COMMANDO LightningFIBER 10GBASE-LR

SFP-LR-10G Data Sheet

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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	-8.2~0.5 dBm	<-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	-8.4~2.4 dBm	<-10.3dBm
QSFP-LR4-100G	QSFP28	103.125Gbps	100GBASE-LR4	LC duplex	-4.3~4.5 dBm	<-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}	-	-
Operating Temperature	T_C	0	-	70	°C	2
		-40	-	85	°C	2
Storage Temperature	TSTO	-40	-	85	°C	3
Supply Current (Commercial Temperature)	ICC	-	200	310	mA	4
Supply Current (Industrial Temperature)	ICC	-	200	350	mA	4
Input Voltage	VCC	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	VMAX	-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	PTX	-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)	$\Delta\lambda$	-	-	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	POUT_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	P_{RX}	-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	-	VCC	V	-
Transmit enable voltage	VEN	VEE	-	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	VOUT PP	300	-	850	mV	-
Data output rise/fall time(20%-80%)	t_r/t_f	28	-	-	ps	-
LOS Assert	VLOS A	2	-	VCC HOST	V	-
LOS De-Assert	VLOS D	VEE	-	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

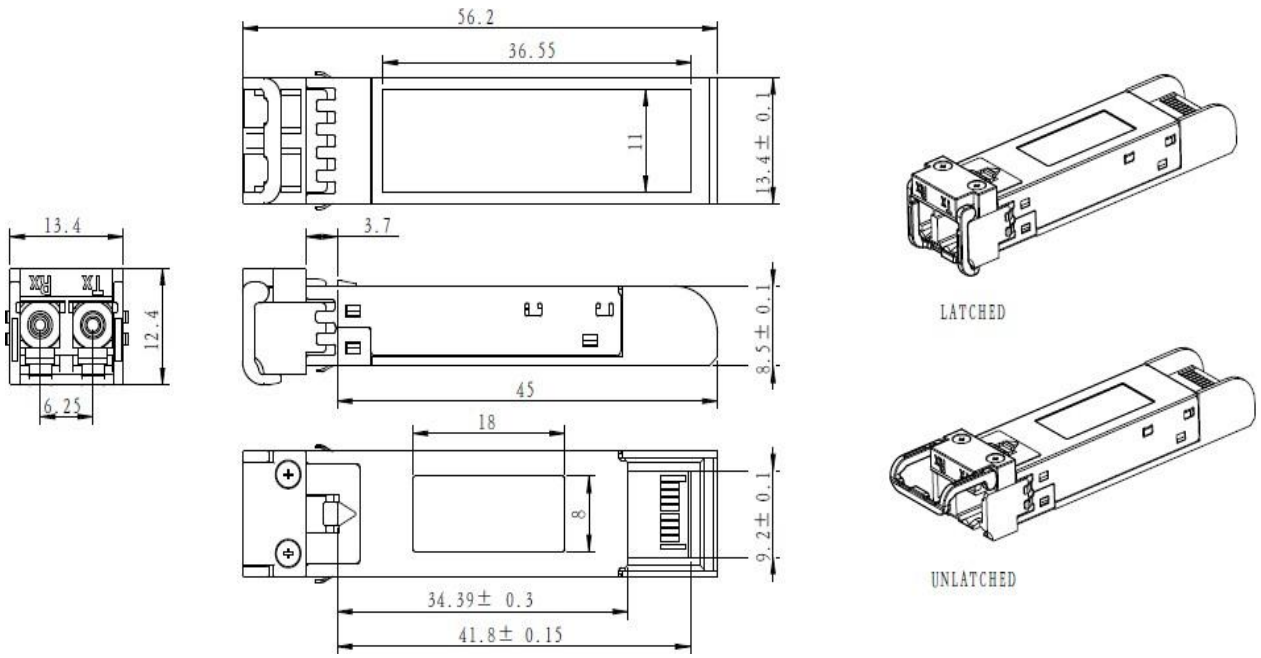
Parameter		Alarm Threshold		Warning Threshold	
		High Value	Low Value	High Value	Low Value
Temperature (°C)	C	90 (5A 00)	-10 (F6 00)	85 (55 00)	-5 (FB 00)
	I	90 (5A 00)	-45 (D3 00)	85 (55 00)	-40 (D8 00)
Vcc (V)		3.63(8D CC)	2.97 (74 04)	3.46 (87 28)	3.13 (7A 44)
Bias (mA)		100 (C3 50)	2 (03 E8)	80 (9C 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 ±0.2mm 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

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

COMMANDO WarrantyX Program available on: www.commandonetworks.com/warranty

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/catalog

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