PLANAR LIGHTWAVE CIRCUITS: CUSTOM DESIGN, FABRICATION & PACKAGING SERVICES

Planar Lightwave Circuits (PLCs) reduce component size, enable the integration of multiple functions into a single component or module and improve manufacturability. Enablence is a global leader in PLC design; the company draws upon a highly experienced team which has been building silica and polymer PLC products for nearly 20 years.

Core capabilities include the design, fabrication, packaging, and testing of highly integrated optical chips. Enablence is a leader in the hybrid integration of active components onto PLC substrates. Advanced packaging and electronics are also available, providing a full turn-key solution for delivering your integrated optical products. It is one of only a few companies in the world that offers these capabilities to support the telecommunications, aerospace, defense and bio/chem-sensor markets.

PROGRAMS

- Optical Component Design
- Wafer Fabrication
- Hybrid Integration
- Packaging and Testing
- Foundry Capabilities

DATA SHEET

OPTICAL COMPONENT DESIGN

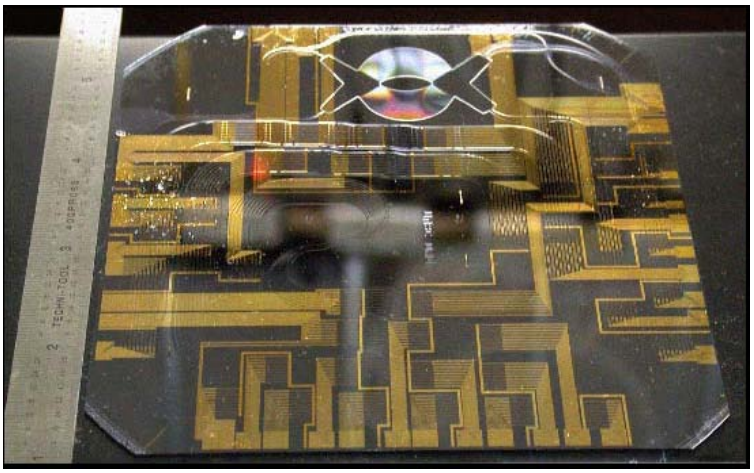
Enablence offers custom PLC design services to address nearly any application. Starting from a simple concept, schematic, or drawing, Enablence engineers can design complete mask layouts to convert your bulk-optic product into a compact, rugged, advanced PLC solution. As part of that process, the design is optimized for manufacturability and high performance. Typical PLC optical functions include:

- Wavelength multiplexing & demultiplexing
- On-chip lasers & detectors
- Arrayed waveguide gratings
- Mach-Zehnder interferometers
- Multimode interference couplers
- Power splitters
- Power taps
- Switches and cross-connects
- Variable optical attenuators
- Tunable couplers
- Optical delay lines

These functions are routinely combined to create custom products such as ROADMs, cross-connects, transceivers, and other highly complex integrated optical components.

WAFER FABRICATION

Enablence is a world leader in photonic wafer manufacturing, with industry leading silica-on-silicon, polymer, and III-V wafer fabrication facilities in-house. Our team has extensive fabrication experience covering products from miniature transceivers to large-scale optical circuits. We can customize our waveguide process to satisfy specific requirements for performance & yield. Enablence's wafer fabrication facilities have the capacity to meet any requirement.

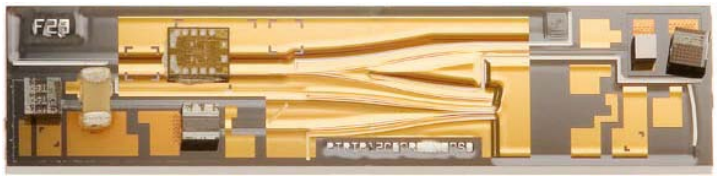


Large scale optical circuit including mux/demux, switching, monitoring, and power control of over 40 channels.

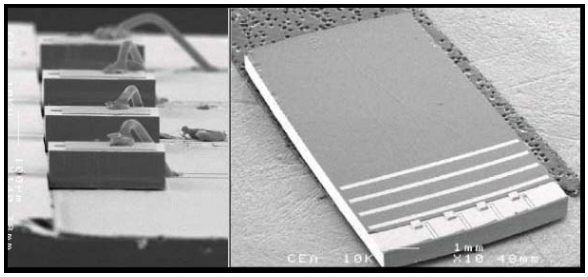
HYBRID INTEGRATION

Enablence offers unique hybrid integration technology that integrates active components such as lasers and photodiodes directly onto PLC substrates. Each of these sub-components can be bonded to the PLC at the Enablence facility, using state-of-the-art flip-chip die bonders. This provides a complete turn-key solution for delivering advanced integrated components.

This flexible approach can accommodate Fabry-Perot or DFB lasers, and PIN or APD photodetectors. As part of this platform, Enablence also has the ability to fabricate key features onto its PLC optical chips, such as deep etched wells, 45º turning mirrors, and a variety of metal patterns for heaters, wirebonds, and electrical routing.



FTTx Transceiver chip which includes hybrid integration of lasers, detectors, TIA, and capacitor



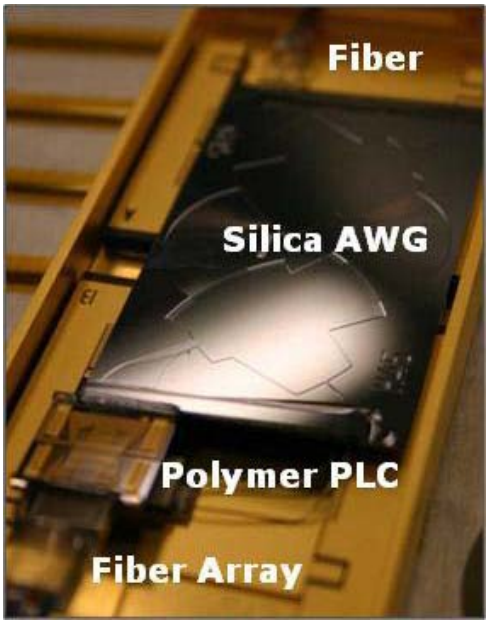
Laser diodes bonded to a multi-channel transmitter

PACKAGING & TESTING

Enablence provides a variety of PLC packaging services based on Telcordia-qualified processes. Advanced optical testing of PLC components is also available. Our capabilities include:

- Multi-channel fiber pig tailing
- Specialty pigtails like polarization maintaining and bend-insensitive fibers
- Co-packaged electronics for drivers, amplifiers, switching, and thermal control
- Software/firmware design & development
- Chip-to-chip bonding
- Wire bonding
- Advanced chip-on-board packaging
- Complex hermetically sealed packages
- 19” rack-mountable housings
- Complete optical testing services

Hermetic Packaging of 8x8 optical cross-connect



Chip-to-Chip coupling of silica and polymer PLCs

FOUNDRY CAPABILITIES

Silica-on-Silicon PLCs:

- Propagation loss: < 0.02 dB/cm
- Index contrast range: 0.1 to 4%
- Wavelength: visible through infrared
- Etching: up to 50 µm depth; side wall verticality better than 88^{o}; accuracy < ± 0.2 µm.
- Metals: Au, Au/Sn, Cr, NiCr, TiW, Al and Ti/Pt
- Thermo-optic effect:$10^{-5}/^{o}$C

Polymer PLCs:

- Propagation loss: as low as 0.11dB/cm
- Index contrast range: as high as 30%
- Wavelength: visible through infrared (with some exceptions)
- Thermo-optic effect: $3.0x10^{-4}/^{o}$C (Low power consumption)
- Low PDL

For more information
visit www.enablence.com