A-GEAR World Wide Manufacturing

Product Specification

SFP OLT 1G 20km SC Grade C (33dB)

1.25Gbps Upstream/1.25Gbps Downstream GE-PON OLT Transceiver

1. Product Features

- Bi-directional 1.25Gbps Upstream/1.25Gbps Downstream
- Complies with IEEE802.3ah 1000Base-PX20+ application
- SFP package with SC Receptacle
- 1490nm continuous-mode 1.25Gb/s DFB transmitter, And 1310nm burst-mode 1.25Gb/s APD receiver
- Single +3.3V power supply
- LVTTL Bias Control input and Rx Signal Detect output
- Laser Class 1 Product which comply with the Requirements of IEC 60825-1 and IEC 60825-2

2. Applications

- Gigabit Ethernet Passive Optical Network (GEPON) OLT

3. Description

A-GEAR's GE-PON OLT transceiver SFP OLT 1G 20km SC is designed for Gigabit Ethernet Passive Optical Network transmission. The module is contained in a SFP package with SC/UPC receptacle connector. The module consists 1490nm DFB laser, InGaAs APD, Preamplifier and WDM filter in a high-integrated optical sub-assembly, and it receives up to 1.25Gbps of continuous data at 1310nm, and receives 1.25Gbps of burst-mode data at 1310nm. The module data link up to 20km in 9/125um single mode fiber.

4. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	85	°C
Storage Ambient Humidity	H_A	5	95	%
Power Supply Voltage	V_{CC}	-0.3	4	V
Signal Input Voltage		-0.3	Vcc+0.3	V
Receiver Damage Threshold		+5		dBm

5. Recommended Operating Conditions

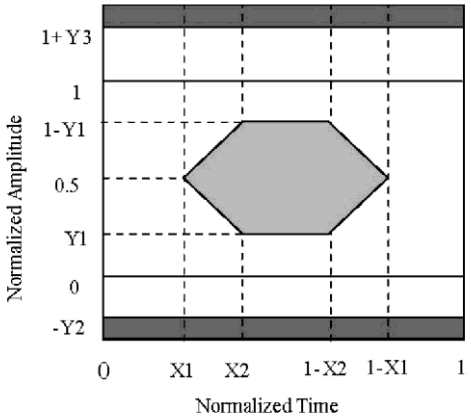
Parameter	Symbol	Min.	Typical	Max.	Unit
Ambient Operating Temperature	T_A	0		70	°C [1]
Ambient Humidity	H_A	5		95	% [2]
Power Supply Voltage	V_{CC}	3.14	3.3	3.47	V
Power Supply Current	I_{CC}			400	mA
Power Supply Noise Rejection				100	mVp-p [3]
Data Rate			1.25		Gbps

Notes:
[1] Without air low
[2] Non-condensing
[3] 100Hz to 1MHz

6. Specification of Transmitter

Parameter	Symbol	Min.	Typical	Max.	Unit
Average Launched Power	P_O	+3		+7	dBm [1]
Extinction Ratio	ER	9			dB
Center Wavelength	λC	1480		1500	nm [5]
Spectrum Width (RMS)	σ			1.0	nm
Transmitter OFF Output Power	P_{OFF}			-39	dBm
Optical Rise/Fall Time	tr/tf			260	ps [2]
Total Jitter	tJ			128	ps [3]
Optical Return Loss Tolerance	ORLT			15	dB
Output Eye Mask{X1,X2,Y1,Y2,Y3}	Compliant with IEEE 802.3ah {0.22,0.375,0.20,0.20,0.30} [4]				

Notes:
[1] Launched power (avg.) is power coupled into a single mode iber with master connector. (Before of Life)
[2] These are uniltered 20-80% values.
[3] Measure at 2^7-1 NRZ PRBS pattern
[4] Transmitter eye mask deinition
[5] DFB Laser



7. Specification of Receiver

Parameter	Symbol	Min.	Typical	Max.	Unit
Input Optical Wavelength	λ_{IN}	1260	1310	1360	nm [5]
Receiver Sensitivity	P_{IN}			-30	dBm [1]
Input Saturation Power (Overload)	P_{SAT}	-6			dBm
Signal Detect -Assert Power	P_A	-45			dBm
Signal Detect -Deassert Power	P_D			-30	dBm [2]
Signal Detect Hysteresis	P_A-P_D		2		dB
Data Output Rise/Fall time	tr/tf			260	ps [3]
Receiver threshold setting time	T_S			400	ns
Receiver Reflectance 1260 to 1360nm				-12	dB [4]

Notes:

[1] Measured with Light source 1490nm, ER=9dB; BER =<10^{-10} @PRBS=2^7-1 NRZ
This assurance should be met with asynchronous data lowing out of the optical transmitter of the system under test. The output data pattern from the transmitter of the system under test is a repetition of alternate 0/1 pattern as defined for this measurement.

[2] When Signal Detect deasserted, the data output is Low-level (fixed)

[3] These are 20%~80% values.

[4] Measured at wavelength of 1310nm.

[5] APD

8. Electrical Interface Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter					
Differential line input Impedance	R_{IN}	80	100	120	Ohm
Differential Data Input Swing	V_{DT}	200		1600	mVp-p [1]
TX_disable Input Voltage- High	V_{DISH}	2		Vcc	V [3]

Parameter	Symbol	Min.	Typical	Max.	Unit
TX_disable Input Voltage- Low	V_{DISL}	0		0.8	V
Transmitter Fault Output-High	V_{FAULTH}	2		Vcc	V[3]
Transmitter Fault Output-Low	V_{FAULTL}	0		0.8	V
Receiver					
Differential Data Output Swing	V_{DR}	400		1600	mVp-p
LOS Output Voltage-High	V_{LOSH}	2.4		Vcc	V[2]
LOS Output Voltage-Low	V_{LOSL}	0		0.4	V[2]

Notes:
[1] Internally AC coupled, but requires a 100ohm diferential termination at or internal to Serializer/ Deserializer.
[2] When los output is high, RX out is no signal.
[3] LVTTL

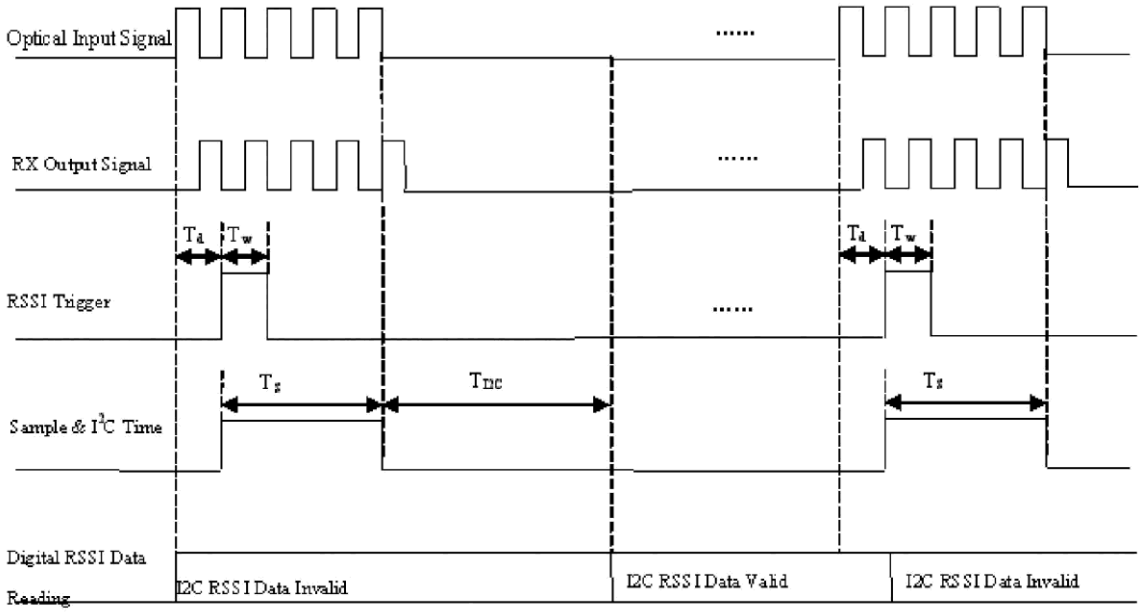
9. Burst Mode Digital Diagnostic Monitor Interface (DDMI) Description

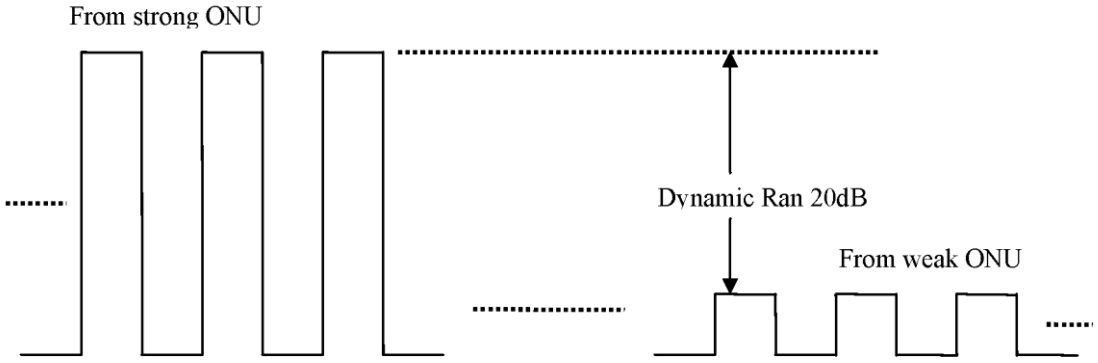
A-GEAR's GE-PON OLT transceiver support the 2-wire serial communication. The DDMI WARNING and ALARM memory positions and addresses are compliant with the SFF 8472 REV9.3 specification.
The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.
The DDMI can detect TX power, RX power, Bias current, Temperature, V_{CC}:

	Monitorscope	Monitor Error
TX power	-3dBm ~ 8dBm	±3dBm
RX power	-6dBm ~ -30dBm	±3dBm
Bias	0mA ~ 90mA	±10%
Temperature	-40°C ~ 85°C	±5°C
V_{CC}	2.8V ~ 3.8V	±5%

10. Timing Characteristics for Digital RSSI

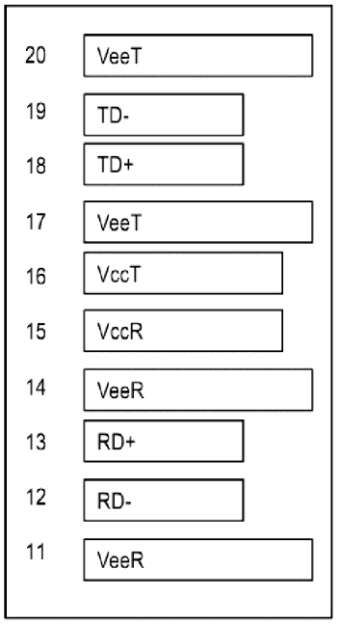
Parameter	Symbol	MIN	TYPE	MAX	Units
Trigger delay	T_D	2			us
Trigger width	T_W	2	4		us
Sample time	T_S	6		500	us
I2C read time	T_{I2C}	150	200		us

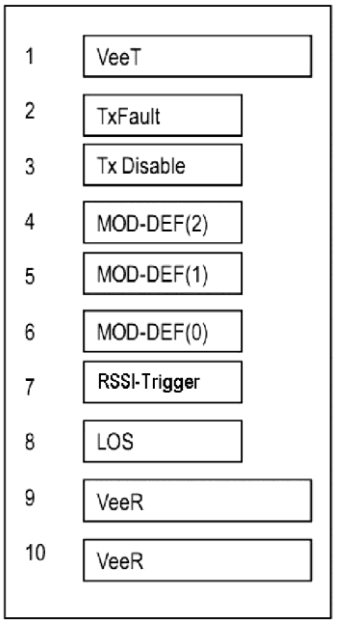




Burst Mode Receiver Dynamic Range

11. Pin Descriptions





Pin#	Name	Function	Notes
1	VeeT	Transmitter Ground	-
2	TX Fault	Transmitter Fault Indication	open collector/drain output,
3	TX Disable	Transmitter Disable	Module disables on high or open
4	MOD-DEF2	Module Definition 2	2 wire serial ID interface, SDA
5	MOD-DEF1	Module Definition 1	2 wire serial ID interface, SCL
6	MOD-DEF0	Module Definition 0	Grounded in Module
7	RSSI-Trigger		
8	LOS	Loss of Signal	
9	VeeR	Receiver Ground	
10	VeeR	Receiver Ground	
11	VeeR	Receiver Ground	
12	RD-	Inv. Received Data Out	DC-coupled
13	RD+	Received Data Out	DC-coupled
14	VeeR	Receiver Ground	
15	VccR	Receiver Power	3.3V± 5%
16	VccT	Transmitter Power	3.3V± 5%
17	VeeT	Transmitter Ground	
18	TD+	Transmit Data In	AC-coupled, differential lines with 100Ω differential termination inside the module

Pin#	Name	Function	Notes
19	TD-	Inv. Transmit Data In	AC-coupled, differential lines with 100Ω differential termination inside the module
20	VeeT	Transmitter Ground	

Notes:

[1] TX Fault is an open collector/drain output, which should be pulled up with a 4.7K - 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

[2] TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 - 10 KΩ resistor. Its states are:
Low (0 - 0.8V): Transmitter on
(>0.8, < 2.0V): Undefined
High (2.0 - 3.465V): Transmitter Disabled
Open: Transmitter Disabled

[3] Mod-Def0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K - 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR (see Section IV for further details). Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID

[4] LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K - 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

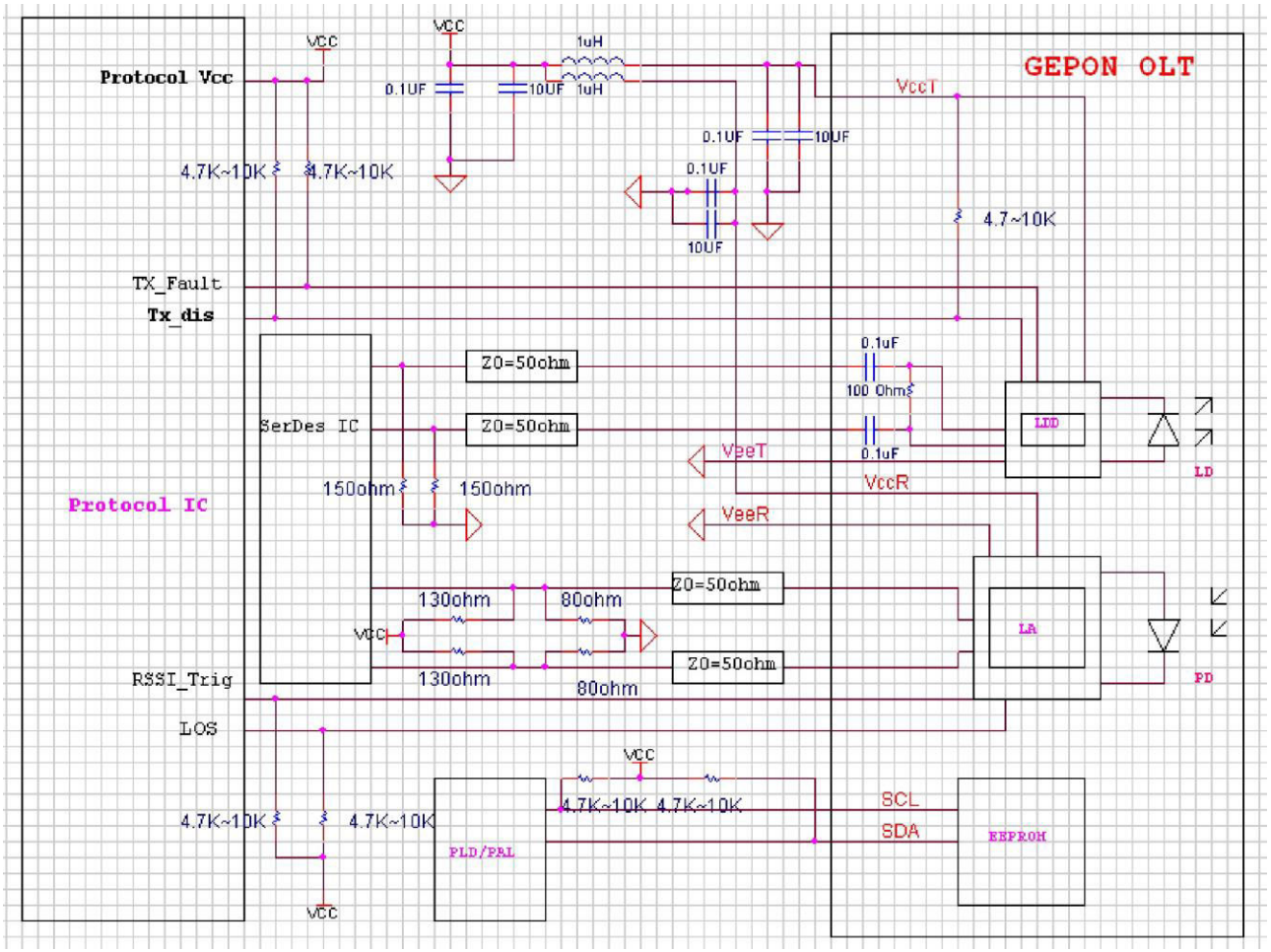
[5] VeeR and VeeT may be internally connected within the SFP module.

[6] RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 - 1000 mV single ended) when properly terminated.

[7] VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300 mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.

[8] TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 500 - 2400 mV (250 – 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 - 600 mV single-ended) be used for best EMI performance.

12. Recommend Circuit Schematic



13. Outline Dimensions

Parameter	Unit	Description	Note
Mechanical Dimensions	mm	48.3 x 13.4 x 9.7	
Connector Type	-	SC/UPC connector	IEC-61754-4