

1250Mbps SFP Transceiver With Digital Diagnostic Function MXPD-248S-E



Features:

- Operating data rate 1250Mbps
- Industry standard Small Form Pluggable (SFP) package
- Digital diagnostic monitor interface compliant with SFF-8472
- Duplex LC connector
- Single +3.3V power supply
- Differential LVPECL inputs and Differential LVPECL /CML outputs
- TTL signal detect indicator
- Hot-pluggable capability
- RoHS compliant

Application:

- Switch to Switch interface
- Switched backplane applications
- Router/Server interface
- Other optical transmission systems

Description:

The MXPD-248S-E transceiver is a high performance, cost effective module that supports data-rate up to 1250Mbps for 550m distance with 50 μ m MMF.

The transmitter section and the receiver section work independently in the transceiver. The receiver section contains an GaAs PIN photo diode (active optical wavelength from 770nm to 860nm), a transimpedance amplifier and a post amplifier (with working data rate up to 1250Mbps), functionally transmit received optical power to steady electrical data. The transmitter section contains a 850nm VCSEL laser with back-facet monitor and a laser driver with APC function, transmit input electrical data to steady optical output signal.

This transceiver meets the Small Form Pluggable (SFP) industry standard package utilizing an integral LC-Duplex optical interface connector. An enhanced Digital Diagnostic Monitoring Interface compliant with SFF-8472 has been incorporated into the transceiver. It allows real time access to the transceiver operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage by reading a built-in memory with I²C interface.

MXPD-248S-E-F is compliant with RoHS5.

MXPD-248S-E-G is compliant with RoHS6.

Specification:

Absolute Maximum Ratings						
Parameter	Symbol	Min.	Max.	Unit	Note	
Storage Temperature	T _s	-40	+85	°C		
Operating Temperature	T _O	0	+75	°C		
Power Supply Voltage	V _{CC}	-0.5	3.7	V		
Operating Relative Humidity		0	85	%		

Recommended Operating Conditions						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Temperature	T _s	0	+25	+75	°C	
Power Supply Voltage	V _{CC}	3.1	3.3	3.5	V	
Power Supply Current	I _{CC}			300	mA	
Power Dissipation	P _{DISS}			1	W	
Data Rate			1250		Mbps	

Regulatory Compliance		
Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 2(>2000 Volts)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Class B; (CISPR22:1997 /EN55022: 1998)	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1002.10 and 1002.13 EN (IEC) 60825-1,2	Compatible with Class I laser Product
Component Recognition	UL and CE TUV	Compatible with standards

MXPD-248S-E (850nm VCSEL and PIN, 550m, Monitoring function)
Transmitter Optical, Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Transmitter Differential Input Voltage	$V_{in\ PP}$	200		2400	mV	AC-coupled
Transmit Disable Input High Voltage		2.0			V	
Transmit Disable Input Low Voltage				0.8	V	
Optical Transmit Power	P_O	-9.5		-3	dBm	Average Power
Extinction Ratio	ER	9			dB	
Optical Rise Time	T_R			260	ps	20%~80%
Optical Fall Time	T_F			260	ps	20%~80%
Total Jitter	T_j			227	ps	
Central Wavelength	λ_c	770	850	860	nm	
Output Spectrum Width (RMS)	$\Delta\lambda$			0.85	nm	
Optical Eye Mask Margin			20%			

Receiver Optical, Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Receiver Differential Output Voltage	$V_{out\ PP}$	600		1200	mV	50Ω load to Vcc-2V
Receiver Loss of Signal Output Voltage -High		2.0			V	External 4.7-10KΩ pull up to Vcc
Receiver Loss of Signal Output Voltage -Low				0.8	V	External 4.7-10KΩ pull up to Vcc
Sensitivity	Sen			-17	dBm	BER<1E-12
Maximum Input Power	P_{inMAX}	0			dBm	
Signal Detect-Deasserted	Pa			-20	dBm	
Signal Detect-Asserted	Pd	-35			dBm	
Signal Detect-Hysteresis		0.5			dB	

- Test condition: 1. Top=-10 to 75°C, Vcc=3.1 to 3.5V;
 2. PRBS 2⁷-1 test pattern @1.25Gbps;
 3. Total Jitter is measured at 50% threshold using PRBS 2⁷-1 test pattern @1.25Gbps.

Reliability Test Definitions and Distributions					
Group	Test	Reference	Condition	SS	C
Mechanical Integrity	Mechanical shock	MIL-STD-883 Method 2002.3	5 times/axis, 1500G, 0.5ms	11	0
	Vibration	MIL-STD-883 Method 2007.2	20G, 20~2000Hz, 4min/cys,4cys/axis	11	0
Endurance	Accelerated Aging	GR-468-CORE	85°C, 2000 hrs	25	-
	High temperature Storage	GR-468-CORE	85°C, 2000 hrs	11	0
	Low temperature Storage	GR-468-CORE	-40°C, 2000 hrs	11	0
	Temperature Cycles	MIL-STD-883 Method 1010.7	-40°C~85°C 500 cycles	11	0
	Damp Heat	MIL-STD-202 Method 103	85 °C, 85%RH 1000 hrs	11	0
	Cyclic moisture resistance	MIL-STD-883 Method 1004.7	20 cycles	11	0
Special Test	ESD threshold	MIL-STD-883E Method 3015.7	2000V HBM	6	0

Note:

1. SS: Sample Size;
2. C: Maximum number of failure allowed in the test.

Pin Definition:

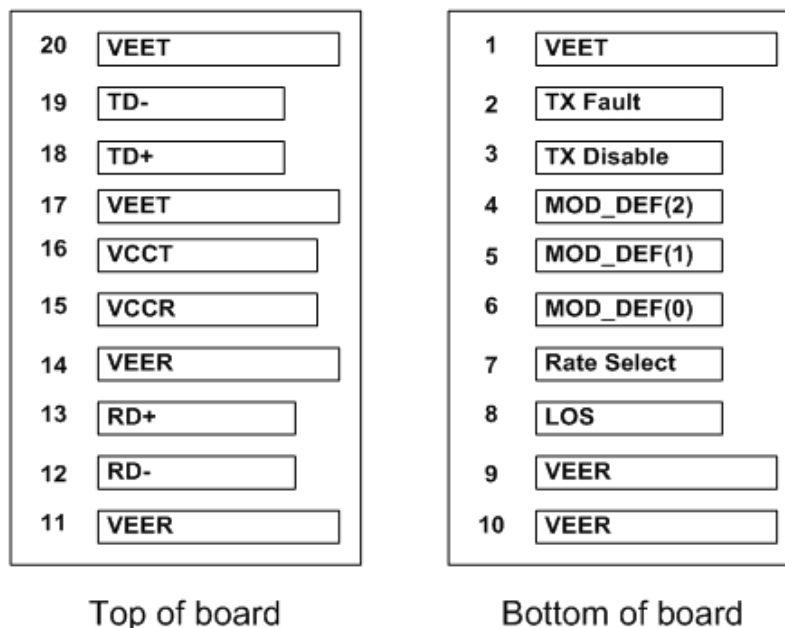
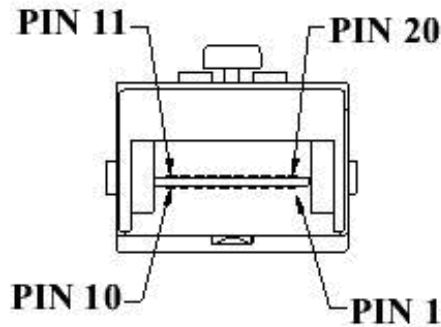


Figure1

Pin Assignment:

Figure2

Pin	Name	Description
1	VEET	Transmitter Ground
2	TXFAULT	Transmitter Fault.
3	TXDIS	Transmitter Disable.
4	MOD_DEF(2)	SDA Serial Data Signal
5	MOD_DEF(1)	SCL Serial Clock Signal
6	MOD_DEF(0)	Grounded within the module.
7	Rate Select	No connection required
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.
9	VEER	Receiver Ground
10	VEER	Receiver Ground
11	VEER	Receiver Ground
12	RD-	Receiver Inverted DATA out.
13	RD+	Receiver Non-inverted DATA out.
14	VEER	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET	Transmitter Ground
18	TD+	Transmitter Non-Inverted DATA in.
19	TD-	Transmitter Inverted DATA in.
20	VEET	Transmitter Ground

Block Diagram Of Transceiver

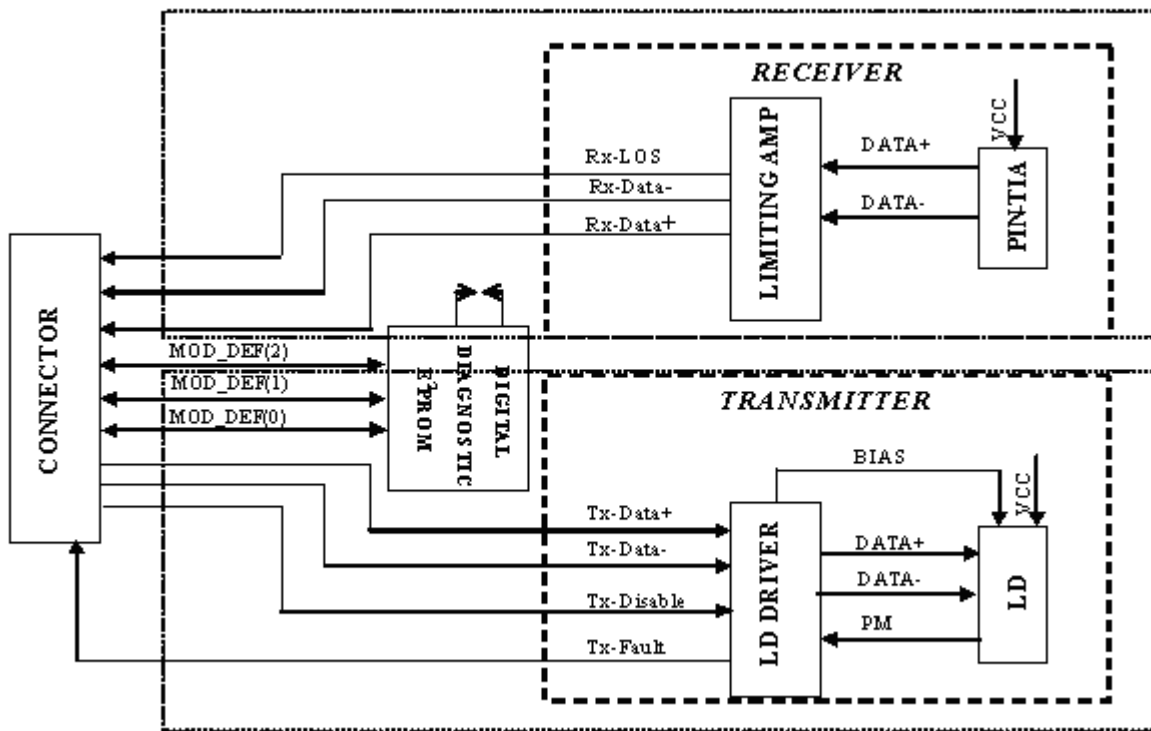


Figure3

Transmitter Section

TX-FAULT

TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V. When sensing an improper power level in the laser driver, the SFP sets this signal high and turns off the laser. TX-FAULT can be reset with the TX-DISABLE line. The signal is in TTL level.

TX-DISABLE

TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are: Low (0 – 0.8V): Transmitter on; (>0.8, < 2.0V): Undefined; High (2.0 – 3.465V): Transmitter Disabled; Open: Transmitter Disabled. The TX-DISABLE signal is high (TTL logic “1”) to turn off the laser output. The laser will turn on when TX-DISABLE is low (TTL logic “0”).

TD-/+

These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on

the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single-ended) be used for best EMI performance.

Receiver Section

RX-LOS

LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K Ω resistor. Pull up voltage between 2.0V and V_{ccT} , $R+0.3V$. 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.

The RX-LOS is high (TTL logic “1”) when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

RD-/+

These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.

Mod-Def 0, 1, 2.

Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 - 10K resistor on the host board to supply less than $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$.

Mod-Def 0 is grounded by the module to indicate that the module is present.

Mod-Def 1 is clock line of two wire serial interface for optional serial ID.

Mod-Def 2 is data line of two wire serial interface for optional serial ID.

Recommended Interface Circuit:

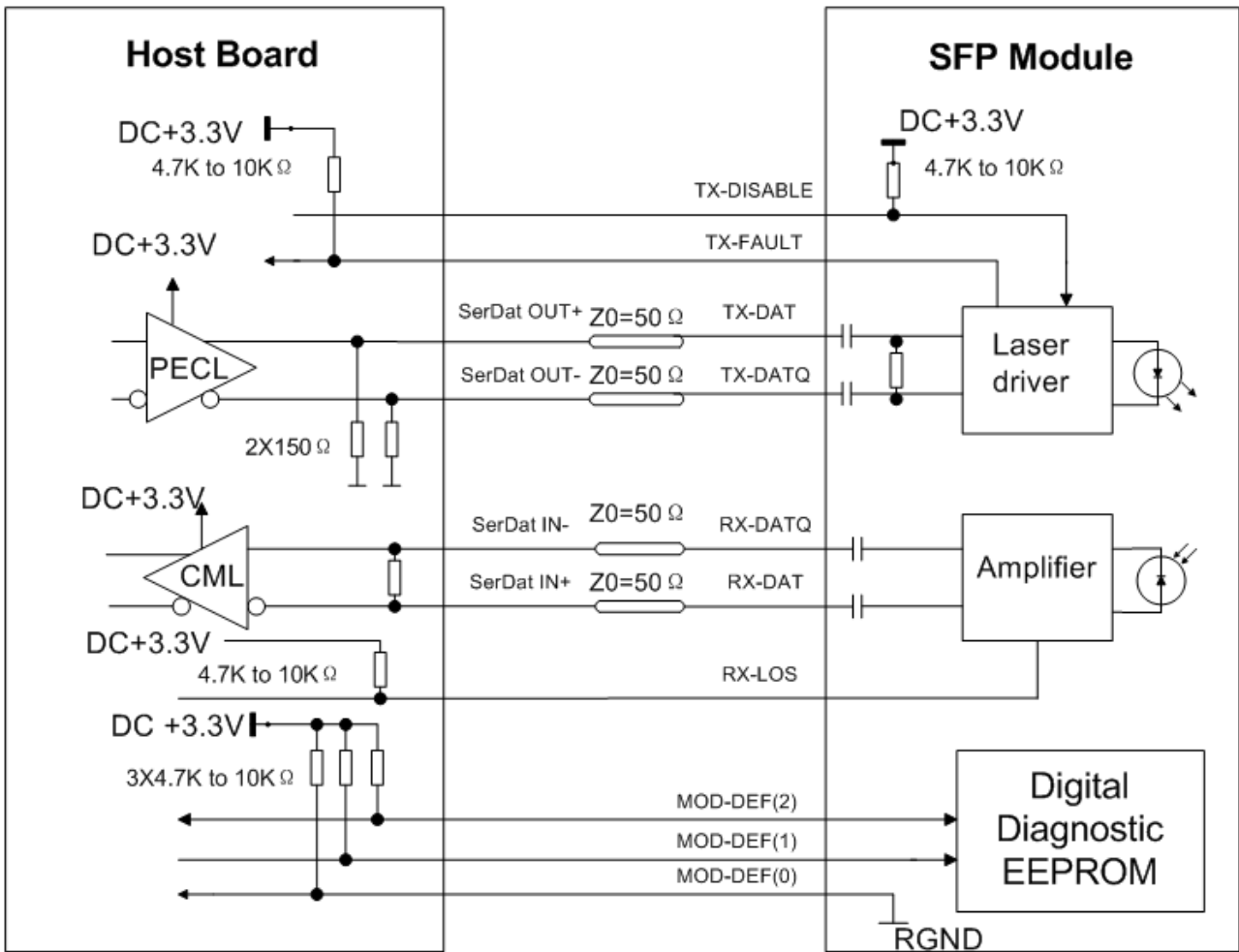


Figure4

Dimensions:

Dimensions are in millimeters. All dimensions are $\pm 0.1\text{mm}$ unless otherwise specified. (Unit: mm).

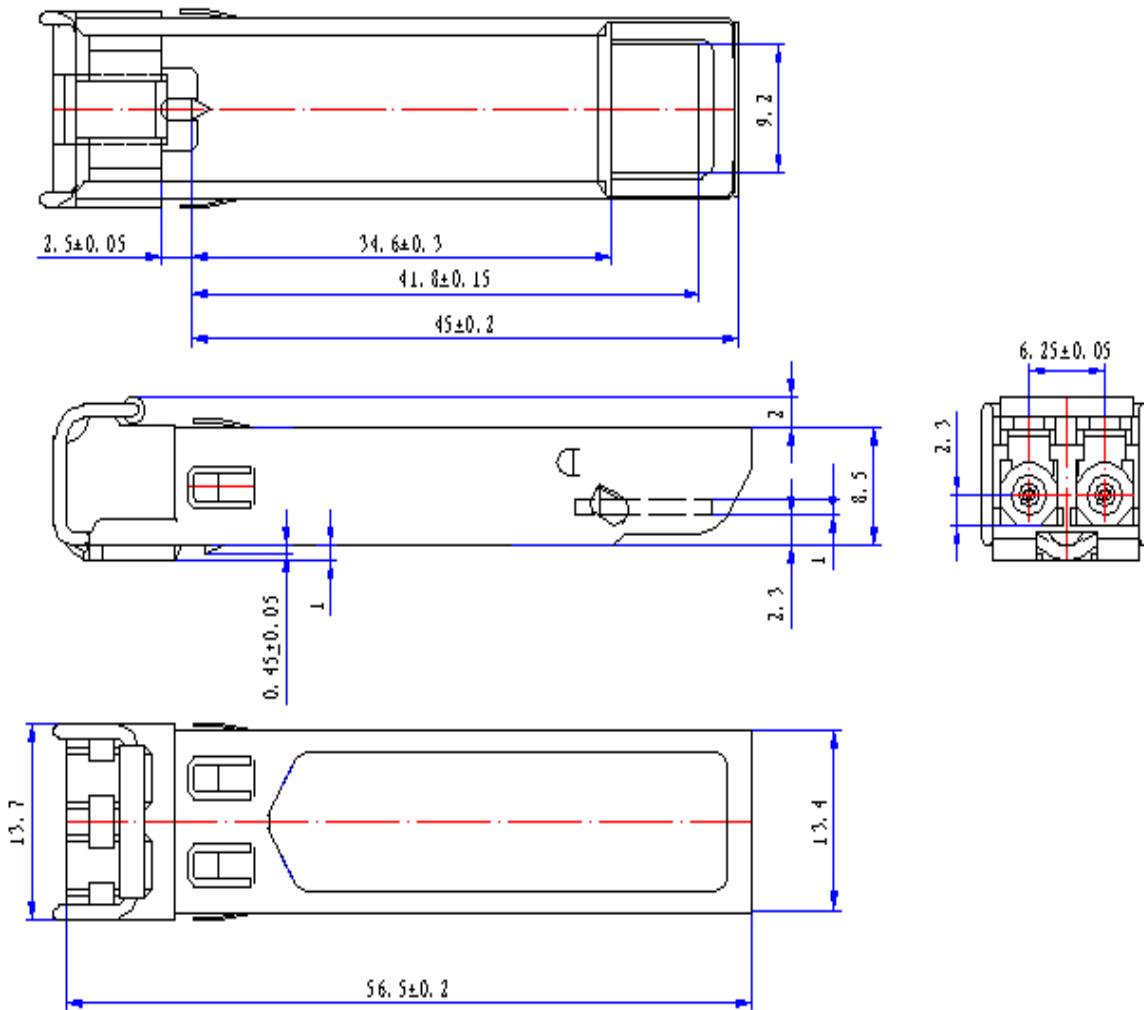
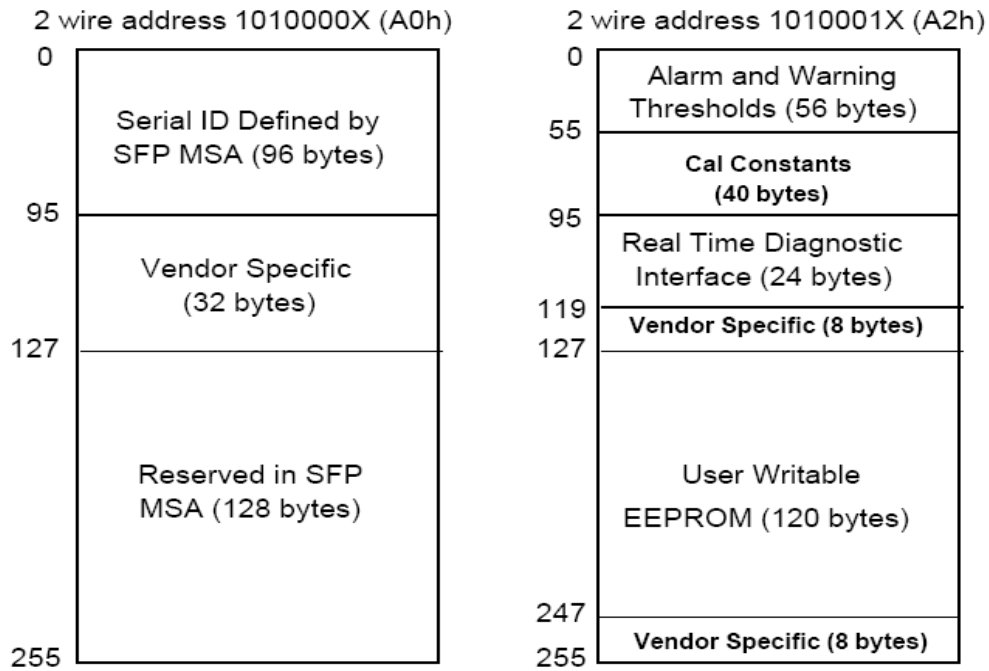


Figure5

Digital Diagnostic Memory Map:

EEPROM Serial ID Memory Contents:

Accessing Serial ID Memory uses the 2 wire address 1010000X (A0). Memory Contents of Serial ID are shown in the table below:

MXPD-248S-E (850nm VCSEL and PIN, 550m, Monitoring function)

Data Address	Size (Bytes)	Name of Field	Contents(Hex)	Description
BASE ID FIELDS				
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	SFP function is defined by serial ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver	00 00 00 01 20 40 0C 01	Transceiver Codes
11	1	Encoding	01	8B/10B
12	1	BR, Nominal	0D	1250 Mbps
13	1	Reserved	00	
14	1	Length(9um,km)	00	Not compliant
15	1	Length (9um)	00	
16	1	Length (50um)	37	Transceiver transmit distance (550m/50um,270m/62.5um)
17	1	Length (62.5um)	1B	

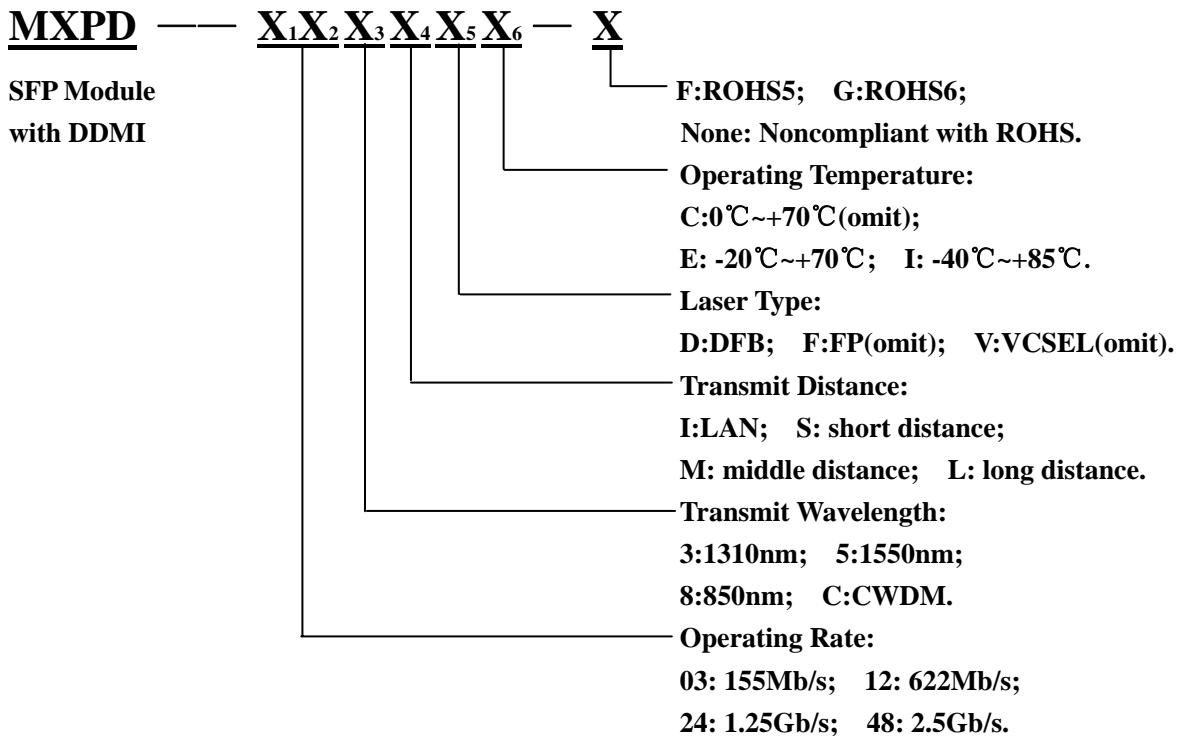
18	1	Length (Copper)	00	Not compliant
19	1	Reserved	00	
20-35	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	“HG GENUINE” (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	4D 58 50 44 2D 32 34 38 53 20 20 20 20 20 20 20	“MXPD-248S-E” (ASCII)
56-59	4	Vendor rev	00 00 00 00	
60-61	2	Wavelength	03 52	Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	Check Sum (Variable)	Check code for Base ID Fields
EXTENDED ID FIELDS				
64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	20 20 20 20 20 20 20 20 38 37 36 35 34 33 32 31	Serial Number of transceiver (ASCII). For example “87654321”.
84-91	8	Date code	30 34 31 32 30 35 20 20	Manufactory date code. For example “041205”.
92	1	Diagnostic Monitoring Type	58	Diagnostics (Ext.Cal)
93	1	Enhanced Options	B0	Diagnostics (Optional Alarm/warning flags,Soft TX_FAULT and RX_LOS monitoring)
94	1	SFF-8472 Compliance	02	Diagnostics (SFF-8472 Rev 9.4)
95	1	CC_EXT	Check Sum (Variable)	Check sum for Extended ID Field.
VENDOR SPECIFIC ID FIELDS				
96-255	160	Vendor Specific		

Digital Diagnostic Monitoring Information:

Parameter	Range	Actual Value	Calibration Option	Note
Transceiver Temperature	0~70℃	±3℃	Internal calibration	Recommended Operating Conditions
Power Supply Voltage	2.85~3.70V	±0.1V	Internal calibration	Recommended Operating Conditions
Tx Bias Current	1~11mA	±10%	External calibration	Recommended Operating Conditions
Tx Optical Power	-9.5~-3dBm	±3dB	External calibration	Recommended Operating Conditions
Rx Optical Power	-17~0dBm	±3dB	External calibration	Recommended Operating Conditions

Ordering Information:

Digital Transceiver Denominate Rule


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