

Optical Network Transceiver Innovator

# GEUS-3515S-X3CDA Asymmetricl 10G EPON ONU Transceiver

### Features

- Single fiber Bi-Directional transceiver with single mode SC receptacle
- 1310nm burst-mode 1.25Gbps transmitter with DFB laser
- 1577nm continuous-mode 10.3125Gbps receiver with APD-TIA
- Complies with IEEE P802.3™D3.2
   10/1GBASE–PRX30
- Digital diagnostic interface compliant with SFF-8472 Rev 9.4 ,

Digital Diagnostic Monitoring (DDM) with external

### calibration

• 3.3V Single power supply

LVPECL interface logic level for data input

- CML interface logic level for data output
- Differential line input/output impedance 100 ohm
- LVTTL for burst signal input and LOS detect output
- Complies with RoHS directive (2002/95/EC)
- Operating case temperature:
   Standard : 0 to +70°C

## **Applications**

Asymmetric 10G/1G Ethernet Passive Optical Network ONT

## Description

The GEUS-3515S-X3CDA Bi-Directional Transceiver is the high performance module for single fiber communications by using 1310nm 1.25Gbps burst mode transmitter and 1577nm 10.3125Gbps continuous receiver. It is Optical Network Unit (ONU) for IEEE802.3av. The optical transceiver is compliant with the Small Form- Factor Pluggable (SFP) Multi-Source Agreement (MSA).





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The transmitter section uses a 1310nm DFB laser diode with automatic power control (APC) function and temperature compensation circuitry to ensure stable extinction ratio over all operating temperature range, and full IEC825 and CDRH class 1 eye safety. The receiver has a hermetically packaged APD-TIA (trans-impedance amplifier) pre-amplifier and a limiting amplifier with CML compatible differential outputs.

The receiver section also provides LVTTL Loss of signal output (LOS). As the input optical power is decreased, LOS output switches from low to high (signal loss point). As the input optical power is increased from very low levels, LOS output will switch back from high to low (signal detection point). The level of signal detection point is at least 0.5 dB higher than the level of signal loss point. LVTTL logic interface simplifies interface to external circuitry.

### **Absolute Maximum Ratings**

#### Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Units	Notes
Storage Temperature	Tst	-40	+85	°C	-
Operating Case Temperature	Тс	0	70	°C	-
Operating Humidity	RH	5	90	%	Non-condensing
Input Voltage	-	GND	Vcc	V	-
Power Supply Voltage	Vcc-Vee	0	3.6	V	-

## **Recommended Operating Conditions**

### **Table 2 - Recommended Operating Conditions**

Parameter		Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	Тс	0	-	+70	°C
Power Supply Voltage		Vcc	3.13	3.3	3.47	V
Power Supply Current		lcc	-	-	500	mA

### **Optical and Electrical Characteristics**

### Table 3 - Optical and Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						



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$ \begin{array}{ c c c } \rac{Tx} Data Rate }{C} & R_T & - & 1.25 & - & Gb/S & - \\ \centre Wavelength & Ac & 1260 & 1310 & 1360 & nm & - \\ \centre Wavelength & AA & - & - & 1 & nm & - \\ \centre Wavelength & AA & - & - & 1 & nm & - \\ \centre Wavelength & SMSR & 30 & - & - & dB & - \\ \centre Wavelength Vere Pout & 1 & - & 6 & dBm & 1 \\ \centre Wavelength Vere Pout & 1 & - & 6 & dBm & 1 \\ \centre Wavelength Vere Pout & 1 & - & 6 & dBm & 1 \\ \centre Wavelength Vere Pout & 1 & - & 6 & dBm & 1 \\ \centre Wavelength Vere Pout & Ton & - & 32 & ns & Fig.2 \\ \centre Wavelength Vere Pout & Toff & - & - & 32 & ns & Fig.2 \\ \centre Wavelength Vere Pout & Toff & - & - & 32 & ns & Fig.2 \\ \centre Wavelength Vere Pout & Toff & - & - & 32 & ns & Fig.2 \\ \centre Wavelength Vere Pout & Triff & - & - & 32 & ns & Fig.2 \\ \centre Wavelength Vere & Z_N & 90 & 100 & 110 & 0 & \\ \centre Wavelength & V_N & 200 & Vcc & V & \\ \centre Wavelength & 0 & 0.8 & V & \\ \centre Wavelength & 0 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & V & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & 3 & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & 3 & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & 3 & \\ \centre Wavelength & Ac & 1575 & 0.8 & 0.8 & 3 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0 & 0.8 & 3 & \\ \centre Wavelength & Ac & 0.7 & 0.8 & 3 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 3 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0.4 & 0.8 & 0 & \\ \centre Wavelength & Ac & 0.8 & 0 & 0.8 & 0 & \\ \centre Waveleng$								
$ \begin{array}{ c c c c c } \hline Poetronomega   P$	Tx Data Rate		R <sub>T</sub>	-	1.25	-	Gb/S	-
Side Mode Supression RatioSMSR30dB-Average $\cup$ up t PowerPout1-6dBm1ExtinctionRatioER8dB-Burst Enable DelayTon32nsFig.2Average Lauch Power-OFFPoff32nsFig.2Average Lauch Power-OFFPoff32nsFig.2Optical Fig.Fill Time (20%~80%)tr/ftIEEE 802.3x (Fig.1) transmitterOptical Rise/Fall Time (20%~80%)tr/ft2001600mV2Data Input StifferentialVin2001600mV2Input DifferentialVin200100110 $\Omega$ -BurstIsable2.0VccVBurstFault2.0VccVTX FaultFault2.0VccVNormal000.8VRx Data RateRR15751580nmReceiver weinstivitySen28.5dBm33Stressed recurse sensitivitySen27.6dBm3Receiver weinstivitySen27.6dBm3Receiver weinstivitySen27.6dBm3Receiver weinstivitySen12.6dBm <td< td=""><td colspan="2">Centre Wavelength</td><td>λc</td><td>1260</td><td>1310</td><td>1360</td><td>nm</td><td>-</td></td<>	Centre Wavelength		λc	1260	1310	1360	nm	-
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Burst DisableToff32nsFig.2Average Launch Power-OFF TransmitterPoff32nsFig.2Optical Everage Launch Power-OFF TransmitterPoffImage: Second	Extinctio	on Ratio	ER	8	-	-	dB	-
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			tr/tf			260	ps	
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Receiver ReflectanceImage: Construction of the sector of the	Receiver	Receiver Overload		-10			dBm	3
LOS De-AssertLOSd-44dBmLOS AssertLOSa-29dBm	Damage threshold		-	-9				4
LOS Assert LOSa -29 dBm	Receiver Reflectance					-12	dB	
	LOS De	e-Assert	LOSd	-44			dBm	
LOS Hysteresis - 0.5 - 6 dB	LOS	Assert	LOSa			-29	dBm	
	LOS Hy	steresis	-	0.5	-	6	dB	



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Output Differen	tial Impedance	Z <sub>IN</sub>	90	100	110	Ω	
Data Outr Differ	out Swing ential	V <sub>out</sub>	600		800	mV	5
LOS Voltage	High		2.0		Vcc	V	
Level	Low		0		0.8	V	

#### Notes:

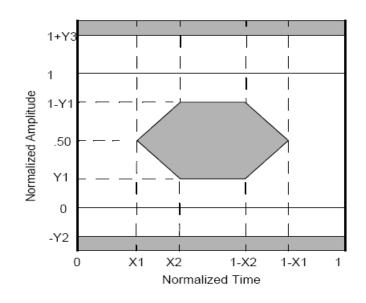
1. The optical power is launched into SMF, 1.25Gbps continuous-mode , PRBS2<sup>7</sup>-1.

- 2. PECL input, internally DC-coupled and terminated.
- 3. Measured with a PRBS  $2^{31}$ -1 test pattern @10312.5Mbps, BER  $\leq 1 \times 10^{-3}$ .
- 4. Direct ONU-OLT connection may result in damage of the receiver
- 5. Internally AC-coupled.

### **Diagnostics**

#### Table 4 – Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	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	1 to 6	dBm	±3dB	Internal / External
RX Power	-29 to -10	dBm	±3dB	Internal / External



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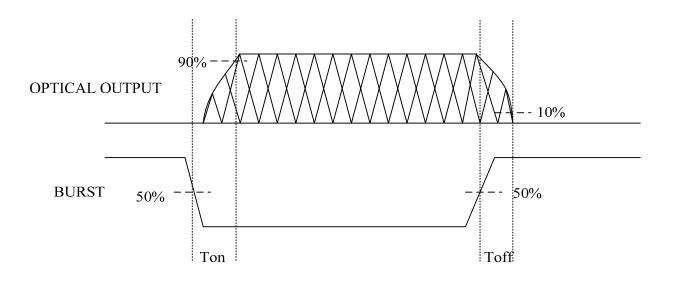


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Fig.1

## **Transmitter Burst Mode Timing Characteristics**

Definition of Burst Enable Delay (Ton) and Burst Disable Delay (Toff)





## **Digital Diagnostic Memory Map**

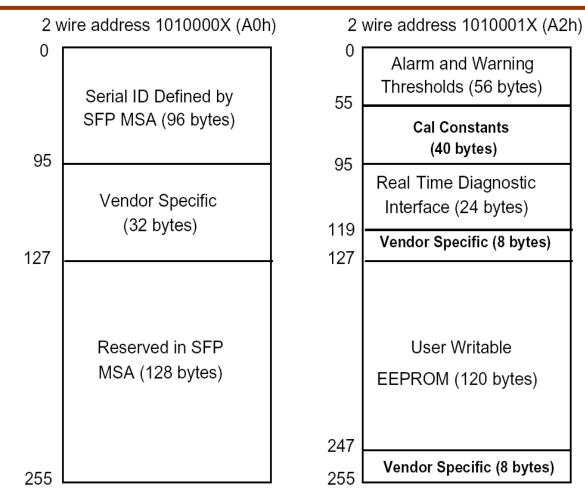
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



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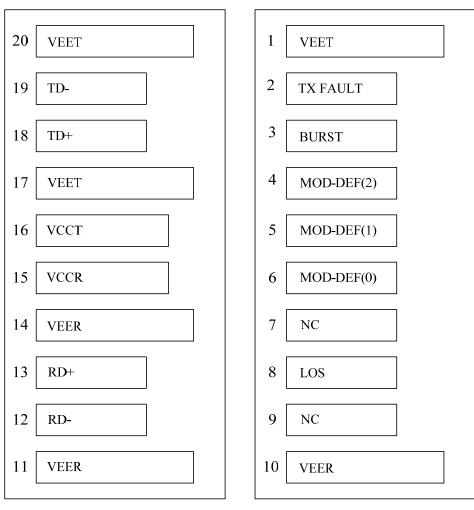
**Pin Definitions** 

Pin Diagram



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Top of Board

Bottom of Board

# **Pin Descriptions**

Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	Burst_BEN	Burst Single	3	Note 2
4	MOD_DEF(2)	SDA Serial Data Signal	3	Note 3
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3
6	MOD_DEF(0)	TTL Low	3	Note 3

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7			3	
/	-	-	3	
8	LOS	Loss of Signal	3	Note 4
9	-	-	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 5
13	RD+	Received Data Out	3	Note 5
14	V <sub>EER</sub>	Receiver ground	1	
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 6
19	TD-	Inv. Transmit Data In	3	Note 6
20	V <sub>EET</sub>	Transmitter Ground	1	

#### Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

- 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.
- 2) BURST is a TTL input. When it is low, LD is on; when it is high, LD is off.
- 3) Mod-Def 0,1,2. 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.

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

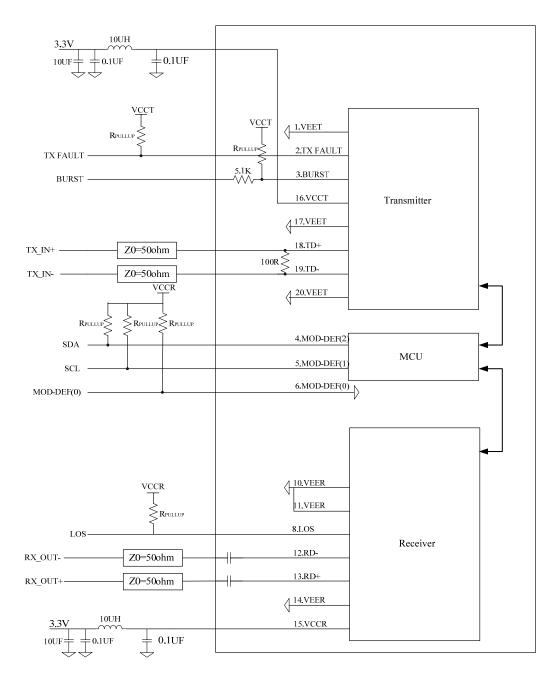
- 4) LOS is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor. Pull up voltage between 2.0V and Vcc+0.3V. Logic 1 indicates loss of signal; Logic 0 indicates normal operation. In the low state, the output will be pulled to less than 0.8V.
- 5) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 6) TD-/+: These are the differential transmitter inputs. They are internally DC-coupled, differential lines with 100Ω



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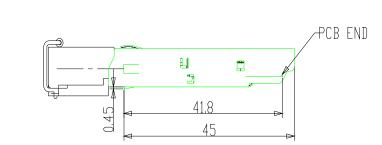
differential termination inside the module.

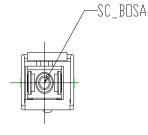
# **Recommend Application Circuit**

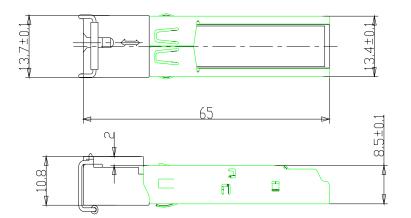


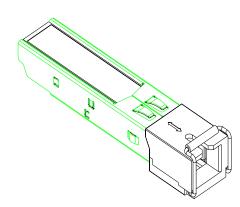


### Mechanical Dimensions









# **Ordering information**

Part Number	Product Description
GEUS-3515S-X3CDA	Tx1310nm, Rx1577nm, 1.25Gbps/10.3125Gbps, 10/1GBASE–PRX30, 0°C ~ +70°C with Digital Diagnostic Monitoring

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