

# 10G SFP+ Optics

The SFP+ pluggable interface is an industry standard—Multisource Agreement (MSA) for pluggable 10 Gigabit Ethernet Optics.

## HIGHLIGHTS

- The IEEE 802.3ae committee ratified the 10 Gigabit Ethernet standard and along with the general specification, defined a number of fiber optic interfaces. These standard interfaces attempted to satisfy a number of different objectives including support for MMF and SMF compatibility.

## SR SFP+

- 10GBASE-SR transceivers are used in a data center to interconnect two Ethernet switches or to link an end-device (e.g. 10 Gigabit Ethernet servers or NAS device) to an Ethernet switch

## LR SFP+

- 10GBASE-LR transceivers are most commonly deployed in inter-building single mode connections

## ER SFP+

- 10GBASE-ER transceivers are most commonly deployed in between sites or locations of 40 kilometers

## ZR SFP+

- 10GBASE-ZR transceivers are most commonly deployed in between sites or locations of 80 kilometers

## TUNABLE DWDM SFP+

- Increases capacity of fiber links through dense wave division multiplexing

## COPPER-CU SFP+

- 10GBASE-Copper cables are most commonly deployed in data centers between two devices in the same rack (server to switch or switch to switch)



**DIRECT  
ATTACH  
SFP+**

**SFP+ OPTICAL TRANSCEIVERS**

## Products

### SR SFP+

- 10GBASE-SR transceiver support with a link length up to 400 meters over 850nm multimode fiber, LC Connector

### LR SFP+

- 10GBASE-LR transceiver support with a link length up to 10 kilometers over 1310nm single mode fiber, LC Connector

### ER SFP+

- 10GBASE-ER transceiver support with a link length up to 40 kilometers over 1550nm single mode fiber, LC Connector

### ZR SFP+

- 10GBASE-ZR transceiver support with a link length up to 80 kilometers over 1550nm single mode fiber, LC Connector

### TUNABLE DWDM SFP+

- Links up to 80 kilometers with a tunable transmitter in the range of 1528.38nm to 1568.77nm with 50GHz channel spacing

### COPPER DIRECT ATTACH SFP+ CABLES

- 10GBASE-Copper CU is a direct attached passive twin-ax copper cable with link lengths of 1m to 10m

## Technical Specifications

	SR SFP+	LRM SFP+	LR SFP+	ER SFP+	TUNABLE DWDM SFP+	DIRECT ATTACH SFP+
Fiber Type	Multimode (MMF)	Multimode (MMF)	Single-Mode (SMF)	Single-Mode (SMF)	Single-Mode (SMF)	N/A
Connector Type	LC	LC	LC	LC	LC	Direct attach
Launch Power	-1 - -7.3dBm	1.5 - -4.5dBm	0.5 - -8.2dBm	4 - -4.7dBm	3 - -1dBm	N/A
Receiver Power Range	-1 - -9.9dBm	1.5 - -6.5dBm	0.5 - -14.4dBm	-1 - -15.8dBm	-7 - -24dBm	N/A
Optical Link Budget	*Depends on fiber type. See below.	2dB	7dB	10dB	24dB	N/A
Center Wavelength Range	850nm	1310nm	1310nm	1550nm	Tunable Range 1528.38 to 1568.77nm	N/A
Distance Range	2m to 400m	220m on OM1/OM2/OM3/OM4 MMF**	2m to 10km	2m-40km	2m-80km	1m-10m

Note: All Extreme Networks qualified SFP+ plugables meet or exceed the IEEE 802.3ae 10 Gigabit Ethernet specification. The table above shows some SFP+ parameters that may be useful for 10 Gigabit Ethernet deployments.

\*62.5  $\mu\text{m}$  (160/200 MHz\*km) = 1.6 dB (typically 26 meters)  
 62.5  $\mu\text{m}$  OM1 (200 MHz\*km) = 1.6 dB (typically 33 meters)  
 50  $\mu\text{m}$  OM2 (500 MHz\*km) = 1.8 dB (typically 82 meters)  
 50  $\mu\text{m}$  OM3 (2000 MHz\*km) = 2.6 dB (typically 300 meters)  
 50  $\mu\text{m}$  OM4 (4700 MHz\*km) = typically 400m

\*\*OM1 and OM2 requires Mode Conditioning Patch cord

Transmission distances are provided as a nominal guide only. To determine achievable distances, refer to the device's optical specifications and to the specific characteristics of your fiber installation.

## Physical Specifications

- Dimensions (HxWxD): 0.48x0.54x2.70 in (1.22x1.38x6.86 cm)
- Weight: 0.06 lb (25.1 g) unpackaged, 0.30 lb (135 g) packaged
- Shipping box dimensions (HxWxD): 2.1x6.8x7.7 in (5.4x17.2x19.6 cm)

## ENVIRONMENTAL CONDITIONS OPERATIONAL

- Operating Temperature: 0° C to +40° C (32° F to 104° F)
- Operating Humidity: 10% to 93% non-condensing
- Altitude: 0 - 4000 meters (13,000 ft)
- Operational Shock: 30 m/s<sup>2</sup> (3g), 11ms
- Operational Random Vibration: 5 - 500 Hz @ 1.5 Grms

## TRANSPORTATION & STORAGE

- Temperature: -40° C to 70° C (-40° F to 158° F)
- Relative Humidity: 10% to 93%
- Shock: 180 m/s<sup>2</sup> (18g), 6ms
- Random Vibration: 5 - 20 Hz @ 1.0 ASD w/-3dB/ oct. from 20 - 200 Hz
- Drop: 42" (105cm)

## ENVIRONMENTAL STANDARDS

- EN 300 019-2-3 v2.1.2 (2003-04), Stationary Use, Class 3.1e
- EN 300 019-2-2 v2.1.2 (1999-09), Public Transportation, Class 2.3
- EN 300 019-2-1 v2.1.2 (2000-09), Storage, Class 1.2
- RoHS 6 compliant

- China RoHS compliant
- WEEE Compliant

## SAFETY COMPLIANCE

### North American Safety of ITE

- UL60950:2000 3rd edition of later, Recognized Component
- cUL to CSA 22.2#60950:2000 3rd Ed or later, Recognized Component

### European Safety of ITE

- EN60950-1:2001+ all available country deviations
- 2006/95/EC Low Voltage Directive (LVD)

### Laser Safety

- EN60825-1:1994, A1:1996, A2:2001
- 21 CFR Subpart J, Class 1 Laser
- CDRH Letter of Approval

## EMI/EMC COMPLIANCE

### North America EMC for ITE

- FCC CFR 47 Part 15 Class A (U.S.A.)
- ICES-003 Class A (Canada)

### European EMC Standards

- EN 55022:2006, Class A
- EN 55024 A2:2003, Class A
- ETSI EN 300 386: v1.4.1 2008-04
- (EMC Telecommunications)
- 2004/108/EC EMC Directive

## International EMC Certifications

- CISPR 22:2006 Ed 5.4, Class A (International Emissions)
- CISPR 24 A2:2003, Class A (International Immunity)
  - IEC/EN 61000-4-2:2001 Electrostatic Discharge, 8kV Contact, 15kV Air, Criteria B
  - IEC/EN 61000-4-3:2006 Radiated Immunity 10V/m, 30MHz to 2GHz, Criteria A
  - IEC/EN 61000-4-4:2005 Transient Burst, 1kV, Criteria A
- IEC/EN 61000-4-5 2005, Surge, 1kV L-L, 2kV L-G, Level 4, Criteria B
- IEC/EN 61000-4-6:2007 Conducted Immunity, 0.15-80MHz, 10V/m unmod. RMS, Criteria A
- IEC/EN 61000-4-11:2004 Power Dips & Interruptions, >30%, 25 periods, Criteria A

*Note: All SFP+ modules meet the above standards when installed in Extreme Networks equipment.*

## Ordering Information

PART NUMBER	NAME	DESCRIPTION
10301	10GBASE-SR SFP+	10GBASE-SR SFP+, 850nm, LC Connector, transmission length of up to 400m on MMF
10302	10GBASE-LR SFP+	10GBASE-LR SFP+, 1310nm, LC Connector, transmission length of up to 10km on SMF
10303	10GBASE-LRM SFP+	10 Gigabit Ethernet SFP+ LRM, 220m MMF, LC
10309	10GBASE-ER SFP+	10GBASE-ER SFP+, 1550nm, LC Connector, transmission length of up to 40km on SMF
10310	10GBASE-ZR SFP+	10GBASE-ZR SFP+, 1550nm, LC Connector, transmission length of up to 80km on SMF
10325	Tunable DWDM SFP+	10 Gigabit Ethernet SFP+ Tunable DWDM module, SMF 80km, LC
10304	10G SFP+ CU Cable 1m	10G SFP+ CU direct attached passive twin-ax copper cable with link lengths of 1m
10305	10G SFP+ CU Cable 3m	10G SFP+ CU direct attached passive twin-ax copper cable with link lengths of 3m
10306	10G SFP+ CU Cable 5m	10G SFP+ CU direct attached passive twin-ax copper cable with link lengths of 5m
10307	10G SFP+ CU Cable 10m	10G SFP+ CU direct attached passive twin-ax copper cable with link lengths of 10m

*Note: See the ExtremeXOS Hardware/Software Compatibility and Recommendation Matrices document for a full list of supported devices and ExtremeXOS release recommendations.*



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