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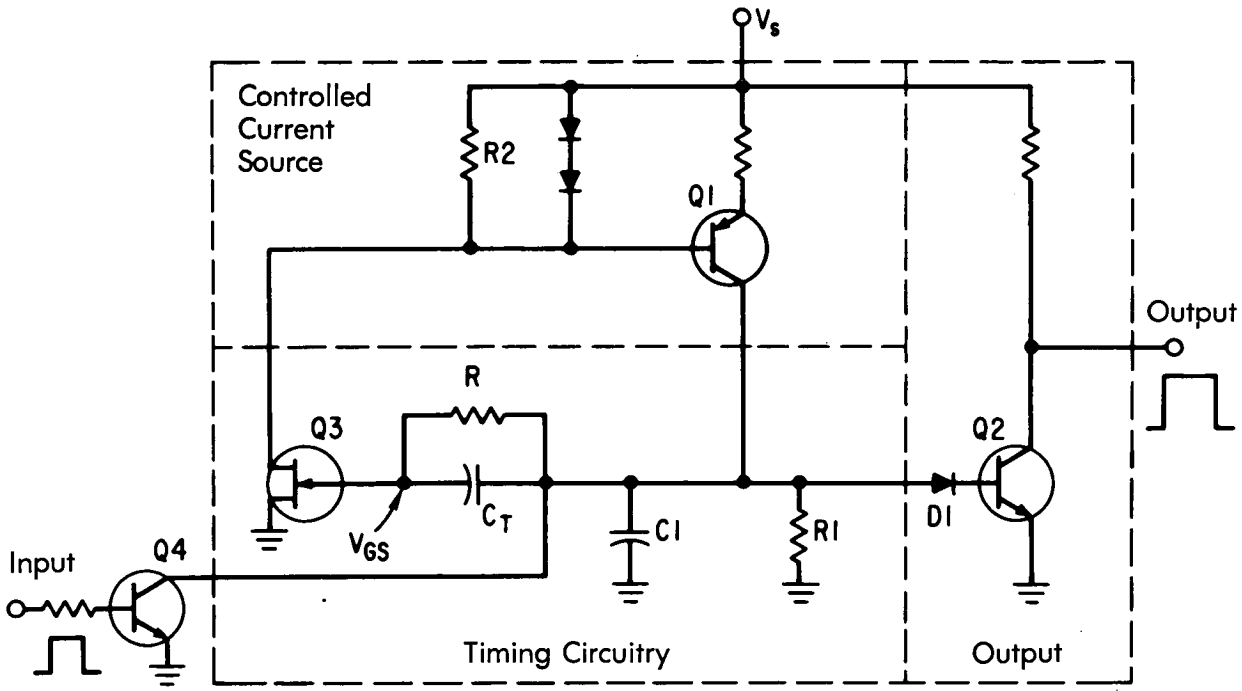
NASA TECH BRIEF

Ames Research Center

High Noise Immunity One Shot



The problem:

In their usual configurations, multivibrators which deliver pulses of duration longer than a second contain R-C timing components which allow power supply fluctuations to pass through and act as triggers. For certain applications, it is desirable to have a multivibrator that produces output pulses of long duration but is not triggered by transients in the supply lines.

The solution:

A one-shot multivibrator circuit which includes a constant current source to isolate line noise from the timing circuitry, and a field-effect transistor to control the circuit's operational modes.

How it's done:

The constant current source, transistor Q1 in the schematic diagram, supplies current to transistor Q2 and resistor R1. The voltage across R1 is fixed by diode D1 and the V_{BE} drop of Q2. Transistor Q3 is a low pinch-off FET, and is normally conducting (V_{GS} = +0.4 volt) to keep the current source on. When a positive trigger pulse arrives at the input of Q4, V_{GS} is driven negative approximately to −1.0 volt and the FET is nonconducting. Q1 is thus turned

(continued overleaf)

off, and this turns off Q2. Resistor R1 holds the timing line at low potential while Q1 is nonconducting. When V_{GS} of the FET reaches about −0.3 volt due to the discharge of C_T, Q3 conducts and turns on the current source. The circuit is now back in its steady-state condition, ready for another trigger pulse.

Capacitor C1 is needed to prevent misfiring from high-frequency noise spikes on the supply line. A value of 0.01 μf is sufficient for most purposes; R_T should be much larger than R1 for proper operation. A minimum value for R_T is around 10K. Because of this limitation, the one shot is not capable of short-duration pulses (less than 50 μsec).

Reference:

Schaffer, G. L.: High Noise Immunity One Shot. EEE Magazine, vol. 17, page 126, March 1969.

Notes:

1. The circuit has a high immunity to supply line noise; for example, with a supply voltage of 15 volts, supply voltage spikes of ±12 volts will not cause misfire.
2. For the circuit shown, the supply voltage may vary from 4 to 40 volts. This wide variation in supply voltage causes only a 10% change in the timing period.
3. If R_T = 10M, and C_T = 330 μf, a timing period of about 1 hour is obtained.
4. Requests for further information may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: B72-10047

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,584,311) and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to:

Patent Counsel
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