永嘉微电
Vinka Microelectronics

VK36N5I Datasheet

5-channel touch I2C output

Rev.1.2

1 General Description

VK36N5I is a 5-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

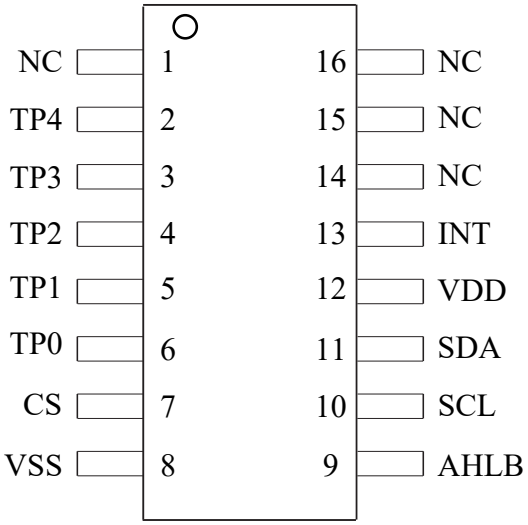
Part No.	Voltage/Standby Current	Output	Packaging
VK36N4I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N5I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N6I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N7I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L
VK36N8I	2.2V-5.5V/10μA(3V)	I2C Output	SOP16/QFN16L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

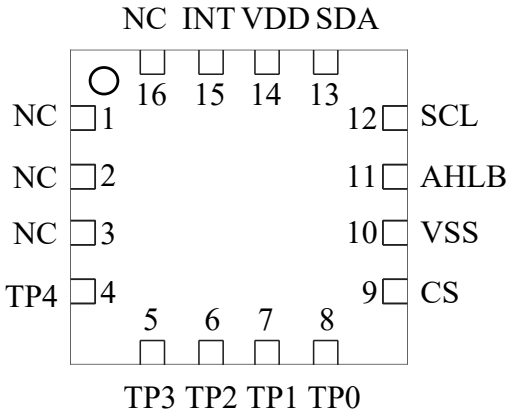
5 Package Pinout Information(SOP16/QFN16L)

TOP VIEW



SOP16

TOP VIEW



QFN16L

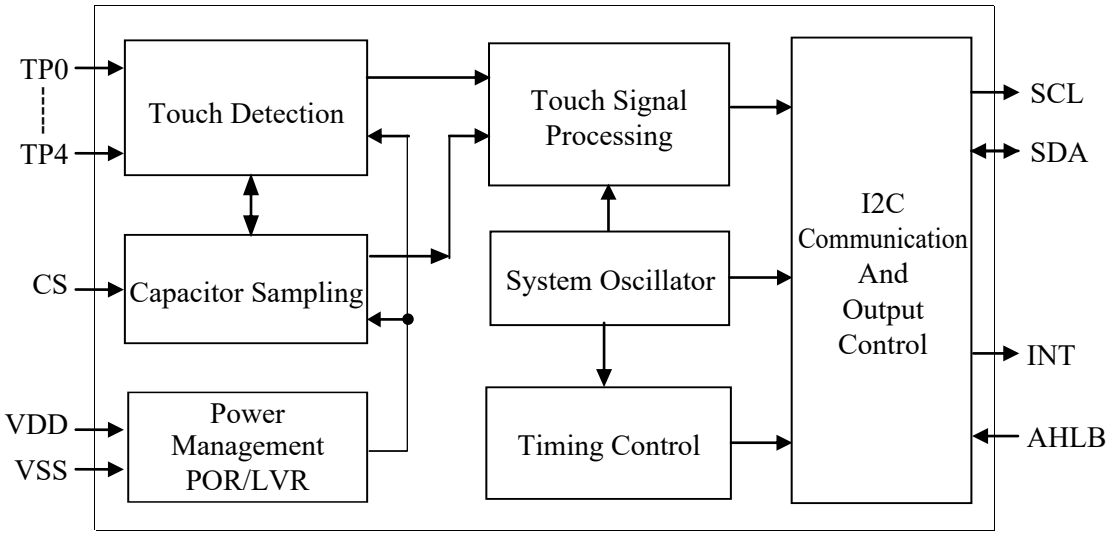
For more information: Page 12-13

5.1 VK36N5I/SOP16/QFN16L Pin Description

Pin Names		I/O	Function Description
SOP16	QFN16L		
1-NC	3-NC	—	——
2-NC	4-NC	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: Hover -> 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-NC	2-NC	—	——

6 Functional Description

6.1 Block Diagram



6.2 Automatic Calibration

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 VK36N5I 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

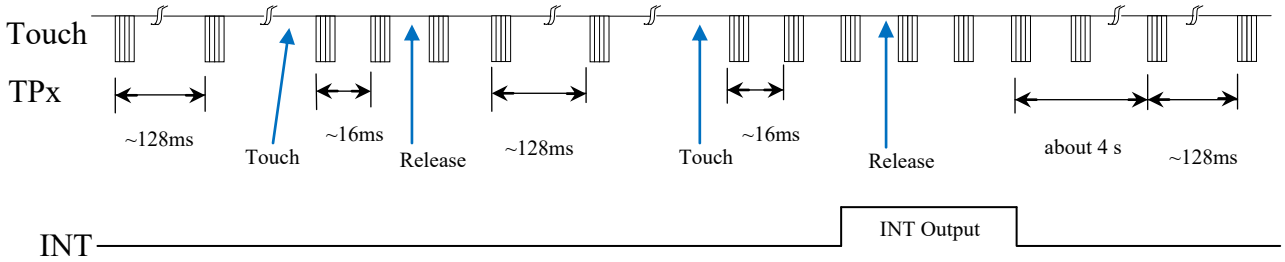
Data format: INT+I2C data key-value.

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
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
Note: When powered on, the I2C data =0000, 0000 INT output pin level =0					

6.6 Working Mode

The VK36N5I 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 VK36N5I 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

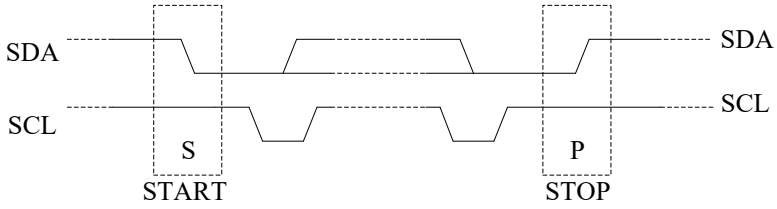
The VK36N5I has 2 communication pins, following the I2C protocol, with a maximum communication speed of 400kbit/S.

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.

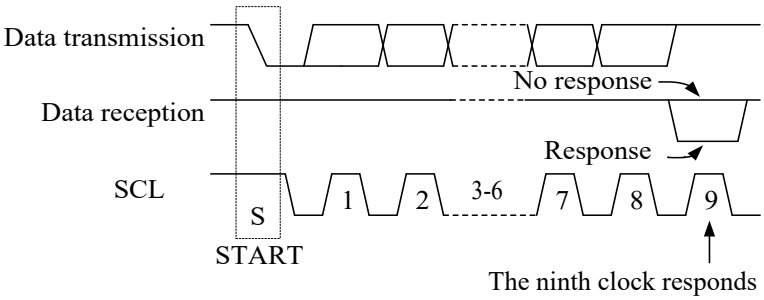
When the I2C bus is idle, both of these pins are at a high level. When the SCL signal is at a high level and the SDA signal changes from a high level to a low level, it starts to work or restarts to work. When the SCL signal is at a high level and the SDA signal changes from a low level to a high level,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



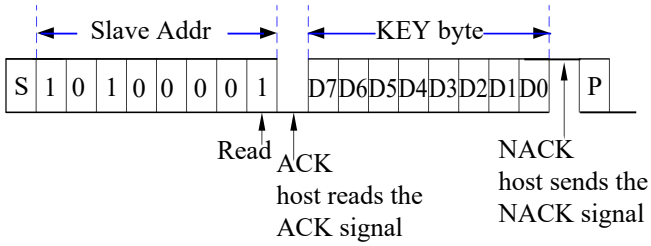
Response signal



IC address
(0xA1)bit0=1read bit

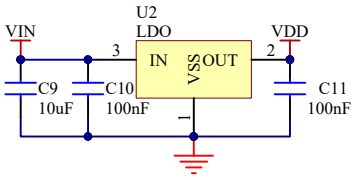
1	0	1	0	0	0	0	1

Read a byte of key value:

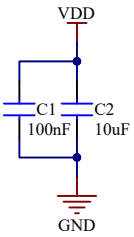


8 Application Circuits

It is recommended to use LDO for power supply

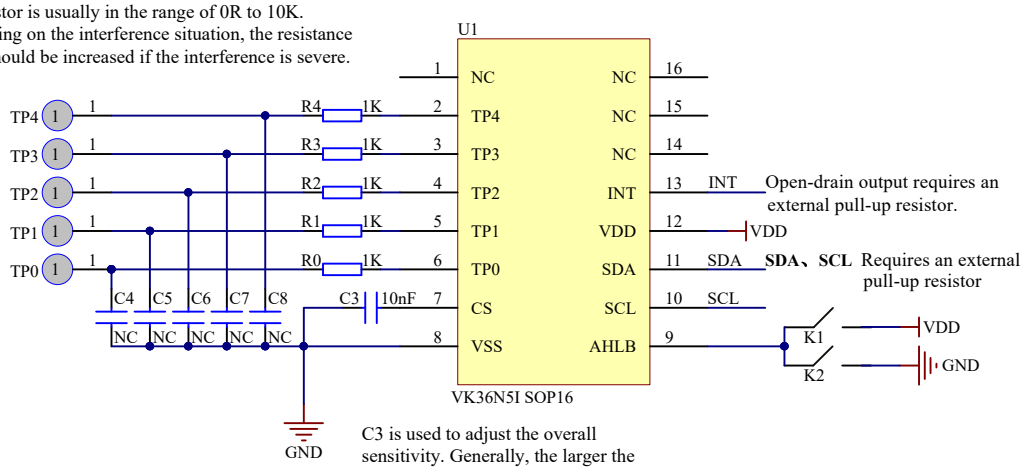


Add a filter capacitor to the power pin to stabilize the power supply



C4-C8 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 least sensitive is when it is not connected.

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



VK36N5I SOP16

Open-drain output requires an external pull-up resistor.

SDA、SCL Requires an external pull-up resistor

C3 is used to adjust the overall sensitivity. Generally, the larger the capacitance (ranging from 1nF to 47nF), the more sensitive it is.

AHLB

VDD Low level is active, output 1 upon power-on

GND High level is active, output 0 upon power-on

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

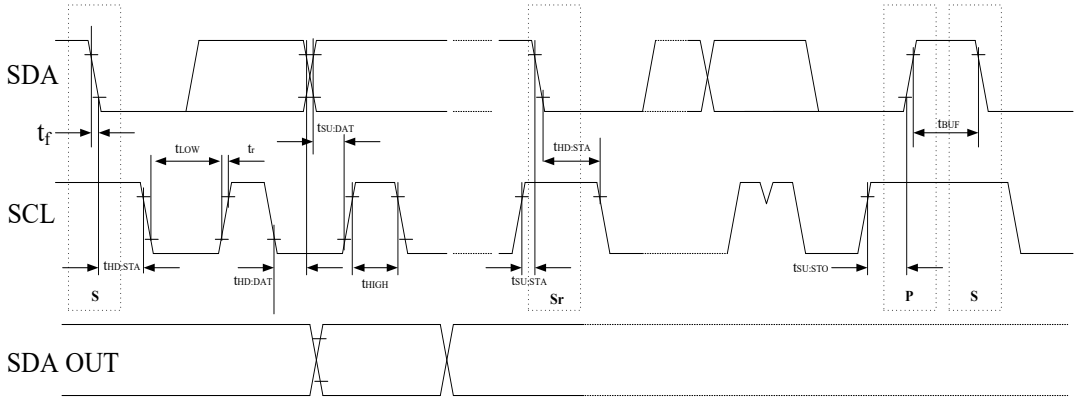
9.2 直流参数

名称	符号	最小值	典型值	最大值	单位	测试条件（25 ℃）	
						VDD	条件
工作电压	VDD	2.2	3.0	5.5	—	—	—
低压复位	LVR	—	2.0	2.1	—	—	—
工作电流	I_{OP}	—	1.3	—	mA	3.0V	CS=10nF
		—	2.2	—		5.0V	
待机电流	I_{ST}	—	10	—	μA	3.0V	CS=10nF
		—	33	—		5.0V	
输出灌电流	I_{IL}	—	4	—	mA	3.0V	V_{OL}=0.6V
		—	8	—		5.0V	
输出源电流	I_{OL}	—	-2	—	mA	3.0V	V_{OH}=2.6V
		—	-4	—		5.0V	V_{OH}=4.3V
输入低电压	V_{IL}	—	—	0.3	VDD	VDD	输入低电压
输入高电压	V_{IH}	0.7	—	1	VDD	VDD	输入高电压
输入上拉电阻	R_{PH}	—	150k	—	ohm	3.0V	VDD=3V
输入下拉电阻	R_{PL}	—	50k	—	ohm	3.0V	VDD=3V
输出响应时间	T_R	—	45	—	mS	3.0V	工作模式
		—	48	—		5.0V	工作模式
		—	150	—	mS	3.0V	待机模式
		—	160	—		5.0V	待机模式

9.3 交流参数

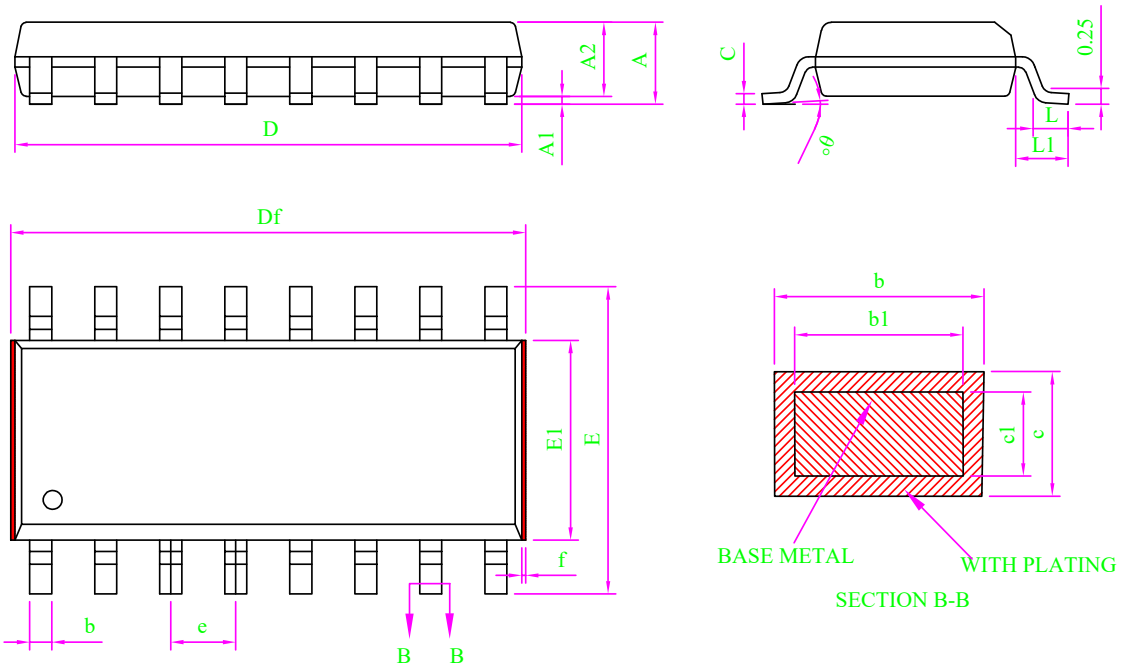
符号	参数	最小值	最大值	单位	测试条件 条件
f_{SCL}	时钟频率	—	400	kHZ	—
t_{BUF}	总线空闲时间	1.3	—	μs	在此时间内总线必须保持空闲直到新的传输开始
$t_{HD;\ STA}$	启动条件保持时间	0.6	—	μs	在此期间之后，将生成第一个时钟脉冲
t_{LOW}	SCL 低电平时间	1.3	—	μs	—
t_{HIGH}	SCL 高电平时间	0.6	—	μs	—
$t_{SU;\ STA}$	Start 状态设置时间	0.6	—	μs	仅与重复的START信号有关
$t_{HD;\ DAT}$	数据保持时间	0	—	μs	—
$t_{SU;\ DAT}$	数据设置时间	100	—	ns	—
t_r	上升时间	—	0.3	μs	周期性采样
t_f	下降时间	—	0.3	μs	周期性采样
$t_{SU;\ STO}$	停止条件设置时间	0.6	—	μs	—
tAA	有效时钟输出时间	—	0.9	μs	—
t_{SP}	输入滤波时间常数 (SDA 和 SCL 引脚)	—	50	ns	噪声抑制时间

I^2C 时序



10 封装信息

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

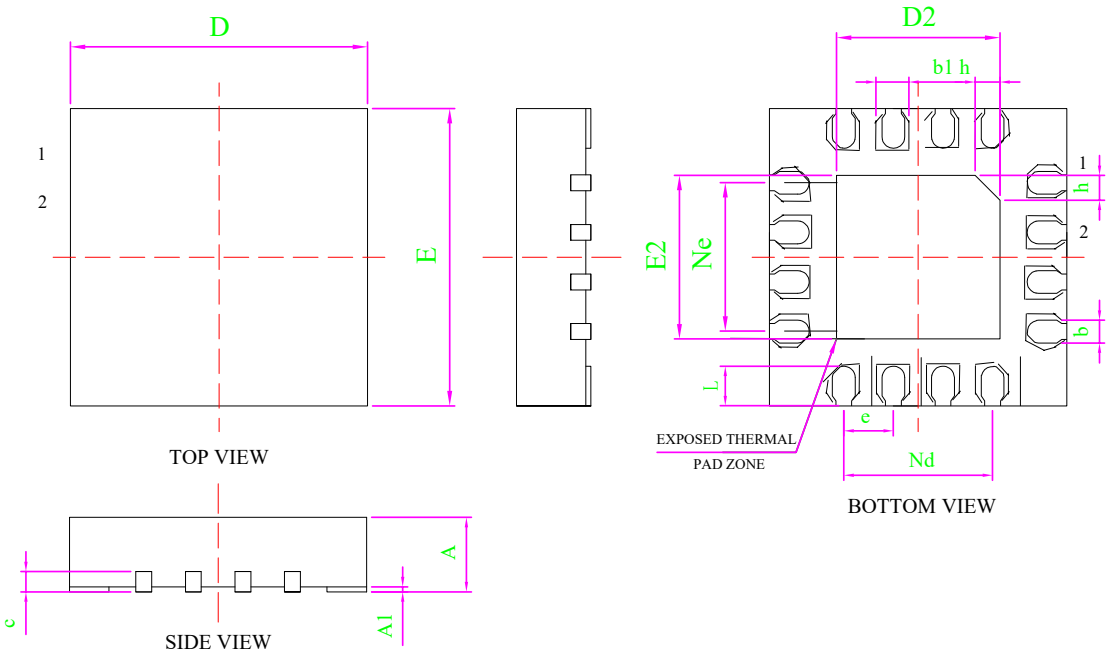


Note:

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 载体尺寸（miL）	75*75		

11 免责说明

保修和责任 —— 本文档中的信息是正确可靠的，但我公司对于这些信息的准确性和完整性不作任何保证。对于此类信息的使用后果不负任何责任。在任何情况下，深圳市永嘉微电科技有限公司(以下简称本公司)不会承担任何间接 、意外发生、惩罚性的相关性的损害赔偿，不管这些损害赔偿是基于侵权（包括疏忽）、保修、违约合同或是其他法律理论。

变更的权利 —— 本公司有权在任何时间对此文件发布的信息做出任何改动。更改过的文件将会取代之前所有公布的信息。您可随时查看我们的官网：
https://www.szvinka.com/

适用性 —— 本公司的产品并非是为那些用于对生命和安全有重大关系的系统和设备而设计的。对于使用本公司的产品而导致的故障，造成的人身伤害、甚至死亡、或是严重的财产或环境损害的应用程序。如果本公司的产品应用在此类的设备或应用程序中，本公司对此造成的风险将不承担任何的责任，因此这些风险由客户自行承担。

应用 —— 在这里所有描述有关产品的任何应用程序仅用于说明的目的。在没有进一步测试或修改的情况下，本公司对该应用程序的指定用途是否合适不作任何表示或保证。本公司不负责协助应用程序或客户的产品设计。同时客户应自行负责决定我司的产品是否适合应用计划产品、计划的应用程序以及第三方客户的使用。客户应适当的提供设计和运行，保障措施以尽量减少其产品与应用的相关风险。如果因客户的应用或产品的弱点或缺陷所产生的，或因使用其他第三方的产品而造成的任何缺陷、损失、费用支出等问题，本公司不承担任何责任。客户应负责为其使用本公司产品的第三方客户做必要的产品或应用的测试，以避免使用不当而造成不必要的损失。本公司对在此方面不承担任何责任。

商业销售条件 —— 本公司的产品销售条款适用于通用的商业销售条款。如有其他要求可另出一份单独有效的书面协议，在此种情况下，将适用该单独有效的书面协议条款和条件。关于客户采购本公司的产品，本公司在此明确拒绝适用客户的通用条款和条件。

出口控制 —— 本文档描述的产品以及其项目可能受出口管制条例限制。出口可能需事先获得国家机关许可。

12 历史版本

No.	版本	日期	修订内容	检查
1	1.0	2018-08-10	原始版本	YES
2	1.1	2020-02-11	添加参考电路	YES
3	1.2	2024-11-07	更新内容	YES

[1] 在开始或完成设计之前，请查阅最近发布的文件。

[2] 自本文档发布以来，本文档中描述的设备产品状态可能已经发生了变化，并且在多个情况下可能会有所不同。最新的产品状态信息可在互联网上查询，网址为 https://www.szvinka.com/