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## SPS-73120W-CXX0

### 3.3V / CWDM / 1.25 Gbps Digital Diagnostic SFP LC SINGLE-MODE TRANSCEIVER

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#### FEATURES

- Hot-Pluggable SFP Footprint LC Optical Transceiver
- Small Form-Factor Pluggable (SFP) MSA compatible
- Compliant with IEEE 802.3z Gigabit Ethernet
- Compliant with Fiber Channel 1x SM-LC-L FC-PI
- 18 Wavelength ( $\lambda$ ): 1270 nm to 1610 nm CWDM DFB LD Transmitter
- APD High Sensitivity Receiver
- 32 dB Power Budget at Least
- SFF-8472 Digital Diagnostic Function
- AC/AC Coupling according to MSA
- Single +3.3 V Power Supply
- 0 to 70°C Operation
- Class 1 Laser International Safety Standard IEC-60825 Compliant

#### APPLICATIONS

- Gigabit Ethernet Switches and Routers
- Fiber Channel Switch Infrastructure
- XDSL Applications
- Metro Edge Switching

#### DESCRIPTION

The SPS-73120W-CXX0 series single mode transceivers is small form factor pluggable module for bi-directional serial optical data communications such as Gigabit Ethernet 1000BASE and Fiber Channel 1x SM-LC-L FC-PI. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I<sup>2</sup>C series bus specified in the SFP MSA SFF-8472. This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eighteen center wavelengths available from 1270 nm to 1610 nm, with each step 20 nm. A guaranteed minimum optical link budget of 32 dB is offered. The transmitter section uses a multiple quantum well CWDM DFB laser and is a class 1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

#### LASER SAFETY

This single mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

#### ORDER INFORMATION

P/No.	Bit Rate (Gb/s)	1000 BASE	Power Budget (dB)	Wavelength (nm)	Package	Case Temp. (°C)	TX Power (dBm)	RX Sens. (dBm)
SPS-73120W-CXX 0	1.25/1.063	EZX	> 32	CWDM*	LC SFP with DMI	0 to 70	5 to 0	-32

\*CWDM Wavelength (0 to 70°C)

Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)	Central Wavelength	Min. (nm)	Typ. (nm)	Max. (nm)
-C270	1264.5	1270	1277.5	-C450	1444.5	1450	1457.5
-C290	1284.5	1290	1297.5	-C470	1464.5	1470	1477.5
-C310	1304.5	1310	1317.5	-C490	1484.5	1490	1497.5
-C330	1324.5	1330	1337.5	-C510	1504.5	1510	1517.5
-C350	1344.5	1350	1357.5	-C530	1524.5	1530	1537.5
-C370	1364.5	1370	1377.5	-C550	1544.5	1550	1557.5
-C390	1384.5	1390	1397.5	-C570	1564.5	1570	1577.5
-C410	1404.5	1410	1417.5	-C590	1584.5	1590	1597.5
-C430	1424.5	1430	1437.5	-C610	1604.5	1610	1617.5

Absolute Maximum Ratings					
Parameter	Symbol	Min	Max	Units	Notes
Storage Temperature	Tstg	-40	85	°C	
Operating Case Temperature	Topr	0	70	°C	Air flow 1m/sec
Power Supply Voltage	Vcc	-0.5	3.6	V	

Recommended Operating Conditions					
Parameter	Symbol	Min	Typ	Max	Units / Notes
Power Supply Voltage	Vcc	3.135	3.3	3.465	V
Case Operating Temperature	Topr	0		70	°C / air flow 1m/sec
Power Supply Current	I <sub>CC(TX+RX)</sub>		230	300	mA
Data Rate		100	1250		Mb/s

Transmitter Specifications (0°C < Topr < 70°C, 3.135V < Vcc < 3.465V)						
Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Optical Transmit Power	P <sub>o</sub>	0	---	5	dBm	1
Output Center Wavelength	λ	λ <sub>c</sub> - 5.5	λ <sub>c</sub>	λ <sub>c</sub> + 7.5	nm	2
Output Spectrum Width	Δλ	---	---	1	nm	-20 dB Width
Side Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	E <sub>R</sub>	9	---	---	dB	
Optical Rise Time	t <sub>r</sub>			260	ps	20 % to 80% Values
Optical Fall Time	t <sub>f</sub>			260	ps	20 % to 80% Values
Relative Intensity Noise	RIN			-120	dB/Hz	
<b>Electrical</b>						
Data Input Current - Low	I <sub>IL</sub>	-350			μA	
Data Input Current - High	I <sub>IH</sub>			350	μA	
Differential Input Voltage	V <sub>IH</sub> - V <sub>IL</sub>	0.5		2.4	V	Peak-to-Peak
TX Disable Input Voltage - Low	T <sub>DIS,L</sub>	0		0.5	V	3
TX Disable Input Voltage - High	T <sub>DIS,H</sub>	2.0		Vcc	V	3
TX Disable Assert Time	T <sub>ASSERT</sub>			10	μs	
TX Disable Deassert Time	T <sub>DEASSERT</sub>			1	ms	
TX Fault Output Voltage -- Low	T <sub>FaultL</sub>	0		0.5	V	4
TX Fault Output Voltage -- High	T <sub>FaultH</sub>	2.0		Vcc+0.3	V	4

1. Output power is power coupled into a 9/125 μm single mode fiber.
2. ITU-T G.694.2 CWDM wavelength from 1270 nm to 1610 nm, each step 20 nm.
3. There is an internal 4.7K to 10K ohm pull-up resistor to VccTX.
4. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

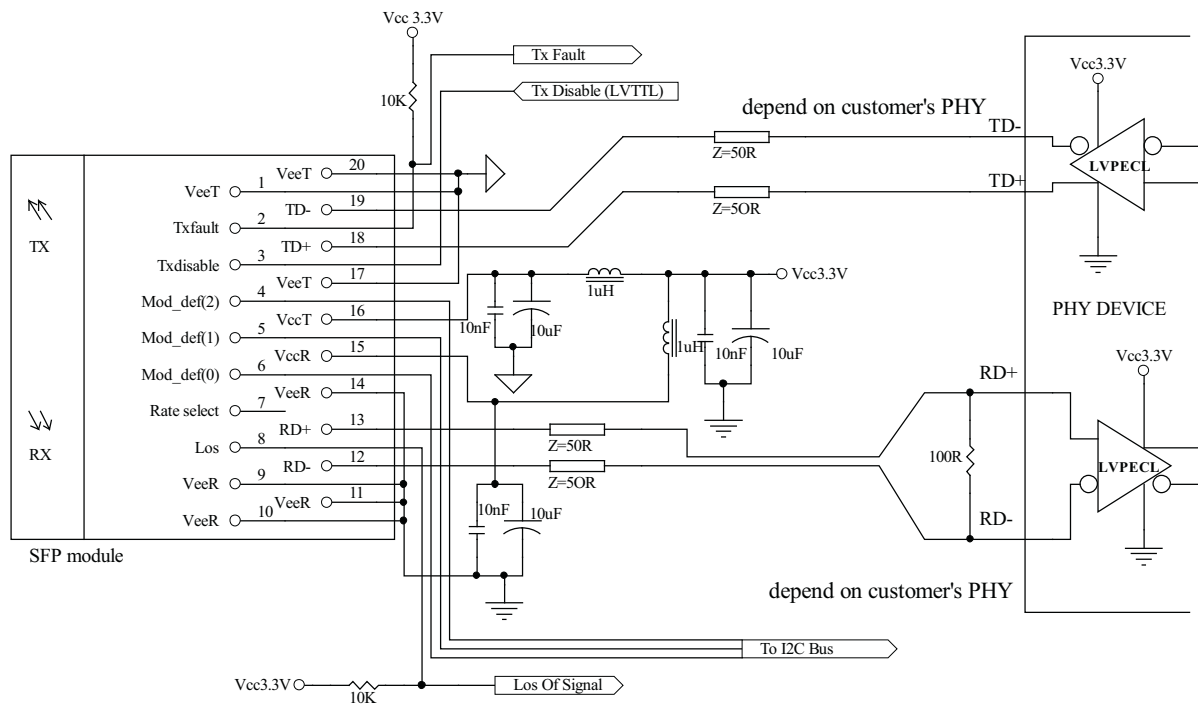
Receiver Specifications (0°C < Topr < 70°C, 3.135V < Vcc < 3.465V)

Parameter	Symbol	Min	Typ	Max	Units	Notes
<b>Optical</b>						
Sensitivity	Sens			-32	dBm	5
Maximum Input Power	Pin	-9			dBm	5
Signal Detect -- Asserted	Pa	---		-32	dBm	Transition: low to high
Signal Detect -- Deasserted	Pd	-43	---	---	dBm	Transition: high to low
Signal detect -- Hysteresis		1.0	---		dB	
Wavelength of Operation		1100	---	1620	nm	
<b>Electrical</b>						
Differential Output Voltage	V <sub>OH</sub> ! V <sub>OL</sub>	0.6		2.0	V	
Output LOS Voltage -- Low	V <sub>OL</sub>	0		0.5	V	6
Output LOS Voltage -- High	V <sub>OH</sub>	2.0		Vcc+0.3	V	6

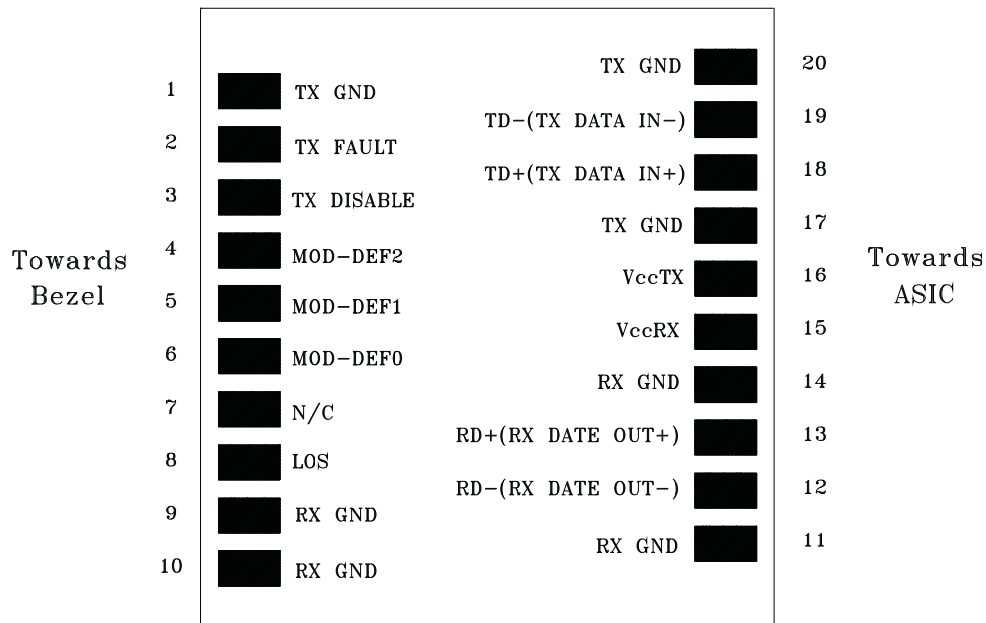
5. Measured at 2<sup>7</sup>-1 PRBS at BER 1E-12.

6. Open collector compatible, 4.7K to 10K ohm pull-up to Vcc (Host Supply Voltage).

RECOMMENDED CIRCUIT SCHEMATIC



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**CONNECTION DIAGRAM**



PIN	Signal Name	Description	PIN	Signal Name	Description
1	TX GND	Transmitter Ground	11	RX GND	Receiver Ground
2	TX Fault	Transmitter Fault Indication	12	RX DATA OUT-	Inverse Receiver Data Out
3	TX Disable	Transmitter Disable (Module disables on high or open)	13	RX DATA OUT+	Receiver Data Out
4	MOD-DFE2	Modulation Definition 2 - Two wires serial ID Interface	14	RX GND	Receiver Ground
5	MOD-DEF1	Modulation Definition 1 - Two wires serial ID Interface	15	Vcc RX	Receiver Power - 3.3V± 5%
6	MOD-DEF0	Modulation Definition 0 - Ground in Module	16	Vcc TX	Transmitter Power - 3.3V± 5%
7	N/C	Not Connected	17	TX GND	Transmitter Ground
8	LOS	Loss of Signal	18	TX DATA IN+	Transmitter Data In
9	RX GND	Receiver Ground	19	TX DATA IN-	Inverse Transmitter Data In
10	RX GND	Receiver Ground	20	TX GND	Transmitter Ground

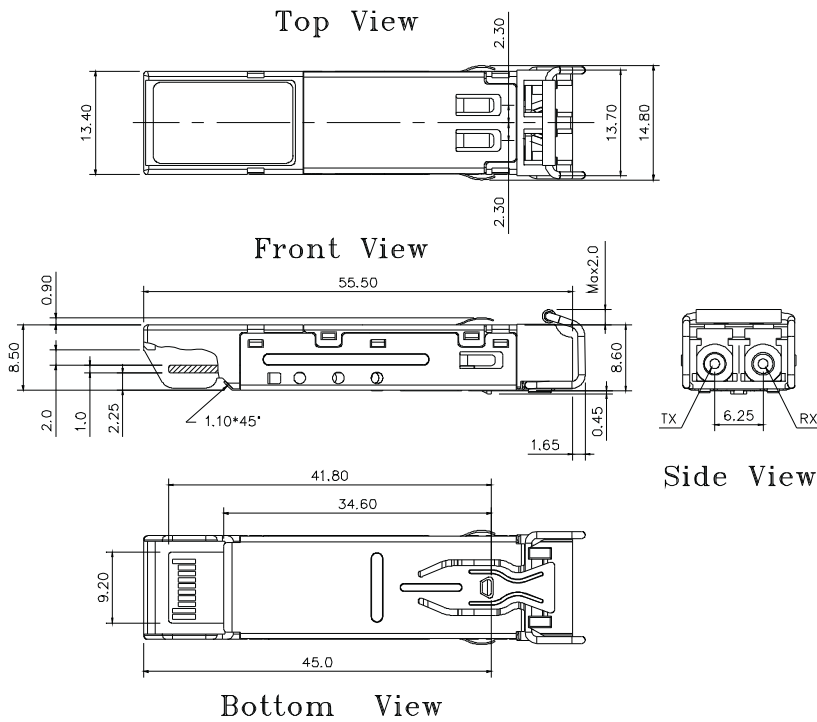
**Module Definition**

Module Definition	MOD-DEF2 PIN 4	MOD-DEF1 PIN 5	MOD-DEF0 PIN 6	Interpretation by Host
4	SDA	SCL	LV-TTL Low	Serial module definition protocol

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, MOD-DEF(1:2) appear as no connector (NC) and MOD-DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol of the ATMEL AT24C01A/02/04 family of components.

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**PACKAGE DIAGRAM**

**Units in mm**



**Note:** Specifications subject to change without notice.