# The Structure and Principle of the Optical Transceiver

with GIGALIGHT Jun 2, 2019 · 4 min read

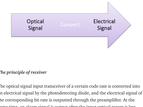
## What is the Optical Transceiver?

The optical transceiver is the core device of optical communication.

The optical transceiver is an interface transceiver for realizing information transmission between devices through photoelectric conversion, and is composed of a receiver and a transmitter. And the transmitter converts the electrical signal into an optical signal, and after transmitting through the optical fiber, and then the receiver converts the optical signal into an electrical signal, and the transmission medium is an optical fiber.

*The principle of transmitter*

An electrical signal input with a certain code rate is processed by an internal driving chip to drive a semiconductor laser (LD) or an optical emitting diode (LED) to emit a modulated optical signal of a corresponding rate, and an optical power automatic control circuit (APC) is internally provided to keep stable of the output optical signal power.




*The principle of receiver*

The optical signal input transceiver of a certain code rate is converted into an electrical signal by the photodetecting diode, and the electrical signal of the corresponding bit rate is outputted through the preamplifier. At the same time, an alarm signal is output after the input optical power is less than a certain value.

## Main parameters of optical transceivers

*Transmission rate*

The transmission rate refers to the number of bits transmitted per second in Mbps or Gbps.

There are four types commonly used: 155 Mbps, 1.25Gbps, 2.5Gbps, 10Gbps, and so on.

The transmission rate is generally backward compatible. Therefore, the 155M optical transceiver is also called the FE (100M) optical transceiver, and the 1.25G optical transceiver is also called the GE (Gigabit) optical transceiver. This is the most widely used transceiver in optical transmission device. In addition, in transmission rate in fiber storage systems (SAN) is 2Gbps, 4Gbps and 8Gbps.

*Transmission distance*

Optical transceivers generally have multimode 550m, single mode 15km, 40km, 80km and 120km.

The transmission distance of the optical transceiver is divided into short distance, medium distance and long distance. Gigalight products naming includes the transmission distance.

For example: 10GG2SFP28.SR4, the"S"is the deputy of short distance.

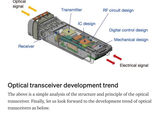
*Center wavelength*

The central wavelength refers to the optical band used for optical signal transmission, in nanometers (nm), and currently has mainly 850 nm band, 1310 nm band and 1550 nm band.

| 850nm | 1310nm | 1550nm |
|---|---|---|
| • MM<br>• It has low cost but short transmission distance, and generally can only transmit 300m | • SM<br>• Large loss but small dispersion during long-distance transmission, generally used for medium and long distance within 40km | • SM<br>• It's the transmission process, the loss is small, but the dispersion is large, generally used for medium and long distance transmission of over 40km of 120km |

## The internal structure of the optical transceiver

The main part of the optical transceiver is composed of an optical emitting component TOSA (Transmitter Optical Sub-Assembly), a laser driver, an optical receiving component ROSA (Receiver Optical Sub-Assembly), a limiting amplifier and a controller.




## Optical transceiver development trend

The above is a simple analysis of the structure and principle of the optical transceiver. Finally, let us look forward to the development trend of optical transceivers as below.

*Two development directions*

•The packaging process of optical transceivers continues to develop in a smaller and more integrated direction.

•Cost and power consumption are moving toward lower and lower directions.

*Two iterations*

•Rapid iteration of requirement

•Product iteration acceleration

*Two ascension*

•High-speed optical transceiver demand increase

•Optical transceiver speed increase trend is significant

*Two mainstream*

•High speed optical transceiver

•Low cost optical transceiver

In 2018, the 5G was booming. In 2019, with the further development of 5G, the optical transceiver will surely usher in a greater development opportunity. Optical transceivers occupy an important position in the development of 5G and are now attracting attention. Since its establishment in 2006, Gigalight has been exploring the optical transceiver market and technology fields. In the past two years, it has invested in the research and development of 100G/200G/400G optical transceivers and coherent optical transceivers. It has achieved major platform breakthroughs and design innovations.

https://www.gigalight.com/optics.html

Technology Optical Fiber Data Center

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# Mini TOSA — The Minimalist Design in the Optical Transceiver

> *"Everything should be made as simple as possible, but not simpler."*
> — *Albert Einstein*

"Less is more", the core idea of minimalism, is also a profound manifestation of the best performance and lowest cost through the simplest design in the field of communications. For example, the design of integrated circuits, the design of signal integrity and so on, including the main character of today's article, the TOSA device in the optical transceiver.

For converting electrical signals to light signals,as the emission device in the optical transceiver,the TOSA component is the core component of the optical communication industry.

At the profound…

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# High-Speed 100G QSFP28 CWDM4 Optical Transceivers

In 2018, the 100G QSFP28 CWDM4 Optical Transceiver is the most popular product in the OCI (Data Center Interconnection). This article mainly introduces what the 100G QSFP28 CWDM4 Optical Transceiver is and Why it is so popular?

**What is the 100G QSFP28 CWDM4 Optical Transceiver?**

The 100G Source Agreement (MSA) defines 4 x 25Gbps Coarse Wavelength Division Multiplex (CWDM) optical modules or 100Gb/s optical transceivers for Ethernet applications including 100GbE. Two transceivers communicate over single mode fibers (SMF) of length from 2 meters to at least 2 kilometers, available in SR and LR versions.

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# 400G Optical Transceiver at a Glance

The broad market prospect of the 400G optical transceiver has become the consensus of the communications industry. Therefore, many optical devices and optical transceiver manufacturers have increased their investment in this area. This article mainly analyzes the driving forces of 400G optical transceivers market and the applications of 400G optical transceivers.

**The followings table is the main specifications of 400G optical transceivers.**

400G MSA MSA

400G-BD4.2 Multimode Fiber 8x50Gps Technical Specifications

QSFP-DD MSA

QSFP DOUBLE DENSITY 8X PLUGGABLE TRANSCEIVER

OSFP MSA

OSFP-OCTAL SMALL FORM FACTOR PLUGGABLE MODULE

CFP MSA

CFP8 Hardware Specification

CDFP, MSA

400 Gb/s (16X 25 GB/s) PLUGGABLE TRANSCEIVER

**The driving forces of 400G optical transceivers market**

**1. The implementation of networks within the mega data centers due to the rapid growth of data centers.**

- *Global adoption of the Internet is driving…*

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# Analysis of Energy Consumption in Data Center

In the data center market, the electricity bill is a huge expense which has eroded the profits of enterprises.For example, in the year of 2012,China Unicom earned 40.7 billion dollars in revenue and made 1.2 billion dollars in profits , but its electricity bill was as high as 1.7 billion dollars —— what a huge bill…

Costs and profits are the eternal theme of entrepreneurs, we used to know too little about the energy consumption of data centers, and now this issue should be taken seriously by more people.

**How about the present, future & answers?**

In the year of 2017, about eight million data centers…

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# How to Ensure the Compatibility and Quality of 3rd-party Optical Transceiver?

When it comes to optical transceiver, as we all know there are 3rd-party optical transceiver and OEM (original equipment manufacturers) optical transceiver. Generally, the 3rd-party optical transceiver is produced by a third-party optical transceiver manufacturer through independent analysis and decoding according to market specifications and standards. Many the 3rd-party optical transceivers are used by many users when they need a large number of optical transceivers to connect their devices. Because the excellent vendors can provide the compatible optical transceivers with a high quality, and the 3rd-party optical transceivers lower price than OEM optical transceivers.

However, how do you ensure the…

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