

Load Characteristics of Improved Howland Current Pump for Bio-Impedance Measurement

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Abstract : The Howland current pump is widely used in bio-impedance measurement. Much attention has been focused on the output impedance of the Howland circuit. Here we focus on the maximum load of the Howland source and discuss the relationship between the circuit parameters at maximum load. We conclude that the signal input terminal of the feedback resistor should be as large as possible, but that the current-limiting resistor should be smaller. The op-amp saturation voltage should also be high. The bandwidth of the circuit is proportional to the bandwidth of the op-amp. The Howland current pump was simulated using multisim12. When the AD8066AR was selected as the op-amp, the maximum load was 11.5 k Ω , and the Howland current pump had a stable output i_{pp} to 2mA $_p$ up to 200 kHz. However, with an OPA847 op-amp and a load of 6.3 k Ω , the output current was also stable, and the frequency was as high as 3 MHz.

Keywords : bio-impedance, improved Howland current pump, load characteristics, bioengineering

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