

# Low Pressure Digital & Analog Sensor

## SM7291, SM7391, SM7491 Gauge and Differential Pressure Sensor



### DESCRIPTION

The SM7X91 series are a low pressure MEMS sensor family offers state-of-the-art pressure transducer technology and CMOS mixed signal processing technology to produce a digital & analog output, fully conditioned, multi-order pressure and temperature compensated outputs. This series provides JEDEC standard SOIC-16 package with a dual vertical or horizontal ports options. It is available in gauge, differential, asymmetric differential configurations. With the dual porting, a reference measurement is possible to minimize errors due to changes in ambient pressure.

### FEATURES

- Pressure range from 5 to 21 cmH<sub>2</sub>O; gauge, differential or asymmetric differential outputs
- Accuracy: +/- 1 %FS
- 16-bit digital, pressure calibrated and temperature compensated output
- I2C and analog Output interface available
- Compensated temperature range: -20 to 85°C
- Robust JEDEC SOIC-16 package for automated assembly
- Manufactured according to ISO9001 and ISO/TS 16949 standards

Combining the pressure sensor with a signal-conditioning ASIC in a single package simplifies the use of advanced silicon micro-machined pressure sensors. The pressure sensor can be mounted directly on a standard printed circuit board and a high level, calibrated pressure signal can be acquired from the digital interface. This eliminates the need for additional circuitry, such as a compensation network or microcontroller containing a custom correction algorithm.

**Customer-specified pressure ranges and supply voltages are available.**

The SM7291, SM7391 and SM7491 series shipped in sticks or tape & reel.

Medical	Industrial	Consumer
Sleep Apnea	Airflow Measurement	Sports Equipment
CPAP	Pneumatic Gauges	Appliances
Ventilators	Pressure Switches	
Gas Flow Instrumentation	Safety Cabinets	
Air Flow Monitors	Life Sciences	
Negative Pressure Wound Therapy	Gas Flow Instrumentation	

## 1. Absolute Maximum Ratings

All parameters are specified at VDD = 3.3 V / 5.0 V supply voltage at 25°C, unless otherwise noted.

No.	Characteristic	Symbol	Minimum	Maximum	Units
1	Compensated Temperature	$T_{COMP}$	-20	85	°C
2	Operating Temperature <sup>(a)</sup>	$T_{OP}$	-40	105	°C
3	Storage Temperature <sup>(a)</sup>	$T_{STG}$	-40	125	°C
4	Proof Pressure <sup>(a, c)</sup>	$P_{Proof}$		100	cmH2O
5	Burst Pressure <sup>(a, d)</sup>	$P_{Burst}$		200	cmH2O
6	Supply voltage	$V_{DD_{MIN/MAX}}$	-0.3	6	V
7	Media Compatibility(a, b)				

### Notes:

- Tested on a sample basis.
- Clean, dry gas compatible with wetted materials. Wetted materials include silicon, epoxy, RTV, gold and aluminum.
- Proof pressure is defined as the maximum pressure to which the device can be taken and still perform within specifications after returning to the operating pressure range
- Burst pressure is the pressure at which the device suffers catastrophic failure resulting in pressure loss through the device.

## 2. ESD

All parameters are specified at VDD = 3.3 V / 5.0 V supply voltage at 25°C, unless otherwise noted.

No.	Description	Condition	Symbol	Min.	Typ.	Max.	Units
7	ESD HBM Protection at all Pins	AEC Q100-002 (HBM) chip level test	$V_{ESD(HBM)}$	-2		+2	kV

## 3. Electrical Characteristics

All parameters are specified at VDD = 5.0 V / 3.3 V DC supply voltage at 25°C, unless otherwise noted.

No.	Description	Symbol	Min.	Typ.	Max.	Units
8	Supply Voltage	$V_{DD}$	4.75	5.0	5.25	V
			3	3.3	3.6	
9	Low level input voltage at Digital I/O	$V_{IN,I2C,lo}$	-0.3		0.9	V
10	High level input voltage at Digital I/O	$V_{IN,I2C,hi}$	0.8*VDD		VDD + 0.3	V
11	Current Consumption with analog output			4.5		mA
12	Current Consumption without analog output			3		mA

## 4. External Components

No.	Description	Symbol	Min.	Typ.	Max.	Units
13	Supply bypass capacitor	$C_{VDD}$		100		nF

## 5. OPERATING CHARACTERISTICS TABLE

All parameters are specified at VDD = 5.0 V / 3.3 V DC supply voltage at 25°C, unless otherwise noted.

No.	Characteristic	Symbol	Minimum	Typical	Maximum	Units
14	Signal Output <sup>(e)</sup> @ $P_{MIN}$	OUT <sub>MIN</sub>		-26214		Counts
15	Signal Output <sup>(e)</sup> @ $P_{MAX}$	OUT <sub>MAX</sub>		26214		Counts
16	Full Scale Span <sup>(e)</sup>	FSP		52428		Counts
17	Resolution			16		Bits
18	Accuracy <sup>(f, g, h)</sup>	ACC	-1		+1	%FS

Calibrated Pressure Ranges				
No.	Device Type	$P_{MIN}$ (cmH <sub>2</sub> O)	$P_{MAX}$ (cmH <sub>2</sub> O)	Comment
19	SM7291 – Gauge	0	+5 to +21	
20	SM7391 – Differential	-21 to -5	+5 to +21	Absolute value of $P_{MIN}$ must match absolute value of $P_{MAX}$
21	SM7491 -- Asymmetric	-21 to 0	0 to +21	Delta between $P_{MAX}$ and $P_{MIN}$ must be at least 5 cm H <sub>2</sub> O

### Notes:

e. Only the typical values are shown here. However, the digital output values can be customized or changed upon request. Please refer to the tear sheet for the specific product to get updated information.

f. The accuracy specification applies over all operating conditions. This specification includes the combination of linearity, repeatability, and hysteresis errors over pressure, temperature, and voltage.

g. Maximum 10-year total output shift < ±1%FS based on 1000 hours of HTOL testing.

h. For less demanding applications, devices with relaxed accuracy specifications are available.

**\*Custom calibration pressures and voltages are available to meet specific customer demands.**

## 5. Sensor Transfer Function

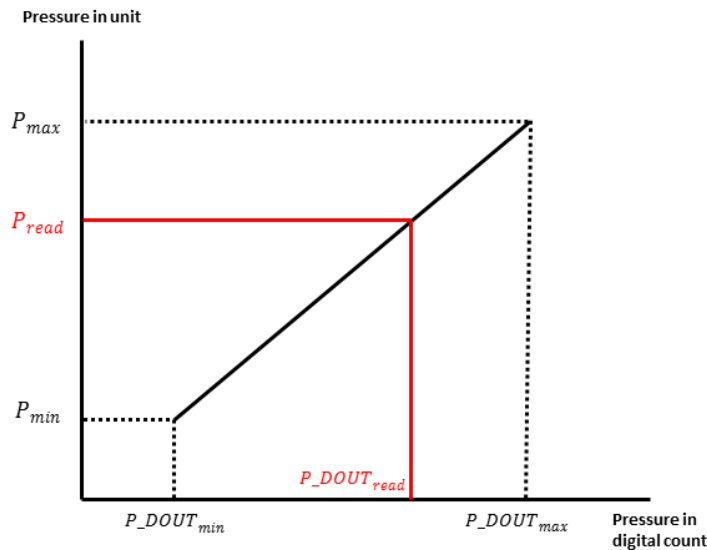
### Digital Pressure Transfer Function

$$P_{read} = P_{min} + \frac{P_{DOUT_{read}} - P_{DOUT_{min}}}{P_{DOUT_{max}} - P_{DOUT_{min}}} (P_{max} - P_{min})$$

$P_{min}$  and  $P_{max}$  are minimum and maximum rating pressure in specified pressure unit on the specification.

$P_{DOUT_{min}}$  and  $P_{DOUT_{max}}$  are minimum and maximum digital counts on the specification.

$P_{DOUT_{read}}$  is digital reading from the output and  $P_{read}$  is the converted pressure output based on  $P_{DOUT_{read}}$ .

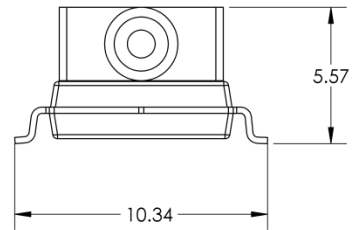
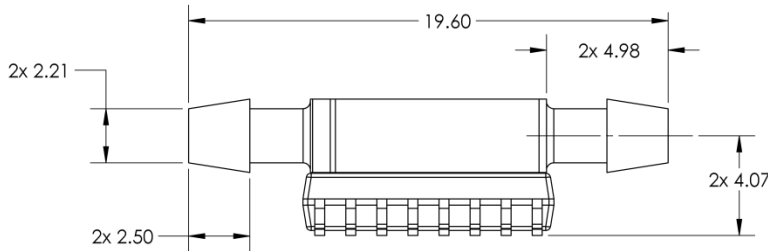
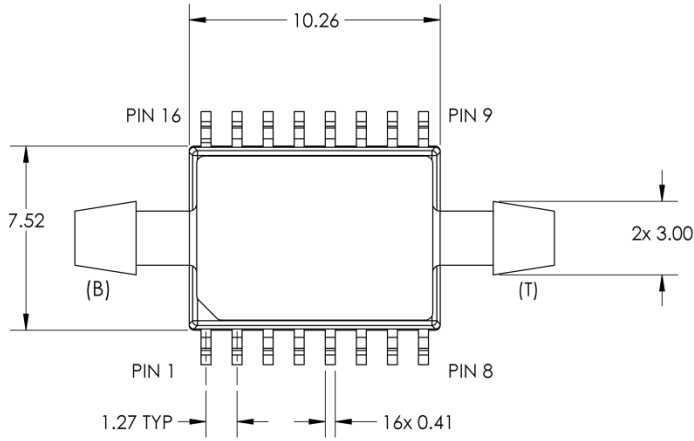


For example, the  $P_{min}$  and  $P_{max}$  for the sensor are specified as  $-10\text{cmH}_2\text{O}$  and  $+10\text{cmH}_2\text{O}$ . The  $DOUT_{min}$  and  $DOUT_{max}$  are  $-26214$  and  $+26214$ . So,

$$P_{read} = -10 + \frac{DOUT_{read} + 26214}{52428} \times 20 \text{ cmH}_2\text{O}$$



SOIC-16 Horizontal (B) Package Dimensions



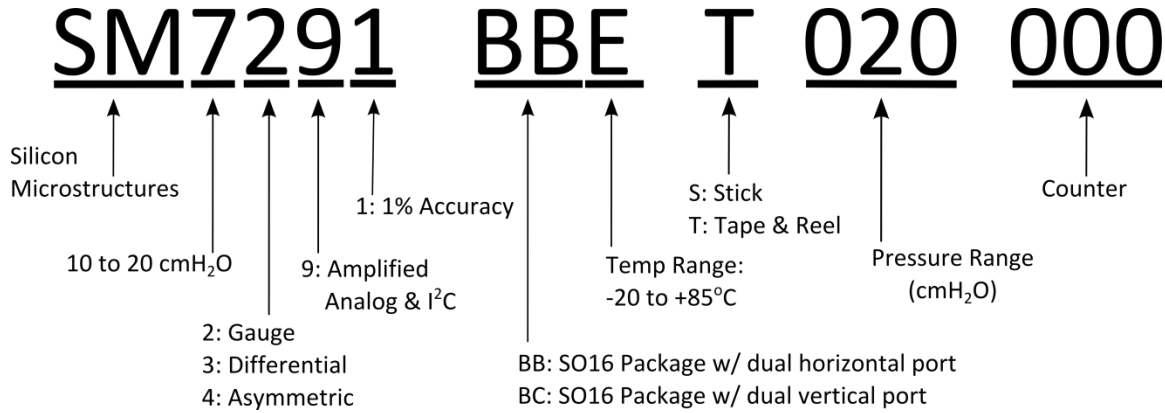
**Qualification Standards**

REACH Compliant  
RoHS Compliant  
PFOS/PFOA Compliant  
For qualification specifications, please contact Sales at [sales@si-micro.com](mailto:sales@si-micro.com)



**Ordering Information:** Specific part number information is provided on a separate tear sheet for each product. The general part number ordering information is provided below:

**Part Number Legend**



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