LP Series - Digital is a surface mountable pressure sensor package with a compensated digital output suitable for ultra-low pressure sensing applications.

COMPANY: Merit Sensor is a leader in piezoresistive pressure sensing and partners with clients to create high performing solutions for a variety of applications and industries.

SENTIUM: Merit Sensor products incorporate a proprietary Sentium® technology developed to provide a best-in-class operating temperature range (-40°C to 85°C) and superior stability.

TECHNOLOGY: Merit Sensor utilizes a piezoresistive Wheatstone bridge in a design that anodically bonds glass to a chemically etched silicon diaphragm. All products are RoHS compliant.

CAPABILITIES: Merit Sensor designs, engineers, fabricates, dices, assembles, tests, sells and services die and packaged products from a state-of-the-art facility near Salt Lake City, Utah.

FEATURES
Pressure 0.15 to 1 psi (10.3 to 68.9 mbar; 1.03 to 6.89 KPa; 4.2 to 27.7 in H₂O)
Output I²C
Type Gage and Differential
Media Clean, Dry Air and Non-corrosive Gases
Packaging Tape and Reel
Customization Sensitivity, Resistance, Bridge, Constraint, etc.

BENEFITS
Performance Enjoy best-in-class performance due to Merit’s proprietary Sentium technology
Cost Save money over time with high-performing die
Security Feel confident doing business with an experienced company backed by a solid parent company (NASDAQ: MMSI)
Speed Get to market quickly with creative and flexible solutions
Service Experience prompt, personal and professional support

1420 Family Part Number Configurator

PRELIMINARY

Sales +1 801.208.4722 · Customer Service +1 801.208.4700 · Fax +1 801.208.4798 · sensors@merit.com · www.MeritSensor.com
1600 W. Merit Parkway · South Jordan, Utah · 84095 · USA
1420seriesDS.006
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Typical</th>
<th>Maximum</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (Vdd)</td>
<td>4.5</td>
<td>5</td>
<td>5.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply Current</td>
<td>3</td>
<td></td>
<td></td>
<td>mA</td>
<td>(1)</td>
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<tr>
<td>Operating Temperature</td>
<td>-40</td>
<td>85</td>
<td></td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55</td>
<td>100</td>
<td></td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Pressure ADC Resolution</td>
<td></td>
<td>14</td>
<td></td>
<td>Bits</td>
<td></td>
</tr>
<tr>
<td>Pressure Accuracy</td>
<td>-1.5</td>
<td>1.5</td>
<td></td>
<td>% FSO</td>
<td>(2) (3)</td>
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<tr>
<td>Startup time</td>
<td>0.5</td>
<td>15</td>
<td></td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>Digital update time</td>
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<td></td>
<td></td>
<td>ms</td>
<td></td>
</tr>
<tr>
<td>Proof Pressure</td>
<td>5X</td>
<td>125</td>
<td></td>
<td>ms</td>
<td></td>
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<td>Burst Pressure</td>
<td>10 psi</td>
<td></td>
<td></td>
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</tbody>
</table>

**Transfer Function Formula**

\[
P_{\text{psi}} = \left( P_{\text{max}} - P_{\text{min}} \right) \cdot \left( \frac{P_{\text{counts}} - 0.1 \cdot \text{Max}}{0.8 \cdot \text{Max}} \right) + P_{\text{min}}
\]

Where:
- \(P_{\text{psi}}\) = Measured Pressure in PSI
- \(P_{\text{counts}}\) = Pressure Counts from Merit Sensor Part
- \(P_{\text{min}}\) = Minimum Calibrated Pressure
- \(P_{\text{max}}\) = Maximum Calibrated Pressure
- Max = 16384 = 14 Bit Resolution

**Notes:**
1. @5V input voltage,
2. Over 0°C to 60°C
3. Applicable if Vdd = 4.75V to 5.25V
4. Full scale pressure

**Media Compatibility**

For Use With Non-corrosive Dry Gasses

Solder temperature: max 250 °C, 5 seconds max

**DIMENSIONS** (millimeters)

**Device Pinout**

- P1 = Vdd - Supply voltage
- P2 = N/C
- P3 = N/C
- P4 = VSS - Ground
- P5 = N/C
- P6 = I²C conversion complete signal
- P7 = SDA - I²C data
- P8 = SCL - I²C clock

Typical 1µf placed near pins 1 and 4.
**I2C PARAMETERS ***

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCL clock frequency</td>
<td>fSCL</td>
<td>100</td>
<td></td>
<td>400</td>
<td>kHz</td>
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<tr>
<td>Start condition hold time relative to SCL edge</td>
<td>tHDSTA</td>
<td>0.1</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Minimum SCL clock low width&lt;sup&gt;1&lt;/sup&gt;</td>
<td>tLOW</td>
<td>0.6</td>
<td></td>
<td></td>
<td>µs</td>
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<tr>
<td>Minimum SCL clock high width&lt;sup&gt;1&lt;/sup&gt;</td>
<td>tHIGH</td>
<td>0.6</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Start condition setup time relative to SCL edge</td>
<td>tSUSTA</td>
<td>0.1</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Data hold time on SDA relative to SCL edge</td>
<td>tHDDAT</td>
<td>0.0</td>
<td></td>
<td></td>
<td>µs</td>
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<tr>
<td>Data setup time on SDA relative to SCL edge</td>
<td>tSUDAT</td>
<td>0.1</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Stop condition setup time on SCL</td>
<td>tSUSTO</td>
<td>0.1</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td>Bus free time between stop condition and start condition</td>
<td>tBUS</td>
<td>2</td>
<td></td>
<td></td>
<td>µs</td>
</tr>
</tbody>
</table>

<sup>1</sup>Combined low and high widths must equal or exceed minimum SCLK period.

**I2C TIMING DIAGRAM***

**MERIT SENSOR 1420 I2C COMMUNICATION**

Communications to the 1420 is read only. To read the pressure counts, the master performs a read request by asserting a start condition, sending the 7 bit address of the part (If the part has an open address, 7 bits of anything is acceptable), and sets the read/write bit. The master then waits for an acknowledgment. The acknowledgment is sent by the pressure sensor along with 2 bits of status and bits 13:8 of the pressure counts, the master acknowledges the first 8 bits, and the pressure sensor sends the remaining 8 bits of data. The Master then does not acknowledge and sends a stop condition signaling the end of the transaction.

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**TRANSFER FUNCTION EXAMPLES**

**Example 1: 0.15 PSI Gage**
Part: 1420-P15G-xx11-111

\[ P_{\text{psi}} = (P_{\text{max}} - P_{\text{min}}) \cdot \left( \frac{P_{\text{counts}} - 0.1 \cdot \text{Max}}{0.8 \cdot \text{Max}} \right) + P_{\text{min}} \]

\[ P_{\text{psi}} = (0.15 - 0.0) \cdot \left( \frac{7215 - 0.1 \cdot 16384}{0.8 \cdot 16384} \right) + 0 \]

\[ P_{\text{psi}} = 0.0638 \text{ Psi} \]

**Example 2: 1.0 PSI Gage**
Part: 1420-1POG-xx11-111

\[ P_{\text{psi}} = (P_{\text{max}} - P_{\text{min}}) \cdot \left( \frac{P_{\text{counts}} - 0.1 \cdot \text{Max}}{0.8 \cdot \text{Max}} \right) + P_{\text{min}} \]

\[ P_{\text{psi}} = (1 - 0.0) \cdot \left( \frac{7215 - 0.1 \cdot 16384}{0.8 \cdot 16384} \right) + 0 \]

\[ P_{\text{psi}} = 0.4255 \text{ Psi} \]

**Example 3: -.5 to .5 PSI Differential**
Part: 1420-P50D-xx11-111

\[ P_{\text{psi}} = (P_{\text{max}} - P_{\text{min}}) \cdot \left( \frac{P_{\text{counts}} - 0.1 \cdot \text{Max}}{0.8 \cdot \text{Max}} \right) + P_{\text{min}} \]

\[ P_{\text{psi}} = (0.5 - (-0.5)) \cdot \left( \frac{8192 - 0.1 \cdot 16384}{0.8 \cdot 16384} \right) + (-0.5) \]

\[ P_{\text{psi}} = 0.0 \text{ Psi} \]