



## Modulelink(Shenzhen) Technology Co., Ltd.

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Optical network solutions provider

### SFP 2.5G Transceiver MSFP-OC48-SR

#### PRODUCT FEATURES

- Up to 2.67 Gb/s bi-directional data links
- Hot-pluggable SFP footprint
- Built-in digital diagnostic functions
- FP laser transmitter
- PIN Receiver
- Very low jitter
- Metal enclosure, for lower EMI
- Operating temperature range: -40°C to 85°C

#### APPLICATIONS

Metro Access Rings and Point-to-Point networking for SONET<sup>1</sup>, Gigabit Ethernet<sup>2</sup> and Fibre Channel<sup>3</sup>

Modulelink's MSFP-OC48-SR Small Form Factor Pluggable (SFP) transceivers are designed for operation in Metro Access Rings and Point-to-Point networks using SONET<sup>1</sup>, Gigabit Ethernet<sup>2</sup> and Fibre Channel<sup>3</sup> networking equipment. Digital diagnostics functions are available via an I<sup>2</sup>C serial bus<sup>5</sup>. In addition, they comply with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA).

#### Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TFAULT	Transmitter Fault. Not supported.	
3	TDis	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	

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16	V <sub>CC</sub> T	Transmitter Power Supply	
17	V <sub>EE</sub> T	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. 100 ohm termination between TD+ and TD-, AC Coupled thereafter.	
19	TD-	Transmitter Inverted DATA in. See TD+	
20	V <sub>EE</sub> T	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 – 10kohms on host board to a voltage between 2.0V and 5.5V. MOD\_DEF(0) pulls line low to indicate module is plugged in.
4. Modulelink 2x receiver achieves simultaneous 1x and 2x operation without active control.
5. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 5.5V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

### Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	V <sub>CC</sub>	-0.5		4.7	V	
Storage Temperature	T <sub>s</sub>	-40		85	□C	
Case Operating Temperature	T <sub>OP</sub>	0		70	□C	

### Electrical Characteristics (T<sub>OP</sub> = 0 to 70 □C, V<sub>CC</sub> = 3.15 to 3.60 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	V <sub>CC</sub>	3.15		3.60	V	
Supply Current	I <sub>CC</sub>		210	300	mA	
<b>Transmitter</b>						
Input differential impedance	R <sub>in</sub>		100		Ω	1
Single ended data input swing	V <sub>in,pp</sub>	250		1200	mV	
Transmit Disable Voltage	V <sub>D</sub>	V <sub>CC</sub> – 1.3		V <sub>CC</sub>	V	
Transmit Enable Voltage	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> + 0.8	V	2
Transmit Disable Assert Time				10	us	
<b>Receiver</b>						
Single ended data output swing	V <sub>out,pp</sub>	250		800	mV	3
Data output rise time	t <sub>r</sub>		100	180	ps	4
Data output fall time	t <sub>f</sub>		100	180	ps	4
LOS Fault	V <sub>LOS fault</sub>	V <sub>CC</sub> – 0.5		V <sub>CC</sub> HOST	V	5
LOS Normal	V <sub>LOS norm</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6

### Notes:

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1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Into 100 ohms differential termination.
4. 20 – 80 %
5. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

**Low Speed Signals**

Parameter	Symbol	Min	Typ	Max	Units	Notes/Conditions
RX_LOS Assert Level		-24			dBm	
RX_LOS Deassert Level				-22	dBm	
RX_LOS Hysteresis		0.5	2		dB	
RX_LOS Assert Delay	t_loss_on			100	sec	From detection of loss of signal to assertion of RX_LOS
RX_LOS Negate Delay	t_loss_off			100	sec	From detection of presence of signal to negation of RX_LOS
TX_DISABLE Assert Time	t_off			10	sec	Rising edge of TX_DISABLE to fall of output signal below 10% of nominal
TX_DISABLE Negate Time	t_on			1000	sec	Falling edge of TX_DISABLE to rise of output signal above 90% of nominal. Time indicated is under steady-state temperature conditions.
TX_DISABLE Reset Time	t_reset	10			sec	TX_DISABLE HIGH before TX_DISABLE set LOW
TX_FAULT Assert				100	sec	From fault to assertion of TX_FAULT
Initialization Time				300	sec	From power on to negation of TX_FAULT using TX_DISABLE

**Optical Characteristics (T<sub>OP</sub> = -40 to 85 °C, V<sub>CC</sub> = 3.15 to 3.60 Volts)**

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
<b>Transmitter</b>						
Output Opt. Pwr (EOL)	P <sub>OUT</sub>	-9		-3	dBm	2
Optical Wavelength		1290	1310	1330	nm	3
Wavelength Temperature Dependence			0.08	0.125	nm/°C	

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Spectral Width	-			1	nm	4
Optical Extinction Ratio	ER	8.2			dB	5
Sidemode Suppression ratio	SMSR <sub>min</sub>	30			dB	
Optical Rise/Fall Time	t <sub>r</sub> / t <sub>f</sub>			180	ps	6
RIN	RIN			-120	dB/Hz	
Transmitter Jitter Generation				75	mUI	7
Dispersion Penalty at 80 km				2.5	dB	8
<b>Receiver</b>						
Optical Input Power	P <sub>in</sub>	-30		-6	dBm	9
Optical Input Wavelength	c	1290		1620	nm	
Receiver Jitter Generation				75	mUI	7
Optical Return Loss		27			dB	

**Notes:**

- Parameters are specified over temperature and voltage, at end of life unless otherwise noted.
- Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
- Over case temperature of -40 to 85°C.
- Full width, -20dB from peak.
- Measured filtered, at 2.488 Gb/s. Min represents worst-case ER over temperature and at end of life.
- Unfiltered, 20% to 80%.
- Measured per GR-253<sup>2</sup> section 5.6 for OC-48 B.
- SMF-28 fiber used. 80kms represents 1600ps/nm at 1610nm. Measured at 2.488Gb/s with a PRBS 2<sup>23</sup>-1 pattern at a BER<10<sup>-12</sup>.
- Pin represents the range of input powers where BER<10<sup>-12</sup>. Pin is valid over all data rates specified in Section IV.

**General Specifications**

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR	0.155*		2.67	Gb/sec	*OC-3/12 compatible. Not compliant w/ all OC-3/12 specifications, such as min ER. (OC-48 compliance takes precedence)
Total Link Budget		16	18		dB	2.488 Gb/s, BER < 10 <sup>-12</sup> w/ PRBS 223-1. Does not include dispersion penalty

**Environmental Specifications**

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T <sub>op</sub>	-40		85	°C	
Storage Temperature	T <sub>sto</sub>	-40		85	°C	

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**Regulatory Compliance**

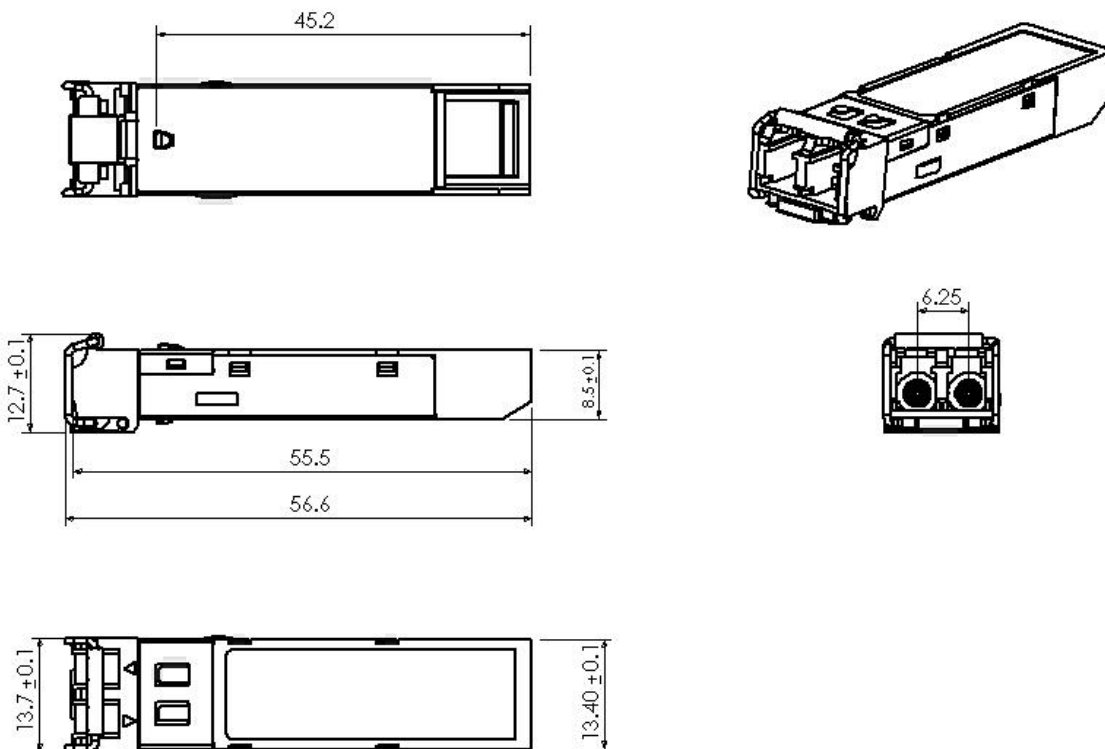
Modulelink SFP transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard
Laser Eye Safety	FDA/CDRH	CDRH and IEC-825 Class 1 Laser Product. See Note 1
Laser Eye Safety	TÜV	EN 60950 EN 60825-1 EN 60825-2
Electrical Safety	CSA	CLASS 3862.07 CLASS 3862.87

Note 1: Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

**Mechanical Specifications**

Modulelink's Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



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