



Features

- Support IEEE 802.3av™-2009 10GBASE-PR30 Power budget
- 1270nm Burst-Mode Transmitter with DFB Laser
- 1577nm Continuous-Mode Receiver with APD-TIA
- Sleep Mode for Power Consumption
- Compliant with SFP+ MSA SFF-8431
- Compliant Digital Diagnostic SFF-8472
- Single 3.3V Power Supply
- Simplex SC Connector Bi-directional
- Telcordia GR-468 Compliant
- Operating case temperature: -5°C-+70°C
- RoHS compliance

Regulatory Compliance

Table 1 - Regulatory Compliance

Feature	Standard	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>500 V)
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class1 laser product.
Component Recognition	UL and CSA	Compliant with standards
RoHS	2011/65/EU	Compliant with standards ^{note}

Note:

In light of item 5 in Annex of 2011/65/EU, "Pb in the glass of cathode ray tubes, electronic components and fluorescent tubes." and item 13 in Annex of 2005/747/EC, "Lead and cadmium in optical and filter glass.", the two exemptions are being concerned for Source Photonics transceivers, because Source Photonics transceivers use glass, which may contain Pb, for components such as lenses, windows, isolators, and other electronic components.

Absolute Maximum Ratings

Table 2 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Storage Ambient Temperature	T _S	-40	-	85	°C	
Operating Case Temperature	T _C	-5		70	°C	1
Operating Relative Humidity	RH	5		95	%	
Power Supply Voltage	V _{CC}	0		4	V	
Input Voltage		GND		V _{CC}	V	
Receiver Damaged Threshold		+1			dBm	
Soldering Temperature				400	°C	3

Note

1: When ambient temperature is above 60°C, airflow at rate higher than 1m/sec is required.

2: Iron soldering only and 10 seconds

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Supply Voltage	V _{CC}	3.13	3.3	3.47	V	±5%
Power Supply Current	I _{CC}	-	-	660	mA	
Operating Case Temperature	T _C	-5		70	°C	1
Inrush Current	I _{IN-RUSH}	-	-	600	mA	2
Data Rate	DR		10.3125		Gbit/s	3
Data Rate Drift		-100		+100	PPM	

Note 1: When ambient temperature is above 60°C, airflow at rate higher than 1m/sec is required.

2: MAX duration 500ms

3: PRBS2³¹-1

Optical Characteristics

Table 4 – Optical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Centre Wavelength	λ _C	1260	1270	1280	nm	
Spectral Width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	

Average Launch Power	P_{OUT}	4		9	dBm	1
Average Launch Power-OFF Transmitter	P_{OFF}			-45	dBm	1
Extinction Ratio	EX	6			dB	2
Total Jitter	TJ			0.35	UI	2
Rise/Fall Time (20%-80%)	T_R/T_F			65	ps	2,3
Burst Turn On Time	$T_{BURST-ON}$			100	ns	4
Burst Turn Off Time	$T_{BURST-OFF}$			100	ns	
Burst Enable Duration	T_{EN-DUR}	600			ns	
Burst Disable Duration	$T_{DIS-DUR}$	512			ns	
RIN ₁₅ OMA				-128	dB/Hz	
Optical Return Loss Tolerance				15	dB	
Transmitter Reflectance				-10	dB	
Optical Eye Mask	Compliant With IEEE Std 802.3av™-2009					2,5
Receiver						
Operating Wavelength	λ_C	1575	1577	1580	nm	
Sensitivity	P_{SEN1}			-24	dBm	6
Sensitivity	P_{SEN2}			-28		
Saturation	P_{SAT}	-8			dBm	
Receiver Total Jitter	TJ	-	-	± 0.35	UI	
Receiver Deterministic Jitter	DJ	-	-	± 0.21	UI	
Loss of Signal Deassert Level	P_{LOSD}	-	-	-29	dBm	7
Loss of Signal Assert Level	P_{LOSA}	-40			dBm	8
LOS Hysteresis	$P_{LOSD} - P_{LOSA}$	0.5		6	dB	
Receiver Reflectance				-12	dB	
WDM Filter Isolation	ISO(1550)	38			dB	1550
	ISO(1650)	35			dB	1650

Notes:

1. The optical power is launched into 9/125um SMF.
2. Measured with PRBS 2³¹-1 test pattern @10.3125Gbps.
3. Measured with the Bessel-Thompson filter OFF.
4. Refer to timing Parameter Definition in Burst Mode Sequence
5. Transmitter eye mask definition {0.25,0.40,0.45,0.25,0.28,0.40}
6. Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps and ER=6dB, BER $\leq 10^{-10}$ or Measured with a PRBS 2³¹-1 test pattern @10.3125Gbps and ER=6dB, BER $\leq 10^{-3}$
7. An increase in optical power above the specified level will cause Los of Signal (LOS) output to switch from a low state to a high state.
8. A decrease in optical power below the specified level will cause Los of Signal (LOS) output to switch from a high state to a low state.

Electrical Characteristics

Table 5 – Electrical Characteristics

Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Supply Current	I_{CC_TX}	-	-	460	mA	
Data Input Differential Swing	V_{IN}	400	-	1200	mVp-p	1
Input Differential Impedance	Z_{IN}	90	100	110	Ω	
Transmitter Disable Voltage - Low	$V_{TDIS, L}$	0		0.8	V	2
Transmitter Disable Voltage - High	$V_{TDIS, H}$	2.0		V_{CC}	V	
Power Down Voltage _Low	$V_{_PDL}$	0		0.8		
Power Down Voltage _High	$V_{_PDH}$	2.0		V_{CC}		
TX Fault Assert Time	$T_{_FAULT_on}$	-	-	50	ms	
TX Fault Reset Time	TX_FAULT_RESET	10	-	-	μs	
TX_Disable Assert Time	TX_DISA			10	us	
TX_Disable Deassert Time	TX_DISD			10	us	
TX Power Down Assert Time	$T_{_PD\ assert}$			512	ns	3
Recovery Time following TX Power Down	$T_{_PD\ recover}$			512	ns	4
Receiver						
Power Supply Current	I_{CC_RX}			200	mA	
Data Output Differential Swing	V_{OUT}	600		900	mV _{P,P}	5
Loss of Signal (LOS) Assert Time	T_{LOSA}	-	-	100	μs	
Loss of Signal(LOS) Deassert Time	T_{LOSD}	-	-	100	μs	
Output Differential Impedance	R_{OUT}	80	100	120	Ω	
RX-LOS	V_{OL}	0.0	-	0.4	V	
	V_{OH}	$V_{CC}-0.5$		V_{CC}	V	
Time to Initialize 2-Wire Interface	$t_{2w-start-up}$	-	-	300	ms	
Time to Initialize	$t_{start-up}$	-	-	300	ms	

Notes:

- Compatible with CML input, AC coupled internally. (See [Recommended Interface Circuit](#))
- TX_nBRST (See [Pin Function Definitions](#)).
- Measured to 10% of final supply current
- Measured to 90% of final supply current
- CML output, AC coupled internally, guaranteed in the full range of input optical power (-24dBm to -8dBm) (See [Recommended Interface Circuit](#)).

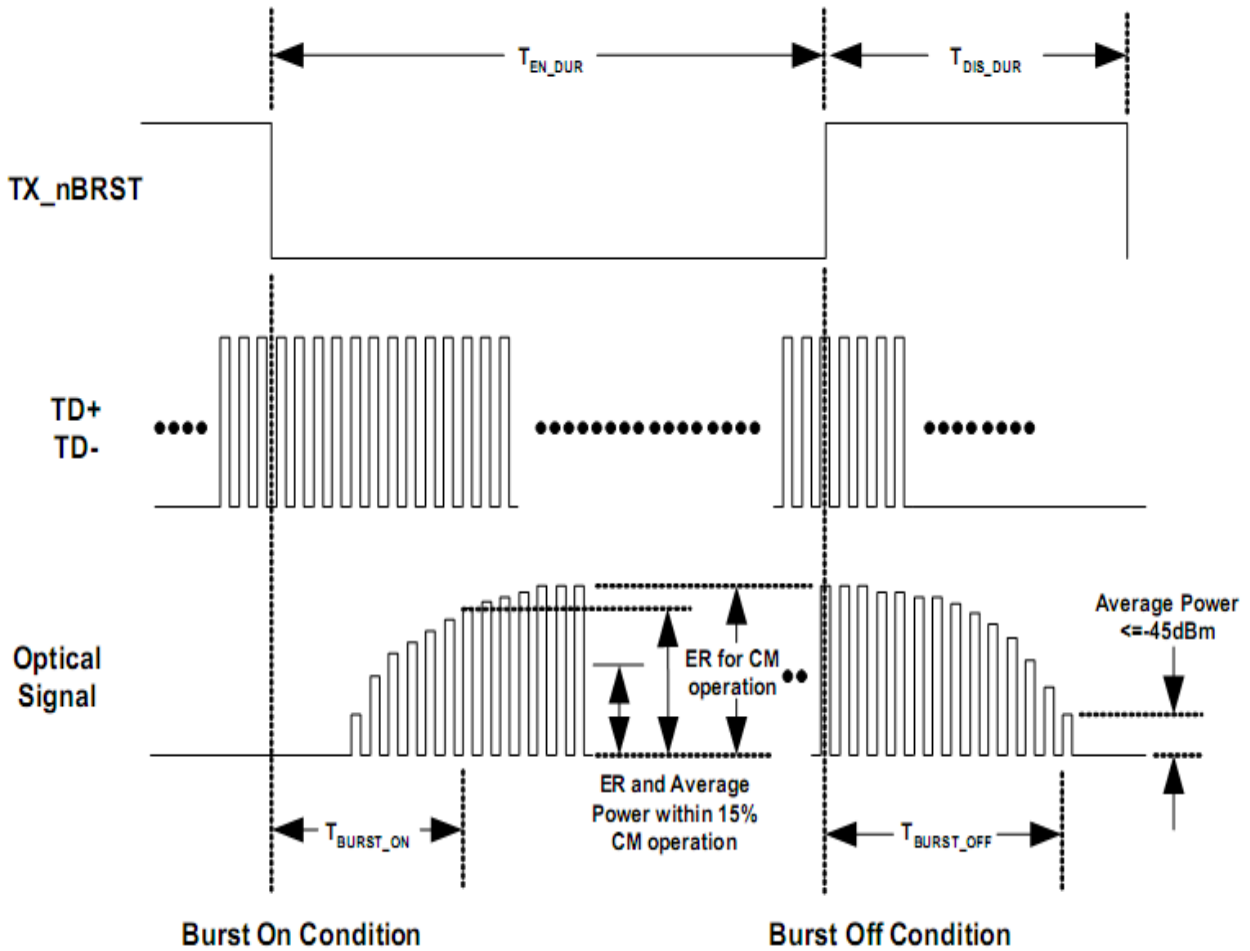


Figure 1, Timing Parameter Definition in Burst Mode Sequence

Diagnostic

Table 6 – Diagnostic

Address	Parameter	Range	Accuracy	Unit	Calibration	Notes
96	Temperature	-5 to 70	±3	°C	Internal	LSB equal to 1/256C
98	Voltage	0 to V _{cc}	±3%	V	Internal	LSB equal to 100uV
100	Bias Current	0 to 100(notes)	±10%	mA	Internal	LSB equal to 4uA
102	Tx Power	3 to 9	±3	dB	Internal	LSB equal to 0.4uW
104	Rx Power	-31 to -10	±3	dB	Internal	LSB equal to 0.1uW

Notes: only for continuous mode

EEPROM Definition

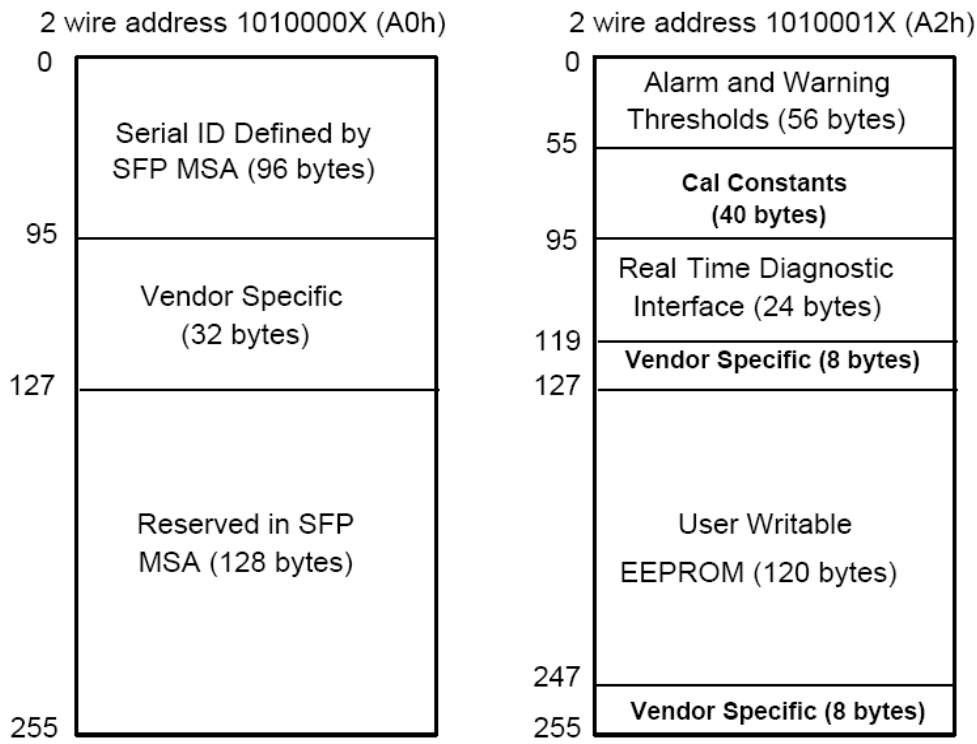


Figure 2, 2-wire Serial Digital Diagnostic Memory Map

Table 7 EEPROM Serial ID Memory Contents (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP+ transceiver
1	1	Ext. Identifier	04	MOD4
2	1	Connector	01	SC
3-10	8	Transceiver	00 00 00 80 00 00 00 00	BASE-PX
11	1	Encoding	06	64B/66B
12	1	BR, Nominal	67	10.3125Gbps
13	1	Rate Identifier	00	
14	1	Length (9um)-km	14	20(km)
15	1	Length (9um)	C8	200(100m)
16	1	Length (50um)	00	Not Support MMF
17	1	Length (62.5um)	00	Not Support MMF
18	1	Length (Copper)	00	Not Support Copper
19	1	Length(OM3)	00	
20-35	16	Vendor name	53 4F 55 52 43 45 50 48 4F 54 4F 4E 49 43 53 20	"SOURCEPHOTONICS "(ASC II)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 1F 12	SFP Vendor IEEE company ID

				For Source Photonics Inc
40-55	16	Vendor PN	53 50 50 53 32 37 58 45 52 33 43 44 46 42 20 20	"SPPS27XER3CDFB" (ASCII)
56-59	4	Vendor Rev	xx xx 20 20	ASCII("31 30 20 20" means 1.0 Revision)
60-61	2	Wavelength	04 F6	1270nm Laser Wavelength
62	1	Reserved	00	
63	1	CC_BASE	xx	Check sum of byte 0-62
64-65	2	Options	00 0A	RX_LOS ,TX_FAULT
66	1	BR, max	00	
67	1	BR, min	00	
68-83	16	Vendor SN	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	ASCII
84-91	8	Date code	xx xx xx xx xx xx 20 20	Year(2 bytes),Month(2 bytes), Day(2 bytes)
92	1	Diagnostic Monitoring Type	68	Compliant with SFF-8472 V9.5 Internally Calibrated Received power measurement type -Average Power
93	1	Enhanced Options	F0	Diagnostics (Optional Alarm/warning flags) implemented Soft TX_Disable control and monitoring implemented Soft TX_Fault monitoring implemented Soft RX_LOS monitoring implemented
94	1	SFF-8472 Compliance	02	Diagnostics Compliance(SFF-8472)
95	1	CC_EXT	xx	Check sum of byte 64-94
96-255	64	Vendor Specific		

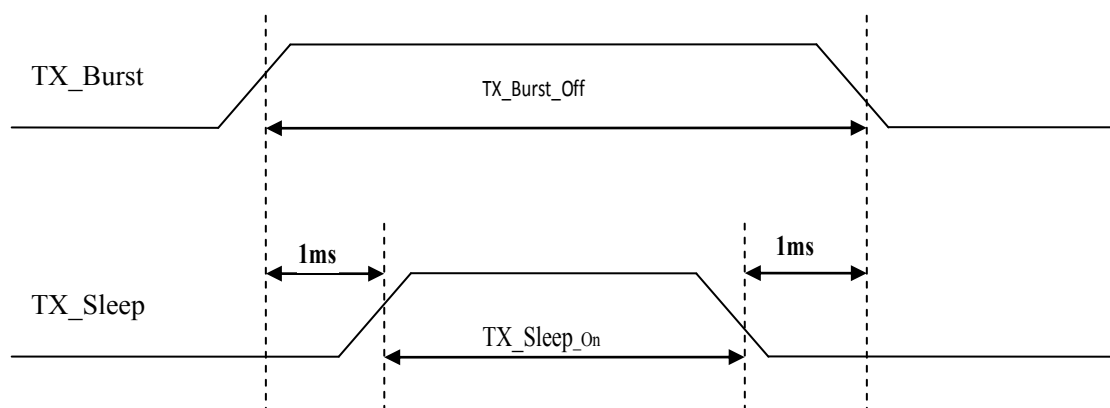
Table 8 –Pin Function Definitions

Pin No.	Logic	Name	Description
1		VEET ⁽¹⁾	Module Ground
2	LVTTL-O	TX_FAULT ⁽²⁾	Module Transmitter Fault
3	LVTTL-I	TX_nBRST	Transmitter Burst Control
4	LVTTL-I/O	SDA	2—wire serial Interface Data line
5	LVTTL-I	SCL	2—wire serial Interface Clock

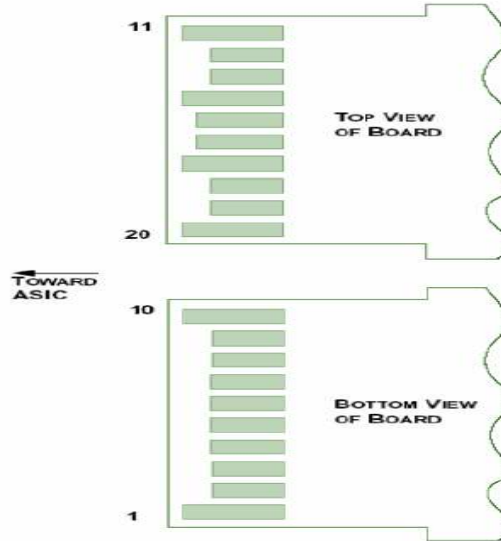
6		MOD_ABS	Connect to VEET OR VEER in the Module
7	LVTTL-O	TX_SD	TX Signal detected
8	LVTTL-O	RX_LOS ⁽³⁾	Receiver Loss of Signal Indication(in FC designated as RX_LOS,in SONET Designated as Los,as in Ethernet Designated as not Signal Detect)
9	LVTTL-I	PDWN_TX ⁽⁴⁾	Power saving of Tx side, On/off time less than 1ms, high active, if not use this feature, main board connection should be NC.
10		VEER	Module Receiver Ground
11		VEER	Module Receiver Ground
12	CML-O	RD-	Receiver inverted Data Output
13		RD+	Receiver Non-inverted Data Output
14		VEER	Module Receiver Ground
15		VCCR	Module Receiver 3.3 Supply
16		Vcct	Module Transmitter 3.3 Supply
17		VEET	Module Transmitter Ground
18	CML-I	TD+	Transmitter Non-inverted Data Input
19		TD-	Transmitter Inverted Data Input
20		VEET	Module Transmitter Ground

Notes:

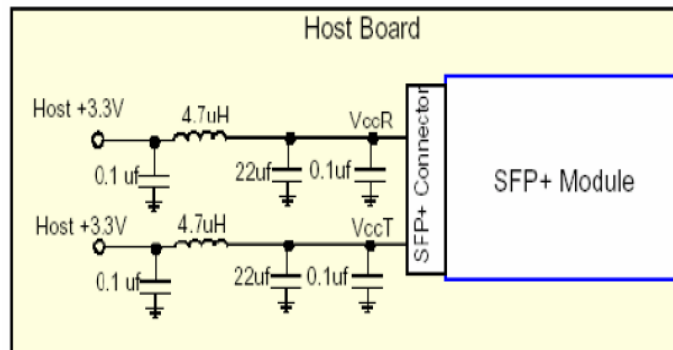
1. The module ground pin, VeeT and VeeR, shall be isolated from the module case.
2. Shall pulled up with 4.7K-10K ohm to a VccT in the module.
3. This pin is an open collector/drain output pin and shall pulled up with 4.7K-10K ohm to a Host-Vcc on the host board.
4. Tx Power saving function timing: Tx_Sleep



SPF+ Module PCB Pinout



Recommended Host Board Power Supply Circuit



Recommended Interface Circuit

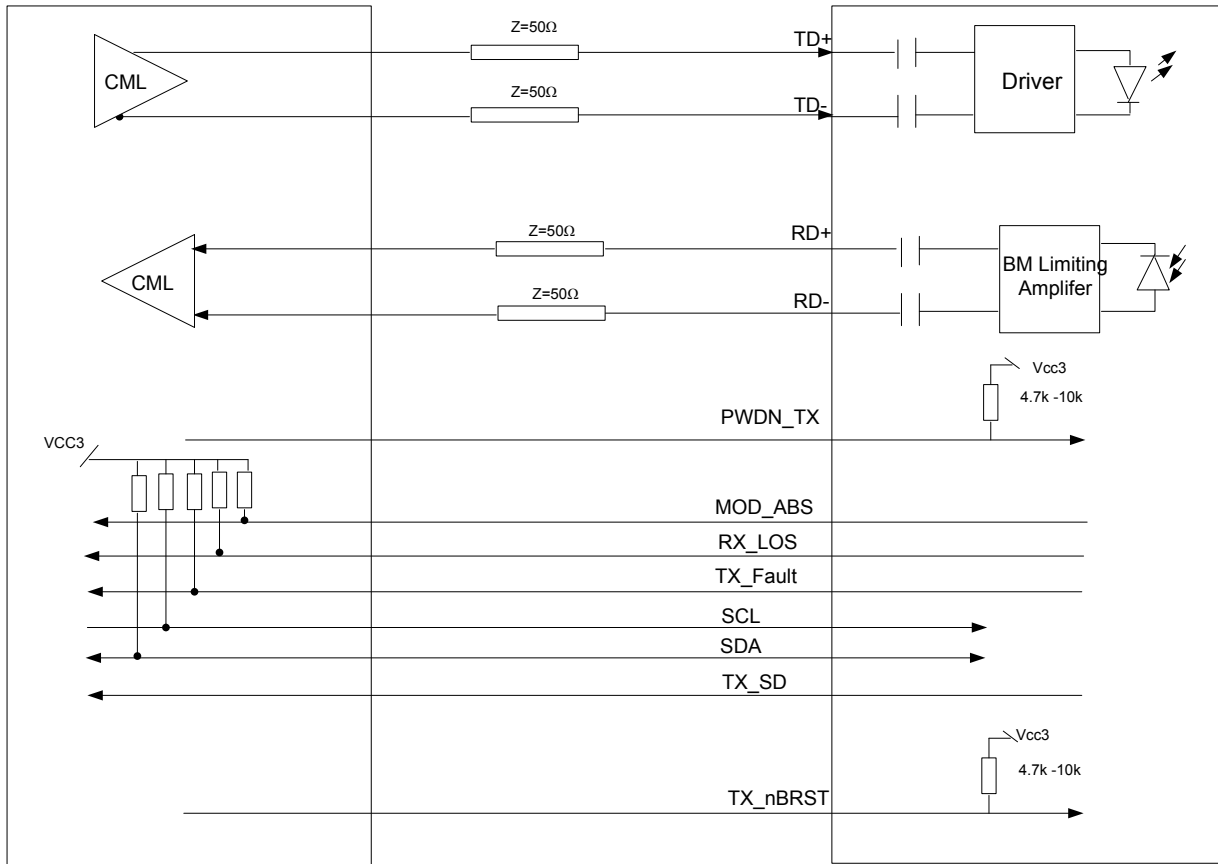


Figure 3, Recommended Interface Circuit

Mechanical Diagram

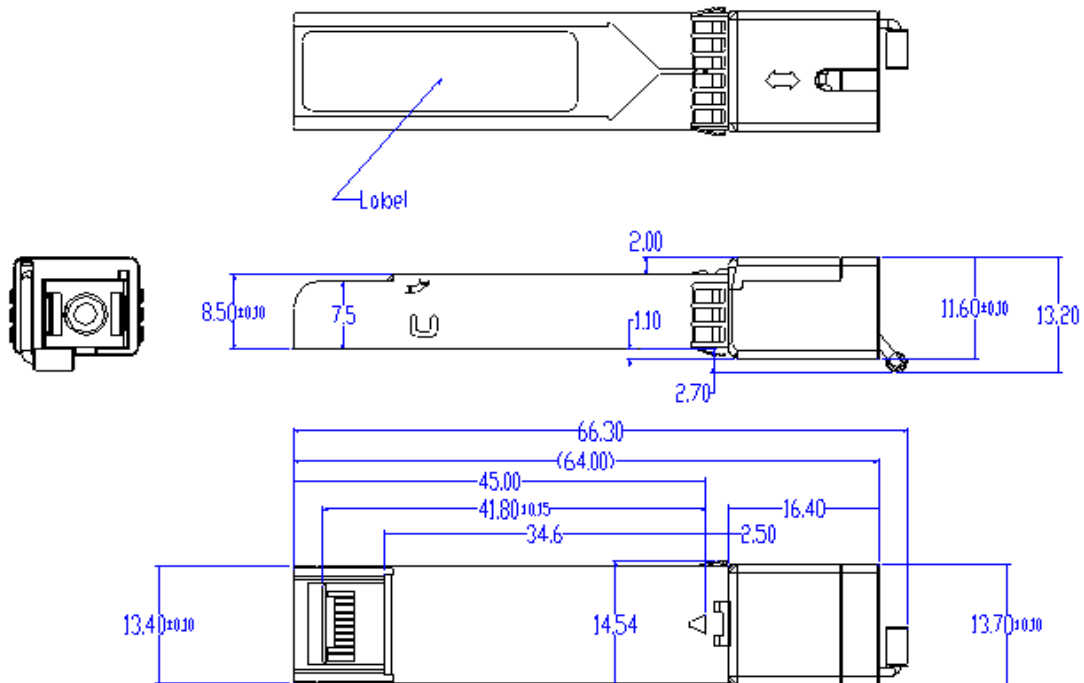


Figure 4, Mechanical Diagram

Order Information

Table 9– Order Information

Part No.	Application	Data Rate	Laser Source	Fiber Type
SPPS-27-XE-R3-CDFB	10GBASE-PR30 ONU	10.3125Gb/s symmetric	1270nm DFB	SMF

Version Information

Table 10– Order Information

Version	Notes
09	Updated the inrush current based on SFF8431

Warnings

Handling Precautions: 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.

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

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