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SPLC-20-4-X-SL Optical Gigabit Ethernet -- +3.3V Small Form Factor Pluggable (SFP) -- 1.25GBaud



ORDERING INFORMATION

SPLC - 20 - 4 - X - S L

+3.3V POWER SUPPLY

SERIAL IDENTIFICATION OPTION
S - Serial ID

WAVELENGTH
1 - 850nm (multimode)
2 - 1300nm (single mode) 5km
2M - 1300nm (single mode) 10km
2L - 1300nm (single mode) 20km

COMMUNICATIONS PROTOCOL
4 - Gigabit Ethernet, 1.25 GBaud
6 - Fibre Channel, 1.0625 GBaud
8 - Fibre Channel, 2.125GBaud

Features

- Compliant with MSA SFP specification
- Compliant With IEEE 802.3z 1000BASE_LX and 1000BASE_SX specification for optical links
- 50Ω AC coupled PECL Inputs/Outputs
- Die Cast Metal Housing
- Hot pluggable
- Single +3.3V Power Supply
- Serial ID functionality

PRODUCT OVERVIEW

The SPLC-20-4-X-SL pluggable transceiver module is a high performance integrated duplex data link for bi-directional communication over single mode or multimode optical fiber. It is compliant with the MSA Small Form Factor Pluggable (SFP) specification. The SPLC-20 is specifically designed for high speed Gigabit Ethernet data links at 1.25 GBaud. The Stratos Lightwave SFP transceiver is hot pluggable which allows a suitably designed enclosure to be changed from one type of external interface to another simply by plugging in a SFP having the alternative external interface. The SPLC-20-4-X-SL operates at +3.3V.

SHORT WAVELENGTH LASER

The use of short wavelength lasers and high volume production processes has resulted in a low cost, high performance datalink which communicates reliably at distances of 500 m over 50µm multimode optical fiber with data transfer rates of 1.25 GBaud.

LONG WAVELENGTH LASER

The SPLC-20-4-X-SL SFP is provided with single mode optics. The 1300nm laser provides highly reliable single mode communications which meets or exceeds the Gigabit Ethernet distance requirements.

MODULE SPECIFICATIONS - ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTES
Storage Temperature	Tstg	-40	85	°C	
Supply Voltage	VccT, VccR		6.00	V	Vcc - ground
Data AC Voltage	Tx+, Tx-		2.6	Vpp	Differential
Data DC Voltage	Tx+, Tx-	-10	10	Vpk	V (Tx+ or Tx-) - ground

MODULE SPECIFICATION - RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Ambient Operating Temperature	Ta	0		70	°C	
Supply Voltage	VddT, VddR	3.15	3.3	3.45	VDC	±5%
Baud Rate	BRate		1.25		GBaud	±100ppm

SPLC-20-4-X-SL Optical Gigabit Ethernet -- +3.3V Small Form Factor Pluggable (SFP) -- 1.25GBaud

PERFORMANCE SPECIFICATIONS - ELECTRICAL **Ta = 25° C, Vcc = 3.3 V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Bit Error Rate	**BER**			1E-12		Errors/Bit @ Pr min
Supply Current	I_{cc}		180	250	mA	Ta = 25°C, Vcc = 3.3 V
	I_{cc}			300	mA	0° C <Ta< 70°C, 3.15 V< Vcc <3.6V
Surge Current	I_{surge}			+30	mA	Surge above steady state value
TRANSMITTER						
PECL Input (Differential)		300		2400	mVpp	AC coupled inputs
Input Impedance (Differential)	Z_{in}	95	100	105	ohms	Rin > 100 kohms @ DC
Tx_DISABLE Input Voltage - High	V_{ih}	2		3.45	V	
Tx_DISABLE Input Voltage - Low	V_{il}	0		0.8	V	
Tx_FAULT output voltage -- high	V_{toh}	Vcc-0.5		Vcc+0.3	V	Io = 400µA; Note 2
Tx_FAULT output voltage -- low	V_{tol}	0		0.5	V	Io = -4.0mA
RECEIVER						
PECL Output (Differential)		400	800	1200	mVpp	AC Coupled Outputs
Rx_LOS Output Voltage - High	V_{roh}	Vcc-0.5		Vcc+0.3	V	Io = 400µA; Note 2
Rx_LOS Output Voltage - Low	V_{rol}	0		0.5	V	Io = -4.0mA
Total Contributed Jitter [Pk - Pk]	**TJ**			266	ps	See Note 1
MOD_DEF (0:2)	V_{oh}	2.5		Vcc+0.3	V	With Serial ID
	V_{ol}	0		0.5	V	
	NC	100K			ohms	Measured to RGND/TGND

PERFORMANCE SPECIFICATIONS - OPTICAL 850 nm Laser Multimode **Ta = 25° C, Vcc = 3.3 V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
50 µm Core Diameter MMF		550	1000		m	BER < 1.0E-12 @ 1.25 GBaud
62.5 µm Core Diameter MMF		300[3]	500		m	BER < 1.0E-12 @ 1.25 GBaud
TRANSMITTER						
Optical Transmit Power	Popt	-9.5		-4	dBm	average @ 850 nm
Disabled Power level	Poff			-35	dBm	TX_DISABLE active
Optical Center	λ	830	850	860	nm	
Spectral Width	Δλ			0.85	nm	RMS
Extinction Ratio	ER	9	10		dB	P1/P0
Relative Intensity Noise	RIN			-117	dB/Hz	
Total Jitter [pk - pk]	TJ			227	ps	See note 1
Output Rise, Fall Time	t_R, t_F			260	ps	20% - 80%
RECEIVER						
Optical Input	λ	770		860	nm	
Optical Input Power	Pr	-17		0	dBm	BER < 1.0E-12
Optical Return Loss	ORL	12			dB	
RX_LOS- Asserted	Pa	-29			dBm	measured on transition - low to high
RX_LOS - Deasserted	Pd			-17	dBm	measured on transition - high to low
RX_LOS - Hysteresis	Pa - Pd		1.5	5.0	dB	

Note 1 - Measured with 2^7-1 pseudorandom bit sequence.
Note 2 - Host Vcc
Note 3 - 300 minimum distance on 160 MHz-Km 62.5/125 µm fiber.

SPLC-20-4-X-SL Optical Gigabit Ethernet -- +3.3V Small Form Factor Pluggable (SFP) -- 1.25GBaud

SPLC-20-4-2-SL PERFORMANCE SPECIFICATIONS - OPTICAL 1300 nm Laser Single Mode **Ta=25°C, Vcc=3.3V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 µm Core Diameter SMF		5			km	BER < 1.0E-12 @ 1.25 GBaud
TRANSMITTER						
Optical Center	λ	1270	1310	1355	nm	
Extinction Ratio	ER	9	10		dB	P1/P0
Disabled Power level	Poff			-35	dBm	TX_DISABLE active
RMS Spectral Width	Δλ			4	nm	RMS
Optical Transmit Power	Popt	-11		-3	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-19		-3	dBm	average power for BER < 1.0E-12
RX_LOS - Asserted	Pa	-29			dBm	Measured on transition - low to high
RX_LOS - Deasserted	Pd			-19	dBm	Measured on transition - high to low
RX_LOS - hysteresis	Pa-Pd		1.5	5.0	dB	

SPLC-20-4-2M-SL PERFORMANCE SPECIFICATIONS - OPTICAL 1300 nm Laser Single Mode **Ta=25°C, Vcc=3.3V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 µm Core Diameter SMF		10			km	BER < 1.0E-12 @ 1.25 GBaud
TRANSMITTER						
Optical Center	λ	1290	1310	1335	nm	
Extinction Ratio	ER	9	10		dB	P1/P0
Disabled Power level	Poff			-35	dBm	TX_DISABLE active
RMS Spectral Width	Δλ			3	nm	RMS
Optical Transmit Power	Popt	-9.5		-3	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-20		-3	dBm	average power for BER < 1.0E-12
RX_LOS - Asserted	Pa	-29			dBm	Measured on transition - low to high
RX_LOS - Deasserted	Pd			-20	dBm	Measured on transition - high to low
RX_LOS - Hysteresis	Pa-Pd		1.5	5.0	dB	

SPLC-20-4-2L-SL PERFORMANCE SPECIFICATIONS - OPTICAL 1300 nm Laser Single Mode **Ta=25°C, Vcc=3.3V**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
FIBER LENGTH						
9.0 mm Core Diameter SMF		20			km	BER < 1.0E-12 @ 1.25 GBaud
TRANSMITTER						
Optical Center	λ	1300	1310	1320	nm	
Extinction Ratio	ER	9	10		dB	P1/P0
Disabled Power level	Poff			-35	dBm	TX_DISABLE active
RMS Spectral Width	Δλ			2	nm	RMS
Optical Transmit Power	Popt	-8		-3	dBm	average @ 1310 nm
RECEIVER						
Optical Input Power	Pr	-21		-3	dBm	average power for BER < 1.0E-12
RX_LOS - Asserted	Pa	-29			dBm	Measured on transition - low to high
RX_LOS - Deasserted	Pd			-21	dBm	Measured on transition - high to low
RX_LOS - Hysteresis	Pa-Pd		1.5	5.0	dB	

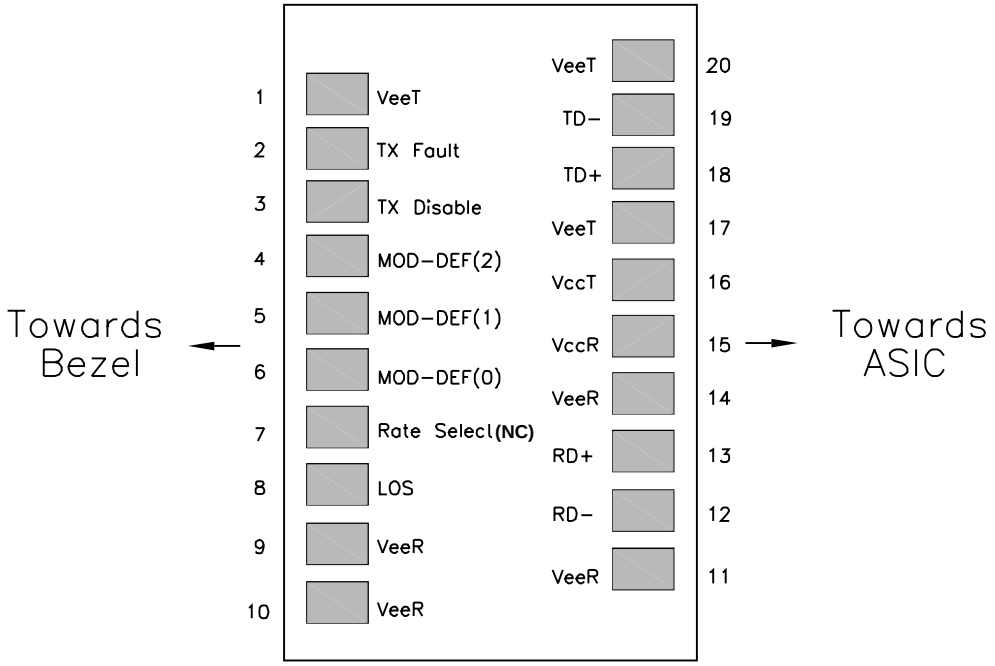


Figure 2. Diagram of Host Board Connector Block Pin Numbers and Names

PIN NO.	NAME	FUNCTION	PLUG SEQ.	NOTES
PIN 1	VeeT	Transmitter Ground	1	
PIN 2	TX_FAULT	Transmitter Fault Indication	3	Note 1
PIN 3	TX_DISABLE	Transmitter Disable	3	Note 2: Module Disables on high or open
PIN 4	MOD_DEF (2)	Module Definition 2	3	Note 3,2: Wire Serial ID interface
PIN 5	MOD_DEF (1)	Module Definition 1	3	Note 3,2: Wire Serial ID interface
PIN 6	MOD_DEF (0)	Module Definition 0	3	Note 3: Grounded Module
PIN 7	RATE SELECT	Not Connected	3	
PIN 8	LOS	Loss of Signal	3	Note 4
PIN 9	VeeR	Receiver Ground	1	Note 5
PIN 10	VeeR	Receiver Ground	1	Note 5
PIN 11	VeeR	Receiver Ground	1	Note 5
PIN 12	RD-	Inverted Received Data out	3	Note 6
PIN 13	RD+	Non-Inverted Received Data out	3	Note 6
PIN 14	VeeR	Receiver Ground	1	Note 5
PIN 15	VccR	Receiver Power	2	+3.3V ±5%, Note 7
PIN 16	VccT	Transmitter Power	2	+3.3V ±5%, Note 7
PIN 17	VeeT	Transmitter Ground	1	Note 5
PIN 18	TD+	Non-inverted Data In	3	Note 8
PIN 19	TD-	Inverted Data In	3	Note 8
PIN 20	VeeT	Transmitter Ground	1	Note 5

Plug Sequence: Pin engagement sequence during hot plugging.

NOTES:

(1) TX FAULT: is an open collector/drain output which should be pulled up with a 4.7K - 10K ohm resistor on 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.

(2) TX DISABLE: is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K - 10K ohm resistor. The states are:

Low (0 - 0.8V):	Transmitter ON
(>0.8, <2.0V):	Undefined
High (2.0 - 3.465V):	Transmitter Disabled
Open:	Transmitter Disabled

(3) MOD-DEF 0,1,2: These are the module definition pins. They should be pulled up with 4.7K - 10K ohm resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. See Table 1. MOD_DEF(0:2) for a complete description.

MOD-DEF 0 is grounded by the module to indicate that the module is present
MOD-DEF 1 is the clock line of two wire serial interface for serial ID.
MOD-DEF 2 is the data line of two wire serial interface serial ID.

(4) RATE SELECT: This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fibre Channel 1x and 2x rates). This signal in **Not Implemented** in the Stratos Lightwave SFP transceiver and sholud be not connected. The 2x Fibre Channel SFP transceiver is designed to be rate agile which means that it is inter-operable with both the 2x and 1x Fibre Channel transceivers including those using the CD Laser based legacy transmitter.

(5) LOS (Loss of Signal) is an open collector/drain output which should be pulled up with a 4.7K - 10K ohm resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical signal power is below the worst case receiver sensitivity. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

(6) VeeR and **VeeT** may be internally connected within the SFP module.

(7) RD-/+: These are the differential receiver outputs. They are AC coupled 100ohm differential lines which should be terminated with 100ohm (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 2000mV differential (185-1000mV) single ended) when properly terminated (Figure 2).

(8) VccR and **VccT:** are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown in figure 3A. When the recommended supply filtering network is used, hot plugging of the SFP module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP module.

(9) TD-/+: are the differential receiver inputs. They are AC coupled differential lines with 100ohm 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 swing of 500 - 2400 mV differential (250-1200mV single ended), though it is recommended that values between 500 and 1200mV differential (250-600 mV single ended) be used for best EMI performance.

TERMINATION CIRCUITS

Inputs to the SPLC-20 transmitter are AC coupled and internally terminated through 50 ohms to AC ground. These modules can operate with PECL or ECL logic levels. The input signal must have at least a 325mV peak-to-peak (single ended) signal swing. Output from the receiver section of the module is also AC coupled and is expected to drive a 50 ohm load. Different termination strategies may be required depending on the particular Serializer/Deserializer chip set used. **The SPLC-20 product family is designed with AC coupled data inputs and outputs to provide the following advantages:**

- Close positioning of SERDES with respect to transceiver; allows for shorter line lengths and at gigabit speeds reduces EMI.
- Minimum number of external components.
- Internal termination reduces the potential for unterminated stubs which would otherwise increase jitter and reduce transmission margin.

Subsequently, this affords the customer the ability to optimally locate the SERDES as close to the SPLC-20 as possible and save valuable real estate. At gigabit rates this can provide a significant advantage resulting in better transmission performance and accordingly better signal integrity.

Figure 1 illustrates the recommended transmit and receive data line terminations.

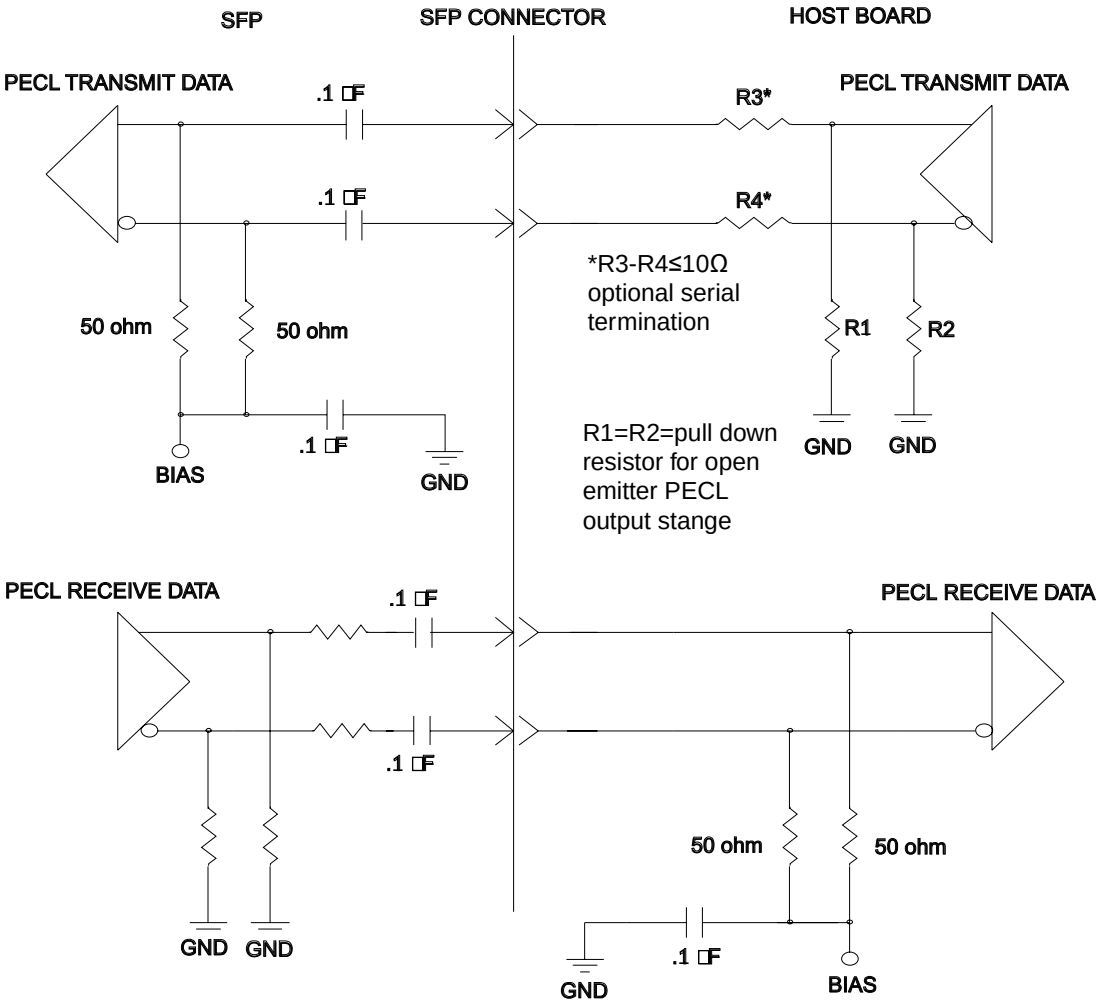


FIGURE 2: Example of termination circuits for Drivers and Receivers in the host and the SFP

POWER COUPLING

A suggested layout for power and ground connections is given in figure 2A below. Connections are made via separate voltage and ground planes. The mounting posts are at case ground and should not be connected to circuit ground. The ferrite bead should provide a real impedance of 50 to 100 ohms at 100 to 1000 MHz. Bypass capacitors should be placed as close to the 20 pin connector as possible.

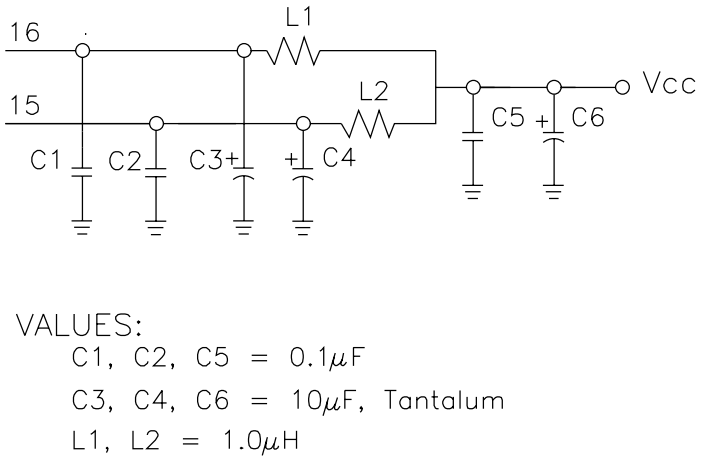


Figure 2A. Suggested Power Coupling

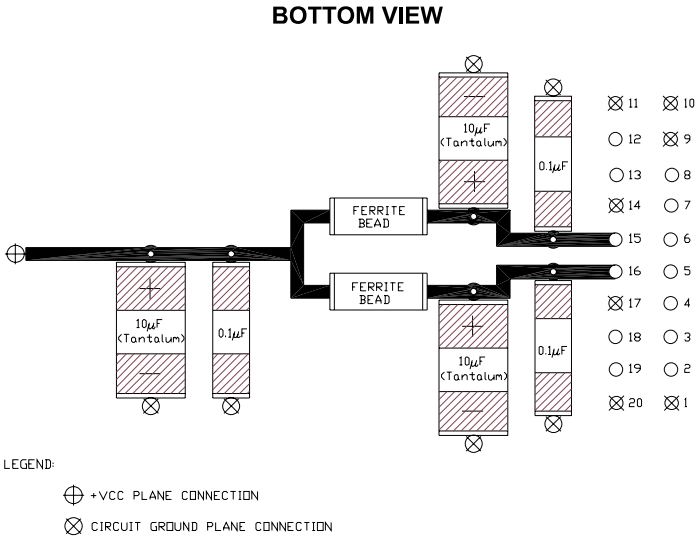


Figure 2B. Suggested Power Coupling

SFP MOD_DEF DETERMINATION

The module definition of SFP that is installed is indicated by the 3 module definition pins. The host shall provide 4.7K Ohm pullup resistor to VDDT. The assigned values for the MOD_DEF(0:2) are shown in table 1. The value NC indicates that the SFP makes no connection to the pin.

Module Definitioin	MOD_DEF(0) Pin 4	MOD_DEF(1) Pin 5	MOD_DEF(2) Pin 6	Interpretation by host
0	NC	NC	NC	GBIC not present
1	NC	NC	TTL LOW	Copper Style 1 pr Style 2 connector, 1.0625 Gbd, 100-TW-EL-S or 100-TP-EL-S, active inter-enclosure connection and IEEE802.3 1000BASE-CX
2	NC	TTL LOW	NC	Copper Style 1 pr Style 2 connector, 1.0625 Gbd, 100-TW-EL-S or 100-TP-EL-S, active or passive inter-enclosure connection and IEEE802.3 1000BASE-CX
3	NC	TTL LOW	TTL LOW	Optical LW, 1.0625 GBD 100-SM-LC-L
4	TTL LOW	SCL	SDA	Serial module definition protocol
5	TTL LOW	NC	TTL LOW	Optical SW, 1.0625 Gbd 100-M5-SN-I or 100-M6-SN-I
6	TTL LOW	TTL LOW	NC	Optical LW, 1.0625 Gbd, 100-Sm-LC-L and similar to 1.25 Gbd IEEE 802.3z 1000BASE-LX, single mode.
7	TTL LOW	TTL LOW	TTL LOW	Optical SW, 1.0625 Gbd, 100-M5-SN-1 or 100-M6-SN-I and 1.25 Gbd, IEEE 802.3z 1000BASE-SX

Table 1: MOD_DEF(0:2)

SFP TIMING PARAMETERS

The timing parameters for SFP management are shown in table 2.

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	CONDITIONS
TX_DISABLE assert time	t_off		10	µsec	Timing from rising edge of TX_DISABLE to when the optical output falls below 10% of nominal
TX_DISABLE negate time	t_on		1	ms	Timing from falling edge of TX_DISABLE ro when the modulated optical output rises above 90% of nominal
Time to initialize includes reset of TX_FAULT	t_init		300	ms	From power on or negation of TX_FAULT using TX_DISABLE
TX_FAULT Assert Time	t_fault		100	µs	Time from fault to TX_FAULT ON
TX Disable to reset	t_reset	10		µs	Time TX Disable must be held high to reset TX_FAULT
RX_LOS Assert time	t_loss_on		100	µs	Time from LOS state to RX_LOS assert
RX_LOS Deassert time	t_loss_off		1000	µs	Time from non-LOS state to RX_LOS deassert
Rate-Select Change time	t_ratesel		100	µs	Timing from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate specification.
Serial ID Clock Rate	f_serial_clock		100	KHz	

Table 2: Timing parameters for SFP management

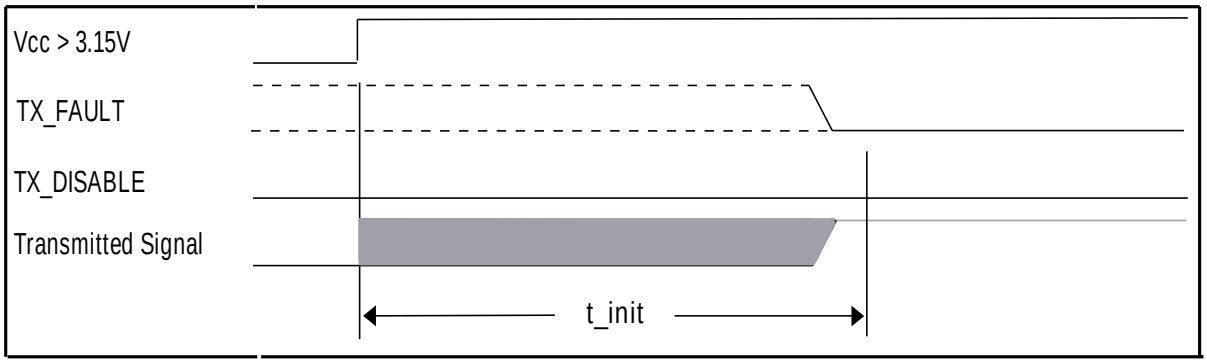


FIgure 3: Power on initialization of SFP with TX_DISABLE negated

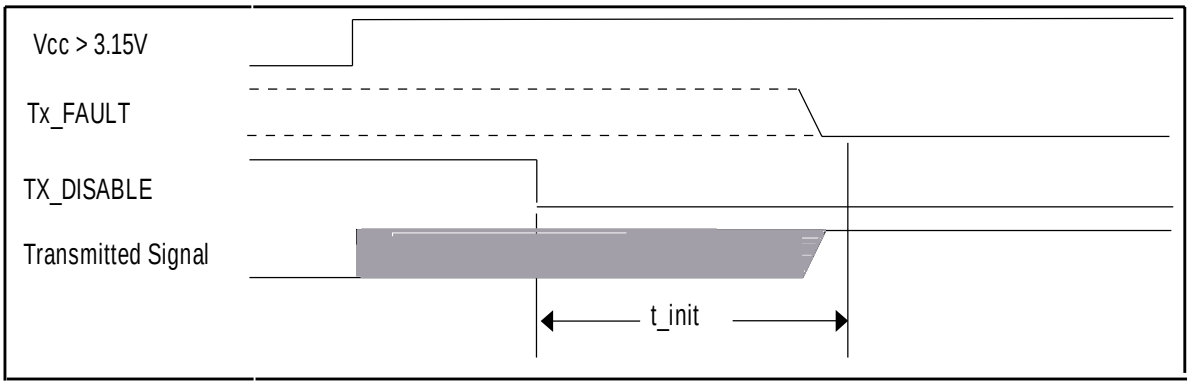


Figure 4: Power on initialization of SFP with TX_DISABLE asserted
Initialzation during hot plugging of SFP transceiver

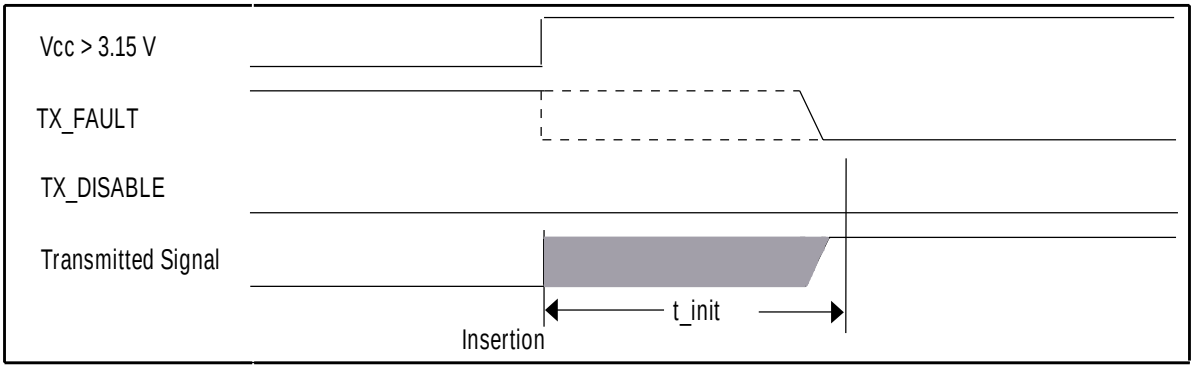


Figure 5: Example of initialization during hot plugging with TX_DISABLE negated.

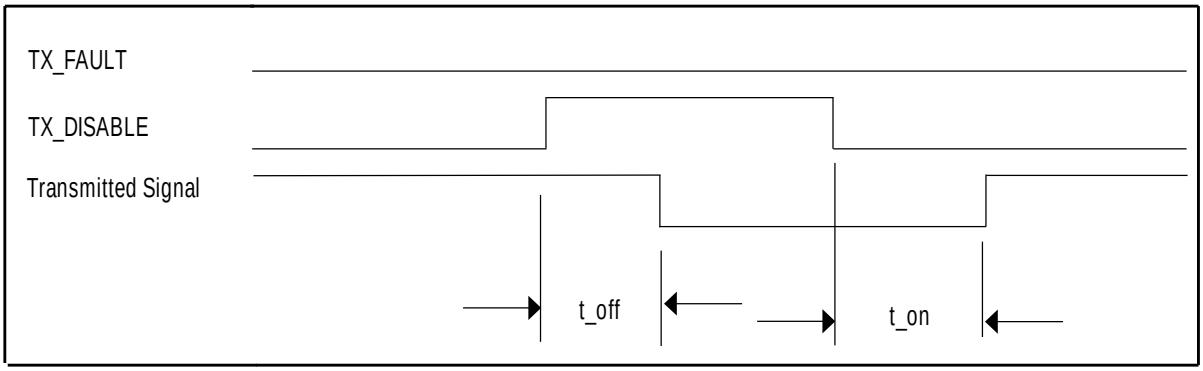


FIgure 6: SFP TX_DISABLE timing during normal operation

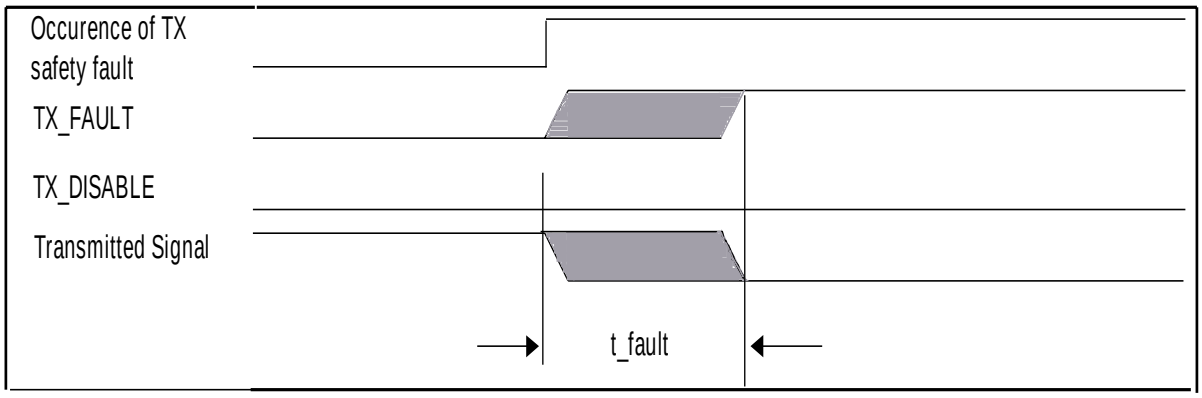


FIgure 7: Detection of transmitter safety fault condition

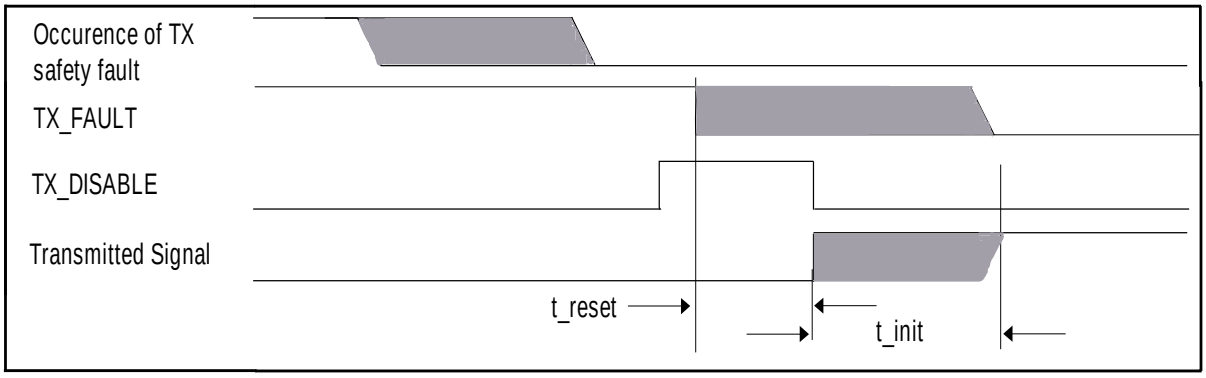


Figure 8: Successful recovery from transient safety fault condition

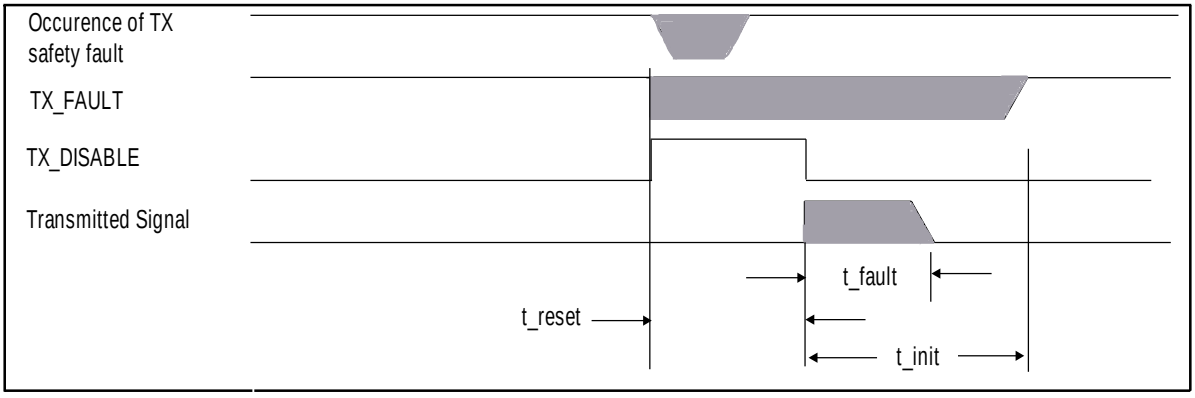


Figure 9: Unsuccessful recovery from safety fault condition

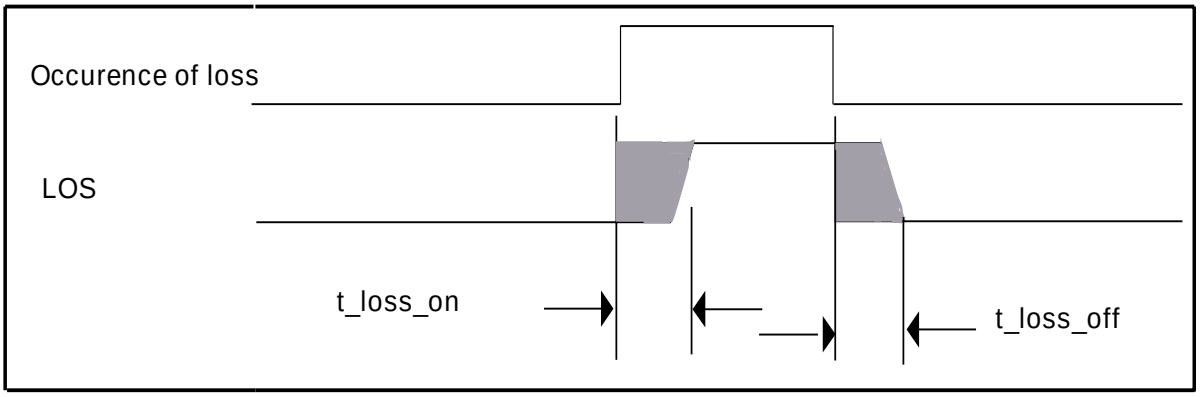


Figure 10: Timing of LOS detection

SERIAL IDENTIFICATION:

A SFP having module definition 4 provides access to sophisticated identification information that describes the SFP's capabilities, standard interfaces, manufacturer and other information. The serial interface uses the 2-wire serial CMOS E2PROM protocol defined for the ATMEL AT24C01A/02/04 family of components. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Data Address	Field Size (Bytes)	Name of field	Description of field
BASE OF FIELDS			
0	1	Identifier	Type of serial transceiver(see table 3.2)
1	1	Ext. Identifier	Extended identifier of type of serial transceiver
2	1	Connector	Code for connector type(see table 3.3)
3-10	8	Transceiver	Code for electronic compatibility or optical compatibility (see table 3.4)
11	1	Encoding	Code for serial encoding algorithm(see table 3.5)
12	1	BR, Nominal	Nominal bit rate, units of 100Mbps
13	1	Reserved	
14	1	Length (9µ) - km	Link Length supported for 9/125 µm fiber, units of km
15	1	Length (9µ)	Link Length supported for 9/125 µm fiber, units of 100 m
16	1	Length (50µ)	Link Length supported for 50/125 µm fiber, units of 10 m
17	1	Length (62.5µ)	Link Length supported for 62.5/125 µm fiber, units of 10 m
18	1	Length (Copper)	Link Length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor name	SFP vendor name (ASCII)
36	1	Reserved	
37-39	3	Vendor OUI	SFP vendor IEEE company ID
40-55	16	Vendor PN	Part number provided by SFP vendor (ASCII)
56-59	4	Vendor rev.	Revision level for part number provided by vendor (ASCII)
60-62	3	Reserved	
63	1	CC_BASE	Check code for Base ID fields (address 0 to 62)
EXTENDED ID FIELDS			
64-65	2	Options	Indicates which optional SFP signals are implemented(see table 3.6)
66	1	BR, Max	Upper bit rate margin, units of %
67	1	BR, Min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number provided by vendor (ASCII)
84-91	8	Date Code	Vendor's manufacturing date code(see table 3.7)
92-94	3	Reserved	
95	1	CC_EXT	Check code for the Extended ID fields (address 64 to 94)
VENDOR SPECIFIC ID FIELDS			
96-127	32	Read-only	Vendor specific data, read only
128-511	384	Reserved	
512-n			Vendor specific

Table 3.1: Serial ID: Data Fields

IDENTIFIER

The identifier value specifies the physical device described by the serial information. This value shall be included in the serial data. The defined identifier values are shown in table 3.2.

Value	Description of physical device
00h	Unknown or unspecified
01h	GBIC
02h	Module/connector soldered to motherboard
03h	SFP transceiver
04-7Fh	Reserved
80-FFh	Vendor specific

Table 3.2: Identifier Values

CONNECTOR

The connector value indicates the external connector provided on the interface. This value shall be included in the serial data. The defined connector values are shown in table 3.3. Note that 01h-05h are not SFP compatible, and are included for compatibility with GBIC standards.

Value	Description of connector
00h	Unknown or unspecified
01h	SC
02h	Fibre Channel Style 1 copper connector
03h	Fibre Channel Style 2 copper connector
04h	BNC/TNC
05h	Fibre Channel Coaxial headers
06h	Fibre Jack
07h	LC
08h	MT-RJ
09h	MU
0Ah	SG
0Bh	Optical Pigtail
0C-1Fh	Reserved
20h	HSSDC
21h	Copper Pigtail
22-7Fh	Reserved
80-FFh	Vendor specific

Table 3.3: Connector Values

ENCODING

The encoding value indicates the serial encoding mechanism that is the nominal design target of the particular GBIC. The value shall be contained in the serial data. The defined encoding values are shown in table 3.5

Value	Description of encoding mechanism
00h	Unspecified
01h	8B10B
02h	4B5B
03h	NRZ
04h	Manchester
05h-FFh	Reserved

Table 3.5: Encoding Codes

TRANSCEIVER

The following bit significant indicators define the electronic or optical interfaces that are supported by the SFP. At least one bit shall be set in this field. For the Fibre Channel SFPs, the Fibre Channel speed, transmission media, transmitter technology, and the distance capability shall all be indicated. The defined transceiver codes are shown in table 3.4

Data Addr	Bit (Note 1)	Description of transceiver		Data Addr	Bit (Note 1)	Description of transceiver
Reserved Standard Compliance Codes				Fibre Channel link length		
3	7-0	Reserved		7	7	Very Long Distance (V)
4	7-4	Reserved		7	6	Short distance (S)
SONET Compliance Codes				7	5	Intermediate distance (I)
4	3	Reserved		7	4	Long distance (L)
4	2	OC-48, long reach		Fibre Channel transmitter technology		
4	1	OC-48, intermediate reach		7	3-2	Reserved
4	0	OC-48, short reach		7	1	Longwave laser (LC)
5	7	Reserved		7	0	Electrical inter-enclosure (EL)
5	6	OC-12, single mode long reach		8	7	Electrical intra-enclosure (EL)
5	5	OC-12, single mode intermediate reach		8	6	Shortwave laser w/o OFC (SN)
5	4	OC-12, multi-mode short reach		8	5	Shortwave laser w/ OFC (SL)
5	3	Reserved		8	4	Longwave laser (LL)
5	2	OC-3, single mode long reach		8	0-3	Reserved
5	1	OC-3, single mode intermediate reach				
5	0	OC-3, multi-mode short reach		Fibre Channel Transmission Media		
				9	7	Twin axial pair (TW)
				9	6	Shielded twisted pair (TP)
				9	5	Miniature coax (MI)
Gigabit Ethernet Compliance Codes				9	4	Video coax (TV)
6	7-4	Reserved		9	3	Multi-mode, 62.5µ (M6)
6	3	1000BASE-T		9	2	Multi-mode, 50µ (M5)
6	2	1000BASE-CX		9	1	Reserved
6	1	1000BASE-LX		9	0	Single mode (SM)
6	0	1000BASE-SX				
				Fibre Channel speed		
				10	7-5	Reserved
				10	4	400 MBytes/Sec
				10	3	Reserved
				10	2	200 MBytes/Sec
				10	1	Reserved
				10	0	100 MBytes/Sec

Table 3.4: Transceiver Codes

Note 1: Bit 7 is the high order bit and is transmitted first in each byte.

BR, nominal:
The nominal bit rate (BR, nominal) is specified in units of 100Megabits per second, rounded off to the nearest 100Megabits per second. The bit rate includes those bits necessary to encode and delimit the signal as well as those bits carrying data information. A value of 0 indicates that the bit rate is not specified and must be determined from the transceiver technology. The actual information transfer rate will depend on the encoding of the data, as defined by the encoding value.

Length (9µm)-km
Addition to EEPROM data from original GBIC definition.This value specifies the link length that is supported by the SFP while operating in compliance with the applicable standards using single mode fiber. The value is in units of kilometers. A value of 255 means that the SFP supports a link length greater than 254 km. A value of zero means that the SFP does not support single mode fiber or that the length information must be determined from the transceiver technology.

Length (9µm)
This value specifies the link length that is supported by the SFP while operating in compliance with the applicable standards using single mode fiber. The value is in units of 100 meters. A value of 255 means that the SFP supports a link length greater than 25.4 km. A value of zero means that the SFP does not support single mode fiber or that the length information must be determined from the transceiver technology.

Length (50µm)
This value specifies the link length that is supported by the SFP while operating in compliance with the applicable standards using 50 micron multimode fiber. The value is in units of 10 meters. A value of 255 means that the SFP supports a link length greater than 2.54 km. A value of zero means that the SFP does not support 50µm multimode fiber or that the length information must be determined from the transceiver technology.

Length (62.5µm)
The value specifies the link length that is supported by the SFP while operation in compliance with the applicable standards using 62.5 micron multi-mode fiber. The value is in units of 10 meters. A value of 255 means that the SFP supports a link length greater than 2.54km. A value of zero means that the SFP does not support 62.5 micron multi-mode fiber or that the length information must be determined from the transceiver technology. It is common for SFPs to support both 50µm and 62.5µm fiber.

Length (Copper)
This value specifies the minimum link length that is supported by the SFP while operating in compliance with the applicable standards using single mode fiber. The value is in units of 1 meters. A value of 255 means that the SFP supports a link length greater than 254 meters. A value of zero means that the SFP does not support copper cables or that the length information must be determined from the transceiver technology. Further information about the cable design, equalization, and connectors is usually required to guarantee meeting a particular length requirement.

Vendor name
The vendor name is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h). The vendor name shall be the full name of the corporation, a commonly accepted abbreviation of the name of the corporation, the SCSI company code for the corporation, or the stock exchange code for the corporation. At least one of the vendor name or the vendor OUI fields shall contain valid serial data.

Vendor OUI
The vendor organizationally unique identifier field (vendor OUI) is a 3-byte field that contains the IEEE Company Identifier for the vendor. A value of zero in the 3-byte field indicates that the Vendor OUI is unspecified.

Vendor PN
The vendor part number (vendor PN) is a 16-byte field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h), defining the vendor part number or product name. A value of all zero in the 16-byte field indicates that the vendor PN is unspecified.

Vendor Rev
The vendor revision number (vendor rev) is a 4-byte field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h), defining the vendor's product revision number. A value of all zero in the 4-byte field indicates that the vendor PN is unspecified.

CC_BASE
The check code is a one byte code that can be used to verify that the first 64 bytes of serial information in the SFP is valid. The check code shall be the low order 8 bits of the sum of the contents of all the bytes from byte 0 to 62, inclusive

OPTIONS
The bits in the option field shall specify the options implemented in the SFP as described in table D.6.

Data address	bit	Description of option
64	7-0	Reserved
65	7-6	Reserved
65	5	RATE_SELECT is implemented If bit is set then active contol of the rate pin is required to change rates. If bit is not set, no control of pin is required. In all cases, compliance with multiple rate standards should be determined by Transceiver Codes in Bytes 4,5,6, and 10. (See Table 3.4)
65	4	TX_DISABLE is implemented and disables the serial output.
65	3	TX_FAULT signal implemented. (Reset defined in section III)
65	2	Loss of signal implemented, signal inverted from definition 3.3. NOTE: This is not standard SFP behavior and should be avoided, since non-interoperable behavior results.
65	1	Loss of signal implemented, signal as defined in Table 1
65	0	Reserved

Table 3.6: Option values

BR, max
The upper bit rate limit at which the SFP will still meet its specifications (BR, max) is specified in units of 1% above the nominal bit rate. A value of zero indicates that this field is not specified.

BR, min
The lower bit rate limit at which the SFP will still meet its specifications (BR, min) is specified in units of 1% below the nominal bit rate. A value of zero indicates that this field is not specified.

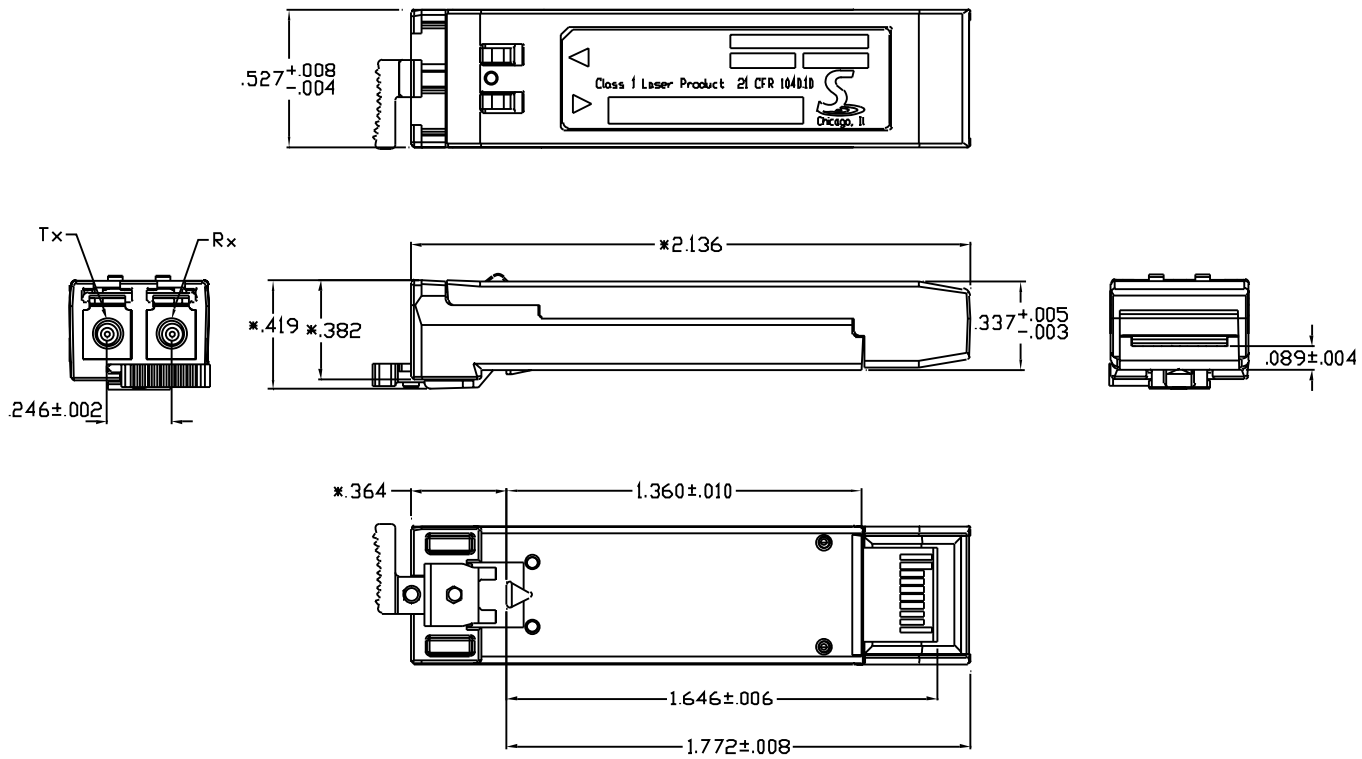
Vendor SN
The vendor serial number (vendor SN) is a 16 character field that contains ASCII characters, left-aligned and padded on the right with ASCII spaces (20h), defining the vendor's serial number for the SFP. A value of all zero in the 16-byte field indicates that the vendor PN is unspecified.

Date Code
The date code is an 8-byte field that contains the vendor's date code in ASCII characters. The date code is mandatory. The date code shall be in format specified by table D.7.

Data Address	Description of field
84-85	ASCII code, two low order digits of year. (00 = 2000).
86-87	ASCII code, digits of month (01 = Jan through 12 = Dec)
88-89	ASCII code, day of month (01-31)
90-91	ASCII code, vendor specific lot code, may be blank

Table 3.7: Date Code

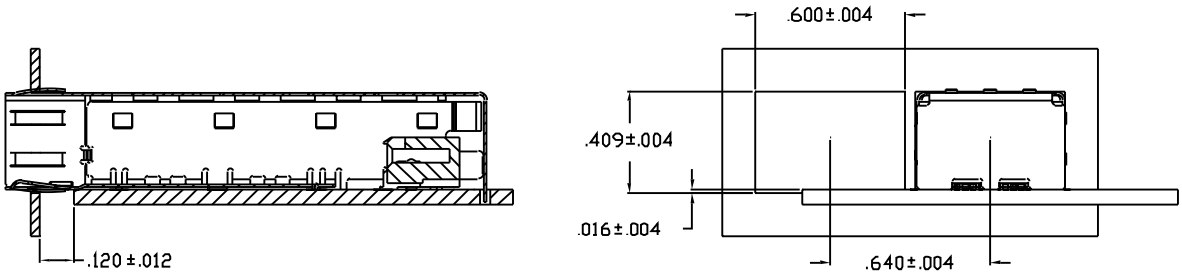
[illegible]



Notes:
1. * Dimensions are for reference only.

[illegible]

[illegible]



Recommended Panel Cutout

SPLC-20-4-X-SL Optical Gigabit Ethernet -- +3.3V Small Form Factor Pluggable (SFP) -- 1.25GBaud

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