

Proposal of CATV RF
Gigabit Ethernet and VoIP
FTTH Triple-Play System

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CATV RF, Ethernet and VoIP FTTH Triple-play system proposal

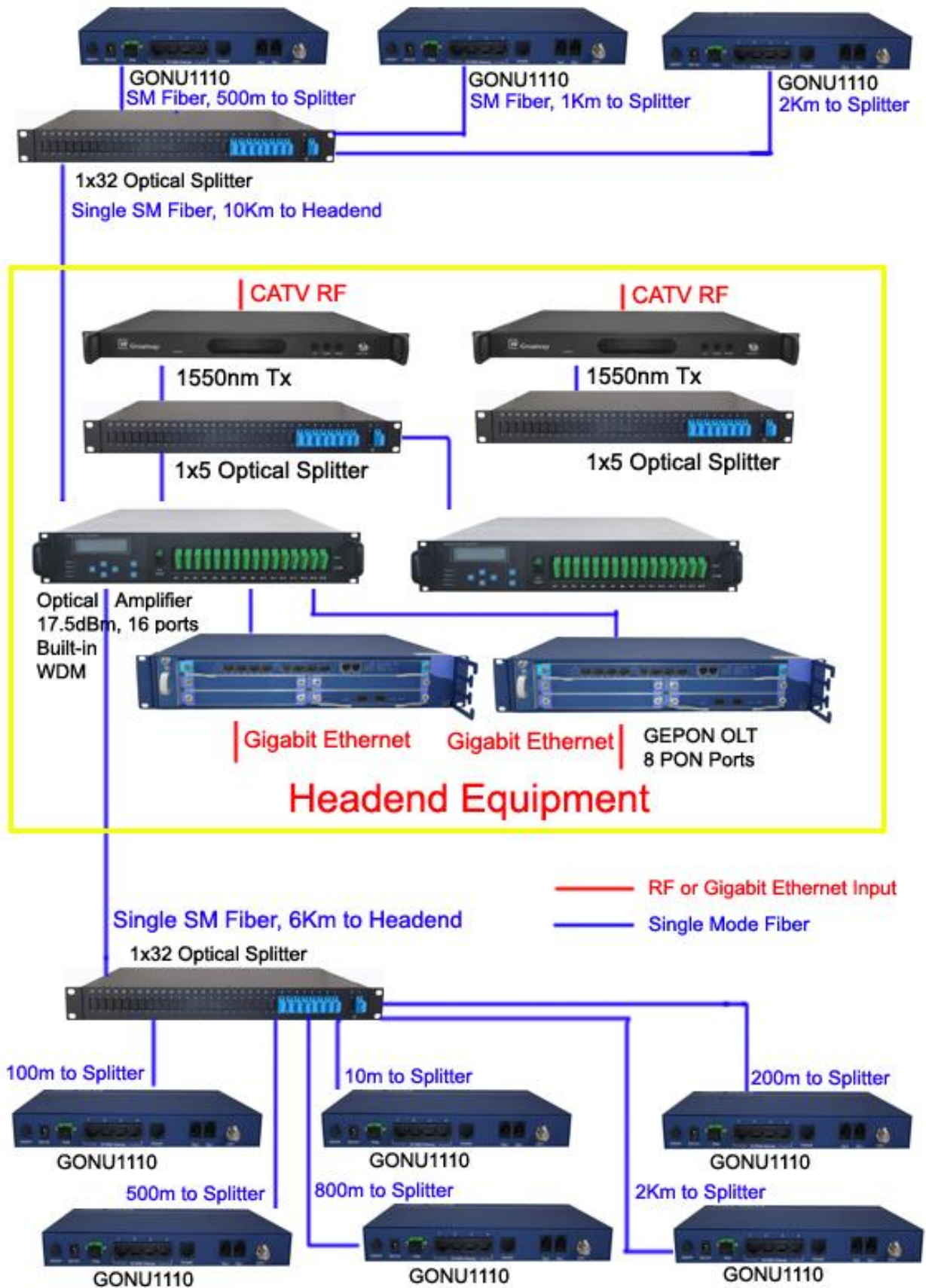
1.0 **Project Description**

The satellite signals are reorganized as the new analog TV RF or digital TV QAM RF, to be distributed to 5000 subscribers via single mode fiber. Along with the RF signal, bi-directional Gigabit Ethernet is available over the same single fiber. With soft switching facility at headend, VoIP is available at the ONU.

2.0 **Project Schedule**

1. Combined QAM RF signal is inputted to GWT3500 (1550nm direct modulation transmitter, 10mW), there are two units GWT3500 in this project;
2. The 1550nm 10mW output power is reduced at 2.5dBm after 1x5 optical splitter, then inputted to optical amplifier GWA3530-31;
3. There are 10 units GWA3530-31-16-SA-W (31dBm optical amplifier with 16 fiber ports, 17.5dBm output at each fiber port, built-in 1550nm/1490nm/1310nm WDM), where 17.5dBm 1550nm from optical amplifier output and 1490nm/1310nm from PON port are inputted to WDM and combined CATV/Ethernet signal are available at one output fiber;
4. There are 20 units GOLT1000-8 (19" 2RU chassis with management card and four dual 1490nm/1310nm PON ports OLT cards), total 160 PON ports. Each PON port is linked with the WDM inside GWA3530 first and sent to splitter hub next to subscribers. Each PON port supports up to 32 ONU;
5. There are 160 counts SM fiber from the Headend to the Hub;
6. 1x32 optical splitter is installed in the hub of subscribers' building. One fiber is connected to headend and 32 fibers are connected to nearest GONU1110.
7. GONU1110 has one SC/APC fiber input, 4 Ethernet ports, 2 VoIP Phone ports and one CATV RF output. The 1550nm input power to GONU1110 should be around -5dBm and the CATV RF output level around 20dBmV. CATV RF can be used for analog TV or digital TV set-up box. GONU1110 has hardware and terminal software for VoIP, where VoIP should be supported by the soft switching equipment at the headend.

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3.0 **Price and Term**

One GOLT1000-4 unit consist of the following:

Part Number	Description	Unit Price	Qty	Extension	Comment
GOLT1000MC	19" 2U Chassis with dual power supplies and management card, 8 SFP uplink ports, capacity for 4 OLT cards		1		
GEAPON1000	2 PON ports OLT Card with two SFP transceivers, 1490nm Tx and 1310nm Rx		4		
GSFP-24-1111	Copper 1Gbps SFP for uplink, 10/100/1000Mbps, RJ45		1		Copper SFP, quantity 1~8
ESFP1G-31LXS	Optical 1Gbps SFP for uplink,15KM		1		Optical SFP, quantity 1~8
GOLT-EMS	TELNET,SNMP Software		1		

Part Number	Description	Unit Price	Qty	Extension	Comment
GWT3500-10-SA	19" 1RU 862MHz 1550nm Direct Modulation Optical Transmitter, 10mW, SC/APC		2		Installed in Headend
MPFS-5-T-SA	1x5 Even Optical Splitter, 19" 1RU, SC/APC		2		Installed in Headend
GWA3530-31-16-SA-W	19" 2RU 31dBm Optical Amplifier, 16 output ports, each 17.5dBm, built-in WDM at each port SC/APC		10		Installed in Headend
GOLT1000-4	As listed above		20		Installed in Headend
MPFS-32-T-SA	1x32 Even Optical Splitter, 19" 1RU, SC/APC		160		Installed next to subscribers
GONU1110	ONU with 4 Ethernet ports, 2 VoIP ports and 1 CATV RF port		5,000		Subscriber
SA-SA-5M	SC/APC to SC/APC patchcord, Simplex, SM, 5 Meter		5332		Headend Subscriber
SU-SU-5M	SC/UPC to SC/UPC patchcord, Simplex, SM, 5 Meter		160		Installed in Headend
LU-LU-5M	LC/UPC to LC/UPC patchcord, Simplex, SM, 5 Meter		40		Installed in Headend

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4.0 **Datasheet Attachments**

4.1 GWT3500 direct modulation 1550nm 862MHz transmitter

4.2 GWA3530 High Power Optical Amplifier

4.3 GOLT1000

4.4 Triple-play ONU GONU1110

4.5 Multi-Port Fiber Splitter

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Specifications

Item	Unit	Parameter
Optical Power	mW	10
Optical Link Path Loss	dB	11
Optical Wavelength	nm	1550±10
Type of Laser		14pin cooled DFB laser in butterfly package with isolator
Optical modulation mode		Direct Modulation
Optical connector Type		SC/APC or FC/APC
Frequency Range	MHz	47~862 (1000MHz Optional)
RF Input Level	dBmV	15~25
Flatness In Band	dB	±0.75
RF Input Impedance	Ω	75
Input Reflection Loss	dB	≥16 (47~862)MHz
C/CTB	dB	≥65
C/CSO	dB	≥59
C/N	dB	≥51
AGC Control Range	dB	0~15
MGC Control Range	dB	0~15
Power Voltage	V	AC 100V~240V (50/60 Hz)
Power Consumption	W	15
Operation Temperature	°C	0~50
Store Temperature	°C	-40~85
Relative Humidity	%	Max 95% no condensation
Dimension	mm	483 (L) × 381 (W) × 44 (H)
Weight	Kg	5

Test condition: Input 59 channels PAL-D signal to the optical transmitter and measure the standard optical receiver C/CTB, C/CSO and C/N in conditions of -1dBm optical input (10km fiber + optical attenuator) and 36 dBmV RF output.

Ordering Information:

GWT3500-AB-CD-EF-G Forward Path Transmitter

AB: Optical output power in mW, 10mW only

CD: Optical connector, FC_FC/APC, SC_SC/APC

EF: None for 862MHz, 1000 for 1GHz bandwidth

G: None for RS-232 interface, N for SNMP interface

GWA3530 Series 1550nm Fiber Amplifier

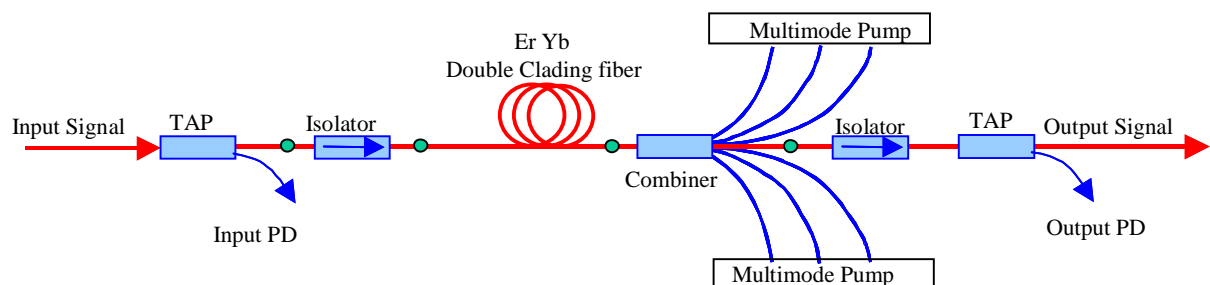


With up to 35dBm 1550nm output, GWA3530 series Er-Yb Doped Fiber Amplifiers are important 1550nm relay transmission equipments for High performance supertrunking links, High power distribution networks, Fiber Deep architectures and FTTH networks. GWA3530 Fiber Amplifier is designed to meet the most demanding noise performance requirements of CATV and FTTH applications. GWA3530 fiber amplifier provides optical isolation on the input and output of the gain block for stable, low noise operation. The input and output optical signal power levels are detected for monitoring and control. The input optical signal is amplified with active gain control for a constant output power level, or with active output power control for constant gain mode. GWA3530 series optical amplifiers also provide monitoring functions and associated alarms for all vital characteristics. The optical output of the GWA3530 series optical amplifiers can be split into up to 32 ports by an optional internal splitter.

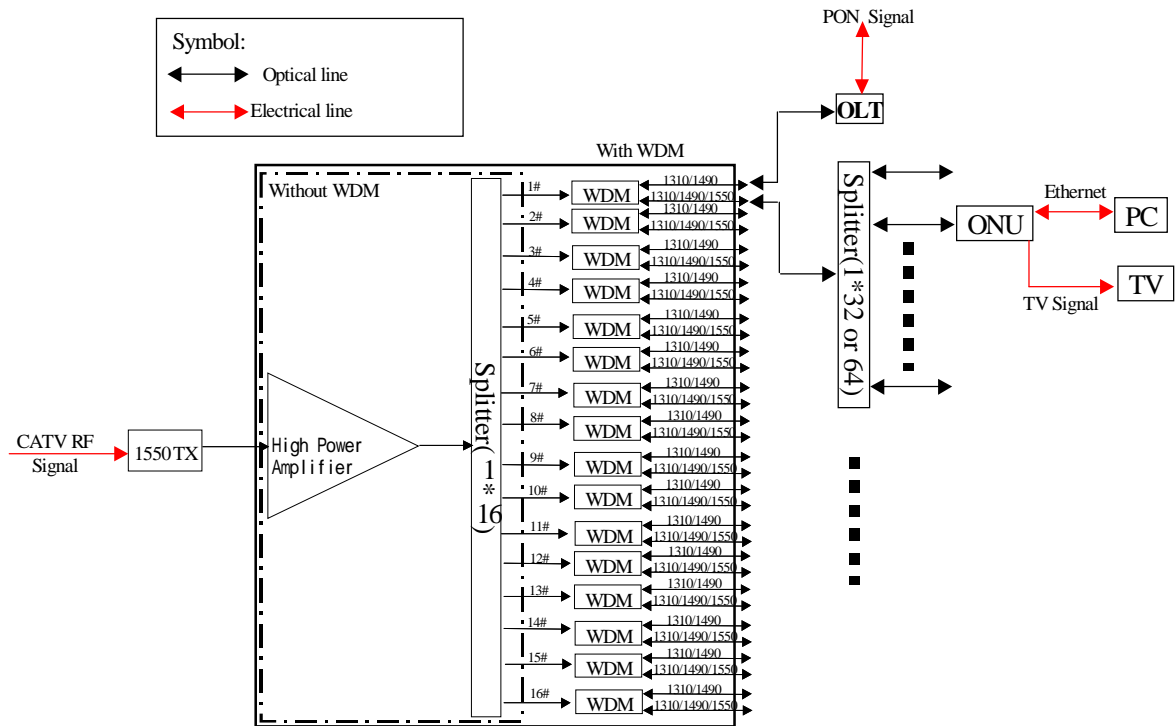
Features

- n High adjustable output power: maximum 35dBm
- n Fiber output supporting multi-ports: 20dBm×N or 17dBm×N
- n Low NF: Typical <5.5dB @+5dBm input
- n Extremely low CSO distortion: < -70dBc
- n Dual CPU dealing with amplifier local controller and remote communication
- n High stability and reliability: MTTF ≥150000 hours
- n Dual Hot-swappable Power supplies
- n Ethernet, RS485 and RS232 network interfaces, SNMP Complied
- n Intelligent temperature control system: Employ special temperature control chip, radiating and power consumption can be reduced 30%
- n Built-in 1310nm,1490nm,1550nm WDM(Optional)
- n RoHS Complied
- n Bellcore GR-1312-CORE Complied

Block and Application Diagram



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EPON System Diagram

Specifications

Optical Parameter

Parameter	Symbol	Min	Typ	Max	Unit
Wavelength	λ_c	1540	1550	1565	nm
Saturated Output Power	P_o	30	33	35	dBm
Input Power	P_i	-3		+10	dBm
Gain	G			30	dB
Noise Figure*	NF			6	dB
Output Power Stability	ΔP_o		± 0.05	± 0.2	dB
Input Isolator	ISO _i	30			dB
Output Isolator	ISO _o	30			dB
Input Pump Leakage	PumpLin			-35	dB
Output Pump Leakage	PumpLout			-45	dB
Return Loss	RL			-45	dB
Polarization Dependent Gain	PDG			0.3	dB
Polarization Mode Dispersion	PMD			0.5	ps

* Tested at +5dBm optical input

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Power Supply

Power Supply: AC: 90V~265V (50/60 Hz) or -48V DC

Power Consumption: $\leq 50W$

Environment

Parameter	Symbol	Min	Typ	Max	Unit
Operating Temperature	T _w	-5		60	°C
Storage Temperature	T _s	-40		80	°C
Humidity		10		85	%

Physical Parameters

Weight: $\leq 20Kg$

Dimensions (mm): 19" × 14.76" × 3.44" (19" 2RU)

Ordering Information

GWA3530-AB-C-D-E-F High Power Fiber Optical Amplifier in 19" 2RU

AB (Output Power): 30_30dBm, 33_33dBm, 35_35dBm

C (Output Ports): 01_1 port, 02_2 ports, 04_4 ports, 08_8 ports, 16_16 ports, 20_20 ports

D (Connector): FA_FC/APC SA_SC/APC

E (Power Supply): AC_90~265V AC, DC_-48V DC power supply

F (1310nm/1490nm/1550nm WDM at each fiber output port): Default_None, W_WDM

GEPON OLT



GOLT1000 Optical Line Terminal (OLT) provides a direct optical interface to the Ethernet/IP network core. Together with Greatway's GONU1000 Optical Network Unit (ONU), it completes the end-to-end optical last mile with up to 1 Gbps of bandwidth to residential and business customers. GOLT1000 consists of 4 PON cards, each card with 2 PON links, total up to 8 PON links. Each PON link delivers 1 Gbps of shared bandwidth between up to 32 subscribers within 20Km reach. GOLT1000 serves a maximum of 256 subscribers from 19" 2RU chassis. With layer 2 switching capability, GOLT1000 has up to 8 optical or electrical gigabit uplink ports.

Features:

- | 19" 2RU Chassis, supporting maximum 256 ONU
- | Meet IEEE802.3ah standards
- | One Network Management and Switching Slot and 4 GEPON Slots
- | Each PON link supporting 32 splits, 20Km reach
- | Up to 8 uplink Electrical port or optical ports
- | Layer 2 switching capability, Auto provision of ONU, DBA
- | System Management: SNMPv1&v2, Telnet; WEB; Console; supporting in-band and out-of-band management
- | User friendly management software
- | Main and standby power supply
- | MTBF>100,000 hours
- | User Authentication: 802.1x; PPPOE Transit
- | Temperature, Fan and power supply status monitoring and alarm
- | Online software upgrade available

Specifications:

GOLT1000MC Main Chassis	
Dimension	483mm(W) × 420mm(D) × 88mm(H)
Weight	6 Kg
Power Consumption	Max. 100W
Power Module	
Slot Number	2
Power Supply	-48V DC or 100~240V AC
Network Management Card	
Slot Number	1
Console Interface	RS232C RJ45
LAN Interface	RJ45 10/100Base-T
Uplink Interface	8 Ports (SFP or RJ45)
Optic Fiber	Single Mode or Multimode
Fiber Connector	LC/UPC

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GEPON1000 Card	
Maximum capacity	4
PON Port per card	Two 1 Gbps PON Ports
Standards	IEEE802.3ah
Optical Fiber	Single Mode Fiber
Fiber Connector	SC/UPC
Maximum ONU Number each PON Link	32
Data Rate	1Gbps uplink and downlink
Optical Transmitting Power at 1490nm	+2~+7dBm
Optical Receiving Sensitivity at 1310nm	-29dBm
Wavelength	Tx: 1490 nm; Rx: 1310 nm
Layer 2 Switching	4 Uplink GE ports converging IGMP Snooping V1/V2 1024 VLAN (IEEE802.1Q) IEEE802.1p RSTP Tree (IEEE 802.1w)
Security	Access Control List and AES-128
User Authentication	Support IEEE 802.1x, PPPOE Transit
System Management	SNMPv1&v2, Telnet, WEB, Console In-band and out-of-band management EMS Auto Provision of ONU Temperature, Fan and Power Alarms
Environment	
Working Temperature	-5 °C ~ 50 °C
Storage Temperature	-40 °C ~ 80 °C
Humidity	5% ~ 95% non-condensing
RoHS	Compatible

Ordering Information:

GOLT1000-N (GOLT1000MC+N GEPON1000 cards)

GOLT1000MC: 19" 2RU Chassis with 2 power supplies, uplink ports, layer 2 switching and management

GEPON1000: Plug and play card with two PON link ports

N=1, 2, 3, 4

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GONU1110 Ethernet /RF/VoIP Triple-Play ONU

GONU1110 is designed to offer one CATV residential RF at 1550nm input optical wavelength along with the high speed GEAPON interactive data and VoIP services at 1310nm/1490nm over one single mode fiber. It supplies Gigabit broadband service to a connected subscriber's gateway or computers. GONU1110 provides one 1000MHz CATV broadcasting analog or digital TV RF, two VoIP phone ports and four 10/100M Base-T Ethernet ports with advanced L2 functionality for Data and IPTV video services.



FEATURES

- | Full IEEE 802.3/802.3ah compliance
- | Single fiber for Data communication and CATV down-streaming broadcasting RF
- | High optical isolation between data and CATV RF wavelength
- | High speed PON: 1 Gbps symmetrical data
- | About 20dBmV RF output when input optical power is -5dBm
- | "Plug-and-play" via auto-discovery and configuration
- | Advanced QoS functions
- | Remote management with advanced OAM functions
- | Secure access via Access Control List (ACL)
- | Advanced L2 Function: IGMP Snooping, VLAN, MAC address Management

VoIP POTS

- | VoIP module by Infineon solo chip with high density SOC
- | Support three kinds of VoIP protocol: H248/MGCP/SIP
- | Support three types of compression calculation method ITU-T G711(64Kbps), G723.1 (5.3Kbps/6.3Kbps), G729(8Kbps); A/u configuration available
- | Support echo cancellation ITU-T G168-2002 with the longest echo cancellation 64ms.
- | Support three types of fax, such as transparent transmission under high/low speed mode T30/T38
- | Support Modem (56Kbps) dialing access
- | Support DTMF detection and generation
- | Produce various signal tone, including dialing tone, busy tone, call back tone and bee tone etc.
- | Support twice-dialing and colour ring service
- | Support RFC2833, redundant RFC2833, shake bell recognition, MD5 encryption authorization.
- | Support 2 POTS ports dial the third party at the same time and talking among three parties.
- | Support POTS external line 112 test function (test power voltage and power resistance)
- | Support IEEE802.1Q, QinQ function
- | Support IEEE802.1p quadruple QoS priority function
- | Comply with ITU-T K20 requirement
- | 7*24hour calling loss $\leq 0.01\%$
- | 220VAC power cable contact automatic protection function

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Ethernet and CATV

Optical Link Performance	
Optical Fiber	Single Mode
Fiber Connector	SC/APC
Optical Return Loss	<55dB
Output Power at 1310nm	-1~ +3 dBm
Receiving Sensitivity at 1490nm	-24 dBm
Receiving Sensitivity at 1550nm	-3~-8dBm
Wavelength for data	TX: 1310 nm RX: 1490 nm
Wavelength for CATV RF	RX: 1550nm
Optical Isolation (1310nm/1490nm to 1550nm)	34dB
Optical Isolation (1550nm to 1490nm)	15dB
Optical Insertion Loss	<1dB (1310nm/1490nm/1550nm)
Ethernet	
Data Rate	1Gbps uplink and downlink
Maximum Splitting	1:32 (20Km fiber reach) 1:64 (10Km fiber reach)
Ethernet Port	Four 10/100Mb/s RJ-45 Ports
Ethernet Cable	CAT-5 or CAT-6 (100 m)
Standards	IEEE 802.3ah IEEE 802.1p 802.1Q 802.1d 802.1w IEEE 802.3ad
Management	Embedded OAM Protocol, SNMP, Remote software upgrading
CATV RF Output	
RF Bandwidth	5~1000MHz (2150MHz on request)
Bandwidth Flatness	1.5dB
RF Output Level	20dBmV@-5dBm
RF Return Loss	16dB
CNR	47dB (-5dBm optical input)
CSO	65dB (77 NTSC Channels)
CTB	65dB (77 NTSC Channels)
RF Connector	American Female
Environment	
Working Temperature	- 5 °C ~ 55 °C
Storage Temperature	-40 °C ~ 80 °C
Humidity	5% ~ 95% Non-condensing
RoHS	Compatible
Physical	
Dimension	260mm(L) × 160mm(W) × 40mm (H)
Weight	1.2Kg
Power Supply	
Power	12V 1.5A DC Adaptor, UL or CE certified
Power Consumption	<15 W

Ordering Information:

GONU1110 Four Ethernet Port + CATV RF + 2 VoIP Triple-Play GEAPON ONU

MultiPort Fiber Splitter (1x4, 1x8, 1x16 or 1x32)

Applications

Fiber To The Home (FTTH)
 Local Loop
 Passive Optical Networks (PON)
 Fiber Optic CATV
 Fiber Optic Test Equipment
 Fiber Optic Sensing
 Local Area Networks (LAN)



Features

- I All fiber structure
- I High Reliability and Stability
- I Low Insertion Loss
- I Polarization Independent

Specifications (25°C)

Item	Unit	Parameter							
Center Wavelength	nm	1310 or 1550							
Bandwidth	nm	20							
Configuration		1(or 2)x4		1(or 2)x8		1(or 2)x16		1(or 2)x32	
Grade	dB	a	b	a	b	a	b	a	b
Typ. Insertion Loss	dB	6.3	6.4	9.5	9.6	12.6	12.8	15.8	16.0
Max. Insertion Loss	dB	7.0	7.3	10.6	11.0	14.0	14.6	17.6	18.3
Max. PDL	dB	0.20	0.30	0.30	0.45	0.40	0.60	0.50	0.75
Min. Directivity	dB	50	40	50	40	50	40	50	40
Max. Uniformity	dB	1.4	1.8	2.1	2.7	2.8	3.6	3.5	4.5
Max. Flatness	dB	0.8		1.2		1.6		2.0	
Max. Temperature Coefficient	dB/°C	0.004		0.006		0.008		0.010	
Operating Temperature	°C	-20 ~ +75							
Storage Temperature	°C	-40 ~ +85							
Package Dimensions		O:100x80x9 P:136x100x12 S:140x114x18 T:19" 1U rack							