

Current-Pumped Abrupt-Junction Varactor Power-Frequency Converters

B.S. Perlman. "Current-Pumped Abrupt-Junction Varactor Power-Frequency Converters." 1965 Transactions on Microwave Theory and Techniques 13.2 (Mar. 1965 [T-MTT]): 150-161.

This paper presents equations and design curves for a noninverting frequency converter which will enable the engineer to design efficient, high-level parametric devices using abrupt-junction varactors. In addition, the excellent intermodulation characteristic and extremely wide dynamic range (in excess of 140 dB) of the parametric frequency converters enables their use immediately as low-frequency downconverters or microwave upconverters without any deterioration of other parameters, such as noise figure, in system performance. It has been shown that these abrupt-junction diode devices possess the largest known dynamic range, in addition to being relatively spurious free with respect to intermodulation products produced by the diode nonlinearity, intermodulation distortion being generated in the device due only to gain saturation. The design curves also indicate the maximum conversion efficiency possible with a given abrupt-junction diode. An inflection point for 50 per cent conversion efficiency occurs for all diodes. Any additional improvement in pump-to-sideband efficiency greater than 50 per cent gained by adjusting the diode and circuit performance, requires relatively large increases in the diode cutoff frequency and reduction in overall circuit losses. Other design curves include impedance variation with drive powers and the overall limiting output power capability for a given diode. A design example is presented to demonstrate the usefulness of the derived results and design curves. The experimental results obtained with this design have demonstrated a microwave, C band, tunable converter with almost 50 per cent conversion efficiency.

 [Return to main document.](#)