

December 1972

B72-10236



# AEC-NASA TECH BRIEF



AEC-NASA Tech Briefs announce new technology derived from the research and development program of the U.S. AEC or from AEC-NASA interagency efforts. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

## Electronic Switching Circuit Uses Complementary Non-Linear Components

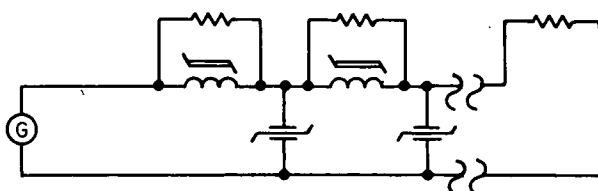


Figure 1

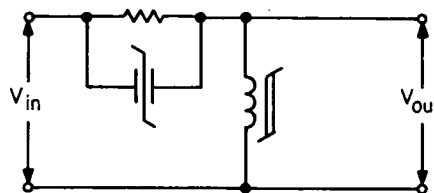


Figure 3

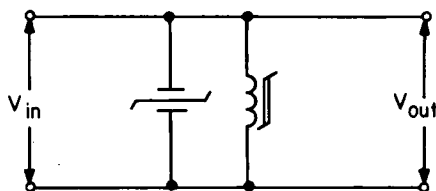


Figure 2

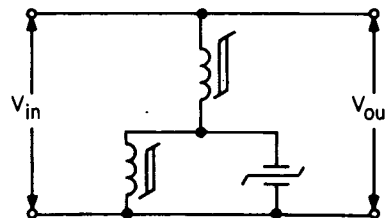


Figure 4

The inherent switching properties of saturable inductors and storage diodes are combined to perform a large variety of electronic functions, such as pulse shaping, gating and multiplexing. These passive elements replace active switching devices in the generation of complex waveforms.

Saturable inductors conduct with very low impedance in the saturated state, but have a very high impedance in the unsaturated state. When voltage is applied across the windings of the core, no current will pass until the core saturates. Thus, the inductor acts as a switch which closes in a specific (characteristic) time after a voltage is applied across it. The characteristic time of a saturable inductor is the time it takes to saturate the core at a particular voltage level.

A semiconductor storage diode stores a charge in the junction while conducting in the forward direction

and continues to conduct until current flow initiated in reverse direction depletes the charge. The storage diode acts as a switch which opens in a specific (characteristic) time after reverse current flow is initiated. The characteristic time of a storage diode is the time it takes to deplete the stored charge at a particular current flow level.

Figure 1 illustrates a multiplexing circuit with saturable inductors and storage diodes in paired modular units forming a ladder circuit with one channel per unit. The diodes are connected to operate in the reverse mode only upon application of a voltage pulse. In actual practice, additional circuitry may be required to restore the charge in the junctions of the diodes after they switch.

Figures 2, 3 and 4 are schematics of a gate circuit, a pulse shaping circuit and pulse interrupting circuit, respectively.

(continued overleaf)

This technique may be useful in low cost pulse or waveform manipulation systems for data transmission applications. It may be of interest to designers and manufacturers of communications systems and components.

**Note:**

Requests for further information may be directed to:

Mr. Glenn K. Ellis  
Technology Utilization Officer  
Office of Information Services  
U.S. Atomic Energy Commission  
Washington, D.C. 20545  
Reference: TSP72-10236

**Patent status:**

Inquiries about obtaining rights for commercial use of this information may be made to:

Mr. George H. Lee, Chief  
Chicago Patent Group  
U.S. Atomic Energy Commission  
Chicago Operations Office  
9800 South Cass Avenue  
Argonne, Illinois 60439

Source: O. S. Zucker  
Lawrence Radiation Laboratory  
under contract to  
Atomic Energy Commission  
(AEC-10060)