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GSFP

User Manual

(Rel_10)

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Notice

Preface

Objectives

The document describes the GSFP optical module, including the overview, technical specifications, internal information, structure, installation, and uninstallation. Meanwhile, the document lists Frequently Asked Questions (FAQs) about the GSFP optical module and related solutions. The appendix lists terms and abbreviations involved in this document.

Conventions

Symbol conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
	Indicate a hazard with a medium or low level of risk which, if not avoided, could result in minor or moderate injury.
	Indicate a potentially hazardous situation that, if not avoided, could cause equipment damage, data loss, and performance degradation, or unexpected results.
	Provide additional information to emphasize or supplement important points of the main text.
	Indicate a tip that may help you solve a problem or save time.

General conventions

Convention	Description
Times New Roman	Normal paragraphs are in Times New Roman.
Arial	Paragraphs in Warning, Caution, Notes, and Tip are in Arial.
Boldface	Buttons and navigation path are in **Boldface**.

Convention	Description
Italic	Book titles are in *italics*.
`Lucida Console`	Terminal display is in `Lucida Console`.
Book Antiqua	Heading 1, Heading 2, Heading 3, and Block are in Book Antiqua.

Change history

Updates between document versions are cumulative. Therefore, the latest document version contains all updates made to previous versions.

Issue 10 (2022-06-01)

Updated the following contents:

- Added the commercial XGS-PON CO optical modules GSFP+-XSN1DM-R and GSFP+-XSN2DM-R.

Issue 09 (2020-03-01)

Updated the following contents:

- Added the commercial 10GEPON CO optical module GSFP+-PR30DM-R.

Issue 08 (2017-12-07)

Updated the following contents:

- Fixed known bugs.
- Added the commercial GPON optical module GSFP-CLBDM-R (B.00).

Issue 07 (2017-08-03)

Seventh commercial release

- Fixed known bugs.
- Added the quasi-industrial GPON optical modules: GSFP-CLBDM-RI and GSFP-CLCDM-RI.

Issue 06 (2016-10-13)

Sixth commercial release

- Fixed known bugs.
- Added the commercial EPON optical module: GSFP-PX2PDM-R.

Issue 05 (2016-08-14)

Fifth commercial release

- Fixed known bugs.
- Added the industrial EPON optical module: GSFP-PX20DM-RI.

Issue 04 (2016-06-22)

Fourth commercial release

- Fixed known bugs.
- Added a commercial GPON optical module GSFP-CLDDM-R.

Issue 03 (2014-04-27)

Third commercial release

- Fixed known bugs.
- Added a commercial Central Office (CO) 10GEPON optical module.
- Added a commercial terminal 10GEPON optical module.

Issue 02 (2013-12-20)

Second commercial release

- Fixed known bugs.
- Deleted description of End Of Life (EOL) products.
- Added an industrial CO EPON optical module.
- Added a commercial CO GPON optical module.

Issue 01 (2012-12-28)

Initial commercial release

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1 Overview

This chapter includes the following sections:

- Introduction
- Features
- Scenarios
- Ordering formation

1.1 Introduction

Raisecom GSFP (PON SPF) optical module is designed for the high-speed and bidirectional telecommunication system. It adopts a single power supply and supports various models, such as commercial EPON Central Office (CO) optical module, industrial CO EPON optical module, commercial CO GPON optical module, commercial CO 10GEPON optical module, commercial terminal 10GEPON optical module, and commercial XGS-PON CO terminal. It supports the following standards:

- Provide the standard Square Connector (SC) interface, electrical connector, and shield cover, which improves the Electromagnetic Interference (EMI) performance efficiently.
- Meet ITU-T and IEEE standards and refer to the Multi Source Agreement (MSA) specifications.
- Comply with Class 1 laser product safety standards (IEC 60825-1 and IEC 60825-2).

1.2 Features

The GSFP optical module has the following features:

- Be of low power consumption.
- Provide the standard SC interface.
- Be of stable performance and high efficiency.
- Adopt the pull-tab latch structure.
- Adopt a single 3.3 V power supply and TTL interface.
- Adopt metallic packaging, featuring excellent EMI performance.

- Adopt the standard serial protocol interface in the internal Electrically Erasable Programmable Read-Only Memory (EEPROM).
- Provide more powerful monitoring functions (DDM follows the SFF-8472 protocol).
- Meet the MSA protocol.
- Meet the operating temperature of the standard industrial or commercial SFP module.
- Meet the Class 1 laser product safety standard (IEC 60825-1 and IEC 60825-2).

1.3 Scenarios

The GSFP optical module applies to the following scenarios:

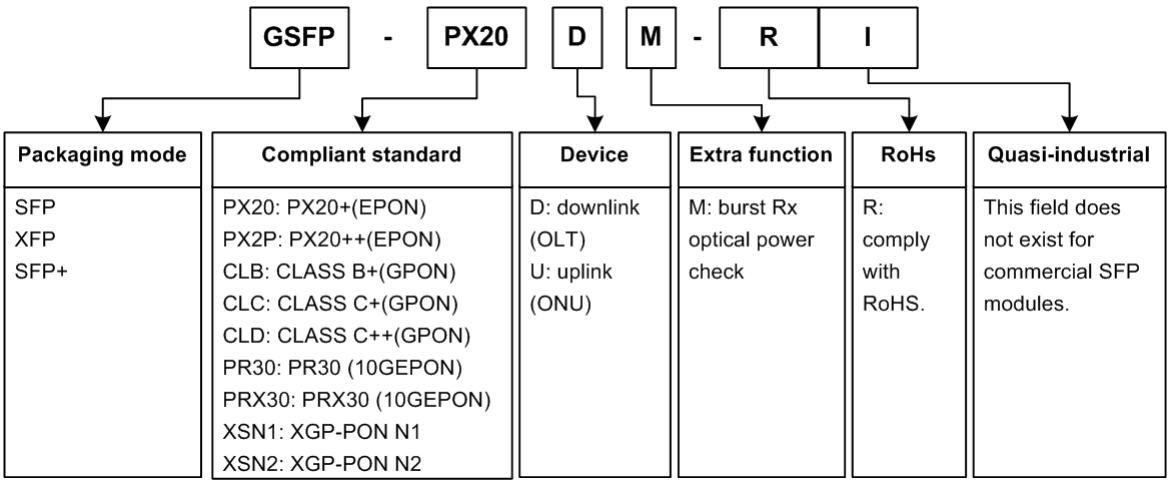
- EPON Access Network (AN) (1000BASE-PX20+, 1000BASE-PX20++, 1000BASE-PX10, and 1000BASE-PX20)
- GPON AN (CLASS B+, CLASS C+, and CLASS C++)
- 10GEPON AN (10GBASE-PR-D3/U3, 10GBASE-PRX-D3/U3, and 10GBASE-PR30-D)
- XGS-PON AN (GSFP+-XSN1DM-R and GSFP+-XSN2DM-R)
- FTTx, such as Fiber To The Home (FTTH), Fiber To The Curb (FTTC), Fiber To The Building (FTTB)
- Point-to-Multipoint (P2MP) system

1.4 Ordering formation

1.4.1 Naming conventions

Figure 1-1 shows naming conventions of GSFP optical modules.

Figure 1-1 Naming conventions of GSFP optical modules



1.4.2 Models

Table 1-1 lists models of GSFP optical modules.

Table 1-1 Models of GSFP optical modules

Model	Name	Description	Compliance
GSFP-PX20DM-R	1.25 Gbit/s commercial CO EPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 1.25 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• IEEE 802.3ah • 1000BASE-PX20+
GSFP-PX20DM-RI	1.25 Gbit/s industrial CO EPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 1.25 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• IEEE 802.3ah • 1000BASE-PX20+
GSFP-PX2PDM-R	1.25 Gbit/s commercial CO EPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 1.25 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• IEEE 802.3ah • 1000BASE-PX20++
GSFP-CLBDM-R	2.488 Gbit/s commercial CO GPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 2.488 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• ITU-T 984.2 • CLASS B+
GSFP-CLBDM-RI	2.488 Gbit/s industrial CO GPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 2.488 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• ITU-T 984.2 • CLASS B+
GSFP-CLCDM-R	2.488 Gbit/s commercial CO GPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 2.488 Gbit/s • Transmission distance: 60 km • Support DDM. • RoHS-compliant	• ITU-T 984.2 • CLASS C+
GSFP-CLCDM-RI	2.488 Gbit/s industrial CO GPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 2.488 Gbit/s • Transmission distance: 60 km • Support DDM. • RoHS-compliant	• ITU-T 984.2 • CLASS C+
GSFP-CLDDM-R	2.488 Gbit/s commercial CO GPON optical module	• Working wavelength: 1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 2.488 Gbit/s • Transmission distance: 60 km • Support DDM. • RoHS-compliant	• ITU-T 984.2 • CLASS C++

Model	Name	Description	Compliance
GXFP-PR30DM-R	10G/10 Gbit/s symmetric commercial CO 10GEPON optical module  The module is compatible with the EPON standard of 1.25 Gbit/s symmetric rate.	• Working wavelength: 1577/1490 nm • Uplink rate: 10 Gbit/s, or 1.25 Gbit/s • Downlink rate: 10 Gbit/s, or 1.25 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• IEEE 802.3av • IEEE 802.3ah • 10GBASE-PR30-D • 1000BASE-PX20+
GXFP-PRX30DM-R	10G/1 Gbit/s asymmetric commercial CO 10GEPON optical module	• Working wavelength: 1577/1490 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 10 Gbit/s, or 1.25 Gbit/s • Transmission distance: 20 km • Support DDM. • RoHS-compliant	• IEEE 802.3av • 10G/1GBASE-PRX30-D
GSFP+-PR30U-R	10G/10 Gbit/s symmetric commercial terminal 10GEPON optical module	• Working wavelength: 1270 nm • Uplink rate: 10 Gbit/s • Downlink rate: 10 Gbit/s • Transmission distance: 20 km • RoHS-compliant	• IEEE 802.3av • 10GBASE-PR30-U
GSFP+-PRX30U-R	10G/1 Gbit/s asymmetric commercial terminal 10GEPON optical module	• Working wavelength: 1310 nm • Uplink rate: 1.25 Gbit/s • Downlink rate: 10 Gbit/s • Transmission distance: 20 km • RoHS-compliant	• IEEE 802.3av • 10GBASE-PRX30-U

Model	Name	Description	Compliance
GSFP+-PR30DM-R	10G/10 Gbit/s symmetric commercial CO 10GEPON optical module Note The module is compatible with the EPON standard of 1.25 Gbit/s symmetric rate.	• Working wavelength: 1577 nm/1490 nm • Uplink rate: 10.3125 Gbit/s and 1.25 Gbit/s • Downlink rate: 10.3125 Gbit/s and 1.25 Gbit/s • Transmission distance: 20 km • DDM • RoHS-compliant	• IEEE 802.3av • IEEE 802.3ah • 10GBASE-PR30-D • 1000BASE-PX10 • 1000BASE-PX20
GSFP+-XSN1DM-R	10G/10 Gbit/s symmetric commercial CO XGS-PON optical module	• Working wavelength: 1577 nm • Uplink rate: 9.953 Gbit/s and 2.488Gbit/s • Downlink rate: 9.953 Gbit/s • Transmission distance: 20 km • DDM • RoHS-compliant	• ITU-T 9807.1 • XGS-PON N1
GSFP+-XSN2DM-R	10G/10 Gbit/s symmetric commercial CO XGS-PON optical module	• Working wavelength: 1577 nm • Uplink rate: 9.953 Gbit/s and 2.488Gbit/s • Downlink rate: 9.953 Gbit/s • Transmission distance: 20 km • DDM • RoHS-compliant	• ITU-T 9807.1 • XGS-PON N2

2 Technical specifications

This chapter includes the following sections:

- Absolute maximum rated parameters
- Recommended operating parameters
- Performance indicators

2.1 Absolute maximum rated parameters

Table 2-1 lists the absolute maximum rated parameters of GSFP optical modules.

Table 2-1 Absolute maximum rated parameters of GSFP optical modules

Parameter	Symbol	Minimum value	Maximum value
Storage temperature (℃)	T_S	-40	85
Supply voltage (V)	V_{cc}	-0.5	4

2.2 Recommended operating parameters

Recommended operating parameters of GSFP optical modules are identical, as listed in Table 2-2.

Table 2-2 Recommended operating parameters of GSFP optical modules

Parameter		Symbol	Minimum value	Maximum value
Operating temperature (℃) (altitude: 0–1800 m)	Commercial	T_A	0	70
	Industrial	T_A	-20	75

Parameter	Symbol	Minimum value	Maximum value
Operating humidity (RH) (non-condensing)	–	10%	95%
Supply voltage (V)	Vcc	3.135	3.465
Input differential voltage (V)	$V_{IN\ p-p}$	0.5	1.2

Note

At an altitude of 1800 m to 5000 m, the maximum operating temperature of the GSFP optical module reduces by 1°C for every 220 m increase in altitude.

2.3 Performance indicators

2.3.1 GSFP-PX20DM-R

Electrical performance indicators

Table 2-3 lists electrical performance indicators of the GSFP-PX20DM-R optical module.

Table 2-3 Electrical performance indicators of the GSFP-PX20DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	300
Tx differential input voltage (mVpp)	V_{IN}	600	–	1900
Rx differential output voltage (mVpp)	V_o	600	–	1200
Tx_Fault (V)	V_{OH}	2.4	–	3.3
	V_{OL}	0	–	0.8
LOS level (V)	V_{OH}	2.4	–	3.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.0	–	V_{cc}
	V_{OL}	0	–	0.8
MOD_DEF1 and MOD_DEF2 (V)	V_{IH}	2.0	V_{cc}	–
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-4 lists optical performance indicators of the GSFP-PX20DM-R optical module.

Table 2-4 Optical performance indicators of the GSFP-PX20DM-R optical module

Parameter		Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser						
Tx wavelength (nm)		λ	1480	1490	1550	Remark 1
-20dB spectral width (nm)		Δλ-20dB	–	–	1	–
SLM laser SMSR (dB)		SMSR	30	–	–	–
Tx optical power (dBm)		PO	2.5	–	7	–
Tx optical power (laser off) (dBm)		PO	–	–	-39	–
$RIN_{15}OMA$ (dB/Hz)		–	–	–	-115	–
Tx OMA	(dBm)		2.8	–	–	–
	(mW)		1.8	–	–	–
Optical return loss threshold (dB)		–	–	–	15	–
Extinction ratio (dB)		ER	9	–	–	–
Transmitter reflection coefficient (dB)		–	–	–	-10	–
Transmitter dispersion penalty (dB)		–	–	–	2.3	–
TDP sampling time offset (UI)		–	±0.1	–	–	–
Eye mask		Comply with IEEE 802.3ah.				After filtering
Optical Rx side: APD receiver						
Rx wavelength (nm)		λR	1260	–	1360	–
Rx sensitivity (dBm)		RSENS	–	–	-30	Remark 2

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Minimum overload optical power (dBm)	POL	-6	–	–	–
Signal detection threshold	PSD	-45	–	–	–
Receiver reflection coefficient	Pref	–	–	-12	–
Vertical eye mask shutdown penalty (dBm)	–	2.2	–	–	Remark 3
Tranceiver_settling (dBm)	–	400	–	–	Remark 4
Strict condition eye mask jitter (dBm)	–	0.28	–	–	–
Jitter cut-off frequency (kHz)	–	–	637	–	–
Sine jitter threshold for receiver consistency test in strict conditions	–	0.05	–	0.15	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, optical extinction ratio EX = 9 dB, BER < 10^{-12}.
- Remark 3: the vertical eye mask shutdown penalty and jitter are the test conditions for Rx sensitivity in strict conditions, rather than the required indexes for the receiver.
- Remark 4: Tranceiver_settling index is for reference only; however, the combination of the Tranceiver_settling and CDR locking time is standardized.

2.3.2 GSFP-PX20DM-RI

Electrical performance indicators

Table 2-5 lists electrical performance indicators of the GSFP-PX20DM-RI optical module.

Table 2-5 Electrical performance indicators of the GSFP-PX20DM-RI optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	300
Tx differential input voltage (mVpp)	V_{IN}	600	–	1900
Rx differential output voltage (mVpp)	V_o	600	–	1200
Tx_Fault (V)	V_{OH}	2.4	–	3.3
	V_{OL}	0	–	0.8
LOS level (V)	V_{OH}	2.4	–	3.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.0	–	V_{cc}
	V_{OL}	0	–	0.8
MOD_DEF1 and MOD_DEF2 (V)	V_{IH}	2.0	V_{cc}	-
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-6 lists optical performance indicators of the GSFP-PX20DM-RI.

Table 2-6 Optical performance indicators of the GSFP-PX20DM-RI

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Working wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Tx optical power (dBm)	PO	2.5	–	7	–
Tx optical power (laser off) (dBm)	PO	–	–	-39	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-115	–
Tx OMA (dBm)	–	2.8	–	–	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
(mW)		1.9	–	–	–
Optical return loss threshold (dB)	–	–	–	15	–
Extinction ratio (dB)	ER	9	–	–	–
Transmitter reflection coefficient (dB)	–	–	–	-12	–
Transmitter dispersion penalty (dB)	–	–	–	2.3	–
TDP sampling time offset (UI)	–	±0.1	–	–	–
Eye mask	IEEE 802.3ah 2004				After filtering
Optical Rx side: APD receiver					
Rx wavelength (nm)	λR	1260	–	1360	–
Rx sensitivity (dBm)	RSENS	–	–	-30	Remark 2
Minimum overload optical power (dBm)	POL	-6	–	–	–
Signal detection threshold	PSD	-45	–	–	–
Receiver reflection coefficient	Pref	–	–	-12	–
Vertical eye mask shutdown penalty (dBm)	–	2.2	–	–	Remark 3
Tranceiver_settling (dBm)	–	–	–	400	Remark 4
Strict condition eye mask jitter (dBm)	–	0.28	–	–	–
Jitter cut-off frequency (kHz)	–	–	637	–	–
Sine jitter threshold for receiver consistency test in strict conditions	–	0.05	–	0.15	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, optical extinction ratio EX = 9 dB, BER < 10^{-12}.
- Remark 3: the vertical eye mask shutdown penalty and jitter are the test conditions for Rx sensitivity in strict conditions, rather than the required indexes for the receiver.
- Remark 4: Tranceiver_settling index is for reference only; however, the combination of the Tranceiver_settling and CDR locking time is standardized.

2.3.3 GSFP-PX2PDM-R

Electrical performance indicators

Table 2-7 lists electrical performance indicators of the GSFP-PX2PDM-R optical module.

Table 2-7 Electrical performance indicators of the GSFP-PX2PDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	370
Tx differential input voltage (mVpp)	V_{IN}	200	–	1600
Rx differential output voltage (mVpp)	V_o	600	–	1600
Tx_Fault (V)	V_{IH}	2.0	–	3.3
	V_{IL}	0	–	0.8
Rx LOS level (V)	V_{OH}	2.4	–	3.3
	V_{OL}	0	–	0.4
Tx_Dis (V)	V_{IH}	2.0	–	3.3
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-8 lists optical performance indicators of the GSFP-PX2PDM-R.

Table 2-8 Optical performance indicators of the GSFP-PX2PDM-R

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Working wavelength (nm)	λ	1480	1490	1500	–
Average Tx optical power (dBm)	P_{EOL}	4.5	–	9	–
Tx optical power (laser off) (dBm)	P_{OFF}	–	–	-39	–
Optical power rising and falling time (ps)	t_r/t_f	–	–	250	20%–80%
-20dB spectral width (nm)	Δλ-20dB	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	9	–	–	–
Unit Interval peak-to-peak (UIPP)	J_{P-P}	–	–	0.2	–
Optical Rx side: APD receiver					
Rx wavelength (nm)	λ	1260	1310	1360	–
Rx sensitivity (dBm)	P_{EOL}	–	–	-32	Remark 1
Minimum overload optical power (dBm)	P_{IN}(SAT)	-10	–	–	Remark 1
Maximum overload optical power (dBm)	P_{IN}(MAX)	–	4	5	Damage threshold
LOS generation threshold (dBm)	P_a	-45	–	–	–
LOS elapse threshold (dBm)	P_d	–	–	-32	–
LOS delay loopback (dB)	P_{hy}	0.5	–	6	–
Receiver reflection ratio (dB)	RFL	–	–	-12	–
Receiver calibration time (ns)	Trx	–	–	256	–

Note

Remark 1: the code pattern is PRBS 2^7-1@1250Mbit/s, ER = 9dB, and BER < 10^{-12}.

2.3.4 GSFP-CLBDM-R

Electrical performance indicators

Table 2-9 lists electrical performance indicators of the GSFP-CLBDM-R optical module.

Table 2-9 Electrical performance indicators of the GSFP-CLBDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	500
Tx differential input voltage (mVpp)	V_{IN}	300	–	1900
Rx differential output voltage (mVpp)	V_o	600	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}+0.3
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.2	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
MOD_DEF1 and MOD_DEF2 (V)	V_{IH}	2.2	V_{cc}	V_{cc}+0.3
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-10 lists optical performance indicators of the GSFP-CLBDM-R optical module.

Table 2-10 Optical performance indicators of the GSFP-CLBDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink rate (Gbit/s)	STx	–	2.488	–	–
Tx optical power (dBm)	PO	1.5	–	5	–
Tx optical power (laser off) (dBm)	PO	–	–	-40	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Tx wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1	–
SMSR (dB)	SMSR	30	–	–	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-115	–
Optical return loss threshold (dB)	–	–	–	15	–
Extinction ratio (dB)	ER	8.2	–	–	–
Eye mask	Comply with ITU-T G.984.2.				After filtering
Optical Rx side: APD receiver					
Uplink rate (Gbit/s)	SRx	–	1.25	–	–
Rx wavelength (nm)	λR	1260	1310	1360	–
Rx sensitivity (dBm)	RSENS	–	–	-28	Remark 2
Minimum overload optical power (dBm)	POL	-8	–	–	–
Signal detection threshold	PSD	-45	–	–	–
Receiver reflection coefficient	Pref	–	–	-12	–
Vertical eye mask shutdown penalty (dBm)	–	2.2	–	–	Remark 3
Strict condition eye mask jitter (dBm)	–	0.28	–	–	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, EX = 9 dB, BER < 10^{-12}.

- Remark 3: the vertical eye mask shutdown penalty and jitter are the test conditions for Rx sensitivity in strict conditions, rather than the required indexes for the receiver.

2.3.5 GSFP-CLBDM-R(B.00)

Electrical performance indicators

Table 2-11 lists electrical performance indicators of the GSFP-CLBDM-R (B.00) optical module.

Table 2-11 Electrical performance indicators of the GSFP-CLBDM-R (B.00) optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	500
Tx differential input voltage (mVpp)	V_{IN}	300	–	1900
Rx differential output voltage (mVpp)	V_o	600	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}+0.3
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.2	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
MOD_DEF1 and MOD_DEF2 (V)	V_{IH}	2.2	–	V_{cc}+0.3
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-14 lists optical performance indicators of the GSFP-CLBDM-R (B.00).

Table 2-12 Optical performance indicators of the GSFP-CLBDM-R (B.00)

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink signal rate (Gbit/s)	STx	–	2.488	–	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Tx optical power (dBm) (room temperature and high temperature)	P_{O-RH}	3	–	5	Remark 1
Tx optical power (dBm) (low temperature)	P_{O-L}	1.5	–	5	
Tx optical power (laser off) (dBm)	PO	–	–	-40	–
Working wavelength (nm)	λ	1480	1490	1500	Remark 2
-20dB spectral width (nm)	Δλ-20dB	–	–	1	–
SMSR (dB)	SMSR	30	–	–	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-115	–
Optical return loss threshold (dB)	–	–	–	15	–
Extinction ratio (dB)	ER	8.2	–	–	–
Eye mask	ITU-T G.984.2				After filtering
Optical Rx side: APD receiver					
Uplink signal rate (Gbit/s)	SRx	–	1.25	–	–
Rx wavelength (nm)	λR	1260	1310	1360	–
Rx sensitivity (dBm)	RSENS	–	–	-28	Remark 3
Minimum overload optical power (dBm)	POL	-8	–	–	–
Signal detection threshold	PSD	-45	–	–	–
Receiver reflection coefficient	Pref	–	–	-12	–
Vertical eye mask shutdown penalty (dBm)	–	2.2	–	–	Remark 4
Strict condition eye mask jitter (dBm)	–	0.28	–	–	–

Note

- Remark 1: the output optical power at high temperature and room temperature (>25ºC) is greater than 3dBm while the output optical power at lower temperature meets the industry standard range.
- Remark 2: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 3: the code pattern is PRBS 2^{23}-1@1250Mbit/s, EX = 9 dB, BER < 10^{-12}.
- Remark 4: the vertical eye mask shutdown penalty and jitter are the test conditions for Rx sensitivity in strict conditions, rather than the required indexes for the receiver.

2.3.6 GSFP-CLBDM-RI

Electrical performance indicators

Table 2-13 lists electrical performance indicators of the GSFP-CLBDM-RI optical module.

Table 2-13 Electrical performance indicators of the GSFP-PX20DM-RI optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply current (mA)	I_{cc}	–	–	500
Tx differential input voltage (mVpp)	V_{IN}	300	–	1900
Rx differential output voltage (mVpp)	V_o	600	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}+0.3
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.2	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
MOD_DEF1 and MOD_DEF2 (V)	V_{IH}	2.2	–	V_{cc}+0.3
	V_{IL}	0	–	0.8

Optical performance indicators

Table 2-14 lists optical performance indicators of the GSFP-CLBDM-RI.

Table 2-14 Optical performance indicators of the GSFP-CLBDM-RI

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink signal rate (Gbit/s)	STx	–	2.488	–	–
Tx optical power (dBm)	PO	1.5	–	5	–
Tx optical power (laser off) (dBm)	PO	–	–	-40	–
Working wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1	–
SMSR (dB)	SMSR	30	–	–	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-115	–
Optical return loss threshold (dB)	–	–	–	15	–
Extinction ratio (dB)	ER	8.2	–	–	–
Eye mask	ITU-T G.984.2				After filtering
Optical Rx side: APD receiver					
Uplink signal rate (Gbit/s)	SRx	–	1.25	–	–
Rx wavelength (nm)	λR	1260	1310	1360	–
Rx sensitivity (dBm)	RSENS	–	–	-28	Remark 2
Minimum overload optical power (dBm)	POL	-8	–	–	–
Signal detection threshold	PSD	-45	–	–	–
Receiver reflection coefficient	Pref	–	–	-12	–
Vertical eye mask shutdown penalty (dBm)	–	2.2	–	–	Remark 3
Strict condition eye mask jitter (dBm)	–	0.28	–	–	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1244Mbit/s, EX = 9 dB, BER < 10^{-10}.
- Remark 3: the vertical eye mask shutdown penalty and jitter are the test conditions for Rx sensitivity in strict conditions, rather than the required indexes for the receiver.

2.3.7 GSFP-CLCDM-R

Electrical performance indicators

Table 2-15 lists electrical performance indicators of the GSFP-CLCDM-R optical module.

Table 2-15 Electrical performance indicators of the GSFP-CLCDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc}	3.135	3.3	3.465
Supply current (mA)	I_{cc}	–	350	500
Tx differential input voltage (mVpp)	V_{IN}	200	–	1600
Rx differential output voltage (mVpp)	V_{OUT}	200	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}+0.3
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.2	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Burst signal detection (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8

Optical performance indicators

Table 2-16 lists optical performance indicators of the GSFP-CLCDM-R optical module.

Table 2-16 Optical performance indicators of the GSFP-CLCDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink rate (Gbit/s)	STx	–	2.488	–	–
Tx optical power (dBm)	PO	3.0	–	7.0	–
Tx optical power (laser off) (dBm)	PO	–	–	-40	–
Tx wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1.0	–
SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	8.2	–	–	–
Eye mask	Comply with ITU-T G.984.2.				After filtering
Optical Rx side: APD receiver					
Uplink signal rate (Gbit/s)	S	–	1.25	–	–
Rx wavelength (nm)	λR	1280	1310	1360	–
Rx sensitivity (dBm)	Pin	–	–	-30	Remark 2
Minimum overload optical power (dBm)	Pin (SAT)	-12	–	–	–
Maximum input optical power (dBm)	Pin (MAX)	–	–	2	Damage threshold
Receiver reflection coefficient	RFL	–	–	-20	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, EX = 9 dB, BER < 10^{-12}.

2.3.8 GSFP-CLCDM-RI

Electrical performance indicators

Table 2-17 lists electrical performance indicators of the GSFP-CLCDM-RI optical module.

Table 2-17 Electrical performance indicators of the GSFP-CLCDM-RI optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc}	3.135	3.3	3.465
Supply current (mA)	I_{cc}	–	350	500
Tx differential input voltage (mVpp)	V_{IN}	200	–	1600
Rx differential output voltage (mVpp)	V_{OUT}	200	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}+0.3
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.2	–	V_{cc}+0.3
	V_{OL}	0	–	0.8
Burst signal detection (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8

Optical performance indicators

Table 2-18 lists optical performance indicators of the GSFP-CLCDM-RI.

Table 2-18 Optical performance indicators of the GSFP-CLCDM-RI

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink signal rate (Gbit/s)	STx	–	2.488	–	–
Tx optical power (dBm)	PO	3.0	–	7.0	–
Tx optical power (laser off) (dBm)	PO	–	–	-40	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Working wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1.0	–
SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	8.2	–	–	–
Eye mask	ITU-T G.984.2				After filtering
Optical Rx side: APD receiver					
Uplink signal rate (Gbit/s)	S	–	1.25	–	–
Rx wavelength (nm)	λR	1260	1310	1360	–
Rx sensitivity (dBm)	Pin	–	–	-30	Remark 2
Minimum overload optical power (dBm)	Pin(SAT)	-12	–	–	–
Maximum input optical power (dBm)	Pin(MAX)	–	–	2	Damage threshold
Receiver reflection coefficient (dB)	RFL	–	–	-12	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1244Mbit/s, EX = 9 dB, BER < 10^{-10}.

2.3.9 GSFP-CLDDM-R

Electrical performance indicators

Table 2-19 lists electrical performance indicators of the GSFP-CLDDM-R optical module.

Table 2-19 Electrical performance indicators of the GSFP-CLDDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc}	3.135	3.3	3.465
Supply current (mA)	I_{cc}	–	350	500

Parameter	Symbol	Minimum value	Typical value	Maximum value
Tx differential input voltage (mVpp)	V_{IN}	600	–	2400
Rx differential output voltage (mVpp)	V_{OUT}	400	–	1600
Tx_Fault (V)	V_{OH}	2.4	–	V_{cc}
	V_{OL}	0	–	0.4
LOS level (V)	V_{OH}	2.0	–	V_{cc}
	V_{OL}	0	–	0.8
Tx_Dis (V)	V_{OH}	2.0	–	V_{cc}
	V_{OL}	0	–	0.8
Burst signal detection (V)	V_{OH}	2.0	–	V_{cc}+0.3
	V_{OL}	0	–	0.8

Optical performance indicators

Table 2-20 lists optical performance indicators of the GSFP-CLDDM-R optical module.

Table 2-20 Optical performance indicators of the GSFP-CLDDM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Downlink rate (Gbit/s)	STx	–	2.488	–	–
Tx optical power (dBm) (BOL)	P_{BOL}	5.5	–	10.0	
Tx optical power (dBm) (EOL)	P_{EOL}	4.5	–	10.0	
Tx optical power (laser off) (dBm)	P_{OFF}	–	–	-39	–
Tx wavelength (nm)	λ	1480	1490	1500	Remark 1
-20dB spectral width (nm)	Δλ-20dB	–	–	1.0	–
SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	8.2	–	–	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Eye mask	Comply with ITU-T G.984.2.				After filtering
Optical Rx side: APD/TIA receiver					
Uplink rate (Gbit/s)	S	–	1.25	–	–
Rx wavelength (nm)	λ	1280	1310	1360	–
Rx sensitivity (dBm) (BOL)	P_{BOL2}	–	–	-31	Remark 2
Rx sensitivity (dBm) (EOL)	P_{EOL2}	–	–	-30	Remark 2
Minimum overload optical power (dBm)	Pin (SAT)	-12	–	–	–
Maximum input optical power (dBm)	Pin (MAX)	–	–	2	Damage threshold
Receiver reflection coefficient (dB)	RFL	–	–	-20	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1244 Mbit/s and BER < 10^{-10}.

2.3.10 GXFP-PR30DM-R

Electrical performance indicators

Table 2-21 lists electrical performance indicators of the GXFP-PR30DM-R optical module.

Table 2-21 Electrical performance indicators of the GXFP-PR30DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc3}	3.135	3.3	3.465
	V_{cc5}	4.75	5	5.25
Supply current (mA)	I_{cc3}	–	700	–
	I_{cc5}	–	120	–

Optical performance indicators

Table 2-22 lists optical performance indicators of the GXFP-PR30DM-R optical module.

Table 2-22 Optical performance indicators of the GXFP-PR30DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
10 Gbit/s optical Tx side: EML laser					
Downlink signal rate (Gbit/s)	STx	–	10.3125	–	–
Tx optical power (dBm)	P_{OUT10}	2	–	5	–
Tx wavelength (nm)	λ_{10}	1575	1577	1580	Remark 1
Spectral width (nm)	$\Delta\lambda_{10}$	–	–	1	–
SLM laser SMSR (dB)	$SMSR_{10}$	30	–	–	–
Extinction ratio (dB)	ER_{10}	6	–	–	–
Eye mask	Comply with IEEE 802.3av.				After filtering
1.25 Gbit/s optical Tx side: DFB laser					
Downlink rate (Gbit/s)	STx	–	1.25	–	–
Tx optical power (dBm)	P_{OUT1}	2	–	7	–
Tx wavelength (nm)	λ_1	1480	1490	1500	Remark 1
Spectral width (nm)	$\Delta\lambda_1$	–	–	1	–
SLM laser SMSR (dB)	$SMSR_1$	30	–	–	–
Extinction ratio (dB)	ER_1	9	–	–	–
Laser raising/falling time (ps)	Tr/Tf	–	–	260	
Eye mask	Comply with IEEE 802.3ah.				After filtering
10.3125 Gbit/s optical Rx side: APD/TIA receiver					
Uplink rate (Gbit/s)	SRx	–	10.3125	–	–
Rx wavelength (nm)	λ	1260	1270	1280	–
Rx sensitivity (dBm)	P_{IN}	–	-28	–	Remark 2
Minimum overload optical power (dBm)	P_{IN}(SAT)	-6	–	–	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Maximum input optical power (dBm)	P_{IN}(MAX)	–	–	-5	Damage threshold
1.25 Gbit/s optical Rx side: APD/TIA receiver					
Uplink rate (Gbit/s)	SRx	–	1.25	–	–
Rx wavelength (nm)	λ	1280	1310	1340	–
Rx sensitivity (dBm)	P_{IN}	–	–	-29.78	Remark 2
Minimum overload optical power (dBm)	P_{IN}(SAT)	-9.38	–	–	–
Maximum input optical power (dBm)	P_{IN}(MAX)	–	–	-5	Damage threshold

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, optical extinction ratio EX = 9 dB, BER < 10^{-12}.

2.3.11 GXFP-PRX30DM-R

Electrical performance indicators

Table 2-23 lists electrical performance indicators of the GXFP-PRX30DM-R optical module.

Table 2-23 Electrical performance indicators of the GXFP-PRX30DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc3}	3.135	3.3	3.465
	V_{cc5}	4.75	5	5.25
Supply current (mA)	I_{cc3}	–	580	–
	I_{cc5}	–	80	–

Optical performance indicators

Table 2-24 lists optical performance indicators of the GXFP-PRX30DM-R optical module.

Table 2-24 Optical performance indicators of the GXFP-PRX30DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
10 Gbit/s optical Tx side: EML laser					
Downlink rate (Gbit/s)	STx	–	10.3125	–	–
Tx optical power (dBm)	P_{OUT}	2	–	5	–
Tx wavelength (nm)	λ	1575	1577	1580	Remark 1
Spectral width (nm)	Δλ	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	6	–	–	–
Eye mask	Comply with IEEE 802.3av.				After filtering
1.25 Gbit/s optical Tx side: DFB laser					
Downlink rate (Gbit/s)	STx	–	1.25	–	–
Tx optical power (dBm)	P_{OUT}	2	–	7	–
Tx wavelength (nm)	λ	1480	1490	1500	Remark 1
Spectral width (nm)	Δλ	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	9	–	–	–
Eye mask	Comply with IEEE 802.3ah.				After filtering
1.25 Gbit/s optical Rx side: APD/TIA receiver					
Uplink rate (Gbit/s)	SRx	–	1.25	–	–
Rx wavelength (nm)	λ	1260	1310	1360	–
Rx sensitivity	P_{IN}	–	–	-29.7	Remark 2

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Minimum overload optical power (dBm)	P_{IN}(MAX)	-9.3	–	–	–
RFL (dBm)	RFL	–	–	-12	

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, optical extinction ratio EX = 9 dB, BER < 10^{-12}.

2.3.12 GSFP+-PR30U-R

Electrical performance indicators

Table 2-25 lists electrical performance indicators of the GSFP+-PR30U-R optical module.

Table 2-25 Electrical performance indicators of the GSFP+-PR30U-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc}	3.135	3.3	3.465
Supply current (mA)	I_{cc}	–	400	–
Tx differential input voltage (mV)	V_{IH}-V_{IL}	190	–	700
Rx differential output voltage (mV)	V_{oH}-V_{oL}	300	–	850
Tx_DIS (V)	V_{IH}	2.0	–	V_{cc}+0.3
	V_{IL}	0	–	0.8
Rx_DIS (V)	V_{oH}	2.4	–	3.3
	V_{oL}	0	–	0.8

Optical performance indicators

Table 2-26 lists optical performance indicators of the GSFP+-PR30U-R optical module.

Table 2-26 Optical performance indicators of the GSFP+-PR30U-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Uplink rate (Gbit/s)	–	–	10.3125	–	–
Tx wavelength (nm)	λ	1260	1270	1280	Remark 1
Tx optical power (dBm)	P_{out}	4	–	9	–
Spectral width (nm)	Δλ	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	6	–	–	–
Eye mask	Comply with IEEE 802.3av.				After filtering
Optical Rx side: APD/TIA receiver					
Downlink rate (Gbit/s)	–	–	10.3125	–	–
Rx wavelength (nm)	λ_R	–	1577	–	Remark 1
Rx sensitivity	R_{IN}	–	–	-28.5	Remark 2
Minimum overload optical power (dBm)	P_{IN}(SAT)	-8	–	–	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, EX = 9 dB, BER < 10^{-12}.

2.3.13 GSFP+-PRX30U-R

Electrical performance indicators

Table 2-27 lists electrical performance indicators of the GSFP+-PRX30U-R optical module.

Table 2-27 Electrical performance indicators of the GSFP+-PRX30U-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value
Supply voltage (V)	V_{cc}	3.135	3.3	3.465
Supply current (mA)	I_{cc}	–	400	–
Tx differential input voltage (mV)	V_{IH}-V_{IL}	200	–	1600
Rx differential output voltage (mV)	V_{oH}-V_{oL}	300	–	850
Tx_DIS (V)	V_{IH}	2.0	–	V_{cc}+0.3
	V_{IL}	0	–	0.8
Rx_DIS (V)	V_{oH}	2.4	–	3.3
	V_{oL}	0	–	0.8

Optical performance indicators

Table 2-28 lists optical performance indicators of the GSFP+-PRX30U-R optical module.

Table 2-28 Optical performance indicators of the GSFP+-PRX30U-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Optical Tx side: DFB laser					
Uplink rate (Gbit/s)	–	–	1.25	–	–
Tx wavelength (nm)	λ	1260	1310	1360	Remark 1
Tx optical power (dBm)	P_{out}	0.62	–	5.62	–
Spectral width (nm)	Δλ	–	–	1	–
SLM laser SMSR (dB)	SMSR	30	–	–	–
Extinction ratio (dB)	ER	6	–	–	–
Eye mask	Comply with IEEE 802.3av.				After filtering
Optical Rx side: APD/TIA receiver					

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Downlink rate (Gbit/s)	–	–	10.3125	–	–
Rx wavelength (nm)	λ_R	–	1577	–	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-28.5	Remark 2
Minimum overload optical power (dBm)	P_{OL}	-8	–	–	
Receiver reflection coefficient (dBm)	RFL	–	–	-12	–

Note

- Remark 1: there is no specific requirement on the prototype with the index. Any device that meets the index can replace the optical module.
- Remark 2: the code pattern is PRBS 2^{23}-1@1250 Mbit/s, EX = 9 dB, BER < 10^{-12}.

2.3.14 GSFP+-PR30DM-R

Electrical performance indicators

Table 2-29 lists electrical performance indicators of the GSFP+-PR30DM-R optical module.

Table 2-29 Electrical performance indicators of the GSFP+-PR30DM-R optical module

Parameter	Minimum value	Typical value	Maximum value
10Gb/s Tx input (mV)	120	–	820
1Gb/s Tx input (mV)	200	–	2400
10Gb/s RD+/- output differential voltage swing (mV)	–	700	–
1Gb/s RD+/- output differential voltage swing (mV)	–	750	–

Optical performance indicators

Table 2-30 lists optical performance indicators of the GSFP+-PR30DM-R optical module.

Table 2-30 Optical performance indicators of the GSFP+-PR30DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
10.3125 Gbit/s optical Tx side					
Rate (Gbit/s)	BR	–	10.3125	–	–
Working wavelength (nm)	λ	1575	1577	1580	CW EML
-20dB spectral width (nm)	$\Delta\lambda_{-20dB}$	–	–	1	
SLM laser SMSR (dB)	SMSR	30	–	–	–
Tx optical power (dBm)	P_O	2	–	5	–
Tx optical power (laser shutdown) (dBm)	P_O	–	–	-39	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-128	–
Tx OMA (dBm)	–	3.91	–	–	–
Tx OMA (mW)	–	2.46	–	–	–
Optical return loss tolerance (dB)	–	–	–	15	–
Extinction ratio (dB)	ER	6	–	–	–
Transmitter reflector coefficient (dB)	–	–	–	-10	–
Transmitter dispersion penalty (dB)	–	–	–	1.5	–
TDP sampling time offset (UI)	–	−0.05	–	+0.05	–
Eye mask	Comply with IEEE 802.3av (add a 1.25G filter)				
1.25 Gbit/s optical Tx side					
Rate (Gbit/s)	BR	–	1.25	–	–
Working length (nm)	λ	1480	1490	1500	• CW DFB • Remark 1
-20dB spectral width (nm)	$\Delta\lambda_{-20dB}$	–	–	1	
SLM laser SMSR (dB)	SMSR	30	–	–	–
Tx optical power (dBm)	P_O	2	–	7	–
Tx optical power (laser shutdown) (dBm)	P_O	–	–	-39	–
Extinction ratio (dB)	ER	9	–	–	–
$RIN_{15}OMA$ (dB/Hz)	–	–	–	-115	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Tx OMA (dBm)	–	2.8	–	–	–
Tx OMA (mW)	–	1.9	–	–	–
Optical return loss tolerance (dB)	–	–	–	15	–
Transmitter reflector coefficient (dB)	–	–	–	-10	–
Transmitter dispersion penalty (dB)	–	–	–	2.3	–
TDP sampling time offset (UI)	–	−0.1	–	+0.1	–
Eye mask	Comply with IEEE 802.3ah (add a 1.25G filter)				
10.3125 Gbit/s optical Rx side					
Rx wavelength (nm)	λ_R	1260	1270	1280	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-28	• APD • Remark 2
Minimum overload optical power (dBm)	P_{OL}	-6	–	–	–
Signal detection threshold (dBm)	P_{SD}	-45	–	–	–
Receiver reflection coefficient (dBm)	Pref	–	–	-12	–
1.25 Gbit/s optical receiver side					
Rx wavelength (nm)	λ_R	1280	1270	1340	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-30	• APD • Remark 3
Minimum overload optical power (dBm)	P_{OL}	-5	–	–	–
Signal detection threshold (dBm)	P_{SD}	-45	–	–	–
Receiver reflection coefficient (dBm)	Pref	–	–	-12	–

Note

- Remark 1: the extinction ratio corresponding to the minimum average Tx power and the minimum Tx OMA is 9 dB.
- Remark 2: the code pattern is PRBS 2^{31}-1 @ 10.3125 Gbit/s, EX = 6 dB, BER < 10^{-3}.
- Remark 3: the code pattern is PRBS 2^{7}-1 @ 1250 Mbit/s, EX = 10 dB, BER < 10^{-12}.

2.3.15 GSFP+-XSN1DM-R

Electrical performance indicators

Table 2-31 lists electrical performance indicators of the GSFP+-XSN1DM-R optical module.

Table 2-31 Electrical performance indicators of the GSFP+-XSN1DM-R optical module

Parameter	Minimum value	Typical value	Maximum value
10Gb/s Tx input (mV)	120	–	850
2.5Gb/s Tx input (mV)	200	–	2400
10Gb/s RD+/- output differential voltage swing (mV)	300	700	800
2.5Gb/s RD+/- output differential voltage swing (mV)	300	750	800

Optical performance indicators

Table 2-32 lists optical performance indicators of the GSFP+-XSN1DM-R optical module.

Table 2-32 Optical performance indicators of the GSFP+-XSN1DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
10 Gbit/s optical Tx side					
Rate (Gbit/s)	BR	–	9.953	–	–
Working wavelength (nm)	λ	1575	1577	1580	• Remark 1 • CW EML
-20dB spectral width (nm)	$\Delta\lambda_{-20dB}$	–	–	1	CW EML
SLM laser SMSR (dB)	SMSR	30	–	–	–
Tx optical power (dBm)	P_O	2	–	5	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Extinction ratio (dB)	ER	8.2	–	–	–
10 Gbit/s Rx side					
Rate (Gbit/s)	BR	–	9.953	–	–
Receiver type	Burst Mode APD/TIA				
Rx wavelength (nm)	λ_R	1260	1270	1280	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-26	Remark 2
Minimum overload optical power (dBm)	$P_{in(MAX)}$	-5	–	–	–
2.5 Gbit/s Rx side					
Rate (Gbit/s)	BR	–	2.488	–	–
Rx wavelength (nm)	λ_R	1260	–	1280	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-27.5	Remark 3
Minimum overload optical power (dBm)	$P_{in(MAX)}$	-7	–	–	–

Note

- Remark 1: the extinction ratio corresponding to the minimum average Tx power and the minimum Tx OMA is 8.2 dB.
- Remark 2: the code pattern is PRBS 2^{31}-1 @ 9.953 Gbit/s, EX = 6 dB, BER < 10^{-3}.
- Remark 3: the code pattern is PRBS 2^{7}-1 @ 2.488 Mbit/s, EX = 8.2 dB, BER < 10^{-4}

2.3.16 GSFP+-XSN2DM-R

Electrical performance indicators

Table 2-33 lists electrical performance indicators of the GSFP+-XSN2DM-R optical module.

Table 2-33 Electrical performance indicators of the GSFP+-XSN2DM-R optical module

Parameter	Minimum value	Typical value	Maximum value
10Gb/s Tx input (mV)	120	–	850
2.5Gb/s Tx input (mV)	200	–	2400

Parameter	Minimum value	Typical value	Maximum value
10Gb/s RD+/- output differential voltage swing (mV)	300	700	850
2.5Gb/s RD+/- output differential voltage swing (mV)	300	750	800

Optical performance indicators

Table 2-34 lists optical performance indicators of the GSFP+-XSN2DM-R optical module.

Table 2-34 Optical performance indicators of the GSFP+-XSN2DM-R optical module

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
10 Gbit/s optical Tx side					
Rate (Gbit/s)	BR	–	9.953	–	–
Working wavelength (nm)	λ	1575	1577	1580	• Remark 1 • CW EML
-20dB spectral width (nm)	$\Delta\lambda_{-20dB}$	–	–	1	CW EML
SLM laser SMSR (dB)	SMSR	30	–	–	–
Tx optical power (dBm)	P_O	4	–	7	–
Extinction ratio (dB)	ER	8.2	–	–	–
10 Gbit/s Rx side					
Rate (Gbit/s)	BR	–	9.953	–	–
Receiver type	Burst Mode APD/TIA				
Rx wavelength (nm)	λ_R	1260	1270	1280	–
Rx sensitivity (dBm)	R_{SENS}	–	–	-28	Remark 2
Minimum overload optical power (dBm)	$P_{in(MAX)}$	-7	–	–	–
2.5 Gbit/s Rx side					
Rate (Gbit/s)	BR	–	2.488	–	–
Rx wavelength (nm)	λ_R	1260	–	1280	–

Parameter	Symbol	Minimum value	Typical value	Maximum value	Remark
Rx sensitivity (dBm)	R_{SENS}	–	–	-29.5	Remark 3
Minimum overload optical power (dBm)	$P_{in(MAX)}$	-9	–	–	–

Note

- Remark 1: the extinction ratio corresponding to the minimum average Tx power and the minimum Tx OMA is 8.2 dB.
- Remark 2: the code pattern is PRBS 2^{31}-1 @ 9.953 Gbit/s, EX = 6 dB, BER < 10^{-3}.
- Remark 3: the code pattern is PRBS 2^{7}-1 @ 2.488 Mbit/s, EX = 8.2 dB, BER < 10^{-4}

3 Internal information

This chapter includes the following sections:

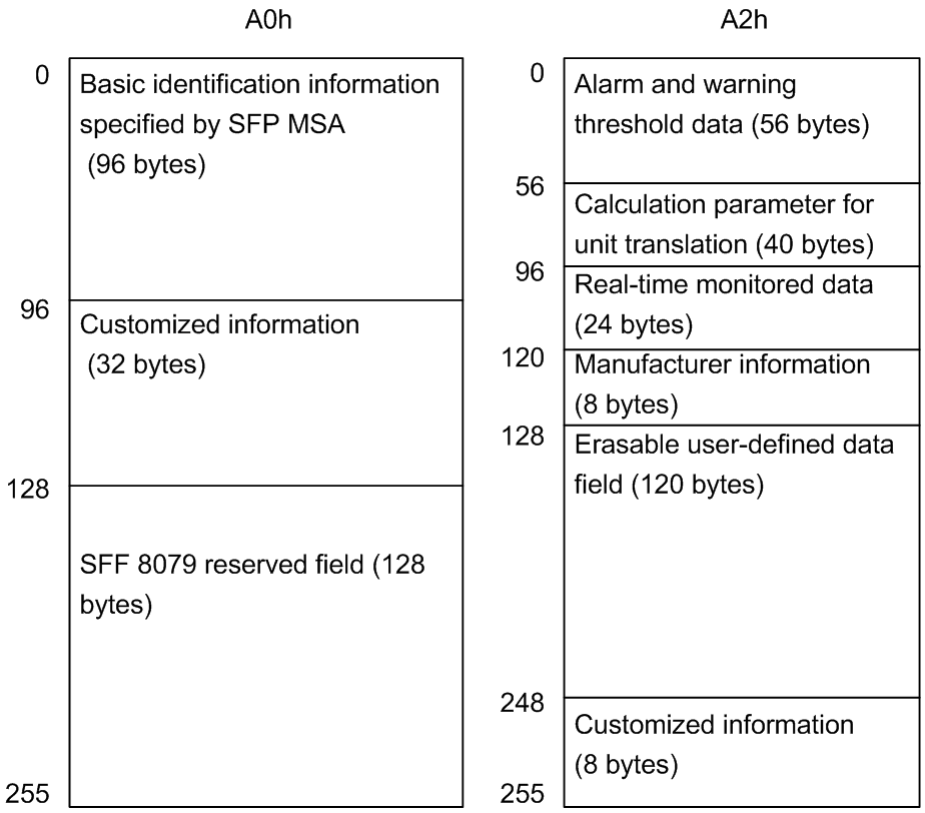
- Internal information
- Serial interface information
- DDMI

3.1 Internal information

Through the Inter-Integrated Circuit (I^2C) protocol, the device accesses the SFP+ internal EEPROM space whose address is set to A0h or A2h. MOD_DEF1 and MOD_DEF2 are used as the serial Clock (SCL) signal and Serial Data Line (SDA) data signal of the serial protocol respectively.

- The capacity of the EEPROM chip space, whose address is set to A0h, is 256×8 bits. It is used to store basic information, such as the manufacturer, model, transmission compatibility, rate, and transmission distance.
- The capacity of the EEPROM chip space, whose address is set to A2h, is 256×8 bits. It is used to store data, such as the threshold data of Digital Diagnostic Monitoring (DDM), dynamically-updated sampling results, and fault flags. The A2h data space stores the Digital Diagnostic Monitoring Interface (DDMI) data.

Figure 3-1 EEPROM space structure of A0h and A2h



3.2 Serial interface information

The 256-byte space of the serial protocol address A0h is mainly used for defining the module identification information specified by the SFP MSA, as listed in Table 3-1.

Table 3-1 Definitions of A0h bytes

Address	Data description	Value (in hexadecimal notation)	Meaning
0–1	Identifier	03 04	SFP optical module
2	Connector	01	SC connector
3–10	Transceiver	Transmission compatibility	
11	Encoding	01	8B/10B
		02	4B/5B
		05	SONET Scrambler
12	BR, Nominal	0D	1.25 Gbit/s
		19	2.5 Gbit/s
		67	10.3125 Gbit/s

Address	Data description	Value (in hexadecimal notation)	Meaning
13	Rate Identifier	xx	
14–19	Length	14 C8 00 00 00 00	SM 20 km
		3C FF 00 00 00 00	SM 60 km
20–35	Vendor name(ASCII)	52 61 69 73 65 63 6F 6D 20 20 20 20 20 20 20 20	Raisecom
36	Unallocated	xx	
37–39	Vendor OUI	00 00 00	
40–55	Vendor PN(ASCII)	55 53 46 50 2D 47 62 2F 53 31 2D 44 2D 52 20 20	Model
56–59	Vendor rev(ASCII)	xx xx xx xx	
60–61	Wavelength	06 0E	Wavelength, in units of nm
		05 D2	1490 nm
62	Unallocated	xx	
63	CC_BASE	xx	
64–65	Rx_Los, Tx_Fault, Tx_Dis	00 1A	
	Signal Detect Tx_Fault Tx_Dis	00 1C	
66–67	BR, Scope	xx	
68–83	Vendor SN(ASCII)	30 38 32 36 31 32 34 32 20 20 20 20 20 20 20 20	SN, such as 08261242
84–91	Date code(ASCII)	30 38 31 30 33 31 20 20	Date, such as 081031
92	Diagnostic Monitoring Type	58	DDM external calibration
		68	DDM internal calibration

Address	Data description	Value (in hexadecimal notation)	Meaning
93	Enhanced Options	B0	Support Tx_FAULT, Rx_LOS, and alarm flag.
		E0	
94	SFF-8472 Compliance	01	SFF Rev 9.3
		05	SFF Rev.11.0
95	CC_EXT	xx	
96–127	Vendor Specific	Reserved	
128–255	Reserved	Reserved	

3.3 DDMI

The 256-byte space of the serial protocol address A2h is used to define 5 kinds of SFP+ monitoring data measured in real time, including the temperature, current, voltage, Tx optical power, and Rx optical power. For the calculation method, see SFF-8472. Ranges and accuracy of all parameters meet SFF-8472 requirements. If some monitored parameter exceeds the threshold, a related alarm will be generated.

4 Structure

This chapter includes the following sections:

- PIN definitions
- Dimensions

4.1 PIN definitions

PIN definitions vary with GSFP optical modules.

4.1.1 EPON optical modules

EPON optical modules involved in this document include the GSFP-PX20DM-R, GSFP-PX20DM-RI, and GSFP-PX2PDM-R.

PIN definitions of EPON optical modules are shown in Figure 4-1 and Table 4-1.

Figure 4-1 PIN definitions of EPON optical modules

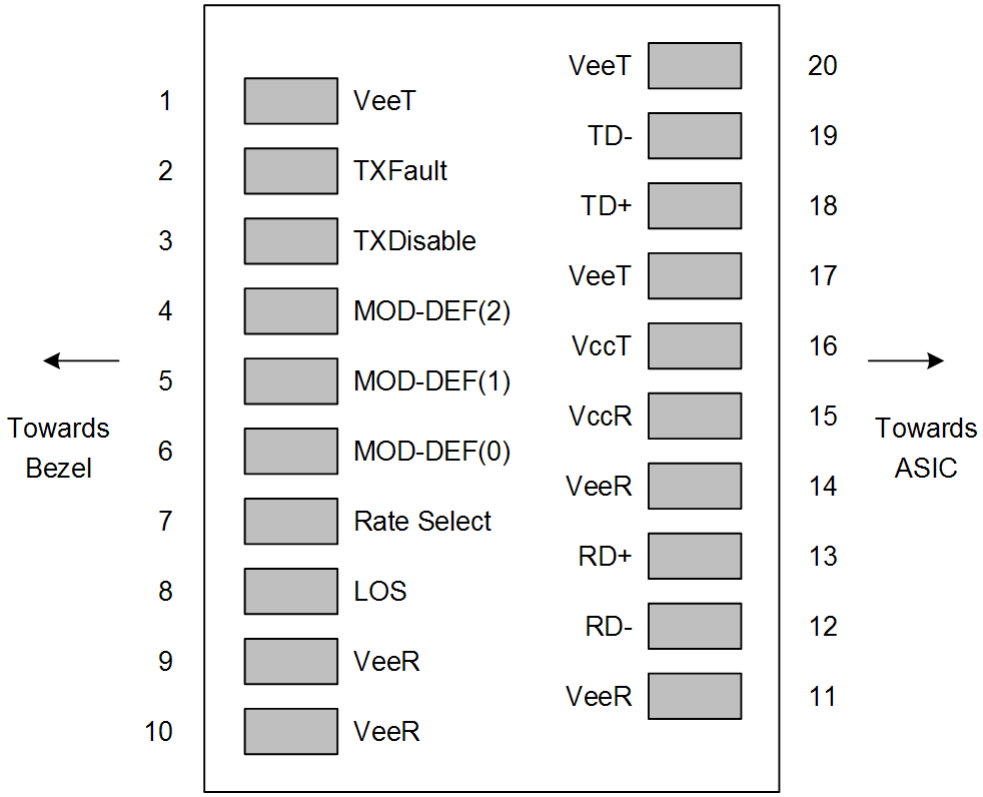


Table 4-1 PIN definitions of the EPON optical module

PIN	Symbol	Logical interface	Description	Remark
1	VEET	N/A	Module transmitter ground	–
2	Tx_FAULT	LVTTL	Module transmitter fault	Remark 1
3	Tx_DIS	LVTTL	ALS • Low level: the laser is not shut down and is working properly. • High level: the laser is shut down and stops working.	Remark 1
4	MOD_DEF2	LVTTL	Module Definition2-Two-Wire interface: SDA	Remark 1
5	MOD_DEF1	LVTTL	Module Definition1-Two-Wire interface: SCK	Remark 1
6	MOD_DEF0	LVTTL	Module Definition0-internal digital ground	Remark 1
7	RSSI_TRI	LVTTL	RSSI signal detection	–
8	Rx_LOS	LVTTL	Rx-side LOS alarm • Low level: normal • High level: an alarm is generated.	Remark 1

PIN	Symbol	Logical interface	Description	Remark
9	VEER	N/A	Module receiver ground	–
10	VEER	N/A	Module receiver ground	–
11	VEER	N/A	Module receiver ground	–
12	RD-	N/A	Receiver inverted data output	Remark 2
13	RD+	N/A	Receiver non-inverted data output	Remark 2
14	VEER	N/A	Module receiver ground	–
15	VCCR	N/A	Module receiver 3.3 V supply	Remark 3
16	VCCT	N/A	Module transmitter 3.3 V supply	Remark 3
17	VEET	N/A	Module transmitter ground	–
18	TD+	LVPECL	Transmitter non-inverted data input	Remark 4
19	TD-	LVPECL	Transmitter inverted data input	Remark 4
20	VEET	N/A	Module transmitter ground	–

Note

- Remark 1: the signal cable of the LVTTL level interfaces, such as Tx_FAULT, Rx_LOS, MOD_DEF0, MOD_DEF1, and MOD_DEF2, needs to be connected to a pull-up resistor with the resistance ranging from 4.7–10 kΩ.
- Remark 2: 100 Ω differential data output signal Rx is output after AC coupling in the module.
- Remark 3: the fluctuation range of both VCCR and VCCT is 3.3 V±5%. Therefore, we recommend isolating the VCCR from the VCCT.
- Remark 4: 100 Ω differential data output signal Tx is output to the transmitter after AC coupling in the module.

4.1.2 GPON optical modules

GPON optical modules involved in this document include GSFP-CLBDM-R, GSFP-CLBDM-RI, GSFP-CLCDM-R, GSFP-CLDDM-R, and GSFP-CLCDM-RI.

PIN definitions of GPON optical modules are shown in Figure 4-2 and Table 4-2.

Figure 4-2 PIN definitions of GPON optical modules

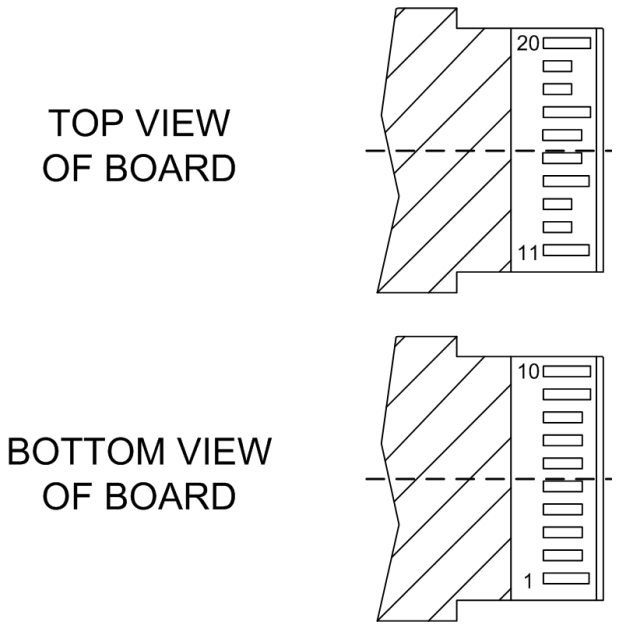


Table 4-2 PIN definitions of the GPON optical module

PIN	Symbol	Description	Remark
1	VEET	Module transmitter ground	–
2	Tx_FAULT	Module transmitter fault	Remark 1
3	Tx_DIS	ALS • Low level: the laser is not shut down and is working properly. • High level: the laser is shut down and stops working.	Remark 1
4	MOD_DEF2	Module Definition2-Two-Wire interface: SDA	Remark 1
5	MOD_DEF1	Module Definition1-Two-Wire interface: SCK	Remark 1
6	MOD_DEF0	Module Definition0-internal digital grounding	Remark 1
7	Reset	–	–
8	BPD/BSD	• Burst Power Detect • Burst Signal Detect	Remark 5
9	RSSI-Trigger	–	–
10	VEER	Module receiver ground	–
11	VEER	Module receiver ground	–
12	RD-	Receiver inverted data output	Remark 2
13	RD+	Receiver non-inverted data output	Remark 2

PIN	Symbol	Description	Remark
14	VEER	Module receiver ground	–
15	VCCR	Module receiver 3.3 V supply	Remark 3
16	VCCT	Module transmitter 3.3 V supply	Remark 3
17	VEET	Module transmitter ground	–
18	TD+	Transmitter non-inverted data input	Remark 4
19	TD-	Transmitter inverted data input	Remark 4
20	VEET	Module transmitter ground	–

Note

- Remark 1: the signal cable of the LVTTL level interfaces, such as Tx_FAULT, Rx_LOS, MOD_DEF0, MOD_DEF1, and MOD_DEF2, needs to be connected to a pull-up resistor with the resistance ranging from 4.7–10 kΩ.
- Remark 2: 100 Ω differential data output signal Rx is output after AC coupling in the module.
- Remark 3: the fluctuation range of both VCCR and VCCT is 3.3 V±5%. Therefore, we recommend isolating the VCCR from the VCCT.
- Remark 4: 100 Ω differential data output signal Tx is output to the transmitter after AC coupling in the module.
- Remark 5: the corresponding PIN of the GSFP-CLBDM-R is BPD. The corresponding PIN of the GSFP-CLCDM-R and GSFP-CLDDM-R is BSD.

4.1.3 10GEPON optical modules (XFP)

The 10GEPON optical modules (XFP) involved in this document include GXFP-PR30DM-R and GXFP-PRX30DM-R.

PIN definitions of 10GEPON optical modules (XFP) are shown in Figure 4-3 and Table 4-3.

Figure 4-3 PIN definitions of 10GEPON optical modules (XFP)

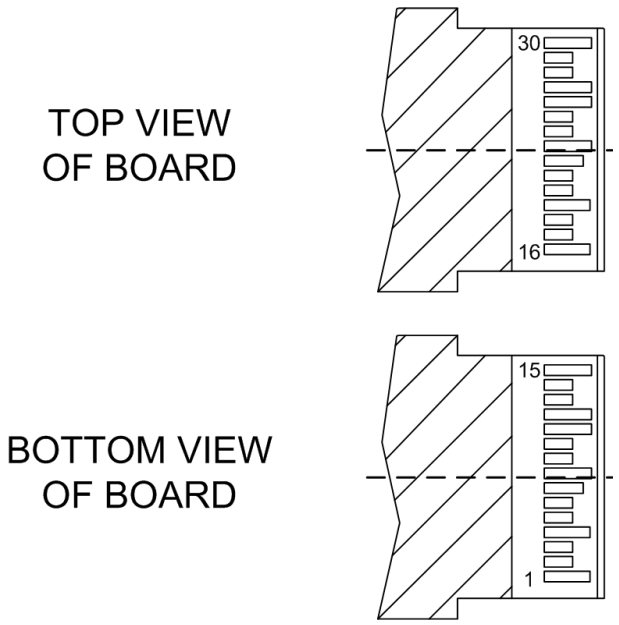


Table 4-3 PIN definitions of the 10GEPON optical modules (XFP)

PIN	Symbol	Description	Remark
1	GND	Module ground	–
2	Tx_1G_P	Receiving unconverted 1.25 Gbit/s signals	–
3	Tx_1G_N	Receiving converted 1.25 Gbit/s signals	–
4	GND	Module ground	–
5	Tx_DIS	10 Gbit/s and 1 Gbit/s lasers fail in transmission.	Remark 1
6	VCC5	+5 V power supply	–
7	GND	Module ground	–
8	VCC3	+3.3 V power supply	–
9	VCC3	+3.3 V power supply	–
10	SCL	2-wire serial interface data line	Remark 2
11	SDA	2-wire serial interface clock	Remark 2
12	MOD_ABS	Module ground. The high level indicates loss of the module.	Remark 2
13	Rx_RateSel	Choose the rate as below: • High level: the rate is 10.3125 Gbit/s. • Low level: the rate is 1.25 Gbit/s.	Remark 3
14	Rx_LOS	1.25 Gbit/s LOS: • High level: normal • Low level: signals are lost.	Remark 2

PIN	Symbol	Description	Remark
15	GND	Module ground	–
16	GND	Module ground	–
17	Rx_10G_N	Sending unconverted 10 Gbit/s signals	–
18	Rx_10G_P	Sending converted 10 Gbit/s signals	–
19	GND	Module ground	–
20	Rx_1G_N	Sending unconverted 1.25 Gbit/s signals	–
21	Rx_1G_P	Sending converted 1.25 Gbit/s signals	–
22	NC	Not Connected	NC
23	Rx_RSSI_TRIG	Signal strength indicator of the optical receiver, able to be accessed by the I^2C bus	Remark 4
24	NC	Not connected	NC
25	NC	Not connected	NC
26	NC	Not connected	NC
27	GND	Module ground	–
28	Tx_1G_N	Receiving unconverted 10 Gbit/s signals	–
29	Tx_1G_P	Receiving converted 10 Gbit/s signals	–
30	GND	Module ground	–

Note

- Remark 1: the signal cable of the Tx_DIS LVTTL level interface needs to be connected to a pull-up resistor with the resistance ranging from 4.7–10 kΩ.
- Remark 2: you should use the pull-up resistor to connect VCC3.
- Remark 3: the function of selecting the rate on the PIN is applicable to the GXFP-PR30DM-R only. The PIN of the GXFP-PRX30DM-R is NC, namely, not connected.

4.1.4 10GEPON optical modules (SFP+)

The 10GEPON optical modules (SFP+) involved in this document include the GSFP+-PR30U-R, GSFP+-PRX30U-R, and GSFP+-PR30DM-R.

PIN definitions of 10GEPON optical modules (SFP+) are shown in Figure 4-4 and Table 4-4.

Figure 4-4 PIN definitions of 10GEPON (SFP+) optical modules

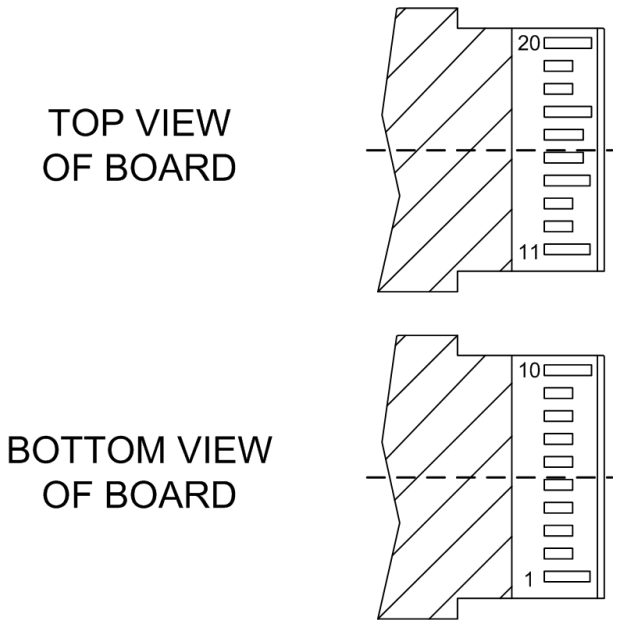


Table 4-4 PIN definitions of the 10GEPON optical module (SFP+)

PIN	Symbol	Description	Remark
1	GND	Module transmitter ground	–
2	Tx_FAULT	Laser fault indicator: • High level: the laser is faulty. • Low level: normal status	Remark 1
3	Tx_BURST	ALS • Low level: the laser is not shut down and is working properly. • High level: the laser is shut down and stops working.	Remark 1
4	SDA	2-wire serial interface data line	–
5	SCL	2-wire serial interface clock	–
6	MOD_ABS	Module ground. The high level indicates loss of the module.	Remark 2
7	Tx_SD	Laser status	–
8	Rx_LOS	Receiver LOS: • High level: signals are lost. • Low level: normal	Remark 2
9	P_Down	Power supply failure indicator: • High level: power supply fails. • Low level: normal	Remark 1
10	GND	Module ground	–
11	GND	Module ground	–

PIN	Symbol	Description	Remark
12	RD-	Receiving converted 10 Gbit/s signals	–
13	RD+	Receiving unconverted 10 Gbit/s signals	–
14	GND	Module ground	–
15	VCC3	Module receiver 3.3 V supply	–
16	VCC3	Module transmitter 3.3 V supply	–
17	GND	Module ground	–
18	TD+	Sending unconverted 10 Gbit/s signals	–
19	TD-	Sending converted 10 Gbit/s signals	–
20	GND	Module ground	–

Note

- Remark 1: the signal cable of the Tx_DIS, Tx_BURST, and P_Downlevel interfaces needs to be connected to a pull-up resistor with the resistance ranging from 4.7–10 kΩ.
- Remark 2: the MCU needs to be connected to a pull-up resistor with the resistance ranging from 4.7–10 kΩ.

4.1.5 XGS-PON optical module (SFP+)

The XGS-PON optical modules (SFP+) involved in this document include the GSFP+-XSN1DM-R and GSFP+-XSN2DM-R.

PIN definitions of XGS-PON optical modules (SFP+) are shown in Figure 4-5, Table 4-5, and Table 4-6.

Figure 4-5 PIN definitions of XGS-PON optical modules

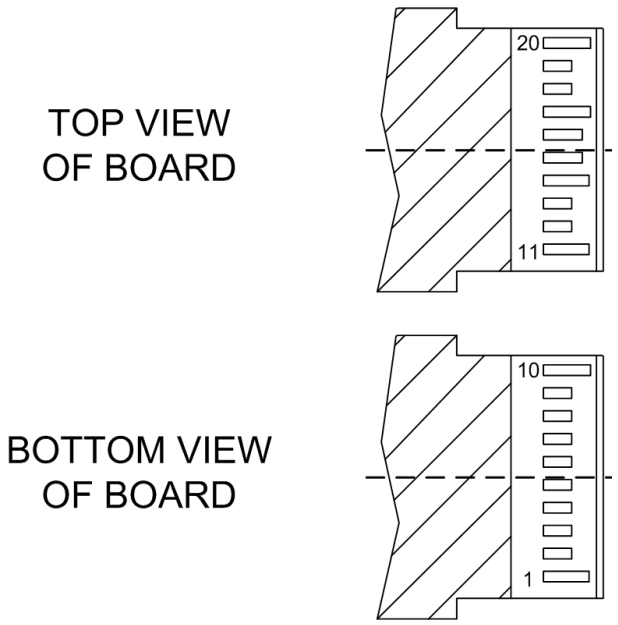


Table 4-5 PIN definitions of the GSFP+-XSN1DM-R

PIN	Symbol	Description
1	Rate_Select	Rate selection, High=9.953Gbps;LOW=2.488Gbps
2	Tx_FAULT	Tx Fault, LOW=Normal Operation, HIGH=Fault Indication
3	Tx_Disable	Tx Disable, LOW=Normal Operation, HIGH=Disables Module
4	SDA	2-Wire Serial Interface - Serial Data.
5	SCL	2-Wire Serial Interface - Clock Signal.
6	MOD_ABS	Module absent indicate pin.
7	Rx_Reset	RX Reset, Active High
8	RX_SD	Rx Signal Detect, Assert High when Burst Packet Coming.
9	RSSI_Trigger	Receiver Signal Strength Indication trigger input.
10	GND	Module Ground
11	GND	Module Ground
12	XGS_RD-	Receiver Inverted 9.953Gb/s and 2.488Gb/s Data Output; DC coupled inside the module, CML
13	XGS_RD+	Receiver Non-Inverted 9.953Gb/s and 2.488Gb/s Data Output; DC coupled inside the module, CML
14	GND	Module Ground

PIN	Symbol	Description
15	VCCR	+3.3V DC Power Supply Input
16	VCCT	+3.3V DC Power Supply Input
17	GND	Module Ground
18	XGS_TD+	Transmitter Non-Inverted 9.953Gb/s Data Input, CML
19	XGS_TD-	Transmitter Inverted 9.953Gb/s Data Input, CML
20	GND	Module Ground

Table 4-6 PIN definitions of the GSFP+-XSN2DM-R

PIN	Symbol	Description
1	Rate_Select	Rate selection, Dedicated upstream speed indication. High=10G;LOW=2.5G
2	Tx_FAULT	Transmitter Fault, LOW=Normal Operation, HIGH=Fault Indication
3	Tx_DIS	Transmitter Disable, LOW=Normal Operation, HIGH=Disables Module
4	SDA	2-Wire Serial Interface - Serial Data.
5	SCL	2-Wire Serial Interface - Clock Signal.
6	MOD_ABS	Module absent indicate pin. Grounded inside the module.
7	Rx_RESET	RX Reset Pulse Input for TIA/LIA
8	RX_SD	Rx Signal Detect, Assert High when Burst Packet Coming.
9	RSSI_TRI	Receiver Signal Strength Indication trigger input.
10	GND	Module Ground
11	GND	Module Ground
12	RD-	Receiver Inverted 9.953Gb/s and 2.488Gb/s Data Output; DC coupled inside the module.
13	RD+	Receiver Non-Inverted 9.953Gb/s and 2.488Gb/s Data Output; DC coupled inside the module.
14	GND	Module Ground
15	VCC3	+3.3V DC Power Supply Input
16	VCC3	+3.3V DC Power Supply Input
17	GND	Module Ground

PIN	Symbol	Description
18	TD+	Transmitter Non-Inverted 9.953Gb/s Data Input
19	TD-	Transmitter Inverted 9.953Gb/s Data Input
20	GND	Module Ground

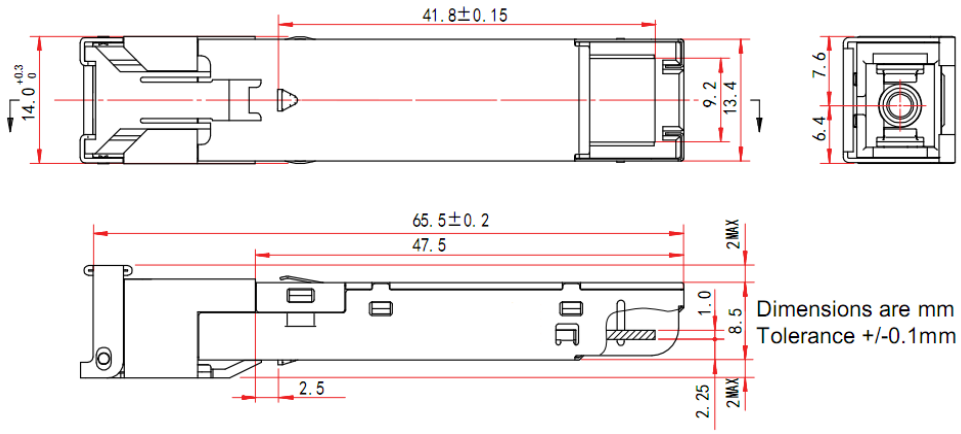
4.2 Dimensions

Dimensions vary with packaging forms.

4.2.1 GSFP

The structure of Raisecom GSFP optical modules meets SFP MSA. For details, see SFF-8074i (SFP MSA).

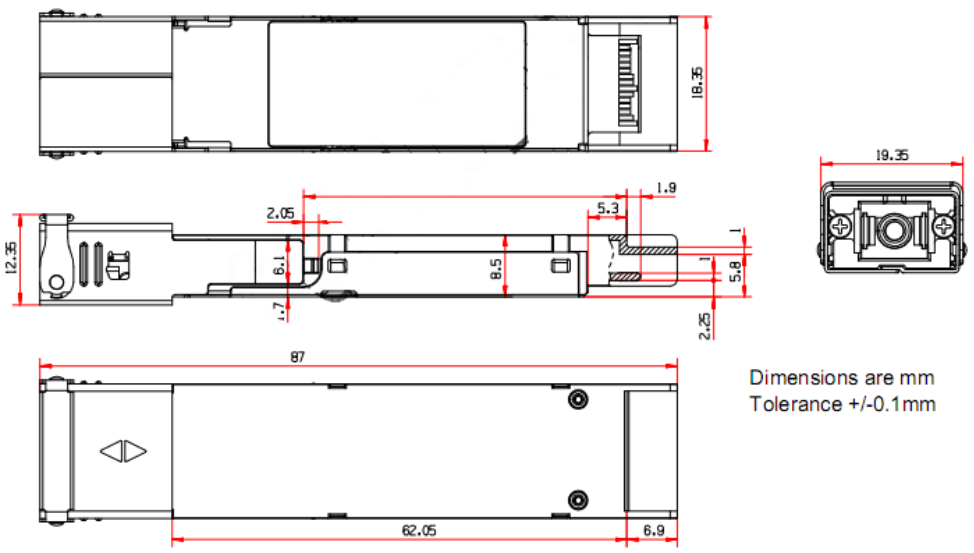
Figure 4-6 Dimensions of GSFP optical modules



4.2.2 GXFP

The structure of Raisecom GXFP optical modules meets XFP MSA. For details, see INF-8077i 10 Gigabit Small Form Factor Pluggable Module.

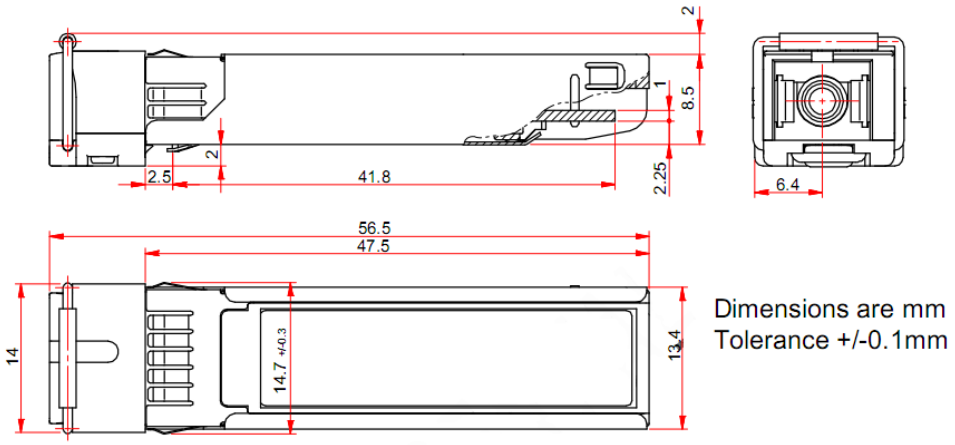
Figure 4-7 Dimensions of GXFP optical modules



4.2.3 GSFP+

The structure of Raisecom GSFP+ optical modules meets SFP MSA. For details, see SFF-8074i (SFP MSA).

Figure 4-8 Dimensions of GSFP+ optical modules



5 Installation and uninstallation

This chapter includes the following sections:

- Installation
- Uninstallation

5.1 Installation

Warning

- During any operation or maintenance process, pay attention to laser safety. For example, do not stare into the optical interface or fiber connector with eyes directly or through an instrument to prevent the laser from damaging eyes.
- Before connecting the fiber, use an optical power meter to measure the current optical power of the fiber. When the current optical power is smaller than the overload point of the optical module, you can connect the fiber. When the current optical power is greater than the overload point of the optical module, bit error or device damage may occur. When the current optical power is lower than the sensitivity, services will be blocked.
- When using a long-distance optical module with a target distance of 20 km or 60 km, do not use an optical fiber jumper to perform hard loopback (in other words, connect the Tx interface of the optical module to the Rx interface through a fiber); otherwise, the device may be damaged. In this case, at least use a 20 dB or 25 dB fiber attenuator respectively to make the optical power smaller than the overload point, so that you can use the optical fiber jumper to perform hard loopback.

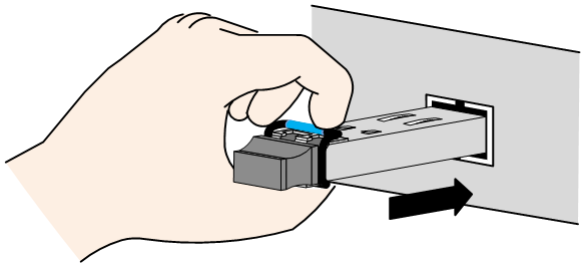
Caution

- Before installing the optical module, take ESD actions to prevent damaging the optical module.
- Before inserting the jumper into the interface of the optical module, clean the end-face of the fiber to keep the interface of the optical module clean. Otherwise, the SFP optical module performance will be influenced.
- If the Rx optical power at the Rx side of the optical module is too high, it may damage the SFP optical module.

To install the optical module, follow these steps:

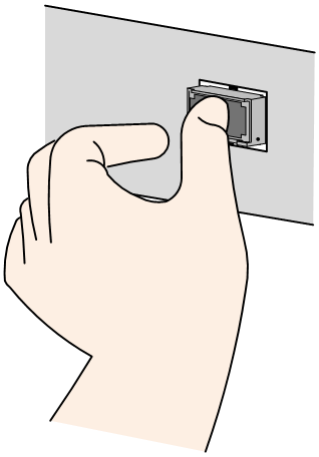
Step 1 Push the optical module into the guide rail stably, as shown in Figure 5-1.

Figure 5-1 Pushing the optical module into the guide rail stably



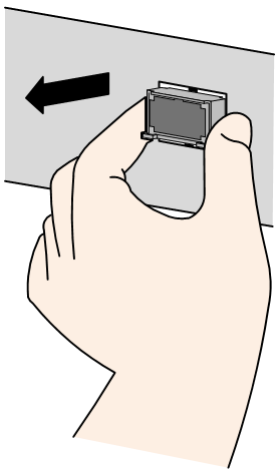
Step 2 Slightly press the optical module to lock it with the guide rail tightly, as shown in Figure 5-2.

Figure 5-2 Pressing the optical module slightly



Step 3 Pull the optical module outward slightly to confirm that the optical module and the connector are connected properly, as shown in Figure 5-3.

Figure 5-3 Pulling the optical module outward slightly



5.2 Uninstallation

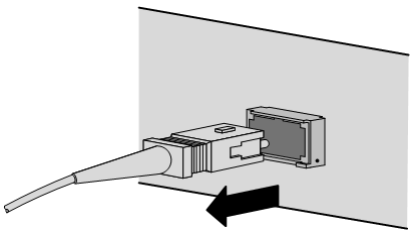
Caution

- Before removing the optical module, take ESD actions to prevent damaging the optical module.
- When removing the optical module, follow these steps strictly. A wrong uninstallation method (such as forcedly removing the SFP optical module without unlocking the module from the guide rail) may cause permanent damage to the SFP optical module or connector.

To remove the optical module, follow these steps:

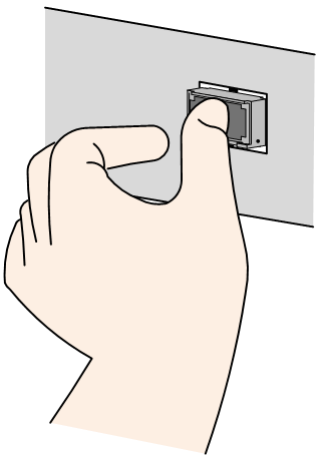
Step 1 Remove the fiber from the optical module, as shown in Figure 5-4.

Figure 5-4 Removing the fiber from the optical module



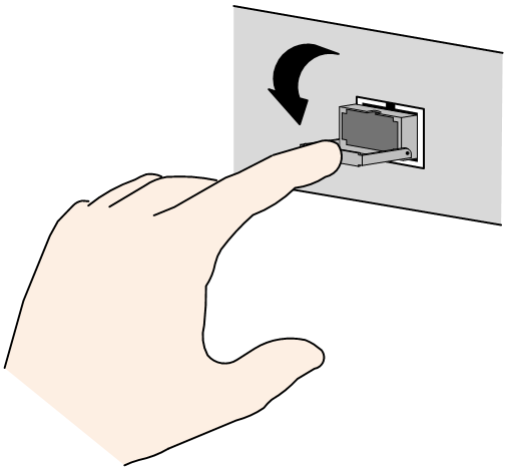
Step 2 Press the optical module slightly to make it return to the original position, as shown in Figure 5-5.

Figure 5-5 Pressing the optical module slightly



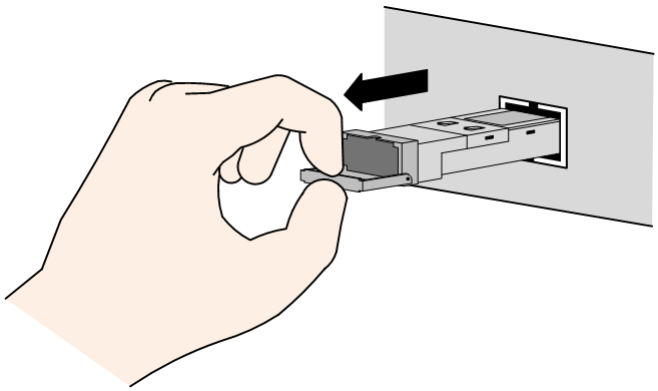
Step 3 Bend the pull tab of the optical module outward about 90 °to unlock the optical module from the guide rail, as shown in Figure 5-6.

Figure 5-6 Bending the pull tab of the optical module outward



Step 4 Keep the angle of the pull tab of the optical module unchanged and then pull the optical module out from the guide rail, as shown in Figure 5-7.

Figure 5-7 Pulling the optical module out



6 FAQs

This chapter describes possible faults when you use the optical module and provides related solutions, as listed in Table 6-1.

Table 6-1 FAQs and solutions

No.	Fault	Solution
1	The LOS LED is lit up (or the LNK LED is off) when the SFP optical module accesses optical signals.	• Check the cleanness of the optical interface of the SFP optical module. • Confirm that the rate of accessed optical signals matches with the SFP optical module. • Confirm that the configured rate of the optical interface of the SFP optical module matches with the SFP optical module. • Check whether the Rx optical power of the related optical interface is greater than the minimum overload or is smaller than the Rx sensitivity. If the Rx optical power is greater than the minimum overload, it may damage the SFP optical module. • If the Rx optical power is smaller than the Rx sensitivity, it may cause the device to fail to be registered. If it is a single-mode SFP optical module, check whether the wavelength and rate of the SFP optical modules on both ends are matched.
2	No optical power is output when the SFP optical module is powered on.	• Check the cleanness of the optical interface of the SFP optical module. • Check whether the end-face of the jumper is contaminated or damaged. • Check whether the SFP optical module is damaged. • Check whether the device is enabled with functions that may cause the laser to be shut down, such as link-state tracking or ALS. • Check whether the Tx-side laser of the optical interface is shut down. • If there is a Tx_fault alarm, perhaps the operating condition is bad or the SFP optical module fails.

No.	Fault	Solution
3	DDM data exceeds the normal range and alarms are generated.	• If the temperature alarm is generated frequently, we recommend improving the heat dissipation environment. • If a current/voltage alarm is generated, it is related to the operating status of the device. • The Tx optical power alarm may cause Tx_fault. Therefore, we recommend changing the SFP optical module. • If the alarm is generated because the Rx optical power is low, maybe the Rx-side optical power is too low or the SFP optical module is damaged. If the alarm is generated because the Rx optical power is too high, we recommend adding an optical attenuator.
4	DDM Tx/Rx optical power is normal but the measured optical power is abnormal.	• Check the cleanness of the optical interface of the SFP optical module. • Check whether the end-face of the jumper is contaminated or damaged. • Check whether the accuracy of the optical power meter is normal.
5	The LOL LED is lit up after the SFP optical module is powered on.	• Check whether the Rx side of the SFP optical module has accessed optical signals. If not, the LOS alarm threshold of the SFP optical module is too small. Therefore, you should change the SFP optical module. • If the problem is not solved after the SFP optical module accesses optical signals, check whether the rate of the local interface and peer interface is correctly configured. • Pull and then insert the SFP optical module again or reboot the device.
6	After the SFP optical module is powered on, the Tx optical power is normal. However, the device fails to communicate with the remote device.	• Check whether the Rx side of the SFP optical interface can work properly. • Check whether the remote device is configured properly. • Check whether the manufacturer asks for specific customized requirements on the SFP optical module. • Check LEDs of the device.

Note

Usually, when the Rx optical power of the SFP optical module exceeds the normal range, it may cause link fault. Therefore, when solving the link fault problem, you can prioritize checking whether the Rx optical power of the SFP optical module is normal. For the Rx optical power of each SFP module, see chapter 2 Technical specifications.

7 Appendix

This chapter includes the following sections:

- Terms
- Acronyms and abbreviations

7.1 Terms

A	
ALS	The technology that is used for automatically shutting down the laser to avoid the maintenance and operation risks when the fiber is pulled out or the output power is over great.
E	
Extinction ratio	The extinction ratio refers to the smallest ratio of A and B in complete modulation under the worst reflection conditions, that is ER=10lg(A/B). Wherein, A refers to the average Tx optical power at high voltage level and B refers to that at low voltage level.
Eye mask	After being binary or N-nary signals are transmitted, they are displayed as a continuous overlapping waveforms on the oscilloscope, which are similar to human eyes. Therefore, it is named as the eye mask. With eye mask, you can learn the degree of the intersymbol interference. An open eye mask corresponds to minimal signal distortion. A close eye mask corresponds to maximal signal distortion.
F	
Fiber	It refers to the filamentous optical waveguide made of dielectric substance, which is used to guide electromagnetic energy in a form of optical wave.

I

I^2C	The I^2C, developed by Philips , is a two-cable serial bus consisting of the serial data line SDA and serial clock SCL. It is used to connect the micro-controller and peripheral devices. It is a bus standard widely used in the micro-electronics communication control area. It is a specific mode of synchronous communication with features of few connected cables, simple control mode, small part encapsulation mode, and high communication rate.

L

Laser	A laser is a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation.
Link-state tracking	Link-state tracking provides an interface linkage scheme, extending the range of link backup. Through monitoring upstream links and synchronizing downstream links, faults of the upstream device can be transferred quickly to the downstream device, and primary/backup switching is triggered. In this way, it avoids traffic loss because the downstream device does not sense faults of the upstream link.

O

Optical power	The work done by light within a time unit Units of optical power include mW and dBm, of which the former is a linear unit and the latter is a logarithmic unit. The relationship between the two units is: P(dBm)=10Log(P(mW)/1mW)

R

Rx sensitivity	The minimum average input optical power received by the optical receiver when the frame loss rate of the fiber transceiver is zero in full-load data traffic conditions

7.2 Acronyms and abbreviations

A

APD	Avalanche Photo Diode

B

BER	Bit Error Rate

D

DDMI	Digital Diagnostic Monitor Interface
DFB	Distributed Feedback

E

EEPROM	Electrically Erasable Programmable Read-Only Memory
EMI	Electromagnetic Interference
ER	Extinction Ratio

I

IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ITU-T	International Telecommunications Union-Telecommunication Standardization Sector

L

LC	Little Connector
LOS	Loss of Signal

M

MM	Multi-Mode
MSA	Multi Source Agreement

P

PRBS	Pseudo-Random Binary Sequence

R

RoHS	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

S

SCL	Serial Clock
SDA	Serial Data Line
SDH	Synchronous Digital Hierarchy

SFP	Small Form-factor Pluggable
SM	Single-Mode
SC	Square Connector

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