The Fin Bulk Acoustic Resonators (FinBAR): Enabling Integrated Signal Processing for 5G

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Abstract

- This work presents the fabrication process for implementation of the Fin Bulk Acoustic Resonator (FinBAR) with high aspect ratio of >30:1 & minimum lateral dimension of <1 µm.
- The FinBAR technology surpasses the long-standing frequency scaling challenge of chip-scale filters through integration of piezo-film on sidewalls of semiconductor fin to enable high-Q mechanical resonance over SHF regime.

Process Flow

1) DRIE to pattern nano-fins on semiconductor substrate, resulting in rough sidewall surfaces. 2) \( \text{H}_2 \) annealing (700°C) to smoothen rough surface and sharp corners of fins. 3) Sputtering AlN transduction layer, sandwiched between Mo layers. 4) Patterning of top Mo & AlN on anchor-pad surfaces to facilitate RF / GND access. 5) One-port FinBAR.

Results

- Measured admittance for the FinBAR operating in 3rd width-extensional mode, compared with COMSOL simulations; (right) wideband UHF filter implemented by electrical coupling of FinBARs with different fin widths [1].


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