

DATA SHEET

ACA2461: 1218 MHz CATV Push-Pull Driver Amplifier

Applications

- DOCSIS® and Euro DOCSIS® 3.1 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
- Gain: 25 dB at 1218 MHz
- Single +24 V supply
- Operating current: 290 mA
- Surface-mount package compatible with automatic assembly and excellent reliability
- Halogen-free/RoHS compliant



Description

The ACA2461 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 DOCSIS 3.1 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 ACA2461 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.

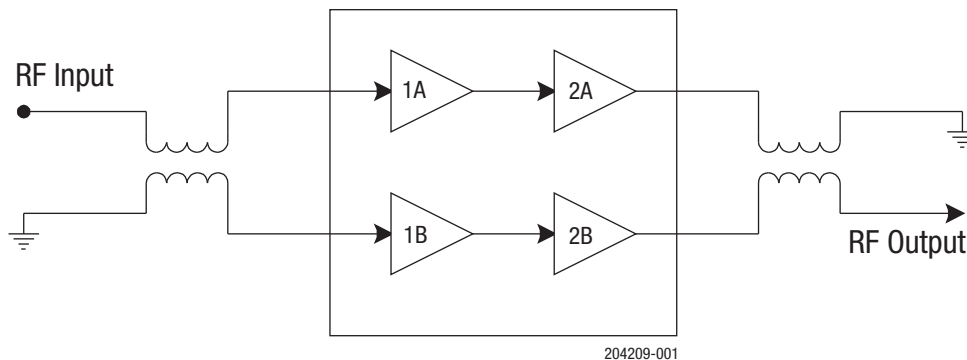


Figure 1. ACA2461 Block Diagram

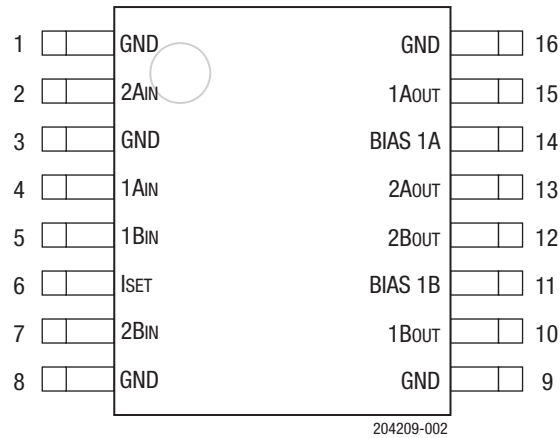


Figure 2. ACA2461 Pinout (Top View)

Table 1. ACA2461 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 ACA2461 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. ACA2461 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. ACA2461 Recommended Operating Conditions¹

Parameter	Symbol	Min	Typ	Max	Units
RF frequency	f	40		1218	MHz
Supply voltage	VDD		+24		VDC
Case temperature	TCASE	-40		+100	°C

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

Table 4. ACA2461 Electrical Specifications

T_A = +25 °C, V_{DD} = +24 VDC, f = 50 to 1218 MHz, 75 Ω System, All Specifications are Measured on the Evaluation Board, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Gain ¹	G	1218 MHz	25.2	26.7	27.2	dB
Gain flatness to 1218 MHz ^{1,2}				± 0.2		dB
Cable equivalent slope ¹			1.5	2.2	2.5	dB
Noise figure	NF			5		dB
Composite triple beat ³	CTB			-68	-65	dBc
Composite second order ³	CSO			-67	-63	dBc
Cross modulation ³	XMOD			-60		dBc
Composite intermodulation noise ³	CIN			-65	-61	dBc
Input return loss ¹	RL	50 to 600 MHz 601 to 1218 MHz		-20 -20	-18 -16	dB dB
Output return loss ¹	RL	50 to 600 MHz 601 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				290	320	mA

¹ Measured in application circuit in Figure 3.

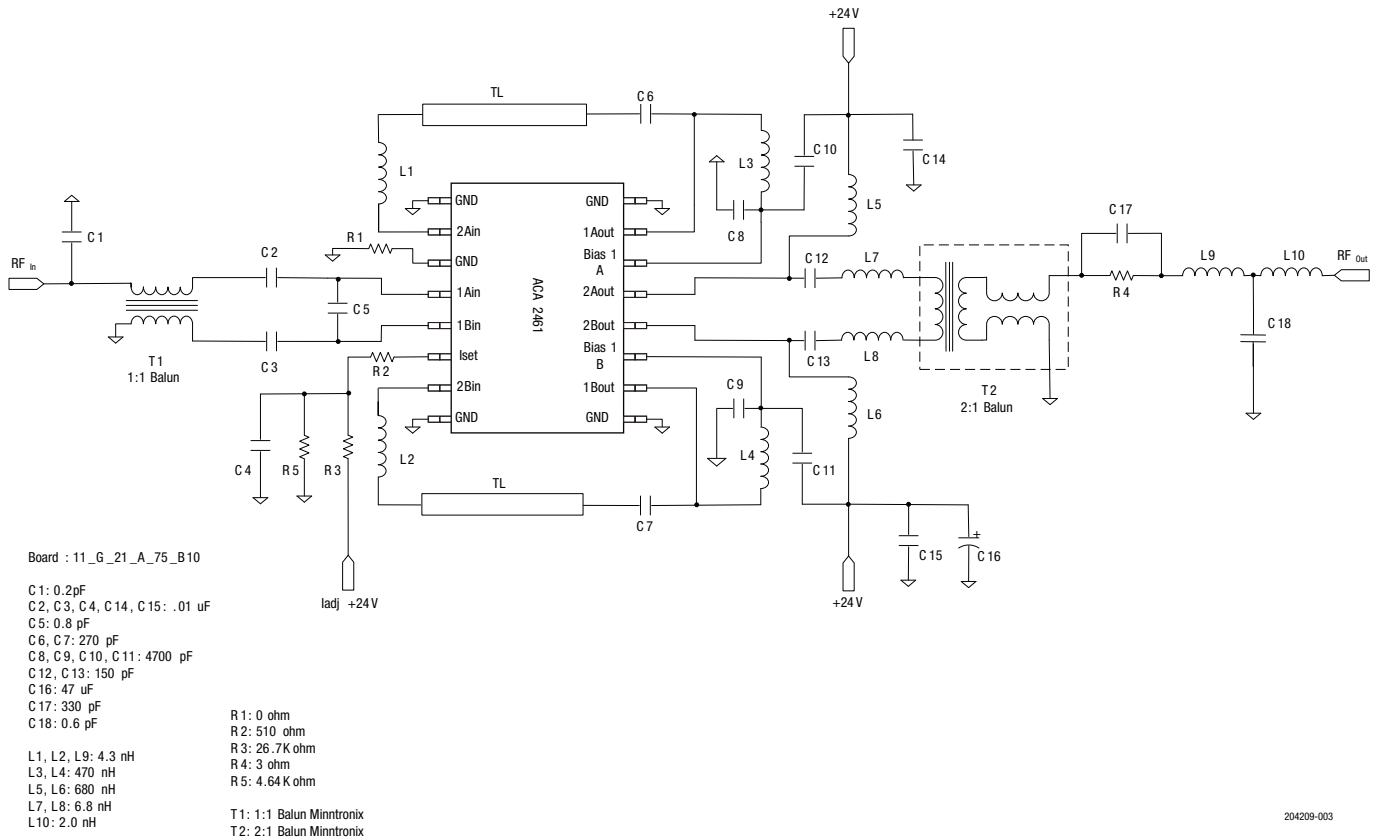
² Peak deviation from a straight line between gain value at 50 MHz and 1218 MHz.

³ Parts measured with 79 NTSC analog channels plus digital SC-256-QAM channels to 1000 MHz, +47 dBmV output power and 0.0 dB tilt.

Evaluation Board Description

The ACA2461 Evaluation Board is used to test the performance of the ACA2461 device. An Evaluation Board schematic is provided

in Figure 3. Table 6 provides the Bill of Materials (BOM) list for Evaluation Board components.



204209-003

Figure 3. ACA2461 Evaluation Board Schematic

Table 5. ACA2461 Evaluation Board Bill of Materials (BOM)

Component	Description	Value	Component	Description	Value
C1	0402 capacitor	0.2 pF	L5, L6	Allied 0603 inductor	680 nH
C2, C3, C4, C14, C15	0402 capacitor	0.01 uF	L7, L8	0402 chip inductor	6.8 nH
C5	0402 capacitor	0.8 pF	L10	0402 chip inductor	2.0 nH
C6, C7	0402 capacitor	270 pF	R1	0402 resistor	0 Ω
C8, C9, C10, C11	0402 capacitor	4700 pF	R2	0402 resistor	510 Ω
C12, C13	0402 capacitor	150 pF	R3	0402 resistor	26.7 kΩ
C16	Electrolytic capacitor	47 uF	R4	0402 resistor	3 Ω
C17	0402 capacitor	150 pF	R5	0402 resistor	4.64 kΩ
C18	0402 capacitor	0.6 pF	T1	Minntronix 1:1 Balun	MRF-25001
L1, L2, L9	0402 chip inductor	4.3 nH	T2	Minntronix 2:1 Balun	MRF-27001
L3, L4	Murata 0805 inductor	470 nH			

Package Dimensions

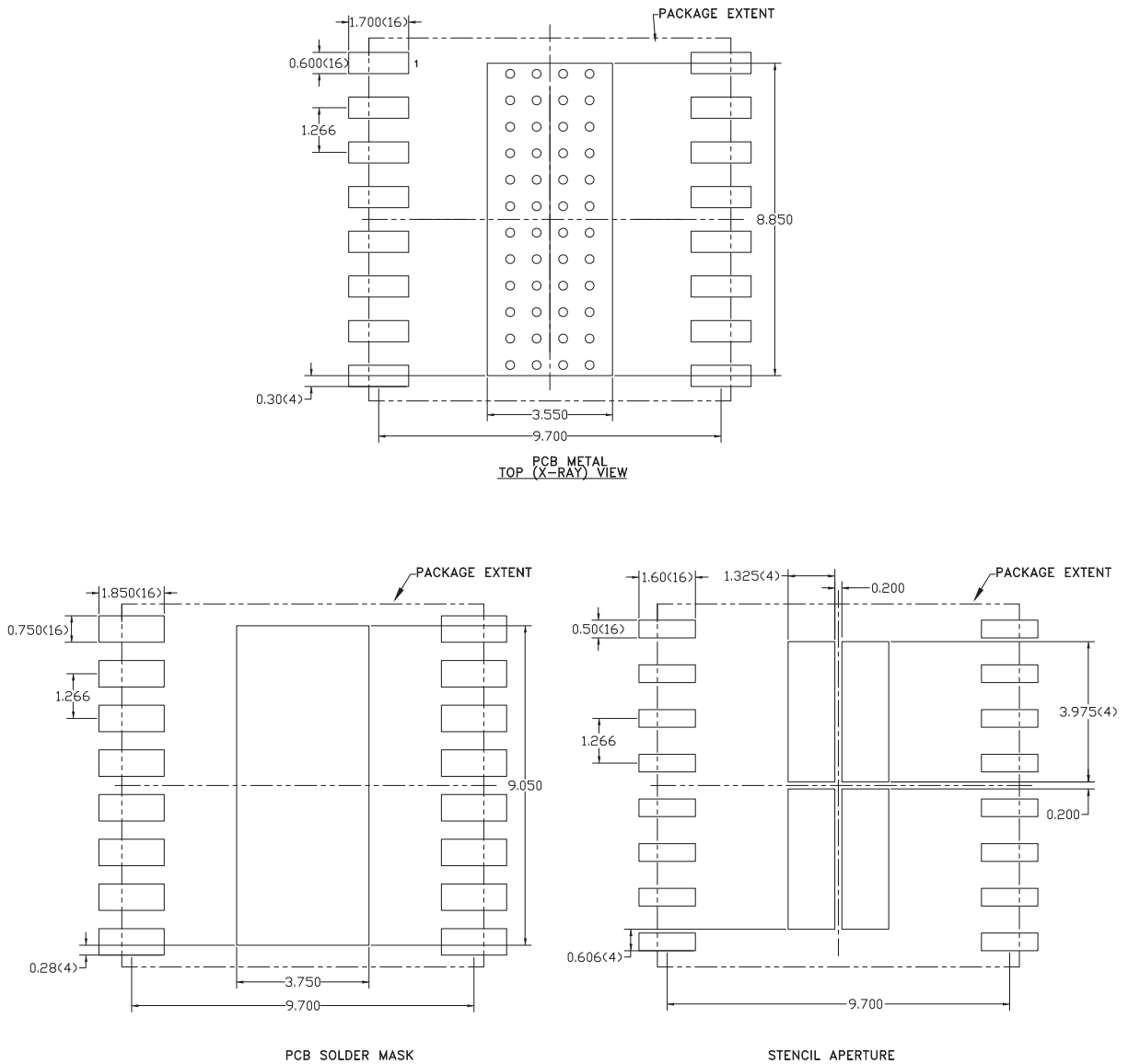
The PCB layout footprint drawing for the ACA2461 is shown in Figure 4. The package dimensions for the ACA2461 are shown in Figure 5. The tape and reel dimensions are provided in Figure 6.

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 ACA2461 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.

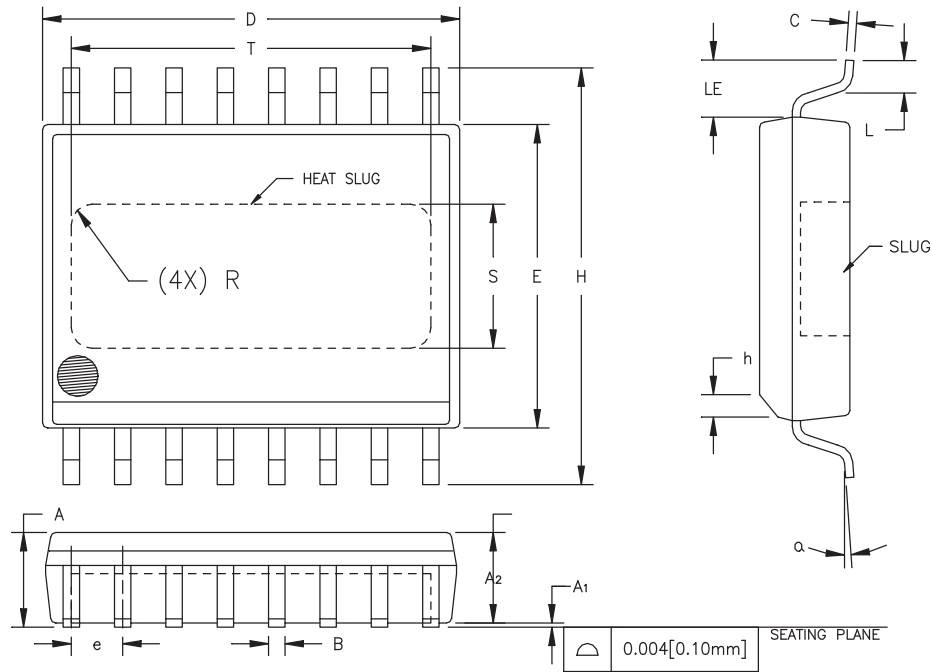
Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.



- 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)

204209-004

Figure 4. ACA2461 PCB Layout Footprint Dimensions



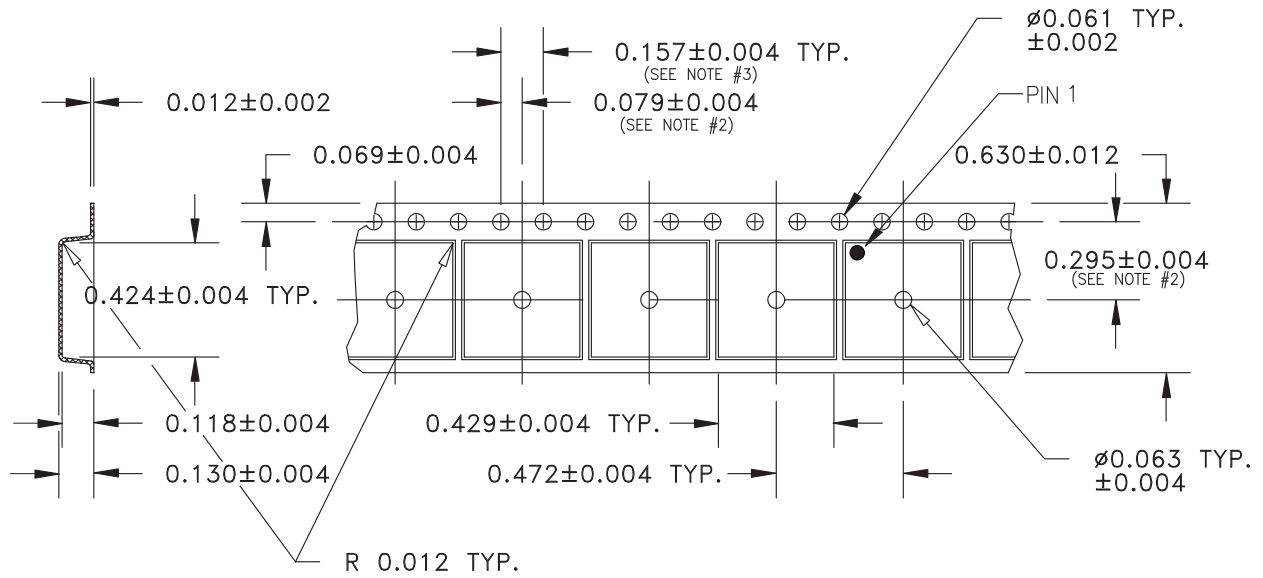
S _W B _{OL}	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A ₁	0.000	0.004	0.00	0.10	6
A ₂	0.087	0.094	2.21	2.39	
B	0.013	0.019	0.33	0.48	
C	0.007	0.009	0.18	0.23	
D	0.398	0.412	10.11	10.46	2
E	0.290	0.300	7.37	7.62	3
e	0.050 BSC		1.27 BSC		4
H	0.394	0.418	10.01	10.62	
h	0.010	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 (A₁) MEASURED FROM BOTTOM OF SLUG.

204209-005

Figure 5. ACA2461 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.

204209-006

Figure 6. ACA2461 Tape and Reel Dimensions

Ordering Information

Model Number	Package Description	Component Packaging
ACA2461P2	16-pin wide body SOIC with heat slug	1500-piece tape and reel
EVB2461		Evaluation Board part number

Copyright © 2017 Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of stated published specifications or parameters.

Skyworks and the Skyworks symbol are trademarks or registered trademarks of Skyworks Solutions, Inc., in the United States and other countries. Third-party brands and names are for identification purposes only, and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at www.skyworksinc.com, are incorporated by reference.