
SFP-1231-20

12Gbps Video SFP Optical Transceiver, 20km Reach

Features

- SD/HD/3G/6G/12G-SDI SFP Transceiver
- ST 259, ST 292-1, ST 424, ST-2081 and ST-2082 compatible
- Metal enclosure for Lower EMI
- 1310nm DFB laser transmitter
- Support pathological patterns for SD-SDI, HD-SDI, 3G-SDI, 6G-SDI and 12G SDI
- Compliant with SFF-8472 with duplex LC connector
- The module's receiver contains reclocker
- ROHS compliant(lead free)
- single 3.3V power supply
- Hot-pluggable SFP footprint
- ✓ Operating case temperature range: 0 to +70° C

Applications

Serial Digital Fiber Transmission System for SMPTE ST 259, SMPTE ST 344, SMPTE ST 292-1/2, SMPTE ST 424, SMPTE ST 2081-1 and SMPTE ST 2082-1 Signals
UHDTV/HDTV/SDTV Service Interfaces

Description

Video transceiver is designed to transmit/receive data rates from 50Mbps to 11.88Gbps , compliant with SMPTE ST 2082-1 (12G UHD-SDI), ST 2081-1 (6G UHD-SDI), ST424 (3G SDI), ST 292-1 (HD-SDI), and ST 259 (SD-SDI). Video transceiver supports SDI pathological patterns signals.

The transceiver includes these sections: a DFB laser, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) ,Reclocker ,and a MCU controller. The transceiver is compatible with SFP Multi-Source Agreement (MSA) .

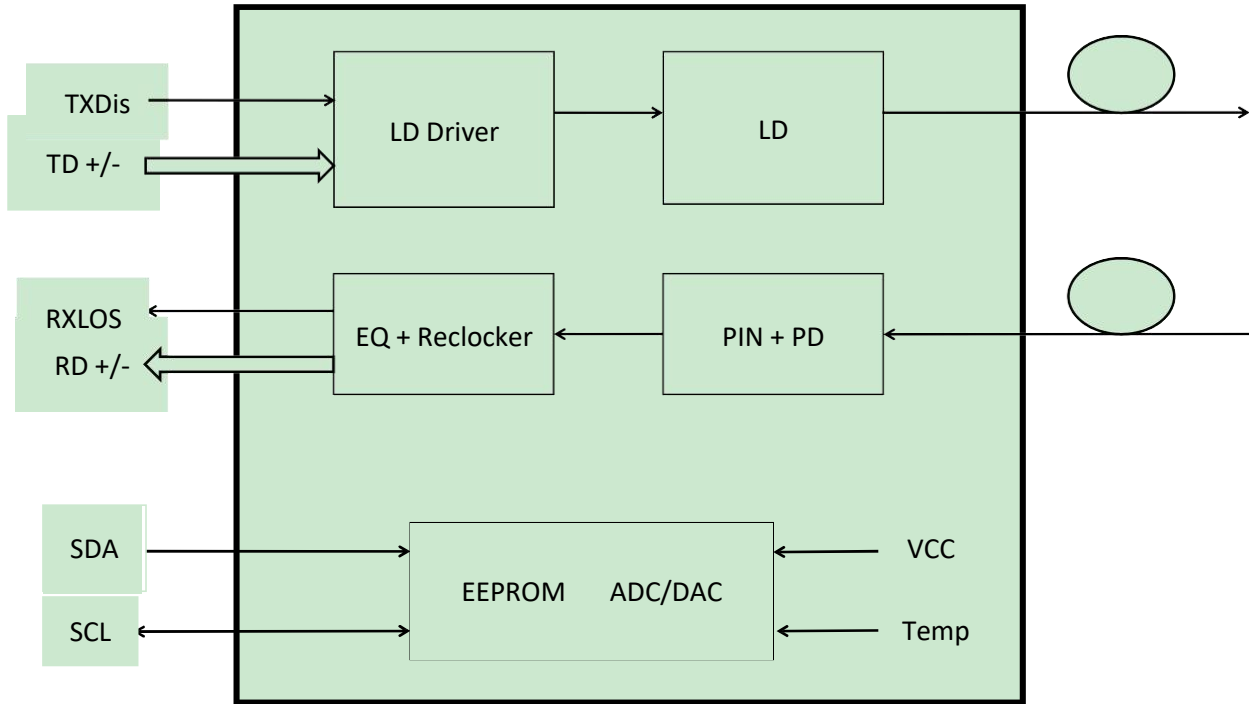


Figure 1. Module Block Diagram

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{cc}	-0.5	4	V
Storage Temperature	T_s	-40	+85	°C
Operating Humidity	-	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	T_c	0		+70	°C
Power Supply Voltage	V_{cc}	3.13	3.3	3.47	V
Power Supply Current	I_{cc}		450		mA
Data Rate			12		Gbps

Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_c	1300	1310	1320	nm	
Spectral Width (-20dB)	σ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Output Power	P_{out}	-3		1	dBm	1
Extinction Ratio	ER	4			dB	

Data Input Swing Differential		V_{IN}	400		1000	mV	2	
Input Differential Impedance		Z_{IN}	90	100	110	Ω		
Rise/Fall Time (20%~80%)	SD-SDI	tr/TF			1500	ps	3	
	HD-SDI				270			
	3G-SDI				135			
	6G-SDI				80			
	12G-SDI				45			
Output Jitter	Timing Jitter	SD-SDI			0.2	UI	4	
		HD-SDI			1			
		3G-SDI			2			
		6G-SDI			4			
		12G-SDI			8			
	Alignment Jitter	SD-SDI						0.2
		HD-SDI						0.2
		3G-SDI						0.3
		6G-SDI						0.3
		12G-SDI						0.3
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		1580	nm		
Receiver Sensitivity@ 11.88Gbps					-11	dBm	5	
Receiver Sensitivity@ 5.94Gbps					-13	dBm		
Receiver Sensitivity@ 2.97Gbps					-15	dBm		
Receiver Overload			1			dBm	6	
LOS De-Assert		LOS_D			-18	dBm		
LOS Assert		LOS_A	-28			dBm		
LOS Hysteresis		LOS_H	1		4	dB		
Data Output Swing Differential		V_{out}	400	800	800	mV	3	
LOS		High	2.0		V_{CC}	V		
		Low			0.8	V		

Note:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Rise and fall times, 20% to 80%, are measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.
4. UI means one period.
5. Measured With Pathological Patterns 11.88Gbps(4096*2160 P60,100% Bars);5.94Gbps (4096*2160 P29.97,100% Bars);2.97Gbps (2048*1080 P50,100% Bars).
6. Internally AC-coupled, minimum input overload power for SMPTE ST 2081-1, SMPTE ST 2082-1.

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		100		KHz
MOD_DEF (0:2)-High	V _H	2		V _{cc}	V
MOD_DEF (0:2)-Low	V _L			0.8	V

Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Tx Disable Negate Time	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	-3to +1	dBm	±3dB	Internal / External
RX Power	-24to +1	dBm	±3dB	Internal / External

I2C Bus Interface

The I2C bus interface uses the 2-wire serial CMOS E2PROM protocol. The serial interface meets the following specifications:

- 1.Support a maximum clock rate of 280Khz.
2. Input/Output levels comply with LVCMOS/LVTTL or compatible logics.

Low: 0 – 0.8 V

High: 2.0 – 3.3 V

Undefined: 0.8 – 2.0 V

Pin Description

Pin	Signal Name	Description	Plug Seq.	Notes
1	VEET	Transmitter Ground	1	
2	VEET	Transmitter Ground	3	
3	NC	Not Connected	3	
4	VEET	Transmitter Ground	3	
5	SCL	SCL Serial Clock Signal	3	Note 1
6	SDA	SDA Serial Data Signal	3	Note 1
7	VEER	Receiver ground	3	
8	LOS	Loss of Signal	3	Note 2

9	NC	Not Connected	1	
10	NC	Not Connected	1	
11	VEER	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 3
13	RD+	Received Data Out	3	Note 3
14	VEER	Receiver ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	
17	VEET	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 4
19	TD-	Inv. Transmit Data In	3	Note 4
20	TX_DIS	Transmitter Disable	1	Note 5

Note:

Plug Seq.: Pin engagement sequence during hot plugging.

1. SCL,SDA. They should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 3.15V and 3.6V.
2. 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 3.15V and 3.6V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
3. RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) on the hostboard.
4. TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.
5. TX_DIS is an input pin 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

Pin Definition

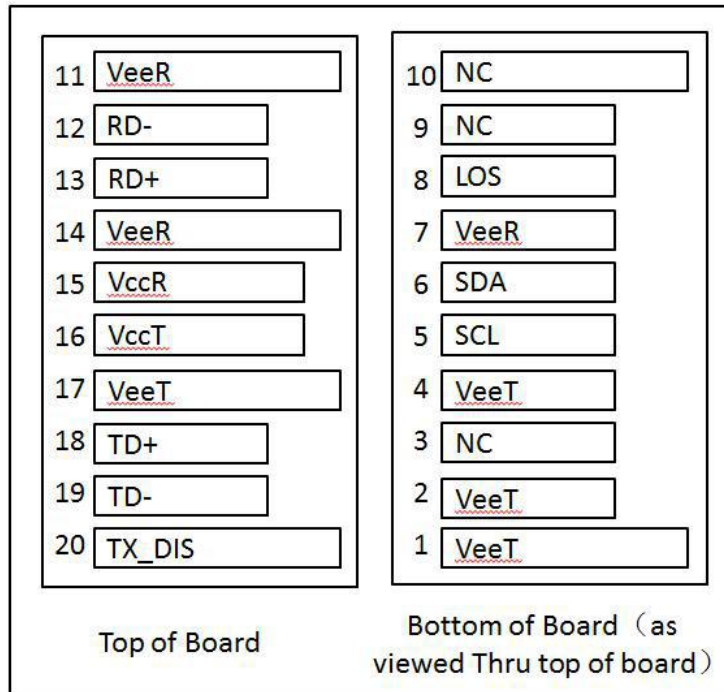


Figure 2. Electrical Pin-out Details

Regulatory Compliance

Feature	Standard
Laser Safety	IEC 60825-1:2014 (Third Edition)
Environmental protection	2011/65/EU
CE EMC	EN55032: 2015 EN55035: 2017 EN61000-3-2:2014 EN61000-3-3:2013
FCC	FCC Part 15, Subpart B; ANSI C63.4-2014
Product Safety	EN/UL 60950-1, 2nd Edition, 2014-10-14

CAUTION:

Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.