



10G SFP+ DWDM Transceiver

Hot Pluggable, Duplex LC, 50GHz DWDM EML, SMF 40KM, DDM

Part Number: FSPP-H7-Dxxx-40D



Overview

FSPP-H7-Dxxx-40D Small Form Factor Pluggable SFP+ transceivers are compliant with the current SFP+ Multi-Source Agreement (MSA) Specification. The high performance cooled DWDM EML transmitter and high sensitivity PIN receiver provide superior performance for 10GBASE-ER/EW applications up to SMF 40km optical links with DWDM wavelength 50GHz spacing.

Applications

- 10GBASE-ER/EW Ethernet @10.3125G
- Fiber Channel 800-SM-LC-L 8GFC @8.5G, 1200-SM-LL-L 10GFC @10.51875G
- SONET OC-192 & SDH STM-64 @9.953G
- CPRI Option #7 @9.83G, #8 @10.1376G
- OTN OTU2 @10.7G, OTU2e @11.09G, OTU2f @11.32G
- 10G DWDM Networks

Features

- Compliant with IEEE802.3ae 10GBASE-ER/EW
- Compliant with CPRI Option 7, 8
- Compliant with SFF-8431, SFF-8432 SFP+ MSA
- Support 8.5Gb/s to 11.32Gb/s Multi-Rate
- Hot Pluggable
- 50GHz ITU Grid, C-Band DWDM cooled EML laser transmitter
- Duplex LC connector
- 2-wire interface for management and diagnostic monitor compliant with SFF-8472
- Single +3.3V power supply
- Link distance 40km over SM fiber
- RoHS Compliant

Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.



Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-40	+85	°C
Storage Relative Humidity	RH	5	95	%
Supply Voltage	V _{CC}	-0.5	+4.0	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temp. (FSPP-H7-Dxxx-40D)	T _{OP}	0	-	+70	°C
Case Operating Temp. (FSPP-H7-Dxxx-40Di)	T _{OP}	-40	-	+85	°C
Supply Voltage	V _{CC}	+3.13	+3.3	+3.47	V
Supply Current (FSPP-H7-Dxxx-40D)	I _{CC}	-	-	500	mA
Supply Current (FSPP-H7-Dxxx-40Di)	I _{CC}	-	-	550	mA

Transmitter Electro-optical Characteristics

V_{CC} = 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C(FSPP-H7-Dxxx-40D); T_{OP} = -40 °C to 85 °C(FSPP-H7-Dxxx-40Di)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	8.5	10.3125	11.32	Gb/s	
Optical Launch Power	P _o	-1		+2	dBm	1
Optical Center Wavelength	λ _c	λ _c -0.06	λ _c	λ _c +0.06	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	8.2			dB	
Dispersion Penalty	DP			2	dB	
Optical Eye Mask		IEEE802.3ae				
Relative Intensity Noise	RIN			-128	dB/H z	
Differential Data Input Swing	V _{IN}	180		850	mV	
Tx Disable Input Voltage-Low (Tx ON)	TDISV _L	GND		0.8	V	
Tx Disable Input Voltage-High (Tx OFF)	TDISV _H	2.0		V _{CC}	V	
Tx Fault Output Voltage-Low (Tx Normal)	TFLT _{V_L}	GND		0.8	V	
Tx Fault Output Voltage-High (Tx Fault)	TFLT _{V_H}	2.0		V _{CC}	V	

Note1: The optical power is launched into a 9/125μm single mode fiber.



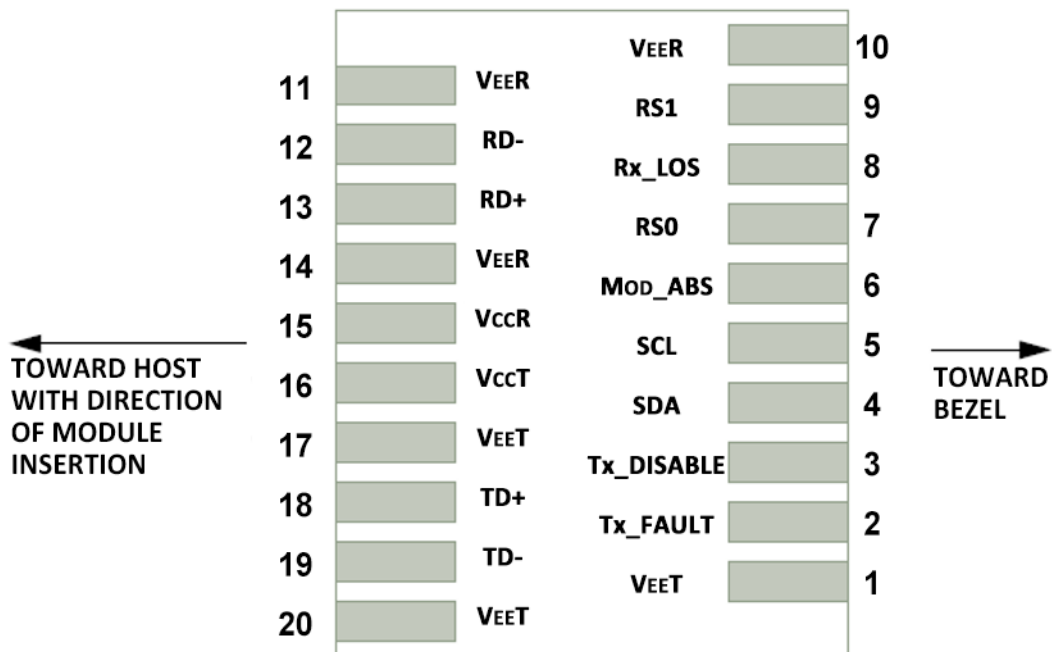
Receiver Electro-optical Characteristics

$V_{CC} = 3.13V$ to $3.47V$, $T_{OP} = 0\text{ }^{\circ}C$ to $70\text{ }^{\circ}C$ (FSPP-H7-Dxxx-40D); $T_{OP} = -40\text{ }^{\circ}C$ to $85\text{ }^{\circ}C$ (FSPP-H7-Dxxx-40Di)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	8.5	10.3125	11.32	Gb/s	
Receiver Sensitivity	SEN			-16	dBm	1
Maximum Receive Power	PRX-MAX	+0.5			dBm	1
Optical Center Wavelength	λ_c	1260		1620	nm	
LOS De-Assert	LOS _D			-17	dBm	
LOS Assert	LOS _A	-28			dBm	
LOS Hysteresis	LOS _{HY}	0.5			dB	
Differential Data Output Swing	V _{OUT}	300		900	mV	
Receiver LOS Signal Output Voltage-Low	LOS _{VL}	GND		0.8	V	
Receiver LOS Signal Output Voltage-High	LOS _{VH}	2.0		V _{CC}	V	

Note1: Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps BER<10⁻¹².

Pin Assignment



Host PCB SFP+ Pad Assignment Top View



Pin Description

Pin	Name	Function / Description
1	VEET	Transmitter Ground
2	Tx_FAULT	Transmitter Fault Indication (1)
3	Tx_DISABLE	Transmitter Disable – Turns off transmitter laser output (2)
4	SDA	2-wire Serial Interface Data Line (SDA: Serial Data Signal) (3)
5	SCL	2-wire Serial Interface Clock (SCL: Serial Clock Signal) (3)
6	MOD_ABS	Module Absent, connected to VEET or VEER in the module (3)
7	RS0	Rate Select 0, optional (5)
8	Rx_LOS	Receiver Loss of Signal Indication (4)
9	RS1	Rate Select 1, optional (5)
10	VEER	Receiver Ground
11	VEER	Receiver Ground
12	RD-	Receiver Inverted Data output, AC coupled
13	RD+	Receiver Non-Inverted Data output, AC coupled
14	VEER	Receiver Ground
15	VccR	Receiver 3.3V Power Supply
16	VccT	Transmitter 3.3V Power Supply
17	VEET	Transmitter Ground
18	TD+	Transmitter Non-Inverted Data Input, AC coupled
19	TD-	Transmitter Inverted Data Input, AC coupled
20	VEET	Transmitter Ground

Note1: Tx Fault is open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

Note2: Tx Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K~10KΩ resistor. 1) Low(0~0.8V): Transmitter on; 2) Between(0.8V and 2V): Undefined; 3) High (2.0~ VccT): Transmitter Disabled; 4) Open: Transmitter Disabled.

Note3: These are the module definition pins. They should be pulled up with a 4.7K~10KΩ resistor on the host board to supply less than VccT+0.3V or VccR+0.3V. MOD_ABS is grounded by the module to indicate that the module is present.

Note4: Rx_LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K~10KΩ resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

Note5: Tied to ground through a 30K ohm resistor.



Digital Diagnostic Functions

As defined by the SFP MSA (SFF-8472) Ficer's SFP+ transceivers provide digital diagnostic functions via a 2-wire serial interface, which allows real-time access to the following operating parameters:

- Transceiver temperature
- Laser bias current
- Transmitted optical power
- Received optical power
- Transceiver supply voltage

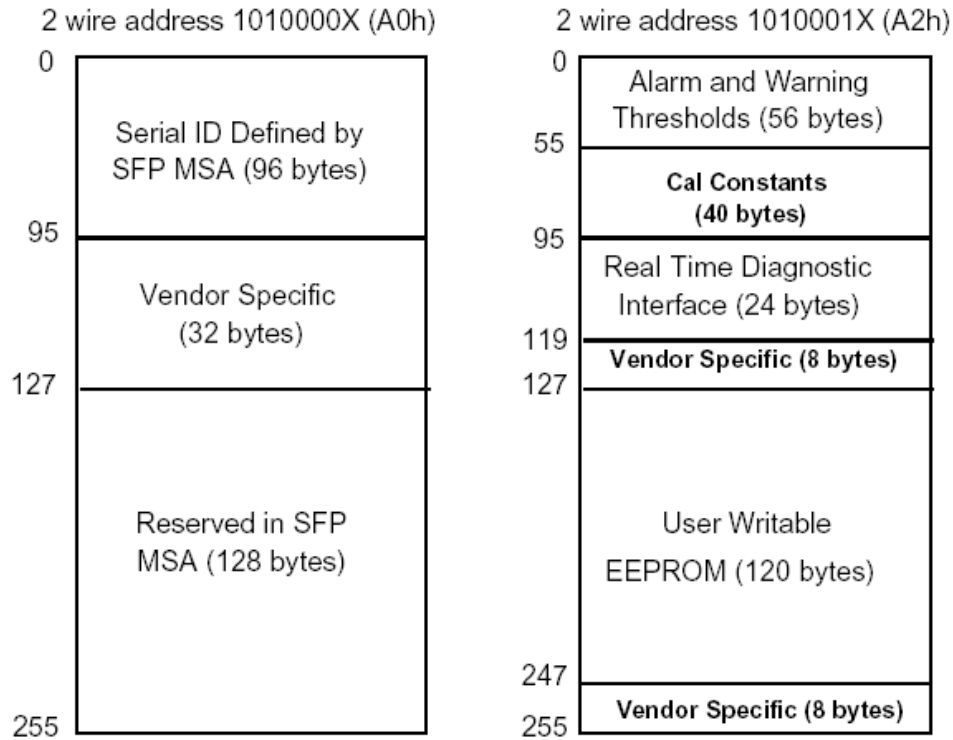
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Controller (DDC) inside the transceiver, which is accessed through the 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL pin) is generated by the host. The positive edge clocks data into the SFP+ transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA pin) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

For more detailed information including memory map definitions, please see the SFP MSA (SFF-8472) Specification.



Digital Diagnostic Memory Map

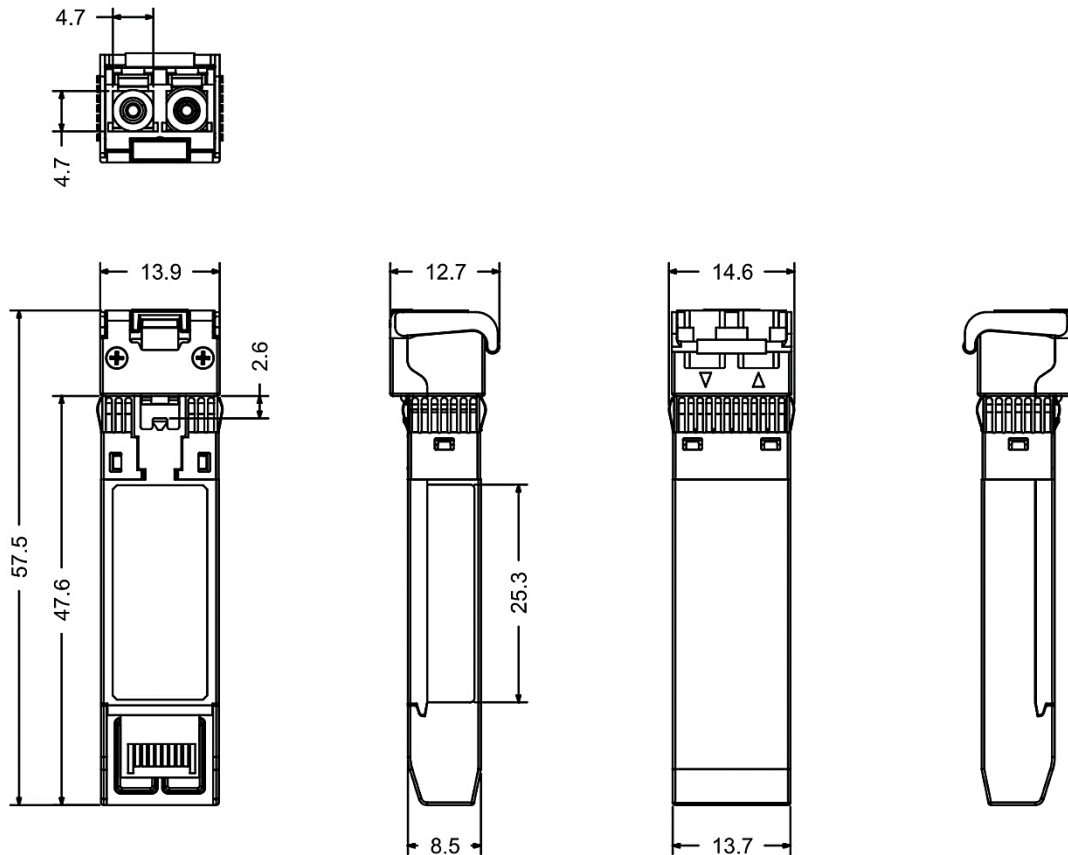


Digital Diagnostic Monitoring Characteristics

Parameter	Accuracy	Unit	Note
Temperature	±3	°C	Internal Calibration
Supply Voltage	±0.1	V	Internal Calibration
Tx Bias Current	±5	mA	Internal Calibration
Tx Output Power	±3	dB	Internal Calibration
Rx Received Optical Power	±3	dB	Internal Calibration



Mechanical Dimensions



(All Dimensions are ± 0.20 mm Unless Otherwise Specified, Unit: mm)

Ordering Information

Part No.	Tx	Rx	Link	DDM	Temp.
FSPH-H7-Dxxx-40D	50GHz ITU Grid C-Band DWDM	1260nm	SMF 40km	Yes	0~70°C
FSPH-H7-Dxxx-40Di		~ 1620nm			-40~85°C

ps: xxx=DWDM Channel Number. Please refer to appendix A for more detail.

Note: Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.



Appendix A: 50GHz ITU Grid DWDM Central Wavelength Table

Channel	Wavelength (nm)	Frequency (THZ)	Channel	Wavelength (nm)	Frequency (THZ)
61C	1528.77	196.10	38C	1546.92	193.80
61H	1528.38	196.15	38H	1546.52	193.85
60C	1529.55	196.00	37C	1547.72	193.70
60H	1529.16	196.05	37H	1547.32	193.75
59C	1530.33	195.90	36C	1548.51	193.60
59H	1529.94	195.95	36H	1548.11	193.65
58C	1531.12	195.80	35C	1549.32	193.50
58H	1530.72	195.85	35H	1548.91	193.55
57C	1531.90	195.70	34C	1550.12	193.40
57H	1531.51	195.75	34H	1549.72	193.45
56C	1532.68	195.60	33C	1550.92	193.30
56H	1532.29	195.65	33H	1550.52	193.35
55C	1533.47	195.50	32C	1551.72	193.20
55H	1533.07	195.55	32H	1551.32	193.25
54C	1534.25	195.40	31C	1552.52	193.10
54H	1533.86	195.45	31H	1552.12	193.15
53C	1535.04	195.30	30C	1553.33	193.00
53H	1534.64	195.35	30H	1552.93	193.05
52C	1535.82	195.20	29C	1554.13	192.90
52H	1535.43	195.25	29H	1553.73	192.95
51C	1536.61	195.10	28C	1554.94	192.80
51H	1536.22	195.15	28H	1554.54	192.85
50C	1537.40	195.00	27C	1555.75	192.70
50H	1537.00	195.05	27H	1555.34	192.75
49C	1538.19	194.90	26C	1556.55	192.60
49H	1537.79	194.95	26H	1556.15	192.65
48C	1538.98	194.80	25C	1557.36	192.50
48H	1538.58	194.85	25H	1556.96	192.55
47C	1539.77	194.70	24C	1558.17	192.40
47H	1539.37	194.75	24H	1557.77	192.45
46C	1540.56	194.60	23C	1558.98	192.30
46H	1540.16	194.65	23H	1558.58	192.35
45C	1541.35	194.50	22C	1559.79	192.20
45H	1540.95	194.55	22H	1559.39	192.25
44C	1542.14	194.40	21C	1560.61	192.10
44H	1541.75	194.45	21H	1560.20	192.15
43C	1542.94	194.30	20C	1561.42	192.00
43H	1542.54	194.35	20H	1561.01	192.05
42C	1543.73	194.20	19C	1562.23	191.90
42H	1543.33	194.25	19H	1561.83	191.95
41C	1544.53	194.10	18C	1563.05	191.80
41H	1544.13	194.15	18H	1562.64	191.85
40C	1545.32	194.00	17C	1563.86	191.70
40H	1544.92	194.05	17H	1563.45	191.75
39C	1546.12	193.90			
39H	1545.72	193.95			