

3.125Gb/s SFP CWDM 40km Optical Transceiver Module

Features

Up to 3.125Gb/s data links

Up to 40km on 9/125μm SMF

Hot-pluggable SFP footprint

Low power dissipation

Single +3.3V power supply

Compliant with SFF-8472

Metal enclosure, for lower EMI

RoHS compliant and lead-free

Support Digital Diagnostic Monitoring interface

Duplex LC/UPC type pluggable optical interface

CWDM DFB laser transmitter and PIN photo-detector

Case operating temperature: Commercial: 0 ~ +70°C Extended: -10 ~ +80°C

Industrial: -40 ~ +85°C



Applications

Other Optical Links

Gigabit Ethernet

Router/Server Interface

Switch to Switch Interface

Switched Backplane Applications

HC-3Lx41xF Wavelength List:

Wavelength	x	Clasp Color Code	Wavelength	x	Clasp Color Code
1270	6	Gray	1450	G	Brown
1290	7	Gray	1470	H	Gray
1310	3	Gray	1490	4	Purple
1330	8	Purple	1510	I	Blue
1350	9	Blue	1530	J	Green
1370	A	Green	1550	5	Yellow
1390	B	Yellow	1570	K	Orange
1410	E	Orange	1590	L	Red
1430	F	Red	1610	M	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	TS	-40	85	°C	
Operating Case Temperature	T _{case}	See order Information		°C	
Power Supply Voltage	VCC	-0.3	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	THd	5		dBm	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TO P	0		70	°C	commercial
		-10		80		extended
		-40		85		industrial
Power Supply Voltage	VCC	3.135	3.3	3.46 5	V	
Data Rate			3.125		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			40	km	9/125um

General Description

HC-3Lx41xF Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the CWDM DFB laser and the PIN photo-detector. The module data link up to 40km in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Pin Assignment and Pin Description

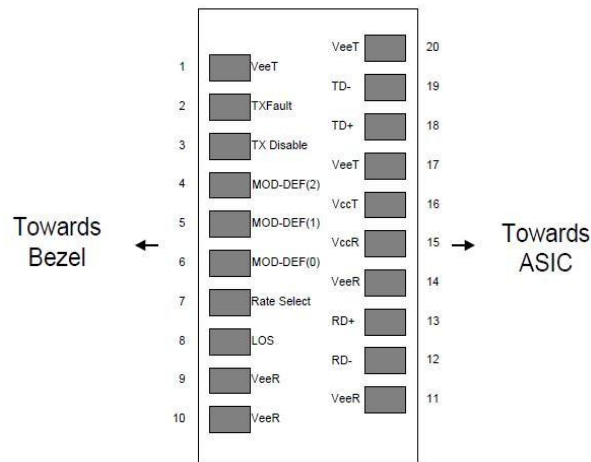


Figure1. Diagram of host board connector block pin numbers and names

PIN	Name	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	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	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	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-10k ohms on host board to a voltage between 2.0V and 3.6V.MOD_DEF
(0) pulls line low to indicate module is plugged in.
4. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates(most likely Fiber Channel 1x and 2x Rates).If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:
 - 1) Low (0 – 0.8V): Reduced Bandwidth2) (>0.8, < 2.0V): Undefined
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms 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.	Typical	Max	Unit	Notes
Power Consumption	P			1.0	W	commercial
				1.5		Industrial

Supply Current	Icc			300	mA	commercial
				450		Industrial
Transmitter						
Single-ended Input Voltage Tolerance	VCC	-0.3		4.0	V	
Differential Input Voltage Swing	Vin,pp	200		2400	mVpp	
Differential Input Impedance	Zin	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee-0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	Vout,pp	500		900	mVpp	
Differential Output Impedance	Zout	90	100	110	Ohm	
Data output rise/fall time	Tr/Tf		100		ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

Optical Characteristics

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_C	X-6.5	X	X+6.5	nm	1
Spectrum Bandwidth(RMS)	σ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	PAVG	-2		3	dBm	2
Optical Extinction Ratio	ER	7			dB	
Transmitter OFF Output Power	POff			-45	dBm	

Transmitter Eye Mask		Compliant with G.959(class 1 laser safety)				
Receiver						
Center Wavelength	λ_C	1270		1610	nm	
Receiver Sensitivity (Average Power)	Sen.			-19	dBm	3
Input Saturation Power (overload)	Psat	-3			dBm	
LOS Assert	LOSA	-36			dB	4
LOS De-assert	LOSD			-20	dBm	4
LOS Hysteresis	LOSH	0.5	2.0	6.0	dBm	

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

Notes:

1. X: See HCSC-3Lx41x Wavelength List. The industrial grade module contains a TEC circuit.
2. Measure at 2²³-1 NRZ PRBS pattern
3. Measured with Light source 1270~1610nm, ER=7dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ
4. When LOS de-asserted, the RX data+/- output is High-level (fixed).

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 calibrationmode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	degC	Over operatingtemp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operatingrange
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

Mechanical Dimensions

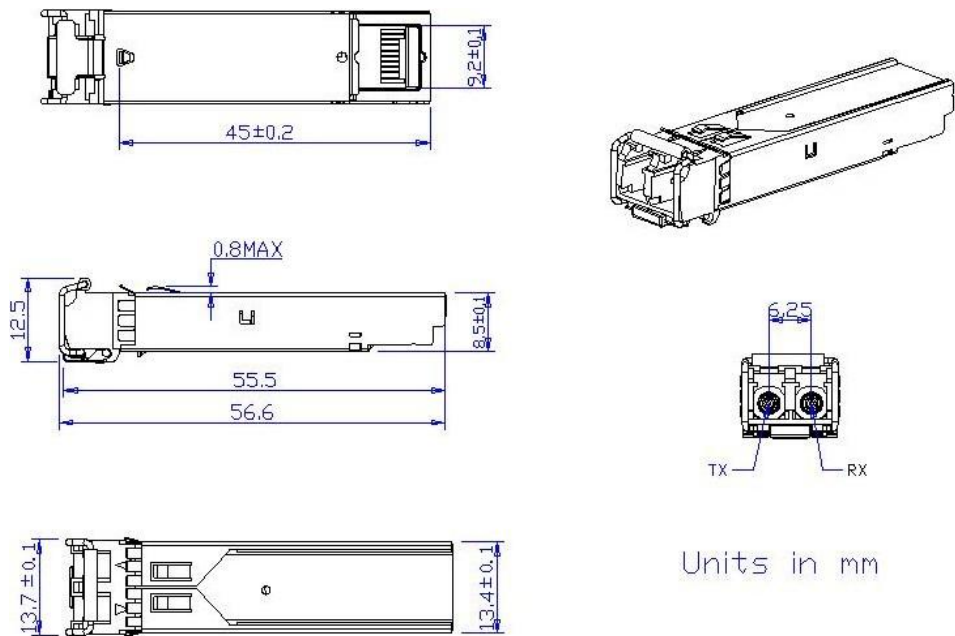


Figure2. Mechanical Outline

Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
HC-3Lx41CF	3.125	Refer to wavelengt hselection	40km SMF	0~70 commercial
HC-3Lx41EF	3.125		40km SMF	-10~80 Extended
HC-3Lx41IF	3.125		40km SMF	-40~85 Industrial