

## COL-SFP-10G-BL45-80/COL-SFP-10G-BL54-80 Series

Tx: 1490nm/Rx: 1550nm BIDI SFP+ 80km Transceiver for 10GbE

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### Features

- Supports up to 10.7Gbps bit rates
- Hot-pluggable SFP+ footprint
- 1490nm Cooled EML laser and APD photodiode, Up to 80km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with single LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:  
Standard: 0 to +70°C

### Applications

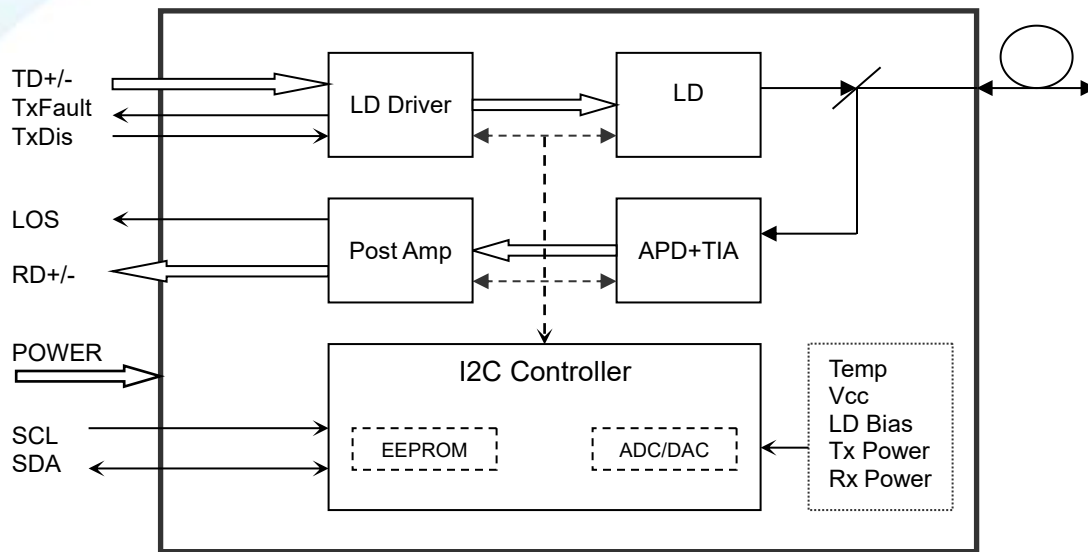
- 10Gbps Optical systems
- 10GBASE-ZR at 10.3125Gbps
- 10GBASE-ZW at 9.953Gbps
- LTE systems
- Other Optical links

### Description

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 10Gbps and 80km transmission distance with SMF.

The transceiver consists of three sections: a Cooled EML laser transmitter, a APD photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.



Transceiver functional diagram

## Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

## Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Tc	0		+70	°C
Power Supply Voltage	Vcc	3.135	3.30	3.465	V
Power Supply Current	Icc			450	mA
Data Rate		1.0	10.3	10.7	Gbps

## Optical and Electrical Characteristics

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Centre Wavelength		$\lambda_c$	1480	1490	1500	nm	
Spectral Width (-20dB)		$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio		SMSR	30	-		dB	
Average Output Power		$P_{out}$	-1		+4	dBm	1
Extinction Ratio		ER	7.5			dB	
Data Input Swing Differential		$V_{IN}$	180		850	mV	2
Input Differential Impedance		$Z_{IN}$	90	100	110	$\Omega$	
TX Disable	Disable		2.0		$V_{cc}$	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		$V_{cc}$	V	
	Normal		0		0.8	V	
Receiver							
Centre Wavelength		$\lambda_c$	1540	1550	1560	nm	
Receiver Sensitivity					-23	dBm	3
Receiver Overload			-7			dBm	3
LOS De-Assert		$LOS_D$			-24	dBm	
LOS Assert		$LOS_A$	-35			dBm	
LOS Hysteresis			0.5			dB	
Data Output Swing Differential		$V_{out}$	300		900	mV	4
LOS	High		2.0		$V_{cc}$	V	
	Low				0.8	V	

## Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS  $2^{31}-1$  test pattern @10312Mbps, BER  $\leq 1 \times 10^{-12}$ .
4. Internally AC-coupled.

## Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t <sub>on</sub>			1	ms
Tx Disable Assert Time	t <sub>off</sub>			10	μs
Time To Initialize, including Reset of Tx Fault	t <sub>init</sub>			300	ms
Tx Fault Assert Time	t <sub>fault</sub>			100	μs
Tx Disable To Reset	t <sub>reset</sub>	10			μs
LOS Assert Time	t <sub>loss_on</sub>			100	μs
LOS De-assert Time	t <sub>loss_off</sub>			100	μs
Serial ID Clock Rate	f <sub>serial_clock</sub>		100	400	KHz
MOD_DEF (0:2)-High	V <sub>H</sub>	2		V <sub>cc</sub>	V
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V

## Diagnostics

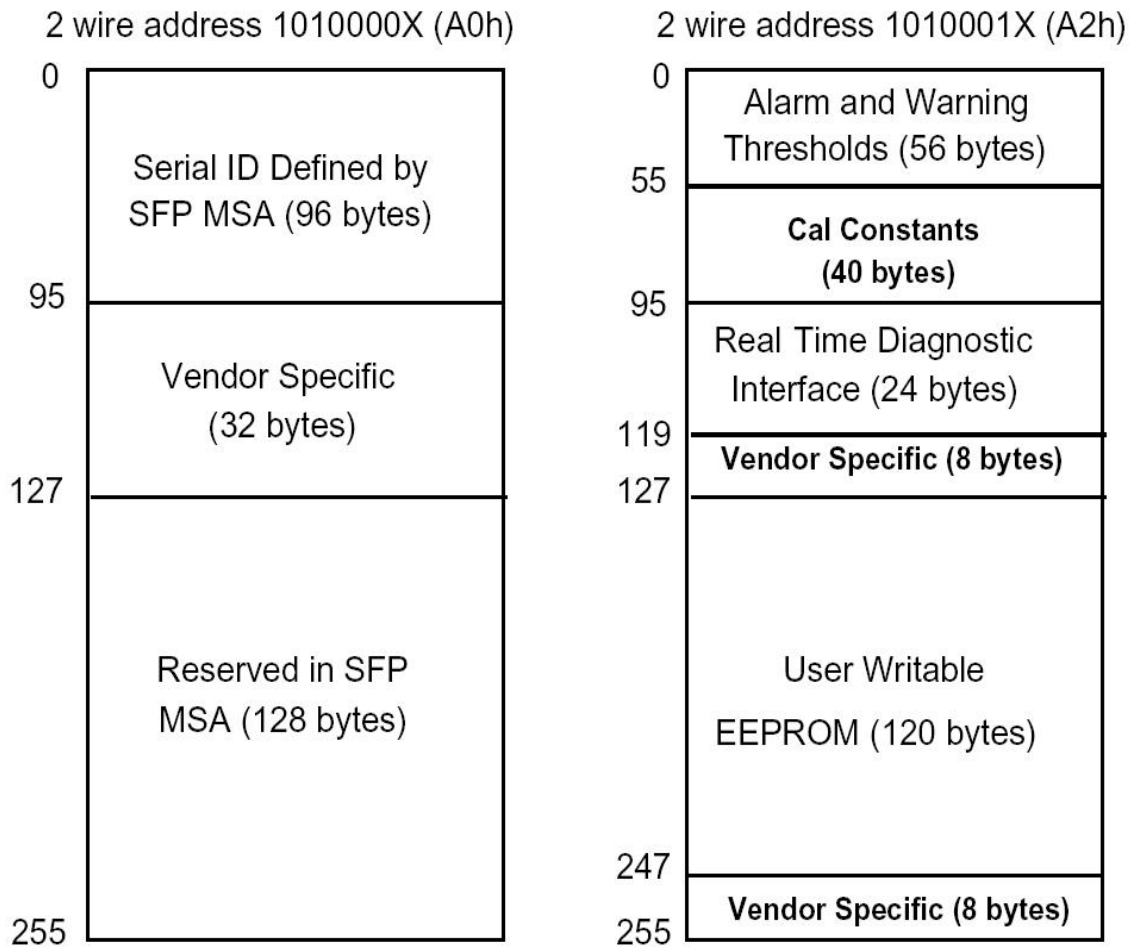
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	-1 to +4	dBm	±3dB	Internal
RX Power	-23 to -6	dBm	±3dB	Internal

## Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

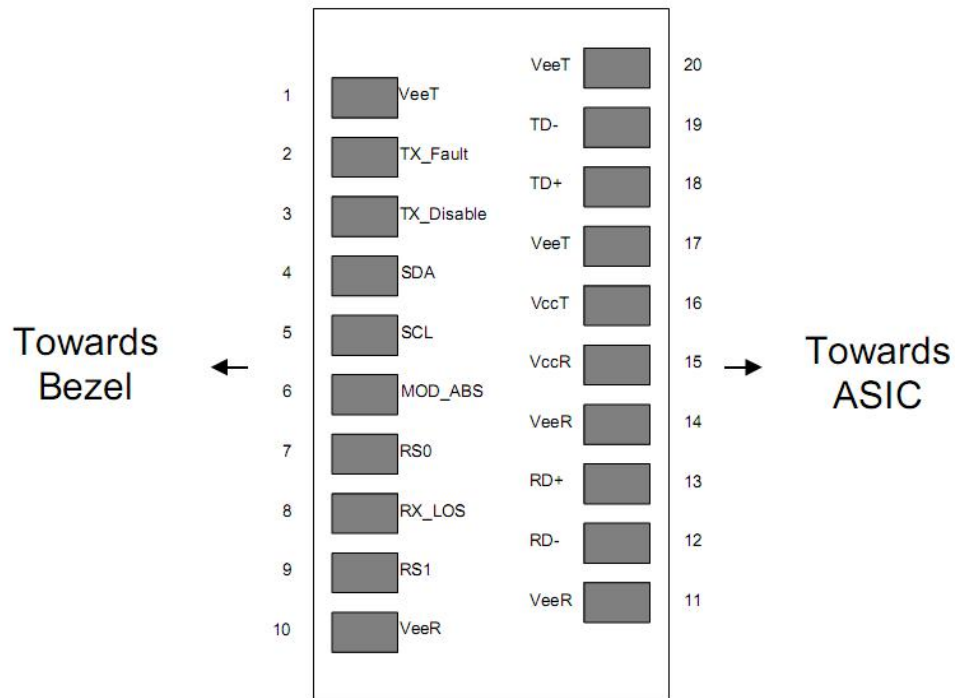
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## Pin Descriptions





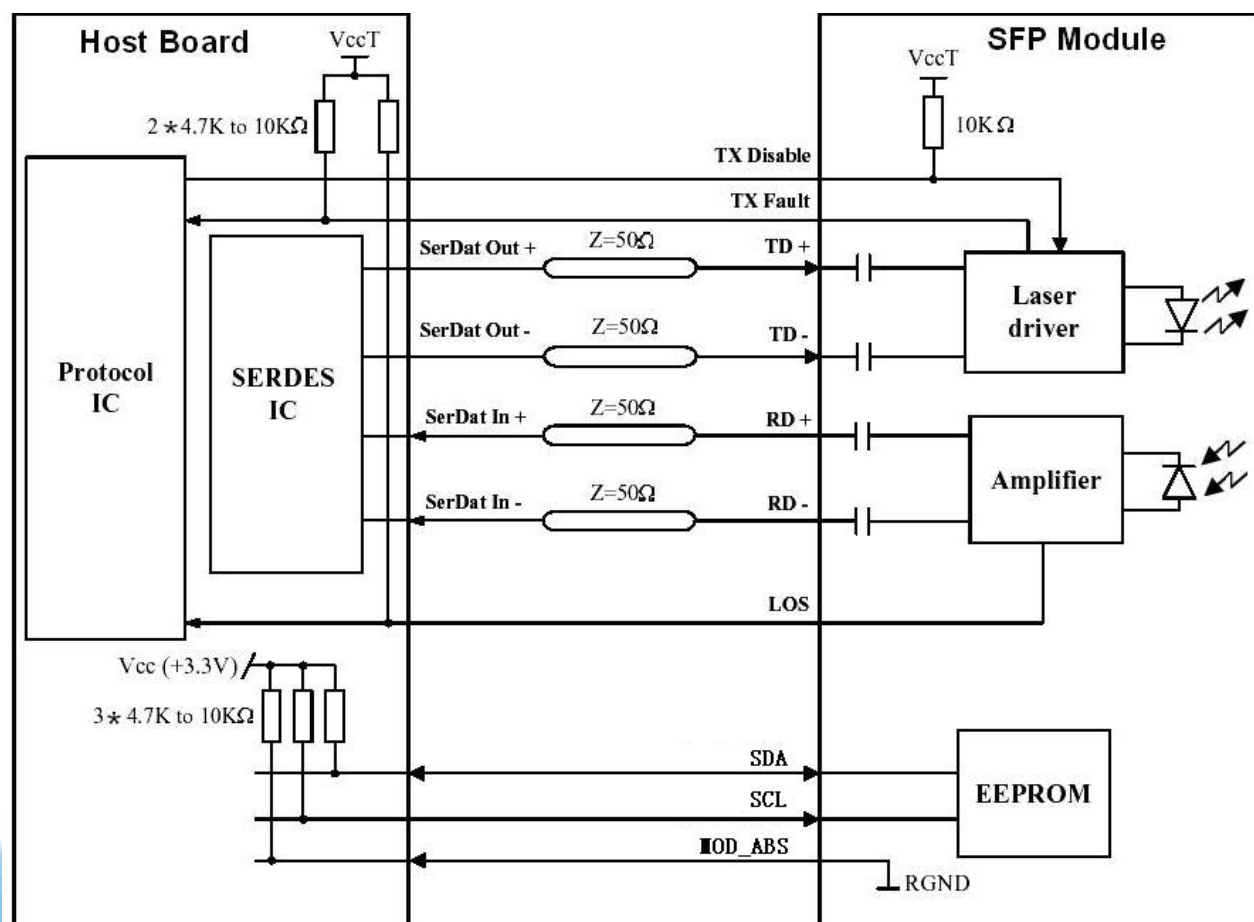
Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	RS1	Not Connected	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V <sub>EET</sub>	Transmitter Ground	1	

#### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 1) 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.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 4) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 5) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

### Recommended Interface Circuit



### Regulatory Compliance

COPTOLINK SFP+ transceiver is designed to be Class I Laser safety compliant and is certified per the following standards:

Feature	Agency	Standard	Certificate / Comments
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Laser Safety	FDA	CDRH 21 CFR 1040 annd Laser Notice No. 50	1120292-000
Product Safety	UL	UL and CUL EN60950-2:2007	E347511
Environmental protection	SGS	RoHS Directive 2002/95/EC	GZ1001008918/CHEM
EMC	WALTEK	EN 55022:2006+A1:2007 EN 55024:1998+A1+A2:2003	WT10093759-D-E-E

## Ordering information

Part Number	Product Description
COL-SFP-10G-BL45-80	10Gbps, SFP+ BIDI TX1490nm/RX1550nm, 80km, 0°C ~ +70°C
COL-SFP-10G-BL54-80	10Gbps, SFP+ BIDI TX1550nm/RX1490nm, 80km, 0°C ~ +70°C

## References

1. "Specifications for Enhanced Small Form Factor Pluggable Module SFP+", SFF-8431, Rev 4.1, July 6, 2009.
2. "Improved Pluggable Formfactor", SFF-8432, Rev 4.2, Apr 18, 2007
3. IEEE802.3ae – 2002
4. "Diagnostic Monitoring Interface for Optical Transceivers" SFF-8472, Rev 10.3, Dec 1, 2007

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sales@coptolink.com  
www.coptolink.com