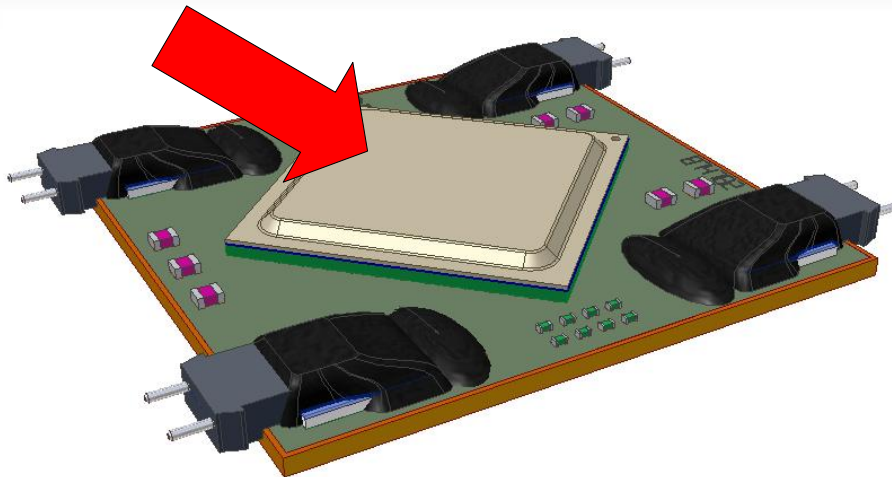


## PRODUCT BRIEF

Reflex Photonics *Light on Board*®  
Optically Enabled ASIC packaging

**Your ASIC here**



Example of *Light on Board*® Optically Enabled ASIC Package with four *LightABLE*™ parallel optical engines

### Product Summary

The Reflex Photonics *Light on Board* Optically Enabled Packaging technology is a fully integrated solution for converting between high-speed electrical and optical I/O.

The *Light on Board* package is comprised of pre-aligned low-profile optical sub-assemblies (*LightABLE*) mounted upon a high-speed printed circuit board along with the ASIC. Short traces connect the high-speed electrical TX and RX signals to the Reflex *LightABLE* optical engines. Multi-fiber optical ribbons then attach to the optical engines for connectivity between chassis', blades, and ICs.

## Highlights

- 4, 12, 24, 48 or 72 TX and RX channels standard in an IC package.
- Up to 10.4 Gbps per channel
- No optical alignment necessary
- RoHS compliant
- Can be fitted into existing designs without PCB spin via custom high speed socket

## Applications

High-speed optoelectronic data conversion for

- 1G & 10G Serial Ethernet
- 4 x 3.125G 10G Ethernet links
- 4G & 8G Fibre Channel
- InfiniBand® DDR and QDR
- PCI Express® 1.1, 2.0 and 3.0
- Serial Rapid IO™
- SATA-IO™ 3.x
- Proprietary inter and intra board systems

## Benefits

**Cost** : save \$20 - \$100 per bi-directional optical port.  
Target cost for *Light on Board* is < \$1 / Gbps / port.

**Power** : save ~1W per port (compared to SFP+ modules).

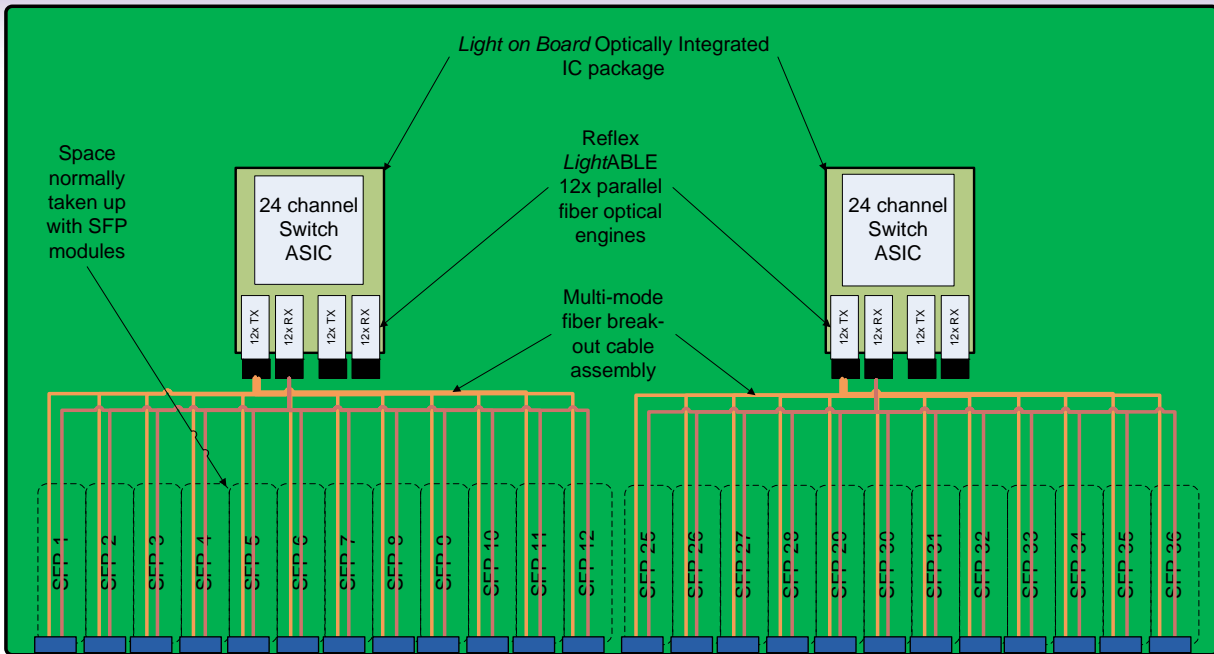
**EMI** : moving optics away from the faceplate reduces EMI emissions and ESD sensitivity.

**Space** : eliminating the need for long high-speed PCB traces, pluggable connectors and bulky modules results in huge space savings.

## *Light on Board*® Optically Enabled Package Applications

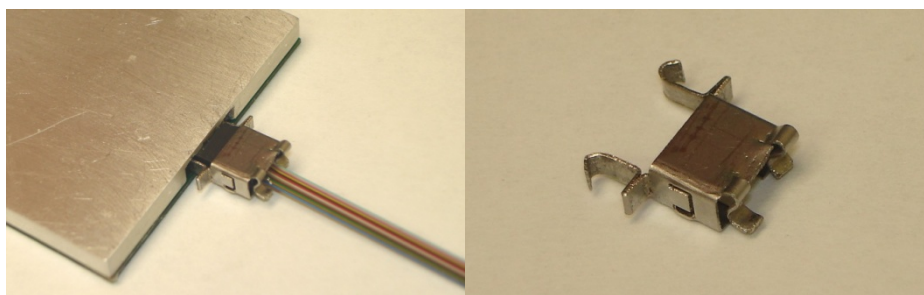
Reflex Photonics *Light on Board* Optically Enabled IC packages offer from 4 to 48 asynchronous bi-directional pairs of channels operating at up to 10.4 Gbps per channel. These links are designed for very short reach application (1m to 300m) with support for both 62.5/125 micron and 50/125 micron multimode fiber.

As shown in Figure 1, a sample application scenario of the *Light on Board* package consists of an ASIC interfaced with the *LightABLE* optical engines inside a switch chassis. Used in conjunction with an optical fiber break-out, these parallel optical engines replace typical single channel transceivers such as SFP SR modules.



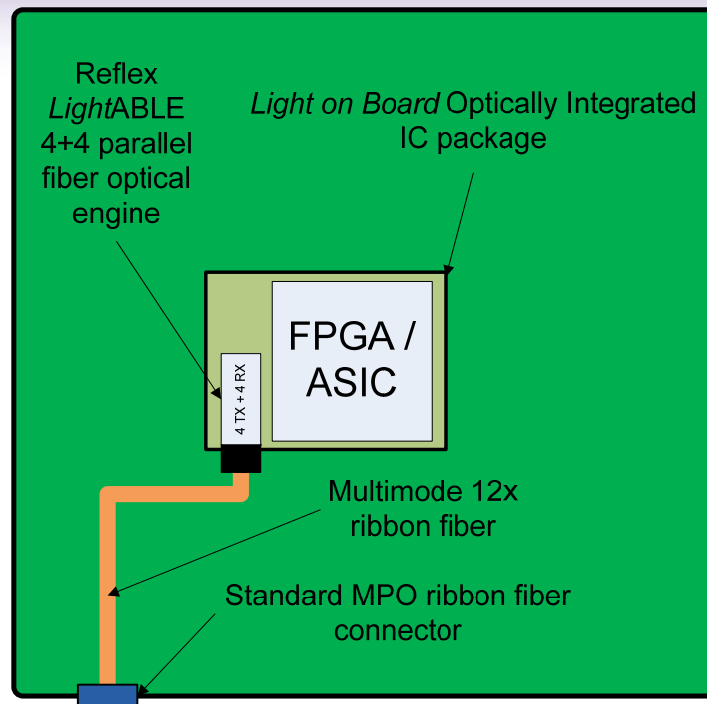
**Figure 1 – Sample application scenario for *Light on Board* 12x parallel optical engines. (Top view) Parallel optical engines replacing traditional single channel SFP modules.**

The *LightABLE* transmitter modules consist of an array of 12 VCSELs (Vertical Cavity Surface Emitting Lasers) and associated circuitry, which converts 12 parallel electrical data inputs to 12 parallel optical data output signals. Conversely, the receiver module inputs 12 parallel optical signals and converts them into 12 parallel electrical signals through an array of 12 PIN photodiodes and associated circuitry. On-board micro-controllers set-up and monitor the optics. An industry standard optical fiber ribbon cable with an MT-terminated compatible connector at one end plugs into the *LightABLE* module receptacle with a small Reflex metal retaining clip to hold it in place. The clip is shown in Figure 2.



**Figure 2 –*LightABLE* parallel module with metal clip and connecting ribbon fiber.**

Another application is shown in Figure 3. An FPGA ASIC is packaged with a single *LightABLE* 4+4 TX / RX optical engine. The optical module consists of 4 transmit channels and 4 receive channels in a single package. The module is connected to a 12 fiber ribbon cable for up to 40 Gbps of optical connectivity to the FPGA.



**Figure 3 – Sample application for *Light on Board* 4+4 parallel optical engines. Optically enabled FPGA package with 40 Gbps bi-directional optical connectivity**

The Reflex optical engines operate from a single +3.3V power supply. In addition to the Optical Sub-assemblies and ICs, a small micro-controller sets up the driver and bias settings at startup and provides communication for the *LightABLE* modules. A 2-wire I2C serial interface is available to send and receive control signals and to obtain digital diagnostic information. Individual channels can be addressed and unused channels can be shutdown for maximum design flexibility.

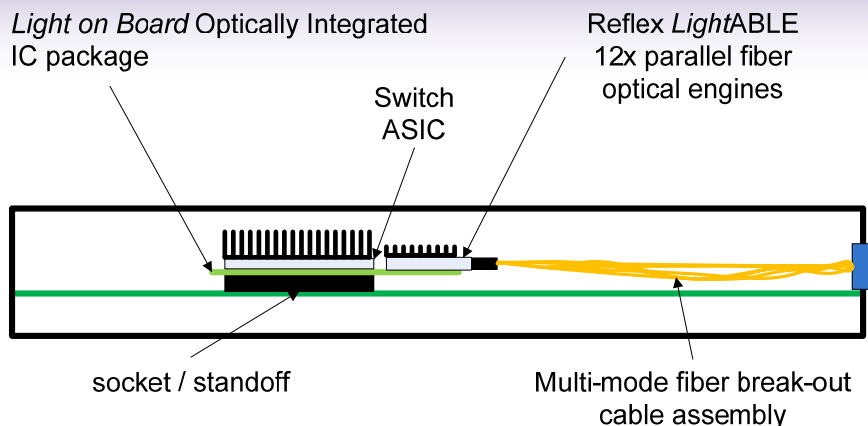
Each parallel module is supplied with a dust-plug for the protection of the optical interface. The transmitter module is Class 1 eye safe by design - please refer to the regulatory compliance section for further details.

## Integration into a Host Board

Reflex Photonics is partnering with a number of ASIC companies to provide reference designs for the *Light on Board* Optically Enabled packages with these ICs. The integration process is very simple; only involving the design of a small mezzanine PCB upon which the ASIC, Reflex *LightABLE* engines and a small number of support components are placed.

Reflex *Light on Board* Optically Enabled IC packages can be soldered directly onto a Host PCB or inserted via a socketed assembly. Figure 4 shows the socket configuration.

A custom socket which fits into the same form factor as the Host ASIC is easily designed and fabricated via Reflex's integration partners. Some of these IC sockets have already been fabricated and verified. The socketed Optically Enabled IC also has the flexibility of being replaceable in the event of an optical channel failure.

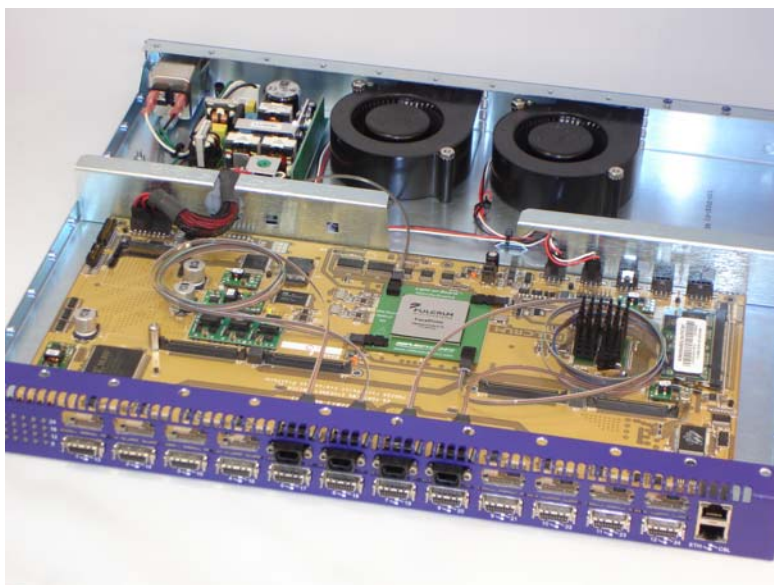


**Figure 4 – Sample chassis with *Light on Board* solution. Socket mounting configuration for *Light on Board* 12x parallel optical engines.**

Existing Host PCBs can be retro-fitted with the Reflex *Light on Board* socket solution for cost reduction or as a proof of concept. The socket can act as a stand-off to clear PCB components.

Once the Reflex *Light on Board* package is in place on the PCB, the ribbon fiber can be attached and the module is ready for use.

An example of the Reflex *Light on Board* optically enabled ASIC package is shown in Figure 5.



**Figure 5 – Fulcrum™ Microsystems Focalpoint™ switch ASIC demonstration system employing the Reflex *Light on Board*® solution. The Fulcrum ASIC is mounted on a *Light on Board* PCB with four Reflex optical engines. Ribbon fibers attach to the faceplate.**



For more information on creating a *Light on Board* optically enabled ASIC package, see the latest revision of the *Light on Board Application note*.

### Document revision history

Revision	Page	Description
1.0		Preliminary version

For more information on this or other products:  
Contact sales at (650) 967- 4416  
or by email at [sales@reflexphotonics.com](mailto:sales@reflexphotonics.com)

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