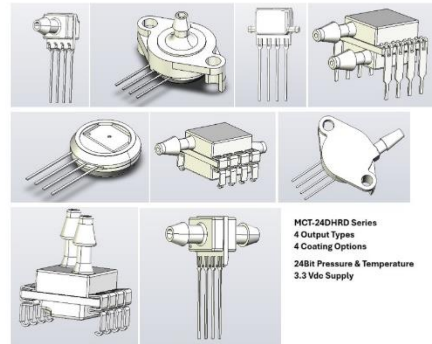
AV Sensors
AdVanced Sensor Design and Manufacture

MCT-24DHRD SERIES

The MCT-24DHRD Series
Thru Hole, J lead, SIL Pin Styles
Digital Pressure & Temperature Outputs
Liquid Level Compatible
4 Output Types



DESCRIPTION

Advanced Sensors Multi Chip Technology (MCT) 24DHRD Series incorporates a bonded silicon gage to the latest mixed signal ASIC (Application Specific Integrated Circuit) with a leading *24Bit* High Resolution ADC (∑ Δ) specifically designed for medical, life science and avionic control industries. The MCT 24DHRD Series provides a 24bit digital pressure and temperature output in SPI and I^2C protocols. The advanced design requires *no* external calculation since a fully integrated digital signal processor (DSP) performs an error correction algorithm. The designs superior performance provides 1% Total Error across a wide temperature range of -10 to 60˚ Given these features and an advanced low power design; the MCT-24DHRD series is the ideal choice for OEM customers.

APPLICATIONS

- Avionic Instrumentation
- Automotive diagnostics
- Medical equipment/instrumentation
- Air Speed and Altitude
- Environmental controls
- Barometric pressure measurement
- Factory Automation
- Process Controls

FEATURES

- Internal Error Correction
- Low Power Sleep Stage
- Highly Accuracy
- Thru Hole, J Lead, and SIL Pin Style
- Wide Selection of Port Styles (43 Total)
- High Resolution Digital Output (24bit ADC Pressure & Temperature)
- I2C & SPI Outputs
- Custom Outputs and Ranges Available
- Wide Pressure Range (100Pa to 10Bar)

SPECIFICATIONS	Symbol	Min	Typical	Max	Unit	Note
Performance Specifications						
Supply Voltage		3.0	3.3	3.60	V	
Current Consumption				3	mA	
Standby Current			0.2		µA	
Output Resolution		12		24	bits	
Pressure Accuracy		-0.25		0.25	%FSS	2
Temperature Accuracy			±4		°C	3
Total Error Band	TEB	-1.0		1.0	%FSS	4
Long Term Stability			±0.25		%FSS	
Conversion Time		2	7	10	mS	5
Power On to Valid Data				3	mS	6
Weight				3	grams	
Compensated Temperature			-10 to 60		°C	7
Operating Temperature			-40 to 85		°C	7

SPECIFICATIONS	Symbol	Min	Typical	Max	Unit	Note
Absolute Maximum Conditions						11
Supply Voltage		-0.3		3.6	V	
Voltage on Any Pin		-0.3		Vsupply +0.3	V	
Digital Interface	I2C	100		400	kHz	
Clock Frequency	SPI	50		800	kHz	
Pull Up Resistor, Data Lines		1			kΩ	
Storage Temperature		-40		85	˚C	
ESD Susceptibility (HBM)		2				kV
Package Integrity, Common Mode		See Pressure Range Table				8
Proof Pressure		See Pressure Range Table				9
Burst Pressure		See Pressure Range Table				10
Media Compatibility		Compatible with Wetted Materials				

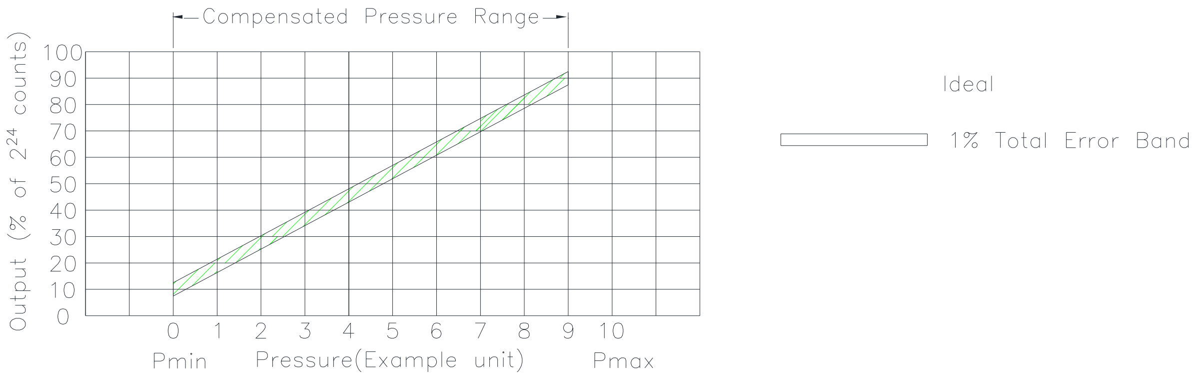
WETTED MATERIALS			
Component	Pressure Port 1		Pressure Port 2
	Dry Gas	Liquid Media	
Ports & Covers	High Temperature Polyamide		
Substrate	Alumina Ceramic	-	Alumina Ceramic
Adhesives	Epoxy, Silicone	Epoxy, Silicone Gel	Epoxy, Silicone
Electronic Components	Silicon, Glass, Solder, Gold, Alumina	304 SST	Silicon

Reference Conditions: Vsupply: 3.30Vdc Ta=25˚C, Positive Pressure Port 1

1. All specification at reference conditions unless otherwise noted.
2. Maximum deviation from a Best Fit Straight Line through Pmin and Pmax measured at 25˚C. Errors included Pressure Non Linearity, Pressure Hysteresis and Repeatability.
3. Typical temperature output error over the compensated temperature range.
4. Maximum deviation from the Ideal Transfer Function expressed as a percentage of the %FSS over the compensated temperature range. Includes calibration errors (Offset & Span), temperature errors (Offset & Span), pressure non-linearity, pressure and thermal hysteresis. See Pressure Range Specifications below.
5. The time for the output DAC to be updated with new data.
6. The time for the output DAC to have valid data after a power on reset.
7. Compensated and operating temperature for mBar ranges are 0˚C to 60˚C and -20˚C – to 105˚C, respectively.
8. Maximum pressure the sensor package can withstand without rupture.
9. Maximum pressure without degrading sensor's performance specifications.
10. Maximum pressure the silicon diaphragm can withstand without rupture.
11. Exceeding Absolute Maximum Specification may damage the device. Extended exposure beyond the operating conditions may affect device reliability.

PRESSURE AND TEMPERATURE TRANSFER FUNCTIONS

PRESSURE OUTPUT CHART EXAMPLE
TYPE 1 (10–90%) EXAMPLE



PRESSURE TRANSFER FUNCTION

$$\text{Output } (\% \text{ of } 2^{24} \text{ counts}) = \frac{M*16777215}{Pmax-Pmin} * (Papplied-Pmin)+N*16777215$$

TEMPERATURE TRANSFER FUNCTION

$$\text{Temperature Output (Decimal Counts)} = \frac{(\text{Output } ^\circ C - (-40^\circ C)_{Tmin}) * 16777215}{(85^\circ C_{Tmax} - (-40^\circ C)_{Tmin})}$$

TRANSFER FUNCTION				
Variable	OUTPUT TYPE			
	1	2	3	4
M	0.8	0.9	0.8	0.9
N	0.1	0.05	0.05	0.04

CONNECTION DIAGRAM

Pin	1	2	3	4	5	6	7	8
I2C/SPI	GND	SUPPLY	SDA/MOSI	SCL/SCLK	SS	NA	NA	/MISO

PRESSURE RANGE SPECIFICATIONS

Pressure Range Specifications for ±1.6 mbar to ±10 bar

Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure[1]	Over Pressure[2]	Burst Pressure[3]	Common Mode Pressure[4]	Total Error Band[5] (%FSS)	Total Error Band after Auto-Zero[6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Absolute										
001BA	0	1	bar	-	2	4	-	±1%	-	±0.25%
1.6BA	0	1.6	bar	-	4	8	-	±1%	-	±0.25%
2.5BA	0	2.5	bar	-	6	8	-	±1%	-	±0.25%
004BA	0	4	bar	-	8	16	-	±1%	-	±0.25%
006BA	0	6	bar	-	17	17	-	±1%	-	±0.25%
010BA	0	10	bar	-	17	17	-	±1%	-	±0.25%
Differential										
001MD	-1	1	mbar	20	40	60	100	±2.5%	±1.75%	±0.5%
1.6MD	-1.6	1.6	mbar	20	40	60	100	±2.5%	±1.75%	±0.5%
2.5MD	-2.5	2.5	mbar	20	40	60	100	±2%	±1.25%	±0.35%
004MD	-4	4	mbar	20	40	60	100	±1.5%	±0.75%	±0.35%
006MD	-6	6	mbar	50	80	100	200	±1%	±0.75%	±0.35%
010MD	-10	10	mbar	375	750	1250	5450	±1%	±0.5%	±0.25%
016MD	-16	16	mbar	375	750	1250	5450	±1%	±0.5%	±0.25%
025MD	-25	25	mbar	435	850	1350	10450	±1%	±0.5%	±0.25%
040MD	-40	40	mbar	435	850	1350	10450	±1%	±0.5%	±0.25%
060MD	-60	60	mbar	-	850	1000	10000	±1%	-	±0.25%
100MD	-100	100	mbar	-	1400	2500	10000	±1%	-	±0.25%
160MD	-160	160	mbar	-	1400	2500	10000	±1%	-	±0.25%
250MD	-250	250	mbar	-	1400	2500	10000	±1%	-	±0.25%
400MD	-400	400	mbar	-	2000	4000	10000	±1%	-	±0.25%
600MD	-600	600	mbar	-	2000	4000	10000	±1%	-	±0.25%
001BD	-1	1	bar	-	4	8	10	±1%	-	±0.25%
1.6BD	-1.6	1.6	bar	-	8	16	10	±1%	-	±0.25%
2.5BD	-2.5	2.5	bar	-	8	16	10	±1%	-	±0.25%
004BD	-4.0	4.0	bar	-	16	17	10	±1%	-	±0.25%

Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure[1]	Over Pressure[2]	Burst Pressure[3]	Common Mode Pressure[4]	Total Error Band[5] (%FSS)	Total Error Band after Auto-Zero[6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Gage										
2.5MG	0	2.5	mbar	335	675	1000	3450	±3%	±2%	±0.5%
004MG	0	4	mbar	335	675	1000	3450	±2%	±1.25%	±0.5%
006MG	0	6	mbar	335	675	1000	3450	±2%	±1%	±0.35%
010MG	0	10	mbar	335	675	1000	3450	±1.5%	±0.75%	±0.35%
016MG	0	16	mbar	335	675	1000	3450	±1%	±0.75%	±0.25%
025MG	0	25	mbar	375	750	1250	5450	±1%	±0.5%	±0.25%
040MG	0	40	mbar	375	750	1250	5450	±1%	±0.5%	±0.25%
060MG	0	60	mbar	-	850	1000	5450	±1%	±0.5%	±0.25%
100MG	0	100	mbar	-	850	1000	10000	±1%	-	±0.25%
160MG	0	160	mbar	-	850	1000	10000	±1%	-	±0.25%
250MG	0	250	mbar	-	1400	2500	10000	±1%	-	±0.25%
400MG	0	400	mbar	-	2000	4000	10000	±1%	-	±0.25%
600MG	0	600	mbar	-	2000	4000	10000	±1%	-	±0.25%
001BG	0	1	bar	-	2	4	10	±1%	-	±0.25%
1.6BG	0	1.6	bar	-	4	8	10	±1%	-	±0.25%
2.5BG	0	2.5	bar	-	8	16	10	±1%	-	±0.25%
004BG	0	4	bar	-	8	16	16	±1%	-	±0.25%
006BG	0	6	bar	-	17	17	17	±1%	-	±0.25%
010BG	0	10	bar	-	17	17	17	±1%	-	±0.25%

PRESSURE RANGE SPECIFICATIONS

Pressure Range Specifications for ±160 Pa to ±1 MPa

Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure [1]	Over Pressure [2]	Burst Pressure [3]	Common Mode Pressure [4]	Total Error Band [5] (%FSS)	Total Error Band after Auto-Zero [6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Absolute										
100KA	0	100	kPa	-	200	400	-	±1%	-	±0.25%
160KA	0	160	kPa	-	400	800	-	±1%	-	±0.25%
250KA	0	250	kPa	-	600	800	-	±1%	-	±0.25%
400KA	0	400	kPa	-	800	1600	-	±1%	-	±0.25%
600KA	0	600	kPa	-	1700	1700	-	±1%	-	±0.25%
001GA	0	1	MPa	-	1700	1700	-	±1%	-	±0.25%
Differential										
100LD	-100	100	Pa	2000	4000	6000	100000	±2.5%	±1.75%	±0.5%
160LD	-160	160	Pa	2000	4000	6000	100000	±2.5%	±1.75%	±0.5%
250LD	-250	250	Pa	2000	4000	6000	100000	±2%	±1.25%	±0.35%
400LD	-400	400	Pa	2000	4000	6000	100000	±1.5%	±0.75%	±0.35%
600LD	-600	600	Pa	5000	10000	20000	200000	±1%	±0.75%	±0.35%
001KD	-1	1	kPa	37.5	75	125	545	±1%	±0.5%	±0.25%
1.6KD	-1.6	1.6	kPa	37.5	75	125	545	±1%	±0.5%	±0.25%
2.5KD	-2.5	2.5	kPa	43.5	85	135	1045	±1%	±0.5%	±0.25%
004KD	-4	4	kPa	43.5	85	135	1045	±1%	±0.5%	±0.25%
006KD	-6	6	kPa	-	85	100	1000	±1%	-	±0.25%
010KD	-10	10	kPa	-	140	250	1000	±1%	-	±0.25%
016KD	-16	16	kPa	-	140	250	1000	±1%	-	±0.25%
025KD	-25	25	kPa	-	140	250	1000	±1%	-	±0.25%
040KD	-40	40	kPa	-	200	400	1000	±1%	-	±0.25%
060KD	-60	60	kPa	-	200	400	1000	±1%	-	±0.25%
100KD	-100	100	kPa	-	400	800	1000	±1%	-	±0.25%
160KD	-160	160	kPa	-	800	1600	1000	±1%	-	±0.25%
250KD	-250	250	kPa	-	800	1600	1000	±1%	-	±0.25%
400KD	-400	400	kPa	-	1600	1700	1000	±1%	-	±0.25%

Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure [1]	Over Pressure [2]	Burst Pressure [3]	Common Mode Pressure [4]	Total Error Band [5] (%FSS)	Total Error Band after Auto-Zero [6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Gage										
250LG	0	250	Pa	2000	4000	6000	100000	±3%	±2%	±0.5%
400LG	0	400	Pa	2000	4000	6000	100000	±2%	±1.25%	±0.5%
600LG	0	600	Pa	2000	4000	6000	100000	±2%	±1%	±0.35%
001KG	0	1	kPa	33.5	67.5	100	345	±1.5%	±0.75%	±0.35%
1.6KG	0	1.6	kPa	33.5	67.5	100	345	±1%	±0.75%	±0.25%
2.5KG	0	2.5	kPa	37.5	75	125	545	±1%	±0.5%	±0.25%
004KG	0	4	kPa	37.5	75	125	545	±1%	±0.5%	±0.25%
006KG	0	6	kPa	-	85	100	545	±1%	±0.5%	±0.25%
010KG	0	10	kPa	-	85	100	1000	±1%	-	±0.25%
016KG	0	16	kPa	-	85	100	1000	±1%	-	±0.25%
025KG	0	25	kPa	-	140	250	1000	±1%	-	±0.25%
040KG	0	40	kPa	-	200	400	1000	±1%	-	±0.25%
060KG	0	60	kPa	-	200	400	1000	±1%	-	±0.25%
100KG	0	100	kPa	-	200	400	1000	±1%	-	±0.25%
160KG	0	160	kPa	-	400	800	1000	±1%	-	±0.25%
250KG	0	250	kPa	-	800	1600	1000	±1%	-	±0.25%
400KG	0	400	kPa	-	800	1600	1600	±1%	-	±0.25%
600KG	0	600	kPa	-	1700	1700	1700	±1%	-	±0.25%
001GG	0	1	MPa	-	1.7	1.7	1.7	±1%	-	±0.25%

PRESSURE RANGE SPECIFICATIONS

Pressure Range Specifications for 0.5 inH_2O to 150 psi

Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure [1]	Over Pressure [2]	Burst Pressure [3]	Common Mode Pressure [4]	Total Error Band [5] (%FSS)	Total Error Band after Auto-Zero [6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Absolute										
015PA	0	15	psi	-	30	60	-	±1%	-	±0.25%
030PA	0	30	psi	-	60	120	-	±1%	-	±0.25%
060PA	0	60	psi	-	120	240	-	±1%	-	±0.25%
100PA	0	100	psi	-	250	250	-	±1%	-	±0.25%
150PA	0	150	psi	-	250	250	-	±1%	-	±0.25%
Differential										
0.5ND	-0.5	0.5	inH_2O	35	70	200	1000	±3%	±2%	±0.5%
001ND	-1	1	inH_2O	35	70	200	1000	±2%	±1.25%	±0.35%
002ND	-2	2	inH_2O	35	70	200	1000	±1%	±0.75%	±0.35%
004ND	-4	4	inH_2O	150	300	500	2200	±1%	±0.5%	±0.25%
005ND	-5	5	inH_2O	150	300	500	2200	±1%	±0.5%	±0.25%
010ND	-10	10	inH_2O	175	350	550	4200	±1%	±0.5%	±0.25%
020ND	-20	20	inH_2O	175	350	550	4200	±1%	±0.5%	±0.25%
030ND	-30	30	inH_2O	175	350	550	4200	±1%	±0.5%	±0.25%
001PD	-1	1	psi	-	10	15	150	±1%	-	±0.25%
005PD	-5	5	psi	-	30	40	150	±1%	-	±0.25%
015PD	-15	15	psi	-	60	120	150	±1%	-	±0.25%
030PD	-30	30	psi	-	120	240	150	±1%	-	±0.25%
060PD	-60	60	psi	-	250	250	250	±1%	-	±0.25%

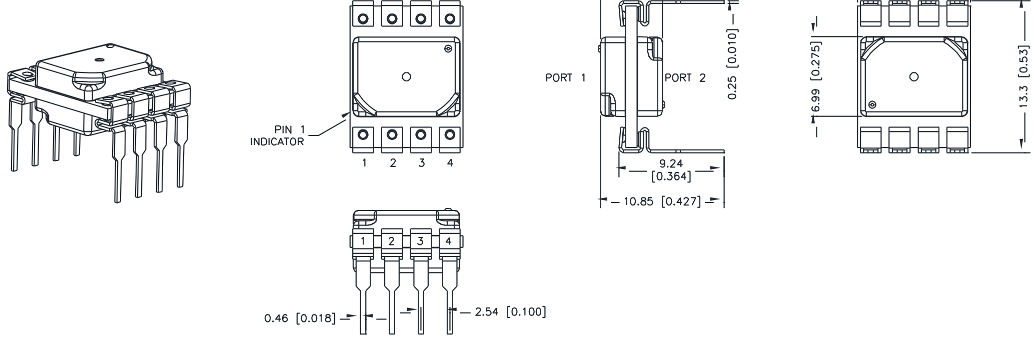
Pressure Range (see Figure 4)	Pressure Range Pmin.	Pressure Range Pmax.	Unit	Working Pressure [1]	Over Pressure [2]	Burst Pressure [3]	Common Mode Pressure [4]	Total Error Band [5] (%FSS)	Total Error Band after Auto-Zero [6] (%FSS)	Long-term Stability 1000 hr, 25 °C (%FSS)
Gage										
001NG	0	1	inH_2O	35	70	100	400	±3%	±2%	±0.5%
002NG	0	2	inH_2O	35	70	100	400	±2%	±1.25%	±0.35%
004NG	0	4	inH_2O	135	270	415	1400	±1.5%	±0.75%	±0.35%
005NG	0	5	inH_2O	135	270	415	1400	±1%	±0.75%	±0.25%
010NG	0	10	inH_2O	150	300	500	2200	±1%	±0.5%	±0.25%
020NG	0	20	inH_2O	175	350	550	4200	±1%	±0.5%	±0.25%
030NG	0	30	inH_2O	175	350	550	4200	±1%	±0.5%	±0.25%
001PG	0	1	psi	-	10	15	150	±1%	-	±0.25%
005PG	0	5	psi	-	30	40	150	±1%	-	±0.25%
015PG	0	15	psi	-	30	60	150	±1%	-	±0.25%
030PG	0	30	psi	-	60	120	150	±1%	-	±0.25%
060PG	0	60	psi	-	120	240	250	±1%	-	±0.25%
100PG	0	100	psi	-	250	250	250	±1%	-	±0.25%
150PG	0	150	psi	-	250	250	250	±1%	-	±0.25%

1. The maximum pressure that may be applied to any port of the sensor in continuous use. The pressure may be outside the operating range units (Pmin or Pmax) in which case the sensor may not provide a valid output until the pressure is returned to within the operating range.
2. See Note 9 above for Proof Pressure.
3. See Note 10 above.
4. See Note 8 above.
5. See Note 4 above.
6. The maximum deviation from the ideal transfer function over the compensated pressure range at a constant temperature and supply voltage for a minimum of 24 hours after an auto-zero operation. Includes all errors due to full scale span, pressure nonlinearity, pressure hysteresis, and thermal effect on span.

PORT CONFIGURATION

MECHANICAL DIMENSIONS

DIP NN



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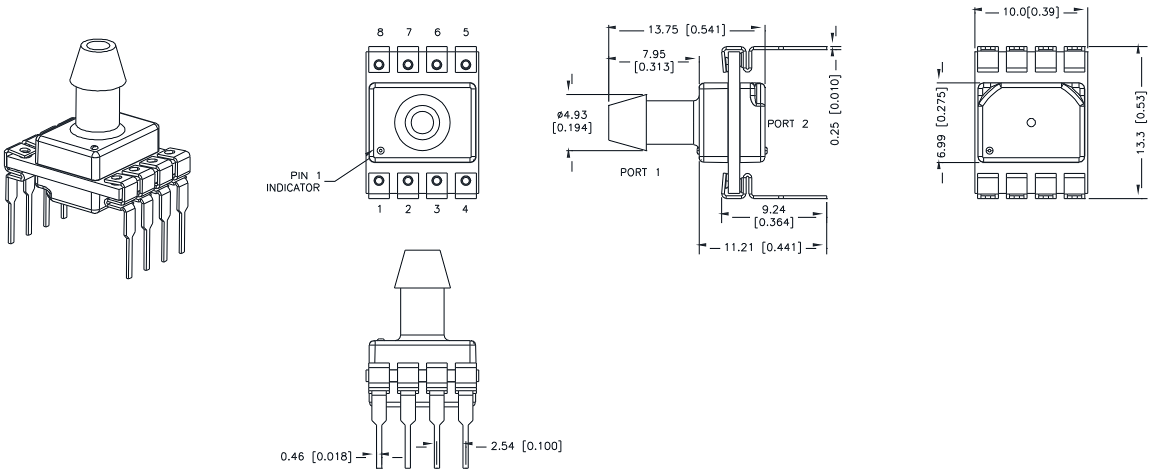

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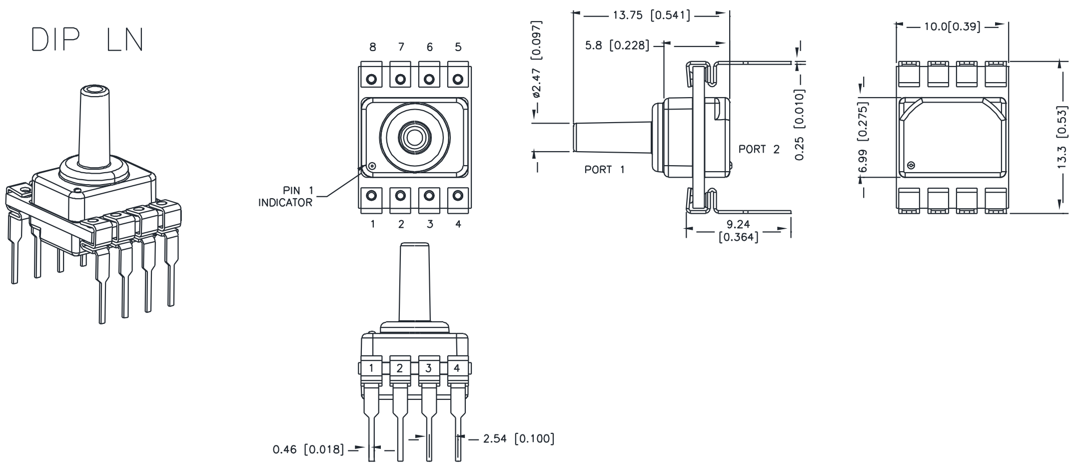
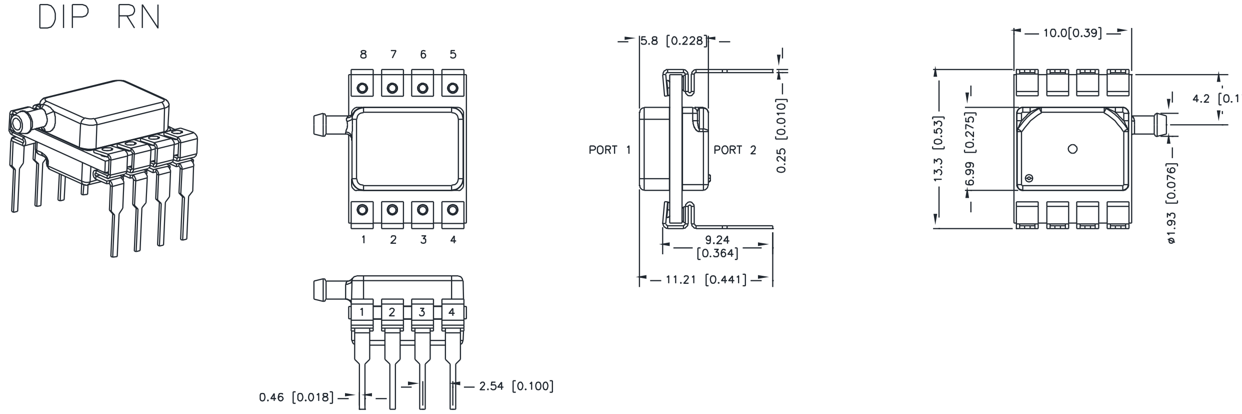
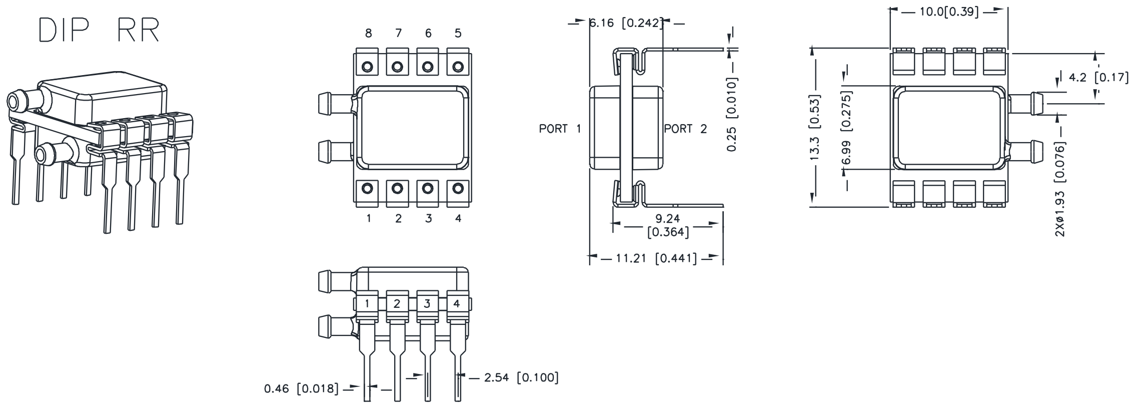


MECHANICAL DIMENSIONS

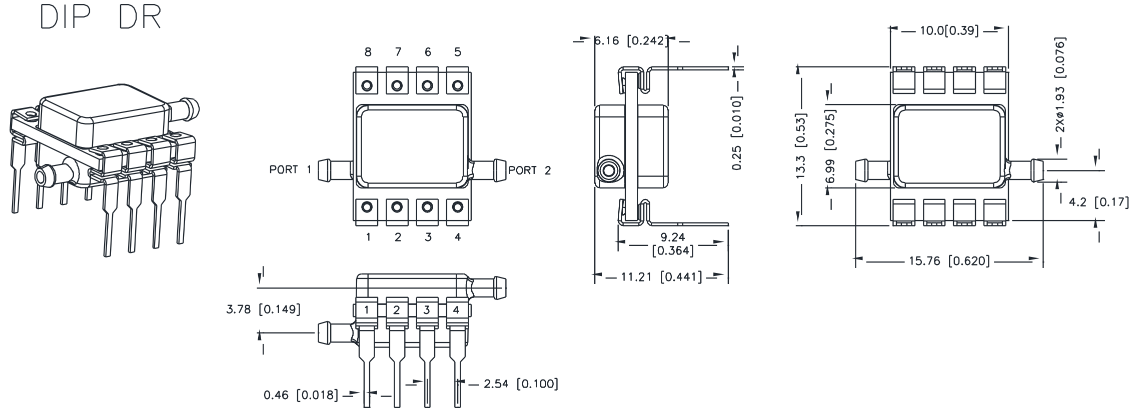
DIP RN



DIP RR

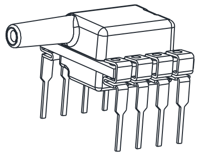


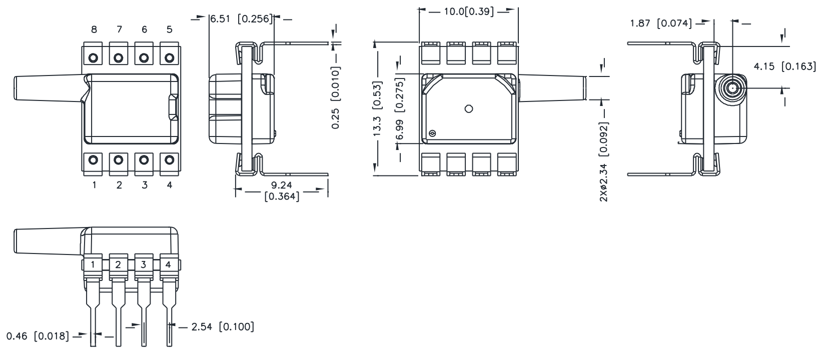
DIP DR



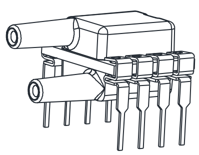
MECHANICAL DIMENSIONS

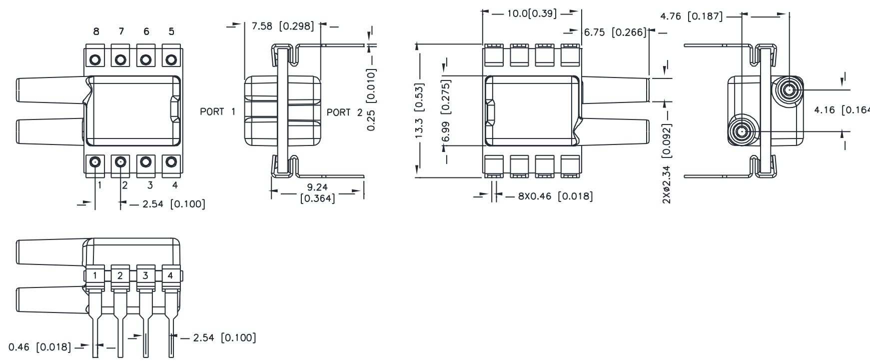
DIP JN



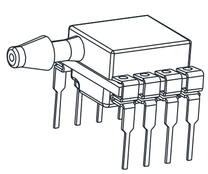


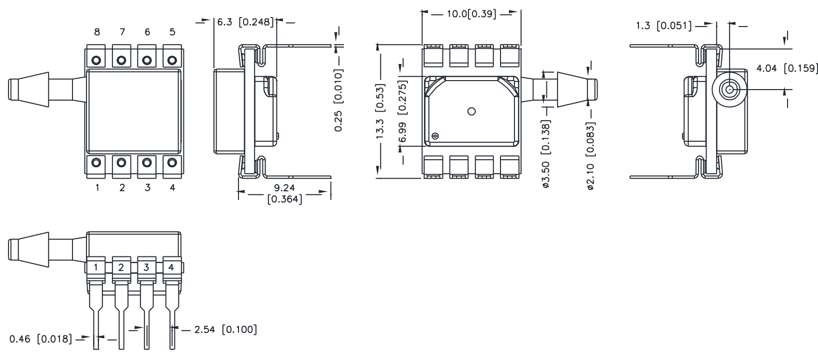
DIP JJ





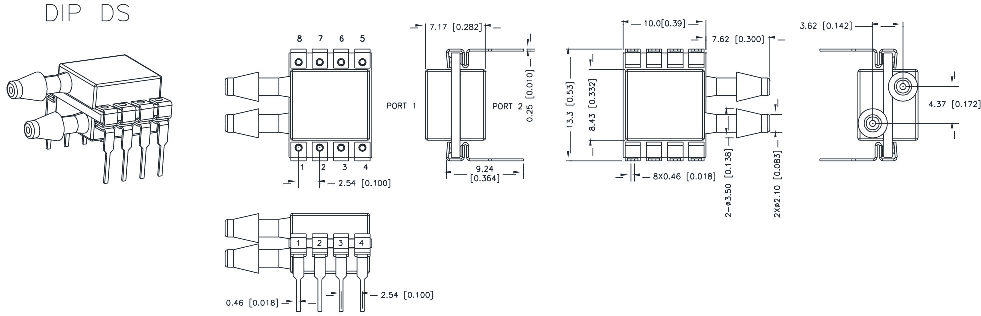
DIP SS





MECHANICAL DIMENSIONS

DIP DS



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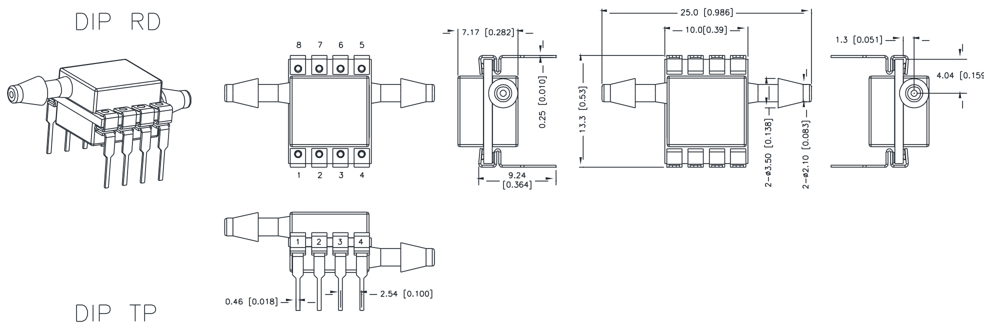

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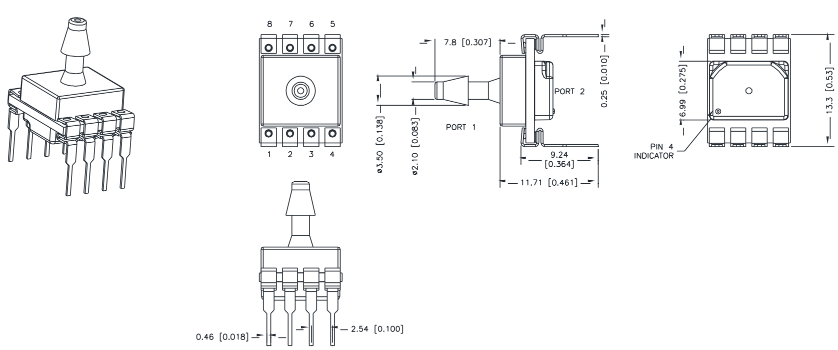

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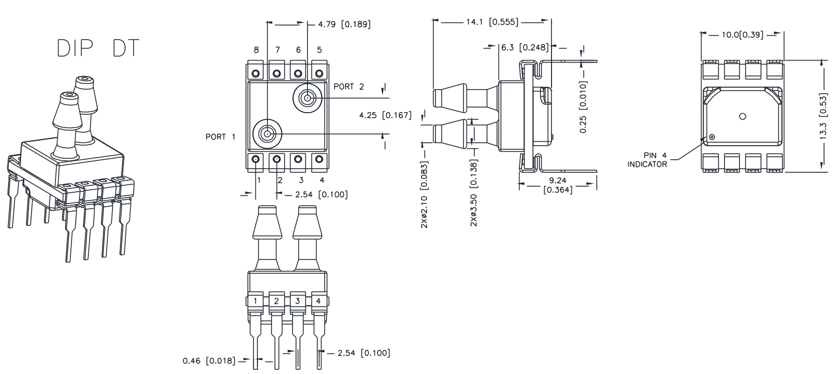

MECHANICAL DIMENSIONS

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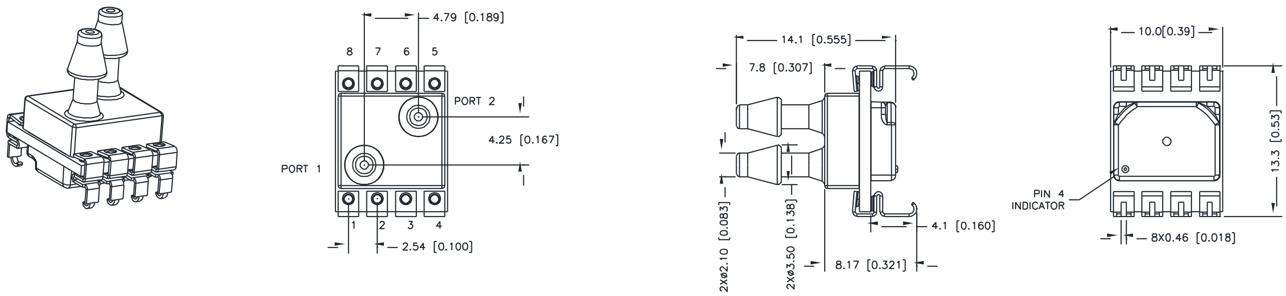

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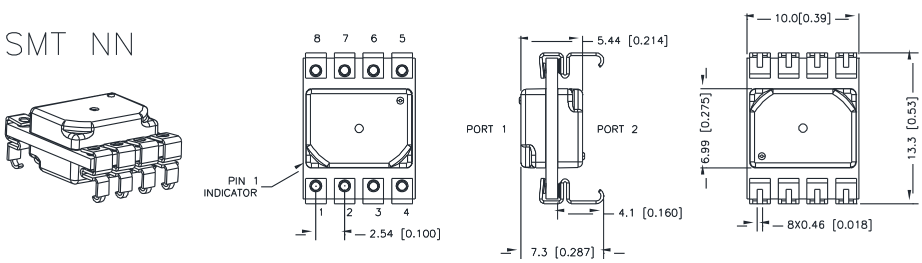

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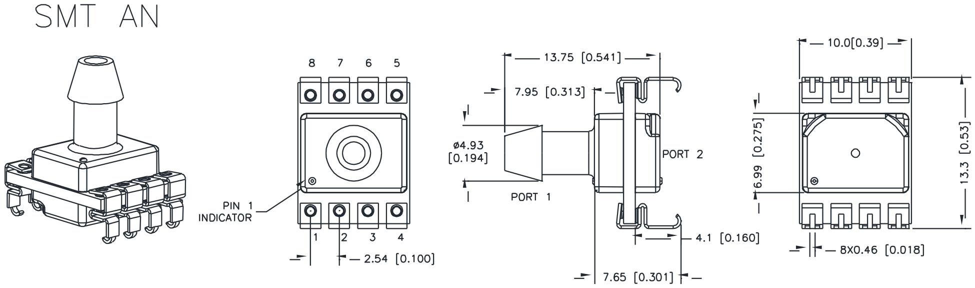
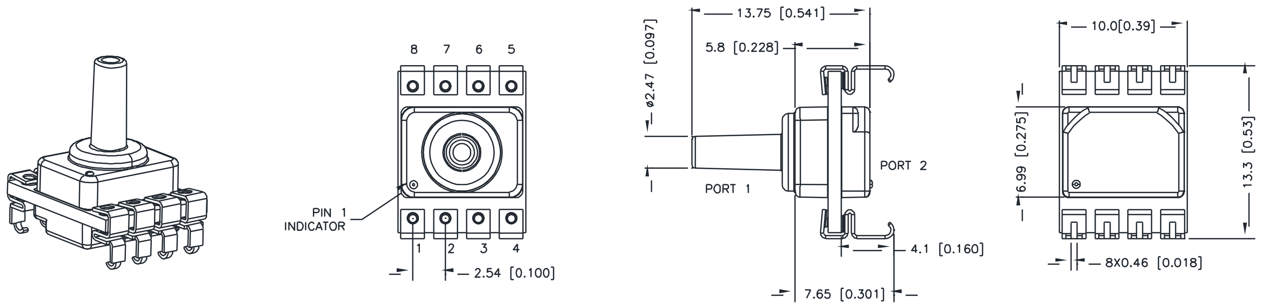


MECHANICAL DIMENSIONS

SMT LN



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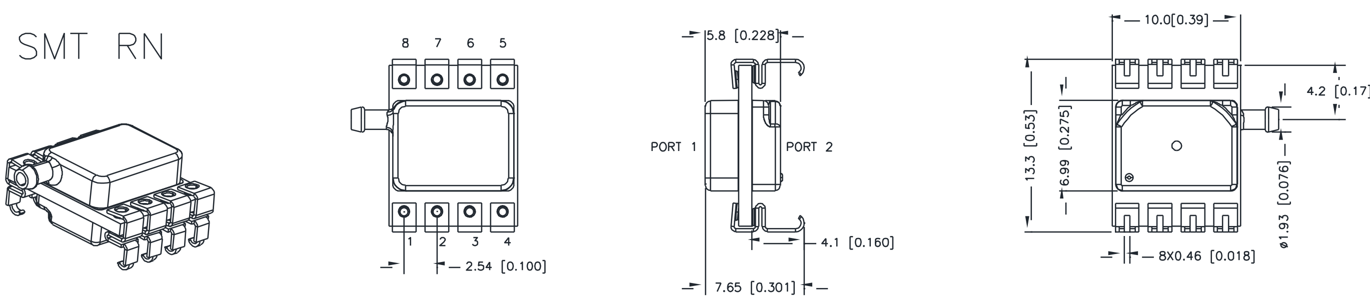

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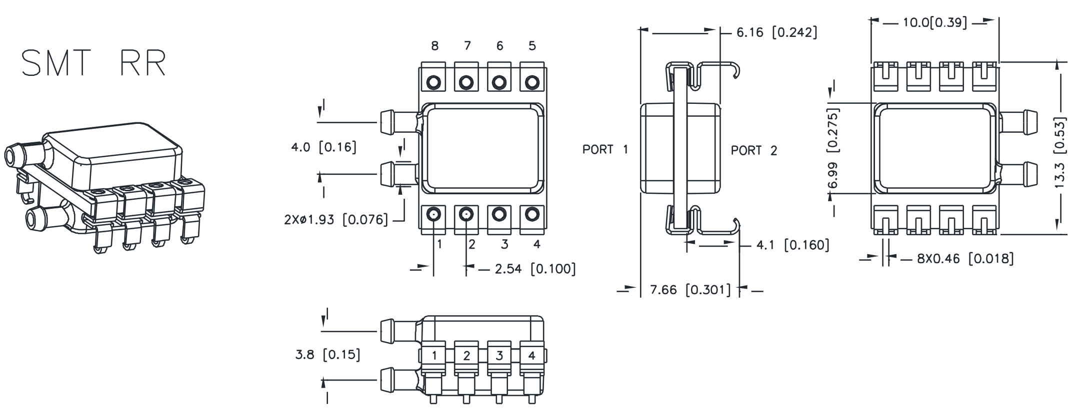

MECHANICAL DIMENSIONS

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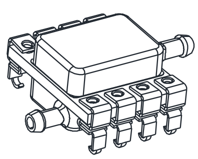

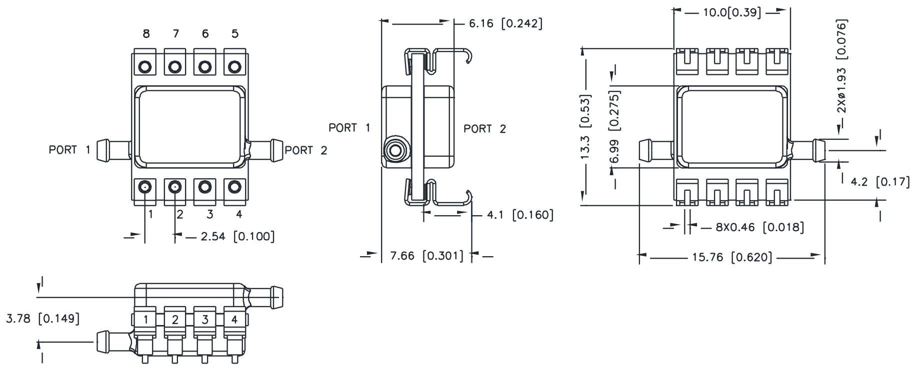

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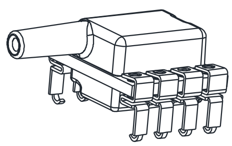
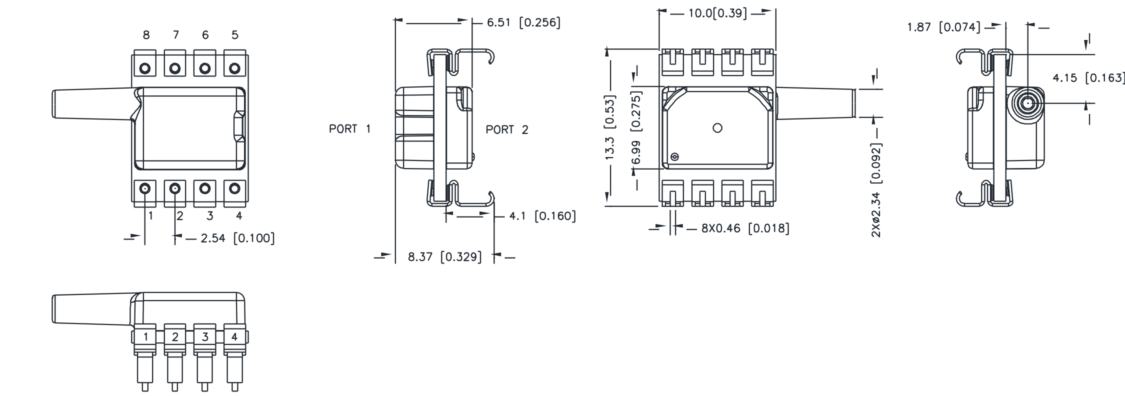
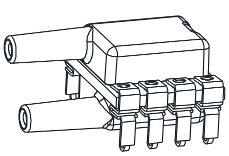
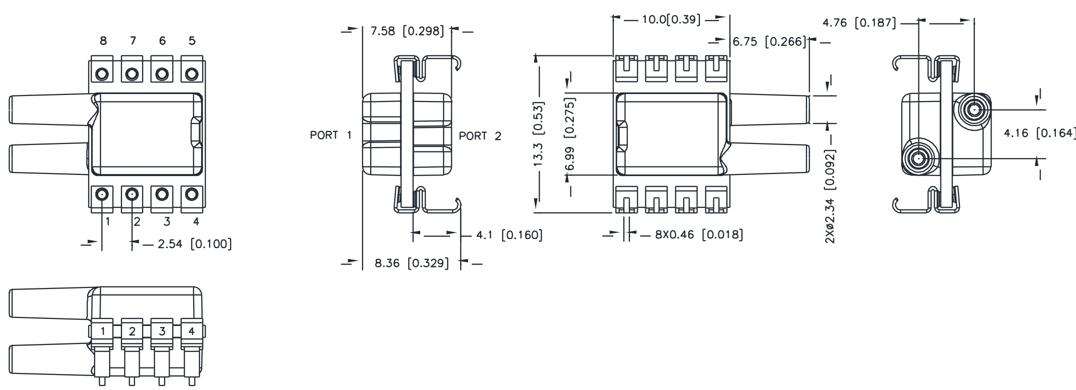




SMT JJ



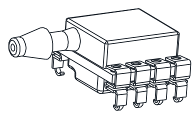


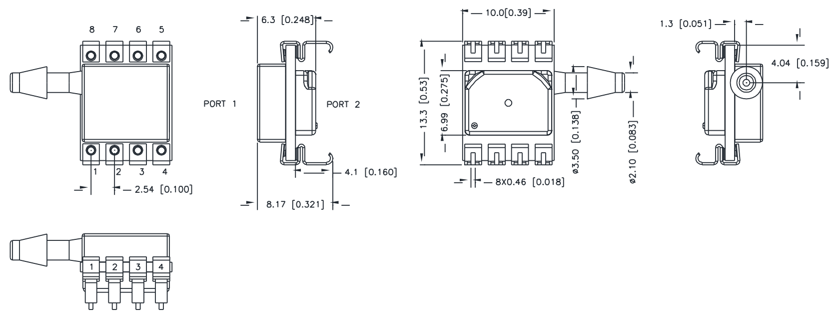
AV Sensors
AdVanced Sensor Design and Manufacture

MCT-24DHRD SERIES

MECHANICAL DIMENSIONS

SMT SS





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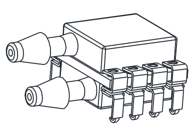

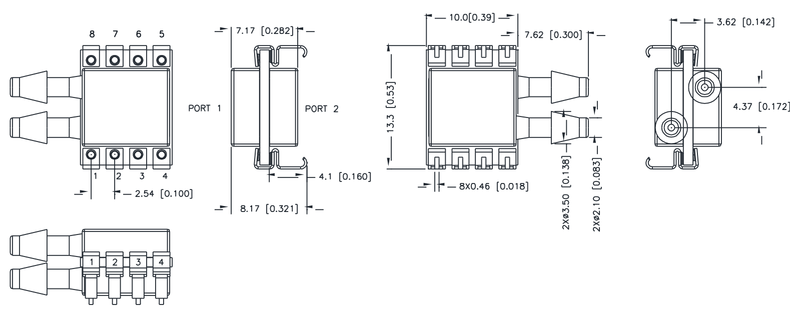

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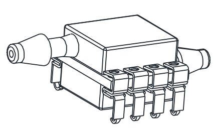

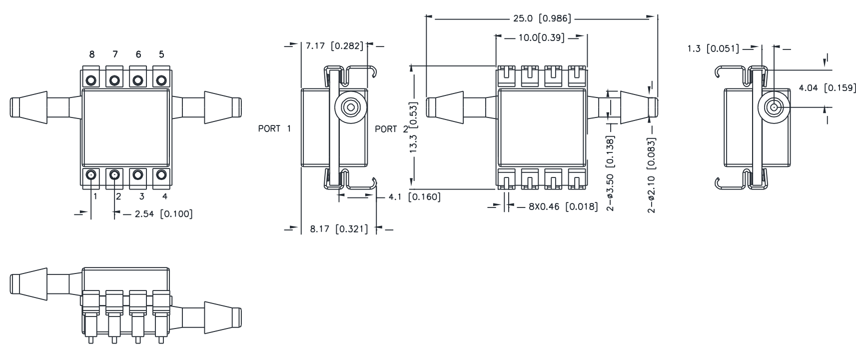

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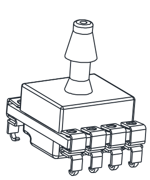

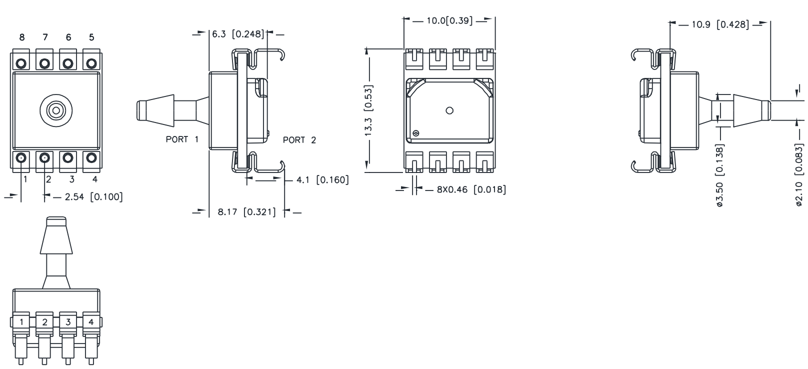

MECHANICAL DIMENSIONS

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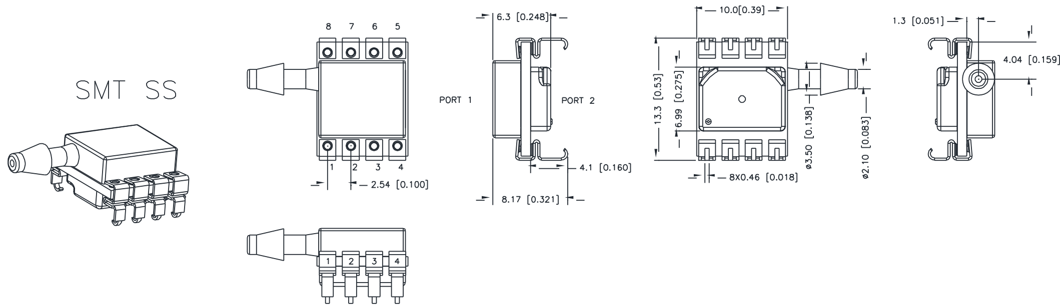

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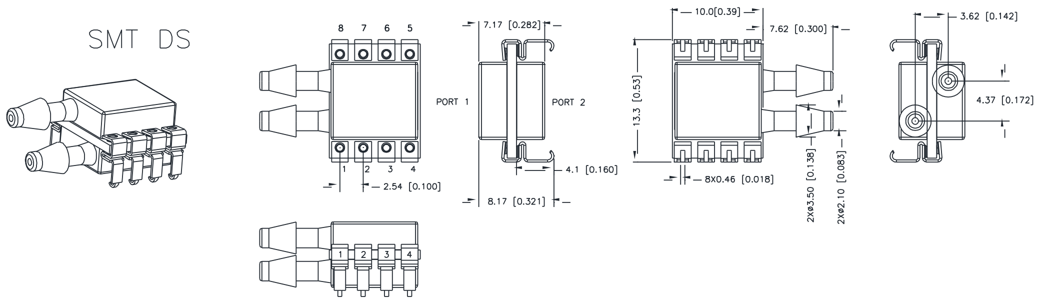

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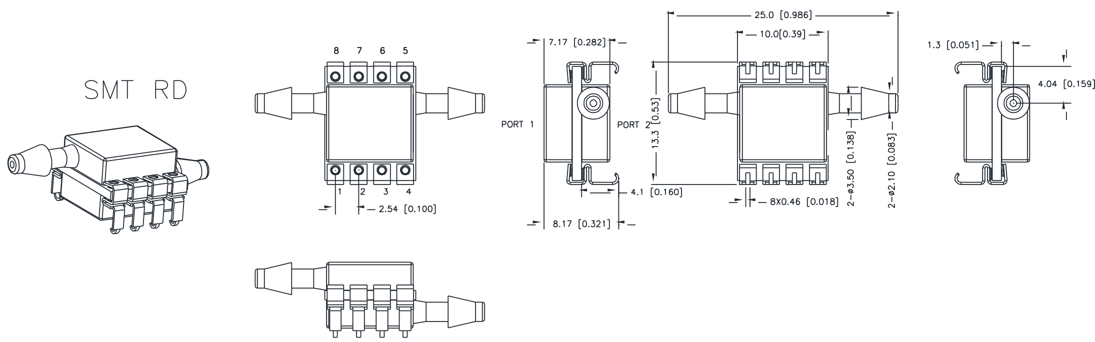

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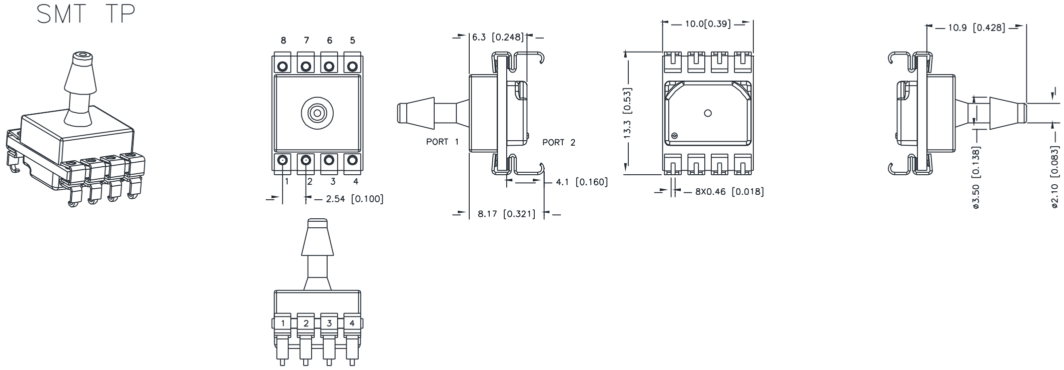

MECHANICAL DIMENSIONS

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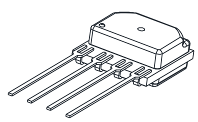

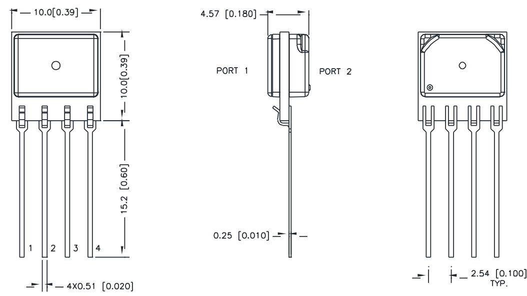

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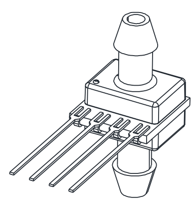

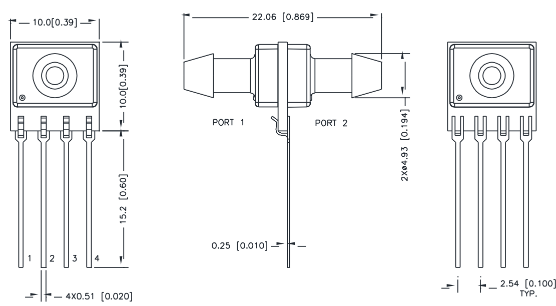

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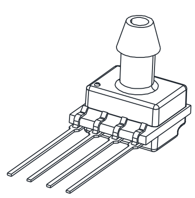

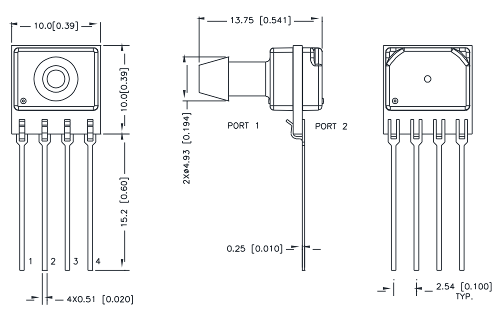

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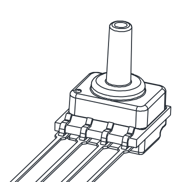

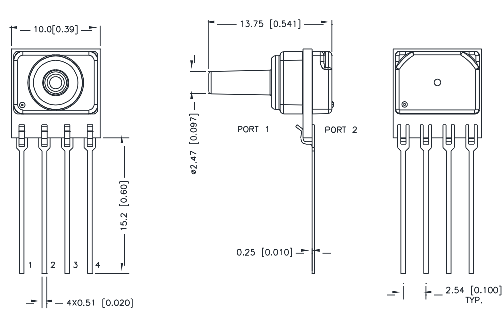

MECHANICAL DIMENSIONS

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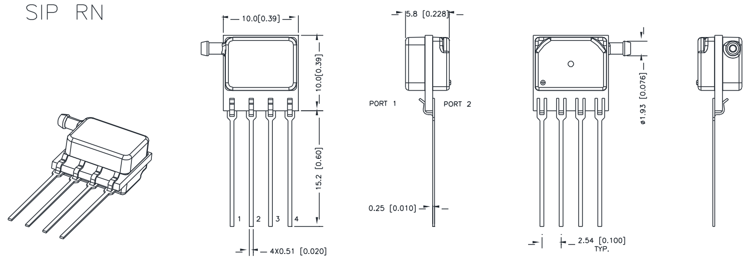

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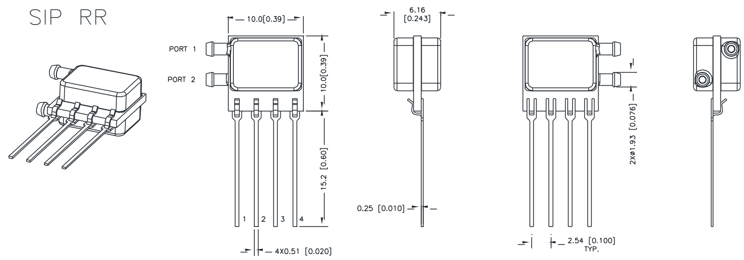

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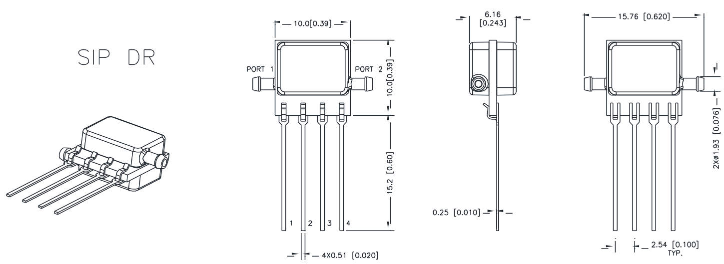

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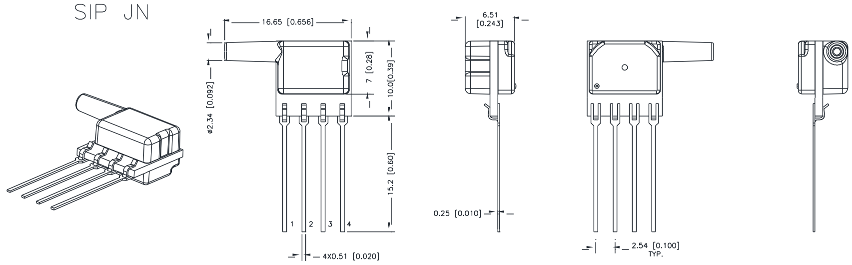

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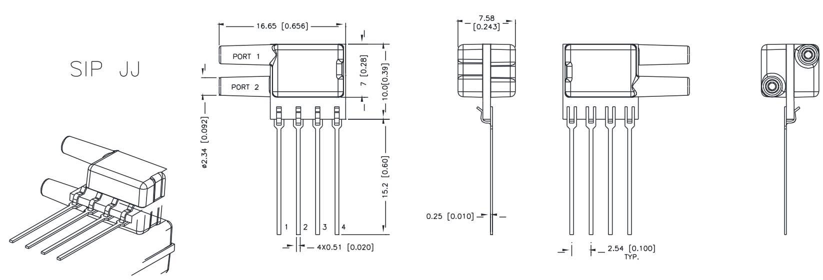

MECHANICAL DIMENSIONS

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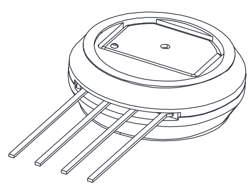

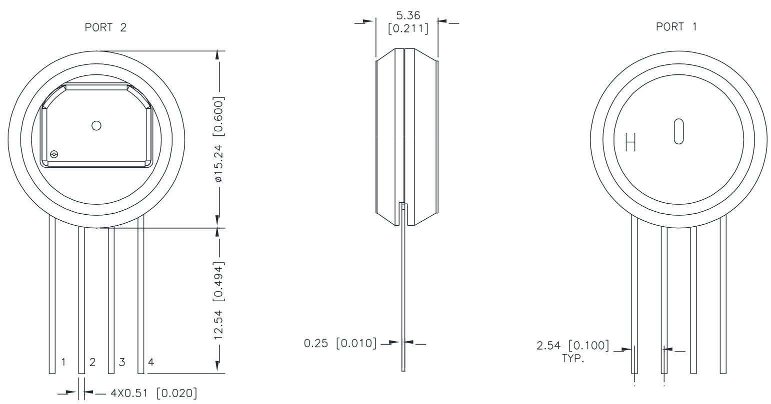

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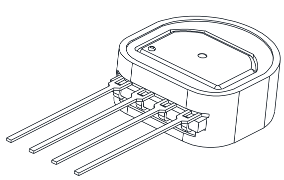

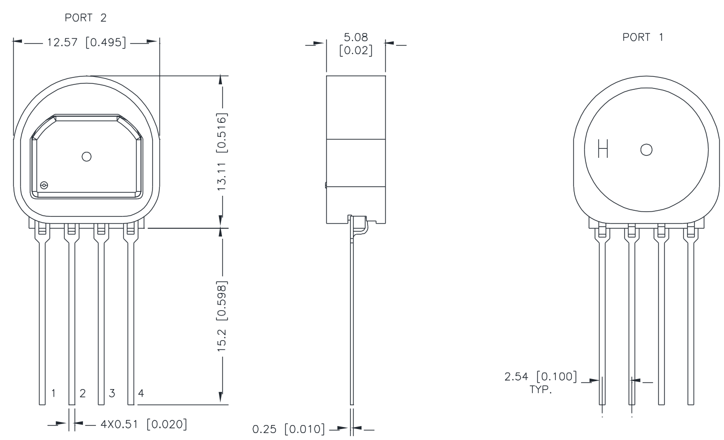

MECHANICAL DIMENSIONS

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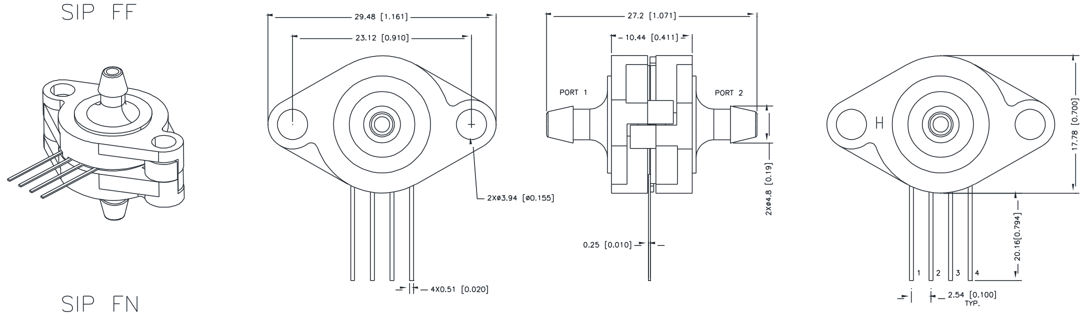

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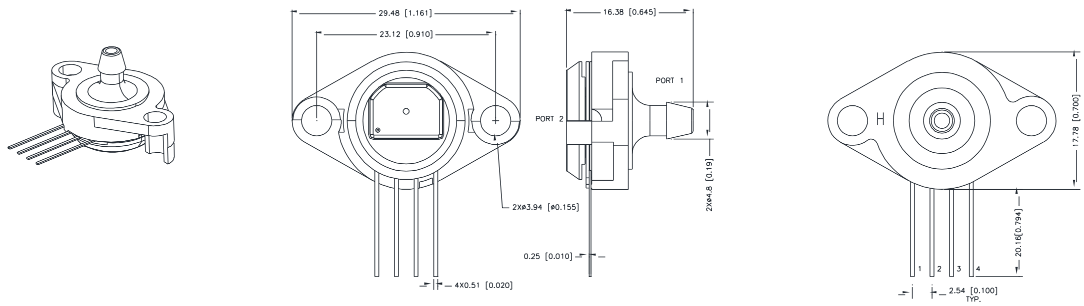

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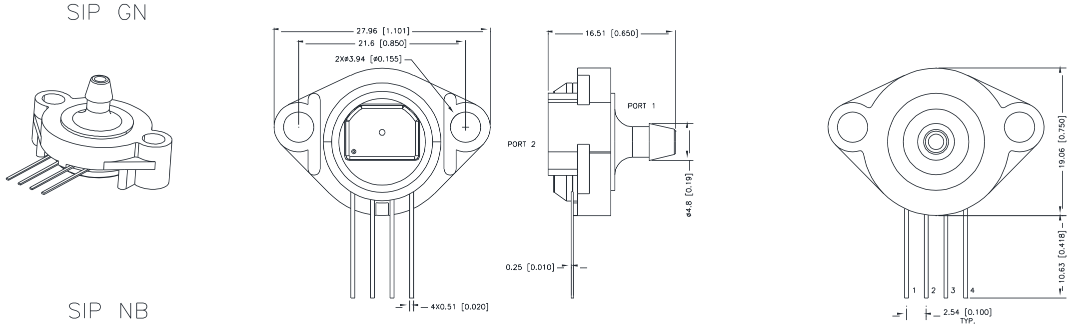

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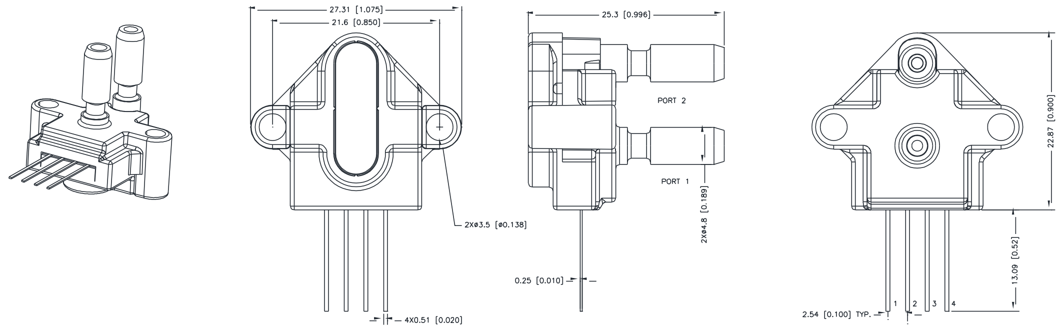


Table 1. Pressure Port Styles Available

NN	No ports	AN	Single axial barbed port	LN	Single axial barbless port	RN	Single radial barbed ports, (ø1.5mm)	RR	Dual radial barbed ports, same side	DR	Dual radial barbed ports, opposite sides
SS	Single radial barbed ports, (ø3.0mm)	DS	Dual radial barbed ports, (ø3.0mm) same side	RD	Dual radial barbed ports, (ø3.0mm) oposite side	TP	Single radial barbed ports, (ø3.0mm) top side	DT	Dual radial barbed ports, (ø3.0mm) top side	AA	Dual axial barbed ports, opposite sides
GN	Ribbed fastener mount, single axial barbed port 008B	NB	Fastener mount, dual axial ports, same side	HH	Fastener mount, dual radial barbed ports, same side	HN	Fastener mount, single radial barbed port	MN	Manifold mount, outer diameter seal	SN	Manifold mount, inner diameter seal
JN	Single radial barbless port	JJ	Dual radial barbless ports same side								
FF	Fastener mount, dual axial barbed ports, opposite sides	FN	Fastener mount, single axial barbed port								

Table 2. Standard Pressure Ranges Available

±1.6 mbar to ±10 bar		±160 Pa to ±1 MPa		±0.5 inH2O to ±150 psi	
Absolute		Absolute		Absolute	
001BA	0 bar to 1 bar	100KA	0 kPa to 100 kPa	015PA	0 psi to 15 psi
1.6BA	0 bar to 1.6 bar	160KA	0 kPa to 160 kPa	030PA	0 psi to 30 psi
2.5BA	0 bar to 2.5 bar	250KA	0 kPa to 250 kPa	060PA	0 psi to 60 psi
004BA	0 bar to 4 bar	400KA	0 kPa to 400 kPa	100PA	0 psi to 100 psi
006BA	0 bar to 6 bar	600KA	0 kPa to 600 kPa	150PA	0 psi to 150 psi
010BA	0 bar to 10 bar	001GA	0 kPa to 1 MPa		
±1.6 mbar to ±4 bar					
Differential		Differential		Differential	
001MD	±1 mbar	100LD	±100 Pa	0.5ND	±0.5 inH2O
1.6MD	±1.6 mbar	160LD	±160 Pa	001ND	±1 inH2O
2.5MD	±2.5 mbar	250LD	±250 Pa	002ND	±2 inH2O
004MD	±4 mbar	400LD	±400 Pa	004ND	±4 inH2O
006MD	±6 mbar	600LD	±600 Pa	005ND	±5 inH2O
010MD	±10 mbar	001KD	±1 kPa	010ND	±10 inH2O
016MD	±16 mbar	1.6KD	±1.6 kPa	020ND	±20 inH2O
025MD	±25 mbar	2.5KD	±2.5 kPa	030ND	±30 inH2O
040MD	±40 mbar	004KD	±4 kPa	001PD	±1 psi
060MD	±60 mbar	006KD	±6 kPa	005PD	±5 psi
100MD	±100 mbar	010KD	±10 kPa	015PD	±15 psi
160MD	±160 mbar	016KD	±16 kPa	030PD	±30 psi
250MD	±250 mbar	025KD	±25 kPa	060PD	±60 psi
400MD	±400 mbar	040KD	±40 kPa		
600MD	±600 mbar	060KD	±60 kPa		
001BD	±1 bar	100KD	±100 kPa		
1.6BD	±1.6 bar	160KD	±160 kPa		
2.5BD	±2.5 bar	250KD	±250 kPa		
004BD	±4 bar	400KD	±400 kPa		

±1.6 mbar to ±10 bar		±160 Pa to ±1 MPa		±0.5 inH2O to ±150 psi	
Gage		Gage		Gage	
2.5MG	0 mbar to 2.5 mbar	250LG	0 Pa to 250 Pa	001NG	0 inH2O to 1 inH2O
004MG	0 mbar to 4 mbar	400LG	0 Pa to 400 Pa	002NG	0 inH2O to 2 inH2O
006MG	0 mbar to 6 mbar	600LG	0 Pa to 600 Pa	004NG	0 inH2O to 4 inH2O
010MG	0 mbar to 10 mbar	001KG	0 kPa to 1 kPa	005NG	0 inH2O to 5 inH2O
016MG	0 mbar to 16 mbar	1.6KG	0 kPa to 1.6 kPa	010NG	0 inH2O to 10 inH2O
025MG	0 mbar to 25 mbar	2.5KG	0 kPa to 2.5 kPa	020NG	0 inH2O to 20 inH2O
040MG	0 mbar to 40 mbar	004KG	0 kPa to 4 kPa	030NG	0 inH2O to 30 inH2O
060MG	0 mbar to 60 mbar	006KG	0 kPa to 6 kPa	001PG	0 psi to 1 psi
100MG	0 mbar to 100 mbar	010KG	0 kPa to 10 kPa	002PG	0 psi to 2 psi
160MG	0 mbar to 160 mbar	016KG	0 kPa to 16 kPa	005PG	0 psi to 5 psi
250MG	0 mbar to 250 mbar	025KG	0 kPa to 25 kPa	015PG	0 psi to 15 psi
400MG	0 bar to 400 mbar	040KG	0 kPa to 40 kPa	030PG	0 psi to 30 psi
600MG	0 bar to 600 mbar	060KG	0 kPa to 60 kPa	060PG	0 psi to 60 psi
001BG	0 bar to 1 bar	100KG	0 kPa to 100 kPa	100PG	0 psi to 100 psi
1.6BG	0 bar to 1.6 bar	160KG	0 kPa to 160 kPa	150PG	0 psi to 150 psi
2.5BG	0 bar to 2.5 bar	250KG	0 kPa to 250 kPa		
004BG	0 bar to 4 bar	400KG	0 kPa to 400 kPa		
006BG	0 bar to 6 bar	600KG	0 kPa to 600 kPa		
010BG	0 bar to 10 bar	001GG	0 kPa to 1 MPa		

PART NUMBERING FOR ORDERS

Series	Port Type	Package Style	Pressure Range	Pressure Units	Pressure Type	Calibrated Voltage	Output Type	Digital Protocol	Media
MCT-24DHRD	**See Table 1**	J= J lead SMT T= DIL Thru Hole S=SIL (I2C Only) C=LLC	**See Table 2**		G= Gage A=Absolute B=Bidirectional	3=3.3Vdc	Type1= 10 -90% of Cts (24 Bits) Type2= 5 -95% of Cts (24 Bits) Type3= 5 -85% of Cts (24 Bits) Type4= 4 -94% of Cts (24 Bits)	I0=I2C, 0x08H I1=I2C, 0x18H I2=I2C, 0x28H I3=I2C, 0x38H I4=I2C, 0x48H I5=I2C, 0x58H I6=I2C, 0x68H I7=I2C, 0x78H [All Packages] S1=SPI [No S Pin Type]	N = Non Ionic Dry Gases D=Non Ionic gas with Humidity T= Liquid Media, Silicone Gel V=Liquid Media, Parylene Coating

Part Number Example: MCT-24DHRD DSJ 005PB31S1N

Dual Side Port Barbed , J Leaded SMT Package, -5 to +5 PSI Range, 3.3Vdc Supply, SPI Protocol, Pmin=-5, Pmax=+ 5 PSI, 10-90% Output, Dry Non Ionic Gases

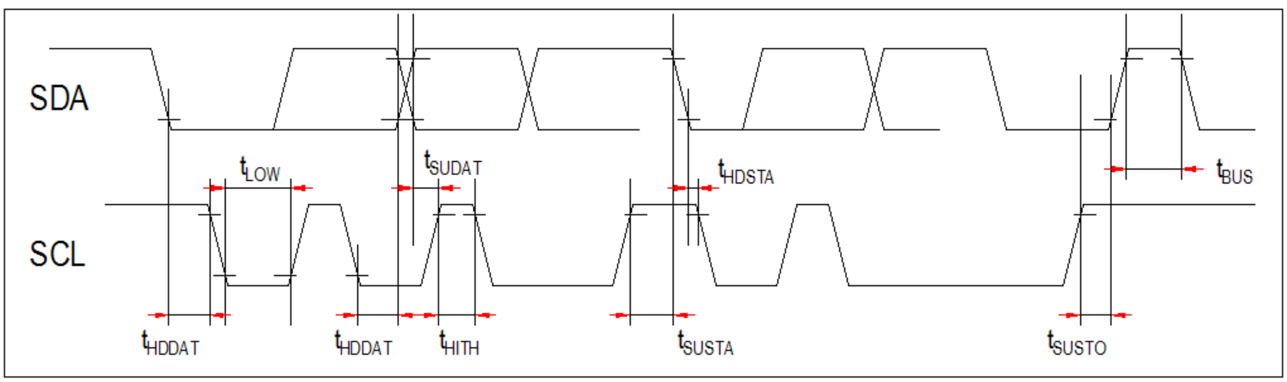
WARRANTY

Pressure sensors have a limited one-year warranty to the original purchaser. AVSensors will repair or replace, at its option, without charge those items it finds defective. This is the buyers sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall AVSensors be liable for consequential, special, or indirect damages. This warranty does not apply to units that have been modified, misused, neglected or installed where the application exceeds published ratings. Specifications may change without notice. The information supplied is believed to be accurate and reliable as of this printing, however, we assume no responsibility for its use.

I2C INTERFACE PARAMETERS & TIMING DIAGRAM

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS
SCLK CLOCK FREQUENCY	FSCL	100		400	KHz
START CONDITION HOLD TIME RELATIVE TO SCL EDGE	tHDSTA	0.1			uS
MINIMUM SCL CLOCK LOW WIDTH @1	tLOW	0.6			uS
MINIMUM SCL CLOCK HIGH WIDTH @1	tHIGH	0.6			uS
START CONDITION SETUP TIME RELATIVE TO SCL EDGE	tSUSTA	0.1			uS
DATA HOLD TIME ON SDA RELATIVE TO SCL EDGE	tHDDAT	0			uS
DATA SETUP TIME ON SDA RELATIVE TO SCL EDGE	tSUDAT	0.1			uS
STOP CONDITION SETUP TIME ON SCL	tSUSTO	0.1			uS
BUS FREE TIME BETWEEN STOP AND START CONDITION	tBUS	2			uS
@1 COMBINED LOW AND HIGH WIDTHS MUST EQUAL OR EXCEED MINIMUM SCL PERIOD.					

I2C INTERFACE TIMING DIAGRAM



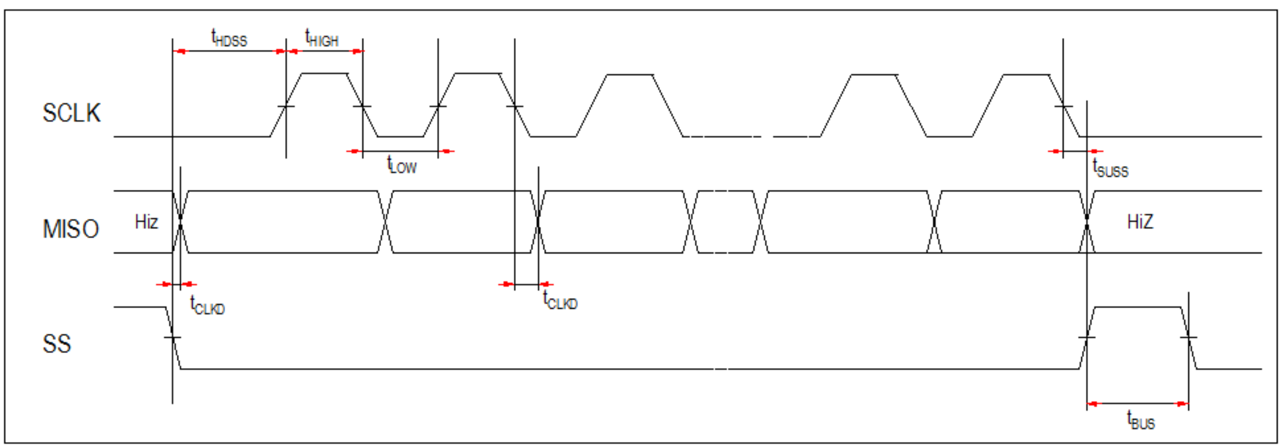
ADC Conversion Time

Resolution (Bits)	Conversion Time in µs (typical)
12	140
13	185
14	250
15	335
16	470
17	640
18	890
19	1250
20	1760
21	2460
22	3480
23	4890
24	6940

SPI INTERFACE PARAMETERS & TIMING DIAGRAM

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS
SCLK CLOCK FREQUENCY	FSCL	50		800	KHz
SS DROP TO FIRST CLOCK EDGE	tHDSS	2.5			uS
MINIMUM SCL CLOCK LOW WIDTH @1	tLOW	0.6			uS
MINIMUM SCL CLOCK HIGH WIDTH @1	tHIGH	0.6			uS
CLOCK EDGE TO DATA TRANSITION	tCLKD	0		0.1	uS
RISE OF SS RELATIVE TO LAST CLOCK EDGE	tSUSS	0.1			uS
BUS FREE TIME BETWEEN RISE AND FALL OF SS	tBUS	2			uS
@1 COMBINED LOW AND HIGH WIDTHS MUST EQUAL OR EXCEED MINIMUM SCLK PERIOD.					

SPI INTERFACE TIMING DIAGRAM



I2C PROGRAMING SAMPLE

I2C （MCT-24DHRD-HBD-001DP）

```
#include "I2C.h"
#include "main.h"
#include "stm32l0xx_hal.h"


float Pdisplay=0;
u32 Tdisplay=0;
float Pmax=6894.757;
float Pmin=-6894.757;
float Pspan=13421772.8;
u32 Pvalue=0;
float Tmax=85;
float Tmin=-40;
u32 Tspan=13421773;
u32 Tvalue=0;


void delay_us(long int time)
{
  long int i=8*time;
  while(i--);
}


void delay_ms(long int time)//1372@4M 686@2M 343@1M
{
  long int i=1372*time;
  while(i--);
}
```

```
void IIC_Init(void)

{

  GPIO_InitTypeDef GPIO_InitStruct;

  /* GPIO Ports Clock Enable */
  __HAL_RCC_GPIOA_CLK_ENABLE();

  /*Configure GPIO pin Output Level */
  HAL_GPIO_WritePin(GPIOA, SCL_Pin|SDA_Pin, GPIO_PIN_RESET);

  /*Configure GPIO pins : PAPin PAPin */
  GPIO_InitStruct.Pin = SCL_Pin|SDA_Pin;
  GPIO_InitStruct.Mode = GPIO_MODE_OUTPUT_PP;
  GPIO_InitStruct.Pull = GPIO_NOPULL;
  GPIO_InitStruct.Speed = GPIO_SPEED_FREQ_LOW;
  HAL_GPIO_Init(GPIOA, &GPIO_InitStruct);
}


void SDA_IN()
{
	GPIO_InitTypeDef  GPIO_InitStructure;
	GPIO_InitStructure.Pin = SDA_Pin;
  GPIO_InitStructure.Mode = GPIO_MODE_INPUT;
  GPIO_InitStructure.Pull = GPIO_NOPULL;
  //GPIO_InitStructure.Alternate = GPIO_PuPd_UP;
  GPIO_InitStructure.Speed = GPIO_SPEED_FREQ_MEDIUM;
  HAL_GPIO_Init(GPIOA, &GPIO_InitStructure);
}


void SDA_OUT()
{
	GPIO_InitTypeDef  GPIO_InitStructure;
	GPIO_InitStructure.Pin = SDA_Pin;
  GPIO_InitStructure.Mode = GPIO_MODE_OUTPUT_PP;
  GPIO_InitStructure.Pull = GPIO_NOPULL;
	GPIO_InitStructure.Speed = GPIO_SPEED_FREQ_MEDIUM;
  HAL_GPIO_Init(GPIOA, &GPIO_InitStructure);
}
```

```
void IIC_Start(void)
{
	SDA_OUT();
	IIC_SDA_ON;
	IIC_SCL_ON;
	delay_us(4);
	IIC_SDA_OFF;//START:when CLK is high,DATA change form high to low
	delay_us(4);
	IIC_SCL_OFF;
}


void IIC_Stop(void)
{
	SDA_OUT();//sda
	IIC_SCL_OFF;
	IIC_SDA_OFF;//STOP:when CLK is high DATA change form low to high
	delay_us(4);
	IIC_SCL_ON;
	IIC_SDA_ON;
	delay_us(4);
}


unsigned char IIC_Wait_Ack(void)
{
	unsigned char ucErrTime=0;
	SDA_IN();
	IIC_SDA_ON;delay_us(1);
	IIC_SCL_ON;delay_us(1);
	while(HAL_GPIO_ReadPin(GPIOA, SDA_Pin))
	{
		ucErrTime++;
		if(ucErrTime>250)
		{
			IIC_Stop();
			return 1;
		}
	}
	IIC_SCL_OFF;
	return 0;
}
```

```
void IIC_Ack(void)
{
            IIC_SCL_OFF;
            SDA_OUT();
            IIC_SDA_OFF;
            delay_us(2);
            IIC_SCL_ON;
            delay_us(2);
            IIC_SCL_OFF;
}


void IIC_NAck(void)
{
            IIC_SCL_OFF;
            SDA_OUT();
            IIC_SDA_ON;
            delay_us(2);
            IIC_SCL_ON;
            delay_us(2);
            IIC_SCL_OFF;
}

void IIC_Send_Byte(unsigned char txd)
{
   unsigned char t;
                        SDA_OUT();
   IIC_SCL_OFF;
   for(t=0;t<8;t++)
   {
                                                if(txd&0x80)
                                                {IIC_SDA_ON;}
                                                else
                                                {IIC_SDA_OFF;}
      txd<<=1;
                        delay_us(2);
                        IIC_SCL_ON;
                        delay_us(2);
                        IIC_SCL_OFF;
                        delay_us(2);
   }
}
```

```
unsigned char IIC_Read_Byte(unsigned char ack)
{
            unsigned char i,receive=0;
            SDA_IN();//SDA
   for(i=0;i<8;i++ )
            {
      IIC_SCL_OFF;
      delay_us(2);
                        IIC_SCL_ON;
      receive<<=1;
      if(HAL_GPIO_ReadPin(GPIOA, SDA_Pin))receive++;
                        delay_us(1);
   }
   if (!ack)
      IIC_NAck();//nACK
   else
      IIC_Ack(); //ACK
   return receive;
}


unsigned char temp[7];
void Get_Value()
{
            IIC_Start();
            IIC_Send_Byte(0x50);
            IIC_Wait_Ack();
            IIC_Send_Byte(0xaa);
            IIC_Wait_Ack();
            IIC_Stop();
            delay_ms(17);

            IIC_Start();
            IIC_Send_Byte(0x51);
            IIC_Wait_Ack();
            temp[0]=IIC_Read_Byte(1);
            temp[1]=IIC_Read_Byte(1);
            temp[2]=IIC_Read_Byte(1);
            temp[3]=IIC_Read_Byte(1);
            temp[4]=IIC_Read_Byte(1);
            temp[5]=IIC_Read_Byte(1);
            temp[6]=IIC_Read_Byte(0);
            IIC_Stop();

                        if(temp[0]==0x40)
```

```
                    {
                              Pvalue=temp[1]*256*256+temp[2]*256+temp[3];
                              Tvalue=temp[4]*256*256+temp[5]*256+temp[6];
                    }

                    Tdisplay=(Tvalue-1677721.6)/Tspan*(Tmax-Tmin)+Tmin;
                    Pdisplay=(Pvalue-1677721.6)/Pspan*(Pmax-Pmin)+Pmin;
}


float pressure;

float filt(unsigned char N)
{
          u8 count;
          float sum=0;
          float value_buf[N];
          for (count=0;count<N;count++)
          {
                    Get_Value();
                    value_buf[count] = Pdisplay;
                    sum += value_buf[count];
          }
          pressure=sum/N;

          return  pressure;
}
```

SPI PROGRAMING SAMPLE

```
SPI
#include "main.h"
#include "stm32l0xx_hal.h"
#include "SPI.h"
#include "delay.h"

//MODE   0  0

void spi_write(u8 spi_dat)
{
   unsigned char n;
   for(n=0;n<8;n++)
   {
      OLED_SCLK_Clr();
      if(spi_dat&0x80)
         OLED_SDIN_Set();
      else
         OLED_SDIN_Clr();
      spi_dat<<=1;
      OLED_SCLK_Set();
   }
   OLED_SCLK_Clr();
}


u8 spi_read()
{
   unsigned char n ,dat;

   for(n=0;n<8;n++)
   {
      OLED_SCLK_Clr();
      dat<<=1;
      if(READ_MISO)
         dat|=0x01;
      else
         dat&=0xfe;
      OLED_SCLK_Set();
   }
   OLED_SCLK_Clr();
   return dat;
}
```

```
u8 SPIx_ReadWriteByte(u8 TxData)
{
	u8 i,RxData=0,num=0x80;
	for (i=0;i<0x08;i++)
	{
		OLED_SCLK_Clr();
		if(TxData&num)
			OLED_SDIN_Set();
		else
			OLED_SDIN_Clr();
		if(num>0x01)
			num=num>>1;
		delay_ms(4);
		OLED_SCLK_Set();
		if(READ_MISO)
			RxData|=0x01;
		if(i<7)
			RxData=RxData<<1;
		delay_ms(4);
	}
	OLED_SCLK_Clr();
	return RxData;
}


unsigned char Soft_Buf_Pressure[7];

void ReadSSDL()
{
	OLED_SCLK_Clr();
	SS_OFF;
	delay_us(5);
 spi_write(0xAA);
	spi_write(0x00);
 spi_write(0x00);
	SS_ON;
 delay_ms(20);
	SS_OFF;
	Soft_Buf_Pressure[0] = SPIx_ReadWriteByte(0xf0);
	Soft_Buf_Pressure[1] = SPIx_ReadWriteByte(0x00);
	Soft_Buf_Pressure[2] = SPIx_ReadWriteByte(0x00);
	Soft_Buf_Pressure[3] = spi_read();
	Soft_Buf_Pressure[4] = spi_read();
	Soft_Buf_Pressure[5] = spi_read();
	Soft_Buf_Pressure[6] = spi_read();
	SS_ON;
```

```
        delay_us(5);
}
```