

| 8MPP2 SERIES

MEMS I²C DIGITAL LOW PRESSURE SENSOR

Introduction

The 8MPP2 low pressure sensor utilizes Sensata's field proven automotive Micro-Electro-Mechanical-Systems (MEMS) technology that outputs fully conditioned pressure values via the digital I²C bus. The 8MPP2 features best-in-class performance including high accuracy, low power consumption, and long-term stability in a convenient package for mounting and electrical connection.

Compatible with natural gas, air and other gaseous media, the 8MPP2 is an atmospheric pressure reference sensor that accurately measures pressure in the 0-1 psig to 0-5 psig range. Typical applications are in the natural gas network including valves, pipelines, meters, etc.



Features

- Field proven MEMS sensor technology
- Digital output I²C
- Low power consumption (8 μ A @1Hz)
- Compatible with natural gas
- Small and robust plastic package
- REACH/RoHS/CE compliant

Applications

- Valves
- Natural gas pipelines
- Gas meters



SPECIFICATIONS

Electrical

Supply Voltage	2.7/3.3/5 VDC $\pm$ 10%
Output	Digital I ² C, 12 bit scaled up to 14 bit
Average Supply Current	8 μ A average @1Hz Sample Rate
Active Supply Current	2.5mA max
Output Response Time	3.2ms (max), power up to output valid
Overvoltage Protection	6 VDC
Reverse Voltage	-0.3 VDC
Short Circuit Protection	Yes
EMC	EN61000-4 Level 2
ESD	4kV
Radiated Immunity	IEC 61000-4-20; 50V/m level
Electrical Connection	4 position FFC connector, gold terminals

Pressure Ranges	0-1 to 0-5 psig (0 - 69 to 0 - 345 mbar)
Typical Operating Range	0.15-1.0 psig (10 - 69 mbar)

Physical

Proof Pressure	10 psig (690 mbar)
Burst Pressure	70 psig (4.8 bar)
Random Vibration	0.5G, 5-150Hz
Mechanical Shock	100G
Drop (any Axis)	1m
Humidity	71C, 95%RH
Media Compatibility	Dry Air, Natural Gas, Toluene, Benzene, Iso-octane, Xylene, Stoddard Solution
Sealing O-Ring	O-ring is supplied by customer with correct material for material compatibility. O-ring should be sized in accordance with ISO 3601-109

Performance

Accuracy @ 25°C (BFSL)⁽¹⁾	+/-1.0%FS ⁽³⁾ , 25°C
Total Error Band Accuracy⁽²⁾	+/-2.0%FS ⁽³⁾ , -40° to 85°C
Aging drift	<0.5 %FS ⁽³⁾
Pressure Reference	Vented/True Gauge
Operating Temperature	-40° to +85°C
Storage Temperature	-40° to +125°C

⁽¹⁾ Best fit straight line accuracy includes errors from non-linearity, non-repeatability, and hysteresis

⁽²⁾ Total error band accuracy includes errors from non-linearity, non-repeatability, hysteresis, temperature drift, zero offset, and full span offset

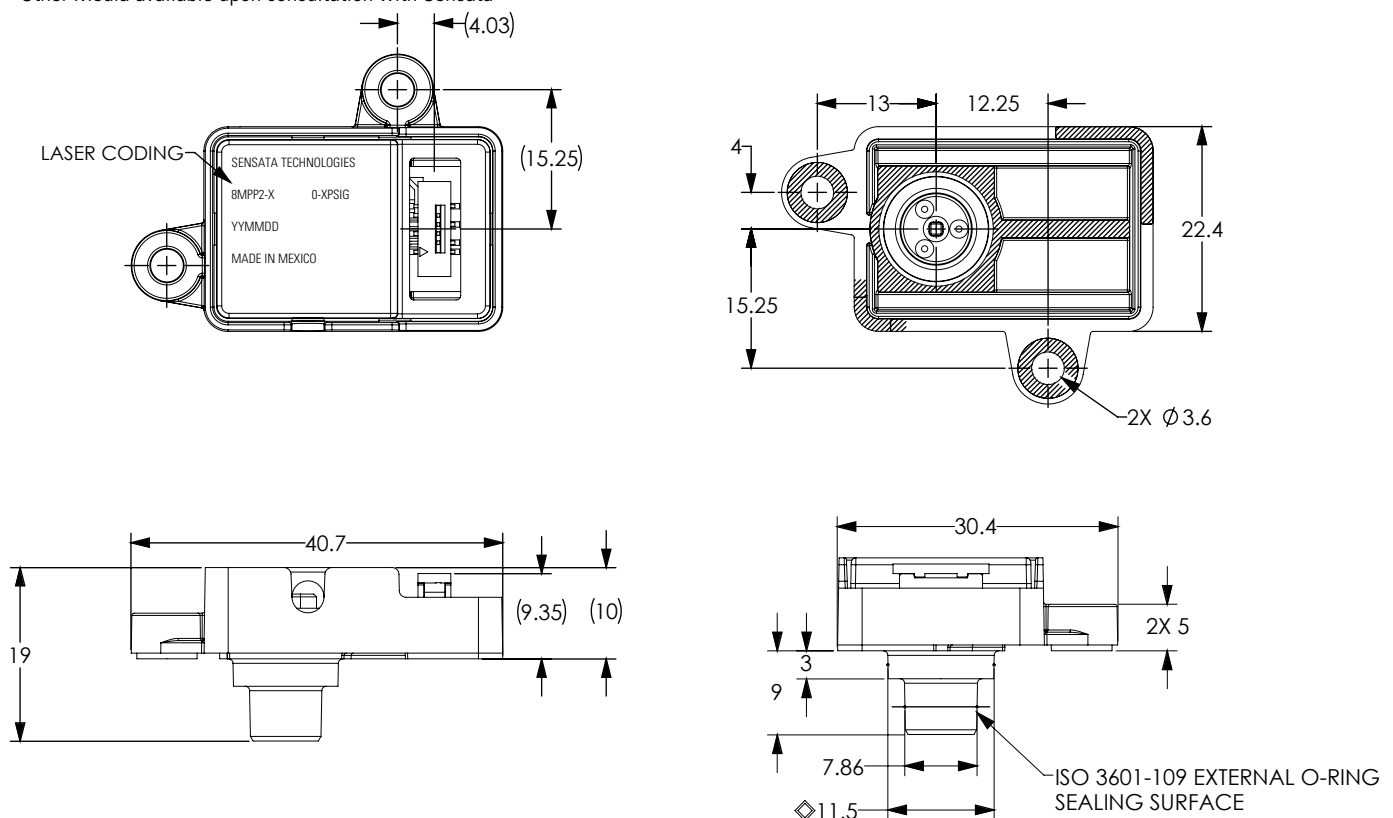
⁽³⁾ Full Scale Pressure = Pmax - Pmin

DIMENSIONS

Dimensions are in millimeters (mm)

FS (Pressure) = Pmax – Pmin

*Other Media available upon consultation with Sensata

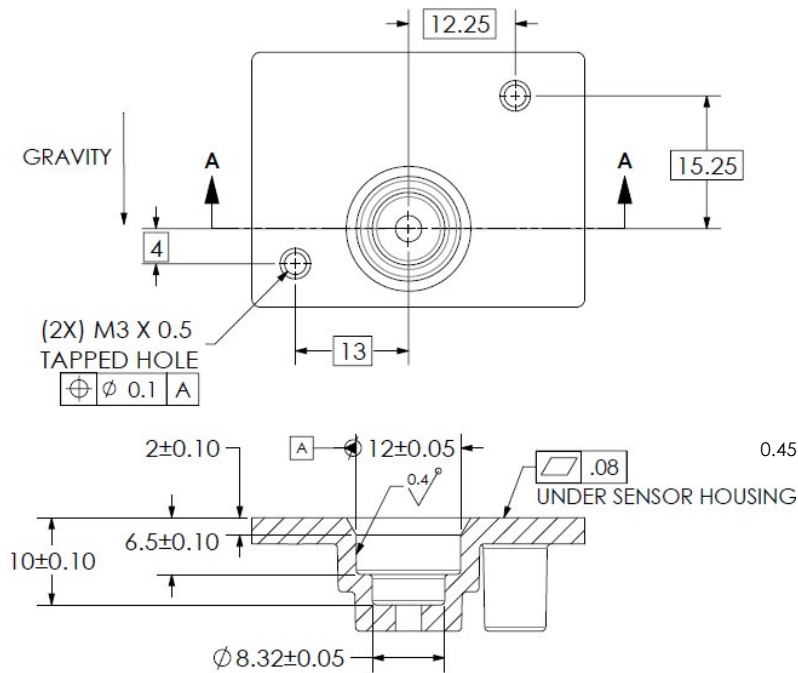




CUSTOMER INTERFACE

Mating Geometry

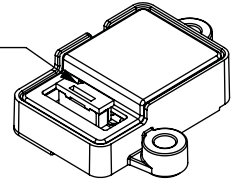
MATING MATERIAL: CAST AL



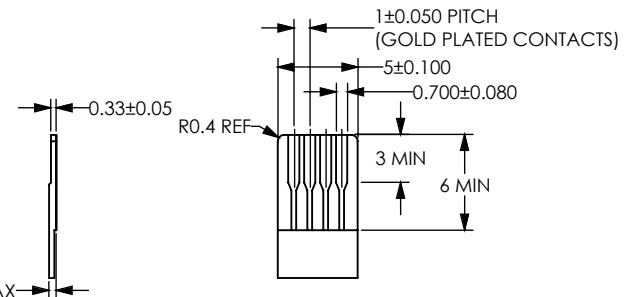
SECTION A-A

HARDWARE INSTALLATION TORQUE:
7 IN-LB (1.20 N-mm) MAX

CONNECTOR TYPE: 4 POS FFC CONNECTOR
PIN 1 LOCATION
MANUFACTURER: AMPHENOL
MANUFACTURER P/N: SFW4S-2STMAE1LF
SINGLE SIDED GOLD CONTACTS



RECOMMENDED CABLE GEOMETRY



Connector Pinout

PIN	Output
1	SCL
2	SDA
3	VSUP
4	GND



ORDERING OPTIONS

Example : 8MPP2-01-0x28-U-0

1 psig, 0x28 I²C address, update mode, 0.5ms update rate

Part numbering for samples

	8MPP2	-	01	-	0x28	-	S	-	0
Family	8MPP2								
Full Scale Pressure Range			01: 1 psig 05: 5 psig						
I²C Address					0x28 0x38 0x48 0x58 0x68 0x78				
Mode							U: Update Mode S: Sleep Mode		
Update Rate (valid for Update Mode Only)									0: 0.5 ms 1: 1.5 ms 2: 6.5 ms 3: 32.0 ms



AGENCY APPROVALS & CERTIFICATIONS



REACH



I²C COMMUNICATION

I ² C INTERFACE OVER TEMPERATURE RANGE						
OUTPUT						
RESOLUTION	12 BITS MIN					
UPDATE RATE (SEE NOTE 3)	1.5ms					
VOLTAGE	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
HIGH-LEVEL INPUT VOLTAGE	V_{IH}	-	$0.8 \times V_{DD}$	-	V_{DD}	V
LOW-LEVEL INPUT VOLTAGE	V_{IL}	-	-	-	$0.2 \times V_{DD}$	V
HIGH-LEVEL OUTPUT VOLTAGE	V_{OH}	-	$V_{DD} - 0.2$	-	V_{DD}	V
LOW-LEVEL OUTPUT VOLTAGE	V_{OL}	-	0	-	0.2	V
PARAMETER						
OUTPUT SINK CURRENT	I_{OL_SDA}	SDA @ V_{OL} , MAX	2.3	3.9	6.2	mA
LOAD CAPACITANCE AT SDA	C_{SDA}	@400kHz	-	-	200	pF
PULL-UP RESISTOR	R_{PC_PU}	-	0.5	1	50	k Ω
INPUT CAPACITANCE	C_{PC_IN}	-	-	-	10	pF

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
SCL clock frequency	f_{SCL}	100		400	kHz
Start condition hold time relative to SCL edge	t_{HDSTA}	0.1			μ s
Minimum SCL clock low width ¹⁾	t_{LOW}	0.6			μ s
Minimum SCL clock high width ¹⁾	t_{HIGH}	0.6			μ s
Start condition setup time relative to SCL edge	t_{SUSTA}	0.1			μ s
Data hold time on SDA relative to SCL edge	t_{HDDAT}	0			μ s
Data setup time on SDA relative to SCL edge	t_{SUDAT}	0.1			μ s
Stop condition setup time on SCL	t_{SUSTO}	0.1			μ s
Bus free time between stop condition and start condition	t_{BUS}	2			μ s

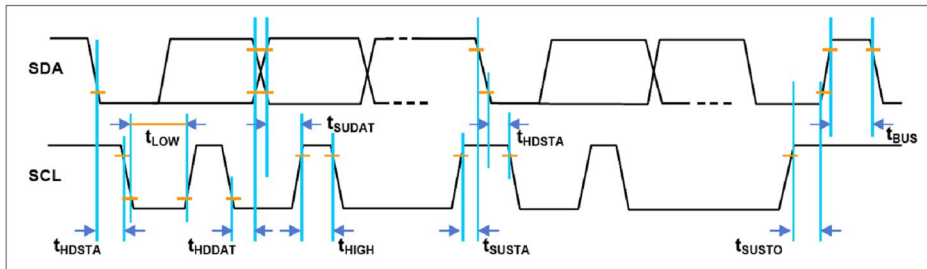
¹⁾ Combined low and high widths must equal or exceed minimum SCLK period

5. NO EXTERNAL CAPACITANCE NEEDED FOR V_s

NOTES:

1. THE SDA SIGNAL IS OPEN DRAIN. IT REQUIRES AN EXTERNAL PULL-UP SIZED TO MEET THE SPECIFIED TIMING REQUIREMENTS
2. LIMITS ON LOAD CAPACITANCE, PULL-UP RESISTOR, AND INPUT PIN CAPACITANCE ARE PROVIDED IN THE CASE WHERE MULTIPLE SLAVES ARE ON THE I²C B
3. UPDATE RATE IS THE TIME INTERVAL BETWEEN NEW MEASUREMENTS WHEN THE SENSOR IS POWERED CONTINUOUSLY.
4. SCL IS INPUT ONLY. SENSOR IS A SLAVE ONLY AND DOES NOT CREATE ANY CLOCK STRETCHING OR MULTIMASTER.

TIMING DIAGRAM OVER TEMPERATURE RANGE:

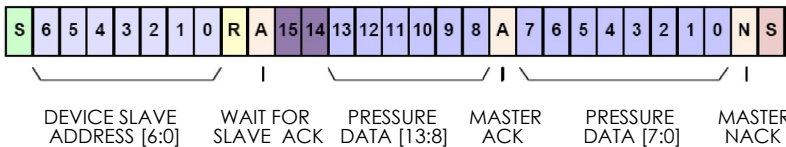


NOTE: THERE ARE THREE ADJUSTMENTS TO THE I²C IMPLEMENTATION COMPARED WITH THE ORIGINAL I²C PROTOCOL:

- SENDING A START-STOP CONDITION WITHOUT ANY TRANSITIONS ON THE CLK LINE (NO CLOCK PULSES IN BETWEEN) CREATES A COMMUNICATION ERROR FOR THE NEXT COMMUNICATION, EVEN IF THE NEXT START CONDITION IS CORRECT AND THE CLOCK PULSE IS APPLIED. AN ADDITIONAL START CONDITION MUST BE SENT, WHICH RESULTS IN RESTORATION OF PROPER COMMUNICATION.
- THE RESTART CONDITION- A FALLING SDA EDGE DURING DATA TRANSMISSION WHEN THE CLK CLOCK LINE IS STILL HIGH- CREATES THE SAME SITUATION. THE NEXT COMMUNICATION FAILS, AND AN ADDITIONAL START CONDITION MUST BE SENT FOR THE CORRECT COMMUNICATION.
- A FALLING SDA EDGE IS NOT ALLOWED BETWEEN THE START CONDITION AND THE FIRST RISING SCL EDGE. IF USING AN I²C ADDRESS WITH THE FIRST BIT 0, SDA MUST BE HELD 0W FROM THE START CONDITION THROUGH THE FIRST BIT.

I²C ADDRESS: 0x28 (IPSI)

I²C COMMUNICATION:



STATUS BITS (2 MSB OF OUTPUT PACKAGE)	DEFINITION
00	NORMAL OPERATION, GOOD DATA PACKET
01	RESERVED (WILL NOT BE SEEN DURING OPERATION)
10	STALE DATA: DATA THAT HAS ALREADY BEEN FETCHED SINCE THE LAST MEASUREMENT CYCLE. NOTE: IF A DATA FETCH IS PERFORMED BEFORE OR DURING THE FIRST MEASUREMENT AFTER POWER-ON RESET, THEN 'STALE' WILL BE RETURNED, BUT THIS DATA IS ACTUALLY INVALID BECAUSE THE FIRST MEASUREMENT HAS NOT BEEN COMPLETED.
11	NOT USED

SPECIFICATION	MIN	MAX
SDA AND SCL RISE TIME	20ns	300ns
SDA AND SCL FALL TIME	12ns	300ns

- Start Condition
- Device Slave Address (example: Bit 5)
- Data Bit (example: Bit 2)
- Read/Write Bit (example: Read=1)
- Acknowledge (ACK)
- No Acknowledge (NACK)
- Stop Condition
- Status Bit



WARNINGS



RISK OF MATERIAL DAMAGE AND HOT ENCLOSURE

- The product's side panels may be hot, allow the product to cool before touching
- Follow proper mounting instructions including torque values
- Do not allow liquids or foreign objects to enter this product

Failure to follow these instructions can result in serious injury, or equipment damage.



HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power before installing or working with this equipment
- Verify all connections and replace all covers before turning on power

Failure to follow these instructions will result in death or serious injury.

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Mailing Address: Sensata Technologies, Inc., 529 Pleasant Street, Attleboro, MA 02703, USA.

CONTACT US

Americas

+1 (800) 350 2727

sensors@sensata.com

switches@sensata.com

Europe, Middle East & Africa

+359 (2) 809 1826

pressure-info.eu@sensata.com

Asia Pacific

sales.isasia@list.sensata.com

China +86 (21) 2306 1500

Japan +81 (45) 277 7117

Korea +82 (31) 601 2004

India +91 (80) 67920890

Rest of Asia +886 (2) 27602006

ext 2808