

**BST****A RELIABLE TESTING FOR TRUST**

GLOBAL TESTING AND CERTIFICATION PRECISION SERVICE CLOUD FACTORY

Certificate of Compliance

Certificate No. : **BST1702498390003-2Y-1EC-1**

Applicant : **SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.**
4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.

Manufacturer : **SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.**
4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.

Product Name : **OPTICAL MODULE**

Trade Name : **WALSUN OPTICS**

Main Test Model : **SFP SERIES**

Additional Model : **HXSX-xLxx1x, HXSX-xLxx2x, HXSX-xTRx-x, HXSx-xxxxxx3x, HXSC-xLxx1x, HXSD-xLxx1x**

Test Standard : **EN 55022:2010**
EN61000-3-2:2014
EN61000-3-3:2013
EN 55024:2010/A1:2015

As shown in the Test Report No. : **BST1702498390003-2Y-1ER-1.**

The EUT described above has been tested by us with the listed standards and found in compliance with the council EMC directive 2014/30/EU. It is possible to use CE marking to demonstrate the compliance with this EMC Directive.

The certificate applies to the tested sample above mentioned only and shall not imply an assessment of the whole production.

**Christina Deng****Manager****Feb. 22, 2017****Shenzhen BST Technology Co.,Ltd.**

Add: Building No.23-24, Zhiheng Industrial Park, Guankouer Road, Nantou, Nanshan District, Shenzhen, Guangdong, China

Certificate Search: <http://www.bst-lab.com>, Tel:400-882-9628, 8009990305, E-mail:christina@bst-lab.com

**BST****A RELIABLE TESTING FOR TRUST**

GLOBAL TESTING AND CERTIFICATION PRECISION SERVICE CLOUD FACTORY

Certificate of Compliance

Certificate Number: BST1702498390001-2Y-1RC-4

Applicant : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.
4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road,
Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen,
China.

Manufacturer : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.
4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road,
Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen,
China.

Product Name : OPTICAL MODULE
Trade Name : WALSUN OPTICS
Main Test Model : SFP SERIES
Additional Model : HXSX-xLxx1x, HXSX-xLxx2x, HXSX-xTRx-x,
HXSx-xxxxx3x, HXSC-xLxx1x, HXSD-xLxx1x

Test Standard : IEC 62321-4:2013, IEC 62321-5:2013
IEC 62321-6:2015, IEC 62321-7-1:2015

**As shown in the
Test Report No.** : BST1702498390001-2Y-1RR-4

The EUT described above has been tested by us and found in compliance with the council RoHS directive—2011/65/EU(RoHS 2.0). It is only valid in connection with the test.



RoHS



Andy Zheng
Technical Director
Feb.20, 2017

Dongguan BST Testing Co., Ltd

Add: A1201-1204 Xinsanqi Of Dongbao Road, Dongcheng District, Dongguan, Guangdong, China

Certificate Search: <http://www.bst-lab.com>, Tel:400-882-9628, 8009990305, E-mail:christina@bst-lab.com



SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.

CE EMC REPORT

Prepared For :	SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD. 4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.
Product Name:	OPTICAL MODULE
Trade Name:	WALSUN OPTICS
Model :	SFP SERIES, HXSX-xLxx1x, HXSX-xLxx2x, HXSX-xTRx-x, HXSx-xxxxxx3x, HXSC-xLxx1x, HXSD-xLxx1x
Prepared By :	Shenzhen BST Technology Co., Ltd. Building No.23-24, Zhiheng Industrial Park, Guankouer Road, Nantou, Nanshan District, Shenzhen, Guangdong, China
Test Date:	Feb. 20-21, 2017
Date of Report :	Feb. 22, 2017
Report No.:	BST1702498390003-2Y-1ER-1



TABLE OF CONTENTS

TEST REPORT DECLARATION	5
1. TEST RESULTS SUMMARY	6
2. GENERAL INFORMATION	7
2.1. Report information	7
2.2. Measurement Uncertainty	7
3. PRODUCT DESCRIPTION	8
3.1. EUT Description	8
3.2. Block Diagram of EUT Configuration	8
3.3. Operating Condition of EUT	8
3.4. Test Conditions	8
3.5. Modifications	8
3.6. Abbreviations	9
3.7. Performance Criterion	9
4. TEST EQUIPMENT USED	10
4.1. For Conducted Emission Test	10
4.2. For Radiated Emission Measurement	10
4.3. For Harmonic / Flicker Test	10
4.4. For Electrostatic Discharge Immunity Test	10
4.5. For RF Strength Susceptibility Test	10
4.6. For Electrical Fast Transient/Burst Immunity Test	11
4.7. For Surge Test	11
4.8. For Injected Currents Susceptibility Test	11
4.9. For Magnetic Field Immunity Test	11
4.10. For Voltage Dips and Interruptions Test	11
5. POWER LINE CONDUCTED EMISSION TEST	12
5.1. Block Diagram of Test Setup	12
5.2. Test Standard	12
5.3. Power Line Conducted Emission Limit	12
5.4. EUT Configuration on Test	12
5.5. Operating Condition of EUT	13
5.6. Test Procedure	13
5.7. Test Result	13
6. RADIATED EMISSION TEST	14
6.1. Setup Diagram	14
6.2. Test Standard	14
6.3. Radiated Emission Limit	14
6.4. EUT Configuration on Test	14
6.5. Operating Condition of EUT	15
6.6. Test Procedure	15
6.7. Test Results	15
7. HARMONIC CURRENT EMISSION TEST	16
7.1. Block Diagram of Test Setup	16
7.2. Test Standard and Limit	16
7.3. Test Procedure	17



7.4. Test Results	17
8. VOLTAGE FLUCTUATIONS & FLICKER TEST	18
8.1. Block Diagram of Test Setup	18
8.2. Test Standard.....	18
8.3. Operating Condition of EUT	18
8.4. Test Results	18
9. ELECTROSTATIC DISCHARGE TEST	19
9.1. Block Diagram of ESD Test Setup.....	19
9.2. Test Standard.....	19
9.3. Severity Levels and Performance Criterion.....	19
9.4. EUT Configuration on Test.....	19
9.5. Operating Condition of EUT	19
9.6. Test Procedure.....	20
9.7. Test Results	20
10. RF FIELD STRENGTH SUSCEPTIBILITY TEST	22
10.1. R/S Test Setup	22
10.2. Test Standard.....	22
10.3. Severity Levels and Performance Criterion.....	22
10.4. EUT Configuration on Test.....	23
10.5. Operating Condition of EUT	23
10.6. Test Procedure.....	23
10.7. Test Results	23
11. ELECTRICAL FAST TRANSIENT/BURST TEST	25
11.1. EFT Test Setup	25
11.2. Test Standard.....	25
11.3. Severity Levels and Performance Criterion.....	25
11.4. EUT Configuration on Test.....	25
11.5. Operating Condition of EUT	25
11.6. Test Procedure	26
11.7. Test Results	26
12. SURGE TEST.....	28
12.1. Surge Test Setup.....	28
12.2. Test Standard.....	28
12.3. Severity Levels and Performance Criterion.....	28
12.4. EUT Configuration on Test.....	28
12.5. Operating Condition of EUT	28
12.6. Test Procedure	29
12.7. Test Results	29
13. INJECTED CURRENTS SUSCEPTIBILITY TEST	31
13.1. Block Diagram of Test AC Mains Setup.....	31
13.2. Test Standard.....	31
13.3. Severity Levels and Performance Criterion.....	31
13.4. EUT Configuration on Test.....	31
13.5. Operating Condition of EUT	31
13.6. Test Procedure.....	32
13.7. Test Results	32
14. MAGNETIC FIELD IMMUNITY TEST.....	34
14.1. Block Diagram of Test Setup	34



14.2. Test Standard.....	34
14.3. Severity Levels and Performance Criterion.....	34
14.4. EUT Configuration on Test.....	34
14.5. Operating Condition of EUT	35
14.6. Test Procedure.....	35
14.7. Test Results	35
15. VOLTAGE DIPS AND INTERRUPTIONS TEST	37
15.1. Voltage Dips and Interruptions Test Setup	37
15.2. Test Standard.....	37
15.3. Severity Levels and Performance Criterion.....	37
15.4. EUT Configuration on Test.....	37
15.5. Operating Condition of EUT	37
15.6. Test Procedure	38
15.7. Test Result.....	38
APPENDIX I	40
APPENDIX II.....	43



TEST REPORT DECLARATION

Applicant	:	SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.
Address	:	4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.
EUT Description	:	OPTICAL MODULE
Model Number	:	SFP SERIES, HXXX-ALxx1x, HXXX-ALxx2x, HXXX-ALxxx3x, HXXC-ALxx1x, HXXD-ALxx1x (Note: The series products have the same circuit diagram, PCB layout and functionality. The differences are the model name and appearance, so, we select SFP SERIES to test.)

Test Standards:

EN 55022:2010

EN61000-3-2:2014

EN61000-3-3:2013

EN 55024:2010/A1:2015

The EUT described above is tested by BST Technology Co., Ltd. EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. BST Technology Co., Ltd. EMC Laboratory is assumed full responsibility for the accuracy of the test results. Also, this report shows that the EUT technically complies with the 2014/30/EU directive and its amendment requirements.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Prepared by :

Assistant

Tested by :

Test Engineer

Reviewer :



Approved & Authorized Signer :

Jack. Shu / Manager



1. TEST RESULTS SUMMARY

Table 1 Test Results Summary

Test Items	Test Results
Radiated Emission	PASS
Conducted Disturbance	N/A
Harmonic Current	N/A
Voltage Fluctuation and Flicker	N/A
Electrostatic Discharge Immunity	PASS
Radiated Electromagnetic Fields Immunity	PASS
Electric Fast Transient Burst Immunity	N/A
Surge Immunity	N/A
Injected currents susceptibility test	N/A
Magnetic Field Immunity Test	PASS
Voltage dips and interruptions Immunity	N/A



2. GENERAL INFORMATION

2.1. Report information

2.1.1.This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that BST approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that BST in any way guarantees the later performance of the product/equipment.

2.1.2.The sample/s mentioned in this report is/are supplied by Applicant, BST therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.

2.1.3.Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through BST, unless the applicant has authorized BST in writing to do so.

2.2. Measurement Uncertainty

(95% confidence levels, $k=2$)

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.2dB
Uncertainty for Radiation emission test (30MHz to 1GHz)	4.0dB

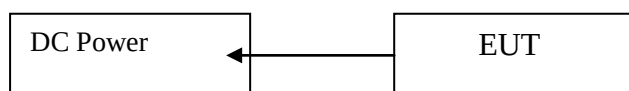


3. PRODUCT DESCRIPTION

3.1. EUT Description

Description	:	OPTICAL MODULE
Applicant	:	SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD. 4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.
Manufacturer	:	SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD. 4 Floor, A1 Building, Runxinfu Industrial Park, No.19 Tianbao Road, Yingrenshi Community, Shiyan Street, Baoan District, Shenzhen, China.
Model Number	:	SFP SERIES, HXXX-ALxx1x, HXXX-ALxx2x, HXXX-ALxxx3x, HXXC-ALxx1x, HXXD-ALxx1x

3.2. Block Diagram of EUT Configuration



3.3. Operating Condition of EUT

Test mode 1: ON

3.4. Test Conditions

Temperature: 23-26 °C

Relative Humidity: 55-68 %

3.5. Modifications

No modification was made.



3.6. Abbreviations

AC	Alternating Current
AMN	Artificial Mains Network
DC	Direct Current
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
IF	Intermediate Frequency
RF	Radio Frequency
rms	root mean square
EMI	Electromagnetic Interference
EMS	Electromagnetic Susceptibility

3.7. Performance Criterion

Criterion A: The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended.

Criterion B: After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended.

Criterion C: Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions.



4. TEST EQUIPMENT USED

4.1. For Conducted Emission Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESHS30	828985/018	Jun. 01, 16	1 Year
2.	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	Jun. 01, 16	1 Year
3.	L.I.S.N.	Rohde & Schwarz	ESH2-Z5	834549/005	Jun. 01, 16	1 Year
4.	Conical	Emtek	N/A	N/A	N/A	N/A
5.	Voltage Probe	Schwarzbeck	TK9416	N/A	Jun. 01, 16	1 Year
6.	Coaxial Switch	Anritsu	MP59B	6100214550	Jun. 01, 16	1 Year

4.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Spectrum Analyzer	ANRITSU	MS2661C	6200140915	Jun. 01, 16	1 Year
2.	Test Receiver	Rohde&Schwarz	ESC830	828982/018	Jun. 01, 16	1 Year
3.	Bilog Antenna	Schwarzbeck	VULB9163	142	Jun. 01, 16	1 Year
4.	50 Coaxial Switch	Anritsu Corp	MP59B	6100237248	Jun. 01, 16	1 Year
5.	Cable	Schwarzbeck	AK9513	ACRX1	Jun. 01, 16	1 Year
6.	Cable	Rosenberger	N/A	FR2RX2	Jun. 01, 16	1 Year
7.	Cable	Schwarzbeck	AK9513	CRRX2	Jun. 01, 16	1 Year
8.	Cable	Schwarzbeck	AK9513	CRRX2	Jun. 01, 16	1 Year
9.	Signal Generator	HP	864A	3625U00573	Jun. 01, 16	1 Year

4.3. For Harmonic / Flicker Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Harmonic and Flicker analyzer	Laplace	AC2000A	309709	Oct. 15, 2016	1 Year

4.4. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	HAEFELY	PSD 1600	H911'292	Jun. 02, 16	1 Year

4.5. For RF Strength Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	HP	8648A	3633A02081	Jun. 03,16	1 Year
2.	Amplifier	A&R	500A100	17034	NCR	NCR
3.	Amplifier	A&R	100W/1000M1	17028	NCR	NCR
4.	Isotropic Field Monitor	A&R	FM2000	16829	NCR	NCR
5.	Isotropic Field Probe	A&R	FLW220100	16755	Jun. 03, 16	1 Year
6.	Biconic Antenna	EMCO	3108	9507-2534	NCR	NCR
7.	Log-periodic Antenna	A&R	AT1080	16812	NCR	NCR
8.	PC	N/A	486DX2	N/A	N/A	N/A



4.6. For Electrical Fast Transient/Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Burst Tester	HAEFELY	PEFT 4010	080981-16	Jun. 01, 16	1 Year

4.7. For Surge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Tester	HAEFELY	PSURGE4.1	080107-04	Jun. 01, 16	1 Year

4.8. For Injected Currents Susceptibility Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Simulator	EMTEST	CWS 500C	0900-12	Jun. 01, 16	1 Year
2.	CDN	EMTEST	CDN-M2	510010010010	Jun. 01, 16	1 Year
3.	VDN	EMTEST	CDN-M3	0900-11	Jun. 01, 16	1 Year
4.	Injection Clamp	EMTEST	F-2031-23MM	368	Jun. 01, 16	1 Year
5.	Attenuator	EMTEST	ATT6	0010222a	Jun. 01, 16	1 Year

4.9. For Magnetic Field Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Magnetic Field Tester	HEAFELY	MAG100.1	083858-10	Jun. 01, 16	1 Year

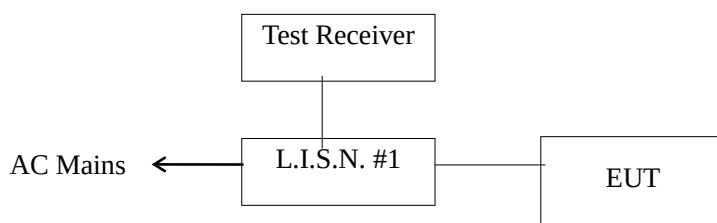
4.10. For Voltage Dips and Interruptions Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Dips Tester	HEAFELY	PLINE 1610	083732-18	Jun. 01, 16	1 Year



5. POWER LINE CONDUCTED EMISSION TEST

5.1. Block Diagram of Test Setup



5.2. Test Standard

EN 55022:2010

5.3. Power Line Conducted Emission Limit

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

5.4. EUT Configuration on Test

The following equipments are installed on conducted emission test to meet EN55022 requirement and operating in a manner, which tends to maximize its emission characteristics in a normal application.

5.4.1. EUT Information

Model Number : SFP SERIES
Serial Number : N/A
Manufacturer : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.



5.5. Operating Condition of EUT

5.5.1. Setup the EUT and simulators as shown in Section 5.1.

5.5.2. Turn on the power of all equipments.

5.5.3. Let the EUT work in test modes (ON) and test it.

5.6. Test Procedure

The EUT is put on the ground and connected to the AC mains through a Artificial Mains Network (AMN). This provided 50ohm-coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission levels according to the EN55022 regulations during conducted emission test.

The bandwidth of the test receiver is set at 9kHz.

The frequency range from 150 KHz to 30 MHz is investigated.

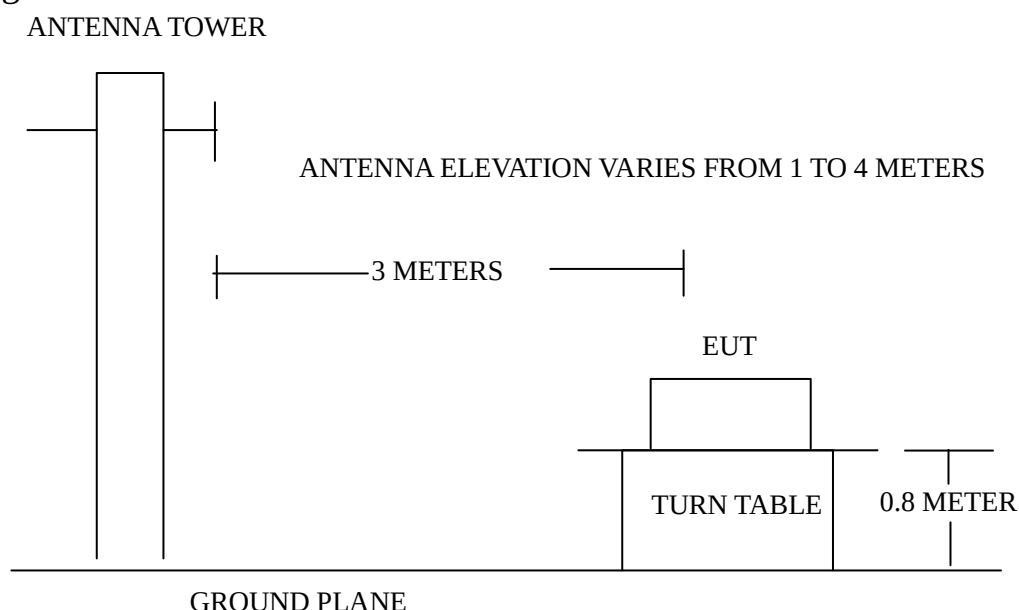
5.7. Test Result

N/A



6. RADIATED EMISSION TEST

6.1. Setup Diagram



6.2. Test Standard

EN 55022:2010

6.3. Radiated Emission Limit

All emanations from a Class B computing devices or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMITS (dB μ V/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note:(1) The tighter limit shall apply at the edge between two frequency bands.

(2) Distance refers to the distance in meters between the measuring instruments antenna and the closed point of any part of the EUT.

6.4. EUT Configuration on Test

The EN55022 Class B regulations test method must be used to find the maximum emission during radiated emission test.



6.5. Operating Condition of EUT

- 6.5.1. Setup the EUT as shown on Section 6.1.
- 6.5.2. Turn on the power of all equipments.
- 6.5.3. Let the EUT work in test mode (on) and measure it.

6.6. Test Procedure

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna (calibrated by dipole antenna) are used as a receiving antenna. Both horizontal and vertical polarization of the antenna are set on test.

The bandwidth setting on the test receiver is 120 KHz.

The EUT is tested in Semi-Anechoic Chamber. and all the scanning waveform is put in

Appendix I.

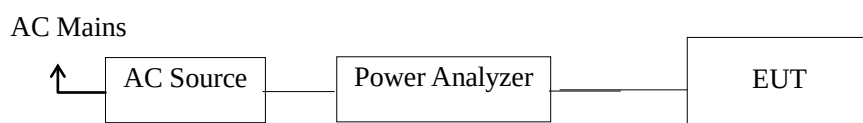
6.7. Test Results

PASS.



7. HARMONIC CURRENT EMISSION TEST

7.1. Block Diagram of Test Setup



7.2. Test Standard and Limit

7.2.1. Test Standard

EN61000-3-2:2014

7.2.2. Limits

Table 12 Harmonic Current Test Limit (Class A)

Harmonic order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≤n≤39	0.15×15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8≤n≤40	0.23×8/n



7.3. Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the Power of the EUT and use the test system to test the harmonic current level.

7.4. Test Results

N/A



8. VOLTAGE FLUCTUATIONS & FLICKER TEST

8.1. Block Diagram of Test Setup

Same as Section 7.1..

8.2. Test Standard

EN61000-3-3:2013

8.3. Operating Condition of EUT

Same as Section 7.3.. The power cord of the EUT is connected to the output of the test system.
Turn on the power of the EUT and use the test system to test.

Flicker Test Limit

Test items	Limits
Pst	1.0
dc	3.3%
dmax	4.0%
dt	Not exceed 3.3% for 500ms

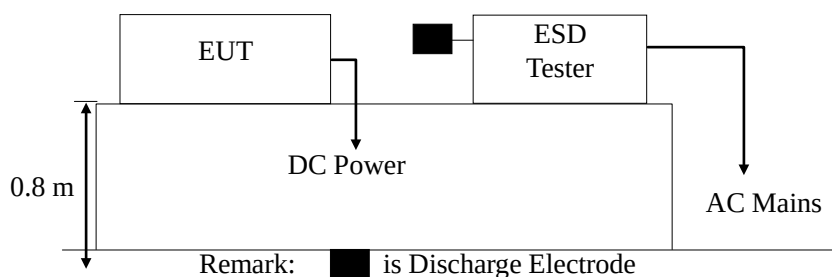
8.4. Test Results

N/A



9. ELECTROSTATIC DISCHARGE TEST

9.1. Block Diagram of ESD Test Setup



9.2. Test Standard

EN 55024:2010/A1:2015(EN61000-4-2:2009)

Severity Level 3 for Air Discharge at 8KV

Severity Level 2 for Contact Discharge at 4KV

9.3. Severity Levels and Performance Criterion

9.3.1. Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

9.3.2. Performance criterion: B

9.4. EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

9.5. Operating Condition of EUT

9.5.1. Setup the EUT as shown in Section 9.1.

9.5.2. Turn on the power of all equipments.

9.5.3. Let the EUT work in test mode (on) and test it.



9.6. Test Procedure

9.6.1.Air Discharge:

This test is done on a non-conductive surfaces. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT.

After each discharge, the discharge electrode shall be removed from the EUT.

The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

9.6.2.Contact Discharge:

All the procedure shall be same as Section 9.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

9.6.3.Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

9.6.4.Indirect discharge for vertical coupling plane

At least 20 single discharge shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

9.7. Test Results

PASS.

Please refer to the following page.



Electrostatic Discharge Test Results

Shenzhen BST Technology Co., Ltd.

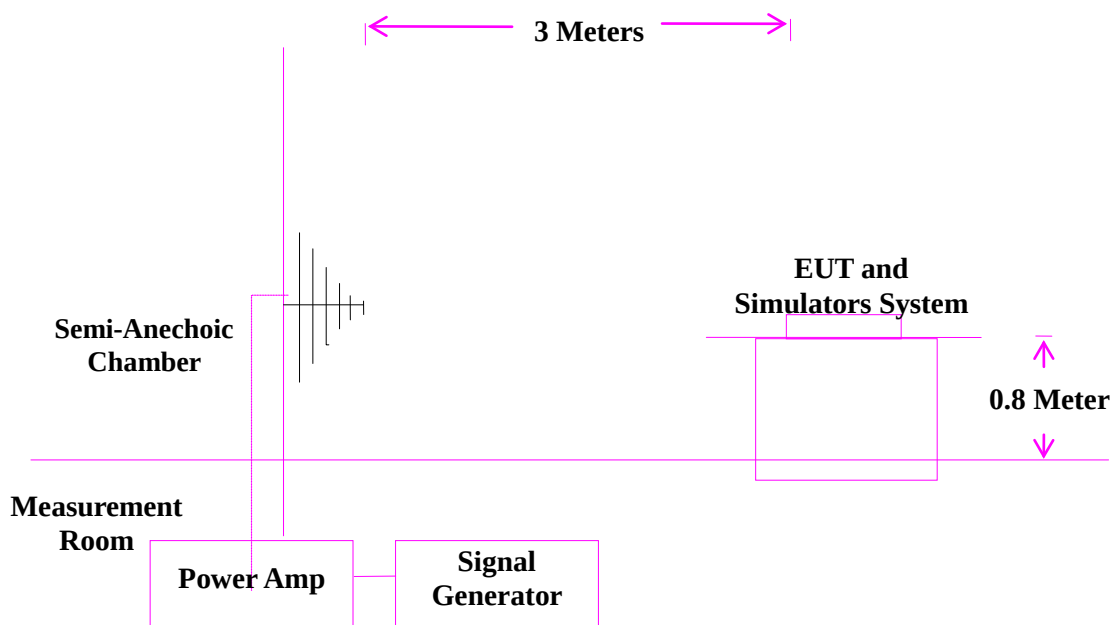
Applicant	SHENZHEN WALSUN OPTICS : TECHNOLOGY CO., LTD.	Test Date	:	Feb. 21, 2017
EUT	: OPTICAL MODULE	Temperature	:	22 °C
M/N	: SFP SERIES	Humidity	:	50 %
Power Supply	: -	Test Mode	:	on
Air Discharge: $\pm 8KV$ For each point positive 10 times and negative 10 times discharge.				
Contact Discharge: $\pm 4KV$				
Location		Kind A-Air Discharge C-Contact Discharge		Result
Slots		A		PASS
Metal Parts		C		PASS
HCP		C		PASS
VCP		C		PASS

Discharge should be considered on Contact and Air and Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).



10.RF FIELD STRENGTH SUSCEPTIBILITY TEST

10.1.R/S Test Setup



10.2.Test Standard

EN 55024:2010/A1:2015 (EN 61000-4-3:2006 + A1:2008 + A2:2010)
Severity Level 2 at 3V / m

10.3.Severity Levels and Performance Criterion

10.3.1.Severity level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

10.3.2.Performance criterion : A



10.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2

10.5.Operating Condition of EUT

Setup the EUT as shown in Section 10.1.. The operating condition of EUT are listed in section 3.3.

10.6.Test Procedure

The EUT and its simulators are placed on a turn table which is 1 meter above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor the EUT. All the scanning conditions are as follows :

Condition of Test	Remarks
1. Fielded Strength	3 V/m (Severity Level 2)
2. Radiated Signal	Modulated
3. Scanning Frequency	80 - 1000 MHz, 1.4GHz-2.7GHz
4. Sweeping time of radiated	0.0015 decade/s
5. Dwell Time	1 Sec.

10.7.Test Results

PASS.

Please refer to the following page.



RF Field Strength Susceptibility Test Results

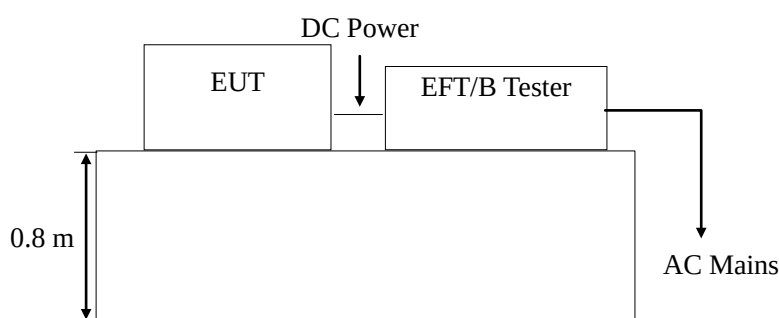
Shenzhen BST Technology Co., Ltd.

Applicant : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.	Test Date : Feb. 21, 2017	
EUT : OPTICAL MODULE	Temperature : 22 °C	
M/N : SFP SERIES	Humidity : 50 %	
Power Supply : -	Test Mode : on	
Frequency Range : 80 MHz to 1000 MHz, 1.4GHz-2.7GHz		
Modulation: ☒ AM ☐ Pulse ☐ none 1 KHz 80%		
Criterion : A		
	Frequency Rang : 80-1000MHZ, 1.4GHz-2.7GHz	
Steps	1%	1%
	Horizontal	Vertical
Front	Pass	Pass
Right	Pass	Pass
Rear	Pass	Pass
Left	Pass	Pass



11.ELECTRICAL FAST TRANSIENT/BURST TEST

11.1.EFT Test Setup



11.2.Test Standard

EN 55024:2010/A1:2015 (EN61000-4-4:2012)

Severity Level 2 at 1KV

11.3.Severity Levels and Performance Criterion

11.3.1.Severity level

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.5 KV	0.25 KV
2.	1 KV	0.5 KV
3.	2 KV	1 KV
4.	4 KV	2 KV
X	Special	Special

11.3.2.Performance criterion : B

11.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2..

11.5.Operating Condition of EUT

Setup the EUT as shown in Section 11.1.. The operating condition of EUT are listed in section 3.3.



11.6.Test Procedure

The EUT is put on the table which is 1 meter high above the ground. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between the EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m.

11.6.1.For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

11.6.2.For signal lines and control lines ports:

It's unnecessary to test.

11.6.3.For DC output line ports:

It's unnecessary to test.

11.7.Test Results

N/A



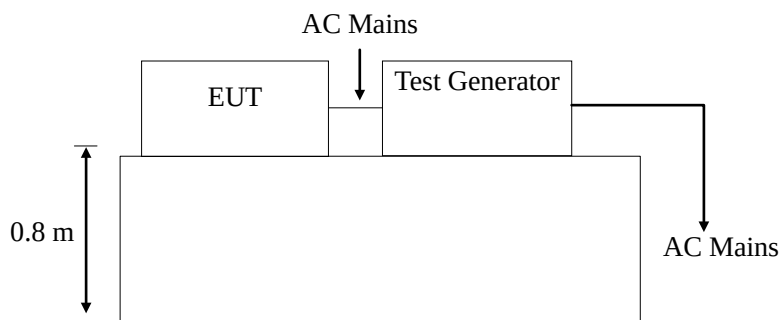
Electrical Fast Transient/Burst Test Results

Shenzhen BST Technology Co., Ltd.

<i>Applicant</i> :		<i>SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.</i>			<i>Test Date</i> :		<i>Feb. 21, 2017</i>		
<i>EUT</i> :		<i>OPTICAL MODULE</i>			<i>Temperature</i> :		<i>22 °C</i>		
<i>M/N</i> :		<i>SFP SERIES</i>			<i>Humidity</i> :		<i>50 %</i>		
<i>Power Supply</i> :		-			<i>Test Mode</i> :		-		
<i>Inject Place : AC Mains</i>									
<i>Inject Line</i>	<i>Voltage KV</i>	<i>Inject Time(s)</i>	<i>Inject Method</i>	<i>Results</i>	<i>Inject Line</i>	<i>Voltage KV</i>	<i>Inject Time(s)</i>	<i>Inject Method</i>	<i>Results</i>
<i>L</i>	<i>±1</i>	<i>120</i>	<i>Direct</i>	<i>--</i>					
<i>N</i>	<i>±1</i>	<i>120</i>	<i>Direct</i>	<i>--</i>					
<i>L N</i>	<i>±1</i>	<i>120</i>	<i>Direct</i>	<i>--</i>					

12.SURGE TEST

12.1.Surge Test Setup



12.2.Test Standard

EN 55024:2010/A1:2015 (EN61000-4-5:2014)

Severity Level 2 for Line to Neutral at 1.0KV

12.3.Severity Levels and Performance Criterion

12.3.1.Severity level

Severity Level	Open-Circuit Test Voltage KV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

Performance criterion : **B**

12.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

12.5.Operating Condition of EUT

12.5.1.Setup the EUT as shown in Section 12.1..

12.5.2.Turn on the power of all equipments.

12.5.3.Let the EUT work in test mode (on) and test it.



12.6.Test Procedure

- 1) Setup the EUT and test generator as shown on Section 12.1.
- 2) For line to line coupling mode, provide a 1.0KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

12.7.Test Results

N/A



Surge Immunity Test Results

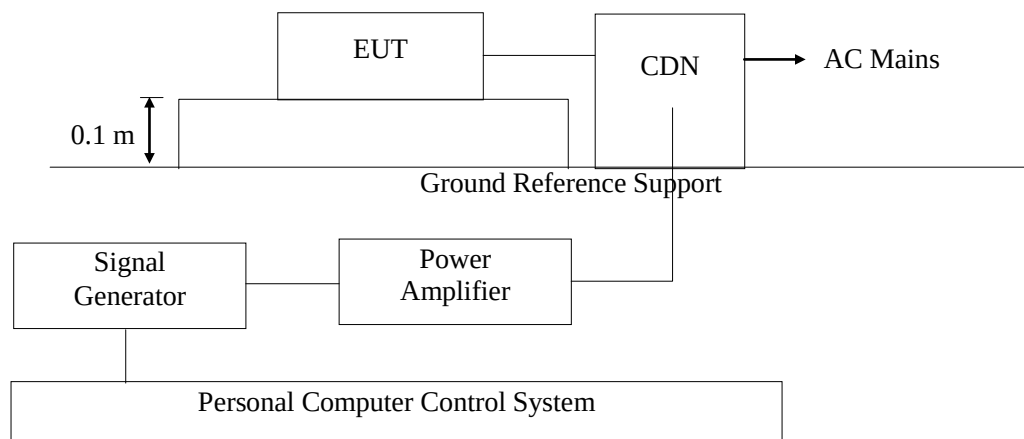
Shenzhen BST Technology Co., Ltd.

Applicant : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.				Test Date : Feb. 21, 2017	
EUT : OPTICAL MODULE				Temperature : 22 °C	
M/N : SFP SERIES				Humidity : 50 %	
Power Supply : -				Test Mode : -	
Location	Polarity	Phase Angle	No of Pulse	Pulse Voltage (KV)	Result
L-N	+	0	5	1.0	--
	+	90	5	1.0	--
	+	180	5	1.0	--
	+	270	5	1.0	--
	-	0	5	1.0	--
	-	90	5	1.0	--
	-	180	5	1.0	--
	-	270	5	1.0	--



13.INJECTED CURRENTS SUSCEPTIBILITY TEST

13.1.Block Diagram of Test AC Mains Setup



13.2.Test Standard

EN 55024:2010/A1:2015 (EN61000-4-6:2014)
Severity Level 2 at 3 V (rms), 0.15MHz ~ 80MHz

13.3.Severity Levels and Performance Criterion

13.3.1.Severity level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

13.3.2.Performance criterion: A

13.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2

13.5.Operating Condition of EUT

Setup the EUT as shown in Section 13.1.. The operating condition of EUT are listed in section 3.3



13.6.Test Procedure

- 1) Set up the EUT, CDN and test generators as shown on Section 13.1.
- 2) Let the EUT work in test mode and test it.
- 3) The EUT are placed on an insulating support 0.8m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

13.7.Test Results

N/A



Injected Currents Susceptibility Test Results

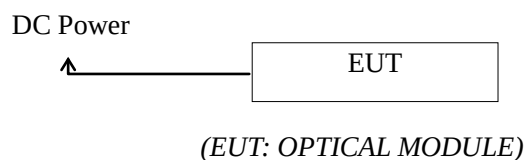
Shenzhen BST Technology Co., Ltd.

Applicant : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.			Test Date : Feb. 21, 2017	
EUT : OPTICAL MODULE			Temperature : 22 °C	
M/N : SFP SERIES			Humidity : 50 %	
Power Supply : -			Test Mode : -	
Frequency Range (MHz)	Injected Position	Strength	Criterion	Result
0.15 ~ 20	AC Line	3V(rms), Unmodulated	A	--
20 ~ 80	AC Line	3V(rms), Unmodulated	A	--

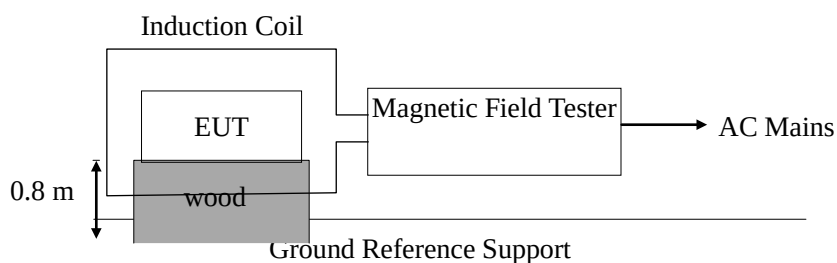
14.MAGNETIC FIELD IMMUNITY TEST

14.1.Block Diagram of Test Setup

14.1.1.Block Diagram of the EUT



14.1.2.Block Diagram of Test Setup



14.2.Test Standard

EN 55024:2010/A1:2015 (EN61000-4-8: 2010)
Severity Level 1 at 1A/m

14.3.Severity Levels and Performance Criterion

14.3.1.Severity level

Level	Magnetic Field Strength A/m
1.	1
2.	3
3.	10
4.	30
5.	100
X.	Special

14.3.2.Performance criterion : A

14.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.



14.5.Operating Condition of EUT

14.5.1.Setup the EUT as shown in Section 14.1

14.5.2.Turn on the power of all equipments.

14.5.3.Let the EUT work in test mode (ON) and test it.

14.6.Test Procedure

The EUT shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m*1m) and shown in Section 14.1. The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

14.7.Test Results

PASS.

Please refer to the following page.



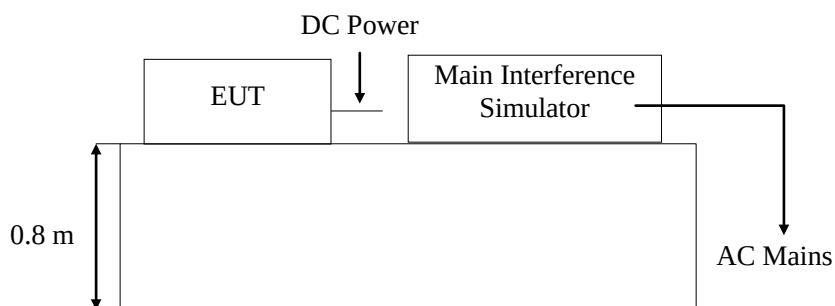
Magnetic Field Immunity Test Results

Shenzhen BST Technology Co.,Ltd.

Applicant : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD. EUT : OPTICAL MODULE M/N : SFP SERIES Power Supply : -			Test Date : Feb. 21, 2017 Temperature : 22 °C Humidity : 60 %	
Test Mode: ON				
Test Level	Testing Duration	Coil Orientation	Criterion	Result
1A/M	5 mins	Horizontal	A	PASS
1A/M	5 mins	Vertical	A	PASS
Remark:		Test Equipment : Magnetic Field Tester MAG100.1		

15. VOLTAGE DIPS AND INTERRUPTIONS TEST

15.1. Voltage Dips and Interruptions Test Setup



Remark: Combination wave generator and decoupling network are included in test generator.

15.2. Test Standard

EN 55024:2010/A1:2015 (EN61000-4-11:2004)

15.3. Severity Levels and Performance Criterion

15.3.1. Severity level

Test Level %U _T	Voltage dip and short interruptions %U _T	Duration (in period)
0	100	250p
40	60	5p
70	30	0.5p

15.3.2. Performance criterion : C & B

15.4. EUT Configuration on Test

The configuration of EUT are listed in Section 3.2.

15.5. Operating Condition of EUT

15.5.1. Setup the EUT as shown in Section 15.1.

15.5.2. Turn on the power of all equipments.

15.5.3. Let the EUT work in test mode (On) and test it.



15.6.Test Procedure

- 1) Set up the EUT and test generator as shown on Section 15.1.
- 2) The interruptions is introduced at selected phase angles with specified duration.
- 3) Record any degradation of performance.

15.7.Test Result

N/A



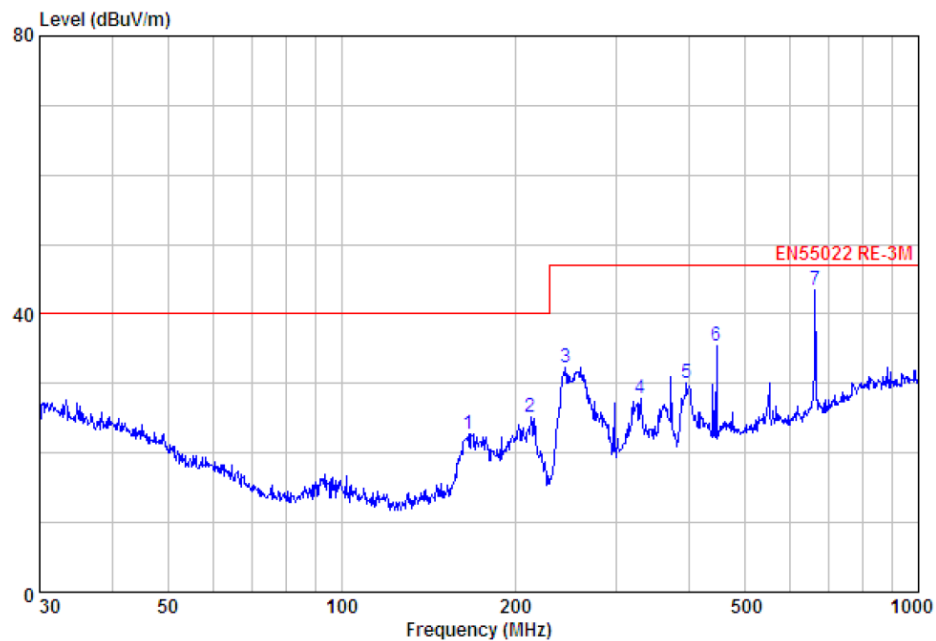
Voltage Dips And Interruptions Test Results

Shenzhen BST Technology Co., Ltd

<i>Applicant</i> : SHENZHEN WALSUN OPTICS TECHNOLOGY CO., LTD.		<i>Test Date</i> :		<i>Feb. 21, 2017</i>	
<i>EUT</i> : OPTICAL MODULE		<i>Temperature</i> :		<i>22 ℃</i>	
<i>M/N</i> : SFP SERIES		<i>Humidity</i> :		<i>50 %</i>	
<i>Power Supply</i> : -		<i>Test Mode</i> :		-	
<i>Test Level</i> % U_T	<i>Voltage Dips & Short Interruptions</i> % U_T	<i>Duration (in period)</i>	<i>Phase Angle</i>	<i>Criterion</i>	<i>Result</i>
0	100	250P	0° ~360°	C	--
40	60	5P	0° ~360°	C	--
70	30	0.5P	0° ~360°	B	--

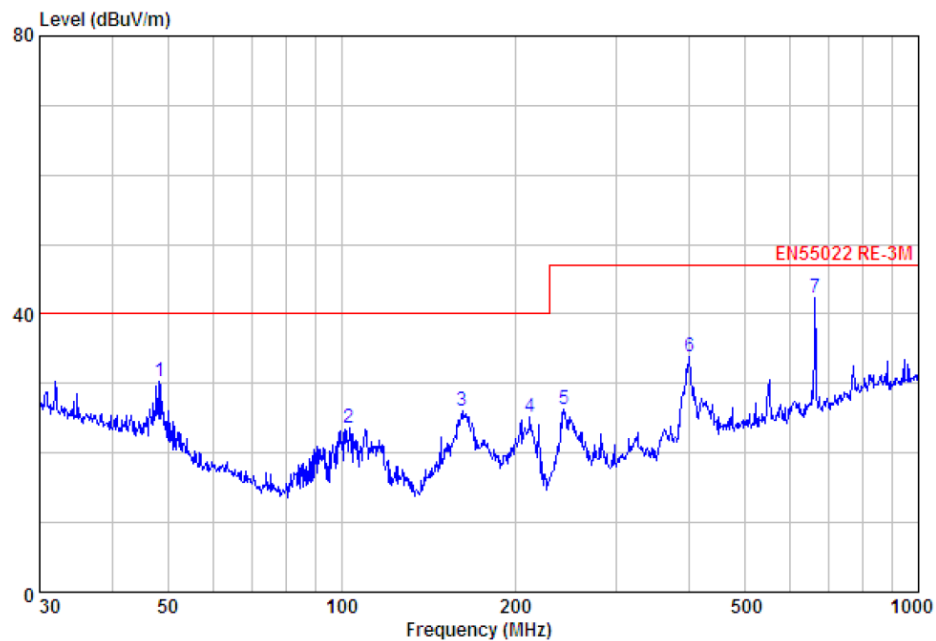


APPENDIX I



Condition : EN55022 RE-3M 3m HORIZONTAL
: RBW:120.000KHz VBW:300.000KHz SWT:Auto

	Freq	Limit	Level	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	166.068	40.0	22.8	-17.2	Peak	HORIZONTAL
2	213.015	40.0	25.1	-14.9	Peak	HORIZONTAL
3	244.232	47.0	32.2	-14.8	Peak	HORIZONTAL
4	330.195	47.0	27.8	-19.2	Peak	HORIZONTAL
5	396.242	47.0	30.2	-16.8	Peak	HORIZONTAL
6	446.414	47.0	35.5	-11.5	Peak	HORIZONTAL
7 max	661.151	47.0	43.6	-3.4	Peak	HORIZONTAL



Condition : EN55022 RE-3M 3m VERTICAL
: RBW:120.000KHz VBW:300.000KHz SWT:Auto

	Freq	Limit	Level	Over	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB		
1	48.332	40.0	30.2	-9.8	Peak	VERTICAL
2	103.080	40.0	23.6	-16.4	Peak	VERTICAL
3	162.041	40.0	26.2	-13.8	Peak	VERTICAL
4	212.270	40.0	25.1	-14.9	Peak	VERTICAL
5	243.377	47.0	26.3	-20.7	Peak	VERTICAL
6	400.432	47.0	33.9	-13.1	Peak	VERTICAL
7 max	661.151	47.0	42.3	-4.7	Peak	VERTICAL



APPENDIX II

Photo 1 General Appearance of the EUT



Photo 2 General Appearance of the EUT

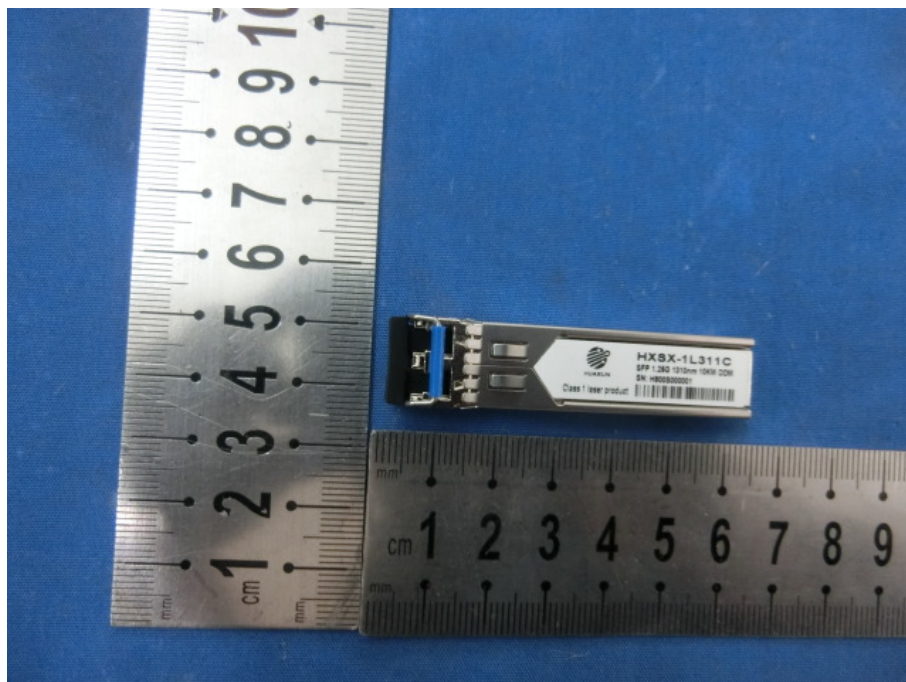


Photo 3 General Appearance of the EUT

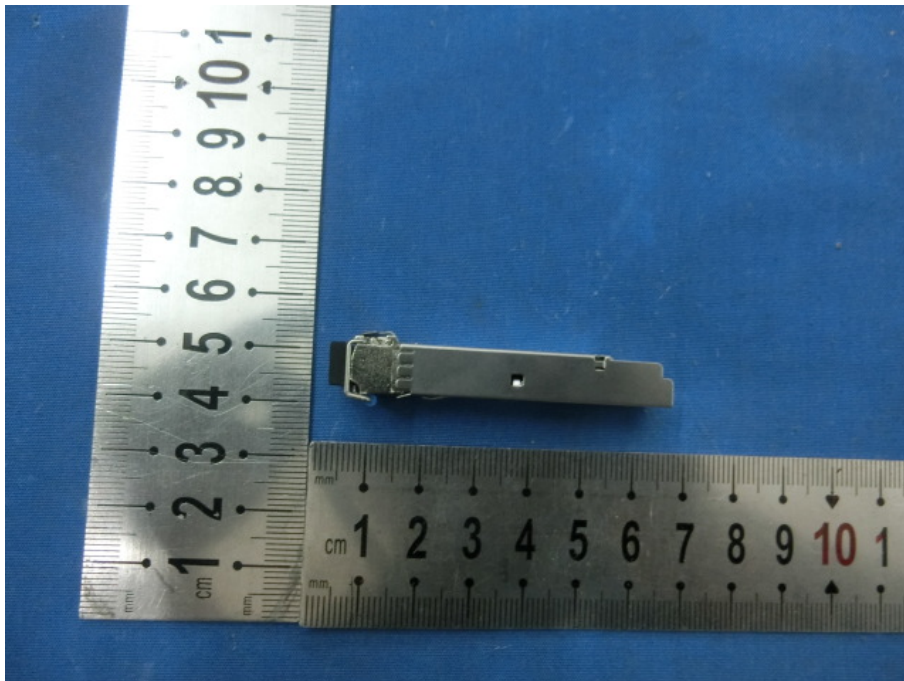
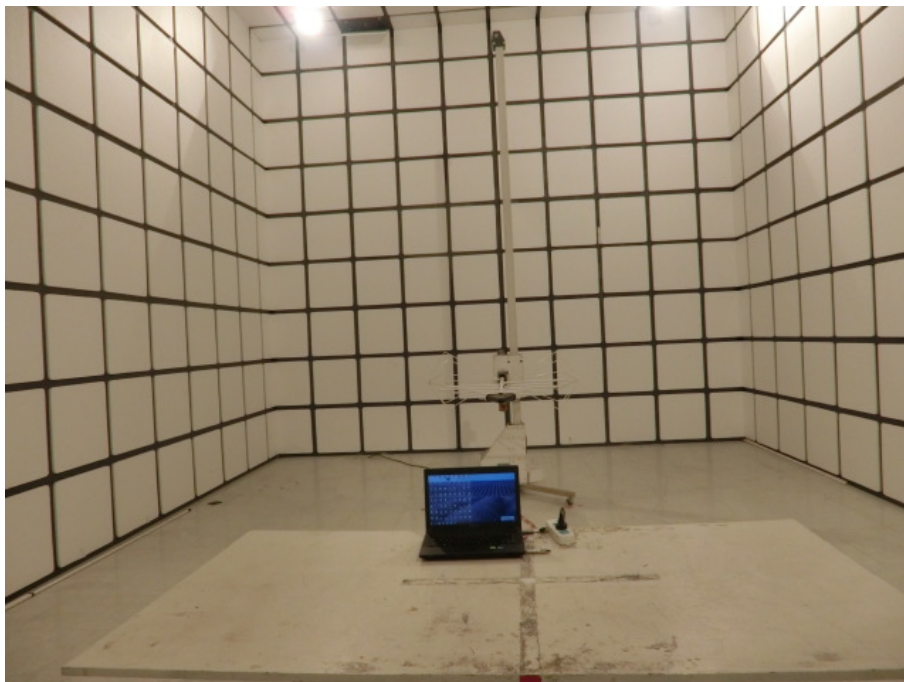


Photo 4 Test scene



155Mb/s SFP BIDI 20km Optical Transceiver Module

HXSX-DL3523xF

Features

- Up to 155Mb/s data links
- 1310nm FP laser transmitter and PIN photo-detector
- Up to 20km on 9/125μm SMF
- Hot-pluggable SFP footprint
- BIDI LC/UPC type pluggable optical interface
- Low power dissipation
- Metal enclosure, for lower EMI
- RoHS compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472
- Case operating temperature
 - Commercial: 0 ~ +70°C
 - Extended: -10 ~ +80°C
 - Industrial: -40 ~ +85°C

Applications

- Switch to Switch Interface
 - Fast Ethernet
 - Switched Backplane Applications
 - Router/Server Interface
 - Other Optical Links
-

Part Number	Data Rate (Mb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
HXSX-DL3523CF	155	1310Tx/1550nmRx	20km SMF	0~70 commercial
HXSX-DL3523EF	155	1310Tx/1550nmRx	20km SMF	-10~80 Extended
HXSX-DL3523IF	155	1310Tx/1550nmRx	20km SMF	-40~85 Industrial

1. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T _s	-40	85	°C	
Power Supply Voltage	V _{CC}	-0.3	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH _d	5		dBm	

2. Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	commercial
		-10		80		extended
		-40		85		industrial
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Data Rate			155		Mb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			20	km	9/125um

3. General Description

HXSX-DL3523xF Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the FP laser and the PIN photo-detector. The module data link up to 20km in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

4. Pin Assignment and Pin Description

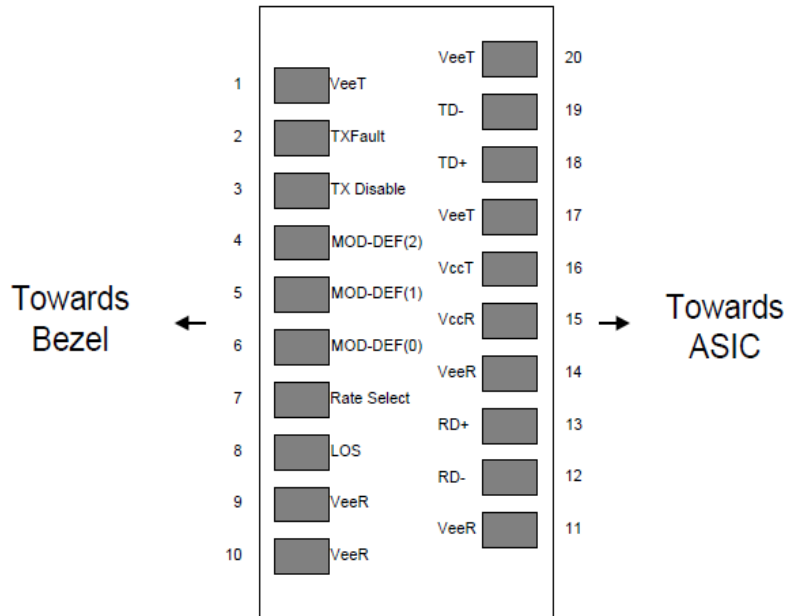


Figure1. Diagram of host board connector block pin numbers and names

PIN	Name	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	VEER	Receiver Ground (Common with Transmitter Ground)	1
10	VEER	Receiver Ground (Common with Transmitter Ground)	1
11	VEER	Receiver Ground (Common with Transmitter Ground)	1

12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VEER	Receiver Ground (Common with Transmitter Ground)	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V.MOD_DEF (0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates).If implemented, the input will be internally pulled down with > 30k Ω resistor. The input states are:
 - 1) Low (0 – 0.8V): Reduced Bandwidth
 - 2) (>0.8, < 2.0V): Undefined
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

5. Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Power Consumption	p			0.86	W	commercial

				0.95		Industrial
Supply Current	Icc			260	mA	commercial
				280		Industrial
Transmitter						
Single-ended Input Voltage Tolerance	VCC	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	200		2400	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee-0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	Vout,pp	500		900	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	
Data output rise/fall time	Tr/Tf		100		ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

6. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ _C	1260	1310	1360	nm	

Spectrum Bandwidth(RMS)	σ			3.5	nm	
Average Optical Power	P _{AVG}	-15		-7	dBm	1
Optical Extinction Ratio	ER	8.2			dB	
Transmitter OFF Output Power	POff			-45	dBm	
Transmitter Eye Mask		Compliant with G.957(class 1 laser safety)				
Receiver						
Center Wavelength	λ_c	1500	1550	1600	nm	
Receiver Sensitivity (Average Power)	Sen.			-28	dBm	2
Input Saturation Power (overload)	Psat	-8			dBm	
LOS Assert	LOSA	-44			dB	3
LOS De-assert	LOSD			-29	dBm	3
LOS Hysteresis	LOSH	0.5	2	6	dBm	

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Notes:

1. Measure at 2²³-1 NRZ PRBS pattern
2. Measured with Light source 1310nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ
3. When LOS de-asserted, the RX data+/- output is High-level (fixed).

7. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
-----------	--------	------	-----	------	-------

Temperature monitor absolute error	DMI_ Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI _VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_ bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

8. Mechanical Dimensions

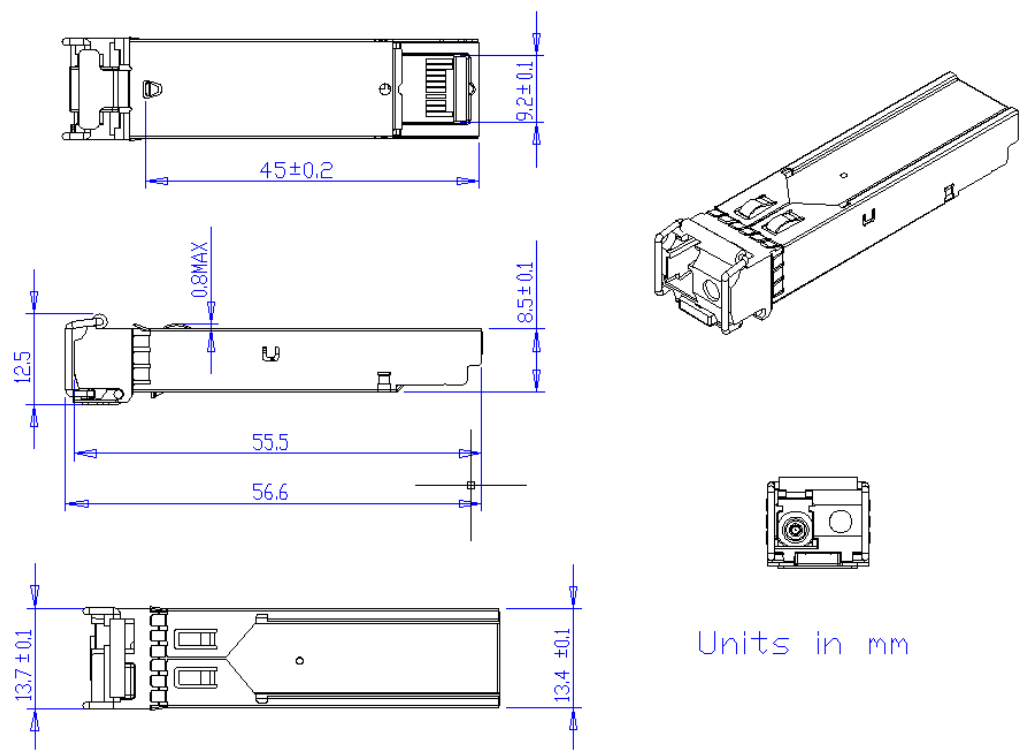


Figure2. Mechanical Outline

155Mb/s SFP BIDI 20km Optical Transceiver Module

HXSX-DL5323xF

Features

- Up to 155Mb/s data links
- 1550nm FP laser transmitter and PIN photo-detector
- Up to 20km on 9/125μm SMF
- Hot-pluggable SFP footprint
- BIDI LC/UPC type pluggable optical interface
- Low power dissipation
- Metal enclosure, for lower EMI
- RoHS compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Single +3.3V power supply
- Compliant with SFF-8472
- Case operating temperature
 - Commercial: 0 ~ +70°C
 - Extended: -10 ~ +80°C
 - Industrial: -40 ~ +85°C

Applications

- Switch to Switch Interface
 - Fast Ethernet
 - Switched Backplane Applications
 - Router/Server Interface
 - Other Optical Links
-

Part Number	Data Rate (Mb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
HXSX-DL5323CF	155	1550Tx/1310nmRx	20km SMF	0~70 commercial
HXSX-DL5323EF	155	1550Tx/1310nmRx	20km SMF	-10~80 Extended
HXSX-DL5323IF	155	1550Tx/1310nmRx	20km SMF	-40~85 Industrial

1. Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
Storage Temperature	T _s	-40	85	°C	
Power Supply Voltage	V _{CC}	-0.3	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH _d	5		dBm	

2. Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	commercial
		-10		80		extended
		-40		85		industrial
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Data Rate			155		Mb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			20	km	9/125um

3. General Description

HXSX-DL5323xF Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the FP laser and the PIN photo-detector. The module data link up to 20km in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

4. Pin Assignment and Pin Description

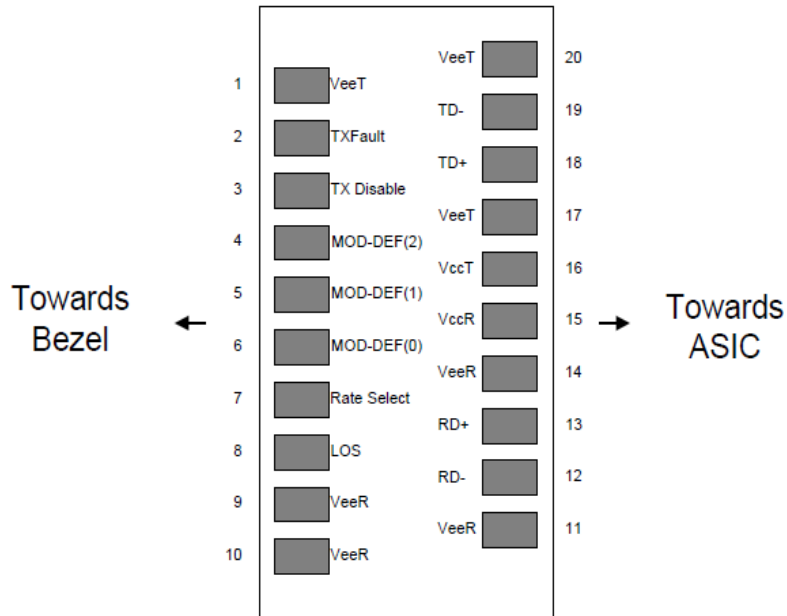


Figure1. Diagram of host board connector block pin numbers and names

PIN	Name	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	VEER	Receiver Ground (Common with Transmitter Ground)	1
10	VEER	Receiver Ground (Common with Transmitter Ground)	1
11	VEER	Receiver Ground (Common with Transmitter Ground)	1

12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VEER	Receiver Ground (Common with Transmitter Ground)	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF (0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:
 - 1) Low (0 – 0.8V): Reduced Bandwidth
 - 2) (>0.8, < 2.0V): Undefined
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

5. Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Power Consumption	p			0.86	W	commercial

				0.95		Industrial
Supply Current	Icc			260	mA	commercial
				280		Industrial
Transmitter						
Single-ended Input Voltage Tolerance	VCC	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	200		2400	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee-0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	Vout,pp	500		900	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	
Data output rise/fall time	Tr/Tf		100		ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

6. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_c	1500	1550	1600	nm	

Spectrum Bandwidth(RMS)	σ			3.5	nm	
Average Optical Power	P _{AVG}	-15		-7	dBm	1
Optical Extinction Ratio	ER	8.2			dB	
Transmitter OFF Output Power	POff			-45	dBm	
Transmitter Eye Mask		Compliant with G.957(class 1 laser safety)				
Receiver						
Center Wavelength	λ_c	1260	1310	1360	nm	
Receiver Sensitivity (Average Power)	Sen.			-28	dBm	2
Input Saturation Power (overload)	Psat	-8			dBm	
LOS Assert	LOSA	-44			dB	3
LOS De-assert	LOSD			-29	dBm	3
LOS Hysteresis	LOSH	0.5	2	6	dBm	

The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Notes:

1. Measure at 2²³-1 NRZ PRBS pattern
2. Measured with Light source 1550nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ
3. When LOS de-asserted, the RX data+/- output is High-level (fixed).

7. Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
-----------	--------	------	-----	------	-------

Temperature monitor absolute error	DMI_ Temp	-3	3	degC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

8. Mechanical Dimensions

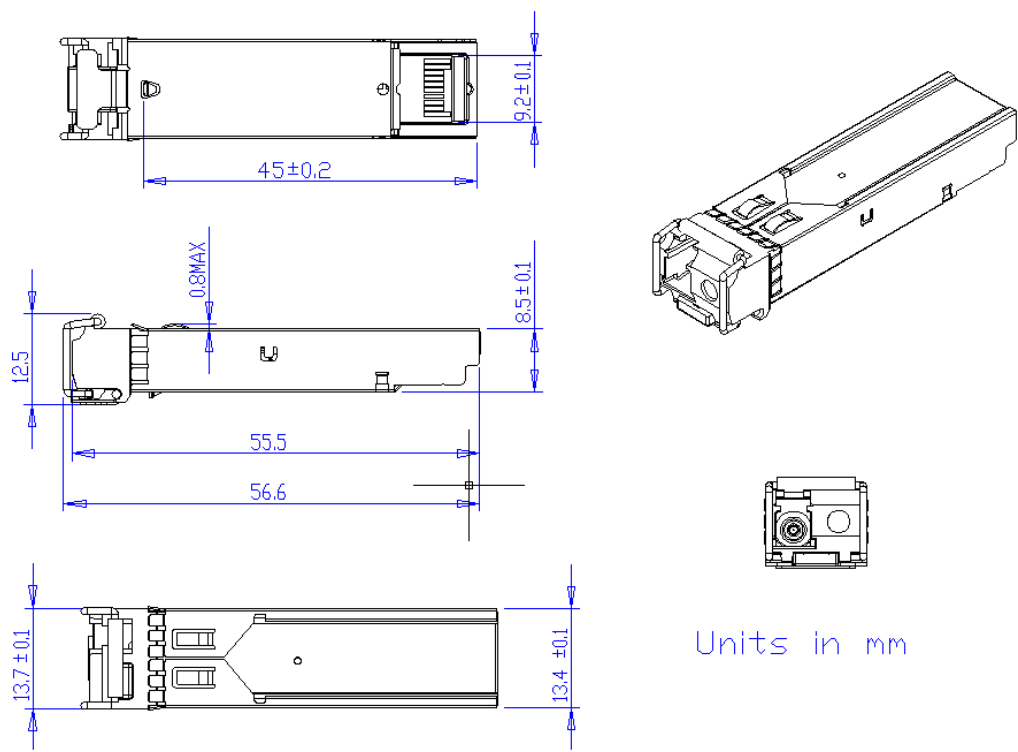


Figure2. Mechanical Outline