MS4525DO



- **PCB Mounted Digital Output Transducer**
- **Combination Temperature and Pressure**
- **I²C or SPI Protocol**
- **Differential, Gage, Absolute, Compound, & Vacuum**
- **Temperature Compensated**
- **3.3 or 5.0 Vdc Supply Voltage**
- **Low Power Option Available (standby < 1uA)**

RoHS

DESCRIPTION

The MS4525DO is a small, ceramic based, PCB mounted pressure transducer from Measurement Specialties. The transducer is built using Measurement Specialties' proprietary UltraStable™ process and the latest CMOS sensor conditioning circuitry to create a low cost, high performance digital output pressure (14bit) and temperature (11bit) transducer designed to meet the strictest requirements from OEM customers.

The MS4525DO is fully calibrated and temperature compensated with a total error band (TEB) of less than 1.0% over the compensated pressure range. The sensor operates from single supply of either 3.3 or 5.0Vdc and requires a single external component for proper operation.

The rugged ceramic transducer is available in side port, top port, and manifold mount and can measure absolute, gauge, differential, vacuum or compound pressure from 1 to 150psi. The 1/8" barbed pressure ports mate securely with 3/32" ID tubing.

FEATURES

- PSI Pressure Ranges
- PCB Mountable
- Digital Output
- Barbed Pressure Ports

APPLICATIONS

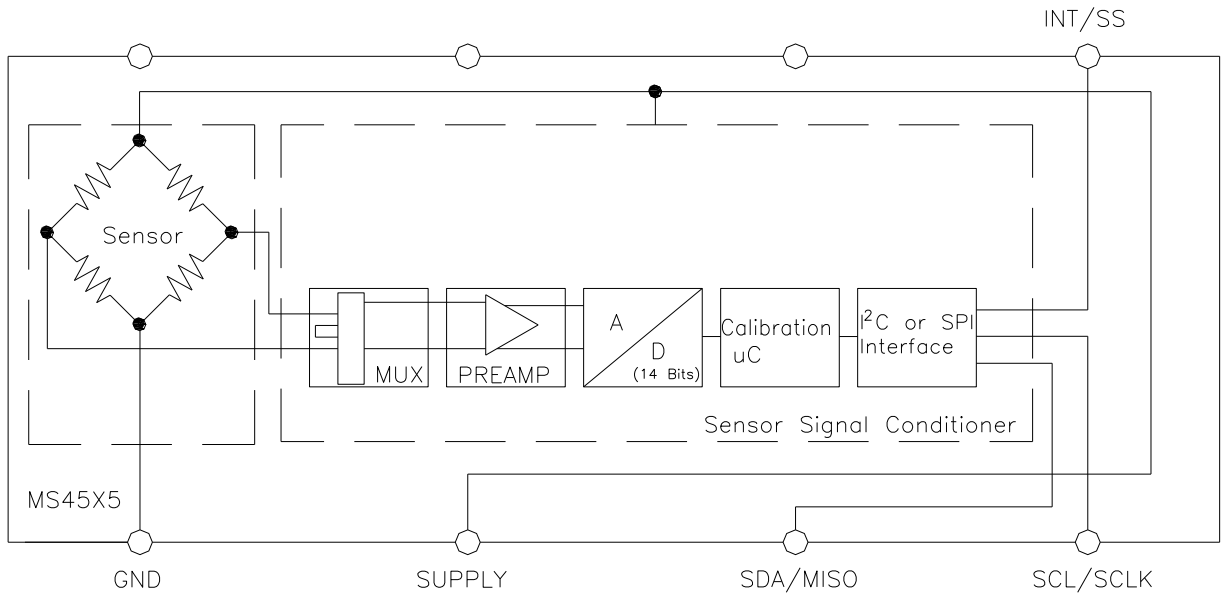
- Factory Automation, Vacuum Switch
- Altitude and Airspeed Measurements
- Medical Instruments
- Leak Detection

STANDARD RANGES (PSI)

Pressure	Absolute	Gage	Differential	Compound	Vacuum	Option Availability
1		DS, SS, TP, MM	DS, SS, TP, MM			-F, -L, -M
2		DS, SS, TP, MM	DS, SS, TP, MM			-F, -L, -M
5		DS, SS, TP, MM	DS, SS, TP ,MM			-F, -L, -M
15	SS, TP	DS, SS, TP, MM	DS, MM	SS, TP	SS, TP, DS	-F, -L, -M
30	SS, TP	DS, SS, TP, MM	DS, MM	SS, TP		-F, -L, -M
50	SS, TP	DS, SS, TP, MM	DS, MM	SS, TP		-F, -L, -M
100	SS, TP	DS, SS, TP, MM	DS, MM	SS, TP		-F, -L, -M
150	SS, TP	DS, SS, TP, MM	DS, MM	SS, TP		-F, -L, -M

See Package Configurations: DS= Dual Side Port, SS= Single Side Port, TP= Top Port, MM= Manifold Mount
Only I²C Protocol is Available on "L" type Pin Styles; Reference Ordering Information for Details
Pin Style "L" is only available SS and MM port types.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Min	Max	Unit	Notes
Supply Voltage	T_A = 25 °C	2.7	5.5	V	
Output Current	T_A = 25°C		3	mA	
Storage Temperature		-40	+125	°C	
Humidity	T_A = 25°C		95	%RH	Non Condensing
Overpressure	T_A = 25 °C, both Ports	Not to Exceed 300		psi	
Burst Pressure	T_A = 25 °C, Port 1			psi	See Table 1
ESD	HBM	-4	+4	kV	EN 61000-4-2
Solder Temperature	250°C, 5 sec max.				

TABLE 1- BURST PRESSURE BY RANGE AND PACKAGE STYLE

Range	DS	SS, TP, MM	Unit
001	20	20	psi
002	20	20	psi
005	15	20	psi
015	45	90	psi
030	90	200	psi
050	150	300	psi
100	300	300	psi
150	300	300	psi

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions
Mechanical Shock	Mil Spec 202F, Method 213B, Condition C, 3 Drops
Mechanical Vibration	Mil Spec 202F, Method 214A, Condition 1E, 1Hr Each Axis
Thermal Shock	100 Cycles over Storage Temperature, 30 minute dwell
Life	1 Million FS Cycles
MTTF	>10Yrs, 70 ºC, 10 Million Pressure Cycles, 120%FS Pressure

PERFORMANCE SPECIFICATIONS

Supply Voltage[1]: 5.0V or 3.3 Vdc
Reference Temperature: 25°C (unless otherwise specified)

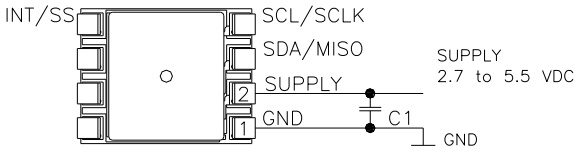
PARAMETERS	MIN	TYP	MAX	UNITS	NOTES
Pressure Accuracy	-0.25		0.25	%Span	2
Total Error Band (TEB)	-1.0		1.0	%Span	3,7
Temperature Accuracy		1.5		ºC	4
Supply Current		3		mA	7
Compensated Temperature	-10		85	ºC	5
Operating Temperature	-25		+105	ºC	
Output Pressure Resolution			14	bits	
Output Temperature Resolution	8		11	bits	
Update Time		0.5		mS	6
Start Time to Data Ready			8.4	mS	6
Weight		3		grams	
Media	Non-Corrosive Dry Gases Compatible with Ceramic, Silicon, Borosilicate Glass, PPS, RTV, Gold, Aluminum and Epoxy. See “Wetted Material by Port Designation” chart below.				

Notes

1. Proper operation requires an external capacitor placed as shown in Connection Diagram. Output is not ratiometric to supply voltage.
2. The maximum deviation from a best fit straight line (BFSL) fitted to the output measured over the pressure range at 25C. Includes all errors due to pressure non linearity, hysteresis, and non repeatability.
3. Total pressure error band includes all accuracy errors, thermal errors over the compensated temperature range and span and offset calibration tolerances. For ideal sensor output with respect to input pressure and temperature, reference Transfer Function charts below. TEB values are valid only at the calibrated supply voltage.
4. The deviation from a best fit straight line (BFSL) fitted to the output measured over the compensated temperature range.
5. For errors beyond the compensated temperature range, see Extended Temperature Multiplier chart below.
6. Start time to data ready is the time to get valid data after POR (power on reset). The time to get subsequent valid data is then specified by the update time specification.
7. This product can be configured for custom OEM requirements, contact factory for lower power consumption or higher accuracy.

MS4525DO

CONNECTION DIAGRAM



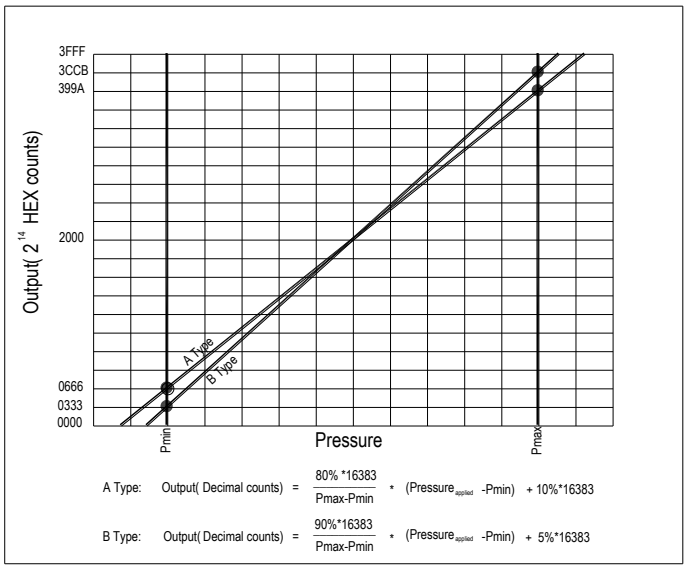
Notes

1. Place 100nF capacitor between Supply and GND to within 2 cm of sensor.

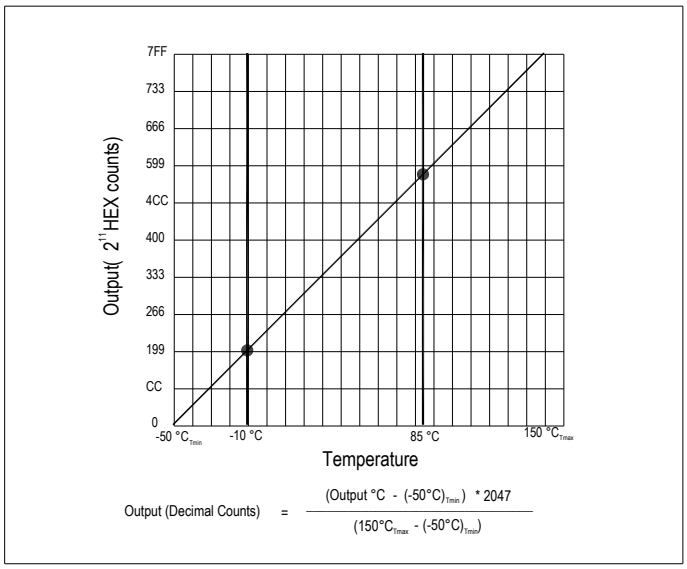
PRESSURE AND TEMPERATURE TRANSFER FUNCTION

Gage, Differential and Compound Pressure Types

Pressure Transfer Functions



Temperature Transfer Functions



Sensor Output at Significant Percentages

% of Counts	Output Type A (PSI)	Output Type B (PSI)	Digital Counts (decimal)	Digital Counts (hex)
0	Pmin−(Pmax−Pmin)*10/80	Pmin−(Pmax−Pmin)*5/90	0	0 X 0000
5		Pmin	819	0 X 0333
10	Pmin		1638	0 X 0666
50			8192	0 X 2000
90	Pmax		14746	0 X 399A
95		Pmax	15563	0 X 3CCB
100	Pmax+(Pmax−Pmin)*10/80	Pmax+(Pmax−Pmin)*5/90	16383	0 X 3FFF

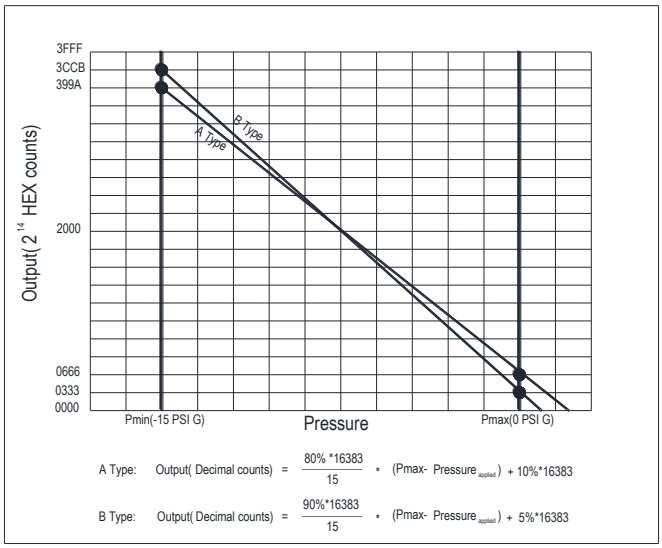
Temperature Output vs Counts

Output °C	Digital Counts (decimal)	Digital Counts (hex)
−50	0	0 X 0000
0	511	0 X 01FF
10	614	0 X 0266
25	767	0 X 02FF
50	1023	0 X 03FF
85	1381	0 X 0565
150	2047	0 X 07FF

MS4525DO

Vacuum Pressure Type

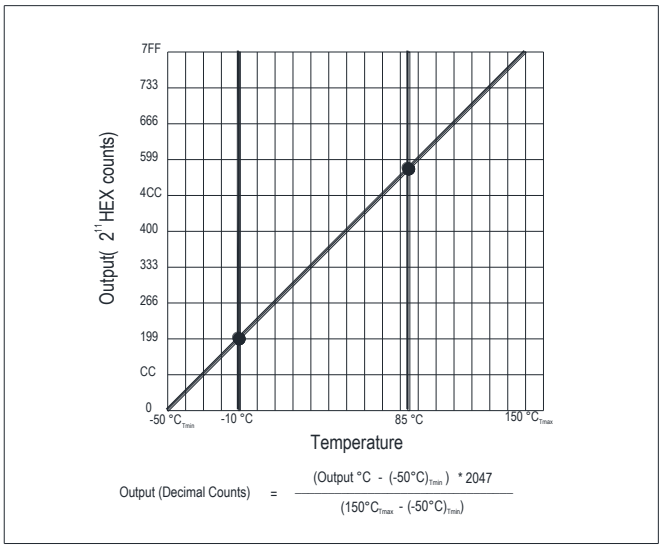
Vacuum Series Pressure Transfer Functions



A Type: $\text{Output(Decimal counts)} = \frac{80\% * 16383}{15} * (\text{Pmax- Pressure}_{\text{applied}}) + 10\% * 16383$

B Type: $\text{Output(Decimal counts)} = \frac{90\% * 16383}{15} * (\text{Pmax- Pressure}_{\text{applied}}) + 5\% * 16383$

Temperature Transfer Functions



Output (Decimal Counts) $= \frac{(\text{Output °C} - (-50°C)_{Tmin}) * 2047}{(150°C_{Tmax} - (-50°C)_{Tmin})}$

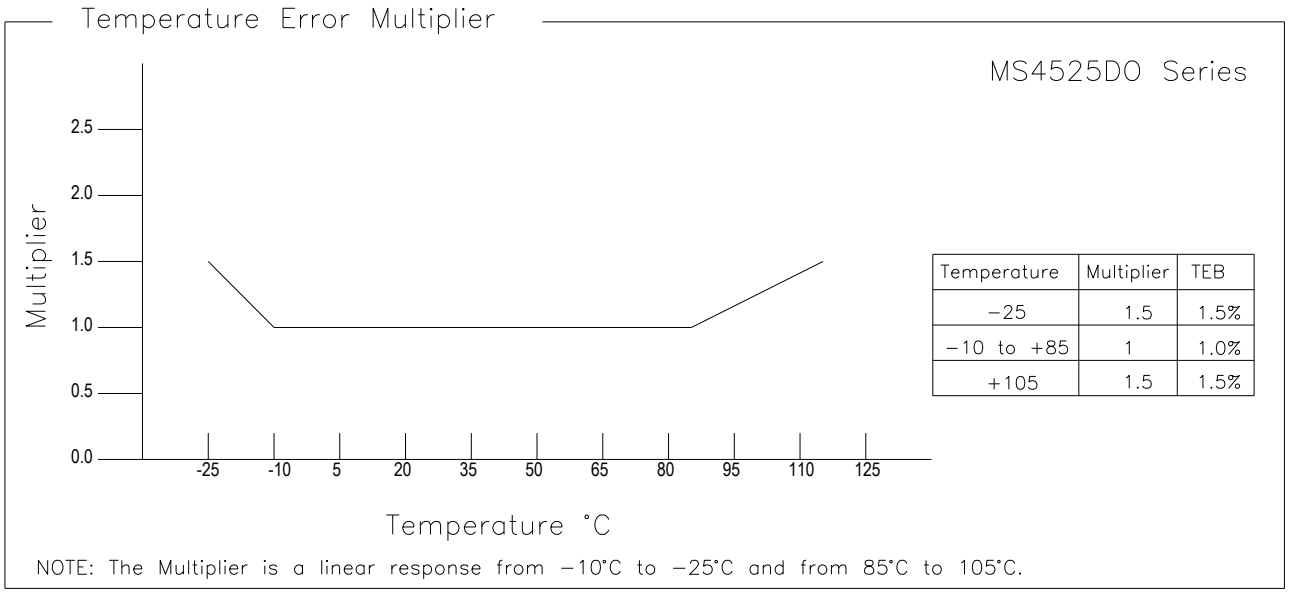
Sensor Output at Significant Percentages

% of Counts	Output Type A (PSIG)	Output Type B (PSIG)	Digital Counts (decimal)	Digital Counts (hex)
0	1.6875	0.833	0	0 X 0000
5		0	819	0 X 0333
10	0		1638	0 X 0666
50			8192	0 X 2000
90	−15		14746	0 X 399A
95	-	−15	15563	0 X 3CCB
100	-	-	16383	0 X 3FFF

Temperature Output vs Counts

Output °C	Digital Counts (decimal)	Digital Counts (hex)
−50	0	0 X 0000
0	511	0 X 01FF
10	614	0 X 0266
25	767	0 X 02FF
50	1023	0 X 03FF
85	1381	0 X 0565
150	2047	0 X 07FF

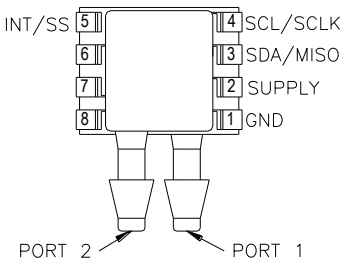
EXTENDED TEMPERATURE MULTIPLIER CHART



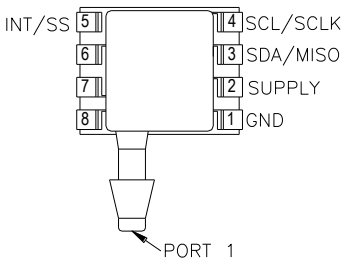
Temperature	Multiplier	TEB
−25	1.5	1.5%
−10 to +85	1	1.0%
+105	1.5	1.5%

NOTE: The Multiplier is a linear response from −10°C to −25°C and from 85°C to 105°C.

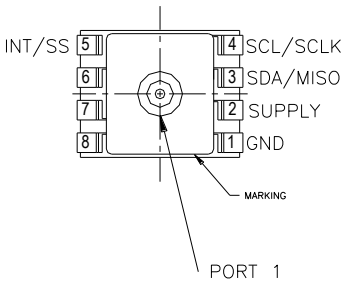
PACKAGE, PINOUT & PRESSURE TYPE CONFIGURATION



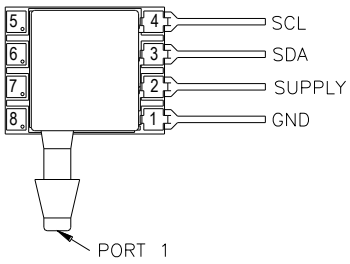
MS4525DO−DSvoixxxyP



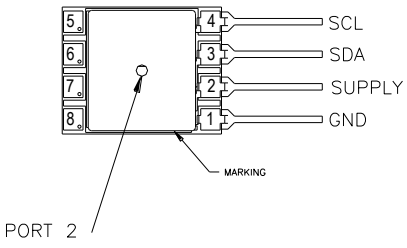
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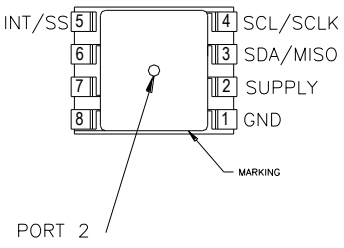
MS4525DO−TPvoixxxyP



MS4525DO−SSvoixxxyL



MS4525DO−MMvoixxxyL



MS4525DO−MMvoixxxyP

Pin Name	Pin	Function
GND	1	Ground
SUPPLY	2	Positive Supply Voltage
SDA MISO	3	I2C Data SPI Data
SCL SCLK	4	I2C Clock SPI Clock
INT SS	5	I2C Interrupt SPI Chip Select
	6-8	No Connection

INT is not available for Pin Style “L” models

Pressure Type	Pmin	Pmax	Description
Absolute	0psiA	+Prange	Output is proportional to the difference between 0psiA (Pmin) and pressure applied to Port 1.
Differential/ Bidirectional	-Prange	+Prange	Output is proportional to the difference between Port 1 and Port 2. Output swings positive when Port 1> Port 2. Output is 50% of total counts when Port 1=Port 2.
Gauge	0psiG	+Prange	Output is proportional to the difference between 0psiG (Pmin) and Port 1. Output swings positive when Port 1> Port 2.
Vacuum	-15psiG	+0psiG	Output is inversely proportional to the difference between -15psiG pressure (Pmin) and pressure applied to Port 1.
Compound	-15psiG	+Prange	Output is proportional to the difference between -15psiG pressure (Pmin) and pressure applied to Port 1.

Prange is equal to the maximum full scale pressure specified in the ordering information.

WETTED MATERIAL BY PORT DESIGNATION

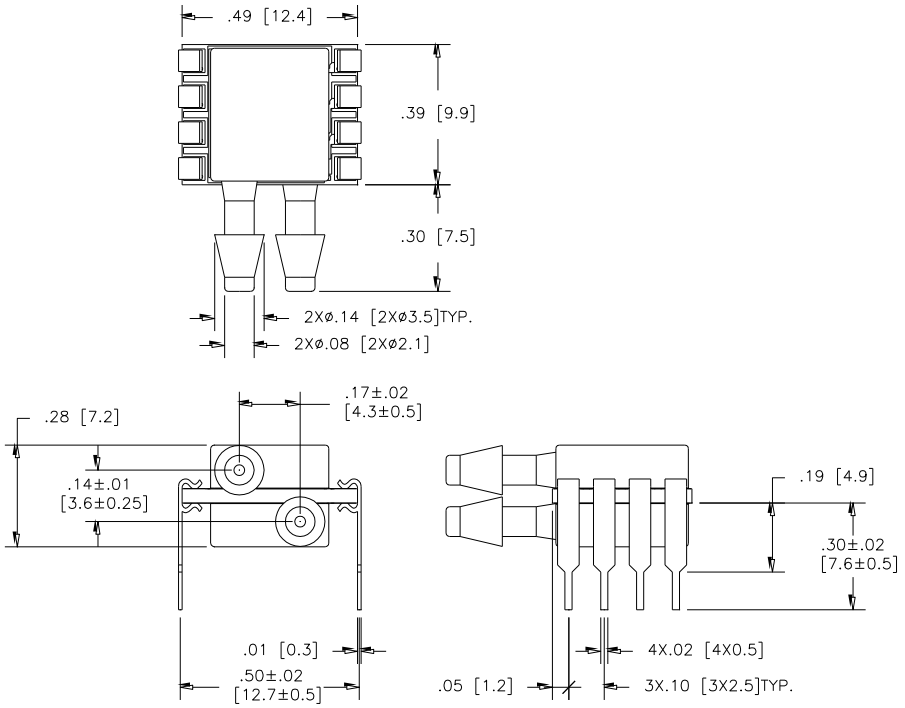
		Material							
Style	Port	PPS	Ceramic	Silicon	Borosilicate Glass	RTV	Gold	Aluminum	Epoxy
DS, MM	Port 1	X	X	X	X	X			X
	Port 2	X	X	X	X	X	X	X	X
SS, TP	Port 1	X	X	X	X	X	X	X	X

"X" Indicates Wetted Material

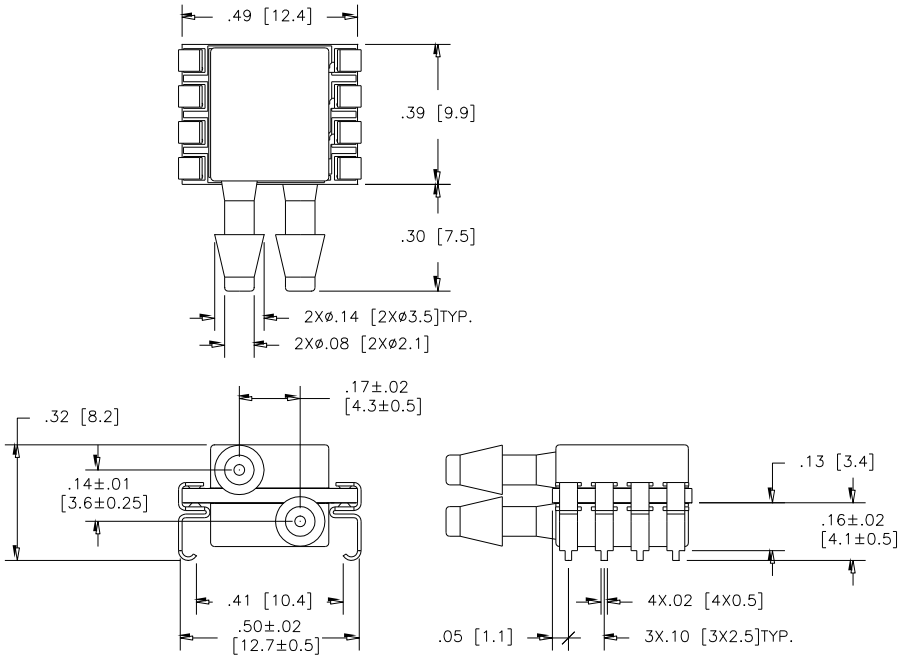
DIMENSIONS

DIMENSIONS ARE IN INCHES [mm]

Model MS4525DO-DSvoixxxyP

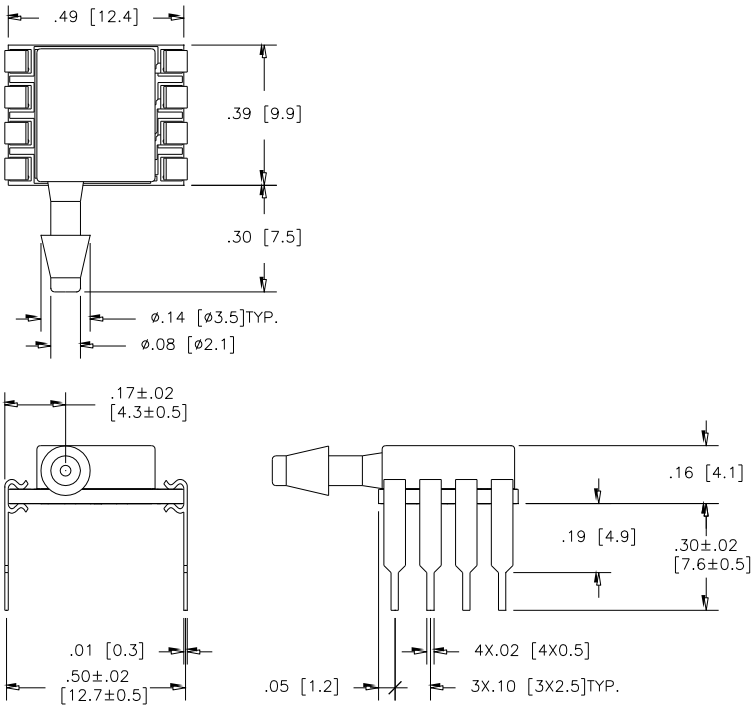


Model MS4525DO-DSvoixxxyS

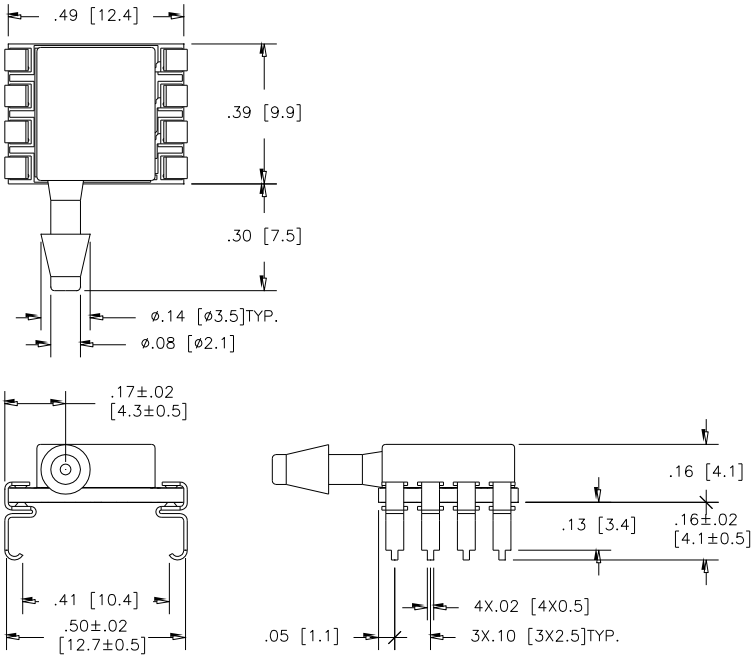


DIMENSIONS ARE IN INCHES [mm]

Model MS4525DO-SSvoixxxyP

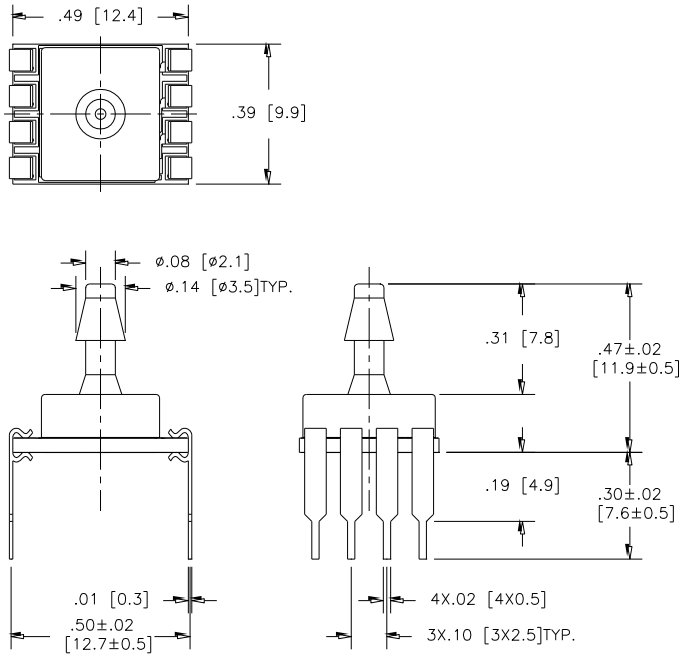


Model MS4525DO-SSvoixxxyS

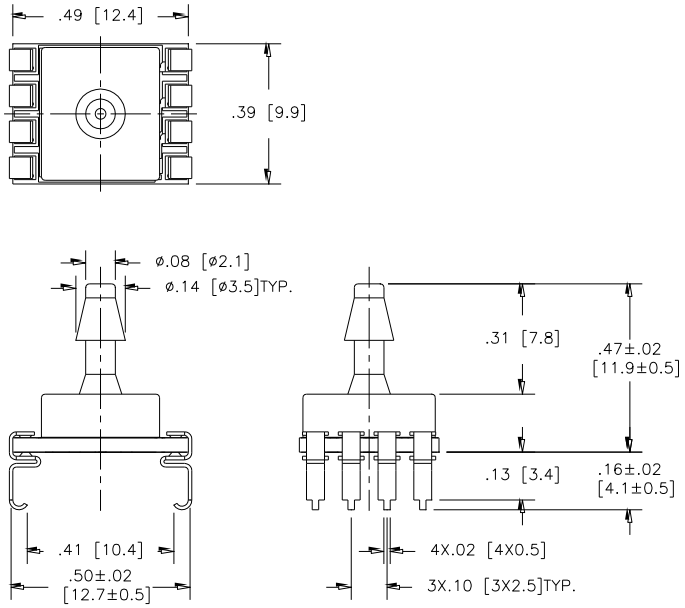


DIMENSIONS ARE IN INCHES [mm]

Model MS4525DO–TPvoixxxyP

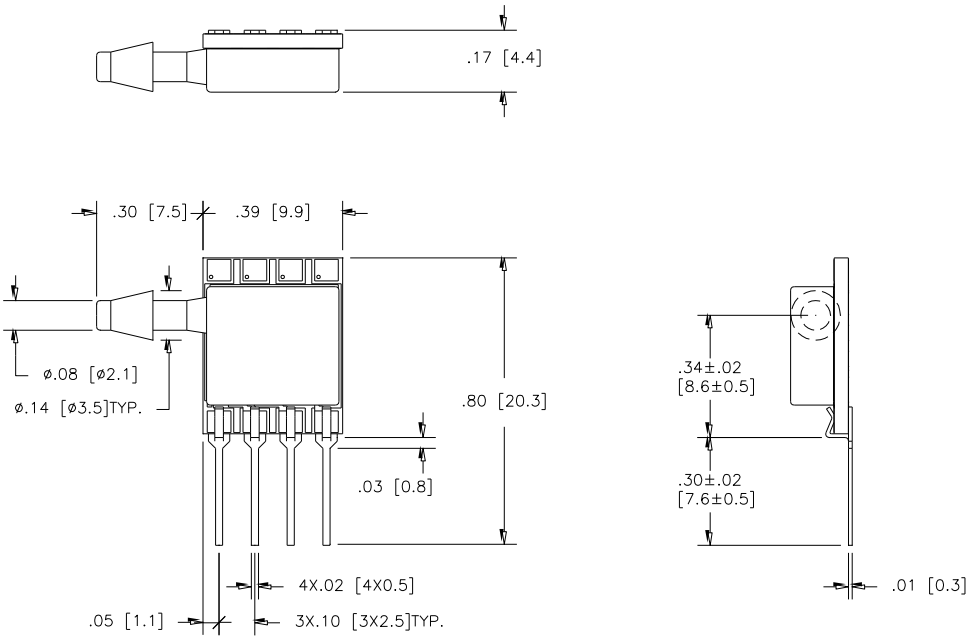


Model MS4525DO–TPvoixxxyS

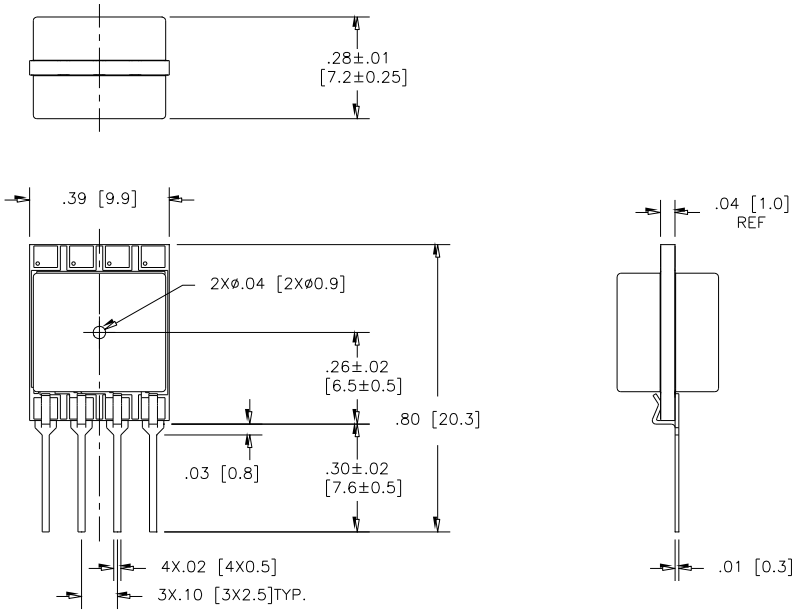


DIMENSIONS ARE IN INCHES [mm]

Model MS4525DO-SSvoixxxyL

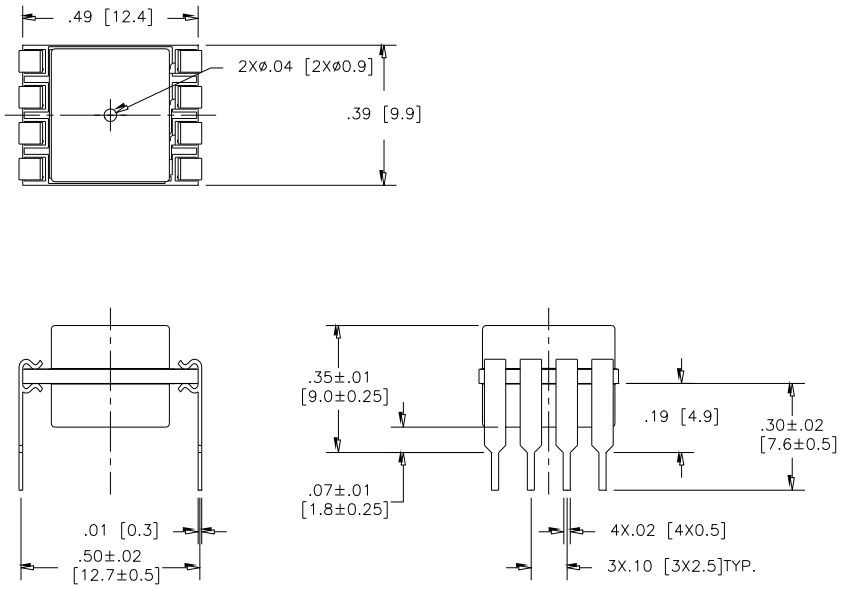


Model MS4525DO-MMvoixxxyL

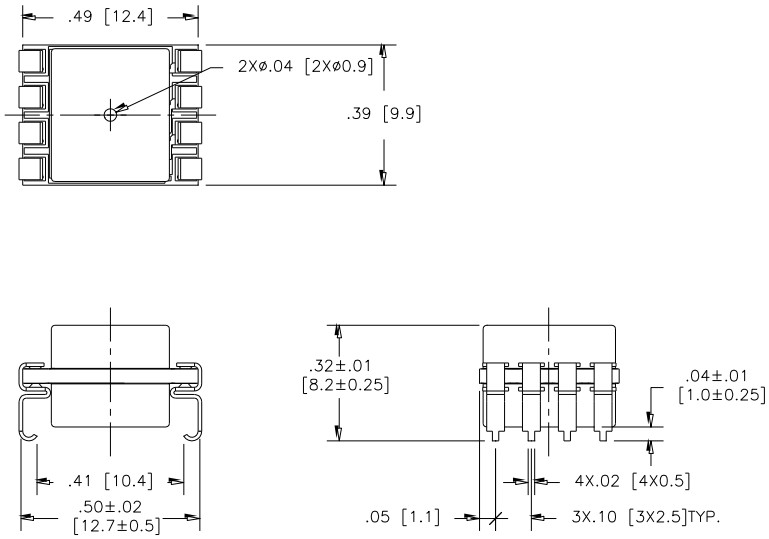


DIMENSIONS ARE IN INCHES [mm]

Model MS4525DO-MMvoixxxyP



Model MS4525DO-MMvoixxxyS



APPLICATION NOTES

Measurement Specialties offers a comprehensive selection of product support documentation. The items below can be found on the Literature tab under **PRESSURE SENSOR - MS4525DO**.

MS45xx Series Application Note
- Bypass Capacitor Selection
- Pressure Hose Recommendations
- PCB Layout Recommendations

Interfacing to MEAS Digital Pressure Modules
- I^2C or SPI Protocol Description
- Data Fetch, Measurement Request Commands
- Timing Diagrams

Configuration, POR and Power Consumption
- Standard and Low Power Configuration
- Power On Reset (POR)
- Current Consumption by Sampling Frequency

AVAILABLE OPTIONS

Gel Coat (-F Option)

The MS4525DO is designed for non-ionic and clean dry air applications. Select this option for added protection in high humidity or slightly corrosive environments with the application of a silicone gel elastomer to sensor and ASIC. For questions concerning media compatibility, contact the factory.

Low Power (-L Option)

Select this option for battery powered or handheld device applications. In this configuration, the sensor and calibration microcontroller are powered down, drawing a current of ~ 0.6uA (Vs=5.0 Vdc). When the master sends a **Read MR** (measurement request) command (I^2C or SPI); the sensor is "awaken" and begins the measurement cycle; data is then placed onto the output registers. The sensor and calibration microcontroller are powered down again, awaiting the **Read DF** (data fetch) command from the master.

MS4525DO

ORDERING INFORMATION

4525DO	-	DS	3	A	I	004	G	P	
Model	**-**	**Package Style**	**Supply Voltage**	**Output Type**	**Interface Type**	**Pressure Range (psi)**	**Pressure Type**	**Pin Style**	**Option Type**
MS4525DO	-	**SS** = Single Sideport **DS** = Dual Sideport **TP** = Top Port **MM** = Manifold Mount	**3** = 3.3 Vdc **5** = 5.0 Vdc	**A** = 10% to 90% **B** = 5% to 95%	**I** = I^2C (Addr.0x28H) **J** = I^2C (Addr.0x36H) **K** = I^2C (Addr.0x46H) **S** = SPI (not available for 'L' pin style) **0** = I^2C (Addr.0x48H) **:** **:** **9** = I^2C (Addr.0x51H)	**001** **002** **005** **015** **030** **050** **100** **150**	**A** = Absolute **D** = Differential **G** = Gage **C** = Compound **V** = Vacuum	**P** = Thru Hole **S** = J Lead **L** = In Line	**Blank** = No Option **F** = Gel Coating **L** = Low Power **M** = Gel Coating and Low Power

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