Members' Profiles

Fuji Electric Systems Co., Ltd.

1. MEMS Projects at Fuji Electric Systems

For more than 20 years, Fuji Electric Systems has used MEMS technology to produce semiconductor pressure sensors for industrial instrumentation and has manufactured numerous MEMS devices during that time. These projects are made distinctive through use of our core technologies in deep silicon etching and bonding.

We have also recently applied these core technologies toward developing a MEMS foundry service at our Tokyo plant in Hino. The plant is equipped with a clean room approximately 1,500 m^2 in floor area that is being used for the development, trial production, and mass production of MEMS devices through integrated process steps from photolithography to film formation, etching, and bare chip mounting.

Photo 1 The clean room in Hino

2. Pressure Sensors

In semiconductor pressure sensors utilizing electrostatic capacitance, the sensing element is configured of a silicon diaphragm formed by deep etching. The shape of the diaphragm is optimally designed to achieve excellent precision and reliability. The electrode spacing that determines electrostatic capacity is produced through silicon micromachining and bonding technologies controlled with high precision. We have been shipping pressure sensors manufactured with these technologies for more than 20 years and are currently developing even smaller and more sophisticated sensors.

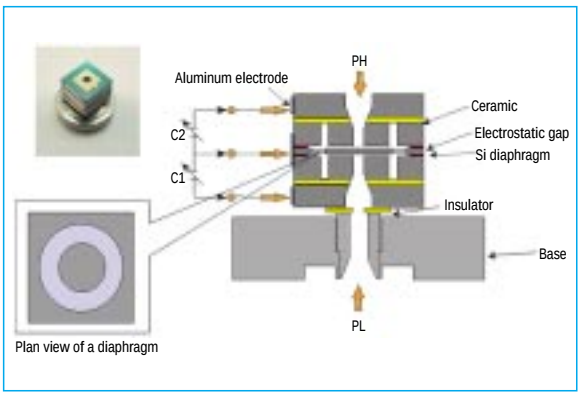

Fig. 1 Cross-sectional view of a pressure sensor

3. Inkjet Heads

Since developing an inkjet recording head for image recorders, Fuji Electric has continued to expand applications for the recording head in commercial and industrial equipment. In our Kaiser on-demand recording head employing piezoelectric elements, ink channels are formed in the head by deep etching a silicon wafer and anodically bonding the wafer to glass. We have also recently begun applying elemental technologies from these products for the trial production of μTAS chips and the like used in chemical and biological fields.

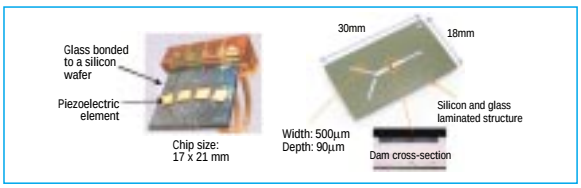

Photo 2 Recording head (left), μTAS chip (right)

4. Intelligent Micro Modules

Through the application of MEMS, Fuji Electric has developed a high-density miniature module known as the Intelligent Micro Module (IMM). The IMM is produced by mounting electronic parts, sensors, or the like on a silicon interposer having built-in passive elements, such as resistors and capacitors. By manufacturing the interposers with MEMS technology and equipment, the IMM is suited to small-scale production of a few thousand. Further, mounting silicon sensors or the like on the interposer not only helps to produce a smaller sensor module, but also contributes to an enhanced performance of the module. Fuji Electric has used this IMM technology to develop such products as temperature gauges and medical instruments. Future plans call for expanding the applications of IMMs for sensors and other MEMS devices and developing IMMs suited to high-frequency circuits.

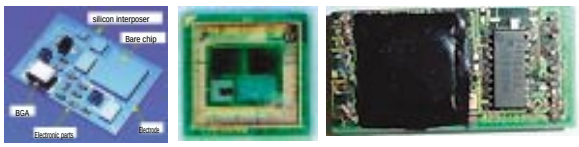

Photo 3 Greater functionality achieved through IMM

5. In Conclusion

By developing the MEMS devices described above and providing MEMS foundry services, we are striving to enhance the added value of new products for our customers. We will continually work toward advances in MEMS in the hope that you, the customer, will have many opportunities to take advantage of this distinctive technology.

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