AH2

High Dynamic Range CATV Amplifier

The Communications Edge™

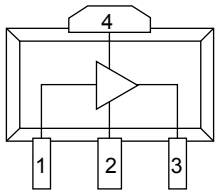
Product Features

- 50-1000 MHz
- -71 dBc CTB
- -48 dBc CSO
- +20 dBm P1dB
- +40 dBm Output IP3
- 14.5 dB Gain
- MTTF >100 Years
- +5 V Single Positive Supply

Product Description

The AH2 is a general purpose, high dynamic range amplifier targeting cable TV markets. The combination of gain flatness, high linearity and bandwidth make it ideal for CATV distribution, cable modem and laser diode driver applications. The AH2 is designed for 75 ohm systems and can operate directly from a +5 Volt DC regulator. The device is manufactured using reliable GaAs MESFET technology and boasts an MTTF of >100 years at a mounting temperature of 85°C. All devices are 100% RF and DC tested.

Functional Diagram



Function	PIN No.
Input	1
Ground	2
Output/Bias	3
Ground	4

Specifications

Parameter	Units	Min.	Typ.	Max.	Condition
Frequency Range	MHz		50-1000		
S21	dB	13	14.5		
Output IP3	dBm	+37	+40		See Note 2
P1dB	dBm		+21		
Operating Current	mA	120	150	180	
Supply Voltage	V		+5		
Max. Junction Temp.	°C			160	See Note 3
Thermal Resistance	°C/W			59	

Test Conditions unless otherwise noted.

1. Parameters reflect performance of a packaged device in a 75 Ω system at 25°C, Vdd = 5.0V, and 800 MHz.
2. OIP3 measured with 2 tones at an output power of 5 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate the OIP3 using a 2:1 slope rule.
3. The maximum junction temperature ensures a minimum MTTF rating of 1 million hours of usage at a tab temperature of +85°C. The MTTF plot and more information is located in the WJ Application Note "AH2 Temperature Effects on Reliability" for more information.

Typical Parameters

Parameter	Units	Typical	Condition
Frequency	MHz	50-1000	
S21 - Gain	dB	14.5	50 MHz
S21 - Gain	dB	13.2	860 MHz
S11 - Input Return Loss	dB	-14	
S22 - Output Return Loss	dB	-17	
Output IP3	dBm	+40	See Note 2
Output IP2	dBm	+47	
P1dB	dBm	+20	
Noise Figure	dB	3.5	
CTB	dBc	-71	See Note 5
CSO	dBc	-48	See Note 5
Xmod	dBc	-65	See Note 5

Test Conditions unless otherwise noted:

4. T=25°C, Vdd = 5.0V in a 75 Ω application circuit (AH2-PCB).
5. 77 Channels 50-550 MHz, +34 dBmV/channel, flat-loading.

Absolute Maximum Ratings

Parameter	Rating
Operating Case Temperture	-40 to +85°C
Storage Temperature	-40 to +125°C
DC Voltage	+6.0 V
RF Input Power (continuous)	+10 dBm

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

Part No.	Description
AH2	High Dynamic Range CATV Amplifier (Available in tape and reel)
AH2-PCB	Fully Assembled Single Ended CATV Application Circuit (75 Ω)

Specifications and information are subject to change without notice.

Single - Ended CATV, 75 Ω Evaluation Circuit: 50-860 MHz (AH2 - PCB)

Typical Performance (75 Ohm System)

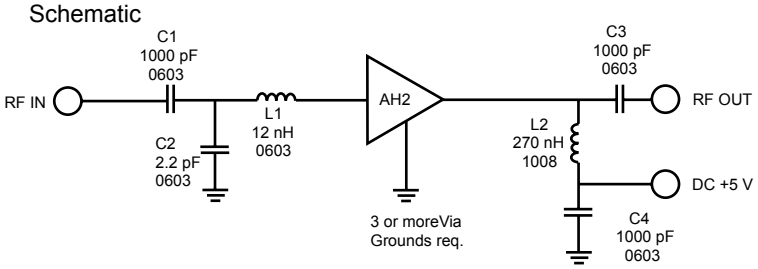
Frequency	MHz	50	450	750	860
S21	dB	14.5	14.5	13.7	13.2
S11	dB	-11.1	-12.7	-14.5	-18.3
S22	dB	-9.5	-22.9	-12.3	-10.6
OIP2	dBm	+46.8	+46.9	+47.7	+48.1
OIP3	dBm	+39.8	+40.7	+41.0	+40.8
Noise Figure	dB	3.9	3.1	3.2	3.2
Bias	Vdd = 5 V, Id = 150 mA				

Multi-Channel Measurements

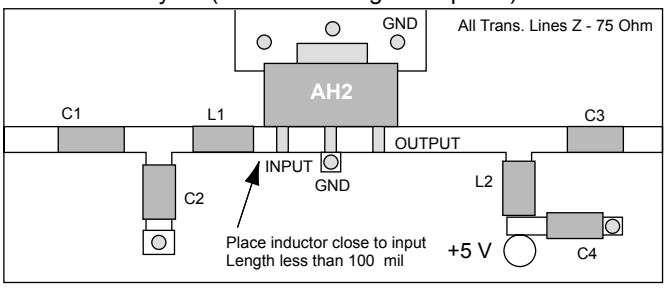
Parameter	Frequency	Value
CTB	50-550 MHz	-71 dBc
CSO	50-550 MHz	-48 dBc
XMOD	50-550 MHz	-65 dBc

Note: 77 Channels, 50-550 MHz, +34 dBmV/channel, flat-loading

Schematic

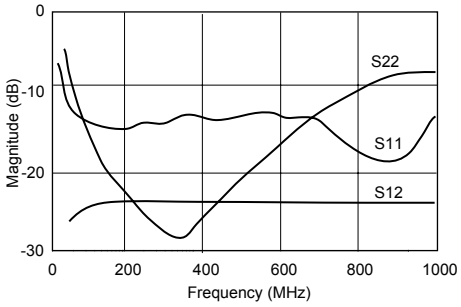


FR4 Board Layout (T = 28 Mils to ground plane)

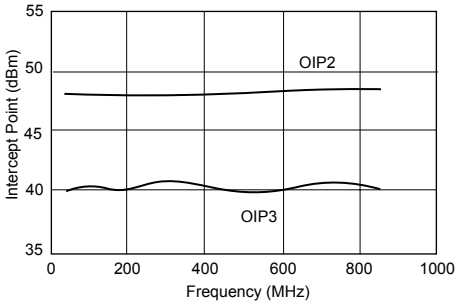


Note: 0.5 dB of gain slope is due to the connector and board losses.

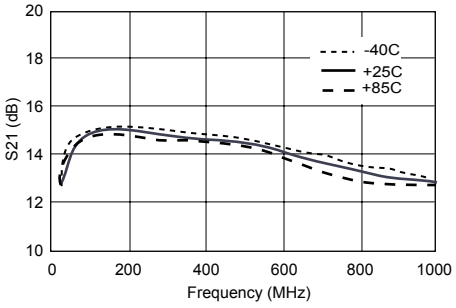
Input / Output Return Loss and Isolation



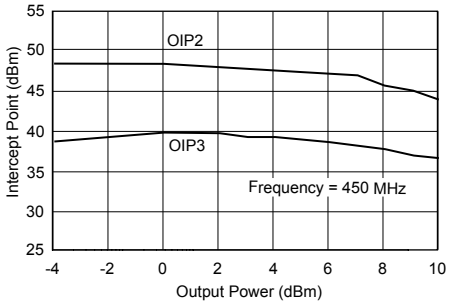
Linearity vs. Frequency



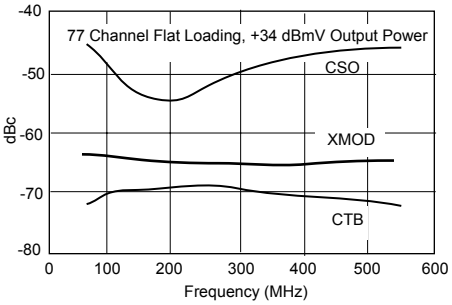
Gain



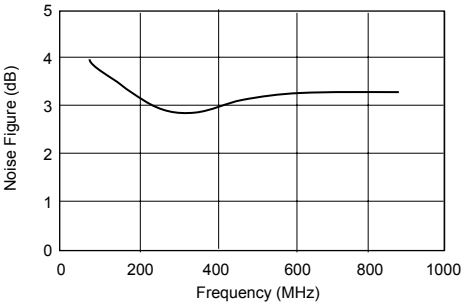
OIP2 and OIP3 vs. Power



CTB, CSO, and XMOD vs. Frequency



Noise Figure



Push-Pull, 75 Ω CATV Evaluation Circuit: 50-860 MHz

Typical Performance (75 Ohm System)

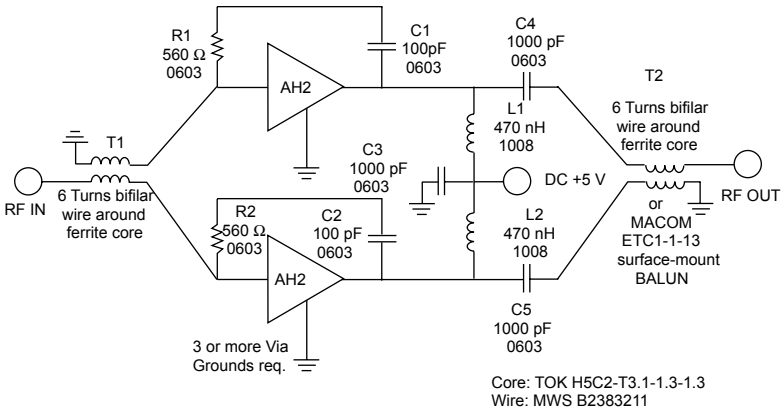
Frequency	MHz	50	450	750	860
S21	dB	11.1	10.8	10.6	10.5
S11	dB	-10.2	-9.7	-10.8	-11.0
S22	dB	-13.3	-14.1	-15.4	-16.4
OIP2	dBm	72.0	70.0	72.0	70.0
OIP3	dBm	42.0	43.0	41.0	40.0
Noise Figure	dB	5.5	4.3	5.0	5.4
Bias	Vdd = 5 V, Id = 300 mA				

Multi-Channel Measurments

Parameter	Frequency	Value
CTB	50-550 MHz	-72 dBc
CSO	50-550 MHz	-75 dBc
XMOD	50-550 MHz	-68 dBc

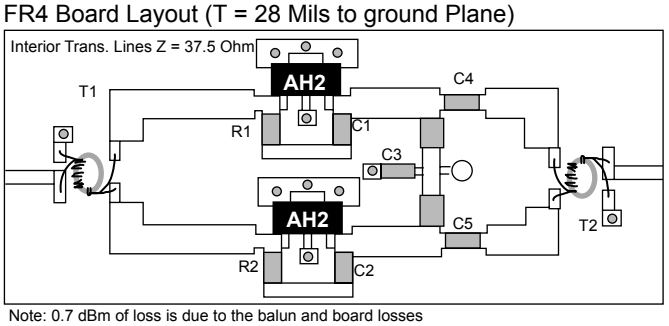
Note: 77 Channels, 50-550 MHz, +34 dBmV/channel, flat-loaded

Schematic



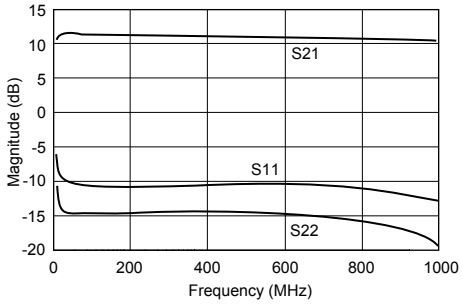
Core: TOK H5C2-T3.1-1.3-1.3
Wire: MWS B2383211

FR4 Board Layout (T = 28 Mils to ground Plane)

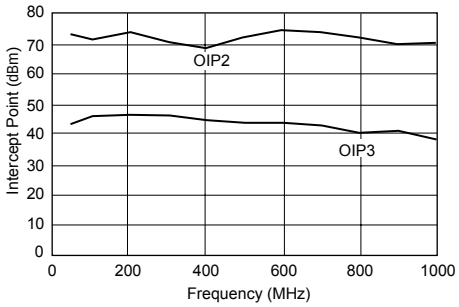


Note: 0.7 dBm of loss is due to the balun and board losses

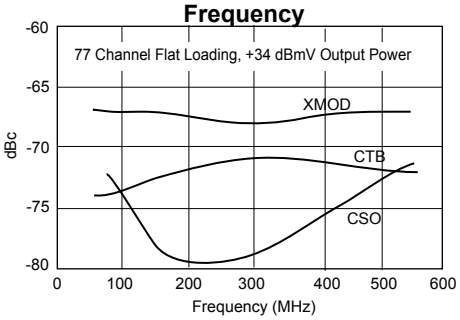
S-Parameters



Linearity vs. Frequency



CTB, CSO, and XMOD vs. Frequency



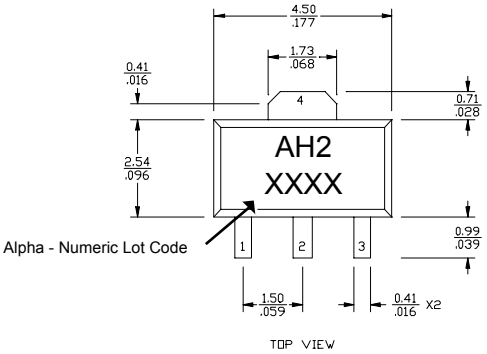
Typical Test Data

S-Parameters (Vds = +5 V, Ids = 150 mA, T = 25°C, unmatched device in a 75 ohm system)

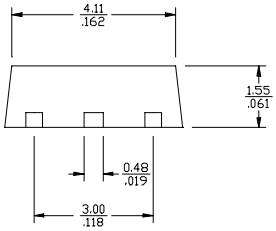
Freq. (MHz)	S11 (dB)	S11 (Ang)	S21 (dB)	S21 (Ang)	S12 (dB)	S12 (Ang)	S22 (dB)	S22 (Ang)
50	-18.00	-34.61	15.49	173.26	-24.20	4.59	-24.26	-85.84
100	-17.80	-42.76	15.43	171.19	-24.14	2.04	-24.75	-86.37
150	-16.90	-48.97	15.37	168.08	-24.16	0.99	-23.99	-88.74
200	-16.00	-53.88	15.31	164.88	-24.17	0.27	-22.81	-91.71
250	-14.55	-58.61	15.22	162.05	-24.14	0.08	-22.96	-92.44
300	-12.92	-65.22	15.14	158.92	-24.17	-0.22	-23.00	-92.45
350	-12.35	-71.82	15.06	155.7	-24.07	-0.74	-22.03	-96.12
400	-11.65	-77.23	14.97	152.52	-24.10	-1.02	-21.07	-98.24
450	-11.00	-82.95	14.86	149.40	-23.99	-1.51	-20.28	-100.75
500	-10.43	-87.24	14.75	146.28	-24.03	-1.44	-19.51	-102.72
550	-9.88	-91.75	14.63	143.33	-24.00	-2.11	-18.84	-104.75
600	-9.44	-95.68	14.50	140.18	-23.96	-2.40	-18.26	-106.88
650	-9.00	-99.68	14.37	137.27	-23.91	-2.75	-17.73	-108.74
700	-8.56	-102.92	14.23	134.37	-23.94	-3.24	-17.21	-110.42
750	-8.23	-106.2	14.09	131.52	-23.90	-3.68	-16.76	-111.98
800	-7.88	-109.41	13.92	128.75	-23.90	-3.95	-16.40	-113.70
850	-7.53	-112.2	13.76	126.18	-23.84	-4.27	-16.02	-115.37
900	-7.25	-114.93	13.62	123.48	-23.83	-5.01	-15.66	-117.11
950	-6.97	-117.87	13.45	120.85	-23.83	-5.79	-15.33	-119.00
1000	-6.72	-120.3	13.29	118.27	-23.81	-5.85	-15.04	-121.09

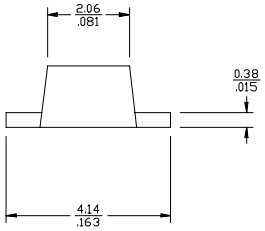
AH2

Outline Drawing

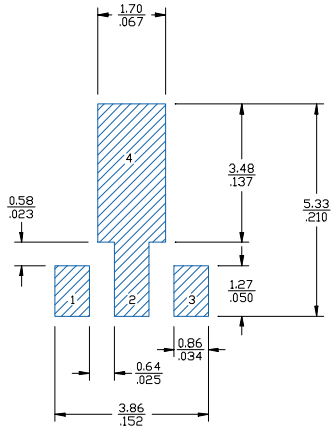


mm
inch

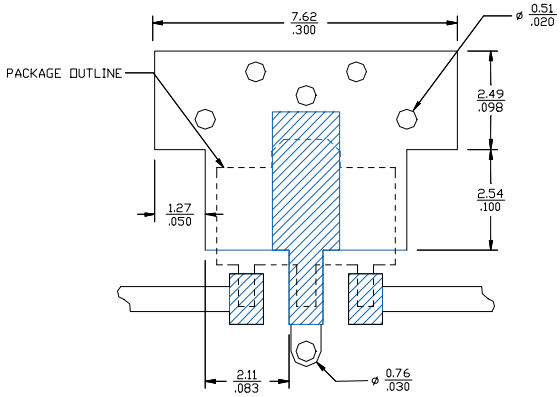




Land Pattern



Mounting Configuration



FUNCTION	PIN NO.
INPUT	1
GROUND	2
OUTPUT (BIAS)	3
GROUND	4

Notes:
1. Ground vias are critical for thermal and RF grounding considerations.
2. A minimum of 6 ground vias are required for 14 mil and 28 mil FR4 board.
3. If your PCB design rules allow, ground vias should be placed under the land pattern for better RF and thermal performance. Otherwise ground vias should be placed as close to land pattern as possible.
4. Trace width depends on PC board.