

Article Overview

Optical modules, such as SFP, SFP+, QSFP, and OSFP, have standardized external dimensions and key electrical/optical parameters defined by industry MSAs to ensure interoperability and reliable performance.

External Dimensions

Optical modules are designed according to Multi-Source Agreements (MSA), which standardize their physical form factors for plug-and-play compatibility:

- o SFP (Small Form-factor Pluggable): Typically measures 13.4 mm x 56.5 mm x 8.5 mm (height x length x width) and fits a standard SFP port on switches or routers .
- o SFP+: Shares the same external dimensions as SFP but supports higher data rates up to 10 Gbps .
- o QSFP (Quad SFP): Larger form factor, approximately 18.35 mm x 72.4 mm x 13.5 mm, supporting 4 channels of data, commonly used for 40 Gbps links .
- o OSFP (Octal SFP): Even larger, designed for 400 Gbps applications, with dimensions around 22 mm x 112 mm x 18 mm . These dimensions ensure modules from different vendors are physically interchangeable, though electrical and optical compatibility must still be verified.

Key Electrical and Optical Parameters

Optical modules include transmitter and receiver subassemblies:

- o TOSA (Transmitter Optical Sub-Assembly): Converts electrical signals into optical signals using laser diodes (LD) or LEDs. Key parameters include average output power, extinction ratio, and modulation rate .
- o ROSA (Receiver Optical Sub-Assembly): Converts incoming optical signals back into electrical signals. Parameters include sensitivity, responsivity, and signal-to-noise ratio . Other critical parameters:
- o Data Rate: SFP (1-4 Gbps), SFP+ (up to 10 Gbps), SFP28 (25 Gbps), QSFP (40 Gbps), OSFP (400 Gbps), .
- o Wavelength: Typically 850 nm, 1310 nm, or 1550 nm depending on fiber type (MMF or SMF), .
- o Optical Power: Average transmitted power in mW or dBm; influenced by data pattern and modulation .
- o Extinction Ratio: Ratio of optical power for logical "1" vs "0", measured in dB, indicating signal clarity .
- o Digital Diagnostic Monitoring (DDM/DOM): Real-time monitoring of temperature, voltage, transmitted/received power, and laser bias current .

Environmental and Operational Considerations

- o Operating Temperature: Typically 0-70°C for commercial modules; extended ranges available for industrial applications .

Optical Module External Dimensions and Parameters

- o Power Consumption: Modules are designed to minimize heat generation, often below 1-3 W for SFP/SFP+ and higher for QSFP/OSFP .
- o Connector and Fiber Compatibility: Ensure matching fiber type (OM3/OM4 MMF or SMF) and connector type (LC, MPO) for proper operation .

Summary

Optical modules are standardized in external dimensions to ensure mechanical compatibility, while electrical and optical parameters define performance and interoperability. Engineers must verify both physical form factor and detailed datasheet specifications to ensure reliable network operation, including data rate, wavelength, optical power, extinction ratio, and DDM support .

An optical module is a typically hot-pluggable optical transceiver used in high-bandwidth data communications applications. Optical

An all inclusive list of the various optical fiber specification sheets.

Learn how to read an optical transceiver datasheet, understand SFP specifications, compare 1G/10G modules, and choose

Some manufacturers may have specific compatibility guidelines or restrictions, so it's important to check for

On an optical network, a sender needs to convert electrical signals into optical signals before sending them to a receiver, and the

Do you want to know more about the importance of optical specifications? Learn the different types of

Explore the working principles, structures, and performance metrics of optical modules, essential components of

The optical module is a core component in optical fiber communication systems, and its performance parameters

Interface Circuit: Provides an electrical interface to external devices, such as SFP, SFP+, QSFP, etc. The internal

In the world of fiber optic communications, optical transceiver modules play a pivotal role as interfaces that convert

Optical Module External Dimensions and Parameters

ABSTRACT The objective of this application note is to help product developers better understand optical module specifications and

Optical transceiver module (optical transceiver), referred to as optical module, is an important device in optical

View the TI Optical module block diagram, product recommendations, reference designs and start designing.

Introduction Optical modules are critical components in fiber optic communications, enabling the conversion between

An optical module serves as the backbone of modern fiber-optic communication. Its appearance often resembles a

Metrology of Optical Systems Figures and Images for Instructors Module 1 Optical System Parameters and Performance Metrics

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