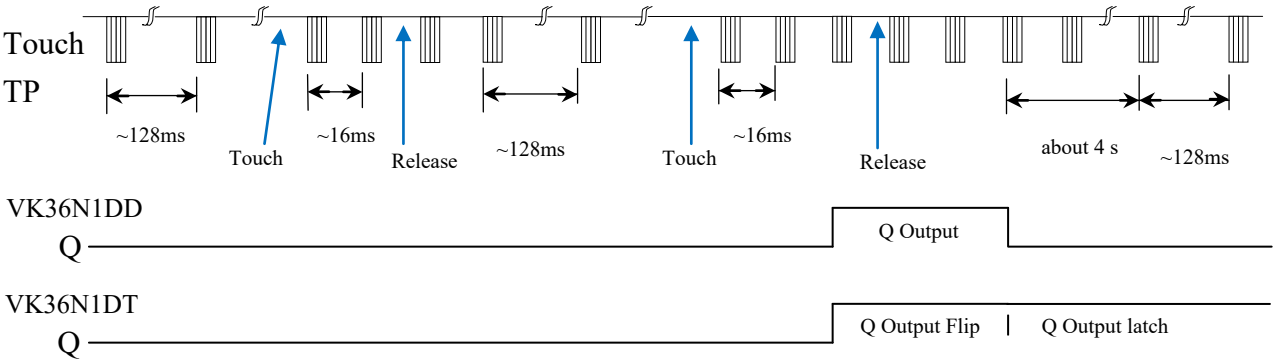
Data format: 1-to-1 key-value pairs.

VK36N1DD					
Touch Pin	AHLB=VSS		Touch Pin	AHLB=VDD	
	Touch	Release		Touch	Release
TP0	D0=1	D0=0	TP0	D0=0	D0=1
Power on：D0=0			Power on：D0=1		

VK36N1DT					
Touch Pin	AHLB=VSS		Touch Pin	AHLB=VDD	
	Touch	Release		Touch	Release
TP0	D0 Flip	D0 Maintain	TP0	D0 Flip	D0 Maintain
Power on：D0=0			Power on：D0=1		

6.6 Operating Mode

The VK36N1D chip has two operating modes: standby mode and normal mode. When the key is touched, it switches to the normal mode. Without key touch, the 4S automatically enters the standby mode to reduce power consumption. When VDD = 5V, the output response is approximately 160 milliseconds in the standby mode and about 48 milliseconds in the operating mode.



6.7 Sensitivity Adjustment

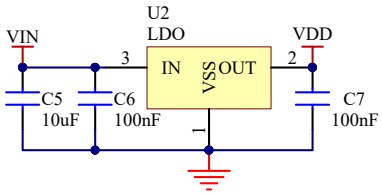
The sensitivity of VK36N1D is related to the size of the touch PAD, the thickness of the shell, the size of the sensitivity capacitance, etc. The sensitivity should be adjusted according to the actual application of the product. The sensitivity can be adjusted from the following four aspects:

1. Touch the area of the PAD
   Under other unchanged conditions, the larger the touch area, the more sensitive it is, but the area must be within the effective area.
2. The thickness of the shell
   Under other unchanged conditions, the thinner the casing, the higher the sensitivity; the thicker the casing, the lower the sensitivity. However, the thickness must not exceed the maximum limit.
3. Adjust the capacitance value of pin CS to ground
   CS adjusts the overall sensitivity. The larger the value, the more sensitive it is. Commonly used values range from 1 to 47nF, and for some special applications, there are also values exceeding 200nF.
4. Adjust the small capacitance between the touch foot and the ground
   The sensitivity is fine-tuned by touching the small capacitance of the touch foot to the ground. The larger the capacitance, the lower the sensitivity. It is most sensitive without a capacitor. Common values range from 1 to 50pF.

Shell thickness (acrylic or glass)	CS Electrical value (for reference only)
<3mm	6.8nF/25V
3-6mm	10nF/25V
6-10mm	22nF/25V

7 Application Circuits

It is recommended to use LDO for power supply



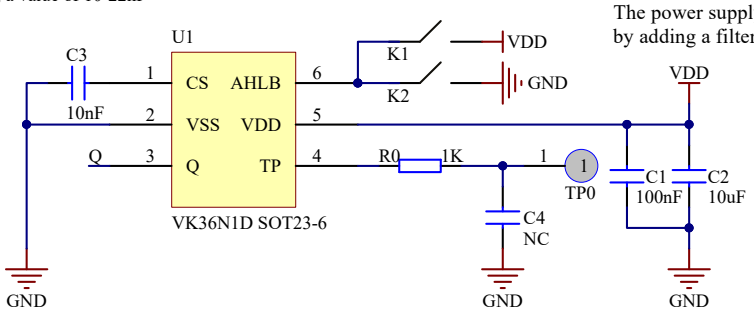
AHLB

VDD	**Low level is valid. Power-on output is 1.**
GND	**High level is valid. Power-on output is 0.**

C3 is used to adjust the overall sensitivity. Generally, the capacitance value ranges from 1nF to 47nF. The larger the capacitance, the more sensitive it is.

For general applications, a value of 10-22nF is typically selected.

The power supply pin is stabilized by adding a filter capacitor.



C4 is used to fine-tune the sensitivity of each channel. Generally, the larger the capacitance (from 0pF to 50pF), the less sensitive it is. The unconnected one is the most sensitive.

The touch pins are connected in series with a 1K resistor to enhance anti-interference. The resistance value of the series-connected 1K resistor usually ranges from 0R to 10K. Depending on the interference situation, the resistance value should be increased if the interference is severe.

8 Electrical Characteristics

Absolute Maximum Ratings

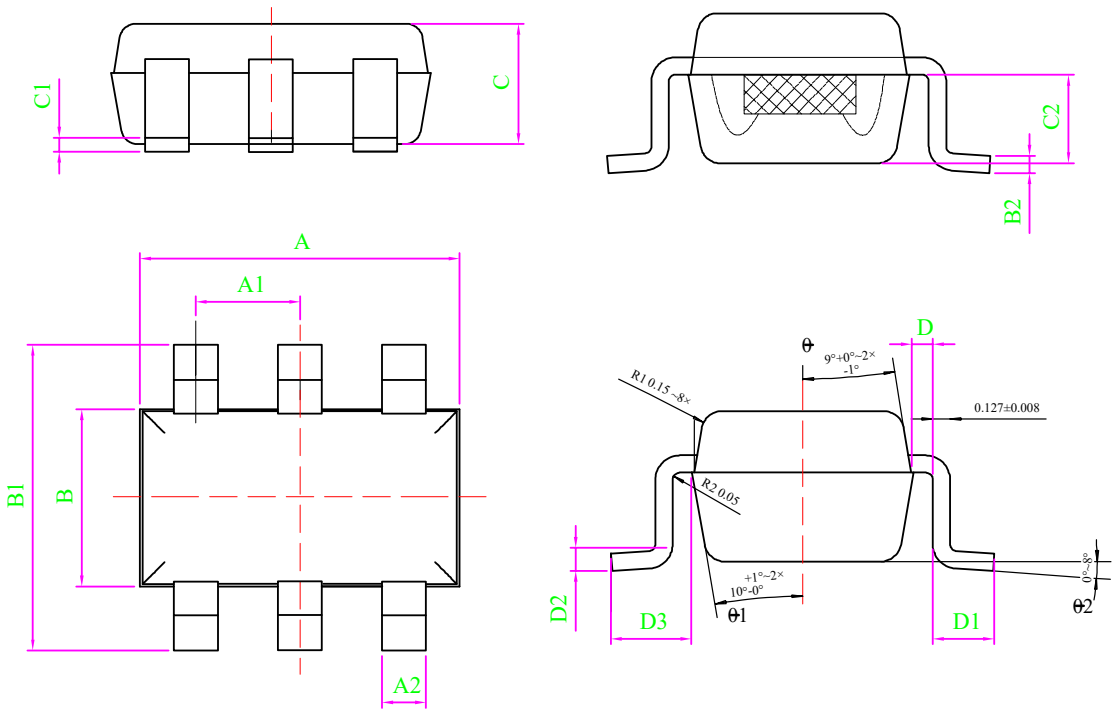
Parameter	Symbol	Ratings	Unit
Power Voltage	VDD	-0.3～6.0	V
Input Voltage	V_{IN}	GND-0.3～VDD+0.3	V
Storage Temperature	T_{STG}	-50～+125	℃
Operating Temperature	T_{OTG}	-40～+85	℃
Human Body Mode	ESD	4KV-8KV(Class 3A)	KV

8.1 DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions (25 ℃)	
						VDD	Conditions
Operating voltage	VDD	2.2	3.0	5.5	—	—	—
Low-voltage reset	LVR	—	2.0	2.1	—	—	—
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 the pull-up resistor	R_{PH}	—	150k	—	ohm	3.0V	VDD=3V
Input the pull-down resistor	R_{PL}	—	50k	—	ohm	3.0V	VDD=3V
Output response time	T_R	—	45	—	mS	3.0V	Operating mode
		—	48	—		5.0V	Operating mode
		—	150	—	mS	3.0V	Standby mode
		—	160	—		5.0V	Standby mode

9 Package Information

9.1 SOT23-6L(3mm x 3mm PP=0.95mm)



MILLIMETER			
SYMBOL	MIN	NOM	MAX
A	2.72	2.92	3.12
A1	0.90	0.95	1.00
A2	0.30	0.35	0.40
B	1.40	1.60	1.80
B1	2.60	2.80	3.00
B2	0.12	0.128	0.135
C	1.00	1.10	1.20
C1	0.04	-	0.10
C2	0.60	0.65	0.70
D	0.03	0.08	0.13
D1	0.30	-	0.60
D2	0.25TYP		
D3	0.60	0.65	0.70

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11 Revision History

No.	Version	Date	Modify the content	Check
1	1.0	2018-08-10	Original version	YES
2	1.1	2020-02-11	Add reference circuit	YES
3	1.2	2026-01-12	Update version	YES

[1] Consult the recently published documents before starting or finishing the design.

[2] Since the release of this document , the device product status described in this document may have changed and may differ in several cases. The latest product status information can be found on the Internet at https://www.szvinka.com/