F i n i s a r

Short-Wavelength Pluggable SFP Transceiver
FTRJ-8519-7D

PRODUCT FEATURES

- Up to 1.25 Gb/s bi-directional data links

- Hot-pluggable SFP footprint

- Built-in digital diagnostic functions

- 850nm VCSEL laser transmitter

- Duplex LC connector

- Very low jitter

- Up to 500m on 50/125μm MMF, 300m on 62.5/125μm MMF

- Metal enclosure, for lower EMI

- Single 3.3V power supply

- Low power dissipation <750mW

- Extended operating temperature range: -10°C to 85°C

APPLICATIONS

- 1.25Gb/s 1000Base-SX Ethernet

- 1.0625Gb/s Fibre Channel

Finisar's FTRJ-8519-7D Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA)[1]. They comply with Gigabit Ethernet as specified in IEEE Std 802.3[2] and Fibre Channel FC-PH, PH2, PH3[3] and FC-PI 10.0. Digital diagnostics functions are available via an SPI serial bus.

PRODUCT SELECTION

FTRJ-8519-xD

x=7: LC connector; bail extraction

I.   Pin Descriptions

Pin	Symbol	Name/Description	Ref.
1	V_{EET}	Transmitter Ground (Common with Receiver Ground)	1
2	T_{FAULT}	Transmitter Fault. Not supported, pin grounded within module.	
3	T_{DIS}	Transmitter Disable. Laser output disables 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	Not applicable to 1.25Gb/s, N/C within module.	
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. 100 ohm termination between TD+ and TD-, AC Coupled thereafter.	
19	TD-	Transmitter Inverted DATA in. See TD+	
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. LOS is an 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.
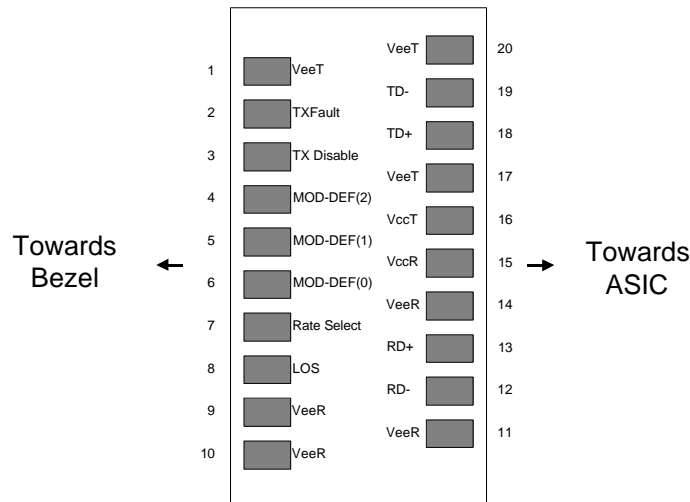
Pinout of Connector Block on Host Board

II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		5.0	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_{OP}	-10		85	°C	

III. Electrical Characteristics (T_{OP} = -10 to 85 °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		180	220	mA	
Transmitter						
Input differential impedance	R_{in}		100		Ω	1
Single ended data input swing	Vin,pp	250		1200	mV	2
Transmit Disable Voltage	V_D	2		Vcc	V	3
Transmit Enable Voltage	V_{EN}	Vee		Vee+ 0.8	V	
Receiver						
Single ended data output swing	Vout,pp	185	250	600	mV	4
Data output rise time	t_r		120	350	ps	5
Data output fall time	t_f		120	350	ps	5
LOS Fault	$V_{LOS\,fault}$			Vcc_{HOST}	V	6
LOS Normal	$V_{LOS\,norm}$	Vee		Vee+0.5	V	6
Power Supply Rejection	PSR	100			mVpp	7

Notes:
1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. We recommend <600mV for best EMI performance.
3. Or open circuit.
4. Into 100 ohm differential termination.
5. 20 – 80 %
6. LOS is an open collector output. Should be pulled up with 4.7k – 10kohms on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.
7. 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.   Optical Characteristics (T_{OP} = -10 to 85 °C, V_{CC} = 3.15 to 3.60 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Pwr: 50 or 62.5 MMF	P_{OUT}	-9.5		-4	dBm	1
Optical Wavelength	λ	830		860	nm	
Spectral Width	σ			0.85	nm	
Optical Extinction Ratio	OMI	9			dB	2
Optical Rise/Fall Time	t_r/ t_f		120	260	ps	3
Relative Intensity Noise	RIN			-120	dB/Hz	
Total Transmitter Jitter at TP2				227	ps	4
Peak-to-Peak Jitter Contribution	TX J-pp		40		ps	5
Receiver						
Receiver Sensitivity	Rx_{SENS}		-21	-18	dBm	6
Stressed receiver sensitivity				-13.5	dBm	7
Stressed receiver eye opening		201			ps	7
Receiver Elec. 3 dB cutoff freq.				1500	MHz	7
Peak-to-Peak Jitter Contribution	RX J-pp		60		ps	5
Optical Center Wavelength	$λ_C$	770		860	nm	
Return Loss		12			dB	
LOS De-Assert	LOS_D		-22	-18	dBm	
LOS Assert	LOS_A	-30	-24		dBm	
LOS Hysteresis		0.5	2		dB	

Notes:
1. Gigabit Ethernet specification, Class 1 Laser Safety per FDA/CDRH and IEC-825-1 regulations.
2. With 1.25Gb/s 8B/10B signal pattern.
3. Unfiltered. Complies with GbE eye mask when filtered.
4. TP2 defined in Gigabit Ethernet specification.
5. Typical peak-to-peak jitter (=6*RMS width of Jitter)
6. With worst-case extinction ratio. -17 dBm is GbE specification.
7. Defined in Gigabit Ethernet specification. Tested on 62.5/125μm MMF. Covers both GbE Requirements.

V.   General Specifications

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Data Rate	BR		1.0625, 1.25		Gb/sec	1
Bit Error Rate	BER			10^{-12}		2
Fiber Length on 50/125μm MMF	L			550	m	
Fiber Length on 62.5/125μm MMF	L			300	m	

Notes:
1. Fibre Channel and IEEE 802.3 (Gigabit Ethernet) compatible. Typical maximum data rate extends to 1.5Gb/s.
2. 1.25Gb/s with PRBS 2^7-1.

VI.   Environmental Specifications

Finisar 850nm SFP transceivers have an extended operating temperature range from –10°C to +85°C case temperature.

Parameter	Symbol	Min	Typ	Max	Units	Ref.
Case Operating Temperature	T_{op}	-10		85	°C	
Storage Temperature	T_{sto}	-40		85	°C	

VII.   Regulatory Compliance

Finisar 850nm SFP transceivers are Class 1 Laser Products. They are certified per the following standards:

Feature	Agency	Standard	Certificate Number
Laser Eye Safety	FDA/CDRH	FDA 21(J) CFR	9210176-16
Laser Eye Safety	TÜV	EN 60950 EN 60825-1 EN 60825-2	R2179338.01
Electrical Safety	UL/CSA	CLASS 3862.07 CLASS 3862.87	CSA 1034405

Copies of the referenced certificates are available at Finisar Corporation upon request.

VIII.   Digital Diagnostic Functions

Finisar FTRJ-8519-7D SFP transceivers support the 2-wire serial communication protocol as defined in the 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".

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the E^{2}PROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) 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 information, please see the SFP MSA documentation[1] or Finisar Application Note AN-2030.
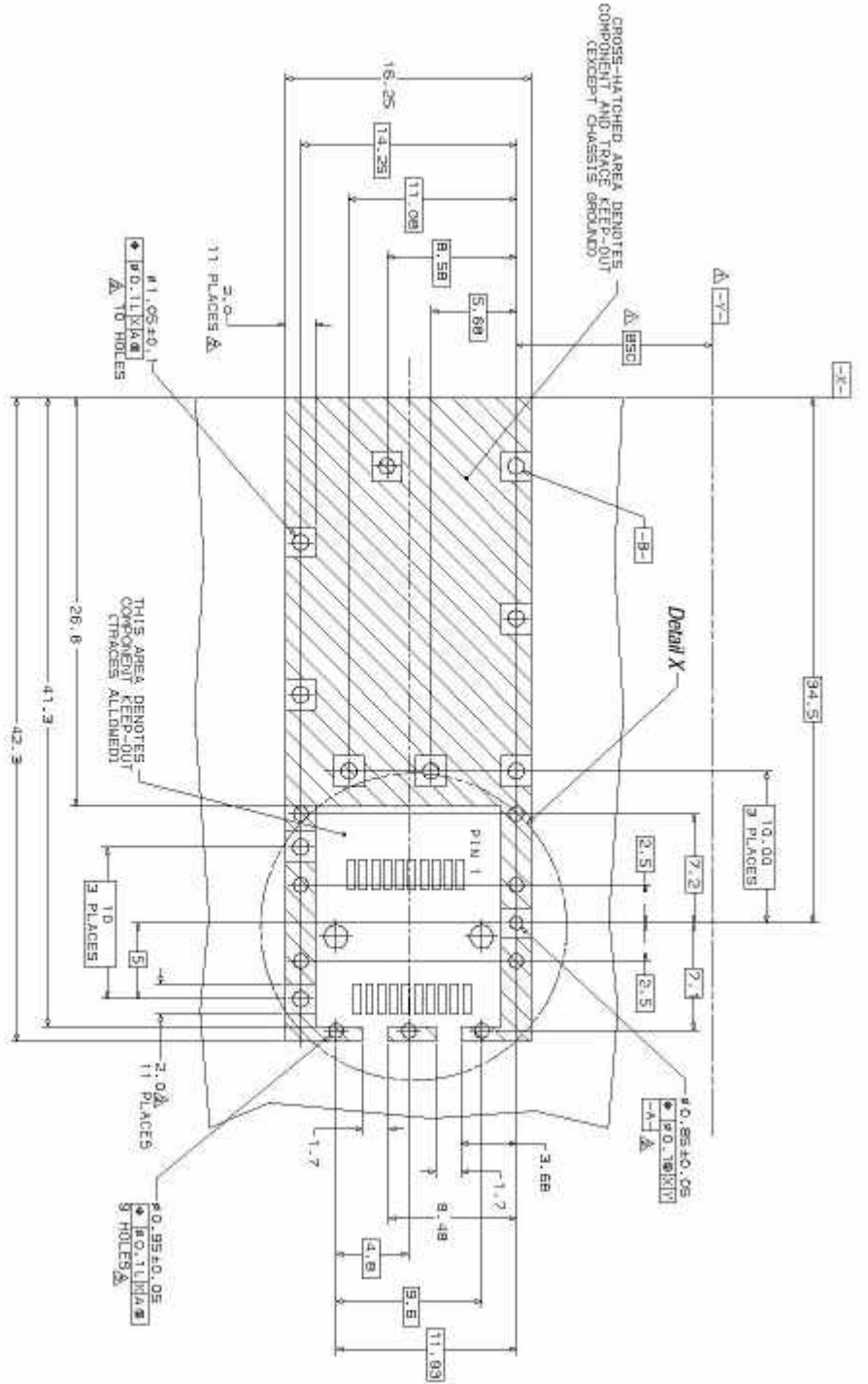
IX. Mechanical Specifications

Finisar's Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA) [1].
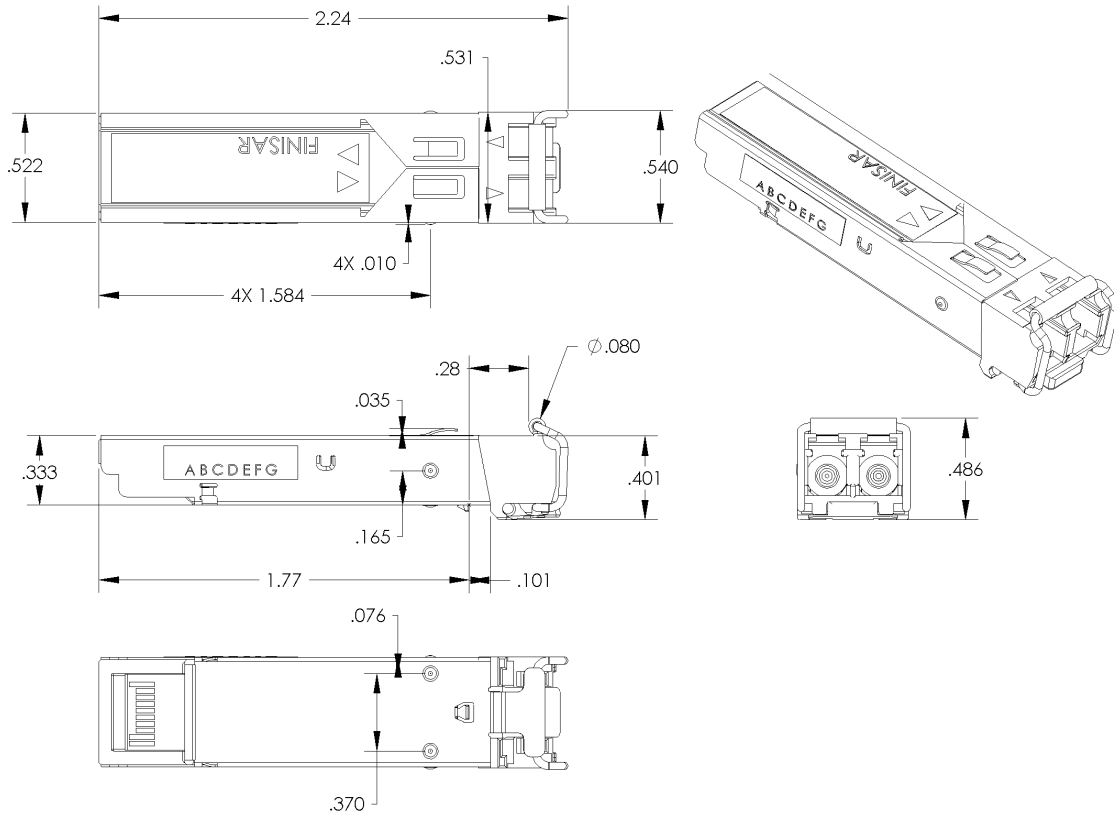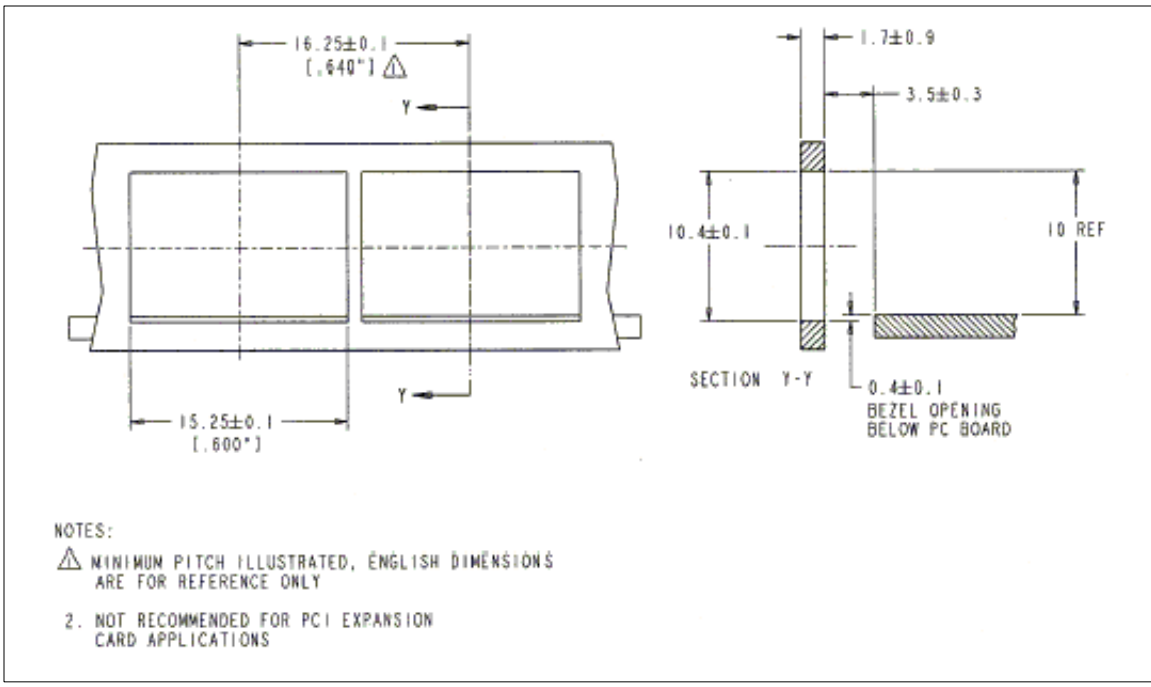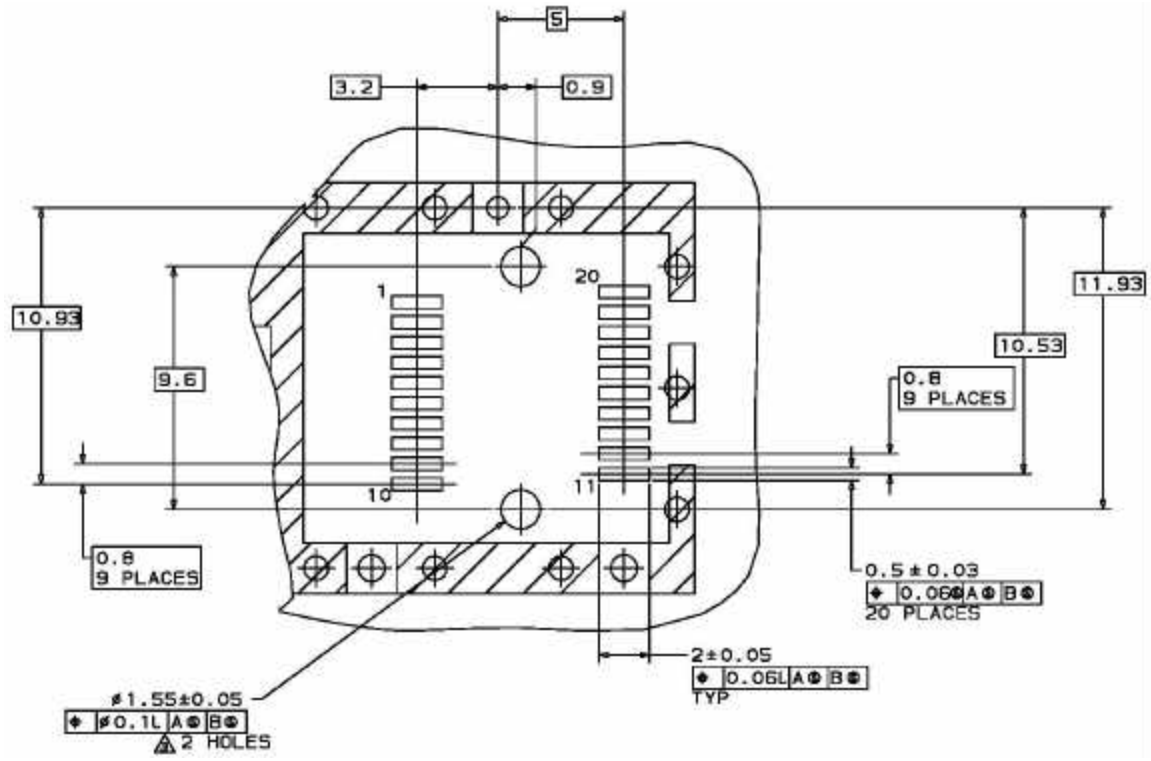

FTRJ-8519-7D (dimensions are in inches)

X.　PCB Layout and Bezel Recommendations

NOTES:

⚠ MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS
   ARE FOR REFERENCE ONLY

2. NOT RECOMMENDED FOR PCI EXPANSION
   CARD APPLICATIONS

XI.   References

1.   Small Form Factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 2000. Documentation is currently available at Finisar upon request.

2.   IEEE Std 802.3, 2000 Edition, Clause 38, PMD Type 1000BASE-SX. IEEE Standards Department, 2000.

3.   "Fibre Channel Physical and Signaling Interface (FC-PH, FC-PH2, FC-PH3)". American National Standard for Information Systems.

4.   "Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)". American National Standard for Information Systems.

XII.   For More Information

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