AC1000 GAN UNIVERSAL AMPLIFIER

The AC1000 GaN is a single active output amplifier with 42dB gain. It can be used normally as an amplifier, but also as an optical node. The input and output amplifier stages are both based on high performance solutions that make the usable gain range especially wide. The amplifier can be used in distribution purposes in high gain mode but also as a line amplifier with lower gain. With internal splitting there are 3 separate outputs available.

The amplifier is very flexible and scalable. It does the basic amplifier functions but can be modified with passive or active plug-in modules to carry out more sophisticated tasks like a two-way optical node. The required modules can be ordered as factory installed with the amplifier, but it is also possible to update the amplifier later in the field.

All essential return path elements like ingress switches are built-in on the motherboard but for example the return amplifier module can be chosen according to the required performance.

Features

- 1 GHz bandwidth
- Remote power supply with PFC
- Amplifiers stages use GaN HEMT and GaAs pHEMT technology
- 1…3 outputs by internal splitting
- Can be updated later to an optical node
- Excellent ESD and surge protection
- Fixed station memory for electrical identification
- Electrical gain & slope control modules available
- With AC6951 transponder module:
  - CATVisor or HMS compatible transponder with wide frequency ranges
  - ALSC with fully user programmable pilots
  - Downstream spectrum analyser
  - Upstream signal quality monitoring

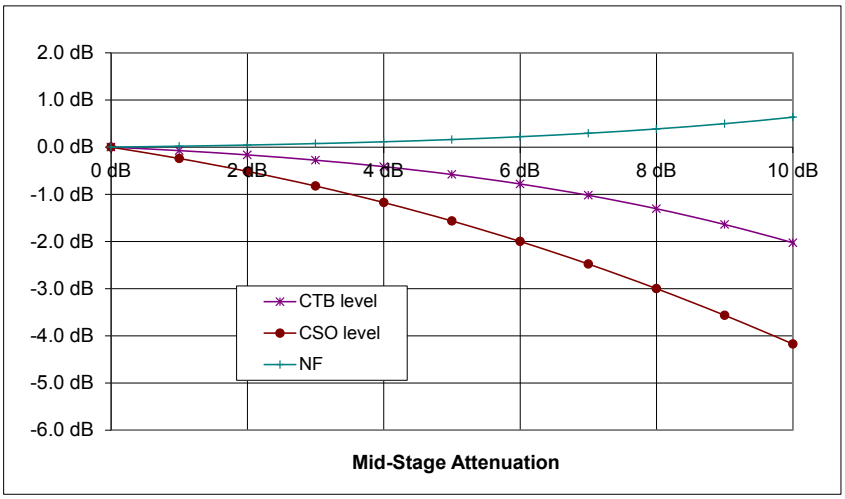
Technical specifications

Parameter	Specification	Note
Downstream signal path (values with diplex filters)		
Frequency range	47...1006 MHz	
Return loss	20 dB	1)
Gain	42 dB	2)
Input attenuator control range	20 dB	3)
Input equaliser control range	25 dB	3)
Interstage slope	8 dB	4)
Flatness	±0.4 dB	5)
Group delay	2 ns	6)
Test point	-20 dB	7)
Transponder connection	-19 dB	8)
Input by-pass attenuation	-2 dB	
Noise figure	4.4 dB	9)
$U_{max(112\ QAM\ channels)}$	113.0 dBuV	10)
CTB 42 channels	117.0 dBµV	11)
CSO 42 channels	117.0 dBµV	11)
XMOD 42 channels	114.5 dBµV	11)
CTB 110 / 77 channels	79.0 / 87.0 dB	12)
CSO 110 / 77 channels	74.0 / 76 dB	12)
XMOD 110 / 77 channels	73.0 / 76.0 dB	12)
Upstream signal path (values with diplex filters)		
Frequency range	5…85 MHz	
Return loss	18 dB	13)
Gain	21 / -6.0 dB	14)
Ingress switching	0 / -6 / < -50 dB	
Attenuator control range	20 dB	15)
Equaliser control range	7 dB	16)
Flatness	±0.5 dB	17)
Test signal injection point	-30 dB	18)
Transponder connection	-26 dB	19)
Noise figure	7.5 dB	20)
Output level, DIN 45004B	113.0 dBµV	20)
CINR	> 63 dBc	21)
General		
Power consumption (65 / 230 V_{AC})	19.0 / 20.0 W	22)
Supply voltage	27...65 V_{AC}, ±33...90V_{DC} / 205…255 V_{AC}	
Maximum current feed through	8.0 A / port	23)
Hum modulation	70 dB	23)
Resistance for remote current	25 mΩ / port	
Input / Output connectors	PG11	
Test point connectors	F female	
Dimensions	245 x 255 x 100 mm	h x w x d
Weight	3.0 kg	
Operating temperature	-40...+55 °C	
Class of enclosure	IP67	24)
EMC	EN50083-2	
ESD	4 kV	25)
Surge	6 kV (EN 60728-3)	

Notes

1) The limiting curve is defined at 40 MHz -1.5 dB / octave.

2) Guaranteed maximum gain is 41.5 dB. With interstage gain control possibility the amplifier can be used in low gain mode. Gain is defined with interstage equaliser and 2 pcs of diplex filters. All other used plug modules are 0 dB jumpers.



The picture depicts how the NF and distortion performances change if interstage gain control is used. Defined with the 8 dB sloped output and CENELEC loading. NF curve is defined at 1006 MHz.

3) Fixed value attenuators and equalisers are available.

4) The amplifier is defined with 8 dB tilted output between 47…1006 MHz.

5) Typical value. The guaranteed value is ±0.75 dB. Flatness is defined with interstage equaliser and 2 pcs of diplex filters. All other used plug modules are 0 dB jumpers. The specification is valid 2 MHz after the starting frequency of the selected diplex filter.

6) Typical value for 4.43 MHz band. Measured at channel S2. At higher frequencies the performance is better.

7) Output TP has a tolerance of ± 0.75 dB between 47…862 MHz and ± 1.0 dB between 862…1006 MHz. The TP is defined with 0 dB plug as OUTPUT MODULE 1. This connection can be used also as an injection point for a test signal of return channel.
Input TP is a transformer type with ±1.5 dB accuracy.

8) This is the level difference between output 1 and transponder connection pin on the motherboard.

9) Typical value at 1006 MHz with the maximum gain. The guaranteed worst case value is 1.0 dB worse. Test conditions are described in Note 2).

10) Typical value according to IEC60728-3-1. Channels have 10 dB cable equivalent slope between 110…1006 MHz and signal level has been defined at 1002 MHz. BER measurement has been done on the worst channel between 110…862 MHz.

11) EN50083-3. Amplifier output 8 dB cable equivalent sloped. All results are typical values in room temperature, which can be used in system calculations. XMOD is measured at the lowest channel.
The highest recommended output level for the amplifier is 116.0 dBµV with 42 channels.

12) Measured with 77 and 110 NTSC channels. Amplifier output was 12 dB linearly sloped and the used levels were at 55 / 550 / 750 / 862 MHz 35.0 / 42.5 / 45.5 / 47.0 dBmV. All results are typical values in room temperature, which can be used in system calculations. XMOD is measured at 55.25 MHz.
The highest recommended output level for the amplifier is 54 dBmV with 110 channels and 56 dBmV with 77 channels.

13) Valid over the band 7…85 MHz.

14) Active (AC6144) / passive (AC6140) return module.

15) Upstream signal path input and output have JDA9xx series attenuator plug-in slots. The upstream input attenuator factory default is JDA900.

16) The pivot point is 65 MHz. In 30 MHz operation the equaliser control range is 3.5 dB lower. Thus the maximum gain in 30 MHz operation is 3.5 dB lower if maximum slope is used.

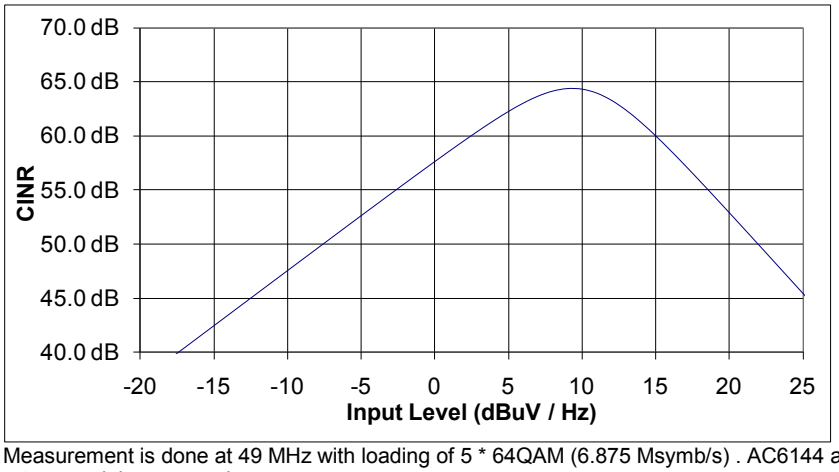
17) Valid with active return module AC6144.

18) The –30 dB level is calculated from the return signal input at output port 1, with 0 dB plugs in Output module 1 and return input attenuator slots. This 2-way connection can be used as an input test point for return signal and as a test signal injection point.

19) This is the theoretical level difference between the input connector of the return signal path and the injection pin of the up-stream signal of the transponder.

20) Typical values which can be used in network design. Valid with the active module AC6144.

21)



Measurement is done at 49 MHz with loading of 5 * 64QAM (6.875 Msymb/s) . AC6144 active return module was used.

22) With the passive return path. With active return path and transponder the value is 4.5 W higher.

23) At any frequency from 10 to 862 MHz when the remote current is less than 8 A. 12 A is the maximum total current which can be locally injected into all ports simultaneously.

24) The housing is tested to be class of IP67. However, in standard delivery condition the lowest side wall is equipped with a 1 mm ventilation hole. Then the practical enclosure class is IP54.

25) EN61000-4-2, contact discharge to enclosure and RF-ports.

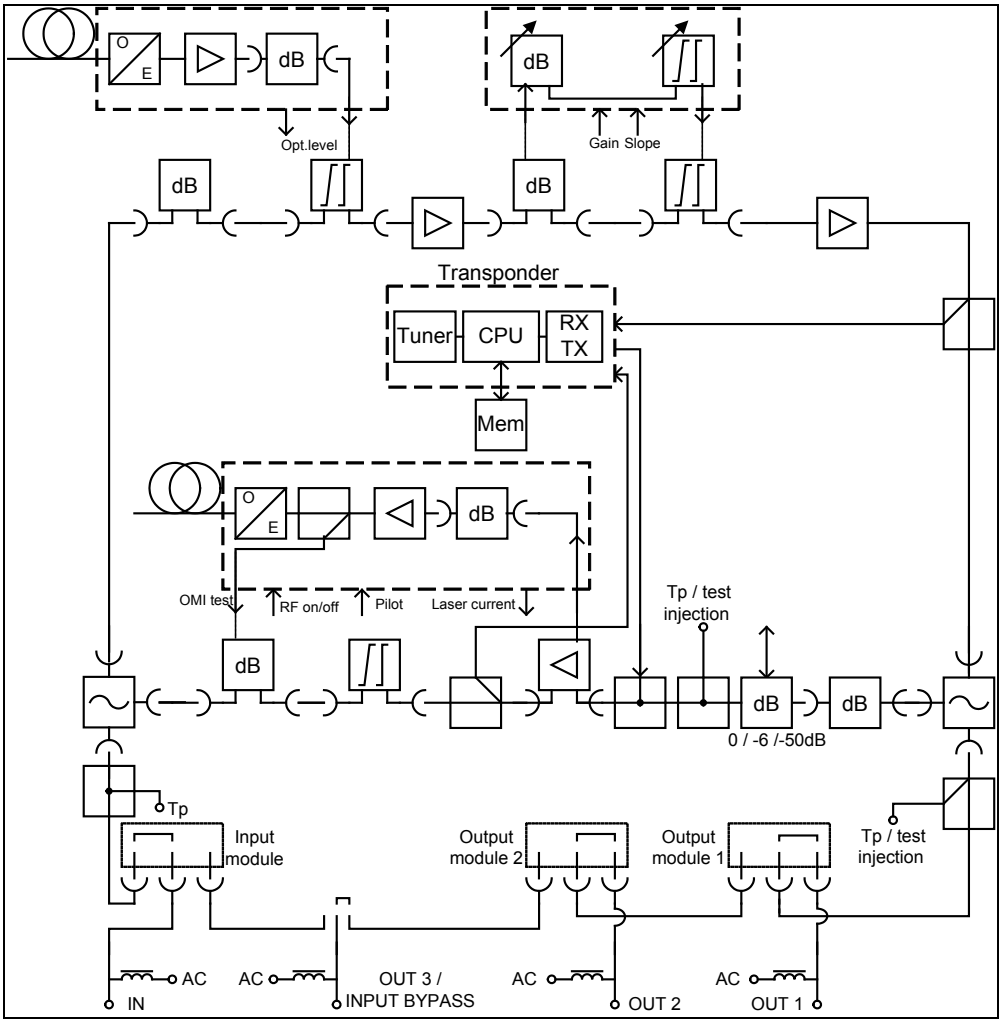
Compatibility

All accessories that will be used together with this product, should use the newest generation available. By using only up-to-date accessories a proper operation can be ensured.

Monitoring functions with AC6951/-52 transponder

- Status LEDs for alarm and modem status indication
- CATVisor and HMS compatible remote connection for monitoring and control
- Electrical downstream gain / slope module control
- Return path ingress switch ON / -6 dB / OFF control
- 65 VAC voltage measurement with alarms
- Local +12 V and +24 V voltage measurements with alarms
- Internal temperature measurement with alarms
- Optical receiver module optical input power measurement with alarms
- Optical transmitter module laser current measurement with alarms
- Optical transmitter module pilot generator control
- Lid status monitoring with alarm
- Service terminal connection monitoring with alarm
- Configuration change monitoring with alarm
- Modem receive and transmit signal level monitoring with alarms
- Fully user configurable alarm limits, severities, enabling and delays
- Configuration data and user notes stored in motherboard memory
- Uptime, total uptime and reset counters for power outage statistics
- Alarm log stored into non-volatile memory for easy troubleshooting
- Fast local softwate update via USB also without power supply
- Remote software update to multiple units simultaneously
- Interstage gain and slope control by ALSC mode with saturation alarm
- ALSC pilot frequencies, detector types, backoffs and decision levels are user programmable
- Automatic reserve pilot switching and ALSC operation with only one pilot
- User configurable all pilots lost behaviour
- Spectrum analyser for downstream level measurement with alarm
- Ingress analyser for upstream level measurement with alarms

Block Diagram



Ordering Information

AC1000 configuration map

	1-					2-				3-				4-				5-			6-				7-			8-		9-		
	1	2	3	4		1	2	3		1		3		1	2	3		1	2		1		3		1	2		1		1	2	
AC1000					-				-				-				-			-				-			-		-			

1-1 Input connection (first from left)
- **A** PG11
- **B** 5/8"
- **C** IEC
- **D** 3.5/12
- **E** F

1-2 Input by-pass/output 3 connection
- **A** PG11
- **B** 5/8"
- **C** IEC
- **D** 3.5/12
- **E** F
- **X** None (PG11 sealing plug)

1-3 Output 2 connection
- **A** PG11
- **B** 5/8"
- **C** IEC
- **D** 3.5/12
- **E** F
- **X** None (PG11 sealing plug)

1-4 Output 1 connection (first from right)
- **A** PG11
- **B** 5/8"
- **C** IEC
- **D** 3.5/12
- **E** F

2-1 Input module
- **A** 0 dB, no by-pass (AC6110)
- **B** Splitter -3.7 dB, by-pass in use (AC6124)
- **C** Tap -8 dB, by-pass in use (AC6128)
- **D** Tap -12 dB, by-pass in use (AC6112)
- **E** Tap -16 dB, by-pass in use (AC6116)
- **F** Tap -20 dB, by-pass in use (AC6119)
- **X** None

2-2 Diplexer filters
- **A** 30/47 MHz (2 x CXF030)
- **B** 42/54 MHz (2 x CXF042)
- **C** 50/70 MHz (2 x CXF050)
- **D** 65/85 MHz (2 x CXF065)
- **F** 85/108 MHz (2 x CXF085)
- **K** Forward path jumper (2 x CXF000)
- **X** None

2-3 Input attenuator and equaliser
- **A** 2 x 0 dB plugs (JDA900 and TXA000)
- **B** Manual gain and slope adjustment (AC6171)
- **X** None

3-1 NA
- **XX** None

3-3 NA
- **X** None

4-1 Interstage slope and gain adjustment
- **A** 8 dB slope @ 862 MHz (TDE810) and no gain adjustment plugs
- **B** 8 dB slope @ 862 MHz (TDE810) and full gain (JDA900)
- **C** 8 dB slope @ 862 MHz, temp. comp. (TTE810) and no gain adjustment plugs
- **D** Flat response (TXA000) and full gain (JDA900)
- **K** Electrical gain & slope (AC6170)
- **R** 8 dB slope @ 1006 MHz (TGE010)
- **X** None

4-2 Output module 1
- **A** 0 dB, 1 output in use (AC6120)
- **B** Splitter -3.7 dB, 2 outputs in use (AC6124)
- **C** Tap -8 dB, 2 outputs in use (AC6128)
- **D** Tap -12 dB, 2 outputs in use (AC6112)
- **E** Tap -16 dB, 2 outputs in use (AC6116)
- **F** Tap -20 dB, 2 outputs in use (AC6119)
- **X** None

4-3 Output module 2
- **A** 0 dB, 2 outputs in use (AC6120)
- **B** Splitter -3.7 dB, 3 outputs in use (AC6124)
- **C** Tap -8 dB, 3 outputs in use (AC6128)
- **D** Tap -12 dB, 3 outputs in use (AC6112)
- **E** Tap -16 dB, 3 outputs in use (AC6116)
- **F** Tap -20 dB, 3 outputs in use (AC6119)
- **X** None

5-1 Return path input module
- **A** 0 dB plug (JDA900)
- **B** HPF 15 MHz, ingress blocker (AC6223)
- **X** None

5-2 Return path unit
- **A** Active return 21 dB (AC6144) without att. and equal.
- **B** Active return 21 dB (AC6144) with 0 dB att. and equal. (2 x JDA900)
- **E** Passive return (AC6140) without att. and equal.
- **F** Passive return (AC6140) with 0 dB att. and equal. (2 x JDA900)
- **I** Active return with gain and slope adjustment (AC6136)
- **X** None

6-1 NA
- **XX** None

6-3 NA
- **X** None

7-1 NA
- **X** None

7-2 NA
- **X** None

8-1 Element management transponder
- **K** Standard, CATVisor (AC6952)
- **L** Standard, HMS (AC6952 HMS)
- **X** None

9-1 Power supply
- **A** Local powering, euro plug (230 VAC)
- **B** Remote powering with cable clamp (65 VAC)
- **C** Local powering, UK plug (230 VAC)

9-2 Gain and housing
- **P** 42 dB, 1 GHz platform, GaN

DOC0009766, Rev055