永嘉微电
Vinka Microelectronics

VKD104CR-3H Datasheet

3-channel touch 1-to-1 output

Rev.1.2

1 General Description

The VKD104CR-3H is a 3-channel touch detection chip, specifically designed to replace traditional mechanical buttons. The chip features low power consumption, wide operating voltage range and stable touch detection performance, and can be widely adapted to various application scenarios. It integrates an internal voltage stabilizing circuit to provide stable power supply for the detection module, and the size of the touch pad can be flexibly adjusted according to the sensitivity requirements.

This chip has a high degree of integration and requires very few peripheral components. Its internal special circuit design endows it with a high power supply rejection ratio, effectively preventing accidental touches and ensuring high reliability even in complex environments.

2 Key Features

- Operating voltage: 2.4-5.5V
- Operating current 13.0μA@VDD=3.0V
  Standby current 2.5μA@VDD=3.0V
- Built-in dedicated voltage stabilizing circuit for touch detection
- The response time is approximately 60ms @VDD=3V
- The sensitivity can be adjusted by an external capacitor (1 to 60pF)
- Built-in key debouncing, no need for external software to debouncing again
- The touchless 8S has entered standby mode
- The maximum output time for valid keys is 16 seconds
- Pins Q0-Q1 are CMOS outputs
  Direct output, high level effective, supports multi-key touch
- After power-on, there is approximately 0.5 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
- The static electricity of HBM is greater than 5KV
- Available Packages:
  SOP8(150mil)(4.9mm x 3.9mm PP=1.27mm)

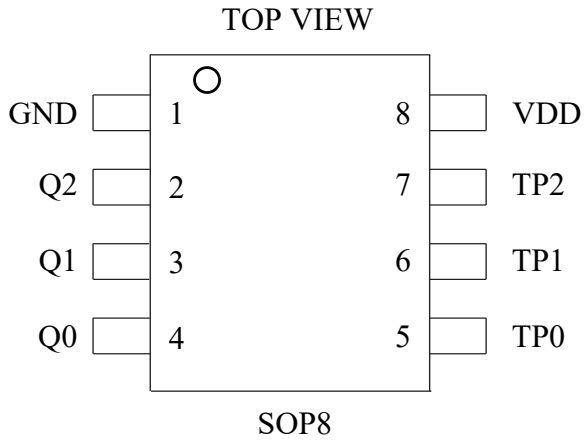
3 Product Selection

Part No.	Touch Channel	Working Voltage	Normal Mode/Standby	Output (/ Optional parameter)	Packaging
VKD232C	2	2.4-5.5V	4.0μA/2.5μA(3V)	Direct output Low level effective	SOT23-6L
VKD104CR	2	2.4-5.5V	13.0μA/2.5μA(3V)	Direct/latch high/low level	SOP8
VKD104CR-3H	3	2.4-5.5V	13.0μA/2.5μA(3V)	Directly output a high level and hold for 16 seconds to reset	SOP8
VKD104CC	4	2.4-5.5V	13.0μA/2.5μA(3V)	Direct/latch high/low level multi-key/ single key CMOS/ Open drain, long press to keep output/Long press for 16 seconds to reset	SOP16
VKD104CB	4	2.4-5.5V	13.0μA/2.5μA(3V)	Direct/latch high/low level multi-key/ single key CMOS/ Open drain, long press to keep output/Long press for 16 seconds to reset	SSOP16
VKD104	4	2.4-5.5V	13.0μA/2.5μA(3V)	Direct/latch high/low level multi-key/ single key CMOS/ Open drain, long press to keep output/Long press for 16 seconds to reset	DICE

4 Ordering Information

Part No.	Packaging	Tube Qty	Tray(reel)Qty	Box Qty	Total Qty	Notes
VKD232C	SOT23-6L		3000/reel	30000/box	120000 PCS	
VKD104CR	SOP8	100/tube		10000/box	100000 PCS	
VKD104CR-3H	SOP8	100/tube		10000/box	100000 PCS	
VKD104	DICE		400/tray	2000/box	4000 PCS	
VKD104CC	SOP16	50/tube		5000/box	50000 PCS	
VKD104CB	SSOP16	100/tube		10000/box	100000 PCS	

5 Package Pinout Information(SOP8)



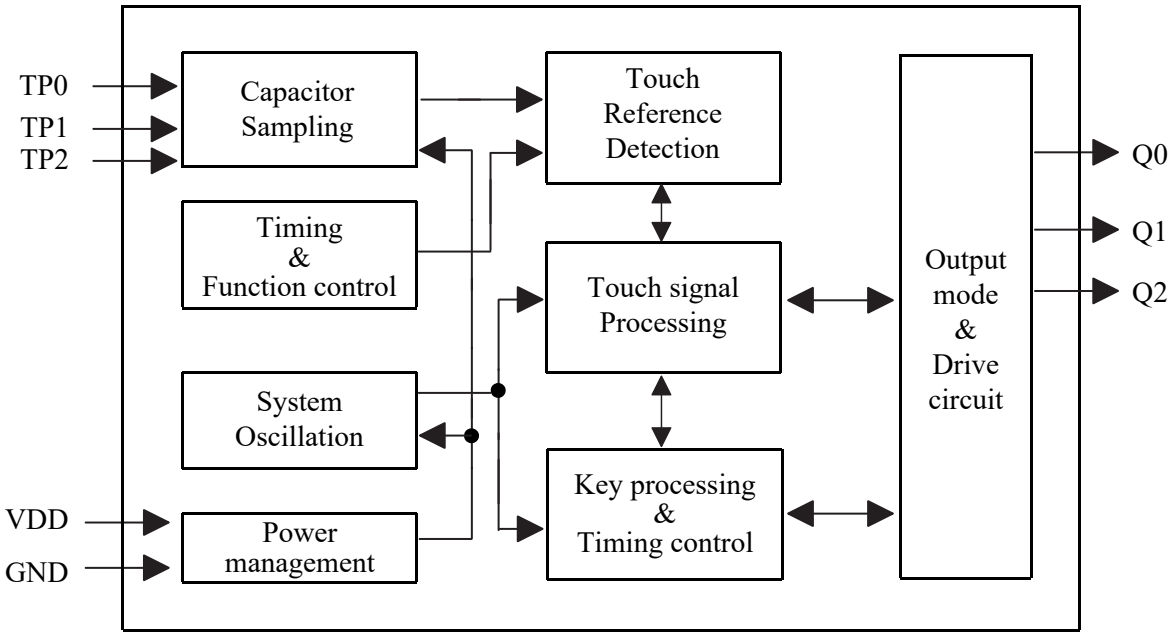
For more information: Page 9

5.1 VKD104CR-3H/SOP8 Pin Description

No.	Name	I/O	Function Description
1	GND	GND	Negative power supply
2	Q2	O	Touch output, high level effective
3	Q1	O	Touch output, high level effective
4	Q0	O	Touch output, high level effective
5	TP0	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-60pF), and it is most sensitive when not connected
6	TP1	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-60pF), and it is most sensitive when not connected
7	TP2	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-60pF), and it is most sensitive when not connected
8	VDD	VDD	Positive power supply

6 Functional Description

6.1 Block Diagram

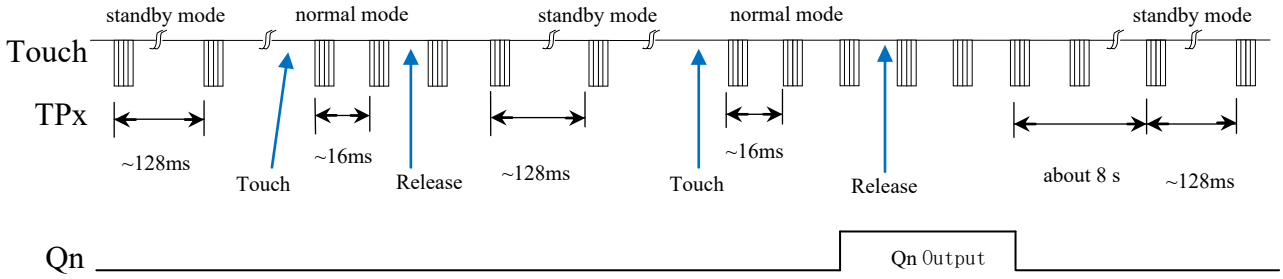


6.2 Output Parameters

The VKD104CR-3H has an output range of Q0 to Q2, supports multi-key touch, direct CMOS output, and is effective at high levels.

6.3 Operating Mode

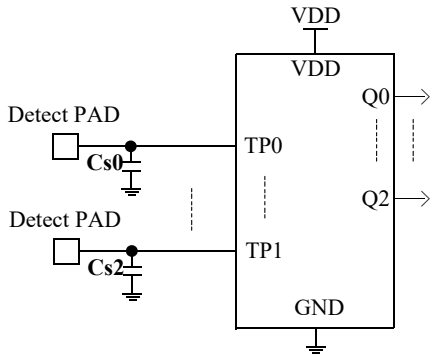
The VKD104CR-3H chip has two Operating modes: standby mode and normal mode. The key was touched and switched to the normal mode. The keyless touch 8S automatically enters standby mode to reduce power consumption. When VDD=5V, the Qn output response is approximately 160 milliseconds in standby mode and about 60 milliseconds in normal mode.



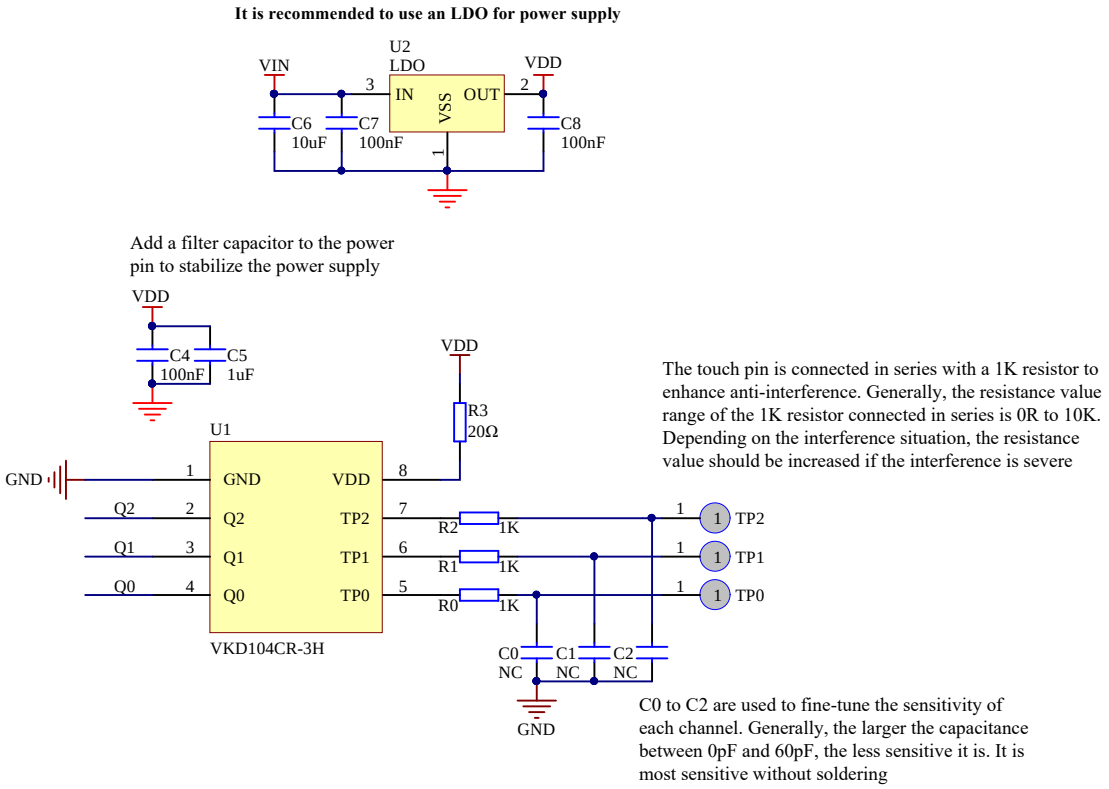
6.4 Sensitivity Adjustment

The size of the detection PAD connected on the PCB and the total load of the capacitance (parasitic capacitance and Cs capacitance) will affect the sensitivity. The sensitivity adjustment needs to be made according to the actual application.

The following are some methods for externally adjusting the sensitivity:
1. Adjust the size of the detection PAD
Under the condition that other factors remain unchanged, using a larger detection PAD size can increase the sensitivity; conversely, it will decrease the sensitivity. However, the detection PAD size must be used within the effective range.
2. Adjust the thickness of the medium (casing)
Under the condition that other factors remain unchanged, using a thinner medium can increase sensitivity, while the opposite will reduce it. However, the thickness of the medium must be below the maximum limit value.
3. Adjust the Cs capacitance value (please refer to the figure below)
Under the condition that other factors remain unchanged, the sensitivity is the highest when a Cs capacitor is not connected to GND on the touch PAD. The Cs capacitor is within the available range ($1 \leq Cs \leq 60pF$), and the larger the value of the Cs capacitor, the lower the sensitivity.



7 Application Circuits



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. Fine-tune the sensitivity of capacitors C0-C2(0~60oF) 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 capacitors. Capacitors with smaller temperature coefficients and greater stability, such as X7R and NPO, must be selected.
6. Resistors R0-R2 are mainly used to effectively prevent radio frequency interference and enhance anti-static capabilities. The commonly used values range from 470R to 1K, with a maximum not exceeding 10K. They can be omitted in conventional applications.

8 Electrical Characteristics

Absolute Maximum Ratings

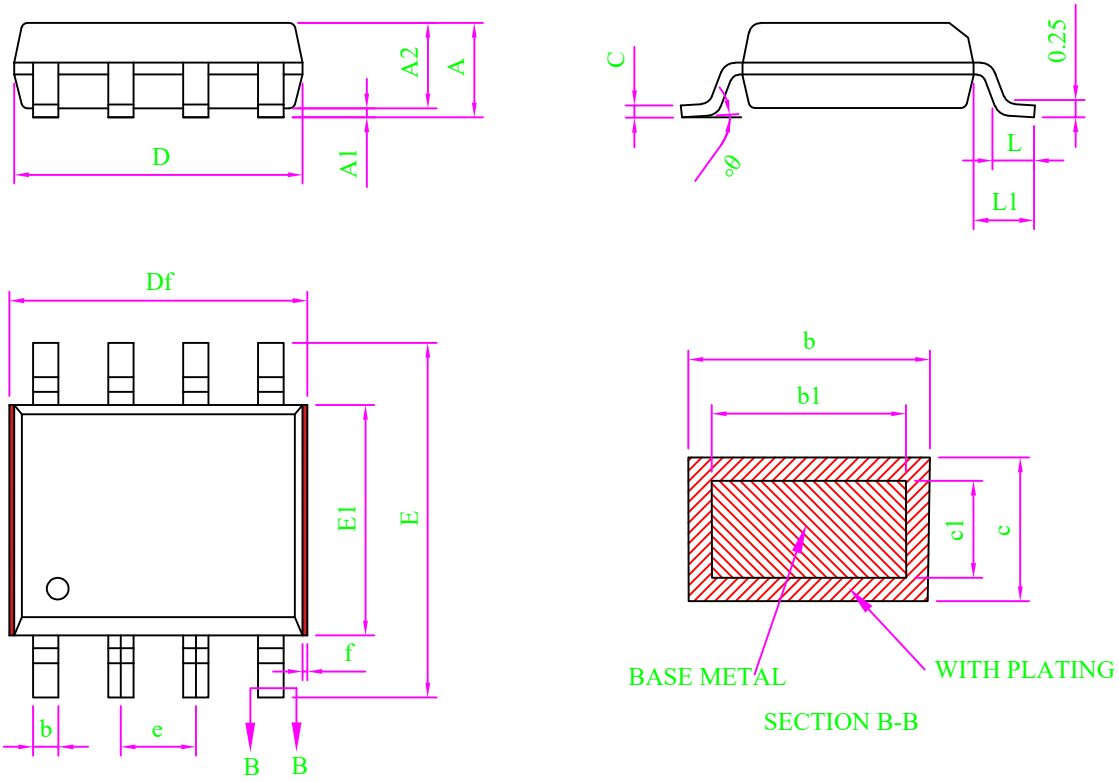
Parameter	Symbol	Ratings	Unit
Power Voltage	VDD	-0.3～6.0	V
Input Voltage	V_{IN}	GND-0.3～VDD+0.3	V
Storage Temperature	T_{STG}	-50～+125	℃
Operating Temperature	T_{OTG}	-40～+85	℃
Human Body Mode	ESD	≧5	KV

8.1 DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions(25 ℃)	
						VDD	Conditions
Operating voltage	VDD	2.4	—	5.5	V	—	Internal voltage stabilization enabling
Standby current	IST	2.2	2.3	2.4	V	—	—
Operating current	IOP	—	13	—	μA	3.0V	Working mode, VDD=3V
Standby current	IST	—	2.5	—	μA	3.0V	Standby mode, VDD=3V
Input low voltage	VIL	0	—	0.2	VDD	—	Input low voltage
Input high voltage	VIH	0.8	—	1	VDD	—	Input high voltage
Output sink current	VIL	—	0.8	—	mA	3.0V	VDD=3V, VOL=0.6V
Output source current	VOL	—	-4.0	—	mA	3.0V	VDD=3V, VOH=2.4V
Output response time	TR	—	60	—	mS	3.0V	Operating mode
		—	160	—		3.0V	Standby mode

9 Package Information

9.1 SOP8(150mil)(4.9mm x 3.9mm PP=1.27mm)



SYMBOL	MILLIMETER		
	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	4.78	4.88	4.98
Df	4.93	-	5.33
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.51	0.66	0.81
L1	0.95	1.05	1.15
θ	0	-	8°
f	0.05	-	0.20

10 Disclaimer

Warranty and liability —— The information provided in this document is believed to be accurate and reliable. However, Shenzhen Vinka Microelectronics Co., Ltd. (hereinafter "the Company") makes no warranties, express or implied, as to the completeness or suitability of this information for any specific purpose.

In no event shall the Company be liable for any indirect, incidental, or consequential damages, including but not limited to loss of profits, equipment damage, or system failure, arising out of the use of this product or documentation, regardless of the legal theory under which such liability is asserted.

Right to change —— The Company reserves the right to modify any information contained herein without prior notice. The latest version of this document is available at: https://www.szvinka.com/

Applicability —— This product is not designed or intended for use in life-critical, medical, or safety systems where failure could result in injury or death. The customer shall assume full responsibility for any such use.

Application —— All product application descriptions provided herein are intended for illustrative purposes only.
The Company makes no representations or warranties, express or implied, regarding the suitability of any specific application without further testing or modification.

The customer is solely responsible for determining whether the Company's products are appropriate for their intended applications or end customers.

The customer shall ensure proper design practices, implementation safeguards, and operational validation to minimize risks associated with product use.

The Company shall not be held liable for any defects, losses, costs, or damages arising from weaknesses or failures in the customer's own products or applications, or from the integration or use of third-party products.

Furthermore, the customer shall conduct all necessary testing and validation for any third-party deployment of the Company's products to avoid potential misuse or associated damages. The Company assumes no liability in this regard.

Commercial terms of sale —— Unless otherwise agreed in writing, sales of this product are subject to the Company's standard terms and conditions of sale. The Company expressly rejects the applicability of the customer's general terms and conditions.

Export control—— This product may be subject to applicable export control regulations. The customer is solely responsible for compliance with such regulations, including obtaining any necessary export licenses.

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	2025-11-26	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/