Abstracts

Microwave Variable Attenuators and Modulators Using PIN Diodes

J.K. Hunton and A.G. Ryals. "Microwave Variable Attenuators and Modulators Using PIN Diodes." 1962 Transactions on Microwave Theory and Techniques 10.4 (Jul. 1962 [T-MTT]): 262-273.

The PIN diode is a double diffused junction with an intrinsic layer separating the P and N regions. At frequencies above 100 Mc, the diode ceases to be a rectifier because of carrier storage and transit time effects. Its shunt capacitance is quite small because of the separation of the P and N regions by the I layer. Conductivity of the I region can be varied by a dc bias current and the device becomes an electrically variable resistor which can be used for microwave attenuators and modulators up to frequencies as high as 20 Gc. The PIN junctions are mounted on posts which are inserted in a 50-ohm strip transmission line as shunt elements, and a number of these elements, spaced a quarter wavelength apart at midband, are used to form an attenuator. At the appropriate bias current, yielding 50-ohm junction resistances, the diode elements are reactively compensated by choice of post dimensions so that they are effectively pure resistances, yielding an image attenuation of 4.2 db per element. Many elements can be used to attain any desired total attenuation and higher impedance end elements can be used to improve the SWR. Bandwidths of 4 to 1 with low SWR in both ON and OFF conditions are achievable. Maximum attenuation of 60 db, insertion loss of 1 db, and SWR of 1.5 are typical for a 12-diode attenuator and powers of the order of watts can be handled with negligible harmonic generation. When used as a pulse modulator, rise times of the order of 10 nsec are achievable.

❑ Return to main document.