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A Gunn Oscillator for the 24 GHz Band

A simple, reliable Gunn oscillator for the 24 GHz amateur band is to be described to help achieve increased activity on this band. During the design, special attention has been paid to obtain a wideband, good impedance matching of the Gunn diode to the load in order to ensure that the sensitive semiconductor will not be brought into a critical, oscillation range.

For this reason, the height of the waveguide is reduced in the resonance range, although this reduces the Q of the resonator and the noise behaviour of the oscillator. However, stability has priority, especially when high performan-

ce, and thus expensive diodes are to be used. Figure 1 shows the cross-section of the Gunn oscillator; the body of the choke is shown separately in Figure 1a. The photographs given in Figures 2 and 3 show an author's prototype which was milled out of two pieces of aluminium.

An alternative type of construction can be made by using a standard waveguide material R 220 (WG 20) together with a wedge which can then be soldered into place. This wedge must be made from copper in order to ensure a good heat dissipation. Such a construction is shown in Figure 4.

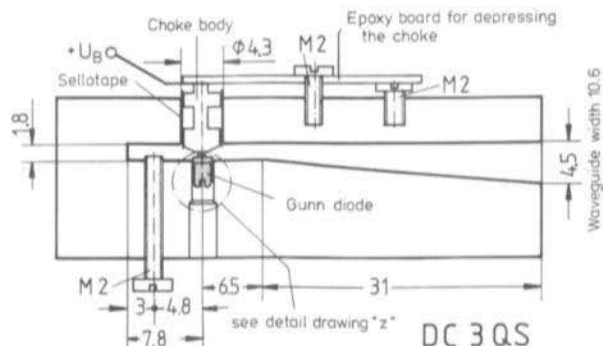


Fig. 1: Cross section of the power-Gunn oscillator for the 24 GHz band

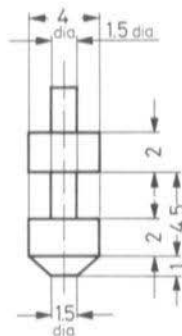


Fig. 1a: The choke of the oscillator is lathed from brass

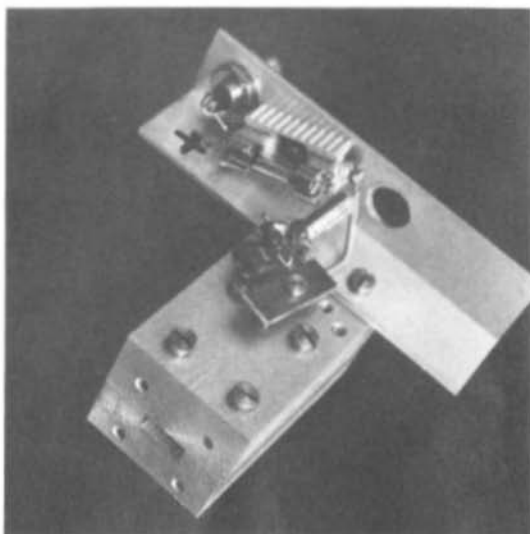


Fig. 2:
External view of the
Gunn oscillator

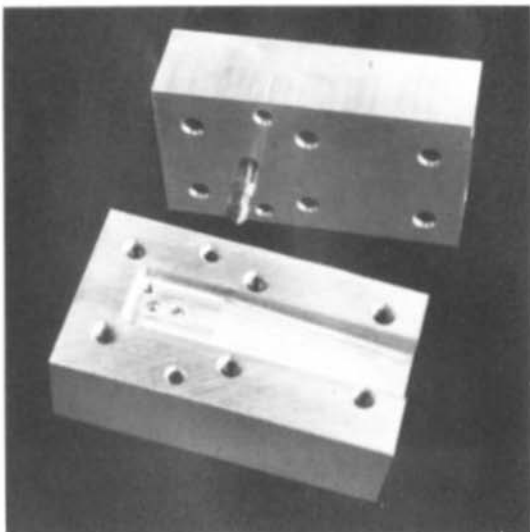
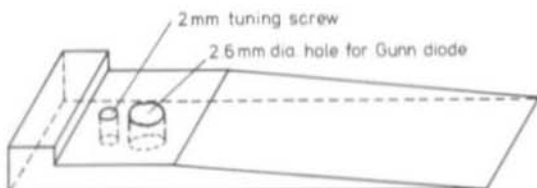


Fig. 3:
Two-piece construction
and choke constructed
as shown in Fig.1a



Solder the copper wedge into a WG 20 waveguide

Fig. 4:
Copper wedge for constructing the oscillator
shown in Fig. 1 in conjunction with a R 220
waveguide

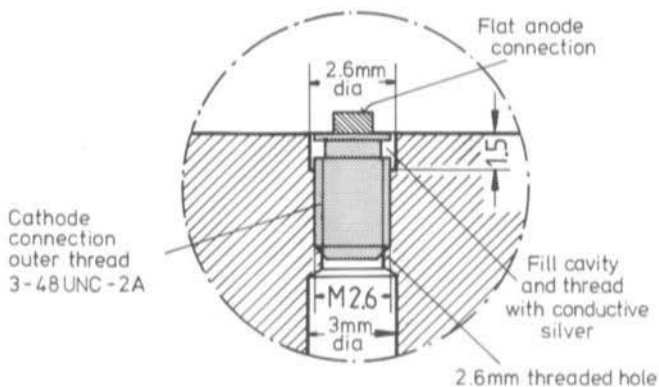


Fig. 5:
The Gunn diode can be mounted in this manner into a 2.6 mm thread, which provides a favorable solution

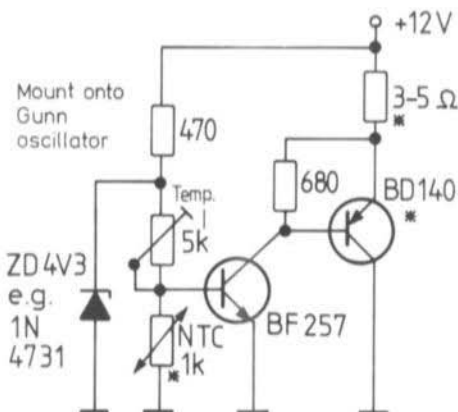


Fig. 6
Circuit for temperature-stabilization of the oscillator

As was mentioned previously, special attention has been paid to a good cooling of the Gunn diode. In the case of 100 mW diodes, the cathode connection to be cooled is provided with a thread which is designated 3-48 UNC-2A. Since such threads can usually not be cut in Europe, the author has used the method shown in **Figure 5** with success. In this case, a M 2.6 thread is cut after which the thread and all cavities up to the cathode connection are filled with a fluid conductive silver that will harden.

In order to improve the frequency stability of the oscillator, the temperature is stabilized using the circuit shown in **Figure 6**. With the

aid of trimmer potentiometer P the temperature is brought to a value above the highest ambient temperature to be expected plus the temperature increase due to the power dissipation of the Gunn diode. Due to the thermally favourable installation of the diode shown in **Figure 5**, a 100 mW Gunn oscillator has been operating at the author's location for a long period without problems both as an oscillator of a transceiver, and as a pump oscillator for a parametric preamplifier for the 5.7 GHz band.

K-band diodes of all types can be used in the described cavity oscillator. The author has tried types TEO 132 (Plessey) and GC-5610 (Frequency Sources/GHz-Division).