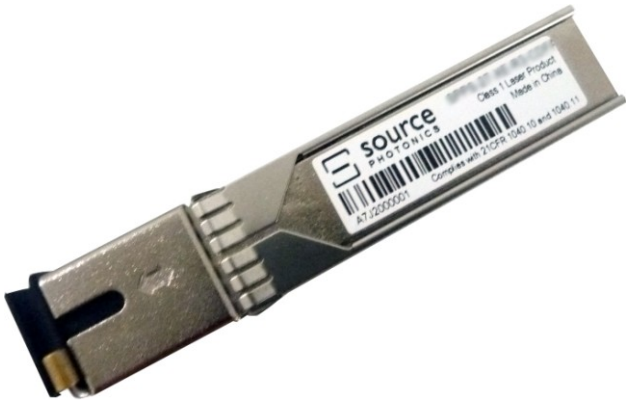


Features

- Single fiber bi-directional data links with asymmetric 2.48832 Gbps upstream and 9.95328 Gbps downstream
- Sleep Mode for Power Consumption
- 1270nm burst mode transmitter with DFB Laser
- 1577nm continuous mode receiver with APD
- Compliant with ITU-TG.987.2 XG-GPON N2 class
- SFP+ MSA SFF-8431 Compliant
- Digital diagnostic SFF-8472 Rev9.5 Compliant
- Telcordia GR-468 compliant
- Single 3.3V power supply
- Operation case temperature:-5-70°C
- SFP+ (Small Form-factor Pluggable Plus) package with SC receptacle optical interface.
- RoHS Compliant

Regulatory Compliance

Table 1 - Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B)	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product.
Component Recognition	UL and CSA	Compliant with standards
RoHS	2002/95/EC 4.1&4.2 2005/747/EC	Compliant with standards note

Note:

In light of item 5 in Annex of 2002/95/EC, “Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes.” and item 13 in Annex of 2005/747/EC, “Lead and cadmium in optical and filter glass.”, the two exemptions are being concerned for Source Photonics transceivers, because Source Photonics transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings

Table 2 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Ambient Temperature	T_S	-40	-	85	°C	
Operating Case Temperature	T_C	-5		70	°C	1
Operating Relative Humidity	RH	5		95	%	
Power Supply Voltage	V_{CC}	0		4	V	

Note 1: When ambient temperature is above 60°C, airflow at rate higher than 1m/sec is required.

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Operating Case Temperature	T_C	-5		70	°C	1
Operating Relative Humidity	RH	5		95	%	
Data Rate	DR		2.48832		Gbit/s	2
Data Rate Drift		-100		+100	PPM	

Note 1: When ambient temperature is above 60°C, airflow at rate higher than 1m/sec is required.

2: PRBS2^{23}-1.

Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Centre Wavelength	λ_C	1260		1280	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	P_{OUT}	2		7	dBm	1
Average Launch Power-OFF	P_{OFF}			-43.5	dBm	
Extinction Ratio	EX	8.2			dB	2
Total Jitter	TJ			0.2	UI	2
Rise/Fall Time (20%-80%)	T_R/T_F			140	ps	2,3
Burst Turn On Time	T_{BURST_ON}			32	ns	4
Burst Turn Off Time	T_{BURST_OFF}			32	ns	4
Optical Return Loss Tolerance		-15			dB	

Transmitter Reflectance				-6	dB	
Optical Eye Mask	Compliant With ITU-T G.987.2					
Receiver						
Operating Wavelength	λ_C	1575	1577	1580	nm	
Sensitivity	P_{SEN1}			-24	dBm	5
	P_{SEN2}			-28		
Saturation	P_{SAT}	-8			dBm	
Receiver Total Jitter	TJ	-	-	0.7	UI	
Receiver Deterministic Jitter	DJ	-	-	0.42	UI	
Loss of Signal Deassert Level	P_{LOSD}			-29	dBm	
Loss of Signal Assert Level	P_{LOSA}	-40	-		dBm	
LOS Hysteresis	P_{LOSD}- P_{LOSA}	0.5		6	dB	
Receiver Reflectance(6)				-20	dB	
WDM Filter Isolation	ISO(1550)	38			dB	1550nm
	ISO(1650)	35			dB	1650nm

Notes:

1. The optical power is launched into 9/125um SMF.
2. Measured with PRBS 2^{23}-1 test pattern @2.48832Gbps.
3. Measured with the Bessel-Thompson filter OFF.
4. Refer to **Timing Parameter Definition in Burst Mode Sequence**
5. P_{SEN1} measured with a PRBS2^{23}-1 test pattern@9.95328Gbps,BER$\leqq 10^{-10}$ for reference
   P_{SEN2} measured with a PRBS2^{23}-1 test pattern @9.95328Gbps, BER$\leqq 10^{-3}$
6. From external 1260-1280nm to 1575-1580nm
7. From internal 1260-1280nm to 1575-1580nm

Electrical Characteristics

Table 5 – Electrical Characteristics

Transmitter						
Parameter	**Symbol**	**Min.**	**Typical**	**Max.**	**Unit**	**Notes**
Power Supply Current	I_{CC_TX}			250	mA	
Data Input Differential Swing	V_{IN}	200		1600	mVp-p	1
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Transmitter Disable Voltage - Low	$V_{TDIS,\ L}$	0		0.8	V	2
Transmitter Disable Voltage - High	$V_{TDIS,\ H}$	2.0		Vcc	V	
Transmitter Fault Assert Time	T-FAULT-ON	0		0.4	V	
Transmitter Fault Reset	TX_Fault Reset	2.4		Vcc	V	
Power Down Voltage _Low	V_{PDL}	0		0.8		

Power Down Voltage _High	$V_{\_PDH}$	2.0		V_{CC}		
TX Power Down Assert Time	T_PD assert			512	ns	
Recovery Time following TX Power Down	T_PD recover			512	ns	
Receiver						
Power Supply Current	I_{CC_RX}			200	mA	
Data Output Differential Swing	V_{OUT}	600		900	mV_{P-P}	3
Loss of Signal (LOS) Voltage - Low	$V_{LOS,\ L}$	0		0.8	V	
Loss of Signal (LOS) Voltage - High	$V_{LOS,\ H}$	2.4		V_{CC}	V	
Loss of Signal (LOS) Assert Time	T_{ASS}			100	μs	
Loss of Signal (LOS) Deassert Time	T_{DAS}			100	μs	
Output Differential Impedance	Rout	80	100	120		
Time to Initialize 2-Wire Interface				300	ms	
Time to Initialize				300	ms	

Notes:

1. Compatible with LVPECL/CML input, AC coupled internally. (See Recommended Interface Circuit)
2. TX _nBRST (See Pin Function Definitions).
3. CML output, AC coupled internally, guaranteed in the full arrange of input optical power (-9dBm to -24dBm)

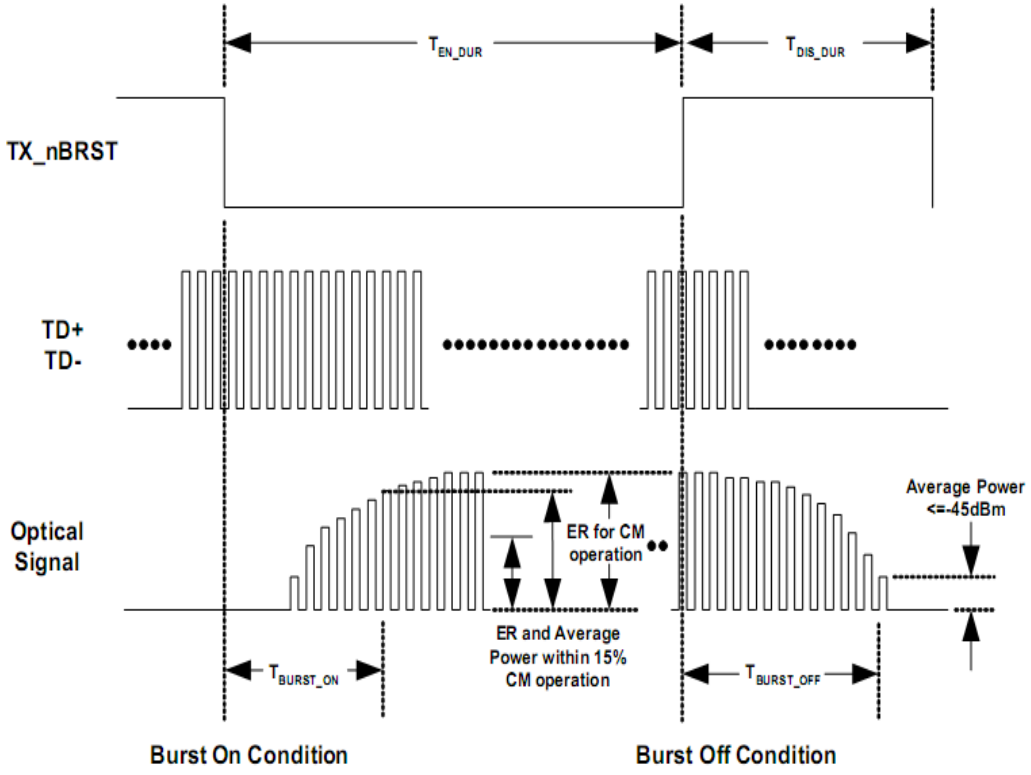


Figure 1, Timing Parameter Definition in Burst Mode Sequence

Diagnostics

Table 6 – Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-5 to 70	±3	ºC	Internal
Voltage	0 to Vcc	±3%	V	Internal
Bias Current	0 to 90(notes)	±10%	mA	Internal
Tx Power	2 to 7	±3	dB	Internal
Rx Power	-30 to -8	±2	dB	Internal

Notes: only for continuous mode

Table 7 – EEPROM Serial ID (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP+ transceiver
1	1	Ext. Identifier	04	MOD4
2	1	Connector	01	SC
3-10	8	Transceiver	00 10 00 00 00 00 00 00	OC48
11	1	Encoding	03	NRZ
12	1	BR, Nominal	19	2.48832Gbps
13	1	Reserved	00	
14	1	Length (9um)-km	14	20(km)
15	1	Length (9um)	C8	200(100m)
16	1	Length (50um)	00	Not Support MMF
17	1	Length (62.5um)	00	Not Support MMF
18	1	Length (Copper)	00	Not Support Copper
19	1	Reserved	00	
20-35	16	Vendor name	53 4F 55 52 43 45 50 48 4F 54 4F 4E 49 43 53 20	“SOURCEPHOTONICS ”(ASCⅡ)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 1F 22	SP vendor OUI
40-55	16	Vendor PN	53 50 50 53 32 37 34 38 46 4E 32 43 44 46 41 20	“SPPS2748FN2CDFA (ASCII)
56-59	4	Vendor Rev	X X 20 20	ASCII(“31 30 20 20” means 1.0 Revision)
60-61	2	Wavelength	04 F6	1270nm Laser Wavelength
62	1	Reserved	00	
63	1	CC_BASE	xx	Check sum of byte 0-62
64-65	2	Options	00 0A	LOS,TX_FAULT
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASCII
84-91	8	Date code	xx xx xx xx xx xx 20 20	Year(2bytes),Month(2bytes),

				Day(2 bytes)
92	1	Diagnostic Monitoring Type	68	Compliant with SFF-8472 V9.5 Externally Calibrated Received power measurement type -Average Power
93	1	Enhanced Options	F0	Diagnostics (Optional Alarm/warning flags) Soft TX_FAULT monitoring implemented Soft TX_Disable monitoring implemented Soft RX_LOS monitoring implemented
94	1	SFF-8472 Compliance	02	Diagnostics Compliance(SFF-8472 V9.5)
95	1	CC_EXT		Check sum of byte 64-94
96-255	64	Vendor Specific		

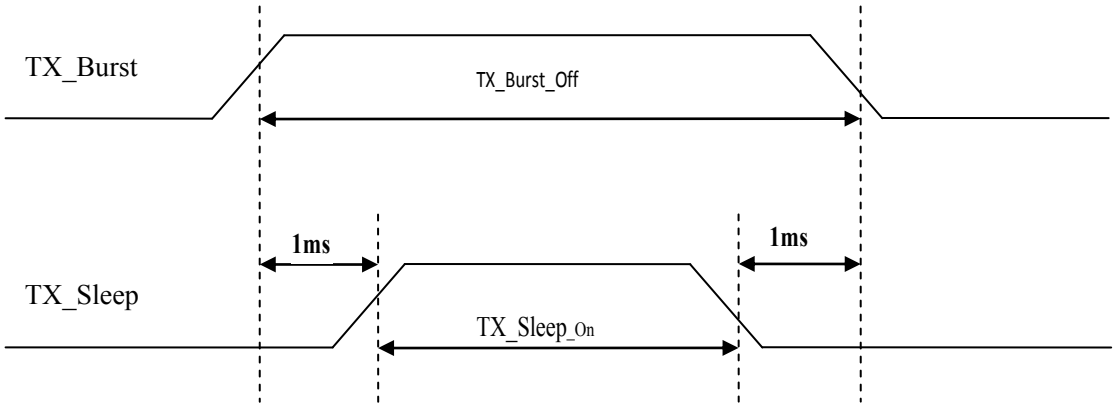
Table 8– Pin Definitions

Pin	Symbol	Name/Description
1	VeeT	Module Transmitter Ground (note1)
2	TX_FAULT	Module Transmitter Fault
3	TX_nBRST	Transmitter Burst Control (note2)
4	SDL	2-Wire Serial Interface Data Line (MOD-DEF2) (note3)
5	SCL	2-Wire Serial Interface Clock (MOD-DEF1)
6	MOD_ABS	Module Absent, connected to VeeT or VeeR in the module
7	Tx_SD	Tx Signal Detect (note4)
8	RX_LOS	Receiver Loss of Signal Indication (in FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated as NOT Signal Detect)
9	PDWN_TX	Power saving of Tx side, On/off time less than 1ms, high active, if not use this feature, main board connection should be NC.(Note5)
10	VeeR	Module Receiver Ground
11	VeeR	Module Receiver Ground
12	RXD-	Receiver Inverted Data Output
13	RXD+	Receiver Non-Inverted Data Output
14	VeeR	Module Receiver Ground
15	VCCR	Module Receiver 3.3V Supply
16	VCCT	Module Transmitter 3.3V Supply
17	VeeT	Module Transmitter Ground
18	TXD+	Transmitter Non-Inverted Data Input
19	TXD-	Transmitter Inverted Data Input

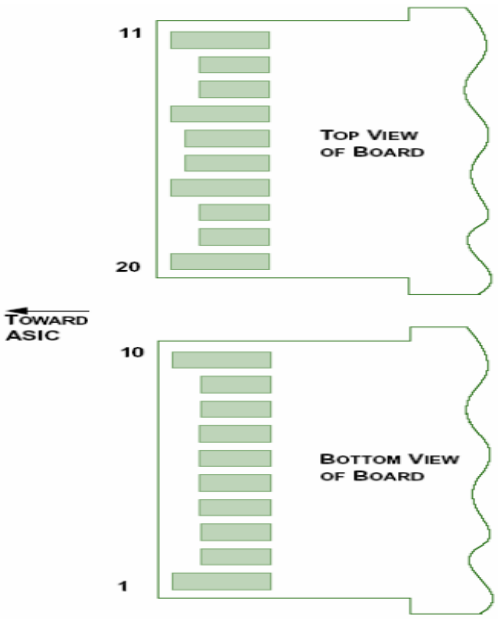
20	VeeT	Module Transmitter Ground

Note

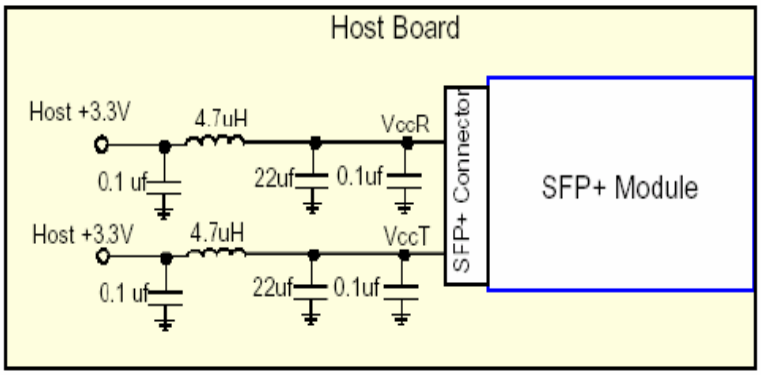
1. The module ground pins, VeeR and VeeT, shall be isolated from the module case.
2. Tx_nburst is an input that is used to shut down the transmitter optical output.
3. MOD-DEF0,1,2. These are the module definition pins. They should be pulled up with a 4.7K-10KΩ resistor on the host board. The pull-up voltage shall be $V_{cc}T$ or $V_{cc}R$.
4. Tx Signal Detect, Tx Active State: High.
5. Tx Power saving function timing: Tx_Sleep



SFP+ Module PCB Pinout



Recommended Host Board Power Supply Circuit



Recommended Interface Circuit

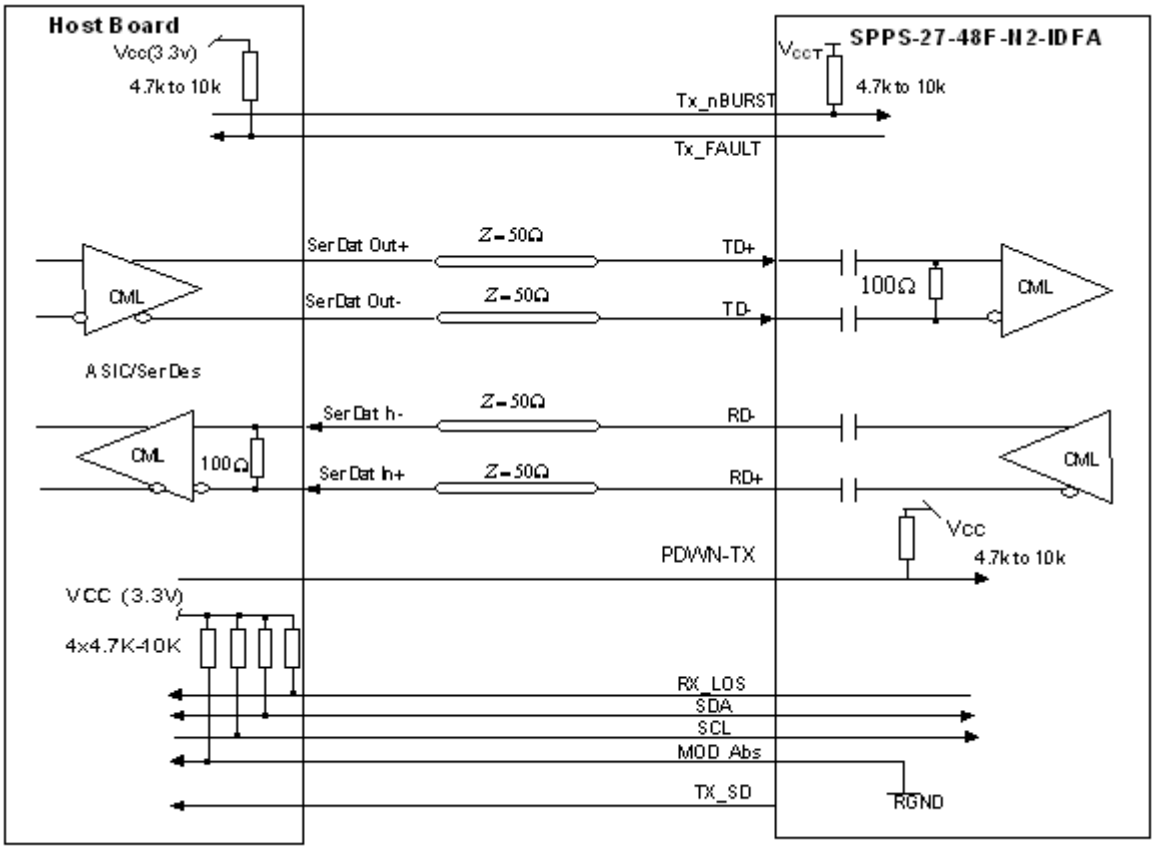


Figure 2, Recommended Interface Circuit

Mechanical Diagram

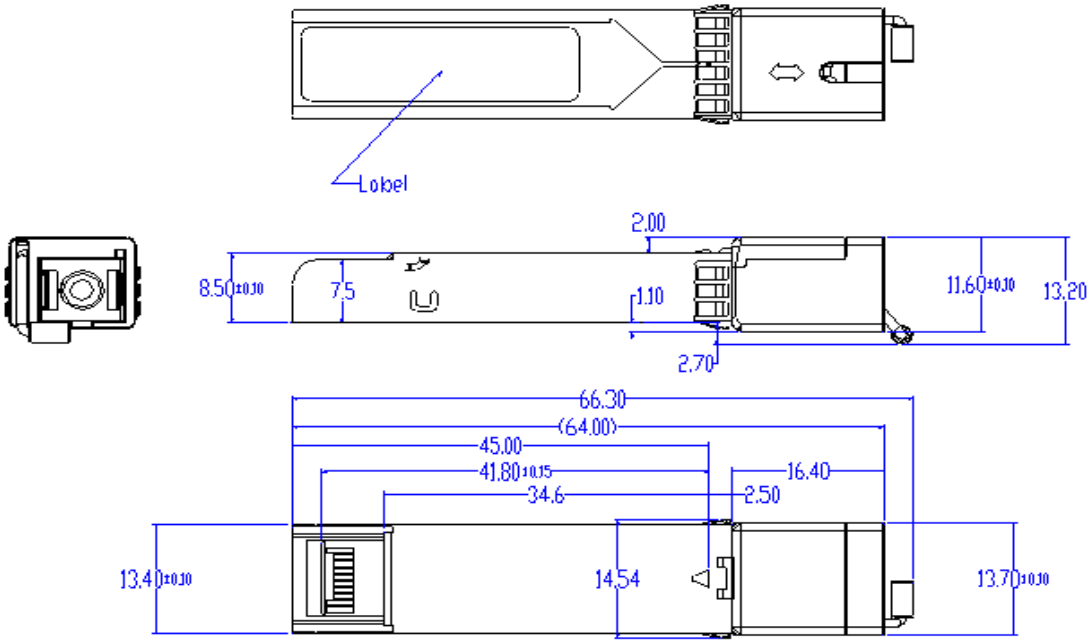


Figure 3, Mechanical Diagram

Order Information

Table9 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
SPPS-27-48F-N2-CDFA	XGPON N1/N2 Class ONT	Tx 2.48832Gb/s and Rx 9.95328Gb/s asymmetric	1270nm DFB	SMF

Warnings

Handling Precautions: This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety: Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

Legal Notice

IMPORTANT NOTICE!

All information contained in this document is subject to change without notice, at Source Photonics' sole and absolute discretion. Source Photonics warrants performance of its products to current specifications only in accordance with the company's standard one-year warranty; however, specifications designated as "preliminary" are given to describe components only, and Source Photonics expressly disclaims any and all warranties for said products, including express, implied, and statutory warranties, warranties of merchantability, fitness for a particular purpose, and non-infringement of proprietary rights. Please refer to the company's Terms and Conditions of Sale for further warranty information.

Source Photonics assumes no liability for applications assistance, customer product design, software performance, or infringement of patents, services, or intellectual property described herein. No license, either express or implied, is granted under any patent right, copyright, or intellectual property right, and Source Photonics makes no representations or warranties that the product(s) described herein are free from patent, copyright, or intellectual property rights. Products described in this document are NOT intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. Source Photonics customers using or selling products for use in such applications do so at their own risk and agree to fully defend and indemnify Source Photonics for any damages resulting from such use or sale.

THE INFORMATION CONTAINED IN THIS DOCUMENT IS PROVIDED ON AN "AS IS" BASIS. Customer agrees that Source Photonics is not liable for any actual, consequential, exemplary, or other damages arising directly or indirectly from any use of the information contained in this document. Customer must contact Source Photonics to obtain the latest version of this publication to verify, before placing any order, that the information contained herein is current.

Contact

U.S.A. Headquarters	China	Taiwan
20550 Nordhoff Street	Building #2&5, West Export Processing Zone	9F, No 81, Shui Lee Rd.
Chatsworth, CA 91311	No. 8 Kexin Road, Hi-Tech Zone	Hsinchu, 300, Taiwan
USA	Chengdu, 611731, China	R.O.C.
Tel: +1-818-773-9044	Tel: +86-28-8795-8788	Tel: +886-3-5169222
Fax: +1-818-773-0261	Fax: +86-28-8795-8789	Fax: +886-3-5169213
sales@sourcephotonics.com	sales@sourcephotonics.com.cn	sales@sourcephotonics.com.tw