



Features

- Available in all 100 GHz C-Band Wavelengths on the DWDM ITU Grid
- DWDM SFP MSA Compliant
- Cold Start Up Wavelength Compliance
- Low Power Dissipation < 1.3W Maximum
- -5°C to 70°C Operating Case Temperature
- Multirate Functionality From 100Mbps to 2.7Gbps
- SONET OC-48/SDH STM-16 Compliant
- Pluggable Into Existing Standard SFP Cages
- Diagnostic Performance Monitoring of Transmit Power, Receiver Power, Laser Bias, Module Temperature, Laser Temperature, APD Bias Voltage, TEC Current
- APD Based Receiver Sensitivity of -28dBm at OC-48
- Long Reach 80km, 120km and 200km Versions Available

Table 1 – General Operating

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V _{cc}	3.135	3.3	3.465	V	
Total Current (BOL)	I _{cc}	-	-	375	mA	
Power Supply Noise Rejection	PSR	100	-	-	mVp-p	1
Operating Temperature (Case)	T _{op}	-5	-	70	°C	
Storage Temperature	T _{st}	-40	-	85	°C	
Data Rate	DR	100	-	2700	Mbps	

Note 1: 20Hz to 155MHz

Table 2 – Transmitter Specifications (Optical)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Optical Power	P _{op}	0	2	4	dBm	
Average Launch Power Tx_Off	P _{off}	-	-	-45	dBm	
Extinction Ratio	ER	8.2	-	-	dB	
Eye Mask		IEEE 802.3, SONET/SDH Compliant				
Optical Jitter Generation	J _{gen(pk-pk)}	-	-	0.07	UI	
Optical Rise/Fall Time	t _r /t _f	-	-	160	ps	2
Channel Spacing	Δf	-	100	-	GHz	
Deviation From Central Frequency, EOL		-	-	±12	GHz	
Spectral Width (20dB)	Δλ	-	-	0.3	nm	
Side Mode Suppression Ratio	SMSR	30	-	-	dB	
Dispersion Penalty at Specified Distance	dp	-	-	2	dB	3
Relative Intensity Noise	RIN	-	-	-135	dB/Hz	
Reflection Tolerance	rp	-24	-	-	dB	4

Note 2: 20%~80% values

Note 3: Measured at BER of 10^{-12} , PRBS of $2^{23}-1$, at eye center, OC-48.

For SFPD-MR-08/E08-xx-A, measured at 80km (1600ps/nm); for SFPD-MR-12/E12-xx-A, measured at 120km (2400ps/nm); for SFPD-MR-20/E20-xx-A, measured at 200km (4000ps/nm).

Note 4: 2dB degradation of receiver sensitivity

Table 3 – Transmitter Specifications (Electrical)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Input Differential Impedance	R_{in}	80	100	120	Ω	
PECL Single Ended Data Input Swing	$V_{in, p-p}$	250	-	1200	mV	
TxFault_Fault	V_{fault}	2	-	Vcc	V	
TxFault_Normal	V_{normal}	Vee	-	Vee + 0.5	V	
TxDisable_Disable	V_d	2	-	Vcc	V	
TxDisable_Enable	V_{en}	Vee	-	Vee + 0.8	V	

Table 4 – Receiver Specifications (Optical)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Receiver Power Low	$R_{sens, low}$	-	-30	-28	dBm	5
Receiver Power at Specified Distance and 20dB OSNR	$R_{sens, OSNR}$	-	-	-24	dBm	5
Receiver Power High	$R_{sens, high}$	-6	-	-	dBm	
Damage Threshold For Receiver	$P_{in, damage}$	4	-	-	dBm	
Wavelength	λ	1528	-	1564	nm	
Maximum Reflectance Of Receiver	RX_r			-27	dB	
LOS Assert	-	-40	-	-	dBm	
LOS De-Assert	-	-	-	-28	dBm	
LOS Hysteresis	-	0.5	-	-	dB	

Note 5: At 10^{-12} BER, PRBS $2^{23}-1$, OC-48

Table 5 – Receiver Specifications (Electrical)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
PECL Single Ended Data Output Swing	$V_{out, p-p}$	185	-	800	mV	
Data Output Rise Time	t_r	-	-	175	ps	
Data Output Fall Time	t_f	-	-	175	ps	

Table 6 – Timing and Electrical

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Tx Disable Negate Time	t _{on}	-	-	20	ms	
Tx Disable Assert Time	t _{off}	-	-	20	ms	
Time to Initialize After Reset of Tx Fault/INT in Normal Operation	t _{init}	-	-	300	ms	
Start-up Time	t _{startup}	-	-	90	secs	
Tx Fault/INT Assert Time	t _{fault}	-	-	50	ms	
Tx Disable to Reset	t _{reset}	10	-	-	μs	
LOS Assert Time	t _{loss_on}	-	-	100	μs	
LOS De-Assert Time	t _{loss_off}	-	-	100	μs	
Serial ID Clock Rate	f _{serial_clock}	-	-	100	kHz	
RX_LOS Voltage (High)	Rx_LOS _H	2	-	-	V	
RX_LOS Voltage (Low)	Rx_LOS _L	-	-	0.8	V	
LOS Output Voltage-Fault	V _{LOS fault}	2	-	V _{cc}	V	
LOS Output Voltage-Normal	V _{LOS normal}	V _{ee}	-	V _{ee} + 0.55	V	
MOD_DEF (0:2)-High	V _H	2	-	V _{cc}	V	
MOD_DEF (0:2)-Low	V _L	V _{ee}	-	V _{ee} + 0.5	V	

Table 7 – Diagnostics

Parameter	Range	Accuracy	Unit	Notes
Temperature	-5 to 70	±3	°C	
Voltage	0 to V _{cc}	0.1	V	
Bias Current	0 to 120	5	mA	
Tx Power	0 to 4	±2	dBm	
Rx Power	-28 to -6	±2	dBm	
TEC Current	-1200 to 1200	±60	mA	
TEC Temperature	20 to 70	±0.25	°C	6

Note 6: Relative accuracy. Absolute accuracy is ±3°C

Table 8 – λ Wavelength Ordering

SFPD-MR-08/12/20-xx-A

See table below for “xx” values

ITU Channel/Product Code	Frequency (THz)	Wavelength (nm)	ITU Channel/Product Code	Frequency (THz)	Wavelength (nm)
15	191.5	1565.495	39	193.9	1546.119
16	191.6	1564.678	40	194.0	1545.322
17	191.7	1563.863	41	194.1	1544.526
18	191.8	1563.047	42	194.2	1543.730
19	191.9	1562.233	43	194.3	1542.936
20	192.0	1561.419	44	194.4	1542.142
21	192.1	1560.606	45	194.5	1541.349
22	192.2	1559.794	46	194.6	1540.557
23	192.3	1558.983	47	194.7	1539.766
24	192.4	1558.173	48	194.8	1538.976
25	192.5	1557.363	49	194.9	1538.186
26	192.6	1556.555	50	195.0	1537.397
27	192.7	1555.747	51	195.1	1536.609
28	192.8	1554.940	52	195.2	1535.822
29	192.9	1554.134	53	195.3	1535.036
30	193.0	1553.329	54	195.4	1534.250
31	193.1	1552.524	55	195.5	1533.465
32	193.2	1551.721	56	195.6	1532.681
33	193.3	1550.918	57	195.7	1531.898
34	193.4	1550.116	58	195.8	1531.116
35	193.5	1549.315	59	195.9	1530.334
36	193.6	1548.515	60	196.0	1529.553
37	193.7	1547.715	61	196.1	1528.773
38	193.8	1546.917			

Table 9 – EEPROM Serial ID (A0h)

Name of Field	Description of Field	Address	Hex	ASCII
Identifier	Type of serial transceiver	0	0B	
Ext. Identifier	Extended identifier of type of serial transceiver	1	24	
Connector	Code for connector type	2	07	
Transceiver	Code for electronic compatibility or optical compatibility	3	04	
		4	0C	
		5	44	
		6	02	
		7	82	
		8	10	
		9	01	
		10	15	
Encoding	Code for serial encoding algorithm	11	05	
BR.Nominal	Nominal bit rate, units of 100 Mbits/sec.	12	19	
Length (9μm,km)	Link length supported for 9/125μm, units of km	13	00	
		14	50/78/C8	
Max Temp	Maximum operating case temperature (see text for encoding)	15	46	
Min Temp	Minimum operating case temperature in °C (see text for encoding)	16	FB	
Max Supply Current	Maximum supply current in units of 4mA	17	6C	
Reserved	Reserved	18	00	
Channel spacing and Tuning	Channel spacing compatibility and number of ITU channels supported	19	41	
Vendor Name	SFP vendor name (ASCII)	20	53	S
		21	4F	O
		22	55	U
		23	52	R
		24	43	C
		25	45	E
		26	50	P
		27	48	H
		28	4F	O
		29	54	T
		30	4F	O
		31	4E	N
		32	49	I
		33	43	C
		34	53	S
		35	20	[SPACE]

Table 9 – EEPROM Serial ID (A0h)

Name of Field	Description of Field	Address	Hex	ASCII
Optional features	Implemented Optional DWDM Features	36	00	
Vendor OUI	SFP vendor IEEE company ID for Source Photonics Inc.	37	00	
		38	1F	
		39	22	
Vendor P/N	Part number in ASCII, e.g. SFPDMRxxxxA	40	53	S
		41	46	F
		42	50	P
		43	44	D
		44	4D	M
		45	52	R
		46	xx	x
		47	xx	x
		48	xx	x
		49	xx	x
		50	41	A
		51	20	[SPACE]
		52	20	[SPACE]
		53	20	[SPACE]
		54	20	[SPACE]
		55	20	[SPACE]
Vendor Rev.	Revision level for part number provide by vendor (ASCII)	56	xx	x
		57	20	[Space]
		58	20	[Space]
		59	20	[Space]
Wavelength	Laser wavelength (in nm)	60	xx	
		61	xx	
Wavelength	Laser wavelength (fractional part in units of 10pm)	62	xx	
CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	63	xx	
Options	Indicates which optional transceiver signals are implemented	64	00	
		65	1A	

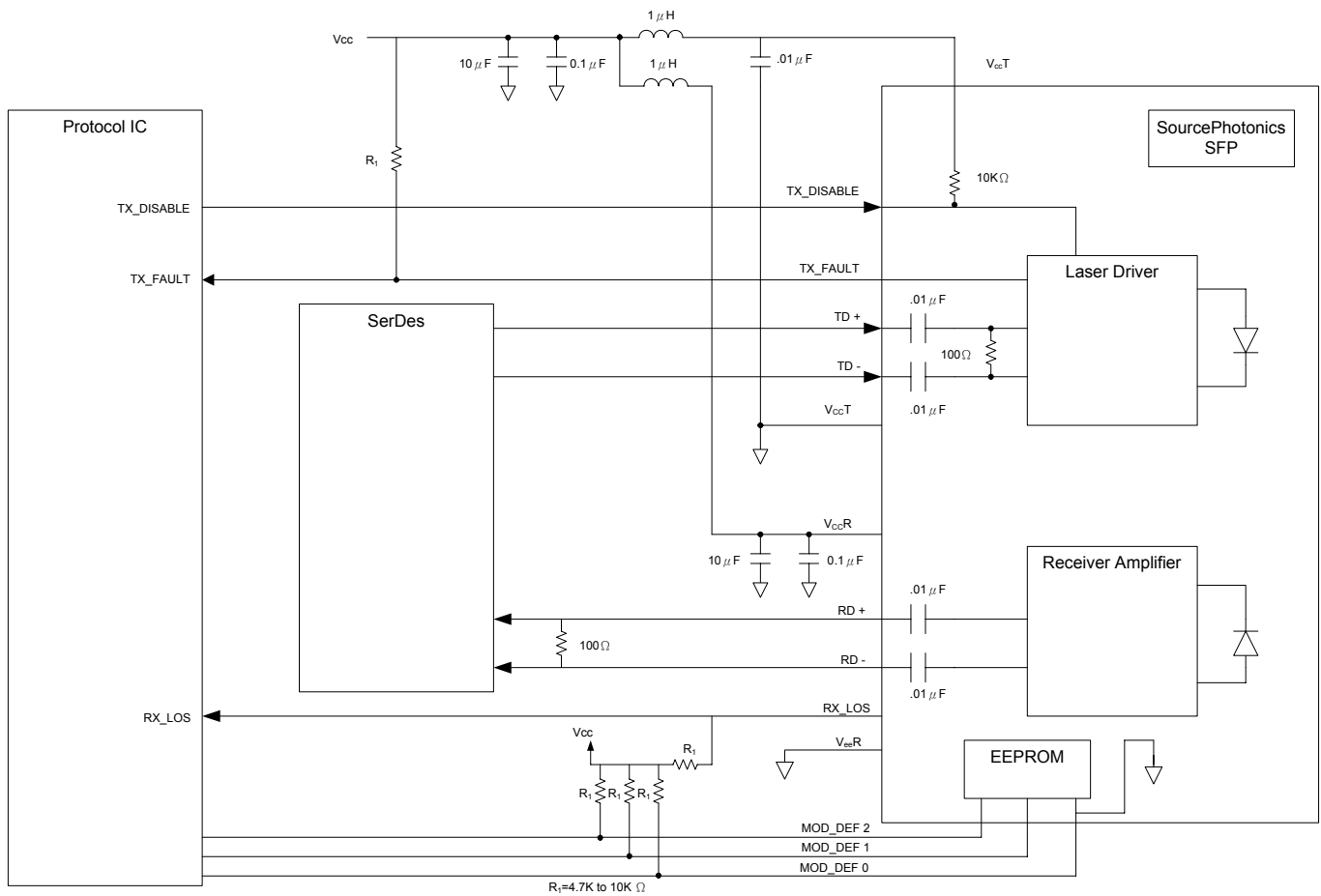
Table 9 – EEPROM Serial ID (A0h)

Name of Field	Description of Field	Address	Hex	ASCII
BR, max	Upper bit rate margin, unit of %	66	08	
BR, min	Lower bit rate margin, unit of %	67	60	
Vendor S/N	Serial number	68-83	xx	
Date Code	Vendor's manufacturing date code	84-91	xx	
Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented in the transceiver	92	68	
Enhanced Options	Indicates which optional enhanced features are implemented in the transceiver	93	F0	
SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	94	01	
CC_EXT	Check code for Extended ID Fields (addresses 64 to 94)	95	xx	
Vendor Specific	Vendor Specific EEPROM	96-127	xx	

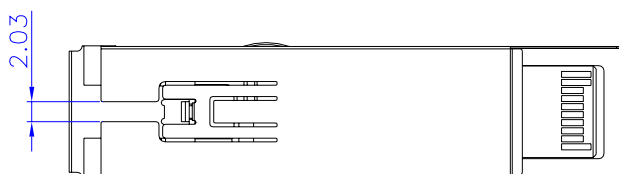
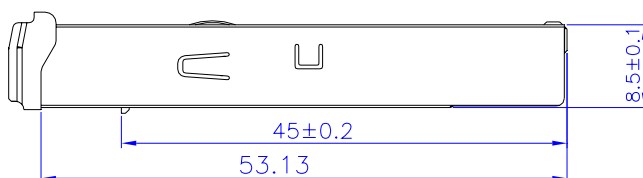
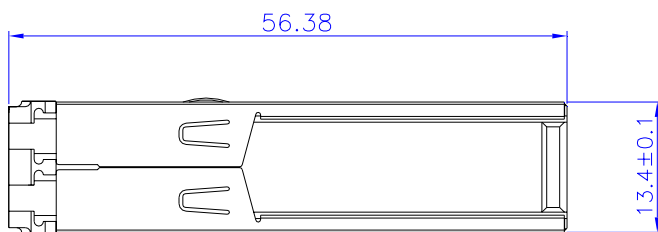
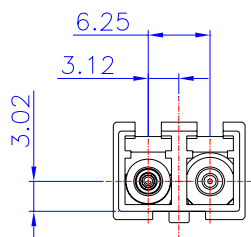
Table 10 – Pin Definitions

Pin	Unit	Notes
1	VeeT	TX GND
2	TX_FAULT/INT	Open Collector
3	TX_DISABLE	Internally Pulled High
4	MOD_DEF2	Serial Data Input
5	MOD_DEF1	Serial Clock Input
6	MOD_DEF0	Internally Grounded
7	NC	Not Connected
8	LOS	Open Collector
9	VeeR	RX Ground
10	VeeR	RX Ground
11	VeeR	RX Ground
12	RXD-	RX Data Negative
13	RXD+	RX Data Positive
14	VeeR	RX GND
15	VCCR	RX Power
16	VCCT	TX Power
17	VeeT	TX GND
18	TXD+	TX Data Positive
19	TXD-	TX Data Negative
20	VeeT	TX GND

Recommended Interface Circuit



Mechanical Diagram



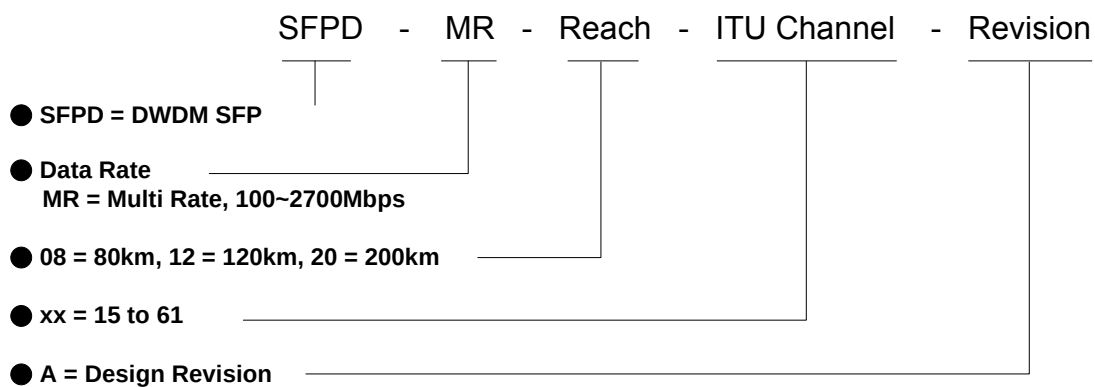
Units in mm

Order Information

Table 11 – Order Information

Part No.
SFPD-MR-08-xx-A
SFPD-MR-12-xx-A
SFPD-MR-20-xx-A

Part Numbering Definition:



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

20550 Nordhoff Street
Chatsworth, CA 91311
USA

Tel: +1-818-773-9044

Fax: +1-818-773-0261

sales@sourcephotonics.com

China

Building #2&5, West Export Processing Zone
No. 8 Kexin Road, Hi-Tech Zone
Chengdu, 611731, China

Tel: +86-28-8795-8788

Fax: +86-28-8795-8789

sales@sourcephotonics.com.cn

Taiwan

9F, No 81, Shui Lee Rd.
Hsinchu, 300, Taiwan
R.O.C.

Tel: +886-3-5169222

Fax: +886-3-5169213

sales@sourcephotonics.com.tw

© Copyright Source Photonics, Inc. 2007~2008

All rights reserved