

Abstracts

Spreading Resistance as a Function of Frequency

L.E. Dickens. "Spreading Resistance as a Function of Frequency." 1967 Transactions on Microwave Theory and Techniques 15.2 (Feb. 1967 [T-MTT]): 101-109.

The equivalent circuit applicable to most semiconductor diodes contains a term $R_{\text{sub s}}$ called the spreading resistance which is a very critical parameter of any diode. In a mixer diode, $R_{\text{sub s}}$ limits the conversion efficiency and increases the noise temperature. In parametric amplifiers, $R_{\text{sub s}}$ affects the overall impedance levels and determines the minimum noise figure of which the amplifier is capable. In harmonic generators it drastically affects the conversion efficiency, as it dissipates power not only at the input and output harmonic frequencies but also at every idler frequency for which current may flow through the diode. This paper details more specifically the problems encountered when high frequency operation must be evaluated. The cylindrical capacitor is examined with emphasis on the configuration which applies to the variable-capacitor diode, which is used primarily for harmonic power generation. The point-contact diode configuration is examined and the field equations are derived in terms of the oblate spheroidal coordinates. It is shown that this is the natural coordinate system for such an analysis and that the spreading resistance is quite easily derived in this system.

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