Product Specification

10.3125Gb/s IR SFP+ 1310nm 2km
Optical Transceiver

P/N: 10G-SFP-IR

Features

- Hot Pluggable SFP+ form factor
- Operating data rate 10.3125Gbps
- Single +3.3V power supply
- Duplex LC-UPC connector
- Max power dissipation <1.2W
- Up to 2km on SMF
- 1310nm FP laser Transmitter and PIN-TIA photo-detector
- 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-IR is a 10Gb/s Enhanced Small Form Factor Pluggable (SFP+) transceiver designed for use in 10-Gigabit Ethernet links. It provides reliable data transmission over OS2 single-mode fiber (SMF) with a reach of up to 2km. This transceiver is fully compliant with SFF-8431, SFF-8432, and IEEE 802.3aq 10GBASE-LRL standards, ensuring high performance and compatibility.

The 10G-SFP-IR transceiver includes digital diagnostic functions, accessible through a 2-wire serial interface, as specified by SFF-8472. This feature allows real-time monitoring of critical operational parameters, such as temperature, voltage, and optical power. The module utilizes a linear receiver design, which requires careful integration with an EDC PHY IC on the host board. Recommended settings from the IC manufacturer should be followed for optimal performance.

This transceiver is ideal for 10GbE network environments requiring reliable, high-speed communication over extended distances. It is suitable for a range of applications, including data centers, enterprise LANs, and SANs. The 10G-SFP-IR also complies with RoHS Directive 2011/65/EU, ensuring it meets environmental standards.

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	-	3.6	V
Relative Humidity	RH	0	-	85	%
Operating Case Temperature	T_C	0	-	70	°C
Power Supply Voltage	V_{CC}	3.13	3.3	3.465	V
Power Supply Current	I_{CC}			300	mA
Power Dissipation	PD	-	-	1200	mW
Data Rate	DR	-	10.3125	-	Gbps
Operating Distance with SMF	-	2	-	2000	m
Bit Error Ratio	BER			10^{-12}	

2. Product Optical and Electrical Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
Transmitter					
Input differential impedance[1]	Rin		100		Ω
Differential data input swing[2]	Vin,pp	90		350	mV
Transmit Disable Voltage[3]	V_D	2		V_{CC}	V
Transmit Enable Voltage	V_{EN}	V_{EE}		V_{EE}+ 0.8	V
Optical Modulation Amplitude (OMA)	P_{OMA}	-4.5		+1.5	dBm
Average Launch Power[4]	P_{AVE}	-8.2		0.5	dBm
Peak Launch Power	P_{MAX}			3	dBm
Optical Wavelength	λ	1260		1355	nm
RMS Spectral Width[5]	λrms@1260nm			2.4	nm
	Λrms@1260nm -1300nm			See Figure as below	
	λrms@1300nm-1355nm			4	
Optical Extinction Ratio	ER	3.5			dB
Optical Eye Mask Margin[6]		10@25°C 5@0°C&70°C			%
Transmitter Waveform Dispersion Penalty[7]	TDP			3.2	dB
Average Launch power of OFF transmitter	P_{OFF}			-40	dBm
Uncorrelated Jitter [rms]	Txj			0.033	UI
Relative Intensity Noise	$RIN_{12}OMA$			-128	dB/Hz
Encircled Flux	<5μm <11μm	30 81			%
Transmitter Reflectance				-12	dB
Optical Return Loss Tolerance	ORLT			12	dB
Receiver					
Termination Mismatch at 1 MHz	ΔZ_M			5	%
Single Ended Output Voltage Tolerance		-0.3		4.0	V
Output AC Common Mode Voltage				7.5	mV
Output Rise and Fall time (20% to 80%)[8]	T_r, T_f	30			Ps
Relative Noise LRL Links with crosstalk[9]	RN	per SFF-8431			

Difference Waveform Distortion Penalty[9,10]	dWDP	per SFF-8431			
Differential Voltage Modulation Amplitude	VMA	180		600	mV
LOS Fault[11]	$V_{LOS\ fault}$	2		$V_{CC\ HOST}$	V
LOS Normal[11]	$V_{LOS\ norm}$	V_{EE}		V_{EE}+0.8	V
Power Supply Noise Tolerance[12]	VccT/VccR	per SFF-8431			mVpp
Receiver Overload[13]	POMA	+1.5			dBm
Comprehensive Stressed Receiver Sensitivity (OMA) @ 10.3125Gb/s[14]	Precursor			-6.5	dBm
	Symmetrical			-6.0	
	Postcursor			-6.5	
Wavelength Range	λ_C	1260		1360	Nm
Receiver Reflectance	Rrx			-12.6	dB
LOS De-Assert	LOS_D			-17	dBm
LOS Assert	LOS_A	-30			dBm
LOS Hysteresis		0.5		4	dB

Note1: Connected directly to TX data input pins. AC coupling from pins into laser driver IC.

Note2: Per SFF-8431 Rev 4.1

Note3: Into 100 ohms differential termination.

Note4: Average power figures are informative only, per IEEE802.3aq

Note5: Maximum RMS spectral width as specified by Figure as below

Note6: Optical Eye Mask requires the host board to be SFF-8431 compliant. Optical eye mask per IEEE802.3aq

Note7: TWDP figure requires the host board to be SFF-8431compliant. TWDP is calculated

Note8: Measured with Module Compliance Test Board and OMA test pattern.

Note9: Values shown in Table 20, SFF-8431. dWDP and RN is calculated by the following equation: RN ≤ min[(m1 × dWDP + b1), (m2× dWDP + b2), RNmax]

Note10: Defined with reference receiver with 14 T/2 spaced FFE taps and 5 T spaced DFE taps.

Note11: LOS is an open collector output. Should be pulled up with 4.7k – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

Note12: As described in Section 2.8.1, SFF-8431 Rev 4.1.

Note13: Using the Matlab code provided in clause 68.6.6.2 of IEEE802.3aq Receiver overload specified in OMA and under the worst comprehensive stressed condition.

Note14: Conditions of stressed receiver tests per IEEE802.3aq. CSRS testing requires the host board to be SFF-8431 compliant.

Recommended Host Board Power Supply Circuit

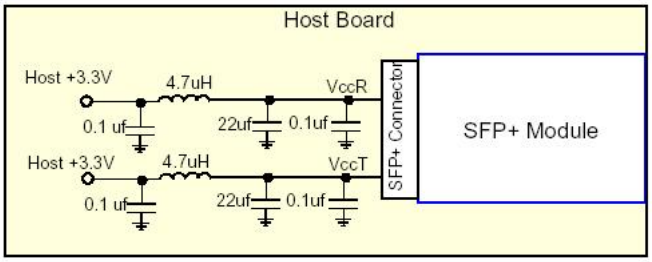


Figure 1: Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

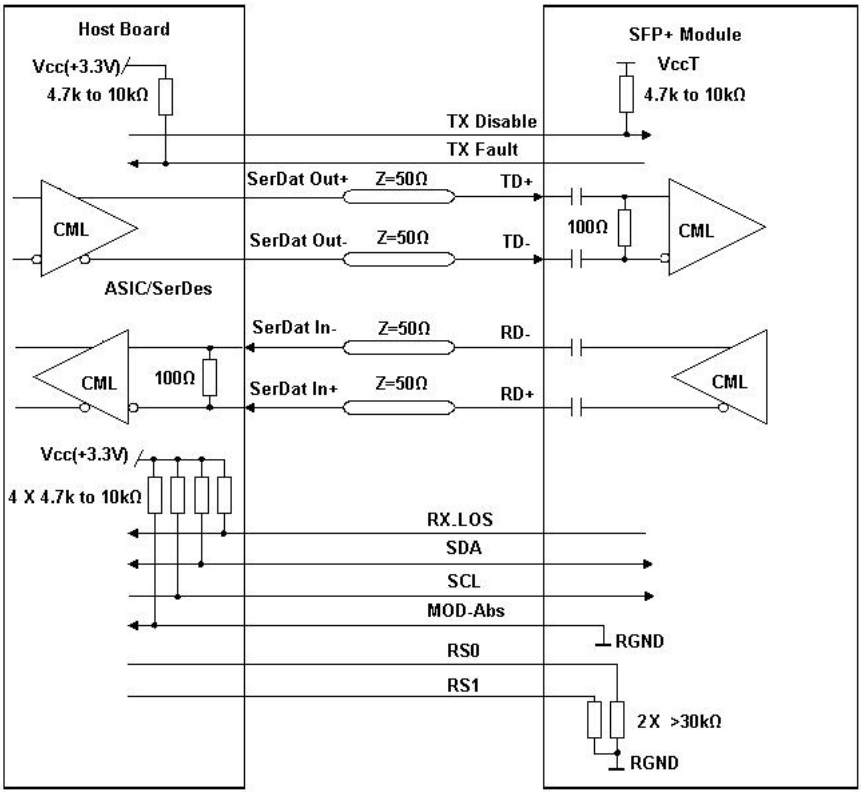


Figure2: Recommended Interface Circuit

Pin-out Definition

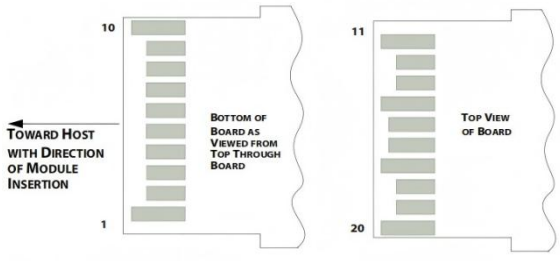


Figure3: Pin view

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

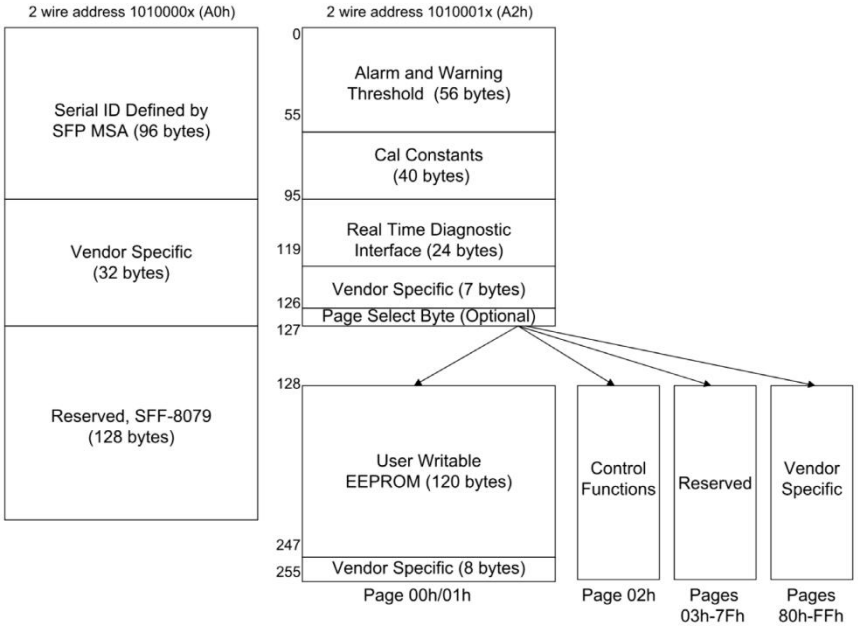


Figure4: Memory map

Memory map Table

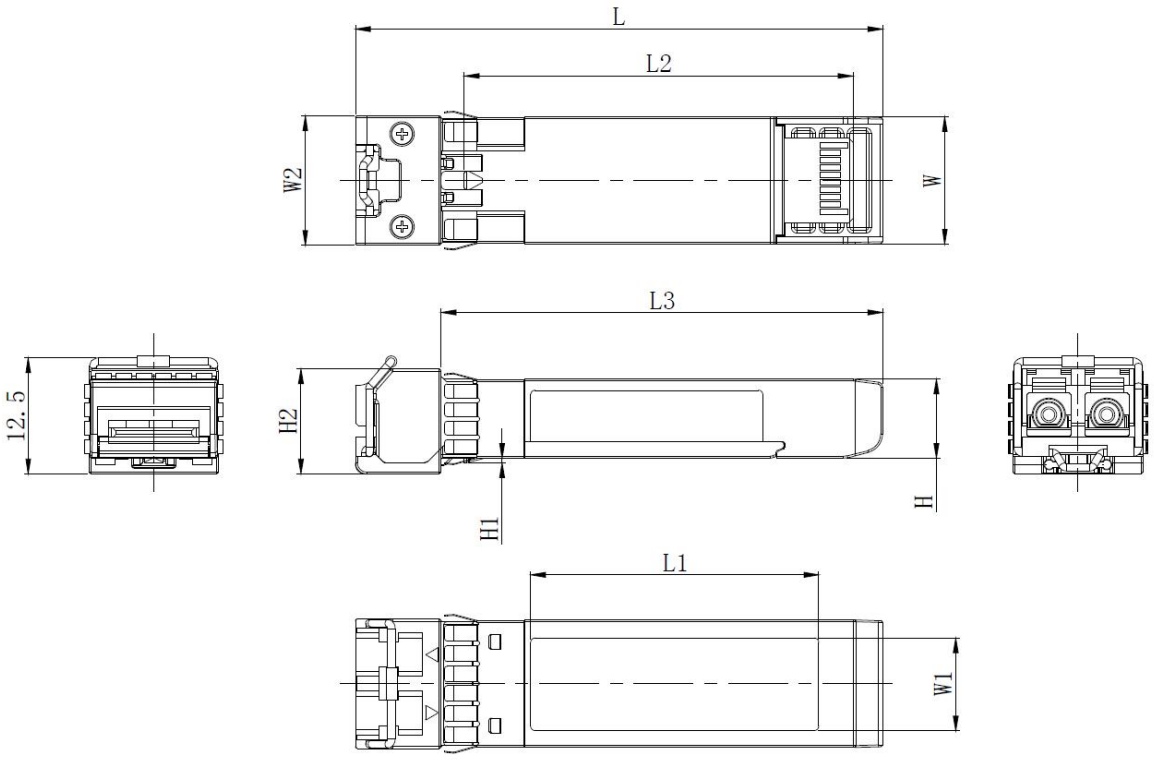
A0h	Bytes	Name	Description
A0h ID Fields			
0	1	Identifier	Type of transceiver
1	1	Ext. Identifier	Extended identifier of type of transceiver
2	1	Connector	Code for connector type
3-10	8	Transceiver	Code for electronic or optical compatibility
11	1	Encoding	Code for high speed serial encoding algorithm
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 Threshold	RDT value setting
132-172	41	Reserved	Reserved for SFF-8690
173-255	83	Reserved	Reserved

Mechanical Dimension



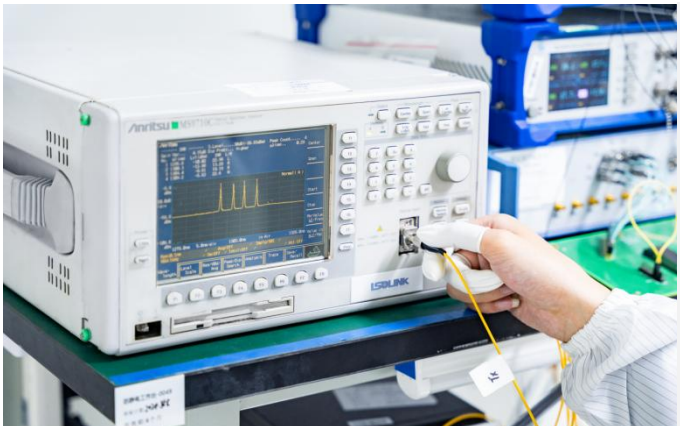
Unit: mm

	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

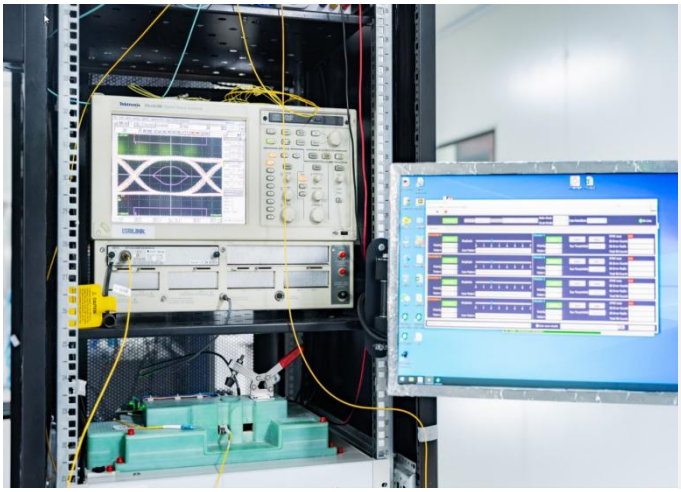
Every fiber optic transceiver is thoroughly tested by the LSOLINK Assurance Program, which is equipped with the world's most advanced analytical equipment to ensure that our transceivers meet the industry's international public protocol standards while still functioning flawlessly in your facility.



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-24

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

LSOLINK | Lighting the Path to Global Links

Web | www.lsolink.com

Email | For Sales@lsolink.com

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.