Abstracts

Broad-Band Small-Signal Impedance Characterization of Silicon (Si) P/sup +/-N-N/sup +/ IMPATT Diodes

M. Ohtomo. "Broad-Band Small-Signal Impedance Characterization of Silicon (Si) P/sup +/-N-N/sup +/ IMPATT Diodes." 1974 Transactions on Microwave Theory and Techniques 22.7 (Jul. 1974 [T-MTT]): 709-718.

A method is described that permits a broad-band small-signal characterization of an IMPATT diode mounted in a package. From automatic-network-analyzer measurements on a package-shaped metal dummy, an empty package, and the diode under test biased below and above breakdown, the method allows first determination of a coupling-circuit parameter, bonding-wire inductance, and diode series resistance, and then evaluation of junction admittance above breakdown. Experimental results on silicon (Si) p/sup +/-n-n/sup +/ diodes over 2.5-15 GHz are shown. Nearly frequency-independent bonding-wire inductance is observed. Avalanche frequency squared (f/sub a//sub 2/) is found to be sublinear with respect to dc current density (I/sub d/), possibly due to a variation of junction temperature (T/sub i/). An experimental formIda for (f/sub a//sub 2/) / (I/sub d/) is obtained in terms of (T/sub i/).Detailed comparisons of the measured junction admittance with an existing analytical theory indicate a good agreement, if a suitable amount of saturation current is postulated, and also suggest that the estimated amount is in excess of the prebreakdown saturation current.

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