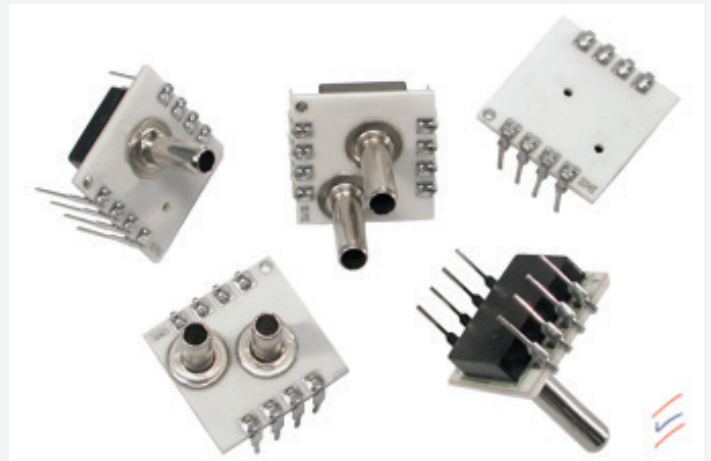


HDS 5812 Amplified pressure sensor

FEATURES

- With analog and digital output (I²C)
- Amplified, calibrated and temperature compensated pressure sensor
- Differential/relative, bidirectional differential, absolute and barometric versions
- Ratiometric analog voltage output of 0.5 – 4.5V
- Digital output for pressure and temperature via I²C interface
- High accuracy at RT
- Small overall error within a temperature range of -25 ... 85°C
- Supply voltage range 4.75...5.25V
- High long term stability
- Programmable I²C-address
- Small DIP package
- Ready to use
- RoHS compliant



GENERAL DESCRIPTION

HDS 5812 pressure sensors are a series of highprecision OEM sensors with an analog 0.5 – 4.5 V voltage output and a digital I²C-interface. They are calibrated and compensated for across a wide temperature range of -25 to +85°C.

HDS 5812 comes as a dual in-line package (DIP) for assembly on printed circuit boards (PCBs) and is fully operational without the need for any additional components. The electrical connection is made via the DIP solder pins; pressure is connected via two vertical metal tubes.

HDS 5812 combines micromachined, high quality piezoresistive measuring cells with a modern, signal conditioning mixed-signal ASIC on a ceramic substrate. This enables high precision measurements and excellent drift and long-term stability.

The sensors in the HDS 5812 series are available for various applications and pressure ranges: differential (relative) devices in pressure ranges from 0 – 0.075 PSI up to 0 – 100 PSI, absolute pressure variants for 0 – 15 PSI, 0 - 30 PSI and a barometric type. Bidirectional differential devices are available from -0.075 /+ 0.075 PSI up to -15/ +15 PSI. Custom specific pressure ranges and modifications are available on request.

TYPICAL APPLICATIONS

- Static and dynamic pressure measurement
- Barometric pressure measurement
- Vacuum monitoring
- Gas flow
- Fluid level measurement
- Medical instrumentation
- Heating, Ventilation and Air Conditioning (HVAC)

HDS 5812 Amplified pressure sensor

PRESSURE RANGES

| Sensor type (code) | Pressure type | Pressure range in PSI | Burst pressure ¹⁾ in PSI | Pressure range in mbar | Burst pressure ¹⁾ in bar |
|---------------------------|----------------------------|-----------------------|-------------------------------------|------------------------|-------------------------------------|
| Ultra low pressure | | | | | |
| HDS 5812-0000-D | differential / relative | 0...0.075 | >5 | 0...5.17 | >0.35 |
| HDS 5812-0001-D | differential / relative | 0 ... 0.15 | >5 | 0 ...10.34 | >0.35 |
| HDS 5812-0000-D-B | bidirectional differential | -0.075 / +0.075 | >5 | -5.17 / +5.17 | >0.35 |
| HDS 5812-0001-D-B | bidirectional differential | -0.15 / +0.15 | >5 | -10.34 / +10.34 | >0.35 |
| Low pressure | | | | | |
| HDS 5812-0003-D | differential / relative | 0 ... 0.3 | >7 | 0 ... 20.68 | >0.5 |
| HDS 5812-0008-D | differential / relative | 0 ... 0.8 | >15 | 0 ... 55.16 | >1 |
| HDS 5812-0015-D | differential / relative | 0 ... 1.5 | >15 | 0 ... 103.4 | >1 |
| HDS 5812-0003-D-B | bidirectional differential | -0.3 / +0.3 | >7 | -20.68 / +20.68 | >0.5 |
| HDS 5812-0008-D-B | bidirectional differential | -0.8 / +0.8 | >15 | -55.16 / +55.16 | >1 |
| HDS 5812-0015-D-B | bidirectional differential | -1.5 / +1.5 | >15 | -103.4 / +103.4 | >1 |
| Standard pressure | | | | | |
| HDS 5812-0030-D | differential / relative | 0 ... 3 | 72 | 0 ... 206.8 | 5 |
| HDS 5812-0050-D | differential / relative | 0 ... 5 | 72 | 0 ... 344.7 | 5 |
| HDS 5812-0150-D | differential / relative | 0 ... 15 | 72 | 0 ... 1034 | 5 |
| HDS 5812-0300-D | differential / relative | 0 ... 30 | 225 | 0 ... 2068 | 15.5 |
| HDS 5812-0600-D | differential / relative | 0 ... 60 | 225 | 0 ... 4137 | 15.5 |
| HDS 5812-1000-D | differential / relative | 0 ... 100 | 225 | 0 ... 6895 | 15.5 |
| HDS 5812-0030-D-B | bidirectional differential | -3 / +3 | 72 | -206.8 / +206.8 | 5 |
| HDS 5812-0050-D-B | bidirectional differential | -5 / +5 | 72 | -344.7 / +344.7 | 5 |
| HDS 5812-0150-D-B | bidirectional differential | -15 / +15 | 72 | -1034 / +1034 | 5 |
| HDS 5812-0150-B | barometric | 11 ... 17.5 | 72 | 758.4 ... 1206 | 5 |
| HDS 5812-0150-A | absolute | 0 ... 15 | 72 | 0 ... 1034 | 5 |
| HDS 5812-0300-A | absolute | 0 ... 30 | 72 | 0 ... 2068 | 5 |

Table 1: HDS 5812 standard pressure ranges (other ranges on request)

Notes:

- 1) Burst pressure is defined as the maximum pressure which may be applied to one pressure port relative to the other port (or while only one pressure port is connected) without causing leaks in the sensor.

HDS 5812 Amplified pressure sensor

MAXIMUM RATINGS

| Parameter | Minimum | Typical | Maximum | Units |
|---|---------|---------|---------|-------|
| Maximum supply voltage: V_S (max) | | | 6.0 | V |
| Operating temperature: T_{op} | -25 | | 85 | °C |
| Storage temperature: T_{amb} | -40 | | 125 | °C |
| Common mode pressure p_{CM} ¹⁾ | | | 175 | PSI |

Table 2: Maximum ratings

Notes:

1) The common mode pressure is defined as the maximum pressure that can be applied on both pressure ports of a differential pressure sensor simultaneously without damaging the sensors housing.

SPECIFICATIONS

All parameters apply to $V_S = 5.0V$ and $T_{op} = 25^\circ C$, unless otherwise stated.

| Parameter | Minimum | Typical | Maximum | Units |
|---|---------|---------|---------|--------|
| Analog output signal (pressure only) ²⁾ | | | | |
| @ specified minimum pressure (see „pressure range“) ¹⁾ | | 0.5 | | V |
| @ specified maximum pressure (see „pressure range“) ¹⁾ | | 4.5 | | V |
| Full span output (FSO) ³⁾ | | | | |
| without pressure (bidirectional differential) | | 2.5 | | V |
| Digital output signal (pressure) ⁴⁾ | | | | |
| @ specified minimum pressure (see „pressure range“) ¹⁾ | | 3277 | | counts |
| @ specified maximum pressure (see „pressure range“) ¹⁾ | | 29491 | | counts |
| Full span output (FSO) ³⁾ | | | | |
| without pressure (bidirectional differential) | | 16384 | | counts |
| Digital output signal (temperature) ⁵⁾ | | | | |
| @ minimum temperature $T = -25^\circ C$ | | 3277 | | counts |
| @ maximum temperature $T = 85^\circ C$ | | 29491 | | counts |
| Accuracy ⁶⁾ (pressure measurement) @ $T = 25^\circ C$ | | | | |
| Ultra low pressure sensors (0.075, 0.15 PSI) | | | ±1.5 | %FSO |
| Low pressure sensors (0.3, 0.8, 1.5 PSI) | | | ±1.0 | %FSO |
| Standard pressure sensors | | | ±0.5 | %FSO |
| Overall error ⁷⁾ (pressure meas.) @ $T = -25...85^\circ C$ | | | | |
| Ultra low pressure sensors (0.075, 0.15 PSI) | | | ±2.0 | %FSO |
| Low pressure sensors (0.3, 0.8, 1.5 PSI) | | | ±1.5 | %FSO |
| Standard pressure sensors | | | ±1.0 | %FSO |
| Total error for temperature measurement | | | | |
| All types of HDS 5812 $T = -25...85^\circ C$ | | | ±3.0 | %FSO |
| Long term stability | | | <0.5 | %FSO/a |
| Ratiometricity error (@ $V_S = 4.75 \dots 5.25V$) | | | 500 | ppm |

HDS 5812 Amplified pressure sensor

| Parameter | Minimum | Typical | Maximum | Units |
|---------------------------------------|---|---------|---------|------------------|
| Resolution A/D converter | | 14 | | bits |
| Resolution D/A converter | | 11 | | bits |
| Resolution analog output signal | | 0.05 | | %FSO |
| Resolution digital output signals | 12 | | | bit |
| Reaction time (10% ... 90%) rise time | | 1 | 2 | ms |
| Supply voltage (V _s) | 4.75 | 5 | 5.25 | V |
| Current consumption | | | 5 | mA |
| Load resistance at output RL | 2k | | | Ω |
| Capacitive load | | | 50 | nF |
| I²C-interface | | | | |
| Input High Level | 90 | | 100 | % V _s |
| Input Low Level | 0 | | 10 | % V _s |
| Output Low Level | 0 | | 10 | % V _s |
| Load capacitance @ SDA | | | 400 | pF |
| Clock frequency SCL | | | 400 | kHz |
| Pull-up resistor | 500 | | | Ω |
| Pressure changes | 10 ⁶ | | | |
| Compensated temperature range | -25 | | 85 | °C |
| Weight | | 3 | | g |
| Media compatibility | See „Specification notes ^{8) 9)} | | | |

Table 3: Specifications

Specification notes

- 1) See Table 1
- 2) The analog output signal (pressure measurement only) is ratiometric to the supply voltage.
- 3) The Full Span Output (FSO) is the algebraic difference between the output signal at the specified minimum pressure and the output signal at the specified maximum pressure (see „Pressure range“).
- 4) The digital output pressure signal is not ratiometric to the supply voltage.
- 5) The digital output temperature signal is not ratiometric to the supply voltage. The temperature value is measured at the piezoresistive measuring cell and is the sensor temperature (including self heating).
- 6) Accuracy is defined as the maximum deviation of the measurement value from the ideal characteristic curve at room temperature (RT) in %FSO including the adjustment error (offset and span), nonlinearity, pressure hysteresis and repeatability. Nonlinearity is the measured deviation from the best fit straight line (BFSL) across the entire pressure range. Pressure hysteresis is the maximum deviation of the output value at any pressure within the specified range when this pressure is cycled to and from the minimum or maximum rated pressure. Repeatability is the maximum deviation of the output value at any pressure within the specified range after 10 pressure cycles.
- 7) The overall error is defined as the maximum deviation of the measurement value from the ideal characteristic curve in %FSO across the entire temperature range (-25 ... 85°C).
- 8) Media compatibility of pressure port 1 (for a description of port 1, see Figure 5): clean, dry gases, non-corrosive to silicon, RTV silicone rubber, gold (alkaline or acidic liquids can destroy the sensor).
- 9) Media compatibility of pressure port 2 (for a description of port 2, see Figure 5): fluids and gases non-corrosive to silicon, Pyrex, RTV silicone rubber.

HDS 5812 Amplified pressure sensor

FUNCTIONAL DESCRIPTION

The pressure sensors in the HDS 5812 series combine a piezoresistive silicon sensing element with a signal conditioning mixed-signal CMOS ASIC with full digital correction on a ceramic substrate. The functional principle of the HDS 5812 sensors is explained in Figure 1.

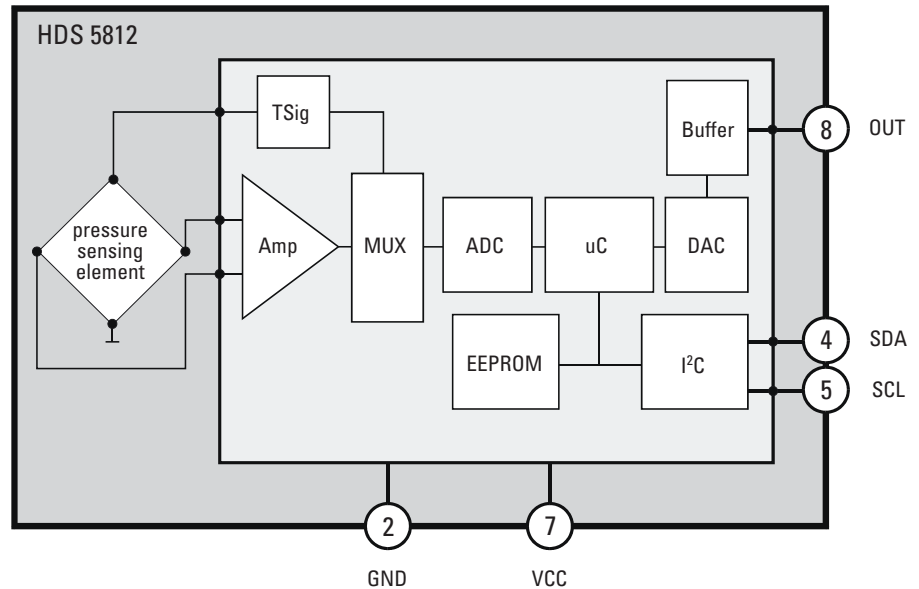


Figure 1: FUNCTIONAL DESCRIPTION

The physical pressure is measured at HDS 5812's piezoresistive pressure sensing element where the pressure is converted into a differential voltage signal which is almost proportional to the pressure. This differential voltage signal is corrected and conditioned by the ASIC in multiple steps.

Firstly, the differential voltage signal from the sensing element is pre-amplified by the amplifier and transmitted by a multiplexer to the A/D converter (ADC). The ADC converts the signal into digital values with a resolution of 14 bits. The digitized signal is corrected and calibrated in the follow-on ASIC microcontroller. Factory precision calibration of HDS 5812 sets the sensor-specific correction coefficients and stores these in the EEPROM for each sensor. This permits sensor-specific calibration and correction (i.e. temperature compensation and linearization) of the digitized pressure signal. The temperature signal necessary for temperature compensation is also measured at the piezoresistive pressure sensing element and is transmitted by the multiplexer to the ADC, where

it is digitized. The ASIC microcontroller runs a cyclic program which continuously calculates the current standardized and corrected digital pressure values. In addition, a standardized current digital temperature value is calculated. These calculated 15-bit digital values (pressure and temperature values) are written to the ASIC output registers and continuously updated (typically every 0.5 ms).

In order to use the digital signal readout for pressure and temperature, the I²C sensor interface at PIN4 (SDA) and PIN5 (SCL) must be connected to the I²C-bus. The corrected digital values for pressure and temperature at the I²C-interface are not ratiometric to the supply voltage.

To generate the analog output signal the corrected digital pressure value is converted into an analog voltage by an 11-bit D/A converter (DAC). The standardized analog output voltage (0.5...4.5V) at the sensor's PIN8 (OUT) is ratiometric to supply voltage.

HDS 5812 Amplified pressure sensor

INITIAL OPERATION

The sensors are connected up electrically by mounting them on a PCB. The principle circuitry of the HDS 5812 sensor with the analog and the digital output in use is shown in Figure 2.

For single use of the analog output it is sufficient to connect up PIN2 (GND), PIN7 (VCC) and PIN8 (OUT).

For operation of the digital output only it is sufficient to connect up PIN2 (GND), PIN7 (VCC) and the I²C-bus lines to PIN4 (SDA) and PIN5 (SCL).

Important: Each I²C-bus communication line has to be connected up to the positive supply voltage VCC (or +5V) using pull-up resistors (4.7 k Ω is recommended). The additional serial resistors are optional (330 Ω is recommended).

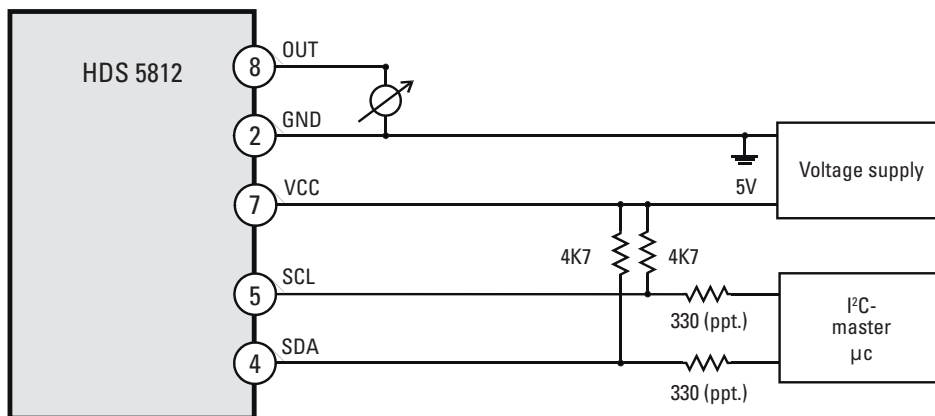


Figure 2: Principle electric circuitry

The sensor pressure connection is made using the two metal pressure ports (hose connectors) on the sensor. Depending on the type of sensor and measuring pressure one or two of the pressure ports are connected up to the measuring media / volume. For the pressures at port 1 and port 2 (see Figure 5) the following requirements have to be fulfilled (according to the definition p1 = pressure at port 1 and p2 = pressure at port 2):

| | |
|--|--------------------------------------|
| Differential / relative pressure sensors: | $p_1 > p_2$ |
| Bidirectional differential sensors: | $p_1 > p_2$ or $p_1 < p_2$ possible. |
| Absolute pressure sensors, barometric sensors: | $p_1 =$ measuring pressure. |

The guidelines governing media compatibility must be taken into account here (see "Specification notes", 8 and 9).

Notes:

- For pressure connections up to 30 PSI Analog Microelectronics recommends a silicone tubing (inner diameter $\varnothing=2\text{mm}$, outer diameter $\varnothing=6\text{mm}$).
- ESD precautions are necessary, it is essential to ground machines and personnel properly during assembly and handling of the device.

HDS 5812 Amplified pressure sensor

I²C-INTERFACE

HDS 5812 pressure sensors have a digital output (I²C-interface). When connected to a bidirectional I²C-bus, the current corrected digital pressure and temperature values can be read out from the output register of the HDS 5812 via the I²C-interface.

Communication via the I²C-bus¹ follows a simple master-slave principle. Data transfer is always initialized by a master (such as a microcontroller, for example), which sends a data request to the sensor; the HDS 5812 sensor – which always operates as slave – then answers.

The I²C-bus requires just two bus lines: a serial data line (SDA) and a serial clock line (SCL). SDA and SCL are bidirectional lines which are connected to the positive supply voltage via pull-up resistors (see Figure 2). I²C communication adheres to a standard I²C communication protocol (given in Figure 3).

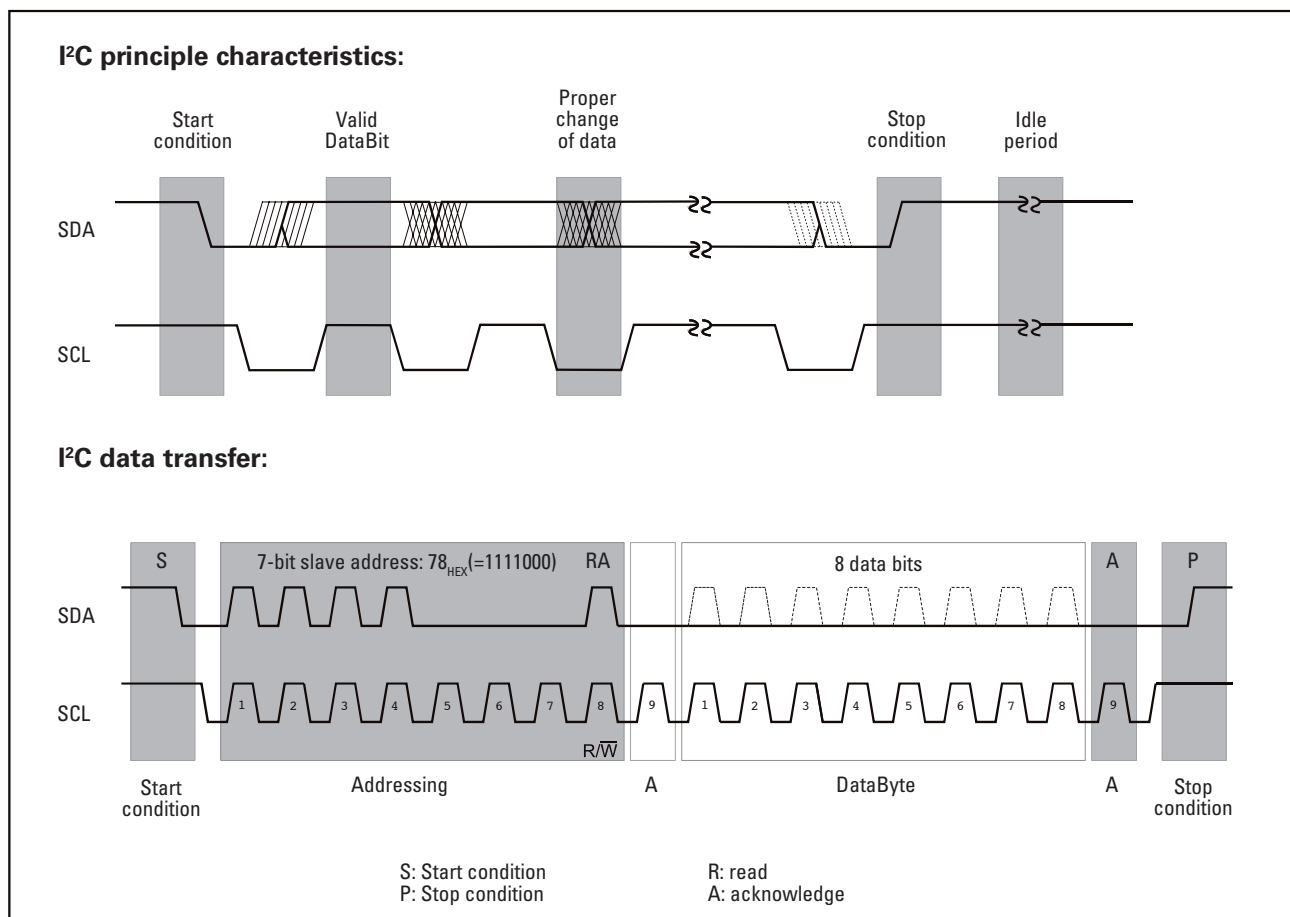


Figure 3: Standard I²C protocol

¹ The I²C-bus is a simple, 8-bit-oriented bus which enables communication between different I²C devices. Each device connected to the bus is software addressable using a unique address.

HDS 5812 Amplified pressure sensor

The I²C communication phases are as follows:

Idle period (bus is free)

When the bus is free, both I²C-bus lines (SDA and SCL) are pulled up to supply voltage level ("high").

Start S (start condition)

Prior to any data transfer on the bus a start condition must be generated. The start condition is always sent by the I²C-master. The start condition is defined as a transition from level "high" to "low" on the SDA line while the level on the SCL line is "high". The digital data readout from the HDS 5812 output register is always initiated by a start condition.

Stop P (stop condition)

The stop condition is always generated by the I²C-master after a data transfer has been completed. The stop condition is defined as a transition from level "low" to "high" on the SDA line while the level on SCL line is "high". The digital data readout from the HDS 5812 output register is always terminated by a stop condition.

Valid data

Data is transmitted in bytes (8 bits), starting with the most significant bit (MSB). One data bit is transmitted with each clock pulse. The transmitted bits are only valid when, following a start condition, the level on the SDA line is constant for as long as the level on SCL line is "high". Changes to the SDA level must be made while the level on SCL line is "low".

Acknowledge A

After a byte has been transmitted the respective receiver (master or slave) has to send an acknowledge (additional acknowledge bit) confirming the correct receipt of the data. To this end the master generates an extra acknowledge-related clock pulse. The receiver sends the acknowledge bit by pulling the level on SDA line down to "low" during the additional clock pulse.

Addressing / Slave address (I²C-address HDS 5812)

After the start condition the master sends an addressing byte (the first byte after the start condition) which determines which slave is selected. The addressing byte contains the individual 7-bit slave address of the selected slave (HDS 5812) and a data direction bit (R/W). A "0" for the R/W bit indicates a transmission from master to slave (W: write; the master wishes to transmit data to the selected slave), a "1" a data request (R: read; the master requests data from the slave).

The pressure sensors in the HDS 5812 series have a standard, factory-programmed 7-bit slave address of 0x78Hex (1111000b).

If more than one HDS 5812 should be connected to the same I²C-bus, each pressure sensor requires an individual slave address. On request each HDS 5812 can be ordered with a second individual 7-bit slave address programmed at the factory; 7-bit addressing allows 128 different addresses. With the relevant USB starter kit the customer can also do the programming of the second individual slave address himself. HDS 5812 pressure sensors programmed in this way will then answer to both addresses.

HDS 5812 Amplified pressure sensor

DATA READOUT VIA THE I²C-INTERFACE

The (corrected) 15-bit digital values for pressure and temperature are read out from the HDS 5812 output register via the HDS 5812 I²C-interface. The data readout is described in Figure 4.

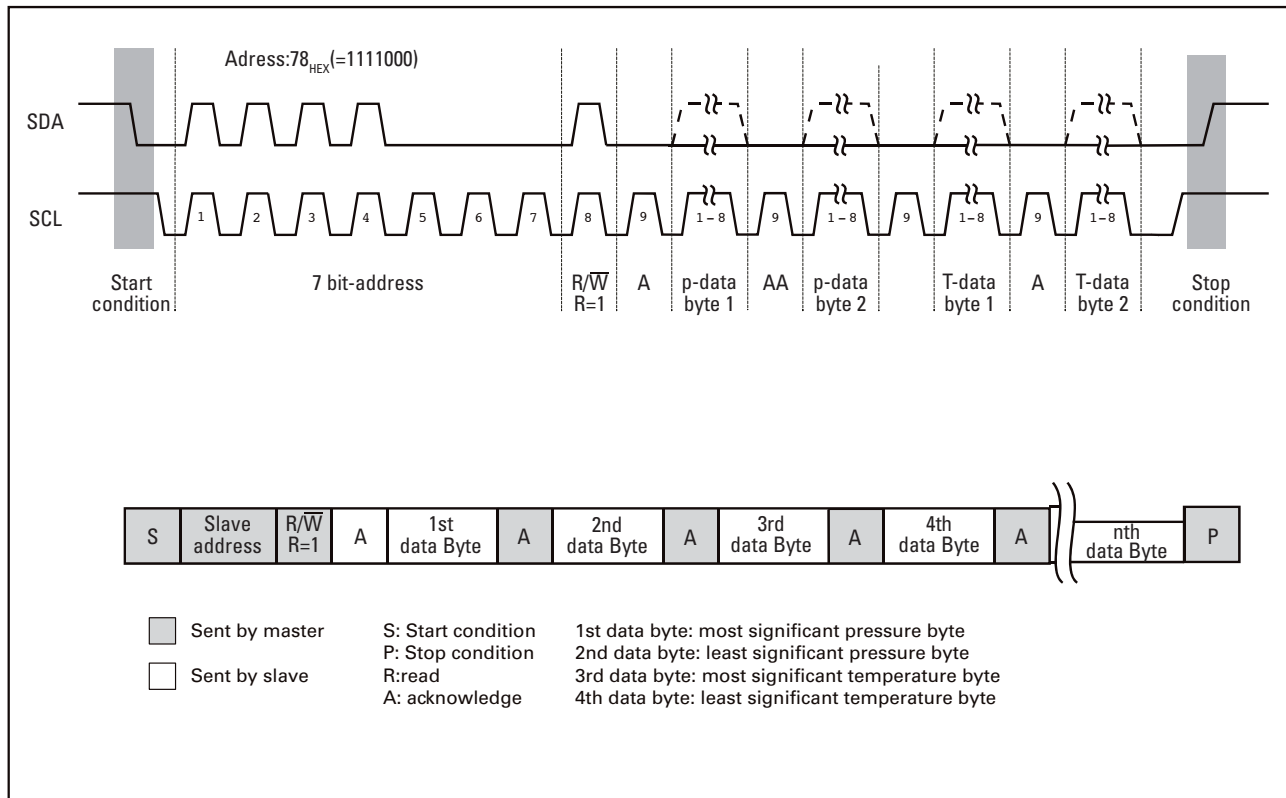


Figure 4: Data readout of the digital pressure and temperature values

Data transfer via the I²C-bus is always initialized by a data request from the I²C-master. For this purpose the I²C-master generates a start condition on the I²C-bus lines. Following the start condition the I²C-master then sends the addressing byte containing the 7-bit slave address of the selected pressure sensor (the HDS 5812 slave address is programmed to 0x78Hex = 1111000b at the factory) and the data direction bit R/W = 1 which indicates a data request. The selected pressure sensor first answers with an acknowledge bit. The selected sensor then starts the data transfer from the output register. A total of four data bytes are transmitted from the pressure sensor to the I²C-master for the current 15-bit digital pressure value and the 15-bit digital temperature value. The two bytes for the current pressure value are first sent, followed by the two bytes for the current temperature value, always beginning with the most significant byte. On each ming the correct receipt of data. If nor shuts down the data transfer by sending a stop condition instead of an acknowledge bit. If the master sends an additional acknowledge bit after the last of the four bytes, pressure sensor HDS 5812 continues to transfer the current pressure and temperature value from the output register, again starting with the most significant pressure byte.

HDS 5812 Amplified pressure sensor

Calculating the current pressure and temperature value from digital 15-bit words

The digital pressure and temperature values are 15-bit words² (without units) which have to be converted in order to generate the desired information on pressure and temperature in physical units.

The current pressure in PSI (or bar) is calculated from the digital pressure value using the following formulas:

$$p = \frac{\text{Digoutp}(p) - \text{Digoutp}_{\min}}{\text{Sensp}} p_{\min} \quad \text{with} \quad \text{Sensp} = \frac{\text{Digoutp}_{\max} - \text{Digoutp}_{\min}}{P_{\max} - P_{\min}} \quad (1)$$

Therein **p** is the current pressure in PSI (or bar), **p_{min}** is the specified minimal pressure and **p_{max}** is the specified maximum pressure in PSI (or bar); depending on the specified pressure range, **Digoutp(p)** is the current digital pressure value in counts, **Digoutp_{min}** and **Digoutp_{max}** are the digital pressure values at minimum and maximum specified pressure in counts and **Sensp** is the sensitivity of the pressure sensor in counts/PSI (or counts/bar).

The current sensor temperature in °C is computed from the digital temperature value analogous to the above formulas by replacing the character "p" with a "T."

Example

At the digital output of a pressure sensor of the type HDS 5812-0015-D (0...1.5PSI differential) a current digital pressure value of

Digoutp(p) = 550A_{Hex} counts = 21770_{Dec} counts (= 01010101 00001010_{bin})

and a digital temperature value of

DigoutT(T) = 3A9A_{Hex} counts = 15002_{Dec} counts (= 00111010 10011010_{bin})

is read.

With **p_{min}** = 0 PSI, **p_{max}** = 1.5 PSI and **Digoutp_{min}** = 3277, **Digoutp_{max}** = 29491, the current pressure in PSI is calculated using Formula (1) as:

$$p = \frac{(21770 - 3277) \text{ counts}}{26214 / 1.5 \text{ counts/PSI}} + 0 \text{ PSI} = 1.058 \text{ PSI}$$

With **T_{min}** = -25 °C, **T_{max}** = 85 °C and **DigoutT_{min}** = 3277, **DigoutT_{max}** = 29491, the current sensor temperature in °C is calculated using Formula (1) as:

$$T = \frac{(15002 - 3277) \text{ counts}}{26214 / 110 \text{ counts/°C}} + (-25)^\circ\text{C} = 24.2^\circ\text{C}$$

² Each pressure and temperature value is transmitted as a 15-bit word; the actual resolution of the internal A/D converter, however, is only 14 bits.

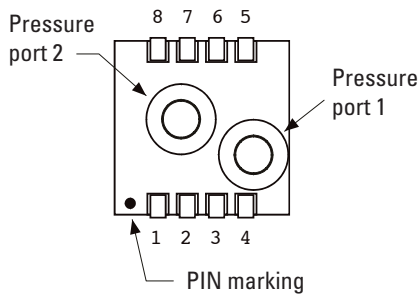
HDS 5812 Amplified pressure sensor

DIMENSIONS AND PINOUT

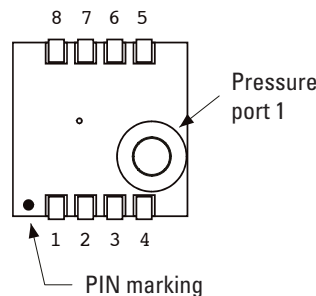
HDS 5812 pressure sensors come in a dual-in-line package (DIP) for assembly on printed circuit boards. Figure 5 below gives the pinout and dimensions of the dual-in-line package.

Pinout and pressure connection:

Differential types:



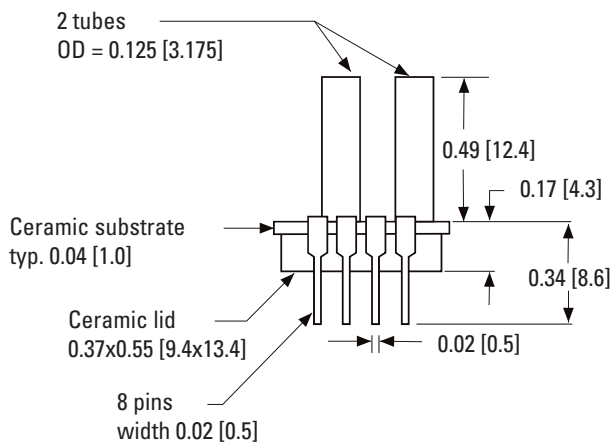
Absolute, barometric types:



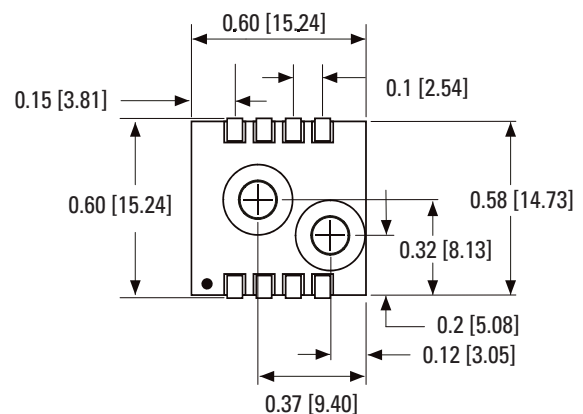
| Pin | Description |
|-----|-------------|
| 1 | N.C. |
| 2 | GND |
| 3 | N.C. |
| 4 | SDA |
| 5 | SCL |
| 6 | N.C. |
| 7 | VCC |
| 8 | OUT |

Package dimensions:

Side view:



Top view:



all dimensions in inch [mm]

Figure 5: Dimensions

All sensors in the HDS 5812 series are maintenance free during their lifetime.

Notes:

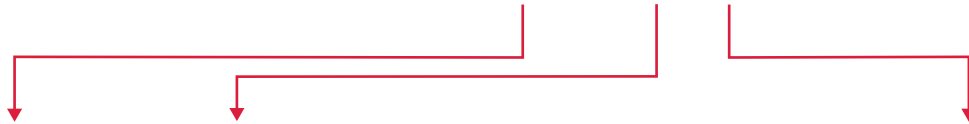
1. A package without tubes (for O-ring sealing) is also possible.
2. SMD Pins are available on request

HDS 5812 Amplified pressure sensor

INFORMATION FOR ORDERING

Ordering code:

HDS 5812 - 0150 - D



| Model | Pressure range | | | |
|----------|---------------------|-------|-------|-------|
| | Pressure range code | PSI | mbar | kPa |
| HDS 5812 | 0000 | 0.075 | 5.17 | 0.517 |
| | 0001 | 0.15 | 10.34 | 1.034 |
| | 0003 | 0.3 | 20.68 | 2.068 |
| | 0008 | 0.8 | 55.16 | 5.516 |
| | 0015 | 1.5 | 103.4 | 10.34 |
| | 0030 | 3.0 | 206.8 | 20.68 |
| | 0050 | 5.0 | 344.7 | 34.47 |
| | 0150 | 15 | 1034 | 103.4 |
| | 0300 | 30 | 2068 | 206.8 |
| | 0600 | 60 | 4137 | 413.7 |
| | 1000 | 100 | 6895 | 689.5 |

Table 4: Pressure ranges

| Pressure type | |
|----------------------------------|------------------------------------|
| Pressure type code | Available pressure ranges |
| D differential / relative (gage) | 0...0.075 PSI to 0...100 PSI |
| D-B bidirectional differential | -0.075/ 0.075 PSI to -100/ 100 PSI |
| A absolute | 0...15 PSI and 0...30 PSI |
| B barometric (absolute) | 11 ... 17.5 PSI |

Table 5: Pressure types

ADDITIONAL EQUIPMENT

A starter kit with software is available for HDS 5812 pressure sensors. The starter kit permits easy readout of the digital I²C output (pressure and temperature) by a standard PC with an USB-port. Furthermore, the starter kit can be used to program an individual (second) I²C slave address for the HDS 5812, which is valid in addition to the standard I²C slave address programmed at the factory (0x78Hex) and which allows the readout of multiple sensors via the I²C-bus.

| Ordering code | Description |
|-------------------------|--|
| USB starter kit HDS5812 | HDS5812 – starter kit (2 PCBs with software) |

HJK Sensoren + Systeme GmbH & Co. KG the right to amend any dimensions, technical data or other information contained herein without prior notification.