

DATA SHEET

ACA1212: 1.2 GHz CATV Line Amplifier MMIC

Applications

- 50 to 1218 MHz 75 Ω amplifier
- HFC distribution systems
- CATV head-end equipment
- CATV line amplifier

Features

- 50 to 1218 MHz frequency range
- Flat gain
- Very low distortion
- Excellent input/output match
- Low DC power consumption
- Single 12 V supply
- Surface-mount package compatible with automatic assembly
- Repeatability of monolithic fabrication
- RoHS-compliant packaging
- Highly reliable GaAs MESFET technology



Description

The ACA1212 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 cascaded between transmission line baluns that are optimized for exceptionally low distortion, high output power, and high crash point in a thermally enhanced surface-mount package. The ACA1212 covers the full 50 to 1218 MHz CATV downstream band demanded by DOCSIS 3.1 systems.

A block diagram of the ACA1212 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.

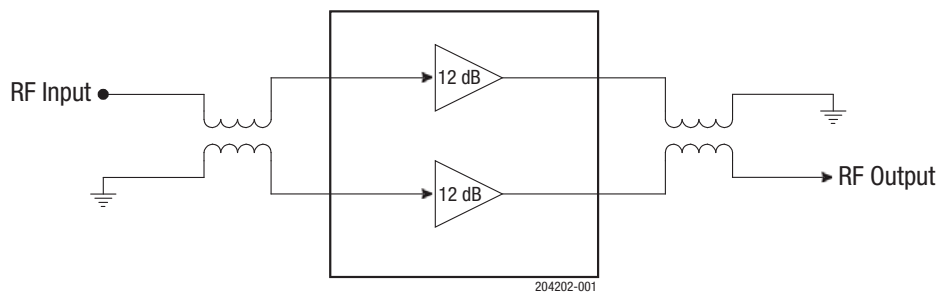


Figure 1. ACA1212 Block Diagram

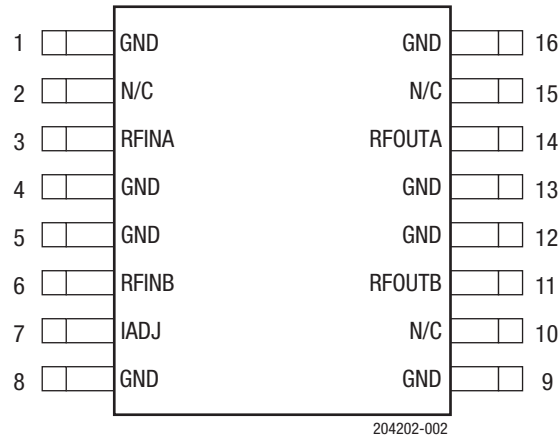


Figure 2. ACA1212 Pinout (Top View)

Table 1. AWB7124 Signal Pin Descriptions¹

Pin	Name	Description	Pin	Name	Description
1	GND	Ground	9	GND	Ground
2	N/C	No connection	10	N/C	No connection
3	RFINA	Input to Amplifier A	11	RFOUTB	Output from Amplifier B
4	GND	Ground	12	GND	Ground
5	GND	Ground	13	GND	Ground
6	RFINB	Input to Amplifier B	14	RFOUTA	Output from Amplifier A
7	IADJ	Current adjust	15	N/C	No connection
8	GND	Ground	16	GND	Ground

¹ The center ground pad must have a low inductance and low thermal resistance connection to the application's printed circuit board ground plane.

Electrical and Mechanical Specifications

The absolute maximum ratings of the ACA1212 are provided in Table 2. Recommended operating conditions are specified in Table 3, and electrical specifications are provided in Table 4.

Table 2. ACA1212 Absolute Maximum Ratings¹

Parameter	Minimum	Maximum	Units
Amplifier supplies (pins 11 and 14)	0	+15	VDC
RF input power (pins 3 and 6)	-	+70	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 3 and 6 should be AC-coupled. No external DC bias should be 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. ACA1212 Recommended Operating Conditions¹

Parameter	Symbol	Min	Typ	Max	Units
RF frequency	f	50		1218	MHz
Supply (pins 11 and 14)	V _{DD}		+12		VDC
Operating temperature	T _A	-40		+100	°C

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

Table 4. ACA1212 Electrical Specifications¹
T_A = +25 °C, V_{DD} = +12 VDC, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typ	Max	Units
Gain ¹	G	1218 MHz	10.3	10.9	11.5	dB
Gain flatness ¹		55.25 MHz to 1218 MHz		± 0.3		dB
Cable equivalent slope ¹			-0.5	0.25	1.0	dB
Noise figure ¹	NF			4	4.5	dB
CTB ^{1,2}	CTB			-72	-70	dBc
CSO ^{1,2}	CSO			-70	-68	dBc
XMOD ^{1,2}	ACLR			-67		dBc
Supply current				395	445	mA
Return loss (input/output) ¹	RL	55.25 MHz to 1218 MHz	18	22		dB
Thermal resistance	θ _{Jc}				6.0	°C/W

¹ Measured with a balun on input and output of the device. See Figure 3 for test setup.

² Device measured with 79 analog channels, +47 dBmV output power at 1000 MHz with a 3 dB tilt and QAM to 1000 MHz.

Evaluation Board Description

The ACA1212 Evaluation Board is used to test the performance of the ACA1212 device. An Evaluation Board schematic is provided

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

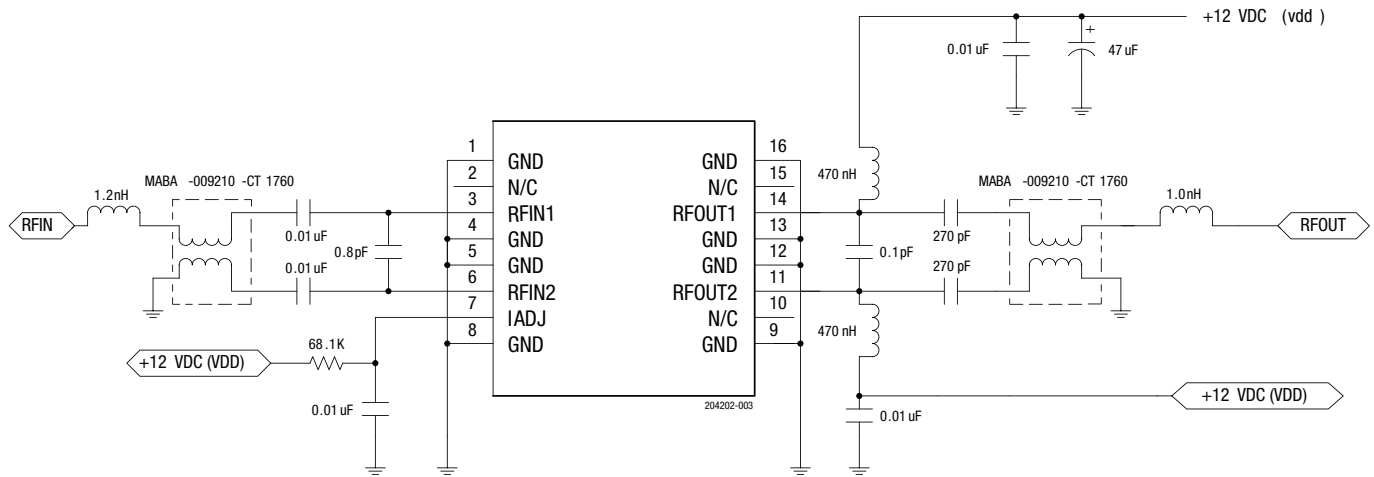


Figure 3. ACA1212 Evaluation Board Schematic

Table 6. ACA1212 Evaluation Board Bill of Materials (BOM)

Component	Description	Manufacturer	Mfr Part Number
L1	1.2 nH inductor (0402)	Murata	LQG15HS1N2S02D
T1, T2	1:1 transmission line balun	Macom	MABA- 009210-CT1760
C1, C2, C4, C6, C8	0.01 uF capacitor (0603)	Murata	GRM188R71H- 103KA01D
C3	0.8 pF (0402)	Murata	GRM- 1555C1HR80RZ01D
R1	68.1 k Ω (0402)	Rohm	MCR01MRTF6802
L2, L3	470 nH (0805)	Murata	LQH31CNR47M03L
C5	0.1 pF (0402)	Murata	GJM- 1555C1HR10WB01D
C9, C10	270 pF (0603)	Murata	GRM1885C1H- 271JA01D
L4	1.0 nH (0402)	Murata	LQG15HS1N0S02D
C7	47 uF electrolytic cap	Panasonic	ECEA1HGE470
CON1-2	75 Ω N bulkhead	Paternack	PE4504

Package Dimensions

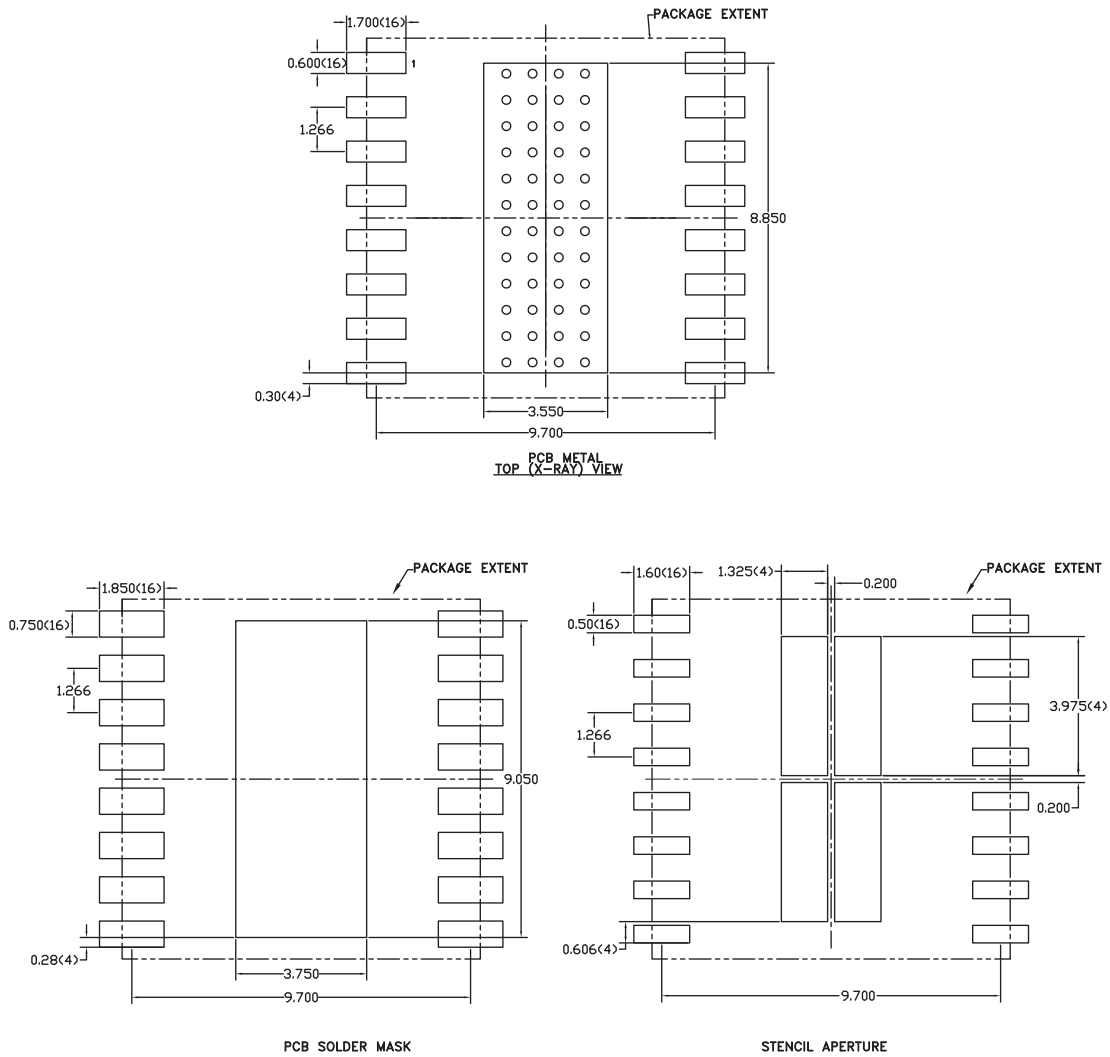
The PCB layout footprint drawing for the ACA1212 is shown in Figure 4. The package dimensions for the ACA1212 are shown in Figure 5. The tape and reel dimensions are provided in Figure 6.

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.

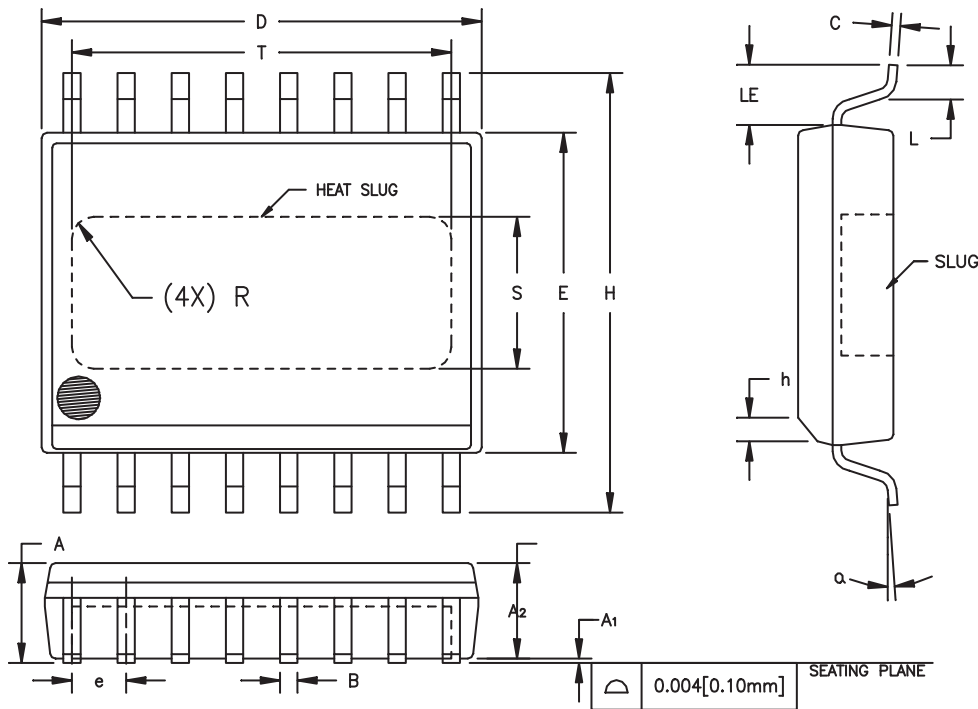
The ACA1212 is rated to Moisture Sensitivity Level 2 (MSL2) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

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)

Figure 4. ACA1212 PCB Layout Footprint Dimensions

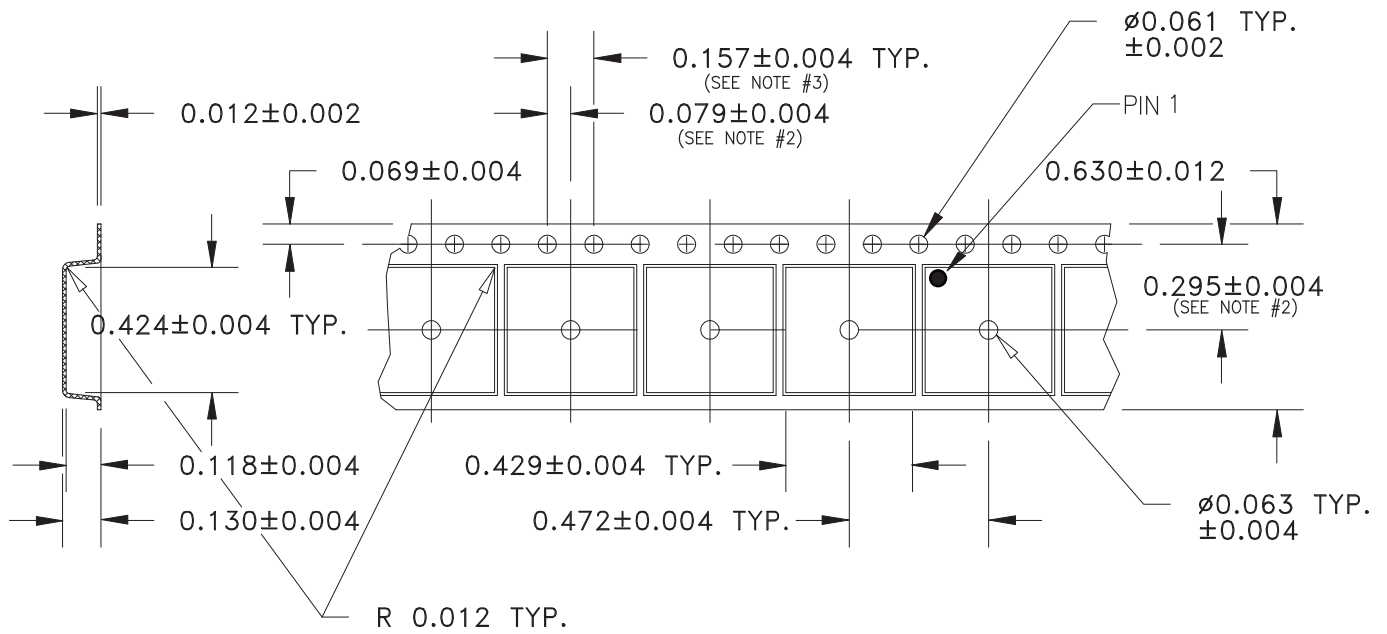


SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A ₁	0.000	0.004	0.00	0.10	6
A ₂	0.087	0.094	2.21	2.39	
B	0.013	0.019	0.33	0.48	
C	0.007	0.009	0.18	0.23	
D	0.398	0.412	10.11	10.46	2
E	0.290	0.300	7.37	7.62	3
e	0.050	BSC	1.27	BSC	4
H	0.394	0.418	10.01	10.62	
h	0.010	0.028	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 (A₁) MEASURED FROM BOTTOM OF SLUG.

Figure 5. ACA1212 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 .

204202-006

Figure 6. ACA1212 Tape and Reel Dimensions

Ordering Information

Model Number	Package Description	Component Packaging
ACA1212P2	16-pin wide body SOIC with heat slug	1500-piece tape and reel
EVB1212		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.