

## Installation Instructions for the MicroPressure Board Mount Pressure Sensors

MPR Series—Compact, High Accuracy, Compensated/Amplified

Issue C

# 32333868

### 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 Ratings<sup>1</sup>**

Characteristic	Min.	Max.	Unit
Supply voltage ( $V_{\text{supply}}$ )	-0.3	3.6	Vdc
Voltage on any pin	-0.3	$V_{\text{supply}} + 0.3$	V
ESD susceptibility (human body model)	—	4	kV
Storage temperature	-40 [-40]	85 [185]	°C [°F]
Soldering peak reflow temperature and time	15 s max. at 250°C [482°F]		

<sup>1</sup>Absolute maximum ratings are the extreme limits the device will withstand without damage.

**Table 2. Environmental Specifications**

Characteristic	Parameter
Humidity: external surfaces internal surfaces	0 %RH to 95 %RH, non-condensing 0 %RH to 100 %RH, condensing
Vibration	10 g, 10 Hz to 2 kHz
Shock	50 g, 6 ms duration
Solder reflow: long port short port	J-STD-020-D.1 Moisture Sensitivity Level 1 (unlimited shelf life when stored at $\leq 30^\circ\text{C}/85\% \text{RH}$ ) J-STD-020-D.1 Moisture Sensitivity Level (consult factory)

**Table 3. Wetted Materials**

Component	Long Port Version	Short Port Version
Ports and covers	304 stainless steel	304 stainless steel
Adhesives	epoxy	not exposed (protected by gel)
Electronic components	not exposed (protected by gel)	not exposed (protected by gel)

**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 ( $V_{\text{supply}}$ ): <sup>1,2</sup>	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 <sup>3</sup>	-40 [-40]	—	85 [185]	°C [°F]
Compensated temperature range <sup>4</sup>	0 [32]	—	50 [122]	°C [°F]
Startup time (power up to data ready)	—	—	2.5	ms
Data rate	—	200	—	samples per second
I <sup>2</sup> C/SPI voltage level: low	—	—	20	% $V_{\text{supply}}$
high	80	—	—	
Pull up on MISO, SCLK, SS, MOSI	1	—	—	kOhm
Total Error Band after customer zero	—	±1.5	—	%FSS BFSL <sup>6</sup>
Accuracy <sup>5</sup>	—	—	±0.25	%FSS BFSL <sup>6</sup>
Resolution	14	—	—	bits

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

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

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

<sup>4</sup>**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).

<sup>5</sup>**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.

<sup>6</sup>**Full Scale Span (FSS):** The algebraic difference between the output signal measured at the maximum (Pmax.) and minimum (Pmin.) limits of the pressure range.

**Table 6. Pressure Range Specifications for 60 mbar to 2.5 bar**

Pressure Range	Pressure Range		Unit	Over Pressure <sup>1</sup>	Burst Pressure <sup>2</sup>	Total Error Band after Customer Auto-Zero <sup>3</sup> (%FSS)	Transfer Function <sup>4</sup>
	Pmin.	Pmax.					
<b>Absolute</b>							
0001BA	0	1	bar	4	8	±1.5	A
01.6BA	0	1.6	bar	4	8	±1.5	A
02.5BA	0	2.5	bar	4	8	±1.5	A
<b>Gage</b>							
0060MG	0	60	mbar	350	700	±3.0	B
0100MG	0	100	mbar	350	700	±3.0	A
0160MG	0	160	mbar	350	700	±2.5	A
0250MG	0	250	mbar	350	700	±2.5	A
0400MG	0	400	mbar	4000	8000	±2.0	B
0600MG	0	600	mbar	4000	8000	±2.0	A
0001BG	0	1	bar	4	8	±1.5	A
01.6BG	0	1.6	bar	4	8	±1.5	A
02.5BG	0	2.5	bar	4	8	±1.5	A

<sup>1</sup> **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.

<sup>2</sup> **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.

<sup>3</sup> **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.

<sup>4</sup> **Transfer Function:** Transfer function "A" = 10% to 90% of 2<sup>24</sup> counts, transfer function "B" = 2.5% to 22.5% of 2<sup>24</sup> counts.

**Table 7. Pressure Range Specifications for 6 kPa to 250 kPa**

Pressure Range	Pressure Range		Unit	Over Pressure <sup>1</sup>	Burst Pressure <sup>2</sup>	Total Error Band after Customer Auto-Zero <sup>3</sup> (%FSS)	Transfer Function <sup>4</sup>
	Pmin.	Pmax.					
<b>Absolute</b>							
0100KA	0	100	kPa	400	800	±1.5	A
0160KA	0	160	kPa	400	800	±1.5	A
0250KA	0	250	kPa	400	800	±1.5	A
<b>Gage</b>							
0006KG	0	6	kPa	35	70	±3.0	B
0010KG	0	10	kPa	35	70	±3.0	A
0016KG	0	16	kPa	35	70	±2.5	A
0025KG	0	25	kPa	35	70	±2.5	A
0040KG	0	40	kPa	400	800	±2.0	B
0060KG	0	60	kPa	400	800	±2.0	A
0100KG	0	100	kPa	400	800	±1.5	A
0160KG	0	160	kPa	400	800	±1.5	A
0250KG	0	250	kPa	400	800	±1.5	A

<sup>1</sup>**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.

<sup>2</sup>**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.

<sup>3</sup>**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.

<sup>4</sup>**Transfer Function:** Transfer function "A" = 10% to 90% of 2<sup>24</sup> counts, transfer function "B" = 2.5% to 22.5% of 2<sup>24</sup> counts.

**Table 8. Pressure Range Specifications for 1 psi to 30 psi**

Pressure Range	Pressure Range		Unit	Over Pressure <sup>1</sup>	Burst Pressure <sup>2</sup>	Total Error Band after Customer Auto-Zero <sup>3</sup> (%FSS)	Transfer Function <sup>4</sup>
	Pmin.	Pmax.					
<b>Absolute</b>							
0015PA	0	15	psi	60	120	±1.5	A
0025PA	0	25	psi	60	120	±1.5	A
0030PA	0	30	psi	60	120	±1.5	A
<b>Gage</b>							
0001PG	0	1	psi	5	10	±3.0	A
0005PG	0	5	psi	60	120	±2.0	B
0015PG	0	15	psi	60	120	±1.5	A
0030PG	0	30	psi	60	120	±1.5	A

<sup>1</sup>**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.

<sup>2</sup>**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.

<sup>3</sup>**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.

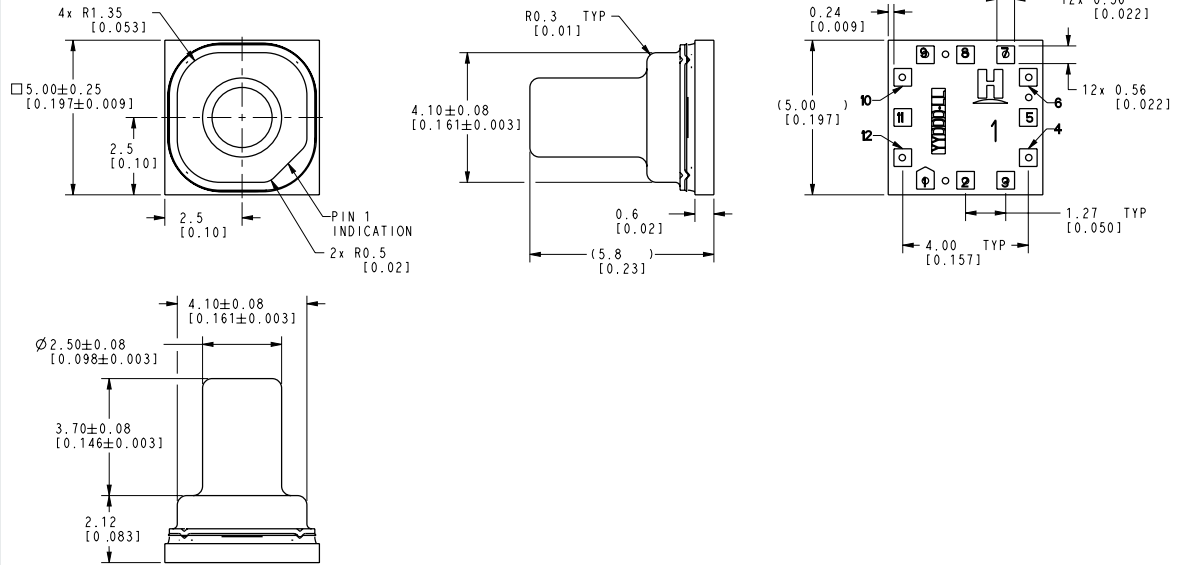
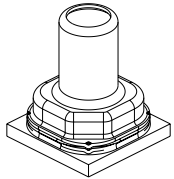
<sup>4</sup>**Transfer Function:** Transfer function "A" = 10% to 90% of 2<sup>24</sup> counts, transfer function "B" = 2.5% to 22.5% of 2<sup>24</sup> counts.

# MicroPressure Board Mount Pressure Sensors, MPR Series

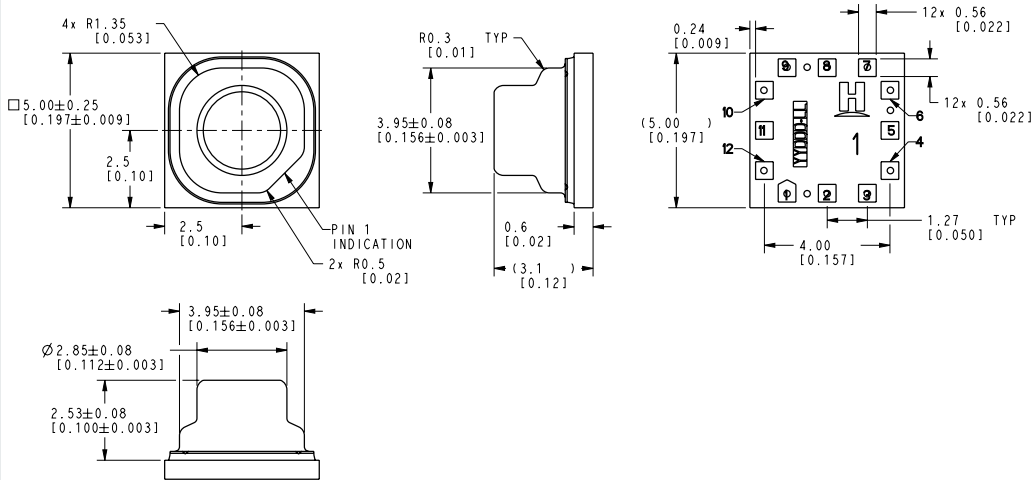
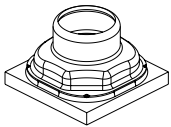
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**Figure 1. Product Dimensions (For reference only: mm [in.] )**

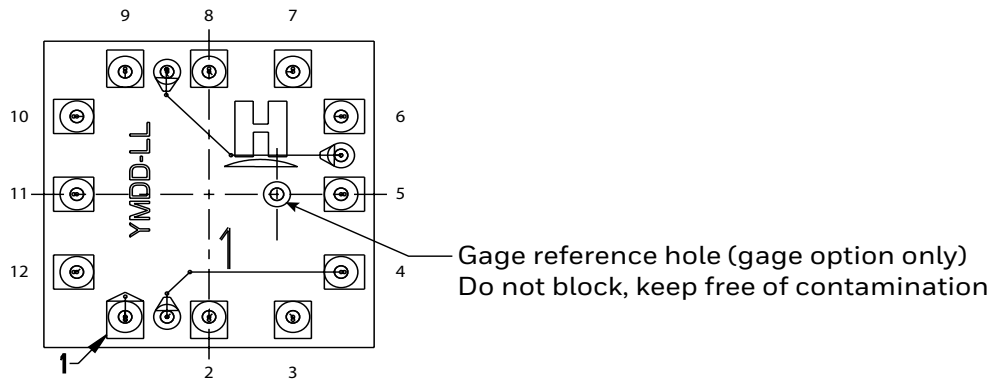
**Long port**



**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 <sup>2</sup> C sensor
3	SCLK/SCL	Clock input for SPI and I <sup>2</sup> C sensor
4	VO+	V <sub>OUT+</sub> pin in piezoresistive Wheatstone Bridge: Anti-aliasing filter can be connected between VO+ and VO-
5	NC	No connection
6	VO-	V <sub>OUT-</sub> 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 <sub>DD</sub> -V <sub>SS</sub> -V <sub>DD</sub> transition at the RES pin leads to a complete sensor reset
10	V <sub>SS</sub>	Ground reference voltage signal
11	NC	No connection
12	V <sub>DD</sub>	Positive supply voltage

**Figure 2. Recommended PCB Pad Layout**

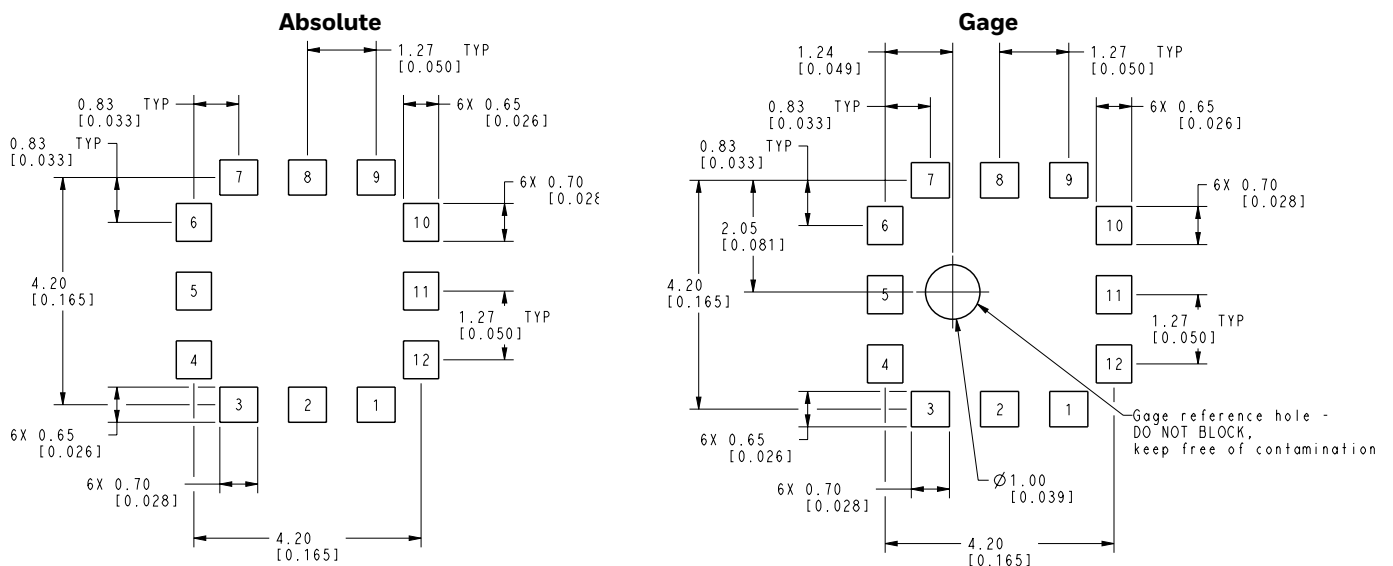


Figure 3. Product Tape and Reel Dimensions (For reference only: mm.)

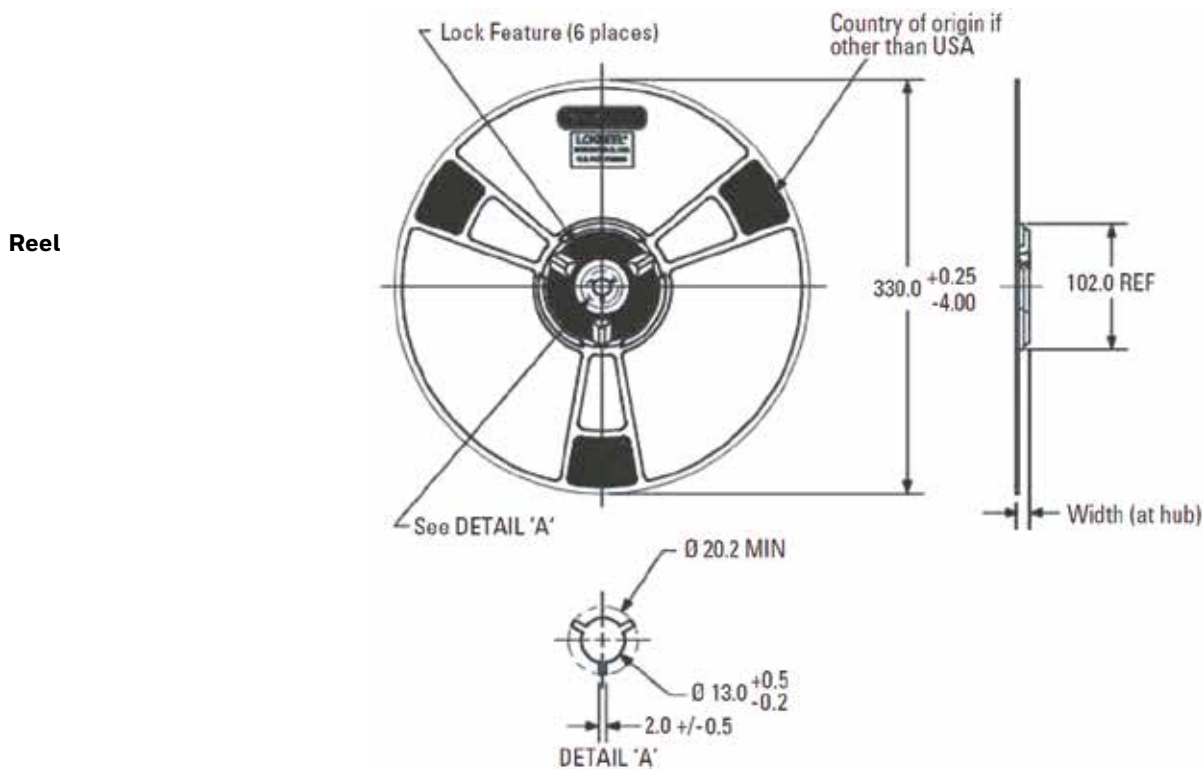
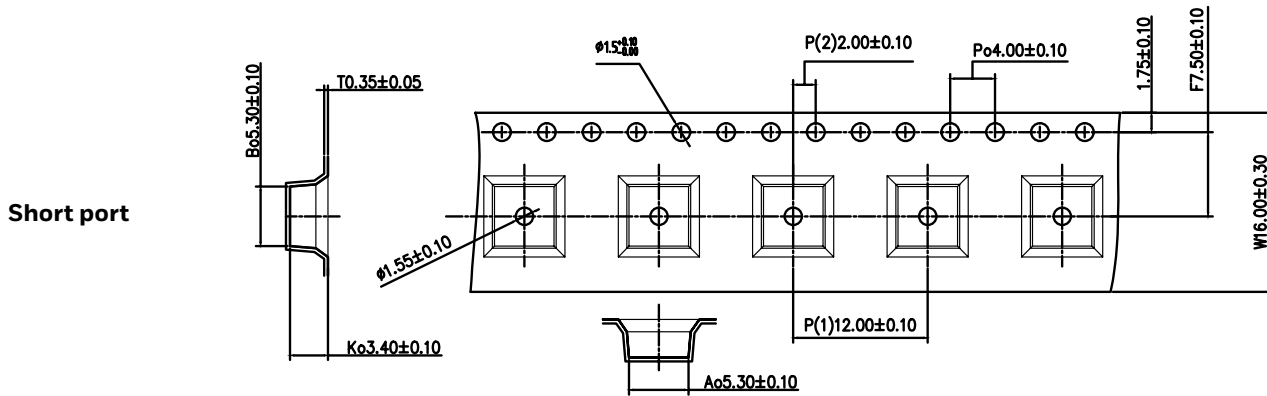
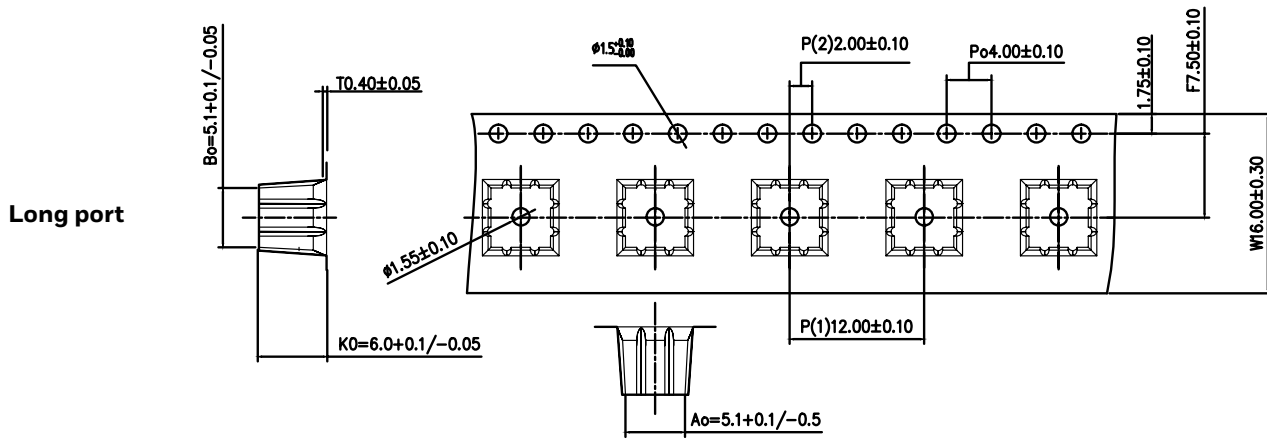
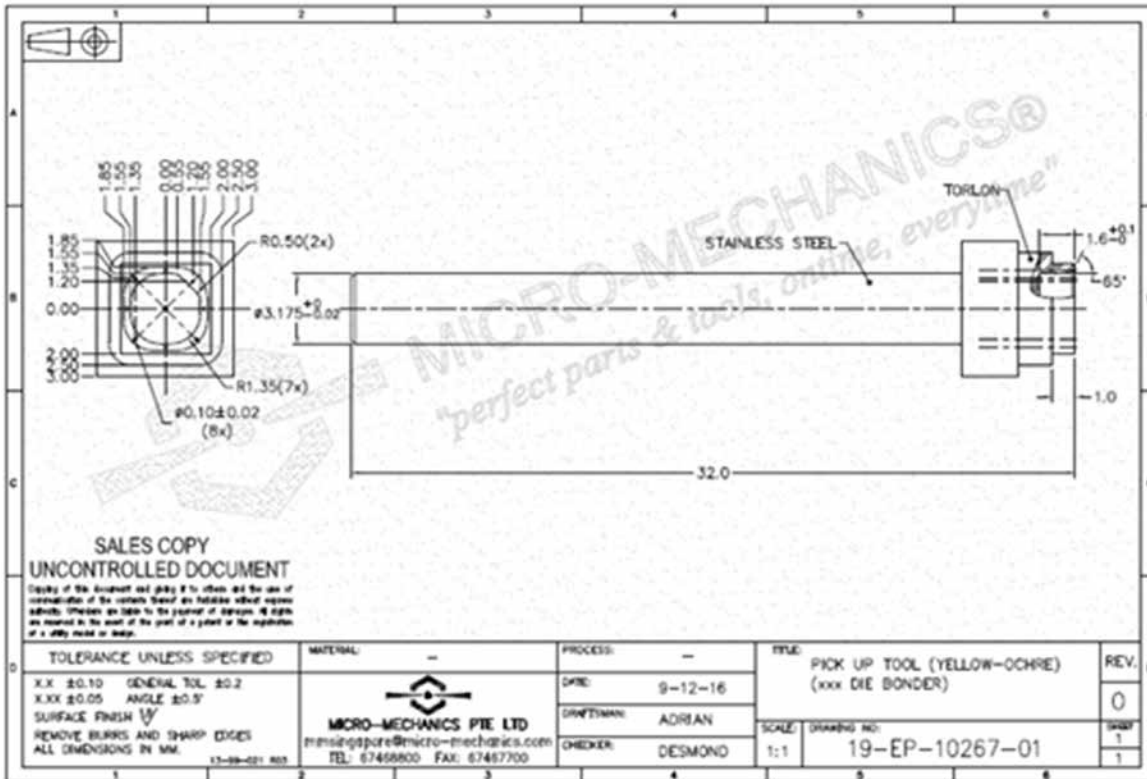


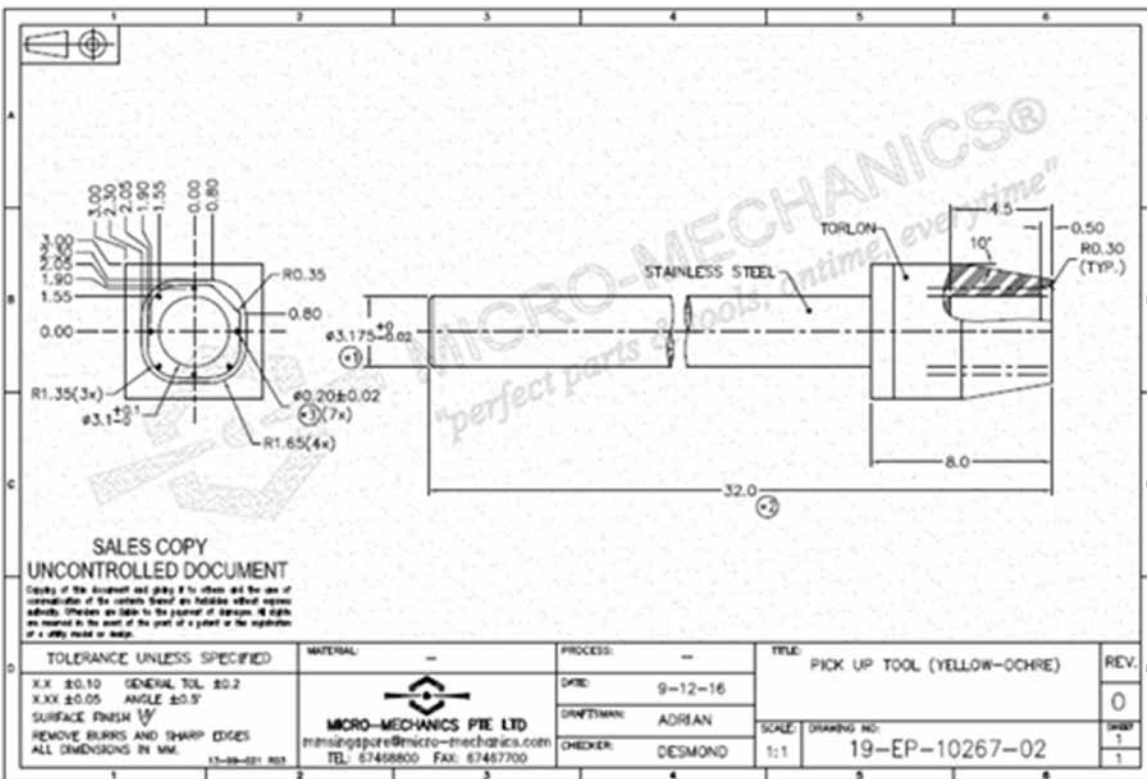


Figure 4. Recommended Pick and Place Geometry (Used with permission of Micro-Mechanics Pte Ltd.)

Short port  
Micro-Mechanics part number: 19-EP-10267-01



Long port  
Micro-Mechanics part number: 19-EP-10267-02



**⚠ 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.**

**Warranty/Remedy**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective.

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