



25G Multi-Rate SFP28 LWDM Transceiver

Hot Pluggable, Duplex LC, 800GHz LWDM EML, SMF 40KM, DDM

Part Number: FSPP-N7-Lxx-40DM



Overview

FSPP-N7-Lxx-40DM is a Small Form Factor Pluggable SFP28 transceiver compliant with SFF-8402 SFP28 MSA standard. The high performance cooled LWDM EML transmitter and high sensitivity APD receiver with built-in CDR provide superior performance for 1~25Gbps Multi-Rate applications up to SMF 40km optical links.

Applications

- Gigabit Ethernet @1.25G
- 10GBASE-ER/EW Ethernet @10.3125G
- 25GBASE-ER Ethernet @25.78G
- Fiber Channel 1GFC @1.0625G, 2GFC @2.125G, 4GFC @4.25G, 8GFC @8.5G, 10GFC @10.51875G, 16GFC @14.025G
- SONET OC-192 & SDH STM-64 @9.953G
- SONET OC-48 & SDH STM-16 @2.488G
- OBSAI @6.144G / 3.072G / 1.536G
- CPRI @24.33G / 12.1651G / 10.1376G / 9.8304G / 6.144G / 4.9152G / 3.072G / 2.4576G / 1.2288G
- OTN OTU2 @10.7G, OTU2e @11.09G,
- OTU2f @11.32G

Features

- Compatible with IEEE802.3cc 25GBASE-ER
- Compatible with IEEE802.3ae 10GBASE-ER/EW
- Compliant with CPRI option 2~10
- Compliant with SFF-8402 SFP28 MSA
- Support 1.0625Gb/s ~ 25.78Gb/s Multi-Rate
- Built-in CDR on both Transmitter and Receiver
- Rate select controlled by 2-wire interface
- 800GHz ITU Grid, cooled O-Band LWDM EML laser transmitter
- APD Receiver
- Hot Pluggable
- 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
- Maximum Power consumption 2.3W
- 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 _{CC3}	-0.5	+4.0	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temp. (FSPP-N7-Lxx-40DM)	T _{OP}	0	-	+70	°C
Case Operating Temp. (FSPP-N7-Lxx-40DMi)	T _{OP}	-40	-	+85	°C
Supply Voltage	V _{CC}	+3.13	+3.3	+3.47	V
Supply Current	I _{CC}	-	-	700	mA
Power Consumption	P			2.3	W

Transmitter Electro-optical Characteristics

V_{CC} = 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C(FSPP-N7-Lxx-40DM); T_{OP} = -40 °C to 85 °C(FSPP-N7-Lxx-40DMi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	1.0625	25.78		Gb/s	
Optical Launch Power	P _o	0		+6	dBm	1
Optical Center Wavelength	λ _c	1268.24	1269.23	1270.22	nm	
		1272.55	1273.54	1274.54		
		1276.89	1277.89	1278.89		
		1281.25	1282.26	1283.27		
		1285.65	1286.66	1287.69		
		1290.07	1291.10	1292.12		
		1294.53	1295.56	1296.59		
		1299.02	1300.05	1301.09		
		1303.54	1304.58	1305.63		
		1308.09	1309.14	1310.19		
		1312.67	1313.73	1314.79		
1317.29	1318.35	1319.42				
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	



Optical Extinction Ratio	ER	6			dB	
Dispersion Penalty	DP			3.0	dB	2
Optical Eye Mask		IEEE 802.3cc				
Relative Intensity Noise	RIN			-130	dB/Hz	
Differential Data Input Swing	V _{IN}	190		700	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.

Note2: After 40km G.652D 9/125μm single mode fiber.

Receiver Electro-optical Characteristics

V_{CC} = 3.13V to 3.47V, T_{OP} = 0 °C to 70 °C(FSP-P-N7-Lxx-40DM); T_{OP} = -40 °C to 85 °C(FSP-P-N7-Lxx-40DMi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR	1.0625	25.78		Gb/s	
Receiver Sensitivity @25G	SEN			-19	dBm	1
Receiver Sensitivity @10G				-20.5		2
Receiver Sensitivity @1G				-24		3
Maximum Receive Power	P _{RX-MAX}	-4			dBm	1
Optical Center Wavelength	λ _c	1260		1355	nm	
LOS De-Assert	LOS _D			-21.5	dBm	
LOS Assert	LOS _A	-30			dBm	
LOS Hysteresis	LOS _{HY}	0.5			dB	
Differential Data Output Swing	V _{OUT}	300		850	mV	
Receiver LOS Signal Output Voltage-Low	LOS _V _L	GND		0.8	V	
Receiver LOS Signal Output Voltage-High	LOS _V _H	2.0		V _{cc}	V	

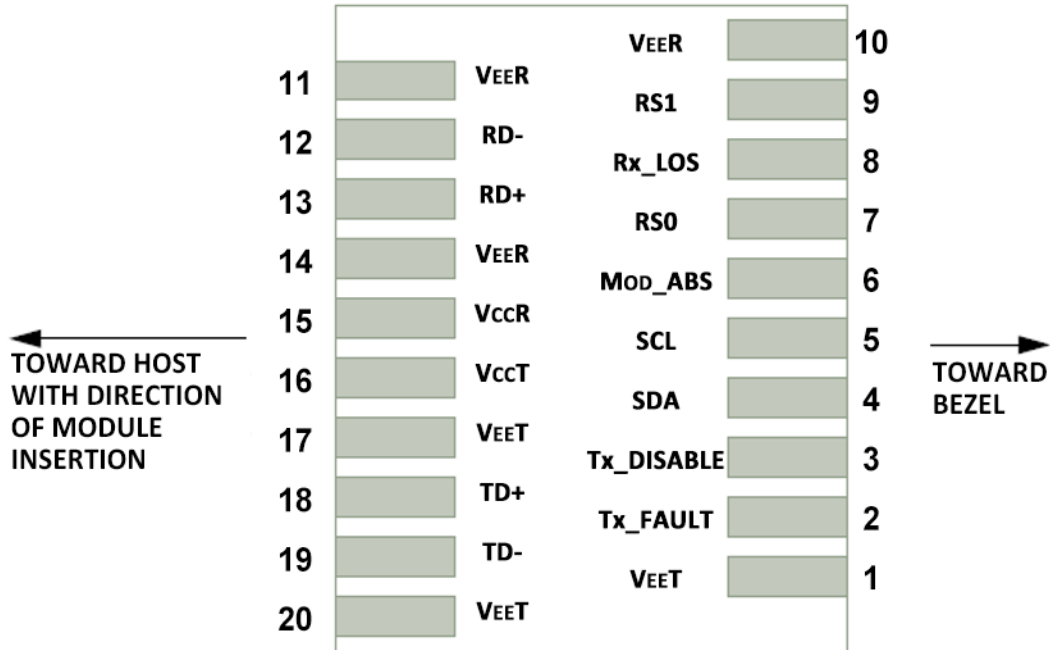
Note1: Measured with a PRBS 2³¹-1 test pattern @25.78Gbps BER<5x10⁻⁵.

Note2: Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps BER<10⁻¹².

Note3: Measured with a PRBS 2⁷-1 test pattern @1.25Gbps BER<10⁻¹².



Pin Assignment



Host PCB SFP28 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 $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. 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 <math><0.8V</math>.
- 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~ V_{ccT}): 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 $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. 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 $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. 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 <math><0.8V</math>.
- Note5:** Tied to ground through a 30K ohm resistor. Rate select can be set through the 2-wire bus in accordance with SFF-8472 v12.1c. Tx Rate Select is set at Bit 3, Byte 118, Address A2h ; Rx Rate Select is set at Bit 3, Byte 110, Address A2h. Writing “1” selects CDR enable for 25G operation ; Writing “0” selects CDR bypass for 1~25G operation.

Digital Diagnostic Functions

As defined by the SFP MSA (SFF-8472) Ficer’s SFP28 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

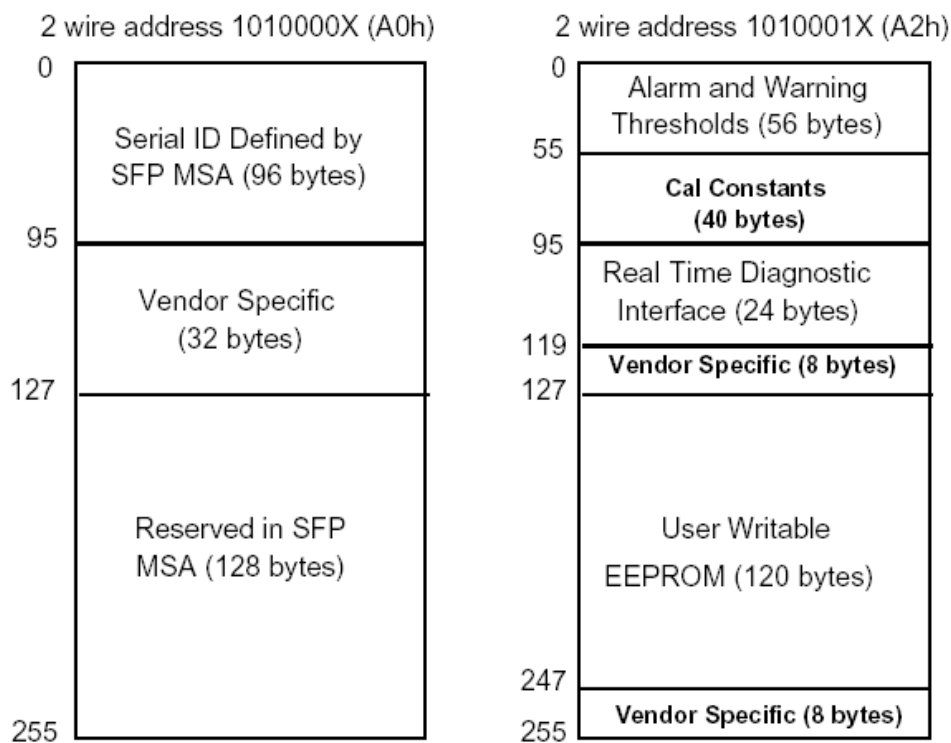
It also provides a sophisticated system of alarm and warning flags, which may be used to alert end-users when particular operating parameters are outside of a factory-set normal range.

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



SFP28 transceiver into those segments of its memory map that are not write-protected. The negative edge clocks data from the SFP28 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

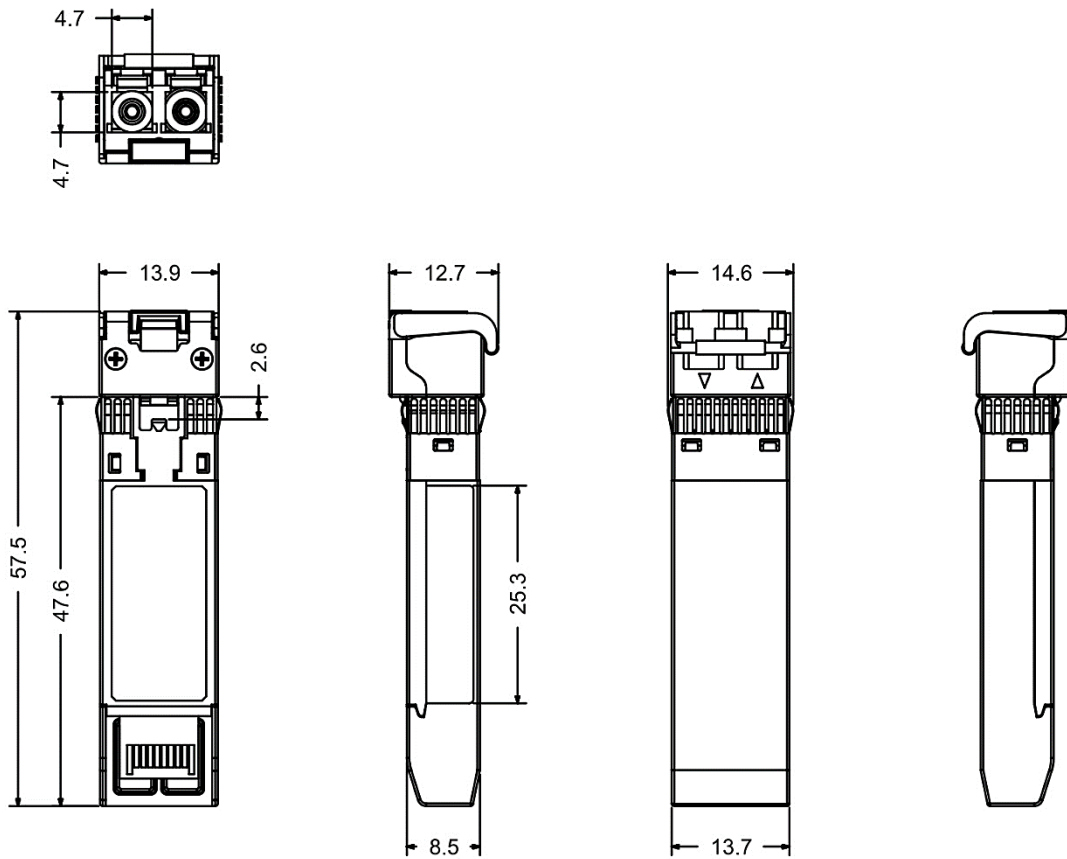


Digital Diagnostic Monitoring Characteristics

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 $\pm 0.20\text{mm}$ Unless Otherwise Specified, Unit: mm)



Ordering Information

Part No.	Tx	Rx	Link	DDM	Temp.
FSPP-N7-Lxx-40DM	69=1269.23nm	1260nm ~ 1600nm	SMF 40km	Yes	0~70°C
	73=1273.54nm				
	77=1277.89nm				
	82=1282.26nm				
	86=1286.66nm				
91=1291.10nm	-40~85°C				
95=1295.56nm					
00=1300.05nm					
04=1304.58nm					
09=1309.14nm					
13=1313.73nm					
18=1318.35nm					

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.