



## **Overview**

Tessera Technologies, Inc., invests in, licenses and delivers innovative miniaturization technologies that transform next-generation electronic devices. The company's micro-electronics solutions enable smaller, higher-functionality devices through chip-scale, 3D and wafer-level packaging technology, as well as high-density substrate and silent air cooling technology. Tessera's imaging and optics solutions provide low-cost, high-quality camera functionality in electronic products and include image sensor packaging, wafer-level optics and image enhancement intellectual property. The company also offers customized micro-optic lenses, from diffractive and refractive optical elements to integrated micro-optical subassemblies. Tessera licenses its technologies, as well as delivers products based on these technologies, to promote the development of the supply chain infrastructure.

After being founded in 1990, Tessera became a leader in integrated circuit (IC) packaging with its transformational Tessera Compliant Chip® (TCC) chip-scale packaging (CSP) technology. This innovative technology, which has been widely adopted by the semiconductor industry, enables the packaging of an IC to be approximately the same size as the IC itself. The company continues to develop breakthrough solutions in this arena, most recently applying its unique packaging expertise to 3D flip-chip and package-on-package technology, high-density substrates and silent air cooling technology.

In 2005, Tessera expanded on its CSP expertise by investing in wafer-level CSP solutions for image sensors. Over the last four years, Tessera has made a series of strategic acquisitions and advancements, furthering its position in the imaging and optics markets.

## **Business Model**

Tessera started as a manufacturer of semiconductor packaging. Once the company realized that its core value was in the development of its innovative packaging technology, it began licensing the rights to its packaging solutions and partnering with industry-leading semiconductor manufacturers to enable the creation of next-generation electronic products.

Through its strategic expansion into imaging and optics, Tessera has been able to realize the opportunities generated by new products and technologies. To ensure its ability to continue to offer solutions that would meet industry demand for smaller, faster, more feature-rich electronics, the company expanded upon its business model. Today, Tessera invests in and licenses its technologies, as well as delivers products based on these technologies, to promote the development of the supply chain infrastructure. This allows industry-leading manufacturers to get the right product to market, at the right time.

To help enable the supply chain, Tessera's business model has expanded to include Product Launch Services. Through these Services, the company delivers state-of-the-art imaging products – such as its OptiML™ single-element VGA lens – directly to cell phone camera module manufacturers. Tessera's Product Launch Services help the company work even more closely with individual members of the cell phone supply chain as they ramp up to produce high-volume quantities of solutions based on Tessera's OptiML wafer-level optics technology.

### **Technology**

Tessera invests in and develops miniaturization technologies that enable new levels of innovation in electronics, optics and imaging. The company delivers scalable solutions, and continues to anticipate and successfully address market demand for smaller, higher-performing electronic products at lower cost.

Tessera focuses on two key technology areas:

- Micro-electronics -- including chip-scale, 3D packaging technology, and high-density substrate and silent air cooling technology
- Imaging and Optics -- including wafer-level camera, wafer-level optics, image sensor packaging and image enhancement technologies, and micro-optical elements

### **Micro-electronics**

A semiconductor package is the physical and electrical interface between a semiconductor chip and the system in which it operates. In the early 1990s, Tessera's founders invented fundamental packaging technology which is now widely used throughout the semiconductor industry. The company's innovations include its visionary  $\mu$ BGA® solution, the industry's first CSP technology, which incorporates the Tessera Compliant Chip (TCC) technology. The  $\mu$ BGA CSP family enables a very short electrical path between the die and the module or printed circuit board (PCB), which allows the package to deliver performance that meets the requirements of

memory such as high-performance DRAM.

Tessera continues to innovate and expand upon these technologies. The company's  $\mu$ PILR™ solution is an advanced packaging solution designed to overcome technical limitations of interconnect, packaging and substrate technologies such as pitch, profile, performance, reliability and test capacity. Tessera's extensive research and development efforts focus on electronic product miniaturization from a system perspective, specifically through the dense interconnection of components and extensive use of three-dimensional and advanced substrate packaging technologies.

Tessera continues to invest in its relationships with leading substrate vendors, and dedicates resources to new developments in silent air cooling technology. Both the company's silent air cooling technology, and its packaging and interconnect solutions are gaining market attention.

### **Imaging and Optics**

Advancements in imaging and optics technologies are enabling significantly higher quality images in considerably smaller digital still cameras and other camera-enabled devices including cell phones, security systems and personal computers (PCs). Tessera's comprehensive portfolio of technologies and products, from wafer-level image sensor packaging, to wafer-level optics and lenses, to optical and embedded image enhancement solutions, help meet growing consumer demand for smaller size, lower cost and greater functionality to provide more capabilities in electronic devices.

Tessera's OptiML wafer-level optics technology advances integration of miniaturized cameras in cell phones, PCs, security devices and other electronics. The technology enables cameras to be manufactured at the wafer level, drastically reducing camera module size and cost. OptiML wafer-level optics technology is reflow compatible, which enables camera modules to go through high heat soldering of up to 200 degrees Celsius without damage. In addition to licensing this technology, Tessera offers an OptiML single-element VGA lens as part of its Product Launch Services offering.

OptiML optical image enhancement technology improves the quality of captured images without the need for mechanical parts. The OptiML Zoom solution offers 3X zoom capabilities, while the OptiML Focus solution enables all aspects of a high-quality image to be simultaneously brought into focus automatically. The OptiML UFL solution improves low-light performance by

increasing the amount of available light by as much as 250 percent without degrading the field depth or other performance factors.

FotoNation® embedded image enhancement technology provides a full portfolio of in-camera image enhancement solutions for digital photos. The FotoNation Red solution automatically detects and removes red- and golden-eye defects. The FotoNation FaceTracker solution, which includes the SmileCheck and BlinkCheck extension modules, detects the presence of human faces in pictures to ensure optimal focus, exposure, color balance and image quality, while the FotoNation Beautification module smoothes and reduces the appearance of wrinkles and other skin imperfections in these captured faces.

SHELLCASE® MVP wafer-level chip-scale packaging (WLCSP) technology makes it possible to create image sensor packaging solutions that are thinner, more reliable and less expensive. The end result is improved device functionality and increased PCB capacity, enabling the next generation of smaller, smarter, faster electronic devices.

Tessera's DigitalOptics™ solutions utilize the company's state-of-the-art wafer-level processes and equipment to develop and deliver customized micro-optic solutions, which are available on a variety of substrates, fabricated on one or both surfaces of a wafer, and in multi-wafer forms. These precise, high-volume solutions are available for a wide range of applications, from advanced optical lithography to security systems and memory storage.

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