

TESSERA



DigitalOptics Micro-Optic Solutions

Greater Efficiency, Performance and Cost Savings with Customized Micro-optics

As the micro-optics industry rapidly evolves, the need for unique refractive and diffractive optical elements that meet specific performance, cost and volume requirements is growing at a faster pace than ever. To stay ahead of industry demands, Tessera® DigitalOptics™ products are designed and developed to offer manufacturers customized wafer-based micro-optic solutions for next-generation defense, aerospace, industrial, medical and communications applications. By providing complete, in-house product development services, from design to fabrication, Tessera offers manufacturers greater efficiency, superior quality and significant cost savings as compared to working with multiple designers and fabricators.

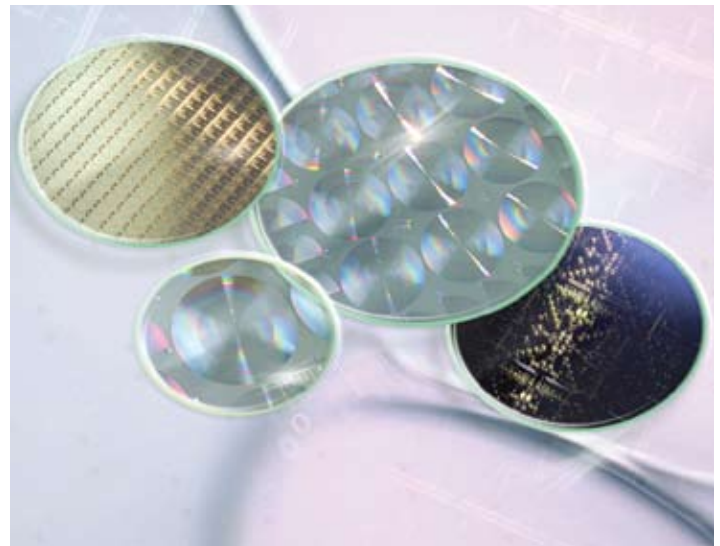
Leverage Powerful Fabrication Facilities

To meet the exacting requirements of today's micro-optics applications, Tessera employs one of the industry's largest internal teams of optical design and application engineers and operates a state-of-the-art ISO-certified fabrication facility.

Tessera's automated processes ensure high-volume, high-precision, cost-effective manufacturing of products for a variety of markets, including sensors, infrared (IR) systems, metrology, data storage, communications, semiconductor equipment and vision systems.

Reduce Costs with Wafer-based Lithography

Tessera ensures greater manufacturability by using wafer-based lithography to make diffractive and refractive elements in a variety of substrates, including fused silica, glass, silicon, germanium and advanced synthetic materials. Wafer-based lithography offers four distinct advantages over conventional manufacturing methods: miniaturization, high-precision, customization and cost efficiency.



Boost your next-generation optical systems with high-performance, cost-effective DigitalOptics solutions from Tessera.

Tessera - Transforming the Future™

Optimize Systems with Precise, Customized Diffractive Optics

DigitalOptics diffractive optical elements provide precise, customized patterns for a broad spectrum of applications, including semiconductor lithography, optical targeting, optical positioning, beam shaping and light source homogenization and sensors. They provide ideal solutions for narrow spectrum optical systems, such as bar-code frame generators, optical diffusers for biomedical applications and off-axis illumination elements for lithography.

Illumination Systems

DigitalOptics illumination solutions are custom-designed to optimize illumination systems in high-performance lithography and semiconductor manufacturing tools. Tessera uses controlled-angle diffusers to enable optimum illumination of masks—minimizing feature size and maximizing the operating process window for the tool. As a result, semiconductor manufacturers can produce more chips that meet higher performance standards.

Defense and Aerospace

Tessera's next-generation DigitalOptics solutions address the advanced needs of aerospace, defense, security and sensing organizations with industry-leading micro-optic elements. Commercial aircraft and defense equipment, vehicles and communications devices depend on Tessera's innovative processes to increase efficiency and reduce costs while meeting stringent new standards for performance. Tessera builds custom diffractive elements for controlled angle illumination and diffractive and refractive aspheric lenses in such materials as silicon, fused silica, germanium and other glass substrates.

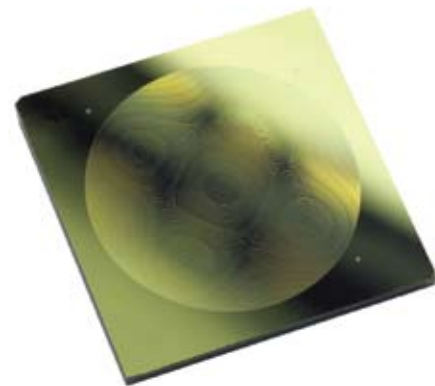
Diffractive Optical Elements

- Diffusers
- Beam shapers
- Beam steering optics
- Pattern generators
- Gratings
- Homogenizers
- Beam splitters
- Lenses
- Spot array generators
- Chromatic correctors

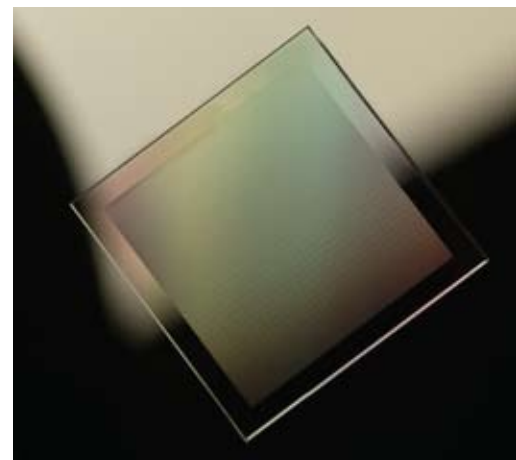
Applications

- Free-form designs for Source Mask Optimization (SMO)
- Off-axis illumination for optical / DUV scanners
- Reticle and wafer inspection equipment
- Medical applications
- Head-mounted displays
- Ultra-compact imaging systems
- Optical sensors
- Machine vision systems
- Missile guidance systems
- Near-field wavefront correction and beam shaping

TECHNICAL SPECIFICATIONS	
Patterning	Sub-micron patterning & alignment capabilities, single or double-sided
Dimension	Typically 0.5mm to 100.0mm
Wavelength	From 193nm to 14µm
Materials	Fused silica, silicon, germanium, crystal quartz and advanced synthetics substrates; single or double-sided anti-reflective (AR) coating and metallization



Germanium Beam Shaper



Fused Silica Diffuser

Achieve Superior Performance with Refractive Optics

Tessera's wafer-level fabrication technique revolutionizes refractive optical element manufacturing by delivering significantly higher manufacturing efficiencies than traditional, time-consuming grinding, molding and polishing.

Tessera's lithographic manufacturing process simultaneously forms up to several thousands of lenses with submicron precision, guaranteeing a level of performance and thermal stability that surpasses conventional manufacturing processes. Its wafer-based fabrication technologies include direct etching and replication. Direct etching lithographically etches pure glass and delivers exceptional environmental performance; thermal, mechanical and chemical stability; and superior optical and geometric performance. Replication is a high-volume solution that features a polymer-on-glass substrate for excellent environmental performance and stability.

Tessera's ultra-precise processes enable manufacturers to add mirrors, micro-labels and registration features to the lens components. Its DigitalOptics refractives provide unmatched unit-to-unit repeatability, unparalleled metrology infrastructure, broad wavelength bandwidth and lens optimization solutions for high-performance applications.

Refractive Optical Elements

- Spherical and aspherical lenses
- Full fill factor lens array (Fly's Eyes)
- Microlens arrays
- 2D arrays

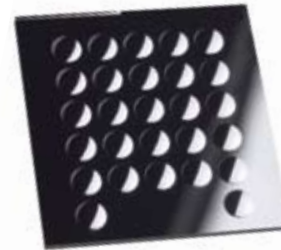
Applications

- Aspheric lenses for IR imaging
- Optical communications
- Collimating / coupling lens
- Parallel transceivers
- CWDM transceivers

Materials

Fused silica, silicon, advanced synthetics, and germanium; single or double-sided patterning, AR coating and metallization

TECHNICAL SPECIFICATIONS		
	Replication	Etch
Nominal Diam. Range	150 μ m - 4mm	50 μ m - 1mm
Nominal Sag Range	10 μ m - 500 μ m	10 μ m - 80 μ m



2D Microlens Array



Silicon Microlens Array

Save Time and Costs with Miniaturized Optical Devices

Tessera's DigitalOptics integrated micro-optic subassemblies (IMOS) enable the seamless integration of wafer-level optics with many types of active and passive devices. By combining elements on both sides of a wafer or on multiple wafers, an IMOS is formed. Integration with active components (lasers, detectors, sensors) as well as passive optical elements (mirrors, filters, gratings) at the wafer or die level enables significant size reduction, cost savings and improved performance.

DigitalOptics IMOS offer three significant advantages over conventional solutions—miniaturization, part-to-part consistency and reduced costs. By assembling the IMOS parts in parallel (a single step at the wafer level), Tessera saves time and reduces manufacturing variability over traditional manufacturing approaches, which rely on individual assembly steps for each component. The functionality and versatility of DigitalOptics IMOS make high-performance solutions possible in a wide range of applications, including wafer-level cameras, memory storage, optical communications, machine control and micro-projectors.

Parallel Optics

DigitalOptics parallel optics solutions enable parallel module manufacturers to solve the bandwidth requirements of high-density and high-speed proprietary backplanes, OIF and Infiniband markets.

Tessera's patented lens technology provides increased bandwidth, reduces modal noise due to back reflection into the laser and attenuates the power of the launch, which is important for eye safety and signal regulation. Tessera's source monitoring features real-time monitoring and adjustment of laser power for maximum source performance.

MUX/DEMUX

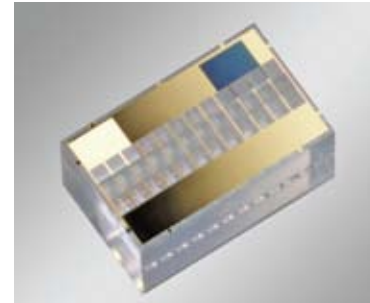
Ideal for telecommunications, fiber to the home (FTTH) and other applications, Tessera's all-glass multiplexer (MUX) and demultiplexer (DEMUX) solutions provide dramatic space and cost-of-use savings over conventional Receive Optical Subassemblies (ROSAs). In addition, DigitalOptics MUX/DEMUX solutions offer excellent crosstalk characteristics and low insertion loss.

DigitalOptics IMOS Elements

- Optical MUX/DEMUX modules
- Optical encoders
- 4-12 channel lens arrays
- Wavelength lockers
- Triplexer

Applications

- Launch optics for parallel optical subassemblies
- Receive optics for parallel optical assemblies
- Optical transceivers for parallel optical assemblies
- 10, 40, 100 GB Ethernet applications
- Fiber to the Home Transceivers
- Proprietary backplane connections
- Infiniband
- QSFP



1 x 12 Transmitter



LX4 DEMUX

Transforming the Future with Innovative Micro-Optic Solutions

Tessera is a total solution provider specializing in the design and manufacture of wafer-based, custom micro-optical components and sub-assemblies. With one of the industry's largest internal teams of optical design and application engineers, and a state-of-the-art ISO-certified (9001:2000 & 14,000) optics fabrication facility, the company develops and delivers its DigitalOptics solutions on a variety of substrates, on one or both

surfaces of a wafer and in multi-wafer forms, all using photolithographic techniques.

By investing in technologies that drive new levels of innovation in electronics, optics and imaging, and delivering scalable solutions that enable manufacturers to get the right product to market, at the right time, Tessera's transformational technologies are enabling the next generation of advanced electronics products.

Contact a Tessera sales representative for more information about how DigitalOptics micro-optic solutions offer greater efficiency, performance and cost-savings.



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