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Hybrid integration specialist Kaiam acquires Gemfire

MONDAY, MAY 13, 2013 AT 8:03AM

Kaiam Corp. has secured US $16M in C-round funding and completed the acquisition of Gemfire.

"We have a micro-machine technology that allows us to use standard pick-and-place electronic assembly tools, and with our micro-machine, we achieve sub-micron alignment tolerances suitable for single-mode applications"

Byron Trop, Kaiam

With the acquisition, Kaiam gains planar lightwave circuit (PLC) technology and Gemfire's 8-inch wafer fab in Scotland. This is important for the start-up given there are few remaining independent suppliers of PLC technology.

Working with Oplink Communications, Kaiam has also demonstrated recently a 100 Gigabit 10x10 MSA 40km CFP module.

Hybrid integration technology

Kaiam has developed hybrid integration technology that achieves sub-micron alignment yet only requires standard electronic assembly tools.

"With single-mode optics, it is very, very difficult to couple light between components," says Byron Trop, vice president of marketing and sales at Kaiam. "Most of the cost in our industry is associated with aligning components, testing them and making sure everything works."

The company has developed a micro-machine-operated lens that is used to couple optical components. The position of the lens is adjustable such that standard 'pick-and-place' manufacturing equipment with a placement accuracy of 20 microns can be used. "If you set everything [optical components] up in a transceiver with a 20-micron accuracy, nothing would work," says Trop.

Components are added to a silicon breadboard and the micro-machine enables the lens to be moved in three dimensions to achieve sub-micron alignment. "We have the ability to use coarse tools to manipulate the machine, and at the far end of that machine we have a lens that is positioned to sub-micron levels," says Trop. Photo-diodes on a PLC provide the feedback during the active alignment.

Another advantage of the technique is that any movement when soldering the micro-machine in position has little impact on the lens alignment. "Any movement that happens following soldering is dampened over the distance to the lens," says Trop. "Therefore, movement during the soldering process has negligible impact on the lens position."

Kaiam Corp.

Kaiam's strategy besides selling TOSA and ROSA products is to work with companies keen to use its hybrid integration technology. "We will work with partners, and we have plenty of people lined up to do that," says Trop. "Our core strength is hybrid integration."

The start-up was founded in 2010 and while the company's staff have varied backgrounds, several of the management team came from distributed feedback (DFB) array tunable laser specialist, Santur, which was acquired by NeoPhotonics in 2011.

Kaiam buys its lasers and photo-detector components, while a fab make its micro-machine. Hybrid integration is used to combine the components for its transmitter optical sub-assembly (TOSA) and receiver optical sub-assembly (ROSA) designs, and these are made by contract manufacturers. Kaiam has a strategic partnership with contract manufacturer, Sanmina-SCI.

The company believes that by simplifying alignment, module and systems companies have greater freedom in the channel count designs they can adopt. "Hybrid integration, this micro-alignment of optical components, is no longer a big deal," says Trop. "You can start thinking differently."

"We will also do more custom optical modules where somebody is trying to solve a particular problem; maybe they want 16 or 20 lanes of traffic"

For 100 Gigabit modules, companies have adopted 10x10 Gigabit-per-second (Gbps) and 4x28Gbps designs. The QSFP28 module, for example, has enabled vendors to revert back to four channels because of the difficulties in assembly.

"Our message is not more lanes is better," says Trop. "Rather, what is the application and don't consider yourself limited because the alignment of sub-components is a challenge."

With the Gemfire acquisition, Kaiam has its own PLC technology for multiplexing and de-multiplexing multiple 10Gbps and, in future, 25Gbps lanes. "Our belief is that PLC is the best way to go and allows you to expand into larger lane counts," says Trop.

Gemfire also owned intellectual property in the areas of polymer waveguides and semiconductor optical amplifiers.

Products and roadmap

Kaiam sells 40Gbps QSFP TOSAs and ROSAs for 2km, 10km and 40km reaches. The company is now selling its 40km 10x10 MSA TOSA and ROSA demonstrated at the recent OFC/NFOEC show. Trop says that the 40km 10x10 CFP MSA module is of great interest to Internet exchange operators that want low cost, point-to-point links.

"Low cost, highly efficient optical interconnect is going to be important and it is not all at 40km reaches," says Trop. "Much of it is much shorter distances and we believe we have a technology that will enable that."

The company is looking to apply its technology to next-generation optical modules such as the CFP2, CFP4 and QSFP28. "We will also do more custom optical modules where somebody is trying to solve a particular problem; maybe they want 16 or 20 lanes of traffic," says Trop.

Kaiam Corp.	At a glance
HQ and staff	Newark, California 30 employees with over half engineers
Revenues/ funding	Start-up founded in 2010. The company has raised US $13M in two rounds of funding. It has since announced a $16M C-round.
Technologies	Hybrid integration using an in-house technique for coupling discrete optical components. Planar lightwave circuit (PLC).
Manufacturing	Contract manufacturing and an 8-inch PLC fab.
Products	40G QSFP+ 2, 10, 40km TOSA/ ROSA 100G 10x10 MSA 40km TOSA/ ROSA.
Acquisitions	Kaiam has acquired Gemfire.