ACA2408

870 MHz, 34 dB Gain
CATV Push-Pull Line Amplifier

PRELIMINARY DATA SHEET - Rev 1.2

FEATURES

- 34 dB Gain
- Very Low Distortion
- Stable with High VSWR Load Conditions
- Monolithic Design for Consistent Performance Part-to-Part
- Low DC Power Consumption
- Surface Mount Package Compatible with Automatic Assembly
- Low Cost Alternative to Hybrids
- RoHS Compliant Package Option

APPLICATIONS

- Line Extenders, Apartment House Amplifiers, System Amplifiers, Distribution Nodes

S7 Package
16 Pin Wide Body SOIC
with Heat Slug

PRODUCT DESCRIPTION

The ACA2408 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 and noise figure. A hybrid equivalent that provides flat gain response and excellent input and output return loss over the 40 to 870 MHz CATV downstream band is formed when one ACA2408 is cascaded between two appropriate transmission line baluns.

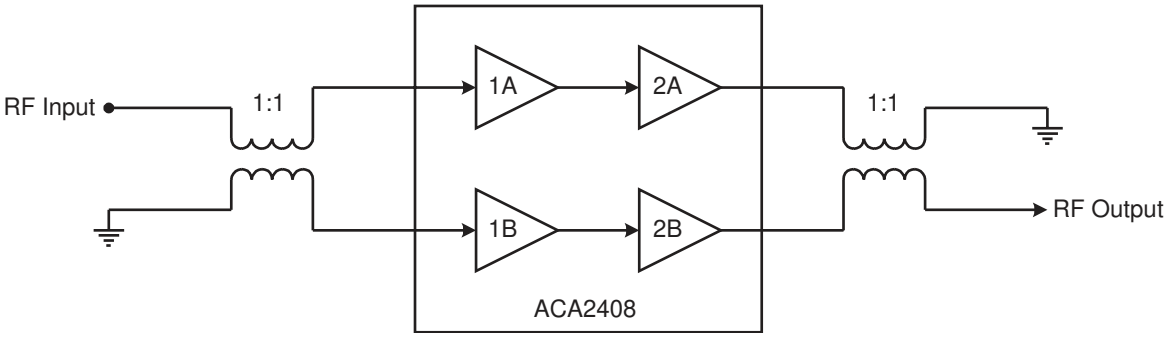


Figure 1: Hybrid Application Diagram

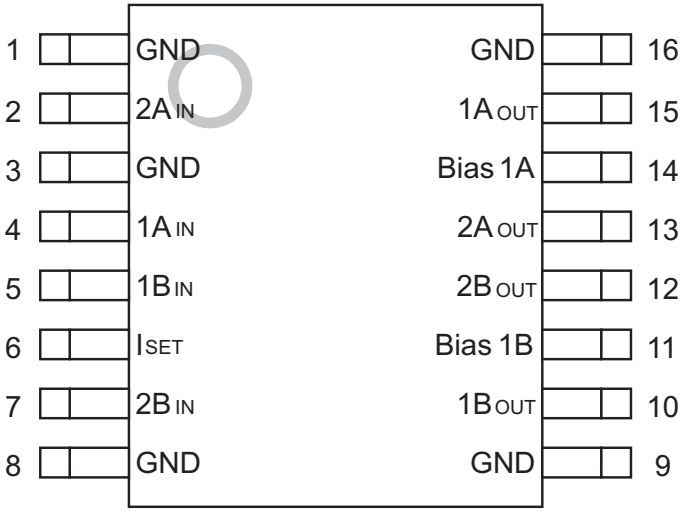


Figure 2: Pin Out

Table 1: Pin Description

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

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Mimimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT
Supply (pins 12, 13)	0	+28	VDC
RF Power at Inputs (pins 4, 5)	-	+55	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	-	VDC
Voltage at I_{SET} (pin 6)	-	+3	-	VDC
RF Frequency	40	-	870	MHz
Case Temperature	-40	-	+110	°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 (1) @ 870 MHz	33.5	34.8	-	dB	
Cable Equivalent Slope (1)	-	0	-	dB	
Gain Flatness (1) to 870 MHz	-	± 0.2	-	dB	
Noise Figure (1)	-	2.0	4.0	dB	
CTB (1) 110 Channels (2)	-	-70	-58	dBc	
CSO (1) 110 Channels (2)	-	-68	-58	dBc	
XMOD (1) 110 Channels (2)	-	-65	-55	dBc	
Input Return Loss (1) (75 Ω System)	- - - - -	-25 -28 -26 -20 -21	-20 - - -15.5 -14	dB	40 to 80 MHz 80 to 160 MHz 160 to 320 MHz 320 to 640 MHz 640 to 870 MHz
Outut Return Loss (1) (75 Ω System)	- - - - -	-27 -24 -20 -17 -17	-20 - - -15.5 -14	dB	40 to 80 MHz 80 to 160 MHz 160 to 320 MHz 320 to 640 MHz 640 to 870 MHz
Supply Current	-	325	340	mA	
Thermal Resistance	-	-	4.5	°C/W	

Notes:
(1) Measured with baluns on the input and output of the device.
(2) Flat output, +44 dBmV per channel.

PERFORMANCE DATA

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

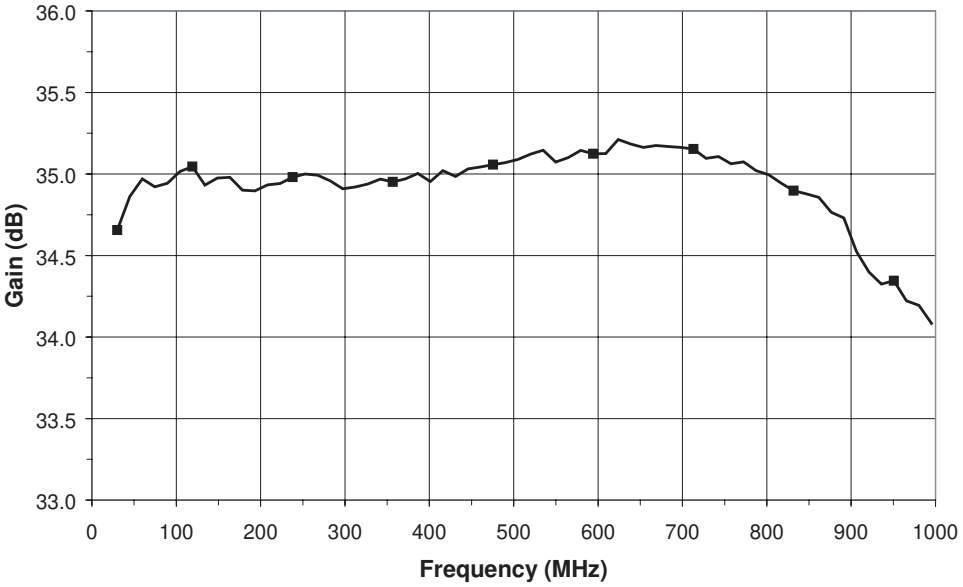


Figure 4: Input and Output Return Loss (S11 and S22) vs. Frequency
(T_A = +25 °C, V_{DD} = +24 V, 75 Ω system)

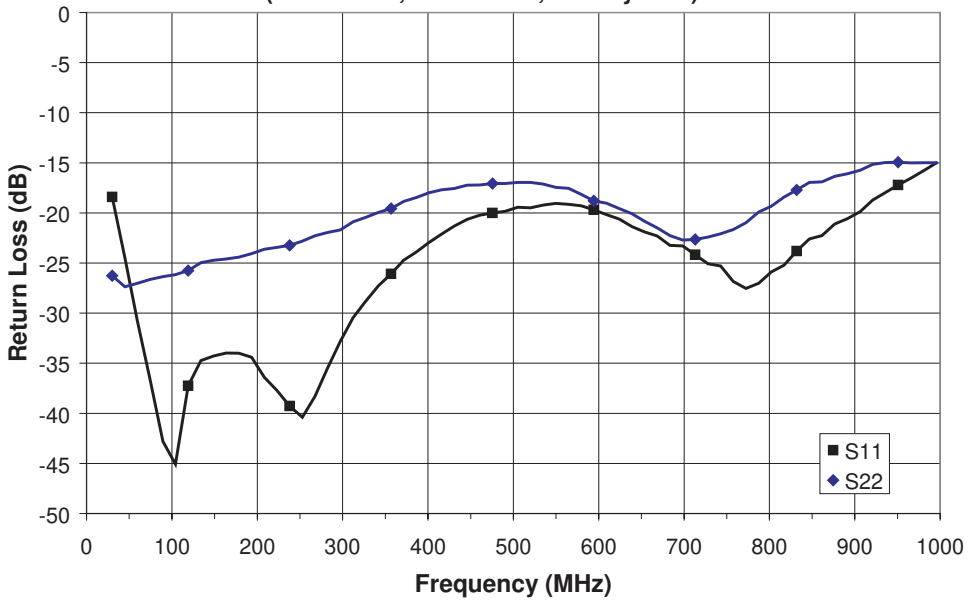


Figure 5: Isolation (S12) vs. Frequency
(T_A = +25 °C, V_{DD} = +24 V, 75 Ω system)

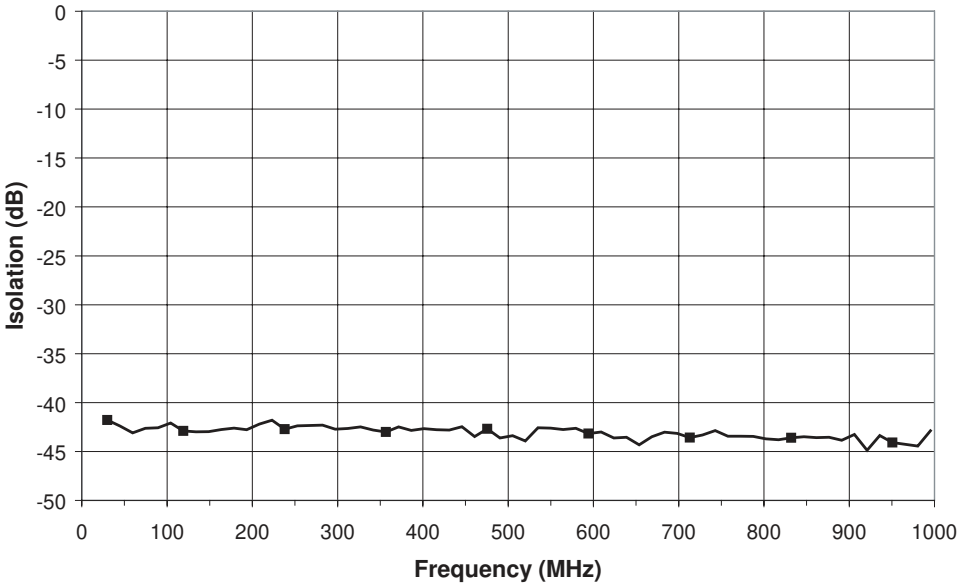


Figure 6: Noise Figure vs. Frequency
(T_A = +25 °C, V_{DD} = +24 V)

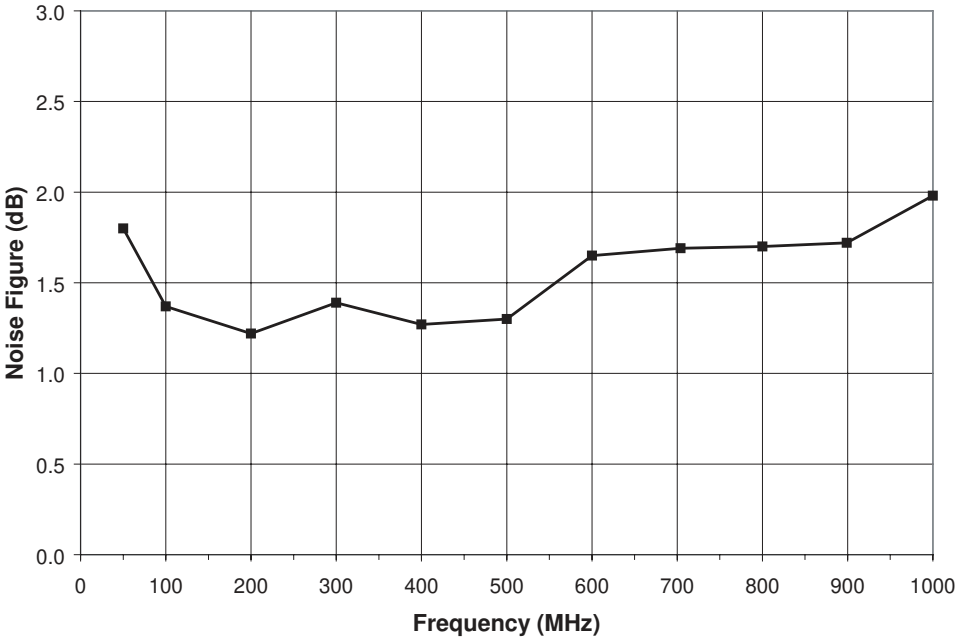


Figure 7: CTB vs. Frequency
(110 channels, +44 dBmV output power, flat output)

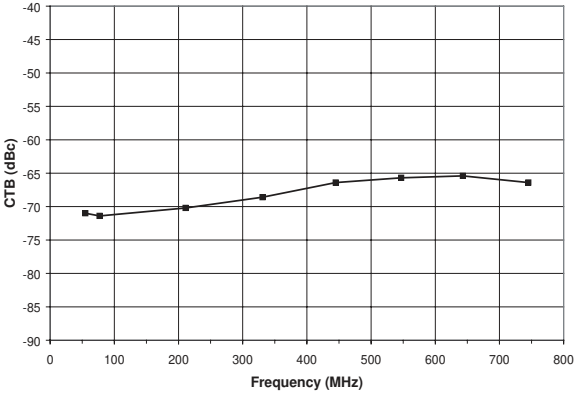


Figure 8: CSO vs. Frequency
(110 channels, +44 dBmV output power, flat output)

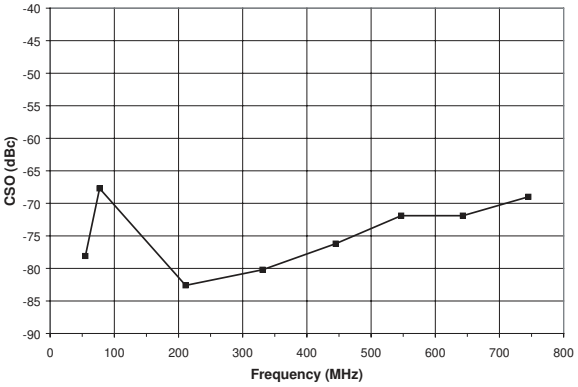


Figure 9: XMOD vs. Frequency
(110 channels, +44 dBmV output power, flat output)

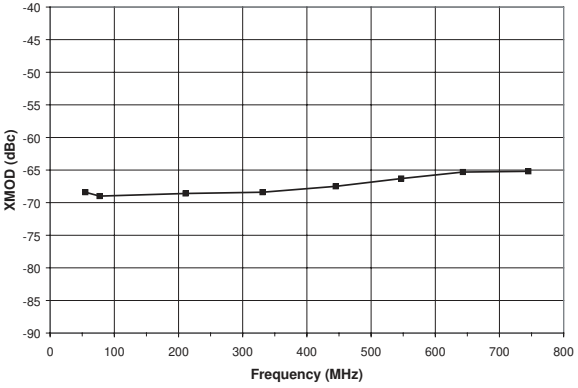


Figure 10: CTB vs. Frequency
(132 channels, +44 dBmV output power, flat output)

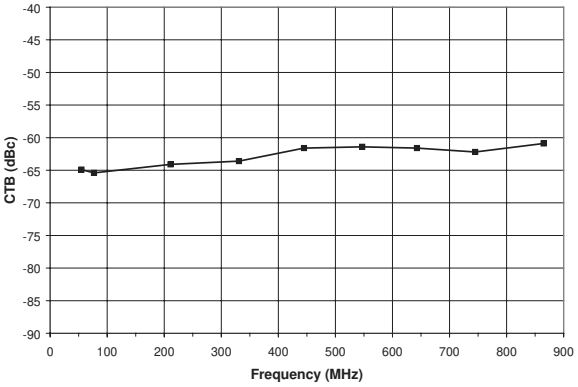


Figure 11: CSO vs. Frequency
(132 channels, +44 dBmV output power, flat output)

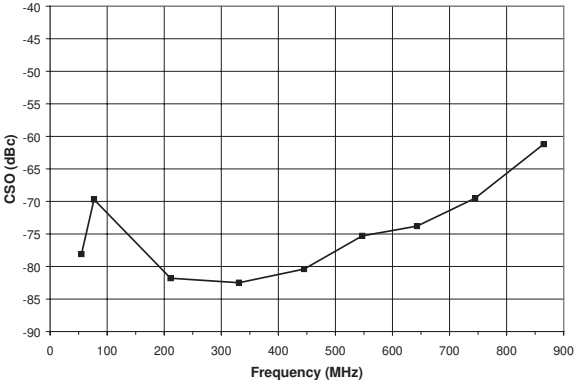
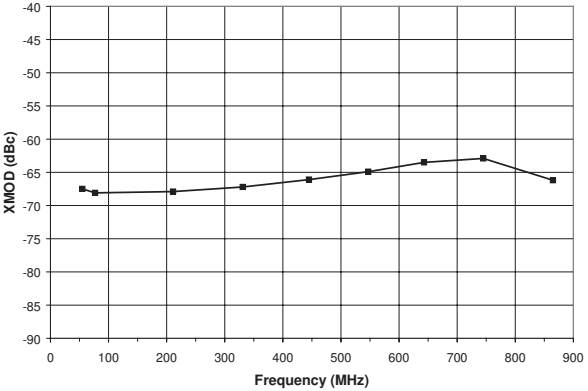


Figure 12: XMOD vs. Frequency
(132 channels, +44 dBmV output power, flat output)



APPLICATION INFORMATION

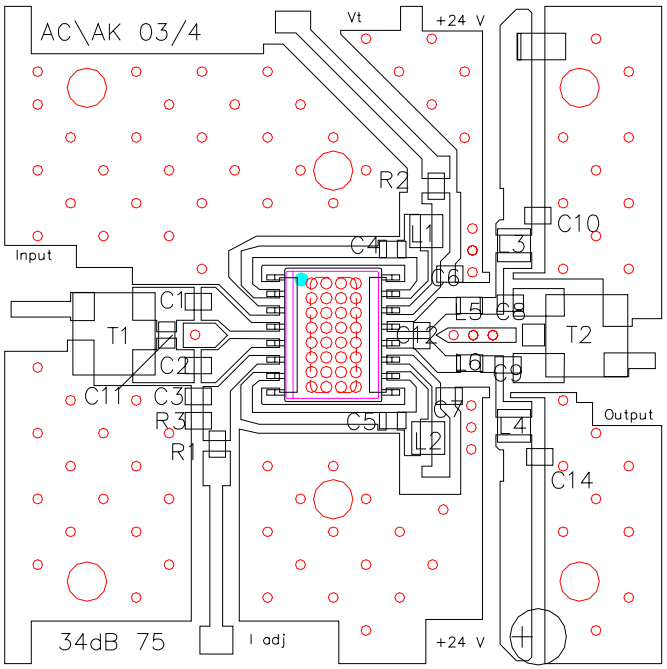


Figure 13: Evaluation Board Layout

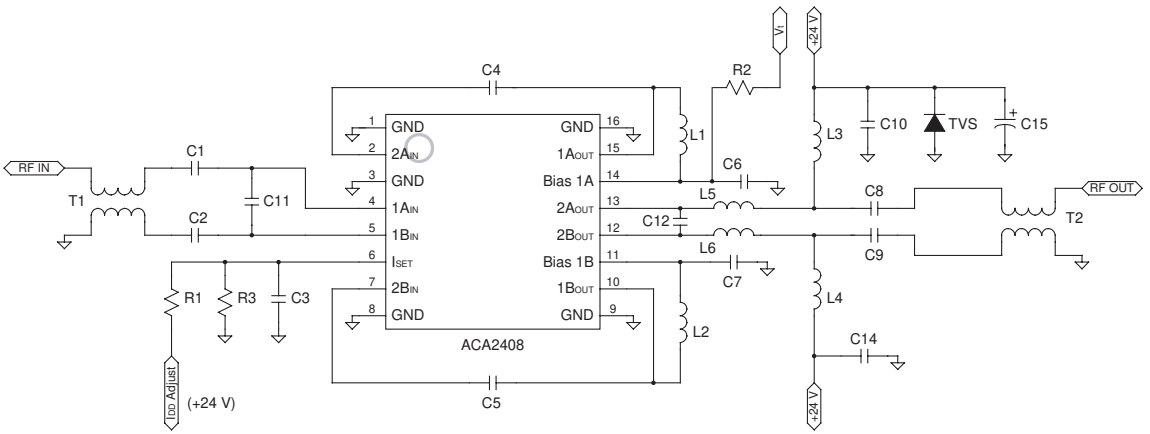


Figure 14: Evaluation Board Schematic

Table 5: Evaluation Board Parts List

REF	DESCRIPTION	QTY	VENDOR	VENDOR P/N
C1, C2, C3, C6, C7, C10, C14	0.01 μF CHIP CAP	7	MURATA	GRM39X7R103K50V
C4, C5, C8, C9	470 pF CHIP CAP	4	MURATA	GRM39X7R471K50V
C11, C12	0.5 pF CHIP CAP	2	MURATA	GRM36COG0R5C50
C15	47 μF ELECT CAP	1	DIGI-KEY CORP	P5275-ND
L1, L2, L3, L4 (4)	680 nH INDUCTOR	4	COIL CRAFT	1008CS-681XKBC
L5, L6 (4)	1.5 nH CHIP INDUCTOR	2	TOKO	PTL2012-F1N5C
R3	13 kΩ Resistor	1	DIGI-KEY CORP	P13KGCT-ND
R1, R2	NOT USED			
TVS	TVS 24 VOLT 600 WATT	1	DIGI-KEY CORP	SMBJ24ACCCT-ND
CONNECTOR (1)	75 Ω MALE PANEL MOUNT	2	PASTERNACK ENTERPRISES	PE4504
T1, T2 (2) (BALUN)	Ferrite Core	2	FAIR-RITE	2843002702
	Wire		MWS WIRE IND.	T-2361429-20
	Printed Circuit Board (3)	1	STANDARD PRINTED CIRC. INC.	24V2X1AC75
INDIUM	300 X 160 MILS	1	INDIUM CORP OF AMERICA	14996Y

Notes:
(1) N connector center pin should be approximately 80 mils in length.
(2) T1, T2, balun: 4.5 turns thru, as shown in Figure 15.
(3) Due to the power dissipation of this device, the printed circuit board should be mounted / attached to a heat sink.
(4) 400 mA minimum current rating.

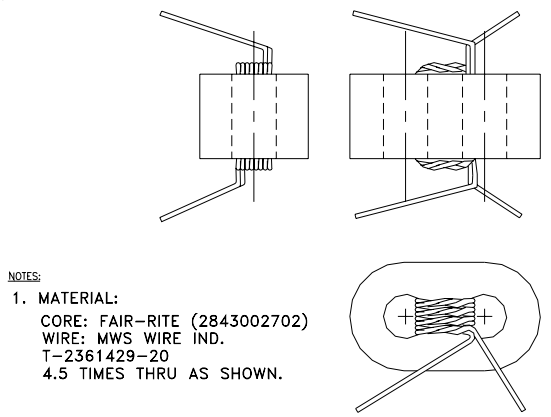
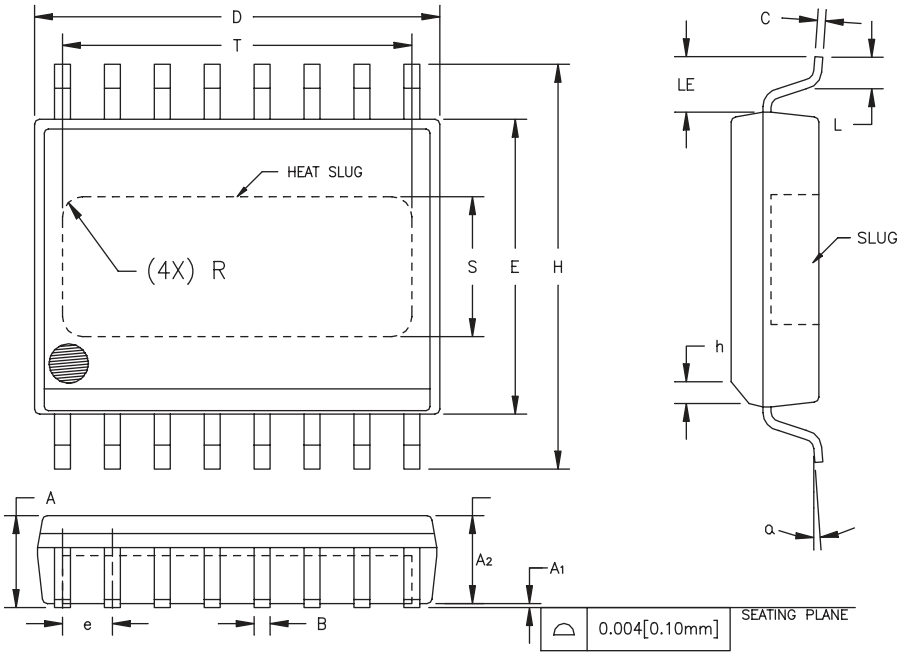


Figure 15: Balun Drawing

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

ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
ACA2408S7P2	-40 °C to +110 °C	16 Pin Wide Body SOIC with Heat Slug	Tape and Reel, 1500 pieces per Reel
ACA2408S7P0	-40 °C to +110 °C	16 Pin Wide Body SOIC with Heat Slug	Plastic Tubes, 50 pieces per Tube
ACA2408RS7P2	-40 °C to +110 °C	RoHS Compliant 16 Pin Wide Body SOIC with Heat Slug	Tape and Reel, 1500 pieces per Reel
ACA2408RS7P0	-40 °C to +110 °C	RoHS Compliant 16 Pin Wide Body SOIC with Heat Slug	Plastic Tubes, 50 pieces per Tube

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