BACHELOR-/FORSCHUNGS-/ or MASTER-Thesis

5-6 GHz 130 nm CMOS Current-Mode Class-D PA Design

IC - Development	
Objectives: - RFIC - Design - Optimization of Transmitter - Development and dimensioning of an output matching circuit - Simulation and optimization - EM simulation of the passive devices	**Requirements:** - Knowledge in high frequency circuit design or related courses - Lectures “IMS” and “PDIC” are recommended

Description

In the framework of the ongoing DFG project “FFlexcom”, fully integrated wireless communication systems on an ultra-thin, bendable and flexible packages are developed. In order to be embedded into flexible foil systems, the device must be small, mechanically flexible and therefore thin. Due to the thin chip in a flexible polyimide substrate, the maximum surface temperature is generally higher, as the polyimide substrate is a poor thermal conductor, hence, the heatspreader is necessary. However, the value of the passive devices is slightly varied due to the ground image current in the heatspreader. An approach to overcome this effect is the modification of the heatspreader.
In this project, we are working on the design of a complete transmitter in the 5 – 6 GHz frequency band on the thin substrate for IoT (Internet of Things) applications. A fully integrated class-A power amplifier (PA) in the 5-6 GHz frequency band has already been fabricated and successfully verified. The complete design of the transmitter system is currently fabricated.

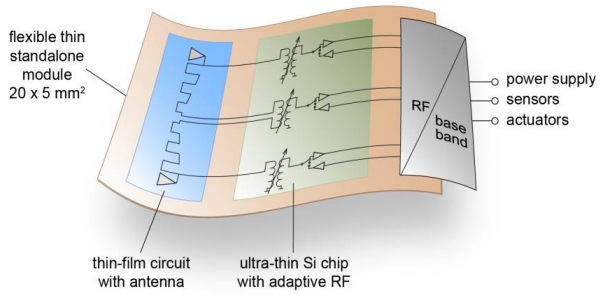

Figure 1: Block diagram of fully integrated wireless communication system on an ultra-thin substrate.

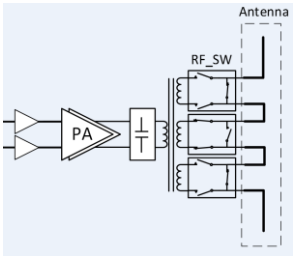

Figure 2: Block diagram of CMPA

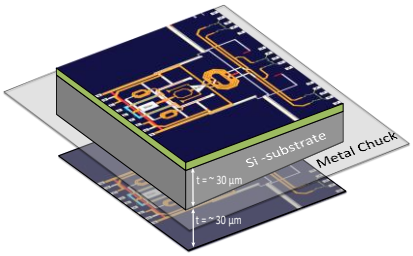

Figure 3: 3D view of the passives

Task:

The thesis covers the following tasks:

- Current-mode Class-D PA (CMPA) redesign (with a cascode and differential structure) in 5-6 GHz frequency band,
- Develop transformer based matching network,
- Characterization, modelling and simulation of the transformer,
- Explorative design of a 5 GHz to 6 GHz driver stage

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