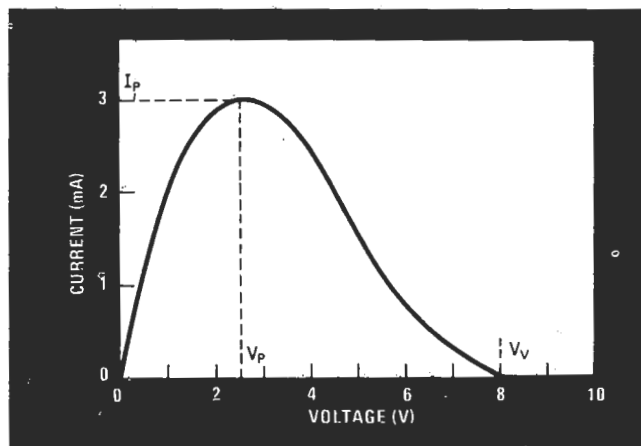


# Complementary JFETs form bimode oscillator

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A complementary pair of junction field-effect transistors can be interconnected to form a negative-resistance two-terminal device, which makes a simple oscillator. In monolithic form this configuration is called a lambda diode [*Electronics*, June 26, p. 105] and is available with a wide range of characteristics. If two discrete JFETs are connected to make the diode, they do not have to be matched, but can be chosen to provide various values of peak current and negative-resistance-voltage range. Figure 1 shows current as a function of voltage for a combination consisting of an n-channel 2N3819 and a p-channel 2N5460.

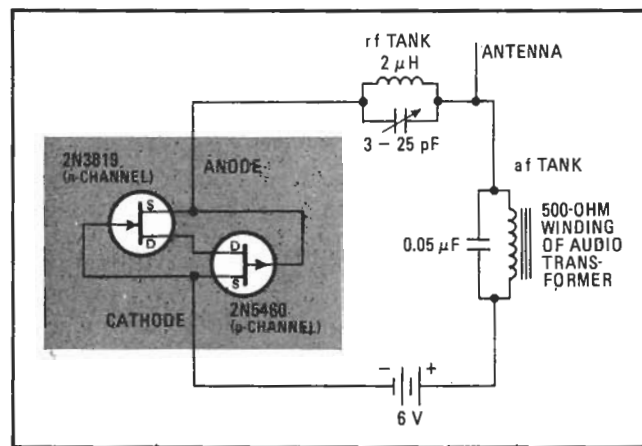
The JFET "diode" can be made to oscillate at frequencies ranging from audio to vhf. All that is required is to connect the diode in series with an inductance-capacitance tank circuit and supply a bias voltage in the negative-resistance region. Figure 2 shows a simple bimode oscillator circuit capable of oscillating at both



**1. Negative resistance.** Current-voltage characteristics are shown for a "diode" consisting of the arrangement of the two complementary JFETs shown in Fig. 2. For any terminal voltage between 2.5 V and 8 V, the combination has a negative resistance.

audio and radio frequencies simultaneously. Oscillation is at approximately the natural resonances of each tank circuit. The radio-frequency tank, consisting of a 2-microhenry choke shunted by a trimmer capacitor, can be tuned over a wide range centered near 20 megahertz. The audio section uses the 500-ohm winding of a miniature audio output transformer and a 0.05-microfarad ceramic capacitor for oscillation at approximately 440 hertz. The audio section cleanly amplitude-modulates the rf section, as demonstrated by reception of the radiated signal on a communications receiver. Power output is in the order of 25 milliwatts and the signal has a range of several hundred feet with no antenna on the oscillator. The range can be extended to several thousand feet with a short length of antenna, so a form of this oscillator can be adapted to radio-control applications.

This circuit can be used as a simple signal source for many experimental purposes. The audio section can be eliminated or shorted out if an unmodulated signal is desired. The circuit can also be adapted to any design requiring a low-level signal source. Variable frequency control can be incorporated at either or both frequency levels. □



**2. Bimode oscillator.** JFET-combination "diode" and two tank circuits can oscillate at audio frequency and radio frequency simultaneously. Resultant signal is rf modulated by af; either component can be varied for communications or control applications.