

Evaluating the ADCA3270 DOCSIS 3.1 Power Doubler Amplifier, 45 MHz to 1218 MHz

FEATURES

2-layer evaluation board with heat sink
75 Ω RF male connectors

EVALUATION KIT CONTENTS

ADCA3270-EVALZ evaluation board

EQUIPMENT NEEDED

RF signal generator
RF spectrum analyzer
DOCSIS 3.0 and DOCSIS 3.1 signal generator
DOCSIS 3.0 and DOCSIS 3.1 signal analyzer
RF network analyzer
25 V, 500 mA power supply
0 V to 3 V voltage measurement unit range

GENERAL DESCRIPTION

The ADCA3270-EVALZ evaluation board consists of a 2-layer printed circuit board (PCB) fabricated from a 32 mil laminate mounted to an aluminum heat sink. The heat sink assists in providing thermal relief to the device as well as mechanical support to the PCB. Mounting holes on the heat sink allow attachment to larger heat sinks for improved thermal management.

The ADCA3270-EVALZ is populated with components to interface the IC to a typical CATV application. J1 (RF_IN) and J2 (RF_OUT) are 75 Ω , N type, male connectors. The respective RF traces of the ports have a 75 Ω characteristic impedance. The ADCA3270-EVALZ is populated with components suitable for use over the -30°C to $+110^{\circ}\text{C}$ operating temperature range of the ADCA3270.

ADCA3270-EVALZ PHOTOGRAPH (TOP SIDE)

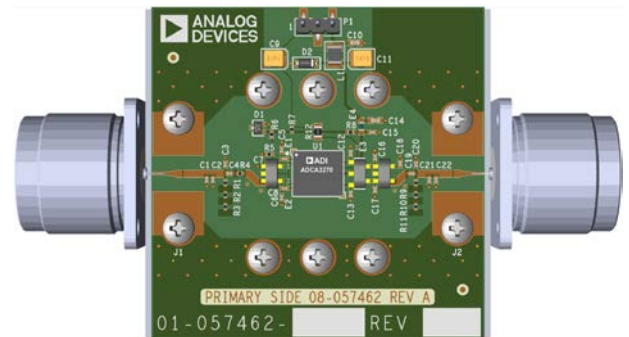


Figure 1.

Access to VCC and GND is through a 3-pin header (P1) on the ADCA3270-EVALZ. The TSEN pin monitors the on-chip thermistor voltage.

RF traces are 75 Ω microstrip. Package ground leads and the exposed paddle connect directly to the ground plane. Multiple vias connect the LGA_CAV ground paddle to the bottom ground plane to provide adequate electrical conduction and thermal conduction to the heat sink. The transfer of heat from the ADCA3270-EVALZ ground to the heat sink is further facilitated by the insertion of a piece of indium approximately the footprint of the LGA_CAV between the ADCA3270-EVALZ bottom and the heat sink. There are no components on the bottom side of the PCB.

Consult the ADCA3270 data sheet in conjunction with this user guide when using the ADCA3270-EVALZ evaluation board.

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REVISION HISTORY

7/2021—Revision 0: Initial Version

OPERATING THE ADCA3270-EVALZ

A 25 V, 500 mA power supply is required to provide the bias to the ADCA3270 on the ADCA3270-EVALZ board. Connect the positive terminal of the 25 V power supply to the VCC pin on P1 and the ground terminal to the GND pin. Connect the positive terminal of the voltage measurement unit to the TSEN pin and the ground terminal to the GND pin.

See the ADCA3270 data sheet for the typical dc current (total) supply value to expect when powering up the VCC supply and to convert the voltage readout on the TSEN pin to temperature (°C).

RECOMMENDED BIAS SEQUENCES

During Power-Up

The recommended bias sequence during power-up follows:

1. Set VCC to 24 V.
2. Apply the RF signal.

During Power-Down

The recommended bias sequence during power-down follows:

1. Turn off the RF signal.
2. Set VCC to 0 V.

Table 1. Header Connections to the ADCA3270

Connector	Header Pin	ADCA3270 Pin
P1	1	TSEN
	2	GND
	3	VCC

RF Measurements

To evaluate the ADCA3270, connect a 75 Ω RF signal source to the N type, male connector (J1), which can be a single or multitone source for distortion measurements, or a wideband DOCSIS signal source for analyzing modulation error ratio (MER) or bit error rate (BER) measurements. This input must not exceed 75 dBmV. The 75 Ω RF output signal is available on the N type, male connector (J2) and can interface directly with instruments (such as a spectrum analyzer or vector network analyzer) with a 75 Ω input impedance.

EVALUATION BOARD SCHEMATIC AND ASSEMBLY DRAWINGS

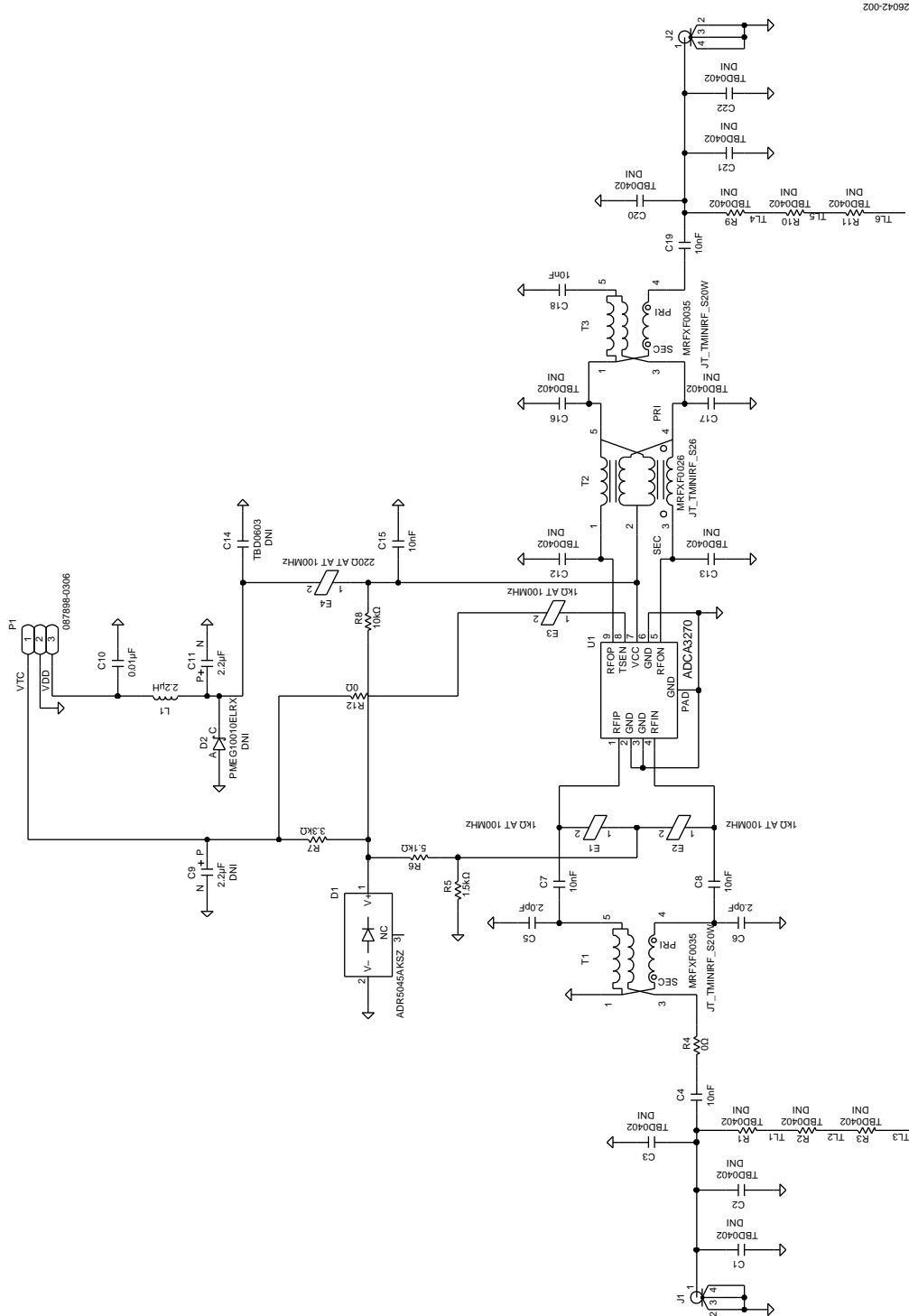


Figure 2. ADCA3270-EVALZ Evaluation Board Schematic

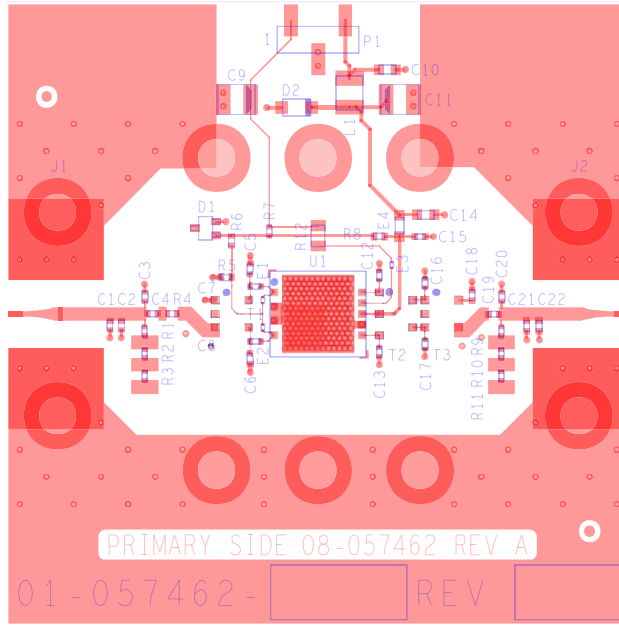


Figure 3. ADCA3270-EVALZ Assembly Drawing (Top Side)

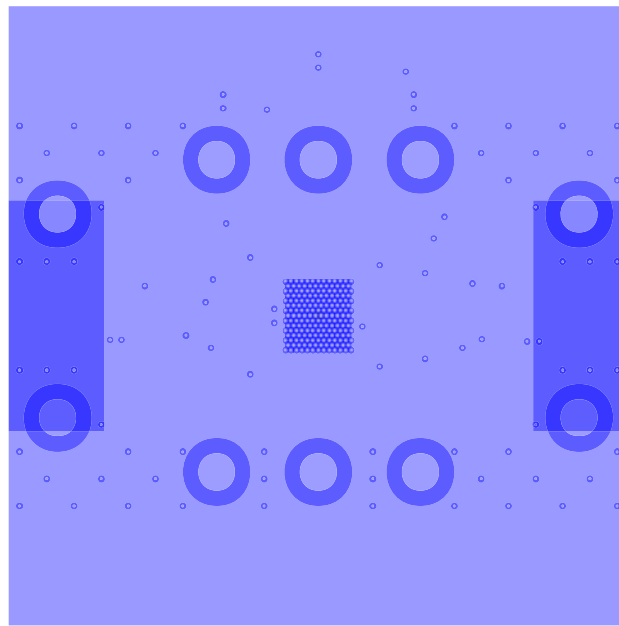


Figure 4. ADCA3270-EVALZ Assembly Drawing (Bottom Side, No Components)

ADCA3270-EVALZ ASSEMBLY INFORMATION

The PCB for the ADCA3270-EVALZ is assembled using normal manufacturing practices, excluding the J1 and J2 connectors, and the custom external aluminum heat sink. Once the PCB is assembled, it is mounted with 10 screws to the external heat sink as shown in Figure 5. The transfer of heat from the ADCA3270-EVALZ ground to the heat sink is enhanced by the

insertion of a thin sheet of indium cut to approximately the footprint of the ADCA3270 and located between the via array on the bottom of the PCB (underneath the ADCA3270) and the heat sink. The J1 and J2 connectors are then mounted to the heat sink using two screws for each (see Figure 6). Then, the center conductor for the RF connectors is soldered to the PCB. Once complete, the ADCA3270-EVALZ is ready for testing.

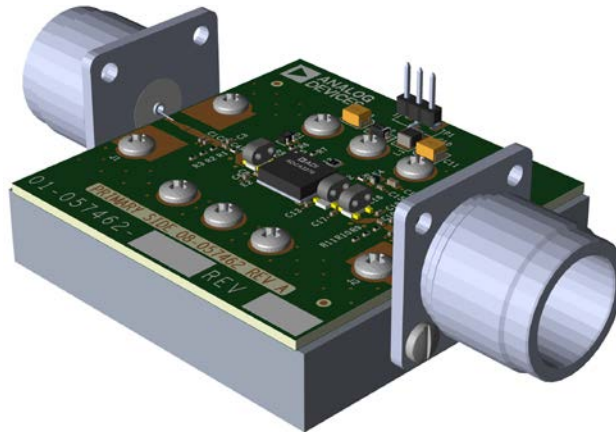


Figure 5. ADCA3270-EVALZ Top Side, Fully Assembled

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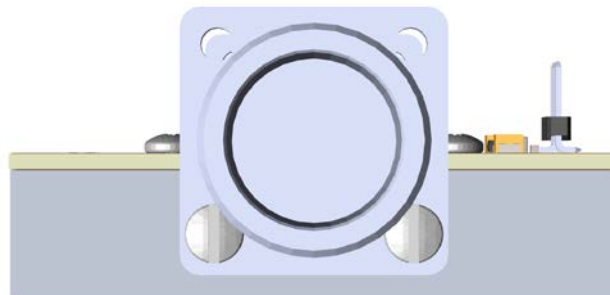


Figure 6. ADCA3270-EVALZ Side View

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ORDERING INFORMATION

BILL OF MATERIALS

Table 2. Bill of Materials

Quantity	Designator	Description	Manufacturer
1	PCB	Not applicable	Analog Devices, Inc.
1	C10	0.01 μ F capacitor	TDK
1	C11	2.2 μ F capacitor	AVX
6	C4, C7, C8, C15, C18, and C19	10 nF capacitors	Samsung
2	C5, C6	2.0 pF capacitors	AVX
1	D1	Precision, micropower shunt mode voltage reference, ADR5045AKSZ	Analog Devices
3	E1, E2, E3	1 k Ω at 100 MHz	Taiyo Yuden Co., Ltd.
1	E4	220 Ω at 100 MHz	Taiyo Yuden Co., Ltd.
2	J1, J2	75 Ω , N type, male connectors, PE4504	PASTERNAK
1	L1	2.2 μ H	Taiyo Yuden Co., Ltd.
1	P1	3-pin header, 087898-0306	Molex Products
1	R12	0 Ω resistor	VISHAY
1	R4	0 Ω resistor	Panasonic
1	R5	1.5 k Ω resistor	Panasonic
1	R6	5.1 k Ω resistor	Panasonic
1	R7	3.3 k Ω resistor	Panasonic
1	R8	10 k Ω resistor	Stackpole Electronics, Inc.
2	T1, T3	MRFXF0035	MiniRF
1	T2	MRFXF0026	MiniRF
1	U1	DOCSIS 3.1 power doubler amplifier, 45 MHz to 1218 MHz, ADCA3270	Analog Devices
1	External heat sink	E042774	Analog Devices
10	Screws, 4-40, 1/4	90403A106	McMaster-Carr Supply Company
10	C1 to C3, C12, C13, C16, C17, C20 to C22 ¹	0402 capacitors	Not applicable
1	C14 ²	0603 capacitor	Not applicable
1	C9 ²	2.2 μ F capacitor	AVX
1	D2 ²	PMEG10010ELRX	Nexperia USA, Inc.
6	R1, R2, R3, R9, R10, R11 ¹	0402	Not applicable

¹ These components are part of the PCB or are do not install (DNI).

² The component is part of the PCB or is DNI.

NOTES

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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