Features

- Operating voltage: 2.2-5.5V
- Standby current:10uA/3.0V
- Power-On Reset（POR）
- Low Voltage Reset（LVR）
- Auto-calibration Function
- Reliable touch key detection
- No touch 4S to enter standby mode
- Reliable detection of water even before power up
- 8 point water level detection
- I2C output+INT interrupt pin
- Any channel has water OUT_FLAG output signal
- OPT pin selects the output level on power-on: level- high or level- low
- Sensitivity adjustment using an external capacitor(1-47nF） on CS pin
- Anti-voltage fluctuation，High anti-interference
- Can use metal probe to touch water detection, also can detect signal outside the water tank without touching water

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

1 General Description

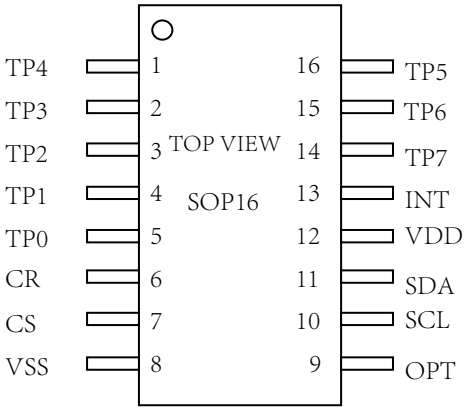
VK36W8I is a touch pad detector IC which offers 8 touch key,It can detect 8 points water level. The high level of device integration enable applications to be implemented with a minimum number of external components.

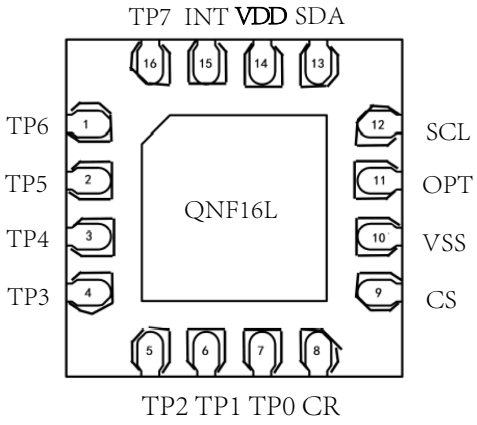
It provides I2C output， 1 INT interrupt output pin. Special internal circuitry is also employed to ensure excellent power noise rejection to reduce the possibility of false detections, increasing the touch switch application reliability under adverse environmental conditions.

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 detect 8 point water level operation in a wide variety of applications.

2 Pinouts and pin description

2.1VK36W8I SOP16 /QFN16L Pin Assignment



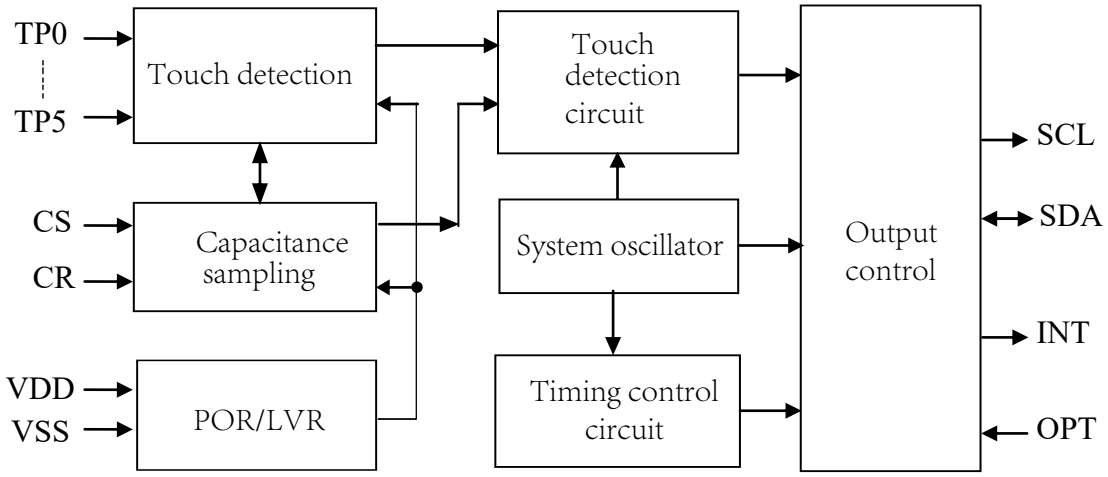


2.2 VK36W8I SOP16/QFN16L Pin Description

Pin name		I/O	Function Description
QFN16L	SOP16		
3-TP4	1-TP4	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
4-TP3	2-TP3	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
5-TP2	3-TP2	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
6-TP1	4-TP1	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
7-TP0	5-TP0	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
8-CR	6-CR	IN	Reference capacitance
9-CS	7-CS	IN	Capacitance detection,the larger the capacitance the higher the sensitivity(1-47nF)
10-VSS	8-VSS	VSS	Negative power supply
11-OPT	9-OPT	IN	Selects the output level： floating-- I2C/SDA pin output high，GND--I2C/SDA output low
12-SCL	10-SCL	IN	Serial Clock Input pin for I2C
13-SDA	11-SDA	I/O	Serial Data Input/Output pin for I2C
14-VDD	12-VDD	VDD	Positive power supply
15-INT	13-INT	OUT	Interrupt output pin，output high level when power on
16-TP7	14-TP7	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
1-TP6	15-TP6	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity
2-TP5	16-TP5	IN	Touch key input pin，Add a capacitor（0-50pF） to a touch key pin can fine tune the sensitivity

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 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.

3.4 Operating Mode

There are two operating modes for VK36N8I， the normal mode and the standby mode.

After the system is powered on, it immediately detects whether there is water or not.

Detected as anhydrous, and it will automatically enter standby mode after 4S.

Detect that any channel has water, switch to normal mode;

Detect any channel from no water to water, the INT pin outputs a 20ms low pulse signal;

Detect any channel from water to no water, the INT pin outputs a 20ms low pulse signal;

OPT Options:

OPT	Select output active level
VSS	I2C & INT output low level; When there is no water to water, the INT pin outputs a 20ms high pulse; When there is water to no water, the INT pin outputs a 20ms high pulse.
NC	I2C & INT output high level; When there is no water to water, the INT pin outputs a 20ms low pulse; When there is water to no water, the INT pin outputs a 20ms low pulse.

Data Format: INT+I2C data key value.

When the Clock pin receives the clock signal, the touch chip will generate an 8-bit data byte and shift it out from the Data pin.TP0 corresponds to bit0 of the first byte, and TP7 corresponds to bit7 of the first byte.

OPT NC when powered on					
Touch pin	I2C data key value B7 B6 B5 B4 B3 B2 B1 B0	INT	Touch pin	I2C data key value B7 B6 B5 B4 B3 B2 B1 B0	INT
TP0 Touch	1 1 1 1 1 1 1 0	0	TP0 Release	1 1 1 1 1 1 1 1	1
TP1 Touch	1 1 1 1 1 1 0 1	0	TP1 Release	1 1 1 1 1 1 1 1	1
TP2 Touch	1 1 1 1 1 0 1 1	0	TP2 Release	1 1 1 1 1 1 1 1	1
TP3 Touch	1 1 1 1 0 1 1 1	0	TP3 Release	1 1 1 1 1 1 1 1	1
TP4 Touch	1 1 1 0 1 1 1 1	0	TP4 Release	1 1 1 1 1 1 1 1	1
TP5 Touch	1 1 0 1 1 1 1 1	0	TP5 Release	1 1 1 1 1 1 1 1	1
TP6 Touch	1 0 1 1 1 1 1 1	0	TP6 Release	1 1 1 1 1 1 1 1	1
TP7 Touch	0 1 1 1 1 1 1 1	0	TP7 Release	1 1 1 1 1 1 1 1	1
Note: I2C data at power-on=1111 1111 INT pin output level=1					

Connect OPT to GND when powered on					
Touch pin	I2C data key value B7 B6 B5 B4 B3 B2 B1 B0	INT	Touch pin	I2C data key value B7 B6 B5 B4 B3 B2 B1 B0	INT
TP0 Touch	0 0 0 0 0 0 0 1	1	TP0 Release	0 0 0 0 0 0 0 0	0
TP1 Touch	0 0 0 0 0 0 1 0	1	TP1 Release	0 0 0 0 0 0 0 0	0
TP2 Touch	0 0 0 0 0 1 0 0	1	TP2 Release	0 0 0 0 0 0 0 0	0
TP3 Touch	0 0 0 0 1 0 0 0	1	TP3 Release	0 0 0 0 0 0 0 0	0
TP4 Touch	0 0 0 1 0 0 0 0	1	TP4 Release	0 0 0 0 0 0 0 0	0
TP5 Touch	0 0 1 0 0 0 0 0	1	TP5 Release	0 0 0 0 0 0 0 0	0
TP6 Touch	0 1 0 0 0 0 0 0	1	TP6 Release	0 0 0 0 0 0 0 0	0
TP7 Touch	1 0 0 0 0 0 0 0	1	TP7 Release	0 0 0 0 0 0 0 0	0
Note: I2C data at power-on=0000 0000 INT pin output level=0					

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 VK36W8I 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. The sensitivity can be adjusted by adjusting the capacitance of CR pin. The lower the capacitance value, the higher the sensitivity. （Generally, 1-10 pF capacitor is used.）

V. Capacitor to a touch key pin
Add a capacitor（0-50pF） to a touch key can fine tune the sensitivity for single key. The greater the capacitance, the more sensitive.

Panel Thickness （Acrylic or Glass）	CS value （only reference）
<3mm	6.8nF/25V
3-6mm	10nF/25V
6-10mm	22nF/25V

4 I2C Serial Interface

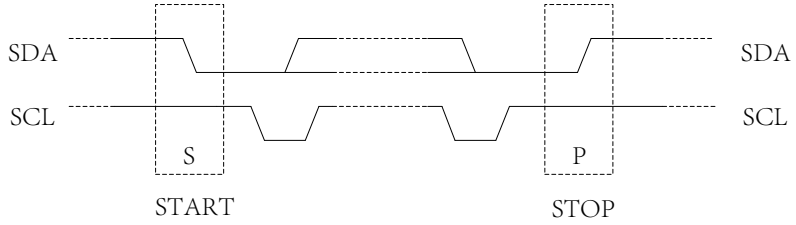
The device supports I2C serial interface. The maximum communication speed is 400kbit/S.

The two lines are a serial data line, SDA, and a serial clock line, SCL. Both lines are required external pull-up resistors.

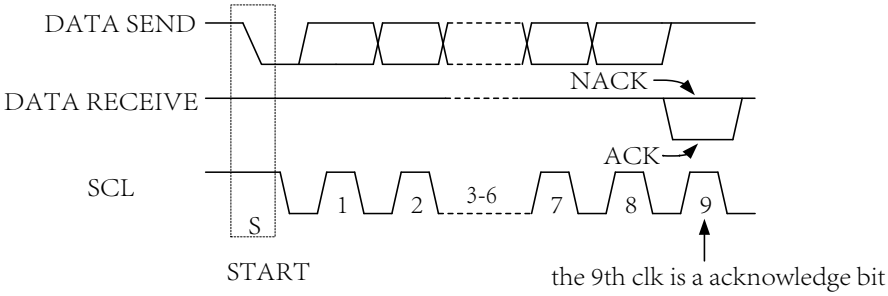
When the bus is free, both lines are high level. When the SCL signal is high level, Start to work or restart when the SDA signal changes from high level to low level. When the SCL signal is high level, It stops working when the SDA signal changes from low level to high level.

The level on the SDA port can only be changed when the SCL signal is low.

START and STOP



Acknowledge

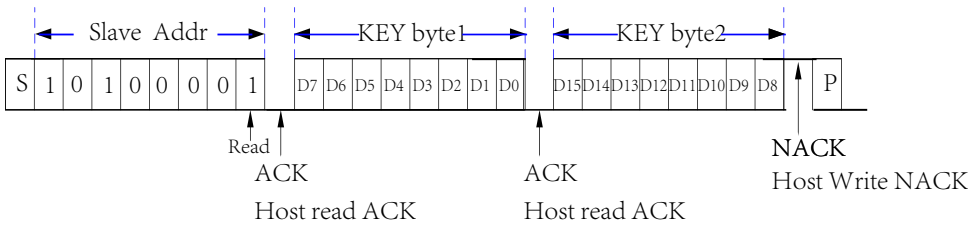


Slave Address

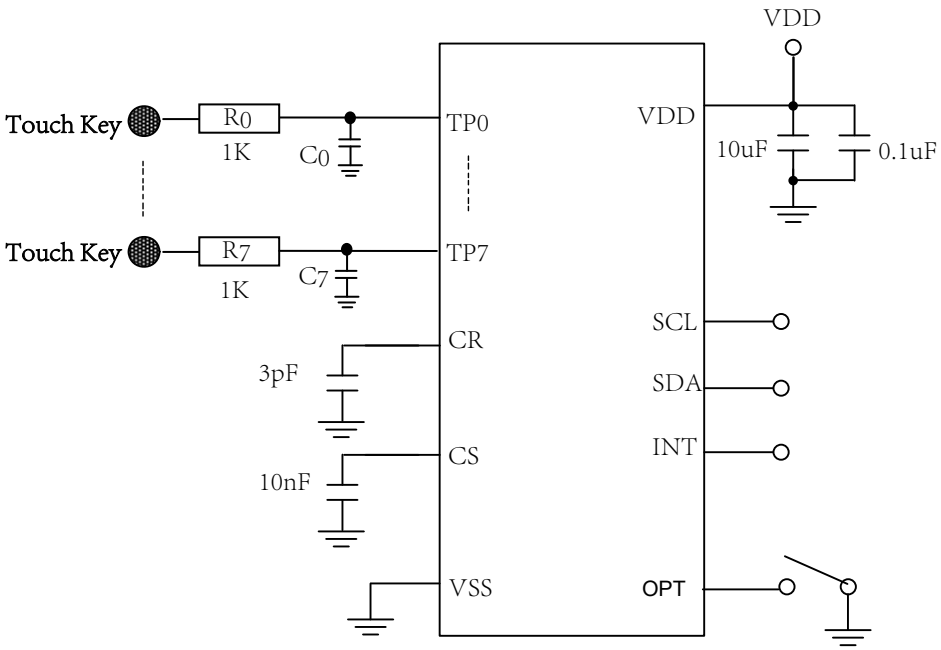
(0xA1) bit0.. Read

1	0	1	0	0	0	0	1

Read a byte key value:



5 Application Circuits



6 Electrical characteristics

6.1 Absolute Maximum Ratings

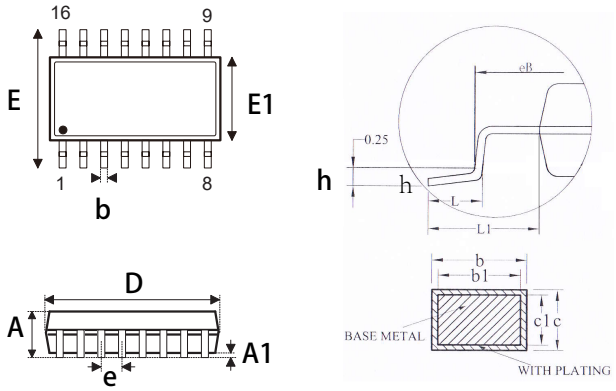
Item	Symbol	Ratings	Unit
Power voltage	VDD	-0.3～6.0	V
Input Voltage	VIN	V_{SS}-0.3～V_{DD}+0.3	V
Storage Temperature	TSTG	-50～+125	℃
Operating Temperature	TOTG	-40～+85	℃
Human Body Mode	ESD	4KV-8KV(Class 3A)	KV

6.2 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
INT pull-up resistor	R_{PH}	—	60k	—	ohm	3.0V	VDD=3V
Output Response Time	T_R		125	—	mS	3.0V	normal mode
		—	125	—		5.0V	normal mode
		—	150	—	mS	3.0V	standby mode
		—	150	—		5.0V	standby mode

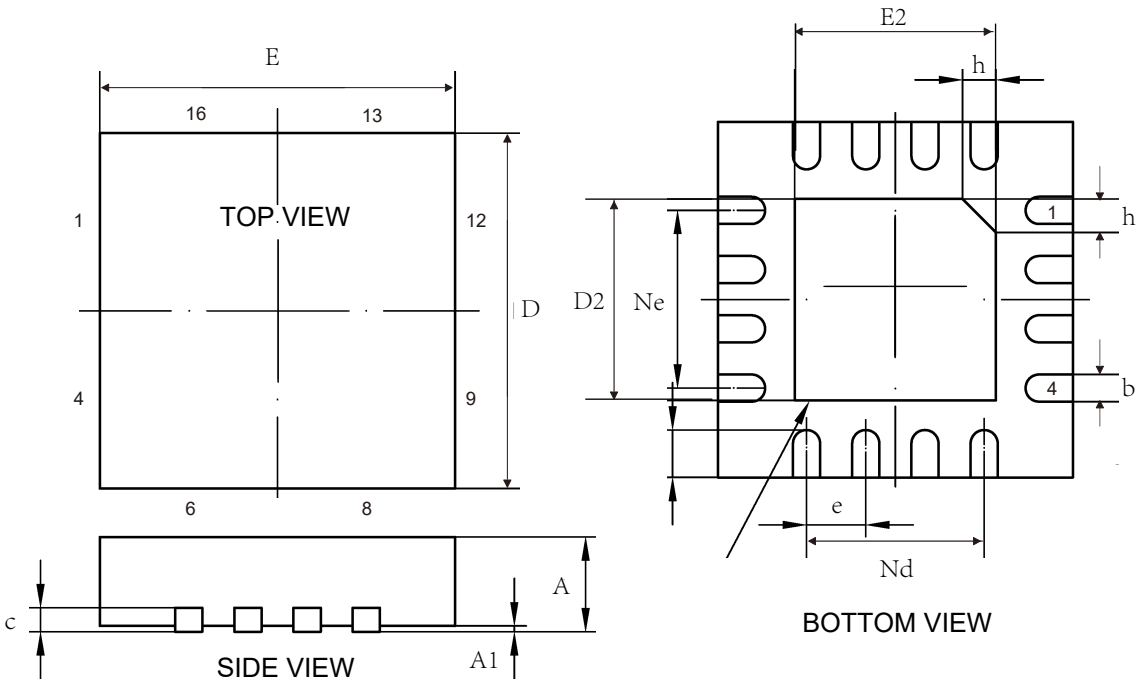
7 Package Information

7.1 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		

7.2 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

8 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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