



SINGLEMODE SFP  
TRANSCEIVER

## Singlemode SFP Transceiver

### Feature:

- SFP package with LC connector
- 1310nm FP laser and PIN photo detector
- 10Km~20Km transmission with SMF
- +3.3V single power supply
- LVPECL compatible data input/output interface
- Low EMI and excellent ESD protection
- Laser safety standard IEC-60825 compliant
- Compatible with RoHS



### Application:

- Ethernet
- Telecom
- Fiber Channel

### Description:

The SFP transceiver supports dual data-rate of 1.25Gbps/1.0625Gbps and from 10km to 20km transmission distance with SMF or 550m with MMF.

The transceiver consists of two sections: The transmitter section incorporates a FP laser. The receiver section consists of a PIN photodiode integrated with a trans-impedance preamplifier (TIA).

All modules satisfy class I laser safety requirements. The optical output can be disabled by a TTL logic high-level input of Tx Disable. Tx Fault indicates that degradation of the laser. Loss of signal (LOS) output indicates the loss of an input optical signal of receiver.

The standard serial ID information compatible with SFP MSA describes the transceiver's capabilities, standard interfaces, manufacturer and other information. The host equipment can access this information via the 2-wire serial bus. For more information, please refer to SFP Multi-Source Agreement (MSA)

### Performance specifications:

#### Absolute Maximum Ratings:

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	Tst	-40	+85	°C
Operating Temperature	Top	0	+70	°C
Supply Voltage	Vcc	0	+3.6	V
Input voltage	Vin	GND	Vcc	
Lead Soldering Temperature & Time		240/10		°C/s

#### Operation Environment:

Parameter	Symbol	Minimum	Maximum	Units
Supply Voltage	Vcc	3.15	3.45	V
Ambient Operating Temperature	Top	0	+70	°C
Operating Relative Humidity	-	5	95	%

## Transmitter Section:

(Ambient Operating Temperature 0°C to +70°C, Vcc =3.3 V)

Parameter	Symbol	Min.	Typ.	Max.	Units
Data rate	-	-	1250	-	Mb/s
Center Wavelength	$\lambda_o$	1270	1310	1350	nm
Output Spectral width	$\Delta\lambda$	-	-	4	nm
Average Optical Output Power	Po	-8	-	-3	dBm
Extinction Ratio	Er	10	-	-	dB
Rise/Fall Time(20%~80%)	Tr/Tf			0.26	ns
Total jitter	Tj			0.43	UI
Optical Eye Diagram	IEEE 802.3z and ANSI Fibre Channel Compatible				
Input Differential impedance	Zdiff		100		Ohm
TX disable	Disable	2.0		Vcc	V
	Enable	0		0.8	V
Fault	Fault	2.0		Vcc+0.8	V
	Normal	0		0.8	V

## Receiver Section:

(Ambient Operating Temperature 0°C to +70°C, Vcc =3.3 V)

Parameter	Symbol	Min.	Typ.	Max.	unit
Data rate			1250		Mb/s
Wavelength	$\lambda$	1270	1310	1570	nm
Maximum Input Power	Pmax	0	-	-	dBm
Receiver Sensitivity	Pmin	-	-27	-25	dBm
Output Differential Impedence	Zdiff		100		Ohm
LOSS Thresholds	LOSA	-	-	-31	dBm
	LOSD	-34			

**EEPROM INFORMATION:**

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 00 00 02 12 00 0D 01	Transmitter Code
11	1	Encoding	01	8B10B
12	1	BR, nominal	0D	1250Mbps
13	1	Reserved	00	
14	1	Length (9µm)-km	0A/14/28	10km/20km/40km
15	1	Length (9µm)	64/C8/FF	
16	1	Length (50µm)	37	550m
17	1	Length (62.5µm)	37	550m
18	1	Length (copper)	00	
19	1	Reserved	00	
20-35	16	Vendor name	57 49 4E 54 4F 50 20 20 20 20 20 20 20 20 20 20	Optiplus
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASC II
56-59	4	Vendor rev	31 2E 30 20	V1.0
60-61	2	Wavelength	05 1E	1310nm
62	1	Reserved	00	
63	1	CC BASE	XX	Check sum of byte 0~62
64-65	2	Options	00 1A	LOS, TX_DISABLE, TX_FAULT
66	1	BR, max	32	50%
67	1	BR, min	32	50%
68-83	16	Vendor SN	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	Unspecified
84-91	8	Vendor date code	XX XX XX 20	Year, Month, Day
92-94	3	Reserved	00	
95	1	CC_EXT	XX	Check sum of byte 64~94
96-255	160	Vendor specific		

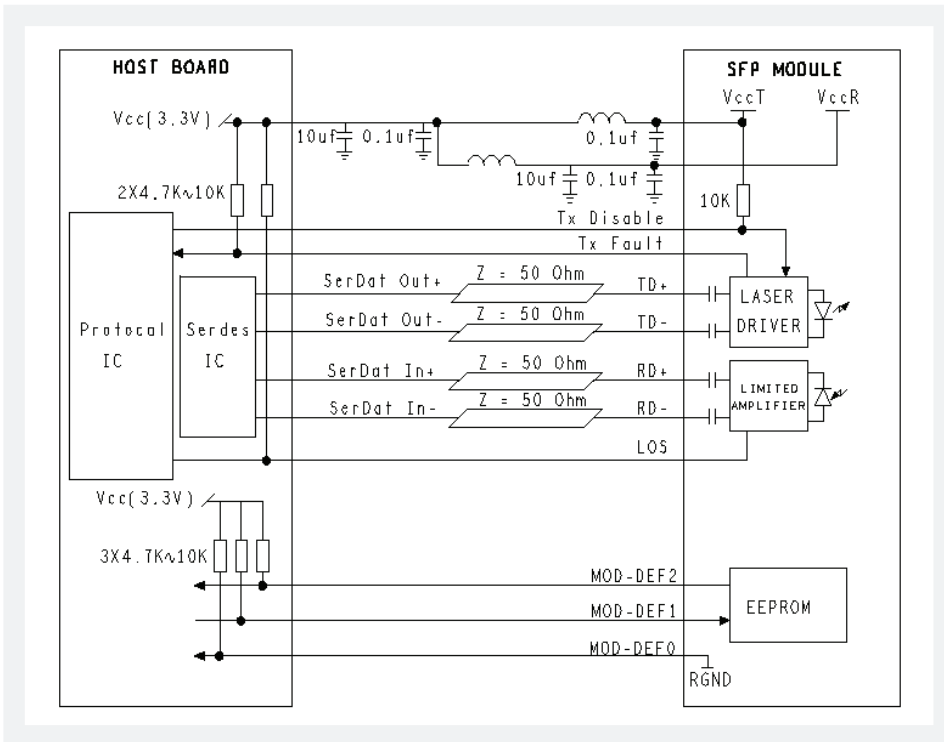
## Pin Description:

Pins	Name	Description	NOTE
1	VeeT	Transmitter Ground	
2	Tx Fault	Transmitter Fault Indication	1
3	Tx Disable	Transmitter Disable	2
4	MOD DEF2	Module Definition 2	3
5	MOD DEF1	Module Definition 1	3
6	MOD DEF0	Module Definition 0	3
7	Rate Select	Not Connected	
8	LOS	Loss of Signal	4
9	VeeR	Receiver Ground	
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Inv. Received Data Output	5
13	RD+	Received Data Output	5
14	VeeR	Receiver Ground	
15	VccR	Receiver Power	
16	VccT	Transmitter Power	
17	VeeT	Transmitter Ground	
18	TD+	Transmit Data Input	6
19	TD-	Inv. Transmit Data Input	6
20	VeeT	Transmitter Ground	

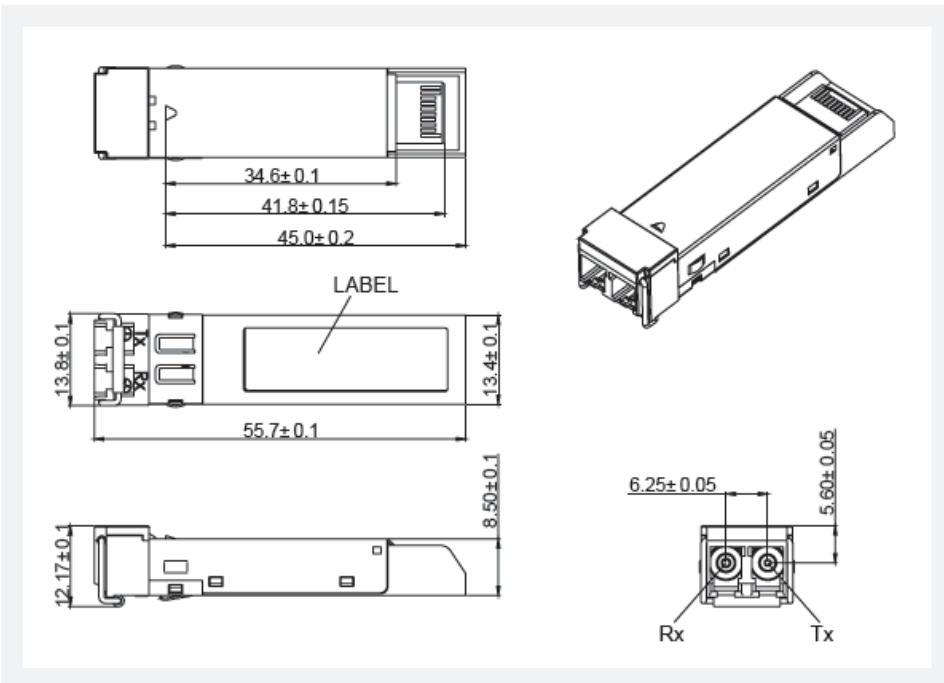
### Notes:

- 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
- 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 wire serial interface for serial ID  
 MOD-DEF 2 is the data line of two wire serial interface for serial ID
- 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.
- 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.
- These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Application Circuit:



Outline drawing (mm):



### Ordering information:

Part No.	Data Rate	Laser	Fibre Type	Distance	Optical Interface	DDMI
OP-UM-SFP-SM/LX1310/10	1.25Gbps	1310nm FP	SMF	10Km	LC	NO
OP-UM-SFP-SM/LX1310/10D	1.25Gbps	1310nm FP	SMF	10Km	LC	YES
OP-UM-SFP-SM/LX1310/10I	1.25Gbps	1310nm FP	SMF	10Km	LC	NO
OP-UM-SFP-SM/LX1310/10ID	1.25Gbps	1310nm FP	SMF	10Km	LC	YES
OP-UM-SFP-SM/LX1310/20	1.25Gbps	1310nm FP	SMF	20Km	LC	NO
OP-UM-SFP-SM/LX1310/20D	1.25Gbps	1310nm FP	SMF	20Km	LC	YES
OP-UM-SFP-SM/LX1310/20I	1.25Gbps	1310nm FP	SMF	20Km	LC	NO
OP-UM-SFP-SM/LX1310/20ID	1.25Gbps	1310nm FP	SMF	20Km	LC	YES

\* I--- Industrial operating temperature

\* D--- DDMI

### NOTICE:

Optiplus Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Optiplus Networks makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.



MULTIMODE SFP  
TRANSCEIVER



## Multimode SFP Transceiver

### Feature:

- SFP package with LC connector
- 1310nm FP Laser and PIN photo detector
- Up to 2Km transmission on 50/125 μ MMF
- +3.3V single power supply
- LVPECL compatible data input/output interface
- Low EMI and excellent ESD protection
- Laser safety standard IEC-60825 compliant
- Compatible with RoHS



### Application:

- Ethernet
- Telecom
- Fiber Channel

### Absolute Maximum Ratings:

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	Tst	-40	+85	°C
Supply Voltage	Vcc	0	+3.6	V
Operating Relative Humidity	RH	5	95	%

### Operation Environment:

Parameter		Symbol	Min	Typical	Max	Units
Supply Voltage		Vcc	3.15		3.45	V
Operating Case Temperature	Commercial	Tc	0		+70	°C
	Industrial		-40		+85	
Power Dissipation					1	W
Data Rate				155		Mbps

## Optical Characteristics:

(Ambient Operating Temperature 0°C to +70°C, Vcc =3.3 V)

Parameter	Symbol	Min.	Typ.	Max.	Units
Transmitter Section					
Center Wavelength	$\lambda_o$	1260	1310	1360	nm
Spectral Width(RMS)	$\Delta\lambda$	-	-	4	nm
Average Output Power	Po	-20	-	-12	dBm
Extinction Ratio	Er	12	-	18	dB
Rise/Fall Time(20%~80%)	Tr/Tf			0.26	ns
Total jitter	Tj			0.43	UI
Optical Eye Diagram	IEEE 802.3u and ANSI Fibre Channel Compatible				
Receiver Section					
Center Wavelength	$\lambda_o$	1260		1620	nm
Receiver Sensitivity	Rsen			-34	dBm
Receiver Overload	Rov	-3			dBm
Return Loss		12			dB
LOS Assert	LOSA	-45			dBm
LOS Dessert	LOSD			-34	dBm
LOS Hysteresis		0.5		5	

## Electrical Characteristics:

(Ambient Operating Temperature 0°C to +70°C, Vcc =3.3 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Transmitter Section					
Input Differential Impedence	Zin	90	100	110	Ohm
Data Input Swing Differential	Vin	500		2400	mV
TX Disable	Disable	2.0		Vcc	V
	Enable	0		0.8	V
Deassert	Assert	2.0		Vcc	V
	Deassert	0		0.8	V
Receiver Section					
Output Differential Impedence	Zout		100		Ohm
Data Input Swing Differential	Vout	370		2000	mV
Rx_LOS	Assert	2.0		Vcc	V
	Deassert	0		0.8	V

## EEPROM INFORMATION (A0):

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 00 00 02 12 00 0D 01	Transmitter Code
11	1	Encoding	01	8B10B
12	1	BR, nominal	01	155Mbps
13	1	Reserved	00	
14	1	Length (9µm)-km	02	2Km
15	1	Length (9µm)	00	
16	1	Length (50µm)	37	550m
17	1	Length (62.5µm)	1B	270m
18	1	Length (copper)	00	
19	1	Reserved	00	
20-35	16	Vendor name	57 49 4E 54 4F 50 20 20 20 20 20 20 20 20 20 20	Optiplus
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASC II
56-59	4	Vendor rev	31 2E 30 20	V1.0
60-61	2	Wavelength	05 1E	1310nm
62	1	Reserved	00	
63	1	CC BASE	XX	Check sum of byte 0~62
64-65	2	Options	00 1A	LOS, TX_DISABLE, TX_FAULT
66	1	BR, max	32	50%
67	1	BR, min	32	50%
68-83	16	Vendor SN	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	Unspecified
84-91	8	Vendor date code	XX XX XX 20	Year, Month, Day
92-94	3	Reserved	00	
95	1	CC_EXT	XX	Check sum of byte 64~94
96-255	160	Vendor specific		

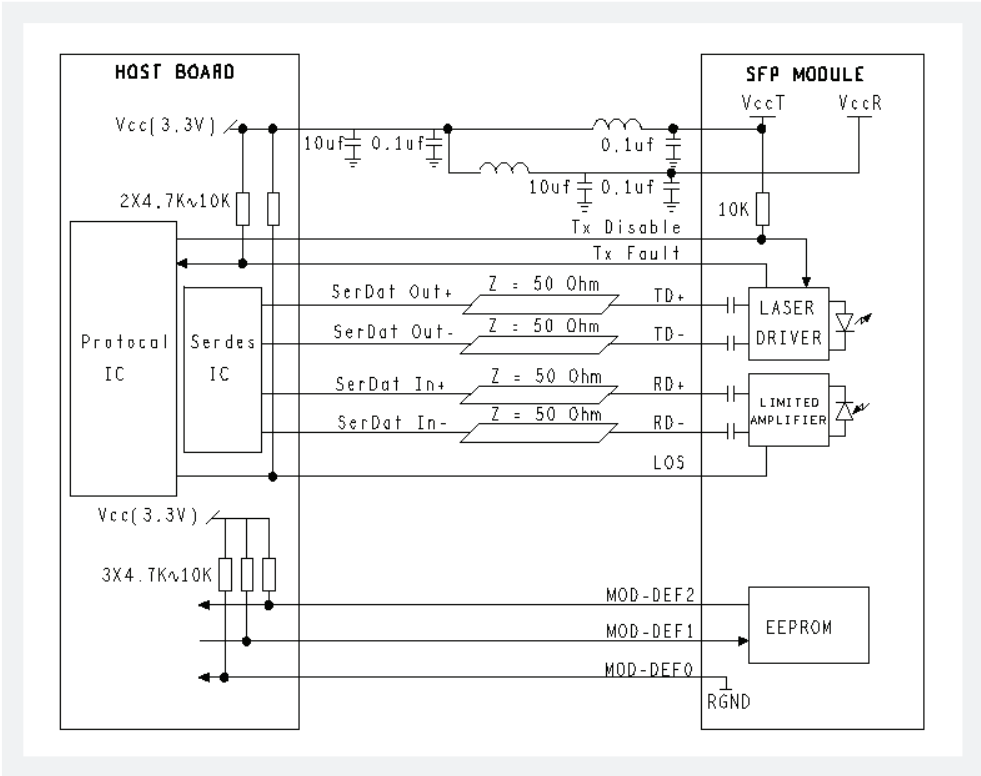
## Pin Description:

Pins	Name	Discription	NOTE
1	VeeT	Transmitter Ground	
2	Tx Fault	Transmitter Fault Indication	1
3	Tx Disable	Transmitter Disable	2
4	MOD DEF2	Module Definition 2	3
5	MOD DEF1	Module Definition 1	3
6	MOD DEF0	Module Definition 0	3
7	Rate Select	Not Connected	
8	LOS	Loss of Signal	4
9	VeeR	Receiver Ground	
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Inv. Received Data Output	5
13	RD+	Received Data Output	5
14	VeeR	Receiver Ground	
15	VccR	Receiver Power	
16	VccT	Transmitter Power	
17	VeeT	Transmitter Ground	
18	TD+	Transmit Data Input	6
19	TD-	Inv. Transmit Data Input	6
20	VeeT	Transmitter Ground	

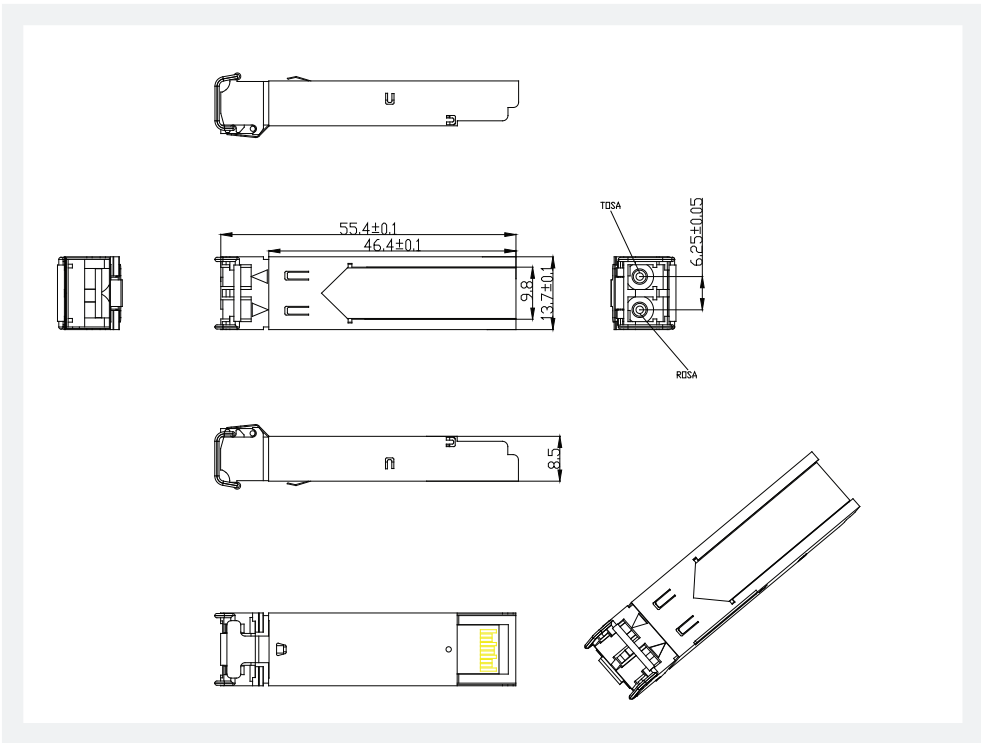
### Notes:

- 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
- 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 wire serial interface for serial ID  
 MOD-DEF 2 is the data line of two wire serial interface for serial ID
- 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.
- 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.
- These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

**Recommended Application Circuit:**



**Outline Drawing (mm):**



## Ordering Information:

OP-UM-SFP-MM/SX850	Commercial	0~70°C
OP-UM-SFP-MM/SX850/I	Industrial	-40~85°C

### NOTICE:

Optiplus Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Optiplus Networks makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.



**OP-SFP<sup>+</sup>-LP-10**  
10.3Gbps SFP<sup>+</sup> Transceiver

## Product Description

The OP-SFP+ -LP-10 series single-mode transceivers are SFP+ module for bi-directional serial optical data communications such as 10GBASE-SR and 10GBASE-SW.

It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. This module is designed for multi-mode fiber and operates at a nominal wavelength of 1310 nm.

The transmitter section uses a 1310 nm multiple quantum well DFB laser and is a class1 laser compliant according to International Safety Standard IEC-60825. The receiver section uses an integrated InGaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

## Features

- Operating data rate up to 10.3Gbps
- 1310 nm DFB-LD Transmitter
- Distance up to 10Km
- Single 3.3V Power supply and TTL Logic Interface
- Duplex LC Connector Interface
- Hot Pluggable
- Operating Case Temperature Standard: 0° c~+70° c
- Compliant with MSA SFP+ Specification
- Digital diagnostic monitor interface

## Applications

- 10G Ethernet at 10.3125Gbps
- Compatible with SFF-8472

## Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class1(>500 V) Isolation with the case
Electromagnetic Interference (EMI)	FCC Part 15 ClassB	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. Compatible with TÜV standards
Component Recognition	UL and CUL	Compatible with UL standards
Green Products	RoHS	RoHS6



## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	VCC	-0.5	3.6	V

## Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub>	OP-SFP+-LP-10	0		+70	°C
Power Supply Voltage	V <sub>CC</sub>		3.15	3.3	3.45	V
Power Supply Current	I <sub>CC</sub>				300	mA
Surge Current	I <sub>Surge</sub>				+30	mA
Baud Rate				10.3125	10.5	GBaud

## Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>TRANSMITTER</b>						
CML Inputs(Differential)	V <sub>in</sub>	150		1200	mVp	AC coupled inputs
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> > 100 kohms @ DC
Tx_DISABLE Input Voltage - High		2		3.45	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage -- High		2		V <sub>CC</sub> +0.3	V	I <sub>o</sub> = 400μA; Host V <sub>CC</sub>
Tx_FAULT Output Voltage -- Low		0		0.5	V	I <sub>o</sub> = -4.0mA

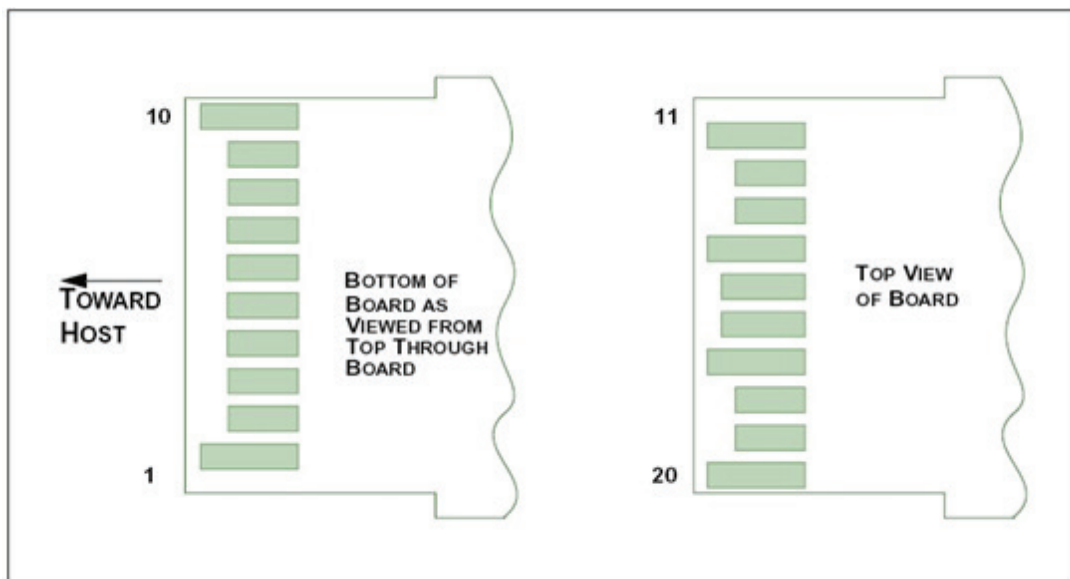
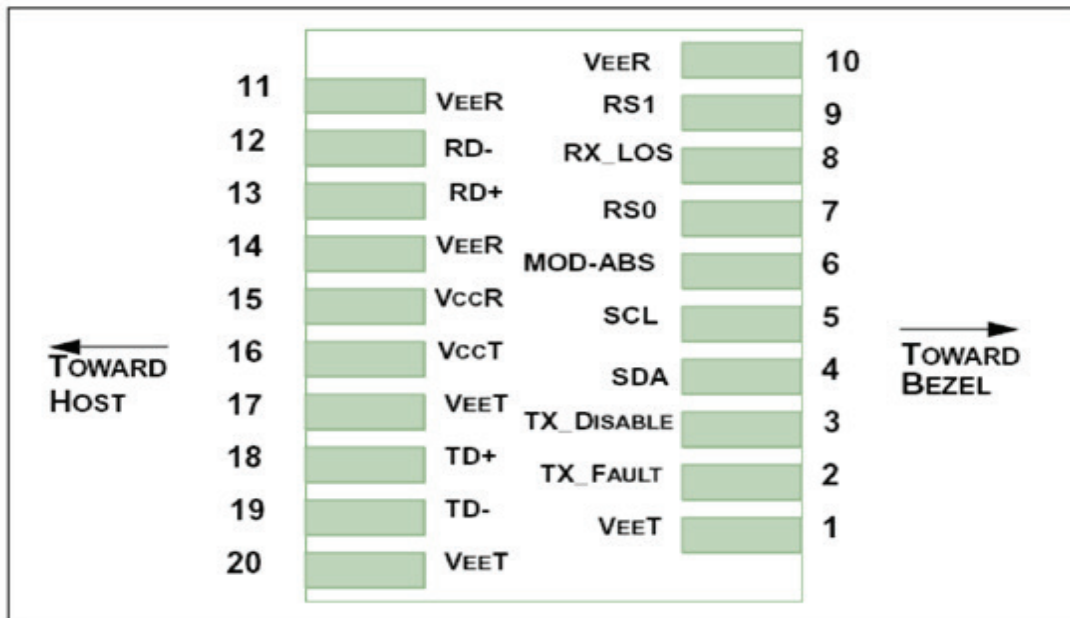
RECEIVER						
CML Outputs (Differential)	Vout	350		700	mVpp	AC coupled outputs
Output Impedance (Differential)	Zout	85	100	115	ohms	
Rx_LOS Output Voltage - High	2			Vcc+0.3	V	Io = 400µA; Host Vcc
Rx_LOS Output Voltage - Low		0		0.8	V	Io = -4.0mA
MOD_DEF ( 0:2 )	VoH	2.5		V		With Serial ID
	VoL	0		0.5 V		

## Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	
9µm Core Diameter SMF			10		Km	
Data Rate			10.3		Gbps	
Transmitter						
Centre Wavelength	$\lambda_c$	1270	1310	1355	nm	
Spectral Width (-20dB)	$\sigma$			1	nm	
Average Output Power	P <sub>out</sub>	-8		+0.5	dBm	
Extinction Ratio	ER	3.5			dB	
Average Power of OFF Transmitter				-30	dBm	
Side Mode Suppression Ratio	SMSR	30			dB	
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc+0.3	V
	Enable		0		0.8	
TX_Fault	Fault		2.0		Vcc+0.3	V
	Normal		0		0.8	
TX_Disable Assert Time	t <sub>off</sub>			10	µs	

Receiver						
Centre Wavelength	$\lambda_c$	1260		1565	nm	
Receiver Sensitivity	PIN			-12.6	dBm	
Output Differential Impedance	$P_{IN}$	90	100	110	$\Omega$	
Receiver Overload	$P_{MAX}$	0.5			dBm	
Optical Return Loss	ORL			-12	dB	
LOS De-Assert	$LOS_D$			-15	dBm	
LOS Assert	$LOS_A$	-25			dBm	
LOS	High		2.0		$V_{CC}+0.3$	V
	Low		0		0.8	

### SFP+ Transceiver Electrical Pad Layout



## 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, Module disables on high or open
4	SDA	Module Definition 2	3	Note 3, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

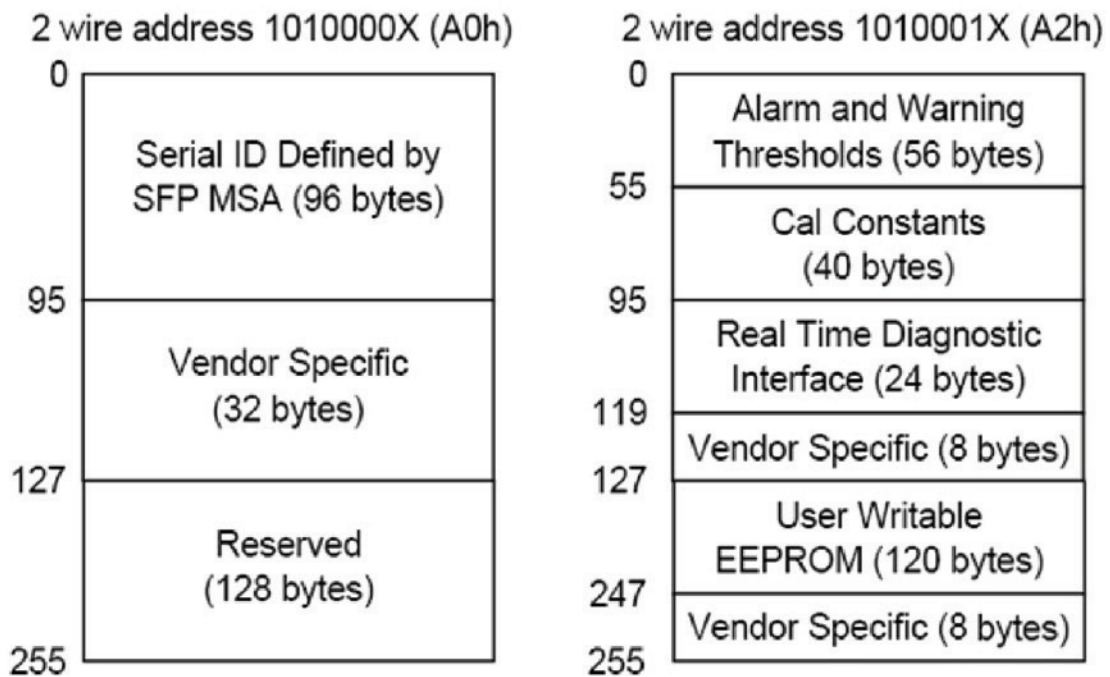
## Notes:

- 1) 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.
- 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 4.7 – 10 K Ω 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
- 3) Modulation Absent, connected to VEET or VEER in the module.
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, 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.
- 5) VeeR and VeeT may be internally connected within the SFP<sup>+</sup> module.
- 6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (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.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP<sup>+</sup> connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP<sup>+</sup> input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP<sup>+</sup> transceiver 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<sup>+</sup> transceiver module.
- 8) 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 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance.

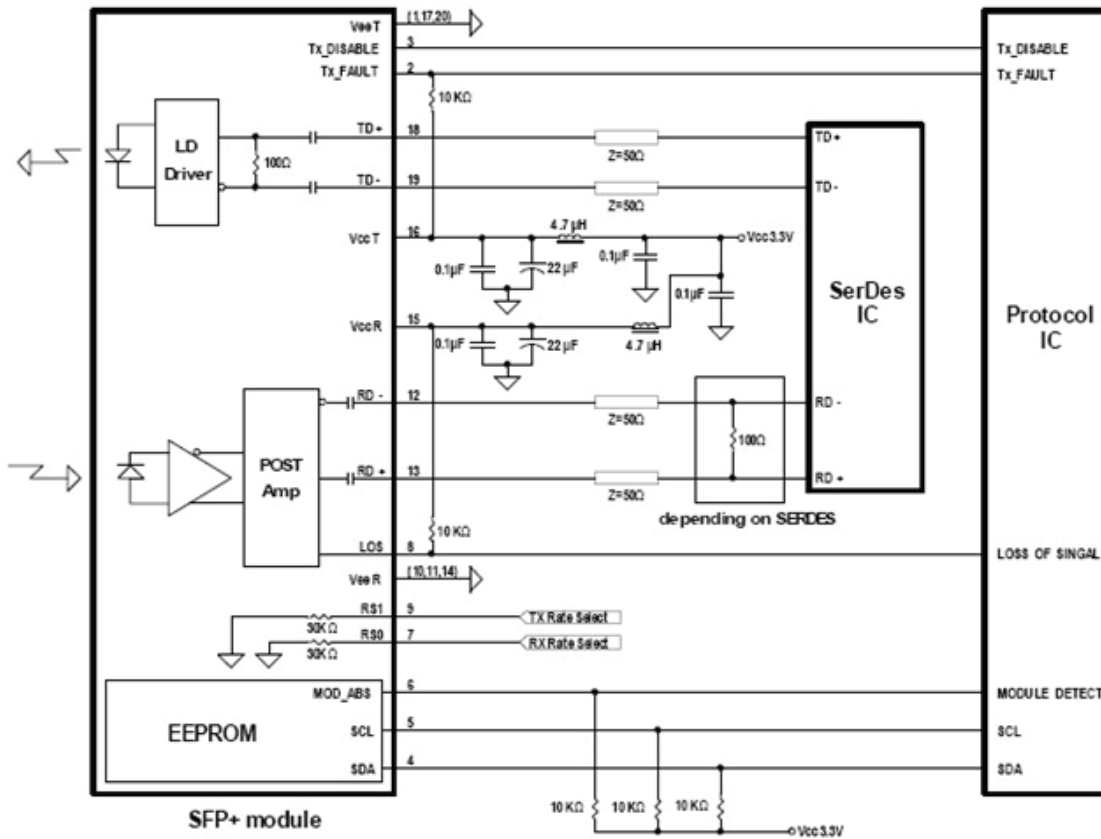
## EEPROM

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) 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.

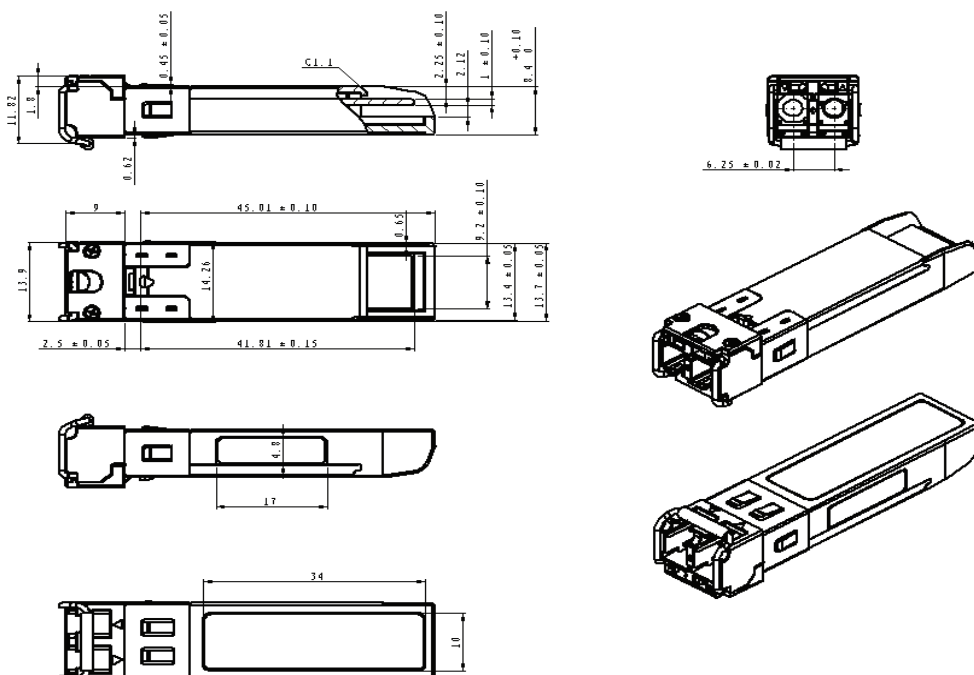
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.2 .



## Recommend Circuit Schematic



## Mechanical Specifications





## Ordering information

Part No.	Data Rate	Laser	Fibre Type	Distance	Optical Interface	DDMI
OP-SFP+-LP-10	10.3Gbps	1310nm DFB	SMF	10Km	LC	YES

\*I--- Industrial operating temperature

\*D--- DDMI

## NOTICE:

Optiplus Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Optiplus networks makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.





**OP-SFP+-300**  
10.3Gbps SFP+ Transceiver

## Product Description

The OP-SFP+-300 series multi-mode transceivers are SFP+ module for bi-directional serial optical data communications such as 10GBASE-SR and 10GBASE-SW.

It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I2C. This module is designed for multi-mode fiber and operates at a nominal wavelength of 850 nm.

The transmitter section uses a Vertical Cavity Surface Emitted Laser (VCSEL) and is a Class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated GaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

## Features

- Operating data rate up to 10.3Gbps
- 850 nm VCSEL Transmitter
- Distance up to 300m
- Single 3.3V Power supply and TTL Logic Interface
- Duplex LC Connector Interface
- Hot Pluggable
- Operating Case Temperature Standard: 0° c ~ +70° c
- Compliant with MSA SFP+ Specification
- Digital diagnostic monitor interface

## Applications

- 10G Ethernet at 10.3125Gbps
- Compatible with SFF-8472

## Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class1(>500 V) Isolation with the case
Electromagnetic Interference (EMI)	FCC Part 15 ClassB	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. Compatible with TÜV standards
Component Recognition	UL and CUL	Compatible with UL standards
Green Products	RoHS	RoHS6

## Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TS	-40	+85	°C
Supply Voltage	VCC	-0.5	3.6	V

## Recommended Operating Conditions

Parameter	Symbol		Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub>	OP-SFP+-LP-10	0		+ 70	°C
Power Supply Voltage	V <sub>CC</sub>		3.15	3.3	3.45	V
Power Supply Current	I <sub>CC</sub>				300	mA
Surge Current	I <sub>Surge</sub>				+30	mA
Baud Rate				10.3125	10.5	GBaud

## Performance Specifications - Electrical

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
<b>TRANSMITTER</b>						
CML Inputs(Differential)	V <sub>in</sub>	150		1200	mVp	AC coupled inputs
Input Impedance (Differential)	Z <sub>in</sub>	85	100	115	ohms	R <sub>in</sub> >100kohms @ DC
Tx_DISABLE Input Voltage - High		2		3.45	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage -- High		2		V <sub>CC</sub> +0.3	V	I <sub>o</sub> = 400μA; Host V <sub>CC</sub>
Tx_FAULT Output Voltage -- Low		0		0.5	V	I <sub>o</sub> = - 4.0mA

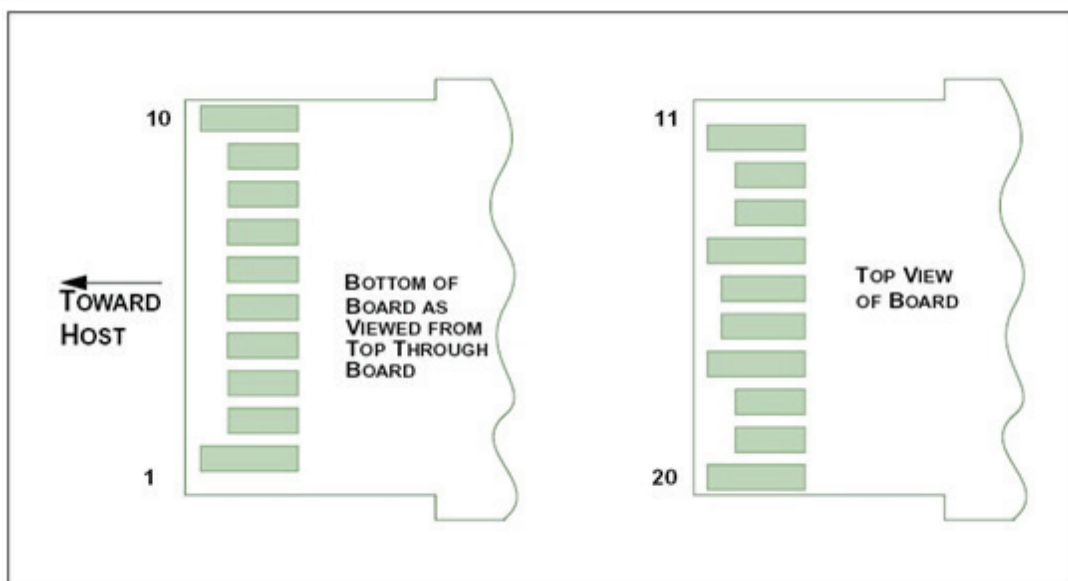
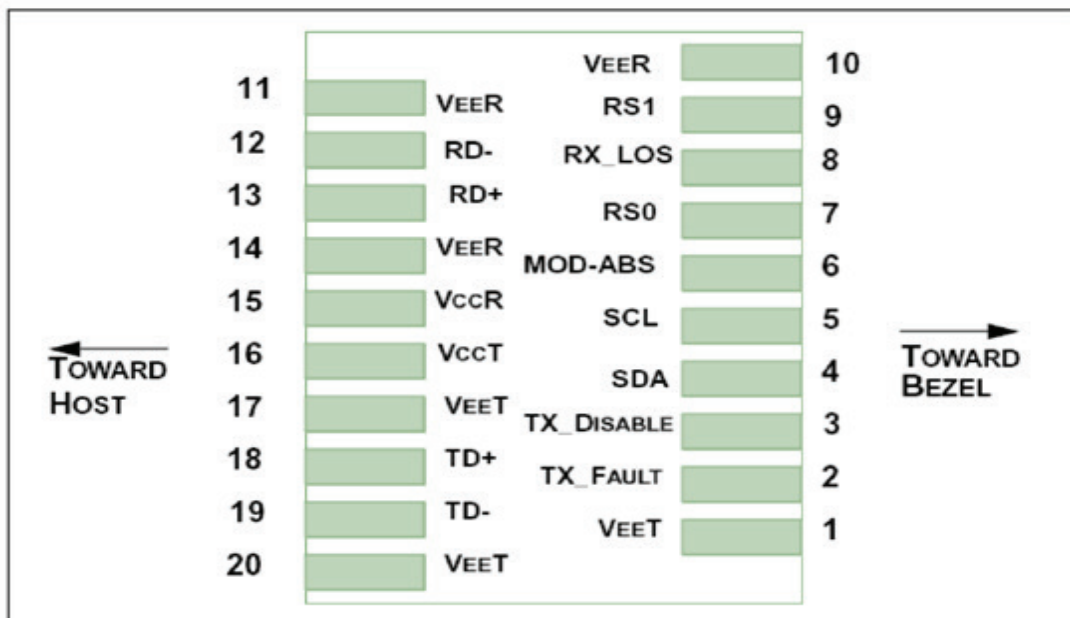
RECEIVER						
CML Outputs (Differential)	Vout	350		700	mVpp	AC coupled outputs
Output Impedance (Differential)	Zout	85	100	115	ohms	
Rx_LOS Output Voltage - High	2			Vcc+0.3	V	Io = 400µA; Host Vcc
Rx_LOS Output Voltage - Low		0		0.8	V	Io = -4.0mA
MOD_DEF ( 0:2 )	VoH	2.5		V		With Serial ID
	VoL	0		0.5 V		

## Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
50 / 125 mm MMF			300		m
Data Rate			10.3		Gbps
Transmitter					
Centre Wavelength	$\lambda_c$	840	850	860	nm
Spectral Width (RMS)	$\sigma$			0.45	nm
Average Output Power	P <sub>out</sub>	-7.3		-1.5	dBm
Transmitter Dispersion Penalty	TDP			3.9	dB
Input Differential Impedance	Z <sub>IN</sub>	90	100	110	Ω
TX Disable	Disable		2.0	Vcc+0.3	V
	Enable		0	0.8	
TX_Fault	Fault		2.0	V <sub>CC</sub> +0.3	V
	Normal		0	0.8	
TX_Disable Assert Time	t <sub>off</sub>			10	µs

Receiver					
Centre Wavelength	$\lambda_c$	840	850	860	nm
Receiver Sensitivity	PIN			-9.9	dBm
Output Differential Impedance	$P_{IN}$	90	100	110	$\Omega$
Receiver Overload	$P_{MAX}$	-1			dBm
Optical Return Loss	ORL			-12	dB
LOS De-Assert	$LOS_D$			-11	dBm
LOS Assert	$LOS_A$	-25			dBm
LOS	High		2.0	$V_{CC}+0.3$	V
	Low		0	0.8	

### SFP+ Transceiver Electrical Pad Layout



## 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, Module disables on high or open
4	SDA	Module Definition 2	3	Note 3, Data line for Serial ID.
5	SCL	Module Definition 1	3	Note 3, Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 7
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3 ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3 ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

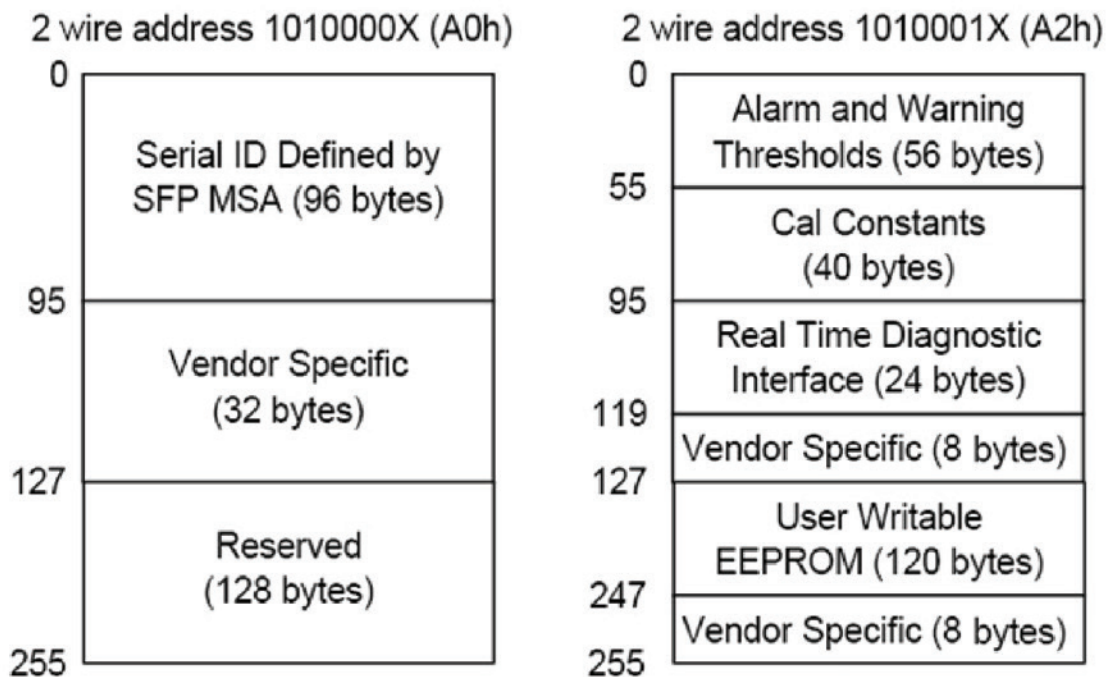
## Notes:

- 1) 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.
- 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 4.7 – 10 K Ω 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
- 3) Modulation Absent, connected to VEET or VEER in the module.
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, 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.
- 5) VeeR and VeeT may be internally connected within the SFP<sup>+</sup> module.
- 6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (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.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP<sup>+</sup> connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP<sup>+</sup> input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP<sup>+</sup> transceiver 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<sup>+</sup> transceiver module.
- 8) 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 – 1200mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600mV single-ended) be used for best EMI performance.

## EEPROM

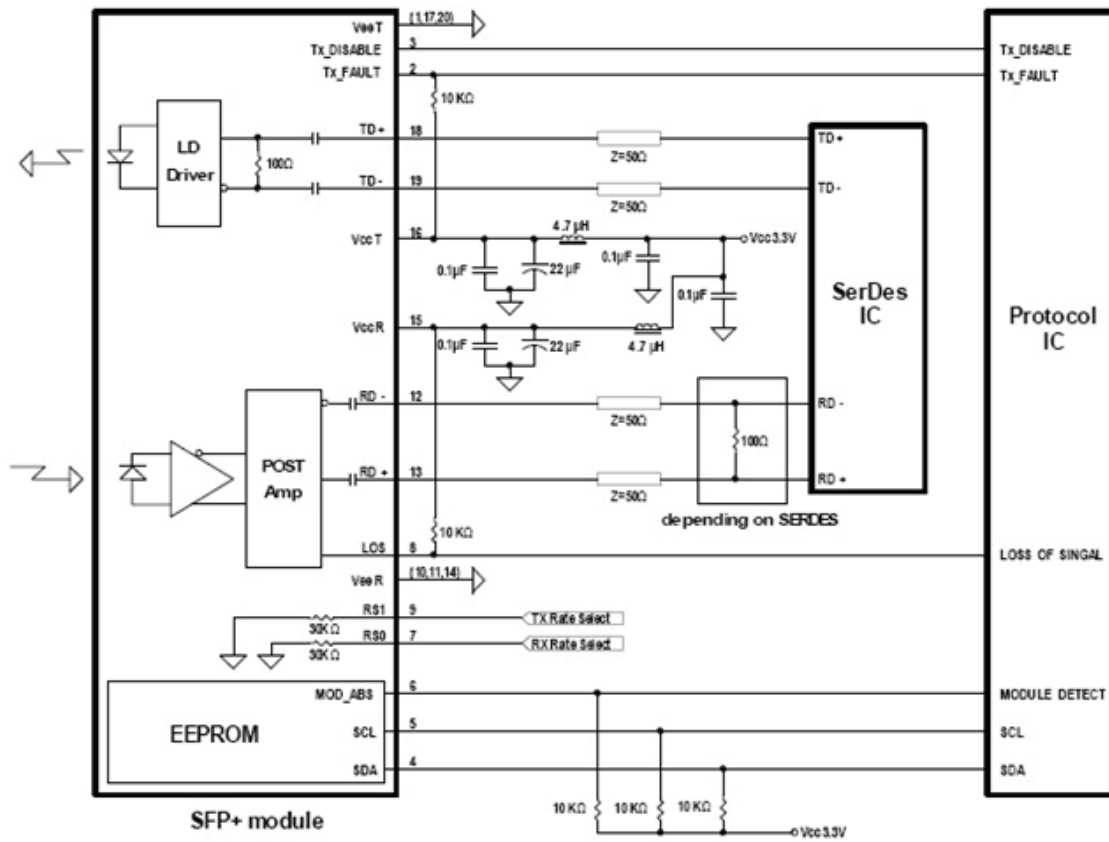
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP+ transceiver. The negative edge clocks data from the SFP+ transceiver. The serial data signal (SDA) 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.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following .For detail EEPROM information, please refer to the related document of SFF 8472 Rev 10.2 .

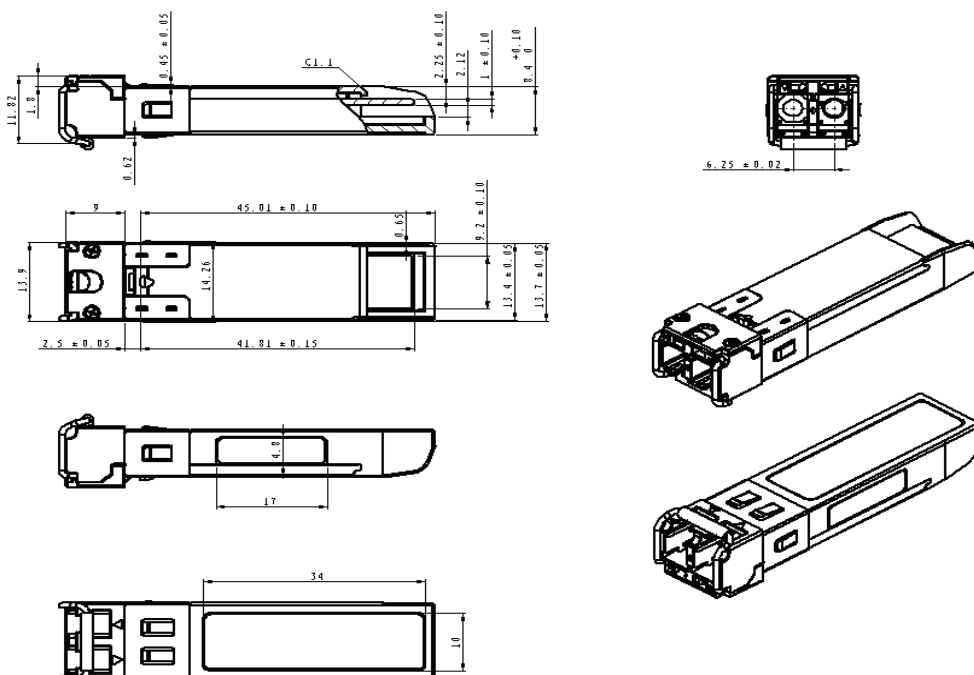




## Recommend Circuit Schematic



## Mechanical Specifications



## Ordering information

Part No.	Data Rate	Laser	Fibre Type	Distance	Optical Interface	DDMI
OP-SFP+-300	10.3Gbps	850nm VCSEL	MMF	300m	LC	YES

## NOTICE:

Optiplus Networks reserves the right to make changes to or discontinue any optical link product or service identified in this publication, without notice, in order to improve design and/or performance. Applications that are described herein for any of the optical link products are for illustrative purposes only. Optiplus networks makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.



[www.optiplusnetworks.com](http://www.optiplusnetworks.com)