Product Specification

10.3125Gb/s ER SFP+ 1550nm 40km
Optical Transceiver

P/N: 10G-SFP-ER

Features

- Hot Pluggable SFP+ form factor
- Operating data rate 10.3125Gbps
- Single +3.3V power supply
- duplex LC connector
- Max power dissipation <1.5W
- 1550nm cooled EML transmitter with TEC
- Up to 40km transmission distance
- PIN receivers
- Built-in digital diagnostic function
- Commercial temperature range 0°C to 70°C

Compliance

- SFP MSA
- Compliant with SFP+ Electrical MSA SFF-8431
- Compliant with SFP+ Mechanical MSA SFF-8432
- SFF-8472
- IEEE 802.3ae
- RoHS

Applications

- Switches with SFP+ ports
- Router with SFP+ Ports
- Server or Network Adapter Card
- Optical Transmission System
- Other devices with SFP+ Ports

Description

The 10G-SFP-ER is a high-performance SFP+ transceiver designed for extended-range 10-Gigabit Ethernet applications over single-mode fiber (SMF). It supports data rates of up to 10Gbps and achieves transmission distances of up to 40 kilometers, making it ideal for use in metropolitan area networks (MANs), wide area networks (WANs), and enterprise network backbones. The module integrates a high-quality 1550nm DFB laser and PIN photodiode in a compact optical sub-assembly, ensuring reliable and efficient performance. Compliant with the SFP+ Multi-Source Agreement (MSA) and IEEE 802.3ae standards, it supports advanced digital diagnostics monitoring (DDM) for real-time access to critical operating parameters.

The 10G-SFP-ER features an enhanced digital diagnostic interface, providing real-time monitoring of transceiver temperature, laser bias current, transmitted and received optical power, and supply voltage. It also includes a sophisticated system of alarm and warning flags to alert users when operating parameters fall outside predefined ranges. With its hot-pluggable design and low power consumption, the transceiver ensures easy installation and energy efficiency. Whether deployed in telecommunications, data center interconnects, or enterprise networks, the 10G-SFP-ER delivers a reliable and cost-effective solution for high-speed, long-distance connectivity.

Product performance Specifications

1. Basic Product Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature	T_S	-40	-	+85	°C
Supply Voltage	V_{CC}	0	-	+4	V
Relative Humidity	RH	5	-	85	%
Operating Case Temperature	T_C	0	25	70	°C
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Power Supply Current	I_{CC}			450	mA
Power Dissipation	PD	-	-	1500	mW
Data Rate	DR		10.3125		Gb/s

2. Product Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Output Center Wavelength	λ_C	1530	1550	1565	nm
RMS Spectral Width	σ			0.45	nm
Optical Power for TX DISABLE	Poff			-30	dBm
Output average power	Pavg	-1		4	dBm
Optical Modulation Amplitude	OMA		-1.5		dBm
Extinction Ratio	ER	3			dB
Relative Intensity Noise	RIN			-128	dB/Hz
Optical Return Loss Tolerance	ORL			12	dB
Transmitter Dispersion Penalty	TDP			3.9	dB
Optical Eye Mask	Compliant with IEEE 802.3ae				
Tx Input Diff Voltage	VI	180		700	mV
Tx Fault	VoL	-0.3		0.4	V
	IoH	-50		37.5	uA
Tx_Disable	VIL	-0.3		0.8	V
	VIH	2		VCC+0.3	V
Receiver					
Center Wavelength	λ_C	840	850	860	nm
Receiver Sensitivity[1]	Rsens			-9.9	dBm
Los Assert	LosA	-30			dBm
Los Dessert	LosD			-11	dBm
Los Hysteresis	LosH	0.5			dB
Overload	Pin	-1			dBm
Receiver Reflectance				-16	dB
Operating Data Rate			10.3125		Gbps
Rx Output Diff Voltage	Vo	300		850	mV
Rx_LOS[2]	VoL	-0.3		0.4	V
	IoH	-50		37.5	uA
RS0 and RS1	VIL	-0.3		0.8	V
	VIH	2		VCC+0.3	V

Note1: Receiver sensitivity is informative. shall be measured with conformance test signal for BER=1x10-12.

Note2: Measured with a 4.7 kΩ load pulled up to Vcc.

Recommended Host Board Power Supply Circuit

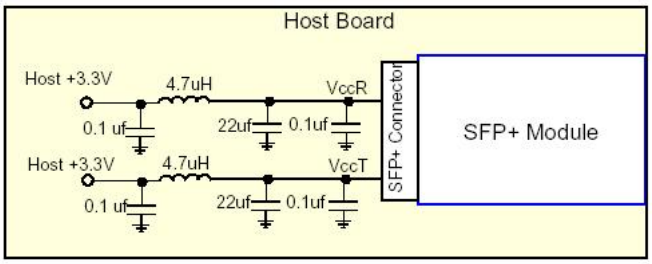


Figure 1: Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

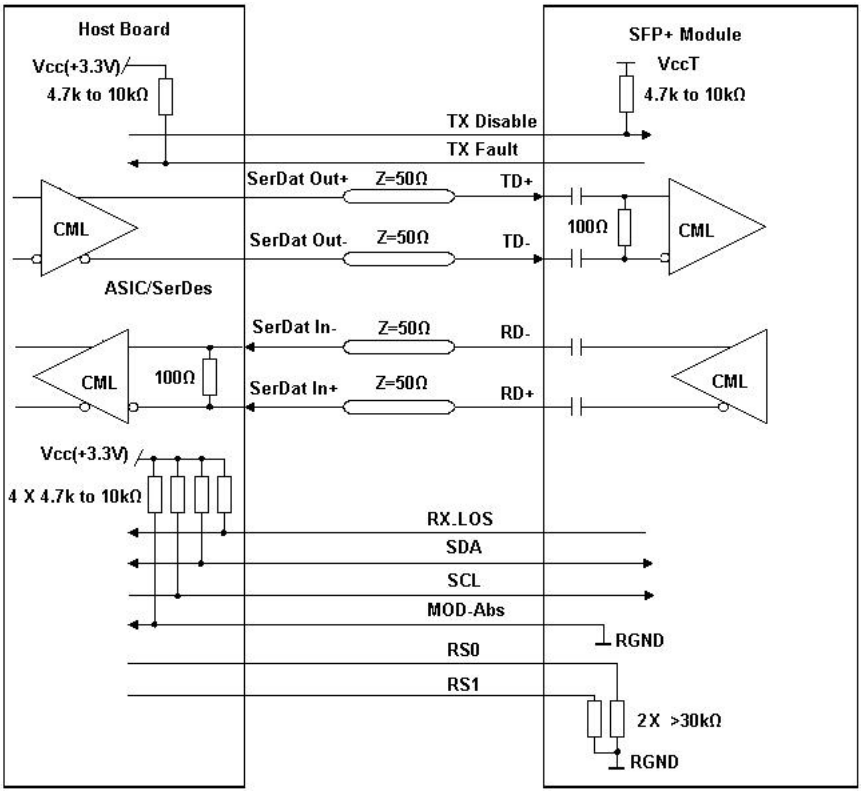


Figure2: Recommended Interface Circuit

Pin-out Definition

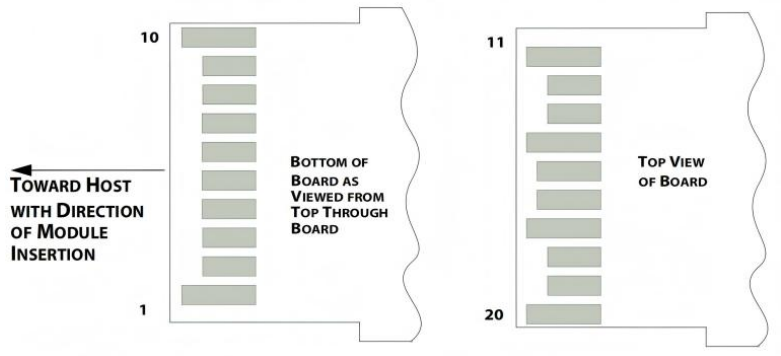


Figure3: Pin view

Pin Function Definitions

Pin	Logic	Symbol	Description	Note
1		VeeT	Module Transmitter Ground	1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	2
3	LVTTL-I	TX_Disable	Transmitter Disable; Turns off transmitter laser output	3
4	LVTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	4
5	LVTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	4
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	5
7	LVTTL-I	RS0	Adaptive multi-rate operation	6
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	2
9	LVTTL-I	RS1	Adaptive multi-rate operation	6
10		VeeR	Module Receiver Ground	1
11		VeeR	Module Receiver Ground	1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	1
15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Transmitter 3.3 V Supply	
17		VeeT	Module Transmitter Ground	1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	1

Note1: The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.

Note2: This pin is an open collector/drain output pin and shall be pulled up with 4.7kΩ-10kΩ to Host_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5V.

Note3: This pin is an open collector/drain input pin and shall be pulled up with 4.7kΩ-10kΩ to VccT in the module.

Note4: See SFF-8431 4.2 2-wire Electrical Specifications.

Note5: This pin shall be pulled up with 4.7kΩ-10kΩ to Host_Vcc on the host board.

Note6: Connect with 30kΩ load pulled down to GND in the module.

Monitoring Specification

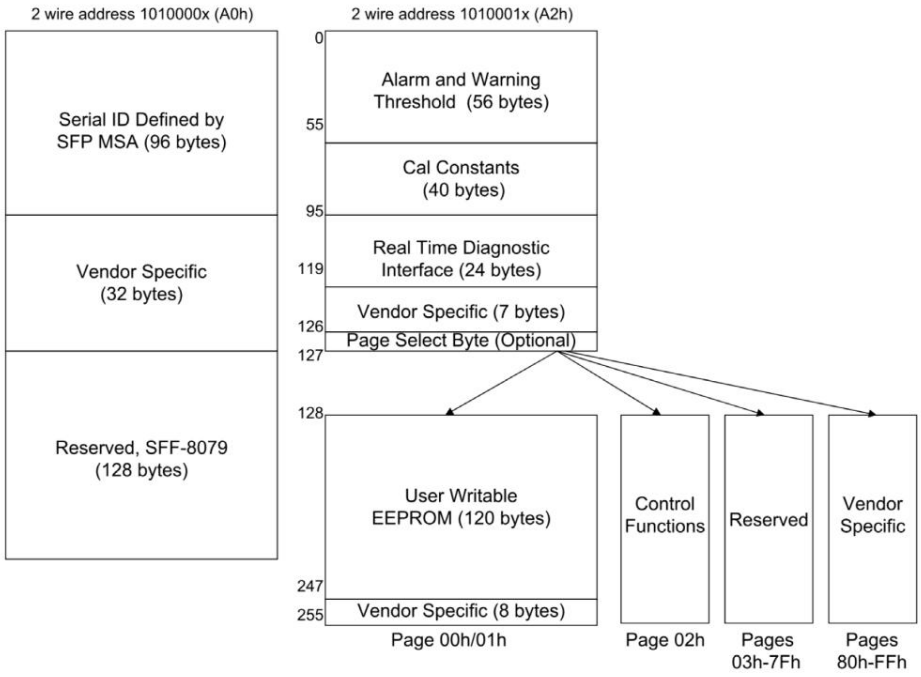


Figure4: Memory map

Memory map Table

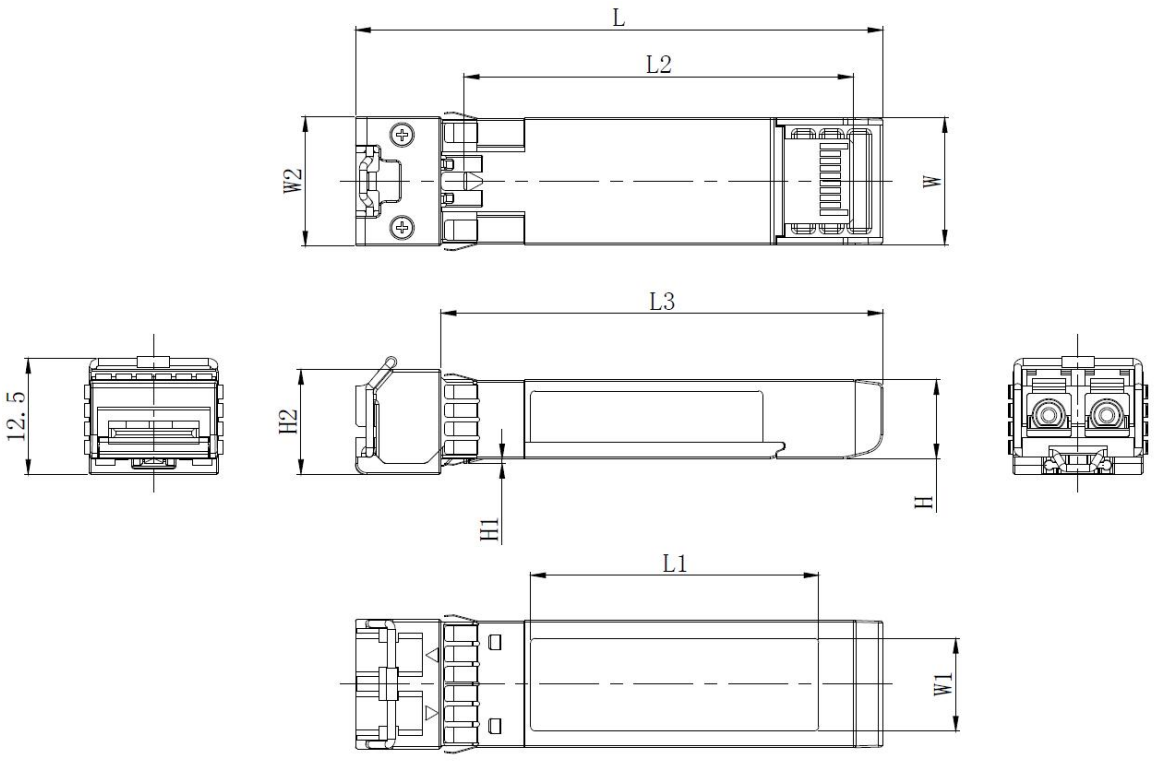
A0h	Bytes	Name	Description
A0h ID Fields			
0	1	Identifier	Type of transceiver
1	1	Ext. Identifier	Extended identifier of type of transceiver
2	1	Connector	Code for connector type
3-10	8	Transceiver	Code for electronic or optical compatibility
11	1	Encoding	Code for high speed serial encoding algorithm
12	1	Signaling Rate, Nominal	Nominal signaling rate, units of 100 MBd.
13	1	Rate Identifier	Type of rate select functionality
14	1	Length (SMF,km) or Copper Cable	Link length supported for single-mode fiber, units of km, or copper

		Attenuation	cable attenuation in dB at 12.9 GHz
15	1	Length (SMF) or Copper Cable Attenuation	Link length supported for single-mode fiber, units of 100 m, or copper cable attenuation in dB at 25.78 GHz
16	1	Length (50 um, OM2)	Link length supported for 50 um OM2 fiber, units of 10 m
17	1	Length (62.5 um, OM1)	Link length supported for 62.5 um OM1 fiber, units of 10 m
18	1	Length (OM4 or copper cable)	Link length supported for 50um OM4 fiber, units of 10 m. Alternatively, copper or direct attach cable, units of m
19	1	Length (OM3) or Cable length, additional	Link length supported for 50 um OM3 fiber, units of 10 m. Alternatively, copper or direct attach cable multiplier and base value
20-35	16	Vendor name	SFP vendor name (ASCII)
36	1	Transceiver	Code for electronic or optical compatibility
37-39	3	Vendor OUI	SFP vendor IEEE company ID
40-55	16	Vendor PN	Part number provided by SFP vendor (ASCII)
56-59	4	Vendor rev	Revision level for part number provided by vendor (ASCII)
60-61	2	Wavelength	Laser wavelength (Passive/Active Cable Specification Compliance)
62	1	Fibre Channel Speed 2	Transceiver's Fibre Channel speed capabilities
63	1	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)
64-65	2	Options	Indicates which optional transceiver signals are implemented
66	1	Signaling Rate, max	Upper signaling rate margin, units of %
67	1	Signaling Rate, min	Lower signaling rate margin, units of %
68-83	16	Vendor SN	Serial number provided by vendor (ASCII)
84-91	8	Date code	Vendor's manufacturing date code
92	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver
93	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with.
95	1	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)
96-127	32	Vendor Specific	Vendor Specific EEPROM
128-255	128	Reserved	Reserved (was assigned to SFF-8079)
A2h ID Fields			
00-01	2	Temp High Alarm	MSB at low address
02-03	2	Temp Low Alarm	MSB at low address
04-05	2	Temp High Warning	MSB at low address
06-07	2	Temp Low Warning	MSB at low address
08-09	2	Voltage High Alarm	MSB at low address
10-11	2	Voltage Low Alarm	MSB at low address
12-13	2	Voltage High Warning	MSB at low address
14-15	2	Voltage Low Warning	MSB at low address
16-17	2	Bias High Alarm	MSB at low address
18-19	2	Bias Low Alarm	MSB at low address
20-21	2	Bias High Warning	MSB at low address

22-23	2	Bias Low Warning	MSB at low address
24-25	2	TX Power High Alarm	MSB at low address
26-27	2	TX Power Low Alarm	MSB at low address
28-29	2	TX Power High Warning	MSB at low address
30-31	2	TX Power Low Warning	MSB at low address
32-33	2	RX Power High Alarm	MSB at low address
34-35	2	RX Power Low Alarm	MSB at low address
36-37	2	RX Power High Warning	MSB at low address
38-39	2	RX Power Low Warning	MSB at low address
40-41	2	Optional Laser Temp High Alarm	MSB at low address
42-43	2	Optional Laser Temp Low Alarm	MSB at low address
44-45	2	Optional Laser Temp High Warning	MSB at low address
46-47	2	Optional Laser Temp Low Warning	MSB at low address
48-49	2	Optional TEC Current High Alarm	MSB at low address
50-51	2	Optional TEC Current Low Alarm	MSB at low address
52-53	2	Optional TEC Current High Warning	MSB at low address
54-55	2	Optional TEC Current Low Warning	MSB at low address
56-91	36	Ext Cal Constants or Additional Enhanced Features	Diagnostic calibration constants for optional External Calibration if External Calibration bit, A0h, byte 92, bit 4 is 1 Additional Enhanced Features advertisement, control and status if External Calibration bit, A0h, byte 92, bit 4 is 0
92-94	3	Reserved	
95	1	CC_DMI	Check code for Base Diagnostic Fields (addresses 0 to 94)
96-105	10	Diagnostics	Diagnostic Monitor Data (internally or externally calibrated)
106-109	4	Optional Diagnostics	Monitor Data for Optional Laser temperature and TEC current
110	1	Status/Control	Optional Status and Control Bits
111	1	Reserved	Reserved (was assigned to SFF-8079)
112-113	2	Alarm Flags	Diagnostic Alarm Flag Status Bits
114	1	Tx Input EQ control	Tx Input equalization level control
115	1	Rx Out Emphasis control	Rx Output emphasis level control
116-117	2	Warning Flags	Diagnostic Warning Flag Status Bits
118-119	2	Ext Status/Control	Extended module control and status bytes
120-126	7	Vendor Specific	Vendor specific memory addresses
127	1	Table Select	Optional Page Select
A2h Page 00-01h			
128-247	120	User EEPROM	User writable non-volatile memory
248-255	8	Vendor Control	Vendor specific control addresses
A2h Page 02h			
128-129	2	Reserved	Reserved for SFF-8690 (Tunable Transmitter)
130	1	Reserved	Reserved for future receiver controls
131	1	Rx Decision	RDT value setting

		Threshold	
132-172	41	Reserved	Reserved for SFF-8690
173-255	83	Reserved	Reserved

Mechanical Dimension



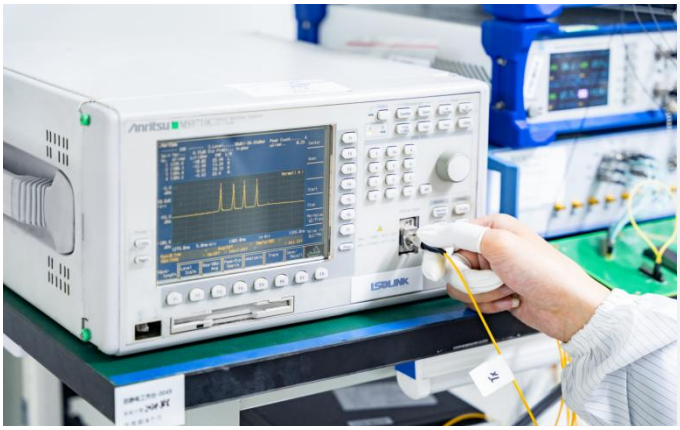
Unit: mm

	L	L1	L2	L3	W	W1	W2	H	H1	H2
MAX	56.9	31.2	41.95	47.7	13.8	10.2	14.0	8.6	0.6	11.5
Typical	56.7	31.0	41.80	47.5	13.7	10.0	-	8.5	0.5	11.3
MIN	56.5	30.8	41.65	47.3	13.5	9.8	-	8.4	0.4	11.1

Test Center

1. Performance Testing

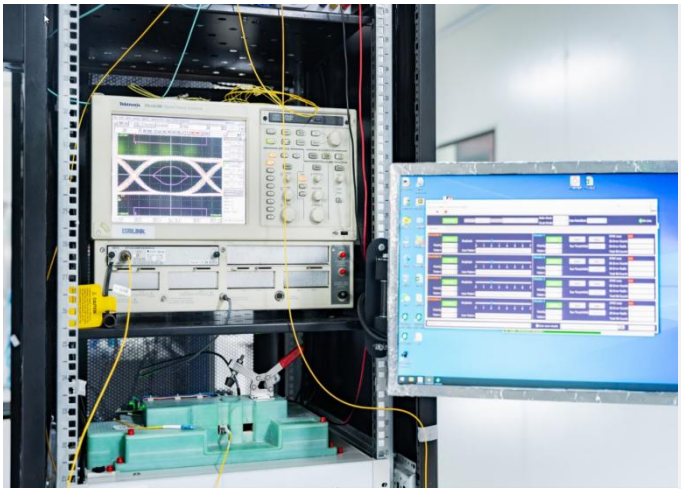
Every fiber optic transceiver is thoroughly tested by the LSOLINK Assurance Program, which is equipped with the world's most advanced analytical equipment to ensure that our transceivers meet the industry's international public protocol standards while still functioning flawlessly in your facility.



Optical Spectrum Inspection

Using the industry's leading optical spectrum analyser to check in real time that the parameters of the optical transceiver's laser comply with industry standards.

- **Peak:** Peak wavelength and peak level
- **2nd Peak:** Side-mode wavelength and level
- **Mean WI:** Center wavelength
- **Total Power:** Total power of spectrum
- **SMSR:** Side-Mode Suppression Ratio



Optical Signal Quality Inspection

Using highly efficient sampling oscilloscopes and BERT testers, equipped with an automated test platform to accurately test the signal quality of the transceiver, test records are kept for up to 5 years to ensure the traceability of each transceiver.

- **Eye Mask Margin(NRZ)**
- **TDECQ(PAM4):**transmitter dispersion eye closure
- **OMA:** Optical modulation amplitude
- **BER:** Bit error rate
- **ER:** Extinction Ratio

Flow Pressure Test

Using multi-protocol network traffic analyser with various brands of switches to test the transceiver's ability to transmit at full speed.

- **Bandwidth:** Actual transceiver bandwidth on the port
- **Packet Loss**
- **Packet Errors:**CRC Errors/PCS Errors/Symbol Errors
- **LinkDown Counts**
- **latency**

Aboveis part of our test bed network equipment. For more information, Please click download for optical transceiver performance test report.

2. Quality Control

We adopt advanced quality management solutions. Each transceiver is self-inspected, including:20x microscope inspection, 200x microscope inspection, and QC process inspection.

visual inspection

Microscopic inspection: 20X

Microscopic inspection: 200X

Reliability Verification

Optical endface inspection

OQC Inspection

3. Compatibility Testing

Each optical transceiver is tested in LSOLINK's library of compatibility test equipment to ensure perfect compatibility with multiple brands on the market.

Arista DCS-7060SX2-48YC6-R

Aruba 8360-32Y4C

Cisco Nexus N9K-C9318YC-EX

Dell S4048-ON

Huawei S6720-30L-HI-24S

Juniper QFX5110-48S-4C

Aboveis part of our test bed network equipment. For more information, Please click download to get the compatibility test report of each brand of optical transceiver.

Order Information

Part Number	Description
10G-SFP-T-30	10GBASE-T SFP+Cooper RJ45 30m Transceiver Module
10G-SFP-T-80	10GBASE-T SFP+Cooper RJ45 80m Transceiver Module
10G-SFP-SR	10GBASE-SR SFP+850nm 300m DOM LC MMF Transceiver Module
10G-SFP-IR	10GBASE-IR SFP+ 1310nm 2km DOM LC SMF Transceiver Module
10G-SFP-LR	10GBASE-LR SFP+1310nm 10km DOM LC SMF Transceiver Module
10G-SFP-ER	10GBASE-ER SFP+1550nm 40km DOM LC SMF Transceiver Module
10G-SFP-ZR	10GBASE-ZR SFP+1550nm 80km DOM LC SMF Transceiver Module
10G-SFP-SR-I	10GBASE-SR SFP+ 850nm 300m DOM LC MMF Industrial-Temp Transceiver Module
10G-SFP-LR-I	10GBASE-LR SFP+ 1310nm 10km DOM LC SMF Industrial-Temp Transceiver Module
10G-SFP-ER-I	10GBASE-ER SFP+ 1550nm 40km DOM LC SMF Industrial-Temp Transceiver Module

Further Information

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Disclaimer

1. We are committed to continuous product improvement and feature upgrades, and the contents con t ained in this manual are subject to change without notice.
2. Nothing herein should be construed as constituting an additional warranty.
3. LSOLINK assumes no responsibility for the use or reliability of equipment or software not provided by LSOLINK.