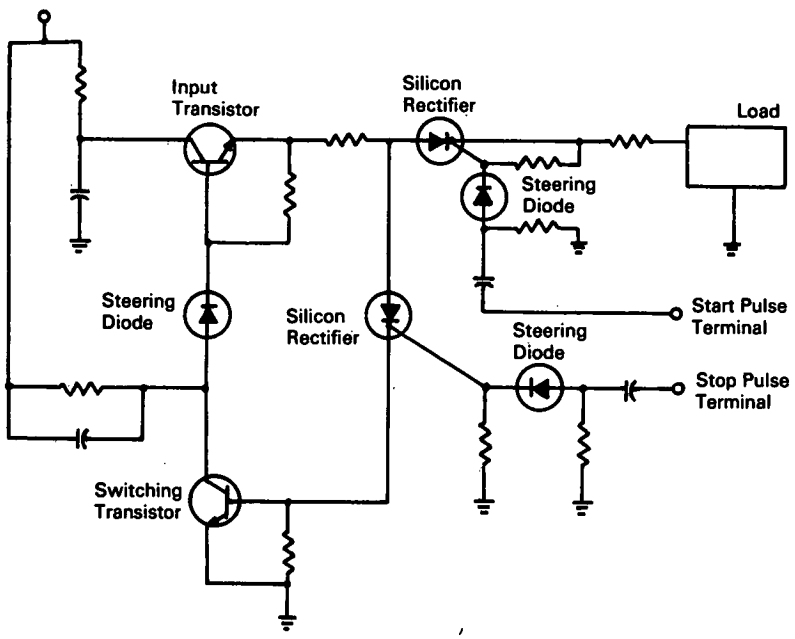
NASA TECH BRIEF

Pulse Generator Using Transistors and Silicon Controlled Rectifiers Produces High Current Pulses With Fast Rise and Fall Times



The problem:

To develop an electrical pulse generator utilizing power transistors and silicon controlled rectifiers for producing a high current pulse having fast rise and fall times. While the power transistor may exhibit rapid turn-on and low saturation impedance when driven into saturation, its use as a fast switch has been severely limited due to its turn-off time and storage time effects. Further, the silicon controlled rectifier (SCR), which may be easily turned on, is difficult to turn off. The two techniques for turning off the SCR are to reduce the anode current to a value below the holding current, or to drive the anode voltage below that of the cathode.

The solution:

An electrical pulse generator in which power transistors and silicon controlled rectifiers are used, and at quiescent conditions, the standby power consumption of the circuit is equal to zero.

How it's done:

The electrical pulse generator contains a storage capacitor which upon application of a pulse to the start pulse terminal is discharged into a load through an input transistor, the first silicon controlled rectifier, and a pair of resistors. Upon application of a pulse to the stop pulse terminal, the second silicon controlled rectifier is turned on causing the load current to be

(continued overleaf)

diverted through it, and also causing the switching transistor to be turned on. When the switching transistor turns on, the input transistor is turned off. Shortly thereafter the first and second silicon controlled rectifiers are turned off and finally the switching transistor is turned off. The cycle is repeated upon application of the next pulse to the start pulse terminal.

Notes:

1. In a typical application, the pulse on time (start pulse time to stop pulse time) and the circuit storage time represent a small fraction of the interpulse period (start pulse time to start pulse time). The storage capacitor under these conditions suffers negligible discharge permitting an average current to peak current ratio, which approaches the duty cycle ratio. In this manner, high pulse currents can be generated with high circuit efficiency. It should be noted that the pulse on time is determined by the turn on characteristics of the circuit elements employed, thus resulting in both fast rise and fall times for the output pulse.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B66-10456

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: Martin G. Woolfson
of Westinghouse Electric Corporation
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