

Main Raw Material Costs of Optical Modules



Overview

Cost structure of optical module chips | WeylandUnderstanding the cost structure of optical module chips is essential for developers, investors, and network.

Key Takeaways

Raw materials account for 60%-70% of optical module costs, with metals, semiconductors, and optical components being the primary contributors.Key Raw Material Components



1. **Metals:** Metals are a major cost driver in optical modules, particularly for connectors, PCB boards, and auxiliary components. Gold is used for gold fingers and connectors to ensure signal stability and corrosion resistance, while copper and tin are used in PCB pins, cable cores, and connector shells. Aluminum and tin are also used in heat sinks and solder, contributing to overall metal costs. For example, a 10% increase in gold prices and a 20% rise in copper can increase the metal cost of a 100G SFP28 module by 8–10 yuan per unit .

2. **Semiconductors and Chips:** Active optical components such as lasers, modulators, photodetectors, and transimpedance amplifiers (TIAs) are essential. Silicon, indium phosphide (InP), and silicon nitride wafers are commonly used substrates. These high-purity wafers are expensive due to strict yield and quality requirements. Raw material costs for chips typically account for 30%-40% of total chip cost, with active optical components representing the largest portion .

3. **Optical Components:** Passive components like lenses, mirrors, waveguides, and optical connectors are smaller contributors but critical for signal integrity. High-speed, tunable, or coherent technologies further increase costs .

4. **Other Materials:** Cables, PCB laminates, and auxiliary materials such as solder and heat sinks also contribute to raw material costs, particularly in high-speed modules .

Cost Proportion and Market Trends

- Raw materials constitute 60%-70% of total optical module costs, with metals and semiconductors being the dominant contributors .
- The optical fiber raw material market was valued at USD 1.12 billion in 2024 and is projected to grow at a CAGR of 11.8% from 2025 to 2032, driven by 5G and IoT demand .
- Rising metal prices, such as gold, copper, and tin, directly impact module costs and can compress profit margins, especially for mid- to high-end modules .

Cost Management Strategies

Manufacturers mitigate raw material cost pressures through:

- **Cost reduction and substitution:** Using alternative materials where feasible.
 - **Price locking:** Securing long-term contracts to stabilize costs.
 - **Supply chain optimization:** Ensuring reliable sourcing and minimizing price volatility .
- . Understanding these cost drivers is crucial for procurement planning, budgeting, and negotiating with suppliers, particularly in a market with rapid technological advancement and fluctuating raw material prices .

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