Why are 400G optical modules so expensive



Overview

Discover the key factors that drive 400G optical transceiver pricing—from form-factor and component costs to market dynamics and sustainability.

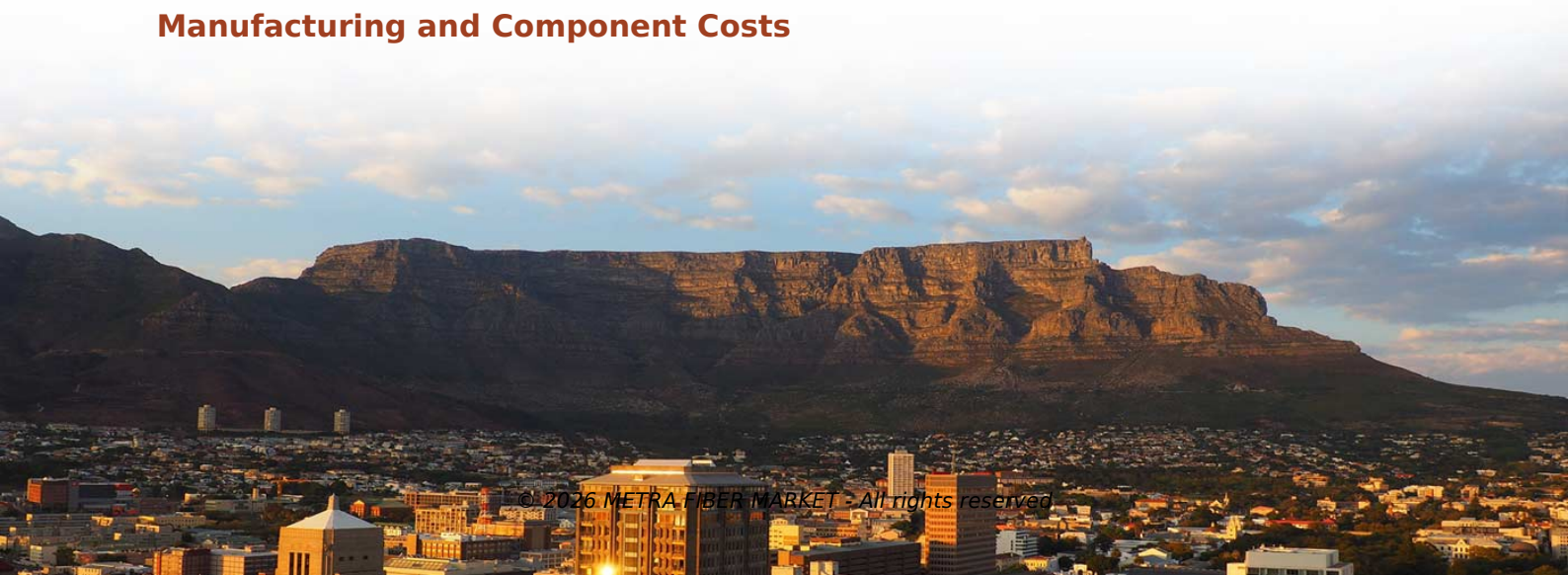
Key Takeaways

400G optical modules are costly due to advanced technology, complex manufacturing, specialized components, and market dynamics.

Technical Complexity400

G modules achieve extremely high data rates using advanced modulation schemes like PAM4, which doubles the bit rate per lane compared to traditional NRZ signaling, and require high-speed digital signal processors (DSPs) to manage signal integrity and error correction. The integration of Silicon Photonics (SiP) and Indium Phosphide (InP) components reduces power consumption but adds significant R&D and fabrication costs. Modules must also support dense form factors like QSFP-DD and OSFP, which demand precise thermal management and packaging to maintain reliability in compact spaces.

Manufacturing and Component Costs



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The production of 400G modules involves specialized optical engines, high-quality low-loss fibers, and precision assembly, all of which increase per-unit costs. Non-recurring engineering (NRE) costs for new form factors and low-volume niche designs further elevate prices. Supply chain constraints, particularly the concentration of DSP and high-speed electrical component manufacturing in specific regions, can create vulnerabilities and drive up costs.

Testing and quality assurance are also more rigorous for 400G modules to ensure performance over long distances and high-density deployments.

Market and Economic Factors

Despite growing adoption, 400G modules are still transitioning from early-stage deployment to mass-market production. Hyperscale data centers and telecom operators drive demand, but the market is sensitive to CAPEX cycles and component availability.

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M pricing often includes markups for brand, warranty, and R&D subsidies, whereas third-party manufacturers like LINK-PP can offer lower prices by focusing on manufacturing efficiency. The transition from 100G to 400G also requires network upgrades, which adds to perceived costs, even though 400G modules can replace multiple 100G modules, improving total rack efficiency and reducing long-term TCO.

Summary

In essence, the high cost of 400G optical modules reflects a combination of cutting-edge technology, complex manufacturing, specialized components, and market economics. While prices are gradually decreasing due to technological maturity and economies of scale, the modules remain expensive because they deliver unprecedented bandwidth, energy efficiency, and density required for modern hyperscale and telecom networks.

Article Content

What factors influence 400G optical transceiver modules price？

Discover the key factors that drive 400G optical transceiver pricing—from form-factor and component costs to market dynamics and sustainability.

How 400G Optical Modules Are Shaping Next-Gen Networks

Discover key factors driving the rapid adoption of 400G optical transceivers, including AI, 5G, coherent optics, and market trends shaping next-gen network infrastructure.

400G vs 100G: Why Price Parity Makes the 400G Upgrade Mandatory

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By leveraging the density of 400G switches, the flexibility of breakout architectures, and the cost-efficiency of LINK-PP''s trusted third-party optics, organizations can reduce their TCO by

400G Optical Transceiver: Cisco 400G Optics, Pricing & Applications

In this article, the 400G optical transceiver is thoroughly explained in terms of definition, major types, application scenarios, price and cost, as well as typical product models such as QDD

400G Optical Transceivers: Power Efficiency Driving Hyperscale Data ...

In Q4 2025 optical transceiver module prices plunged to multi-year lows as supply chains stabilized and 400G/800G adoption accelerated. Learn what''s driving the trend, how buyers can

400G Transceiver Guide: Architecture, Selection & TCO for AI

400G delivers four times the capacity of 100G at only 2.5 to 3 times the module cost, while 800G''s incremental bandwidth benefits arrive with significantly higher acquisition costs and

QSFP-DD Price Guide 2026: 400G/800G Costs & TCO Analysis

QSFP-DD Price by Module Type (2026) The 400G transceiver price spread between the most economical and the most expensive modules is roughly 100:1.

Overview of 400G Optical Modules

Although only one optical chip is used in a 400G optical module, the cost is high. In 10G/25G modules, optical chips make up about 30% of the cost; in 40G/100G modules, this rises to

400G Optical Module: Growth Opportunities and Competitive

Pricing for 400G optical modules typically experiences gradual reduction due to increased production volumes and intense competition. However, R&D investments, advanced material costs,

Challenges Faced in Implementing 200G/400G Optical Transceivers ...

Sure, the initial cost for 400G gear might be steeper, but when you think about the savings on operational costs and how much better the network performance will be, it''s a smart move

What Is An Optical Module? Differences Between 100G,

With the continuous growth of network demand, optical modules with different rates have been launched one after another, among which 100G, 400G

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400G vs 800G Optical Modules: Differences, Use Cases, and

Introduction: Why 400G and 800G Matter? The rise of AI training, HPC (high-performance computing), and hyperscale cloud services has pushed network bandwidth demands

Optical Module Evolution: From 400G to 3.2T

Speed Roadmap: From 400G to 3.2T Optical module development has converged on a de facto “speed-doubling” roadmap, with each new generation arriving approximately every two to

400G vs 800G Optical Module: Which is Right for Your Network?

A deep technical comparison of 400G vs 800G optical module technology. Understand the key differences, benefits, and applications to optimize your next-generation data center network.

Why 400G and 800G Optical Modules Are Critical for AI ...

This is where 400G and 800G optical transceivers step in—delivering high-speed, low-latency, and energy-efficient interconnects for the next generation of AI-driven data centers.

Optical Modules Evolution and Innovation From 400G to 1.6T

Optical modules, which serve as the building blocks for optical communication systems, are at the forefront of this evolution. This article will explore the evolution of modules'' speed and form

Ultimate Guide to QSFP-DD 400G Optical Modules:

The QSFP-DD 400G optical module has become a key element in the fast-changing field of data transmission technology to improve network

Key Differences Of 100G, 400G, And 800G Explained

Its core function is to convert electrical signals into optical signals at the transmitting end and convert optical signals back to electrical signals at the

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