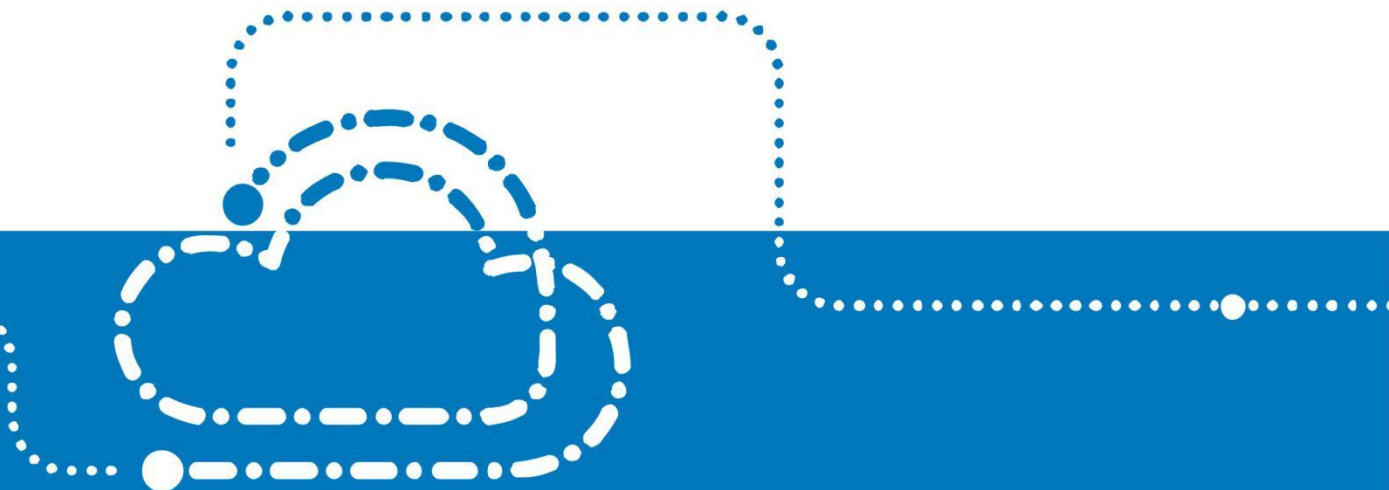




Operator Logo

ZXHN F6201B Product Description



ZXHN F6201B Product Description

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TABLE OF CONTENTS

| | |
|---|-----------|
| TABLES | 4 |
| 1 Overview | 5 |
| 1.1 Product Positioning | 5 |
| 1.2 Network Applications | 5 |
| 2 Product Highlights | 7 |
| 2.1 High Reliability | 7 |
| 2.2 Enriched User-Side Interfaces | 7 |
| 2.3 Gigabit Wi-Fi Access | 7 |
| 2.4 Eco-Friendly Design | 8 |
| 2.5 Convenient Installation and Management | 8 |
| 3 Hardware Features | 8 |
| 3.1 Physical Interfaces and buttons | 8 |
| 3.2 LED Indicators | 10 |
| 4 System Features | 12 |
| 4.1 GPON Features | 12 |
| 4.1.1 Bandwidth Allocation | 12 |
| 4.1.2 GEM Adaptation | 13 |
| 4.1.3 T-CONT | 13 |
| 4.1.4 Operation and Maintenance | 13 |
| 4.1.5 Optical Link Analysis and Diagnosis | 13 |
| 4.2 Ethernet Features | 14 |
| 4.2.1 MAC Address Features | 14 |
| 4.2.2 VLAN Features | 14 |
| 4.3 Wi-Fi Features | 15 |
| 4.4 QoS Features | 16 |
| 4.5 Multicast Features | 16 |
| 4.6 L3 Features | 17 |
| 4.7 IPv6 Features | 17 |
| 4.8 Management Features | 18 |
| 4.9 Security Features | 19 |
| 4.9.1 Data Security of the GPON Interface | 19 |
| 4.9.2 Traffic Suppression | 19 |
| 4.10 Alarm Features | 19 |
| 4.11 Performance Statistic Features | 20 |
| 4.11.1 Ethernet Port Performance Parameters | 20 |

| | |
|--|-----------|
| 5 Technical Indices and Parameters | 21 |
| 5.1 Physical Structure, Environmental and Electrical Indices | 21 |
| 5.2 GPON Interface Indices and Parameters | 21 |
| 5.3 Key Technical Indices | 22 |
| 6 Standards Compliance | 23 |
| 7 Glossary | 25 |

FIGURES

| | | |
|------------|---|----|
| Figure 1-1 | ZXHN F6201B Housing Design | 5 |
| Figure 1-2 | Network Topology of the ZXHN F6201B | 6 |
| Figure 3-1 | Rear Panel of the ZXHN F6201B | 9 |
| Figure 3-2 | LED Indicators of the ZXHN F6201B | 10 |

TABLES

| | | |
|-----------|--|----|
| Table 3-1 | Specifications for the Interfaces and buttons on the ZXHN F6201B | 9 |
| Table 3-2 | Specification for the LED Indicators of the ZXHN F6201B | 10 |
| Table 5-1 | Specifications and Environmental Indices of the ZXHN F6201B | 21 |
| Table 5-2 | GPON Interface Indices of the ZXHN F6201B | 21 |
| Table 5-3 | Key Technical Indices of the ZXHN F6201B | 22 |
| Table 6-1 | Standards Compliance | 23 |
| Table 7-1 | Glossary | 25 |

1 Overview

1.1 Product Positioning

The ZXHN F6201B is an ITU-T G.984 and ITU-T G.988 compliant optical network terminal (ONT) that is designed for high-end home users. It is well suited to fiber to the home (FTTH) scenarios and supports desktop mounting. At the network side, it supports 2.488 Gbps downlink and 1.244 Gbps uplink. At the user side, it provides four GE ports, and 2x2 802.11b/g/n/ax@2.4GHz & 2x2 802.11a/n/ac/ax@5GHz concurrent. Figure 1-1 shows the housing design of the ZXHN F6201B:

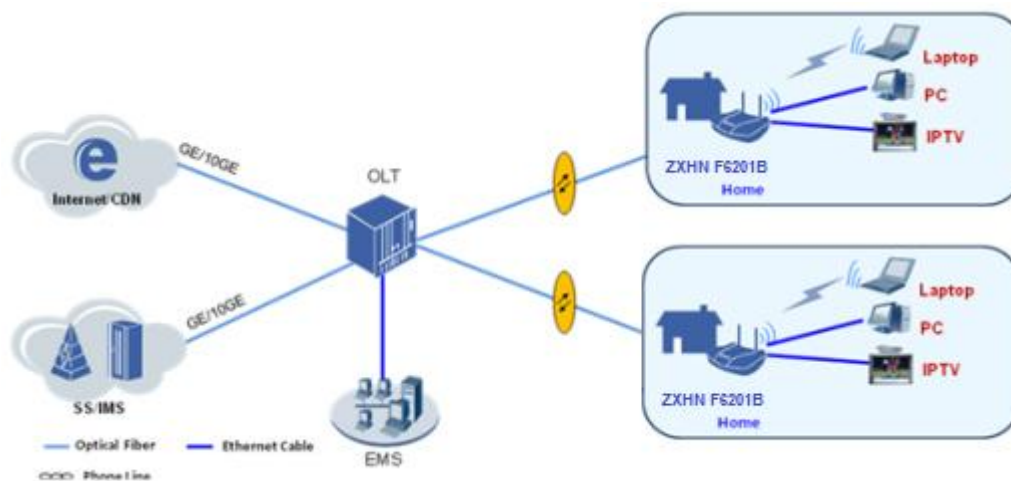
Figure 1-1 ZXHN F6201B Housing Design



1.2 Network Applications

The ZXHN F6201B is an ONT designed for FTTH application scenarios. By using the ZXHN F6201B, the home users can access data, video services, and enjoy high-speed Internet access. Figure 1-2 illustrates the application scenarios of the ZXHN F6201B:

Figure 1-2 Network Topology of the ZXHN F6201B



2 Product Highlights

2.1 High Reliability

- The full-service access capability featuring high bandwidth, high performance, high reliability, and easy operation, administration and maintenance (OMCI/TR-069) meets the ever changing customer requirements, protects legacy investments, and enhances the value of operators' networks.
- The highly reliable heat dissipation design guarantees stable operation.
- The dual image ensures will not lost configuration after software downloads or upgrades, thereby enhancing software reliability.
- The highly reliable lightning protection design provides lightning and surge protection of 4 kV for the adapter, and 2 kV for the Ethernet ports.

2.2 Enriched User-Side Interfaces

- Provides four GE ports for HSI or HD VoD services.
- Supports dual band concurrent Wi-Fi up to 574Mbps (802.11ax 2x2 @ 2.4GHz) and 2402Mbps (802.11ax 2x2 @5GHz).
- Users can connect PCs, IPTV STBs, tablets, smartphones, and other terminals to the ZXHN F6201B to enjoy all kinds of Internet services.

2.3 Gigabit Wi-Fi Access

- Users can build a convenient and secure wireless LAN, and access the Internet flexibly and reliably.
- Complies with the IEEE 802.11b/g/n/ax@2.4GHz (MIMO 2*2) standard.

- Complies with the IEEE 802.11a/n/ac/ax@5GHz (MIMO 2*2) standard.
- Supports WPA2-PSK and WPA3-PSK authentication to ensure safe and reliable home Wi-Fi access.

2.4 Eco-Friendly Design

- Automatically switches to energy-saving mode according to traffic status and busy/idle status of the port.
- Complies with CE and RoHS

2.5 Convenient Installation and Management

- Remote batch upgrade, fault diagnosis, port loopback, and link detection via the OMCI/TR-069.
- Software upgrade and management via the EMS/ACS/OLT. (Upgrade timeout < 120s)
- Local Web management.
- Offline & batch configuration.
- configuration backup/restore

3 Hardware Features

3.1 Physical Interfaces and buttons

The ZXHN F6201B includes one GPON optical port, four 10/100/1000M Ethernet ports, and 2x2 802.11b/g/n/ax@2.4GHz & 2x2 802.11a/n/ac/ax@5GHz concurrent.

The ZXHN F6201B provides one WPS/Wi-Fi button, one On/Off button and one Reset button.

Figure 3-1 Rear Panel of the ZXHN F6201B



Table 3-1 Specifications for the Interfaces and buttons on the ZXHN F6201B

| Interface | Description |
|-----------|---|
| PON | SC/APC GPON optical interface. |
| Reset | <p>When the ZXHN F6201B is powered on, press and hold the Reset button for one second to restart the ZXHN F6201B. The user's settings information will not be lost.</p> <p>When the ZXHN F6201B is powered on, press and hold the Reset button for more than five seconds to restore the ZXHN F6201B to the factory settings.</p> |
| LAN1-LAN4 | <p>Supports four 10/100/1000Base-T Ethernet ports with RJ-45 connector.</p> <p>Supports half/full duplex and flow control, auto negotiation or manual configuration.</p> <p>Supports MDI/MDIX auto-sensing.</p> |
| Power | 12 V Power Input Interface. ZXHN F6201B does not lose its configuration when the power is turned off and when the |

| Interface | Description |
|-----------|---|
| | mains power is unstable +12 V DC (via external AC/DC adapter: 90 – 264 V, 50/60 Hz AC input, 12 V DC output). |
| On/Off | Power switch. |
| WPS/Wi-Fi | After pushing the WPS/Wi-Fi button for no longer than 3s, the WLAN function will be enabled or disabled. |

The WPS/Wi-Fi button is on the side of the ZXHN F6201B device.

3.2 LED Indicators

Figure 3-2 LED Indicators of the ZXHN F6201B

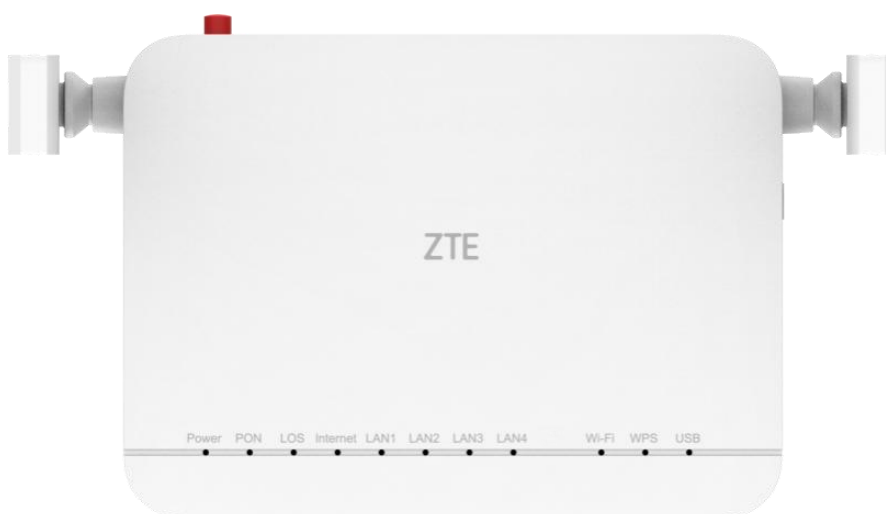


Table 3-2 Specification for the LED Indicators of the ZXHN F6201B

| LED | Color | Status Description |
|-------|-------------|----------------------------|
| Power | Off | The device is powered off. |
| | Solid green | The device is powered on. |

| LED | Color | Status Description |
|------------|---------------------|--|
| PON | Off | The device is powered off or the device has not started the registration process. |
| | Solid green | The device registration is successful. |
| | Slow Flashing green | The device is upgrading. |
| | Fast Flashing green | The device is registering. |
| LOS | Off | The device is powered off or the device received optical power is normal. |
| | Solid red | The optical transmitter of the PON interface is powered off. |
| | Flashing red | The received optical power is less than the optical receiver sensitivity. |
| Internet | Off | The device is powered off or there is no WAN connection with Internet properties configured, or the session is disconnected on user request or remote peer request (PPP disconnected, DHCP address released or no static IP address available on the Internet WAN connection). |
| | Solid green | There is IP connected (the ONT has a Internet WAN IP address from IPCP, DHCP or statically configured). |
| | Flashing green | IP traffic is passing through the Internet WAN connection (either direction). |
| LAN1-LAN 4 | Off | The device is powered off or the network link is not established. |
| | Solid green | The Ethernet port is connected but no data is transmitted via the Ethernet port. |
| | Flashing green | Data is being transmitted or received via the Ethernet port. |
| Wi-Fi | Off | The device is powered off or the wireless interface is disabled. |
| | Solid green | The wireless interface is enabled but no data is being transmitted or received. |
| | Flashing green | Data is being transmitted or received on the wireless interface. |
| WPS | Off | The device is powered off or the WPS function is disabled. |

| LED | Color | Status Description |
|-----|----------------|---|
| | Solid green | Some device has connected the device Wi-Fi using WPS. |
| | Flashing green | Some devices are trying to connect to the device. |

4 System Features

4.1 GPON Features

- ITU-T G.984 and ITU-T G.988 compatible
- Flexible mapping between GEM port and T-CONT
- Priority queuing and scheduling for upstream traffic
- AES-128 encryption
- FEC
- Five types of T-CONT
- Upstream traffic classification based on VLAN ID and 802.1p
- Multicast GEM port
- SN, password, and SN+password authentication
- Auto-restart and recovery after power failure

4.1.1 Bandwidth Allocation

- Static bandwidth allocation
 - ITU-T G.983.1 compliant static bandwidth allocation

- Dynamic bandwidth allocation (DBA)
 - Adopts fair DBA policy for the same CoS services during traffic congestion
 - Dynamic bandwidth status report mode complies with ITU-T G.984.3

4.1.2 GEM Adaptation

- GEM mode
- GEM frame mapping to GTC payload
- Ethernet data frame mapping to GEM frame; Ethernet frame mapping into GEM ports based on VLAN, CoS, or VLAN+CoS

4.1.3 T-CONT

- Five types of T-CONT
- T-CONT as the basic unit of the upstream service
- T-CONT allocation based on the user and CoS; mapping to T-CONT queue based on the CoS value or GEM port
- WRR, SP, or WRR+SP T-CONT queue scheduling mode

4.1.4 Operation and Maintenance

- Physical layer operations and maintenance (PLOAM) defined in ITU-T G.984.3
- OMCI and OMCI extension defined in ITU-T G.984.4 and ITU-T G.988

4.1.5 Optical Link Analysis and Diagnosis

- The optical module diagnostic interface analyses the parameters including operating temperature of the optical module, supply voltage, bias current, transmission power, and receiving power.

- Detection and auto shutdown of rogue ONTs.

4.2 Ethernet Features

4.2.1 MAC Address Features

- MAC address learning
- MAC address aging
- MAC address learning enable/disable
- MAC address learning limit
- MAC address binding to a user port. Only controls the input side of the port.
- Anti-MAC transferring (spoofing)
 - Forbids the MAC addresses learned from a user port to be transferred to other user port before aging.
 - Forbids the MAC addresses learned from an uplink port to be transferred to the user port.
- MAC filtering
 - Both the source and destination MAC addresses support the blacklist and the white list function.

4.2.2 VLAN Features

- IEEE 802.1q VLAN with the VLAN ID from 1 to 4094
- Eight bridge WAN Connection
- QinQ VLAN
- VLAN tagging/untagging on the user port

- VLAN overwrite function on the user port
- 1:1 mapping between the user port (physical port or logical port) and VLAN
- VLAN-based data forwarding
- VLAN-based packet filtering
- VLAN untagged mode, tagged mode and double tagged mode
- VLAN tag
 - Adds S-Tag to the untagged or priority tagged frames from the user port as per the needs.
 - Adds C-Tag and S-Tag to the untagged or priority tagged frames from the user port as needed.

4.3 Wi-Fi Features

The Wi-Fi function provides an easy, convenient, flexible, and cost-efficient method for users to access the Internet via a wireless LAN network.

- Supports 2.4GHz (2* 2 MIMO), IEEE802.11b/g/n/ax compliant
- Supports 5GHz (2* 2 MIMO), IEEE802.11a/n/ac/ax compliant
- Auto and manual channel selection
- Auto and manual rate control
- Transmission power control
- Four SSIDs per frequency band
- Maximum 32 users per frequency band
- SSID broadcast enabling/disabling, Split traffic across SSIDs
- Access control based on MAC address

- WPA2-PSK, and WPA3-PSK security authentication
- WPS
- WMM
- Beamforming
- MU-MIMO
- STAs accessing WiFi are not affected by nearby STAs with $RSSI \leq -80\text{dBm}$.

4.4 QoS Features

- Traffic rate limiting based on the user port, traffic, and GEM port
- Upstream traffic classification based on VLAN ID, VLAN priority level (IEEE802.1P), and Ethernet type (such as IP, PPPoE and ARP/RARP)
- Ethernet priority level tagging of the upstream services based on the DSCP value
- Ingress rate limiting
- Egress shaping
- The LAN port can load the capacity of 30 PCs simultaneously through the switch

4.5 Multicast Features

- IGMP v1/v2/v3, IGMP Snooping and MLD Snooping
- IGMP PROXY
- 256 multicast groups per LAN port
- Fast leave time-the interval, from when a user sends an IGMP leaving message to when the ONU stops the multicast data packet, is less than 20ms.
- Supports MVLAN

4.6 L3 Features

- Data forwarding and routing
 - Bridging, routing, or hybrid mode (bridging and routing)
 - Static routing
- Address management
 - DHCP server/client, Option 60
 - DHCP client, options 6, 15, 42, 50, 60, and 120
- PPPoE client
- DNS client/relay
- SNTP client
- NAT/PAT; The maximum number of NAT/PAT sessions is 8000
- ALG function: implements H.323, SIP, FTP, TFTP, PPTP, L2TP, IPSec, and RTSP private network traversal function; provides separate switches for each ALG function.

4.7 IPv6 Features

- Transparent transmission of IPv6 protocol packets
- IPv4/IPv6 dual stack
- MLD v1/v2 and MLD snooping
- Maximum Transmission Unit(MTU) of 1500 Bytes
- Maximum Jumbo frame size is 9000 Bytes
- IPv4 RFC1918

- CGNAT RFC6598
- IPv6 address management
 - SLAAC allocation mode on LAN side
 - DHCPv6 on LAN side
 - SLAAC on WAN side
 - DHCPv6 on WAN side
 - DHCPv6-PD on WAN side
 - PPPoE+DHCPv6 on WAN side
 - PPPoE+SLAAC on WAN side

4.8 Management Features

- OMCI management
- Web management
- TR-069 management
- Management via the OLT on the EMS
- Built-in capability for remote management with standards compliance, including the full range of FCAPS functions like supervision, analysis, and maintenance
- UNI loopback detection
- Remote software download, activation, and reboot via the OMCI
- Dual image, version download, update detection, and auto rollback

4.9 Security Features

- Traffic filtering based on UNI, VLAN ID, 802.1p, UNI + 802.1p, and VLAN + 802.1p
- Multicast , unicast and broadcast flow attack protection
- MAC address limiting based on each UNI or a single ONT
- Broadcast packet rate limiting
- Anti-DoS attack
- MAC filtering

4.9.1 Data Security of the GPON Interface

Because the GPON system works in broadcast mode in the downstream direction, malicious users can easily attack other users' messages. To enhance data security of the user, the GPON downstream provides AES-128 encryption.

4.9.2 Traffic Suppression

- Broadcast storm suppression
 - When the broadcast traffic including the unknown unicast and multicast traffic exceeds the threshold that the user sets, the broadcast traffic will be discarded till the traffic is reduced to an allowable range, thereby avoiding network congestion and ensuring normal operation of the network services.

4.10 Alarm Features

- Dying gasp
- Receiving optical power too high
- Receiving optical power too low

- Transmission optical power too high
- Transmission optical power too low
- Port loopback alarm
- Loss of signal
- Loss of frame
- Signal degradation alarm
- Loss of GEM channel delineation

4.11 Performance Statistic Features

4.11.1 Ethernet Port Performance Parameters

- Frames transmitted
- Bytes transmitted
- Unicast frames
- Multicast frames
- Broadcast frames
- Frames received
- Bytes received
- Unicast frames received
- Multicast frames received
- Broadcast frames received

5 Technical Indices and Parameters

5.1 Physical Structure, Environmental and Electrical Indices

Table 5-1 Specifications and Environmental Indices of the ZXHN F6201B

| Parameter | Nominal Value |
|-----------------------|--|
| Net dimensions | 150mm (W) x 110mm (D) x 40mm (H) (Not including antenna) |
| Net weight | 0.29kg |
| Noise | Null |
| Heat dissipation mode | Natural heat dissipation |
| Power supply | Rated 12 V DC (through the external AC/DC adapter) |
| Mounting | Desktop- or wall-mount |
| Operating environment | 0°C – 45°C |
| Storage temperature | 0°C – 60°C |
| Relative humidity | 5% – 95% |
| Atmospheric pressure | 70 – 106 kPa |

5.2 GPON Interface Indices and Parameters

Table 5-2 GPON Interface Indices of the ZXHN F6201B

| Parameter | Nominal Value |
|----------------|---|
| Connector type | SC/APC |
| Number of PON | 1 |
| Fiber type | Single-mode fiber |
| Wavelength | Transmitting : 1310 nm (PON) Receiving : 1490 nm (PON) |

| Parameter | Nominal Value |
|---|--------------------------------|
| Compliant standard of the PON interface | ITU-T 984.x |
| Receiving rate of the optical interface | 2.488 Gbps |
| Transmitting rate of the optical interface | 1.244 Gbps |
| Transmission wavelength range | 1290 – 1330 nm |
| Root-mean-square spectral width of the transmitting end | < 1 nm (spectral width: 20 dB) |
| Output optical power | 0.5 – 5 dBm |
| Optical power of the transmitter in output OFF status | < -45 dBm |
| Extinction ratio | > 10 dB |
| Receive range | 1480 – 1500 nm |
| Receive sensitivity | -27 dBm |
| Saturation optical power of the receiver | -8 dBm |
| Optical link length | 20 km |

5.3 Key Technical Indices

Table 5-3 Key Technical Indices of the ZXHN F6201B

| Parameter | Nominal Value |
|-----------------------------------|--------------------------|
| Configurable VLAN ID range | 1 – 4094 |
| Capacity of the MAC address table | 1K |
| Capacity of the multicast table | 1K |
| IGMP join delay | < 10 ms (single channel) |
| IGMP leave delay | < 10 ms (single channel) |
| Startup time | 80s (default) |
| T-CONTs | 32 |
| GEM ports | 256 |

6 Standards Compliance

Table 6- 1 Standards Compliance

| Standard | Description |
|------------------------|---|
| ITU-T G.984.1 | General characteristics for Gigabit-capable Passive Optical Networks (GPON) |
| ITU-T G.984.2 | Gigabit-capable passive optical networks (GPON): Physical media dependent (PMD) layer specification |
| ITU-T G.984.3 | Gigabit-capable Passive Optical Networks (G-PON): Transmission convergence layer specification |
| ITU-T G.984.4 | Gigabit-capable Passive Optical Networks (G-PON): ONT management and control interface specification |
| ITU-T G.984.5 | Gigabit-capable Passive Optical Networks (G-PON): Enhancement band |
| Broadband Forum TR-101 | Migration to Ethernet-Based DSL Aggregation, April 2006 |
| Broadband Forum TR-156 | Using GPON Access in the context of TR-101, December 2008 |
| IEEE Std 802.1D-2004 | Media Access Control (MAC) Bridges |
| IEEE Std 802.1Q-2005 | Virtual Bridged Local Area Networks |
| IEEE Std 802.1ad-2005 | IEEE Standards for Local and Metropolitan Area Networks—Virtual Bridged Local Area Networks—Revision—Amendment 4: Provider Bridges |
| IEEE 802.3-2005 | IEEE Standard for Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications (Includes: IEEE Std 802.3ae-2002, IEEE Std 802.3af-2003, IEEE Std 802.3ah-2004, IEEE Std 802.3aj-2003, IEEE Std 802.3ak-2004)(Revision of IEEE 802.3-2002) |

| Standard | Description |
|------------------------------|---|
| IEEE 802.1X-2004 | IEEE Standards for Local and Metropolitan Area Networks: Port-Based Network Access Control |
| ITU-T Y.1291 | An architectural framework for support of Quality of Service in packet networks |
| IETF RFC3261 | SIP: Session Initiation Protocol |
| IETF RFC1112 | Host extensions for IP multicasting |
| IETF RFC2236 | Internet Group Management Protocol, Version 2 |
| IETF RFC 3376 | Internet Group Management Protocol, Version 3 |
| EN 62368-1:2014+A11:2017 | Audio/video, information and communication technology equipment – Part 1: Safety requirements |
| EN IEC 62368-1:2020+A11:2020 | Audio/video, information and communication technology equipment – Part 1: Safety requirements |

7 Glossary

Table 7-1 Glossary

| Acronym | Full Term |
|---------|---------------------------------------|
| OMCI | ONU Management and Control Interface |
| AES | Advanced Encryption Standard |
| HSI | High Speed Internet |
| ARP | Address Resolution Protocol |
| MIMO | Multiple-Input Multiple-Output |
| FAT | File Allocation Table |
| NTFS | New Technology File System |
| PPP | Point to Point Protocol |
| IPCP | IP Control Protocol |
| PPPoE | Point to Point Protocol over Ethernet |
| DHCP | Dynamic Host Configuration Protocol |
| CDR | Call Detail Record |
| CoS | Class of Service |
| GEM | G-PON Encapsulation Mode |
| DBA | Dynamic Bandwidth Allocation |
| EMS | Element Management System |
| ACS | Auto-Configuration Server |
| LED | Light Emitting Diode |
| FEC | Forward Error Correction |
| FTP | File Transfer Protocol |
| TFTP | Trivial File Transfer Protocol |
| WMM | Wi-Fi Multi-Media |
| IGMP | Internet Group Management Protocol |
| MLD | Multicast Listener Discover |
| DNS | Domain Name System |
| FTTH | Fiber to the Home |

| Acronym | Full Term |
|---------|--|
| GE | Gigabits Ethernet |
| GFP | Generic Framing Procedure |
| GPON | Gigabit-capable Passive Optical Networks |
| IP | Internet Protocol |
| IPTV | Internet Protocol Television |
| ITU | International Telecommunication Union |
| L3 | Layer 3 |
| WAN | Wide Area Network |
| LAN | Local Area Network |
| MAC | Media Access Control |
| SNTP | Simple Network Time Protocol |
| NAT | Network Address Translation |
| L2TP | Layer Two Tunneling Protocol |
| PPTP | Point to Point Tunneling Protocol |
| RTSP | Real Time Streaming Protocol |
| ALG | Application Layer Gateway |
| SLAAC | |
| OLT | Optical Line Termination |
| ONT | Optical Network Terminal |
| ONU | Optical Network Unit |
| PON | Passive Optical Network |
| SN | Serial Number |
| QoS | Quality of Service |
| RARP | Reverse Address Resolution Protocol |
| SP | Service Priority |
| SP | Strict Priority |
| STB | Set Top Box |
| UNI | User Network Interface |
| VLAN | Virtual Local Area Network |
| VoD | Video on Demand |
| WPS | Wi-Fi Protected Setup |

| Acronym | Full Term |
|---------|--------------------|
| WRR | Weight Round Robin |