

Characterization of SAW propagation in Langasite at high temperatures

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For langasite, a piezocrystal used as substrate material for SAW-based ID tags and sensors operating at high temperatures, the parameters of SAW propagation have been determined experimentally as a function of temperature for several crystal cuts.

Some of the parameters, such as phase velocity on free and metallized surfaces, propagation loss, and electromechanical coupling coefficient, were obtained from the measurements of transfer functions for delay lines on langasite chips at frequencies ranging from 150 MHz to 1 GHz. From the measured admittances of several resonators with different pitches (from 2.2 to 4.6 μm) the COM parameters – velocity under the grating and the reflection coefficients of one finger – were obtained for frequencies in the range between 300 and 550 MHz. The following metallization layers were applied: Al (only for lower temperatures) and Zr (adhesive)/ Pt.

The SAW devices were measured on a wafer prober at temperatures up to 200°C or they were placed in a tube furnace heated up to 750 °C. A specially developed signal processing algorithm, utilizing cross-correlations, is used to determine precise time delays for the extraction of SAW propagation parameters.