Silicon Pressure Sensor Signal Conditioned, Temperature Compensated and Calibrated

The MCPV4006 series piezoresistive transducers are designed for the appliance, consumer, health care and industrial market. The analog output can be read directly into the A/D input of microcontrollers. This transducer uses advanced micromachining techniques to provide an accurate, high level analog output signal that is proportional to the applied pressure. The axial port can accommodate industrial grade tubing.

MCPV4006 Series

0 to 6 kPa (0 to 0.87 psi)
0.2 to 4.8 V Output

Features

- 5.0% Maximum Error over 0° to 85°C
- Thermoplastic (PPS) Surface Mount Package
- Available in Surface Mount (SMT)
- Available with Standard silicone Gel

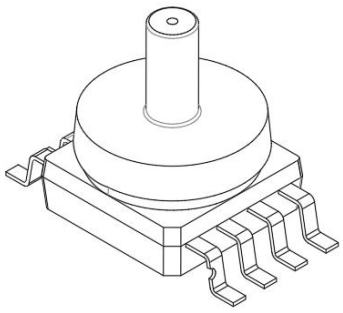
Application Examples

- Washing Machine Water Level Measurement
- Ideally Suited for Microprocessor or Microcontroller-Based Systems
- Appliance Liquid Level and Pressure Measurement
- Respiratory Equipment

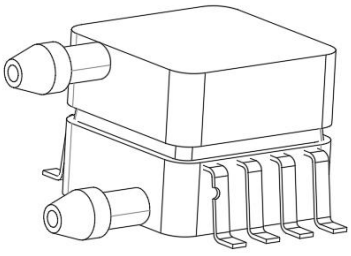
ORDERING INFORMATION

Device Name	# of Ports			Pressure Type			Device Marking
	None	Single	Dual	Gauge	Differential	Absolute	
MCPV4006DP			●		●		MCPV4006DP
MCPV4006GP		●		●			MCPV4006GP
MCPV4006GC6U		●		●			MCPV4006G

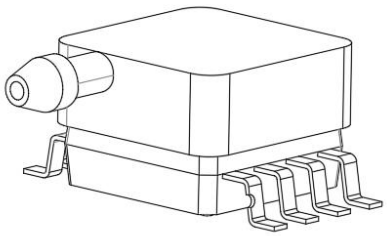
SMALL OUTLINE PACKAGES



MCPV4006GC6U



MCPV4006DP



MCPV4006GP

Operating Characteristics

Table 1. Operating Characteristics (VS = 5.0 Vdc, TA = 25°C unless otherwise noted, P1 > P2)

Characteristics	Symbol	Min	Typ	Max	Unit
Pressure Range	P_{OP}	0	—	6.0 612	kPa mm H_2O
Supply Voltage(1)	V_S	4.75	5.0	5.25	Vdc
Supply Current	I_o	—	2.5	10	mAdc
Full Scale Span(2)	V_{FSS}	—	4.6	—	V
Offset(3)	V_{off}	0.152	0.265	0.378	V
Sensitivity	V/P	—	766 7.511	—	mV/kPa mV/mm H_2O
Accuracy(4) (10°C to60°C)	—	—	—	±5.0	%V_{FSS}

1. Device is ratiometric within this specified excitation range.
2. Full Scale Span (V_{FSS}) is defined as the algebraic difference between the output voltage at full rated pressure and the output voltage at the minimum rated pressure.
3. Offset (V_{off}) is defined as the output voltage at the minimum rated pressure.
4. Accuracy (error budget) consists of the following:

   Linearity: Output deviation from a straight line relationship with pressure over the specified pressure range.

   Temperature Hysteresis: Output deviation at any temperature within the operating temperature range, after the temperature is cycled to and from the minimum or maximum operating temperature points, with zero differential pressure applied.

   Pressure Hysteresis: Output deviation at any pressure within the specified range, when this pressure is cycled to and from the minimum or maximum rated pressure, at 25°C.

   TcSpan: Output deviation over the temperature range of 0° to 85°C, relative to 25°C.

   TcOffset: Output deviation with minimum rated pressure applied, over the temperature range of 0° to 85°C, relative to 25°C.

   Variation from Nominal: The variation from nominal values, for Offset or Full Scale Span, as a percent of V_{FSS}, at 25°C.

Note: Plugged or unplugged with power may cause permanent damage.

Maximum Ratings

Table 2. Maximum Ratings(1)

Rating	Symbol	Value	Unit
Maximum Pressure (P1 > P2)	P_{max}	24	kPa
Storage Temperature	T_{stg}	–30 to +100	°C
Operating Temperature	T_A	+10 to +60	°C

1. Exposure beyond the specified limits may cause permanent damage or degradation to the device.

Figure 1 shows a block diagram of the internal circuitry.

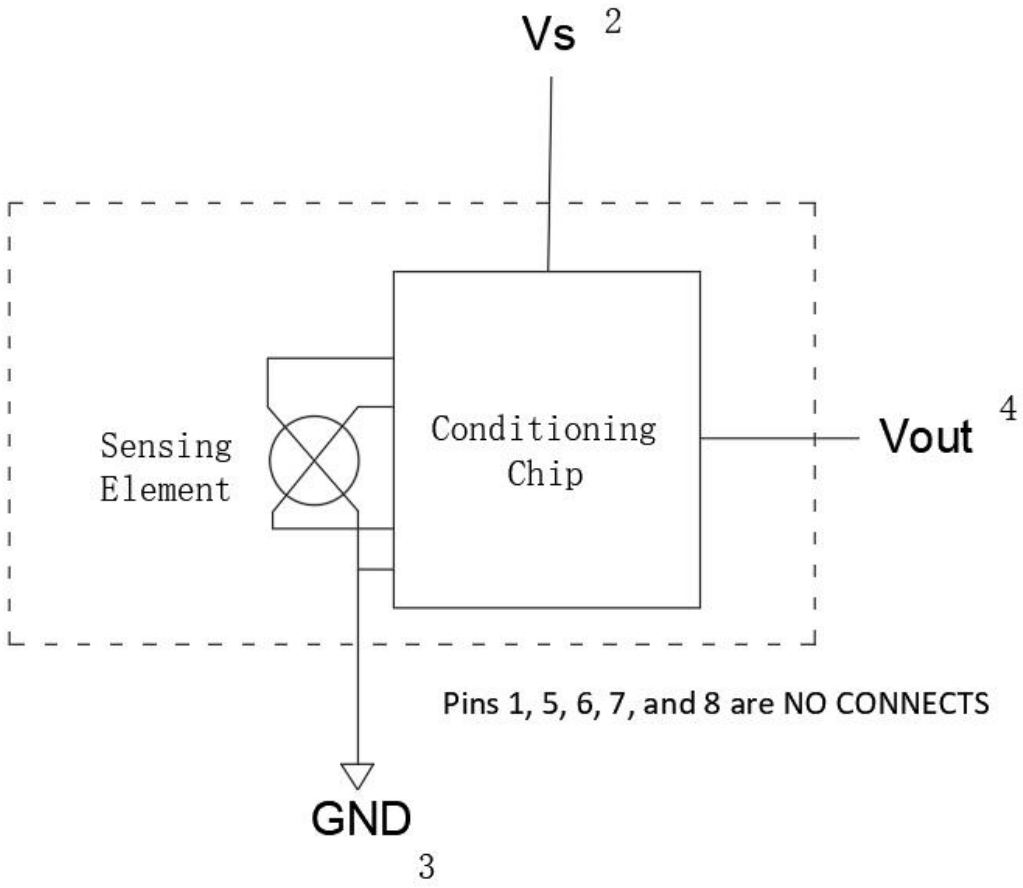


Figure 1. Pressure Sensor Schematic

TEMPERATURE COMPENSATION AND CALIBRATION

The performance over temperature is achieved by temperature compensation, calibration and signal conditioning circuitry.

A silicone gel isolates the die surface and wire bonds from the environment, while allowing the pressure signal to be transmitted to the sensor diaphragm.

The MCPV4006 series pressure sensor operating characteristics, and internal reliability and qualification tests are based on use of dry air as the pressure media. Media, other than dry air, may have adverse effects on sensor performance and long-term reliability. Contact the factory for information regarding media compatibility in your application.

Figure 2 shows the recommended decoupling circuit for interfacing the integrated sensor to the A/D input of a microprocessor or microcontroller. Proper decoupling of the power supply is recommended.

Figure 3 shows the sensor output signal relative to pressure input. Typical, minimum, and maximum output curves are shown for operation over a temperature range of 10° to 60°C using the decoupling circuit shown in Figure 2.

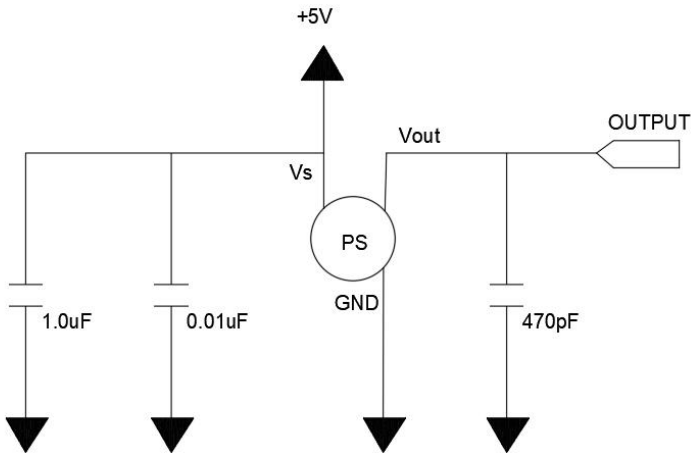


Figure 2. Recommended Power Supply Decoupling and Output Filtering

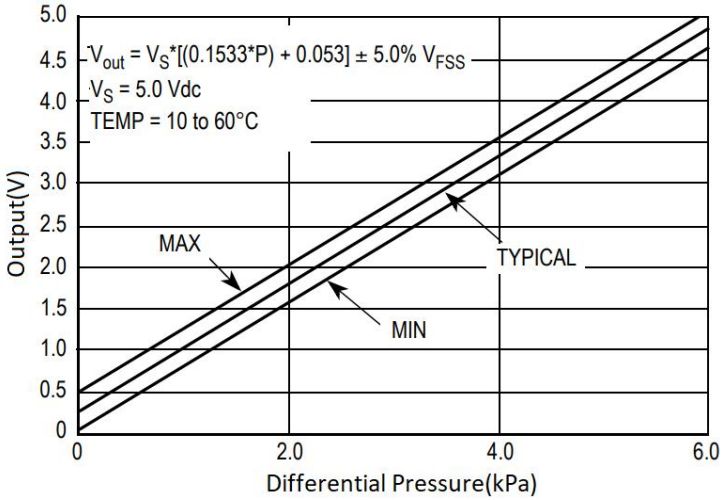


Figure 3. Output vs. Pressure Differential

PRESSURE (P1)/VACUUM (P2) SIDE IDENTIFICATION TABLE

The two sides of the pressure sensor are designated as the Pressure (P1) side and the Vacuum (P2) side. The Pressure (P1) side is the side containing silicone gel which protects the die from harsh media. The MCP pressure sensor is designed to operate with positive differential pressure applied, P1 > P2.
The Pressure (P1) side may be identified by using the table below:

Part Number	Pressure (P1) Side Identifier
MCPV4006GC6U	Side with Port Attached
MCPV4006GP	Side with Port Attached
MCPV4006DP	Side with Part Marking

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the surface mount packages must be the correct size to ensure proper solder connection interface between the board and the package. With the correct footprint, the packages will self align when subjected to a solder reflow process. It is always recommended to design boards with a solder mask layer to avoid bridging and shorting between solder pads.

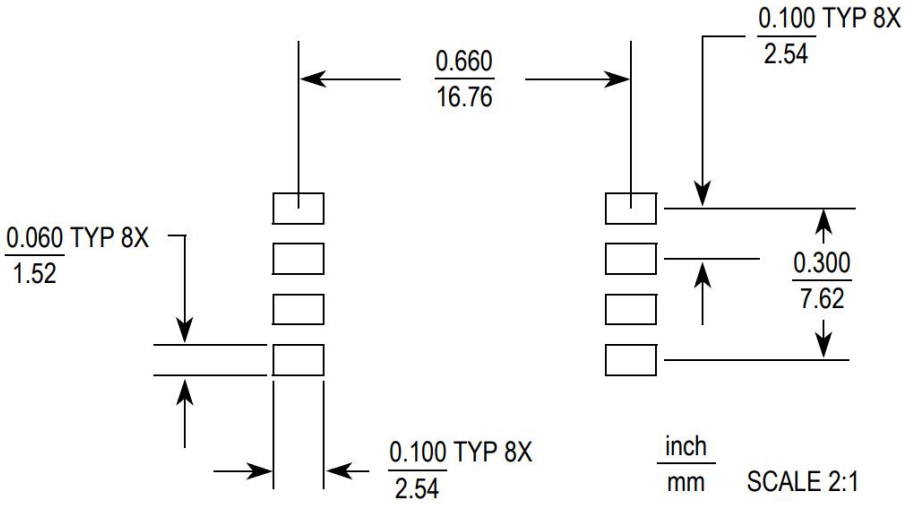
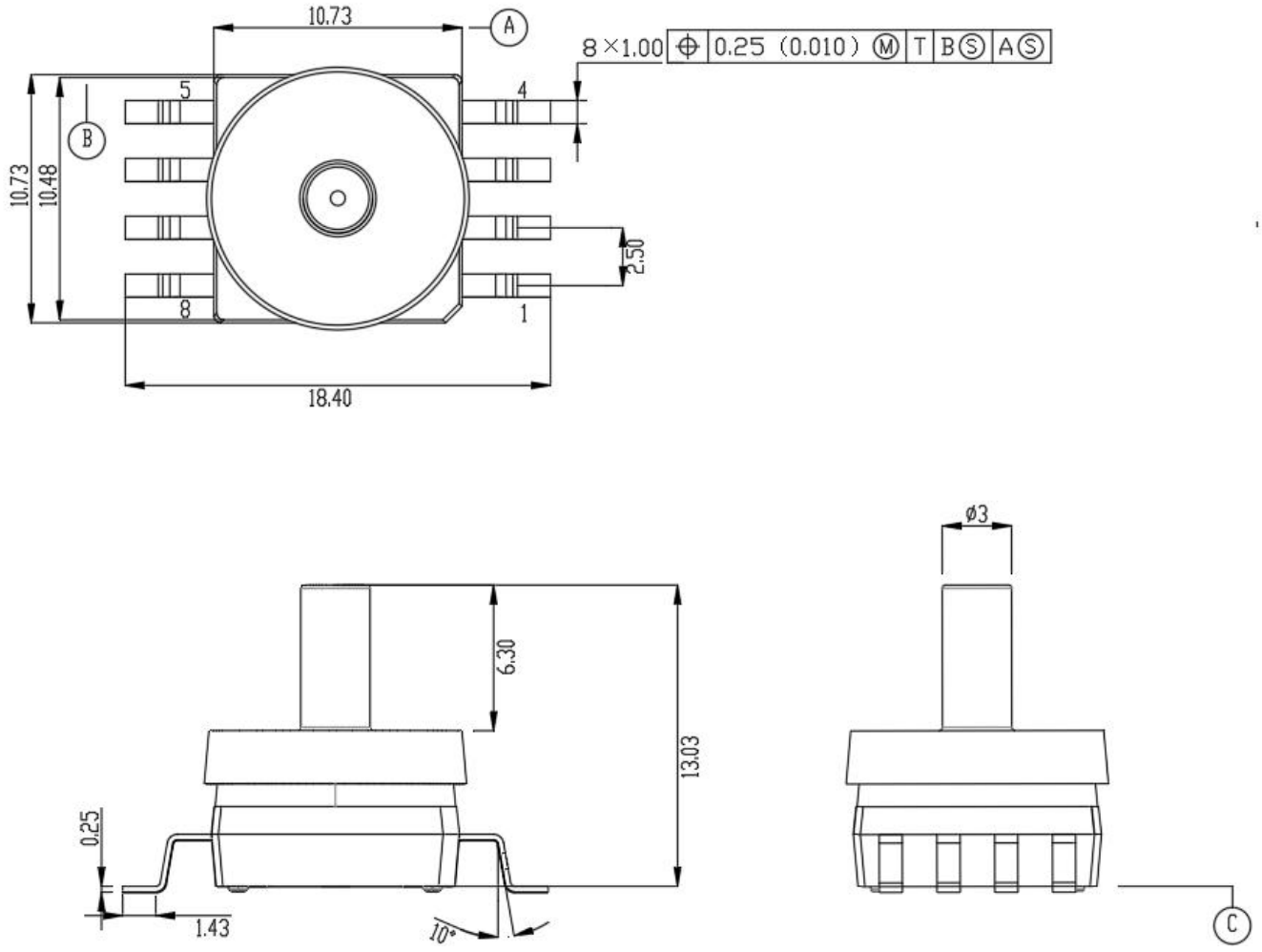
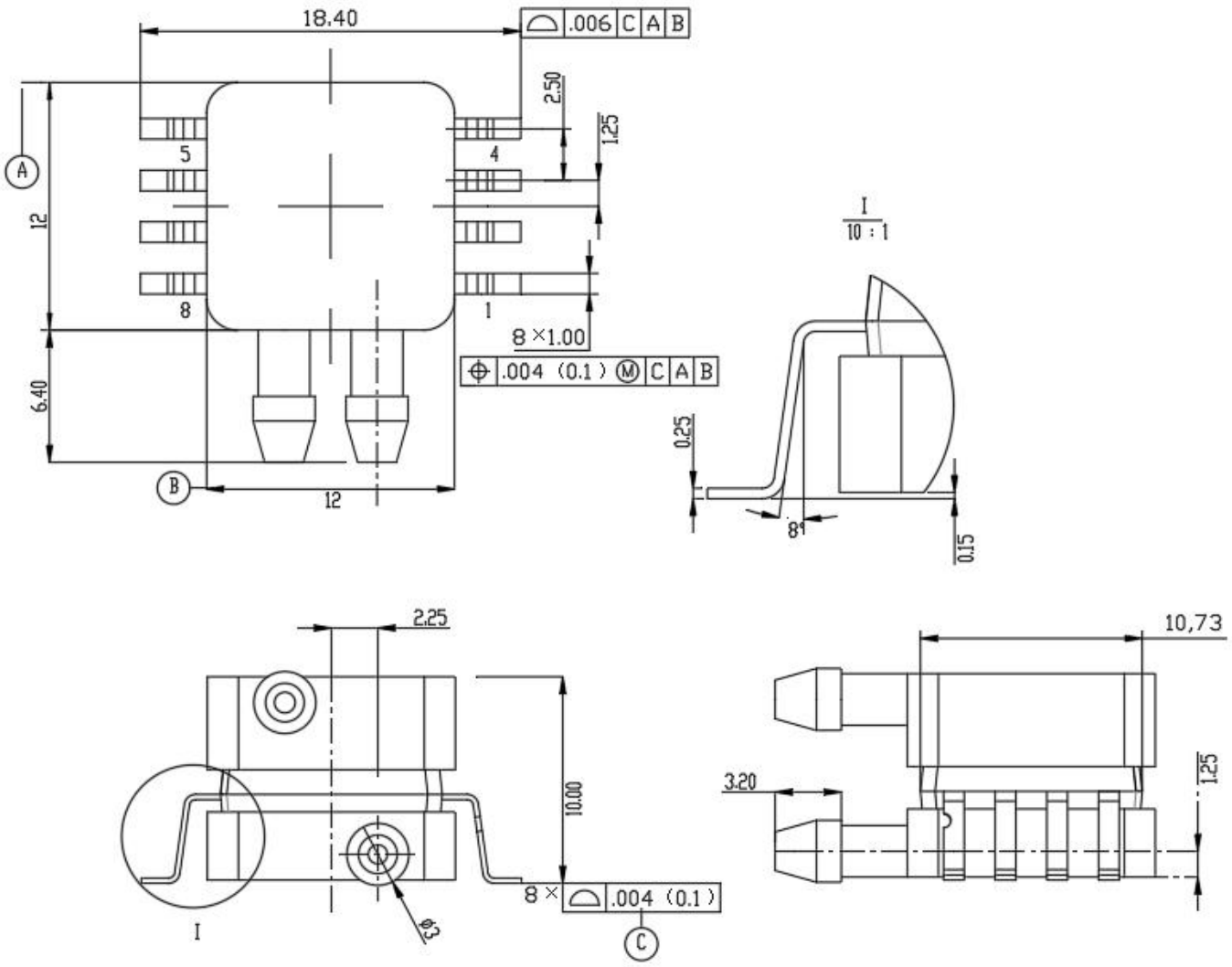


Figure 4. SOP Footprint

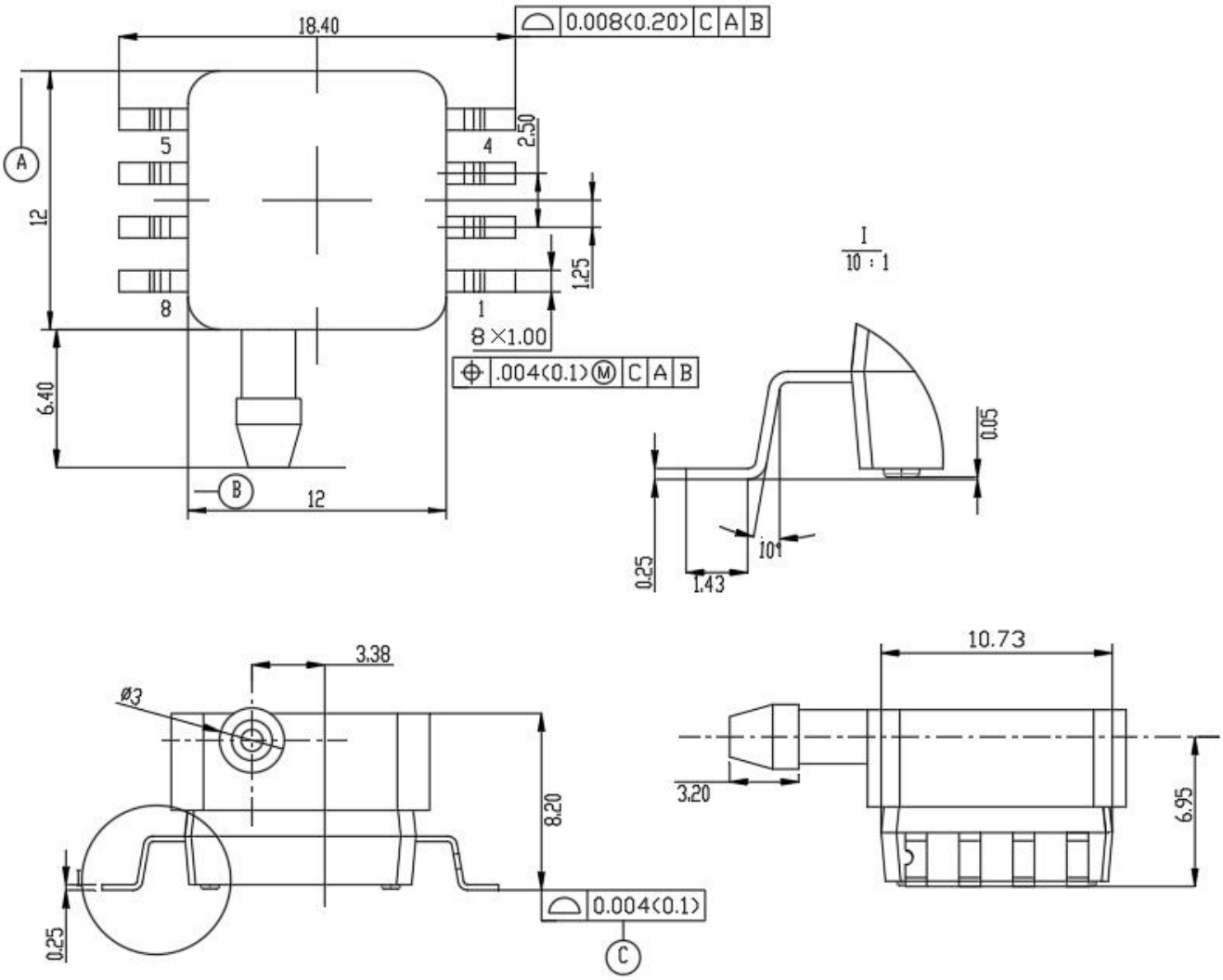
PACKAGE DIMENSIONS



MCPV4006GC6U


18.40
.006 C A B
2.50
1.25
5
4
A
12
8
1
8 ×1.00
.004 (0.1) M C A B
6.40
B
12
I
10 : 1
0.25
8°
0.15
2.25
10.00
8 × .004 (0.1) C
I
Ø3
10,73
3.20
1.25

MCPV4006DP


18.40
0.008(0.20) C A B
A
12
5
4
2.50
1.25
8
1
8×1.00
.004(0.1) M C A B
6.40
B
12
I
10 : 1
0.05
0.25
1.43
10°
3.38
Ø3
8.20
0.25
0.004(0.1)
C
10.73
3.20
6.95

MCPV4006GP