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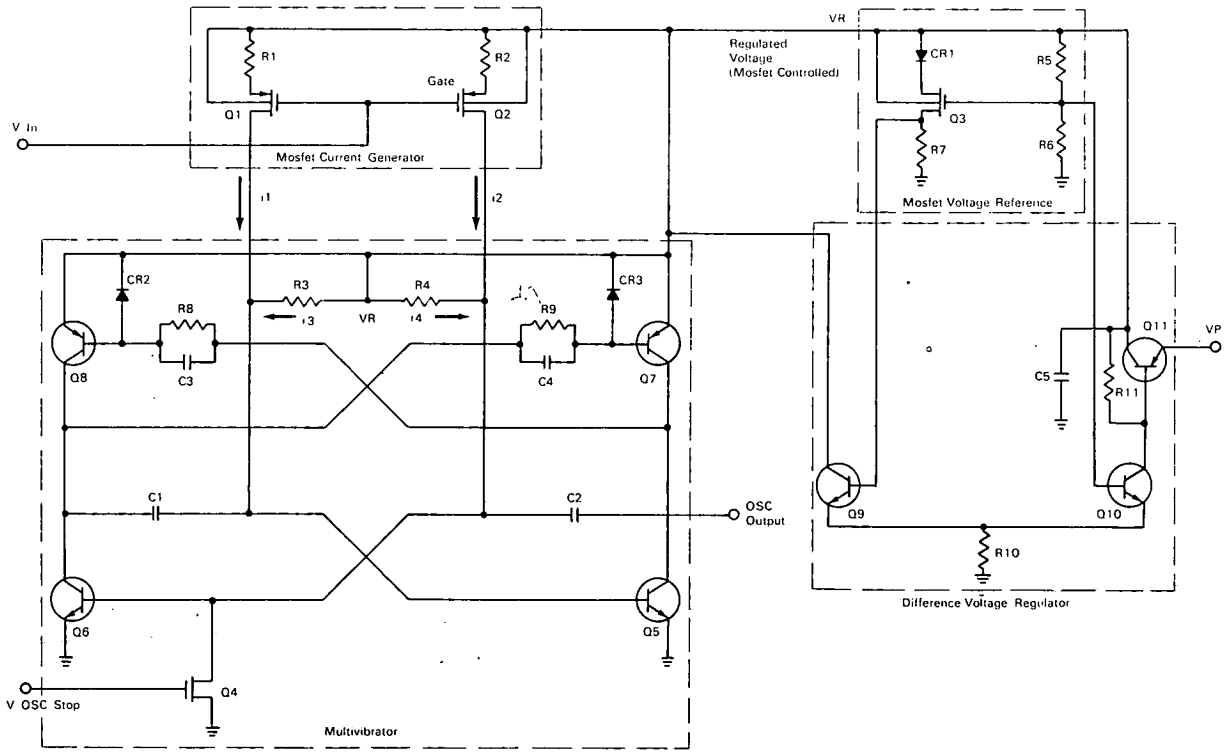
NASA TECH BRIEF

Linear Voltage-to-Frequency Converter



Voltage To Frequency Converter Using Mosfet Devices

A voltage-to-frequency converter has been designed with properties of ultra-high input impedance and linear response. Potential circuit applications are quite broad and would generally include use in analog to digital data conversion systems.

The problem:

Voltage sensitive magnetic-core oscillators have previously been used to provide voltage-to-frequency conversion for 8 bit 20 ms samples. But, inherent non-linearities of response and required temperature compensation, in addition to a limited frequency range have proved to be limitations with no simple solutions for their circumvention when 8 bit 5 ms sampling is now required.

The solution:

A high input impedance voltage-to-current converter using MOSFET devices, combined with a complementary multivibrator, has been designed with ultra-linear voltage-to-frequency characteristics from 6 kHz

(continued overleaf)

to 46 kHz. Temperature compensation has been provided from −35°C to +85°C by counterbalancing the V/F convertor changes with corrective changes in the regulator supply voltage.

How it's done:

The MOSFET Current Generator produces currents $i_1 + i_2$ with $i_3 + i_4$ which determine the frequency produced by the multivibrator. The regulated voltage V_r varies in proportion to the gate threshold voltage of Q_1 and Q_2; changes in the gate-source voltage must be compensated by equivalent changes in the regulated supply. The MOSFET Voltage Reference accomplishes this by using a conventional difference amplifier, voltage regulator composed of Q_3, Q_9, Q_{10} and Q_{11}. The regulator is able to control the voltage supplied to the analog oscillator and varies as a function of temperature in the same manner as the MOSFETS within the oscillator.

Note:

Documentation is available from:

Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: TSP69-10220

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: Donald C. Lokerson
Goddard Space Flight Center
(GSC-10546)