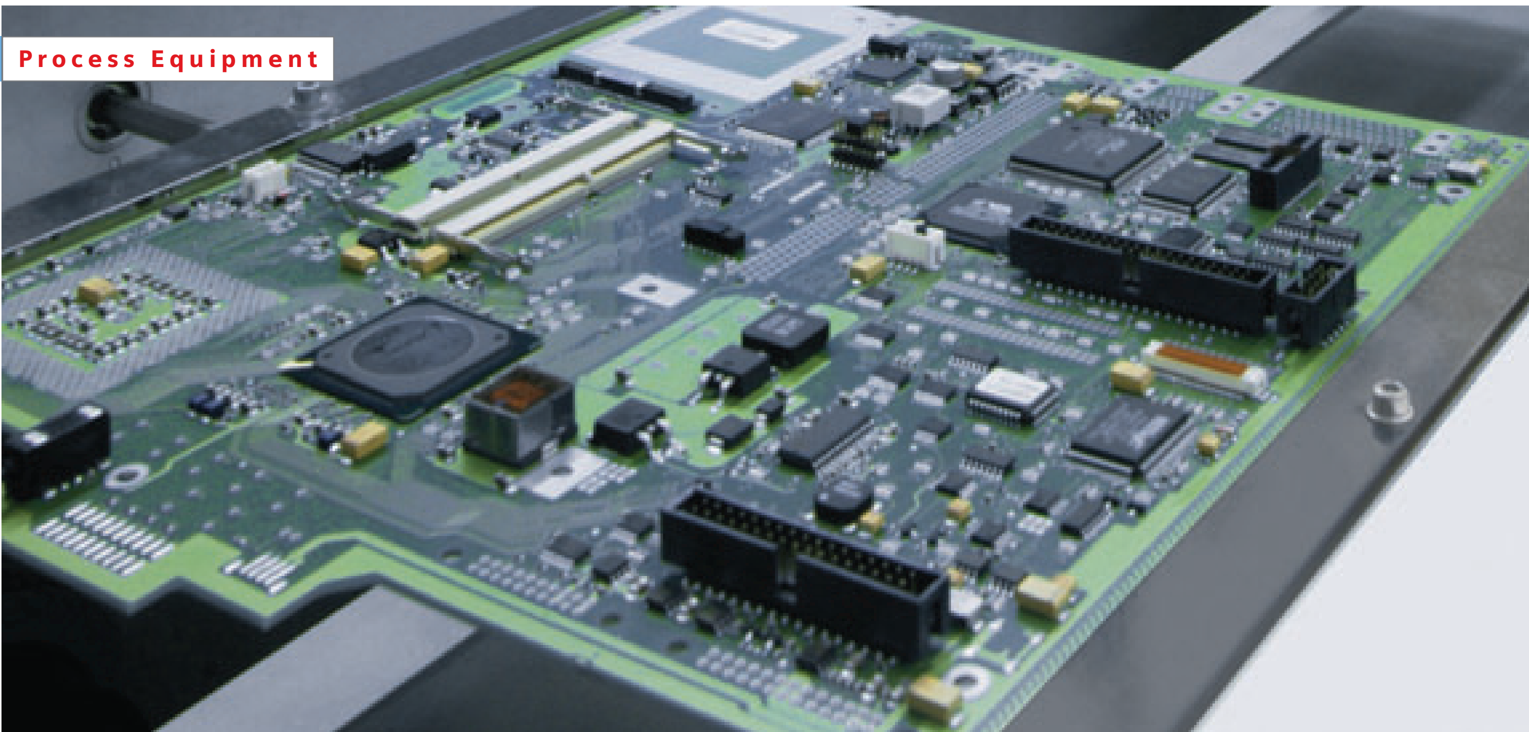

■ Tango Systems, USA

Keeping electronics affordable

Siemens technology allows an IC chip fab tool to be reconfigured quickly and cheaply, reducing manufacturing costs.

New and improved cell phone features with each passing year, frequent upgrades to computers and gaming systems, electrical appliances so inexpensive that people choose to replace them rather than fix them, consumers have come to expect electronics to get progressively better while staying affordable. To gain customers in tough times, manufacturers must keep functionality high and prices low. But production costs sometimes go up.

At the heart of electronics is the integrated circuit (IC) chip. The cost of packaging, or mounting and interconnecting the devices on the IC chip, has risen, due to increased functionality and performance, from 10 percent of the production cost to 28 to 30 percent. In addition, manufacturers must be able to switch between the different types of thin films required for advanced packaging applications, such as under bump metallization (UBM), redistributed layers (RDL), back side metallization (BSM), barrier and seed for through silicon vias (TSV), and so on. If the systems don't offer the full applications capability or take a long time to switch between thin-film applications, the capital costs increase with the dedication of a set of tools for every film. To help manufacturers compete, OEMs (original equipment manufacturers) must offer manufacturing tools with advanced processing capabilities thanks to adaptable mechanical designs and flexible control systems.

Flexible and high-performance tool

To meet this demand, Tango Systems offers a high-performance tool that can be reconfigured in one shift instead of weeks or months as in the past. A multichamber and modular system can continue production while one of the modules is undergoing maintenance or inspection. Tango's Axcela 300/200/150 PVD (physical vapor deposition) system is a high-volume manufacturing tool that enables advanced IC packaging. Manufacturers traditionally buy dedicated tools for different packaging methods.

IC Packaging

Integrated circuit packaging is the final stage of semiconductor device fabrication. It involves mounting the die, connecting the die pads to the pins or bumps on the package, and sealing the die. There are many methods of packaging. These include pin grid array (PGA), small-outline integrated circuit (SOIC), plastic leaded (or leadless) chip carrier (PLCC), plastic quad flat pack (PQFP), thin small outline package (TSOP), land grid array (LGA), ball grid array (BGA), and flip chip ball grid array (FCBGA), in which the die is mounted upside down. Multiple dies are sometimes stacked in one package using through silicon vias (TSV). Most ICs are packaged in opaque ceramic or plastic insulation. The connection to the outside world is through leads; the leads are solder spheres on BGA packages and ball spheres or copper pillars for WLP (wafer level packages). Bumps on die pads (direct or redistributed) are used to connect to pads on the package substrates or pads on the PCB for flip chip packages.

Siemens AG

Tango Systems

Tango's Axcela 300/200/150 PVD system combines an advancement in flexibility with increased performance

Tango's patented multitarget, multiwafer chamber architecture, however, can produce a variety of packaging methods, such as UBM. Tango's PVD system offers cost savings and therefore a higher return on investment (ROI).

Simatic makes it possible

The high ROI and flexibility of Tango's AXCELA system is made possible by a Simatic S7-317F safety controller connected to Simatic ET 200S distributed I/O system using Profisafe. The integrated safety solution allows one control system for process and safety control, saving hardware, wiring, implantation, diagnostic, and maintenance costs.

With PLC control of the safety I/O system, one chamber's safety circuit can be disabled for maintenance or removal while the tool continues to run processes in other chambers. This functionality is crucial to support Tango's multitarget, multiwafer chamber architecture. Only a Profibus bus connection to the distributed I/O and an Industrial Ethernet connection for integrating the devices with serial communication is needed to control the connections to the process chambers. In contrast, a hardwired control system requires complicated keyed bypass systems and more wiring terminations between the load locks and process chambers. The fieldbus solution costs less, increases flexibility, and decreases the time needed to swap a chamber.

Integrated safety features

Tango uses the Siemens 317F integrated safety I/O to monitor the magnetic switches on the chamber lids and covers. There are about four switches on each chamber. The fail-safe logic also controls 5 to 10 leak sensors and three flow switches to monitor the coolant system.

Tango's PVD system uses argon and oxygen, which are not dangerous, and the safety logic is not used for controlling or monitoring vacuum valves or a gas box. Therefore, to save money, the Siemens logic used for Tango is not safety I/O. However, the logic and output relay are still safety-rated. The Safety Integrated solution offers a single control system for all needs, lowering packaging costs for Tango and its customers. ■

Key Points

- Tango Systems' AXCELA system/fab tool can be easily adapted for different packaging needs, which lowers manufacturing costs and helps offset rising packaging costs
- Siemens technology supports this multifunctionality, since all devices such as pumps, robots, gauges, load locks, motion controllers, power supplies, and other devices are not hardwired, but controlled through a PLC, Profibus, and Industrial Ethernet
- Siemens PLC control of the safety I/O system also allows part of the machine to run while other parts are undergoing inspection and maintenance.

info contact
www.siemens.com/semiconductor
azad.jafari@siemens.com