

SHFP-GU-CP

Tx 1.25Gbps/Rx 2.5Gbps GPON ONU SFP Module Class C+ Hot Pluggable, Simplex SC, Tx 1310/Rx 1490nm DFB/APD, SM, +3.3V, 0~70°C

SHFP-GU-CP GPON ONU SFP Module class C+, is designed for passive optical network application. It can fully support the Class B+ ODN application specified by the ITU-T G.984.2 standard and ITU-T G.984.2 Amendment1. It is fully compliant with IEEE 802.3ah-2004. It is packaged of small form package with SC connector. The digital diagnostic monitoring function is fully compliant with SFP MSA. It is 1310nm un-cooled DFB Laser, InGaAs preamplifier and WDM filter in a high-integrated optical sub-assembly. It transmits 1.244Gbps at 1310nm in burst mode and receives 2.488Gbps at 1490nm in continuous mode.

■ Features:

- ◇ SFP Package with SC receptacle
- ◇ 1.244Gbps, 1310nm Burst Mode Transmitter
- ◇ 2.488Gbps, 1490nm Continuous Mode Receiver
- ◇ Un-cooled DFB Laser and APD High sensitivity detector
- ◇ Compliant with ITU-T G.984.2 and G.984.2 Amendment-2006
- ◇ Compliant with SFP MSA Specification
- ◇ Operating Case Temperature Commercial: 0°C~70°C; Industrial: -40°C~85°C
- ◇ RoHS compliant

■ Applications:

- ◇ GPON system
- ◇ FTTx

■ Ordering Information:

Part Number	Data Rate	Class	Wavelength	Laser	Fiber	DDM	Connector	Temp.
SHFP-GU-CP	1.25/2.5Gbps	C+	T1310/R1490nm	DFB/APD	SM	Yes	Simplex SC	0°C~70°C
SHFP-GU-CP-I	1.25/2.5Gbps	C+	T1310/R1490nm	DFB/APD	SM	Yes	Simplex SC	-40°C~85°C



SH LINK CO., LIMITED

6/7F Yunfaqixiu Building, No.4 Meicun Road, Futian District, Shenzhen, 518000, China

Tel: +86-755-82891446, 83691556, 83100013, 83100029, 83224802, 23615613

Fax: +86-755-82891849 Email: sales@shlinkco.com

Website: www.buysfp.com, www.shlinkco.com

➤ Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T _s	-40	+85	°C
Supply Voltage	V _{cc}	-0.5	4.0	V
Relative Humidity	RH	-	95	%
Wave Soldering Conditions Temp/Time		-	260/10	°C/s

➤ Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Power supply Voltage	V _{cc}	3.15	3.3	3.45	°C
Power Supply Current	I _{cc}			300	mA
Case Operating Temperature	T _c	SHFP-GU-CP	0	+70	°C
		SHFP-GU-CP-I	-40	85	
Data Rate	Upstream/Downstream		1.244/2.488		Gbps

➤ Electrical Characteristics (TOP = 0 to 70 °C, VCC = 3.15 to 3.45 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section:						
LVPECL Compatible Input (Differential)	V _{in}	300		1600	mVpp	DC coupled inputs
Input differential impedance	Z _{in}	85	100	115	Ω	R _{in} >100Ω@DC
Burst Control	Tx ON/Burst Enable	V _{IH}	2	V _{cc}	V	
	Tx OFF/Burst Disable	V _{IL}	0	0.8		
	Tx ON/Burst Enable	V _{IL}	0	0.8		
	Tx OFF/Burst Disable	V _{IH}	2	V _{cc}		
Receiver Section:						
CML Outputs (Differential)	V _{out}	600		1000	mVpp	AC coupled outputs
Output Impedance (Differential)	Z _{out}	85	100	115	ohm	
RX_SD	Normal		2	V _{cc} +0.3	V	
	SD		0	0.8	V	
I²C Serial Logic						
I2C Serial Data	SDA_H	2		V _{cc} +0.3	V	
	SDA_L	0		0.8	V	
I2C Serial Clock	SCL_H	2		V _{cc} +0.3	V	
	SCL_L	0		0.8	V	

➤ Optical Parameters (T_{OP} = 0 to 70°C, VCC = 3.15 to 3.45 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Data Rate (Upstream/Downstream)	R		1.244/2.488		Gbps	
Transmitter Section:						
Center Wavelength	λ _c	1280	1310	1360	nm	
spectral width (-20dB)	Δλ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	P _{out}	0.5		5	dBm	
Extinction Ratio	ER	10			dB	2
Rise/Fall Time(10%~90%)	Tr/tf		0.15	0.26	ns	

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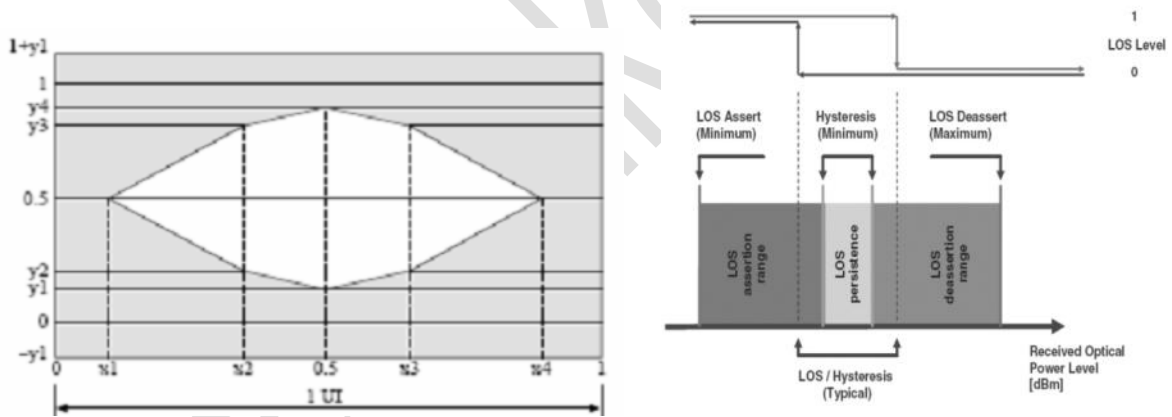
Tel: +86-755-82891446, 83691556, 83100013, 83100029, 83224802, 23615613

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Output Optical Eye	ITU-T G.984.2 compliant					3
Optical Burst On/Off Time	T _{on} /T _{off}			12.8	ns	
Additive Jitter Generation	J _A			0.2	UI	
Optical Output Power with TX OFF	P _{off}			-45	dBm	1
Receiver Section:						
Center Wavelength	λ _c	1480	1490	1500	nm	
Receiver Sensitivity	P _{min}			-30	dBm	4
Saturation Optical Power	P _{max}	-8			dBm	
Damage Threshold	P _{DT}			4	dBm	
Receiver Reflectance	CR			-20	dB	
Polarization Dependent Loss	PDL			0.5	dB	
LOS Assert	LOSA	-42			dBm	
LOS De-Assert	LOSD			-31	dBm	
LOS Hysteresis		0.5	2	6	dB	5

- Notes:
1. Measured with 9/125um G.652 SMF
 2. Filtered, Measured with PRBS2²³-1 test pattern @1.244Gbps
 3. Eye pattern mask (see below left figure)
 4. Measured with a PRBS2²³-1 test pattern @2.488Gbps and ER=10dB, BER 1x10⁻¹²
 5. LOS Hysteresis (SD signal coincides with the LOS signal inversion) (see below right figure)



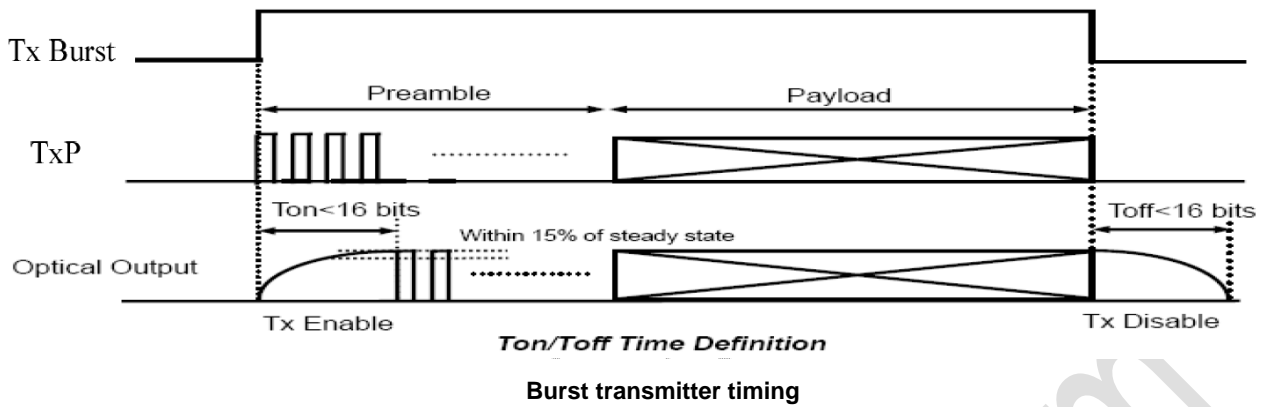
➤ Transmitter Burst Mode Timing Characteristics

Power Supply	Burst Control	Data Input	Optical Output
Power supply <3V	X ¹	X	OFF ²
Power supply >3.13V	Disable	X	OFF
	Enable	NO ³	Other ⁴
		YES	Laser bias and modulation signal output

1. "X" means don't care.
2. "OFF" means the optical power less than -45dBm.
3. "No" means data not present, "Yes" means data present.
4. "Other" means peak power less than +8dBm.
5. "High/Low" means Logic high/low level.

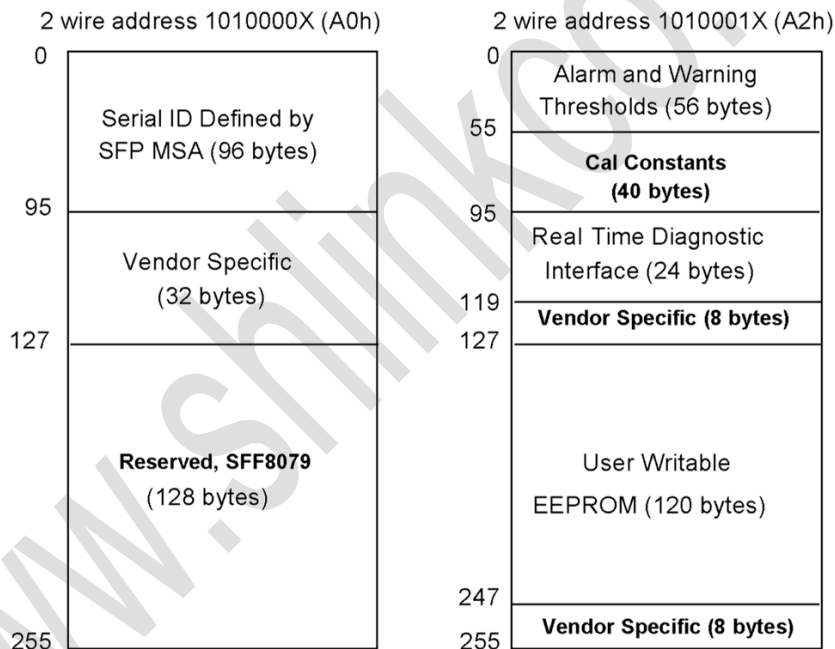
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➤ **Digital Diagnostic Interface**

The memory map in the following describes an extension to the memory map defined in SFF-8472 MSA. The enhanced interface uses the two wire serial bus address 1010001X (A2H) to provide diagnostic information about the module’s present operating conditions.



➤ **SFP Module EEPROM Information and Management (2-Wire Address A0H)**

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	SFP
1	1	Ext.Identifier	Serial ID module supported
2	1	Connector	SC
3-10	8	Transceiver codes	Undefined for GPON
11	1	Encoding	NRZ
12	1	BR, Nominal	Nominal 1.244Gbps(indicates transmitter data rate)
13	1	Reserved	-

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14	1	Length(9um)-km	-
15	1	Length(9um)-100m	20000m @9/125um fiber
16-18	1	Length for MMF	Undefined for GPON
19	1	Reserved	-
20-35	16	Vendor Name	SFP vendor name: SH Link
36	1	Channel Spacing	
37-39	3	Vendor OUI	
40-55	16	Vendor PN	Part Number: "SHFP-GU-BP" (ASCII)
56-59	4	Vendor rev	
60-61	2	Laser Wavelength	1310nm in 05 1E
62	1	DWDM Wavelength Fraction	Reserved
63	1	CC_BASE	Check sum of byte 0-62
Extended ID Fields			
64-65	2	Option	Signal Detect is implemented
66	1	BR, max	Undefined
67	1	BR, min	Undefined
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	SH's Manufacturing date code
92	1	Diagnostic Monitoring Type	Implemented with external calibration and received power measurement type by Avg. power
93	1	Enhanced options	Alarm/Warning flags monitor are implemented
94	1	SFF-8472 compliant	SFP-8472 compliant with revision 10.2
95	1	CC_EXT	Check sum of bytes 64-94
Vendor Specific ID Fields			
96-127	32	Vendor Specific	Vendor specific EEPROM
128-255	128	Reserved	Reserved for future use

➤ Pin Function Definitions

PIN	Name	Function
1	VeeT	Module transmitter ground
2	Tx Fault	Indicate the TX fail.
3	Burst Control	LVTTL input. The default setting is that laser output is disable when this pin is asserted high and laser output is enabled when this pin is asserted low or laser output is disable when this pin is asserted low and laser output is enabled when this pin is asserted high.(BEN)
4	MOD_DEF(2)	2-Wire Serial Data I/O Pin.(SDA)
5	MOD_DEF(1)	2 wire serial clock input. (SCL)
6	MOD-DEF(0)	Internally Ground
7	TX_SD	Tx Transmitter State Indication, Assert high when Transmitter ON. Or to the ground directly if not use.
8	LOS/SD	Set LOS is that active high when signal is detected. (LVTTL); While the setting is SD, it active low when signal is detected. (LVTTL); Can be selected via specific part number.
9	NC	Not Connect
10	VeeR	Module receiver ground

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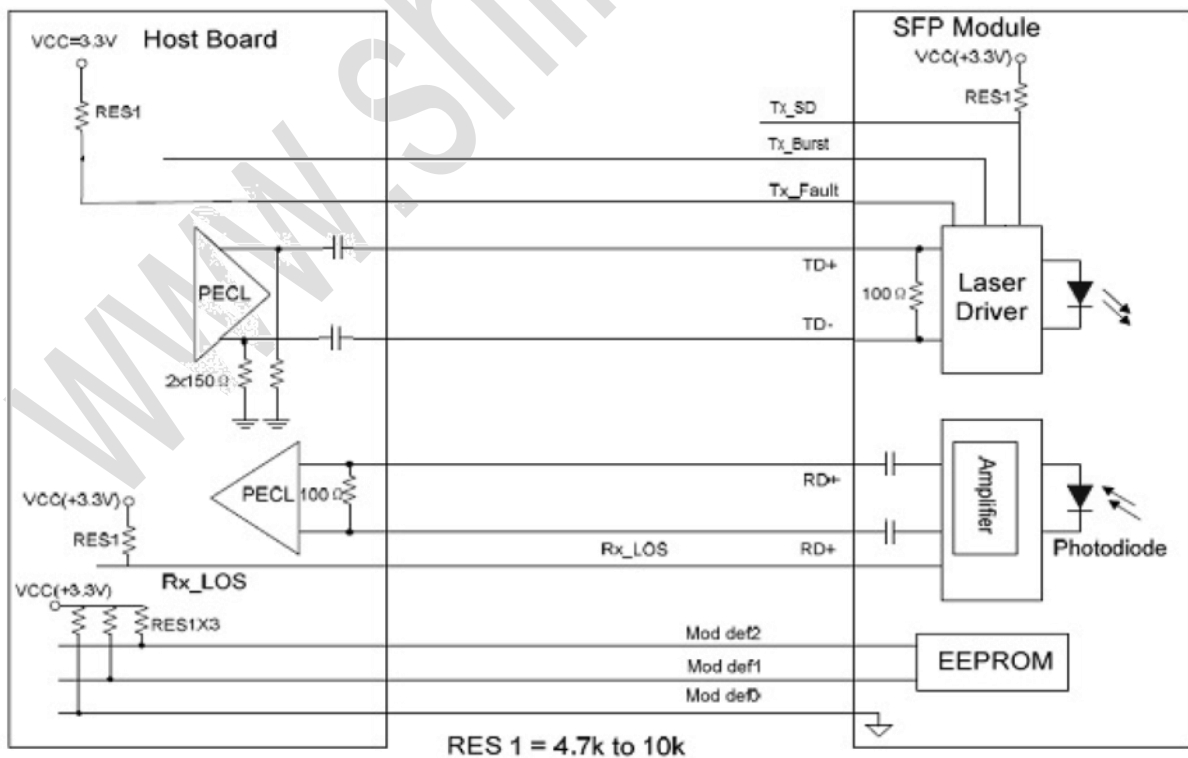
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11	VeeR	Module receiver ground
12	RxD-	Inverted Receiver Data Output (AC-Coupled internally)
13	RxD+	Non-Inverted Receiver Data Output (AC-Coupled internally)
14	VeeR	Module receiver ground
15	Vcc_RX	Module receiver 3.3V supply
16	Vcc_T X	Module transmitter 3.3V supply
17	VeeT	Module transmitter ground
18	TXD+	Non-Inverted Transmitter Data Input (DC-Coupled)
19	TXD-	Inverted Transmitter Data Input (DC-Coupled)
20	VeeT	Module transmitter ground
	F	Mounting Stubs

➤ **Regulatory Compliance**

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

➤ **Recommended Circuit**



Recommended High-speed Interface Circuit

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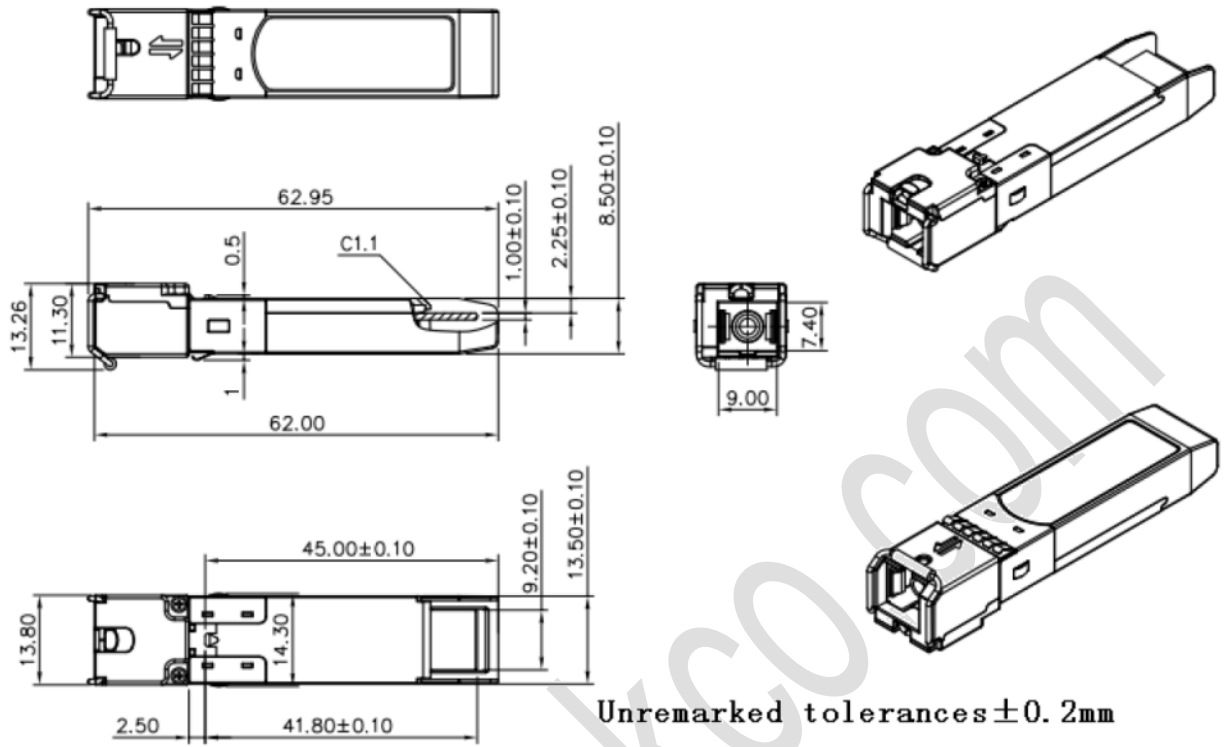
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➤ Mechanical Dimensions



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