

2.5Gb/s SFP DWDM 40km Optical Transceiver Module

Features

Monitoring interface
Low power dissipation
Up to 2.5Gb/s data links
Single +3.3V power supply
Compliant with SFF-8472
Support Digital Diagnostic
Hot-pluggable SFP footprint
Metal enclosure, for lower EMI
Up to 40km on 9/125μm SMF
RoHS compliant and lead-free
Duplex LC/UPC type pluggable optical interface
DWDM DML laser transmitter and PIN photo-detector
Meet ESD requirements, resist 8KV direct contact voltage
100 GHz ITU channel spacing with integrated wavelength locker
Case operating temperature: Commercial: 0 ~ +70oC
Extended: -10 ~ +80o Industrial: -40 ~ +85oC



Applications

Gigabit Ethernet
C Band DWDM networks
1xFiber /2xFiber Channel
SONET/SDH networks

Wavelength Selection: C-band λ_c Wavelength Guide PinDescriptions

Channel	Wavelength (nm)	Frequency (THZ)	Channel	Wavelength (nm)	Frequency (THZ)
C17	1563.86	191.70	C39	1546.12	193.90
C18	1563.05	191.80	C40	1545.32	194.00
C19	1562.23	191.90	C41	1544.53	194.10
C20	1561.42	192.00	C42	1543.73	194.20
C21	1560.61	192.10	C43	1542.94	194.30
C22	1559.79	192.20	C44	1542.14	194.40
C23	1558.98	192.30	C45	1541.35	194.50
C24	1558.17	192.40	C46	1540.56	194.60
C25	1557.36	192.50	C47	1539.77	194.70
C26	1556.55	192.60	C48	1538.98	194.80
C27	1555.75	192.70	C49	1538.19	194.90
C28	1554.94	192.80	C50	1537.40	195.00
C29	1554.13	192.90	C51	1536.61	195.10
C30	1553.33	193.00	C52	1535.82	195.20
C31	1552.52	193.10	C53	1535.04	195.30
C32	1551.72	193.20	C54	1534.25	195.40
C33	1550.92	193.30	C55	1533.47	195.50
C34	1550.12	193.40	C56	1532.68	195.60
C35	1549.32	193.50	C57	1531.90	195.70
C36	1548.51	193.60	C58	1531.12	195.80
C37	1547.72	193.70	C59	1530.33	195.90
C38	1546.92	193.80	C60	1529.55	196.00
Non-ITU	Peak wavelength between 1528.77nm-1563.86nm		C61	1528.77	196.10

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	
Power Supply Voltage	VCC	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	THd	0		dBm	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	TOP	0		70	°C	commercial
		-10		80		extended
		-40		85		industrial
Power Supply Voltage	VCC	3.1 35	3.3	3.465	V	
Data Rate			2.5		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-2Lxx41x transceivers include an PIN photo-detector diode and temperature stabilized DWDM DML transmitter. Digital diagnostic functions are available via an I2C. This module is designed for single mode fiber and operates at a nominal wavelength of 100GHz ITU Grid, C Band DWDM wavelength. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

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

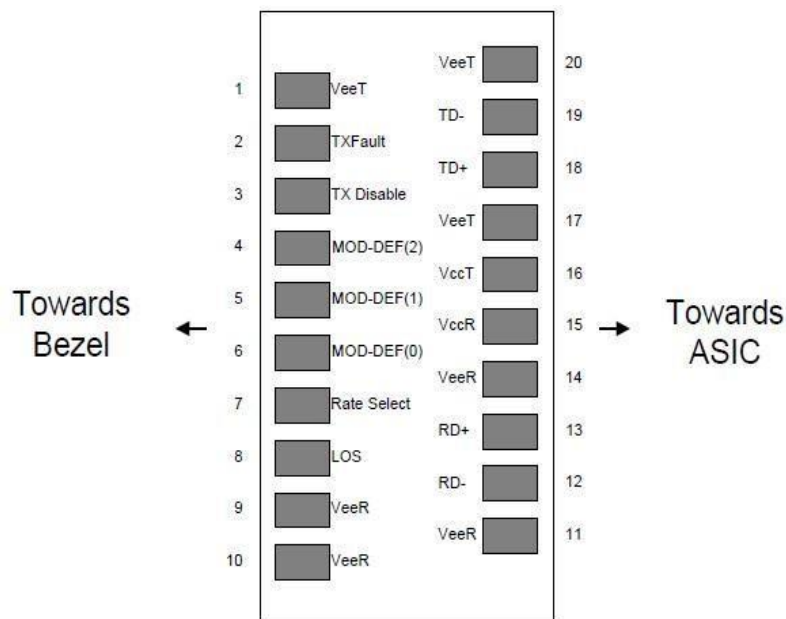


Figure1. Diagram of host board connector block pin numbers and names

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 Bandwidth
- 2) (>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.

Specification of Transmitter 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				1.0	W	commercial
				1.5		Industrial
Supply Current	Icc			300	mA	commercial
				450		Industrial
Transmitter						
Single-ended Input Voltage Tolerance		-0.3		4.0	V	
Differential Input VoltageSwing	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	

Notes:

1. λc refer to wavelength selection, and corresponds to approximately 0.8 nm
2. Measure at 2²³-1 NRZ PRBS pattern
3. Measured with Light source 1563.86~1528.77nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ

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

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor	DMI _ Temp	-3	3	degC	Over operating temp
Supply voltage monitor	DMI _ VCC	-0.15	0.15	V	Full operating range
RX power monitor	DMI _ RX	-3	3	dB	
Bias current monitor	DMI _ bias	-10%	10%	mA	
TX power monitor	DMI _ TX	-3	3	dB	

Mechanical Dimensions

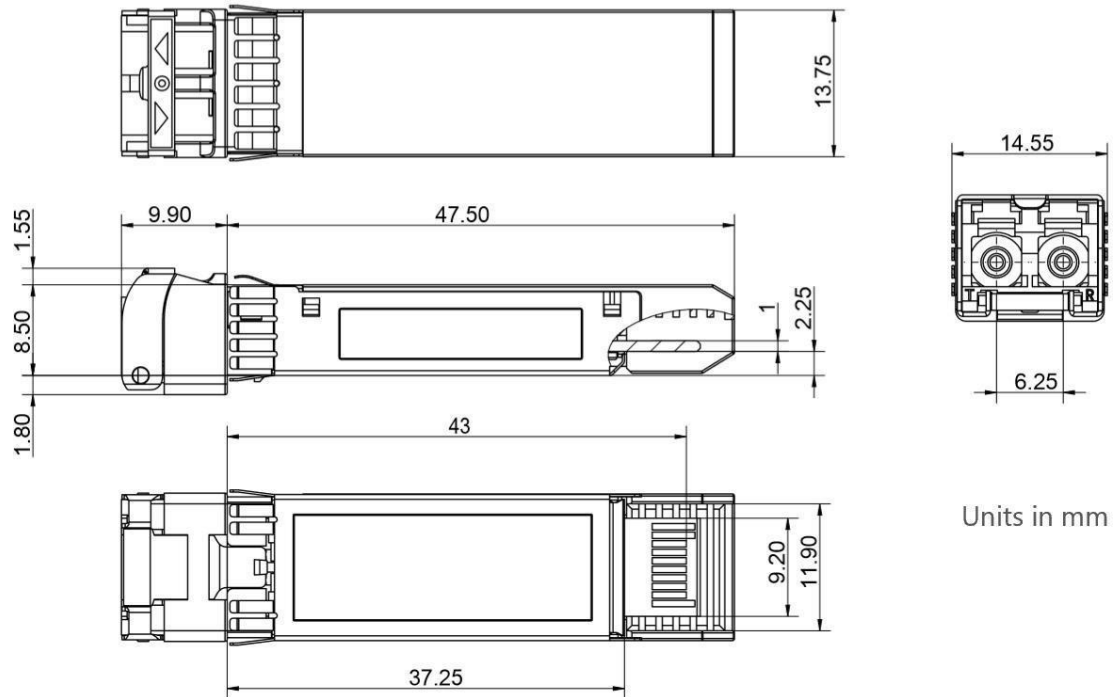


Figure2. Mechanical Outline

Ordering Information

Part Number	Data Rate (Gb/s)	Wavelength (nm)	Transmission Distance(km)	Temperature (°C) (Operating Case)
HC-2Lxx41C	2.5	Refer to wavelength selection	40km SMF	0~70 commercial
HC-2Lxx41E	2.5		40km SMF	-10~80 Extended
HC-2Lxx41I	2.5		40km SMF	-40~85 Industrial