Pressure sensors

Pressure transmitter with SPI output

Series/Type: **AVR 0.016 KA D4 Z14E L ST B538**
Ordering code: **B58621V4121B538**

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Applications

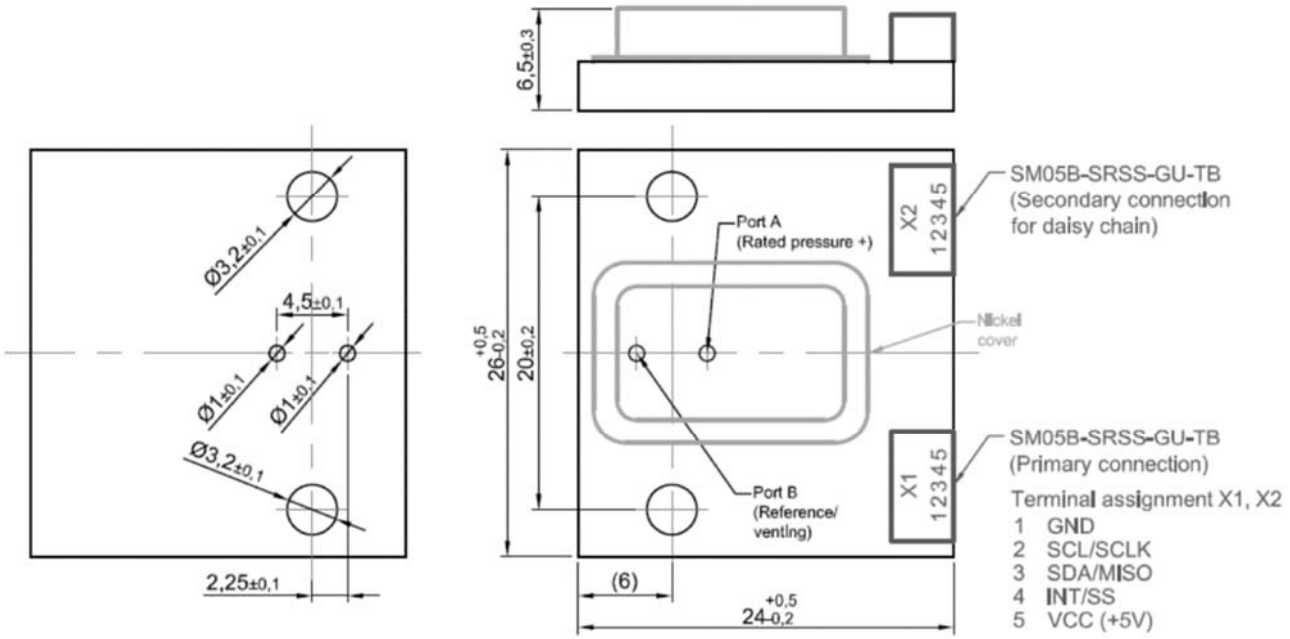


- Differential pressure measurement
- Gauge pressure measurement

Features

- Piezoresistive MEMS technology
- Measured media (Port A): Air, non-aggressive gases (gas humidity 0 ... 100% r.h.). Unsuitable for substances reacting with glass, silicon, gold, epoxy glue or silicone glue.
- Measured media (Port B): Air, non-aggressive gases (gas humidity 0 ... 85% r.h., without dew) Unsuitable for substances reacting with glass, silicon, gold, aluminum, nickel, epoxy glue, silicone glue or silicone gel.
- Digital SPI output proportional to pressure: 10 ... 90% of digital output range (14 bit)
- Integrated temperature measurement
- RoHS-compatible
- Alternative pressure ranges on request
- Alternative configuration of SPI output on request
- I²C output on request

Dimensional drawings



All dimensions in mm

Technical data

Absolute maximum ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Temperature ranges						
Storage temperature range	T_{st}	1)	–30		+70	°C
Operating temperature range	T_a	2)	–20		+70	°C
Compensated temperature range	T_c	3)	–20		+70	°C
Pressure ranges						
Rated pressure range	p_r	Gauge pressure, port A 4)	0		16	mbar
Overpressure	p_{ov}	Gauge pressure, port A 5)	–160		160	mbar
		Gauge pressure, port B 5)	–160		160	
Supply voltage /-current						
Supply voltage	V_{CC}	6)	2.7		5.5	V
Supply current	I_{CC}			3	10	mA

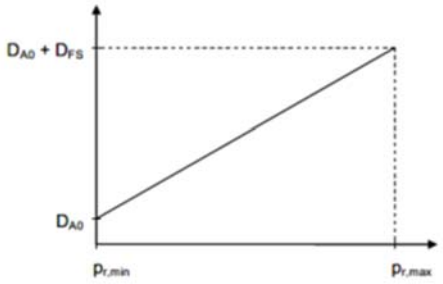
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output signal @ T_a = 25 °C, V_{CC} = 5 V						
Digital output range			0		16384	digit
Offset IF)	D_{A0}	@ 25°C 7)		1638		digit
Signal span (Full Scale)	D_{FS}	@ 25°C 8)		13107		digit
Temperatur output range (-50…150°C)			0		2048	digit
Offset error	E_{0LTS}	@ 25°C 9)		±1	±5	% FS
Nonlinearity	L	@ 25°C 10)		±0.15	±0.5	% FS
Characteristic curve error	E_c	@ T_a = –20 …70 °C 3) 11)		±0.5	±1.0	% FS
Total error (E_{0LTS} + E_c)	E_{total}	@ T_a = –20 …70 °C 3) 12)		±1.5	±6.0	% FS
Temperatur error	E_T			±2.0	±3.0	K

Configuration, digital interface			
System clock frequency		13)	4 MHz
Update period		13)	0.5 ms
Communication type		13)	SPI
Sensor connection check		13)	inactive
Sensor short check		13)	inactive
I^2C-adress		13)	0 x 10

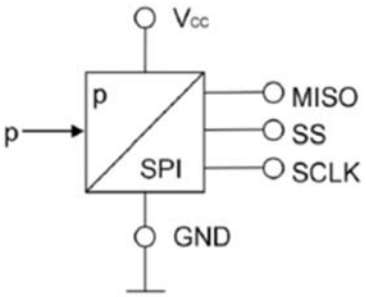
Anti-aliasing filter				
Attenuation reference		3Hz	0	dB
Attenuation		30Hz	8±1.5	dB
Attenuation		200Hz	32±8	dB

Characteristics

Simple output



Connection diagram



Materials in contact tot he measured media

- Gloptop material based on epoxy
- Silicone adhesive
- Silicone gel
- Glass
- Silicon
- Aluminium
- Nickel
- ENIG surface on pcb

Symbols and terms

1) Storage temperature range T_{st}
A storage of the pressure sensor within the temperature range $T_{st,min}$ up to $T_{st,max}$ and without applied pressure and supply voltage will not affect the performance of the pressure sensor.

2) Operating temperature range T_a
An operation of the pressure sensor within the temperature range $T_{a,min}$ up to $T_{a,max}$ will not affect the performance of the pressure sensor.

3) Compensated temperature range T_C
While operating the pressure sensor within the temperature range $T_{c,min}$ up to $T_{c,max}$, the deviation of the output signal from the values at 25 °C will not exceed the temperature coefficients. Out of the compensated temperature range, the deviations may increase.

4) Rated pressure p_r
Within the rated pressure range $p_{r,min}$ up to $p_{r,max}$ the signal output characteristic corresponds to this specification.

5) Over pressure p_{OV}
Pressure cycles within the pressure range 0 up to p_{ov} will not affect the performance of the pressure sensor.

6) Supply voltage V_{CC}
$V_{CC,max}$ is the maximum permissible supply voltage, which can be applied without damages.
$V_{CC,min}$ is the minimum required supply voltage, which has to be applied for normal operation.

7) Offset D_{A0}
The offset D_{A0} is the signal output D_A (p = 0).

8) Signal span (Full Scale)
$D_{FS} = FS = D_A (p_{r,max}) – D_A (p_{r,min})$

9) Offset error E_{0LTS}
Sum of temperature hysteresis and all non systematic offset changes.
The temperature hysteresis is the change of offset, starting from the value at 25 °C after a temperature change and return to 25 °C. Determined during temperature cycles in operating temperature range (cycles with 1 K/min).

10) Non-linearity L (including pressure hysteresis)
The non-linearity is the deviation of the real sensor characteristic $I_{CC} = f(p)$ from the ideal straight line.
It can be approximated by a polynomial of second order, with the maximum at $p_x = p_r / 2$.
The equation to calculate the non-linearity is:

$$L = \frac{D_A(p_x) - D_{A0}}{D_A(p_r) - D_{A0}} - \frac{p_x}{p_r}$$

11) Characteristic curve error E_c
Within the compensated temperature range $T_{c,min}$ up to $T_{c,max}$ the error of characteristic curve E_c is the maximum deviation to the ideal characteristic curve, including non-linearity, calibration tolerances as well as temperature errors of offset and span.
Out of the compensated temperature range, the deviations may increase.

12) Total error $E_{total} = E_{0LTS} + E_c$
Sum of Offset error and characteristic curve error. The offset error E_{0LTS} is a parallel translation of the whole tolerance zone of the characteristic curve error. A periodic (to be defined by the user) offset correction at a defined pressure (e.g. zero) may considerably improve the measurement accuracy.

13) Functional description
For detailed description of the SPI digital interface see the data sheet "ZSC31014_iLite_datasheet_rev1.51". (Provided by ZMDi)

IF) Significant characteristic
Internal function relevant significant characteristic

Cautions and warnings

Storage

The pressure sensors should be stored in their original packaging. They should not be placed in harmful environments such as corrosive gases nor exposed to heat or direct sunlight, which may cause deformations. Similar effects may result from extreme storage temperatures and climatic conditions.
Avoid storing the pressure sensors in an environment where condensation may form or in a location exposed to corrosive gases, which will adversely affect their performance.

Soldering

The thermal capacity of the pressure sensor is normally low, so measurements should be taken to minimize the effects of external heat. High temperatures may lead to damage or changes in characteristics.

A no-clean flux should normally be used. Flux removal processes are not recommended.
Avoid rapid cooling due to dipping in solvent. Note that the output signal may change if pressure is applied to the terminals during soldering.

Operation

Media compatibility with the pressure sensors must be ensured to prevent their failure (see page 2).
The use of inappropriate media can cause damage and malfunction.
Never use them in atmospheres containing explosive liquids or gases.

Ensure pressure equalization to the environment, if relative pressure sensors are used.
Avoid operating the pressure sensors in an environment where condensation may form or in a location exposed to corrosive gases. These environments adversely affect performance of the sensors.

If the operating pressure is not within the rated pressure range, it may change the output characteristics.
Do not exceed the rated overpressure, it may damage the pressure sensor.

Do not exceed the maximum rated supply voltage, it may damage the pressure sensor.

Do not exceed the rated storage temperature range, it may damage the pressure sensor.

Temperature variations in both the ambient conditions and the media (liquid or gas) can affect the accuracy of the output signal from the pressure sensors. Check the operating temperature range and thermal error specification of the pressure sensors to determine their suitability for the application.

Connections must be wired in accordance with the terminal assignment specified in this publication.
Care should be taken as reversed pin connections can damage the pressure sensors or degrade their performance.

Contact between the pressure sensor terminals and metals or other materials may cause errors in the output characteristics.

This listing does not claim to be complete, but merely reflects the experience of TDK Sensors AG & Co. KG.

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