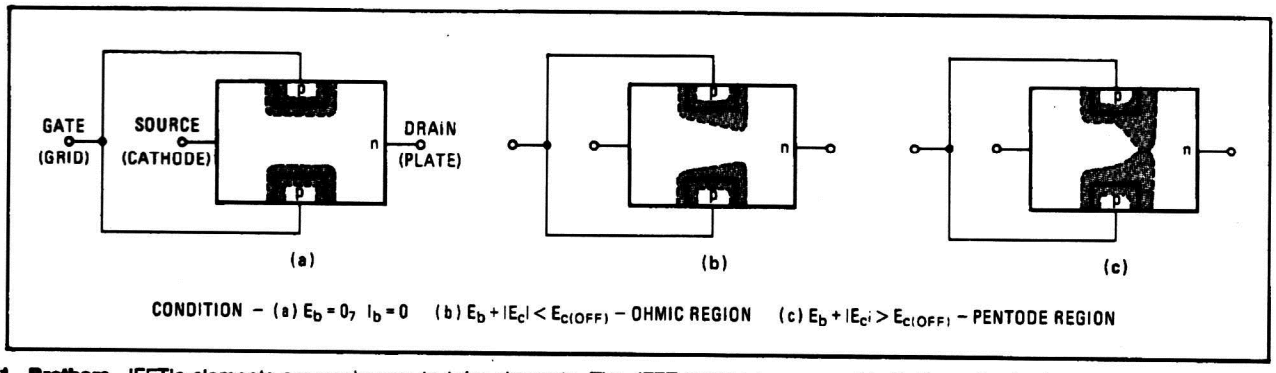


1. Brothers. JFET's elements are analogous to tube elements. The JFET source is comparable to the cathode, its drain to the plate, and gates to the grid. As the grid (plate) voltage goes negative, plate (drain) current drops. The gate's p-regions, growing into the channel, causes pinchoff, which is analogous to tube's cutoff.

telephone system's 50 million 6AK5 and 12AT7 tubes alone is estimated to be $500 million a year. Less than half that amount would be required to replace all these tubes with Fetrons once and for all. Then there are probably another 70 million pentode and triode tubes in use in other equipment that is regularly maintained and regularly tuned—from mobile radios to various types of industrial equipment. The potential market grows toward a billion dollars, without even considering consumer equipment.

Viva la similarity

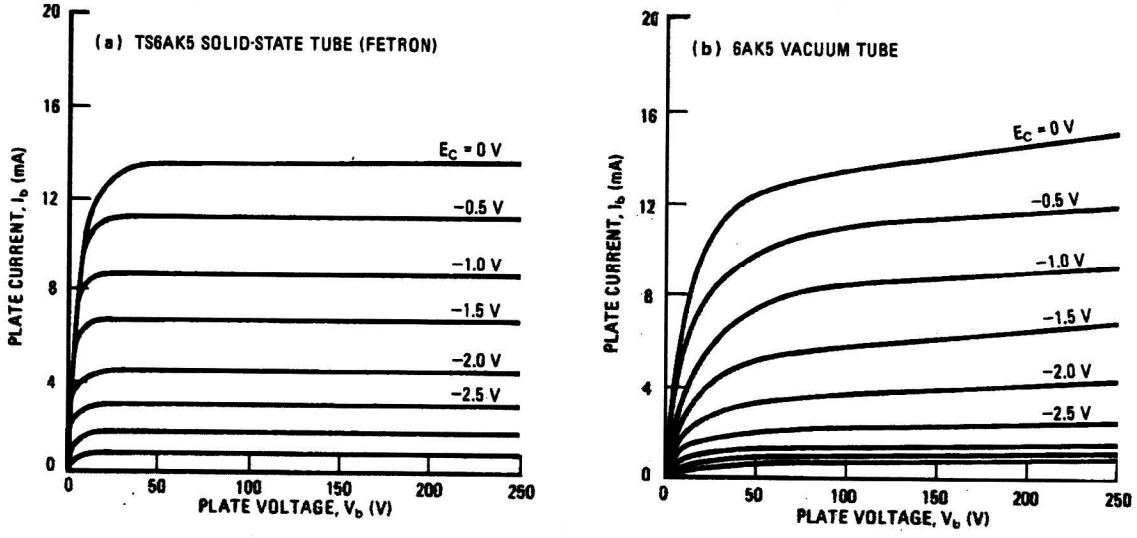
What makes the Fetron so attractive is that the JFET characteristics can be simply chosen to simulate a tube's dynamic performance. The circuit's normal trimmer components are used for high frequency tuning.

Basically, and very conveniently, a vacuum tube pentode and a JFET are brothers under the skin. Both are voltage-controlled devices and, if the differences between tube and transistor terminologies are ignored, both can be designed by using the same equations. Indeed, the operating polarities of n-channel JFETs and pentodes are identical, and they have similar output characteristics. If the JFET's drain and gate voltage are varied, the resultant family of curves will look just like the old familiar pentode plate-voltage-versus-plate-current curves at different values of control-grid voltage.

Even the current-control mechanisms of the two devices are analogous. In a tube, the grid voltage controls the number of electrons emitted from the cathode that reach the plate. In the JFET, the gate potential modulates conduction in a channel that exists between source and drain, as is shown in Fig. 1. The top and bottom gates of the JFET are comparable to the grid of the tube, its source is comparable to the tube's cathode, and its drain is comparable to the tube's plate. As the gate (grid) voltage goes negative, drain (plate) current drops because the gate (grid) p-regions grow into the n-channel region until they eventually pinch off the channel. This pinchoff is analogous to tube cutoff.

Again, the output characteristics of JFET and pentode are very similar, as can be seen in Fig. 2. But since the JFET has no elements comparable to the pentode's screen grid and suppressor grid, it is closer to the simpler triode in construction.

Since a JFET doesn't need a heater, warmup is instantaneous. Also, because of its lower inter-electrode capacitance and low channel resistivity, it can operate at



2. Equal but better. The JFET's output characteristics, although similar to those of a pentode, follow the square law more closely, and give a much cleaner on-off action, as is evident from the sharp cutoff.