# Studies on the Technology of impatt diodes.

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## Abstract:

As telecommunication is pushing farther into the GHz radio frequency range IMPATT diodes have shown the highest power output of all microwave semiconductor devices at these frequencies. Though noisy, they are adequate for communication purposes and can be made to operate well into the waves.

The physical basis of operation of IMPATT Ts is avalanche multiplication and transit tine of carriers through de[p]letion layer of a reverse biased pn junction; giving rise to negative resistance. The device utilizes this property to generate rf power from a dc source.

A survey of available literature has shown that the IMPATT diode is basically a pn junction and has evolved into complex multiple pn junctions over the years. It has also been observed that the technology of this device matured through the 1970's, therefore it can be adapted to existing facilities after a thorough study.

This work is an attempt to make a simple diffused $p^+n$ Si structure with the necessary characteristics of a $p^+n$ IMPATT diode. Thus, having studied the device physics and technology a process for making a viable $p^+n$ IMPATT diode was proposed. A 5.0 ± 0.5 pm boron doped $p^+$ layer was diffused on n type Si following the basic steps of this process. These $p^+n$ Si structures were characterised. Those with background concentration greater than $5 \times 10^{15}$ $cm^3$ were found to posses the expected properties.

**Keywords**: Telecommunication/ communication/ IMPATT diodes/ microwave/ semiconductor/ resistance/ diffusion

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