



TSE AS10

Wireless Temperature SAW Sensor

Surface Acoustic Wave Breakthrough Technology

Key Features

- ▶ Wireless, batteryless, robust
- ▶ Accurate, precise, reliable
- ▶ Measuring temperature range: -15°C, 165°C
- ▶ Various mountings available
- ▶ Dimensions: 5x5x1.5 mm
- ▶ MIL-STD-883 (Method 2003 mechanical shock 3000 g-force)

Benefits

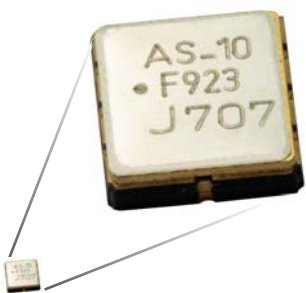
Enables new measurements

- ▶ on moving and rotating parts
- ▶ in explosive, corrosive, radiated environments
- ▶ in confined and inaccessible places
- ▶ where cabling costs too much or is impossible

For process optimization and better equipment utilization through condition monitoring and process control

Working Principle

An electromagnetic wave is sent by the transceiver and converted into a mechanical wave on the surface of the acoustic wave chip. The mechanical wave is reflected and sent back to the transceiver, which allows SENSeOR to measure physical phenomena. TSE AS10 is based on two resonators working at two different frequencies in the 434 MHz ISM band [433.05 MHz, 434.79 MHz]. Use of a differential structure offers improved accuracy in measurements and enables SENSeOR to provide the most time stable devices in the industry.



Applications

For OEM's and end-users in Energy, Transportation, Aerospace

- ▶ Temperature measurement on rotors inside turbines, generators, motors
- ▶ Temperature measurement on moving carriers in industrial automation
- ▶ Temperature monitoring of bearings inside engines and machinery



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Electrical specifications at room temperature

Resonant frequency resonator 1 (25°C)	433.63 MHz ± 0.2 MHz (see figure 1)
Resonant frequency resonator 2 (25°C)	434.36 MHz ± 0.15 MHz (see figure 1)
Unloaded quality factor resonator 1 (minimum value)	10 000 (typical value 12 000)
Unloaded quality factor resonator 2 (minimum value)	10 000 (typical value 12 000)
Maximum value of S11 at resonant frequency for resonators 1 and 2 Amplitude reference level is 0 dB	-20 dB

Temperature specifications

Operating temperature range	-40°C, 200°C
Measuring temperature range	-15°C, 165°C ⁽¹⁾
Accuracy	+/- 2°C ⁽²⁾
Typical first order temperature coefficient C1 resonator 1	6.5 ppm /°C ⁽³⁾
Typical second order temperature coefficient C2 resonator 1	-20.3 ppb /°C ² ⁽³⁾
Typical first order temperature coefficient C1 resonator 2	1.2 ppm /°C ⁽³⁾
Typical second order temperature coefficient C2 resonator 2	-33.8 ppb /°C ² ⁽³⁾
Differential temperature sensitivity (typical value at room temperature)	- 2.3 kHz /°C

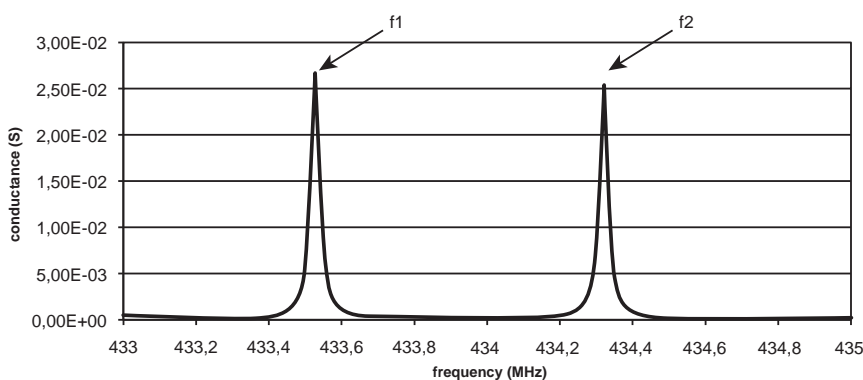


Figure 1: Typical conductance of TSE AS10 at 25°C with regard to frequency

- (1) Measuring temperature range is determined by the temperature range used for calibration i.e. -15°C,165°C.
 (2) Sensor accuracy is application and system dependant.
 (3) Frequency dependence with regard to temperature is given by: $f(T)=f(25^{\circ}\text{C}) (1+C1*(T-25^{\circ}\text{C})+C2*(T-25^{\circ}\text{C})^2)$ where T is the temperature expressed in °C.

SENSeOR HEADQUARTERS
 Parc du Font de l'Orme - Lot N° 3
 694, av. du Docteur Maurice Donat - 06250 MOUGINS - FRANCE
 Phone : +33 (0)4 97 23 13 20 - Fax: +33 (0)4 93 06 08 58
contact@senseor.com - www.senseor.com



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HY-LINE®
 S E N S O R - T E C

Inselkammerstr. 10
 82008 Unterhaching
 Tel.: 089/614 503 - 30
 E-Mail: sensortec@hy-line.de

Postfach 1222
 82002 Unterhaching
 Fax: 089/614 503 - 34
www.hy-line.de