

# NASA TECH BRIEF

## Goddard Space Flight Center



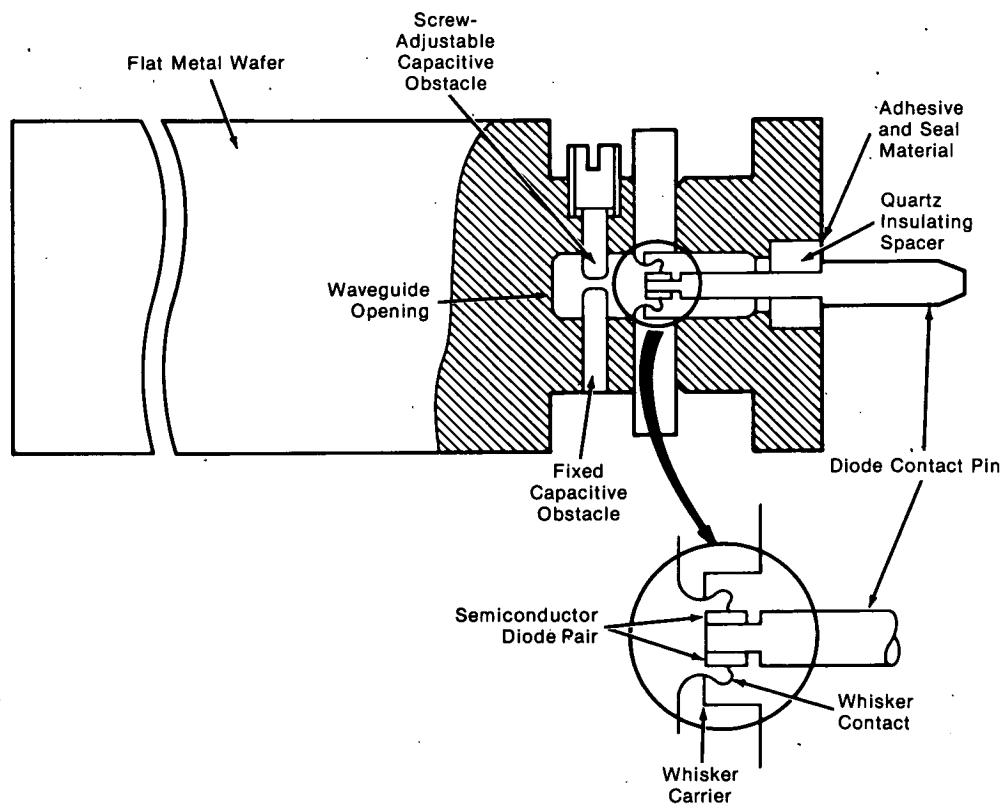
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### Varactor Diode Assembly With Low Parasitic Reactances

Parametric amplifiers have been in use for a number of years for low-noise amplification of microwave signals. They are still undergoing improvements which can yield lower noise and wider band operation.

One recent improvement is the development of the varactor diode assembly shown in the figure. It overcomes the parasitic reactances of conventional varactor packages. In this specially constructed

assembly very high idler-frequency to signal-frequency ratios are used to obtain low-noise operation over a maximum bandwidth. The idler energy is restricted to the vicinity of the metal wafer holder used for mounting a pair of semiconductor chips. The dimensions of the diode contact wires and the diode junction capacitances are such that resonant frequencies are greater than are possible with conventional diodes.



Varactor Diode Assembly

(continued overleaf)

The enlarged area of the figure shows a pair of semiconductor chips mounted on a contact pin. Contact is established through a pair of low-inductance wire whiskers that are positioned by whisker carriers. An insulating quartz spacer, which is solidly affixed by adhesive and sealer material, positions the contact pin assembly. The two diodes provide a balanced arrangement and geometrically isolate the idler and the fundamental pump energies from the signal circuit.

The idler tuner consists of the waveguide section, the fixed capacitive obstacle, and the screw-adjustable capacitive obstacle. These elements restrict the major part of the circulating idler current to the immediate vicinity of the diodes.

Each wafer has its own adjustable idler resonator; this is a key feature in the attainment of both low-noise operation and broad bandwidth. The diode is reactance matched at the signal frequency which effectively presents the negative of the average junction reactance to the junction point of the two diodes. This arrangement also efficiently couples energy to and from the diode without affecting the idler current.

**Note:**

Requests for further information may be directed to:

Technology Utilization Officer  
Goddard Space Flight Center  
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Reference: TSP75-10031

**Patent status:**

This invention has been patented by NASA (U.S. Patent No. 3,833,857). Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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