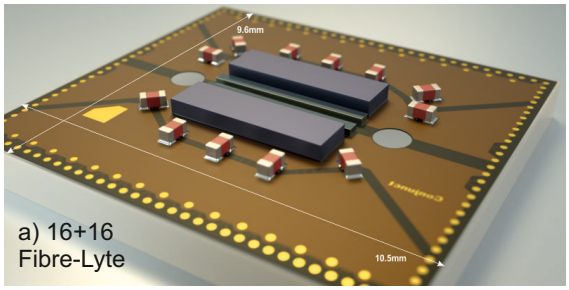
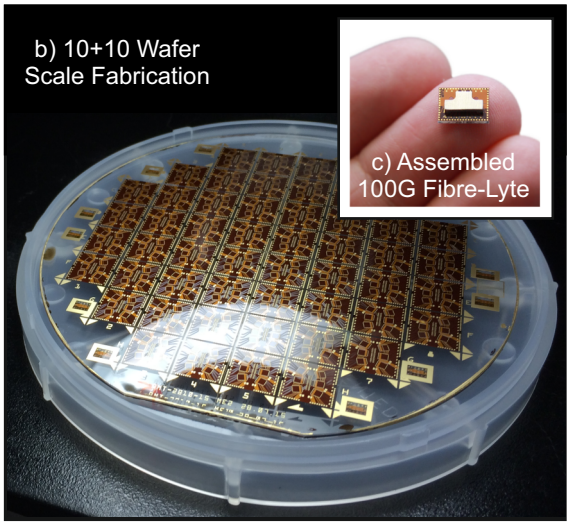
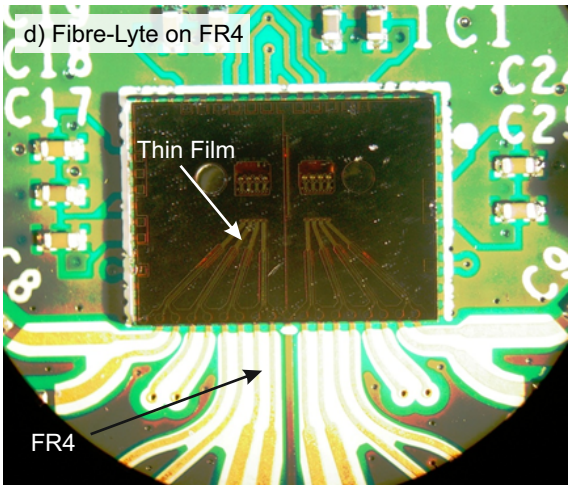
Fibre-Lyte Optical Engines (1/2)

Fibre-Lyte is Conjunct's innovative Optical Sub-Assembly (OSA) which can be used in applications demanding the highest performance at data rates of 25 Gbps and 50 Gbps and which can accommodate PAM4 modulation. Fibre-Lyte products incorporate Conjunct's considerable experience from working over 10 years in the design and manufacture of transparent substrates based OSAs.



a) 16+16 Fibre-Lyte





- **SIZE:** The transparent substrate is the perfect substrate for opto-electronic devices which are flip chipped. If the performance of your OSA can only be realised through flip-chipping use Conjunct's Fibre-Lyte product. Of course, flip-chipping may reduce the size of the substrate since no additional space is required for wire bonding and Conjunct can already offer, for example, an 8+8 OSA which is only 9.5x9.8mm (0.5mm pad pitch) and a 16+16 OSA which is only 9.6x10.5mm (0.3mm pad pitch).
- **POWER MANAGEMENT:** The simplicity of Fibre-Lyte's construction leads to very efficient thermal management. An integrated heat spreader allows rapid heat transfer between OSA and the parent housing.
- **POWER CONSUMPTION:** Power consumption continues to be a major issue for data farm deployment. The power consumption is dictated largely by the power consumption of the opto-electronic devices. Conjunct can integrate most devices on to its transparent substrate and a range of optical and electronic devices which provide very low power consumption have been selected. For example, an 8+8 x 25G (850nm) OSA will consume as little as 0.85W (106mW per Tx/Rx pair) Conjunct's 10+10 x 10G (1310nm) will consume as little as 1.0W (100mW per Tx/Rx pair).
- **CROSS TALK:** Fibre-Lyte will typically deliver cross talk performance which Conjunct believes is unequalled in the industry. This is because Fibre-Lyte does not use wire bonding and does not use lenses which disperse the beams. Further, the precision connecting tracks and connection points are all integrated with high integrity ground planes.
- **INTEGRATION INTO ELECTRONIC PCBs:** Fibre-Lyte provides a standard LGA interface and the OSA can be solder reflowed on to a PCB using industry standard techniques. Such a capability makes Fibre-Lyte the ideal candidate OSA for mid-board and optical back plane applications. Fibre-Lyte can also be mounted on to a flexible circuit to allow easier integration in certain configurations.
- **CONFIGURATIONS:** Conjunct can provide most of the current industry standard configurations, namely: Rx only, Tx only and Duplex (Rx +Tx). Within the duplex range, 2+2, 4+4, 8+8 10+10 and 16+16 configurations can be realised. The lanes can contain 10G and 25G VCSELs operating in short wavelengths (850nm) and long wavelength (1310nm).

Conjunct

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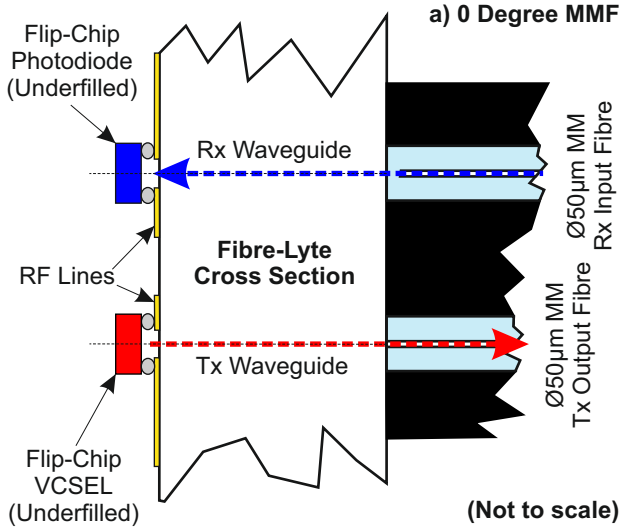
Fibre-Lyte Optical Engines (2/2)

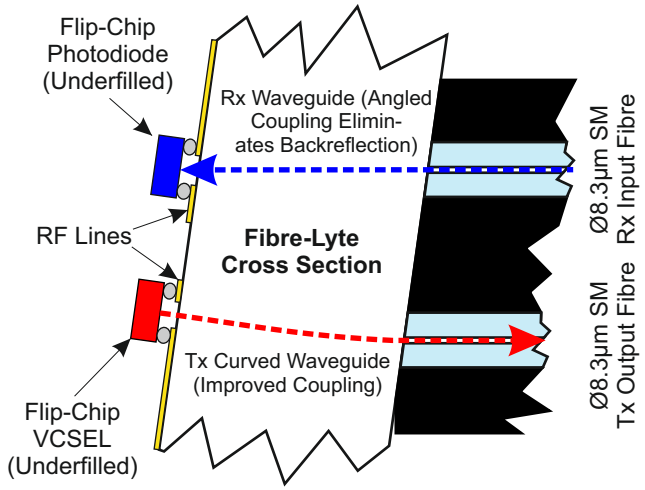
The essential uniqueness of Fibre-Lyte is its use of vertical waveguides processed into an optically transparent substrate on which are mounted the electronic and optical devices.

a) 0 Degree MMF



(Not to scale)

b) 8 Degree SMF



Optical Coupling

- Fibre-Lyte uses waveguides instead of lenses to minimise both beam expansion and optical cross talk.
- Fibre-Lyte can interface with 0 and 8 degree connectors (see cross sections **a** and **b** above).
- Fibre-Lyte is directly butt-coupled in the same way as two MPO connectors would be (ferrule connection in **c**).
- Fibre-Lyte waveguides are immune from curvature and surface roughness issues common in lens equivalents.
- The use of a transparent Borosilicate substrate, which possesses a CTE that is well matched to die attachment, makes the Fibre-Lyte assembly dimensionally stable over temperature.

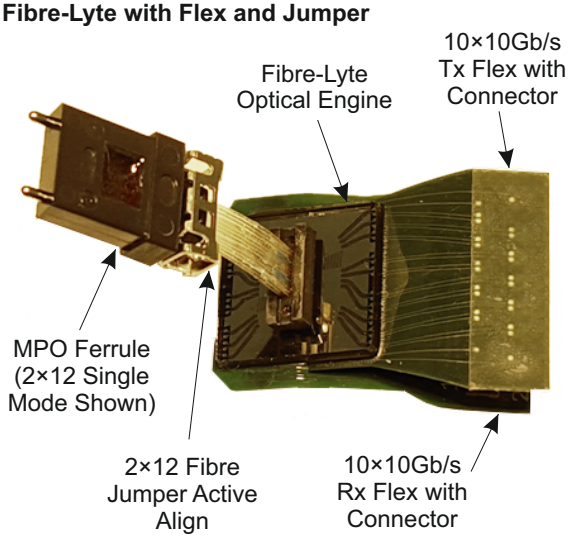
Wafer Scale Production

- The Fibre-Lyte substrate is manufactured using both serial and wafer scale techniques on 4 and 6 inch wafers. Waveguides are initially processed into the wafers and subsequently thin film tracks are deposited on the substrates.
- Multiple electrical layers (including ground planes) are deposited on the substrate to minimise routing problems on the parent PCB and to minimise RF cross talk.

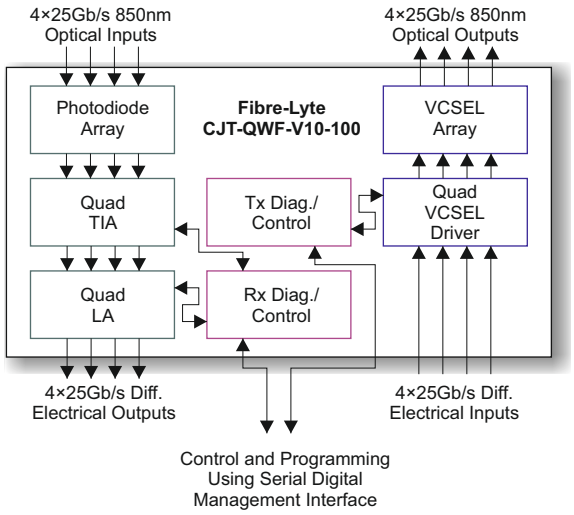
Flip-Chip Assembly

The opto-electronic devices are finally flip chipped on to the substrate. This provides a robust assembly which obviates the use of wire bonding which can provide performance in excess of 25G. Flip-chip is robust and ideal for devices which must be mounted on a transparent substrate.

c) Fibre-Lyte with Flex and Jumper



d) Functional Block Diagram



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