

### SO04D199-PLGA-XX

#### FEATURES

- Supports 9.95Gb/s to 11.1Gb/s bit rates
- Maximum link length of 40km
- 3.3V power supplies required
- SFP+ package with Duplex LC connector
- 100GHz ITU Grid, C Band
- Temperature-stabilized 1550nm DWDM EML transmitter and High performance PIN receiver
- Commercial temperature range:-5°C to 70°C
- Built-in CDR
- Digital diagnostic monitor interface
- RoHS-6 Compliant for SO04D199-PLGA-XX
- SFI electrical interface

#### APPLICATIONS

- DWDM Network
- OTN
- 10GBASE-ER/EW
- 10Gb/s Fiber Channel

#### STANDARDS

- Compliant with IEEE 802.3ae
- Complies with SFP+ MSA (SFF-8431)
- Complies with SFF-8472
- Complies with FCC 47 CFR Part 15, Class B
- Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007

**ABSOLUTE MAXIMUM RATING**

Parameter	Symbol	Min.	Max.	Unit	Notes
Storage Ambient Temperature	T <sub>STG</sub>	-40	85	°C	
Operating Case Temperature	T <sub>c</sub>	-5	70	°C	
Operating Humidity	OH	5	95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.5	3.6	V	

**RECOMMENDED OPERATING CONDITION**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Case Temperature	T <sub>c</sub>	-5		+70	°C	
Power Supply Voltage	V <sub>CC</sub>	3.13	3.3	3.47	V	
Power Supply Current	I <sub>CC</sub>			450	mA	
Nominal upstream line rate				11.1	Gbps	

**TRANSMITTER OPTICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Average Launch Optical Power	P <sub>OUT</sub>	-3	-	2	dBm	
Extinction Ratio	ER	8.2	-	-	dB	
Centre Wavelength space			100		GHz	
Centre Wavelength (BOL)	λ	X-40	X	X+40	pm	
Centre Wavelength (EOL)	λ	X-100	X	X+100	pm	
Spectral Width (-20dB)	Δλ	-	-	0.3	nm	
Side Mode Suppression Mode	SMSR	35			dB	
Tx Jitter (SONET) 20kHz-80MHz	T <sub>xj1</sub>			0.3	UI	
Tx Jitter (SONET) 4MHz-80MHz	T <sub>xj2</sub>			0.1	UI	
Transmitter Dispersion Penalty (@ 800 ps/nm)	TDP			2	dB	
Eye Diagram	IEEE802.3ae 10GBASE-ER					
Mask margin			15		%	

**TRANSMITTER ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	Ω	
Data Input Swing Differential	V <sub>IN</sub>	120	-	820	mV	
Transmit Disable Voltage	V <sub>D</sub>	2		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	-0.3		0.8	V	
Transmit Fault - Normal Voltage		-0.3		0.4	V	
Transmit Fault - Fault Voltage		2.4		V <sub>CC_HOST</sub>	V	

**RECEIVER ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential data output swing	V <sub>out</sub>	340	650	850	mV	
LOS	High	2.4	-	V <sub>CC_HOST</sub>	V	
	Low	-0.3	-	0.4	V	

**RECEIVER CHARACTERISTICS**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Optical Center Wavelength	λ <sub>c</sub>	1270	-	1600	nm	
Receiver Sensitivity (BOL)				-14	dBm	RATE:10.3G BER<1E-12
Receiver Overload		-1			dBm	
Receiver reflectance				-27	dB	
LOS De-Assert				-20	dBm	
LOS Assert		-30			dBm	
LOS Hysteresis		0.5		5	dB	

PIN DESCRIPTION			
PIN	Name	Description	Notes
1	V <sub>EE</sub> T	Transmitter Ground	
2	TX_Fault	Transmitter Fault Indication	Low: normal; High: abnormal
3	TX_Disable	Transmitter Disable	Low: transmitter on; High: transmitter off
4	SDA	SDA	The data line of two wire serial interface
5	SCL	SCL	The clock line of two wire serial interface
6	MOD_ABS	Module Absent	Connected to V <sub>EE</sub> T or V <sub>EE</sub> R in the module
7	RS0	Not Connected	
8	RX_LOS	Loss of Signal	Low: signal detected; High: loss of signal
9	RS1	Not Connected	
10	V <sub>EE</sub> R	Receiver Ground	
11	V <sub>EE</sub> R	Receiver Ground	
12	RD-	Inv. Received Data Out	AC-coupled, CML
13	RD+	Received Data Out	AC-coupled, CML
14	V <sub>EE</sub> R	Receiver Ground	
15	V <sub>CC</sub> R	Receiver Power	
16	V <sub>CC</sub> T	Transmitter Power	
17	V <sub>EE</sub> T	Transmitter Ground	
18	TD+	Transmit Data In	AC-coupled, CML
19	TD-	Inv. Transmit Data In	AC-coupled, CML
20	V <sub>EE</sub> T	Transmitter Ground	

1. Module ground pins Gnd are isolated from the module case and chassis ground within the module.
2. Shall be pulled up with 4.7K-10Kohms to a voltage between 3.15V and 3.45V on the host board.

PIN OUT DRAWING

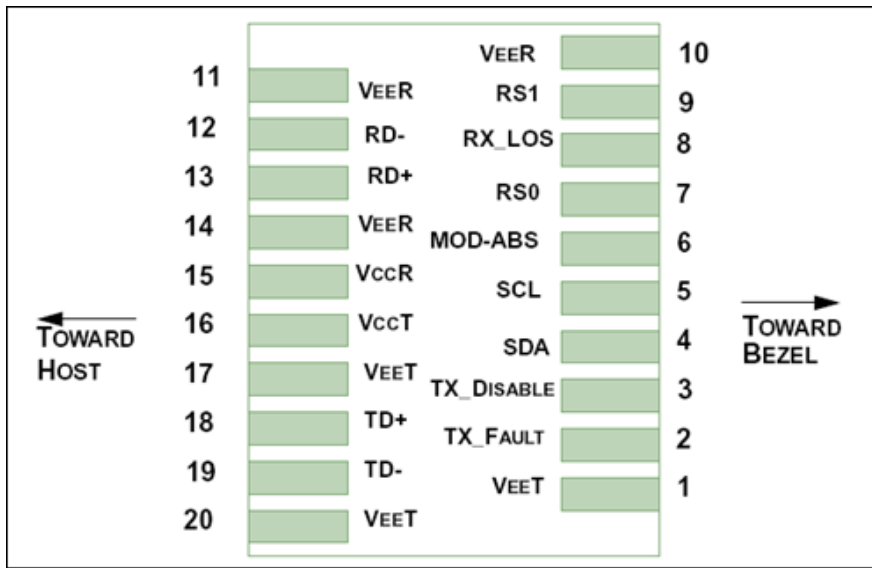


Figure 1 Host PCB SFP+ Pinout Top View

Host Board Supply Filtering Network

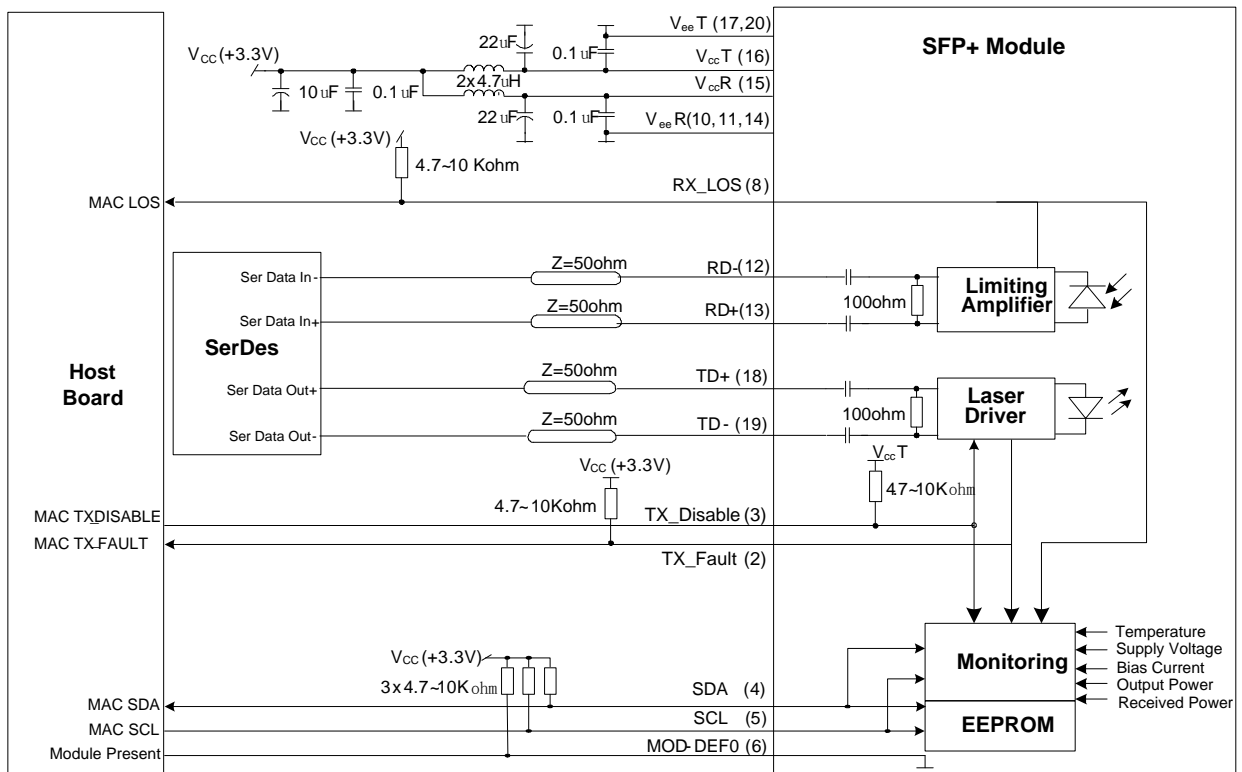


Figure 2 Typical Interface Circuit

PACKAGE OUTLINE

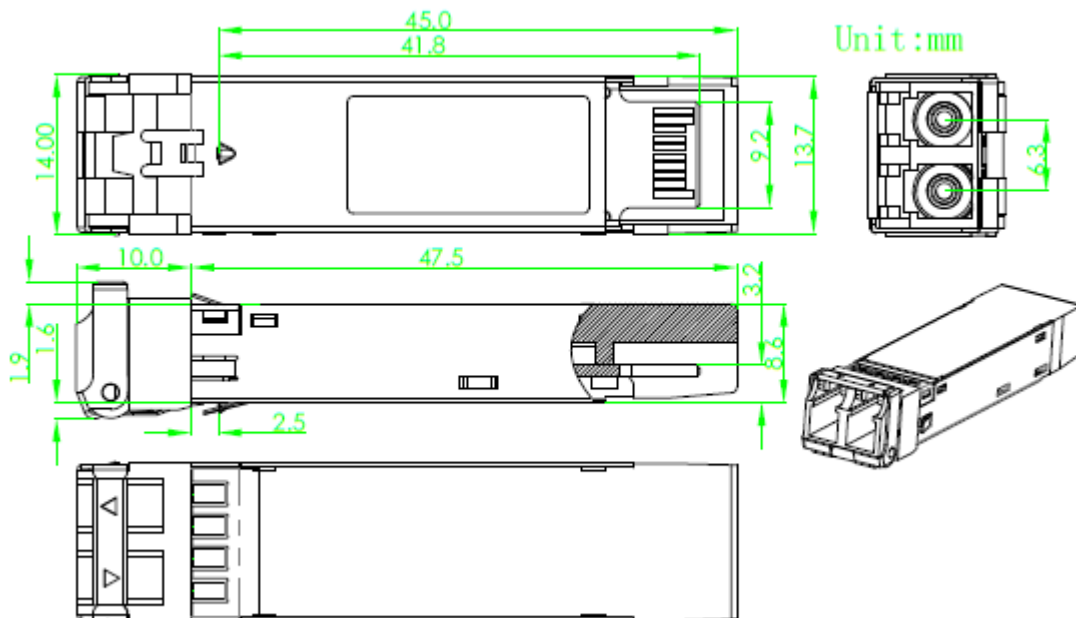


Figure 3 Package Outline

EEPROM INFORMATION

2 wire address 1010000X (A0h)		2 wire address 1010001X (A2h)	
0	Serial ID Defined by SFP MSA (96 bytes)	0	Alarm and Warning Thresholds (56 bytes)
95		55	Cal Constants (40 bytes)
127	Vendor Specific (32 bytes)	95	Real Time Diagnostic Interface (24 bytes)
	Reserved, SFF8079 (128 bytes)	119	Vendor Specific (8 bytes)
		127	User Writable EEPROM (120 bytes)
255		247	Vendor Specific (8 bytes)
		255	

**Figure 4 EEPROM Memory Map Specific Data Field Descriptions**
**DIGITAL DIAGNOSTIC MONITORING INTERFACE**

Five transceiver parameter values are monitored. The following table defines the monitored parameter's accuracy.

Parameter	Range	Accuracy	Calibration
Temperature	-5 to 70°C	±5°C	Internal
Voltage	2.97 to 3.63V	±3%	Internal
Bias Current	0 to 128mA	±10%	Internal
TX Power	-4 to 3dBm	±3dB	Internal
RX Power monitor	-18 to 0dBm	±3dB	Internal

**ORDERING INFORMATION**

Channel	Product Code	Frequency (THz)	Center Wavelength (nm)
1	SO04D199-PLGA-61	196.1	1528.77
3	SO04D199-PLGA-60	196.0	1529.55
5	SO04D199-PLGA-59	195.9	1530.33
7	SO04D199-PLGA-58	195.8	1531.12
9	SO04D199-PLGA-57	195.7	1531.9
11	SO04D199-PLGA-56	195.6	1532.68
13	SO04D199-PLGA-55	195.5	1533.47
15	SO04D199-PLGA-54	195.4	1534.25
17	SO04D199-PLGA-53	195.3	1535.04
19	SO04D199-PLGA-52	195.2	1535.82
21	SO04D199-PLGA-51	195.1	1536.61
23	SO04D199-PLGA-50	195.0	1537.4
25	SO04D199-PLGA-49	194.9	1538.19
27	SO04D199-PLGA-48	194.8	1538.98
29	SO04D199-PLGA-47	194.7	1539.77
31	SO04D199-PLGA-46	194.6	1540.56
33	SO04D199-PLGA-45	194.5	1541.35

35	SO04D199-PLGA-44	194.4	1542.14
37	SO04D199-PLGA-43	194.3	1542.94
39	SO04D199-PLGA-42	194.2	1543.73
41	SO04D199-PLGA-41	194.1	1544.53
43	SO04D199-PLGA-40	194.0	1545.32
45	SO04D199-PLGA-39	193.9	1546.12
47	SO04D199-PLGA-38	193.8	1546.92
49	SO04D199-PLGA-37	193.7	1547.72
51	SO04D199-PLGA-36	193.6	1548.51
53	SO04D199-PLGA-35	193.5	1549.32
55	SO04D199-PLGA-34	193.4	1550.12
57	SO04D199-PLGA-33	193.3	1550.92
59	SO04D199-PLGA-32	193.2	1551.72
61	SO04D199-PLGA-31	193.1	1552.52
63	SO04D199-PLGA-30	193.0	1553.33
65	SO04D199-PLGA-29	192.9	1554.13
67	SO04D199-PLGA-28	192.8	1554.94
69	SO04D199-PLGA-27	192.7	1555.75
71	SO04D199-PLGA-26	192.6	1556.55
73	SO04D199-PLGA-25	192.5	1557.36
75	SO04D199-PLGA-24	192.4	1558.17
77	SO04D199-PLGA-23	192.3	1558.98
79	SO04D199-PLGA-22	192.2	1559.79
81	SO04D199-PLGA-21	192.1	1560.61
83	SO04D199-PLGA-20	192.0	1561.42
85	SO04D199-PLGA-19	191.9	1562.23
87	SO04D199-PLGA-18	191.8	1563.05
89	SO04D199-PLGA-17	191.7	1563.86
91	SO04D199-PLGA-16	191.6	1564.68
93	SO04D199-PLGA-15	191.5	1565.5
95	SO04D199-PLGA-14	191.4	1566.31
97	SO04D199-PLGA-13	191.3	1567.13
99	SO04D199-PLGA-12	191.2	1567.95



**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.

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