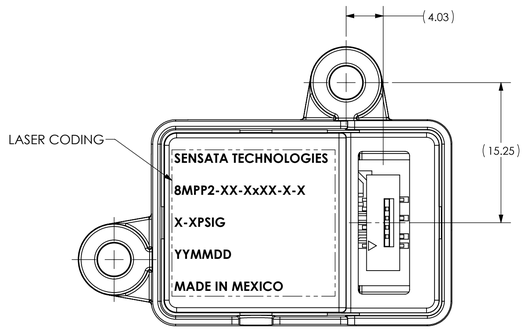
ZONE	REV.	REVISION DESCRIPTION	ECN NO.	DATE
	A	INITIAL RELEASE TO PRODUCTION: RTB	ECO-388275	10-SEP-2020



8MPP2 - XX - XxXX - X - X

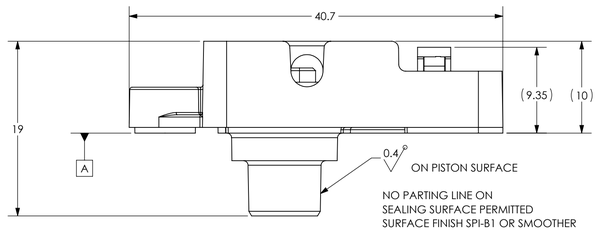
FAMILY DESCRIPTION
MEMS I²C DIGITAL
LOW PRESSURE SENSOR

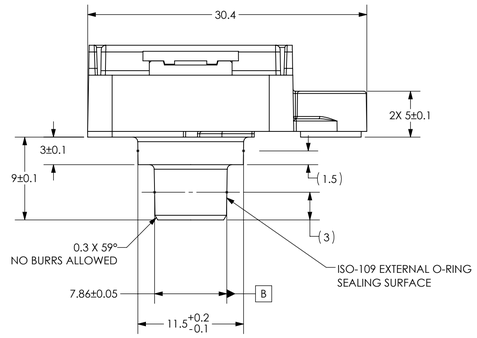
FULL SCALE PRESSURE RANGE
01: 1PSIG
05: 5PSIG

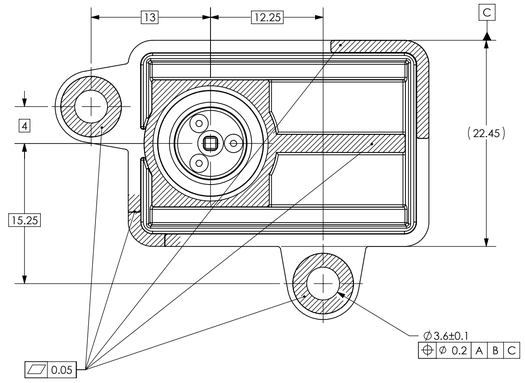
I²C ADDRESS
0x28
0x38
0x48
0x58
0x68
0x78

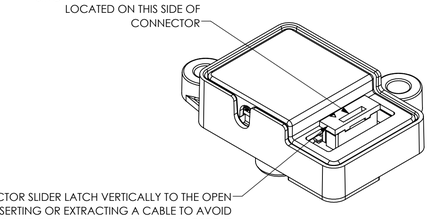
UPDATE RATE (SEE NOTE 3)
0: 0.5ms
1: 1.5ms
2: 6.5ms
3: 32.0ms

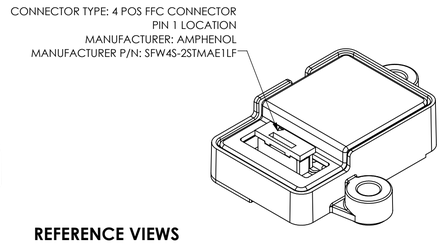
MODE
U: UPDATE MODE
S: SLEEP MODE











REFERENCE VIEWS
SCALE 2:1

ENVIRONMENT

OPERATING TEMPERATURE	-40°C TO +85°C
STORAGE TEMPERATURE	-40°C TO +125°C
FULL SCALE PRESSURE RANGE	TRUE GAGE
HUMIDITY	95% CONDENSING ON ATMOSPHERIC PORT
ORIENTATION	SENSING ELEMENT PERPENDICULAR TO GROUND
EXPOSURE	NATURAL GAS AND ITS IMPURITIES ON GAS SIDE PORT
SHOCK	100G/6ms (PER MIL-STD-810)
VIBRATION	5-150Hz @ 5m/s² FOR 20 SWEEPS PER AXIS
ESD	IEC 61000-4-2; 2kV HBM
RADIATED IMMUNITY	IEC 61000-4-20; 50V/m LEVEL

MATERIAL

PACKAGE	BLACK FORTRON 1140 L4 (40% FIBER REINFORCED PPS)
PRESSURE SEAL	O-RING SUPPLIED BY END USER
CONNECTOR CONTACTS	GOLD
RoHS COMPLIANT	

PERFORMANCE

TOTAL ERROR BAND @ -40°C TO 85°C	±2.0%FSP @ Vs = 3.3V
BURST PRESSURE	70 PSIG
PROOF PRESSURE	20 PSIG (MAX)
HELIUM LEAK RATE, OUT OF BOX	<1e-6 cc/sec @25°C
NATURAL GAS LEAKAGE RATE OVER LIFE	<0.1mL/min @ 10 PSI AFTER 1k THERMAL CYCLES FROM -40°C TO 85°C
TEB AFTER 1k TEMPERATURE CYCLES	±2.0% @Vss = 3.3V AFTER 1k THERMAL CYCLES FROM -40°C TO 85°C

CONNECTOR PINOUT

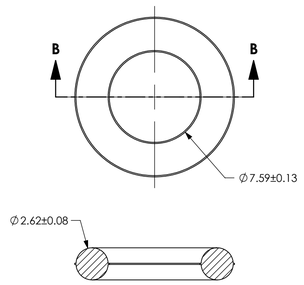
PIN	OUTPUT
1	SCL
2	SDA
3	VSUP
4	GND

ELECTRICAL CHARACTERISTICS OVER OPERATING TEMP RANGE

OPERATING SUPPLY VOLTAGE RANGE (Vs)	3.3 VDC ± 5%
INPUT VOLTAGE PROTECTION	VSUP: -0.3 TO 6VDC; ALL OTHERS: -0.3 TO VSUP + 0.3
AVERAGE SUPPLY CURRENT	2.5mA (MAX)
OUTPUT	14 BIT DIGITAL OUTPUT
OUTPUT RANGE (0%FSP TO 100%FSP)	1638 TO 14745 COUNTS
OUTPUT RESOLUTION	12 BITS SCALED TO 14 BITS
POWER ON RESET THRESHOLD	FALLING - 1.8V GUARANTEED SHUTDOWN RISING - 2.35V GUARANTEED STARTUP
MAX POWER UP TIME TO OUTPUT VALID	8.4ms (MAX)
PEAK CURRENT	10mA (MAX)
Vs RAMP UP TO 3.3V TIME LIMITS	5µS MIN, 20µS MAX
AVERAGE CURRENT DURING A POWER UP AND SINGLE READ CYCLE	2mA (MAX)
AVERAGE CURRENT DURING I²C READ OVER TEMP (DURING INTERVAL I²C START TO STOP)	2.5mA (MAX)
VOLTAGE (Vs) NOISE TOLERANCE	5%

RECOMMENDED O-RING MATING GEOMETRY (PER ISO3601-109)

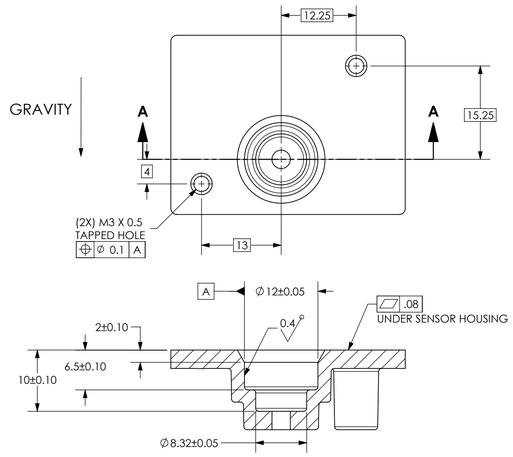
MATING MATERIAL: SELECTED BY CUSTOMER (COMPATIBLE WITH NATURAL GAS AND RELEVANT APPLICATION MEDIA)



SECTION B-B
SCALE 4 : 1

RECOMMENDED PORT MATING GEOMETRY

MATING MATERIAL: CAST Al



SECTION A-A

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

CHARACTERISTIC NAME	DRAWING SYMBOL	AIAG APQP REFERENCE MANUAL: GLOBAL SUPPLIER QUALITY MANUAL (G-SM-01) QMS-1004255, APPENDIX A	(INITIAL) SHORT TERM Cpk	LONG TERM Ppk
ISO 26262 FUNCTIONAL SAFETY RELATED SPECIAL	✚	A CHARACTERISTIC OF AN ITEM, ELEMENT OR PRODUCTION PROCESS FOR WHICH REASONABLY FORESEEABLE DEVIATION COULD AFFECT, CONTRIBUTE TO OR CAUSE ANY POTENTIAL REDUCTION OF FUNCTIONAL SAFETY.	≥ 1.67	MONITORING OF COMPLIANCE REQUIRED
	✚ S		≥ 1.67	≥ 1.67
CRITICAL	▽	CONTROL ITEM PRODUCTS HAVE CRITICAL CHARACTERISTICS THAT MAY AFFECT SAFE VEHICLE/PRODUCT OPERATION AND/OR COMPLIANCE WITH GOVERNMENT REGULATIONS. UNIQUE SYMBOLS IDENTIFYING SAFETY AND REGULATORY CHARACTERISTICS.	≥ 1.67	MONITORING OF COMPLIANCE REQUIRED
	▽ S		≥ 1.67	≥ 1.67
SIGNIFICANT	◇	SIGNIFICANT CHARACTERISTICS ARE THOSE PRODUCT PARAMETERS AND REQUIREMENTS THAT ARE IMPORTANT FOR CUSTOMER SATISFACTION (FORM, FIT AND FUNCTION) AND FOR WHICH QUALITY PLANNING ACTIONS MUST BE ADDRESSED ON A CONTROL PLAN.	≥ 1.67	MONITORING OF COMPLIANCE REQUIRED
	◇ S		≥ 1.67	≥ 1.33
SPC	S	USED TO SPECIFY ONGOING SPC METHODOLOGIES TO BE PERFORMED.	≥ 1.67	≥ 1.33
STANDARD		NON-KEY CHARACTERISTIC - STANDARD DIMENSION VS. STANDARD (INCL. TOLERANCE)	FIRST ARTICLE INSPECTION OK FIRST PART	FIRST ARTICLE INSPECTION OK FIRST PART

FOR REFERENCE ONLY, CHECK LATEST REVISION BEFORE USE. PARTS MADE TO THIS PRINT MUST CONFORM TO E9898 REV. E.

DRAWN ROB BALLERSTEDT DATE 10-SEP-2020
ENGINEER ROBERT LOUGHREY DATE 10-SEP-2020
APPROVED MIKE FALCO DATE 10-SEP-2020
APPROVED RICARDO YANEZ DATE 10-SEP-2020

INTERPRET DIMENSIONING AND TOLERANCING PER ASME Y14.5-2009. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS.
TOLERANCES
DECIMALS
ANGLES

DO NOT SCALE DRAWING
THIRD ANGLE PROJECTION

Sensata Technologies
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TITLE: GAS METER TRANSDUCER ENVELOPE DRAWING

SIZE	DWG NO.	REV.
A1	8MPP2-XX-XxXX-X-X	A

SCALE 3:1 | SOLIDWORKS | SHEET 1 OF 2

DEVICE: 8MPP
PROJECT:

I²C COMMUNICATION

I²C INTERFACE OVER TEMPERATURE RANGE						
OUTPUT						
RESOLUTION	12 BITS MIN					
VOLTAGE	**SYMBOL**	**CONDITIONS**	**MIN**	**TYP**	**MAX**	**UNITS**
HIGH-LEVEL INPUT VOLTAGE	V_{IH}	-	0.8 × V_{DD}	-	V_{DD}	V
LOW-LEVEL INPUT VOLTAGE	V_{IL}	-	-	-	0.2 × 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	$R_{I^2C\_PU}$	-	0.5	1	50	kΩ
INPUT CAPACITANCE	$C_{I^2C\_IN}$	-	-	-	10	pF

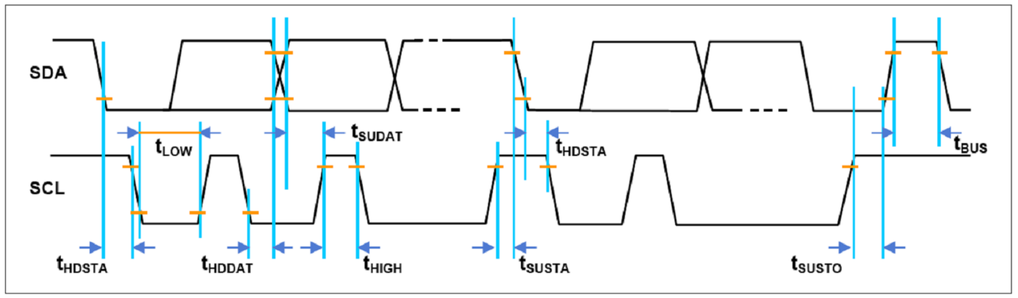
NOTES:
1. THE SDA SIGNAL IS OPEN DRAIN. IT REQUIRES AN EXTERNAL PULL-UP SIZED TO MEET THE SPECIFIED TIMING REQUIREMENTS
2. LIMITS ON LOAD CAPACITANCE, PULL-UP RESISTOR, AND INPUT PIN CAPACITANCE ARE PROVIDED IN THE CASE WHERE MULTIPLE SLAVES ARE ON THE I²C B
3. UPDATE RATE IS THE TIME INTERVAL BETWEEN 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.

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			µs
Minimum SCL clock low width [1)]	t_{LOW}	0.6			µs
Minimum SCL clock high width [1)]	t_{HIGH}	0.6			µs
Start condition setup time relative to SCL edge	t_{SUSTA}	0.1			µs
Data hold time on SDA relative to SCL edge	t_{HDDAT}	0			µs
Data setup time on SDA relative to SCL edge	t_{SUDAT}	0.1			µs
Stop condition setup time on SCL	t_{SUSTO}	0.1			µs
Bus free time between stop condition and start condition	t_{BUS}	2			µs

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

5. NO EXTERNAL CAPACITANCE NEEDED FOR Vs

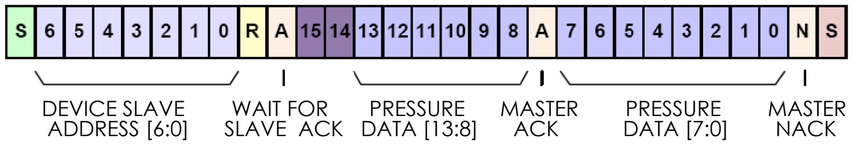
TIMING DIAGRAM OVER TEMPERATURE RANGE:



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 OW FROM THE START CONDITION THROUGH THE FIRST BIT.

I²C COMMUNICATION:

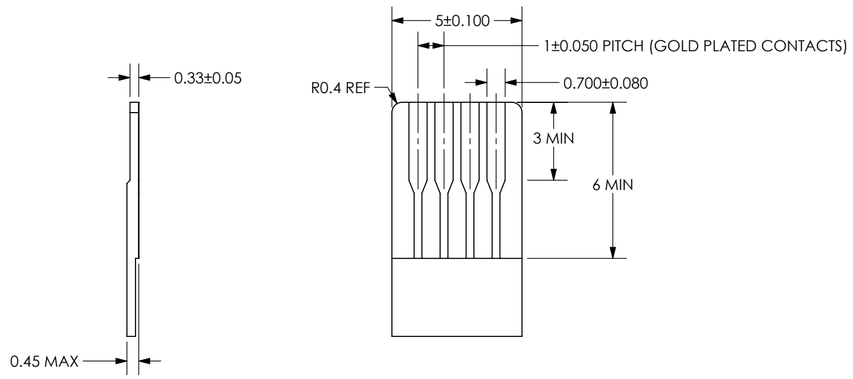


- S — Start Condition
- 5 — Device Slave Address (example: Bit 5)
- 2 — Data Bit (example: Bit 2)
- R — Read/Write Bit (example: Read=1)
- A — Acknowledge (ACK)
- N — No Acknowledge (NACK)
- S — Stop Condition
- Status Bit

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

RECOMMENDED CABLE GEOMETRY



REFERENCE VIEWS
SCALE 6:1

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SIZE	DWG NO.	REV.
A2	8MPP2-XX-XxXX-X-X	A
SCALE 20:1	SOLIDWORKS	SHEET 2 OF 2