Printed Transceiver Circuit for System-on-chip Sensor and Processor

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Abstract

This research employs aerosol jet printing to rapidly manufacture a multilayer PCB with COTs component integration. Specifically, this research provides a method to making a system-on-a-chip (SOC) circuit on a variety of substrates with novel integration methods. This fits well into the recent research phenomenon deemed “the internet of things.” By advancing the manufacturing capabilities for a system that can measure and transmit data, one can integrate such circuits with minimal spatial and geometric interference to the broader device. A unique manufacturing process was developed for non-embedded components which involves the building up of the circuit around the system’s microprocessor. The transceiver circuit and its microprocessor, based off a commercially available circuit, has been successfully programmed and has shown to be working. The matching network is still being worked on, however, the goal is to have it working by the conference. To the best of the researchers’ knowledge, this research is novel in that it is the most complicated multilayer circuit that has been built using aerosol jet printing technology. Rapid ageing tests for a silver and a CNT ink were done and analyzed to determine the reliability of an aerosol jet printed circuit board. Results show adhesion is the primary mechanism of device failure as opposed to conductor degradation.

Bio

Peter Lewis is a Masters of Science in Mechanical Engineering candidate at Tufts University in Professor Robert White’s research group. He is a Draper Fellow whose focus has been the printing of complex heterogeneous material systems for the last 2 years. His research is co-advised by Brian Smith, an engineer at Draper. As an undergraduate at Tufts university, Peter was a summer scholar and the recipient of the Trefethen award recognizing outstanding undergraduate research.