永嘉微电
Vinka Microelectronics

VK36N7I Datasheet

7-channel touch I2C output

Rev.1.2

1 General Description

VK36N7I is a 7-channel touch detection chip designed to detect touch actions on external capacitive keys. With high integration, it requires only minimal external components to implement touch detection.

The chip supports I2C communication, includes one INT interrupt output pin, and allows selection of the active output level via an IO pin. Its internal specialized circuit design provides a high power supply rejection ratio, effectively preventing false triggering and ensuring high reliability even in challenging environments.

Equipped with features such as auto-calibration, low standby current, and voltage fluctuation resistance, the chip offers a simple and efficient solution for applications requiring touch keys with I2C 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
- I2C output with INT interrupt pin
- Supports multi-key simultaneous touch detection
- Anti - misoperation function: maximum valid key output duration is 13 seconds
- Enters standby mode if no touch is detected for 4 seconds
- Overall sensitivity adjustable via a capacitor connected to the CS pin (1–47nF)
- Individual touch channel sensitivity fine-tunable with a small capacitor to ground (0–50pF)
- 0.3-second stabilization period after power-up; touch detection is disabled during this interval
- Automatic baseline calibration when no touch is detected after power-up
- Excellent voltage fluctuation tolerance and strong anti-interference performance
- Available Packages:
  SOP16(150mil)(9.9mm x 3.9mm PP=1.27mm)
  QFN16L(3.0mm x 3.0mm PP=0.5mm)

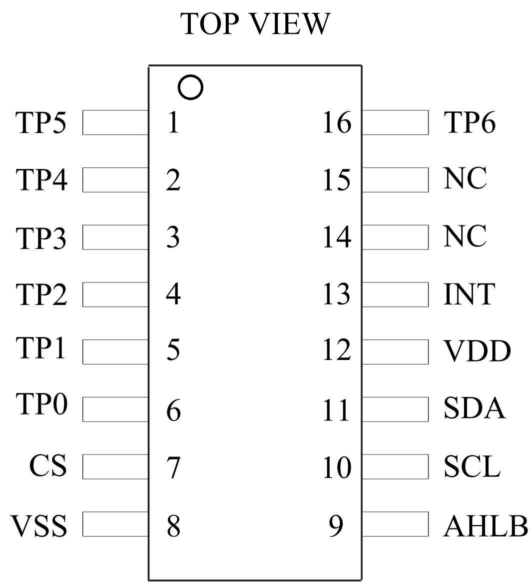
3 Product Selection

Part No.	Voltage/Standby Current	Output	Packaging
VK36N4I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N5I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N6I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N7I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N8I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N9I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N10I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L

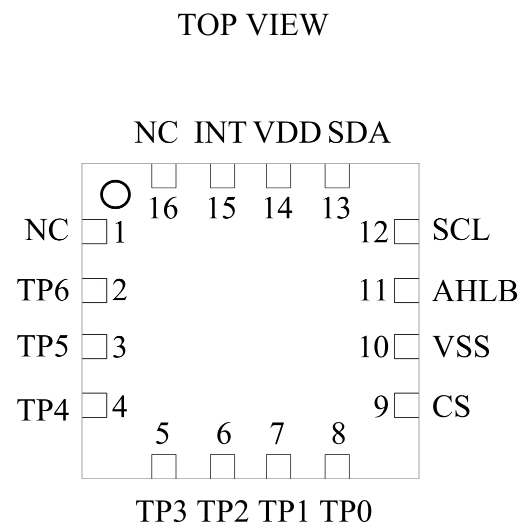
4 Ordering Information

Part No.	Packaging	Tube Qty	Tray(reel)Qty	Box Qty	Total Qty	Notes
VK36N4I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N5I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N6I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N7I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N8I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N9I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N10I	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	

5 Package Pinout Information(SOP16/QFN16L)



SOP16



QFN16L

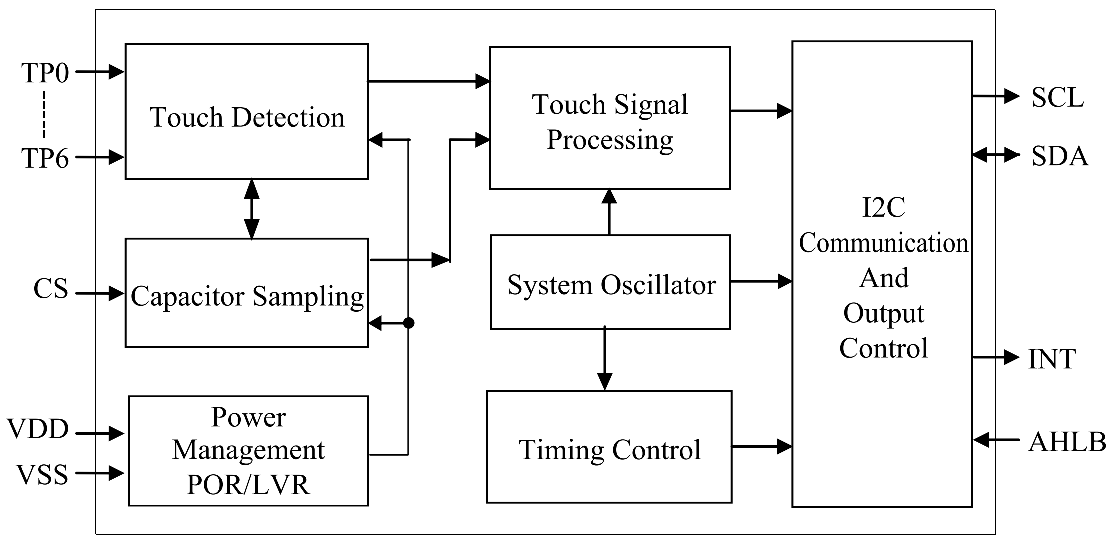
For more information: Page 13-14

5.1 VK36N7I/SOP16/QFN16L Pin Description

Pin Names		I/O	Function Description
SOP16	QFN16L		
1-TP5	3-TP5	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
2-TP4	4-TP4	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
3-TP3	5-TP3	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
4-TP2	6-TP2	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
5-TP1	7-TP1	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
6-TP0	8-TP0	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected
7-CS	9-CS	I	Sensitivity adjustment, connect to ground capacitor (1-47nF)
8-VSS	10-VSS	VSS	Negative power supply
9-AHLB	11-AHLB	I	Select the output level: Open -> low level effective, VSS-> high level effective
10-SCL	12-SCL	I	The I2C serial clock pin requires an external pull-up resistor
11-SDA	13-SDA	I/O	The I2C serial data input/output pins need to be connected to an external pull-up resistor
12-VDD	14-VDD	VDD	Positive power supply
13-INT	15-INT	O	Touch state output and open-drain output require an external pull-up resistor
14-NC	16-NC	—	——
15-NC	1-NC	—	——
16-TP6	2-TP6	I	Touch input: Connect a small capacitor to ground to fine-tune the sensitivity (1-50pF), and it is most sensitive when not connected

6 Functional Description

6.1 Block Diagram



6.2 Auto-calibration Function

After power-on, the chip will be initialized to obtain the first reference value. When there is no touch, the touch chip will automatically calibrate the reference value, allowing it to change dynamically according to the external environment.

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

6.3 Fool-proof function

To minimize the detection of unintentional key presses such as accidentally touching the sensing electrode, the chip is equipped with a maximum key press duration function internally. When a touch key is pressed, the internal timer starts to count. Once the key is pressed for too long, exceeding approximately 13 seconds, the touch chip will ignore the status of the touched key, recaliculate it, obtain a new reference value, and simultaneously reset the output status to the initial power-on state.

6.4 Resistance to voltage fluctuations

The chip is equipped with an anti-voltage fluctuation function, which can prevent the touch keys from malfunctioning due to the sudden drop in working voltage caused by the large current drive from the outside.

6.5 Output Mode

The output of VK36N7I is I2C output +INT interrupt pin. The effective output level can be selected based on the status of the AHLB pin when powered on.
The INT interrupt pin outputs the touch status. When there is a touch, the output level changes; when there is no touch, the output level returns to the power-on state.

AHLB	Select the output effective level
NC	Low level effective, power-on output 1
VSS	High level effective, power-on output 0

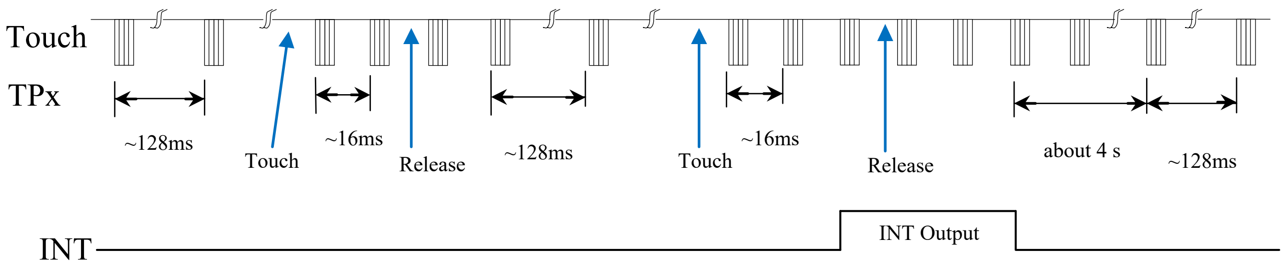
Data format: INT+I2C data key-value.

AHLB is suspended when powered on					
Touch Pin	I2C data corresponds to key values B7 B6 B5 B4 B3 B2 B1 B0	INT	Touch Pin	I2C data corresponds to key values 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
Note: When powered on, I2C data =1111 1111, INT output pin level =1					

Powering on, connect AHLB to VSS					
Touch Pin	I2C data corresponds to key values B7 B6 B5 B4 B3 B2 B1 B0	INT	Touch Pin	I2C data corresponds to key values 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
Note: When powered on, the I2C data =0000 0000 INT output pin level =0					

6.6 Working Mode

The VK36N7I 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 INT output response is approximately 160 milliseconds in standby mode and about 48 milliseconds in working mode.



6.7 Sensitivity Adjustment

The sensitivity of VK36N7I 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 I2C Communication Interface

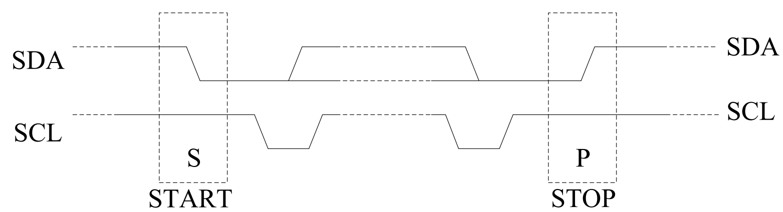
The VK36N7I has 2 communication pins, following the I2C protocol, with a maximum communication speed of 400kbit/S.

The SCL pin is the clock input pin, and the SDA pin is the serial data input/output pin. An external pull-up resistor is required.

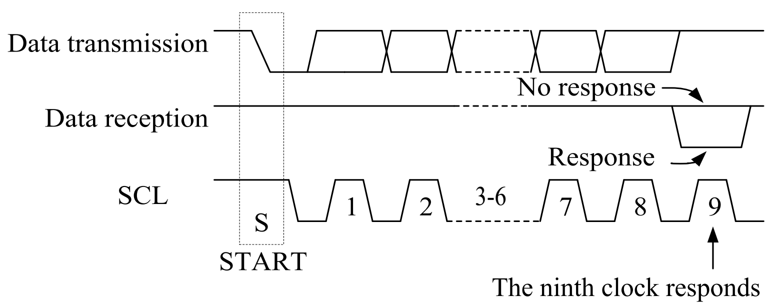
When the I2C bus is idle, both of these pins are at a high level. When the SCL signal is at a high level and the SDA signal changes from a high level to a low level, it starts to work or restarts to work. When the SCL signal is at a high level and the SDA signal changes from a low level to a high level, it stops working.

When the SCL signal is at a high level, the data on the SDA port is valid and stable. Only when the SCL signal is at a low level can the level of the SDA port be changed.

START and STOP signals



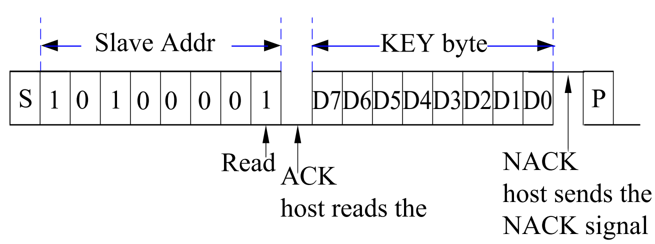
Response signal



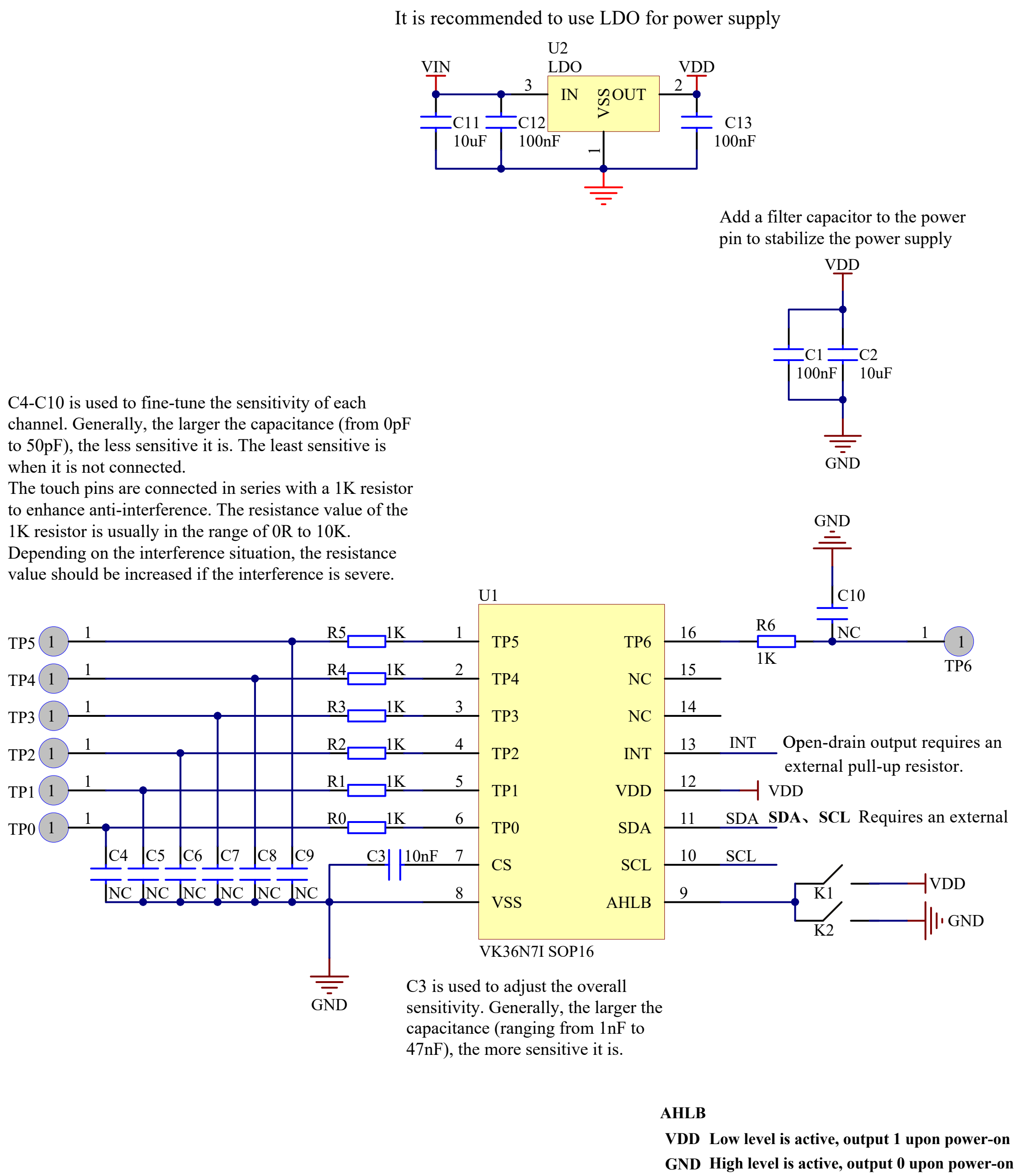
IC address
(0xA1)bit0=1read bit

1	0	1	0	0	0	0	1

Read a byte of key value:



8 Application Circuits



9 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

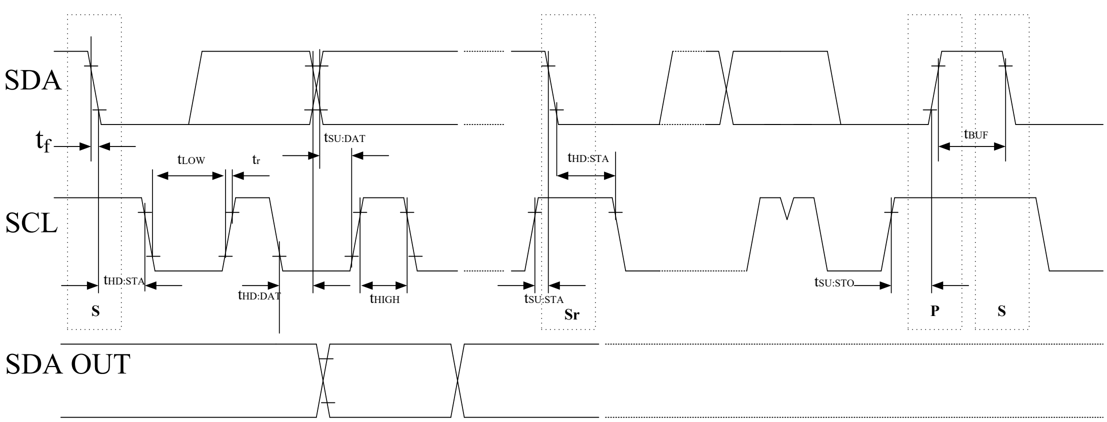
9.1 DC Electrical Characteristics

Parameter	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 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	Normal mode
		—	48	—		5.0V	Normal mode
		—	150	—	mS	3.0V	Standby mode
		—	160	—		5.0V	Standby mode

9.2 AC Electrical Characteristics

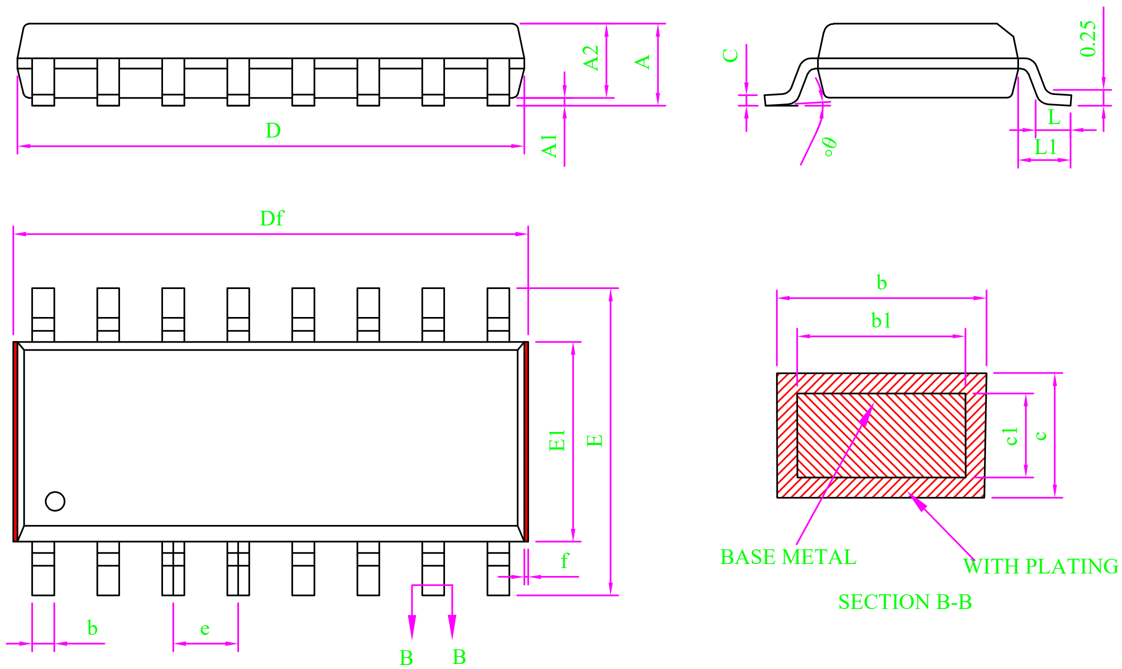
Symbol	Parameter	Min.	Max.	Unit	Test Conditions
					Conditions
f_{SCL}	Clock frequency	—	400	kHZ	—
t_{BUF}	Bus idle time	1.3	—	μs	During this period, the bus must remain idle until a new transmission begins
$t_{HD;\,STA}$	Start-up condition holding time	0.6	—	μs	After this period, the first clock pulse will be generated
t_{LOW}	SCL low-level time	1.3	—	μs	—
t_{HIGH}	SCL high-level time	0.6	—	μs	—
$t_{SU;\,STA}$	Set the time in the "Start" state	0.6	—	μs	It is only related to the repeated START signal
$t_{HD;\,DAT}$	Data retention time	0	—	μs	—
$t_{SU;\,DAT}$	Data setting time	100	—	ns	—
t_r	Rising time	—	0.3	μs	Periodic sampling
t_f	Decrease time	—	0.3	μs	Periodic sampling
$t_{SU;\,STO}$	Stop setting the time for the condition	0.6	—	μs	—
t_{AA}	The effective clock output time	—	0.9	μs	—
t_{SP}	Input filter time constant (SDA and SCL pins)	—	50	ns	Noise suppression time

I^{2}C timing



10 Package Information

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

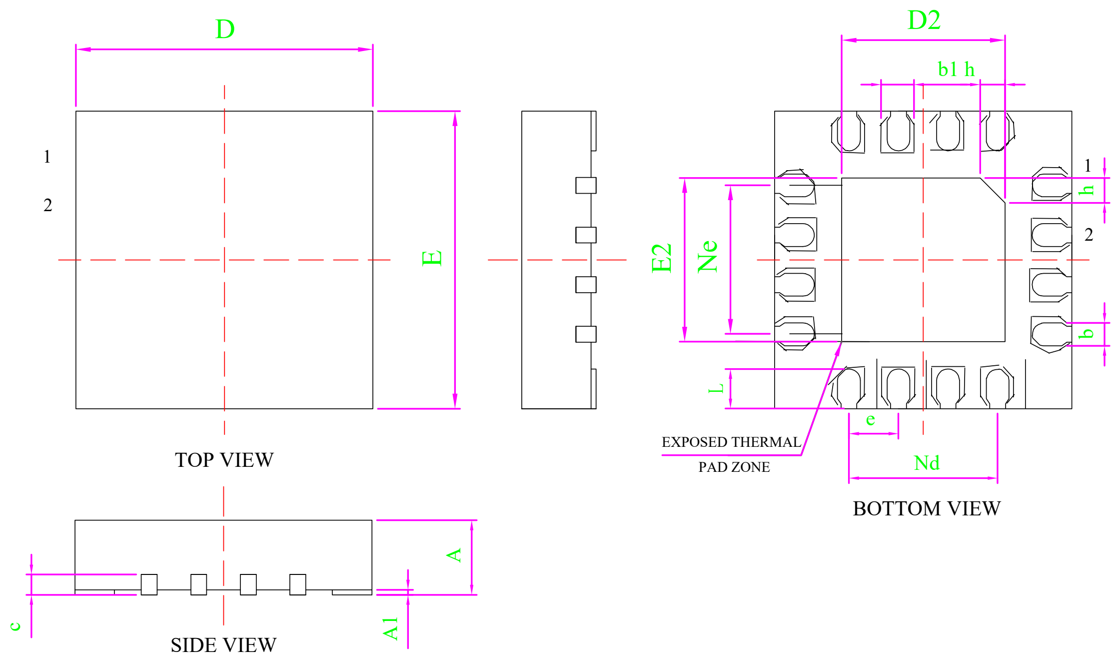


Note:

1. All dimension are in mm.
   Dim D&El does not include plastic flash； Df includes plastic flash(f);
   Flash: Plastic residual around body edge after de junk/singulation.
2. Dim b does not include dambar protrusion/intrusion.
3. 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

10.2 QFN16L(3.0mm × 3.0mm PP=0.5mm)



Dimensions			
SYMBOL	MIN	NOMINAL	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.18	0.25	0.30
b1	0.30	0.35	0.40
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	1.55	1.65	1.75
e	0.50BSC		
Ne	1.50BSC		
Nd	1.50BSC		
E	2.90	3.00	3.10
E2	1.55	1.65	1.75
L	0.35	0.40	0.45
h	0.20	0.25	0.30
L/F carrier size（miL）	75*75		

11 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.

12 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	2026-01-05	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/