



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/UPC Connector Bi-directional
- Telcordia GR-468 Compliant
- Commercial and Industrial Temperature Available
- RoHS compliance
- Compliant with ITU-T G.9807.1 XGS-PON N1/N2/E1 class

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 exemptions

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 (SPPS-27-XE-R3-CDFD)	T _C	0		70	° C	
Operating Case Temperature (SPPS-27-XE-R3-IDFD)	T _C	-40		85	° C	
Operating Relative Humidity	RH	5		95	%	
Power Supply Voltage	V _{CC}	0		4	V	
Maximum Reach		20			Km	

Recommended Operating Conditions

Table 3 – Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Supply Voltage	V _{CC}	3.14	3.3	3.47	V	
Power Supply Current	I _{CC}	-	-	550	mA	
Inrush Current	I _{IN-RUSH}	-	-	600	mA	
Data Rate	DR	10.3125			Gbit/s	

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)	$\Delta \lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Launch Power	P _{OUT}	4		9	dBm	1
Average Launch Power-OFF	P _{OFF}			-45	dBm	1
Extinction Ratio	EX	6			dB	2
Optical Eye Mask	Compliant With IEEE Std 802.3av™-2009					2,3
Receiver						
Operating Wavelength	λ_c	1575	1577	1580	nm	
Sensitivity	P _{SEN1}			-28.5	dBm	4
Saturation	P _{SAT}	-8			dBm	
Bit Error Ratio		10E-3				
Loss of Signal Deassert Level	P _{LOSD}	-	-	-30	dBm	5

Loss of Signal Assert Level	P_{LOSA}	-45			dBm	6
WDM Filter Isolation	ISO(1400~1560nm)	35			dB	
	ISO(1600~1675nm)	35			dB	
	ISO(1575~1580nm)	34.5			dB	

Notes:

1. The optical power is launched into 9/125um SMF.
2. Measured with PRBS $2^{31}-1$ test pattern @10.3125Gbps.
3. Transmitter eye mask definition {0.25,0.40,0.45,0.25,0.28,0.40}
4. Measured with a PRBS $2^{31}-1$ test pattern @10.3125Gbps and ER=6dB, BER $\leq 10^{-3}$
5. 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.
6. 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

Electrical & Timing						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Time to Initialize	t-start-up	-	-	300	ms	
Transmitter						
Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Power Supply Current	I_{CC_TX}	-	-	425	mA	
Data Input Differential Swing	V_{IN}	190	-	1000	mVp-p	1
Input Differential Impedance	Z_{IN}	80	100	120	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	$T_{_FAULT_RESET}$	10	-	-	μs	
Burst Turn On Time	$T_{BURST-ON}$			512	ns	
Burst Turn Off Time	$T_{BURST-OFF}$			512	ns	
TX Power Down Assert Time	$T_{_PD\ assert}$			512	ns	3
TX Power Down De-assert Time	$T_{_PD\ recover}$			512	ns	4
Receiver						
Power Supply Current	I_{CC_RX}			235	mA	

Data Output Differential Swing	V_{OUT}	600		850	mV _{P-P}	5
Loss of Signal (LOS) Assert Time	T_{LOSA}	-	-	100	μ S	
Loss of Signal(LOS) Deassert Time	T_{LOSD}	-	-	100	μ S	
Output Differential Impedance	R_{OUT}	80	100	120	Ω	
RX-LOS	V_{OL}	0	-	0.4	V	
	V_{OH}	2.4		V_{CC}	V	

Notes:

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

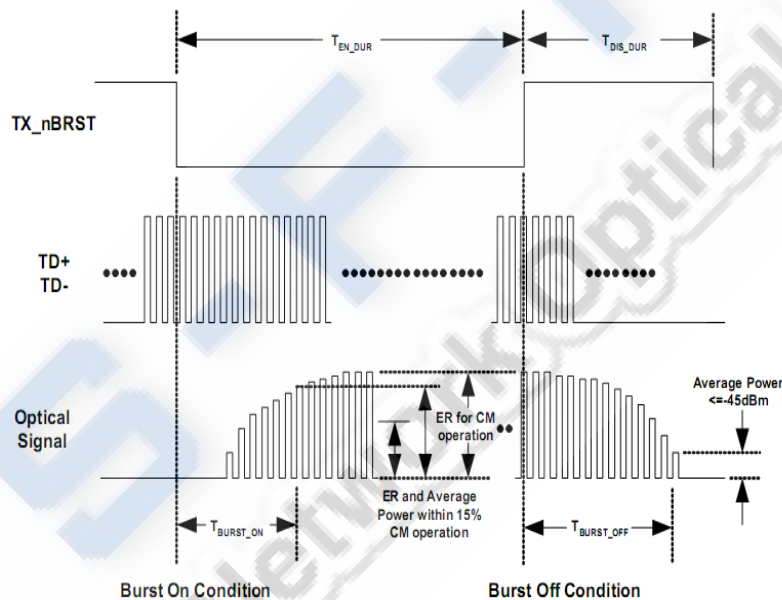


Figure 1, Timing Parameter Definition in Burst Mode Sequence

Diagnostic

Table 6 – Diagnostic

Address	Parameter	Range	Accuracy	Unit	Calibration	Notes
96	Temperature	0 ~70	± 3	$^{\circ}$ C	Internal	LSB equal to 1/256C
98	Voltage	2.97 ~ 3.63	$\pm 3\%$	V	Internal	LSB equal to 100uV
100	Bias Current	0 ~ 262(notes)	$\pm 10\%$	mA	Internal	LSB equal to 4uA
102	Tx Power	4 ~ 9	± 3	dB	Internal	LSB equal to 0.2uW
104	Rx Power	-29 ~ -8	± 3	dB	Internal	LSB equal to 0.1uW

Notes: only for continuous mode

EEPROM Definition

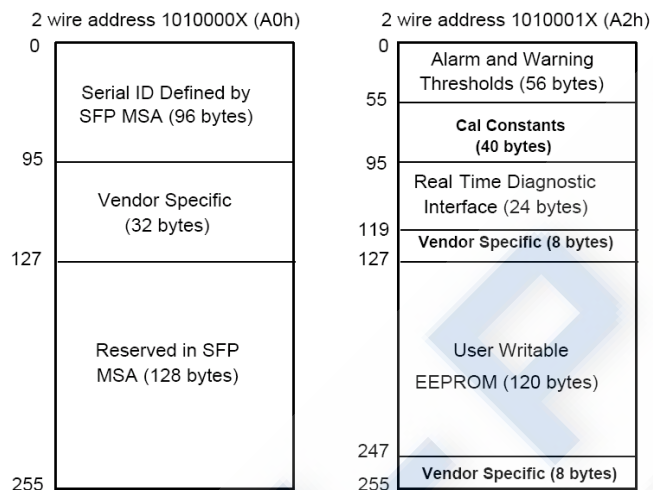


Figure 2, 2-wire Serial Digital Diagnostic Memory Map

Pin Function Definitions

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

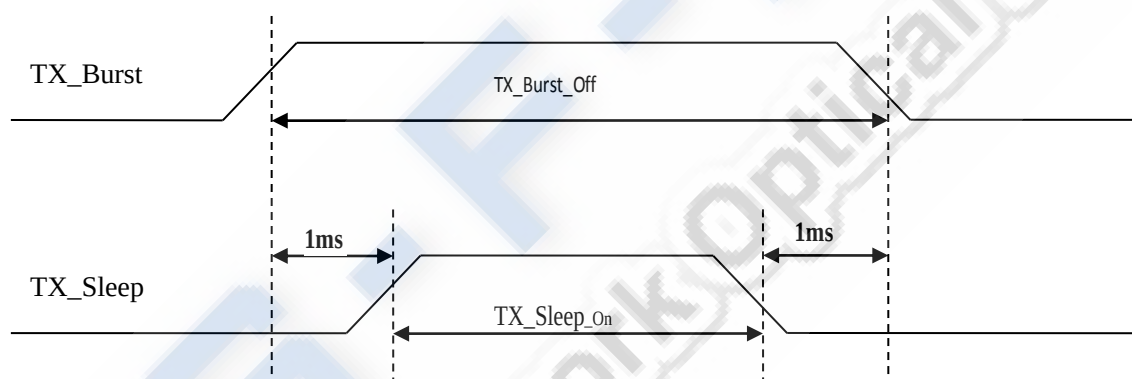


Figure 3, Tx Power saving function timing

SPF+ Module PCB Pinout

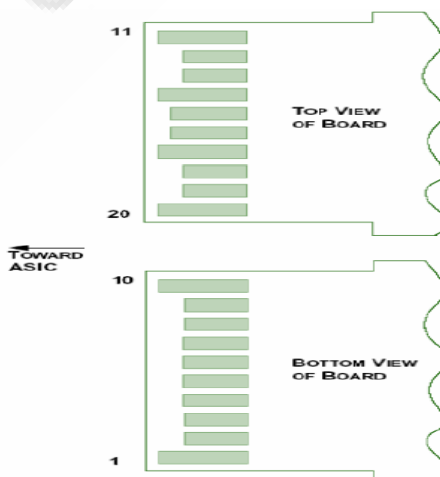


Figure 4, SPF+ Module PCB Pinout

Recommended Host Board Power Supply Circuit

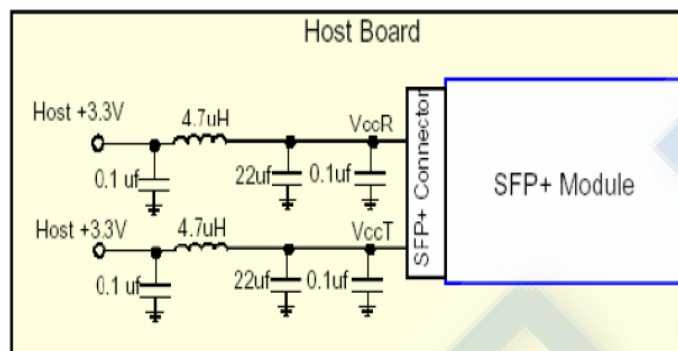


Figure 5, Recommended Host Board Power Supply Circuit

Recommended Interface Circuit

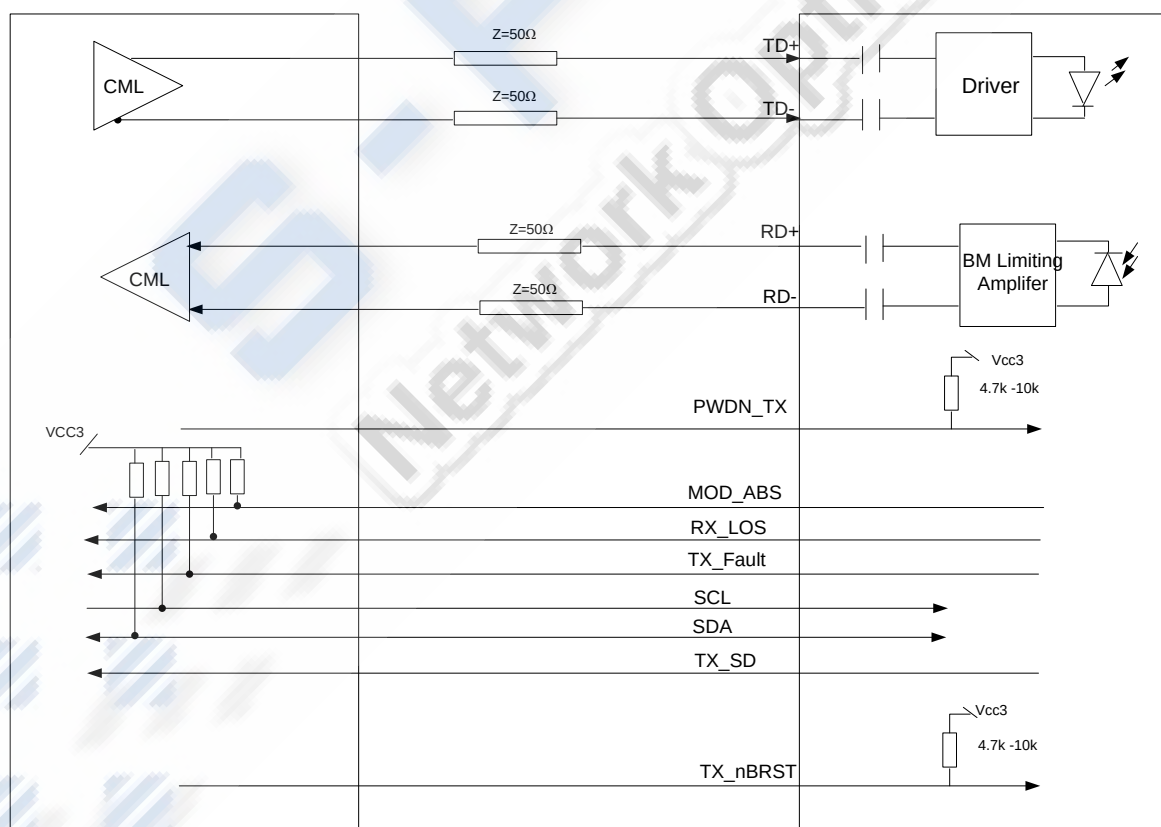


Figure 6, Recommended Interface Circuit

Mechanical Diagram

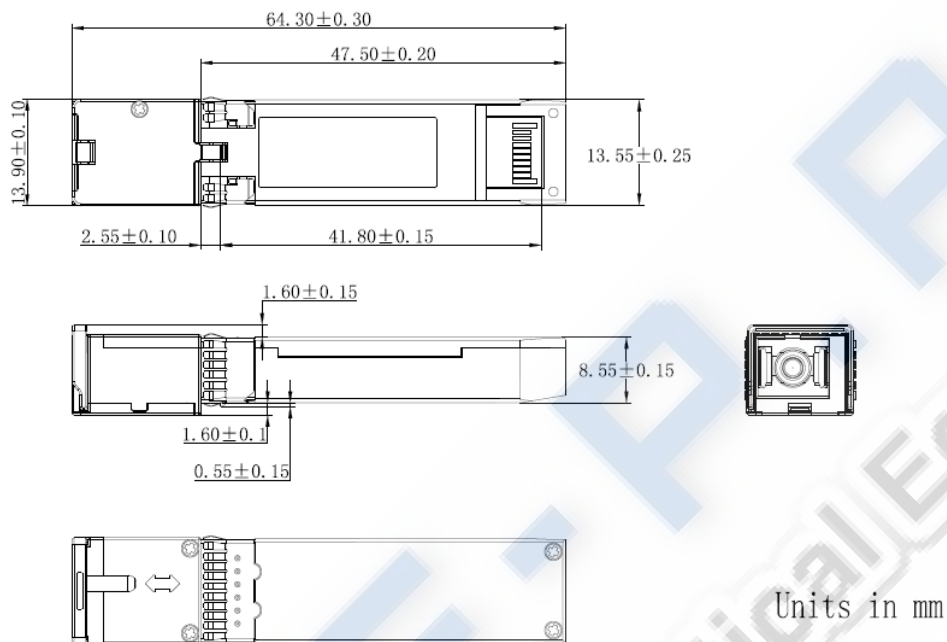


Figure 7, Mechanical Diagram

Order Information

Table 9– Order Information

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

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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