

CSM-SP10TG-S31-10

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

Description

The SFP+ transceivers are high-performance, cost-effective modules supporting data rates up to 10.7 Gbps and transmission distances up to 10 km over SMF.

These modules consist of three sections: a DFB laser transmitter, a PIN photodiode integrated with a transimpedance preamplifier (TIA), and an MCU control unit.

All modules satisfy Class 1 laser safety requirements and comply with the SFP+ Multi-Source Agreement (MSA) and the SFF-8472 digital diagnostics interface.

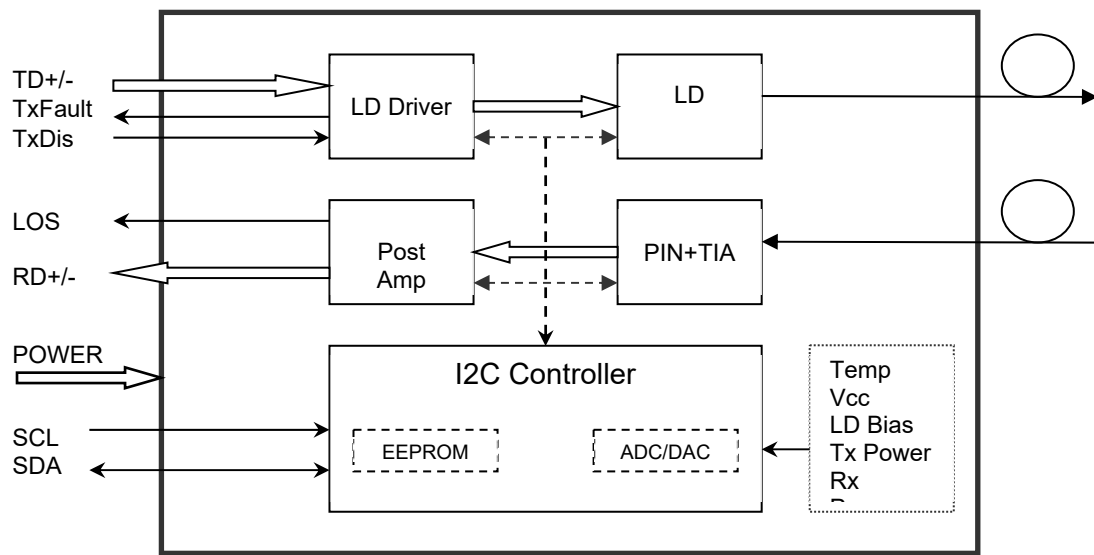
Features

- Supports data rates up to 10.7 Gbps
- Hot-pluggable SFP+ footprint
- 1310 nm DFB laser and PIN photodiode, supporting transmission distances of up to 10 km over SMF
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- RoHS compliant
- Single +3.3 V power supply
- Real-time Digital Diagnostic Monitoring
- Operating case temperature:
 - Standard: 0 °C to +70 °C
 - Industrial: -40 °C to +85 °C



Applications

- 10 Gbps Optical Systems
- 10GBASE-LR at 10.3125 Gbps
- 10GBASE-LW at 9.953 Gbps
- LTE Systems
- Other Optical Links



Transceiver Functional Block Diagram

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{CC}	-0.5	4.5	V
Storage Temperature	T _s	-40	+85	°C
Operating Relative Humidity	RH	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	0		+70	°C
	Extended	-20		+80	°C
	Industrial	-40		+85	°C
Power Supply Voltage	V _{CC}	3.135	3.30	3.465	V
Power Supply Current	I _{CC}			350	mA
Data Rate		1.0	10.3	10.7	Gbps

Optical and Electrical Specifications

Parameter		Symbol	Min	Typical	Max	Unit	Notes
Transmitter							
Center Wavelength		λ_c	1270	1310	1350	nm	
Spectral Width (-20 dB)		$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio		SMSR	30	-		dB	
Average Output Power		P_{out}	-6.5		-0.5	dBm	1
Extinction Ratio		ER	3.5			dB	
Differential Data Input Swing		V_{IN}	180		850	mV	2
Input Differential Impedance		Z_{IN}	90	100	110	OHM	
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							
Center 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	
Differential Data Output Swing		V_{out}	300		900	mV	4
LOS Output	High		2.0		V_{cc}	V	
	Low		0		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 at 10.3125 Gbps, BER $\leq 1 \times 10^{-12}$.
4. Internally AC-coupled.

Timing Specifications

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}		100	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 Monitoring Specifications

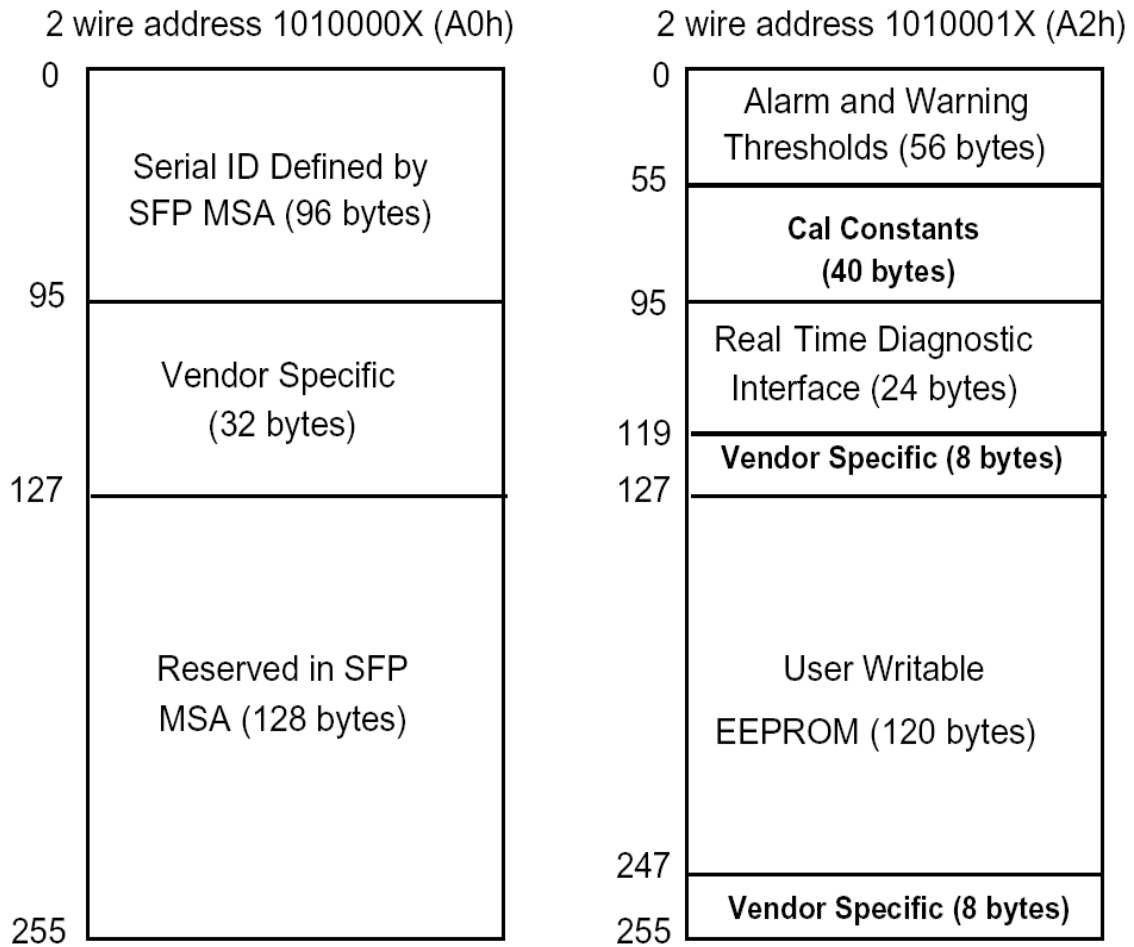
Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 °C to +70 °C	±3	°C	Internal
	-20 °C to +80 °C			
	-40 °C to +85 °C			
Voltage	3.0 to 3.6	±3 %	V	Internal
Bias Current	0 to 100	±10 %	mA	Internal
TX Power	-6.5 to -0.5	±3 dB	dBm	Internal
RX Power	-20 to -1	±3 dB	dBm	Internal

Digital Diagnostic Memory Map

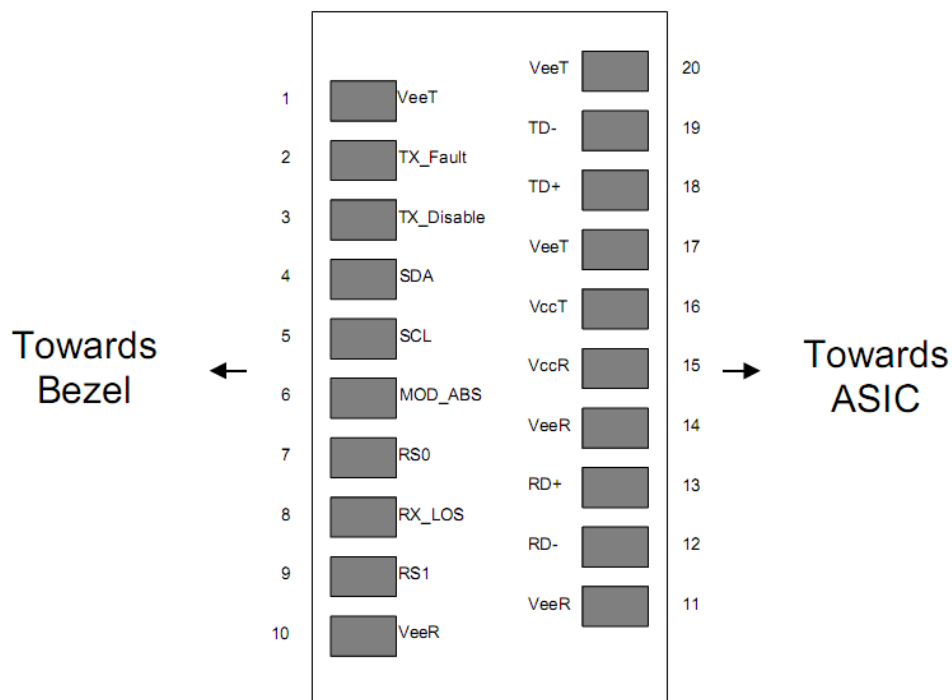
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions via the 2-wire serial interface (SCL, SDA).

Both internal and external calibration are supported for the diagnostic monitoring parameters, including received power, transmitted power, bias current, supply voltage, and temperature.

The detailed data field descriptions for the digital diagnostic memory map are outlined below.



Pin Diagram



Pin Descriptions

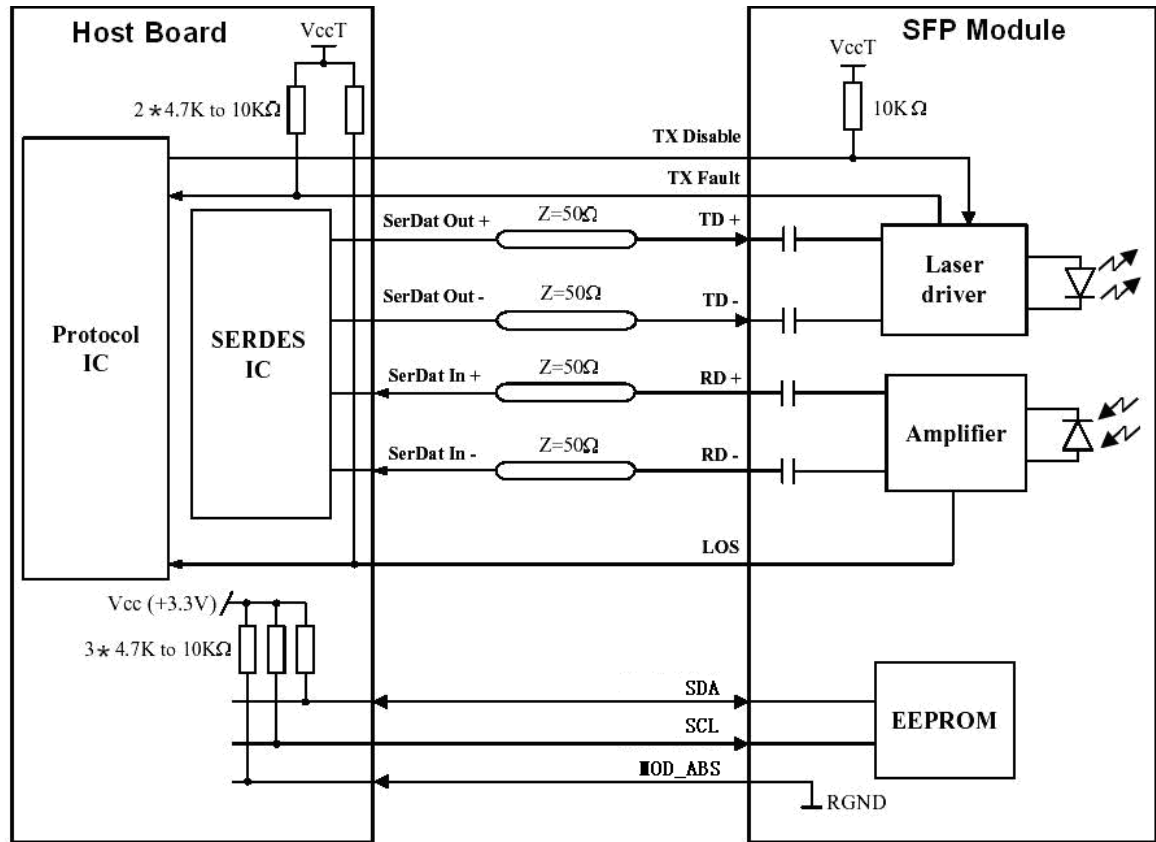
Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	1
3	TX Disable	Transmitter Disable	3	2
4	SDA	Serial Data	3	
5	SCL	Serial Clock	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	3
9	RS1	Not Connected	3	
10	V _{EER}	Receiver Ground	1	
11	V _{EER}	Receiver Ground	1	
12	RD-	Inverted Received Data Output	3	4
13	RD+	Received Data Output	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 Input	3	5
19	TD-	Inverted Transmit Data Input	3	5
20	V _{EET}	Transmitter Ground	1	

Notes:

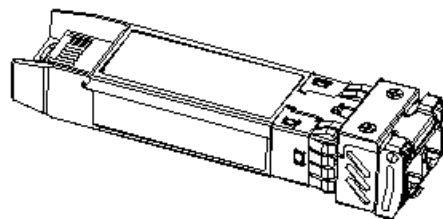
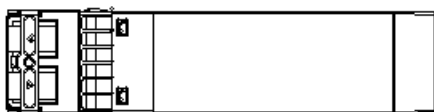
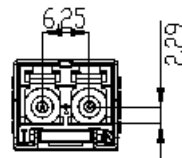
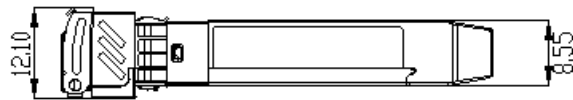
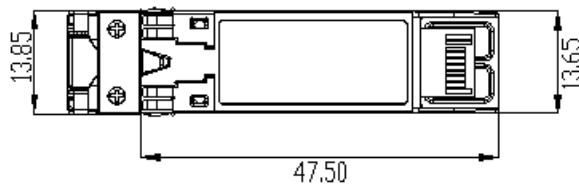
Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open-collector output that should be pulled up with a 4.7 kOhm to 10 kOhm resistor on the host board to a voltage between 2.0 V and V_{cc} + 0.3 V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault. In the low state, the output is pulled to less than 0.8 V.
2. Laser output is disabled when TX Disable > 2.0 V or is open, and enabled when TX Disable < 0.8 V.
3. LOS is an open-collector output that should be pulled up with a 4.7 kOhm to 10 kOhm resistor on the host board to a voltage between 2.0 V and 3.6 V. Logic 0 indicates normal operation, while Logic 1 indicates loss of signal.
4. RD-/RD+: These are the differential receiver outputs. They are internally AC-coupled 100 Ohm differential lines that must be terminated with a 100 Ohm differential load at the host SERDES.
5. TD-/TD+: These are the differential transmitter inputs. They are internally AC-coupled 100 Ohm differential lines with internal differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



Unit: mm

Ordering Information

Part Number	Product Description
CSM-SP10TG-S31-10C	1310 nm, 10 Gbps, LC, 10 km, 0 °C to +70 °C, with DDM
CSM-SP10TG-S31-10I	1310 nm, 10 Gbps, LC, 10 km, -40 °C to +85 °C, with DDM

For More Information

Tel: +886-2-8227 1877

E-mail: sales@cosmo-ic.com

Web: <http://www.cosmo-ic.com>