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VK36N8B Datasheet

8-channel touch 3-bit BCD code output

Rev.1.2

1 General Description

The VK36N8B has 8 touch channel, which can be used to detect the touch actions of human hands on the external touch buttons. This chip has a high degree of integration and only requires a few external components to achieve the detection of touch buttons.

It provides a 3-bit BCD code output function, 1 touch status output pin, and can be selected through the IO pin to output the power-on level and output mode - latch or direct output. The chip internally adopts a special integrated circuit, with a high power supply voltage suppression ratio, which can reduce the occurrence of key detection errors and ensure the high reliability of the chip in adverse environmental conditions.

This touch chip has an automatic calibration function, low standby current, and anti-voltage fluctuation characteristics. It provides a simple and effective implementation method for various touch buttons + BCD code output applications.

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
- Select the high or low voltage level of the power output through the AHLB pin.
- Output 3-bit BCD output pin + touch status indication pin (OUTFLAG)
- Single key output is valid. The output occurs immediately upon touching, and no response will be given to other keys if the touch is not released.
- Anti-error function, maximum output time of the effective key: 13 seconds
- Touchless 4S enters standby mode
- Adjust overall sensitivity by connecting a ground capacitor to the CS pin (1-47nF)
- Each touch channel is independently connected to a small ground capacitor for fine-tuning sensitivity (0-50pF).
- The system is stable within 0.3 seconds after power-on, and no touching is allowed.
- When the power is turned on and no touch is detected, the environmental changes will automatically calibrate the reference value.
- Resistant to voltage fluctuations and has good anti-interference performance
- Model number：VK36N8BT Latched output
  VK36N8BD Direct output
- Available Packages:
  SOP16(150mil)(9.9mm x 3.9mm PP=1.27mm)
  QFN16L(3.0mm x 3.0mm PP=0.5mm)

3 Product Selection

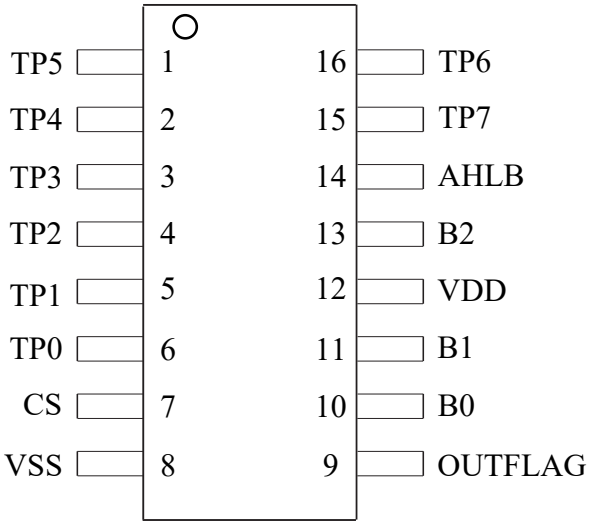
Part No.	Voltage/Standby Current	Output	Packaging
VK36N3B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP8
VK36N4B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP16/QFN16L
VK36N5B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP16/QFN16L
VK36N6B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP16/QFN16L
VK36N7B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP16/QFN16L
VK36N8B	2.2V-5.5V/10μA(3.0V)	BCD Output	SOP16/QFN16L

4 Ordering Information

Part No.	Packaging	Tube Qty	Tray(reel)Qty	Box Qty	Total Qty	Notes
VK36N3B	SOP8	100/tube		10000/box	100000 PCS	
VK36N4B	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N5B	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N6B	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N7B	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	
VK36N8B	SOP16	50/tube		5000/box	50000 PCS	
	QFN16L		3000/reel	30000/box	120000 PCS	

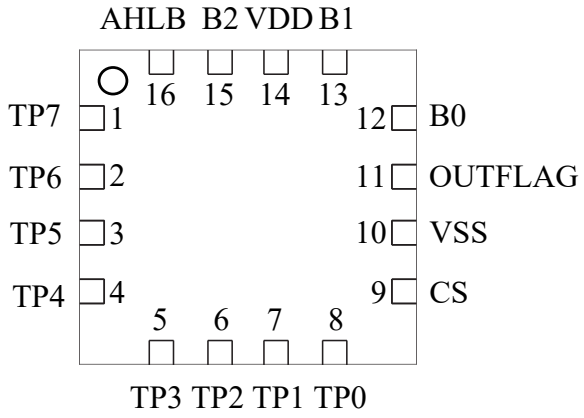
5 Package Pinout Information(SOP16/QFN16L)

TOP VIEW



SOP16

TOP VIEW



QFN16L

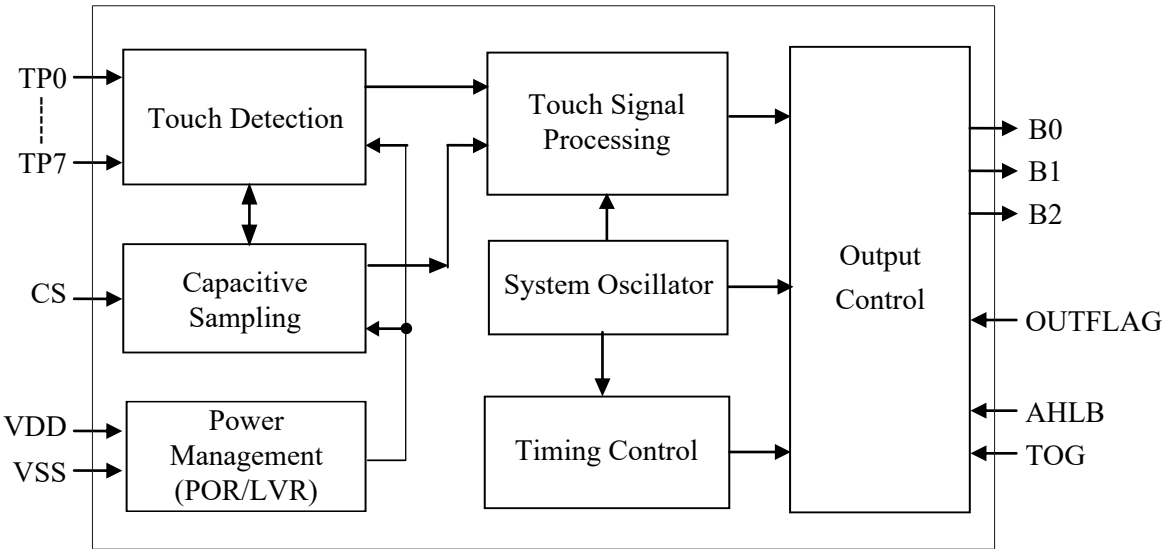
For more information: Page 11-12

5.1 VK36N8B/SOP16/QFN16L Pin Description

Pin Names		I/O	Function Description
SOP16	QFN16L		
1-TP5	3-TP5	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
2-TP4	4-TP4	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
3-TP3	5-TP3	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
4-TP2	6-TP2	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
5-TP1	7-TP1	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
6-TP0	8-TP0	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
7-CS	9-CS	I	Sensitivity adjustment, connecting ground capacitor (1-47nF)
8-VSS	10-VSS	VSS	Negative power supply
9-OUTFLAG	11-OUTFLAG	O	Touch status output
10-B0	12-B0	O	Touch output
11-B1	13-B1	O	Touch output
12-VDD	14-VDD	VDD	Positive power supply
13-B2	15-B2	—	Touch output
14-AHLB	16-AHLB	I	Select output level: Open circuit -> Low level is valid, VSS -> High level is valid
15-TP7	1-TP7	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.
16-TP6	2-TP6	I	Touch input. Connect a ground capacitor to fine-tune the sensitivity (1-50pF). No connection results in the highest sensitivity.

6 Functional Description

6.1 Block Diagram



6.2 Auto-calibration Function

After power-on, the chip will perform initialization and obtain the first reference value. Subsequently, when there is no touch, the touch chip will automatically calibrate the reference value, enabling the reference value to dynamically change according to the external environment.

For example, this mechanism can achieve reliable touch detection when there is a temperature change or environmental noise.

6.3 Anti-Calcification Function

To minimize unintended key presses such as accidental contact with the sensing electrodes, a maximum key duration function is set within the chip. When a touch key is pressed, the internal timer starts timing. If the pressing time exceeds approximately 13 seconds, the touch chip will ignore the state of the touched key, recalibrate, obtain a new reference value, and reset the status to the initial state upon power-on.

6.4 Resistance To Voltage Fluctuations

The chip is equipped with an anti-voltage fluctuation function, which can prevent the occurrence of touch button malfunction caused by the sudden drop in working voltage due to the large current drive from the peripheral devices.

6.5 Output Mode

The output of VK36N8B is B0 to B2, in CMOS format. The valid output level can be selected by the state of the AHLB pin during power-on.
The OUTFLAG outputs the touch status. When there is a change in the touch output level, the output level returns to the power-on state when there is no touch.

AHLB	Select the output of the valid level
NC	Low level is valid. Power-on output is 1.
VSS	High level is valid. Power-on output is 0.

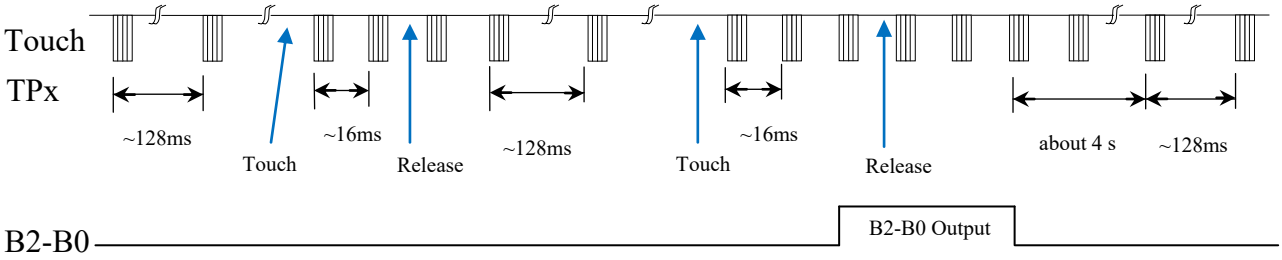
Data format: OUTFLAG + 3-digit BCD code value.

AHLB is floating during power-on							
Touch Pin	BCD code		OUTFLAG	Touch Pin	BCD code		OUTFLAG
	VK36N8BT	VK36N8BD			VK36N8BT	VK36N8BD	
TP0 Touch	000	000	0	TP0 Release	000	111	1
TP1 Touch	001	001	0	TP1 Release	001	111	1
TP2 Touch	010	010	0	TP2 Release	010	111	1
TP3 Touch	011	011	0	TP3 Release	011	111	1
TP4 Touch	100	100	0	TP4 Release	100	111	1
TP5 Touch	101	101	0	TP5 Release	101	111	1
TP6 Touch	110	110	0	TP6 Release	110	111	1
TP7 Touch	111	111	0	TP7 Release	111	111	1
Note: When powered on, the output level is BCD = 111 ， OUTFLAG = 1.							

When powered on, AHLB is connected to VSS							
Touch Pin	BCD code		OUTFLAG	Touch Pin	BCD code		OUTFLAG
	VK36N8BT	VK36N8BD			VK36N8BT	VK36N8BD	
TP0 Touch	111	111	1	TP0 Release	111	000	0
TP1 Touch	110	110	1	TP1 Release	110	000	0
TP2 Touch	101	101	1	TP2 Release	101	000	0
TP3 Touch	100	100	1	TP3 Release	100	000	0
TP4 Touch	011	011	1	TP4 Release	011	000	0
TP5 Touch	010	010	1	TP5 Release	010	000	0
TP6 Touch	001	001	1	TP6 Release	001	000	0
TP7 Touch	000	000	1	TP7 Release	000	000	0
Note: When powered on, the output level is BCD = 000 ， OUTFLAG = 0.							

6.6 Working Mode

The VK36N8B chip has two working modes: standby mode and normal mode. When the key is touched, it switches to the normal mode. Without touching the key, the 4S automatically enters the standby mode to reduce power consumption. When VDD = 5V, the output response of B2-B0 in the standby mode is approximately 160 milliseconds, and in the working mode it is approximately 48 milliseconds.



6.7 Sensitivity Adjustment

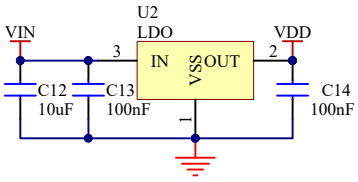
The sensitivity of VK36N8B is related to the size of the touch PAD, the thickness of the shell, the size of the sensitivity capacitance, etc. The sensitivity should be adjusted according to the actual application of the product. The sensitivity can be adjusted from the following four aspects:

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.

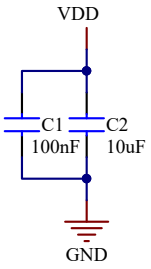
Shell thickness (acrylic or glass)	CS Electrical value (for reference only)
<3mm	6.8nF/25V
3-6mm	10nF/25V
6-10mm	22nF/25V

7 Application Circuits

It is recommended to use LDO for power supply

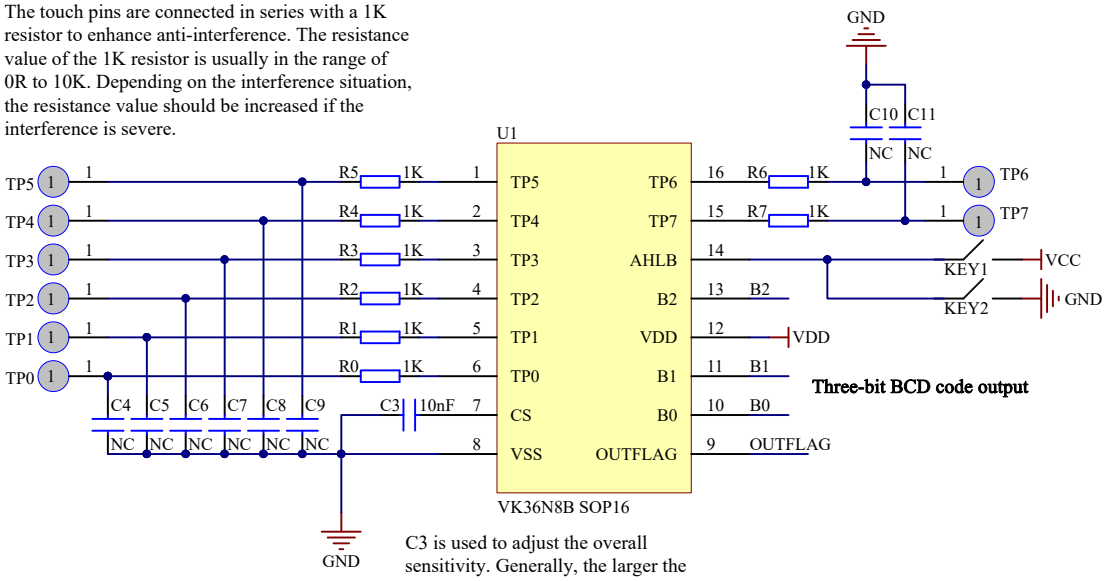


The power supply pin is stabilized by adding a filter capacitor.



C4-C11 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.



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 valid. Power-on output is 1.
GND High level is valid. Power-on output is 0.

8 Electrical Characteristics

Absolute Maximum Ratings

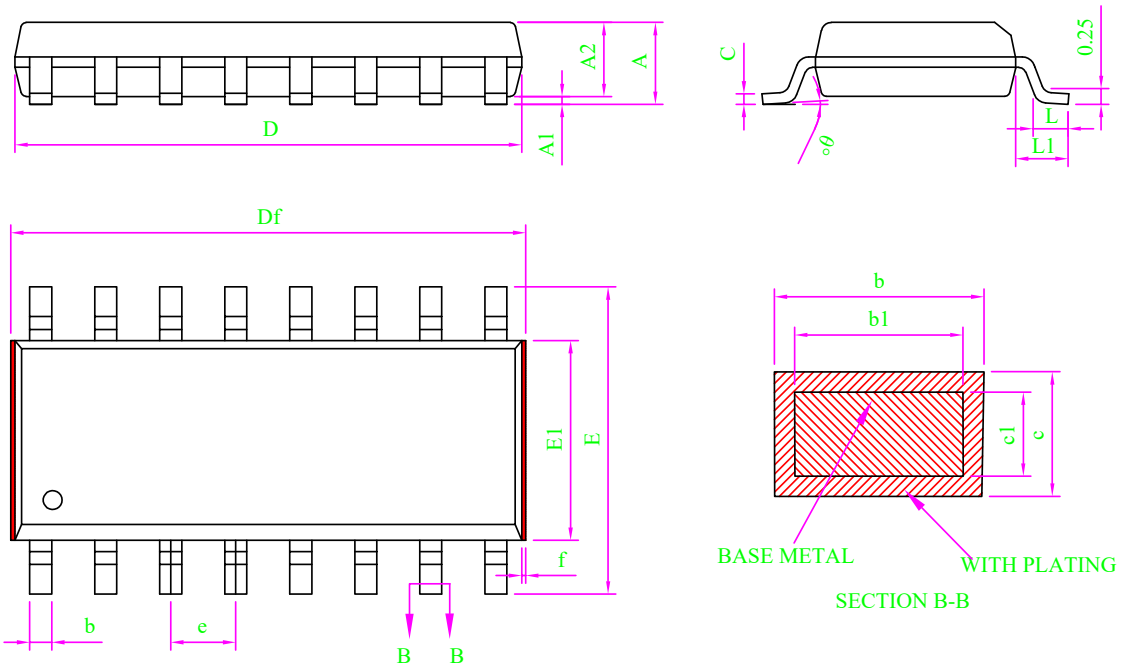
Parameter	Symbol	Ratings	Unit
Power Voltage	VDD	-0.3～6.0	V
Input Voltage	V_{IN}	GND-0.3～VDD+0.3	V
Storage Temperature	T_{STG}	-50～+125	℃
Operating Temperature	T_{OTG}	-40～+85	℃
Human Body Mode	ESD	4KV-8KV(Class 3A)	KV

8.1 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 Package Information

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

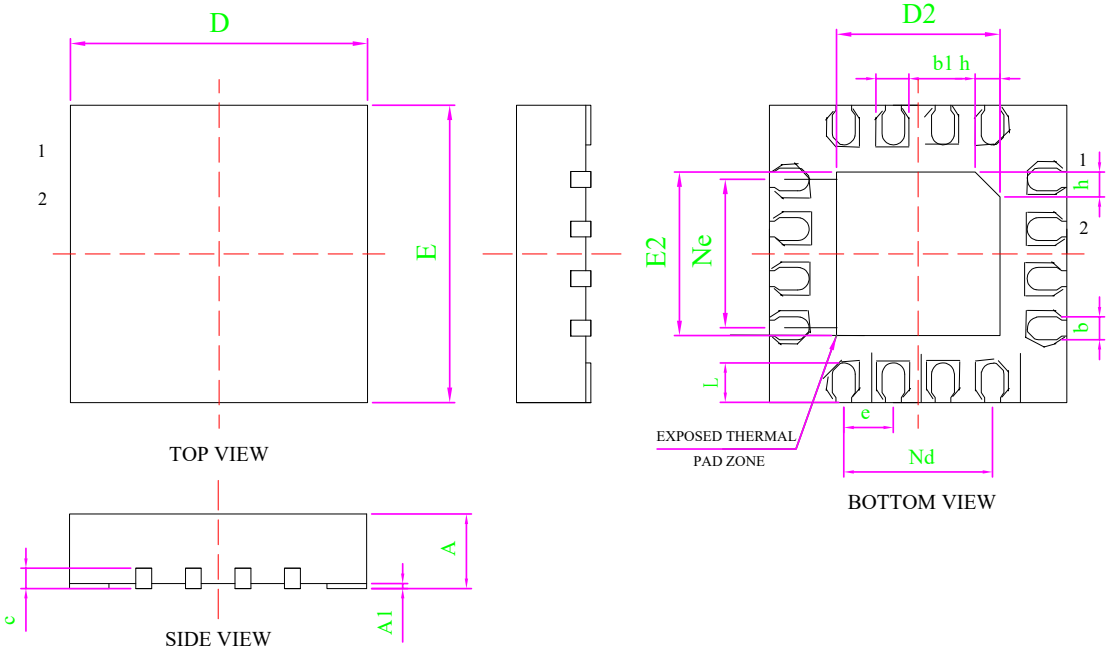


Note:

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

9.2 QFN16L(3.0mm x 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		

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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	2026-01-19	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/