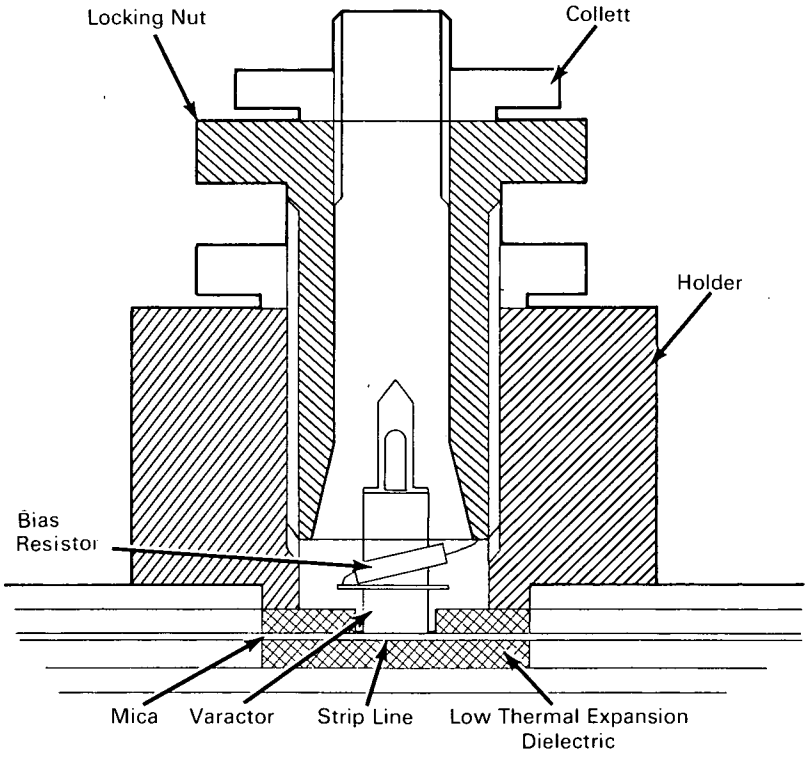
February 1969

Brief 69-10013

NASA TECH BRIEF

Device for Diode Tuning in a Stripline Varactor Harmonic Multiplier



A device has been designed that improves the performance of a stripline varactor harmonic multiplier by providing means for positioning the varactor diode with respect to the stripline circuit so that series resonance of the diode is obtained. The innovation also reduces detuning effects, due to thermal expansion, over a wide temperature range.

Previous multiplier designs for stripline circuits positioned the diode in shunt with the stripline circuit so that one diode terminal was secured to the ground plane for heat sink purposes, and the other terminal was in contact with the stripline circuit conductor. Proper positioning of the diode relative to the circuit would in general produce reasonable harmonic multiplication. However, the circuit was difficult to tune for spurious free operation, and diode repeatabilty was poor. Matching of the diode was accomplished through the use of capacitive screws, but this approach caused the circuit to have relatively narrow band characteristics and to be quite critical in operation. If the diode could be made series resonant in the circuit, then only resistive matching would be required and

(continued overleaf)

circuit performance in general would be improved.

Referring to the drawing, series resonance of the diode is accomplished by adding a small capacitance in series with the diode. This series capacitance is provided by modifying the diode package to have a larger flat surface on the end terminal facing the stripline, positioning the diode over the stripline circuit so that there is a small gap between the flat diode terminal and the stripline conductor. By inserting a thin sheet of mica insulation in this gap, capacitance is obtained between the stripline circuit and the diode end terminal. The diode is secured in a collet which is adapted to be screwed in and out of a holder mounted to the stripline board to permit adjustment, or tuning of the series capacitance. Diode bias is provided by soldering a very small resistor across the diode.

The operation of this multiplier circuit is a significant improvement over previous designs in both efficiency and spurious-free operation. In the presence of large temperature variations, however, considerable detuning of the circuit is observed. This detuning effect was found to be caused by variation of the series capacitance gap between the diode and stripline circuit due to high thermal expansion of the dielectric material supporting the stripline. This thermal expansion effect is reduced by inserting a small disk of dielectric material, having a lower thermal expansion, to support the stripline circuit beneath the diode. This construction greatly reduces the detuning effect over a very large temperature variation.

Note:

1. No additional documentation is available for this invention.
2. Technical questions may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B69-10013

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C., 20546.

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under contract to
Marshall Space Flight Center
(MFS-20153)