

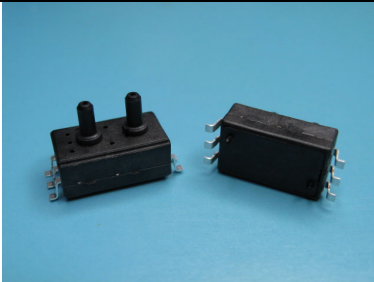
MIS-3300 series (Preliminary) Intelligent Pressure Sensor

■ Features

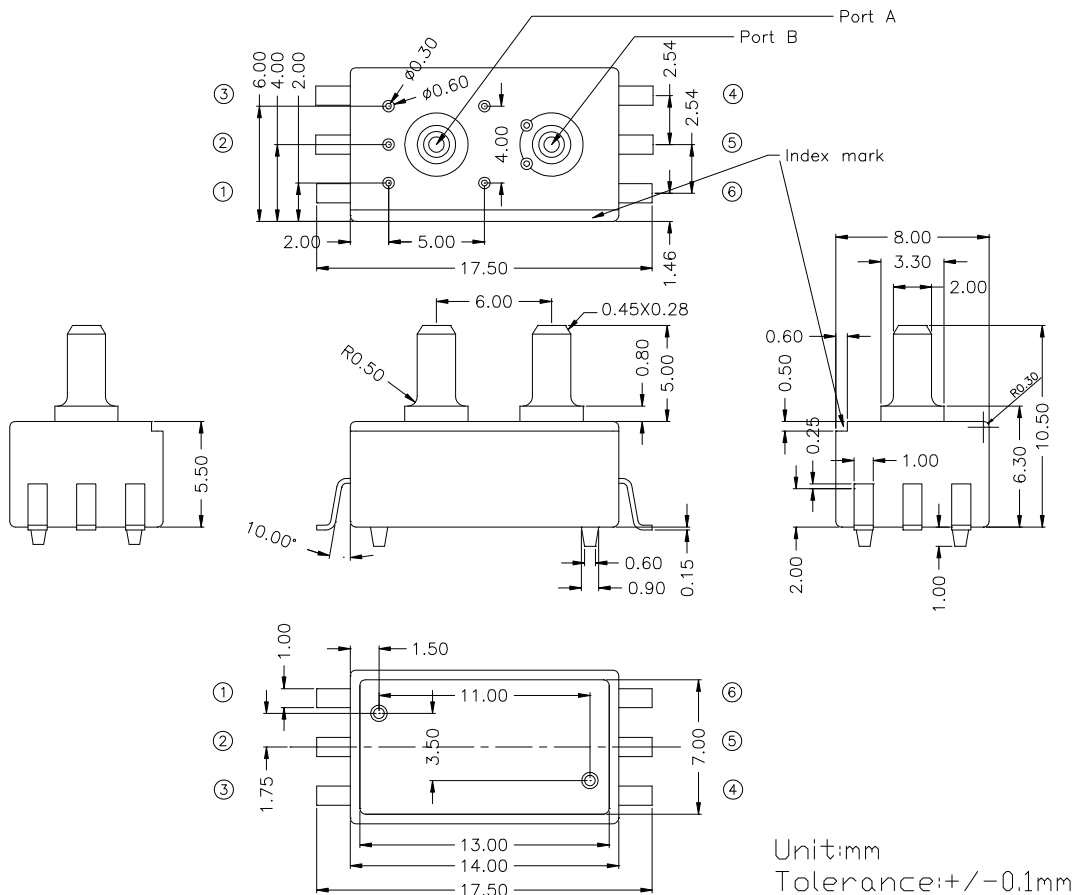
- Competitive price SMD package
- Wide operating temperature range: -40 to 85°C
- High accuracy ($\pm 2\%FS$ @ -10 to 85°C)
- Factory calibrated and temperature compensated
- Differential pressure type (1、5.8、15、30psi)
- Digital signal output、rail to rail ratiometric analog output

■ Applications

- Pressure switch, Pneumatic device
- Industrial instrumentation
- Ventilation and air flow monitor
- Gas flow instrumentation
- Medical instrumentation & monitoring

| Pressure type | Differential |
|---------------|---|
| Model |  |

■ Outline dimensions

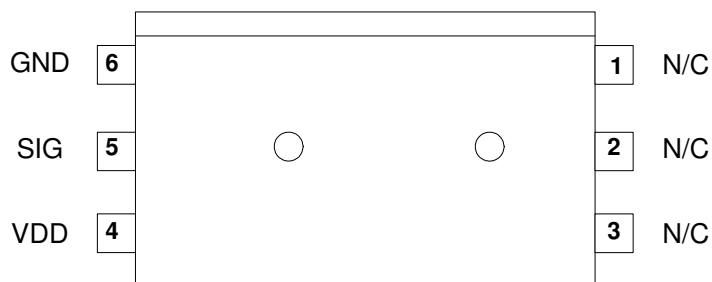


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■ Specifications

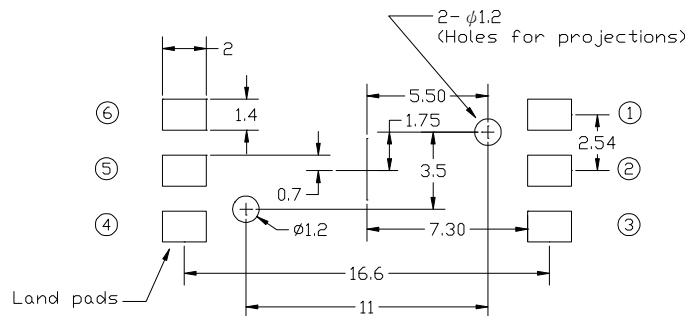
| Parameter | Min | Typ | Max | Units | Notes |
|---|--------------------------------------|-------|-------|--------|-----------------|
| Absolute Maximum Ratings | | | | | |
| Supply Voltage | -0.3 | | 6.0 | V | |
| Maximum Overpressure | | | 2X | | Rated pressure |
| Storage Temperature Range | -40 | | 125 | °C | -40°F~+185°F |
| Operating Temperature Range | -40 | | 85 | °C | |
| Operating humidity | 0 | | 95 | % RH | No condensation |
| Media Compatibility | Clean, dry air & non-corrosive gases | | | | |
| Recommended Operating Conditions | | | | | |
| Pressure Range | 1、5.8、15、30 | | | PSI | 4 |
| Supply Voltage | | | | V | |
| MIS-3300 series | 4.75 | 5 | 5.25 | | |
| MIS-3303 series | 2.7 | 3 | 3.3 | | |
| Supply Current (varies with update rate) | 0.25 | | 2 | mA | 2 |
| External Capacitance between Vdd and Gnd | 100 | 220 | 470 | nF | |
| Output load Capacitance | | 10 | 15 | nF | |
| Power ON Rise Time | | | 100 | ms | |
| Power Supply Rejection Ratio | 60 | | | dB | |
| Power-On Reset Level | 1.4 | | 2.6 | V | |
| Pressure Output Characteristics | | | | | |
| For 0-5V Ratiometric Analog Output | | | | | |
| Offset voltage (0 to 85°C) | | | | | |
| MIS-3300 series | 0.16 | 0.25 | 0.34 | V | |
| MIS-3303 series | 0.096 | 0.15 | 0.204 | | |
| Full scale output (0 to 85°C) | | | | | |
| MIS-3300 series | 4.66 | 4.75 | 4.84 | V | |
| MIS-3303 series | 2.796 | 2.85 | 2.904 | | |
| Full scale span (0 to 85°C) | | | | | |
| MIS-3300 series | 4.32 | 4.5 | 4.68 | V | |
| MIS-3303 series | 2.592 | 2.7 | 2.808 | | |
| For Digital Output | | | | | |
| Output code range | | | | | |
| Offset | 534 | 819 | 1114 | counts | |
| FSO (Full scale output) | 15270 | 15565 | 15860 | | |
| Resolution | 12 | | | Bits | 3 |
| Accuracy (0 to 85°C) | | | ±2 | %FS | |
| Notes : | | | | | |
| 1. Unless otherwise specified, measurements were taken with a supply voltage of 5 Vdc at a temperature of 25±3°C and humidity ranging from 25% ~85% . | | | | | |
| 2. The update rate is selectable including 8, 40, 200, and 1kHz. | | | | | |
| 3. Only for digital output mode. | | | | | |
| 4. Pressure range was defined as pressure of port A subtract pressure of port B. | | | | | |
| Metrodyne Microsystem Corp. reserves the right to make changes to the product specification in this publication. | | | | | |

■ Terminal connection diagram



| Pin | Name | Function |
|-----|------|-------------------------------|
| 1 | N/C | No connection |
| 2 | N/C | No connection |
| 3 | N/C | No connection |
| 4 | VDD | Supply voltage (2.7 to 5.5V) |
| 5 | SIG | Analog output, digital output |
| 6 | GND | Ground supply |

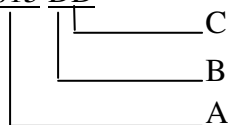
■ Recommended footprint



Unit:mm

Metrodyne Microsystem Corp**■ Ordering information**

MIS-3300-015 DD



| A | Pressure range | B | Pressure type |
|-----|--------------------------|---|-------------------------|
| 001 | 1 PSI | D | Diff. pressure bipolar |
| 006 | 5.8 PSI | S | Diff. pressure unipolar |
| 015 | 15 PSI | | |
| 030 | 30 PSI | | |
| C | Output type | | |
| D | digital | | |
| F | one-wire-interface | | |
| | rail-to-rail ratiometric | | |
| | analog output | | |

| Part No. | Pressure type | Pressure range | Supply voltage | Feature |
|----------------|-----------------------|----------------|----------------|-----------------|
| MIS-3300-001DD | Differential bipolar | -1~1 PSI | 5V | Digital output |
| MIS-3300-001SD | Differential unipolar | 0~1 PSI | 5V | Digital output |
| MIS-3300-006DD | Differential bipolar | -5.8~5.8 PSI | 5V | Digital output |
| MIS-3300-006SD | Differential unipolar | 0~5.8 PSI | 5V | Digital output |
| MIS-3300-015DD | Differential bipolar | -15~15 PSI | 5V | Digital output |
| MIS-3300-015SD | Differential unipolar | 0~15PSI | 5V | Digital output |
| MIS-3300-030DD | Differential bipolar | -30~30 PSI | 5V | Digital output |
| MIS-3300-030SD | Differential unipolar | 0~30 PSI | 5V | Digital output |
| MIS-3300-030DF | Differential bipolar | -30~30 PSI | 5V | 5V rail-to-rail |
| MIS-3303-001DD | Differential bipolar | -1~1 PSI | 3V | Digital output |
| MIS-3303-001SD | Differential unipolar | 0~1 PSI | 3V | Digital output |
| MIS-3303-006DD | Differential bipolar | -5.8~5.8 PSI | 3V | Digital output |
| MIS-3303-006SD | Differential unipolar | 0~5.8 PSI | 3V | Digital output |
| MIS-3303-015DD | Differential bipolar | -15~15 PSI | 3V | Digital output |
| MIS-3303-015SD | Differential unipolar | 0~15PSI | 3V | Digital output |
| MIS-3303-030DD | Differential bipolar | -30~30 PSI | 3V | Digital output |
| MIS-3303-030SD | Differential unipolar | 0~30 PSI | 3V | Digital output |

1. ZACwire™ Communication Interface

1.1 Properties and Parameters

| Parameter | Symbol | Min | Typ | Max | Units | Notes |
|----------------------------|----------------------------|-----|-----|-----|-----------------|---|
| Pull-up resistor (on-chip) | R _{ZAC,pu} | | 30 | | kΩ | On-chip pull-up resistor switched on during Digital Output Mode and during CM mode (first 6ms power up) |
| ZACwire™ rise time | t _{ZAC,rise} | | | 9 | μs | Any user RC network included in Sig™ path must met this rise time |
| ZACwire™ load capacitance | C _{ZAC,load} | 0 | 1 | 15 | nF | |
| Voltage level - low | V _{ZAC,low} | | 0 | 0.2 | V _{DD} | Rail-to-rail CMOS driver |
| Voltage level - high | V _{ZAC,high} | 0.8 | 1 | | V _{DD} | Rail-to-rail CMOS driver |

1.2 Bit Encoding

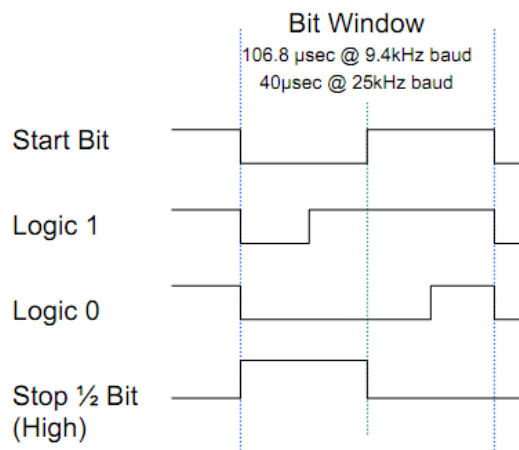
Start bit => 50% duty cycle used to set up strobe time

Logic 1 => 75% duty cycle

Logic 0 => 25% duty cycle

Stop Bit = high signal level for half a bit width

There is a half stop bit time between bytes in a packet.



1.3 MIS-3300 Read Operations

The MIS-3300 transmits 10-bit bytes (1 start bit, 8 data, 1 parity). During Normal Operation Mode, it transmits 3 data bytes packet (First two bytes for pressure data, the third for temperature data). It first transmits the first byte of pressure data followed by the second byte and the third byte is temperature data. The pressure data is 14-bits in resolution, so the upper two bits of the first byte are always zero padded. There is a half stop bit time between bytes in a packet. That means for the time of a half a bit width, the signal level is high.

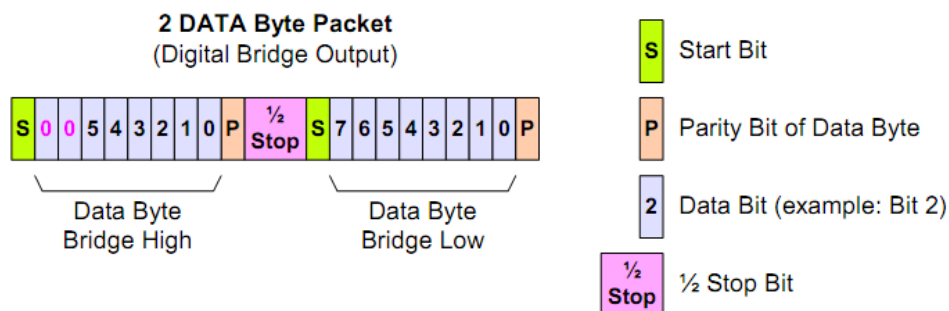


Figure 2. Digital Output Pressure Readings

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There is a variable idle time between packets. This idle time varies with the update rate setting in EEPROM. The table below shows the idle time between packets versus update rate. This idle time can vary by nominal +/-15% between parts and over a temperature range of -50°C to 150°C. **The typical update rate setting is 1kHz.** Other update rates are available in 8, 40, and 200Hz. Please contact factory for more information.

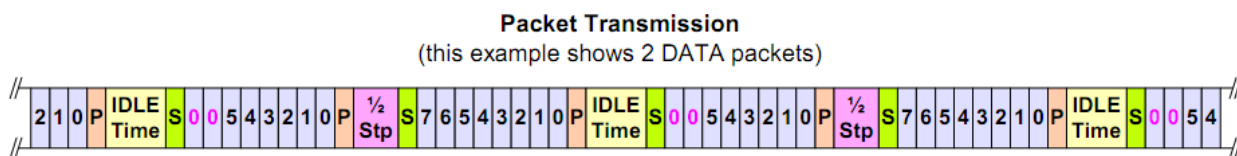


Figure 3. Transmission of a Number of Data Packets

Transmissions from the IC occur at one of two speeds depending on the update rate programmed in EEPROM. If the user chooses one of the two fastest update rates (1ms or 5ms) then the baud rate of digital transmission will be 32kHz. If however, the user chooses one of the two slower update rates (25ms or 125ms), then the baud rate of digital transmission will be 8kHz.

| Update Rate setting | Idle Time between Packets | Baud rate of digital transmission |
|---------------------|---------------------------|-----------------------------------|
| 1kHz (1ms) | 1ms | 32kHz (default) |
| 200Hz (5ms) | 4.85ms | 32kHz |
| 40Hz (25ms) | 22.5ms | 8kHz |
| 8Hz (125ms) | 118ms | 8kHz |

2. Pressure and Temperature Calculations

For pressure measurement :

Although the ASIC is capable of 14 bit ADC resolution, for pressure calibration, only 5 to 95% range of ADC dynamic range was adopted. The pressure range was spanned from 5 to 95% range of 14bit ADC dynamic range. The transfer function of pressure was expressed as the following :

$$\text{Pressure} = (\text{AD}(P) - 819) \times \left(\frac{P_R}{14746} \right) + P_B$$

- * AD(P) : Pressure reading
- * P_R : Pressure range
- * P_B : Bottom of pressure range

For example :

When pressure range is -15~15PSI, the transfer function is expressed as following :

$$P_R = [15 - (-15)] = 30 \text{ (PSI)}$$

$$P_B = -15 \text{ (PSI)}$$

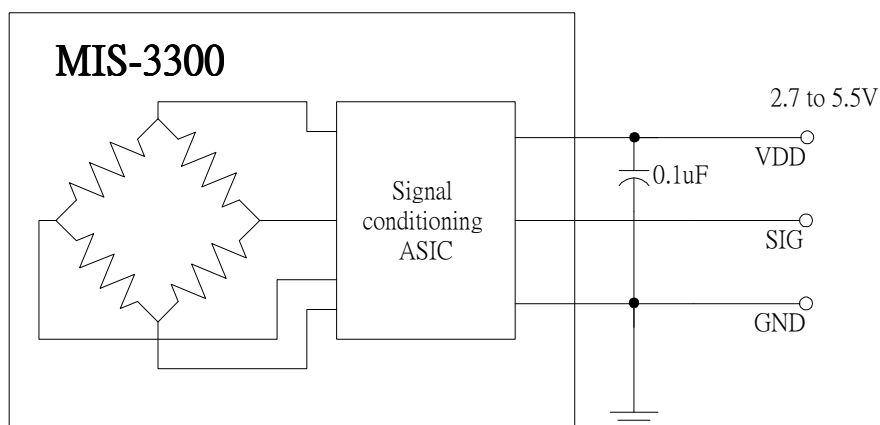
$$\text{Pressure} = (\text{AD}(P) - 819) \times \left(\frac{30}{14746} \right) - 15$$

The detail of transfer function for all pressure range is listed as the following table :

| Pressure range (PSI) | Type | Transfer function |
|----------------------|-------------------------|--|
| -1~1 | Differential (bipolar) | Pressure = (AD(P) - 819) × $\left(\frac{2}{14746}\right)$ - 1 |
| 0~1 | Differential (unipolar) | Pressure = (AD(P) - 819) × $\left(\frac{1}{14746}\right)$ |
| -5.8~5.8 | Differential (bipolar) | Pressure = (AD(P) - 819) × $\left(\frac{11.6}{14746}\right)$ - 5.8 |
| 0~5.8 | Differential (unipolar) | Pressure = (AD(P) - 819) × $\left(\frac{5.8}{14746}\right)$ |
| -15~15 | Differential (bipolar) | Pressure = (AD(P) - 819) × $\left(\frac{30}{14746}\right)$ - 15 |
| 0~15 | Differential (unipolar) | Pressure = (AD(P) - 819) × $\left(\frac{15}{14746}\right)$ |
| -30~30 | Differential (bipolar) | Pressure = (AD(P) - 819) × $\left(\frac{60}{14746}\right)$ - 30 |
| 0~30 | Differential (unipolar) | Pressure = (AD(P) - 819) × $\left(\frac{30}{14746}\right)$ |

3. Application Circuit Examples

For the digital output no load resistor or load capacity are necessary. No pull down resistor is allowed. If a line resistor or pull up resistor is used, the requirement for the rise time must be met ($\leq 9\mu\text{s}$). The IC output includes a pull up resistor of about $100\text{k}\Omega$. The digital output can easily be read by firmware from a microcontroller.



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