

DATA SHEET

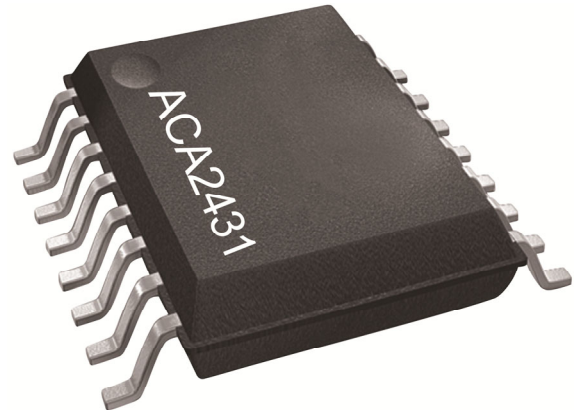
ACA2431: 1218 MHz High-Output GaN CATV Power-Doubler Amplifier

Applications

- Advanced high-power, high-frequency HFC transmission systems
- Output power doubler for deep fiber node in CATV distribution
- CATV digital edge QAM output driver

Features

- 50 to 1218 MHz frequency range
- Output power: +59 dBmV
- Gain: 28.5 dB at 1218 MHz
- Single +24 V supply
- Operating current: 460 mA (current adjust maintains linearity to < 400 mA)
- GaN amplifier technology
- Halogen-free/RoHS compliant
- External control for lower power applications



Description

The ACA2431 is a highly linear, high-output power integrated RF amplifier designed for CATV head-ends and HFC distribution systems. The IC consists of two parallel amplifiers that are optimized for exceptionally low distortion, high-output power, and high crash-point in a thermally enhanced surface-mount package. A GaN output stage is incorporated to minimize the operating (bias) current, thus making this an excellent choice for environmentally friendly "green" initiatives. The ACA2431 provides high gain over the 50 to 1218 MHz CATV downstream band, and is cascaded between two transmission line baluns.

A block diagram of the ACA2431 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.



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.

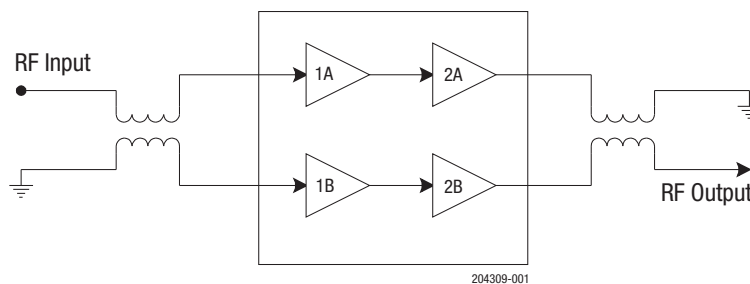


Figure 1. ACA2431 Block Diagram

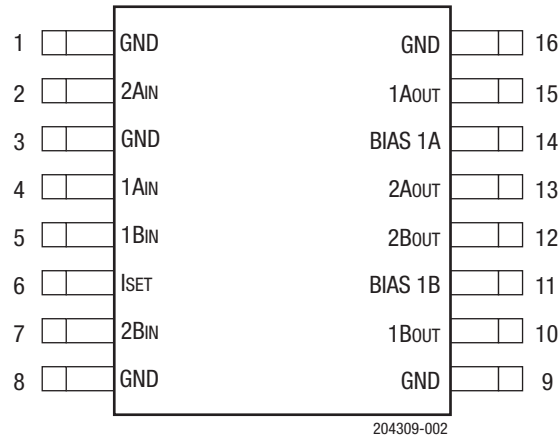


Figure 2. ACA2431 Pinout (Top View)

Table 1. ACA2431 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 and supply
5	1Bin	Amplifier 1B input	13	2Aout	Amplifier 2A output and supply
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 ACA2431 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. ACA2431 Absolute Maximum Ratings¹

Parameter	Minimum	Maximum	Units
Supply (pins 12 and 13)	0	+28	VDC
Current adjust (pin 6)	0	+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. ACA2431 Recommended Operating Conditions¹

Parameter	Symbol	Min	Typ	Max	Units
RF input/output frequency	f	50		1218	MHz
Supply voltage	V _{DD}		+24		VDC
Current adjust (pin 15)			+1.5		VDC
Case temperature	T _{CASE}	-40		+100	°C

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

Table 4. ACA2431 Electrical Specifications

(TA = +25 °C, VDD = +24 VDC, f = 50 to 1218 MHz, 75 Ω System, All Specifications Measured on the Evaluation Board, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Gain ³	G	1218 MHz	27.5	28.5	29.5	dB
Gain flatness to 1218 MHz ^{2,3}				± 0.2		dB
Cable equivalent slope ³				0		dB
Noise figure	NF			5		dB
Composite triple beat ¹	CTB			-78	-72	dBc
Composite second order ¹	CSO			-66	-64	dBc
Cross modulation ¹	XMOD			-65		dBc
Composite intermodulation noise ¹	CIN			-60	-56	dB
Return loss ³	RL	50 to 800 MHz 801 to 1218 MHz		-20 -20	-18 -16	dB dB
Thermal resistance	θ _{Jc}	Junction-to-case slug		2.7	3.3	°C/W
Supply current			440	460	480	mA

¹ Parts measured with 79 NTSC analog channels plus digital SC-256-QAM channels to 1000 MHz, +58 dBmV output power and 15.5 dB tilt referenced to 1 GHz.

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

³ Measured in application circuit in Figure 3.

Evaluation Board Description

The ACA2431 Evaluation Board is used to test the performance of the ACA2431 device. An Evaluation Board schematic is provided

in Figure 3. An Evaluation Board assembly is shown in Figure 4. Table 5 provides the Bill of Materials (BOM) list for Evaluation Board components.

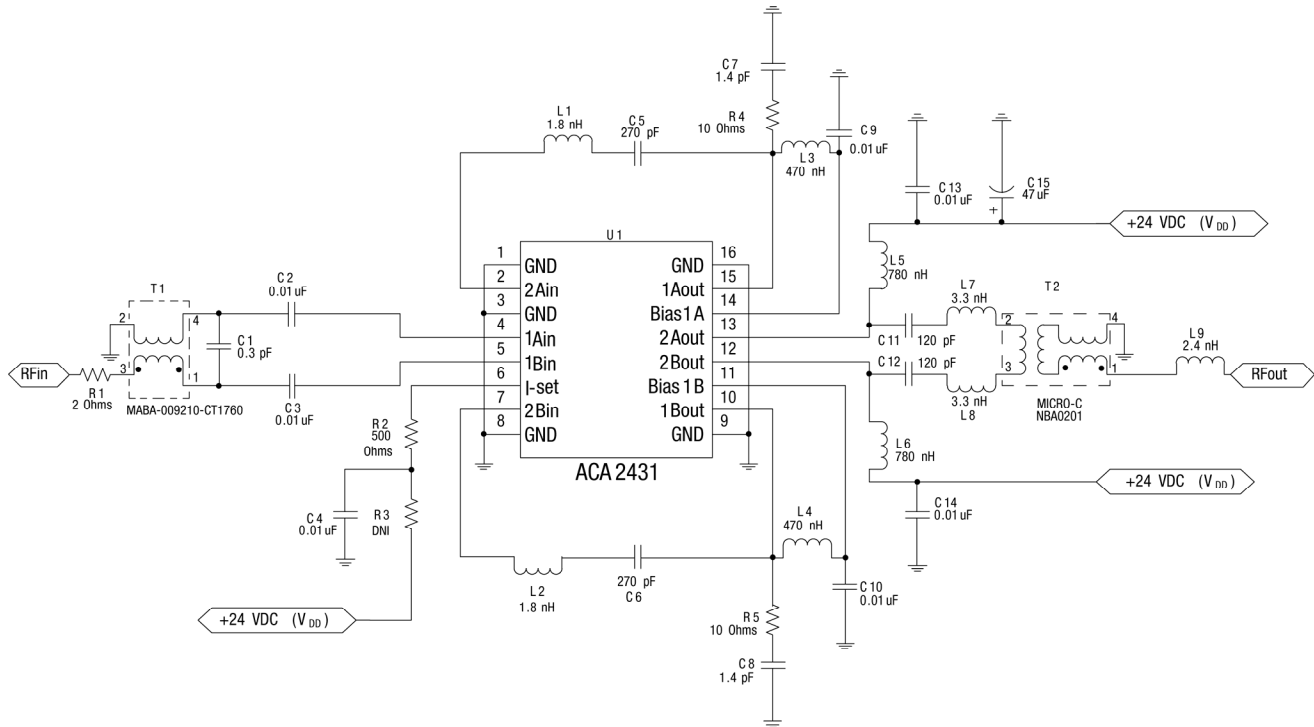


Figure 3. ACA2431 Evaluation Board Schematic

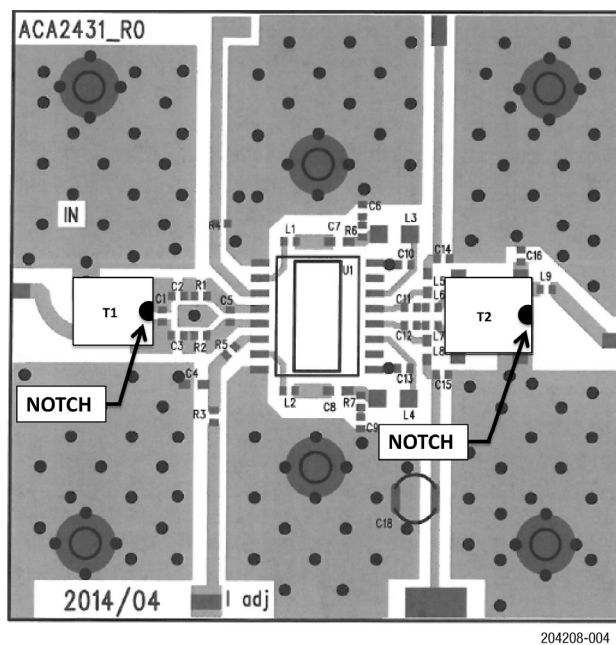


Figure 4. ACA2431 Evaluation Board Assembly

Table 5. ACA2431 Evaluation Board Bill of Materials (BOM)

Component	Value	Mfr	Mfr Part Number
C1	0.3 pF	Murata	GRM1555C1HR30BA01D
C11, C12	120 pF	Murata	GRM1555C1H121JA01D
C2, C3, C4, C9, C10, C13, C14	0.01 uF	Murata	GRM155R71H103KA88D
C5, C6	270 pF	Murata	GRM155R71H271KA01D
C7, C8	1.4 pF	Murata	GRM1555C1H1R4BA01D
C15	47 uF	Panasonic	ECE-A1HN470UB
L1, L2	1.8 nH	Murata	LQG15HN1N8S02
L3, L4	470 nH	Murata	LQH31CNR47M03L
L5, L6	780 nH	Allied	LS03-R78J-RC
L7, L8	3.3 nH	Murata	LQG15HN3N3S02
L9	2.4 nH	Murata	LQG15HN2N4S02
R1	2 Ω	Panasonic	ERJ-U020R00X
R2	500 Ω	Panasonic	ERJ-2RKF4990X
R3	DNI	DNI	DNI
R4, R5	10 Ω	Panasonic	ERJ-2RKF10R0X
T1	1:1 transformer	MACOM	MABA-009210-CT1760
T2	2:1 transformer	MICRO-C	NBA0201

Package Dimensions

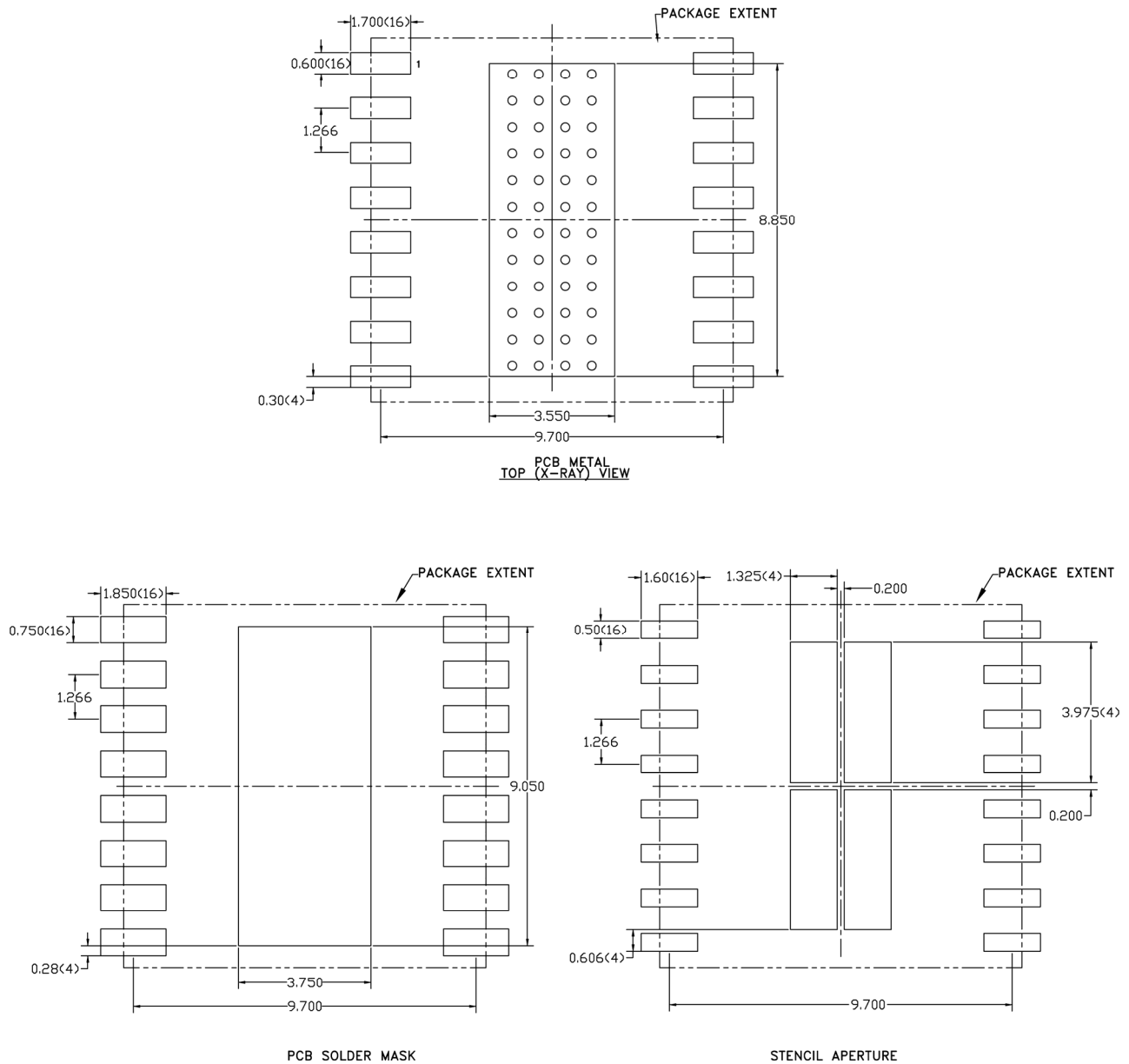
The PCB layout footprint drawing for the ACA2431 is shown in Figure 5. The package dimensions for the ACA2431 are shown in Figure 6. The tape and reel dimensions are provided in Figure 7.

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 ACA2431 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.

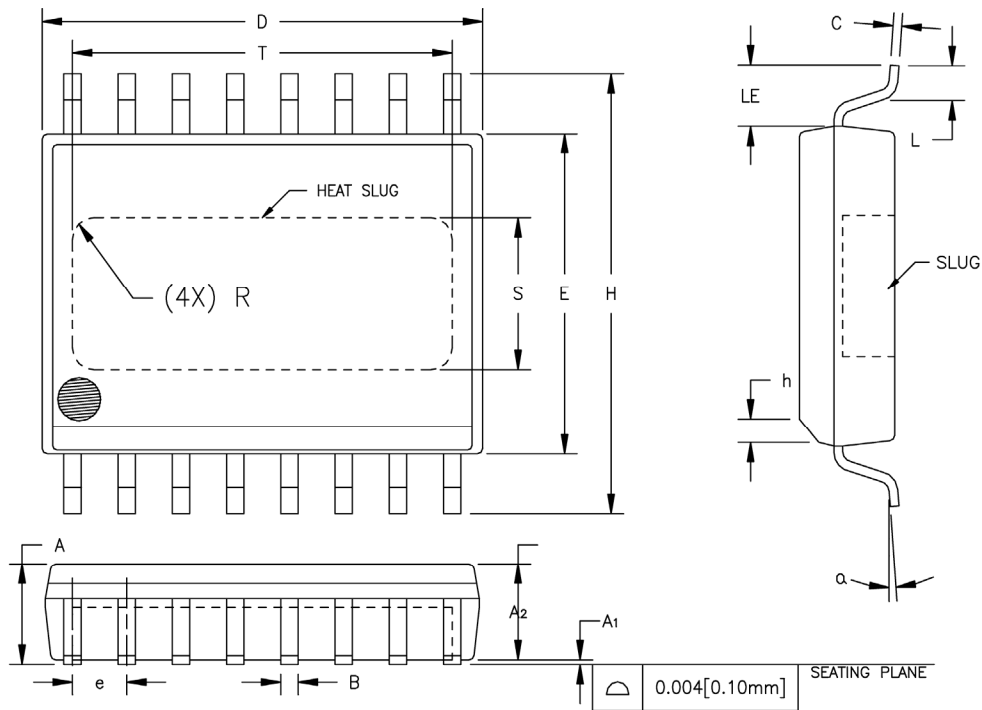


NOTES:

- (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 5. ACA2431 PCB Layout Footprint Dimensions



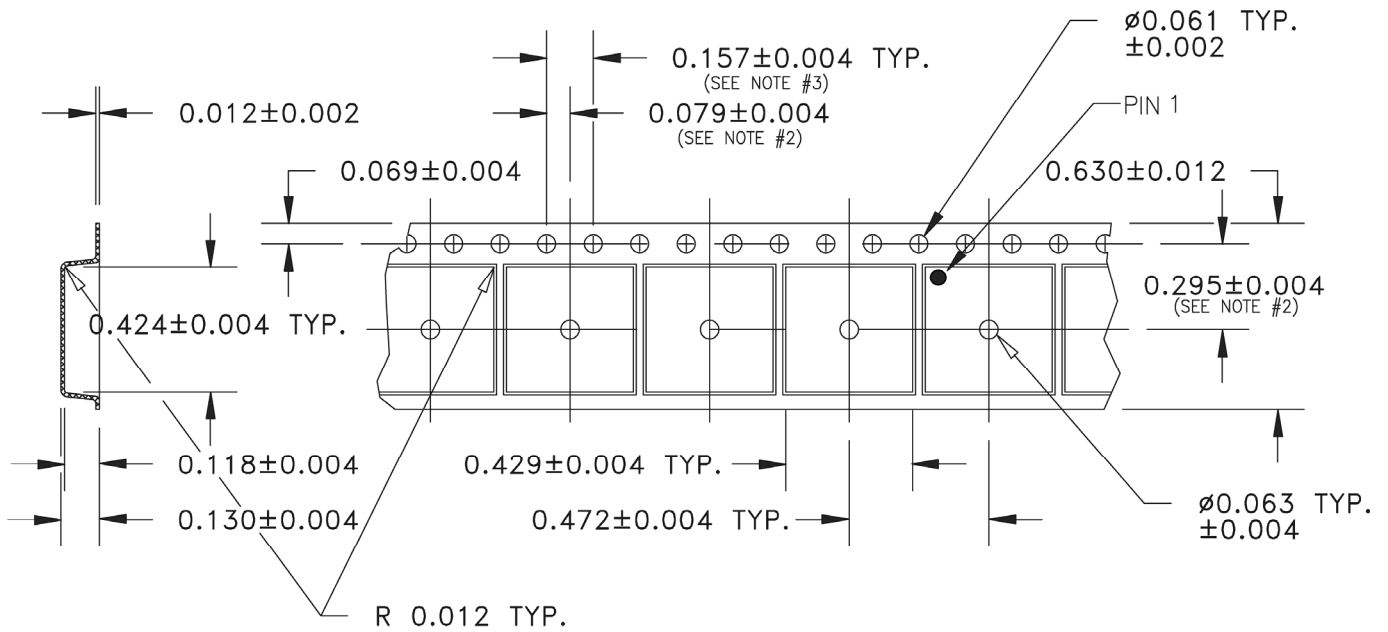
SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A1	0.000	0.004	0.00	0.10	6
A2	0.087	0.094	2.21	2.39	
B	0.013	0.019	0.33	0.48	
C	0.007	0.009	0.18	0.23	
D	0.398	0.412	10.11	10.46	2
E	0.290	0.300	7.37	7.62	3
e	0.050	BSC	1.27	BSC	4
H	0.394	0.418	10.01	10.62	
h	0.010	0.028	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 (A₁) MEASURED FROM BOTTOM OF SLUG.

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Figure 6. ACA2431 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.

204208-007

Figure 7. ACA2431 Tape and Reel Dimensions

Ordering Information

Part Number	Product Description	Packaging
ACA2431P2	16-pin wide body SOIC with heat slug	1500-piece tape and reel
EVB2431	Evaluation Board	

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