Abstract

Lack of a good system for rapid prototyping of printed circuit boards has been a major bottleneck in Senior Design at the University of Texas at Tyler. A simple method using artwork printed on toner-transfer paper and transferred through heat and pressure to copper-clad circuit-board stock had been successfully applied to simple designs but showed itself to be unsuited to the complexity of printed circuit boards developed for senior design projects. This unsuitability was due to two factors; low density (due to inability to accurately control line widths) and highly- variable results.

Alternative methods have their drawbacks. Tooling charges for commercially-produced circuit boards are expensive if only a small number of examples are to be built. Inexpensive prototype printed-circuit boards can be obtained from specialty circuit board vendors, but these vendors usually require the use of their proprietary software. Small high-speed milling machines that can cut circuit traces are available, but it is difficult to justify the expense of a dedicated circuit board mill for annual production of a few circuit boards.

An alternative being investigated by the University of Texas at Tyler is the use of a CO2 engraving laser as the principal patterning element in a system for rapid prototyping of printed circuit boards (PCBs). The engraving laser was acquired principally for research into microfluidic devices, but it appeared that it might be an effective way of patterning masks for chemical etching of copper-clad circuit board material. Efforts have so far focused on ablating a thin film of a resist material, leaving copper cladding exposed to chemical etching in the areas where the resist was ablated. Marking, scoring, and drilling with the laser have also been attempted. This paper describes the methods and accomplishments to date as well as directions for future work.