



## TECHNOLOGY SOLUTION

### Electrical and Electronics



# Gated Chopper Integrator (GCI)

A variable gain, low offset, low noise chopper amplifier for amplifying microvolt level signals.

#### BENEFITS

- Lower cost variable amplification
- High accuracy

NASA's Goddard Space Flight Center has developed an innovative technique for amplification of microvolt level signals requires gains of at least a thousand. Offsets and noise in the amplifier chain will be amplified by the same amount which can saturate the amplifier or swamp the signal so that it is not resolvable. Other methods use chopping and/or autozero techniques to lower the offset and noise. The key disadvantages of these methods are they require filters before and/or after demodulation of the amplified signal and delay equalization to account for the delay through the amplifier(s) prior to the demodulator. The gain of these circuits is generally limited to fixed values determined by resistors. These methods are also susceptible to transient noise associated with the switching action of the modulator.



## THE TECHNOLOGY

The gated chopper integrators function is to amplify low level signals without introducing excessive offset and noise and to do this with accurate and variable gain. The unique feature of the technology is the inherent demodulation present in the integrator which eliminates the need for filtering and allows the user to accurately vary the gain in finely graduated steps. The reduction of the offset of the amplifier is very efficient and lends itself to radiation hardened by design implementations. Since total dose can change the offset due to varying threshold voltages of CMOS transistors, the circuit adapts and compensates for any variations. The autozero integrator also adapts to its own varying offsets. The net outcome is variable, accurate gain that is very robust to supply variations, radiation effects and aging.

The technology was developed as a multi-channel thermopile signal processor. Lab measurements indicate very accurate amplification with low offset and noise.

## APPLICATIONS

The technology has several potential applications:

- Medical
- Scientific
- Industrial
- Space

## PUBLICATIONS

Patent No: 9985594

## More Information

National Aeronautics and Space Administration

**Agency Licensing Concierge**

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