ShieldRock

SRFBR-12G-TXRX Technical Manual

Revision A

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1.0 Introduction

The SRFBR-12G series of SFP+ devices are designed specifically for the transmission of SMPTE standard video over fiber optic connections. The series is based on the same technology in each product, with the relative parts populated for each variant.

1.1 Products in Series

	Part Number	Description
	SRFBR-12G-TXRX	Transceiver
	SRFBR-12G-TX	Single Transmitter
	SRFBR-12G-RX	Single Receiver

Table 1. SRFBR-12G Series

1.2 Technical Highlights

- Interfaces speeds up to 11.88Gbps
- Intended for Single Mode Fiber (SMF) transmissions up to 10km
- 1310nm DFB laser transmitter
- PIN receiver
- Supports: SD-SDI, HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI rates
- Compliant with SMPTE 424M, SMPTE 292M, and SMPTE 259M
- Tested with pathological pattern transmissions
- Class I laser product

1.3 Standards Compliance

- SFF-8472 Mechanical/Electrical
- SFP+ MSA Interface
- FCC 47 CFR Part 15, Class B
- FDA 21 CFR 1040.10 and 1040.11, Class I
- SMPTE: 259M, 292M, 296M, 372M, 425M
- RoHS

1.4 Full Description

This SFP+ module includes a receiver and a transmitter which facilitates the conversion of an electrical SDI signal into an optical signal for transmission over fiber, and also receives an optical SDI signal and converts to an electrical signal for further processing. Wavelength is a fixed 1310nm and suitable for distances up to 10km at 11.88G on SMF. The transceiver consists of two sections; the transmitter section incorporates a 1310nm DFB laser, and the receiver section consists of a PIN photodiode integrated with a trans-impedance preamplifier (TIA). The use of a purpose-built 12G TIA ensures that two modules used together will pass and receive a pathological pattern without unlocking.

2.0 Technical Ratings

2.1 Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Case Temperature	Tc	0		+70	°C
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Data Rate	DR	0.27		11.88	Gbps

2.2 Transmitter Optical and Electrical Characteristics

Parameter		Symbol	Minimum	Typical	Maximum	Unit	Note
Center Wavelength		λ_C	1260	1310	1360	nm	
Average Output Power		P_{OUT}	-6	-4	-2	dBm	Over SMF
Pout @ TX Disable Asserted		P_{OUT}			-45	dBm	
Spectral Width (-20dB)		Δλ			1	nm	
Side Mode Suppression Ratio		SMSR	30			dB	
Total Jitter	Pathological Pattern				60	ps	11.88Gbps
	Color Bar Test				50		
	Pathological Pattern				30	ps	5.94Gbps
	Color Bar Test				25		
Data Input Swing Differential		V_{IN}	500		2400	mVpp	
Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		V_{CC}	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		V_{CC}	V	
	Normal		0		0.5	V	

2.3 Receiver Optical and Electrical Characteristics

Parameter		Symbol	Minimum	Typical	Maximum	Unit	Note
Center Wavelength		λ_C	1260	1310	1360	nm	
Receiver Sensitivity	Pathological Pattern			-12	-10	dBm	11.88Gbps
	Color Bar Test			-12	-10	dBm	
Receiver Overload			-3			dBm	
Data Output Swing Differential		V_{OUT}	370		2000	mVpp	
LOS	HIGH		2.0		Vcc	V	
	LOW		0		0.5	V	

2.4 Recommended Power Supply Circuit

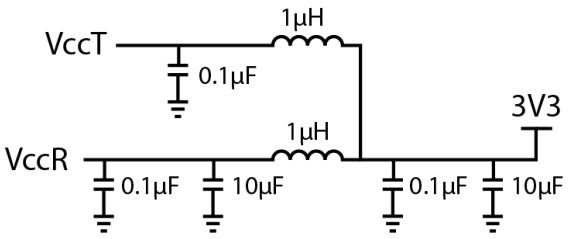


Figure1. Recommended Host Board Power Supply Circuit

2.5 Recommended Interface Circuit

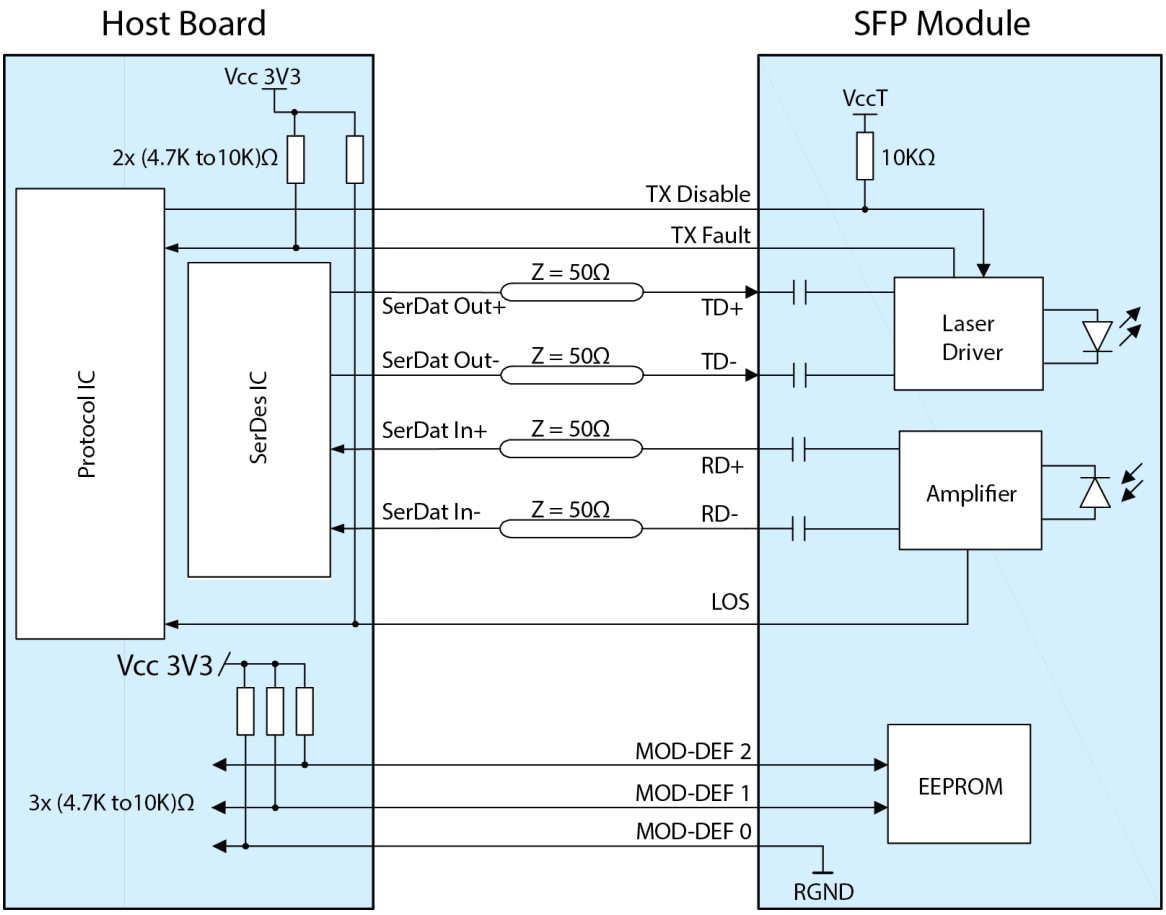


Figure2. Recommended Interface Circuit

3.0 Control Features

3.1 Pin Definitions

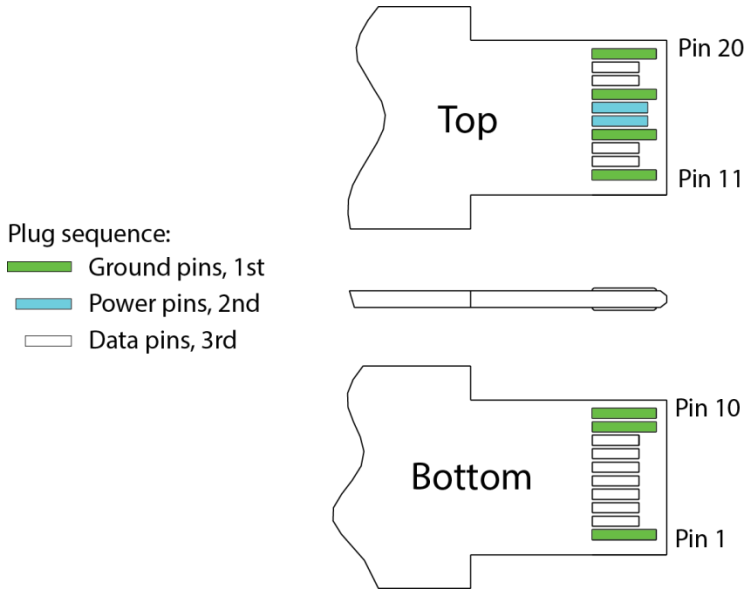


Figure3. PCB pin arrangement

PIN	Name	Function
1	VeeT	Transmitter ground
2	TX Fault	Transmitter fault indicator (Output: LOW = normal, HIGH = laser fault)
3	TX Disable	Disable transmitter (Input: LOW = TX enabled, HIGH = TX disabled)
4	MOD-DEF2	Data line of two-wire serial interface for serial ID
5	MOD-DEF1	Clock line of two-wire serial interface for serial ID
6	MOD-DEF0	Module present (Output: LOW = module detected, HIGH = not detected)
7	Rate Select	Not connected
8	LOS	Loss of Signal (Output: LOW = normal, HIGH = signal not detected)
9	VeeR	Receiver ground
10	VeeR	Receiver ground
11	VeeR	Receiver ground
12	RD-	Receiver negative differential output
13	RD+	Receiver positive differential output
14	VeeR	Receiver ground
15	VccR	Receiver power (typically 3.3V DC)
16	VccT	Transmitter power (typically 3.3V DC)
17	VeeT	Transmitter ground
18	TD+	Transmitter positive differential input
19	TD-	Transmitter negative differential input
20	VeeT	Transmitter ground

Table2. Pin definitions.

3.2 Transmitter control

The optical output can be disabled by a TTL logic high-level input of Tx Disable. Tx Fault is provided to indicate degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver.

3.2.1 TX Fault

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.

3.2.2 TX Disable

TX Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor.

0V to 0.8V (Low)	Transmitter on
>0.8V, <2.0V	Undefined
2.0V to 3.4V (High)	Transmitter Disabled
Open/Floating	Transmitter Disabled

3.2.3 Loss of Signal (LOS)

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.

3.3 Serial ID Interface

The standard serial ID information compatible with SFP+ MSA describes the transceiver's capabilities, standard interfaces, manufacturer and other information. The host equipment can access this information via the two-wire serial CMOS EEPROM protocol.

3.4 Differential Signals

3.4.1 Receiver Output

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

3.4.2 Transmitter Inputs

The differential transmitter inputs are designated by TD+/TD-. They are AC-coupled, differential lines with 100Ω differential termination inside the module.

4.0 Safety and Cleaning

4.1 Warnings

This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

4.2 Cleaning

It is not recommended to use compressed air to clean the LC transmitter or receiver connection ferrules. Both pen style and cassette systems are recommended alternatives to using alcohol or harsh chemicals. One-Click pen styles cleaners are inexpensive and available from most resellers of fiber optic equipment.