SOLAR-POWERED MW RADIO

This article describes a miniature medium-wave band receiver powered by a solar cell. The circuit is based on a single integrated circuit, the ZN414Z from Ferranti.

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A LTHOUGH the ZN414Z looks like an ordinary transistor in a TO-92 package (Fig. 2), the device contains quite a few things: a wide-band, three-stage amplifier with a very high input impedance, a demodulator circuit, and an automatic gain control (AGC) circuit. Its small size, high degree of integration and low power consumption make the ZN414Z eminently suited to building a miniature medium-wave band AM receiver with quite acceptable sensitivity and selectivity

The circuit

The application circuit in Fig 2 shows that the ZN414Z is followed by an audio amplifier, T1-T2, which raises the demodulated signal at pin 1 of the IC to a level suitable for driving a pair of headphones The RF signal is picked up by a small ferrite rod assembly. which in the prototype was salvaged from a medium-wave transistor radio The inductor is tuned by a 500-pF variable capacitor, C4. Since the input impedance of the ZN414Z is of the order of $4 M\Omega$, the tuned circuit is lightly loaded and thus ensures adequate selectivity. The value of R3 has been changed from the recommended value (cf Fig. 1) to achieve the proper gain Resistor R1 and diodes D1-D2 reduce the solar cell voltage to about 1 3 V for the IC Capacitor C1 acts as a buffer device The solar cell used is a 3-V type capable of supplying about 20 mA

The output signal of IC1 is fed to a darlington transistor circuit, T1-I2, via coupling capacitor C2. The loudspeaker(s) connected between the collectors and the positive terminal of the solar cell should have a minimum impedance of 50 Ω . The author used a miniature 100- Ω magnetic loudspeaker as found in modern telephone sets. High-impedance headphones as supplied with the well-known Walkman³ may also be used

Construction

The circuit is so small that it is easily built on a piece of stripboard. Clearly miniature components must be used if the receiver is to fit in, say, a matchbox. Make sure the ZN414Z is properly connected—see the pinning diagram in Fig. 2. Transistors T1-T2 can be mounted face to face. Capacitor C1 is preferably a mylar type as this is smaller than the

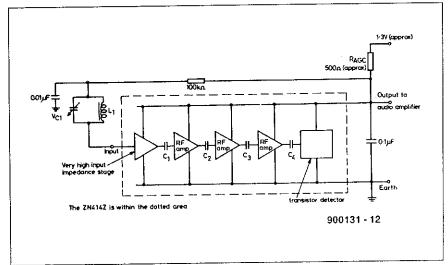


Fig 1. Block diagram of the ZN414Z MW receiver chip from Ferranti

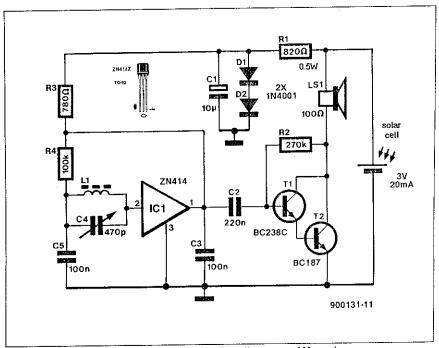


Fig 2 Circuit diagram of the solar-powered medium-wave AM receiver

more common polyester type. The final size of the receiver depends mainly on the size of the tuning capacitor. C4. The solar cell is simply glued on to one of the sides of the enclo-

sure To turn off the receiver, simply turn it over so that the solar cell lies face down or cover the solar cell

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