SmartAX MA5633 D-CCAP CMC Device V800R017C00

Product Overview

Huawei SmartAX MA5633 distributed converged cable access platform (D-CCAP) coaxial media converter (CMC) device (MA5633 for short) is a full-service, digital cable network device designed for fiber deep migration. Installed at the edge of an HFC network, the MA5633 delivers a Gigabit bandwidth to a single group of users at a lower cost than FTTH. With the built-in EQAM or optical receiver, the MA5633 is fully backward compatible to existing QAM-based services. A Huawei OLT located at the head end aggregates up to hundreds of distributed MA5633s and provides space, power, and cooling efficiencies required for a large-scale transition toward fiber deep. Positioning to support the SDN framework, the D-CCAP further evolves HFC.

Product Highlights

High-performance DOCSIS3.1

- ✓ DOCSIS3.1 performance improves significantly: 10% CMs reach 4096 QAM by I-CCAP, 80% CMs reach 4KQAM by D-CCAP which is the only architecture supporting real DOCSIS 3.1 with 4KQAM benefit from CNR.
- ✓ One step DOCSIS3.1 Deployment: Hardware is ready for DOCSIS3.1 2*192 MHz DS, comparing I-CCAP need change platform and boards by stages.
- ✓ E2E DOCSIS3.1 Solution: CMC, Cable Modem, ODN, HFC components and professional service.

High Integration

- ✓ Built-in optical receiver or transmitter
  - ◆ Significantly simplifies installation and cable connections because only one chassis needs to be installed.
  - ◆ Reduces installation space, resolving issues caused by space limitations on installing a ground-based network box.
  - ◆ Supports remote management and alarm generation for the optical receiver or transmitter.
- ✓ Built-in wavelength division multiplexing (WDM)

  The built-in WDM applies in newly deployed networks where feeder fibers are insufficient, which reduces optical fiber investments and fiber routing.
- ✓ Built-in edge quadrature amplitude modulation (EQAM)

  The built-in EQAM applies in newly deployed networks or the networks requiring reconstruction in both downstream and upstream directions. On these networks, no external EQAM needs to be purchased or installed in a hub equipment room, which reduces investments and maintenance costs and simplifies hub equipment room deployment.

Converged Services

- ✓ Supports heterogeneous access and shared platform for provisioning cable and fiber to the home (FTTH) services, which simplifies coordinate network construction.
- ✓ Supports L2VPN business services over DOCSIS (BSoD).
  - ◆ Dot1Q-based and Dot1ad-based L2VPN services
  - ◆ MPLS-based L2VPN service (An OLT model MA5800 is required.)
- ✓ Provides an integrated solution for video and data services using a built-in EQAM, which simplifies network deployment.
- ✓ Broadcasting (BC) redundancy protects TV service flows so that when a service flow fails, the other service flow can be normally forwarded. This effectively ensures that users can watch TV programs when a network fault occurs.

Power Saving

- ✓ Supports RX/TX module shutdown and RF port group shutdown through the CLI, reducing power consumption of the device.

Complete Maintenance and Management

- ✓ Supports centralized management. In this mode, the MA5633 is plug-and-play and regarded as a service board of the OLT. The functions of the combined OLT and MA5633 are the same as those of centralized CCAPs. All maintenance operations are performed on the OLT. The OLT supports remote configuration, upgrades, and O&M for the MA5633. This allows simple and efficient maintenance and management.
- ✓ Supports smart RF adjustment. With this feature, the CLI or NMS can be used to pre-configure the downstream expected Tx power of the MA5633, and upstream attenuation and equalization of the combiner. The mobile APP can be used to query MA5633 parameters and set RF parameters. Parameters such as Tx power of the MA5633 can be adjusted remotely, simplifying MA5633 O&M and reducing O&M costs.
- ✓ Supports upstream spectrum scanning. Upstream cable channels are prone to interference from external noises, which adversely affect CMs and user services.
  - ◆ In spectrum planning, this function enables the MA5633 to obtain noise distribution on upstream channels so that the MA5633 can configure services in the frequency bands with weakest noises, minimizing noise interference on services.
  - ◆ In network O&M, this function can be used to detect line noises to assist fault diagnosis.
  - ◆ This function supports the spectrum scanning file storage for follow-up manual analysis.
  - ◆ The U2000 supports upstream spectrum scanning. Spectrum range 0 – 204 MHz supports quiet noise scanning, carrier with noise scanning, and free running scanning. The sampling is performed at an interval of 100 ms and step of 60 kHz. The collected data is displayed at a delay of 10 – 40s.
- ✓ Supports proactive network maintenance (PNM): Before a network fault adversely affects user services, the fault diagnosis system connected to the MA5633 detects this fault based on the analysis on the pre-equalization coefficients obtained between CMs and the MA5633. This function maximally decreases faults, thereby reducing network O&M costs and improving carriers' service level agreement (SLA).
- ✓ Supports maintenance using mobile Apps. Using mobile Apps, CMCs, cables, and CMs can be maintained, and the following information can be queried: CMC statuses and locations, downstream and upstream channel parameters of cables, MAC and IP addresses of CMs, and working channels of CMs.

Reliability Design

The MA5633 meets requirements of IP65 protection level. It supports a wide temperature range and can be used in extreme weather conditions. In addition, it applies low power consumption and noise design.

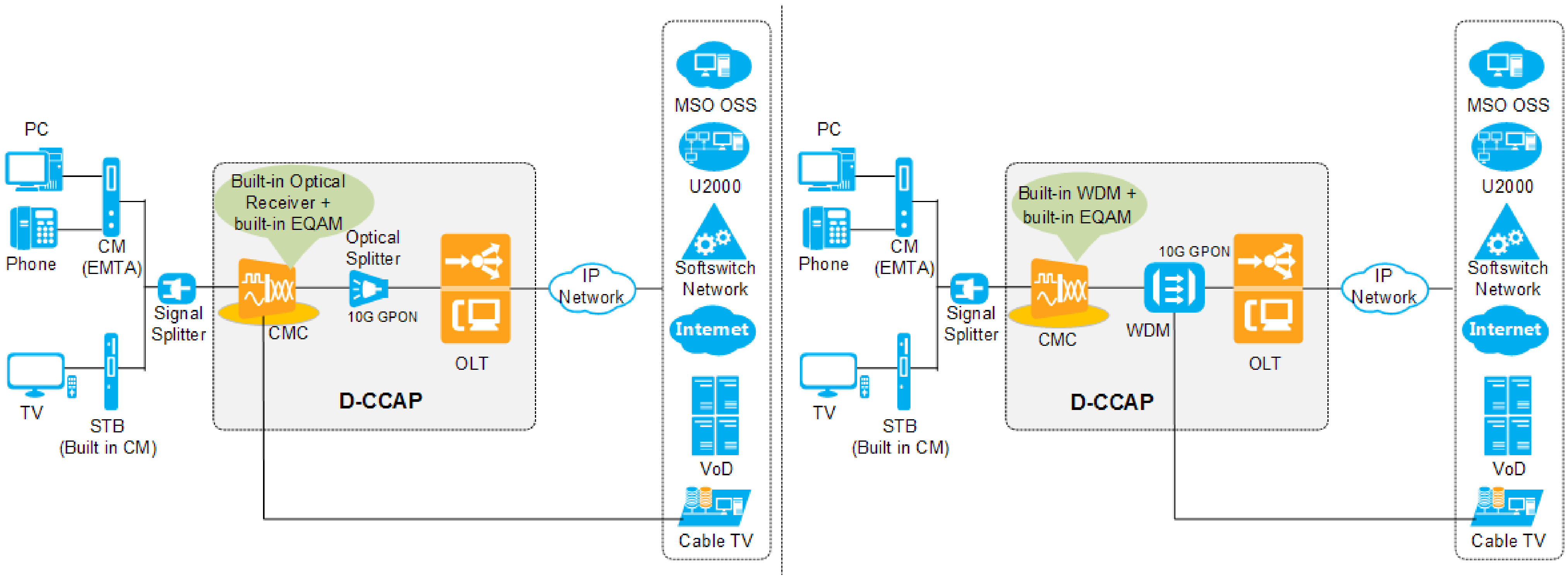
The shell of the MA5633 is made of die casting aluminum alloy, which enables the bottom layer of the shell to use cooling grooves to implement passive cooling.

The surge protection level of the MA5633 is as follows: 6 kV in both common and differentiated modes for the AC power port; 10 kA in common mode and 3 kA in differentiated mode for RF ports.

Application Scenarios

- Provides the HSI, VoD, BC, and dynamic voice services for residential users to meet multiple service operators (MSOs)' service requirements.
- Provides the L2VPN/L3VPN BSoD service for enterprise users.
- Provides the WLAN hotspot backhaul service using APs.

Figure1 Typical D-CCAP networking of the MA5633

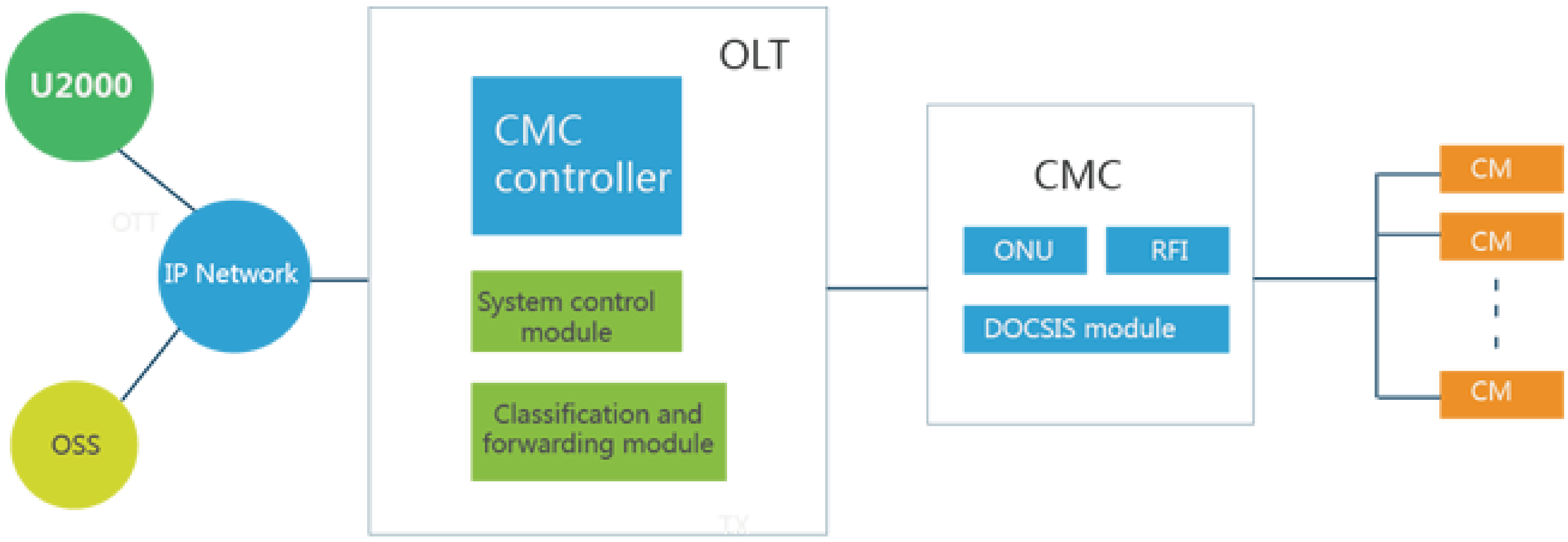


D-CCAP Network Structure

A distributed converged cable access platform (D-CCAP) network consists of an optical line terminal (OLT), CMCs, and a U2000 network management system, complying with the remote MACPHY architecture requirements specified by CableLabs DCA (Data-Over-Cable Service Interface Specifications).

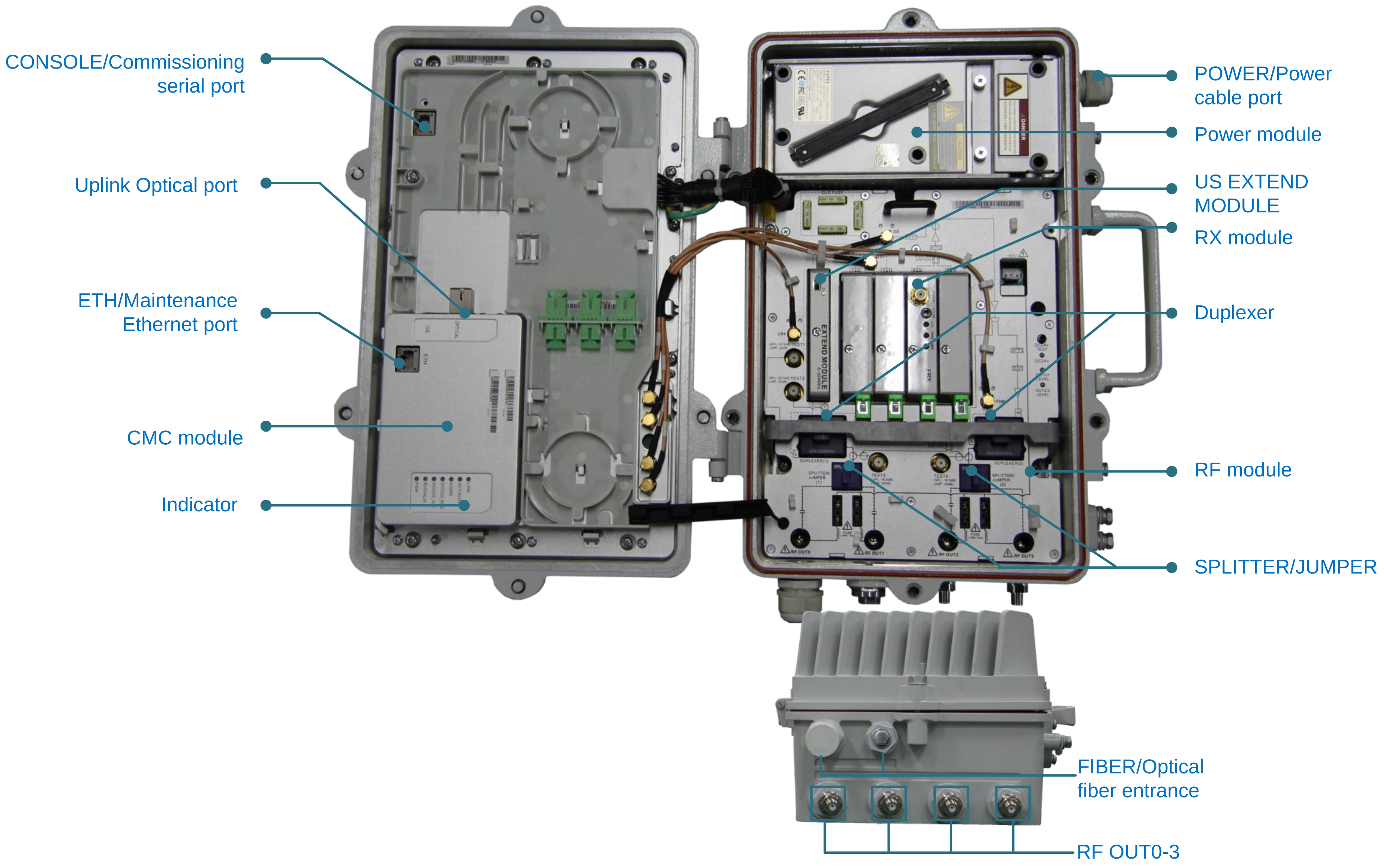
- OLT: an aggregation device (CMC controller) that terminates the PON protocol and locates in a central office (CO). The OLT manages CMCs in a centralized manner.
- CMC: forwards data signals at Layer 2 between the upper-layer network and the HFC network.
- U2000: virtually manages and maintains NEs and services in the D-CCAP network.

Figure 2 D-CCAP Network Structure



Hardware Structure

Figure 3 Hardware structure



Port Description

Port Type	Silkscreen	Description	Count
Power port	Power	Introduces the 220 V AC power to the MA5633. NOTE Block this port if you do not use it. Replace this port with an F connector when the MA5633 uses the 60 V AC power supply.	1
Uplink optical port	OPTICAL	Provides one uplink port, which can be a 10G GPON port, which uses a small form-factor pluggable (SFP) module.	1
Optical RX port on the built-in optical transceiver	RX	Can only be of the SC/APC type.	1
Optical TX port on the built-in optical transmitter	TX	Can only be of the SC/APC type.	0 or 2
Commissioning serial port	CONSOLE	Supports local maintenance and remote maintenance.	1
Maintenance Ethernet port	ETH	A 100M Base-T commissioning Ethernet port and supports 100M full-duplex autonegotiation.	1
RF port	RF OUT	Inputs and outputs CATV and data signals.	4 RF outputs or 2 RF outputs • 4 RF outputs using the signal splitter • 2 RF outputs, for example using jumper, RF ports 1 and 3 are available • 2 RF outputs, for example using the CLI to shut down an RF port group, RF ports 2 and 3 are available • 1 RF output, for example using the jumper and CLI to shut down RF port group 1, RF port 3 is available

Replaceable Modules

- DUPLEXER: supports frequency divisions in 65 MHz/87 MHz, 85 MHz/108 MHz, and 204 MHz/258 MHz. Frequency division supports only upgrade from low frequency division (such as 65 MHz/87 MHz) to high frequency division (such as 204 MHz/258 MHz) (does not support downgrade from high frequency division to low frequency division). By default, 65 MHz/87 MHz is used.
- US EXTEND MODULE: When its DIP switch is set to SG_N, it supports 2-channel separated Tx signal backhaul in the upstream direction. When its DIP switch is set to SG_1, it supports signal backhaul through only TX0.

  The following table lists the relationship between the DUPLEXER and US EXTEND MODULE.

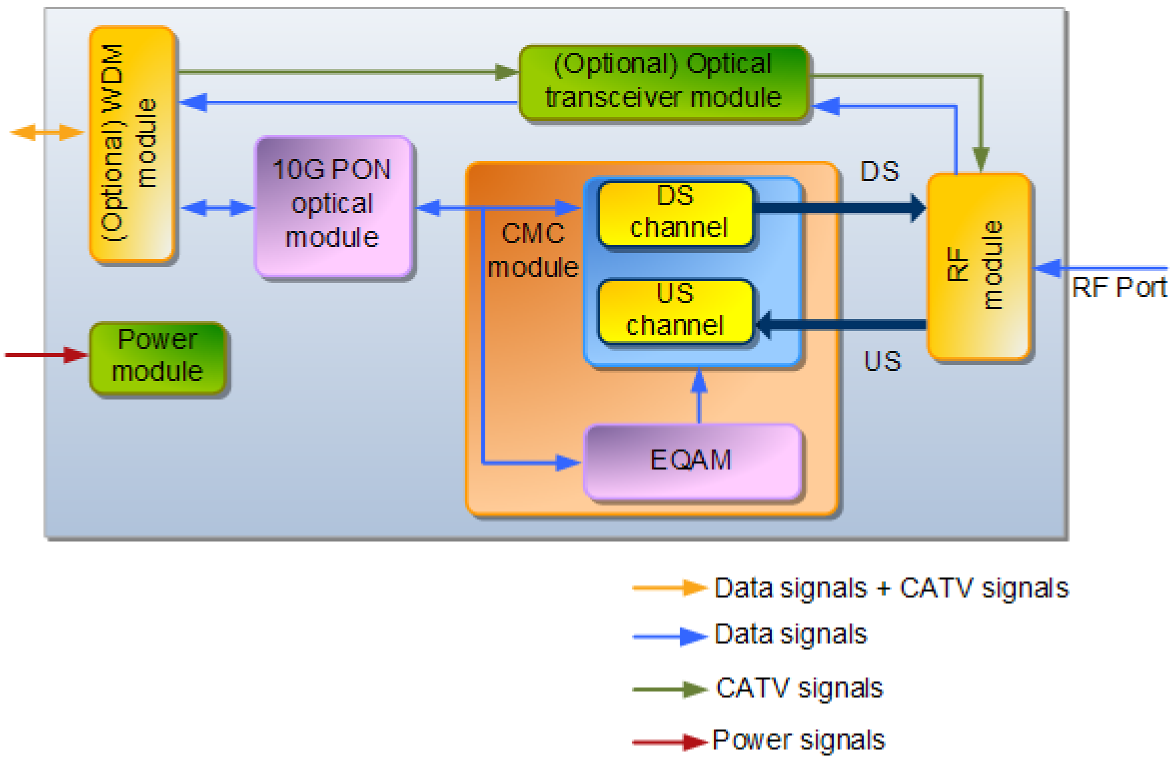
DUPLEXER	US EXTEND MODULE
65 MHz/87 MHz	5 - 65 MHZ
85 MHz/108 MHz	5 - 85 MHZ
204 MHz/258 MHz	5 - 204 MHZ

If the DUPLEXER is replaced, this module needs to be replaced either to support different frequency divisions.

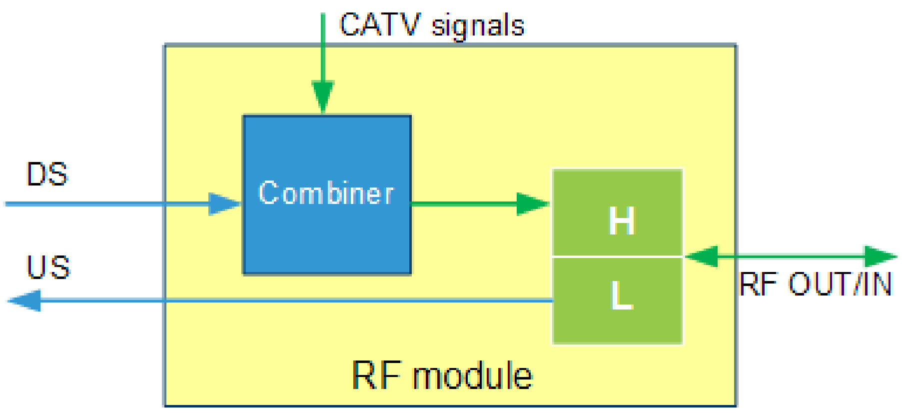
- SPLITTER/JUMPER: the splitter is used by default. In this condition, 4 RF ports are used for signal output. If the jumper is used, 4 RF ports are changed to 2, that is, RF ports 1 and 3 are used for signal output and RF ports 0 and 2 have no signal output.
- RX/TX (FRX/RTX): supports 2 RX modules and 2 TX modules. The 2 RX modules back up with each other and 2 TX modules support standalone return. The number of RX and TX modules can be configured according to actual requirements.

Functional Modules

Figure 4 Functional diagram



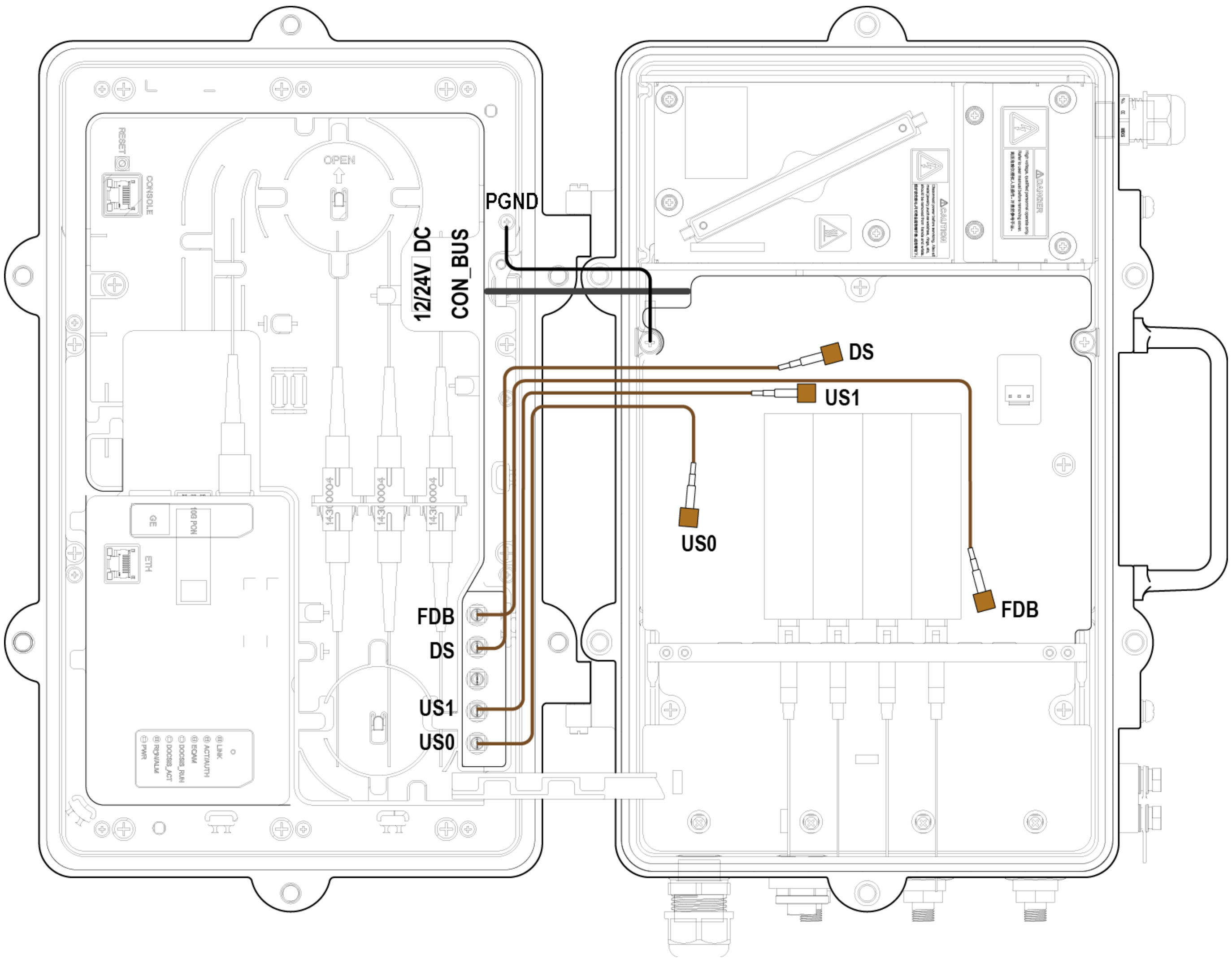
Functional modules include the power module, optical receiver/transceiver module, CMC module, and RF module, which are separate modules.

<table>
<tr><th>Module</th><th>Function</th></tr>
<tr><td>Power module</td><td>Converts the input 220 V AC or 60 V AC voltage to the 24 V and 12 V DC voltage required by each module.</td></tr>
<tr><td>WDM module</td><td>The WDM combiner located in the branch equipment room combines data signals with CATV signals for transmission over one feeder fiber and the WDM module built in the MA5633 on an FN separates data signals from CATV signals.
✓ In the downstream direction, the WDM module sends the CATV signals to the optical receiver or transceiver module and the data signals through 10G GPON optical module to the CMC module for forwarding.
✓ In the upstream direction, the WDM module sends the data signals to the upper-layer device.</td></tr>
<tr><td>Optical receiver or transmitter</td><td>The functions of an optical receiver or transmitter module are as follows:
✓ Optical receiver module: converts optical signals to RF signals. An optical receiver module consists of optical receiving components, an RF power amplifier and a gain regulator.
The RF signals after O/E conversion are sent to the RF module.
✓ Optical transmitter module: converts RF signals to optical signals. The optical transmitter provides OOB signal backhaul for the VoD service and transponder signal backhaul for the lower-layer amplifier. It uses the optical backhaul transmitter module built in the MA5633 to send OOB and transponder signals in an upstream frequency band to the head end OOB server and transponder controller, respectively, for modulation.</td></tr>
<tr><td>CMC module</td><td>Converts data between the upper-layer network and the HFC network.
✓ In the downstream direction, the CMC module modulates data signals to RF signals and sends the RF signals to the RF module.
✓ In the upstream direction, the CMC module demodulates the RF signals sent by the RF module to data signals for data conversion.</td></tr>
<tr><td>RF module</td><td>✓ In the downstream direction, the RF module uses a combiner to combine downstream signals with CATV signals. The combined signals are high-frequency signals. These signals pass through a high-pass/low-pass filter to CMs connected to RF ports.
✓ In the upstream direction, upstream signals are low-frequency signals. They pass through RF ports and a high-pass/low-pass filter over upstream channels to the RF module for modulation.

</td></tr>
</table>

Module	Function
EQAM	Multiplexes and modulates IP-based media data to RF signals and sends these signals over downstream channels to the RF module and then to STBs.

Block Diagram

Figure 5 Internal cable connection



Brown cables:

- ✓ FDB cable: monitors CATV and downstream CMC signals.
- ✓ DS cable: transmits downstream CMC data.
- ✓ US1 and US0 cables: transmits upstream backhaul data.

Black cables: power and device control signal cables (controlling power and combiner signals).

CMC Module Specifications

10G GPON Upstream Transmission	Description	Notes
Standards compliance	ITU-T G.987	-
Port type	SC/UPC	-
TX rate	2.488 Gbit/s	-
RX rate	9.953 Gbit/s	-
TX wavelength	1270 nm	-
RX wavelength	1577 nm	-
Minimum TX optical power	2 dBm	-
Maximum TX optical power	7 dBm	-
RX sensitivity	–28 dBm	-
Overload optical power	–8 dBm	-
Transmission distance	20 km	-

Performance Parameter of the Integrated Device	Description	Notes
Maximum throughput	**DOCSIS 3.1:** ✓Downstream: 3.6G @4096 QAM ✓Upstream: 1.5G@ 2048 QAM **DOCSIS 3.0:** ✓Downstream: 1600 Mbit/s@256 QAM ✓Upstream: 400 Mbit/s@256 QAM **BC+VoD:** 64*50Mbps	1 and 2
Number of supported service flows	4000 in both downstream and upstream directions	-

Number of concurrent online CMs	1023 DOCSIS 3.0-compliant and DOCSIS 3.1-compliant CMs (300 at most)	-
System reliability specifications	System availability for the typical configuration: > 99.999% Mean time between failures (MTBF): about 35 years.	3

Notes:

1: The rate is obtained at the PHY layer.

2: DOCSIS 3.1: The test is performed under the conditions of 2 192 MHz OFDM channels and 2 96 MHz OFDMA channels.

DOCSIS 3.0: The test is performed under the conditions of 32 downstream channels (8 MHz per channel) and 10 upstream channels (6.4 MHz per channel).

3. Due to different network environments and different configurations used by devices, the preceding MTBF (35 years) of the MA5633 is only for reference. The preceding values are only for reference. For details, contact the related Huawei engineers.

Performance Parameter of the DOCSIS Module	Description	Notes
Standards compliance	DOCSIS 3.1, DOCSIS 3.0 or DOCSIS 2.0	-
Upstream communication protocol	ATDMA, OFDMA	-
Frequency band	**DOCSIS 3.0 European standard 1:** ✓Downstream: 87–1006 MHz ✓Upstream: 5–65 MHz **DOCSIS 3.0 European standard 2:** ✓Downstream: 108–1006 MHz ✓Upstream: 5–85 MHz **DOCSIS 3.1 standard 1:** ✓Downstream: 87–1218 MHz ✓Upstream: 5–65 MHz **DOCSIS 3.1 standard 2:** ✓Downstream: 108–1218 MHz ✓Upstream: 5–85 MHz **DOCSIS 3.1 standard 3:** ✓Downstream: 258–1218 MHz ✓Upstream: 5–204 MHz	1
Channel width	**DOCSIS3.0:** ✓Downstream: 6MHz or 8 MHz ✓Upstream: 1.6 MHz, 3.2 MHz, or 6.4 MHz **DOCSIS3.1:** ✓Downstream: 192 MHz ✓Upstream: 96 MHz	-
Number of channels	**Downstream:** ✓DOCSIS 3.1: 2 ✓DOCSIS 3.0: 32 ✓BC+VoD: 64 SC-QAM channels **Upstream:** ✓DOCSIS 3.1: 2 ✓DOCSIS 3.0: 10	-
Modulation	**DOCSIS 3.0:** ✓Downstream: 64 QAM or 256 QAM ✓Upstream: QPSK, 16 QAM, 32 QAM, 64 QAM, or 256 QAM **DOCSIS 3.1:** ✓Downstream: 16 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 1024 QAM, 2048 QAM or 4096 QAM ✓Upstream: BPSK, QPSK, 16 QAM, 32 QAM, 64 QAM, 128 QAM, 256 QAM, 512 QAM, 1024 QAM or 2048 QAM	-
Maximum QAM output level (obtained based on the number of CMC channels)	33 dBmV@160 channels 34 dBmV@128 channels 38 dBmV@64channels 42 dBmV@32 channels 45 dBmV@16 channels 49 dBmV@8 channels 52 dBmV@4 channels 56 dBmV@2 channels 60 dBmV@1 channel	2
Output impedance	75 ohms	-
Upstream input level (can be configured using software)	**DOCSIS 3.0:** –13.0 dBmV to 23.0 dBmV **DOCSIS 3.1:** –10 dBmV to 10 dBmV	3
Downstream MER	**DOCSIS 3.0:** ≥ 43 dB (after equalization)	4

	≥ 35 dB (before equalization) **DOCSIS 3.1:** ● 87–600 MHz: ≥ 48 dB (a single carrier) ≥50 dB (average value of multiple OFDM channels) ● 600–1002 MHz ≥ 45 dB (a single carrier) ≥ 47 dB (average value of multiple OFDM channels) ● 1002–1218 MHz: ≥ 43 dB (a single carrier) ≥ 45 dB (average value of multiple OFDM channels)	

Notes:

1: DOCSIS 3.0 European standards 1 and 2 specify different RF module configurations. DOCSIS 3.1 standards 1, 2 and 3 specify different duplexers and US EXTEND MODULEs.

2. The channel width of each channel is 6 MHz. The output level of each channel can be reduced based on the maximum output level.

The CMC output is flat. The output level of each channel can be configured. Configure the output level for channels one by one. The maximum downstream output level can be set by running the **cable downstream** *channel-id* **rf-power** *value* command.

3: The range of the upstream input level is the collection of powers supported by all frequency ranges. When the configured upstream input level is out of the value range specified by the protocol, the CMC adjusts the upstream input level. The following table lists the adjustment method and the value range supported by the protocol.

DOCSIS 3.0:

Frequency Range (Unit: kHz)	Value Range of the Upstream Input Level (Unit: dBmV)	Notes
1600	–13 to 17	-
3200	–10 to 20	-
6400	–7 to 23	-

DOCSIS 3.1:

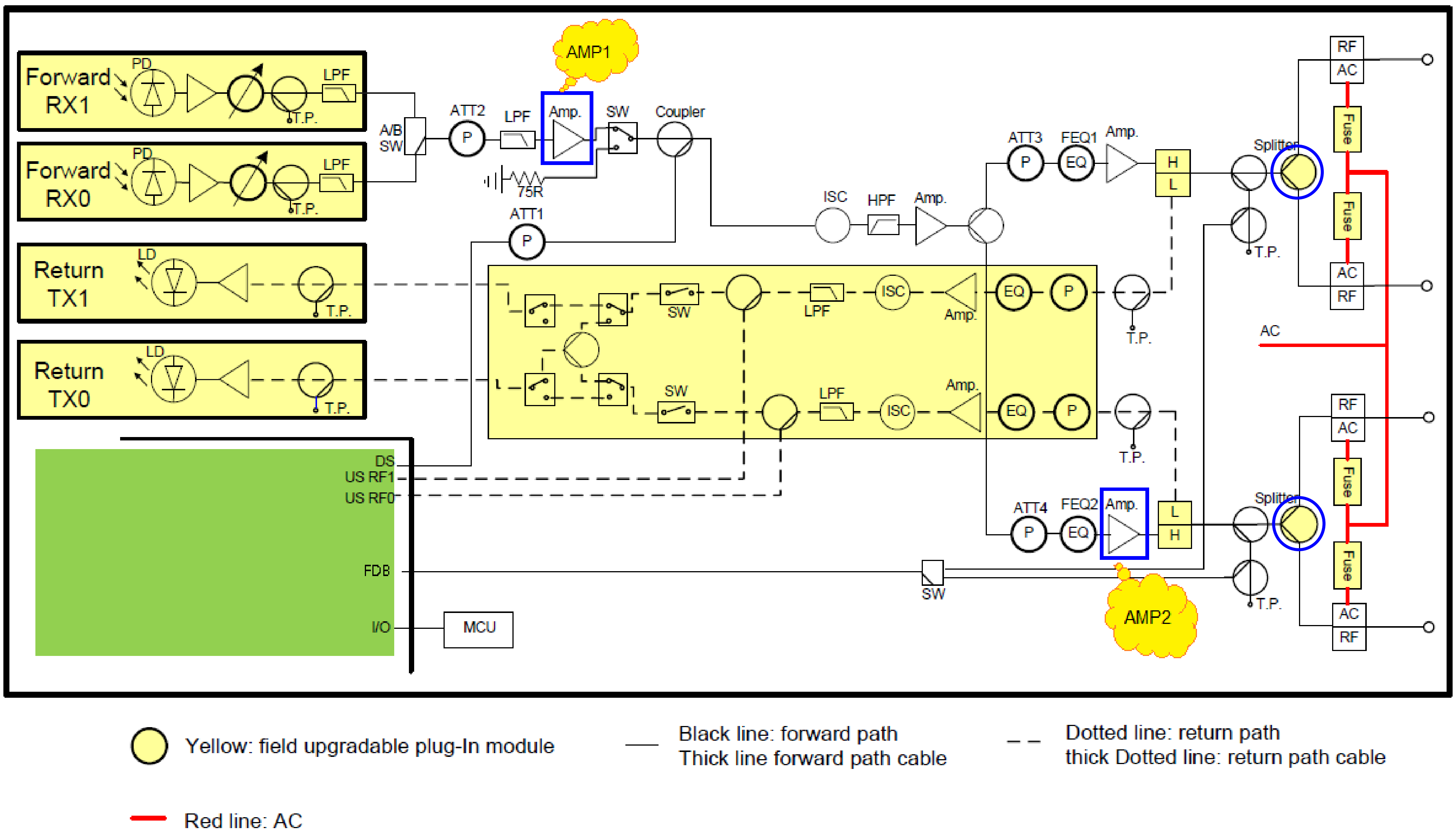
Value Range of the Upstream Input Power (Unit: dBmV@ 1.6MHz)	-10 to 10	-

4: The values are obtained on CMC RF_OUT ports.

DOCSIS 3.1 MER test conditions: 192 MHz OFDM channel, total frequency width 528 MHz (2 x 192 MHz + 144 MHz); equal to 88 DOCSIS 3.0 channels (calculated using the U.S. standard 6M channel bandwidth)

RF Section Specifications

Figure 6 RF module diagram



- RX and TX on the RF combiner can be shut down through the CLI. Then, AMP1 is concurrently shut down. When the RX/TX module is not used, the power consumption of the device is reduced through power saving.

- The RF port group (group 1 contains P0 and P1) on the RF combiner can be shut down through the CLI. Then, AMP2 is shut down to shut down RF port group 1 and enable only 2 RF outputs (P2 and P3). JUMPER also supports 2 RF outputs but the power consumption remains the same. When only 2 RF ports are used, the power consumption is reduced through power saving.
- SPLITTER/JUMPER: the splitter is used by default. In this condition, 4 RF ports are used for signal output. If the jumper is used, 4 RF ports are changed to 2, that is,P1 and P3 are used for signal output and P0 and P2 have no signal output.

Notes:

In the figure, T.P indicates the test point TEST.

Forward Station Performance	Description	Notes
Frequency range (downstream)	✓DOCSIS 3.0 European standard 1: 87–1006 MHz ✓DOCSIS 3.0 European standard 2: 108–1006 MHz ✓DOCSIS 3.1 standard 1: 87–1218 MHz ✓DOCSIS 3.1 standard 2: 108–1218 MHz ✓DOCSIS 3.1 standard 3: 258–1218 MHz	1
Operational gain (from DS to RF_OUT)	15±1 dB	2
Operational gain (from CATV to RF_OUT)	45±1 dB	2
Frequency flatness	✓±0.75 dB@87–750 MHz ✓±1 dB@87–1218 MHz ✓±0.75 dB@108–750 MHz ✓±1 dB@108–1218 MHz ✓±0.75 dB@258–750 MHz ✓±1 dB@258–1218 MHz	-
EQ	0–22 dB (Default value: 18 dB)	3
Port-to-port isolation	✓≥ 40dB (87-1006MHz) ✓≥ 35dB (1006-1218MHz)	4
Maximum output level@1218 MHz @18dB EQ	112dBuV@4 RF OUT (splitter by default) 116dBuV@2 RF OUT (jumper)	5
Output return loss	≥ 16 dB (5–1218 MHz)	6
Hum modulation	Downstream: ✓≥ 65dB @87–862 MHz ✓≥ 60dB @862–1218 MHz Upstream: ✓≥ 60dB @5–10 MHz ✓≥ 65dB @10–204 MHz	7
Test point	✓20±0.75 dB@87–1218 MHz (jumper) ✓16.5±0.75 dB@87–1218 MHz (splitter)	-
Output impedance	75 ohms	-
Current pass-through capability	15 A (35–95 V AC pass-through voltage)	-
Distortion@79 NTSC+75 256QAM (with RX module)	✓CSO ≥ 65 dB ✓CTB ≥ 68 dB ✓CNR ≥ 51 dB ✓XMOD ≥ 60 dB	8

Notes:

1: European standards 1 and 2 specify different RF module configurations. All European standard 2 parameters can be obtained in European standard 1. DOCSIS 3.1 standards 1, 2 and 3 specify different duplexers and US EXTEND MODULEs.

2: The test is performed at 0 dB attenuation and 18 equalization in the downstream direction within the frequency band of 87–1218 MHz.

3. The frequency ranges from 87 MHz to 1218 MHz.

4: This indicates the isolation between a port of RF port 0 and RF port 1 and a port of RF port 2 and RF port 3.

5: The test is performed at 18 dB equalization. The QAM carrier level is –6 dB lower than the analog video carrier level. The output level of the RF port on the integrated device is adjusted based on the actual output level of the DS port on the CMC and the attenuation of the RF module.

6. This indicator is tested under default splitter and diplexer 65 MHz/87 MHz.

7: The test is performed at the 15 A pass-through current in the frequency band of 87–1218 MHz.

8: The test is performed in conditions: loaded with 79 NTSC CW carriers from 77–550 MHz. QAM refers to 550–1006 MHz loading. input optical signals of 0 dBm and OMI 3.5%.

Reverse Station Performance	Description	Notes
Frequency range (upstream)	✓DOCSIS 3.0 European standard 1: 5–65 MHz ✓DOCSIS 3.0 European standard 2: 5–85 MHz ✓DOCSIS 3.1 standard 1: 5–65 MHz ✓DOCSIS 3.1 standard 2: 5–85 MHz ✓DOCSIS 3.1 standard 3: 5–204 MHz	1
Operational gain (from RF_OUT to US port)	–6±1 dB (splitter) –2.5±1 dB (jumper)	2

Frequency response	±0.75 dB@5–65 MHz ±0.75dB@5–85 MHz ±0.75dB@5–204 MHz	-
Test point	✓20±0.75 dB@5–204 MHz (jumper) ✓23.5±0.75 dB@5–204 MHz (splitter)	-
Attenuator	0–20 dB	-
EQ	0–5 dB (Default value: 0 dB)	-
Path-to-path isolation	≥ 23 dB (5–204 MHz)	-
Upstream NPR	See figures 7 and 8.	-

Notes:

1: European standards 1 and 2 specify different RF module configurations. All European standard 2 parameters can be obtained in European standard 1. DOCSIS 3.1 standards 1, 2 and 3 specify different duplexers and US EXTEND MODULEs.

2: The test is performed at 0 dB attenuation and equalization in the upstream direction within the frequency band of 5–204 MHz.

Figure 7 Port3 to US1 NPR

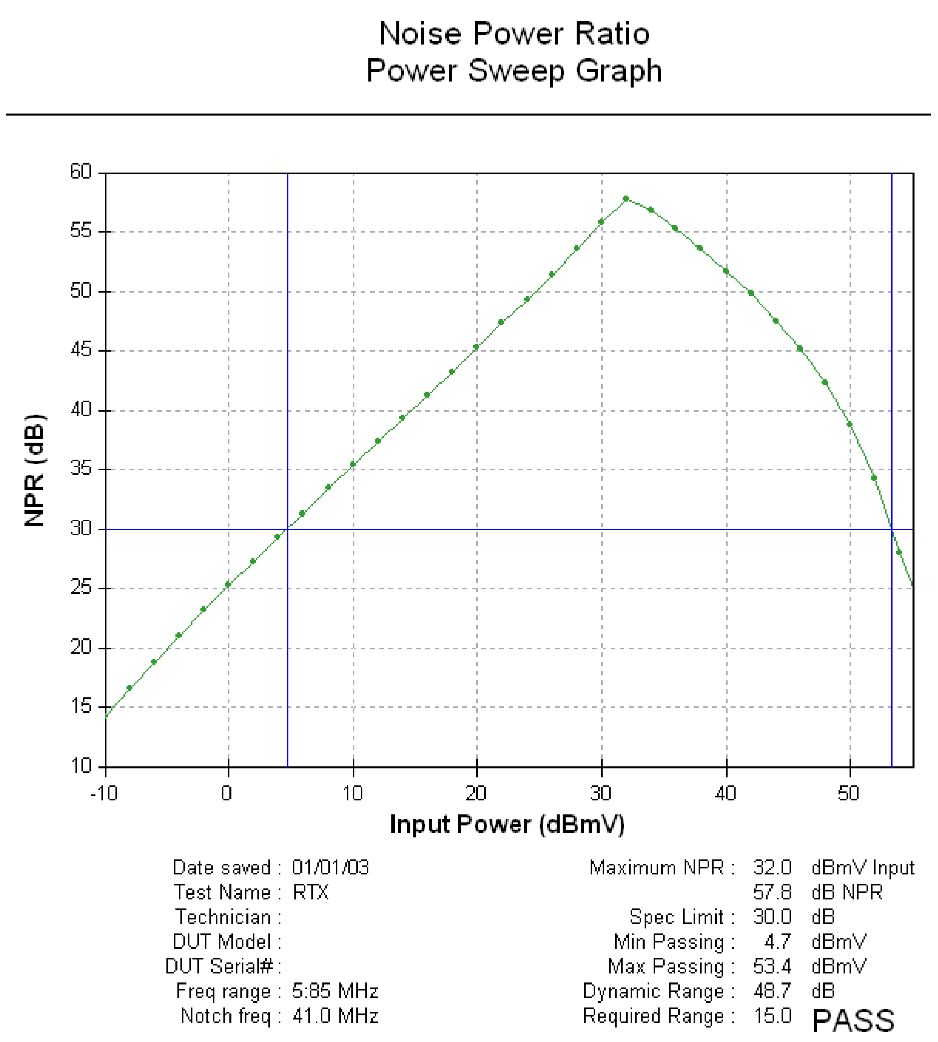
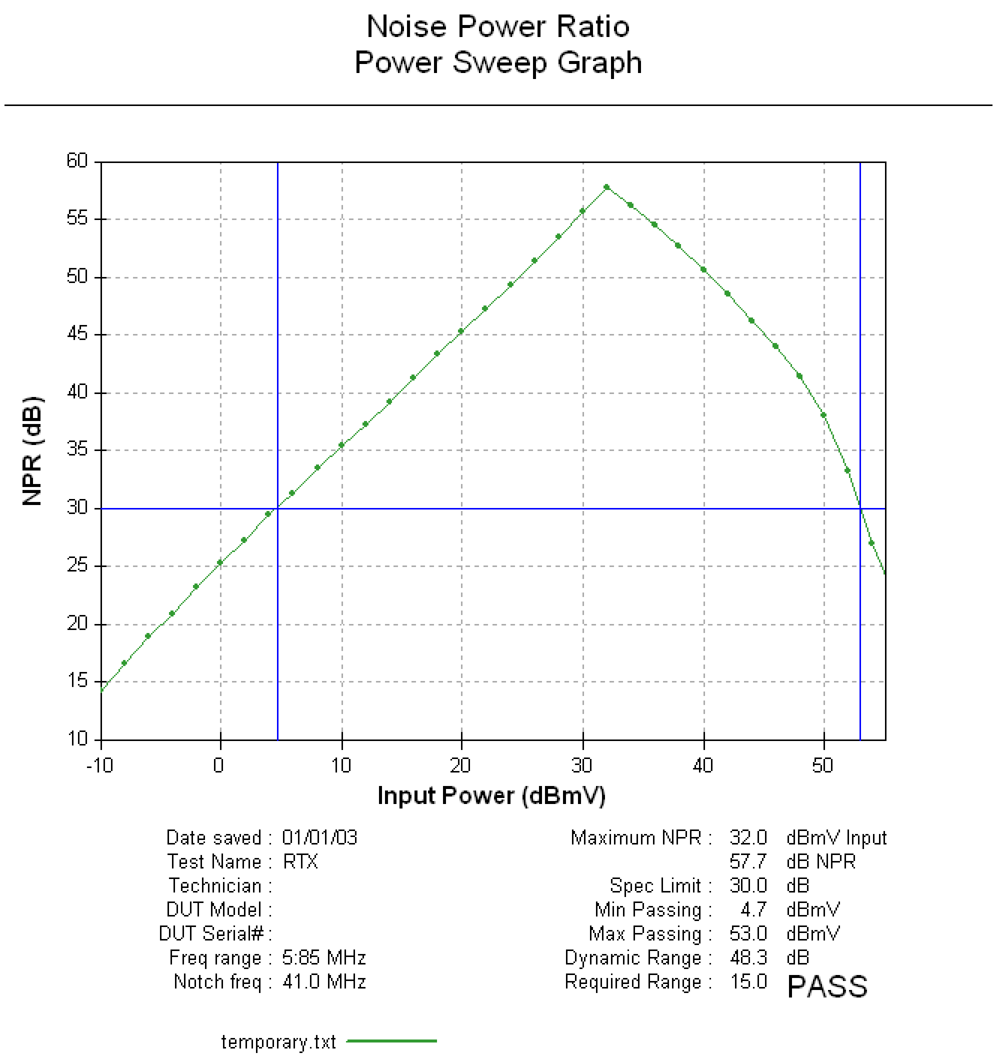
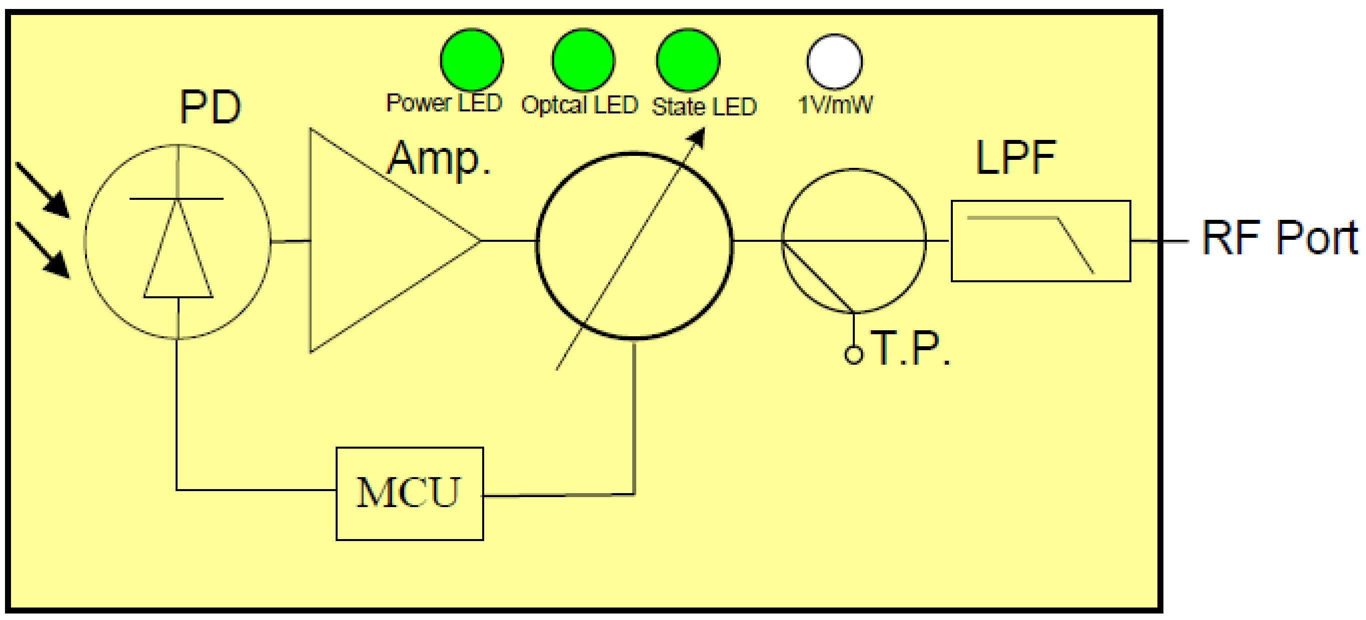


Figure 8 Port1 to US0 NPR



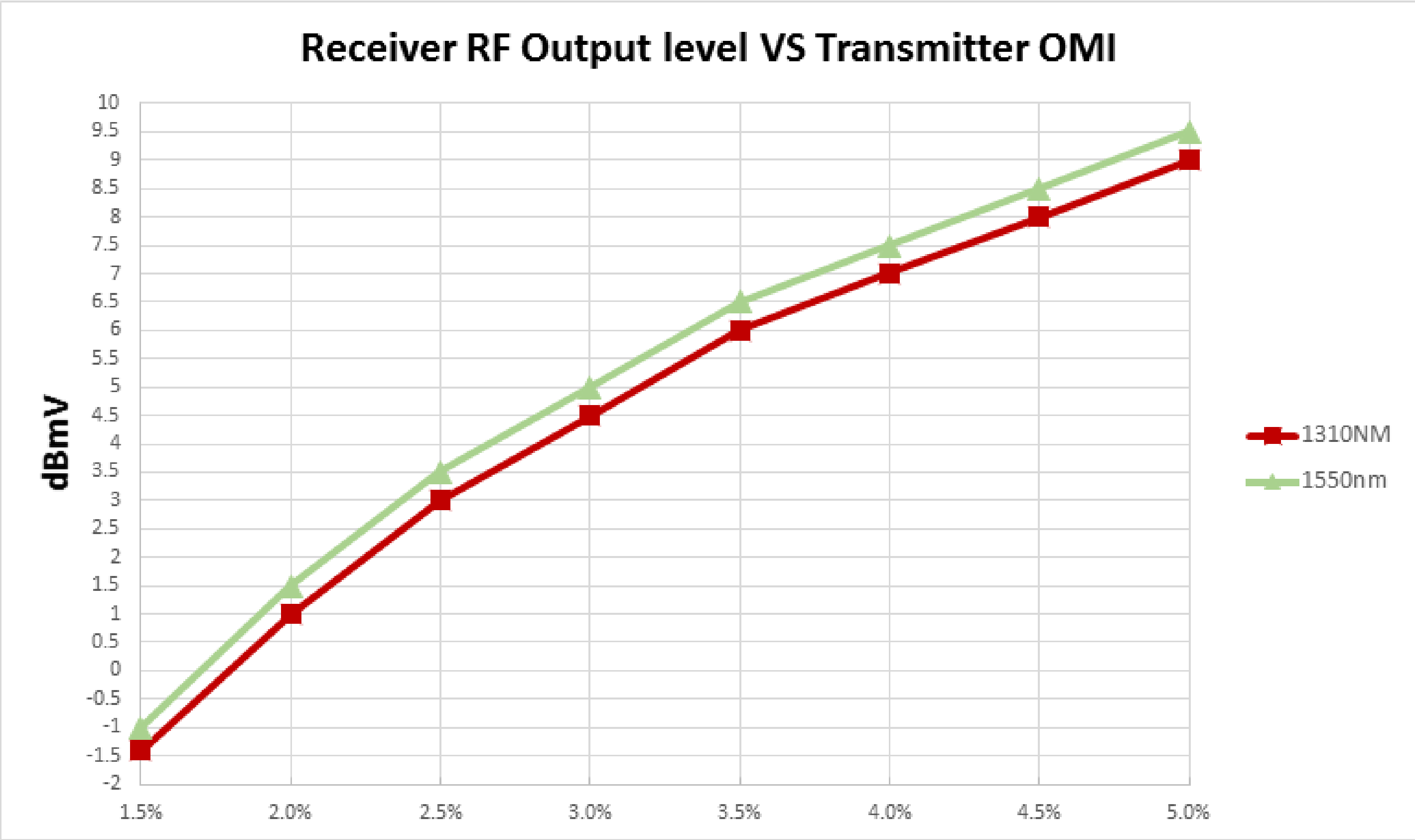
Optical Section Specifications

Figure 9 Optical receiver diagram



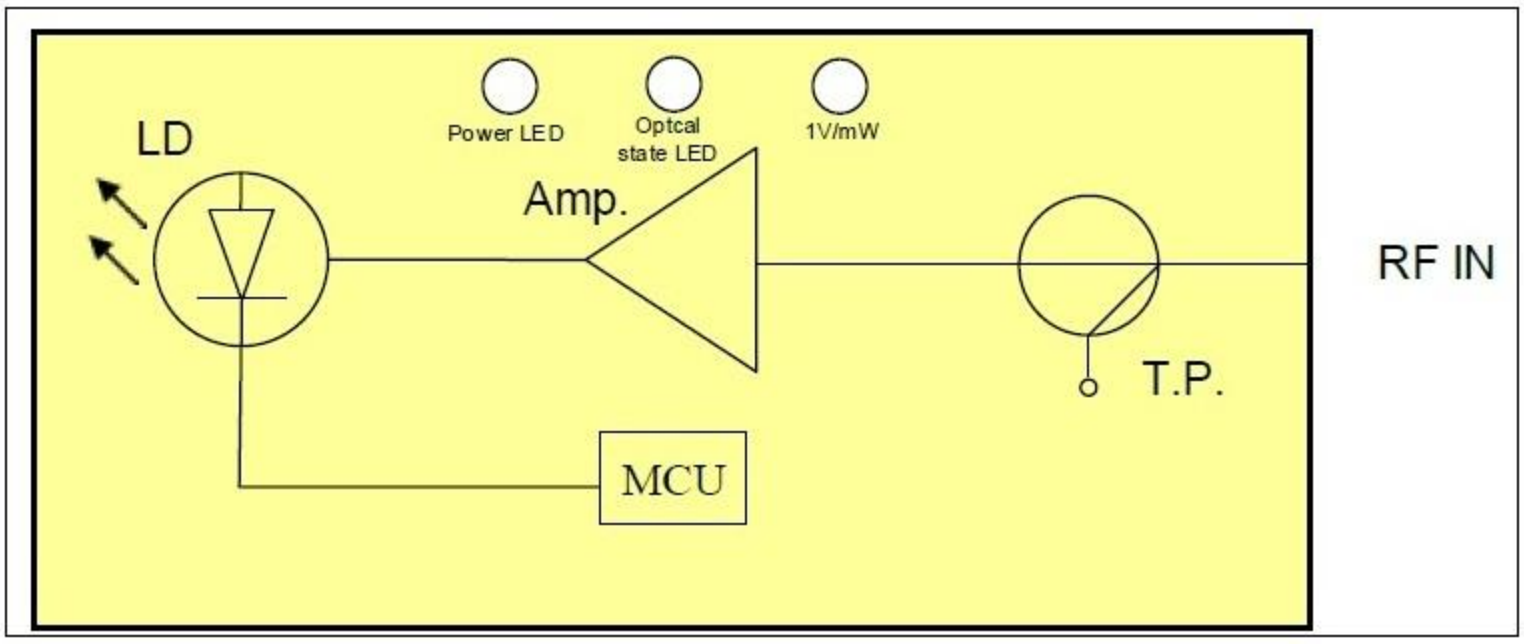
Optical Section — Optical Receiver Module	Description	Notes
Center wavelength	1310 nm or 1550 nm	-
Optical input range	-8 dBm to +3 dBm	-
AGC range	-6 dBm to 0 dBm	-
Pass band	45–870 MHz	-
Frequency response	±0.75 dB	-
Output return loss	16 dB	-
RF output level@0 dBm optical RX power	See the Figure 10.	-
Optical input test point (±10%)	1 V/mW	-
RF output test point	-20±1 dB	-

Figure 10 RF output level



Optical Transmitter Diagram

Figure 11 Optical Transmitter Diagram



Optical Section — Optical Transmitter Module	Description	Notes
Center wavelength	1550 nm or 1310 nm	2 different kinds of module
Pass band	5–204 MHz	-
Frequency response	±0.75 dB	-
Input return loss	16 dB	-
Optical output power	3±1 dBm	-
Noise power ratio (NPR)	See the following chart.	1 and 2
Single CW carrier RF input level for 100% OMI	38 dBmV	
Optical output test point (±10%)	1 V/mW	-
RF test point relative to transmitter RF input	-20±1 dB	-

Figure 12 1550 nm RTX module

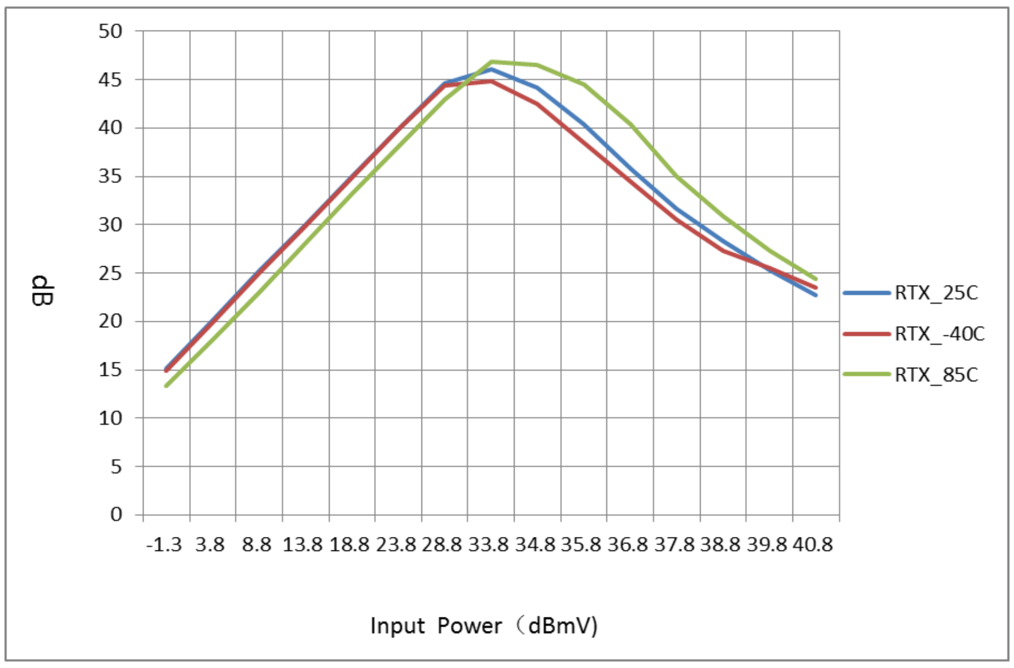
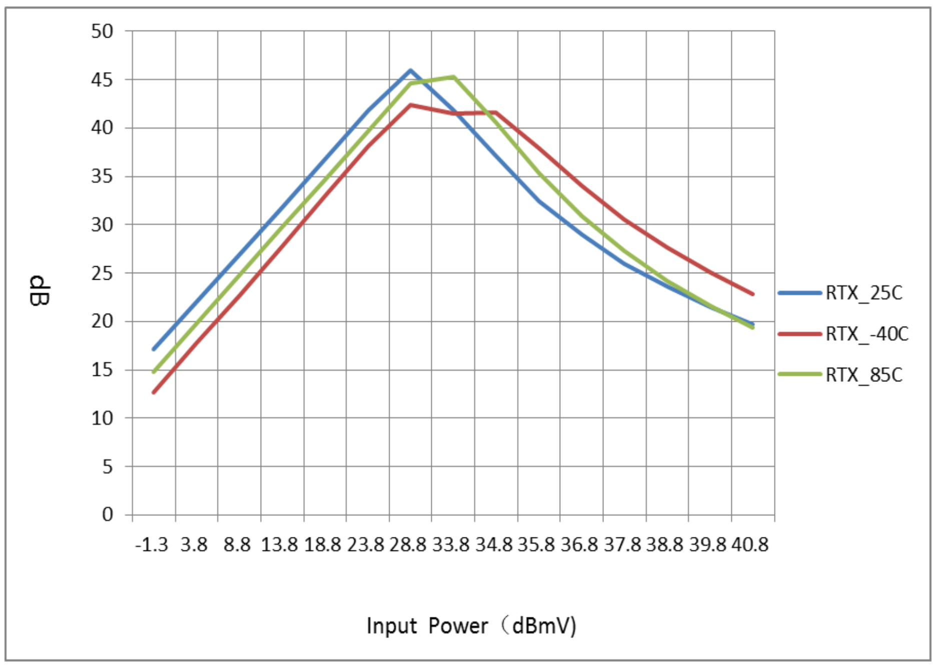


Figure 13 1310 nm RTX module



Notes:

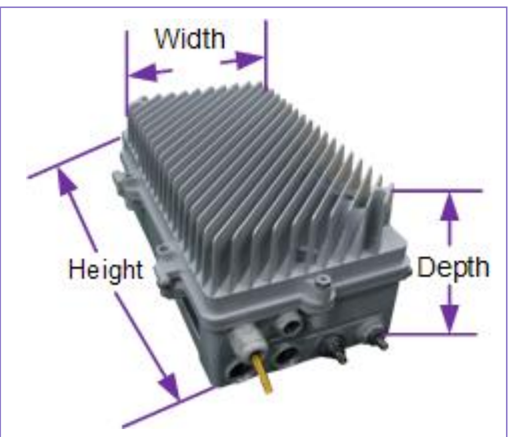
The test is performed under the following conditions:

1: Input optical power -8 dBm at RRX (11 dB link loss)

2: NPR performance with noise loading from 5–85 MHz

Mechanical Specifications

Parameter			
Weight	9±2 kg		
Dimensions (height x width x depth)	365 mm x 220 mm x 175 mm		
Environment Parameter			
Operating Temperature	**Operating Humidity**	**Atmospheric Pressure**	**Altitude**
–40°C to +55°C The MA5633 can start at a lowest temperature of –25°C.	5% RH to 95% RH	70 kP_a to 106 kP_a	< 4000 m*



* The air density varies with the altitude, which affects the heat dissipation of the MA5633. Therefore, the operating temperature of the MA5633 varies with the altitude.

Module Power Consumption Specifications

Module Type	Power Consumption (Unit: W)	Notes
RF module	42	Power consumption of the RF module when 2 TX and 1 RX modules are installed
CMC module	75	-
RX module	3	Power consumption of one RX module
TX module	2	Power consumption of one TX module

Notes: The power consumption of the module has not considered the conversion efficiency of the primary power supply.

Power Specifications

Power Specifications		
Input AC voltage (typical)	220 V AC	60 V AC
Operating voltage	90 V AC to 300 V AC	35 V AC to 95 V AC
Input current	< 0.8 A	< 3 A

Power Consumption in Typical Configurations

Power Consumption of the Integrated Device (Unit: W)		
Typical Configuration	60 V AC	220 V AC
4 RF ports and 1 RX+2 TX modules	140	133
4 RF ports and 1RX module	134	130
2 RF ports and 1RX module*	122	118
2 RF ports**	110	107

Notes:
The power consumption of the integrated device has considered the conversion efficiency of the primary power supply.
*The power consumption is tested by using the CLI to shut down RF port group 1, and 2 RF outputs are available.
**The power consumption is tested by using the CLI to shut down the RX/TX and RF port group 1, and 2 RF outputs are available.

Standards Compliance

CMTS
DOCSIS 2.0
DOCSIS 3.0
European DOCSIS 2.0
European DOCSIS 3.0
DOCSIS 3.1

GPON
ITU-T G.984.1
ITU-T G.984.2
ITU-T G.984.3
ITU-T G.984.4
ITU-T G.983.3
ITU-T G.983.3 Amendment 1
ITU-T G.987

Environment Standards
ETS 300 019-1-1
ETS 300 019-1-2
ETS 300 019-1-4
ETS 300 019-2-1
ETS 300 019-2-2
ETS 300 019-2-4

Electromagnetic Compatibility Standards
CISPR 22
CISPR 24
EN 50083-2
EN 55022
EN 55024
ETSI EN 300 386
ETSI ES 201 468

Security Standards
EN 60065
EN 60728-11
IEC 60950-1
EN 60950-1
IEC 60950-22
EN 60950-22
EN 41003
EN 60825-1
EN 60825-2
IEC 60825-1
IEC 60825-2

MPE System Standards
ETSI 300 119

Other Standards
BELLCORE TR-332/SR-332
ISTA Procedure 2A/2B

Primary Function List

Cable Access

Channel management
Load balancing
Channel bonding
Information statistics
Spectrum management policy group
Upstream 2SG

Dynamic Voice

Dynamic voice service creation using PacketCable

Video Service

EQAM
NGOD D6

CM Management

CM registration and management
Limitation on the number of CPEs connected to a CM
CM admission control
CM information query
Periodic statistics for CMs
CM event reporting

Layer 2 Management

MAC address management
Layer 2 forwarding policy (VLAN+MAC address)

QoS

Priority processing
Traffic management
Congestion management
Access control list (ACL) policies
Traffic burst
QoS adjustment

Emulation Service

Dynamic Host Configuration Protocol (DHCP) emulation

IPv6

IPv6 ACL
DHCPv6 Option 18 or 37
IPv6 neighbor discovery (ND)

Layer 3 Features

DHCP client
DHCP relay
ARP
Static route

Clock Features

Network time synchronization

User Security

DHCP Option 82
Relay agent info option (RAIO)
MAC address anti-spoofing
MAC address anti-duplication
Source address verification (SAV)
User isolation
BPI+
X.509 authentication
Message integrity check
TFTP proxy

System Security

Destination IP address filtering (IP address access list)
DoS anti-attack
ICMP or IP address anti-attack
Destination MAC address filtering
Source route filtering
Firewall and blacklist
Setting of permitted or denied source IP address segments

O&M Security

Simple Network Management Protocol (SNMP)
Secure shell (SSH)
Operator management
Remote connection security
Serial port shutdown
Log management
Centralized management
DHCP dialup emulation

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