

## Developing a Global R&D Network to Stay Close to Our Customers and Expanding into New Business Areas

Tokyo Electron is expanding its R&D network worldwide in a variety of fields

● Tokyo Electron's R&D centers  
● Partner research organizations



### Ensuring timely delivery of products from a location close to customers

In order to ensure timely delivery of necessary products to customers, it is important to establish R&D centers at locations adjacent to them and to maintain close cooperation to expedite the commercialization of technology.

In addition to a technology center established in Hsinchu City, Taiwan in 2010, we also opened a process technology center in South Korea and a technology center in Tsukuba City, Ibaraki Prefecture in 2012 to enhance our ability to meet customers' needs promptly.

The development of the most advanced technology requires the creation of novel concepts through the synthesis of technical knowledge from various fields, making it necessary to leverage

external sources of expertise. Tokyo Electron is actively promoting collaboration with universities and research consortiums such as SEMATECH and imec for basic research. The establishment of the Tokyo Electron Technology Center Tsukuba has also opened up the way for joint projects with research institutes clustered in Tsukuba City, allowing us to work together in R&D on new semiconductor materials and photovoltaic power generation as well as on the creation of new technological seeds.

These R&D efforts are expected to bear fruit over the next five to 10 years and yield products that will drive the company's continued growth.

#### Tokyo Electron Technology Center Tsukuba

- Location : Tsukuba City, Ibaraki Prefecture, Japan
- Floor area : 13,234 m<sup>2</sup>
- Construction began/completed:  
August 2011/March 2012
- Activities : Research and development of photovoltaic panel production equipment technology and semiconductor production equipment technology
- Number of employees:  
Approx. 110 (plan for the first fiscal year)



## The acquisition of NEXX Systems—Paving the way to providing exceptional opportunities in the emerging 3D interconnect technology arena for energy-saving electronic devices

Amid the explosive growth of multifunctional mobile devices, such as smartphones and tablets, it has become critical to produce thinner and smaller devices that consume less power. Advanced packaging technologies address these needs. From flip chip bumping to through silicon vias (TSV), wafer level packaging has emerged as the fastest growing semiconductor packaging arena.

Flip chip is a method for interconnecting semiconductor devices, such as IC chips, to external circuitry with solder bumps that have been deposited onto the chip parts. The solder bumps are deposited on the top side of the wafer during the final wafer processing step. This is an innovative departure from conventional wire bonding, in which wires are used to interconnect the chip pads to external circuitry. The resulting completed flip chip assembly is much smaller and shorter in height than a traditional wire bonding system. The short interconnects greatly

reduce inductance, allowing higher-speed signals and conducting heat better. The wafer level packaging processing equipment market, which includes flip chip bumping and TSV, is expected to grow at an annual rate of more than 30 percent in the coming five years.

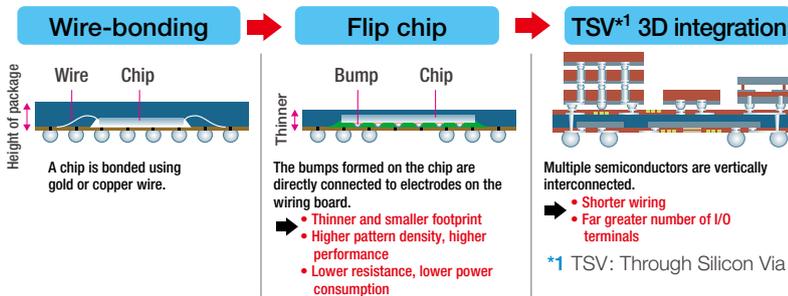
Tokyo Electron's acquisition of NEXX will expand its position in advanced packaging to include electrochemical deposition (ECD) and physical vapor deposition (PVD) systems that have won awards for their outstanding performance, low cost of ownership, development flexibility, and their extendibility to future applications.

Integrating NEXX's applications with Tokyo Electron's broad product line-up and leading global support will enable the company to grow its business portfolio while continuing to offer the best solutions to customers. NEXX Systems, a wholly-owned subsidiary of Tokyo Electron US Holdings, Inc., changed its name to TEL NEXX, Inc. on May 1, 2012.

### TEL NEXX's advanced wafer-level packaging technology

TEL NEXX's metal deposition technology enables the formation of not only electrode bumps but also TSV electrodes for 3D packaging on the wafer, with excellent cost performance.

#### Development of packaging technology



### TEL NEXX, Inc.

- Location : United States
- Number of employees : 153 (as of June 2012)



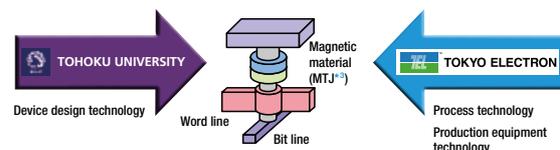
## Joint development project with Tohoku University

Tokyo Electron will participate in STT-MRAM (magnetic memory) research and development led by Prof. Tetsuo Endoh of Tohoku University's Graduate School of Engineering as part of a program to be implemented at the International Academic-Industrial Collaboration Center for Integrated Electronics Research and Development (provisional name), which Tohoku University plans to open in the spring of 2013. The Company will engage in the development of manufacturing equipment technology.

Tokyo Electron has been working with Prof. Endoh on the development of STT-MRAM production equipment technology and integration technology since December 2011. Under the upcoming program, we will further develop this partnership, provide the Center with products, and aim to quickly establish manufacturing equipment technology and integration technology for the production of STT-MRAM, which is attracting attention as a next-generation memory device.

### Advantages of STT-MRAM\*2 (spintronics memory)

- Uses magnetic materials for the semiconductor.
- Realizes lower power consumption for servers, PCs, mobile phones, and other devices.
- Maintains data without power supply (non-volatile).



Courtesy of Prof. Tetsuo Endoh, Tohoku University

\*2 STT-MRAM: Spin Transfer Torque-Magneto-resistive Random Access Memory

\*3 MTJ: Magnetic Tunnel Junction