Evaluating the ADCA5192 5 MHz to 1794 MHz Broadband CATV Amplifier

FEATURES

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

EVALUATION KIT CONTENTS

- ADCA5192-EVALZ evaluation board

EQUIPMENT NEEDED

- RF signal generator
- RF spectrum analyzer
- DOCSIS signal generator
- DOCSIS signal analyzer
- RF network analyzer
- 5 V, 350 mA power supply

GENERAL DESCRIPTION

The ADCA5192-EVALZ evaluation board consists of a 2-layer printed circuit board (PCB) fabricated from a 62 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 ADCA5192-EVALZ is populated with components to interface the IC to a typical cable TV (CATV) application. P1 (RF_IN) and P2 (RF_OUT) are 75 Ω, N-type, male coaxial connectors. The respective RF traces of the ports have a 75 Ω characteristic impedance. The ADCA5192-EVALZ is populated with components suitable for use over the −40°C to +100°C operating temperature range of the ADCA5192.

Access to the supply voltage (VDD) and GND is through a 3-pin header (P3) on the ADCA5192-EVALZ.

RF traces are 75 Ω microstrip at the input and output RF connectors. The package ground leads and the exposed paddle connect directly to the ground plane. Multiple vias connect the lead frame chip scale package (LFCSP) 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 ADCA5192-EVALZ ground to the heat sink is further facilitated by the insertion of a piece of indium approximately the footprint of the LFCSP between the ADCA5192-EVALZ bottom and the heat sink. There are no components on the bottom side of the PCB.

Consult the ADCA5192 data sheet in conjunction with this user guide when using the ADCA5192-EVALZ evaluation board.

ADCA5192-EVALZ PHOTOGRAPH (TOP SIDE)

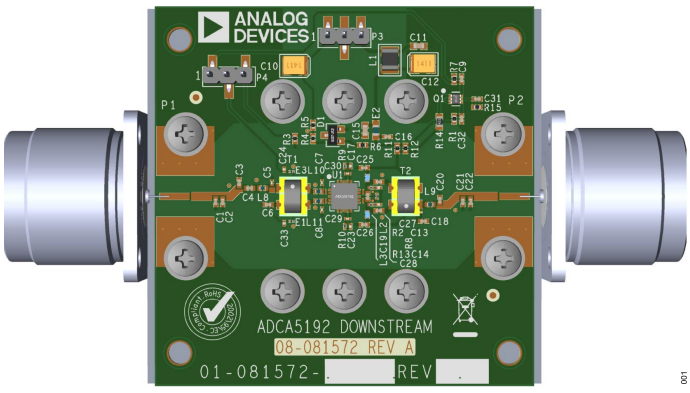


Figure 1. ADCA5192-EVALZ Photograph (Top Side)

TABLE OF CONTENTS

REVISION HISTORY

1/2024—Revision 0: Initial Version

OPERATING THE ADCA5192-EVALZ

A 5 V, 350 mA power supply is required to provide the bias to the ADCA5192 on the ADCA5192-EVALZ. Connect the positive terminal of the 5 V power supply to the VDD pin on P3 and the ground terminal to the GND pin.

The bias current (I_{DD}) of the ADCA5192 can be controlled by adjusting the voltage of the VADJ pin on connector P3. Figure 2 shows the typical I_{DD} vs. VADJ voltage. Setting VADJ is optional, and the pin can be left floating. If VADJ is left floating, see the ADCA5192 data sheet for the typical DC supply current to expect when powering up the V_{DD} supply.

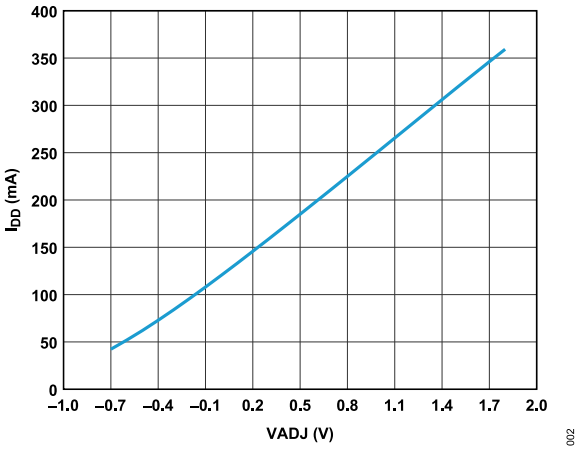


Figure 2. I_{DD} vs. VADJ

RECOMMENDED BIAS SEQUENCES

During Power-Up

The recommended bias sequence during power-up follows:

1. Set VADJ to ≤ 0 V to limit I_{DD} at power-up. Note that VADJ is optional and can be left floating to have the typical I_{DD}.
2. Set VDD to 5.0 V.
3. Increase the VADJ setting as needed to adjust I_{DD} to the desired level. See Figure 2.
4. Apply the RF signal.

During Power-Down

The recommended bias sequence during power-down follows:

1. Turn off the RF signal.
2. Set VADJ to 0 V.
3. Set VDD to 0 V.

Table 1. Header Connections

Connector	Header Pin	Mnemonic
P3	1	VADJ
	2	GND
	3	VDD

RF Measurements

To evaluate the ADCA5192, connect a 75 Ω RF signal source to the N-type, male connector (J1), which can be a single-tone or multitone source for distortion measurements, or a wideband data over cable service interface specification (DOCSIS) signal source for analyzing modulation error ratio (MER) or bit error rate (BER) measurements. The input power must be <53 dBmV to produce an output power of <70 dBmV to support DOCSIS 3.0, DOCSIS 3.1, and DOCSIS 4.0 applications. The 75 Ω RF output signal is available on the N-type, male connector (J2) and can be interfaced directly to instruments (such as a spectrum analyzer or vector network analyzer) with a 75 Ω input impedance.

EVALUATION BOARD SCHEMATIC AND ASSEMBLY DRAWINGS

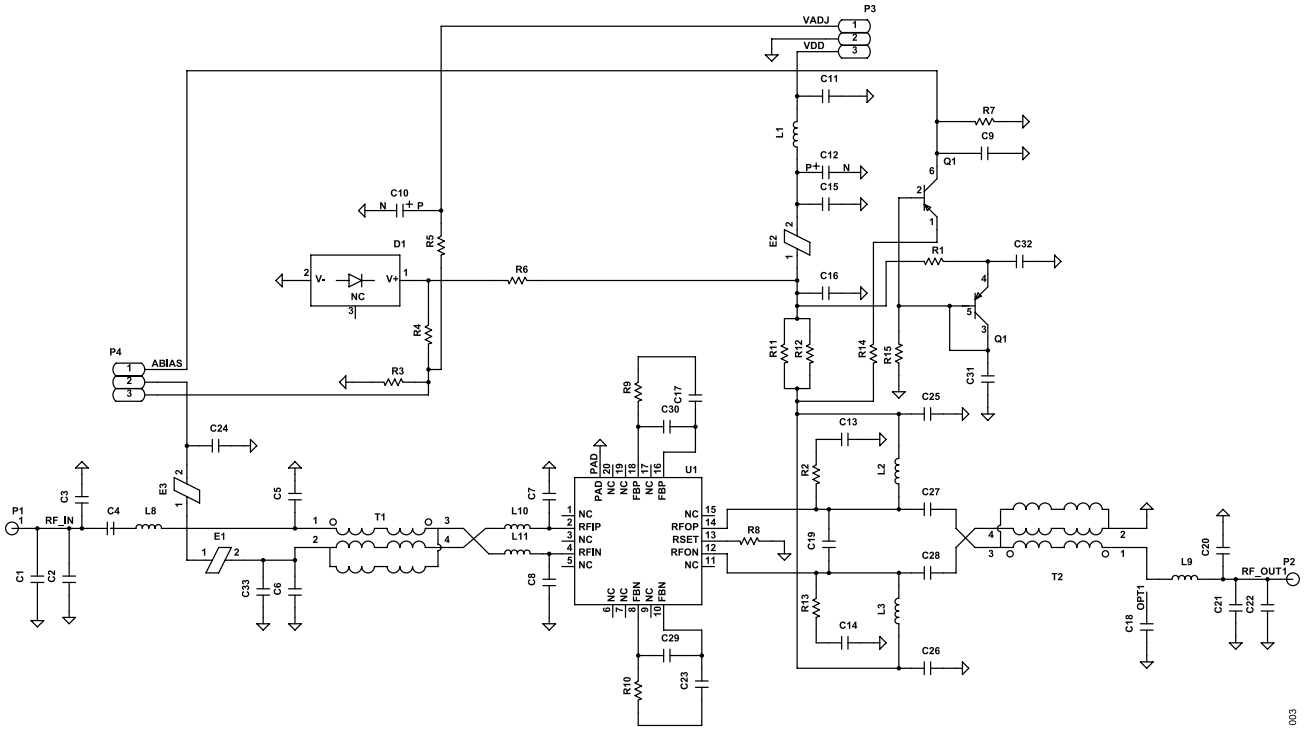


Figure 3. ADCA5192-EVALZ Evaluation Board Schematic

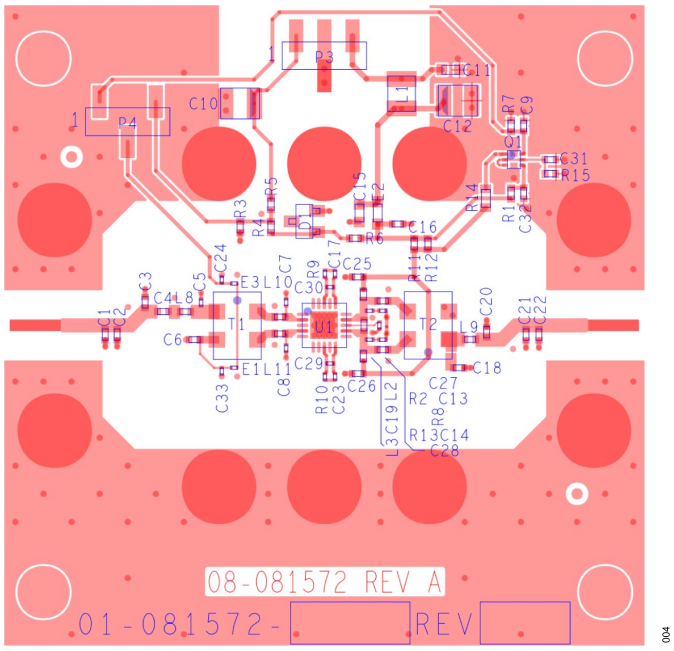


Figure 4. ADCA5192-EVALZ Assembly Drawing (Top Side)

EVALUATION BOARD SCHEMATIC AND ASSEMBLY DRAWINGS

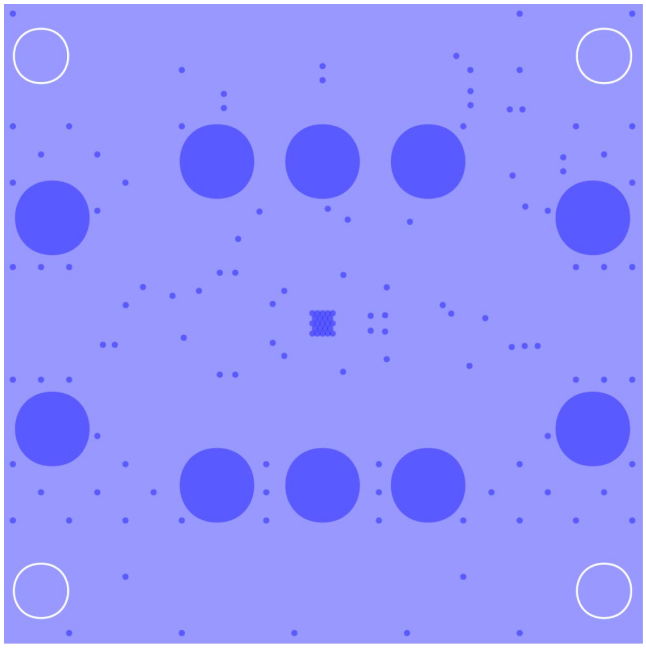
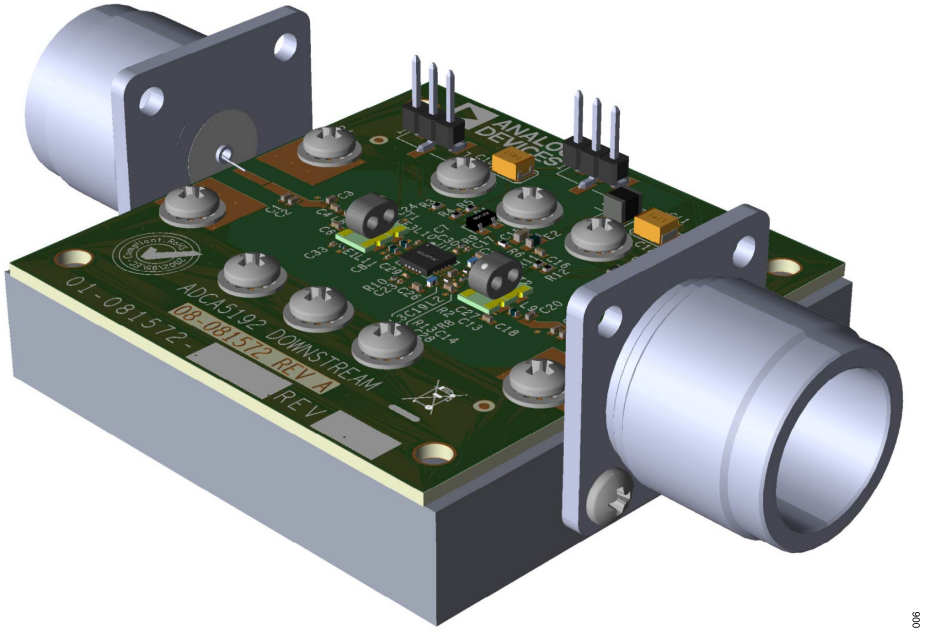


Figure 5. ADCA5192-EVALZ Assembly Drawing (Bottom Side, No Components)

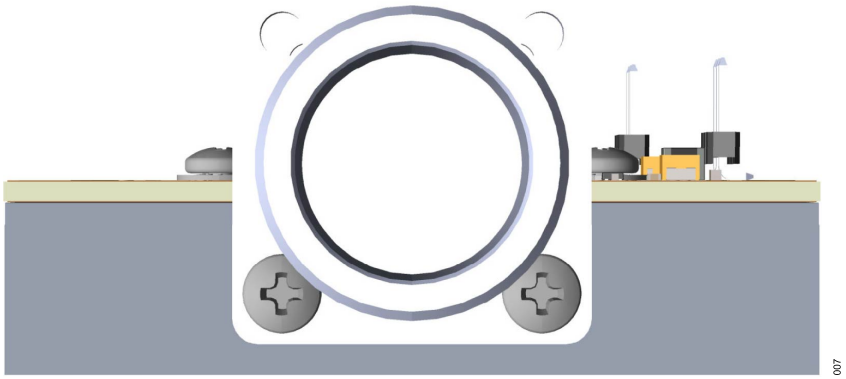
EVALUATION BOARD SCHEMATIC AND ASSEMBLY DRAWINGS

ADCA5192-EVALZ ASSEMBLY INFORMATION



900

Figure 6. ADCA5192-EVALZ Top Side, Fully Assembled



007

Figure 7. ADCA5192-EVALZ Side View

ORDERING INFORMATION

BILL OF MATERIALS

Table 2. Bill of Materials[1]

Reference Designator	Value	Tolerance	Minimum Rating	Footprint	Suggested Vendor	Suggested Part Number
C4, C6, C16	0.01 µF	±10%	50 V	0402	Samsung	CL05B103KB5NNNC
C7, C8	1.1 pF	±0.1 pF	25 V	0201	Johanson	250R05L1R1BV4T
C11	0.01 µF	±10%	100 V	0603	TDK	C1608X7R2A103K080AA
C12	2.2 µF	±10%	50 V	1411	Kyocera	TAJB225K050RNJ
C15	0.047 µF	±5%	25 V	0603	Kyocera	06033C473JAT2A
C19	0.3 pF	±0.1 pF	50 V	0402	Murata	GJM1555C1HR30BB01D
C25, C26	0.01 µF	±10%	50 V	0402	Murata	GCM155R71H103KA55D
C27, C28	220 pF	±5%	50 V	0402	Murata	GCM1555C1H221JA16D
C29, C30	330 pF	±10%	25 V	0201	Murata	GRM033R71E331KA01D
D1	ADR5041ARTZ	N/A	N/A	SOT23	Analog Devices, Inc.	ADR5041ARTZ
E1, E3	1 kΩ ferrite	±25%	N/A	0201	Taiyo Yuden	BKH0603LM102-T
E2	220 Ω ferrite	±25%	N/A	0603	Taiyo Yuden	FBMH1608HM221-T
L1	2.2 µH	±20%	N/A	1210	Taiyo Yuden	BRL3225T2R2M
L2, L3	270 nH	±5%	N/A	0402	Coilcraft	0402DF-271XJRW
L8	1 nH	±0.1 nH	N/A	0402	Murata	LQG15HH1N0B02D
L9	2.2 nH	±0.2 nH	N/A	0402	Murata	LQW15AN2N2C10D
L10, L11	2.7 nH	±0.2 nH	N/A	0402	Murata	LQW15AN2N7C00D
P1, P2	75 Ω, type N	N/A	N/A	N/A	Pasternack	PE4503
P3, P4	087898-0306	N/A	N/A	0.100"	Molex	087898-0306
R3, R5	1 kΩ	±1%	N/A	0402	Panasonic	ERJ-2RKF1001X
R4, R6	2 kΩ	±0.1%	N/A	0402	Panasonic	ERA-2AEB202X
R8[2]	536 Ω	1%	50 mW	0201	Panasonic	ERJ-1GNF5360C
R11, R12	0 Ω	N/A	N/A	0402	Panasonic	ERJ-2GE0R00X
T1, T2	TRS1-182-75-3+	N/A	N/A	TT1618-2	Mini-Circuits	TRS1-182-75-3+
U1	ADCA5192	N/A	N/A	4 mm × 4 mm, 20-lead LFSCP	Analog Devices, Inc.	ADCA5192
C5, C13, C14, C17, C23, R2, R9, R10, R13	Do not install (DNI)	N/A	N/A	0201	N/A	N/A
C1, C2, C3, C9, C18, C20, C21, C22, C31, C32, R1, R7, R15	DNI	N/A	N/A	0402	N/A	N/A
R14	DNI	N/A	N/A	0603	N/A	N/A
C10	DNI	N/A	N/A	1411	N/A	N/A
Q1	DNI	N/A	N/A	SOT666	N/A	N/A

[1] N/A means not applicable.

[2] For optimum performance at the adjusted bias currents, adjust this resistor per the Suggested Values for R8 vs. I_{DD} in Downstream Application table in the ADCA5192 data sheet.)

ORDERING INFORMATION

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.