Abstracts

Optically Controlled Coplanar Transmission Lines for Microwave Signal Processing

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This paper reviews optically controlled wave propagation effects in coplanar transmission lines on semiconducting substrate. Special emphasis is laid upon distributed Schottky photodiodes where a depletion layer is formed below the center conductor. The cross section is that of a InAlAs/InGaAs/InP heterostructure, where the thin InGaAs layer is optimized with respect to optical absorption leading to an optical control of phase velocity, time delay or attenuation. Experimentally, phase shifts as high as 110 deg/mm at 9 GHz using an optical power of merely 50 pW are obtained for an MBE grown sample with a suitable doping profile and for backside illumination through the transparent InP-substrate. The theoretical treatment is based upon an equivalent circuit including the optoelectronic properties under different illumination conditions. It is further shown that periodic structures can sucessfully be used as efficient phase, shifters or attenuators with optical control. This leads to interesting applications as optical MMIC's for microwave signal processing.

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