Abstracts

Optical Control of Microwave-Integrated Circuits Using High-Speed GaAs and Si Photoconductive Switches

S.E. Saddow and C.H. Lee. "Optical Control of Microwave-Integrated Circuits Using High-Speed GaAs and Si Photoconductive Switches." 1995 Transactions on Microwave Theory and Techniques 43.9 (Sep. 1995, Part II [T-MTT] (Special Issue on Microwave and Millimeter Wave Photonics)): 2414-2420.

An optoelectronic attenuator suitable for the optical control of microwave-integrated circuits is presented. High-speed photoconductive switches are embedded in planar microwave transmission lines fabricated on both semi-insulating GaAs and high-resistivity silicon substrates, and a fiber pigtailed semi-conductor laser diode is used to control the microwave signal level on these high-speed lines. Forty-five dB of microwave attenuation was demonstrated with a silicon coplanar waveguide-photoconductive switch, while up to 8.5 dB of attenuation was achieved with a GaAs device. In addition, the optically induced phase delay through the silicon device was observed to be as large as 180°. The microwave performance of these photoconductive devices has been fully characterized and their suitability for various optical control applications compared. So that one can optimize the laser diode/GaAs photoconductive device interaction, the GaAs device has been characterized as a function of laser photon energy, switch temperature, and applied dc electric field, and the optimum operating point has been determined through experiment.

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