Optical Transceivers

FWLF15217DXX

Multi-rate CWDM Pluggable SFP Transceiver

FWLF15217Dxx CWDM Small Form Factor Pluggable (SFP) transceivers are designed for operation in Metro Access Rings and Point-to-Point networks using SONET, Gigabit Ethernet and Fibre Channel networking equipment. They are available in eight different CWDM wavelengths. Digital diagnostics functions are available via an I2C serial bus. In addition, they comply with the Small Form Factor Pluggable Multi_x005F_xFFFE_Sourcing Agreement (MSA)[1].

FEATURES

- Up to 2.67 Gb/s bi-directionaldata links
- Hot-pluggable SFP footprint
- Built-in digital diagnostic functions
- Uncooled DFB laser transmitter in 8 possible CWDM wavelengths
- Duplex LC connector
- Very low jitter
- Metal enclosure, for lower EMI
- Single 3.3V power supply
- Low power dissipation <700mW
- Operating temperature range: 0°C to 70°C

APPLICATIONS

- Metro Access Rings and Point-to-Point networking for SONET, Gigabit Ethernet and Fibre Channel

COHERENT

Product Selection

FWLF15217Dxx

Wavelength	Xx	Clasp Color Code	Wavelength	Xx	Clasp Color Code
1471 nm	47	Gray	1551 nm	55	Yellow
1491 nm	49	Violet	1571 nm	57	Orange
1511 nm	51	Blue	1591 nm	59	Red
1531 nm	53	Green	1611 nm	61	Brown

I. Pin Descriptions

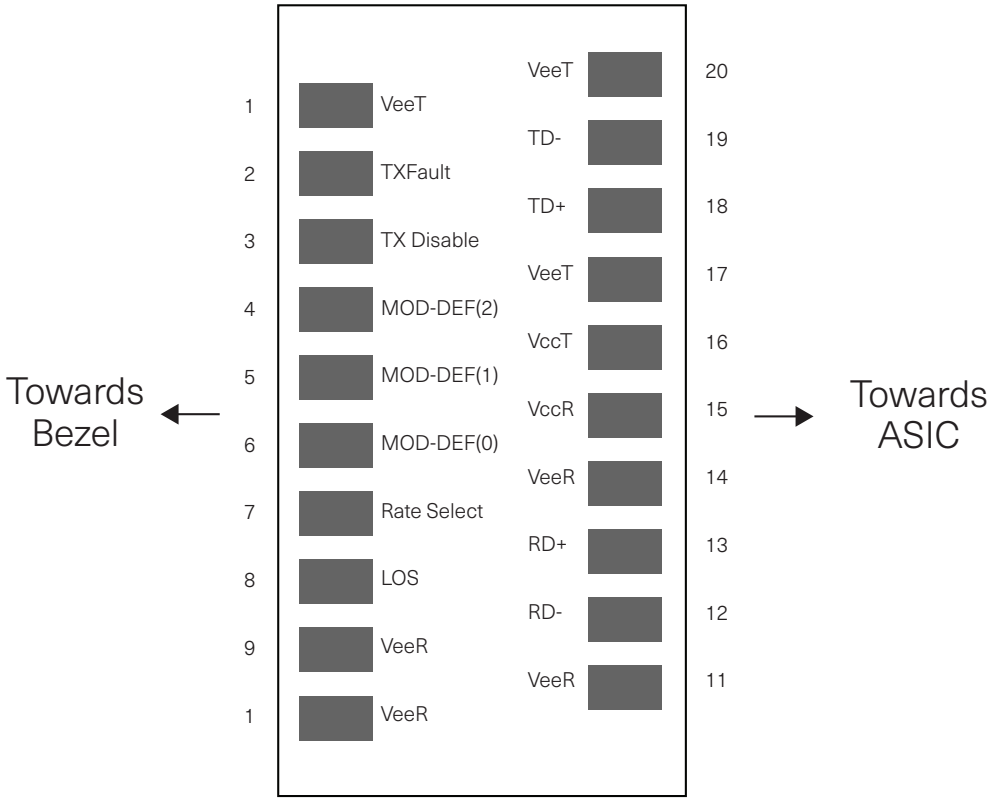


Diagram of Host Board Connector Block Pin Numbers and ames

Pin	Symbol	Name/Description	Notes
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault.	
3	T_{DIS}	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	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	4
9	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
10	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
11	V_{EER}	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	V_{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	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	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes
1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on T_{DIS} >2.0V or open, enabled on T_{DIS} <0.8V.
3. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 5.5V. MOD_DEF(0) pulls line low to indicate module is plugged in.
4. Receiver achieves multi-rate operation without active control.
5. LOS is open collector output. Should be pulled up with 4.7k – 10kohms on host board to a voltage between 2.0V and 5.5V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit
Maximum Supply Voltage	Vcc	-0.5		4.7	V
Storage Temperature	T_S	-40		85	°C
Case Operating Temperature	T_{OP}	0		70	°C

III. Electrical Characteristics (T_{OP} = 0 to 70 °C, V_{CC} = 3.15 to 3.60 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.15		3.60	V	
Supply Current	Icc		200	300	mA	
Transmitter						
Input differential impedance	R_{in}		100		Ω	1
Single ended data input swing	Vin,pp	250		1200	mV	
Transmit Disable Voltage	V_D	Vcc – 1.3		Vcc	V	
Transmit Enable Voltage	V_{EN}	Vee		Vee+ 0.8	V	2
Transmit Disable Assert Time				10	us	
Receiver						
Single ended data output swing	Vout,pp	250		800	mV	3
Data output rise time	t_r		100	175	ps	4
Data output fall time	t_f		100	175	ps	4
LOS Fault	$V_{LOS\ fault}$	Vcc – 0.5		Vcc_{HOST}	V	5
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6

Notes:
1. Connected directly to TX data input pins. AC coupled thereafter.
2. Or open circuit.
3. Into 100 ohms differential termination.
4. 20 – 80 %
5. Loss Of Signal is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. Receiver sensitivity is compliant with power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the recommended power supply filtering network.

IV. Low Speed Signals

Parameter	Symbol	Min	Typ	Max	Unit	Rotes/Conditions
RX_LOS Assert Level		-30			dBm	
RX_LOS Deassert Level				-19	dBm	
RX_LOS Hysteresis		0.5	2		dB	
RX_LOS Assert Delay	t_loss_on			100	µsec	From detection of loss of signal to assertion of RX_LOS
RX_LOS Negate Delay	t_loss_off			100	µsec	From detection of presence of signal to negation of RX_LOS
TX_DISABLE Assert Time	t_off			10	µsec	Rising edge of TX_DISABLE to fall of output signal below 10% of nominal
TX_DISABLE Negate Time	t_on			1000	ms	Falling edge of TX_DISABLE to rise of output signal above 90% of nominal. Time indicated is under steady-state temperature conditions.
TX_DISABLE Reset Time	t_reset	10			µ sec	TX_DISABLE HIGH before TX_DISABLE set LOW
TX_FAULT Assert				100	nm	From fault to assertion of TX_FAULT
Initialization Time				300		From power on to negation of TX_FAULT using TX_DISABLE

IV. Optical Characteristics (T_{OP} = 0 to 70 °C, V_{CC} = 3.15 to 3.60 Volts)

Parameter	Symbol	Min	Typ	7BMax	Unit	Ref.
Transmitter						
Output Opt. Pwr (End of Life)	P_{out}	+0		+5	dBm	1
Optical Wavelength	λ	(x-6.5)	(x)	(x+6.5)	nm	2
Wavelength Temperature Dependance			0.08	0.125	nm/°C	
Spectral Width (-20dB)	σ			1	nm	
Optical Extinction Ratio	ER	8.2			dB	
Sidemode Supression ratio	SSR_{min}	30			dB	
Optical Rise/Fall Time	t_r / t_f			180	ps	3
RIN	RIN			-120	dB/Hz	
Transmitter Jitter Generation				75	mUI	
Dispersion Penalty at 50km				1.5	dB	
Receiver						
Optical Input Power	P_{in}	-20		0	dBm	
Optical Center Wavelength	λ_C	1270		1620	nm	
LOS De-Assert	LOS_D			-19	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis			1.0		dB	
Receiver Jitter Generation @2.488Gbps				130	ps	6
Receiver Jitter Generation @1.25Gbps				160	ps	7
Dispersion Penalty at 60km				2	dB	8

Notes:
1. Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. Over case temperature of 0 to 70 °C. The Transmitter Center Wavelength "x" is as specified by the customer. The current available wavelengths are: 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm. Please see the "Product Selection" section on page 1.
3. Unfiltered
4. Worst-case extinction ratio. Measured with a PRBS 2^{23}-1 test pattern, @2.67Gb/s, BER<10^{-12}, EOL
5. Worst-case extinction ratio. Measured with a PRBS 2^{7}-1 test pattern, @1.25Gb/s, BER<10^{-12}, EOL
6. Jitter added by receiver (peak to peak). Measured at Average Rx Sensitivity of –20dBm, PRBS 2^{31}-1 test pattern.
7. Jitter added by receiver (peak to peak). Measured at Average Rx Sensitivity of –23dBm, PRBS 2^{7}-1 test pattern.
8. Measured using 9/12υm SMF-28 @2.488Gbps, PRBS 2^{23}-1 test pattern, BER<10^{-10}.

V. General Specifications

Parameter	Symbol	Min	Typ	Max	Unit	Notes/Conditions
Data Rate	BR	0.622		2.67	Gb/sec	
Total System Budget	--	20	21.0		dB	@2.67 Gb/s, BER < 10^{-12} w/ PRBS 2^{23}-1.

Note 1: Total link budget is defined as Pout – Pin – typical connector losses. Operating in low rate mode

VI. Environmental Specifications

Finisar CWDM SFP transceivers have an operating temperature range from 0°C to +60°C case temperature.

Environmental Specifications	Symbol	Min	Typ	Max	Units	Ref
Operating Temp	T_{op}	0		70	°C	
Storage Temp	T_{sto}	-40		85	°C	

VII. Regulatory Compliance

Finisar CWDM SFP transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard
Laser Eye Safety	FDA/CDRH	CDRH and IEC-825 Class 1 Laser Product. See Note 1
Electrical Safety	TÜV	EN 60950 EN 60825-1 EN 60825-2
	CSA	CLASS 3862.07 CLASS 3862.87

Note 1: Complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

VIII. Digital Diagnostic Functions

Finisar FWLF15217Dxx SFP transceivers support the 2-wire serial communication protocol as defined in the draft SFP MSA[1]. It is very closely related to the E^{2}PROM defined in the GBIC standard, with the same electrical specifications.

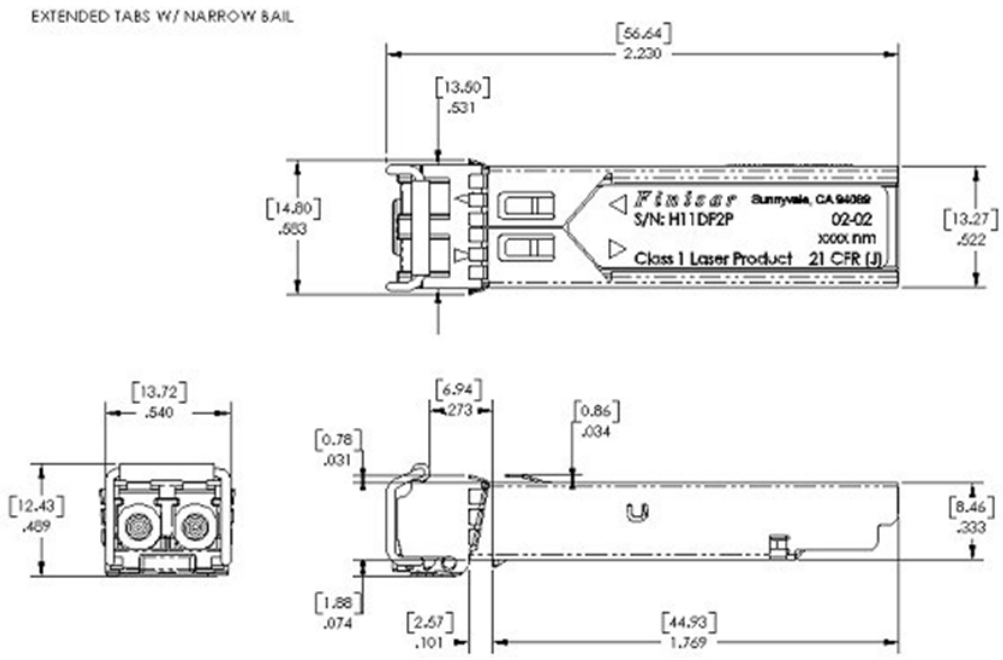
The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, Finisar SFP transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in E^{2}PROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi
Source Agreement. The complete interface is described in Finisar Application Note AN- 2030: "Digital Diagnostics Monitoring Interface for SFP Optical Transceivers".
e found in the table below. Values in the table represent the worst-case values over temperature, voltage, and life.

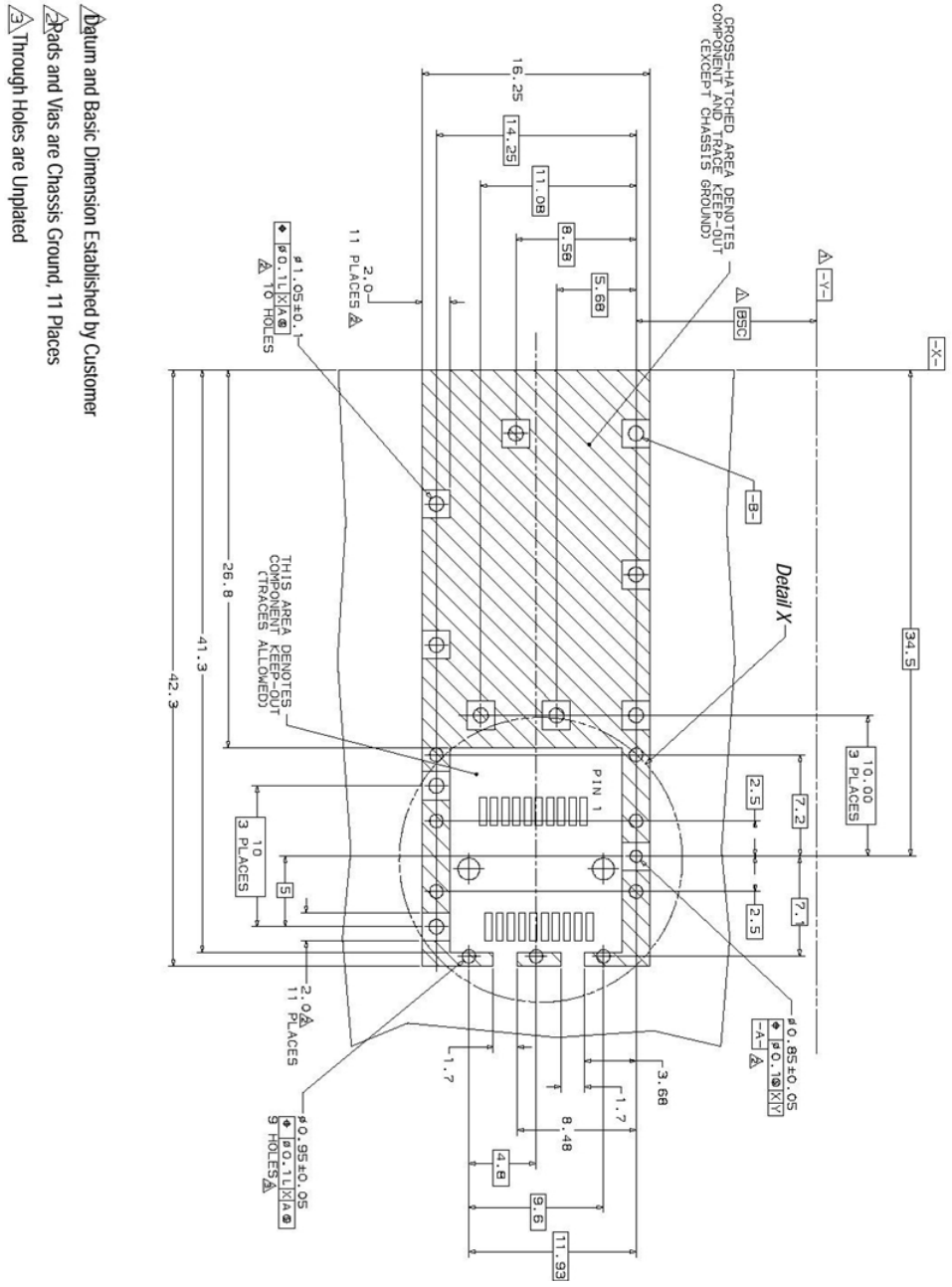
X. Mechanical Specifications

Finisar's Multi-rate DWDM Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the DWDM SFP Multi-Sourcing Agreement (MSA).



FWLF15217Dxx (dimensions are in inches)

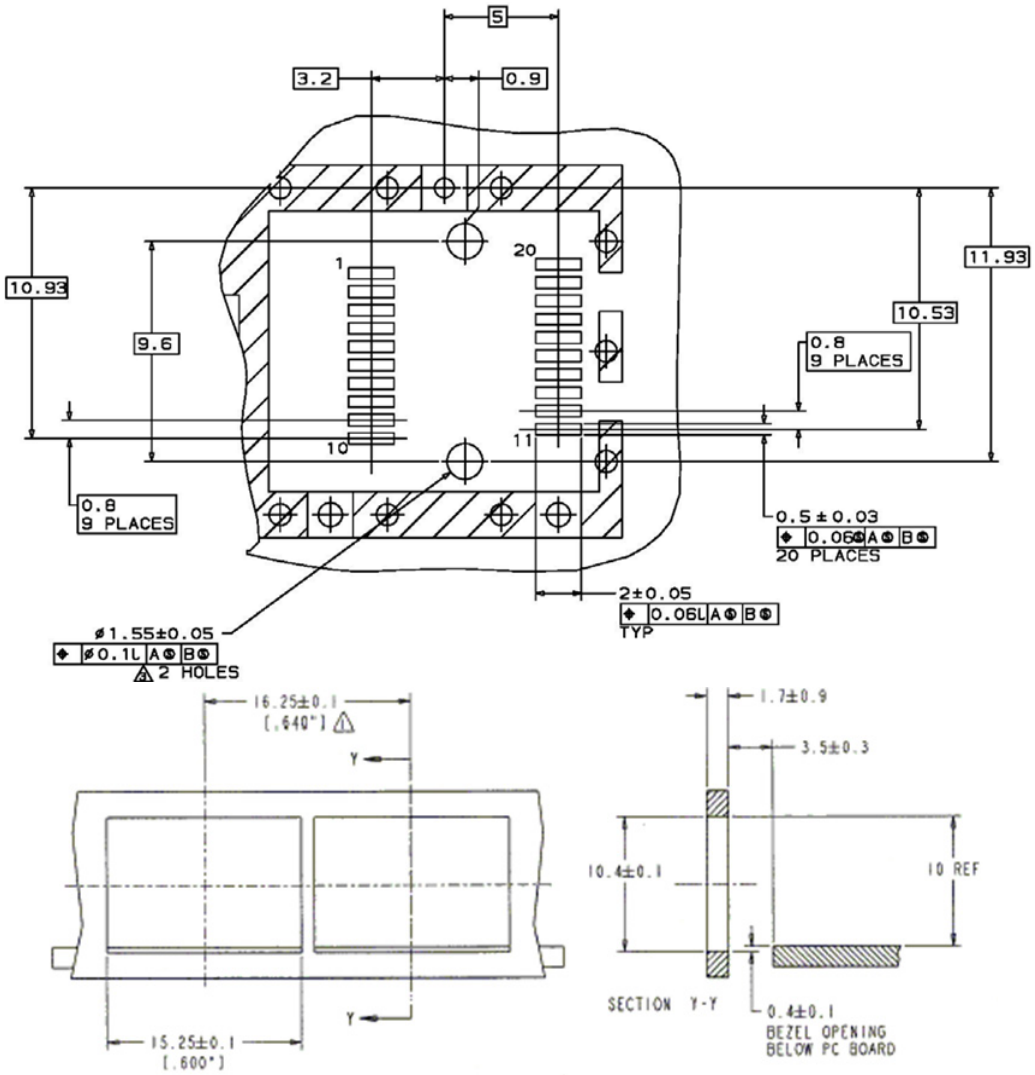
X. PCB Layout and Bezel Recommendations



△1 Datum and Basic Dimension Established by Customer

△2 Pads and Vias are Chassis Ground, 11 Places

△3 Through Holes are Unplated



NOTES:

1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY
2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

XII. References

1. Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.
2. Bellcore GR-253 and ITU-T G.957 Specifications.
3. IEEE Std 802.3. IEEE Standards Department, 2000.(*)
4. “Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)”. American National Standard for Information Systems. (*)
5. (*) Neither IEEE 802.3 nor FC-PI 10.0 specifies a 15xx nm DFB single mode interface. The FWLF15217Dxx complies with these specifications except for the following optical parameters, which have different values: transmitter wavelength, receiver sensitivity, and transmit output power. See Section IV for details.

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