GigOptix: Taking a Breakthrough Device to Market in “Record Time”

**The Opportunity**

Everyone wants more bandwidth for movies and YouTube videos, and it is especially crucial for data centers and telecom in general. Yet traffic slows at the border between electronic and optical. As the demand rises for optical modulators that widen this bottleneck, network operators are upgrading from 10G devices to 40G and 100G. Engineers had long dreamed of a way to handle the speeds and size required. Polymers had seemed promising for years, but until GigOptix no one had ever made them succeed.

GigOptix created a 40G Mach-Zehnder modulator based on its proprietary Thin Film Polymer on Silicon (TFPS™) technology. Traditional devices used either lithium niobate or indium phosphide, both crystalline materials. But unlike lithium niobate, the GigOptix modulator was smaller and fit into industry standard 3.5 × 4.5” 300-pin transponders — and form-factor advantages are crucial as devices shrink. Its polymer innovation also outperformed indium phosphide. Overall, this modulator was faster and its low drive voltage cut power consumption by over 20%. It was truly disruptive to the field.

Moreover, GigOptix could bundle the new modulator with its 40G and 100G drivers. With this revolutionary modulator, GigOptix can offer a bundled solution with their compatible Mach-Zehnder 40G and 100G drivers.

The market for optical modulators is growing rapidly. It is currently $250 million a year, and studies forecast growth of 50% per year for 40G and 110% a year for 100G, over at least the next three or four years.

Mach-Zehnder modulators are a key segment of this expanding market and, with its revolutionary product, GigOptix had the chance to take it. But success was far from certain.

**The Challenge**

GigOptix had to overcome a variety of obstacles simultaneously:

- **Time-to-market was absolutely critical.** If its 40G modulator did not reach companies in time, they would fill their available slots with modulators from other vendors. The TFPS™ device would become just a complicated science exercise.
- **Manufacturing had to be best-in-class.** For instance, polymer modulators require much finer alignment than lithium niobate parts, because the optical mold is much smaller, and this task is extremely difficult and complex.
- **The manufacturer had to create new packaging.** It had to develop an effective hermetically sealed container, since polymers have different sensitivities to water, light and oxygen than traditional materials.
- **Reliability and affordability were essential.** To win over customers, GigOptix had to offer a more dependable and economical modulator than anyone else.
- **Customer acceptance was a key entry barrier.** Since polymer modulators were utterly new, they lacked a track record. Buyers had to trust both the technology and its manufacture, so credibility would take longer to establish.
- **GigOptix had to stay at the forefront.** It had to build and sell the product ahead of competitors, and maintain its lead as the technology improved.
WHY SANMINA?
GigOptix initially took this modulator to a small North American company skilled at design but without manufacturing prowess. GigOptix realized it needed a change, and selected Sanmina because of its:

- **Speed.** Sanmina is an expert at new product introduction. It can bring complex, quality products to market quickly.
- **Size.** Sanmina is a strong, firmly established partner that can outcompete well-known names. With its global footprint in 18 countries on four continents it can manufacture in best-cost regions, closer to the customer. It excels at managing the supply chain, and buying raw materials and components in volume at lower prices.
- **Deep experience in optics.** Sanmina’s Optical and Microelectronics Division is focused on the design, industrialization, test and custom manufacturing of revolutionary optical products with decades of background in the field. It had also previously manufactured the traditional modulators.
- **End-to-end capability.** Sanmina can handle every task from design to development and prototyping, and thus eliminate delays and costly, needless interactions with other parties.
- **Manufacturing knowhow.** Sanmina makes some of the most complex and valuable optical, electronic and mechanical products in the world. It can meet difficult design and manufacturing challenges, such as the parts alignment in polymer modulators.
- **Credibility.** Sanmina is a Tier 1 company with a long history and a well-known reputation for quality. Its involvement assured customers that the disruptive modulators were of the highest caliber.
- **Intelligence.** Sanmina learns quickly. Its designers and engineers have Ph.D.’s and complete understanding of their fields.
- **Partnership.** Sanmina has a deeply collaborative culture.

THE APPROACH
The project was pure innovation, because no one had ever seen a polymer modulator before. Sanmina’s Optical and Microelectronics Division applied its full array of technical skills to the challenges.

With the LX 8401 DPSK 40G modulator, Sanmina:

- **Developed the passive alignment and epoxy curing processes.** It also constantly improved them, eliminating glitches as they arose.
- **Solved the difficult alignment problem.** At first, aligning the minuscule parts took up to a whole day, but the Shenzhen engineers spent nights and weekends accelerating the process and eventually produced 100 parts per week to within +/- 2 micron.
- **Created new equipment.** It devised the machines needed to produce these new designs in volume.
- **Consulted continually with GigOptix.**
- **Built in China.** It moved the entire project to its state-of-the-art factory in Shenzhen, where labor was less expensive and the China market was easily accessible.

Meanwhile, GigOptix was also working on a 100G DP-QPSK polymer modulator. As GigOptix saw rapid progress on the 40G device, it asked Sanmina to co-design and manufacture its 100G DP-QPSK modulator, as well as its new 40G DP-QPSK modulator. Sanmina:

- **Helped design these ultra-compact solutions.** Engineers at its Ottawa facility took on the project.
- **Ensured a smooth collaboration.** Dr. Raluca Dinu, GigOptix Vice President and General Manager of Optics Product Line, said the Sanmina engineers “were basically an extension of our design team.”
- **Prototyped the devices in North America.**
- **Manufactured them in Shenzhen.**
RESULTS
Together with GigOptix, Sanmina:

- Developed prototypes early. They began appearing within two to three months.
- Achieved high yields. The rate reached 85%.
- Succeeded with the critical production time requirement. Sanmina got the 40G production line up and running in six months, in "record time," according to GigOptix Chairman and CEO, Dr. Avi Katz.
- Matched the reliability of the best traditional devices. The TFPS™ modulator won full compliance in October 2011, as tested against Telcordia GR-468 standard. Its reliability equaled that of lithium niobate, the most dependable traditional technology.
- Swiftly produced the 100G modulator. It became available for sampling in February 2012.

THE BIG PICTURE
With the help of Sanmina, GigOptix:

- Brought the first polymer modulator to market, fully qualified. It was a monumental milestone for GigOptix.
- Won acceptance from Tier 1 customers. GigOptix executives often heard them declare, in essence, "It’s as good as you say or better."
- Entered further contracts with Sanmina. GigOptix partnered for additional product design and industrialization services, including the design of new automated-alignment and production equipment.
- Solidified its position in the technological forefront. "GigOptix is the one that’s there. And other companies admit it," says Vice President Dinu.
- Received project offers from numerous other companies. Acknowledging GigOptix’ leading position, other firms now seek to partner with it on projects in their own lines.
- Unequivocally recognized the unique capabilities of Sanmina. CEO Dr. Katz congratulated Sanmina “for bringing up this leading production line in record time,” and stated, “I am thankful for their solid partnering in enabling our revolutionary TFPS™ modulators.” Added Vice President Dinu, “Sanmina was the right choice, for sure.”
About GigOptix

GigOptix is a leading fabless supplier of semiconductor and optical components for high-speed information streaming. Since optical fiber can carry vast amounts of information and electronic systems have huge bandwidth, the engines that connect the two are vital to widening bottlenecks at their boundary. GigOptix is committed to providing better flow between the two realms, and to leading the way to an optically connected world. It is the sole player in high-speed optical communications with both modulator and driver technology under the same roof.

The company’s broad portfolio of high-speed electronic devices also includes laser drivers and receiver amplifiers. Its products address telecom, datacom, Infiniband and consumer optical systems, covering serial and parallel communication technologies from 1G to 100G. In addition, GigOptix offers the widest range of mixed-signal and RF ASIC solutions in the market including Standard Cell, Hybrid and Structured ASICs for the consumer, industrial, defense and avionics industries.

About Sanmina

Sanmina Corporation is a leading electronics contract manufacturer serving the fastest-growing segments of the global Electronics Manufacturing Services (EMS) market. Recognized as a technology leader, Sanmina provides end-to-end manufacturing solutions, delivering superior quality and support to OEMs primarily in the communications, defense and aerospace, industrial and semiconductor systems, medical, multimedia, enterprise computing and storage, automotive and clean technology sectors. Sanmina has facilities strategically located in key regions throughout the world.