

## SFP+-10G-LR13-10

### 10Gb/s 1310nm LC SFP+ Transceiver

#### 1.Feature

- SFP+ package with LC connector
- 1310nm DFB Laser and PIN photo detector
- Up to 10km transmission on SMF
- Power dissipation < 1W
- LVPECL compatible data input/output interface
- Low EMI and excellent ESD protection
- laser safety standard IEC-60825 compliant
- Compatible with RoHS
- Compatible with SFF8472



#### 2.Application

- Ethernet
- Fiber Channel

#### 3.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	0	85	%

## 4.Operation Environment

Parameter		Symbol	Min	Typical	Max	Units
Supply Voltage		Vcc	3.15		3.45	V
Operating Case Temperature	Commercial	Tc	0		+70	°C
Power Dissipation					1	W
Data Rate				10.3125		Gbps

## 5.Optical Characteristics

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

Parameter	Symbol	Min.	Typ.	Max.	Units
<b>Transmitter Section</b>					
Center Wavelength	$\lambda_o$	1290	1310	1330	nm
Side-Mode Suppression Ratio	SMSR	35	-	-	dB
Average Output Power	Po	-5	-	+0.5	dBm
Extinction Ratio	Er	3.5	-	-	dB
Dispersion Penalty				3.2	dB
Relative Intensity Noise	RIN <sub>12</sub> OMA			-128	dB/Hz
Total jitter	Tj	IEEE 802.3ae			
<b>Receiver Section</b>					
Center Wavelength	$\lambda_o$		1310		nm
Receiver Sensitivity	Rsen			-13	dBm
Stressed Sensitivity	Rsen			-12	dBm
Receiver Overload	Rov	-3			dBm
Return Loss		12			dB
LOS Assert	LOS <sub>A</sub>	-28			dBm
LOS Dessert	LOS <sub>D</sub>			-14	dBm
LOS Hysteresis		0.5		4	

## 6. Electrical Characteristics

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

Parameter		Symbol	Min.	Typ.	Max.	unit
<b>Transmitter Section</b>						
Input Differential Impedence		Zin	90	100	110	Ohm
Data Input Swing Differential		Vin	180		700	mV
TX Disable	Disable		2.0		Vcc	V
	Enable		0		0.8	V
TX Fault	Assert		2.0		Vcc	V
	Deassert		0		0.8	V
<b>Receiver Section</b>						
Output differential impedance		Zout		100		Ohm
Data output Swing Differential		Vout	300		800	mV
Rx_LOS	Assert		2.0		Vcc	V
	Deassert		0		0.8	V

## 7. Diagnostics

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-10 ~ 75	±5	°C	Internal
Voltage	3.15 ~ 3.45	±0.1	V	Internal
Bias Current	10 ~ 80	±2	mA	Internal
Tx Power	-6 ~ 1	±2	dBm	Internal
Rx Power	-16 ~ -3	±3	dBm	Internal

## 8.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	10 00 00 00 00 00 00 00	Transmitter Code
11	1	Encoding	06	64B66B
12	1	BR, nominal	67	10000M bps
13	1	Reserved	00	
14	1	Length (9um)-km	0A	10km
15	1	Length (9um)	00	
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	57 49 4E 54 4F 50 20 20 20 20 20 20 20 20 20 20	
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	00	
67	1	BR, min	00	
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		

## 9.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	RS0	Not Connected	
8	LOS	Loss of Signal	4
9	RS1	Not Connected	
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Inv. Received Data Output	5
13	RD+	IReceived 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	

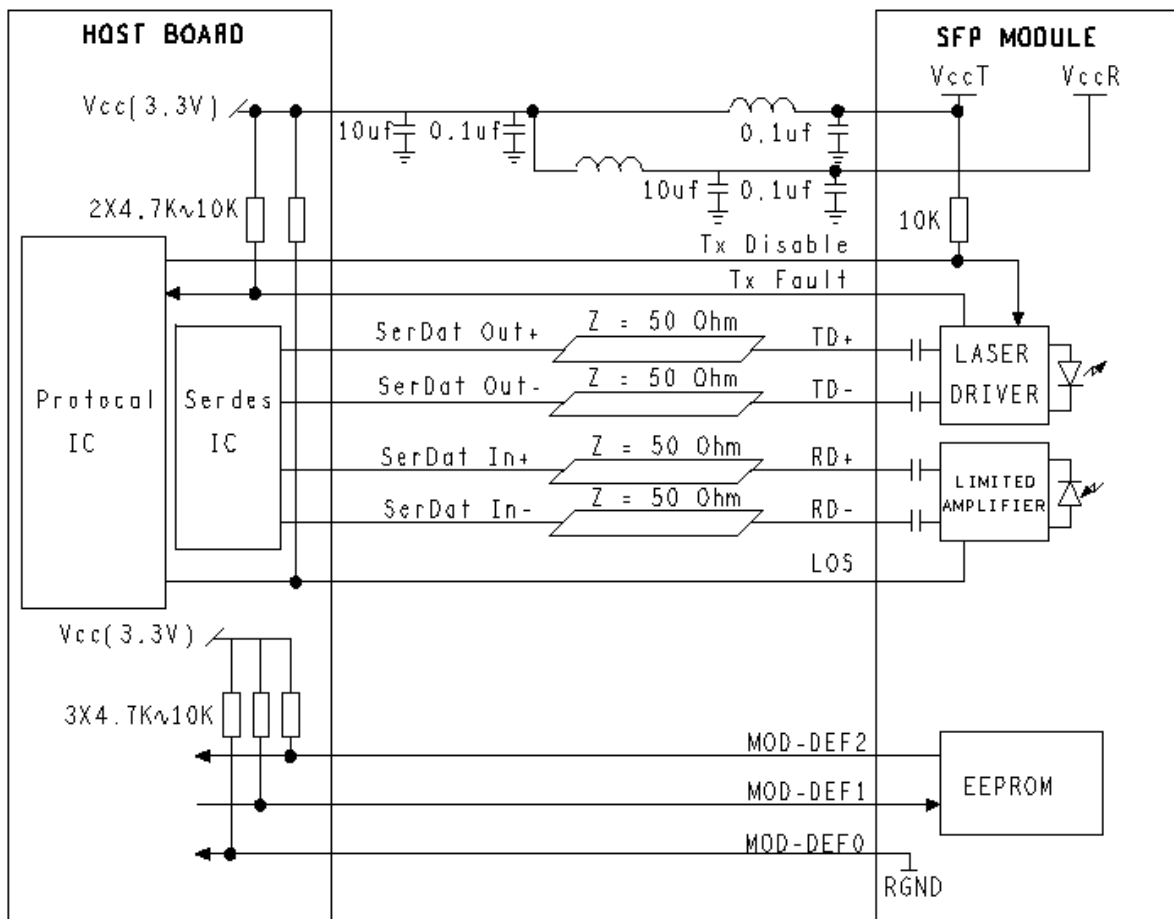
### Notes:

- 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

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.

## 10.Recommended Application Circuit



## 11. Outline Dimensions (mm)

