Abstracts

Tunnel-Diode Low-Level Detection

W.F. Gabriel. "Tunnel-Diode Low-Level Detection." 1967 Transactions on Microwave Theory and Techniques 15.10 (Oct. 1967 [T-MTT]): 538-553.

An analysis of tunnel-diode low-level detection is presented for the purpose of explaining some of the unusual detection characteristics that occur under certain bias conditions. For example, in the vicinity of its inflection bias point, a tunnel diode exhibits a discriminator-like rectification behavior with two sensitivity peaks. When biased at one of these peaks, the diode is capable of unusually high sensitivities, at least an order of magnitude better than the sensitivity of any other known diode. It is shown that these high sensitivities are proportional to (1 - Gamma^2), where Gamma^2 is the RF power gain of the detector viewed as a reflection-type amplifier. The resultant gain bandwidth (or sensitivity bandwidth) limitations of the detector are discussed. Unusually high sensitivities are also possible at the lower microwave frequencies when the tunnel diode is biased at its peak current point. A knowledge of the diode static characteristics, the reflection coefficient, and the video circuit permits an accurate analytical evaluation of the sensitivity performance of any tunnel diode, and calculations are carried out for an example diode and compared against measured data. The paper also contains a specific comparison of the relative sensitivity performance of the example tunnel diode versus a hot carrier diode.

❑ Return to main document.