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MEMS at Bosch – Products and their hardware and process technology demands

Andrea Urban

Robert Bosch GmbH, Reutlingen, Germany

Andrea.Urban@de.bosch.com

Micro Electro Mechanical Systems (MEMS) at Bosch look back on more than 25 years of development and production. MEMS elements are small mechanical systems, acting either as sensors or as actuators. From the historical point of view MEMS manufacturing technology started based on the established silicon semiconductor process technology. In contrast to semiconductor components, MEMS sensors and actuators are 3-dimensional movable elements. This required the development of additional, new and application specific manufacturing technologies besides typical semiconductor processes. Nowadays, some of these specific processes are MEMS key manufacturing technologies. Silicon Deep Reactive Ion Etching (DRIE), also known as the „Bosch Process“, is one of the worldwide established MEMS key manufacturing processes on the market. The starting point of this plasma trench etch process for silicon dates back to the development in the early 90's at Bosch corporate research on a prototype equipment. With the „Bosch Process“ 3-D structures in silicon can be etched with high etch rates and aspect ratios at high mask selectivity and without restrictions in crystal orientation. It was an enabler for a large variety of interesting bulk and surface micro machined MEMS applications helpful in our daily life. Throughout the years, a wide base of equipment suppliers for MEMS key manufacturing processes and tools established on the market. MEMS provides low-cost mass products like microphones, micro mirrors, pressure and inertial sensors for automotive and consumer applications. New applications like e.g. autonomous driving or virtual reality require inertial sensors with higher sensitivity and resolution. A close co-operation between equipment suppliers and MEMS manufacturers helps to enhance equipment hardware and processes and MEMS products in parallel, in order to fulfil enhanced MEMS product requirements for the future.

Keywords

MEMS

Plasma Etching

Trench

Bosch Process