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SNP830

Air Pressure Measurement Sensor

SNP830 Datasheet

Release version: Version 1.1

Date: 2023-10-19

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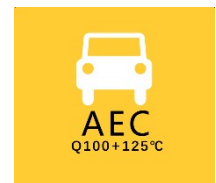
1 Introduction

1.1 Product Overview

SNP830 is an air pressure monitoring sensor designed for new energy vehicle battery pack pressure monitoring applications. The chip consists of 8-bit MCU, 24-bit ADC, temperature sensor, air pressure sensor and supply voltage monitoring unit. The chip can measure the pressure change of the battery pack in real time and provide an alarm signal when the pressure change is out of normal range.

1.2 Features

- Pressure range : 40kPa~260kPa
- Pressure accuracy: $\pm 1.2\text{kPa}@25^\circ\text{C}$
- Temperature range: $-40\sim 125^\circ\text{C}$
- Integrated temperature sensor, air pressure sensor, supply voltage monitoring unit
- Built-in 24-bit ADC
- Typical value of current in monitor mode: $<12\mu\text{A}$ (Sampling period 5s)
- Typical value of current in monitor mode: $<25\mu\text{A}$ (Sampling period 1s)
- Supply voltage: 3.3V/5V
- Bus interface: SPI
- Package: LGA24 (6.0 mmx5.0mmx1.9mm)
- AEC-Q100 specification



1.3 Applications

- Battery pack pressure monitoring for new energy vehicles
- MEMS sensor

1.4 Order Information

Table 1-1 Order Information

Model	Package	Ordering Number	Packing Option
SNP830	LGA24	SNP830BNCLE	Reel

2 Pin Description

2.1 Pin Configuration

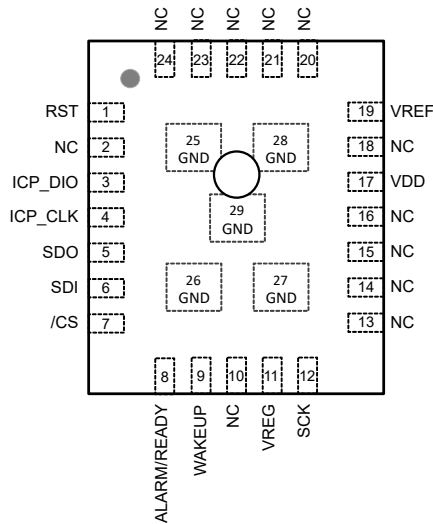


Figure 2-1 Pin Configuration

2.2 Pin Description

Table 2-1 Pin Description

Pin No.	Name	Pin Type	Function
1	RST	Input	Reset pin, active high
2	NC		N.C., just place a test point on board
3	ICP_DIO		N.C., just place a test point on board
4	ICP_CLK		N.C., just place a test point on board
5	SDO	Output	SPI data transmit port
6	SDI	Input	SPI data receive port
7	/CS	Input	SPI selection signal, active low
8	ALARM/READY	Output	Alarm output /communication response signal
9	WAKEUP	Input	wakeup input, active high
11	VREG	Power	Internal regulator, external 100nF capacitor ground
12	SCK	Input	SPI CLK
10,13~16	NC		N.C., just place a test point on board
17	VDD	Supply	Power supply 3.3V~5V
19	VREF	Power	Internal regulator, external 100nF capacitor ground
18,20~24	NC		N.C., just place a test point on board
25~29	EPAD	Ground	Ground

3 Reference Design

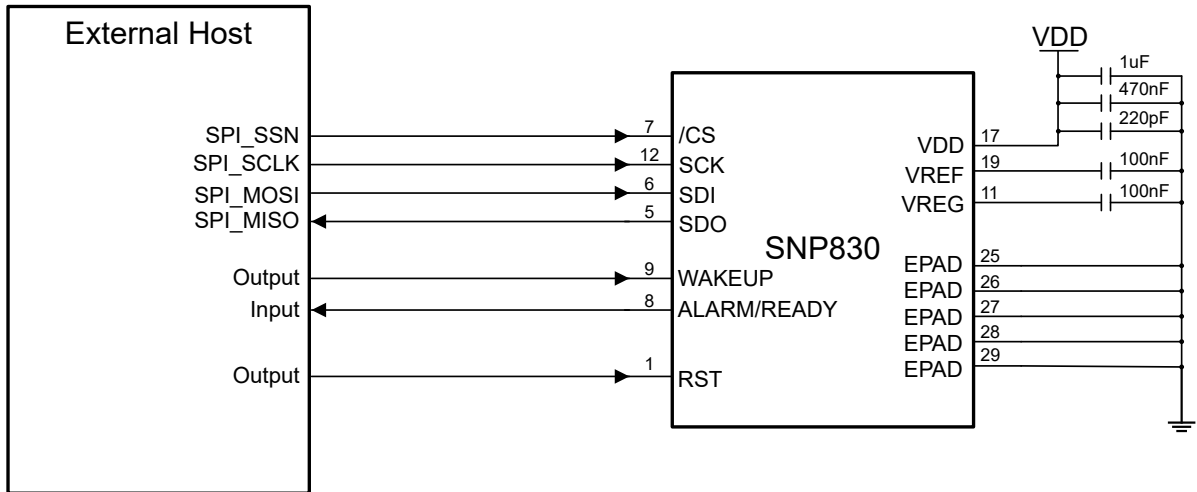


Figure 3-1 Reference Design

4 Specification

4.1 Absolute Maximum Ratings

Table 4-1 Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	-0.3		+5.5	V	
Operating Temperature	T_j	-40		+125	°C	
Storage Temperature	$T_{storage}$	-50		+150	°C	No power on
ESD HBM	$V_{ESD,HBM}$	-2000		+2000	V	All pins according to JS-001-2014
ESD CDM	$V_{ESD,CDM}$	-500		+500	V	All pins according to JS-002-2014
Latch up	I_{LU}	-100		+100	mA	All pins according to JEDEC 78D
Input Voltage	V_{in}	-0.3		$V_{DD}+0.3$	V	All I/O pins
Digital Pin Input Current	$I_{io,dig1}$	-10		+10	mA	All I/O pins

4.2 Operating Range

Table 4-2 Operating Range

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	3.1		5.5	V	Measurement of pressure, temperature and supply voltage
Ambient Temperature	$T_{operating}$	-40		+125	°C	Normal operation

4.3 Pressure Sensor

Table 4-3 Pressure Sensor

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Measurement range	P_{range}	40		260	kPa	$T=-40\sim 125^{\circ}C$ $V_{DD}=5V$
Measurement resolution	P_{ratio}		0.1		kPa	
Measurement Error	P_{Error}	-1.2		+1.2	kPa	$T=0\sim 85^{\circ}C$ 50kPa~160kPa $V_{DD}=5V$
		-2.5		+2.5	kPa	$T=-40\sim 125^{\circ}C$ 40kPa~260kPa $V_{DD}=5V$

4.4 Temperature Sensor

Table 4-4 Temperature Sensor

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Measurement range	T_{range}	-40		+125	°C	

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Measurement resolution	T_{ratio}		1		°C	
Measurement Error	T_{error}	-3		+3	°C	$V_{DD}=5V$

4.5 Battery Sensor

Table 4-5 Battery Sensor

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Measurement range	V_{range}	3		5.5	V	
Measurement resolution	V_{ratio}		10		mV	
Measurement Error	V_{error}	-100		+100	mV	

4.6 Supply Current

Table 4-6 Supply Current

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Supply Current	I_{avg}		25	30	μA	$T=25^{\circ}C, V_{DD}=5V$ Sampling period 1s
			12	15	μA	$T=25^{\circ}C, V_{DD}=5V$ Sampling period 5s
			180	250	μA	$T=25^{\circ}C, V_{DD}=5V$ Sampling period 100ms
Peak current	I_{max}			4	mA	$T=25^{\circ}C, V_{DD}=5V$ Sampling peak current
Supply Current in Sleep Mode	I_{sleep}		6	10	μA	$T=25^{\circ}C, V_{DD}=5V$ Sampling Supply Current in Sleep Mode

4.7 Power-on Reset

Table 4-7 Power-on Reset

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Power-on Reset Voltage	V_{POR}	2.35		2.45	V	Measured at Pin V_{DD}
Power-on Reset Release Voltage	V_{THR}	2.25		2.35	V	Measured at Pin V_{DD}
Under Voltage Alarm Voltage	V_{UVR}	2.95	3.0	3.05	V	Measured at Pin V_{DD}

4.8 Digital I/O Pins

Table 4-8 Digital I/O Pins

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Input Low Voltage	V_{IL}			$0.2V_{DD}$	V	
Input High Voltage	V_{IH}	$0.8V_{DD}$			V	

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Output Low Voltage	V_{OL}			$0.2V_{DD}$	V	$I_{OL}=4mA$
Output High Voltage	V_{OH}	$0.8V_{DD}$			V	$I_{OL}=4mA$
Digital pin output current	$I_{out,DIG}$	-4		4	mA	
Digital pin input capacitance	$C_{in,DIG}$			10	pF	

4.9 SPI

Table 4-9 SPI

Parameter	Symbol	Values			Unit	Note/Test Condition
		Min.	Typ.	Max.		
SPI communication rate	f_{SCK}			1	MHz	
SPI command interval	f_{SSH}	50			us	

5 Functional Description

5.1 Block Diagram

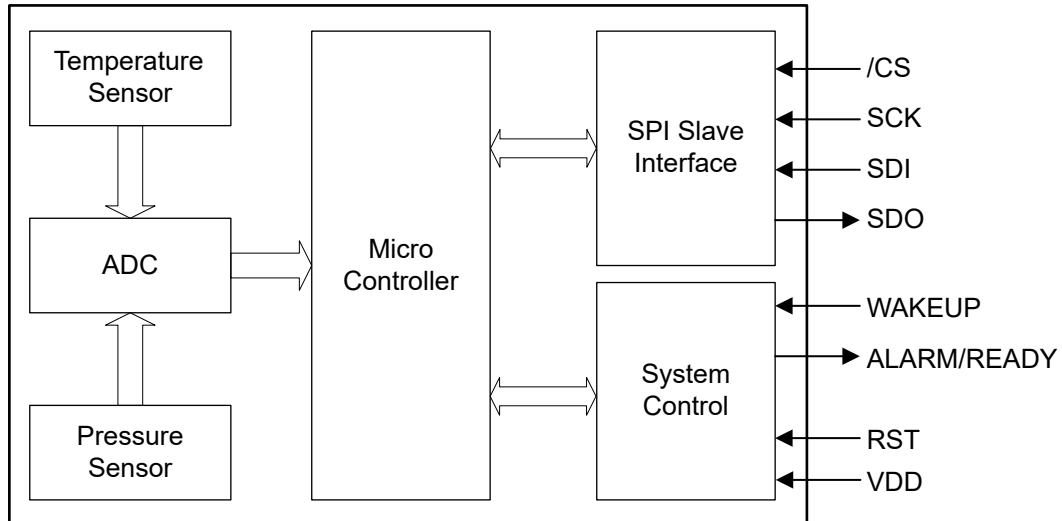


Figure 5-1 Block Diagram

5.2 Interface Description

The following figure depicts a schematic diagram of the external host and sensor signal connection.

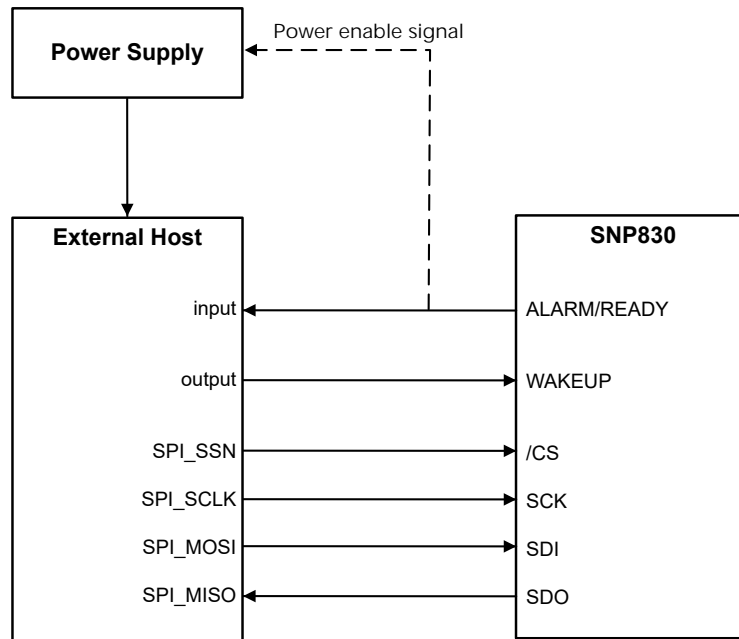


Figure 5-2 The external host and sensor signal connection

- The ALARM signal can be used as one of the host power enable signals when the external host is in the power-down state under low power consumption.
- When the sensor monitors an abnormality and alarms, the ALARM output goes high to enable the power supply of the host computer.
- After the host is powered on, the ALARM signal status is detected to determine if the sensor is in alarm and handle it accordingly.

Note: The ALARM level will only go high when an alarm is detected and cannot be used as the only enable signal for the host power supply.

5.3 RST Interface

In order to make the BPS system back to initial state, BMS can control the sensor to RST mode by setting the RST pin a high-level signal. The RST pin has an internal pull-down resistor and the BMS should maintain a low level or high impedance during BPS operation.

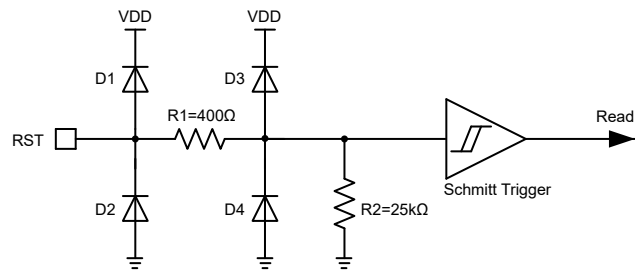


Figure 5-3 RST Interface

5.4 WAKE Interface

The BMS provides a WAKE signal to control the operating mode of the sensor. In continuous mode, the WAKE remains low level. In monitor mode or deep sleep mode, the WAKE remains high level. When the WAKE signal changes from high level to low level, the sensor will switch to continuous mode.

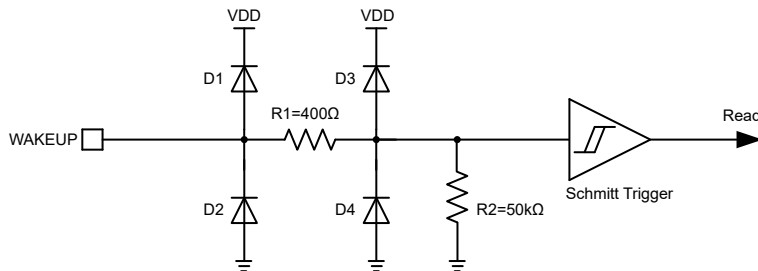


Figure 5-4 WAKE Interface

5.5 ALARM Interface

ALARM/READY has two uses, can be used for both alarm output and communication response, normally outputs low.

- Alarm Output: The ALARM signal outputs a high level when the sensor monitors a pressure abnormality.
- Communication response: When the external host pulls up WAKEUP to request communication, the READY signal will output high when the communication interface is ready.

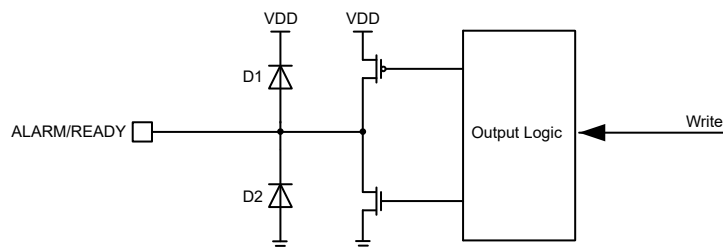


Figure 5-5 ALARM Interface

5.6 SPI

When the SNP830 is in communication, an external host can access the sensor operating registers via SPI. The SPI interface supports a maximum rate of 1Mbps, CPOL=0, CPHA=0 . An SPI data frame starts at the falling edge of CS and ends at the rising edge of CS, with a fixed 16bits data length.

Note: The SNP830 is used as an SPI slave only.

The SPI access timing needs to satisfy the following constraints.

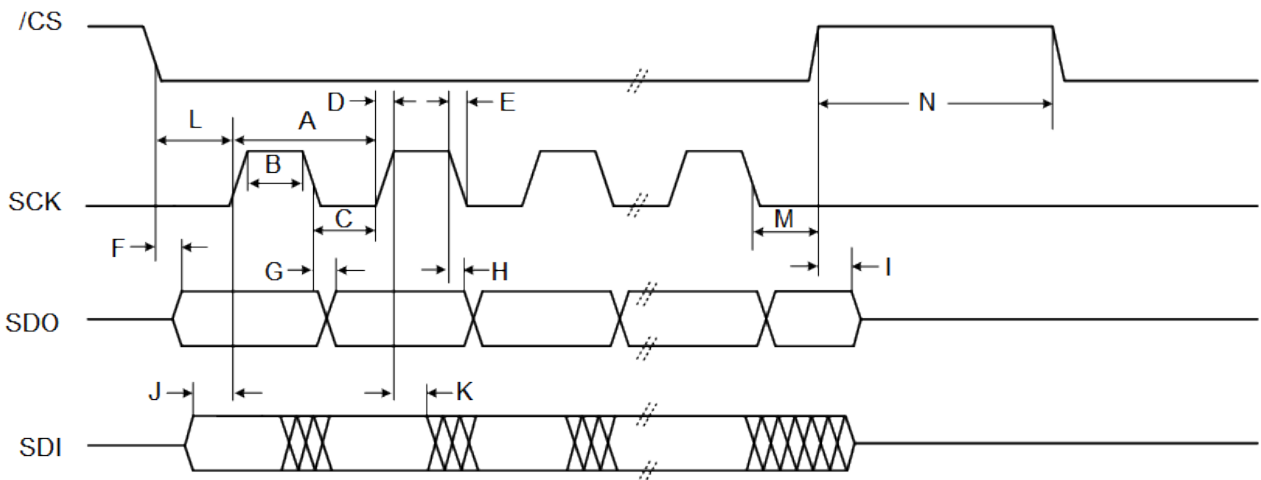


Figure 5-6 SPI Timing

Table 5-1 SPI Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit
A	t_{SCK}	1000			ns
B	t_{SCKH}	0.4		0.6	t_{SCK}
C	t_{SCKL}	0.4		0.6	t_{SCK}
D	t_{SCKR}			50	ns
E	t_{SCKF}			50	ns
F	t_{ACCESS}			500	ns
G	t_{VALID}			300	ns
H	t_{HOLD_OUT}			300	ns
I	$t_{DISABLE}$			600	ns
J	t_{SETUP}	200			ns
K	t_{HOLD_IN}	200			ns
L	t_{LEAD}	500			ns
M	t_{LAG}	500			ns
N (frames to frames interval)	t_{SSN}	50			us

6 Package Information

6.1 Package Dimension (mm)

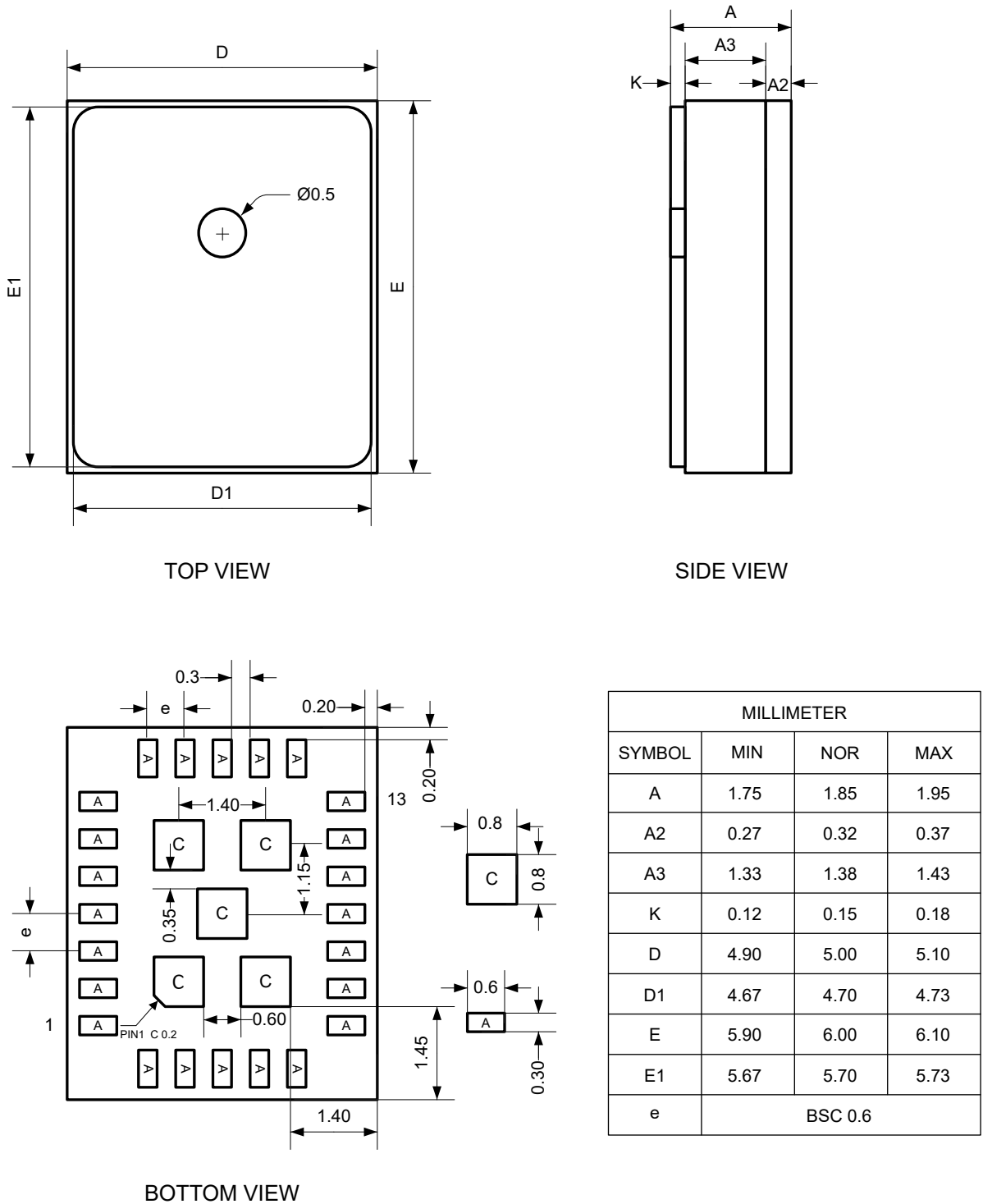


Figure 6-1 Package Dimension

6.2 Package Reference

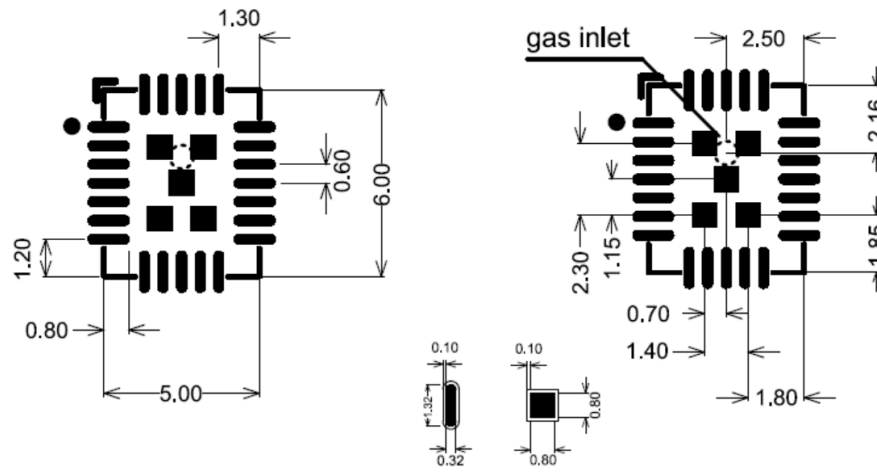


Figure 6-2 Package Reference

7 Revision History

Table 7-1 Revision History

Version	Date	Note
V1.0	2023.09.11	Initial version.
V1.1	2023.10.19	update Table SPI Timing.