

# OneChip solution for Fibre-To-The-Home

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## An interview with Jim Hjartarson, CEO of OneChip Photonics

**Q. In March 2009, OneChip raised \$19.5m. How difficult is it nowadays for an optical component firm to receive venture capital funding?**

A. Clearly, the venture capital community, given the current macroeconomic environment, is being selective about the new investments it makes in the technology market in general, and photonics in particular. However, if you can demonstrate that you have a unique approach to a problem that has not yet been solved, and that there is a large, untapped market opportunity, VCs will be interested in your value proposition.

**Q. What is it about your company's business plan that secured the investment?**

A. We believe OneChip Photonics has three fundamental advantages that resulted in our securing our initial two rounds of funding, which totaled \$19.5 million:

- A truly breakthrough approach and technology that will remove the cost and performance barriers that have been impeding the ubiquitous deployment of Fiber-to-the-Home (FTTH) and enable new business and consumer broadband applications.
- A large, untapped market opportunity. Ovum estimates that the FTTx optical transceiver market will grow from \$387 million by the end of 2009 to \$594 million by the end of 2013. OneChip also is poised to introduce photonics integration into other high-volume business and consumer markets, where our breakthrough photonic integrated circuit (PIC) technology can reduce costs and improve performance. These markets could be orders of magnitude larger than the FTTx optical transceiver market.
- A seasoned and successful management team. OneChip has attracted top talent – from industry leading companies such as MetroPhotonics, Bookham, Catena Networks, Fiberson, Nortel and Teknovus – who have successful track records of designing, manufacturing, marketing and selling transceivers, PICs and mass-market broadband access solutions.

**Q. The passive optical networking (PON) transceiver market faces considerable pricing pressures. Companies use TO cans and manual labour or more sophisticated hybrid integration where the laser and photodetectors are dropped onto a common platform to meet various PON transceiver specifications. Why is OneChip pursuing indium phosphide-based monolithic integration and why will such an approach be cheaper than a hybrid platform that can address several PON standards?**

A. Most current FTTH transceiver providers base their transceivers on either discrete optics or planar lightwave circuit (PLC) designs. These designs offer low levels of integration and require assembly from multiple parts. There is little technical differentiation among them. Rather, vendors must compete on the basis of who can assemble the parts in a slightly cheaper fashion. And there is little opportunity to further reduce such costs.

While more integrated than fully discrete optics-based designs, PLC designs still require discrete active components and the assembly of as many as 10 parts. Great care must be taken, during the manufacturing

process, to align all parts of the transceiver correctly. And while packaging can be non-hermetic, these parts can fall out of alignment through thermal or mechanical stress. PLC designs also have proven to be an expensive alternative. For all of these reasons, the PON system vendors with which OneChip has engaged have indicated that they are not interested in deploying PLC-based designs.

OneChip Photonics is taking a new approach with its breakthrough PIC technology. OneChip is monolithically integrating all the functions required for an optical transceiver onto a single, indium phosphide (InP)-based chip. All active AND passive components of the chip – including the distributed-feedback (DFB) laser, optically pre-amplified detector (OPAD), wavelength splitter (WS), spot-size converter (SSC), and various elements of passive waveguide circuitry – are, uniquely, integrated in one epitaxial growth step, without re-growth or post-growth modification of the epitaxial material.

With respect to transmit performance, OneChip's single-frequency DFB lasers will offer a superior performance – much more suitable for longer-reach and higher bit-rate applications – than competing Fabry-Perot (FP) lasers. With respect to receive performance, OneChip's optically pre-amplified detector design is a higher gain-bandwidth solution than competing avalanche photodiode (APD) solutions. It also is a lower-cost solution, as it does not require a high-voltage power source.

OneChip's monolithic photonic integrated circuits (PICs) have the smallest footprint on the market, the optical parts are aligned for life, and the parts are highly robust (resistant to vibration and other outside elements). Further, OneChip's PICs are designed for automated mounting on a silicon optical bench, without requiring active alignment, using industry-standard, automated assembly processes – resulting in high yields of good devices.

Utilizing automated production processes, OneChip can maintain the highest production scalability (easily ramping up and down) in the industry and respond rapidly to customer needs. Standard production processes also mean reliable supplies to customers, at the lowest prices on the market.

**Q. Several companies have explored integrated PON solutions and have either dismissed the idea or have come to market with impressive integrated designs only to ultimately fail (e.g. Xponent Photonics). Why are you confident OneChip will fare better?**

As noted earlier, PLC designs developed by vendors such as Xponent are not fully integrated. PLC designs still require discrete active components and the assembly of as many as 10 parts, using a glass substrate. This results in poor yields and high costs.

OneChip is taking a fundamentally different approach. We are the only company in the optical access market that is monolithically integrating all the active and passive functions required for an optical transceiver onto a single, indium phosphide (InP)-based chip. This enables us to achieve low cost, high performance, high yields and high quality.

OneChip is one of only a few companies with new core intellectual property and advanced technology in the optical transceiver business that can sustain a competitive advantage over other optical component providers, which rely on conventional technology and assembly processes. Carriers and system providers recognize that an approach, which would eliminate assembly from multiple parts, is needed to lower the cost and improve the performance of transceivers, Optical Network Terminals (ONTs) and Optical Line Terminals (OLTs) in optical access networks. We believe OneChip's fully integrated technology can help unleash the potential of FTTH and other mass-market optical communications applications.

**Q. If integrated PON is a good idea why, in OneChip's opinion, have silicon photonics startups so far ignored this market?**

A. "Silicon photonics" designs face the inherent limitation that a laser cannot be implemented in silicon. Therefore, separate optical and electrical devices must be grown with different processes and then

assembled together. With as many as 10 parts having to be interconnected on a ceramic substrate, the alignment, tuning and reliability issues can significantly add costs and reduce yields.

In addition, system providers and service providers need to be cognizant of the inherent performance limitations with transceivers built from discrete parts. While short-reach EPON transceivers already have been optimized down to below a U.S. \$15 price, these implementations can only meet low-end performance requirements. Networks would require a switch to more costly transceivers to support longer-range EPON, 2.5G EPON, GPON or 10G PON. Because most service providers are looking to reap the payback benefits of their investments in fiber installations/retrofits over the shortest possible timeframes, it doesn't make sense to risk adding the high cost of a forklift changeover of transceiver technology at some point during the payback period.

**Q. PON with its high volumes has always been viewed as the first likely market for photonic integrated circuits (PICs). What will be the second?**

A. OneChip recognizes that optical communications is becoming economically and technologically mandatory in areas outside of traditional telecommunications, such as optical interconnections in data centers and other short to ultra-short reach broadband optical networks. OneChip is poised to introduce photonics integration into these and other high-volume business and consumer markets, where our PIC technology can reduce costs and improve performance.

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