MEMS Based Conductivity-Temperature-Depth Sensor for Harsh Oceanic Environment

Researchers at the University of South Florida have developed a digitally controlled wide range pulse width modulator for on-chip power supplies. The invention consists of a header circuit that enables dynamic control of a pulse width of a switching signal, and a duty cycle that can vary between 50% and 90%.

In recent years, significant attention has been devoted to reducing the energy consumption of electronic devices. In particular, mobile devices require low energy consumption to extend battery life, and satisfy the demands of modern consumers.

One technique for reducing energy consumption of electronic devices is to of increasing the efficiency of power supplies measuring ocean parameters such as pressure/mixed layer depth, salinity and temperature as they critically influence the physical, chemical and biological processes in the ocean. These processes range from changing strengths of ocean currents to coral growth to global warming.

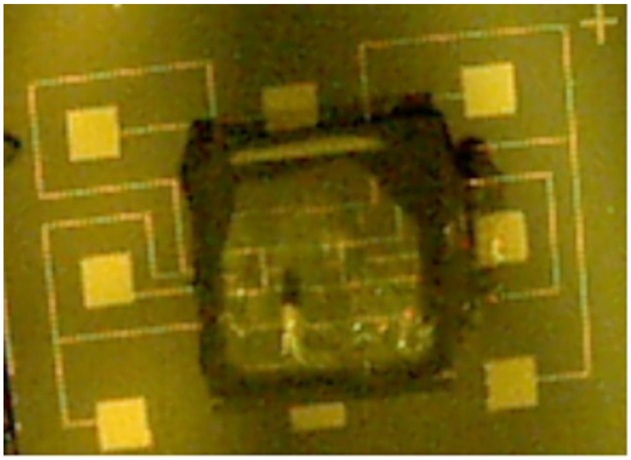
Historically marine researchers have been unable to measure ocean parameters continuously throughout large volumes of sea-space and over large time spans. The accepted methods for measuring ocean parameters usually involve research vessels, Autonomous Underwater Vehicles (AUV) or Remote Operated Vehicles (ROV), which can only sense local environmental variables at a single point in space-time. The use of multiple vehicles improves measurement quality; however, the gain from higher spatial sampling frequency is directly related to the number of additional vessels used, which adds to costs.

Our inventors have created a MEMS sensing device that has the ability to inexpensively meet the afore mentioned needs of marine researchers. The device consists of a gold doped temperature sensor, a capacitive based conductivity sensor, and a piezoresistive pressure/depth sensor. These devices have the ability to operate in sea depths up to 500m and possess an output resolution better than 1%.

ADVANTAGES:

- **3 sensors built into one all-silicon MEMS based CTD system.**
- **Can be used in deep waters, up to 500m.**
- **Resolution found to be better than 1%.**

Duty cycle can vary between 50% & 90%



The above schematic is a picture of the final packaged multiple diaphragm piezoresistive pressure sensor. The final silicon MEMS sensor created by our inventors consists of a gold doped temperature sensor, a capacitive based conductivity sensor, and the above pictured piezoresistive pressure/depth sensor.

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