

SFP-10G-LR

TransOpto

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10.3Gbps SFP+ Transceiver, Single Mode, 10km Reach

DESCRIPTIONS

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



FEATURES

- Supports up to 10.7Gbps bit rates
- Hot-pluggable SFP+ footprint
- 1310nm DFB laser and PIN photodiode, Up to 10km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring

- Operating case temperature:

Standard : 0 to +70°C

Industrial : -40 to +85°C

APPLICATIONS

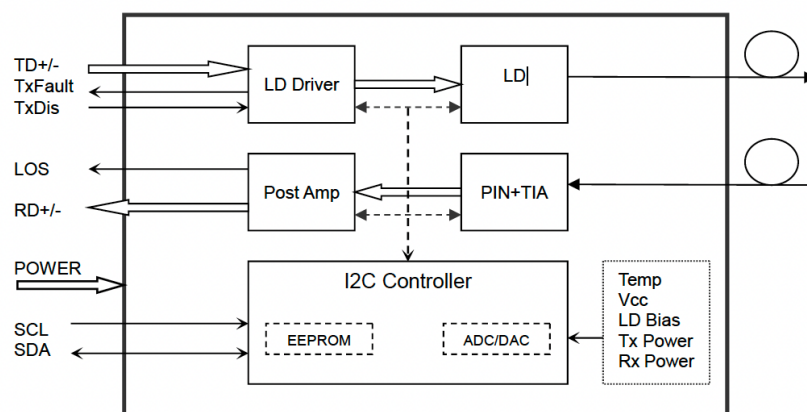
- 10Gbps Optical systems
- 10GBASE-LR at 10.3125Gbps
- 10GBASE-LW at 9.953Gbps
- LTE systems
- Other Optical links

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The transceiver consists of three sections: a DFB laser transmitter, a PIN 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 ENVIRONMENT

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature - Standard	TC	0		+70	°C
Operating Case Temperature - Extended	TC	-20		+80	°C
Operating Case Temperature - Industrial	TC	-40		+85	°C
Power Supply Voltage	Vcc	3.135	3.30	3.465	V
Power Supply Current	Icc			350	mA
Date rate		1.0	10.3	10.7	Gbps

OPTICAL AND ELECTRICAL CHARACTERISTICS

SFP-10SM31-10C: (DFB and PIN, 1310nm, 10km Reach)

Parameter Transmitter	Symbol	Min.	Typical	Max.	Unit	Note
Centre Wavelength	λ_c	1270	1310	1350	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30	-		dBm	
Average Output Power	P_{out}	-6.5		-0.5	dBm	1
Extinction Ratio	ER	3.5			dB	
Data Input Swing Differential	V_{IN}	180		850	mV	2
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
TX Disable - Disable		2.0		V_{cc}	V	
TX Disable - Enable		0		0.8	V	
TX Fault - Fault		2.0		V_{cc}	V	
TX Fault - Normal		0		0.8	V	
Parameter Receiver						
Centre Wavelength	λ_c	1260		1600	nm	
Receiver Sensitivity				-14.4	dBm	3
Receiver Overload		0.5			dBm	3
LOS De-Assert	LOS_D			-15.5	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis		0.5			dB	
Data Output Swing Differential	V_{out}	300		900	mV	4
LOS - High	High	2.0		V_{cc}	V	
LOS - Low	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.

DIAGNOSTICS SPECIFICATION

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	± 3°C	Internal
	-20 to +80	°C	± 3°C	
	-40 to +85	°C	± 3°C	Internal
Voltage	3.0 to 3.6	V	± 3 %	Internal
Bias Current	0 to 100	mA	± 10 %	Internal
TX Power	-6.5 to -0.5	dBm	± 3° dB	Internal
RX Power	-20 to -1	dBm	± 3° dB	Internal

TIMING AND ELECTRICAL

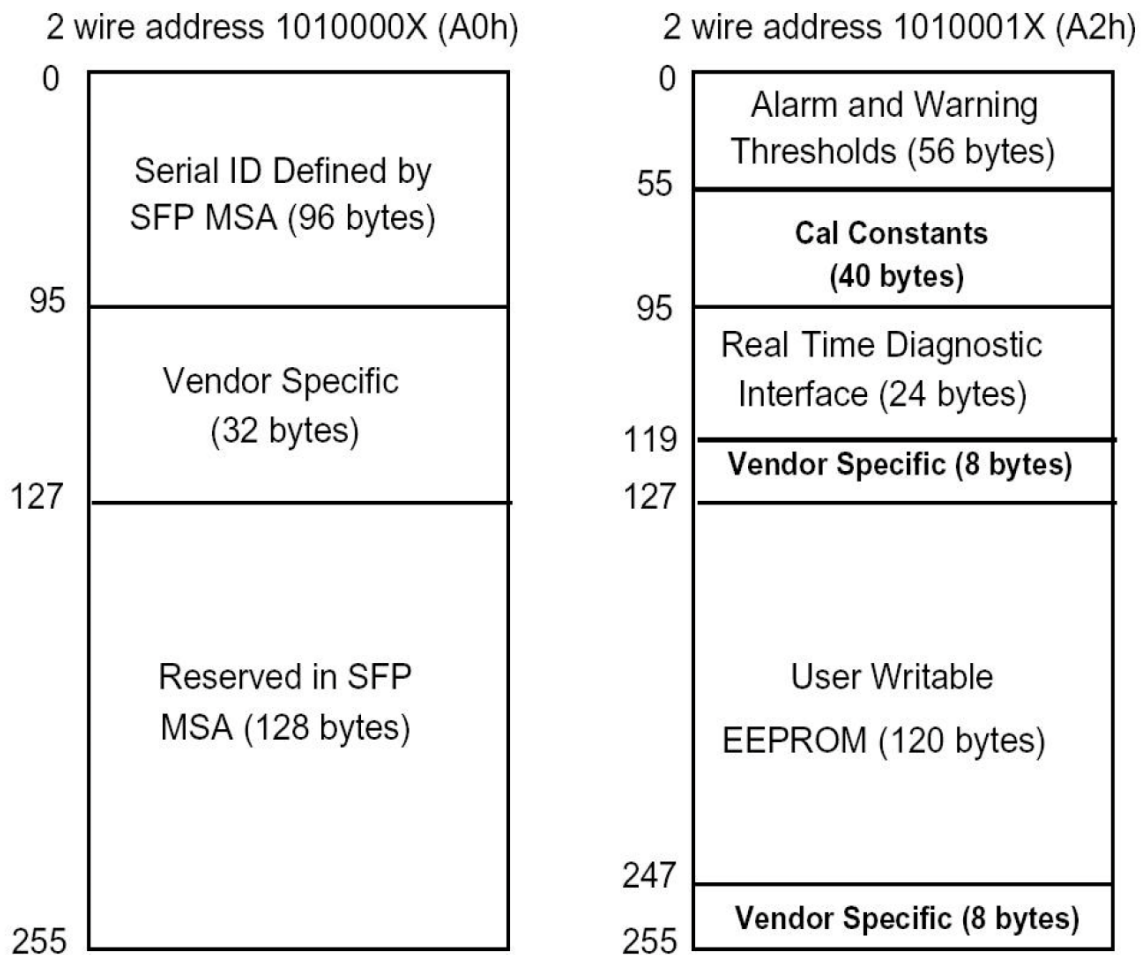
Parameter	Symbol	Min.	Typical	Max.	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	µs
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	µs
Tx Disable To Reset	t_reset	10			µs
LOS Assert Time	t_loss_on			100	µs
LOS De-assert Time	t_loss_off			100	µs
Serial ID Clock Rate	f_serial_clock			400	KHz
MOD_DEF (0:2) - High	V _H	2		V _{CC}	V
MOD_DEF (0:2) - Low	V _L			0.8	V

DIGITAL DIAGNOSTIC MEMORY MAP

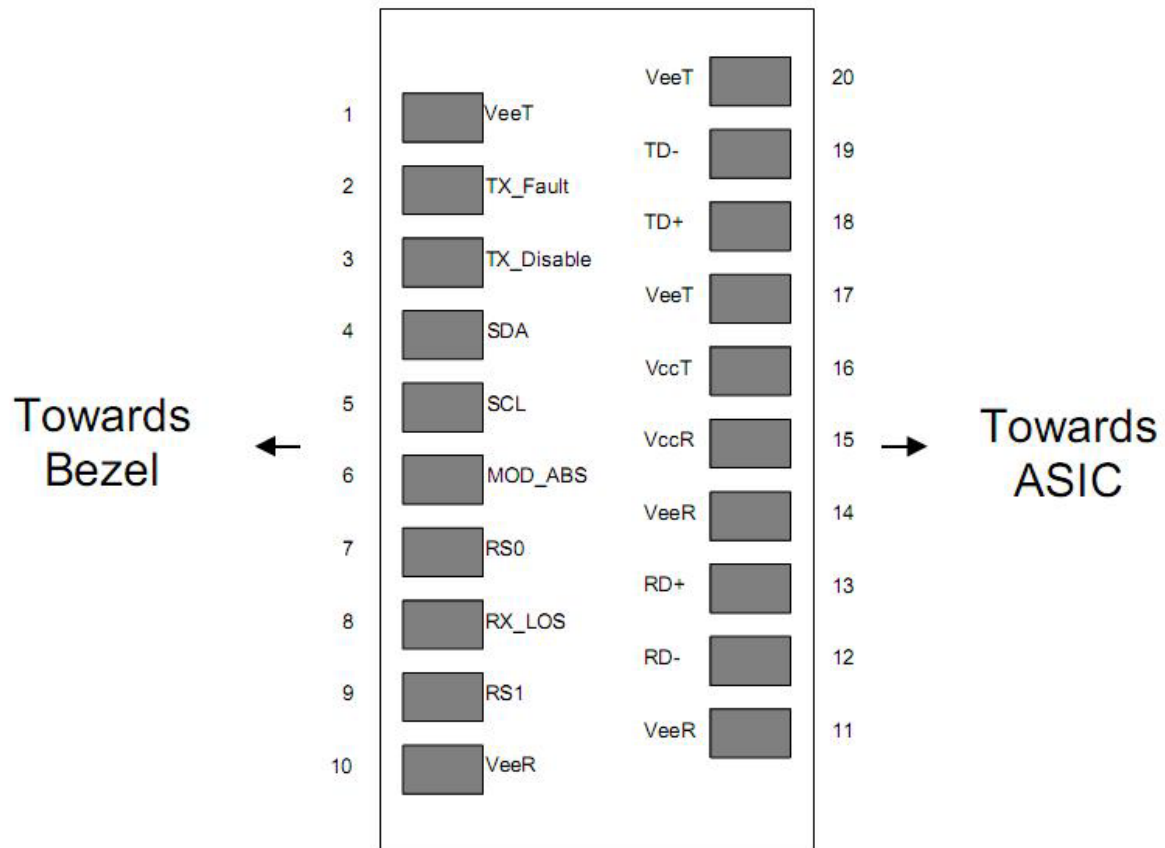
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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 ASSIGNMENT



PIN DESCRIPTION

Pin	Signal name	Description	Plug seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	1
3	TX DISABLE	Transmitter Disable	3	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	3
9	RS1	Not Connected	3	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	4
13	RD+	Received Data Out	3	4
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	5
19	TD-	Inv. Transmit Data In	3	5
20	V _{EET}	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 V_{CC}+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.

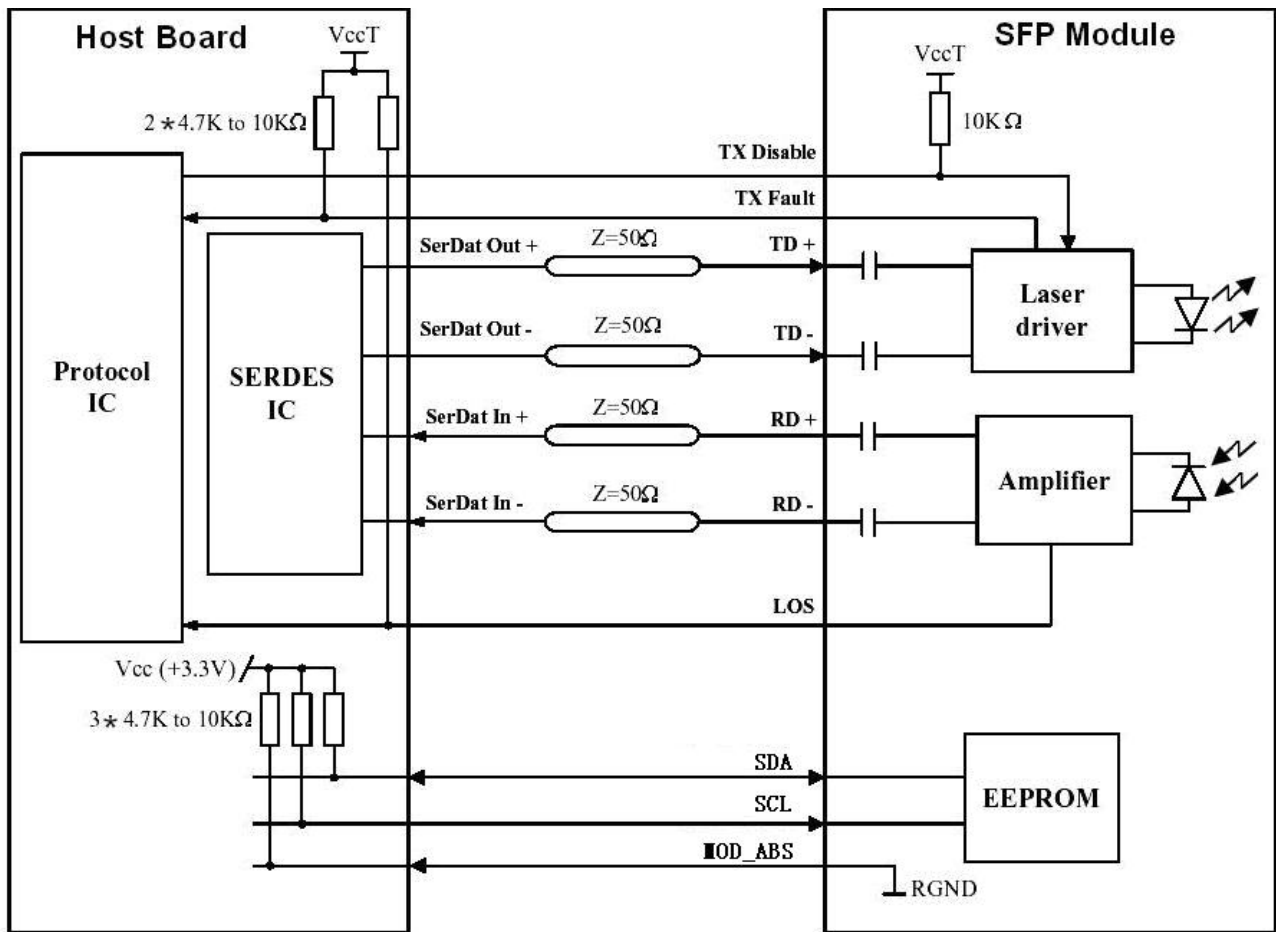
2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

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.

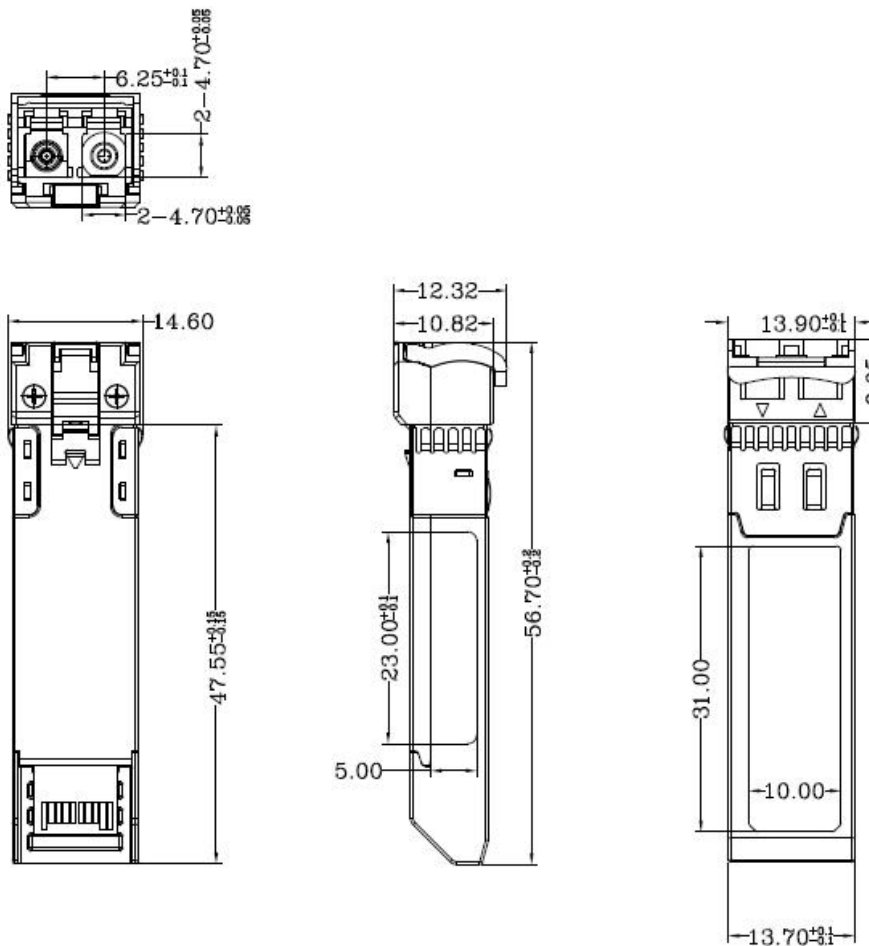
4) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

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



MECHANICAL DIMENSIONS



ORDERING INFORMATION

Part Number	Product Description
SFP-10G-LR	1310nm, 10Gbps, LC, 10km, 0°C~+70°C, with DDM
SFP-10G-LR-IND	1310nm, 10Gbps, LC, 10km, -40°C~+85°C, with DDM

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