Pressure sensors

Differential pressure transmitter with I²C output

Series/Type:	**AVD 7.000 KA D4 Z14E L ST B767**
Ordering code:	**B58621V2894B767**
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Version:	1.1

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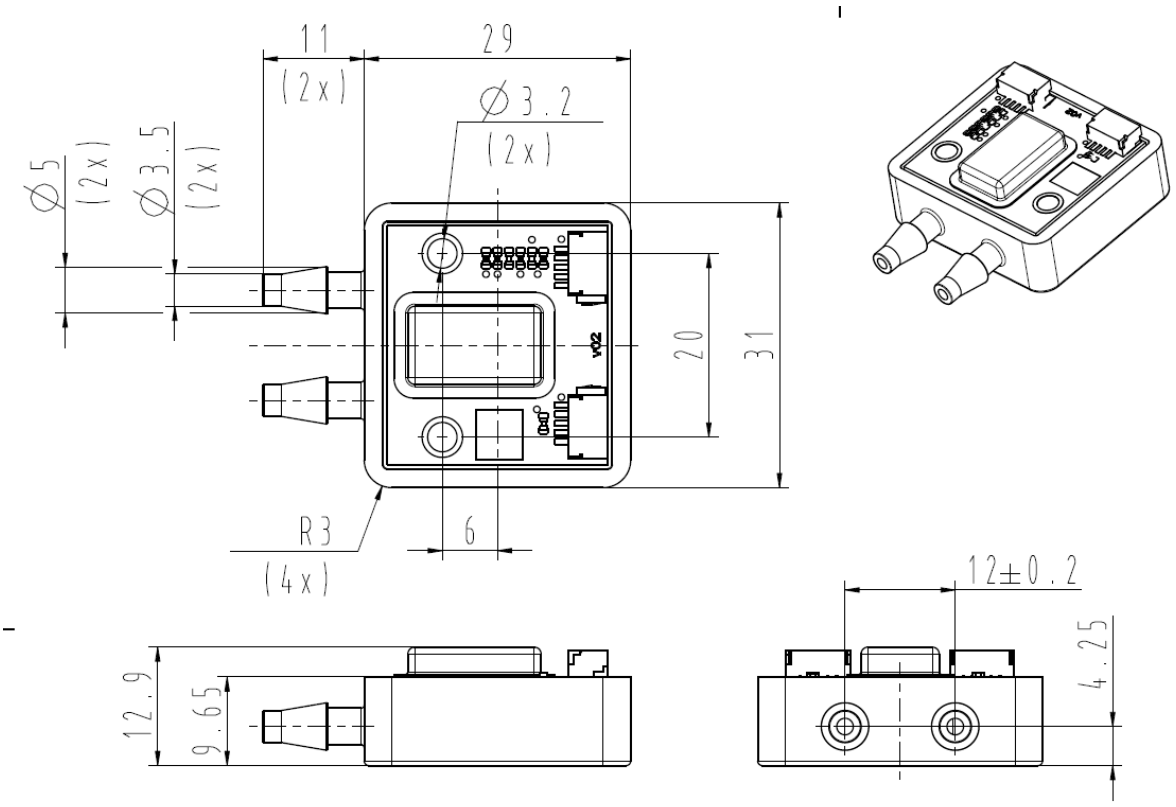
Applications

- Differential pressure measurement e.g. for flow control and filter monitoring in building measurement systems
- Gauge pressure measurement e.g. for pressure level control and gas dosing in respirators

Features

- Pressure range 0 … 7 bar
- Pressure signal accuracy typ. ± 0.35 % FS in a wide temperature range from -20 … +70 °C
- Temperature signal accuracy typ. ± 2 K in a wide temperature range from -20 … +70 °C
- Digital I²C output proportional to pressure: 10 ... 90% of digital output range (14 bit)
- Piezoresistive MEMS technology
- Measured media: air, non-aggressive gases
- Prepared for screw mounting to provide improved mechanical stability
- Pressure ports with hose connections for easy mounting of tubes
- RoHS-compatible, halogen free according to IEC 61249-2-21 clause 3.1

Dimensional drawings

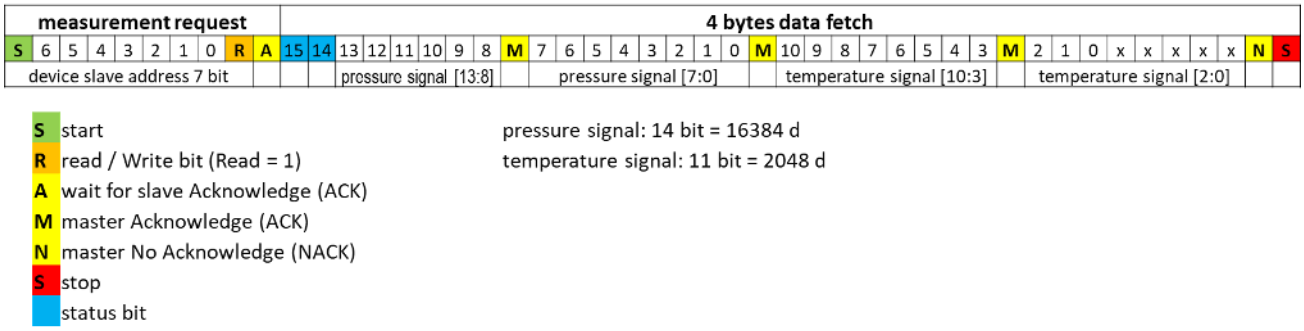


Dimensions in mm

Technical data

Absolute maximum ratings

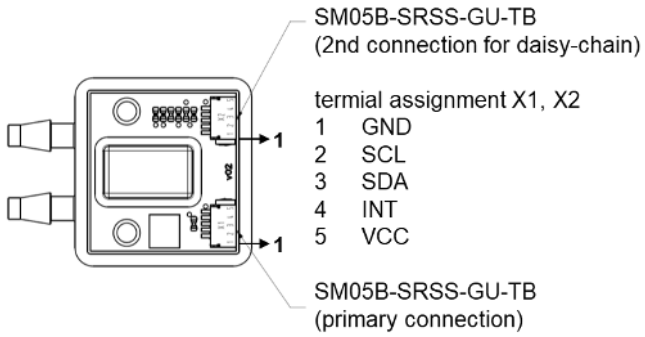
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Temperature ranges						
Storage temperature range	T_{st}	1)	–30		+70	°C
Operating temperature range	T_a	2)	–20		+70	°C
Compensated temperature range	T_c	3)	–20		+70	°C
Pressure ranges						
Rated pressure range	p_r	differential pressure 4)	0		7	bar
Overpressure	p_{ov}	differential pressure 4), 5)	-1		14	bar
Burst pressure	p_{burst}	differential pressure 4), 6)	-1		14	bar
Line burst pressure	p_{line}	7)	0		15	bar abs.
Supply voltage /-current						
Supply voltage	V_{CC}	8)	2.7		5.5	V
Supply current	I_{CC}	9)		3	10	mA
Output signal @ T_a = 25 °C, V_{CC} = 5 V						
Pressure output range ($p_{r,min}$ .. $p_{r,max}$)	D_A	10%...90% of 14 bit range	1637		14745	digit
Offset IF)	D_{A0}	10)		1637		digit
Signal span (Full Scale)	D_{FS}	11)		13107		digit
Temperature output range (-50…+150°C)	D_T	full 11 Bit range	0		2047	digit
Offset error	E_{0LTS}	12)		±0.1	±0.5	% FS
Nonlinearity	L	13)		±0.15	±0.5	% FS
Characteristic curve error	E_c	@ T_a = –20 ... 70 °C 3), 14)		±0.25	±0.5	% FS
Total error (E_{0LTS} + E_c)	E_{total}	@ T_a = –20 ... 70 °C 3), 15)		±0.35	±1	% FS
Temperatur signal error	E_T	@ T_a = –20 ... 70 °C		±2.0	±3.0	K
Configuration, digital interface						
System clock frequency				4 MHz		
Update period				0.5 ms		
Communication type				I²C		
I²C-address				0 x 30		
Sleep mode				inactive		



I²C Read Operation

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

Connection diagram



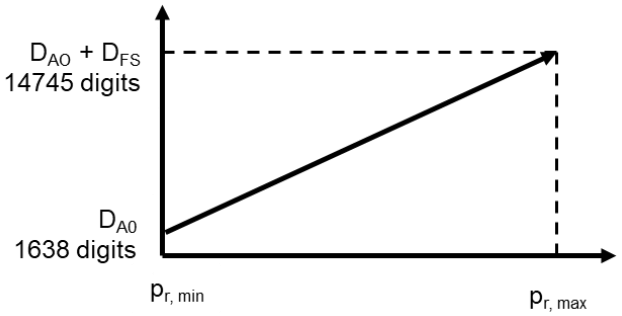
Pressure calculation from digital output D_A

$$p[mbar] = \frac{D_A - D_{A0}}{D_{FS}} \times p_r$$

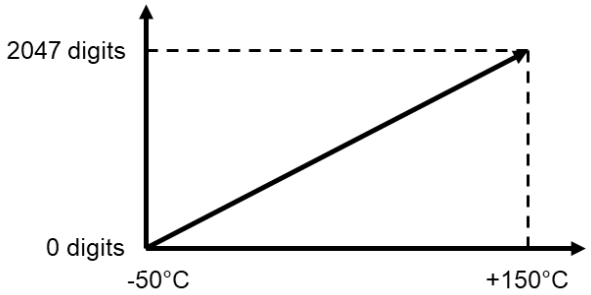
Temperature calculation from digital output D_T

$$T[°C] = \frac{D_T}{2047} \times 200°C - 50°C$$

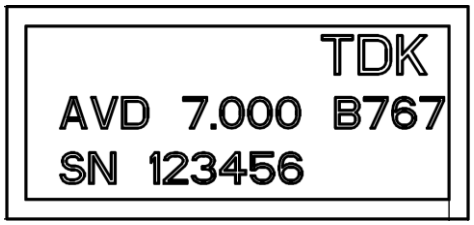
Pressure output characteristics



Temperature output characteristics

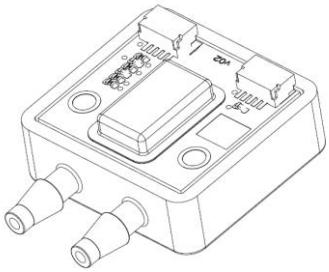


Labeling



AVD – Sensor type, product family
0.016 – Rated pressure range p_r: 0… 16 mbar
B765 – Sensor type specification number
SN – Serial number of sensor

Pressure port assignment



P_1 – high pressure
P_2 – low pressure
$p_r = p_1 - p_2$

Installation of the sensor

For fixation of the pressure transmitter two screws M3 with washers should be used. Cross head, hexagon socket head or star head screws should be preferred instead of slotted head screws to avoid damages during the mounting process. Maximum of washer's outer diameter is 7 mm. Maximum of screw's mounting torque is limited by the sensor to 1.5 Nm.

Pressure ports are designed for flexible tubes with inner diameter of 4 mm. The joint of tube and pressure port has to be tested in pressure and temperature range to avoid leakage.

The electrical connector on the sensor is specified as JST SM05B-SRSS-GU-TB or equivalent. Matching SR / SZ connector sockets are JST 05SR-3S or JST A05R05SR30K203B or equivalent.

Materials exposed to the media to be measured

Materials exposed to measured media at high pressure port p_1: gloptop material based on epoxy, silicone adhesive, glass, silicon, ENIG surface on PCB, PA66 + EPDM

Materials exposed to measured media at low pressure port p_2: gloptop material based on epoxy, silicone adhesive, silicone gel, glass, silicon, aluminium, nickel, ENIG surface on PCB, PA66 + EPDM

Media compatibility

All media which are compatible with the above mentioned materials like air and non-aggressive gases.

Condensing or freezing liquids or residues thereof can affect the accuracy or even damage the sensor.

Gas humidity shall be in range of 0 ... 100% r.h. at high pressure port $p_1$and in range of 0 ... 85% r.h. at low pressure port p_2

Further cautions and warnings for storage, mounting and operation on page 8.

For fixation of the pressure transmitter two screws M3 with washers should be used. Cross head, hexagon socket head or star head screws should be preferred instead of slotted head screws to avoid damages during the mounting process. Maximum of washer's out

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. Rated pressure p_r is calculated as difference between p_1 and p_2. ($p_r = p_1 - p_2$).

5) Overpressure p_{OV}

Pressure cycles within the pressure range 0 up to p_{ov} will not affect the performance of the pressure sensor. p_{ov} is calculated as difference between p_1 and p_2. ($p_r = p_1 - p_2$).

6) Burst pressure p_{burst}

Pressure cycles within the pressure range 0 up to p_{burst} will not affect the hermeticety of the pressure sensor. Performance of the pressure sensor may be affected. p_{ov} is calculated as difference between p_1 and p_2. ($p_r = p_1 - p_2$).

7) Line burst pressure p_{line}

Pressure working symmetrically on both pressure ports. Pressure cycles within the range 0 up to p_{burst} will not affect the hermeticety of the pressure sensor. Performance of the pressure sensor will not be affected irreversibly. High line pressure can cause high pressure peaks working on one side of the sensor and affecting the sensor.

8) 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.

9) Supply current I_{CC}

$I_{CC,}$ is current consumption of the pressure sensor in operation.

10) Offset D_{A0}

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

11) Pressure output span (Full Scale)

$D_{FS} = FS = D_A(p_{r,max}) - D_A(p_{r,min})$

12) Offset error E_{A0}

Deviation of the offset signal output $D_A(p = 0)$ to nominal value.

13) Non-linearity L (including pressure hysteresis)

The nonlinearity is the deviation of the real sensor characteristic $D_A = f(p)$ 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 nonlinearity is:

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

14) 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.

15) Total error $E_{total} = E_{0LTS} + E_C$

Sum of Offset error and characteristic curve error. The offset error E_{A0} 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.

Cautions and warnings

■ Storage

All pressure sensors should be stored in their original packaging. Maximum storage and time in original package is 2 years after the date of production. Transmitters 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 sensors in an environment where condensation may form or in a location exposed to corrosive gases, which will adversely affect their performance.

■ Mounting

Handle the fixation screws carefully during the mounting process to avoid damages of the sensor. Do not exceed the given mounting torque. Check length of screws for stable fixation.

The joint of tubes and pressure ports has to be tested in pressure and temperature range to avoid leakage.

Release all mounting processes carefully.

■ Operation (general)

Media compatibility with the pressure sensors has to be ensured to prevent failure. The use of other media can cause damage and malfunction. Never use pressure sensors in atmospheres containing explosive liquids or gases.

Ensure pressure equalization to the environment, if gauge 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 their performance.

If the operating pressure is not within the rated pressure range, it may change the output characteristics. This may also happen with pressure sensor dies if an incorrect mounting method is used. Be sure that the applicable pressure does not exceed the over pressure, as it may damage the pressure sensor.

Do not exceed the maximum rated supply voltage nor the rated storage temperature range, as 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. Be sure to 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 the data sheets. Care should be taken as reversed pin connections can damage the pressure transmitters or degrade their performance. Contact between the pressure sensor terminals and metals or other materials may cause errors in the output characteristics.

Re-programming of sensor's signal conditioner can effect accuracy of measurements and function of interface. TDK reserves the right to end all warranties of the sensor if interventions in sensors programming were made.

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Important notes

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