General Instruction and Datasheet

Measuring your business

ESS503 GID-5-EV03.3.2

ESS503 Ceramic Piezo-Resistive Pressure & Temperature Sensor Cell

MONOLITHIC THCIK-FILM | AI2O3 96%

Range: 0～2bar~100bar/600bar **Size:**18mm*6.35mm; 18mm*3.5mm **Diaphragm Material:** Ceramic Al2O3 96% **Power Supply:** 2-30V **Long Term Stability**: 0.3%/FS **NTC Thermistor** **Working Temperature:** -40...+135 ℃

Description

ESS503 **Monolithic Pressure & Temperature Sensor Cell** are made with a **Ceramic Base Plate and Diaphragm** and work following the piezoresistive principle. With **temperature sensor mounted**, ESS503 can detect temperature change via **NTC Thermistor**.

By integrating an **NTC thermistor**, ESS503 can continuously monitor the temperature and apply real-time compensation to the pressure readings, and can provide the necessary temperature data, allowing a more comprehensive understanding of the environment.

The Wheatstone bridge is **Screen Printed** on one side of the flush ceramic diaphragm which is, in turn, glued to the sensor's body. The bridge faces the inside where a cavity is made and the diaphragm's opposite side can therefore be exposed directly to the medium to be measured.

As the same as ESS501 and ESS502, ESS503 is also available with two kinds size: **18*6.35mm and 18*3.5mm (thin type)**.

Key Features & Benefits

- **Pressure range 0-2bar-100bar/600bar**
- **Excellent resistance to corrosion and abrasion**
- **Integrated with NTC Thermistor**
- **Thermally compensated**
- **Extended customization**
- **Extended choice of measuring ranges**

Application

- **Cooling equipment & A/C system**
- **Automotive and vehicle**
- **Industrial process control**
- **HVAC system**
- **Refrigeration equipment**
- **Air conditioning unit**

Technical Characteristics

Parameter	Unit	Description
Sensor type	-	absolute (A), gauge (R) or sealed gauge (S)
Technology	-	Piezoresistive (Ceramic Thick Film)
Diaphragm material	-	Ceramic Al_2O_3 96% (standard), 99.6% or sapphire (on request)
Weight	g	≤ 8 (ceramic cell only)
Response time	ms	≤ 1

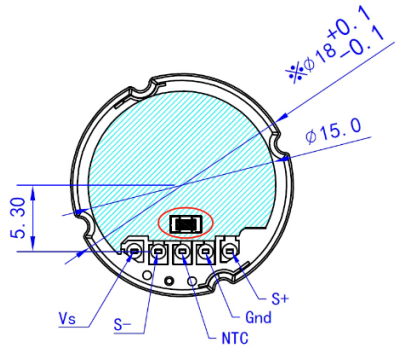
Supply voltage		VDC	2...30										
Offset		mv/v	2 ±4 (Other nominal values available on request)										
Current		mA	≤ 1.3 @ 10V										
TCR			≤100ppm/℃@-40℃~120℃										
NTC			10kΩ±1.5%@25℃, B=3950K										
Operating temperature		°C	-40...+135 (-40 °F...+275 °F)										
Storage temperature		°C	-40...+150 (-40 °F...+302 °F)										
Impedance		kΩ	11 ± 30%										
Nominal pressure FSO	bar	0.5*	1*	2	5	10	20	50	100	200	400	600	800 *
	psi	7	14	29	73	145	290	725	1450	2900	5800	8700	11600
Overload pressure	bar	1	2	4	10	15	35	100	150	350	500	750	1000
	psi	14	29	58	145	217	507	1450	2175	5075	7250	10875	14500
Burst pressure	bar	2	3	6	15	25	65	120	200	500	650	950	1250
	psi	29	43	87	217	362	942	1740	2900	7250	9425	13775	18125
Vacuum capability	bar	-0.1	-0.5	-0.5	-1	-1	-1	-1	-1	-1	-1	-1	-1
	psi	-1.4	-7	-7	-14	-14	-14	-14	-14	-14	-14	-14	-14
Type	-	R	A/R/S	A/R/S	A/R/S	A/R/S	A/R/S	A/R/S	S	S	S	S	S
Total thickness	mm/in	6.40±0.05/2.51±0.2											
	mm/in	3.55±0.05/1.40±0.2; for thin type											
Sensitivity	mv/v	1.4-	2.0-3.6	2.3-3.5	2.3-4.0	3.1-5.5	2.4-4.0	4.0-6.0	3.0-4.8	2.5-3.9	3.1-4.8	3.1-4.8	2.0-3.5
Accuracy	%/fs	0.4/0	0.3/0.9	0.3/0.6	0.2/0.4	0.2/0.5	0.2/0.5	0.2/0.5	0.2/0.5	0.4/0.9	0.5/1.0	0.5/1.0	0.5/1.0
Thermal offset shift(typ./max.)	%/fs/k	± 0.005 / ± 0.040				25 °C...85 °C				(77 °F...185 °F)			
Thermal span shift	%/fs/k	≤ ± 0.010 ≤ ± 0.012 ≤ ± 0.014				0 °C...70 °C -25 °C...0 °C / 70 °C...85 °C -40 °C...-25 °C / 85 °C...135 °C				(32 °F...158 °F) (-13 °F...32 °F / 158 °F...185 °F) (-40 °F...-13 °F / 185 °F...275 °F)			
Reliability tests	-	1000 hours @85 °C (185 °F) & 85 %RH 1000 hours burn-in @150 °C (302 °F)								500 thermal shocks -40°C...+150 °C (-40 °F... +302 °F) 10 million 0 bar to Pnom pressure cycles			

Tests performed at 25°C in Eastsensor housings, unless otherwise specified. Different housings may affect performances.
1. *Psi values for reference only.* ***2.*** *The sensitivity of each production batch is constant, within the indicated range and with minimal dispersion.*
3. *Accuracy* $= \sqrt{NonLinearity^2 + Hysteresis^2 + NonRepeatability^2}$, *terminal based.*
4. *All technical characteristics will remain within indicated ranges performing the above-mentioned reliability tests.* ***5.*** *Please consult manufacturer when pressure range with" * "*

Drawing

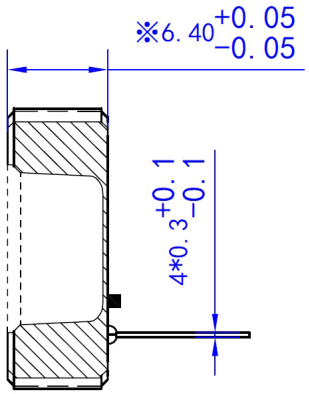
ESS503 Ceramic Piezo-resistive Pressure & Temperature Sensor Range: 0bar~2bar~600bar

Top View: Pitch 1.95mm (0.077 inches)

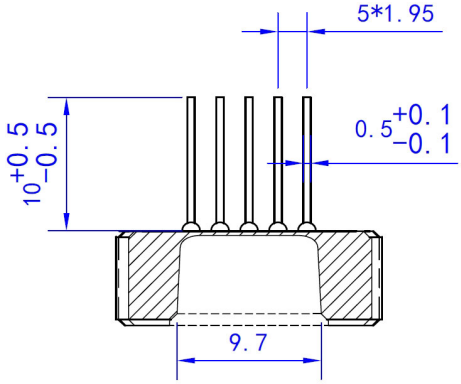


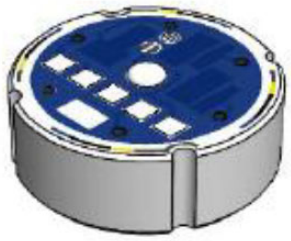
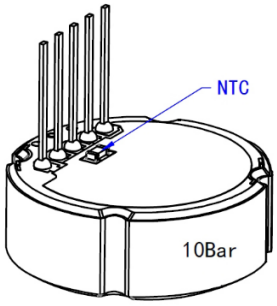
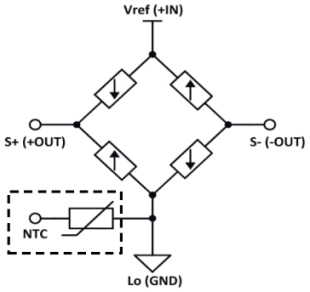
Vs	Voltage Supply
Gnd	Ground
S+	Signal positive
S-	Signal negative
NTC	NTC thermistor

Side View

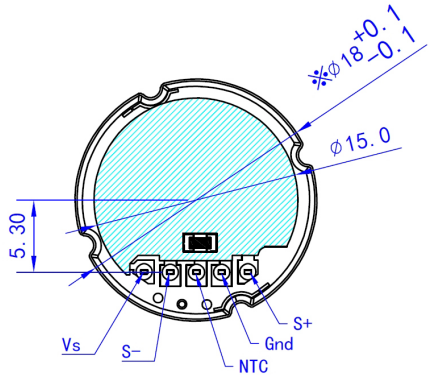
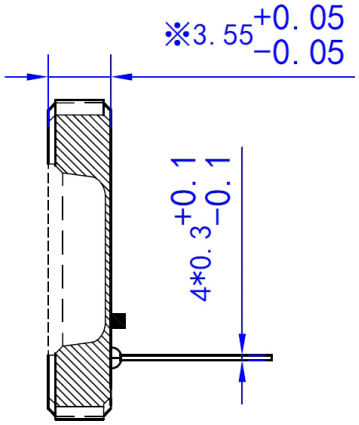
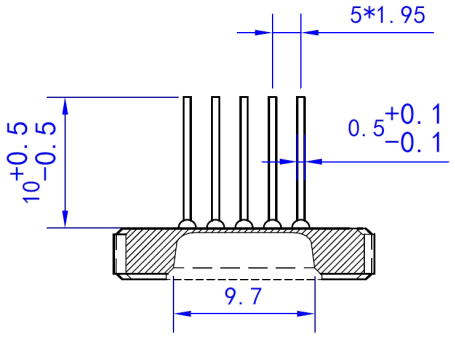


Side View

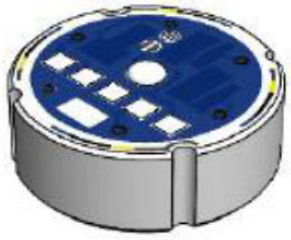
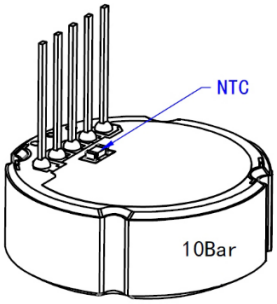
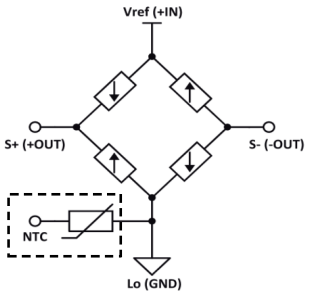


Type A: Pre-tinned soldering pads		**Type B:** Polyester/Silicone cable	Schematics
	Pitch: 1.95 ± 0.05 Op. Temp: -40°C...+135°C Type A:-40°C..+105°C Type B Cable length: 80.8 ± 2		

ESS503 [Thin Type] Ceramic Piezo-resistive Pressure & Temperature Sensor Range: 0bar~2bar~100bar

Top View: Pitch 1.95mm (0.077 inches)	Side View	Side View
		

Vs	Voltage Supply
Gnd	Ground
S+	Signal positive
S-	Signal negative
NTC	NTC thermistor

Type A: Pre-tinned soldering pads		**Type B:** Polyester/Silicone cable	Schematics
	Pitch: 2.54 ± 0.05 Op. Temp: -40°C...+135°C Type A:-40°C..+105°C Type B Pin section: 0.51 x 0.25 Pin length: L = 9.0 ± 0.5		

1. Storage Conditions: *Store at 10~35°C with ≤ 70% RH. Avoid places that are too hot, exposed to direct sunlight, dusty, or have corrosive gases. The metal pins can easily oxidize in the air, so it's recommended to use the product within 10 days after unpacking. Under proper storage conditions, the soldering validity is 12 months. If stored for more than 12 months, the ceramic core needs to be rechecked for solderability and can only be used if it passes inspection.*

2. Product Installation Pressure: *During crimping installation, the crimping pressure should not exceed 20KN, and the direct pressure on the core should not exceed 5KN. Excessive force may damage the core structure or cause abnormal output signals. The ceramic core should not come into direct contact with hard objects like a metal casing to avoid significant internal stress and unstable output.*

3. Sealing Recommendations: *When using sealing rings, ensure that the sealing ring is centered with the elastic diaphragm and without uneven force. The inner diameter of the sealing ring should be >11.0mm and the outer diameter <16.0mm after compression deformation.*

4. Solder Pads: *The pressure core PIN is constructed of nickel-tin copper. The welding hole for the PIN measures 0.7mm, with a pad width exceeding 0.5mm. The soldering temperature must not exceed 370 ℃, with each soldering session limited to under 3 seconds and a maximum of 3 sessions.*

Ordering Procedure

ESS5	Ceramic Piezoresistive Pressure Sensor
Code	Model
01	Pressure Sensor Cell, Monolithic 18*6.35mm
01 Thin	Pressure Sensor Cell, Monolithic 18*3.35mm
01-I	Pressure Sensor Module, Monolithic (with pcb) 4-20mA; Electronics on PCB
01-V	Pressure Sensor Module, Monolithic (with pcb) 0.5-4.5V; Electronics on PCB
01-IIC	Pressure Sensor Module, Monolithic (with pcb) I2C Output; Electronics on PCB
02 (18)	Pressure Sensor Cell, Flush diaphragm 18*6.35mm
02 (18)Thin	Pressure Sensor Cell, Flush diaphragm 18*3.35mm
02 (12)	Pressure Sensor Cell, Flush diaphragm 12*12*3mm
02 (14)	Pressure Sensor Cell, Flush diaphragm 14*14*3mm
02 (21)	Pressure Sensor Cell, Flush diaphragm 21*4.35mm
02-I	Pressure Sensor Module, Flush diaphragm (with pcb) 4-20mA; Electronics on PCB
02-IOC	Pressure Sensor Module, Flush diaphragm (with pcb) 4-20mA; Electronics on Ceramic
02-V	Pressure Sensor Module, Flush diaphragm (with pcb) 0.5-4.5V; Electronics on PCB
02-VOC	Pressure Sensor Module, Flush diaphragm (with pcb) 0.5-4.5V; Electronics on Ceramic
02-IIC	Pressure Sensor Module, Flush diaphragm (with pcb) I2C Output; Electronics on PCB
02-IICOC	Pressure Sensor Module, Flush diaphragm (with pcb) I2C Output; Electronics on Ceramic
03	Pressure Sensor Cell (with temperature sensor mounted), Monolithic 18*6.35mm
03 Thin	Pressure Sensor Cell (with temperature sensor mounted), Monolithic 18*3.35mm

Code	Span	Code	Span
R01	0...0.5 bar [0...7psi]	R07	0...50 bar [0...720psi]
R02	0...1 bar [0...14psi]	R08	0...100 bar [0...1450psi]
R03	0...2 bar [0...29psi]	R09	0...200 bar [0...2900psi]
R04	0...5 bar [0...72psi]	R10	0...400 bar [0...5800psi]
R05	0...10 bar [0...145psi]	R11	0...600 bar [0...8700psi]
R06	0...20 bar [0...290psi]	R12	0...800 bar [0...11600psi]

Code	Pressure Type
R	Gauge
A	Absolute
S	Sealed Gauge

Code	Sensitivity adjustment
0	Without
9	On request

Code	Thermal offset
0	≤ ± 0.06 % FS/K (not thermally compensated)
1	≤ ± 0.04 % FS/K
2	≤ ± 0.02 % FS/K

Code	Termination type
02	4 pins, Pre-tinned pads, pitch 1.95 mm
03	4 pins, Silicone single wires 80 mm, pitch 1.95 mm

Code	Additional coating
1	Without
2	Parylene coating

ESS5	03	R10	R	0	2	03	1

Note: ❶*Extremely attention must be paid to sensor installation process to avoid any miss conduction that affect the sensor performance,* ❷*please protect the diaphragm and the compensated board carefully to prevent any damage.* ❸ *Please contact us if your requested working temperature lower than -20℃;*