ACA2420

24 V, 1000 MHz, 21.5 dB Gain

High Output Power Doubler Line Amplifier

Data Sheet

FEATURES

- 21.5 dB Gain
- 75 Ω input and output match
- Characterized at +58 dBmV output power
- Superior gain flatness (± 0.2 dB)
- Very Low Distortion
- Stable with High VSWR Load Conditions
- Monolithic GaAs Design for Consistent Performance Part-to-Part
- Surface Mount Package Compatible with Automatic Assembly
- RoHS Compliant Package

APPLICATIONS

- CATV Line Amplifiers, Deep Fiber Nodes



S7 Package
16 Pin Wide Body SOIC
with Heat Slug

PRODUCT DESCRIPTION

The ACA2420 is a highly linear, monolithic GaAs RF amplifier that has been developed to replace, in new designs, standard CATV hybrid amplifiers. Offered in a convenient surface mount package, the MMIC consists of two pairs of parallel amplifiers that are optimized for exceptionally low distortion. A hybrid equivalent that provides flat gain response and excellent input and output return loss over the 40 to 1000 MHz CATV downstream band is formed when one ACA2420 is cascaded between two appropriate transmission line baluns.

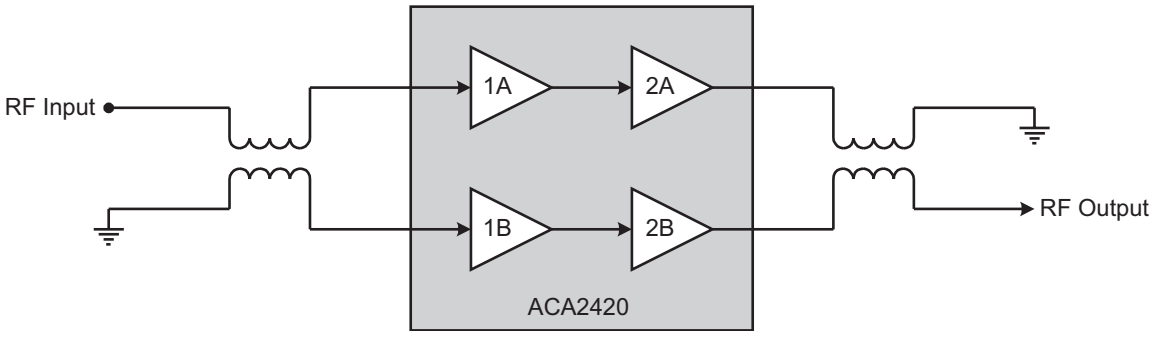


Figure 1: Hybrid Application Diagram

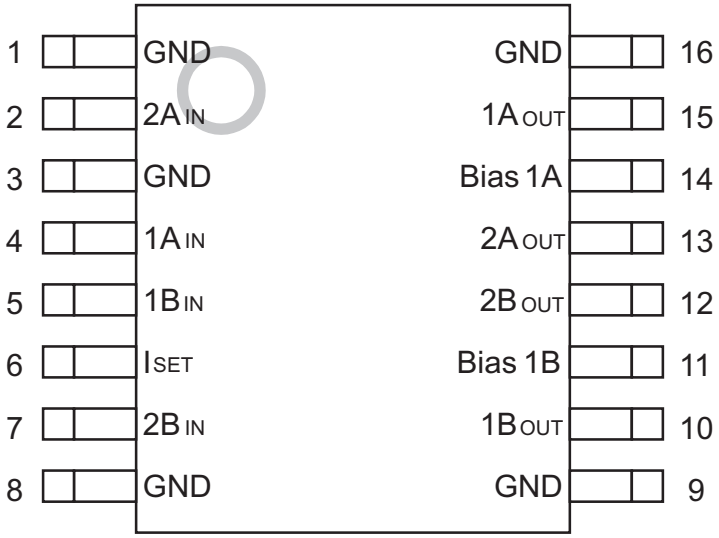


Figure 2: Pinout Diagram

Table 1: Pin Description

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	GND	Ground	9	GND	Ground
2	$2A_{IN}$	Amplifier 2A Input	10	$1B_{OUT}$	Amplifier 1B Output
3	GND	Ground	11	Bias 1B	Bias for 1B Amplifier
4	$1A_{IN}$	Amplifier 1A Input	12	$2B_{OUT}$	Amplifier 2B Output and Supply
5	$1B_{IN}$	Amplifier 1B Input	13	$2A_{OUT}$	Amplifier 2A Output and Supply
6	I_{SET}	Current Adjust	14	Bias 1A	Bias for 1A Amplifier
7	$2B_{IN}$	Amplifier 2B Input	15	$1A_{OUT}$	Amplifier 1A Output
8	GND	Ground	16	GND	Ground

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Mimimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Supply (pins 12, 13)	0	+28	V_{DC}
Current Adjust (pin 6)	0	+4	V_{DC}
RF Power at Inputs (pins 4, 5)	-	+75	dBmV
Storage Temperature	-65	+150	°C
Soldering Temperature	-	+260	°C
Soldering Time	-	5.0	Sec

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Notes:

(1) Pins 2, 4, 5 and 7 should be AC-coupled. No external DC bias should be applied.

(2) Pin 6 should be AC-grounded and/or pulled to ground through a resistor for current control.

(3) Pins 11 and 14 are bias feeds for input amplifiers 1A and 1B. No external DC bias should be applied.

(4) Pins 10 and 15 receive DC bias directly from pins 11 and 14.

Table 3: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT
Supply: V_{DD} (pins 12, 13)	-	+24	-	V_{DC}
Current Adjust (pin 6)	-	+1.5	-	V_{DC}
RF Frequency	40	-	1000	MHz
Case Temperature	-40	-	+100	°C

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Table 4: AC and DC Electrical Specifications
(T_A = +25 °C, V_{DD} = +24 VDC)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain @ 1000 MHz (1)	20.8	21.5	22.3	dB	
Cable Equivalent Slope (1)	-0.1	0	0.7	dB	
Gain Flatness 50 to 1000 MHz (1)	-	±0.2	-	dB	
Noise Figure (1)	-	5.75	6.5	dB	
CTB (1) 77 Channels (2) 77 Channels (3)	 - -	 -78 -76	 - -74	dBc	
CSO (1) 77 Channels (2) 77 Channels (3)	 - -	 -71 -69	 - -67	dBc	
XMOD (1) 77 Channels (2) 77Channels (3)	 - -	 -64 -63	 - -59	dBc	
CIN (1) 77 Channels (3)	 -	 -	 -58	dBc	
Return Loss (Input) (1) 40-1000 MHz	-	-22	-18	dB	75 Ω system
Return Loss (Output) (1) 40-900 MHz 901-1000 MHz	 - -	 -22 -22	 -20 -18	dB	75 Ω system
Supply Current	495	520	545	mA	
Thermal Resistance	-	2.7	3.3	°C/W	

Notes:
(1) Measured with baluns on the input and output of the device.
(2) Parts measured with 77 channels, +58 dBmV power, 15.5 dB tilt at 1000 MHz.
(3) Parts measured with 77 channels, +58 dBmV power, 15.5 dB tilt at 1000 MHz, plus Q_{AM} to 1GHz.
(4) All specifications as measured on Evaluation Board (see Figures 13 & 14).

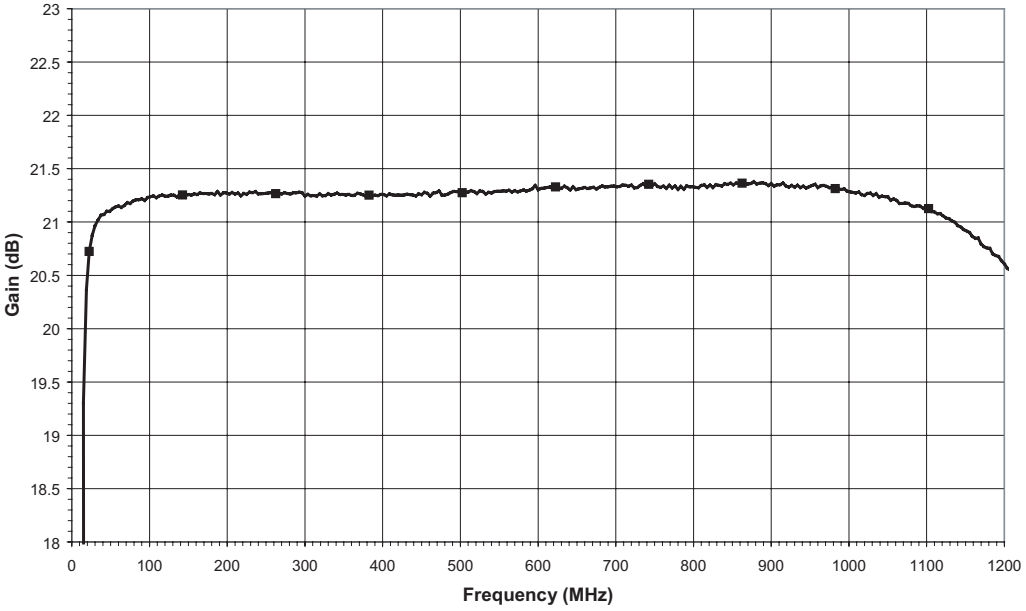


Figure 3: Gain (S21) vs Frequency
(T_A = +25 °C, V_{DD} = +24 V, 75 Ω system)

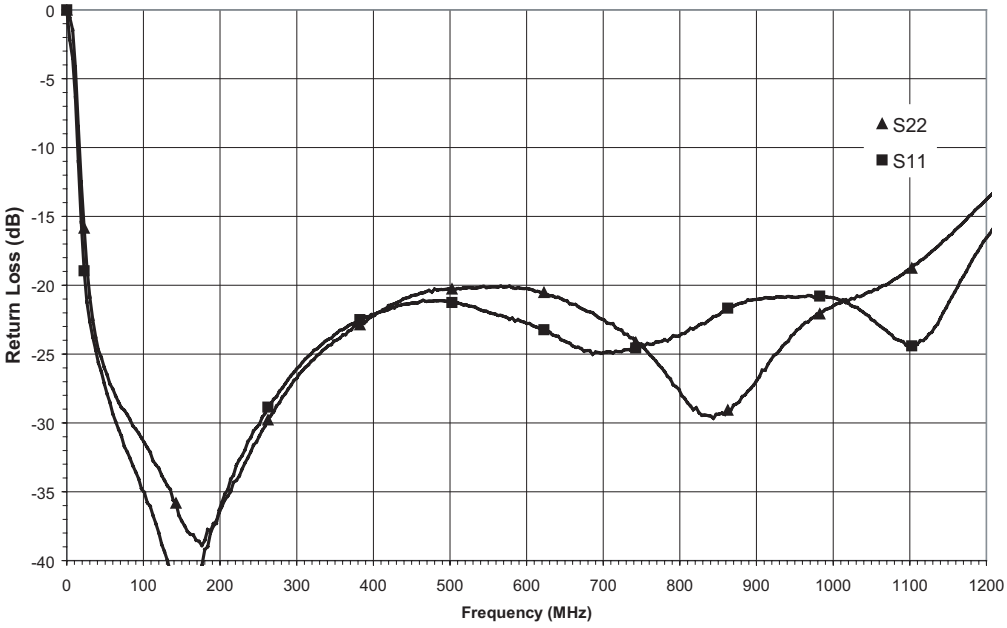


Figure 4: Input and Output Return Loss (S11 and S12) vs. Frequency
(T_A = +25 °C, V_{DD} = +24 V, 75 Ω system)

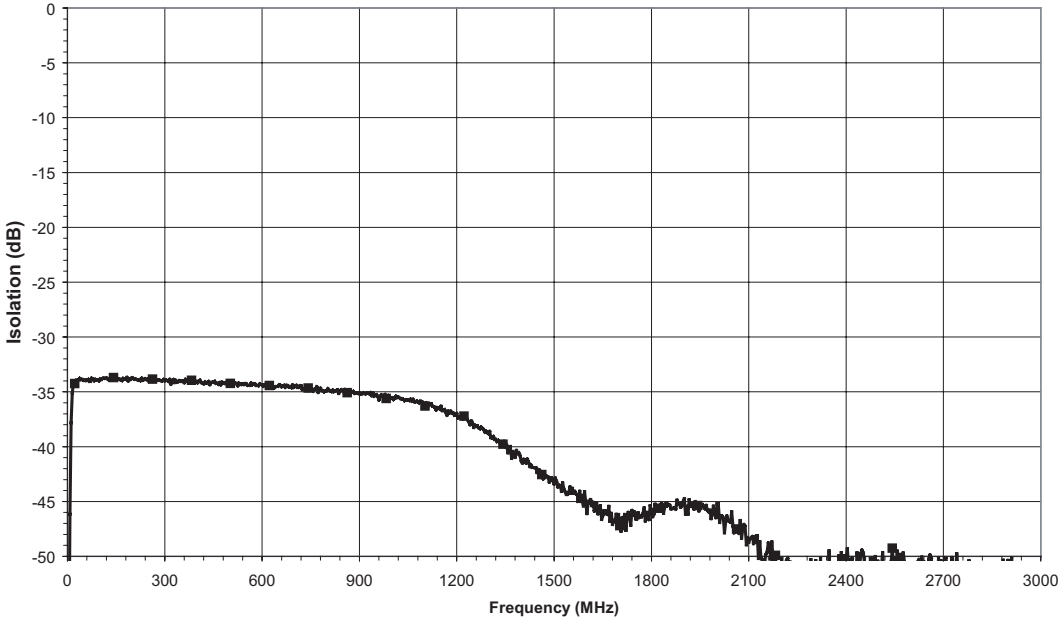


Figure 5: Isolation (S12) vs. Frequency
(T_A = +25 °C, V_{DD} = +24 V, 75 Ω system)

APPLICATION INFORMATION

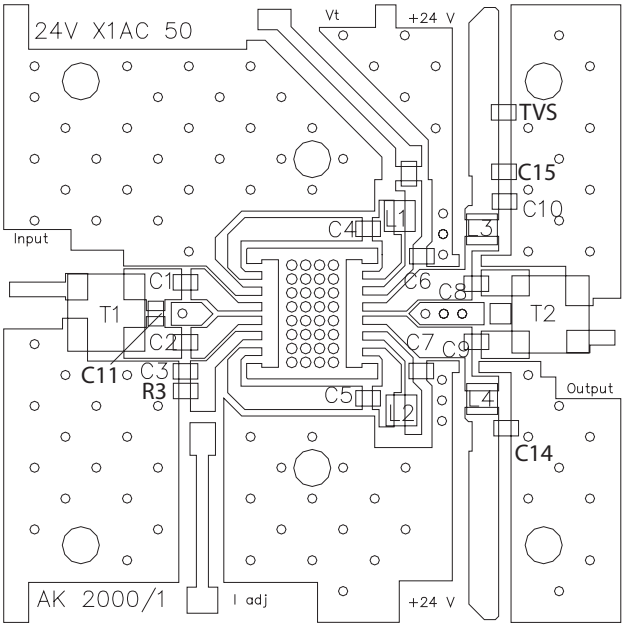


Figure 6: Evaluation Board Layout

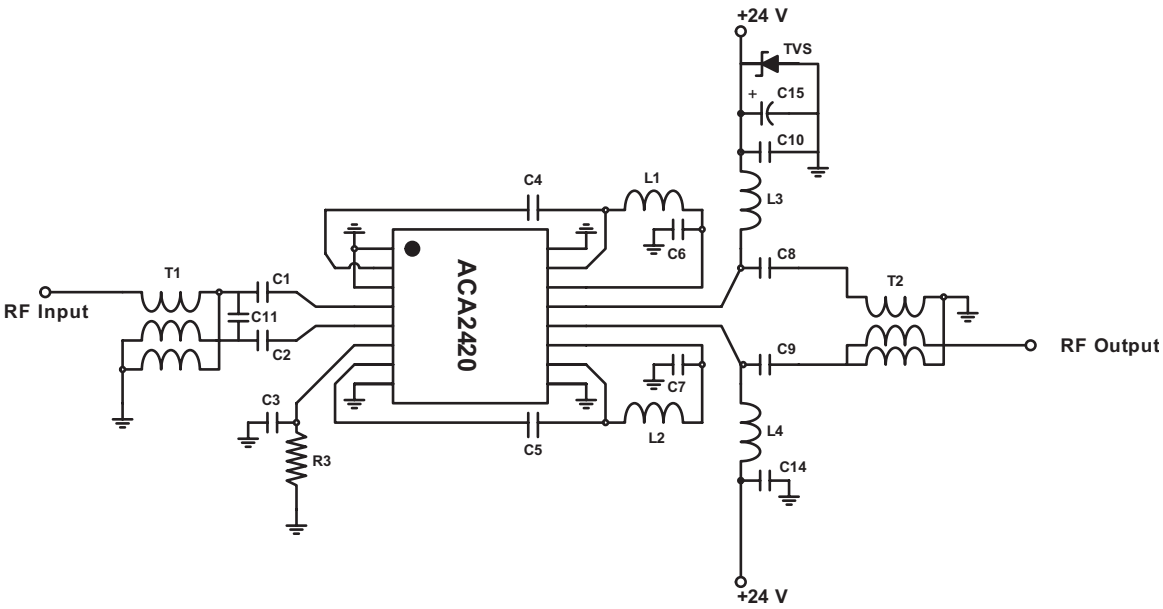


Figure 7: Evaluation Board Schematic

Table 5: Evaluation Board Parts List

REFERENCE	DESCRIPTION	QTY	VENDOR	VENDOR P/N
C1, C2, C3, C6, C7, C10, C14	0.01 uF CHIP CAP	7	MURATA	GRM39X7R103K50V
C4, C5, C8, C9	270 pF CHIP CAP	4	MURATA	GRM39X7R271K50V
C11	1.0 pF CHIP CAP	1	MURATA	GRM36COG0R5C50
C15	47 uF ELECT CAP	1	DIGI-KEY CORP	P5275-ND
C12, C13, R2, R3	NOT USED			
TVS	TVS 24 VOLT 600 WATT	1	DIGI-KEY CORP	SMBJ24ACCCT-ND
L1, L2, L3, L4	470 nH INDUCTOR	4	MURATA	LQH1WA47KONO003/-4052
R3	15 K Ohm	1	-	-
CONNECTOR (1)	75 Ohm N MALE PANEL MOUNT	2	PASTERNACK ENTERPRISES	PE4504
T1, T2	Balun	2	M/A-COM	MABA-009210-CT1760
	Printed Circuit Board (2)	1	STANDARD PRINTED CIRC. INC.	24VX1AC50

Notes:
(1) N connector center pin should be approximately 80 mils in length.
(2) Due to the power dissipation of this device, the printed circuit board should be mounted / attached to a heat sink.

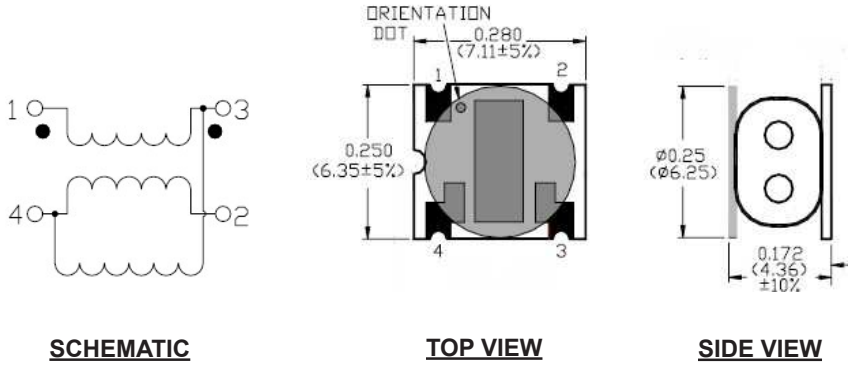
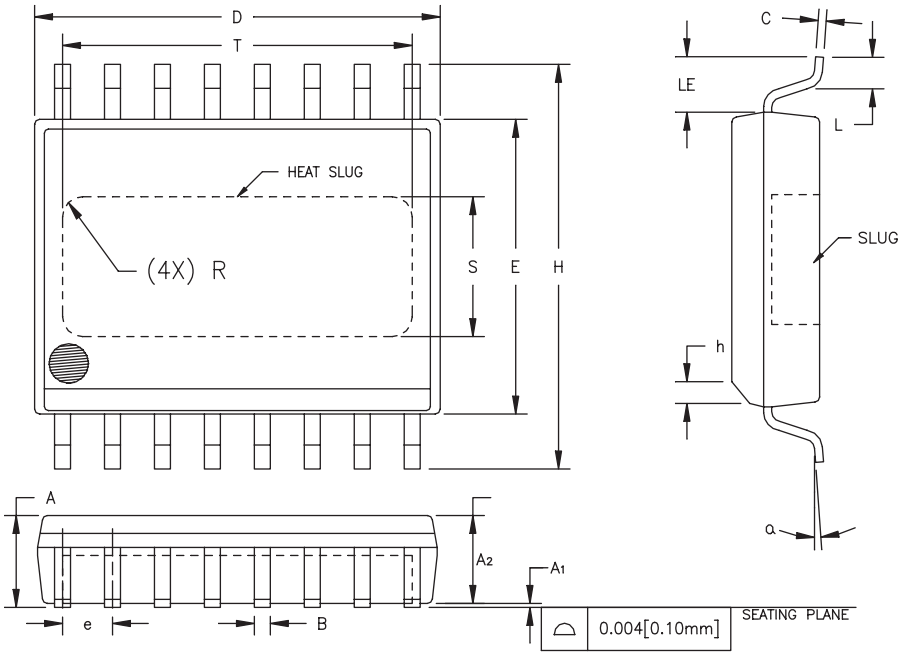


Figure 4: Balun Drawing

Note:
See M/A-COM's data sheet for more details.

PACKAGE OUTLINE



SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A_1	0.000	0.004	0.00	0.10	6
A_2	0.087	0.094	2.21	2.39	
B	0.013	0.019	0.33	0.48	
C	0.007	0.009	0.18	0.23	
D	0.398	0.412	10.11	10.46	2
E	0.290	0.300	7.37	7.62	3
e	0.050 BSC		1.27 BSC		4
H	0.394	0.418	10.01	10.62	
h	0.010	0.028	0.25	0.71	
L	0.024	0.040	0.61	1.02	
LE	0.052	—	1.32	—	
α	0°	8°	0°	8°	
S	0.120	0.140	3.05	3.56	5
T	0.330	0.350	8.38	8.89	5
R	REF. 0.015		REF. 0.38		5

NOTES:

1. CONTROLLING DIMENSION: INCHES
2. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.006 [0.15mm] PER SIDE.
3. DIMENSION "E" DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.010 [0.25mm] PER SIDE.
4. MAXIMUM LEAD TWIST/SKEW TO BE ±0.005 [0.13mm].
5. DIMENSIONS "S", "T" AND "R" INDICATE EXPOSED SLUG AREA.
6. STANDOFF HEIGHT (A_1) MEASURED FROM BOTTOM OF SLUG.

Figure 5: S7 Package Outline - 16 Pin Wide Body SOIC with Heat Slug

ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
ACA2420RS7P2	-40 °C to +110 °C	16 Pin Wide Body SOIC with Heat Slug	Tape and Reel, 1500 pieces per Reel
EVB2420			Evaluation Board Part Number

NOTES

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