

"Integrated Optical and Electronic PCB Manufacturing"
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High Speed Digital Systems.
David R. Selviah

Abstract

In high speed digital systems the signals travel through copper track interconnections in Printed Circuit Boards (PCBs) but suffer loss, radiation, cross-talk, electromagnetic interference (EMI), and corruption limiting the maximum speed and interconnect distance so costly low loss dielectrics, pulse pre-emphasis, adaptive equalization and high levels of Forward Error Correction (FEC) must be used. This paper describes a lower cost approach using optical interconnections for the highest speed interconnects, This optical approach is scalable to large area PCBs and bit rates in excess of 10 Gb/s and makes use of multimode polymer waveguides butt coupled via dismountable, self aligning connectors to VCSEL laser and PIN photodiode arrays. The optical PCB (OPCB) 3 university and 10 company consortium, formed and led by the speaker constitutes a supply chain including waveguide modeling, OPCB layout, polymer manufacturing, OPCB manufacturing with route to exploitation in storage system, aerospace and optical sensor markets. The consortium's research is reviewed including the establishment of waveguide design rules by measurement and simulation to build into PCB layout tools enabling the easy widespread adoption of this disruptive technology. Manufacturing technologies studied for acrylate and polysiloxane waveguides include photolithography, laser ablation, laser direct write, embossing, extrusion and ink jet printing.