



VK3604A Datasheet

4-channel touch 1-to-1 output

Rev.1.2

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1 General Description

VK3604A is a 4-channel touch detection chip with strong anti-interference ability, high penetration, wide operating voltage range and low quiescent current. It can replace traditional buttons, making the product panel waterproof, dustproof, sealed and isolated, sturdy and beautiful. It is very suitable for those electronic products that are small in size, have high anti-interference requirements and low power consumption requirements.

When powered on, the parameters of the 4 output channels can be selected through the IO pins: output level, output mode, and output pin structure. When powered on, you can also choose through the IO pin whether to enable the 16-second long-press reset function and select the touch single-key/multi-key mode. The chip adopts special integrated circuits inside, featuring a high power supply voltage rejection ratio, which can reduce the occurrence of key detection errors. This characteristic ensures that the chip still has high reliability in applications under adverse environmental conditions.

2 Key Features

- Operating voltage: 2.4-5.5V
- Operating current 20.0 μ A@VDD=3.0V
Standby current 7.0 μ A@VDD=3.0V
- Power-on reset function (POR)
- Low-voltage reset function (LVR)
- Response time approximately 45ms @VDD=3V
- The overall sensitivity is adjusted by connecting a capacitor to ground through the CS pin. The capacitance value ranges from 1 to 100nF. The larger the capacitance value, the more sensitive it is. It is not allowed not to connect a capacitor.
- Connect a small capacitor to the ground for fine-tuning the sensitivity of each touch channel to make the sensitivity of each channel consistent. The capacitance value ranges from 1 to 100pF. The larger the capacitance value, the less sensitive it is. It is most sensitive without connecting a capacitor.
- Built-in key debouncing, no need for external software to debouncing again
- Pins Q0 to Q3 are the output
The output level is selected by the MHL pin as either high level active or low level active
The output mode is selected by the MDT pin as direct output or latched output
The output pin structure is selected by the MOD pin as CMOS output or open-drain output
- Select the touch multi-key mode or single-key mode through the MMS pin
- Select through the MTS pin whether to enable the 16-second long-press button reset function
- After power-on, there is approximately 0.25 seconds of stabilization time during which all functions are disabled. Do not touch the detection point during this period
- Self-calibrate parameters according to environmental changes.
- It is relatively easy to pass the EMC test
- HBM Electrostatic 4KV-8KV(Class 3A)
- Available Packages:
SOP16(150mil)(9.9mm x 3.9mm PP=1.27mm)

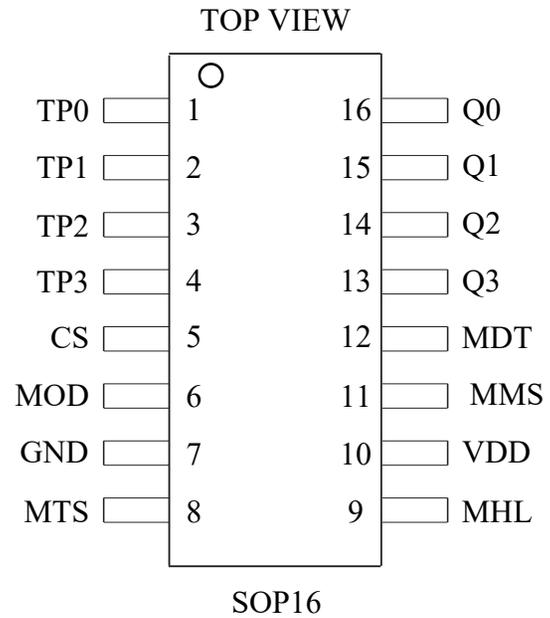
3 Product Selection

Part No.	Touch Channel	Working Voltage	Normal Mode/Standby	Output (/ Optional parameter)	Packaging
VK3601	1	2.4-5.5V	120 μ A/4 μ A(3V)	Direct CMOS output high/low level	SOT23-6
VK3602K	2	2.4-5.5V	60 μ A/8 μ A(3V)	Direct CMOS output high/low level	SOP8
VK3602XS	2	2.4-5.5V	60 μ A/8 μ A(3V)	Latch the CMOS output high/low level	SOP8
VK3603	3	2.4-5.5V	20 μ A/7 μ A(3V)	Direct CMOS output, low level effective	ESOP8
VK3604A	4	2.4-5.5V	20 μ A/7 μ A(3V)	Direct/latch high/low level multi-key/single-key CMOS/ Drain long press to keep output/ Long press for 16 seconds to reset	SOP16
VK3604B	4	2.4-5.5V	20 μ A/7 μ A(3V)	Direct/latch high/low level multi-key/single-key CMOS/ Drain long press to keep output/ Long press for 16 seconds to reset	TSSOP16
VK36E4	4	2.4-5.5V	20 μ A/6 μ A(3V)	Direct/latch high/low level multi-key/single-key CMOS/ Drain long press to keep output/ Long press for 16 seconds to reset	ESSOP10
VK36Q4	4	2.4-5.5V	20 μ A/6 μ A(3V)	Direct/latch high/low level multi-key/single-key CMOS/ Drain long press to keep output/ Long press for 16 seconds to reset	DFN10L
VK3606D	6	2.4-5.5V	20 μ A/7 μ A(3V)	Direct CMOS output, low level effective, multi-key mode, long press for 10 seconds to reset	SOP16
VK3610I	10	2.4-5.5V	45 μ A/9 μ A(3V)	I2C interface +INT pin, multi-key mode, hold for 10 seconds to reset	SOP16
VK3618I	18	2.4-5.5V	60 μ A/16 μ A(3V)	Two groups of touch correspond to I2C interface +INT pin, each group has 9 touch channels, multi-key mode, and reset after holding for 10 seconds	SSOP28

4 Ordering Information

Part No.	Packaging	Tube Qty	Tray(reel)Qty	Box Qty	Total Qty	Notes
VK3601	SOT23-6		3000/reel	30000/box	120000 PCS	
VK3602K	SOP8	100/tube		10000/box	60000 PCS	
VK3602XS	SOP8	100/tube		10000/box	60000 PCS	
VK3603	ESOP8		4000/reel	8000/box	64000 PCS	
VK3604A	SOP16	50/tube		5000/box	50000 PCS	
VK3604B	TSSOP16	100/tube		10000/box	100000 PCS	
VK36E4	ESSOP10		4000/reel	8000/box	64000 PCS	
VK36Q4	DFN10L		5000/reel		40000 PCS	
VK3606D	SOP16	50/tube		5000/box	50000 PCS	
VK3610I	SOP16	50/tube		5000/box	50000 PCS	
VK3618I	SSOP28	50/tube		5000/box	50000 PCS	

5 Package Pinout Information(SOP16)



For more information: [Page 11](#)

5.1 VK3604A/SOP16 Pin Description

No.	Name	I/O	Function Description
1	TP0	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-100pF),and it is most sensitive when not connected
2	TP1	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-100pF),and it is most sensitive when not connected
3	TP2	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-100pF),and it is most sensitive when not connected
4	TP3	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-100pF),and it is most sensitive when not connected
5	CS	I	Sensitivity adjustment, connect to ground capacitance (1-100nF)
6	MOD	I-RH	Select the output pin structure: 1->CMOS output (default), 0-> open-drain output
7	GND	GND	Negative power supply
8	MTS	I-RH	Whether to enable the long-press reset function: 1-> continuous output (default), 0->16S reset
9	MHL	I-RL	Select output level: 1-> low level effective, 0-> high level effective (default)
10	VDD	VDD	Positive power supply
11	MMS	I-RL	Select the touch mode: 1-> Multi-key (default), 0-> single-key
12	MDT	I-RL	Select the output mode: 1-> latch output, 0-> direct output (default)
13	Q3	O	Touch output
14	Q2	O	Touch output
15	Q1	O	Touch output
16	Q0	O	Touch output

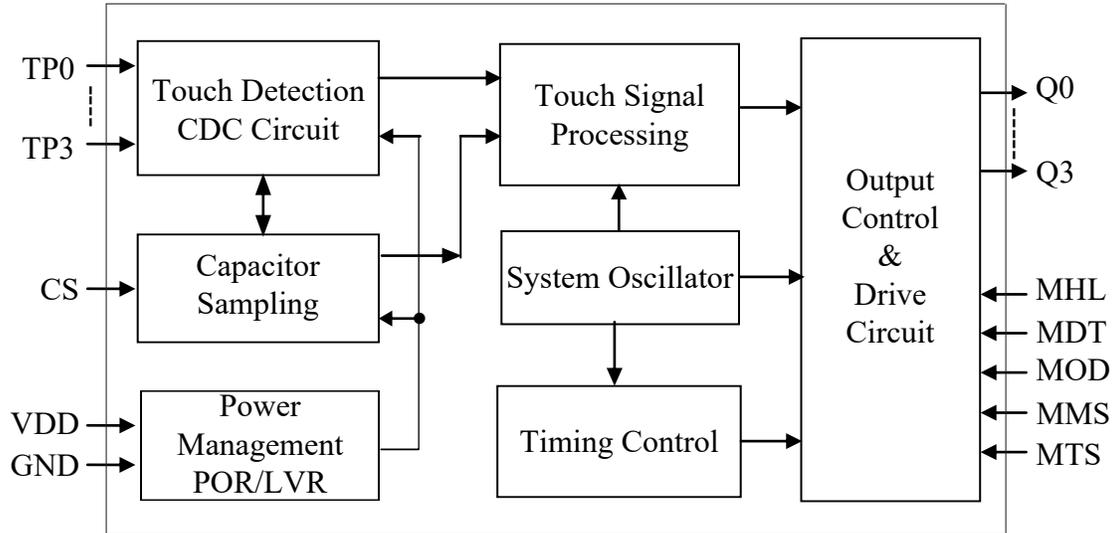
Notes:

Input - RH CMOS input with built-in pull-up resistor

Input - RL CMOS input with built-in pull-down resistor

6 Functional Description

6.1 Block Diagram



6.2 Output Parameters

The output of VK3604A is Q0 to Q3, and the output can be configured.

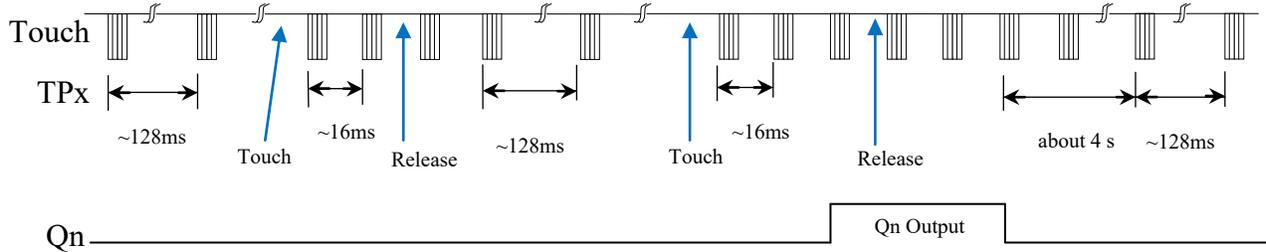
MDT	MOD	MHL	Configuration output function
NC	NC	NC	Direct CMOS output, high level effective
NC	NC	VDD	Direct CMOS output, low level effective
NC	GND	NC	Direct leakage output, high level effective
NC	GND	VDD	Direct leakage output, low level effective
VDD	NC	NC	Latch CMOS output, power-on output 0
VDD	NC	VDD	Latch CMOS output, power-on output 1
VDD	GND	NC	Latch open drain output, power-on output high resistance, high level effective
VDD	GND	VDD	Latch open drain output, high resistance output upon power-on, and effective at low level

MMS	Select the touch multi-key/single-key mode
NC	Touch multi-key output, supporting simultaneous pressing
VDD	Single-key touch output only outputs the key touched first

MTS	Whether to enable the long-press button reset function
NC	Press and hold the key continuously to output
GND	Press and hold the button for 16 seconds and then reset it

6.3 Working Mode

The VK3604A chip has two working modes: standby mode and normal mode. The key was touched and switched to the normal mode. The keyless touch 4S automatically enters standby mode to reduce power consumption. When VDD=5V, the Qn output response is approximately 160 milliseconds in standby mode and about 48 milliseconds in working mode.



6.4 Sensitivity Adjustment

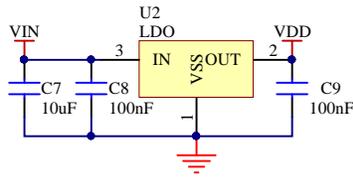
The sensitivity of VK3604A is related to the size of the touch PAD, the thickness of the shell, the size of the sensitivity capacitance, etc. The sensitivity should be adjusted according to the actual application of the product. The sensitivity can be adjusted from the following four aspects:

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, with the larger the value, the more sensitive it is. Commonly used values range from 1 to 100nF, and for some special applications, there are also those exceeding 200nF. CS capacitors should be selected with smaller temperature coefficients, such as X7R and NPO.
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 capacitance. Common values range from 1 to 100pF.

Shell thickness (acrylic or glass)	CS Electrical value (for reference only)
<3mm	10nF/25V
3-6mm	22nF/25V
6-10mm	47nF/25V

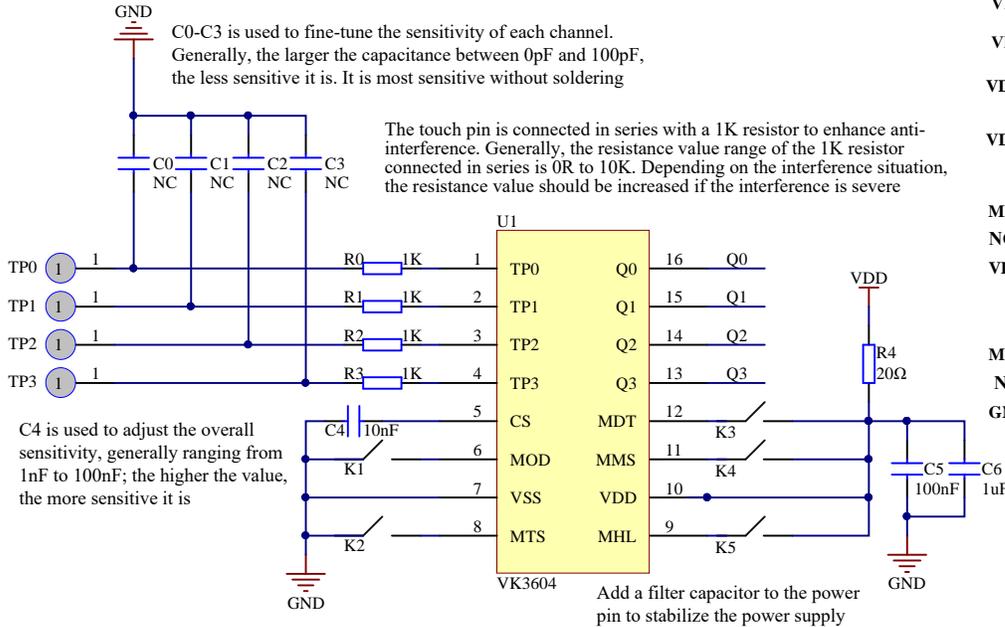
7 Application Circuits

It is recommended to use LDO for power supply



The output of the TPQ pin is configurable

MDT	MOD	MHL	Output function
NC	NC	NC	Direct CMOS output, high level effective(default)
NC	NC	VDD	Direct CMOS output, low level effective
NC	GND	NC	Direct leakage output, high level effective
NC	GND	VDD	Direct leakage output, low level effective
VDD	NC	NC	CMOS latch output, power-on output 0
VDD	NC	VDD	CMOS latch output, power-on output 1
VDD	GND	NC	Open the drain latch output, power on the output high resistance, high level effective
VDD	GND	VDD	Open the drain latch output, output high resistance upon power-on, and be effective at low levels



MMS	Select multi-key/single-key output
NC	Multi-key output, supporting simultaneous pressing
VDD	Single-key output, only output the first touched key. Direct CMOS output, high level effective= (default)
MTS	Select the longest output time by long-pressing
NC	Infinity
GND	The maximum output is 16 seconds. If it exceeds 16 seconds, reset

Notes:

1. On the PCB, the length of the line from the touch PAD to the touch pin should be as short as possible, and the touch traces must not be parallel or cross with other lines.
2. The power supply must be stable. Fluctuations, rapid drift or interference in the supply voltage may cause abnormal sensitivity or false detection.
3. The board covering the PCB must not contain any metal or conductive materials, and the same applies to the surface coating.
4. A 0.1uF capacitor must be used between VDD and GND, and the distance from the VDD and GND pins of the chip should be the shortest. It is recommended to add a 20Ω resistor and a 1uF capacitor on the power supply.
5. CS adjusts the overall sensitivity. This capacitor must be connected and placed as close to the chip as possible. The larger it is, the more sensitive it is. Common values range from 1 to 100nF, and for some special applications, there are also those exceeding 200nF. CS capacitors should be selected with a smaller temperature coefficient and stability, such as X7R and NPO.
6. Fine-tune the sensitivity of capacitors C0-C3(0~100pF) to ensure consistent sensitivity across all channels. The smaller the capacitance value, the more sensitive it is. The highest sensitivity is achieved without connecting capacitors. Sensitivity adjustments must be made based on the actual PCB application. For conventional applications, it is not necessary to connect them. Capacitors with smaller temperature coefficients and greater stability, such as X7R and NPO, must be selected.
7. Resistors R0-R3 are mainly used to effectively prevent radio frequency interference and enhance anti-static capability. The common values range from 470R to 1K, with a maximum not exceeding 10K. Resistors should be placed as close as possible to the chip. For conventional applications, they can be omitted.

8 Electrical Characteristics

Absolute Maximum Ratings

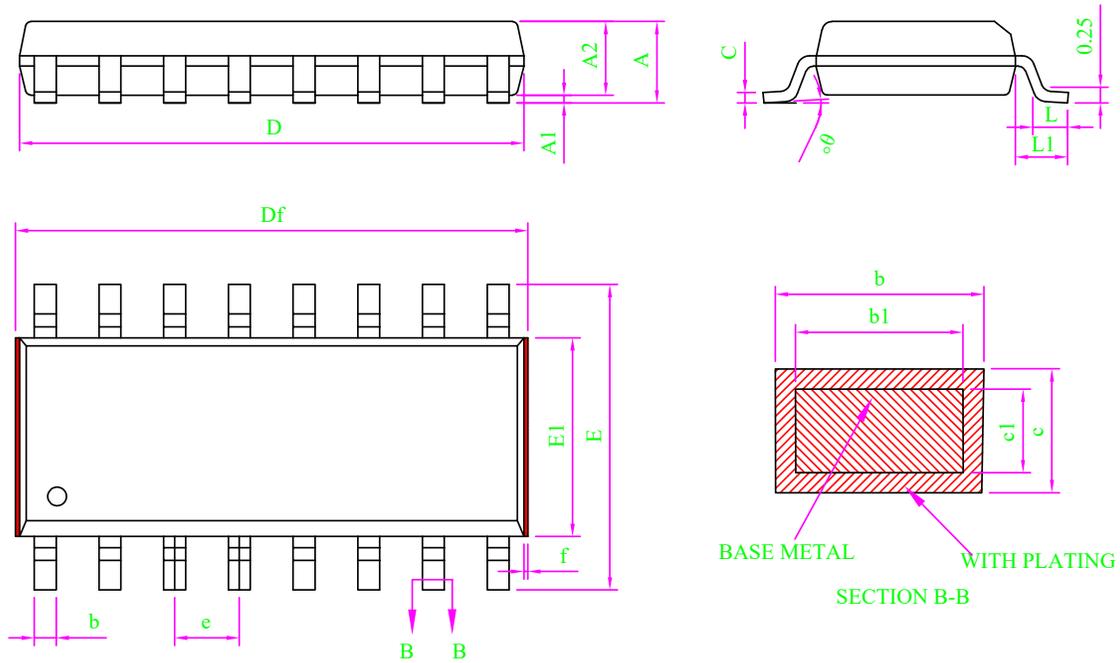
Parameter	Symbol	Ratings	Unit
Power Voltage	VDD	-0.3~6.0	V
Input Voltage	V _{IN}	GND-0.3~VDD+0.3	V
Storage Temperature	T _{STG}	-50~+125	°C
Operating Temperature	T _{OTG}	-40~+85	°C
Human Body Mode	ESD	≧4	KV

8.1 DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions (25 °C)	
						VDD	Conditions
Operating voltage	VDD	2.4	3.0	5.5	V	—	—
Operating current	I _{OP}	—	20	40	μA	3.0V	CS=10nF
		—	30	60		5.0V	
Standby current	I _{ST}	—	7	14	μA	3.0V	CS=10nF
		—	14	28		5.0V	
Output sink current	I _{IL}	—	10	—	mA	3.0V	V _{OL} =0.5V
		—	14	—		5.0V	
Output source current	I _{OL}	—	-6	—	mA	3.0V	V _{OH} =2.8V
		—	-9	—		5.0V	V _{OH} =4.5V
Input low voltage	V _{IL}	—	—	0.2	VDD	VDD	Input low voltage
Input high voltage	V _{IH}	0.8	—	1	VDD	VDD	Input high voltage
Input the pull-up resistor	R _{PH}	—	30k	—	ohm	3.0V	VDD=3V
Input the pull-down resistor	R _{PL}	—	25k	—	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

9 Package Information

9.1 SOP16(9.9mm x 3.9mm PP=1.27mm)



Note:

- All dimension are in mm.
Dim D&E1 does not include plastic flash; Df includes plastic flash(f);
Flash: Plastic residual around body edge after de junk/singulation.
- Dim b does not include dambar protrusion/intrusion.
- Plating thickness 0.007mm-0.020mm

MILLIMETER			
SYMBOL	MIN	NOM	MAX
A	-	-	1.75
A1	0.10	0.15	0.20
A2	1.35	1.45	1.55
b	0.39	-	0.47
b1	0.38	0.41	0.43
c	0.20	-	0.25
c1	0.19	0.20	0.21
D	9.80	9.90	10.00
Df	9.90	-	10.40
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.51	0.66	0.81
L1	0.95	1.05	1.15
θ	0	-	8°
f	0.05	-	0.20

10 Disclaimer

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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	2025-12-22	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/>