PRODUCT PORTFOLIO

Powering High Speed Communications
at 100G and Beyond

HIGHER YIELD　　**SUPERIOR PERFORMANCE**　　**RAPID INNOVATION**　　**BETTER INTEGRATION**　　**LOWER COST**

Acacia's mission is to deliver disruptive high-speed communications technology that increases the bandwidth, increases overall performance and reduces costs for carriers, data centers, and cloud providers. Our innovation is powered by our component technology, which we develop using a process we refer to as the "siliconization of optical interconnect." This allows us to combine many optical functions into a single integrated solution that has the potential to transform current and future cloud and communication networks.

CLOUD/DCI　　**METRO CARRIER**　　**LONG HAUL**　　**SUBMARINE**

WIRELESS ACCESS　　**WIRED ACCESS**　　**CABLE ACCESS / REMOTE PHY**
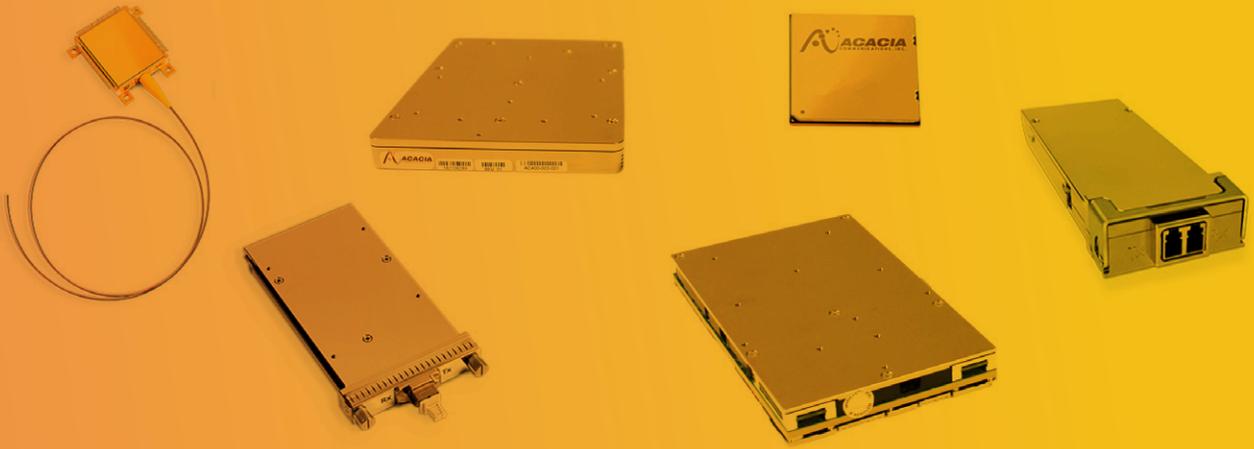
EMBEDDED MODULES

AC1200 Coherent Module

The AC1200 Coherent Module is based on Acacia's high-performance Pico digital signal processor (DSP) ASIC with low power dissipation that the industry has come to expect from Acacia products. Utilizing two wavelengths, with up to 600 Gbps capacity each, Acacia's AC1200 supports transmission speeds of up to 1.2 Tbps in a footprint which is 40% less than the size of a 5" x 7" module supporting 400 Gbps today. The versatile AC1200 will support multiple network applications including Cloud/DCI, metro, long-haul and submarine. The AC1200 incorporates 3D-shaping which enables fine-tune adjusting of the line-side modulation characteristics, helping network operators optimize capacity and reach for their network. The key features enabling 3D-shaping include: Shaping of the constellation points' probability to increase capacity using Acacia's patented Fractional QAM modulation; Shaping of the constellation points' location to increase reach; and Shaping of the spectral width to match the available channel passband by adapting the baud rate.

In addition to 3D shaping, the AC1200 offers additional features that increase flexibility and performance: Wide range client interface support (100GbE, OTU4, 400GbE and FlexE); Internal interconnect fabric to enable increased traffic flexibility, including mapping of 3x400GbE client traffic on to two line-side wavelengths carrying 600Gbps each; for maximizing fiber capacity, and single 400GE client on to two line-side wavelengths carrying 200Gbps each for Ultra Long Haul transmission and Enhanced Turbo Product Code SD-FEC for ultra-high net coding gain (NCG) to extend reach, while maintaining low power dissipation.

Leading-edge interconnection technologies: Highly integrated silicon photonic integrated circuit (PIC) that supports high baud rates while reducing interconnect costs; and co-optimization and short connection between the DSP ASIC and optics designed to yield improved signal integrity for the high speed interconnects.

The module will support security encryption and a wide range of host interfaces designed to reduce or eliminate the need for costly external devices. Acacia will support its AC1200 with a software development kit designed to streamline the integration and allow customers to more quickly take advantage of this highly flexible solution.

AC400 FLEX Product Family

Acacia's AC400 Flex product family, based on Acacia's Denali DSP, supports transmission capacities ranging from 100 Gbps to 400 Gbps per module. By changing the configuration of these modules through software, customers can use the transmission speed and distance that is best suited to their needs. AC400 Flex modules are well suited for DCI applications that require exceptional performance to leverage the high data rate per carrier and long haul/submarine applications.

Leveraging Acacia's dual-core Denali DSP and in-house silicon PIC technology, we believe the AC400 was the first coherent module available supporting 400 Gbps in a 5" x 7" form factor. This low power, high density solution still offers the performance required for even the most challenging submarine applications. This combination of features offers a unique level of flexibility in the industry, especially for 37.5/50GHz channel spacing applications.

PLUGGABLE MODULES

AC200 CFP2-DCO Product Family

Acacia's award winning CFP2-DCO product family supports four times the faceplate density of CFP-DCO. With support for 100 Gbps using QPSK modulation and 200 Gbps using either 8QAM or 16QAM, the module offers enhanced flexibility in a pluggable coherent solution. The module incorporates Acacia's Meru DSP ASIC, based on 16nm CMOS technology, and Acacia's silicon PIC.

Supporting a digital host interface, similar to client optical transceivers, the CFP2-DCO module offers simpler integration and a pay as you grow commercial model that includes the cost of the DSP. The module supports interoperable G.709 FEC and staircase FEC, as well as Acacia's high gain proprietary soft-decision FEC that is backward compatible with previous generation Acacia DSPs. Client interface support for 100GbE and OTU4. Optional Layer-1 encryption, in combination with Line-Side integrated soft decision FEC and interoperable Staircase FEC, makes the CFP2-DCO well suited for security sensitive and highly integrated metro and long-haul applications. Additional applications include DCI, cable access/ remote PHY, 5G, and Open ROADM/open line system architectures. The low power consumption when used in 100G mode enables deployment in existing 100GBASE-LR4 sockets, expanding the application space and dropping inventory costs to operators.

The CFP2-DCO product family includes DCI, metro, and long-haul variants, with features optimized for each application.

PRODUCT NAME	AC200-CFP2-DCI	AC200-CFP2-M	AC200-CFP2-LH
Application Domain	DWDM Point-Point Links	Metro DWDM	Long-Haul DWDM
Data Rate and Modulation	200 Gbps 16QAM	200 Gbps 8QAM	100 Gbps QPSK
Reach[1]	300km	800km	2500km

AC200 CFP2-ACO Product Family

Acacia's CFP2-ACO is the fourth product family to utilize its integrated coherent silicon PIC and addresses a new portion of the inter-data center and metro carrier markets.

Acacia's CFP2-ACO product has an analog electrical host interface and a linear optical transmitter supporting up to 250 Gbps transmission speeds. The industry standard pluggable CFP2 form factor was designed in accordance with the Implementation Agreement defined by the Optical Internetworking Forum.

This CFP2-ACO form factor offers an optics-only solution for customers who currently rely on in-house DSP capabilities. The optics used in the module are identical to the ones used in applications ranging from DCI to submarine when paired with an Acacia internal DSP.

CFP2-ACO modules are commonly used in metro carrier and DCI applications where high density and pluggability are more valued.

AC100 CFP-DCO Product Family

Acacia's award winning CFP-DCO product family supports 100 Gbps transmission speeds in an industry-standard, pluggable CFP form factor, which is optimized for power sensitive applications. With a rich feature set, Acacia's coherent CFP modules enable cost effective system architectures. The integration of power saving DSP technology and silicon photonic integrated circuit (PIC) technologies has allowed Acacia to optimize the balance of power and performance.

Widely adopted in long-haul and metro carrier and Cloud/DCI applications, Acacia's coherent CFP modules support a range of applications from 80km client interfaces up to 2,500km DWDM links. Various features can also be configured to optimize the power dissipation for any given application.

The CFP-DCO product family includes ZR, long-haul, and metro variants, with features optimized for each application.

PRODUCT NAME	CFP-DCO-ZR	CFP-DCO-M	CFP-DCO-LH
Feature	100G ZR	Metro DWDM	Long-Haul DWDM
Reach[1]	80km	1200km	2500km

# DSP ASIC and Photonic Integrated Circuit (PIC) Products

Acacia's DSPs and PICs are at the heart of the aforementioned coherent module products. They enable the optical performance and low power that have become synonymous with Acacia throughout the optical transport industry.

A standalone DSP with the support of an accompanying reference design can take advantage of the feature set of Acacia's DSP, which includes forward error correction algorithms required for high-capacity coherent transmission.

Acacia is a pioneer in the introduction of silicon-based PICs for coherent optical communications--the highly integrated Silicon Photonics single-chip PICs are low cost, low power, and ultra-compact. Coupled with Acacia's DSP ASIC, the combination provides a leading coherent solution in low power and size.

Acacia's PIC is optimized for high yield and low cost, tested electrically and optically on the wafer before dicing, enabling very high volumes and much higher packaging yields than components manufactured with legacy material, while leveraging mature CMOS processes without needing temperature controls or hermetic packaging.
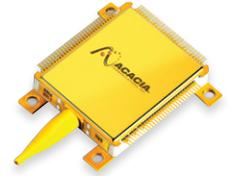
Broad Coherent Module Portfolio

Product Family	AC400	AC1200	CFP-DCO	CFP2-DCO	CFP2-ACO
Versions	• C-Band • L-Band		• Gen 1 • Gen 2		
Benefits	• Flexibility • Performance	• Flexibility • Capacity • Performance	• Pluggability • Low Power	• Pluggability • Low Power	• Pluggability • DSP Independent
Applications	• DCI • Metro • Long-Haul • Submarine	• DCI • Metro • Long-Haul • Submarine	• DCI • Metro • Long-haul • Access	• DCI • Metro • Long-haul • Access	• DCI • Metro • Long-haul

1 Non-Dispersion Shifted Fiber, without in-line dispersion compensation

ABOUT ACACIA COMMUNICATIONS

Acacia's innovative silicon-based high speed optical interconnect products accelerate network scalability through advancements in performance, capacity, and cost. Our silicon photonic PICs, DSP ASICS, and coherent modules inside a variety of network equipment products empower cloud and service providers to meet the fast growing consumer demand for data.

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