



COMMANDO LightningFIBER 10GBASE-LR SFP-LR-10G Data Sheet



Contents

Product Overview

Product Highlights

Features and Benefits

Hardware

Specifications

Support and Warranty

Ordering Information

Document History

Product Overview

COMMANDO LightningFIBER SFP-LR-10G, SFP+ (Small Form-factor Pluggable Plus) operates at 1310nm is on single mode fiber transceiver based on IEEE 802.3ae standard and SFF-8431 standard, providing a faster and reliable interface for 10G Ethernet applications up to 20Km. 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 1310nm over Single Mode fiber. It is compliant with SFF-8431, SFF-8432 and IEEE 802.3ae Ethernet standards which make it ideally suited for data communications. The SFP+ transceiver is featured with low-power, high-density and 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 up to 20Km link lengths over LC duplex SMF fiber. It offers customers a wide variety of 10 Gbps 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 9.83Gb/s to 11.3Gb/s bit rates
 - Hot-pluggable SFP+ footprint
 - 1310nm DFB laser transmitter
 - Duplex LC connector
 - Compliant with IEEE 802.3ae, 10GBASE-LR/LW
 - Compliant with 10G FC 1200-SM-LL-L
 - Compliant with SFF-8431
 - Built-in Digital Diagnostic functions
 - Up to 20km on SMF
 - Single power supply 3.3V
 - RoHS Compliant
 - Operating temperature range (Case Temperature): 0°C to 70°C
 - Applications: 10GBASE-LR/LW Ethernet, 10G Fiber Channel, 10G CPRI
- Standard and compact size, fully metallic enclosure for Low EMI

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.

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 | Maximum 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 |
| SFP-SR-25G | SFP28 | 25.78Gbps | 25GBASE-SR | LC Duplex | -9.40 --3.40 | -10.3dBm |
| SFP-LR-25G | SFP28 | 26.5Gbps | 25GBASE-LR | LC Duplex | -7.97--2.8 | 14.4/-13.3dBm |
| QSFP-SR4-40G | QSFP+ | 41.2Gbps | 40GBASE-SR4 | MTP/MPO-12 Male | -7.6~1dBm | <-11.1dBm |
| QSFP-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-LR-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 1310nm wavelengths & supports up to 20Km link lengths over LC duplex SMF fiber.

Table 2. COMMANDO SFP+ Model Comparison

| Product Code | Center Wavelength (nm) | Media Type | Max Transmission Distance | Digital Diagnostics Monitoring Supported |
|---------------------|-------------------------------|--------------------|----------------------------------|---|
| SFP-SM-1G | GBIC-LX/LH, 1310nm | MMF/SMF | 550m/20km | DDM |
| SFP-MM-1G | GBIC-SX, 850nm | MMF | 550m | DDM |
| SFP-UTP-1G | GBIC-T, RJ-45 | Copper | 100m | Standard |
| SFP-SR-10G | 10GBASE-SR, 850nm | MMF | 300m | DDM |
| SFP-LR-10G | 10GBASE-LR, 1310nm | SMF | 20km | DDM |
| SFP-ER-10G | 10GBASE-ER, 1550nm | SMF | 40km | DDM |
| SFP-ZR-10G | 10GBASE-ZR/ZW, 1550nm | SMF | 80km | DDM |
| SFP-UTP-10G | 10GBASE-T RJ-45 | Copper CAT 6a/7 | 80m | Standard |
| SFP-SR-25G | 25GBASE-SR, 850nm | MMF | 70/100m | DDM |

| | | | | |
|----------------------|-------------------------------|-----------------|------|-----|
| SFP-LR-25G | 10GBASE-LR/25GBASE-LR, 1310nm | SMF | 10km | DDM |
| QSFP-SR4-40G | 40GBASE-SR4, 850nm | MMF | 100m | DDM |
| QSFP-LR4-40G | 40GBASE-LR4, 1310nm | SMF | 10km | DDM |
| QSFP-SR4-100G | 100GBASE-SR4, 850nm | MTP/MPO-12, MMF | 100m | DDM |
| QSFP-LR4-100G | 100GBASE-LR4, 1310nm | LC Duplex, SMF | 10km | DDM |

General Specifications

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|--|------------------|------|---------|-------------------|------|---------|
| Data Rate | DR | 9.83 | 10.3125 | 11.3 | Gb/s | 1 |
| Bit Error Rate | BER | - | - | 10 ⁻¹² | - | - |
| | | 0 | - | 70 | °C | 2 |
| | | -40 | - | 85 | °C | 2 |
| Storage Temperature | T _{STO} | -40 | - | 85 | °C | 3 |
| Supply Current (Commercial Temperature) | I _{CC} | - | 200 | 310 | mA | 4 |
| Supply Current (Industrial Temperature) | I _{CC} | - | 200 | 350 | mA | 4 |
| Input Voltage | V _{CC} | 3.14 | 3.3 | 3.46 | V | - |
| Power Dissipation (Commercial Temperature) | P _C | - | 0.65 | 1.0 | W | - |
| Power Dissipation (Industrial Temperature) | P _I | - | 0.65 | 1.2 | W | - |

| | | | | | | |
|-----------------|------------------|------|---|---|---|---|
| Maximum Voltage | V _{MAX} | -0.5 | - | 4 | V | 4 |
|-----------------|------------------|------|---|---|---|---|

Notes:

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

Link Distances

| Data Rate | Fiber Type | Distance Range (km) |
|-----------------|------------|---------------------|
| 9.83 -11.3 Gb/s | 9/125umSMF | 10 |

Optical – Characteristics – Transmitter

V_{CC}=3.14V to 3.46V, T_c

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|---------------------------------|----------------------|------|-----|------|-------|---------|
| Output Optical Power | P _{TX} | -8.2 | - | 0.5 | dBm | 1 |
| Optical Center Wavelength | λ _c | 1260 | - | 1355 | nm | - |
| Optical Modulation Amplitude | OMA | -5.2 | - | - | dBm | 2 |
| Extinction Ratio | ER | 3.5 | 5.5 | - | dB | - |
| Spectral Width(-20dB) | Δλ | - | - | 1 | nm | - |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | - |
| Relative Intensity Noise | RIN | - | - | -128 | dB/Hz | - |
| Transmitter Dispersion Penalty | TDP | - | - | 3.2 | dB | - |
| Launch Power of OFF Transmitter | P _{OUT_OFF} | - | - | -30 | dBm | 1 |
| Transmitter Jitter | - | - | - | - | - | 2 |

Notes:

1. Average
2. According to IEEE 802.3ae requirement

Optical – Characteristics – Receiver

$V_{CC}=3.14V$ to $3.46V$, T_C

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|--------------------------------|------------------|-------|-----|-------|------|---------|
| Optical Center Wavelength | λ_C | 1260 | - | 1370 | nm | - |
| Average Receive Power | PRX | -14.4 | - | 0.5 | dBm | - |
| Receiver Sensitivity @10.3Gb/s | RX_SEN | - | - | -14.4 | dBm | 1 |
| Receiver Reflectance | TR _{RX} | - | - | -12 | dB | - |
| LOS Assert | LOS _A | -30 | - | - | dBm | - |
| LOS De-Assert | LOS _D | - | - | -17 | dBm | - |
| LOS Hysteresis | LOS _H | 0.5 | - | - | dB | - |

Notes:

1. Test the resulting value using the minimum ER value within the defined range;
BER < 10^{-12} ; $2^{31}-1$ PRBS

Electrical – Characteristics – Transmitter

$V_{CC}=3.14V$ to $3.46V$, T_C

| Parameter | Symbol | Min | Typ | Max | Unit | Remarks |
|-------------------------------|--------------------|-----|-----|-----|----------|---------|
| Input differential impedance | R _{IN} | - | 100 | - | Ω | - |
| Differential data input swing | V _{IN PP} | 180 | - | 700 | mV | - |

| | | | | | | |
|--------------------------|-----------------|-----------------|---|----------------------|---|---|
| Transmit disable voltage | V _D | 2 | - | V _{CC} | V | - |
| Transmit enable voltage | V _{EN} | V _{EE} | - | V _{EE} +0.8 | V | - |

Electrical – Characteristics – Receiver

V_{CC}=3.14V to 3.46V, T_C

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

Digital Diagnostic Monitor (DDM) Functions

COMMANDO SFP-LR-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-LR-10G are internally calibrated by default. The internal micro control unit accesses the device 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

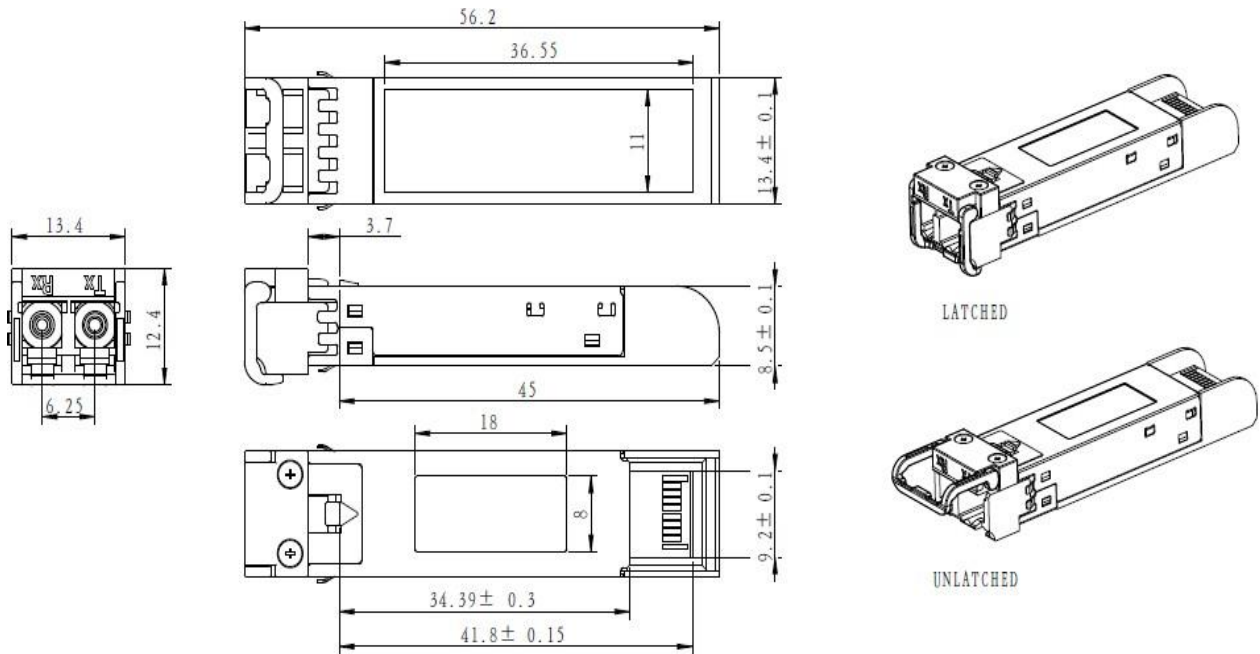
| Parameter | | Alarm Threshold | | Warning Threshold | |
|---------------|---|-----------------|---------------|-------------------|---------------|
| | | High Value | Low Value | High Value | Low Value |
| | C | 90 (5A 00) | -10 (F6 00) | 85 (55 00) | -5 (FB 00) |
| | I | 90 (5A 00) | -45 (D3 00) | 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) | | 100 (C3 50) | 2 (03 E8) | 80 (9C 40) | 4 (07 D0) |
| TxPower (dBm) | | 1.3 (34 98) | -9.2 (04 BA) | 0.5 (2B D4) | -8.2 (05 E9) |
| RxPower (dBm) | | 3.0 (4E 20) | -18.0 (00 9E) | 0.0 (27 10) | -15.0 (01 3C) |

Product Weight

Net weight of module: 15.7g /pc

Net weight of dust cap: 0.95g /pc

Dimensions



All dimensions are ± 0.2 mm unless specified otherwise

Unit: mm

Included in the bundle/box

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

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

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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-LR4, QSFP+, 1310nm, 20km, SMF, DDM (SFP-LR-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 commandonetworks.com for all available technical queries. |

Ordering Information

Ordering information for the COMMANDO SFP-LR-10G, SFP+ Transceivers, To place an order, please contact your local reseller/distributor or COMMANDO Sales Representative at www.commandonetworks.com/rfq

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 |
| SFP-SR-25G | COMMANDO LightningFIBER 25GBASE-SR, SFP28, 850nm, 70/100m, OM3/4 MMF, DDM, Multi-vendor Compatible |
| SFP-LR-25G | COMMANDO LightningFIBER 10/25GBASE-LR, SFP28, 1310nm, 10km, SMF, DDM, Multi-vendor Compatible |
| QSFP-SR4-40G | COMMANDO LightningFIBER 40GBASE-SR4, QSFP+, 850nm, 100m, MMF, DDM |
| QSFP-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 | What's new | Date |
|-----------|-------------------------------------|--------------------|
| Release 1 | First Release | March 24, 2021 |
| Release 2 | Multi-brand compatible model launch | November 9, 2022 |
| Release 3 | Model adjustment | September 18, 2023 |
| Release 4 | 25G Model added | October 13, 2023 |