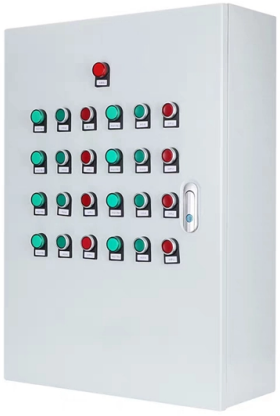
Optical Module Packaging Types



Overview

This article analyzes the requirements of optical transceivers and discusses packaging methods and optical chip types to help readers better understand their design and manufacturing...

Key Takeaways

Optical module packaging types define the form factor, performance, and application of optical transceivers, ranging from GBIC and SFP to QSFP-DD and co-packaged optics (CPO).

Standard Form Factor Packages

Optical modules are commonly categorized by their physical form factor, which affects port density, transmission rate, and compatibility: GBIC (Gigabit Interface Converter): Early standard in the 1990s, hot-swappable, uses SC interface, supports ~1 Gbps, now largely obsolete.

SF

P (Small Form Factor Pluggable): Miniaturized GBIC, LC interface, supports Gigabit Ethernet and SONET/SDH networks, widely used in data centers. SFP+ / SFP28: Enhanced versions of SFP for 10G and 25G transmission rates, maintaining compact size for high port density.

XF

P / X2 / XPAK / XENPAK: Larger modules designed for 10G and higher speeds, used in telecom and enterprise networks.

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QSF

P / QSFP+ / QSFP28 / QSFP-DD: Quad Small Form Factor Pluggable modules supporting 40G, 100G, and 400G, enabling high-speed interconnects in data centers.

CF

P / CPAK / CXP / OSFP: High-performance modules for 100G to 400G applications, often used in cloud computing and high-speed networking.

COB

O / CPO (Co-Packaged Optics): Advanced packaging integrating optics with switch ASICs for ultra-high-speed, low-latency data center applications.

Packaging Methods

Optical modules are also classified by packaging techniques, which influence reliability, thermal management, and cost: Hermetic Packaging: Seals the optical chip in a metal or ceramic casing with inert gas, protecting against moisture and temperature variations. Common methods include TO-CAN, Box, and Butterfly packages.

Non-

Hermetic Packaging: Includes COB (Chip on Board) and COC (Chip on Carrier), which are cost-effective, compact, and suitable for short-distance or lower-power applications. TO-CAN Packaging: Laser mounted on a heat sink, enclosed in a metal can with a sealed window; suitable for telecom applications up to 10 km.

CO

B Packaging: Directly mounts the optical chip on the substrate, offering compact size, improved thermal management, and reduced cost, widely used in modern high-speed modules.

Evolution and Application

Optical module packaging has evolved from large, low-density GBIC modules to nano-scale QSFP-DD and co-packaged optics, driven by the need for higher port density, faster transmission rates, and lower power consumption in data centers and telecom networks. The choice of packaging depends on: Transmission rate (10G, 25G, 40G, 100G, 400G)Distance requirements (short-reach vs. long-haul)Thermal and power constraintsCost and reliability considerations By selecting the appropriate form factor and packaging method, manufacturers can optimize performance, minimize heat dissipation issues, and meet specific network requirements.

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Article Content

What is an Optical Module?

Explore the world of optical modules, essential components in optical fiber communication. Learn about the different types of optical modules, their

Optical Transceiver: Packaging Methods & Optical Chip Types

This article analyzes the requirements of optical transceivers and discusses packaging methods and optical chip types to help readers better understand their design and manufacturing...

Photonic Packaging – optical interfaces, package types, TO-can ...

The article introduces to photonic packaging: functions, optical and electrical interfaces, package types, design, testing, reliability, cost and standardization.

Optical Packaging/Module Technologies: Design Methodologies

Packaging is much more complex for photonics than for electronic integrated circuits (ICs). The chapter categorizes optical packages into two types: coaxial type package, which is generally uncooled, and

Optical Module Package Types Overview

There are many types of optical modules, and there are several standard ways to categorize them, such as according to different package forms,

Advanced optical packaging – how much do you know ?

Common optical module packaging types include GBIC, SFP, XFP, QSFP+, OSFP, QSFP28, QSFP-DD, and COBO. These optical packaging types

Packaging of optical modules

The encapsulation of optical modules ensures the stability and reliability of optical communication. Shenzhen Mshine Technology Co.,Ltd. introduces several common types of packaging for optical

A complete list of common optical module types-ETU-LINK

Many partners do not know much about the packaging types of optical modules,so in this article,ETU-LINK introduces you to what are the common packaging types of optical modules,right?

Common optical module package types: SFP, SFP+, SFP28, QSFP+,

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These optical module packaging types have different characteristics in different application scenarios, such as size, power consumption, transmission rate, and fiber type support.

Optical Module Devices | SCIVAX

Lineup Three Standard Tx-Module Types We offer three types depending on the lens used: Flood distribution (Platanus®), Dot distribution (Ardisia®), and Combo (Dot & Flood) distribution, which

Everything You Need to Know About 800G/1.6T Optical Transceiver

Technical Architecture of 800G/1.6T Modules Key Components: DSP, LPO Technology, and Co-Package Design The architecture of 800G/1.6T optical modules hinges on three transformative

KB: Creating protection for Hyper-V VMs on Windows Server 2012

First published on TECHNET on Oct 11, 2012 Here''s a new Knowledge Base article we published. This one talks about an issue where using DPM 2012 SP1 to create a protection group for

Stock SFP+ 10G BIDI 1270/1330nm 20km 5G 3G Optical Module

About this supplier FiberRun (Wuhan Fangran Technology Co., Ltd.) is a professional optical module and fiber communication component manufacturer established in 2020, headquartered in Wuhan

Broadcom CPO: Highest Power Efficiency and Bandwidth Density

Co-Packaged Optics (CPO) is an advanced integration of optics and silicon on a single packaged substrate addressing interconnect bandwidth and power challenges.

GlobalFoundries accelerates adoption of co-packaged optics for

SCALE CPO solution is the industry''s first OCI MSA capable platform and built with GF''s proven silicon photonics technology MALTA, N.Y., May 4, 2026 – GlobalFoundries (Nasdaq: GFS)

Stock SFP28 25G 850NM 100M LC 5G 3G Optical Module

Key attributes Model Number FRSF25LS851H Type SFP28 optical module Brand Name FR Place of Origin China Use Gigabit and 25-Gigabit networks

HTF DWDM equipment,OTN Solution,QSFP28 OSFP

HTFuture offers industry-leading fiber optic products and WDM system solutions with global recognition for excellence and innovation.

Small Form-factor Pluggable

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Small Form-factor Pluggable Small Form-factor Pluggable connected to a pair of fiber-optic cables Small Form-factor Pluggable (SFP) is a compact, hot-pluggable network interface module format used for

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