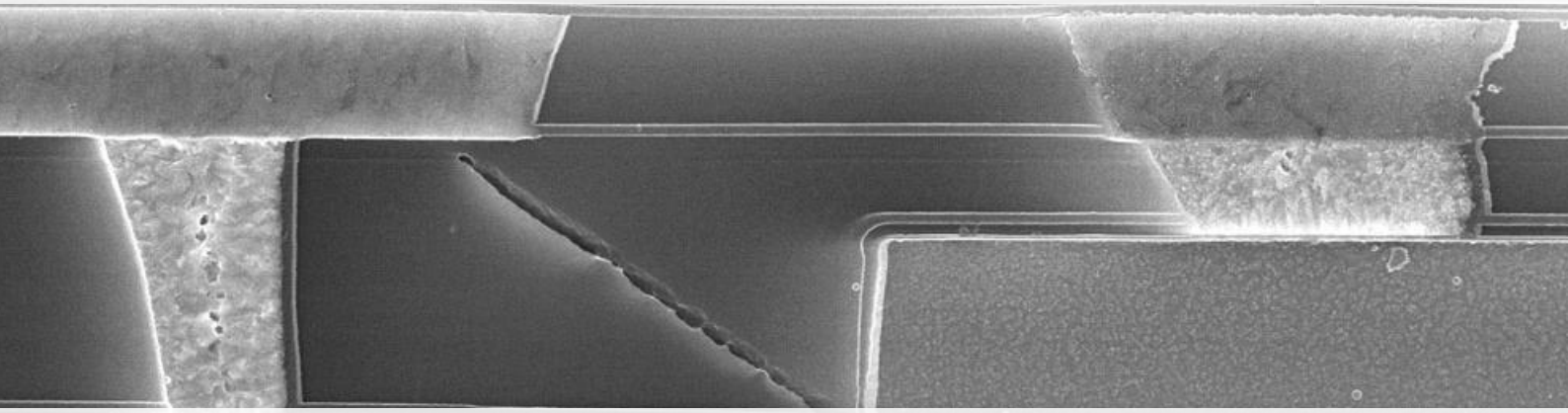
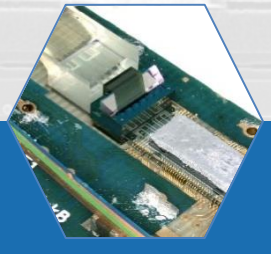
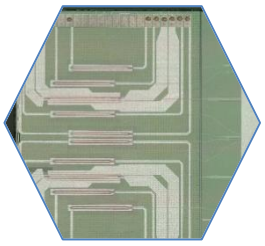
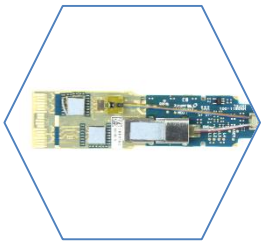




Intel Silicon Photonic 100G PSM4 QFSP28 Transceiver

Deep analysis of the first silicon photonic die with Intel's unique approach for laser integration, the outcome of 15 years of development, along with the main optoelectronic components in the connector.





In only a few years, Intel has become the number two supplier for silicon photonics-based optical transceivers. Intel has succeeded because it put a lot of effort into the bottleneck, which was integrating the laser chip through InP chiplet bonding followed by post processing. Intel introduced a silicon photonics Quad Small Form-factor Pluggable (QSFP) format transceiver that supports 100G communications in 2016. The company now ships a million units of this product per year into data centers. Intel's 400G products are expected to enter volume production in the second half of 2019. At ECOC 2018, Intel announced new 100G silicon photonics transceivers targeted at 5G wireless fronthaul applications. All these innovations have been enabled by Intel's first generation 100G series silicon photonics QSFP transceivers, featuring laser-on-chip integration.

The transceiver contains two separate blocks, each with several dies. The transmitter integrates several InP lasers and a CMOS die chiplets through bonding on the main silicon die in flip-chip configuration. On the main silicon die a Mach-Zehnder modulator encodes signals. Other components focus or isolate the signals. Data are processed using a four-channel 25G optical Clock and Data Recovery (CDR) component from MACOM. The receiver function is performed by four germanium (Ge) photodiode dies and a TransImpedance Amplifier (TIA) circuit. The Ge photo-diodes are manufactured on a dedicated Silicon-on-Insulator substrate. A fiber-optical coupler with focusing lens connects the photodiode die with the fiber optic.

All of these components – described in this report – show Intel's potential in terms of packaging and photonics. In a very small form factor, Intel manages to integrate four lasers, a photonic driver, optical modules, CDR functionality, high performance photodiodes, two advanced substrates and materials for optics. This report will show how the company implements the chiplet configuration, and provides a detailed description of the transmitter and receiver line.

This report is exhaustive analysis of the main components of the Intel 100G PSM4 connector, including a full analysis of the silicon photonic die, the TIA circuit, the Mach-Zehnder driver circuit, the MACOM circuit and the germanium photodiode along with a cost analysis and price estimate. It also describes the two fiber optic couplers, focusing lens and the isolator and estimates their price. We also compare the product against Luxtera's silicon photonic circuit.

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- Detailed photos
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Title: Intel Silicon Photonic 100G PSM4 QFSP28

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Date: March 2019

Format: PDF & Excel file

Price: EUR 3,990

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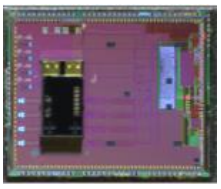

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The 1064101003 Quad Small Form-factor Pluggable Plus connector from Molex integrates this photonic circuit from Luxtera.

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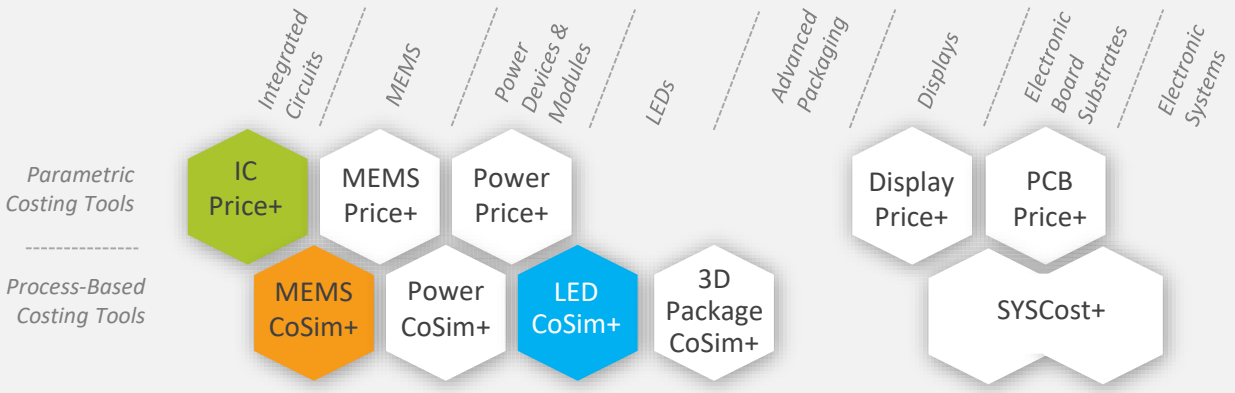

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