



YPP7004D16B

Pressure Sensor With Analog Output

Key Features

- ◆ Piezo-resistive silicon micro-machined sensor
- ◆ Gauge Type Pressure Sensor
- ◆ Pressure Range: 0 ~ +40 cmH₂o
- ◆ Operating Voltage Range: 4.75V ~ 5.25V (Typical: 5V)
- ◆ Ratiometric analog output: 10%VS ~ 90%VS
- ◆ DAC Resolution: 12 Bit
- ◆ DAC Data Update Time: 0.15 ms (~ 6.67kHz, Typical)
- ◆ Temperature Compensation: -5 ~ +65 °C
- ◆ Operating Temperature: -40 ~ +125 °C
- ◆ Over-voltage(OVP) and reverse voltage protection(RVP) at output and supply pins
- ◆ Package: SOP 16 (Dual Tube)
- ◆ RoHS compliant and Halogen-free

Applications

- ◆ Automotive applications
- ◆ Medical instrumentation
- ◆ Industrial pneumatic control
- ◆ Air Conditioning
- ◆ Home electricity appliances

Description

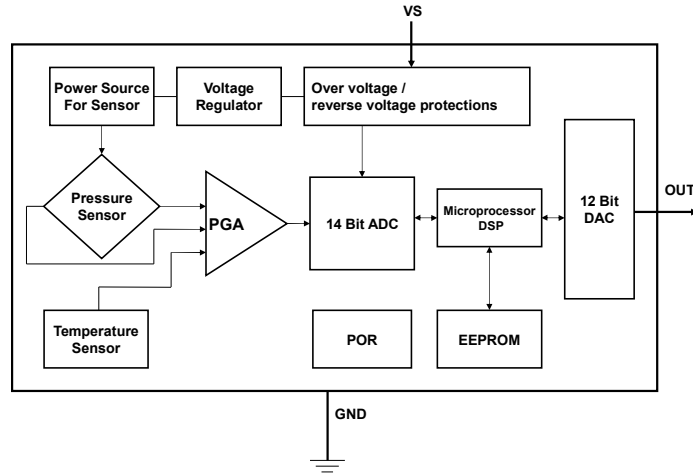
The YPP700 is the pressure sensor which measures gauge pressures. It consists of a silicon micro-machined sensing element chip and a signal conditioning ASIC. The ASIC is equipped with a 14-bit Σ - Δ ADC and a 12 bit D/A converter that it outputs a highly precise pressure value as a analog output signal. The pressure sensor element and the ASIC are mounted inside a system-in-package and wire-bonded to appropriate contacts. The YPP700 provides analog output interface. It can achieve ESD robustness, fast response time, high accuracy and linearity as well as long-term stability. All measurement data is fully calibrated and temperature compensated. In addition, it allows for easy system integration.



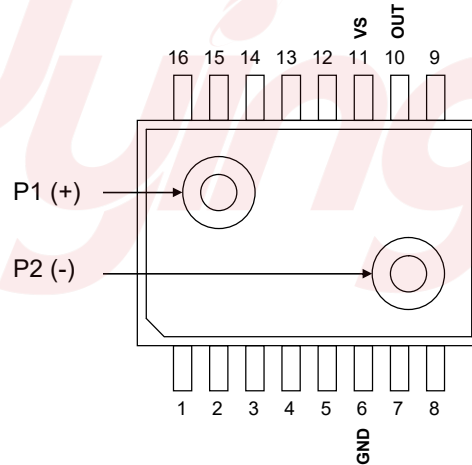
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Block Diagram



Pin Configuration



Top View

Pin Description

| Pin No. | Pin Name | Type | Function Description |
|---------|----------|------|-------------------------|
| 6 | GND | S | Connected to GND |
| 10 | OUT | O | Analog Voltage Output |
| 11 | VS | S | Positive supply voltage |

Note:

- (1) P1(+): Top side of the pressure sensor. If $P1 > P2$, the output value will be positive pressure.
- (2) P2(-): Back side of the pressure sensor. If $P2 > P1$, the output value will be negative pressure.
- (3) Type Symbol: S = Supply, O = Output.
- (4) The pin number of no connected: as 1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 14, 15, 16.



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Maximum Ratings

(Voltage with respect to GND unless otherwise noted)

| | |
|---|---------------------|
| Max Supply Voltage (VS) | -28 V to +40 V |
| Max Proof Pressure | ± 5 psi |
| Operating Temperature Range | -40°C to +125°C |
| Storage Temperature Range | - 40°C to +125°C |
| ESD Human Body Model Protection @ system level pins (VS, OUT) | ± 4kV |
| ESD Human Body Model Protection @ all pins | ± 2kV |
| Pressure Media | Non-corrosive gases |

Electrical Characteristics

(All parameters are specified at VS = 5.0 V supply voltage at 25°C, unless otherwise noted.)

| Power Supply Characteristics | | | | | | |
|----------------------------------|-------------------------|--|------|-------|------|----------------------|
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
| VS | Operating Voltage | — | 4.75 | 5.0 | 5.25 | V |
| I _{VS} | Operating Current | Active state | — | 8 | 10 | mA |
| Pressure Output Characteristics | | | | | | |
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
| V _{F.S} | Full-Scale Span | Pressure: 0 ~ 40 cmH ₂ o | — | 80 | — | %VS |
| V _{Out1} | Voltage Output 1 | Pressure: 0 cmH ₂ o | — | 10 | — | %VS |
| V _{Out2} | Voltage Output 2 | Pressure: 20 cmH ₂ o | — | 50 | — | %VS |
| V _{Out3} | Voltage Output 3 | Pressure: 40 cmH ₂ o | — | 90 | — | %VS |
| P _{TO_ERR} | Pressure Total Error | Pressure: 0 ~ 40 cmH ₂ o, Temperature: -5 ~ +65°C | -2.5 | — | +2.5 | %F.S |
| RES _{RMS} | Output Resolution (RMS) | Pressure: 0 ~ 40 cmH ₂ o | — | 0.03 | — | %F.S |
| P _{SENS} | Pressure Sensitivity | Pressure: 0 ~ 40 cmH ₂ o, T: 25°C, VS= 5V | — | 0.1 | — | V/cmH ₂ O |
| T _{COMP} | Compensation Temp. | — | -5 | — | +65 | °C |
| ADC/DAC Characteristics | | | | | | |
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
| RES _{ADC} | ADC Resolution | — | — | 14 | — | bit |
| RES _{DAC} | DAC Resolution | — | — | 12 | — | bit |
| T _{Update} | DAC Data Update Time | — | — | 6.7 | — | kHz |
| T _{start_up} | Start-Up Time | VS ramp up to analog operation | — | 1.8 | 2 | ms |
| System Frequency Characteristics | | | | | | |
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
| F _{sys} | System Frequency | — | 9.7 | 10.24 | 10.8 | MHz |

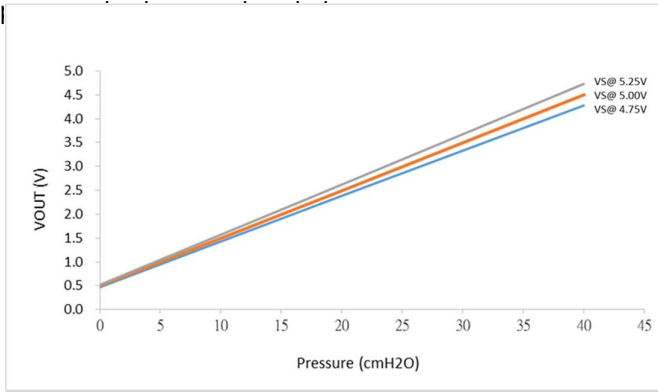


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Pressure Output Characteristics

Device is ratiometric within this specified excitation range, the relationship between voltage output value and



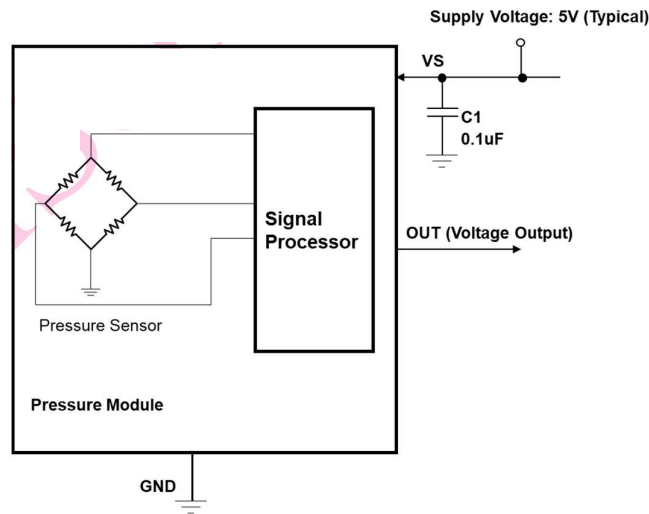
| Ratiometric Output (Typical) vs. VS | | | |
|-------------------------------------|------------|-----------|------------|
| VOUT | VS @ 4.75V | VS @ 5.0V | VS @ 5.25V |
| 40 cmH2O | 4.275V | 4.500V | 4.725V |
| 20 cmH2O | 2.375V | 2.500V | 2.625V |
| 0 cmH2O | 0.475V | 0.500V | 0.525V |

$$P_{out} \text{ (cmH2o)} = \frac{[(5V / VS) \times V_{OUT} - 0.5V]}{0.1V/cmH2o} \dots\dots\dots \text{Equation (1)}$$

- * Pout: Rated Pressure Output (mH2O)
- * VOUT: Voltage Output Value

Application Circuit

A application circuit diagram of the YPP700 used with analog voltage output is depicted as below and the analog voltage output is ratiometric to the supply VS of the YPP7004D16B



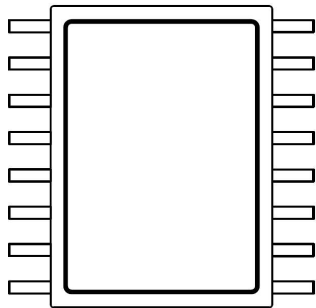
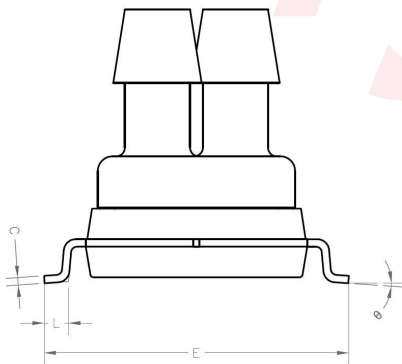
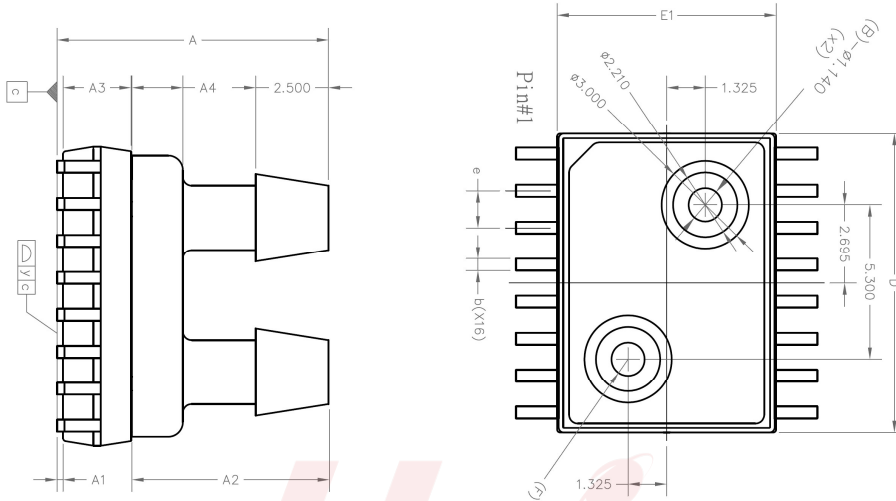
Application Circuit – Voltage Output Configuration



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Package Information



| SYMBOLS | DIMENSIONS IN MILLIMETERS | | |
|---------|---------------------------|------------|--------|
| | MIN. | NOM. | MAX. |
| A | 9.12 | 9.32 | 9.52 |
| A1 | 0.00 | 0.19 | 0.25 |
| A2 | 6.65 | 6.75 | 6.85 |
| A3 | 2.23 | 2.337 | 2.43 |
| A4 | --- | 1.75 REF. | --- |
| b | 0.33 | 0.41 | 0.51 |
| c | --- | 0.254 REF. | --- |
| D | 10.033 | 10.262 | 10.439 |
| E | 10.033 | 10.348 | 10.668 |
| E1 | 7.420 | 7.520 | 7.620 |
| e | --- | 1.27 | --- |
| L | 0.38 | 0.81 | 1.27 |
| y | --- | --- | 0.076 |
| θ | 0° | --- | 8° |