

Installation Instructions for the MicroPressure Board Mount Pressure Sensors

MPR Series—Compact, High Accuracy, Compensated/Amplified

Issue A
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General Information

The MPR Series is a very small piezoresistive silicon pressure sensor offering a digital output for reading pressure over the specified full scale pressure span and temperature range. It is calibrated and compensated over a specific temperature range for sensor offset, sensitivity, temperature effects, and

non-linearity using an on-board Application Specific Integrated Circuit (ASIC). This product is designed to meet the requirements of higher volume medical (consumer and non-consumer) devices and commercial appliance applications.

Table 1. Absolute Maximum Ratings¹

Characteristic	Min.	Max.	Unit
Supply voltage (V_{supply})	-0.3	3.6	Vdc
Voltage on any pin	-0.3	$V_{\text{supply}} + 0.3$	V
ESD susceptibility (human body model)	—	2	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering peak reflow temperature and time	15 s max. at 250°C [482°F]		

¹Absolute maximum ratings are the extreme limits the device will withstand without damage.

Table 2. Environmental Specifications

Characteristic	Parameter
Humidity: all external surfaces internal surfaces of Liquid Media Option (S, F, L) internal surfaces of Dry Gases Option (N)	0 %RH to 95 %RH, non-condensing 0 %RH to 100 %RH, condensing 0 %RH to 95 %RH, non-condensing
Vibration	15 g, 10 Hz to 2 Hz
Shock	100 g, 6 ms duration
Solder reflow	J-STD-020-D.1 Moisture Sensitivity Level 1 (unlimited shelf life when stored at $\leq 30^\circ\text{C}/85\% \text{RH}$)

Table 3. Wetted Materials

Component	Non-Gel Version	Gel Protected Version
Ports and covers	304 stainless steel	304 stainless steel
Substrate	FR4	—
Adhesives	epoxy	gel
Electronic components	silicon, glass, copper, gold	—

Table 4. Sensor Pressure Types

Pressure Type	Description
Absolute	Output is proportional to the difference between applied pressure and a built-in vacuum reference.
Gage	Output is proportional to the difference between applied pressure and atmospheric (ambient) pressure.

Table 5. Operating Specifications

Characteristic	Min.	Typ.	Max.	Unit
Supply voltage (V_{supply}): ^{1,2}	3.0	3.3	3.6	Vdc
Supply current at 3.3 Vdc: standby mode	—	0.0005	—	mA
active mode	—	1.7	—	
Power consumption	—	10	—	mW
Operating temperature range ³	-40 [-40]	—	85 [185]	°C [°F]
Compensated temperature range ⁴	0 [32]	—	50 [122]	°C [°F]
Startup time (power up to data ready)	—	—	0.3	ms
Data rate	—	200	—	samples per second
I ² C/SPI voltage level: low	—	—	20	% V_{supply}
high	80	—	—	
Pull up on MISO, SCLK, SS, MOSI	1	—	—	kOhm
Total Error Band after customer zero	—	—	±1.5	%FSS BFSL ⁶
Accuracy ⁵	—	—	±0.25	%FSS BFSL ⁶
Resolution	13.0	—	—	bits

¹**Ratiometricity of the sensor (the ability of the device output to scale to the supply voltage):** Achieved within the specified operating voltage.

²The sensor is not reverse polarity protected. Incorrect application of supply voltage or ground to the wrong pin may cause electrical failure.

³**Operating temperature range:** The temperature range over which the sensor will produce an output proportional to pressure.

⁴**Compensated temperature range:** The temperature range over which the sensor will produce an output proportional to pressure within the specified performance limits (Total Error Band).

⁵**Accuracy:** The maximum deviation in output from a Best Fit Straight Line (BFSL) fitted to the output measured over the pressure range. Includes all errors due to pressure non-linearity, pressure hysteresis, and non-repeatability.

⁶**Full Scale Span (FSS):** The algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range. (See Figure 2 for pressure ranges.)

Table 6. Pressure Range Specifications for ±40 mbar to ±2.5 bar

Pressure Range	Pressure Range		Unit	Over Pressure ¹	Burst Pressure ²	Total Error Band after Customer Auto-Zero ³ (%FSS)
	Pmin.	Pmax.				
Absolute						
0001BA	0	1	bar	4	8	±1.5
01.6BA	0	1.6	bar	4	8	±1.5
02.5BA	0	2.5	bar	4	8	±1.5
Gage						
0040MG	0	40	mbar	350	700	±1.5
0060MG	0	60	mbar	350	700	±1.5
0100MG	0	100	mbar	350	700	±1.5
0160MG	0	160	mbar	350	700	±1.5
0250MG	0	250	mbar	350	700	±1.5
0400MG	0	400	mbar	4000	8000	±1.5
0600MG	0	600	mbar	4000	8000	±1.5
0001BG	0	1	bar	4	8	±1.5
01.6BG	0	1.6	bar	4	8	±1.5
02.5BG	0	2.5	bar	4	8	±1.5

¹ **Overpressure:** The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.

² **Burst Pressure:** The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.

³ **Total Error Band after Customer Auto-Zero:** The maximum deviation from the ideal transfer function over the entire compensated pressure range for a minimum of 24 hours after an auto-zero operation. Includes all errors due to full scale span, pressure non-linearity, pressure hysteresis, and thermal effect on span.

Table 7. Pressure Range Specifications for ± 4 kPa to ± 250 kPa

Pressure Range	Pressure Range		Unit	Over Pressure ¹	Burst Pressure ²	Total Error Band after Customer Auto-Zero ³ (%FSS)
	Pmin.	Pmax.				
Absolute						
0100KA	0	100	kPa	400	800	± 1.5
0160KA	0	160	kPa	400	800	± 1.5
0250KA	0	250	kPa	400	800	± 1.5
Gage						
0004KG	0	4	kPa	35	70	± 1.5
0006KG	0	6	kPa	35	70	± 1.5
0010KG	0	10	kPa	35	70	± 1.5
0016KG	0	16	kPa	35	70	± 1.5
0025KG	0	25	kPa	35	70	± 1.5
0040KG	0	40	kPa	400	800	± 1.5
0060KG	0	60	kPa	400	800	± 1.5
0100KG	0	100	kPa	400	800	± 1.5
0160KG	0	160	kPa	400	800	± 1.5
0250KG	0	250	kPa	400	800	± 1.5

¹ **Overpressure:** The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.

² **Burst Pressure:** The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.

³ **Total Error Band after Customer Auto-Zero:** The maximum deviation from the ideal transfer function over the entire compensated pressure range for a minimum of 24 hours after an auto-zero operation. Includes all errors due to full scale span, pressure non-linearity, pressure hysteresis, and thermal effect on span.

Table 8. Pressure Range Specifications for ±6 psi to ±30 psi

Pressure Range	Pressure Range		Unit	Over Pressure ¹	Burst Pressure ²	Total Error Band after Customer Auto-Zero ³ (%FSS)
	Pmin.	Pmax.				
Absolute						
0015PA	0	15	psi	60	120	±1.5
0025PA	0	25	psi	60	120	±1.5
0030PA	0	30	psi	60	120	±1.5
Gage						
0001PG	0	1	psi	5	10	±1.5
0005PG	0	5	psi	60	120	±1.5
0015PG	0	15	psi	60	120	±1.5
0030PG	0	30	psi	60	120	±1.5

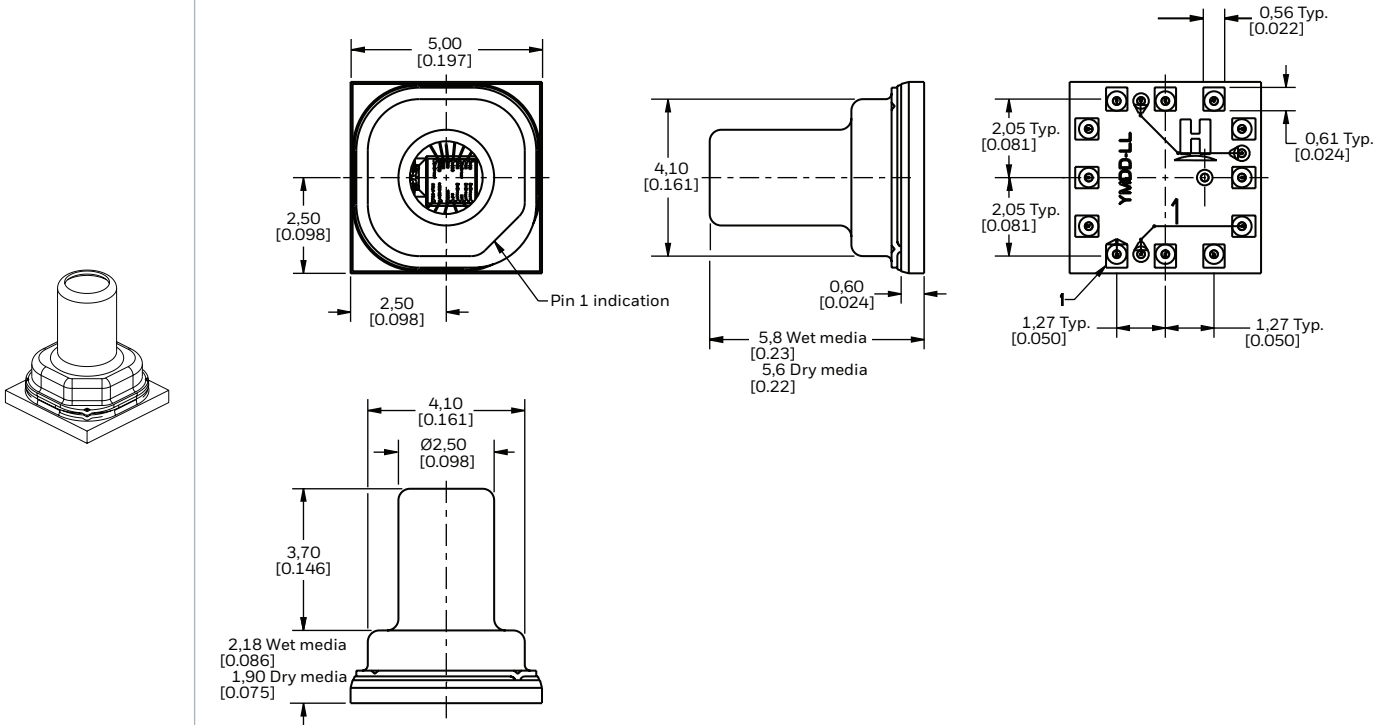
¹ **Overpressure:** The maximum pressure which may safely be applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressures may cause permanent damage to the product. Unless otherwise specified this applies to all available pressure ports at any temperature with the operating temperature range.

² **Burst Pressure:** The maximum pressure that may be applied to any port of the product without causing escape of pressure media. Product should not be expected to function after exposure to any pressure beyond the burst pressure.

³ **Total Error Band after Customer Auto-Zero:** The maximum deviation from the ideal transfer function over the entire compensated pressure range for a minimum of 24 hours after an auto-zero operation. Includes all errors due to full scale span, pressure non-linearity, pressure hysteresis, and thermal effect on span.

Figure 1. Product Dimensions (For reference only: mm [in.])

Long port



Short port

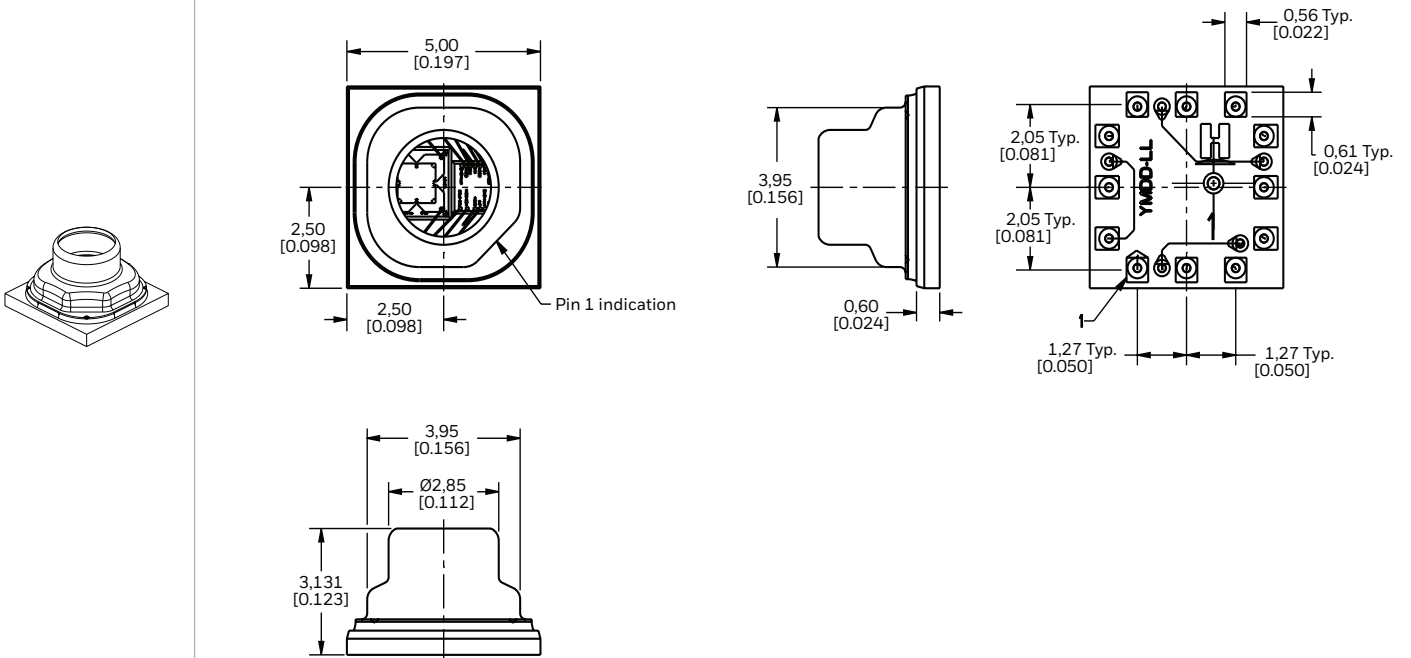
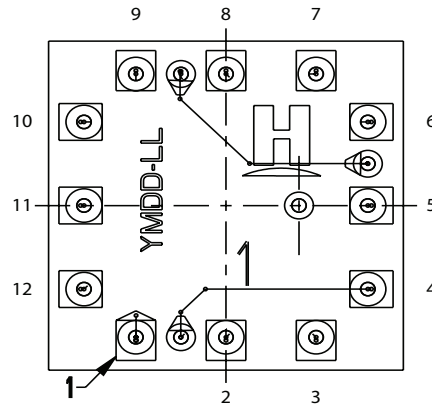


Table 9. Pinout and Functionality



Pad Number	Name	Description
1	SS	Slave Select: Chip select for SPI sensor
2	MOSI/SDA	Master Out/Slave In: Data in for SPI sensor; data in/out for I ² C sensor
3	SCLK/SCL	Clock input for SPI and I ² C sensor
4	VO+	V _{OUT+} pin in piezoresistive Wheatstone Bridge: Anti-aliasing filter can be connected between VO+ and VO-
5	NC2	No connection
6	VO-	V _{OUT-} pin in piezoresistive Wheatstone Bridge: Anti-aliasing filter can be connected between VO- and VO+
7	MISO	Master In/Slave Out: data output for SPI sensor
8	EOC	End-of-conversion indicator: This pin is set high when a measurement and calculation have been completed and the data is ready to be clocked out
9	RES	Reset: This pin can be connected and used to control safe resetting of the sensor. RES is active-low; a V _{DD} -V _{SS} -V _{DD} transition at the RES pin leads to a complete sensor reset
10	V _{SS}	Ground reference voltage signal
11	NC1	No connection
12	V _{DD}	Positive supply voltage

Figure 2. Recommended PCB Pad Layout

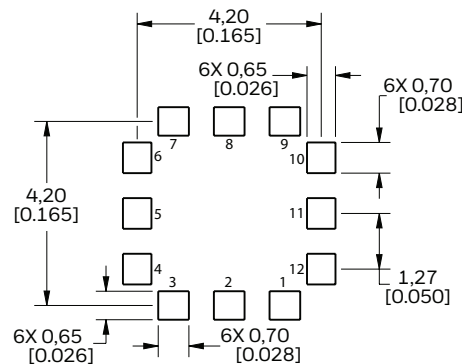
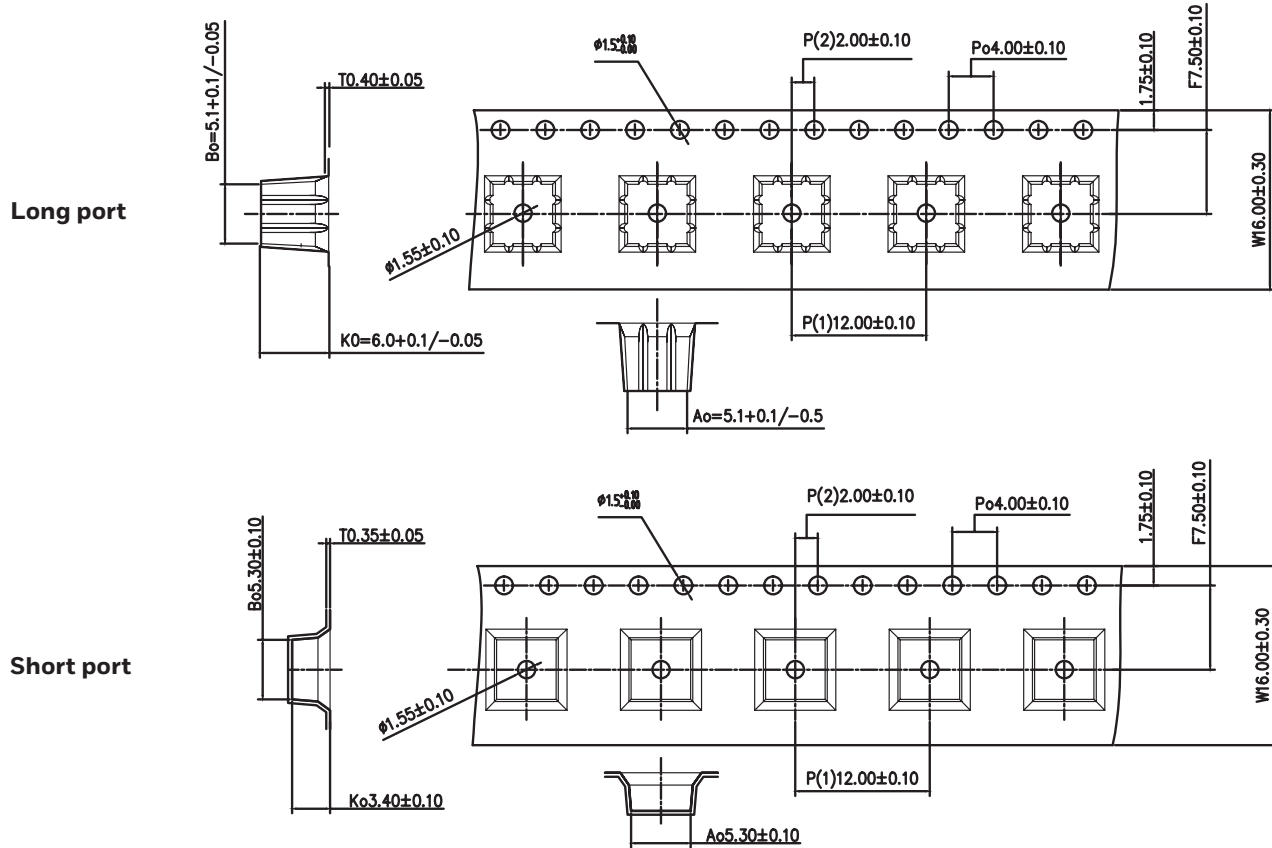
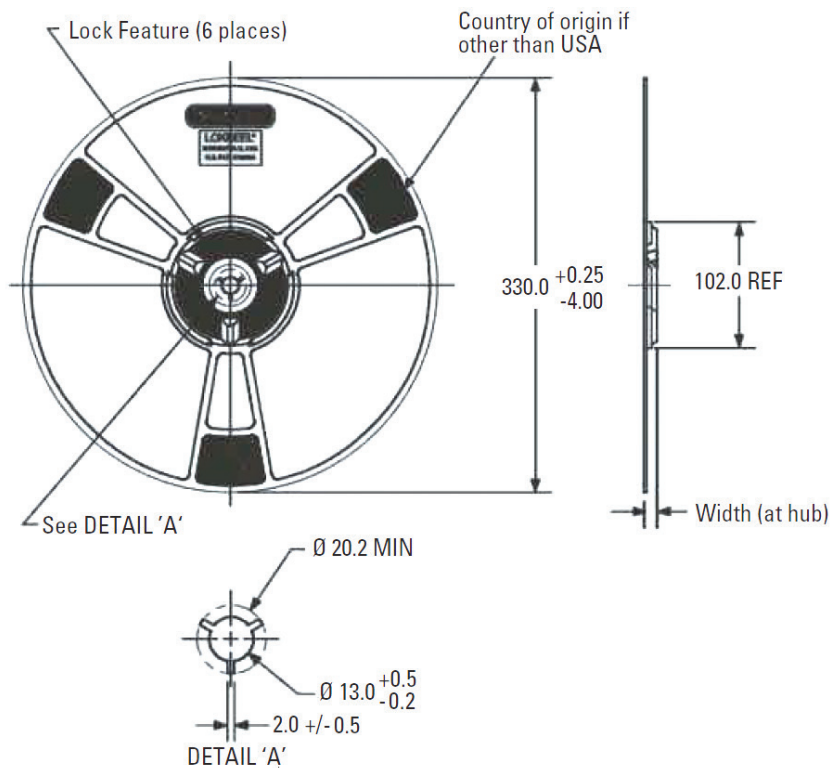


Figure 3. Product Tape and Reel Dimensions (For reference only: mm.)



Reel



⚠️ WARNING

PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

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