Nanomotion: Clean, Stable 1nm Motion Systems

Every organization, laboratory, and research center that studies and implements semiconductor technology would need a device with the tiniest transistors. Smaller transistors are power-efficient, don't heat much on extensive use, and amount to faster calculations by an IC. As a result, we are now in an era where 1nm processors are becoming the go-to technology for almost every semiconductor organization. However, developing such systems still has not become commonplace yet. The reason is the hard-to-achieve stability of the device when it comes to variations that occur during its synthesis. As the size of the semiconductor

Alan Feinstein, Vice President

decreases, many undesired variations can occur in their properties like optical, catalytic, or thermal variations. Such changes can exponentially affect the device manufacturing process, making it even harder to create a semiconductor device that exhibits the desired property.

Another issue that makes synthesizing such devices even harder is the cleanliness of the equipment. Cleanliness in terms of semiconductor manufacturing refers to the removal of organic contaminants from the wafers during synthesis. Unfortunately, with the decreasing size of the IC, the requirements for achieving a certain level of immaculateness increase exponentially. Consequently, the material selection process, baking components in the vacuum oven, and other semiconductor manufacturing processes become that much more challenging. Hence, only a few companies can develop a clean, stable 1nm device to enrich their client business operation. Nanomotion is one such organization.

> What makes our motion systems unique is the ability to bridge ultra-high resolution and stability with the ability to achieve unlimited travel

Founded in 1992, Nanomotion develops motors and motion systems based on the Ultrasonic Stand

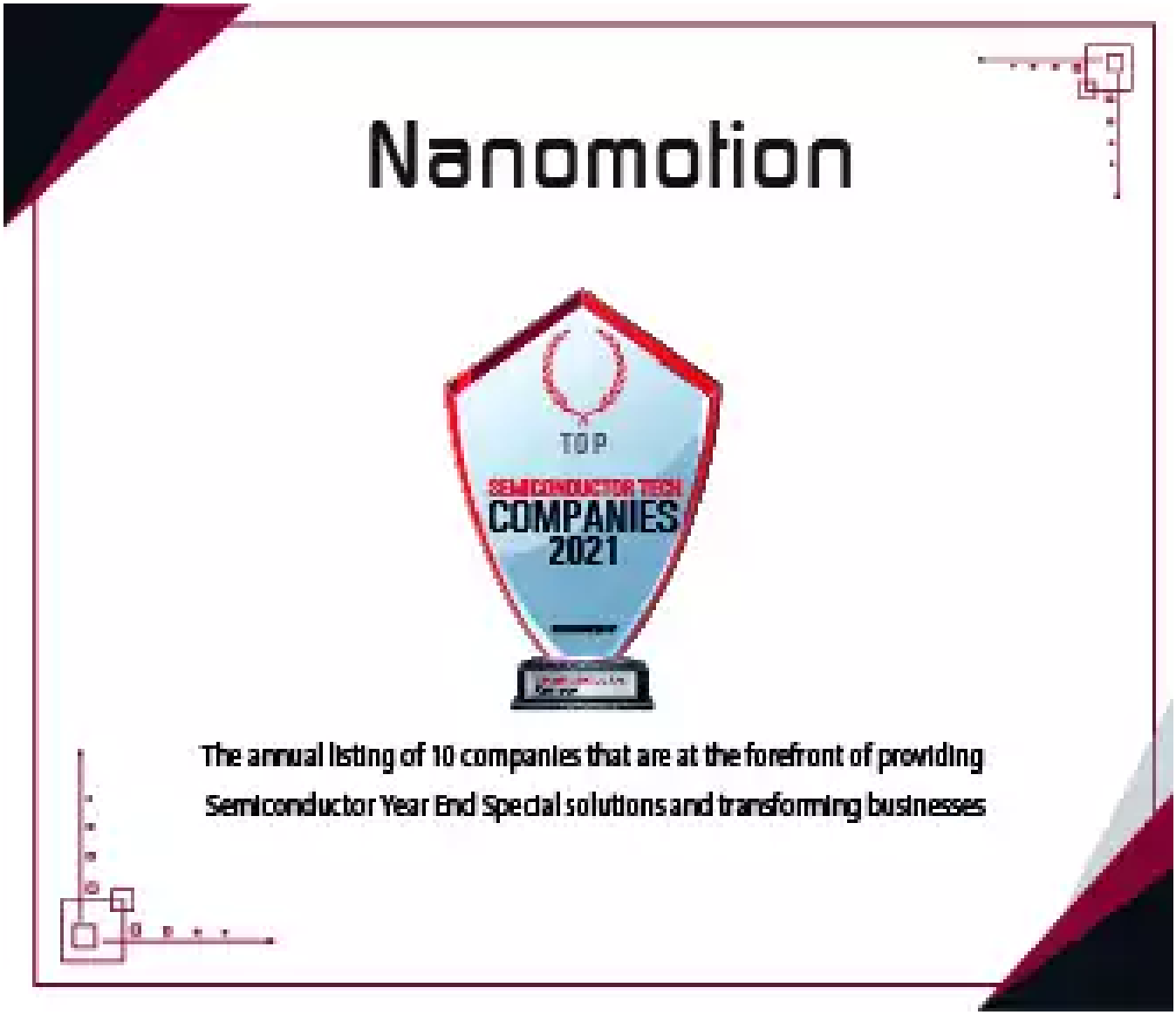
Wave principle of Piezoelectric materials. Johnson Electric, one of the world's largest providers of motion products, acquired the company in 2005. Nanomotion's focus is on designing and manufacturing OEM stage solutions for major tool builders like Applied Materials, KLA, Lam Research, ASML, etc.

The company's motors can drive systems up to 500 millimeters per second for near unlimited travel. What makes its motion systems so unique is that the motor can work as a high resolution piezo actuator in addition to having unlimited travel. This means they can move at high speeds and drive the primary device at higher system performance modes without adding extra brakes or other components.

Nanomotion's motion devices work in both AC mode which generates standing waves for high speed operation and in DC mode, where it can work as a piezo actuator, positioning in the sub-nanometer level. Along with the two modes, a motion axis can also have an additional third mode where they can counteract and stabilize the unwanted vibrations while commanding the motor. The company emphasizes developing equipment that has low friction, high stiffness, and is very stable. To create them, it can sometimes use exotic materials to eliminate thermal drift in case of overexertion or use more traditional materials to improve their stability in a short amount of time.

The first 1nm system that Nanomotion built, in 2014, involved replacing a motion system in an older tool. It replaced the older (100nm resolution) motion system with a stage operating at 0.1nm resolution and providing 1nm position stability.. The client was working with a motor of 100nm level. Nanomotion's team designed two multi-axis systems to fit and function in the same space but work at a much higher level.

Today, along with developing 1nm motion systems, the organization also has success in the scanning electron microscope field, where it is building systems that can eliminate the need for a separate mechanism to bend the electron beam, thereby improving the observation accuracy of the user. Furthermore, Nanomotion continues to invest and develop infrastructures that can aid in creating some of the cleanest, most efficient motion systems in the world. Hence, shortly, the company can very well be responsible for ushering in a new age of concise, powerful, and clean next-generation semiconductor devices.



Company

Nanomotion Ltd (https://www.nanomotion.com/)

Headquarters

Yoqneam, Israel

Management

Alan Feinstein, Vice President

Description

Nanomotion primarily develops motors and motion systems based on the Ultrasonic Standing Wave principle of Piezoelectric materials for companies like Applied Materials, KLA, Lam Research, ASML, etc, etc.

(https://www.semiconductorreview.com/magazines/December2021/Semiconductor_Tech/)

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- Alan Feinstein, Vice President

(https://www.linkedin.com/company/semiconductor-review/)