

CPS171

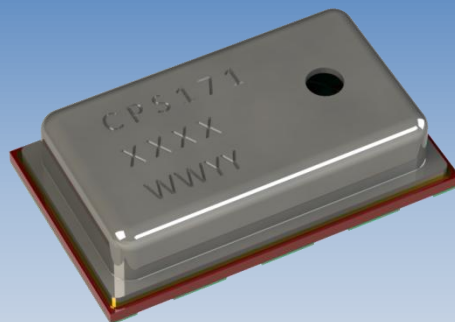


Consensic

# Data Sheet

Rev 0.2  
Sep. 2023  
DAT-0021

## Manifold Absolute Pressure Sensor



# CPS171

Manifold Absolute Pressure Sensor



## Overview

The CPS171 is a resistive absolute pressure sensor solution with a fully calibrated pressure compensated analog output for low pressure applications, such as MAP (Manifold Absolute Pressure) systems.

The CPS171 solution comprises of an ultra-small resistive MEMS pressure sensor and a conditioning ASIC for accurate pressure measurements in factory calibrated ranges for the MAP applications. An integrated sigma-delta based ADC combined with internal calibration logic provides a high level analog output signal that is proportional to the applied pressure.

## Applications

- Manifold Absolute Pressure
- Industrial Equipment
- Air Control Systems
- Vacuum Systems

## Benefits

- Low Power Consumption
- External Clock not Required
- High Resistance to Sensing Media

## Features

- Factory Calibrated Pressure Sensor
- Supply Voltage: 5.0V  $\pm$ 10%
- Operating Temperature Range: -40°C to +85°C

## Interfaces

- Analog Output: Typical 10% to 90% of  $V_{SUPPLY}$

## Physical Characteristics

- Small Form Factor, 3 x 5 x 1.2mm (w x l x h)
- LGA Package, 8 Lead
- Top Side Sensing Port



FIGURE 1: CPS171 ANALOG OUTPUT CIRCUIT

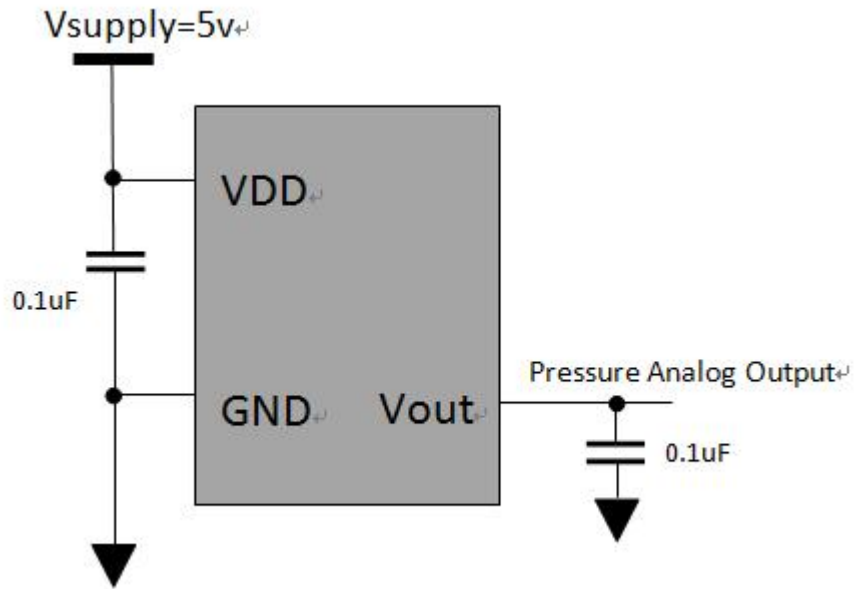


TABLE1: ORDERING INFORMATION

PART NUMBER	PRESSURE RANGE	OUTPUT	PACKAGE
CPS171	10 to 115kPa	Analog	8-Lead LGA, Metal Lid, PCB Substrate
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## 1 OPERATING CHARACTERISTICS

### 1.1 ABSOLUTE RATINGS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Over Pressure					1000 (10)	kPa (bar)
Supply Voltage (with respect to GND)	$V_{DD}$		-0.3		6.0	V
Voltages at Analog I/O – In Pin	$V_{INA}$		-0.3		$V_{DD} + 0.3$	V
Voltages at Analog I/O – Out Pin	$V_{OUTA}$		-0.3		$V_{DD} + 0.3$	V
Storage Temperature	$T_{STOR}$		-50		130	°C

### 1.2 OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>OPERATION</b>						
Supply Voltage to GND <sup>1</sup>	$V_S$		4.75	5.0	5.25	V
Operating Temperature Range			-40		85	°C
<b>PRESSURE RANGE 1 CHARACTERISTICS (CPS171-JW001)</b>						
Range 1			10 (100)	—	115 (1150)	kPa (mbar)
Full Scale Output	$V_{FSO}$	@ $V_S=5.0V$	—	4.7	—	V
Full Scale Span	$V_{FSS}$	@ $V_S=5.0V$	—	4.5	—	V
Accuracy		(0 to 85°C)	—	—	±1.5	% $V_{FSS}$
Sensitivity	V/P		—	45	—	mV/kPa

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## 1.3 ELECTRICAL PARAMETERS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>SUPPLY CURRENT</b>						
Update Mode Current	$I_{DD}$	Worst Case Settings: 12-bit, 0ms Power Down		1200	1500	$\mu A$
<b>ANALOG OUTPUT</b>						
CPS171	Analog_P	10 to 115kPa (100 to 1150mbar)	0.4		4.65	V
<b>Analog OUTPUT</b>						
Resolution	RES			12		Bits
Analog Additional Error (Including Ratiometricity Error)	$E_{out}$	-40 to 125°C		0.1	0.5	%
<b>SYSTEM</b>						
Trimmed System Frequency	$f_{SYS}$	All Timing in this Specification are Subject to this Variation		1.85		MHz
Start-Up-Time Power-On to Data Ready	$t_{STA}$	Fastest and Slowest Settings	4.25		173	ms
Update Rate (Normal Mode)	$T_{RESP\_UP}$	Fastest and Slowest Settings	0.70		288	ms
Peak-to-Peak Noise @ Output (100 Measurements in 12-bit)	$N_{OUT}$			5		LSB

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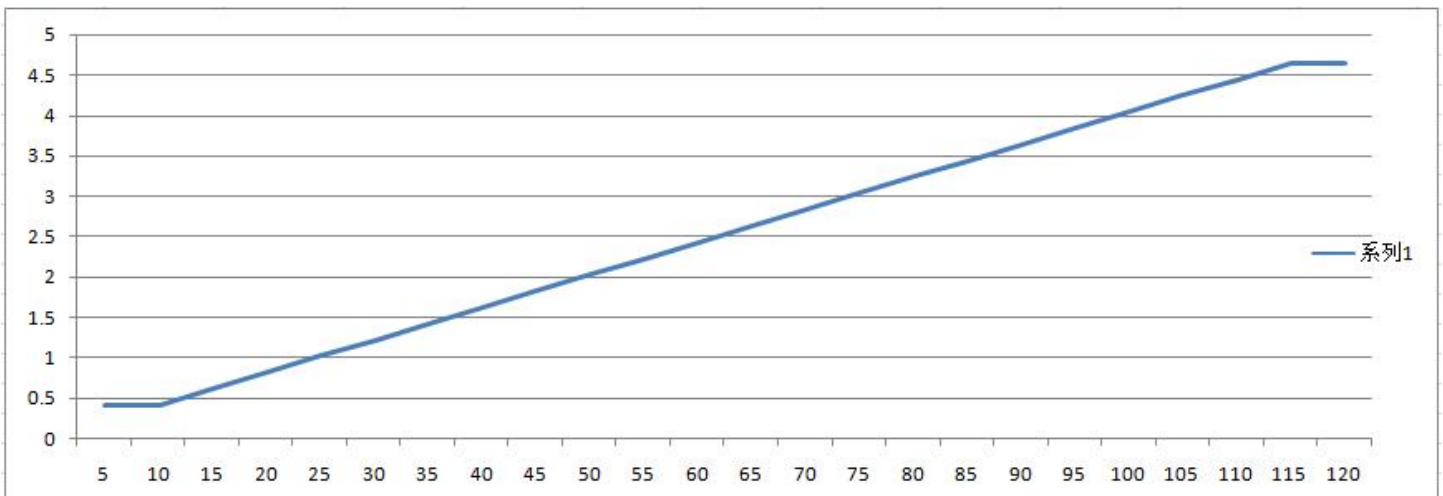


## 2 OUTPUT MODES

### 2.1 ANALOG OUTPUT

The CPS171 provides a ratio metric analog output to applied pressure.

FIGURE 2: EXAMPLE OF ANALOG OUTPUT VS. PRESSURE





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## 3 OPERATION MODE

The CPS171 is factory programmed in Update Mode only. Measurements are taken continuously.

## 4 OTP ROM

The OTP ROM array contains the sensor calibration coefficients and the configuration bits for the analog front end, output modes, measurement modes, etc.

## 5 CALCULATING OUTPUT

The pressure output is a linear transfer function between measured pressure and the input voltage.

### 5.1 PRESSURE OUTPUT

#### 5.1.1 Pressure Output Transfer Function

$$\text{Pressure (kPa)} = (V_{\text{out}} / 0.040476) + 0.117647$$

## 6 PACKAGE AND ASSEMBLY

The CPS171 is available in a small land grid array (LGA) package with a metal lid. There is a hole on the lid to allow for external pressure to the sensing diaphragm.

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## 6.1 PIN LAYOUT

FIGURE 3: CPS171 PACKAGE PIN LAYOUT

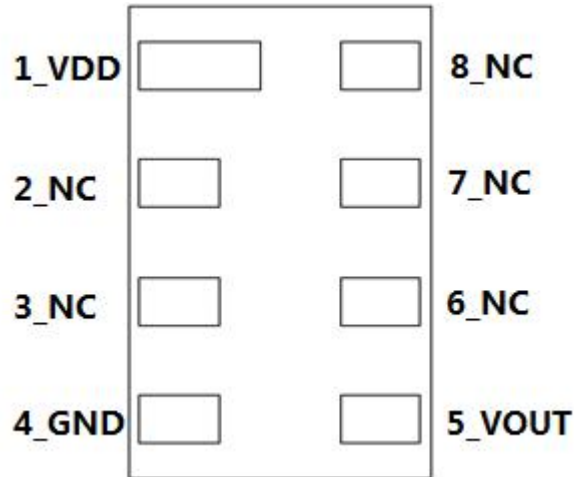


TABLE 2: CPS171 PIN DESCRIPTION

Pin	Name	Type	Function
1	VDD	P	Connect 0.1uF CAP to GND
2	NC	--	--
3	NC	--	--
4	GND	G	Ground
5	VOUT	O	Voltage output
6	NC	--	Factory use only
7	NC	--	Factory use only
8	NC	--	--

## 6.2 MECHANICAL DRAWING

FIGURE 4: LGA WITH METAL LID PACKAGE

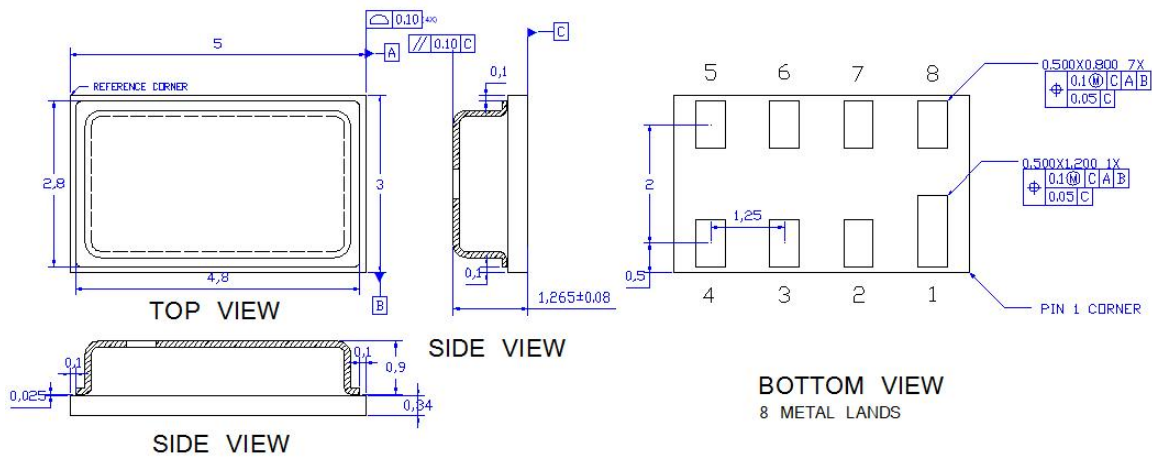


TABLE 3: MECHANICAL DIMENSIONS

DIMENSION	MIN.	TYP.	MAX.	UNITS
Length		5		mm
Width		3		mm
Height		1.265		mm
Pad 1 Length		0.5		mm
Pad 1 Width		1.2		mm
Pad 2 to 8 Length		0.5		mm
Pad 2 to 8 Width		0.8		mm
Pad Pitch(Y-Axis)		2		mm
Pad Pitch(X-Axis)		1.25		mm
Port Hole Diameter		0.5		mm

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## 6.3 SOLDERING CONDITIONS

TABLE 4: PACKAGE REFLOW TEMPERATURE

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Soldering Peak Temperature	Less than 30 seconds (JEDEC-STD-020 Standard)			260	°C

## 7 DOCUMENT HISTORY

REVISION	DATE	DESCRIPTION
0.0	12-Jul-2018	Preliminary Release
0.1	01-Mar-2021	Modify company address
0.2	20-Sep-2023	Modify error information

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## 8 DISCLAIMER

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