

## LWO-SFPP-Cxxxx-20

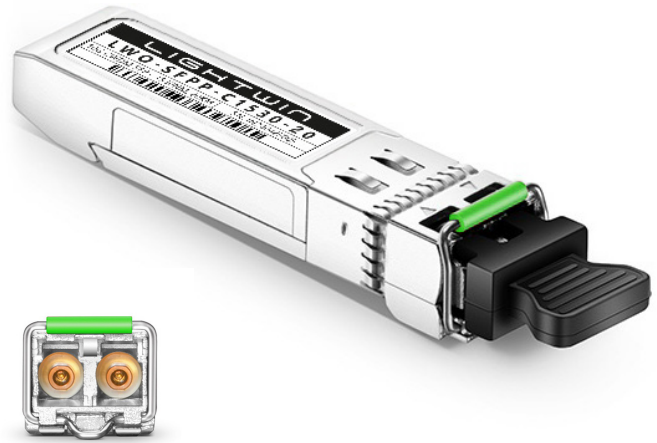
### 10 Gbit SFP+ CWDM, 1270-1610nm, 20km, LC-Duplex, Singlemode

#### Features

- Up to 11.3Gb/s data links
- CWDM DFB transmitter and PIN receiver
- Up to 20km on 9/125µm SMF
- Hot-pluggable SFP+ footprint
- Duplex LC/UPC type pluggable optical interface
- RoHS-10 compliant and leadfree
- Support Digital Monitoring interface
- Single +3.3V power supply
- Compliant with SFF+MSA and SFF-8472
- Metal enclosure, for lower EMI
- Meet ESD requirements, resist 8KV direct contact voltage
- Case operating temperature
  - Commercial: 0 ~ +70°C
  - Industrial: -40 ~ +85°C

#### Application

- 10GBASE-LR/LW & 10G Ethernet
- SDH STM64
- Other Optical Links



#### General Description

Lightwin's LWO-SFPP-Cxxxx-20x SFP+ transceiver is designed for use in 10-Gigabit Ethernet links up to 20km over single mode fiber. The module consists of CWDM DFB Laser, PIN and Pre-amplifier in a high-integrated optical sub-assembly. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

LWO-SFPP-Cxxxx-20x transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, and received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP+ MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

#### Wavelength Selection: CWDM Wavelength Guide Pin Descriptions

Wavelength	xx	Clasp Color Code	Wavelength	xx	Clasp Color Code
1270	27	Gray	1450	45	Brown
1290	29	Gray	1470	47	Gray
1310	31	Gray	1490	49	Purple
1330	33	Purple	1510	51	Blue
1350	35	Blue	1530	53	Green
1370	37	Green	1550	55	Yellow
1390	39	Yellow	1570	57	Orange
1410	41	Orange	1590	59	Red
1430	43	Red	1610	61	Brown

#### 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 <sub>s</sub>	-40	+85	°C	
Power Supply Voltage	V <sub>cc</sub>	-0.5	+3.6	V	
Relative Humidity (non-condensation)	R <sub>H</sub>	5	95	%	
Damage Threshold	TH <sub>d</sub>	5		dBm	

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#### Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max.	Unit	Notes
Operating Case Temperature	$T_{OP}$	0		70	°C	commercial
		-40		85		industrial
Power Supply Voltage	$V_{CC}$	3.135	3.3	3.465	V	
Data Rate			10.3125		Gb/s	
Control Input Voltage High		2		$V_{CC}$	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			20	km	9/125 $\mu$ m

#### Pin Assignment and Description

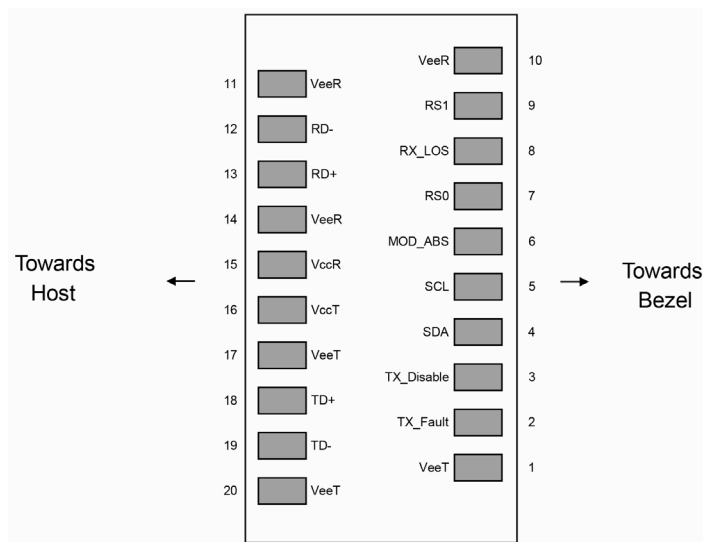


Figure 1: SFP+ module pad layout

#### Pad Function Definition 1/2

Pins	Logic	Symbol	Name/Description	Notes
1		VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	LVTTTL-O	TX_Fault	Transmitter Fault.	2
3	LVTTTL-I	TX_Disable	Transmitter Disable. Laser output disabled on high or open.	3
4	LVTTTL-I/O	SDA	2-wire Serial Interface Data Line	4
5	LVTTTL-I/O	SCL	2-wire Serial Interface Clock Line	4
6		MOD_ABS	Module Absent. Grounded within the module	4
7	LVTTTL-I	RS0	Rate Select 0, internal pull down	5
8	LVTTTL-O	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	LVTTTL-I	RS1	Rate Select 1, internal pull down	5
10		VeeR	Receiver Ground (Common with Transmitter Ground)	1
11		VeeR	Receiver Ground (Common with Transmitter Ground)	1
12	CML-O	RD-	Receiver Inverted DATA out. AC Coupled	
13	CML-O	RD+	Receiver Non-inverted DATA out. AC Coupled	

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### 10 Gbit SFP+ CWDM, 1270-1610nm, 20km, LC-Duplex, Singlemode

#### Pad Function Definition 2/2

Pins	Logic	Symbol	Name/Description	Notes
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	CML-I	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	CML-I	TD-	Transmitter Inverted DATA in. AC Coupled.	
20		VeeT	Transmitter Ground (Common with Receiver Ground)	1

#### Notes:

- Circuit ground is internally isolated from chassis ground.
- TFAULT is an open collector/drain output, which should be pulled up with a 4.7kΩ ~ 10kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
- Laser output disabled on TDIS>2.0V or open, enabled on TDIS<0.8V.
- Should be pulled up with 4.7kΩ ~ 10kΩ host board to a voltage between 2.0V and 3.6V.  
MOD\_ABS pulls line low to indicate module is plugged in.
- Internally pulled down per SFF-8431 Rev 4.1.
- LOS is open collector output. It should be pulled up with 4.7kΩ ~ 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

#### Electrical Characteristics

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Consumption	P			1.5	W	
Supply Current	Icc			450	mA	
<b>Transmitter</b>						
Single-ended Input Voltage Tolerance	VCC	-0.3		4.0	V	
AC Common Mode Input Voltage Tolerance (RMS)		15			mV	
Differential Input Voltage Swing	Vin, pp	120		820	mV pp	
Differential Input Impedance	Zin	90	100	110	Ohm	1
Transmit Disable Assert Time				10	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee		Vee+0.8	V	2
<b>Receiver</b>						
Differential Output Voltage Swing	Vout, pp	350		850	mV pp	
Differential Output Impedance	Zout	90	100	110	Ohm	3
Data output rise/fall time	Tr/Tf	28			ps	4
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	5
LOS De-assert Voltage	VlosL	Vee		Vee+0.8	V	5
Power Supply Rejection	PSR	100			mV pp	6

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#### Notes:

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Input 100 ohms differential termination.
4. These are unfiltered 20-80% values.
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.

#### Optical Characteristics

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

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
<b>Transmitter</b>						
Center Wavelength	$\lambda$	$\lambda-6.5$		$\lambda+6.5$	nm	1
Optical Spectral Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	$P_{AVG}$	-6		0.5	dBm	2
Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty	TDP			3.2	dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Transmitter Eye Mask	Compliant with IEEE802.3ae					
<b>Receiver</b>						
Center Wavelength	$\lambda_c$	1270		1610	nm	
Sensitivity (Average Power)	Sen.			-14.4	dBm	3
Input Saturation Power (overload)	$P_{sat}$	0.5			dBm	
LOS Assert	LOSA	-30			dBm	
LOS De-assert	LOSD			-17	dBm	
LOS Hysteresis	LOSH	0.5			dB	

#### Notes:

1.  $\lambda$  refer to wavelength selection, 1270~1610nm please refer to the product selection.
2. Launched power (avg.) is power coupled into a single mode fiber with master connector (Before of Life).
3. Measured with Light source 1270~1610nm, ER=3.5dB; BER $\leq$ 1E-12 @10.3125Gbps, PRBS=2<sup>31</sup>-1 NRZ.

#### Digital Diagnostic Functions

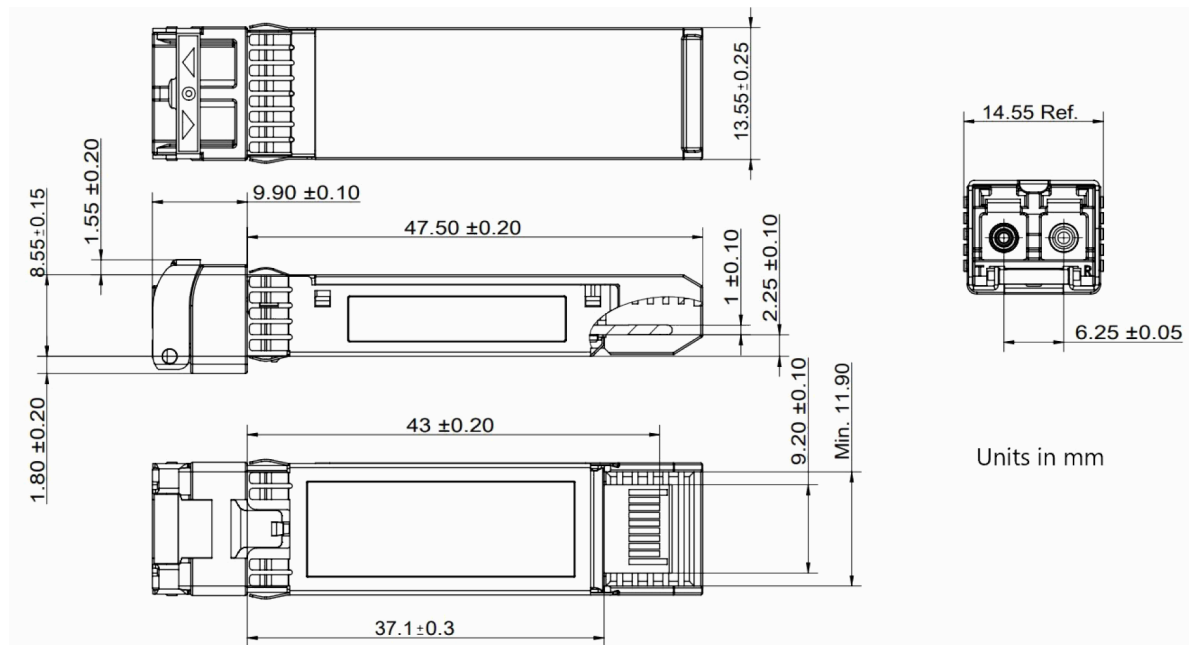
The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max.	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°C	-40 ~ +85°C
Supply voltage monitor absolute error	DMI_VCC	-3	3	%	3.13~3.47V
RX power monitor absolute error	DMI_RX	-3	3	dB	-17~+1dBm
Bias current monitor	DMI_bias	-10%	10%	mA	0~60mA
TX power monitor absolute error	DMI_TX	-3	3	dB	-6~+1dBm

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### Mechanical Dimensions



**Figure 2. Mechanical Outline**

### ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 / JESD22- A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

### Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

### Ordering Information

Part Number	Wavelength
LWO-SFPP-C1270-20	1270nm
LWO-SFPP-C1290-20	1290nm
LWO-SFPP-C1330-20	1330nm
LWO-SFPP-C1450-20	1450nm
LWO-SFPP-C1470-20	1470nm
LWO-SFPP-C1490-20	1490nm
LWO-SFPP-C1510-20	1510nm
LWO-SFPP-C1530-20	1530nm
LWO-SFPP-C1550-20	1550nm
LWO-SFPP-C1570-20	1570nm
LWO-SFPP-C1590-20	1590nm