

Photo-injection p-i-n diode switch for high-power RF switching

E.W. Jacobs, D.W. Fogliatti, H. Nguyen, D.J. Albares, C.T. Chang and C.K. Sun. "Photo-injection p-i-n diode switch for high-power RF switching." 2002 Transactions on Microwave Theory and Techniques 50.2 (Feb. 2002 [T-MTT]): 413-419.

The high RF power-switching properties of the photo-injection p-i-n switch (PIPINS), an optically controlled RF switch, are investigated. Proper functioning of a PIPINS as a low insertion-loss RF switch requires that it operates as a photoconductor, where the photo-injected charge is much greater than the RF sweep out charge. Insertion loss using 650-mW optical power was <0.4 dB at RF (VHF-UHF) power in excess of 200 W, and devices successfully standoff 200-W incident RF power with the series isolation being determined by the device capacitance (e.g., 225 fF). PIPINS hot-switching measurements are reported for the first time, with output RF power up to 180 W at low duty cycle, rise times of 1 ps, and fall times for a series shunt switch of ~ 2.5 μ s. The RF power for hot switching a PIPINS is limited by a latch-on effect, which is dependent on a variety of parameters, including duty cycle and repetition period, consistent with thermally generated carriers contributing to the latch-on effect. The switching properties of PIPINS make them a candidate for high RF power applications such as reconfigurable antennas, where electromagnetic isolation of the switch and control lines are critical.

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