



# **COMMANDO LightningFIBER 10GBASE-ZR/ZW SFP-ZR-10G Data Sheet**



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## Product Overview

COMMANDO LightningFIBER SFP-ZR-10G is an SFP+ (Small Form-factor Pluggable Plus) operates at Wavelength 1550nm on single mode fiber Transceiver based on 10G Ethernet IEEE 802.3ae standard and SFF-8431 standard, providing a faster and reliable interface for 10G Ethernet applications. The product implements Digital Diagnostics Monitoring (DDM) via a 2-wire serial bus, compliant with the SFF-8472 standard.

The module is designed to offer multi-vendor compatibility offering users flexibility, scalability without incurring additional overhead and increasing interoperability.

COMMANDO SFP+ transceiver module is for transmission at 1550nm over single mode fiber. The SFP+ transceiver is featured with low-power, high-density, high-speed and offers an efficient way to help your IT infrastructure to be quickly scaled up and ready for up to 10Gbps transmission. It supports distances up to 80Km link lengths via an LC duplex connector. It offers customers a wide variety of 10Gbps connectivity to multi-vendor equipment like routers, switches, server, NICs of data center, enterprise wiring closet, and service provider transport applications. It is ideal for Internet Service Provider (ISP) Gigabit Ethernet communication links, Enterprise LAN & SAN Networks, Data Center LAN & SAN networks, and other optical links. It can be used as uplinks for 10 Gbps Small Form-Factor Pluggable Plus (SFP+) Fiber Network Module for delivering robust performance and Cloud networking needs of growing businesses, data centers and high-end campus networks.

## Product Highlights

- Multi-vendor platform compatible
- Supports from 11.3Gb/s bit rates
- Hot-pluggable SFP+ footprint
- 1550nm VCSEL laser transmitter
- Duplex LC connector
- Compliant with IEEE 802.3ae 10GBASE-ER
- Compliant with SFF-8431 and SFF-8432
- Built-in Digital Diagnostic Monitoring (DDM) functions
- Up to 80Km on SMF
- Low power consumption (Module work consumption <1W)
- Single power supply 3.3V
- RoHS Compliant
- Class 1 laser product complies with EN 60825-1
- Operating temperature range (Case Temperature): 0°C to 70°C
- Applications: 10GBASE-ZR/ZW, Ethernet, 10G Fiber Channel, 10G CPRI
- Standard and compact size, fully metallic enclosure for Low EMI

## General Specifications

| Parameter             | Symbol           | Min  | Typ   | Max               | Unit | Remarks |
|-----------------------|------------------|------|-------|-------------------|------|---------|
| Data Rate             | DR               | 9.83 | 11.30 | 11.5              | Gb/s | 1       |
| Bit Error Rate        | BER              | -    | -     | 10 <sup>-12</sup> | -    | -       |
| Operating Temperature | T <sub>c</sub>   | 0    | -     | 70                | °C   | 3       |
|                       |                  | -5   | -     | 85                | °C   | 3       |
|                       |                  | -40  | -     | 85                | °C   | 3       |
| Storage Temperature   | T <sub>STO</sub> | -40  | -     | 85                | °C   | 3       |
| Supply Current        | I <sub>CC</sub>  | -    | 180   | 290               | mA   | 4       |
| Input Voltage         | V <sub>CC</sub>  | 3.14 | 3.3   | 3.46              | V    | -       |
| Maximum Voltage       | V <sub>MAX</sub> | -0.5 | -     | 4                 | V    | 4       |

Notes:

1. IEEE 802.3ae
2. Case temperature
3. Ambient temperature
4. For electrical power interface

## Optical – Characteristics – Transmitter

V<sub>cc</sub>=3.14V to 3.46V, T<sub>c</sub>

| Parameter                       | Symbol               | Min  | Typ  | Max  | Unit  | Remarks |
|---------------------------------|----------------------|------|------|------|-------|---------|
| Output Optical Power            | PTX                  | -7   | -    | -1   | dBm   | 1       |
| Optical Center Wavelength       | $\lambda_C$          | 1535 | 1550 | 1565 | nm    | -       |
| Optical Modulation Amplitude    | OMA                  | -    | -1.5 | -    | dBm   | 2       |
| Extinction Ratio                | ER                   | 3    | 5.5  | -    | dB    | -       |
| Spectral Width (RMS)            | $\Delta\lambda$      | -    | -    | 0.45 | nm    | -       |
| Relative Intensity Noise        | RIN                  | -    | -    | -128 | dB/Hz | -       |
| Transmitter Dispersion Penalty  | TDP                  | -    | -    | 3.9  | dB    | -       |
| Transmitter Jitter              | -                    | -    | -    | -    | -     | 3       |
| Launch Power of OFF Transmitter | P <sub>OUT_OFF</sub> | -    | -    | -30  | dBm   | 1       |

Notes:

1. Average
2. IEEE 802.3ae
3. According to IEEE 802.3ae requirement

## Optical – Characteristics – Receiver

V<sub>CC</sub>=3.14V to 3.46V, T<sub>c</sub>

| Parameter                     | Symbol             | Min  | Typ  | Max  | Unit | Remarks |
|-------------------------------|--------------------|------|------|------|------|---------|
| Optical Center Wavelength     | $\lambda_C$        | 1535 | 1550 | 1565 | nm   | -       |
| Receiver Sensitivity@41.2Gb/s | R <sub>X_SEN</sub> | -    | -    | -10  | dBm  | 1       |
| Receiver Overload             | P <sub>OL</sub>    | 0.5  | -    | -    | dBm  | -       |
| Receiver Reflectance          | T <sub>R_RX</sub>  | -    | -    | -12  | dB   | -       |
| LOS Assert                    | LOS <sub>A</sub>   | -30  | -    | -    | dBm  | -       |
| LOS De-Assert                 | LOS <sub>D</sub>   | -    | -    | -14  | dBm  | -       |
| LOS Hysteresis                | LOS <sub>H</sub>   | 0.5  | -    | -    | dB   | -       |

Notes:

1. Measured with worst ER; BER < 10<sup>-12</sup>; 2<sup>31</sup>-1 PRBS

## Electrical – Characteristics – Transmitter

V<sub>CC</sub>=3.14V to 3.46V, T<sub>c</sub>

| Parameter                     | Symbol             | Min             | Typ | Max                  | Unit     | Remarks |
|-------------------------------|--------------------|-----------------|-----|----------------------|----------|---------|
| Input differential impedance  | R <sub>IN</sub>    | -               | 100 | -                    | $\Omega$ | -       |
| Differential data input swing | V <sub>IN_PP</sub> | 180             | -   | 700                  | mV       | -       |
| Transmit disable voltage      | V <sub>D</sub>     | 2               | -   | V <sub>CC</sub>      | V        | -       |
| Transmit enable voltage       | V <sub>EN</sub>    | V <sub>EE</sub> | -   | V <sub>EE</sub> +0.8 | V        | -       |

## Electrical – Characteristics – Receiver

V<sub>cc</sub>=3.14V to 3.46V, T<sub>c</sub>

| Parameter                            | Symbol                         | Min             | Typ | Max                  | Unit | Remarks |
|--------------------------------------|--------------------------------|-----------------|-----|----------------------|------|---------|
| Differential data output swing       | V <sub>OUT PP</sub>            | 300             | -   | 850                  | mV   | -       |
| Data output rise/fall time (20%-80%) | t <sub>r</sub> /t <sub>f</sub> | 28              | -   | -                    | ps   | -       |
| LOS Assert                           | V <sub>LOS A</sub>             | 2               | -   | V <sub>CC HOST</sub> | V    | -       |
| LOS De-Assert                        | V <sub>LOS D</sub>             | V <sub>EE</sub> | -   | V <sub>EE</sub> +0.5 | V    | -       |

## Digital Diagnostic Monitor (DDM) Functions

COMMANDO SFP-ZR-10G transceiver module supports 2-wire serial communication protocol as defined in SFF-8472. Digital diagnostic information is accessible over the 2-wire interface at address 0xA2. Digital diagnostics for SFP-ZR-10G are internally calibrated by default. The internal micro control unit accesses the device's operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage in real time. The module implements the alarm function of the SFF-8472, alerts the user when a particular operating parameter exceeds the factory-set normal range.



## DDM Threshold Information

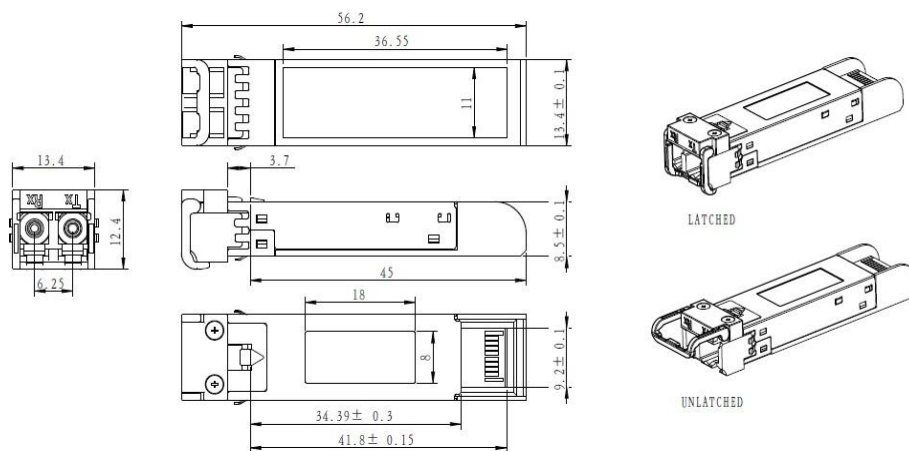
| Parameter        |   | Alarm Threshold |                | Warning Threshold |               |
|------------------|---|-----------------|----------------|-------------------|---------------|
|                  |   | High Value      | Low Value      | High Value        | Low Value     |
| Temperature (°C) | C | 90 (5A 00)      | -10 (F6 00)    | 85 (55 00)        | -5 (FB 00)    |
|                  | E | 90 (5A 00)      | -10 (F6 00)    | 85 (55 00)        | -5 (FB 00)    |
|                  | I | 90 (5A 00)      | -45 (D3 00)    | 85 (55 00)        | -40 (D8 00)   |
| Vcc (V)          |   | 3.63(8D CC)     | 2.97 (74 04)   | 3.46 (87 28)      | 3.13 (7A 44)  |
| Bias (mA)        |   | 15 (1D 4C)      | 1 (01 F4)      | 12 (17 70)        | 2 (03 E8)     |
| TxPower (dBm)    |   | 0.79 (2E E0)    | -7.97 (06 3C)  | 0.0 (27 10)       | -7.0 (07 CB)  |
| RxPower (dBm)    |   | 3.01 (4E 20)    | -16.02 (00 FA) | 0.0 (27 10)       | -13.0 (01 F5) |

## Product Weight

Net weight of module: 15.7g /pc

Net weight of dust cap: 0.95g /pc

## Dimensions



All dimensions are  $\pm 0.2\text{mm}$  unless specified otherwise  
Unit: mm

## **Features and Benefits**

### **Easy to Use**

COMMANDO SFP+ Transceivers are easy to use with simple and hassle-free setup. Its compact and standard size makes it ideal for all top brand devices along with COMMANDO products. Easy Installation, Plug-and-play installation with no configuration required.

### **10 Gigabit speed with Reliable performance**

It provides and offers 10Gbps speed. These SFP+ are well built and rigorously tested and can sustain in very rough environment to provide reliable performance.

### **Dust proof Enclosure**

It has a resilient dust proof enclosure protects against harsh outdoor condition with no ingress of dust.

### **Support uninterrupted critical network infrastructure**

It is protected from any hardware failures with Extra Long operational life. With this feature protect on cost and the impact to your business by losing these network devices and thus the users/servers connected to them.

### **Cost Efficient**

State of art quality product that can serve with world's top brand products along with COMMANDO devices on real time high-speed Performance, highly reliable, conformance to international open standards, durable, serviceable, aesthetics, perceived quality, enhanced performance leads to value to money.

### **Green Technology**

It automatically adjusts power consumption according to the link status to limit the carbon footprint of your network. It also complies with RoHS, prohibiting the use of certain hazardous materials. Moreover, most of the packaging material can be recycled and reused.

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## Hardware

### High Performance

- Low power consumption <1W typically, saving power
- 100us typical latency, MTBF over 1 million hours
- SFP+ Multi source Agreement (MSA) Compliant
- Input Voltage: 3.1V DC to 3.5V DC Maximum / 3.3V DC Typical.
- Input Current 300mA Maximum / 200mA Typical.

### Extra Long operational life

- Stainless steel material
- Anti-corrosion and salt spray resistance
- Storage Relative Humidity: 5% to 95%
- Exceptional Performance in Harsh Outdoor Climates with dust proof enclosure ensuring it can withstand harsh outdoor and indoor environments.

### Operating temperature range

- Commercial temperature range: 0 to 70°C (32 to 158°F)
- COMMANDO Extended temperature range: -5°C to 85°C (23 to 185°F)
- Storage temperature range: -40 to 85°C (-40 to 185°F)

Table 1 COMMANDO SFP Hardware Specifications Comparison

| Product Code  | Form Factor    | Transmission Speed | IEEE Standard Compliance | Connector Type  | TX Power (dBm) | Receiver Sensitivity (dBm) |
|---------------|----------------|--------------------|--------------------------|-----------------|----------------|----------------------------|
| SFP-SM-1G     | SFP            | 1000Mbps           | 1000BASE-LX/LH           | LC duplex       | -9.5 ~ -3dBm   | < -23dBm                   |
| SFP-MM-1G     | SFP            | 1000Mbps           | 1000BASE-SX              | LC duplex       | -9.5 ~ -3dBm   | < -17dBm                   |
| SFP-UTP-1G    | GBIC-T, SFP    | 1000Mbps           | 1000BASE-T               | RJ-45           | Standard       | <1W                        |
| SFP-SR-10G    | SFP+           | 10.3125Gbps        | 10GBASE-SR               | LC Duplex       | -7.3~-1dBm     | < -11.1dBm                 |
| SFP-LR-10G    | SFP+           | 10.3125Gbps        | 10GBASE-LR               | LC Duplex       | -8.2~0.5dBm    | <-14.4dBm                  |
| SFP-ER-10G    | SFP+           | 10.3125Gbps        | 10GBASE-ER               | LC Duplex       | -7.3~-1dBm     | < -11.1dBm                 |
| SFP-ZR-10G    | SFP+           | 11.3Gbps           | 10GBASE-ZR               | LC Duplex       | 0~5dBm         | <-23dBm                    |
| SFP-UTP-10G   | 10GBASE-T SFP+ | 10Gbps             | 10GBASE-T                | Copper CAT 6a/7 | Standard       | <1W                        |
| QSFP-SR4-40G  | QSFP+          | 41.2Gbps           | 40GBASE-SR4              | MTP/MPO-12 Male | -7.6~1dBm      | <-11.1dBm                  |
| CMD-LR4-40G   | QSFP+          | 44.6Gbps           | 40GBASE-LR4              | LC duplex       | -7~2.3dBm      | <-11.5dBm                  |
| QSFP-SR4-100G | QSFP28         | 103.1 Gbps         | 100GBASE-SR4             | MTP/MPO-12      | -8.4~2.4dBm    | <-10.3dBm                  |
| QSFP-LR4-100G | QSFP28         | 103.125Gbps        | 100GBASE-LR4             | LC duplex       | -4.3~4.5dBm    | <-10.6dBm                  |

## Specifications

COMMANDO SFP-ZR-10G SFP+ is used for speed 10Gbps Ethernet fiber speed and It is a compact, hot-swappable device that plugs into a physical port of a network device. SFP+ optics are used in communication networks and have a transmitting side (Tx) and a receiving side (Rx) work with 1550nm wavelengths & supports up to 80Km link lengths via LC duplex connector.

Table 2. COMMANDO SFP Model Comparison

| <b>Product Code</b> | <b>Center Wavelength (nm)</b> | <b>Media Type</b> | <b>Max Transmission Distance</b> | <b>Digital Diagnostics Monitoring Supported</b> |
|---------------------|-------------------------------|-------------------|----------------------------------|---|
| <b>SFP-SM-1G</b>    | GBIC-LX/LH, 1310nm            | MMF/SMF           | 550m/20km                        | DDM   |
| <b>SFP-MM-1G</b>    | GBIC-SX, 850nm                | MMF               | 550m                             | DDM   |
| <b>SFP-UTP-1G</b>   | GBIC-T, RJ-45                 | Copper            | 100m                             | Standard  |
| <b>SFP-SR-10G</b>   | 10GBASE-SR, 850nm             | MMF               | 300m                             | DDM   |
| <b>SFP-LR-10G</b>   | 10GBASE-LR, 1310nm            | SMF               | 20km                             | DDM   |
| <b>SFP-ER-10G</b>   | 10GBASE-ER, 1550nm            | SMF               | 40km                             | DDM   |
| <b>SFP-ZR-10G</b>   | 10GBASE-ZR/ZW, 1550nm         | SMF               | 80km                             | DDM   |
| <b>SFP-UTP-10G</b>  | 10GBASE-T RJ-45               | Copper CAT 6a/7   | 80m                              | Standard  |

|                      |                         |                    |      |     |
|----------------------|-------------------------|--------------------|------|-----|
| <b>QSFP-SR4-40G</b>  | 40GBASE-SR4, 850nm      | MMF                | 100m | DDM |
| <b>CMD-LR4-40G</b>   | 40GBASE-LR4, 1310nm     | SMF                | 10km | DDM |
| <b>QSFP-SR4-100G</b> | 100GBASE-SR4, 850nm     | MTP/MPO-12,<br>MMF | 100m | DDM |
| <b>QSFP-LR4-100G</b> | 100GBASE-LR4,<br>1310nm | LC Duplex, SMF     | 10km | DDM |

### Included in the bundle/box

All COMMANDO SFP-ZR-10G, SFP+ Transceivers are made available for use globally along with accessory used to facilitate or enhance operations. COMMANDO SFP-ZR-10G, SFP+ Transceivers comes with following Accessories.

1x (COMMANDO 10G SFP+ Transceiver Module) SFP-ZR-10G

## Support and Warranty

- Same-day assistance.
- Comprehensive 24-hour support using common communication/chat platforms, Email and Telephone.
- Provide FAQs and troubleshooting help online (self-service) through cloud-based solutions.
- Highly technical and trained representatives to resolve issues.
- One-year default warranty with option of warranty extension up to 3 years

**Table 3. Support and Warranty**

| Warranty and Support |   |
|----------------------|---|
| Products covered     | COMMANDO LightningFIBER 10GBASE-ZR, SFP+, 1550nm, 80Km, SMF, DDM (SFP-ZR-10G)   |
| Warranty duration    | One Year RTB (Return To Base) replacement warranty – optionally extendable up to 3 years.   |
| Hardware replacement | COMMANDO, its resellers, or its service center will use commercially reasonable efforts to replace the product subject to stock availability. Otherwise, a replacement will be arranged within 15 working days after receipt of the Return Materials Authorization (RMA) request.                                     |
| End-of-life policy   | In case of discontinuation of the product, support is limited to 3 years from announcement date.  |
| Effective date       | Hardware warranty commences from the date of shipment to customer (and in case of resale by a COMMANDO reseller, not more than 90 days after original shipment by COMMANDO).  |
| Support duration     | Lifetime support.   |
| COMMANDO Care        | COMMANDO will provide 24x7 support for basic configuration, diagnosis, and troubleshooting of device-level problems for up to one year from the date of shipment of the originally purchased product. This support does not include solution or network-level support beyond the specific device under consideration. |
| Online Portal Access | Warranty allows guest access to <a href="http://commandonetworks.com">commandonetworks.com</a> for all available technical queries.   |



## Ordering Information

Ordering information for the COMMANDO SFP+, SFP-ZR-10G Transceivers, To place an order, please contact your local reseller/distributor or COMMANDO Sales Representative at [www.commandonetworks.com/ordering](http://www.commandonetworks.com/ordering)

Table 4. Ordering Information

| Product Code  | Description  |
|---------------|--|
| SFP-SM-1G     | COMMANDO LightningFIBER 1000BASE-LX/LH, SFP, 1310nm, 20km, SMF, DDM              |
| SFP-MM-1G     | COMMANDO LightningFIBER 1000BASE-SX, SFP, 850nm, 550m, MMF, DDM                  |
| SFP-UTP-1G    | COMMANDO LightningCOPPER 1000BASE-T SFP, Copper, RJ-45, 100m, Standard           |
| SFP-SR-10G    | COMMANDO LightningFIBER 10GBASE-SR, SFP+, 850nm, 300m, MMF, DDM                  |
| SFP-LR-10G    | COMMANDO LightningFIBER 10GBASE-LR, SFP+, 1310nm, 20km, SMF, DDM                 |
| SFP-ER-10G    | COMMANDO LightningFIBER 10GBASE-ER, SFP+, 1550nm, 40km, SMF, DDM                 |
| SFP-ZR-10G    | COMMANDO LightningFIBER 10GBASE-ZR/ZW, SFP+, 1550nm, 80km, SMF, DDM              |
| SFP-UTP-10G   | COMMANDO LightningCOPPER 10GBASE-T Copper RJ-45, SFP+, Up to 80m, CAT 6a/7       |
| QSFP-SR4-40G  | COMMANDO LightningFIBER 40GBASE-SR4, QSFP+, 850nm, 100m, MMF, DDM                |
| CMD-LR4-40G   | COMMANDO LightningFIBER 40GBASE-LR4, QSFP+, 1310nm, 10km, SMF, DDM               |
| QSFP-SR4-100G | COMMANDO LightningFIBER 100GBASE-SR4, QSFP28+, 850nm, 100m, MTP/MPO-12, MMF, DDM |
| QSFP-LR4-100G | COMMANDO LightningFIBER 100GBASE-LR4, QSFP28+, 1310nm, 10km, SMF, DDM            |

## Document History

| Release   | New or Revision | Described in   | Date             |
|-----------|-----------------|--|------------------|
| Release 1 | First Release   | First Release  | March 24, 2021   |
| Release 2 | Second Release  | Multi-brand compatibility improvement and model adjustment | November 9, 2022 |