

# Microelectronics component designing by Cadence software

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**Abstract.** Acoustic-electronic radio components on surface acoustic waves (SAW) are the most promising class of radio-frequency filters in the frequency range from 20 to 2500 MHz. The most important feature that determines the rapid introduction of acoustoelectronic radio components into modern information systems is the possibility of combining manufacturing processes with micro and nanotechnologies, high temperature stability and reliability, and small weight and size characteristics. Element performing excitation and reception of acoustic waves in all devices types is an interdigital transducer (IDT), which is a grid of metal electrodes deposited on the surface of the piezoelectric.

## 1. Modelling using COMSOL Multiphysics

There are a number of methods for calculating SAW devices: filters, delay lines, resonators. Engineers use both simplified, in particular, phenomenological calculation methods, which involve the use of a variety of empirical data, as well as various FEM or FEM / BEM techniques. Using COMSOL Multiphysics for calculating devices on SAW is quite popular.

In this paper, the calculation of the delay line is considered, the FEM calculation is compared with the analytical phenomenological model based on the Delta-function method. The main aspects of setting SAW calculations in COMSOL are analyzed: geometric samples for multi-element structures of IDT, structured grids, correct 2D-settings, post-processing and obtaining S-parameters matrices. As a result, a high sensitivity of IDT to a change in frequency (in the vicinity of a resonant one), both in energy and in mechanical stresses, was noted.

## 2. Developing build-in model in Cadence Virtuoso

According to the simulation results, it is possible to specify the description of the IDT in Cadence Virtuoso as an embedded library element. In Cadence Virtuoso CAD, this is possible to use the Component Description Format (CDF). CDF allows to:

- describe the parameters and attributes of elements and libraries;
- set default values and permissible limits of values;
- dynamically change the display of the elements topology;
- define and perform callback functions on changes in selected parameters.

Element parameters are set directly before building a topology or simulation model. Various ways of setting parameters are allowed, such as: buttons, a group of radio buttons, text fields. In this work, the model of IDT was chosen as the sample element. The basic parameters in the CDF for building topology are described.

### 3. References

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