



## Features

- 155Mbps data links
- Up to 20km point-point transmission on SMF
- 1310nm FP transmitter and 1550nm PIN receiver for SPL-35-03-EBX-IDFM
- 1550nm FP transmitter and 1310nm PIN receiver for SPL-53-03-EBX-IDFM
- SFP MSA package with LC connector
- +3.3V single power supply
- Operating case temperature: -40~+85°C
- RoHS compliant

## Regulatory Compliance

Table 1 - Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class I laser product.
RoHS	2002/95/EC 4.1&4.2 2005/747/EC	Compliant with RoHS

## Absolute Maximum Ratings

Table 2 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Temperature	T <sub>s</sub>	-40	-	+85	°C	
Supply Voltage	V <sub>CC</sub>	-0.5	-	+3.6	V	
Operating Relative Humidity	RH	+5	-	+95	%	

## Recommended Operating Conditions

**Table 3 – Recommended Operating Conditions**

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	$T_C$	-40	-	+85	°C	
Power Supply Voltage	$V_{CC}$	3.13	3.3	3.47	V	
Power Supply Current	$I_{CC}$	-	-	300	mA	
Power Dissipation	$P_D$	-		1.041	W	
Data Rate			155		Mbps	

## Optical Characteristics

**Table 4 – Optical Characteristics: SPL-35-03-EBX-IDFM**

Transmitter							
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes	
Centre Wavelength	$\lambda_C$	1260	1310	1360	nm		
Average Output Power	$P_{OUT}$	-14		-8	dBm	1	
Spectral Width (RMS)	$\Delta\lambda$		2.5	7	nm		
Extinction Ratio	EX	10			dB		
Optical Isolation		30			dB		
Optical Eye Mask		ITU-T G.957 Compatible					2
Receiver							
Centre Wavelength	$\lambda_C$	1450	1550	1580	nm		
Receiver Sensitivity	$P_{IN}$			-32	dBm	3	
Receiver Overload	$P_{IN}$	-8			dBm	3	
Return Loss		14			dB		
LOS Assert	$LOS_A$	-45			dBm		
LOS Deassert	$LOS_D$			-34	dBm		
LOS Hysteresis		0.5		5	dB		

Notes:

1. The optical power is launched into SMF
2. Measured with a PRBS  $2^{23}-1$  test pattern @155Mbps.
3. Measured with PRBS  $2^{23}-1$  test pattern@155Mbps,  $BER \leq 1 \times 10^{-10}$ .

**Table 5 – Optical Characteristics: SPL-53-03-EBX-IDFM**

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	$\lambda_C$	1450	1550	1580	nm	
Average Output Power	$P_{OUT}$	-14		-8	dBm	1
Spectral Width (RMS)	$\Delta\lambda$		2.5	4.6	nm	
Extinction Ratio	EX	10			dB	
Optical Isolation		30			dB	
Optical Eye Mask	ITU-T G.957 Compatible					2
Receiver						
Centre Wavelength	$\lambda_C$	1260	1310	1360	nm	
Receiver Sensitivity	$P_{IN}$			-32	dBm	3
Receiver Overload	$P_{IN}$	-8			dBm	3
Return Loss		14			dB	
LOS Assert	$LOS_A$	-45			dBm	
LOS Deassert	$LOS_D$			-34	dBm	
LOS Hysteresis		0.5		5	dB	

Notes:

1. The optical power is launched into SMF
2. Measured with a PRBS  $2^{23}-1$  test pattern @155Mbps.
3. Measured with PRBS  $2^{23}-1$  test pattern@155Mbps,  $BER \leq 1 \times 10^{-10}$ .

## Electrical Characteristics

**Table 6 – Electrical Characteristics**

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Input Swing Differential	$V_{IN}$	500		2400	mV	1
Input Differential Impedance	$Z_{IN}$	90	100	110	$\Omega$	
Tx_DIS Disable	$V_D$	2.0		$V_{CC}$	V	
Tx_DIS Enable	$V_{EN}$	GND		GND+0.8	V	
TX_ Fault (Fault)		2.0		Vcc+0.3	V	
TX_ Fault (Normal)		0		0.8	V	
Receiver						
Data Output Swing Differential	$V_{OUT}$	370		2000	mV	1
Rx_LOS Fault	$V_{LOS-Fault}$	2.0		Vcc+0.3	V	
Rx_LOS Normal	$V_{LOS-Normal}$	GND		GND+0.8	V	

Notes:

1. Internally AC coupled

### Recommended Host Board Power Supply Circuit

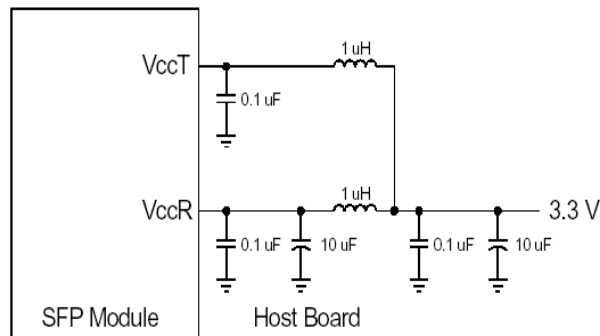


Figure 1, Recommended Host Board Power Supply Circuit

### Recommended Interface Circuit

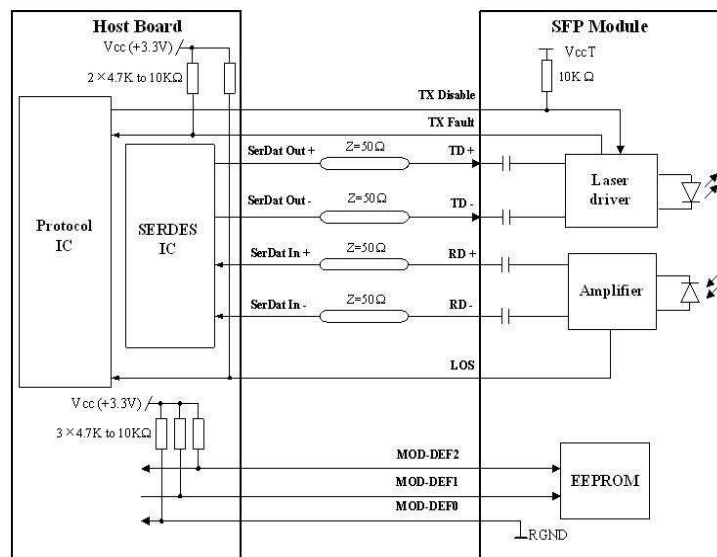
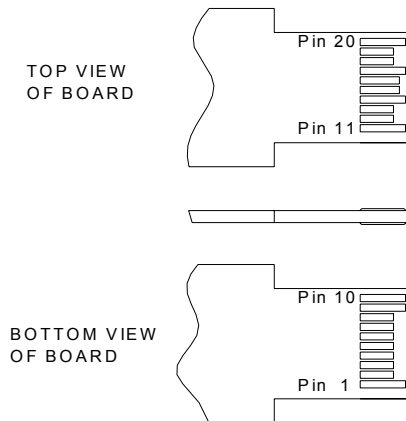


Figure 2, Recommended Interface Circuit

### Pin Definitions

Figure 3 below shows the pin numbering of SFP electrical interface. The pin functions are described in Table 7 with some accompanying notes.



**Figure 3, Pin View**

**Table 7 - Pin Function Definitions**

Pin No.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2
4	MOD-DEF2	Module Definition 2	3	Note 3
5	MOD-DEF1	Module Definition 1	3	Note 3
6	MOD-DEF0	Module Definition 0	3	Note 3
7	Rate Select	Not Connected	3	
8	LOS	Loss of Signal	3	Note 4
9	VeeR	Receiver Ground	1	
10	VeeR	Receiver Ground	1	
11	VeeR	Receiver Ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	VeeR	Receiver Ground	1	
15	VccR	Receiver Power	2	
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	VeeT	Transmitter Ground	1	

**Notes:**

- TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 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~10kΩ resistor. Its states are:  
Low (0~0.8V): Transmitter on

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

3. MOD-DEF 0,1,2 are the module definition pins. They should be pulled up with a 4.7k~10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.  
 MOD-DEF 0 is grounded by the module to indicate that the module is present  
 MOD-DEF 1 is the clock line of two wires serial interface for serial ID  
 MOD-DEF 2 is the data line of two wires serial interface for serial ID
4. LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; logic 1 indicates loss of signal. In the low state, the output will be pulled to less than 0.8V.
5. These are the differential receiver output. They are internally AC-coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES.
6. These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

### EEPROM Information

The SFP MSA defines a 256-byte memory map in EEPROM describing the transceiver’s capabilities, standard interfaces, manufacturer, and other information, which is accessible over a 2 wire serial interface at the 8-bit address 1010000X (A0h). The memory contents refer to Table 8.

**Table 8 - EEPROM Serial ID Memory Contents (A0h)**

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	MOD4
2	1	Connector	07	LC
3—10	8	Transceiver	00 xx 02 00 00 00 00 00	Transmitter Code xx:10 for SPL-35-03-EBX-IDFM and 08 for SPL-53-03-EBX-IDFM
11	1	Encoding	03	
12	1	BR, nominal	02	155Mbps
13	1	Reserved	00	
14	1	Length (9um)-km	14	20km
15	1	Length (9um)	C8	20km
16	1	Length (50um)	00	
17	1	Length (62.5um)	00	
18	1	Length (copper)	00	
19	1	Reserved	00	
20—35	16	Vendor name	53 4F 55 52 43 45 50 48 4F 54 4F 4E 49 43 53 20	“SOURCEPHOTONICS“(ASC II)

36	1	Reserved	00	
37—39	3	Vendor OUI	00 1F 22	
40—55	16	Vendor PN	53 50 4C xx xx 30 33 45 42 58 49 44 46 4D 20 20	35 for SPL-35-03-EBX-IDFM(ASC II) 53for SPL-53-03-EBX-IDFM (ASC II)
56—59	4	Vendor rev	31 30 20 20	ASC II ( “31 30 20 20” means 1.0 revision)
60-61	2	Wavelength	05 1E/06 0E	1310nm/1550nm
62	1	Reserved	00	
63	1	CC BASE	xx	Check sum of bytes 0 - 62
64—65	2	Options	00 1A	LOS, TX_FAULT and TX_DISABLE
66	1	BR, max	00	
67	1	BR, min	00	
68—83	16	Vendor SN	xx	ASC II .
84—91	8	Vendor date code	xx	Year (2 bytes), Month (2 bytes), Day (2 bytes)
92	1	Diagnostic type	58	
93	1	Enhanced option	B0	
94	1	SFF-8472	02	
95	1	CC EXT	xx	Check sum of bytes 64 - 94
96-255	160	Vendor specific		

Note: The “xx” byte should be filled in according to practical case. For more information, please refer to the related document of SFF-8472 Rev 9.5.

**Table 9-Monitoring Specification**

Parameter	Range	Accuracy	Calibration*
Temperature	-40 to +95°C	±3°C	External
Voltage	2.97 to 3.63V	±3%	External
Bias Current	3mA to 80mA	±10%	External
TX Power	-8 to -14dBm	±3dB	External
RX Power	-8 to -32dBm	±3dB	External



## Mechanical Diagram

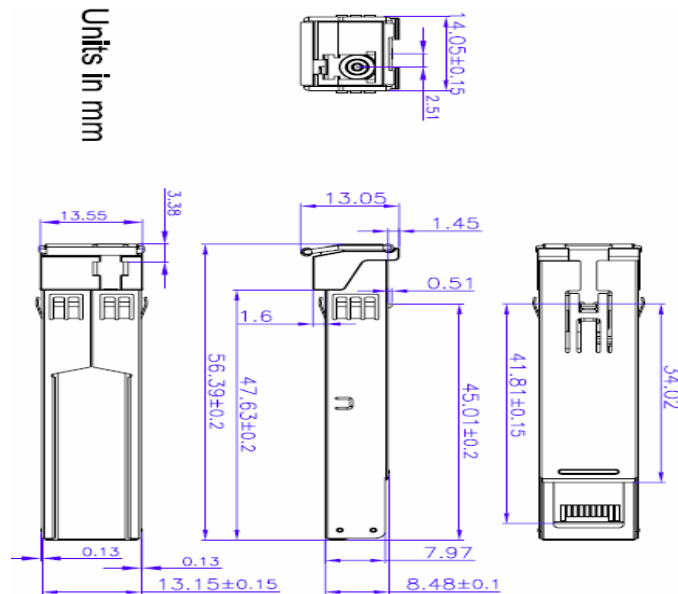


Figure 5, Mechanical Design Diagram of the SFP with Spring-Latch

## Order Information

Table 10 – Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
SPL-35-03-EBX-IDFM	100Base-BX10-U	155Mbps	1310nm FP Tx/1550nm PIN Rx	SMF
SPL-53-03-EBX-IDFM	100Base-BX10-D	155Mbps	1550nm FP Tx/1310nm PIN Rx	SMF

## Warnings

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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