APPLICATION SUCCESS STORIES
- Custom Solutions
- Ethernet Switches

In-flight entertainment system uses custom Ethernet switch solution from Diamond Systems

Solution Summary

Customer requirements
- Airborne application
- Gigabit Ethernet switch with copper and fiber ports
- Compact size
- Quick development time
- Rugged design with as few cables as possible

Diamond solution
- EPSILON compact Ethernet switch module with custom carrier board
- 2-board solution based on off-the-shelf switch module achieved lowest development cost and smallest size

Background

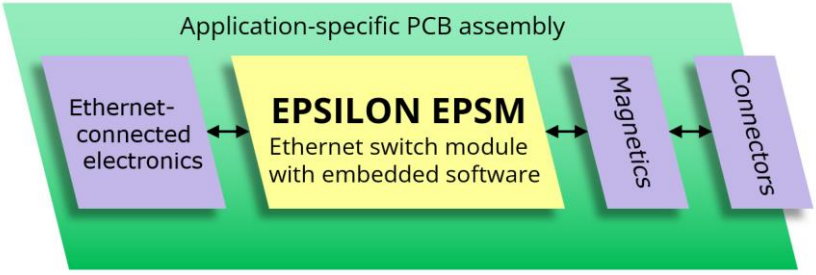
A manufacturer of passenger aircraft in-flight entertainment and internet connectivity systems was building an Ethernet switch to manage traffic between the main controller and the in-seat computers. The system had to be compact and rugged. Thus the company's product design consisted of a rugged enclosure with MIL-TDL-38999 style connectors mounted on a PCB. They were seeking a solution where they could plug the Ethernet switch directly onto their connector board to eliminate internal cables and improve ruggedness and reliability and make the system as compact as possible. As this solution called for a custom design, the customer was also seeking to minimize the cost of the custom engineering effort.

Switch Module Simplifies Solution Design Effort

Diamond Systems was able to deliver a perfect-fit solution for this project. In order to reduce development time and cost for a custom product, we used an **EPSILON Ethernet switch module** as the core of the system. These switch modules provide an almost complete Ethernet switch in a rugged, compact module measuring only 84 x 55 mm (3.3 x 2.2 inches). The core switching circuit, control processor, and embedded software are built into the board, and only the "final inch" of connectors and magnetics is needed to complete the design. By using a switch module, a custom Ethernet switch design can be implemented quickly and easily, since 90% of the effort is already complete and available as an off-the-shelf component, and only the relatively easy portion of the effort remains to be done.

Diamond's **EPSM-10GX** Ethernet switch module was selected for this project. The EPSM-10GX module includes 24 1 gigabit Ethernet ports for device connectivity plus 2 10 gigabit Ethernet ports for aggregation and upstream linking. Two embedded software packages are available: a Layer 2+ switching application and a Layer 3 routing application. (A newer model **EPSM-10GX4** increases the quantity of 10Gbe ports from 2 to 4.)

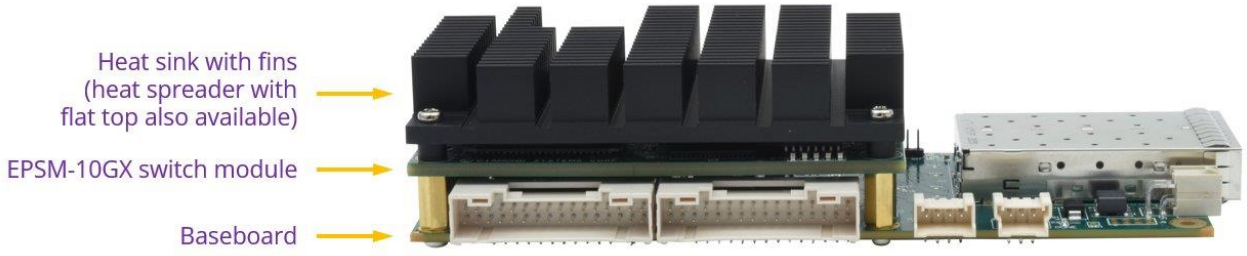
EPSM-10GX switch module



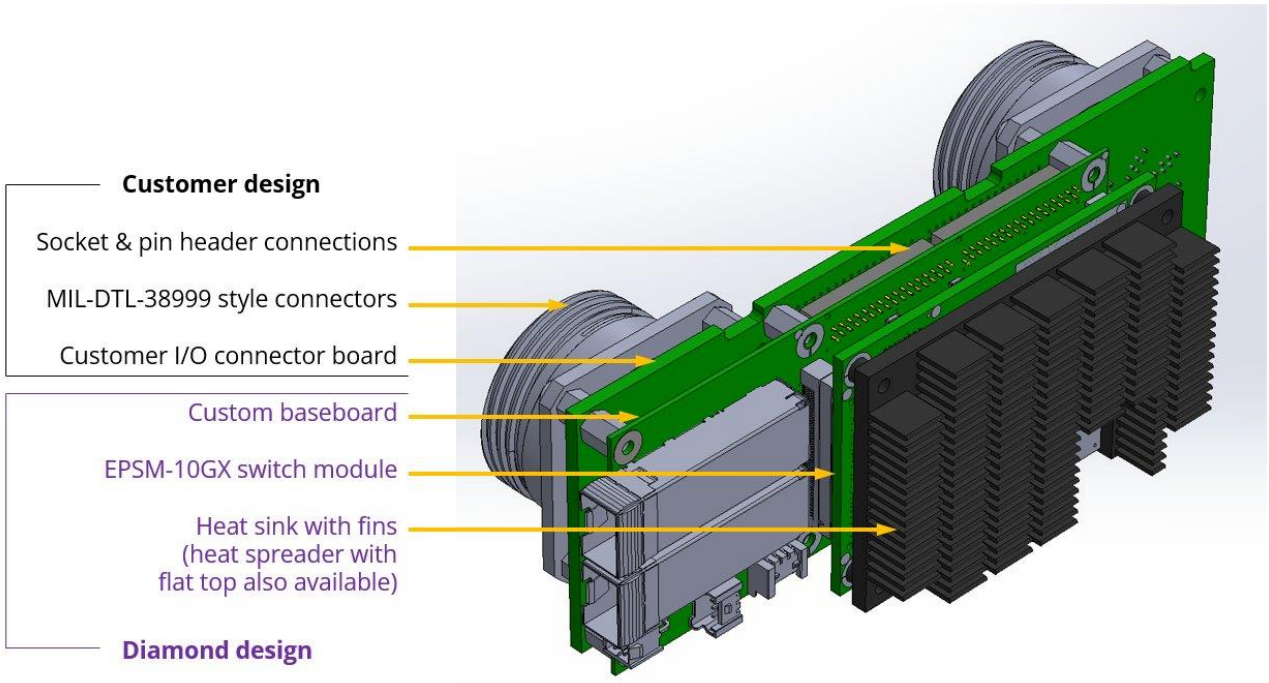
Diamond' EPSILON miniature Ethernet switch modules simplify integration of Ethernet switching functionality into custom electronics.

Custom Baseboard Completes the Solution

The Epsilon switch module requires a baseboard to complete the circuit with magnetics and I/O connectors. It uses a pair of high-speed board to board connectors with 28Gbps rating to carry all signals and power between it and the baseboard. The customer's connector board, on the other hand, contained only the rugged 38999 I/O connectors and no electronics. A transition board was therefore needed to complete the circuit between the two boards. Diamond designed a custom carrier board to fill this need. This transition board contained the SFP+ sockets to support the 10G fiber connections for the switch as well as power and serial port connectors (the serial port is used for "out of band" configuration and management of the switch).



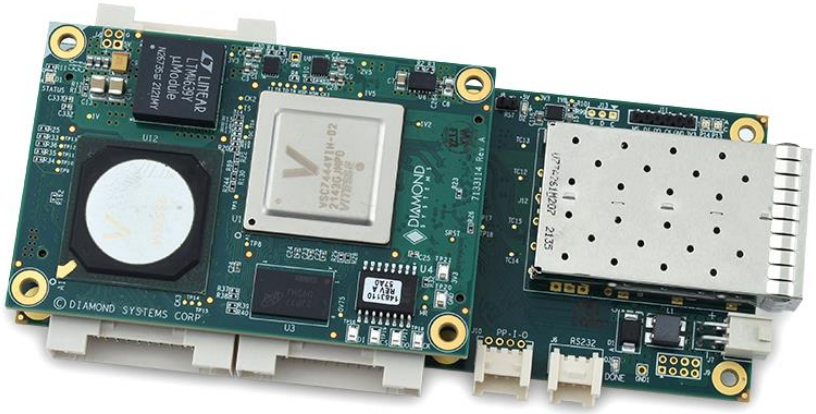
As mentioned earlier, a key design goal was to eliminate cables for ruggedness and compactness. The custom baseboard used a series of socket headers to plug onto pin headers on the customer's connector board to avoid cables between the two boards. It was designed to be as small as possible; the final size matches the width of the EPSM-10GX and extends in one direction to add the SFP+ sockets, for a total size of only 55 x 136mm (2.2 x 5.3"). Thus a compact 3-layer "sandwich" of boards was created to implement the complete system.



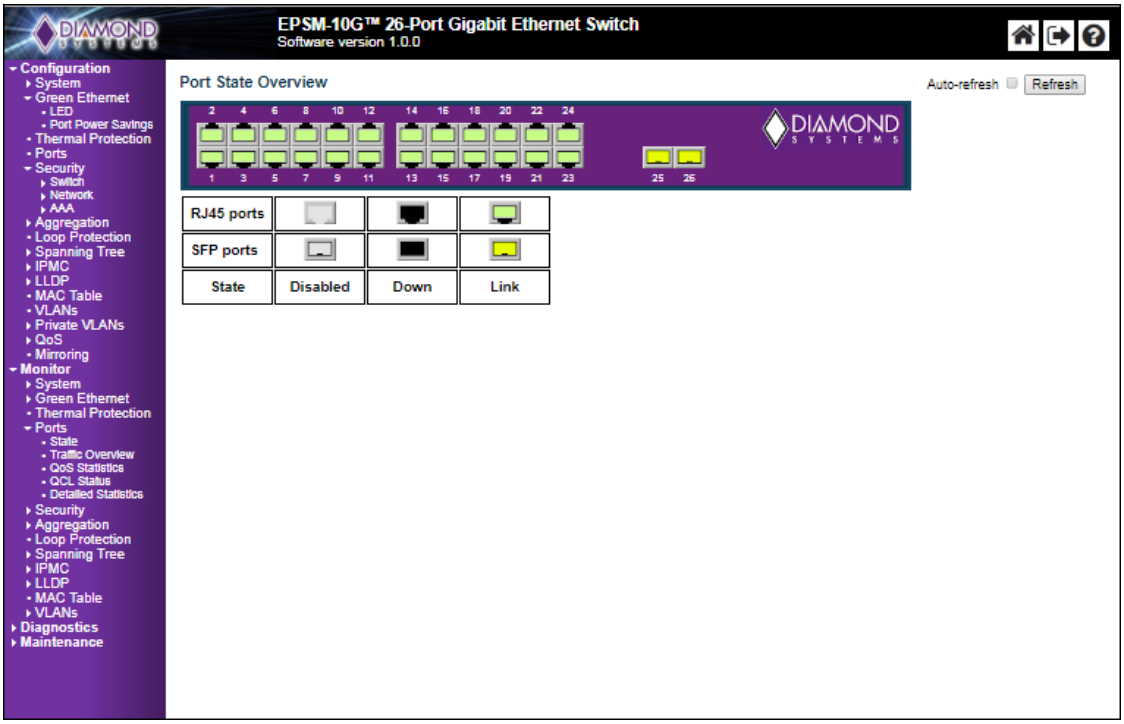
Anatomy of the custom solution

By using our EPSILON compact Ethernet switch module and a custom baseboard, Diamond was able to deliver a quick-turn, compact, economical, and rugged custom switch for this new on-board entertainment and internet service system. This application success illustrates the benefit of using an Ethernet switch module to reduce development time, cost, and risk for Ethernet switches, as well as Diamond's custom product development capabilities.

In most cases, a product Diamond designs specifically for a customer is exclusive to that customer. However, in this case, the customer agreed that Diamond could also make the product available to the general market. A self-contained variant of the custom baseboard, with integrated Epsilon switch module and standard pin headers for I/O, is available as Diamond's standard product **EPS-12002L**. The product is available with both heat sink and heat spreader thermal solutions, and with both Layer 2 and Layer 3 embedded software. EPS-12002L is an excellent choice for applications requiring up to 12 gigabit Ethernet ports and 2 10G SFP+ ports in a rugged, compact form with wide temperature range operation.



EPS-12002L 12+2 port Ethernet switch with EPSM-10GX switch module
(thermal solution removed for illustration purposes)



Example screenshot of embedded software for Diamond's EPSILON Ethernet switch modules
The software can be customized with customer branding, port configuration, and other features.

For More Information

Diamond products discussed in this article:
EPSM-10GX Ethernet switch module: https://www.diamondsystems.com/products/epsm10gx
EPSM-10GX4 Ethernet switch module: https://www.diamondsystems.com/products/epsm10gx4
EPS-12002L Ethernet switch: https://www.diamondsystems.com/products/eps12002l

Diamond's Ethernet switch product line:
https://www.diamondsystems.com/products/ethernetsw

Diamond's custom product development capabilities:
https://www.diamondsystems.com/solutions/custom

General inquiries:
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