DATA SHEET

ACA2417: 1218 MHz CATV Push-Pull Driver Amplifier

Applications

- DOCSIS® and Euro DOCSIS® 3.1 (D3.1) compliant downstream
- RF Pre-amplifier for node + 0 HFC and FTTC/FTTB networks
- Final stage amplifier in FTTC applications

Features

- 40 to 1218 MHz frequency range
- Output power: ≥ +44 dBmV/channel
- Gain: 25 dB at 1218 MHz
- Total composite power : ≥ +64.4 dBmV
- Single +24 V supply
- Operating current: 240 mA (Pdiss < 6 Wdc)
- Surface-mount package compatible with automatic assembly and excellent reliability
- Halogen-free/RoHS compliant

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04–0074.

Description

The ACA2417 is a highly linear low-noise, high-gain RF pre-amplifier module in the industry standard SOIC-16 wide body SMT package. Designed to drive D3.1 compliant power doublers in deep fiber node CATV infrastructure applications, the module consists of two parallel amplifiers in cascade forming a push-pull optimized for low noise, low distortion, high output power per channel, and high TCP. Advanced GaAs optimizes operating current, making the module an excellent choice for environmentally friendly “green” applications.

A block diagram of the ACA2417 is shown in Figure 1. The device package and pinout are shown in Figure 2. Signal pin assignments and functional pin descriptions are described in Table 1.

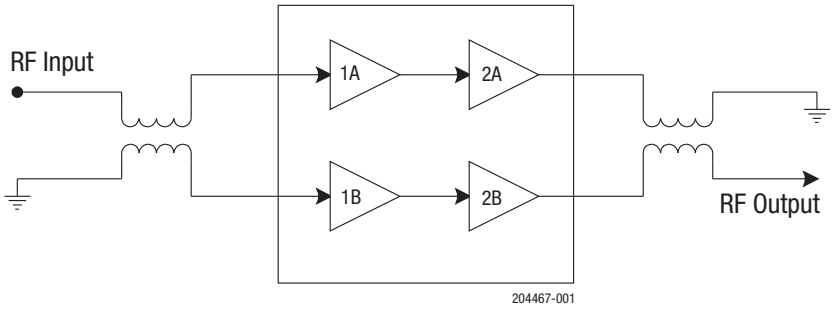


Figure 1. ACA2417 Block Diagram

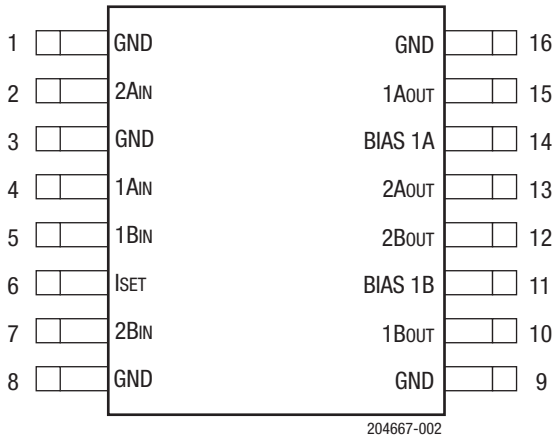


Figure 2. ACA2417 Pinout
(Top View)

Table 1. ACA2417 Signal Pin Descriptions

Pin	Name	Description	Pin	Name	Description
1	GND	Ground	9	GND	Ground
2	2AIN	Amplifier 2A input	10	1BOUT	Amplifier 1B output
3	GND	Ground	11	BIAS 1B	Bias for 1B amplifier
4	1AIN	Amplifier 1A input	12	2BOUT	Amplifier 2B output
5	1BIN	Amplifier 1B input	13	2AOUT	Output from Amplifier A
6	ISET	Current adjust	14	BIAS 1A	Bias for 1A amplifier
7	2BIN	Amplifier 2B input	15	1AOUT	Amplifier 1A output
8	GND	Ground	16	GND	Ground

Electrical and Mechanical Specifications

The absolute maximum ratings of the ACA2417 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. ACA2417 Absolute Maximum Ratings[1]

Parameter	Minimum	Maximum	Units
Supply (pins 12 and 13)	0	+28	VDC
Current adjust (pin 6)		+4	VDC
RF power at inputs (pins 4 and 5)		+75	dBmV
Storage temperature	-65	+150	°C
Soldering temperature		+260	°C
Soldering time		5.0	sec

[1] Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

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

[3] Pin 6 should be AC-grounded and/or pulled to ground through a resistor for current control.

[4] Pins 10, 11, 14, and 15 should have no other external bias applied.

***ESD HANDLING**: Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

Table 3. ACA2417 Recommended Operating Conditions[1]

Parameter	Symbol	Min	Typ	Max	Units
RF frequency	f	40		1218	MHz
Supply voltage	V_{DD}		+24		VDC
Case temperature	T_{CASE}	-40		+110	°C

[1] Performance is guaranteed only under the conditions listed in this table.

Table 4. ACA2417 Electrical Specifications[1]
T_A = +25 °C, VDD = +24 VDC, 75 Ω System, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Gain[3]	G	1218 MHz	24.2	25.2	26.2	dB
Gain flatness to 1218 MHz[2,3]				± 0.2		dB
Cable equivalent slope[3]			0.5	1.0	1.5	dB
Noise figure	NF			5		dB
CTB[1]	CTB			-68	-65	dBc
CSO[1]	CSO			-67	-65	dBc
XMOD[1]	ACLR			-60		dBc
CIN[1]				-65	-62	dB
Return loss 50 to 600 MHz	RL			-20	-18	dB
Return loss 600 to 1218 MHz	RL			-20	-16	° C/W
Thermal resistance	θ_{JC}	Junction to case slug		2.7	3.3	°C/W
Supply current				240	270	mA

1 Parts measured with 79 NTSC analog channels plus digital QAM channels to 1000 MHz, +44 dBmV output power and 0.0 dB tilt.

2 Peak deviation from a straight line between gain value at 50 MHz and 1218 MHz.

3 Measured in application circuit in Figure 3.

4 All specifications as measured on the Evaluation Board.

Evaluation Board Description

The ACA2417 Evaluation Board is used to test the performance of the ACA2417 device. An Evaluation Board schematic is provided in Figure 3. Table 6 provides the Bill of Materials (BOM) list for Evaluation Board components.

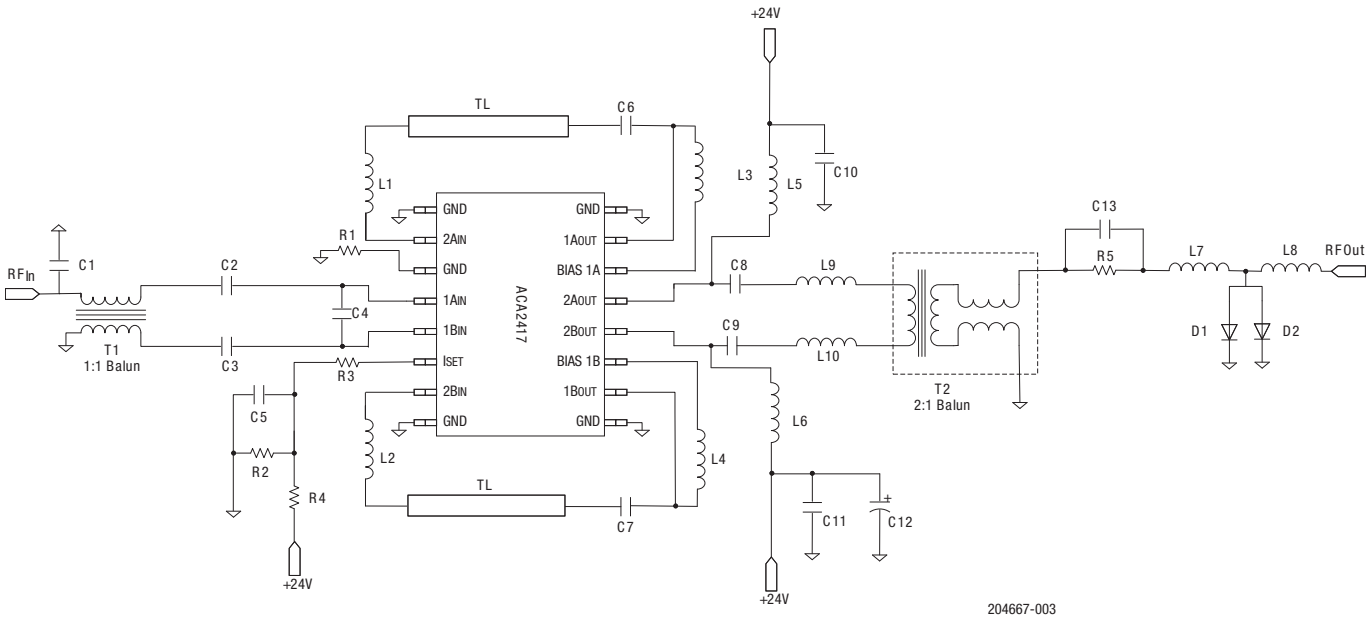


Figure 3. ACA2417 Evaluation Board Schematic

Table 5. ACA2417 Evaluation Board Bill of Materials (BOM)

Component	Description	Value	Component	Description	Value
C1	0402 capacitor	0.2 pF	L9, L10	0402 inductor	5.1 nH
C2, C3, C5, C10, C11	0402 capacitor	0.01 uF	T1	Minntronix 1:1 BALUN	MRF-25001
C4	0402 capacitor	1.0 pF	T2	Minntronix 2:1 BALUN	MRF-27001
C6, C7	0402 capacitor	270 pF	R1	0402 resistor	0 Ω
C8, C9	0402 capacitor	150 pF	R2	0402 resistor	4.64 kΩ
C12	ELECTR CAP	47 uF	R3	0402 resistor	510 Ω
C13	0402 capacitor	330 pF	R4	0402 resistor	26.7 kΩ
L1, L2	0402 inductor	2.7 nH	R5	0402 resistor	3 Ω
L3, L4	0805 inductor	470 nH	D1, D2	0402 DIO	
L5, L6	0603 inductor	680 nH	TL	75 Ω transmission line	
L7	0402 inductor	3.3 nH	U1	ACA2417	
L8	0402 inductor	1.8 nH			

Package Dimensions

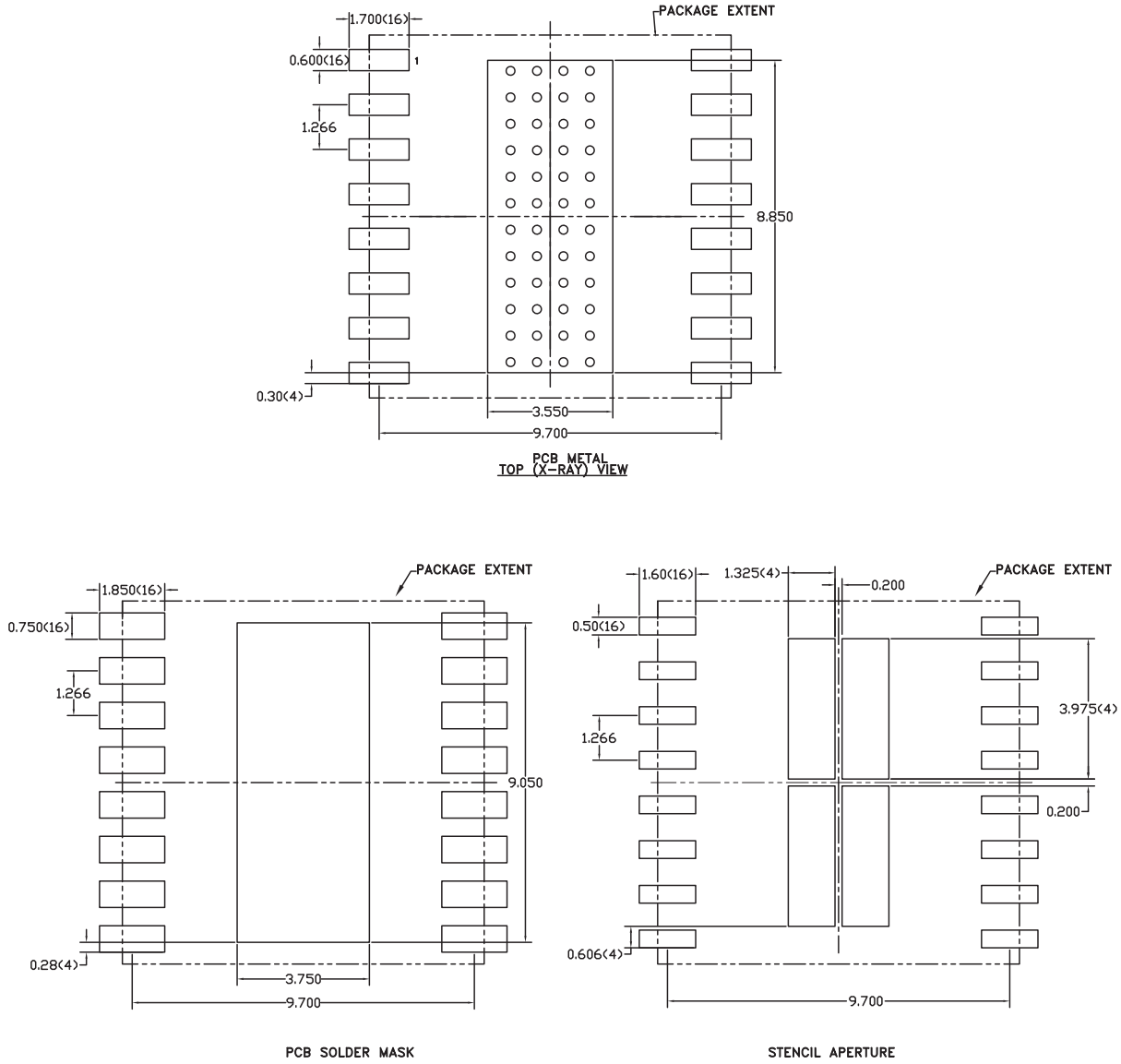
The PCB layout footprint drawing for the ACA2417 is shown in Figure 4. The package dimensions for the ACA2417 are shown in Figure 5. The tape and reel dimensions are provided in Figure 6.

Package and Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The ACA2417 is rated to Moisture Sensitivity Level 2 (MSL2) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.



NOTES:
(1) UNLESS SPECIFIED DIMENSIONS ARE SYMMETRICAL ABOUT CENTER LINES SHOWN.

(2) DIMENSIONS IN MILLIMETERS.

(3) VIAS SHOWN IN PCB METAL VIEW ARE FOR REFERENCE ONLY. NUMBER & SIZE OF THERMAL VIAS REQUIRED DEPENDENT ON HEA DISSIPATION REQUIREMENT AND THE PC PROC SS CAPABILITY.

(4) RECOMMENDED STENCIL THICKNESS: APPROX. 0.125mm (5 Mils)

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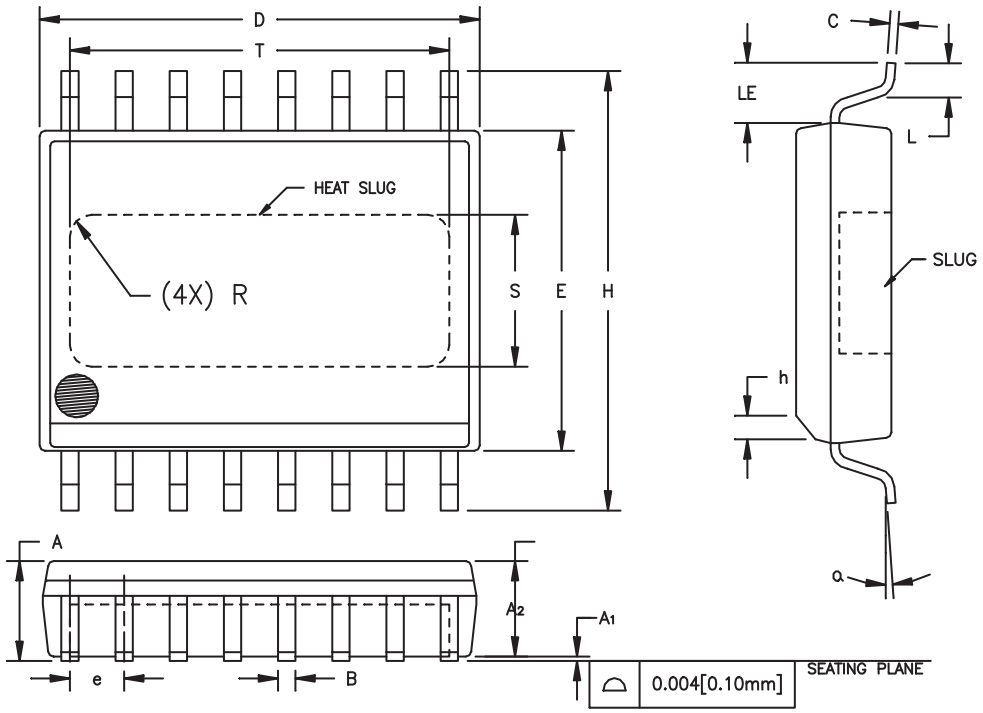
Figure 4. ACA2417 PCB Layout Footprint Dimensions



SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A1	0.000	0.004	0.00	0.10	6
A2	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.

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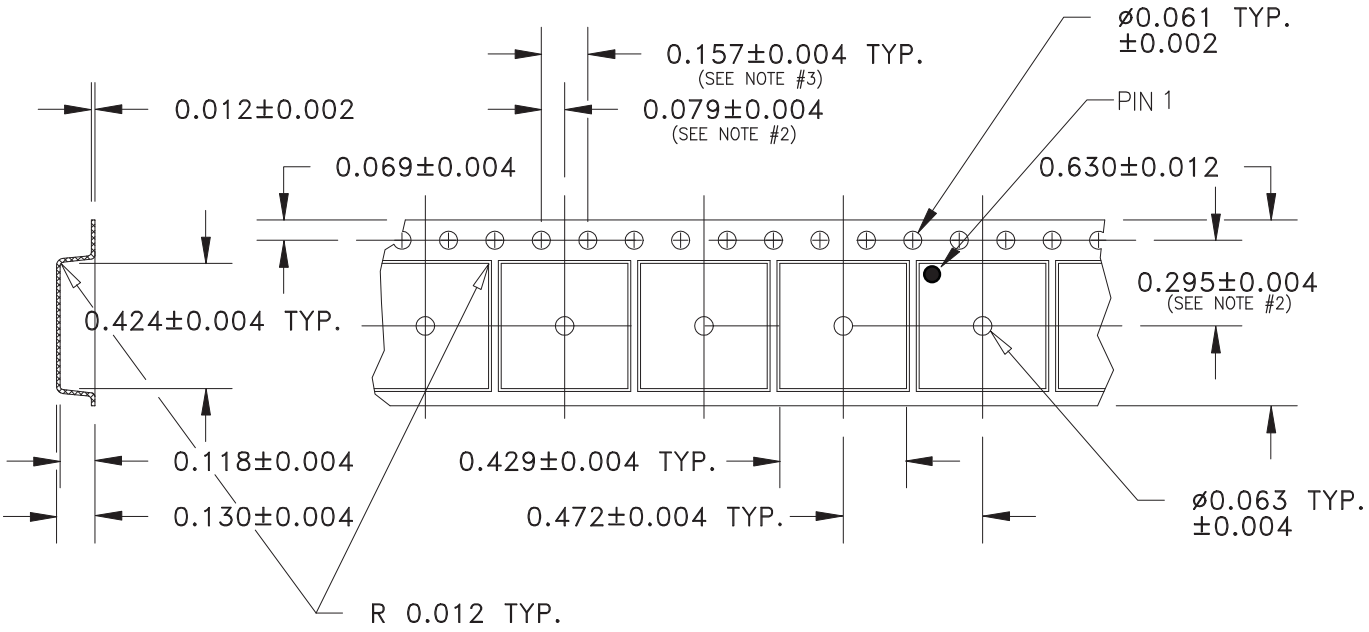
Figure 5. ACA2417 Package Dimensions



NOTES:
1. MATERIAL – CONDUCTIVE POLYSTYRENE.
2. MEASURED FROM CENTERLINE OF SPROCKET HOLE TO CENTERLINE OF POCKET.
3. CUMULATIVE TOLERANCE OF 10 SPROCKET HOLES IS ± 0.008.

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Figure 6. ACA2417 Tape and Reel Dimensions

Ordering Information

Product Description	Package Description	Component Packaging
ACA2417P2	16-pin wide body SOIC with heat slug	1500-piece tape and reel
EVB2417		Evaluation Board part number

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