

## GUP-0S12-20C

### Features

- Single fiber bi-directional data links
- 1310nm DFB laser transmitter and 1490nm Super-TIA receiver
- 1.244Gbps burst mode transmission
- 2.488Gbps continuous mode receiver data rate
- SFP 2x10 package with SC/UPC Receptacle Connector
- Single 3.3V power supply
- Digital diagnostic monitoring interface
- LVPECL compatible data input/output interface
- Provide TX burst mode signal detect function
- LVTTTL transmitter laser fault alarm
- Low EMI and excellent ESD protection
- Class I laser safety standard IEC-60825 compliant
- RoHS6 Compliance



### Applications

- Gigabit Passive Optical Networks (GPON)

### Standards

- Complies with SFP Multi-Source Agreement (MSA) SFF-8074i
- Complies with ITU-T 984.2
- Complies with FCC 47 CFR Part 15, Class B
- Complies with FDA 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007
- Complies with SFF-8472
- Compatible with TR-NWT-000870 4.1 ESD sensitivity classification Class2.
- Compatible with Telcordia GR-468-CORE

## Absolute Maximum Ratings

Table 1- Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage Ambient Temperature	T <sub>STG</sub>	-40	85	°C
Storage Humidity	H <sub>s</sub>	5	90	%
Operating Humidity	H <sub>o</sub>	5	85	%
Power Supply Voltage	V <sub>CC</sub>	0	+3.6	V
Receiver Damaged Threshold		+4		dBm

## Recommended Operating Conditions

Table 2- Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T <sub>c</sub>	-5		70	°C	GUP-0S12-20C
		-40		85		GPON-ONT-SFP-I
Power Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V	
Supply Current	I <sub>CC</sub>			300	mA	
Power Consumption	PW			1	W	
Data Rate			Tx 1.244 Rx 2.488		Gbps	

## Electrical Characteristics

Table 3- Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter Differential Input Voltage		300		2400	mV	
Receiver Differential Output Voltage		500		1200	mV	AC Coupled
Transmitter Common-Mode Data Input Voltage	V <sub>CM</sub>	1.6		2.4	V	Note 1
Transmit Fault Alarm Voltage	V <sub>OH</sub>	2.4		V <sub>CC</sub> +0.3	V	LVTTL
	V <sub>OL</sub>	0		0.4	V	LVTTL
TX Burst Input Voltage	V <sub>IH</sub>	2		V <sub>CC</sub> +0.3	V	LVTTL
	V <sub>IL</sub>	0		0.8	V	LVTTL
Input Differential Impedance		90	100	110	Ω	
SD Voltage	V <sub>SDH</sub>	2.4		V <sub>CC</sub>	V	LVTTL
	V <sub>SDL</sub>	0		0.4	V	LVTTL
SD Assert Time	T <sub>D</sub>			100	us	
SD De-assert Time	T <sub>A</sub>			100	us	

**Note** : Requirement for DC couple on the host board

## Optical transmitter Characteristics

**Table 4- Optical transmitter Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Launched Power (avg.)	P <sub>OUT</sub>	0.5		5	dBm	
Operating Wavelength Range	λ <sub>C</sub>	1260		1360	nm	
Output Spectrum Width(RMS)	Δλ			1.0	nm	
Side Mode Suppression Ratio	SMSR	30				
Extinction Ratio	ER	9			dB	PRBS 2 <sup>23</sup> -1 @1.244Gbit/s
Optical Rise Time				260	ps	
Optical Fall Time				260	ps	
Optical Output Power after TX Disable	P <sub>DIS</sub>			-50	dBm	
Output Eye Diagram	Compliant with ITU-T G.984.2 Mask					
Burst Turn On Time	T <sub>ON</sub>			12.8	ns	
Burst Turn Off Time	T <sub>OFF</sub>			12.8	ns	
Transmitter Reflectance				-15	dB	

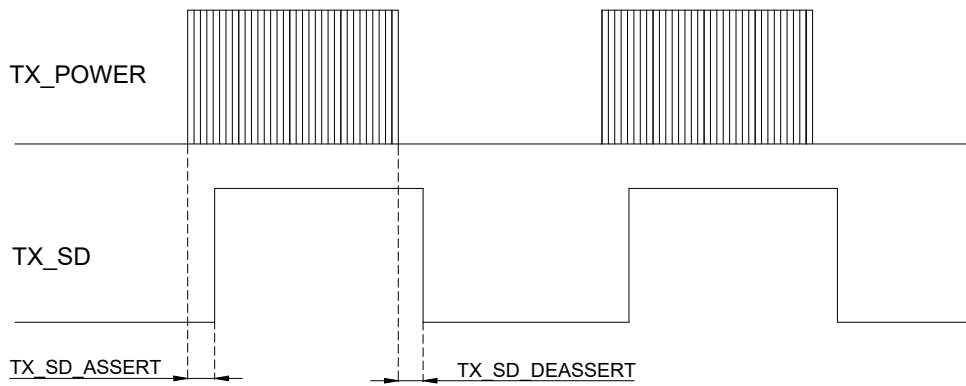
## Optical Receiver Characteristics

**Table 5- Optical Receiver Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Wavelength Range	λ <sub>C</sub>	1480		1500	nm	
Receiver Sensitivity	SEN			-28	dBm	Note1
Optical Power Input Overload	SAT	-8			dBm	Note1
SD Assert Level	SDA			-29	dBm	
SD Deassert Level	SDD	-45			dBm	
SD Hysteresis	HYS	0.5		6	dB	
Receiver Reflectance				-12	dB	

**Note :** Measured with 1490nm, PRBS 2<sup>23</sup>-1@2.488Gbps, ER=9dB, BER ≤1×10<sup>-12</sup>

Parameter	Symbol	Min.	Typ.	Max.	Units
TX_SD Assert Time	TTX_SD_ASSERT	-	-	100	ns
TX_SD Deassert Time	TTX_SD_DEASSERT	-	-	100	ns



TX\_SD Timing Characteristics

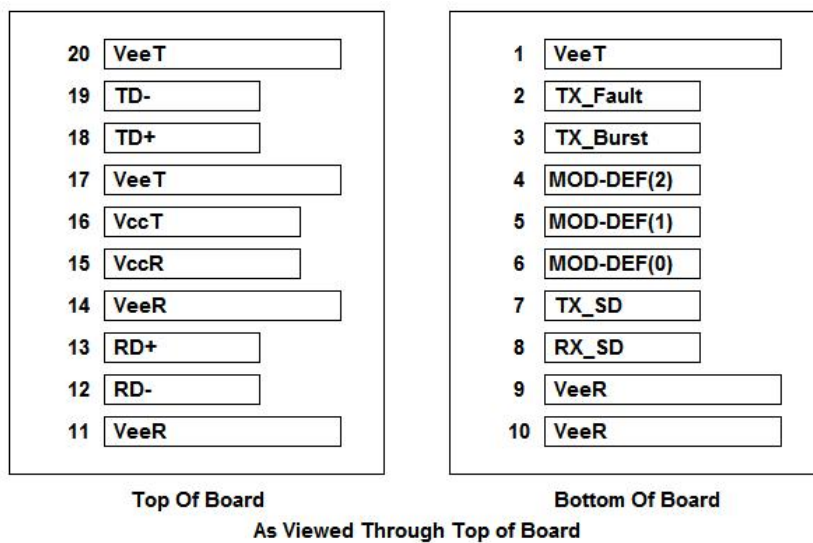
## Digital Diagnostic Monitoring Information

Table 6- Digital Diagnostic Monitoring Information

Parameter	Accuracy	Calibration	Note
Temperature	±3°C	Internal	
Voltage	±3%	Internal	
Bias Current	±10mA	Internal	
TX Power	±3dB	Internal	
RX Power	±3dB	Internal	

**Note:** The digital diagnostic monitoring interface defines 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). Please refer to the SFF-8472 Rev 10.2 for the detail information.

## Pin definition



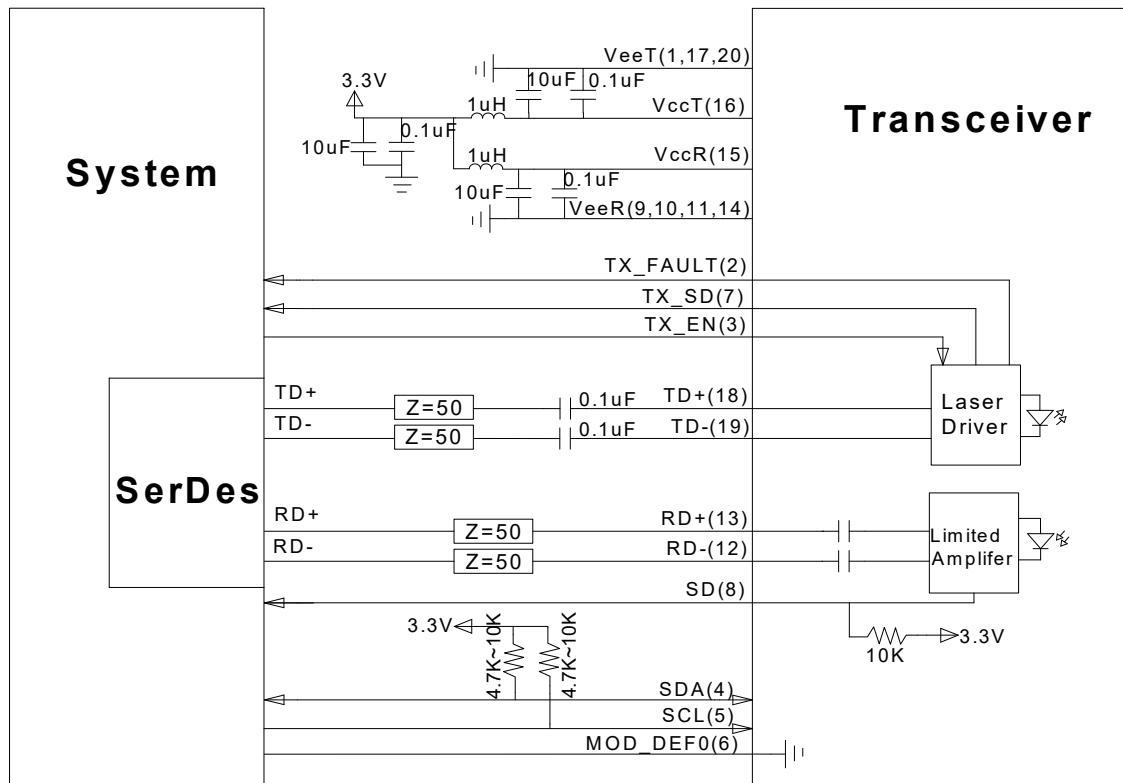
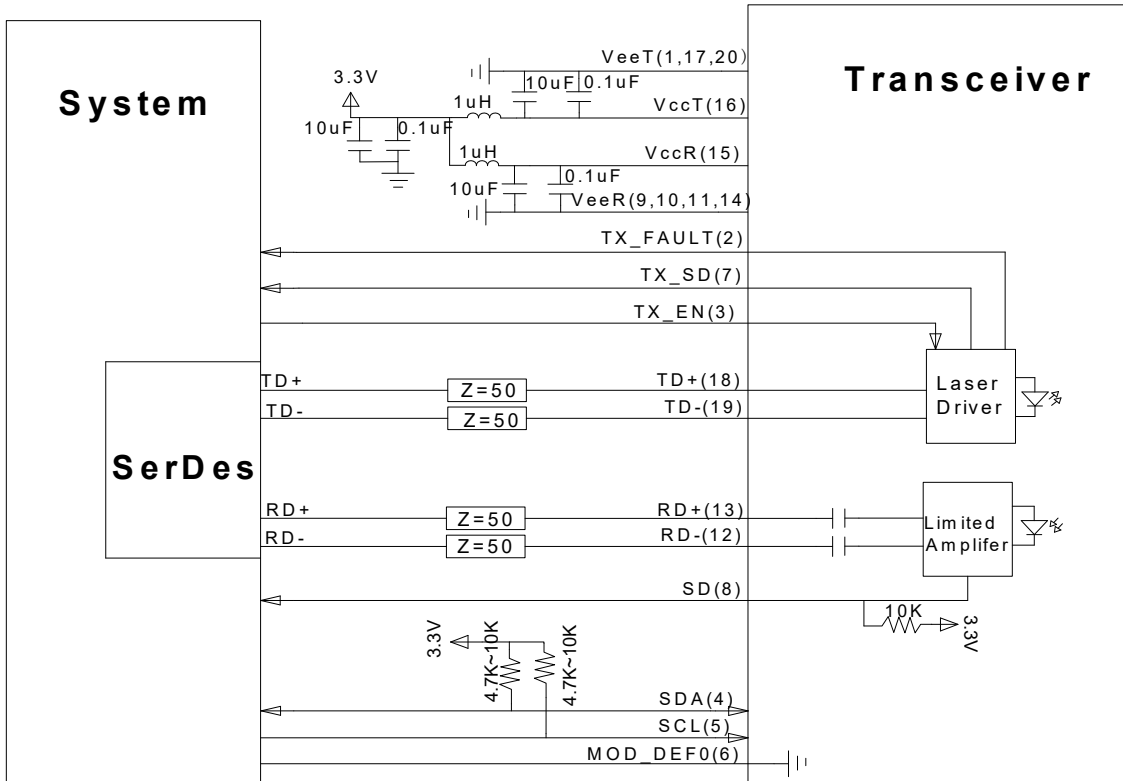
## Pin Description

Table 7- Pin Description

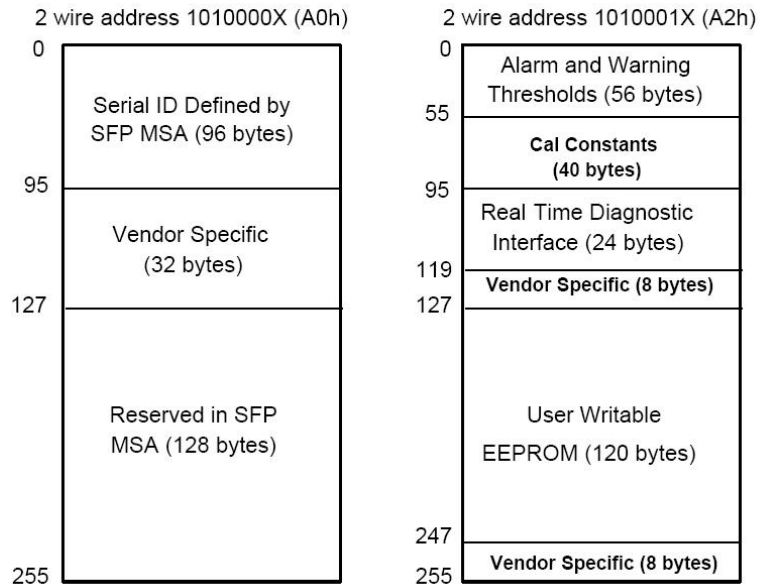
Pin No	Symbol	Name/Description	Note
1	V <sub>EE</sub> T	Transmitter Ground	
2	TX_Fault	Transmitter Fault Indication, LVTTTL Output	High: abnormal Low: normal
3	TX_Burst	Transmitter Burst Enable Input, LVTTTL Input	Active High: GUP-0S12-20CH Active Low: GUP-0S12-20CL
4	MOD-DEF(2)	Module Definition 2. I2C Data, LVTTTL	
5	MOD-DEF(1)	Module Definition 1. I2C Clock, LVTTTL	
6	MOD-DEF(0)	Module Definition 0. Grounded within the module	
7	TX_SD	Transmitter Signal Detected Indication, LVTTTL Output, Active High.	
8	RX_SD	Receiver Signal Detected Indication, LVTTTL Output	Low: loss of signal; High: signal detected;
9	V <sub>EE</sub> R	Receiver Ground	
10	V <sub>EE</sub> R	Receiver Ground	
11	V <sub>EE</sub> R	Receiver Ground	
12	RD-	Inv. Receiver Data Out	CML output, AC coupled
13	RD+	Receiver Data Out	CML output, AC coupled
14	V <sub>EE</sub> R	Receiver Ground	
15	V <sub>CC</sub> R	Receiver Power	
16	V <sub>CC</sub> T	Transmitter Power	
17	V <sub>EE</sub> T	Transmitter Ground	
18	TD+	Transmit Data In	LVPECL logic input, DC coupled
19	TD-	Inv. Transmit Data In	LVPECL logic input, DC coupled
20	V <sub>EE</sub> T	Transmitter Ground	

## Typical application Circuit

TX DC Couple:



## EEPROM Memory Map



EEPROM Memory Map Specific Data Field Descriptions

## EEPROM Serial ID Memory Contents

The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data fields define as following.

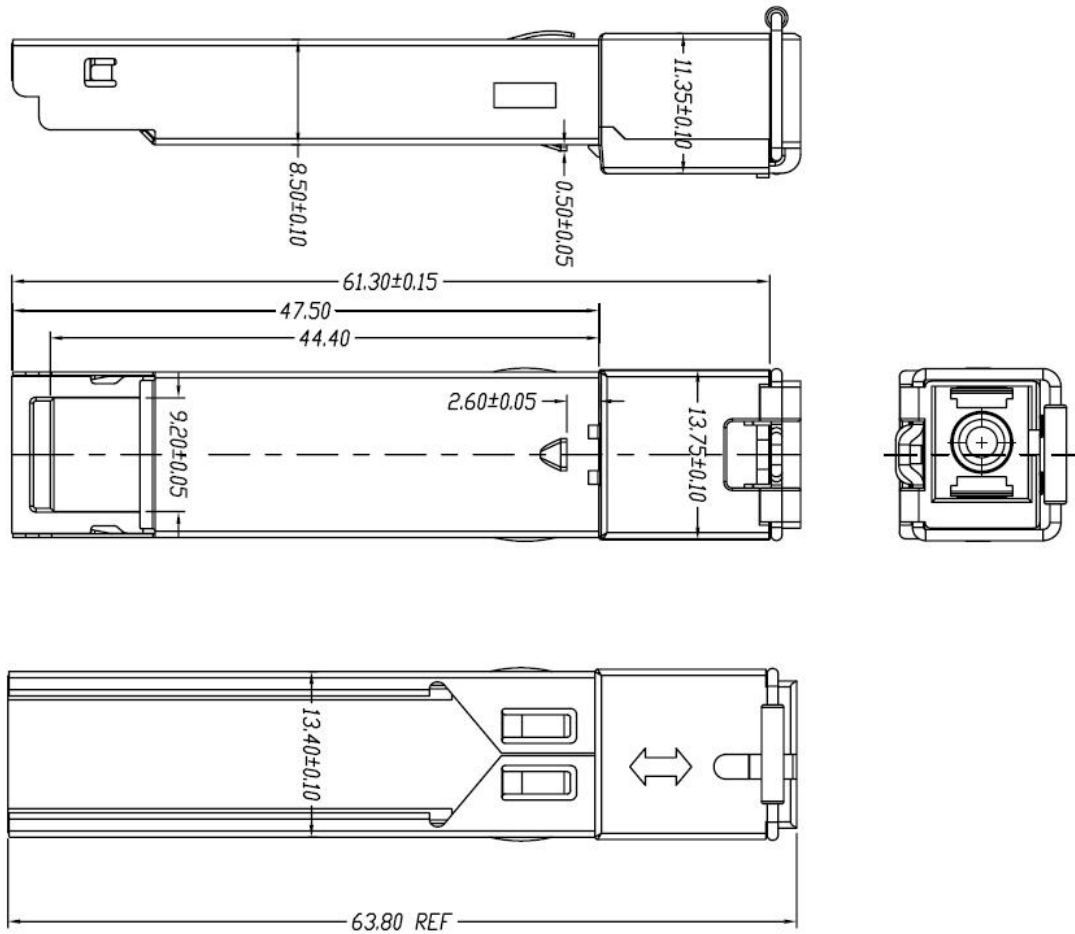
## EEPROM Serial ID Memory Contents (2-Wire Address A0h)

Address	Name of field	Hex	Description
<b>BASE ID Fields</b>			
00	Identifier	03	Module soldered to motherboard

Address	Name of field	Hex	Description
<b>BASE ID Fields</b>			
01	Ext. Identifier	04	
02	Connector	01	Optical Pigtail
03-10	Transceiver Codes	00 00 00 00 00 00 00 00	
11	Encoding	03	NRZ
12	BR, Nominal	0C	1.2Gbps
13	Rate Identifier	00	Not defined
14	Length(9um)-km	14	20(km)
15	Length(9um)-m	C8	200(100m)
16	Length(50um)	00	Transceiver transmit distance
17	Length(62.5um)	00	
18	Length(cable)	00	Not support cable
19	Length(OM3)	00	Not support OM3
20-35	Vendor Name	xx xx .... xx	ASCII character
36	Reserved	00	Not defined
37-39	Vendor OUI	00 00 00	Not defined
40-55	Vendor P/N	47 54 53 2D 53 47 55 31 32 2D 32 30 44 43(49) 4C(48)	"GUP-0S12-20C"(ASCII character)
56-59	Vendor P/N Rev.	41 30 20 20	"A0"(ASCII character)
60-61	Laser Wavelength	03 1E	1310nm
62	Reserved	00	Not defined
63	CC_BASE	xx	Check sum of bytes 0-62
<b>Extended ID Fields</b>			
64-65	Options	00 1C	TX_Disable、TX_Fault and RX_SD are implemented
66	BR, max	00	Upper bit rate margin,20%
67	BR, min	00	Lower bit rate margin,20%
68-83	Vendor SN	xx.....xx	Vendor Serial Number in ASCII character
84-91	Date Code	Data Code	Vendor Date Code in ASCII character
92	Diagnostic Monitoring Type	68	Digital Diagnostic monitoring implemented "Internal calibrated " is implemented, RX measurement type is "Average Power"
93	Enhanced options	E0	Optional Alarm/warning flags, soft Tx_Disable control and monitoring, soft Tx_Fault monitoring, and soft RX_LOS monitoring are implemented
94	SFF-8472 compliant	03	SFF-8472 compliant with revision 10.2
95	CC-EXT	xx	Check sum of bytes 64-94
<b>Vendor Specific ID Field</b>			
96-127	Vendor Specific	00	Vendor specific EEPROM
128-255	Reserved	00	Reserved for future use



## Package Outline



## Ordering information

Part Number	Product Description
GUP-0S12-20CL	SFP, Low Level Enable TX, -5~70°C, 20km.with DDM
GUP-0S12-20CH	SFP, High Level Enable TX, -5~70°C, 20km.with DDM
GPON-ONT-SFP-IL	SFP, Low Level Enable TX, -40-85°C, 20km.with DDM
GPON-ONT-SFP-IH	SFP, High Level Enable TX -40-85°C, 20km.with DDM

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