SOREXSENSORS

Sensing a better future

Datasheet

SFS2070 – S

V1 – November 2019

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SFS2070 – S is in engineering release. Sorex Sensors cannot guarantee performance of the sensors.

Datasheet SFS2070 – S

Sorex Sensors dual mode FBAR sensor

- Mass and temperature sensor based on Film Bulk Acoustic Resonator (FBAR) technology.
- High frequency operation (1.9 GHz – 2.6 GHz).
- Ceramic SMD package, 3 mm x 3 mm.
- 3 pins, Ground-Signal-Ground configuration.

SFS2070-S is a simultaneous mass and temperature sensor based on FBAR technology. The device displays two resonances (Fig. 1a) that exhibit different sensitivity coefficients for mass attachment on the surface of the sensor and temperature variations. This unique feature allows using a single sensor to obtain information on both the mass attached to the sensing area and temperature. This also means that the sensor can be self-referenced for temperature variations during the sensing operation.

Parameter	Typical Value		Comments
	Resonance 1	Resonance 2	
Frequency [MHz]	1960 to 2040	2540 to 2660	Range of values of the resonant frequencies.
K_{eff}^2 [%]	2 to 3.5	2 to 3.5	Calculated using the equation: $K_{eff}^2 = \frac{\pi}{2}\frac{f_r}{f_a}\frac{1}{\tan(\frac{\pi}{2}\frac{f_r}{f_a})}$ being f_r and f_a the resonant and antiresonant frequencies, respectively.
Q-factor	500 to 800	500 to 800	Calculated at the resonant frequency using the equation: $Q = \frac{f_r}{2}\left(\frac{d\varphi(Z)}{df}\right)$ where φ is the phase of the impedance
TCF [ppm/°C]	+19 to +24	+23 to +35	Calculated for the resonant frequency as: $TCF = \frac{\Delta f}{\Delta T \cdot f_0} 10^6$ being f_0 the resonant frequency at room temperature and Δf the shift in frequency upon a temperature variation of ΔT in [°C]. Calibration was performed in the range of 23°C to 100°C.
Mass sensitivity [Hz cm²/pg]	-1.5 ± 10%	-0.9 ± 10%	Calculated using the equation : $Mass\ Sensitivity = \frac{\Delta f}{\Delta t \cdot \rho_{SiO_2}}$ being Δf the shift in frequency upon deposition of thin layers of SiO_2 of thickness Δt [nm], and density ρ_{SiO_2} = 2.13 g/cm^3. * Calibration performed on pristine devices. Mass sensitivity gradually improves in function of the thickness of the deposited SiO_2 (see Fig. 2). Thin films of materials different than SiO_2 can induce a different tendency.
Mass resolution [pg]	0.46	0.9	Estimated for an active surface area of 38500 μm^2 and a limit of detection given by the fluctuations in Δf when no perturbations are applied (standard deviation: σ=±2.0 kHz).

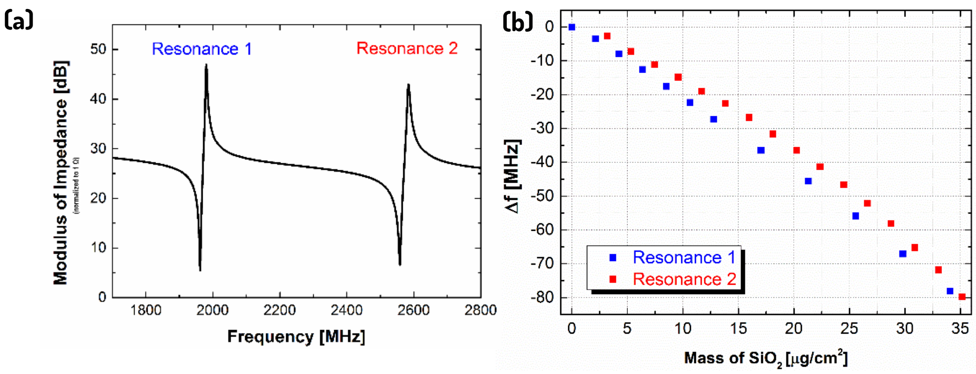

Fig. 1 **(a)** Electrical response of the device represented by its impedance modulus. The response was measured with a network analyser. **(b)** Relative shifts in frequency of both resonances upon deposition of thin films of SiO_2. The mass axis represents the cumulative SiO_2 deposited sequentially.