Sold in North America by:
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Low Pressure Digital & Analog Sensor

SM6291, SM6391, SM6491 Gauge and Differential Pressure Sensor

FEATURES

- Pressure range from 0.3 to 0.79 psi; gauge, differential or asymmetric differential outputs
- Digital Accuracy: +/- 1 %FS; Analog Accuracy: +/- 1.5 %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

DESCRIPTION

The SM6X91 series are a low pressure MEMS sensor family offering 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 sensor in JEDEC standard SOIC-16 package with a dual vertical or horizontal ports. 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.

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 SM6291, SM6391 and SM6491 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[a]	T_{OP}	-40	105	°C
3	Storage Temperature[a]	T_{STG}	-40	125	°C
4	Proof Pressure[a, c]	P_{Proof}		4.5	psi
5	Burst Pressure[a, d]	P_{Burst}		6	psi
6	Supply voltage	$VDD_{MIN/MAX}$	-0.3	6	V
7	Media Compatibility(a, b)				

Notes:

a. Tested on a sample basis.

b. Clean, dry gas compatible with wetted materials. Wetted materials include silicon, epoxy, RTV, gold and aluminum.

c. 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

d. 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
8	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
9	Supply Voltage	V_{DD}	4.75	5.0	5.25	V
			3	3.3	3.6	
10	Low level input voltage at Digital I/O	$V_{IN,I2C,lo}$	-0.3		0.9	V
11	High level input voltage at Digital I/O	$V_{IN,I2C,hi}$	0.8*VDD		VDD + 0.3	V
12	Current Consumption with analog output			4.5		mA
13	Current Consumption without analog output			3		mA

4. External Components

No.	Description	Symbol	Min.	Typ.	Max.	Units
14	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
15	Digital Pressure Output @ P_{MIN}	$DOUT_{MIN}$		-26214		Counts
16	Digital Pressure Output @ P_{MAX}	$DOUT_{MAX}$		26214		Counts
17	Digital Full Scale Span	DFS		52428		Counts
18	Resolution			16		Bits
19	Digital Output Accuracy (f, g, h)	DACC	-1		+1	%FS
20	Analog Pressure Output @ P_{MIN}	$AOUT_{MIN}$		10		%VDD
21	Analog Pressure Output @ P_{MAX}	$AOUT_{MAX}$		90		%VDD
22	Analog Full Scale Span	AFS		80		%VDD
23	Analog Output Accuracy (f, g, h)	AACC	-1.5		+1.5	%FS

Calibrated Pressure Ranges				
No.	Device Type	P_{MIN} (psi)	P_{MAX} (psi)	Comment
24	SM6291 – Gauge	0	+0.3 to +0.79	
25	SM6391 – Differential	-0.79 to -0.3	+0.3 to +0.79	Absolute value of P_{MIN} must match absolute value of P_{MAX}
26	SM6491 -- Asymmetric	-0.79 to 0	0 to +0.79	Delta between P_{MAX} and P_{MIN} must be at least 0.3 psi

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 across the compensated temp range. 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

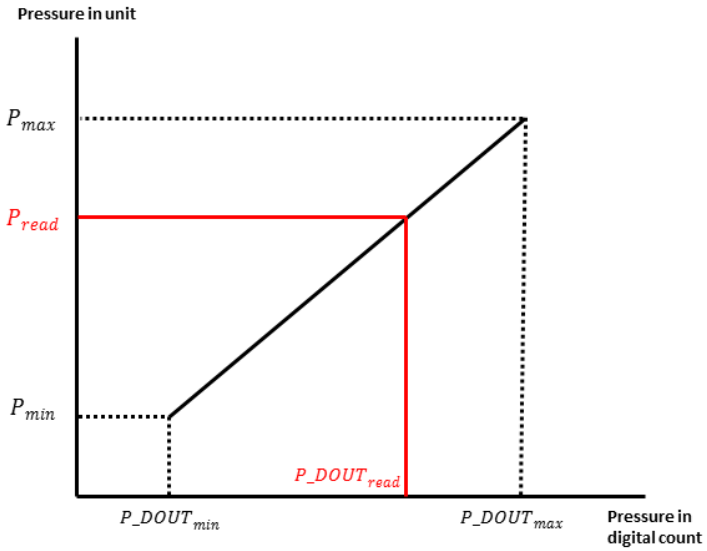
Digital Pressure Transfer Function

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

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}.

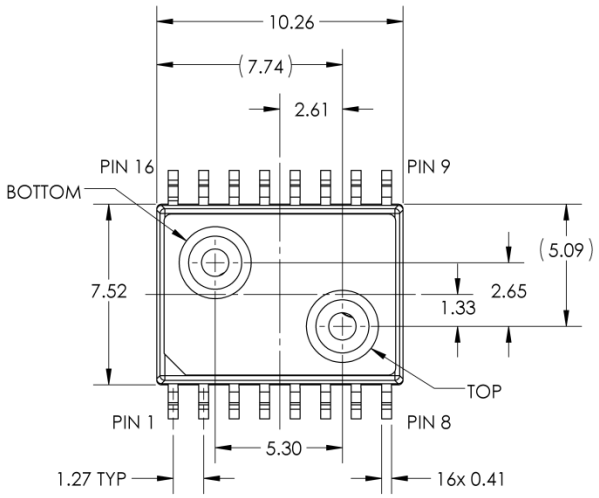


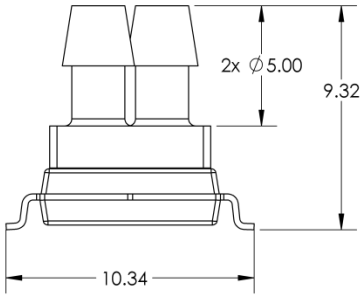
For example, the P_{min} and P_{max} for the sensor are specified as -0.3 and +0.3 psi. The $DOUT_{min}$ and $DOUT_{max}$ are -26214 and +26214. So,

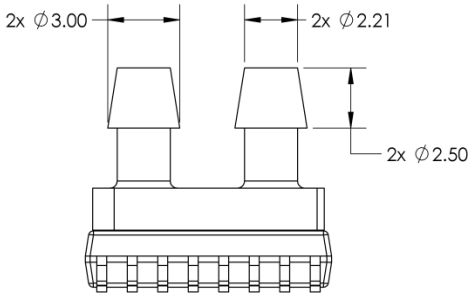
$$P_{read} = -0.3 + \frac{DOUT_{read} + 26214}{52428} \times 0.6\ psi$$

6. Package Dimensions

SOIC-16 (C) Vertical Package Dimensions



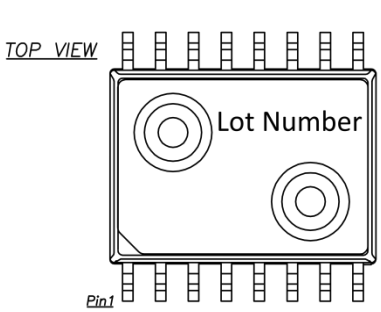


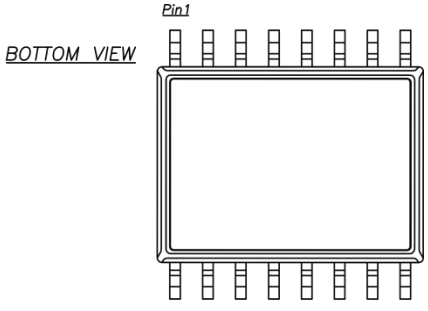


Notes:

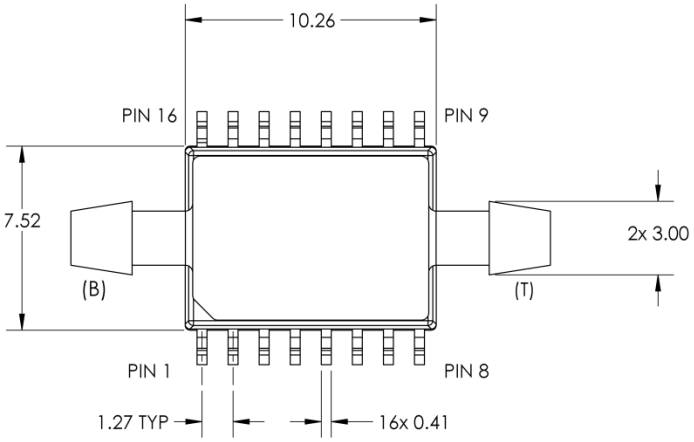
- All dimensions in units of [mm]
- Moisture Sensitivity Level (MSL): Level 3
- Wetted materials: Silicon, glass, gold, aluminum, copper, silicone, epoxy, mold compound.
- [B] is tube connected to bottom side of sensor die.
- [T] is tube connected to top side of sensor die. Topside pressure is positive pressure. An increase in topside pressure will result in an increase in sensor output unless otherwise noted on the tear sheet.

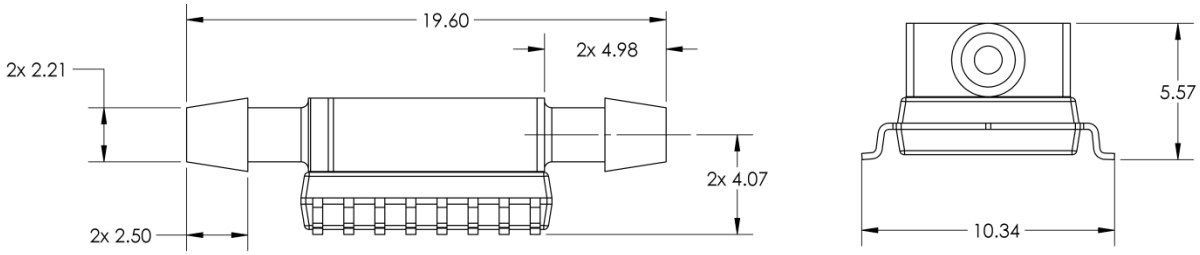
Part & Lot Number Identification





SOIC-16 Horizontal (B) Package Dimensions

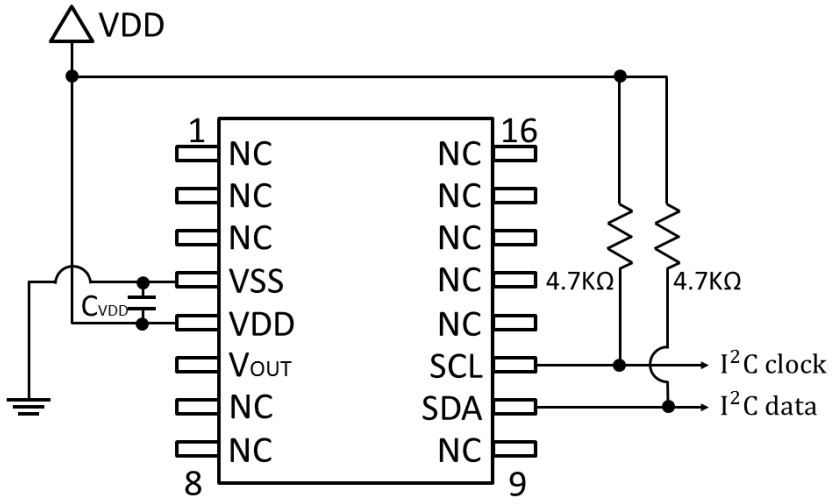




Qualification Standards

REACH Compliant
RoHS Compliant
PFOS/PFOA Compliant
For qualification specifications, please contact Sales at sales@si-micro.com

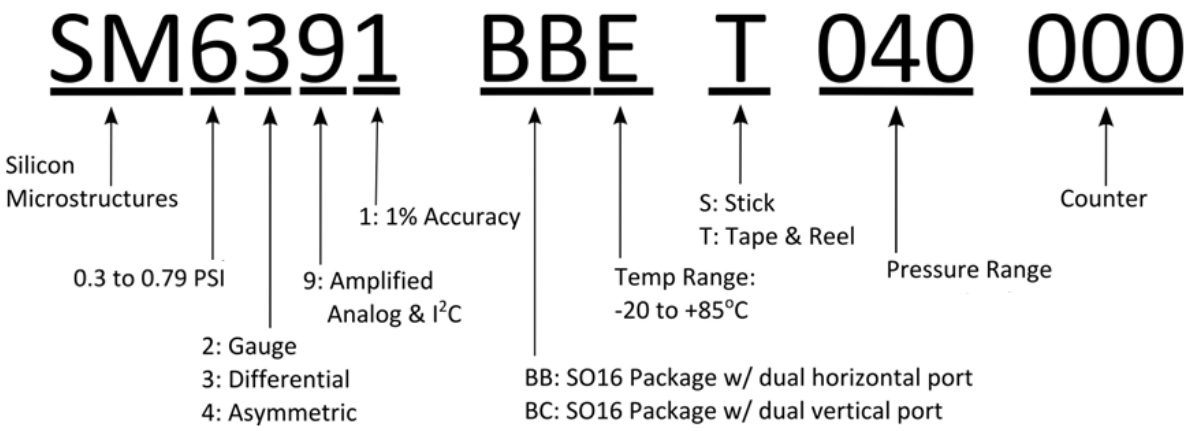
SM6X91 + Family Applications Circuit



Pin No.	Pin function	Pin No.	Pin function
1	NC	9	NC
2	NC	10	SDA
3	NC	11	SCL
4	VSS	12	NC
5	VDD	13	NC
6	VOUT (analog output)	14	NC
7	NC	15	NC
8	NC	16	NC

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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