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Evaluation Board for the ADF5904 4-Channel, 24 GHz Receiver Downconverter

FEATURES

Contains ADF5904 4-channel, 24 GHz receiver downconverter
Accompanying software allows control of ADF5904 functions from a PC

EVALUATION KIT CONTENTS

EV-ADF5904SD2Z evaluation board

ADDITIONAL EQUIPMENT

PC running Windows XP or more recent version
Analog Devices, Inc., EVAL-SDP-CS1Z system demonstration platform-serial (SDP-S) board
Spectrum analyzer (optional)
Oscilloscope
5 V power supplies
USB cable

DOCUMENTS NEEDED

ADF5904 data sheet

REQUIRED SOFTWARE

Analog Devices ADF5904 Software

GENERAL DESCRIPTION

The EV-ADF5904SD2Z evaluation board allows the user to evaluate the performance of the ADF5904 24 GHz receiver downconverter. Figure 1 shows the board, which contains the ADF5904, five high frequency SMA connectors for the local oscillator (LO) input, four receiver (Rx) inputs, eight SMA connectors for the baseband outputs, banana connectors for power supply, and a connector for serial interface.

The evaluation kit also contains software that is compatible with Windows® XP and later versions to allow easy programming of the device.

This evaluation board requires an EVAL-SDP-CS1Z SDP-S board (not supplied with the kit). The SDP-S board allows software programming of the ADF5904 device.

Full specifications on the ADF5904 are available in the product data sheet, which should be consulted in conjunction with this user guide when working with the evaluation board.

EVALUATION BOARD PHOTOGRAPH

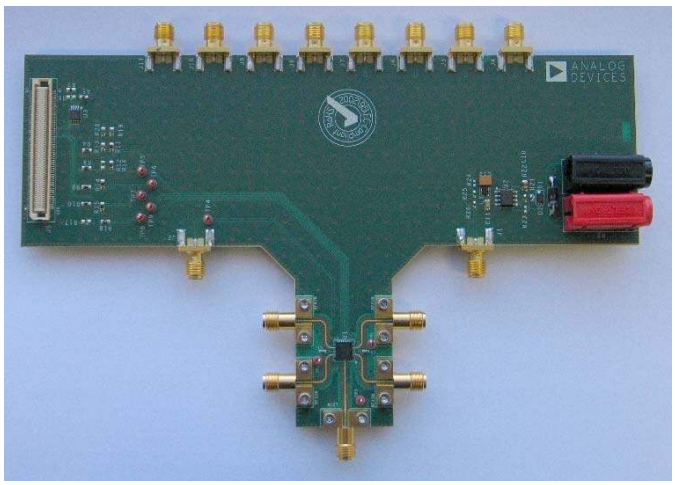

Figure 1.

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REVISION HISTORY

3/15—Revision 0: Initial Version

QUICK START GUIDE

Follow these steps to quickly evaluate the ADF5904.

1. Connect the power supply to the EV-ADF5904SD2Z:
   a. 5 V to Banana Connector P2
   b. GND to Banana Connector P1
2. Install the ADF5904 software.
3. Connect the SDP-S motherboard to the PC and to the EV-ADF5904SD2Z evaluation board.
4. Follow the hardware driver installation procedure.
5. Run the ADF5904 software.
6. Select the ADF5904 device and the USB board in the **Select Device and Connection** tab of the software front panel window (see Figure 2).
7. Check that the message **SDP board connected** appears at the bottom left of the software window (see Figure 2).
8. Connect an ac-coupled RF source to LOIN SMA and connect an ac-coupled RF source to one of the RXxIN input SMAs.
9. In the **Main Controls** tab, click **Initialize**.
10. Connect the corresponding Rx baseband channel output to an oscilloscope.
11. Measure the results.

EVALUATION BOARD HARDWARE

The evaluation board requires an SDP-S motherboard to program the device. The SDP-S board is not included and must be purchased separately. The EV-ADF5904SD2Z schematics are shown in Figure 5 to Figure 9. The top layer and assembly layout are shown in Figure 10.

POWER SUPPLIES

The evaluation board is powered via one external supply, 5 V connected as described in the Quick Start Guide section.

INPUT SIGNALS

The LO input pin and the Rx input pins on the ADF5904 contain a dc bias voltage; the inputs must be ac-coupled to the evaluation board.

OUTPUT SIGNALS

The baseband outputs from the ADF5904 contain dc bias voltages and are available on the J3 to J11 output SMAs.

Table 1. Baseband Output Mapping

Rx Input	Baseband Outputs
RF1IN	J3, J4
RF2IN	J6, J7
RF3IN	J8, J9
RF4IN	J10, J11

DEFAULT OPERATION

All components necessary for ADF5904 operation are inserted on the board.

EVALUATION BOARD SOFTWARE

The control software for the EV-ADF5904SD2Z is included in the evaluation kit on a CD. To install the software, follow the on-screen instructions.

To run the software, click the **ADF5904** file on the desktop or from the **Start** menu.

In the **Select Device and Connection** tab, select the device and the connection method, and click **Connect.**

Confirm that **Analog Devices Eval Board connected** is displayed at the bottom left of the window (see Figure 2). Otherwise, the software has no connection to the evaluation board.

Note that, when connecting the board, it takes approximately 5 sec to 10 sec for the status label to change.

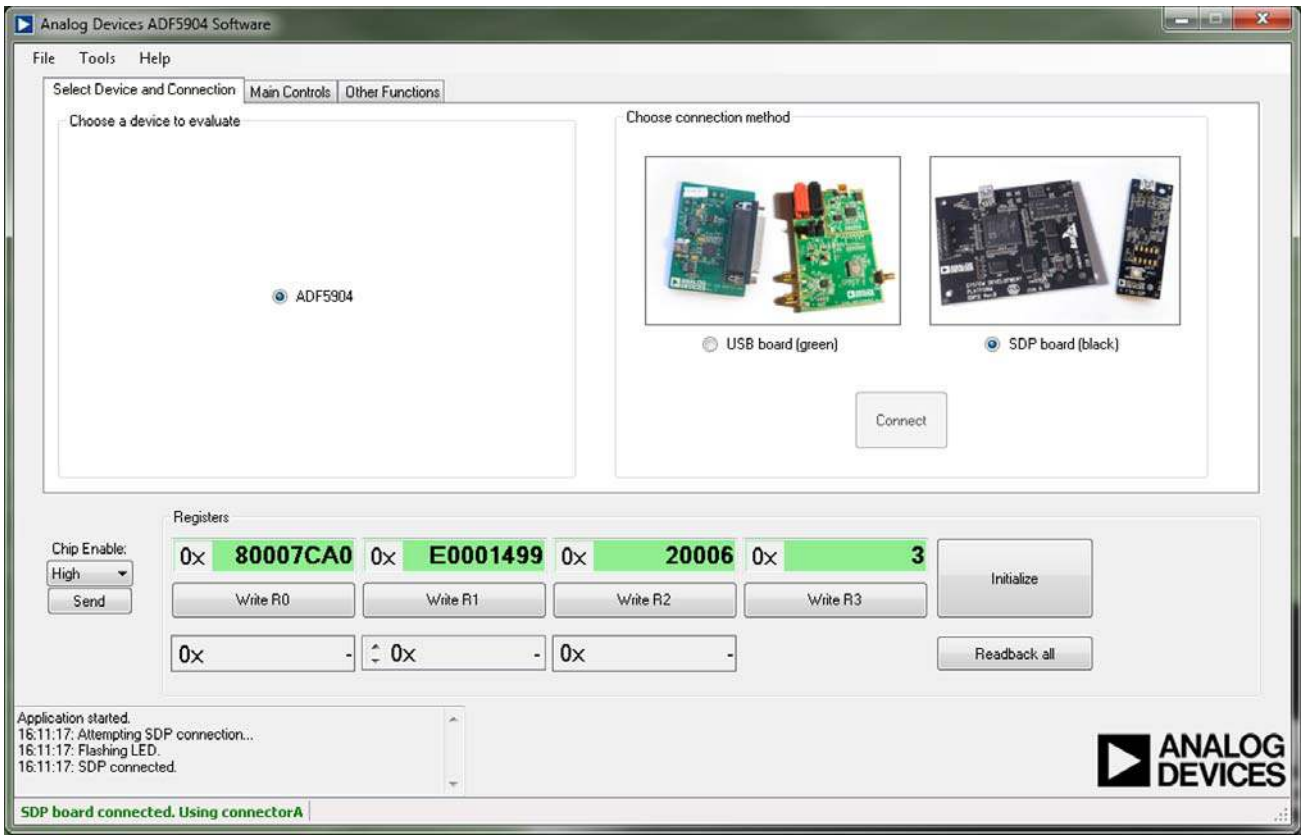

Figure 2. Software Front Panel Display—Select Device and Connection

The **Main Controls** tab controls the ADF5904 device settings (see Figure 3).

This tab allows the user to select general options available for the ADF5904, including power up/down control and register readback.

On initial power-up of the device, click the **Initialize** button to perform the initialization sequence as described in the ADF5904 data sheet.

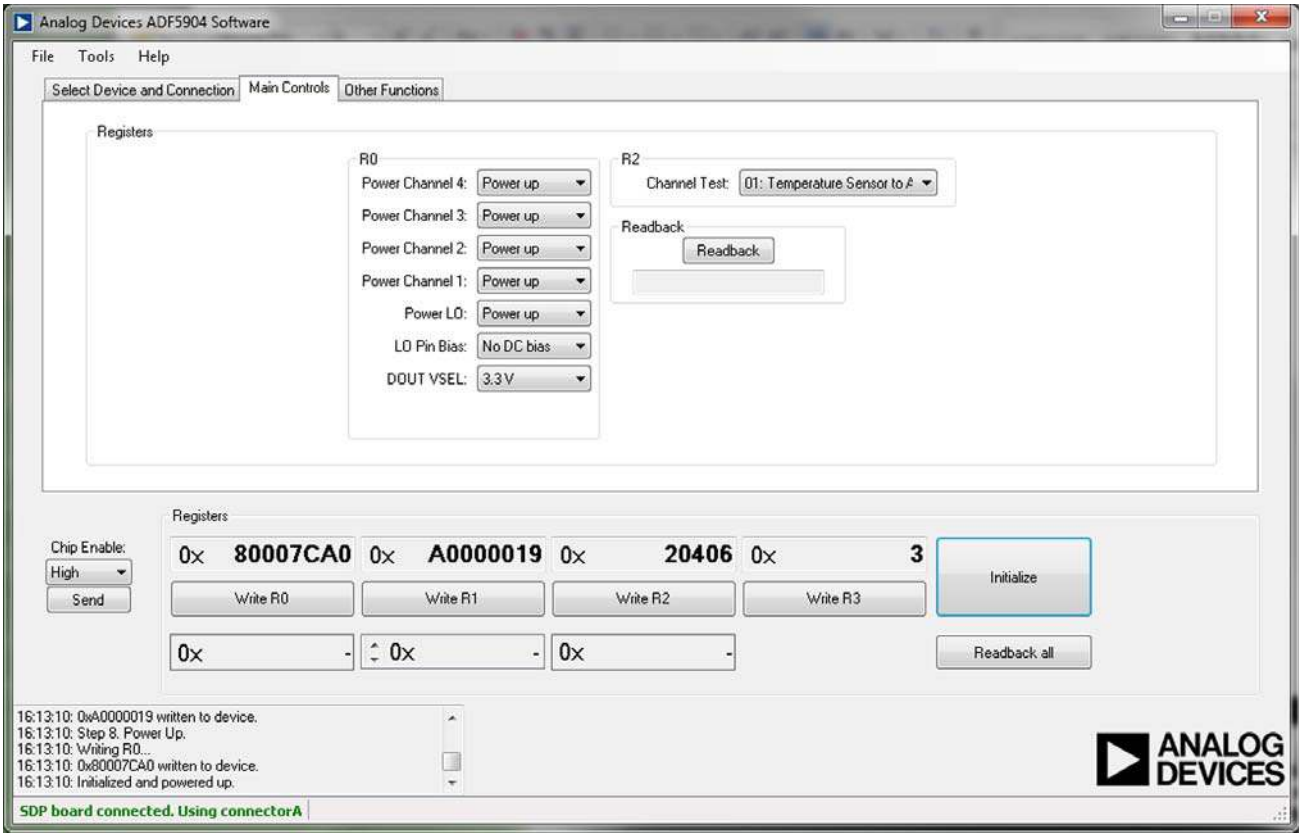

Figure 3. Software Front Panel Display—Main Controls

EVALUATION AND TEST

To evaluate and test the performance of the ADF5904, take the following steps:

1. Install the SDP-S software drivers. Connect the evaluation board to a PC using the supplied USB cable. Follow the hardware driver installation procedure that appears.
2. Connect the SDP-S connector to the EV-ADF5904SD2Z.
3. Install the ADF5904 software.
4. Connect an ac-coupled RF signal to LOIN SMA.
5. Connect an ac-coupled RF signal to the RX1IN input SMA.
6. Connect a 1 MΩ, ac-coupled oscilloscope to the J3 and J4 output SMAs.
7. Run the ADF5904 software.
8. Select the SDP-S board and the ADF5904 device in the **Select Device and Connection** tab of the software window.
9. In the **Main Controls** tab, click **Initialize** to power up the ADF5904 (see Figure 3). See Figure 4 for the suggested setup.
10. Measure the baseband output signals.

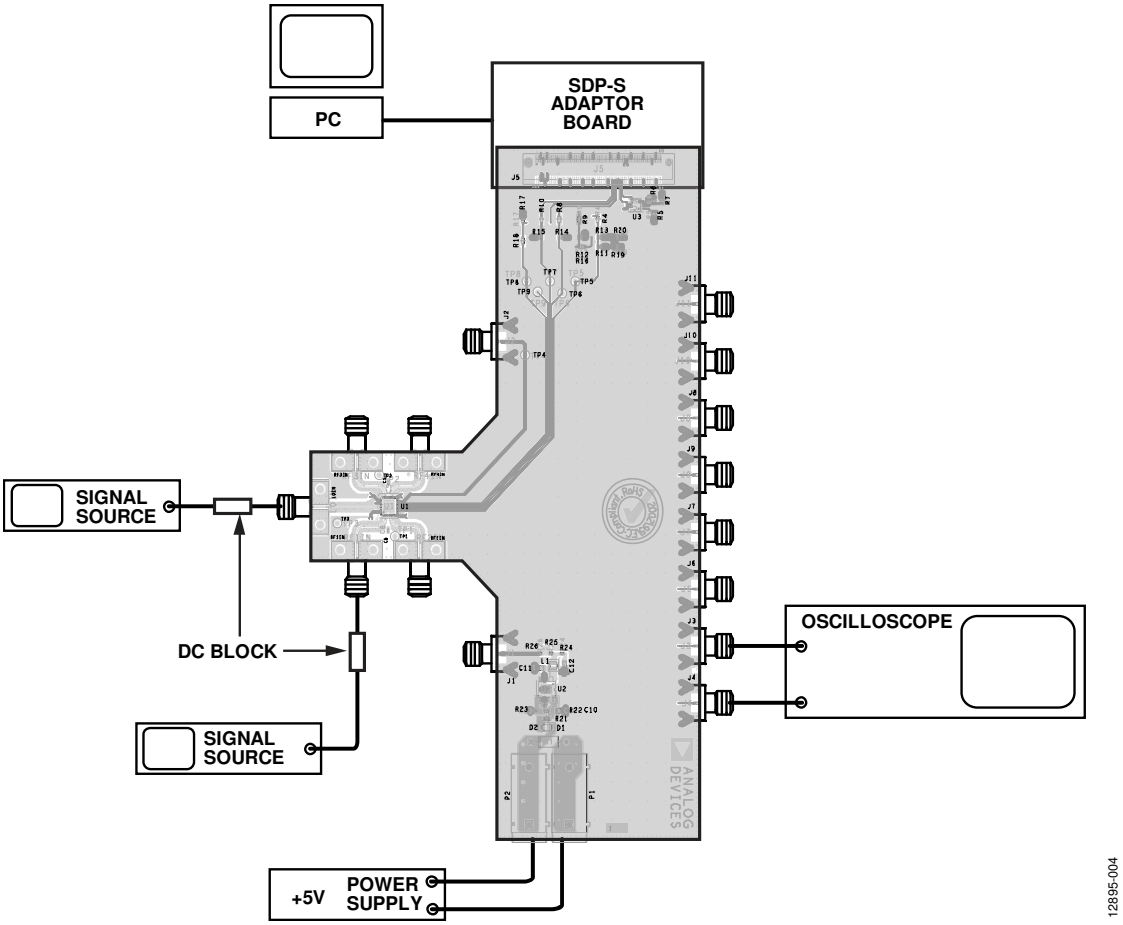

Figure 4. Typical Evaluation Setup

EVALUATION BOARD SCHEMATICS AND ARTWORK

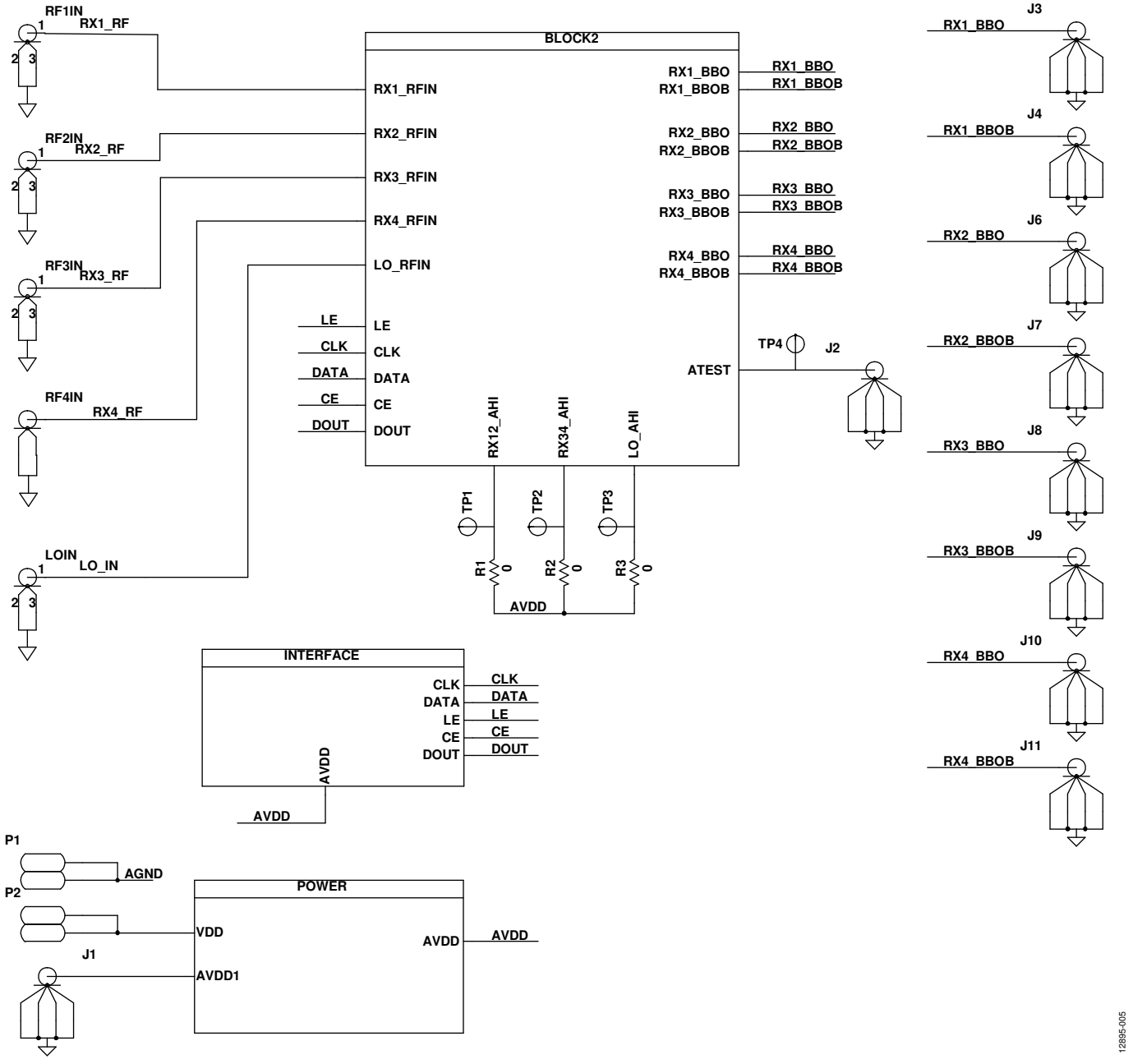

Figure 5. Evaluation Board Schematic (Page 1)

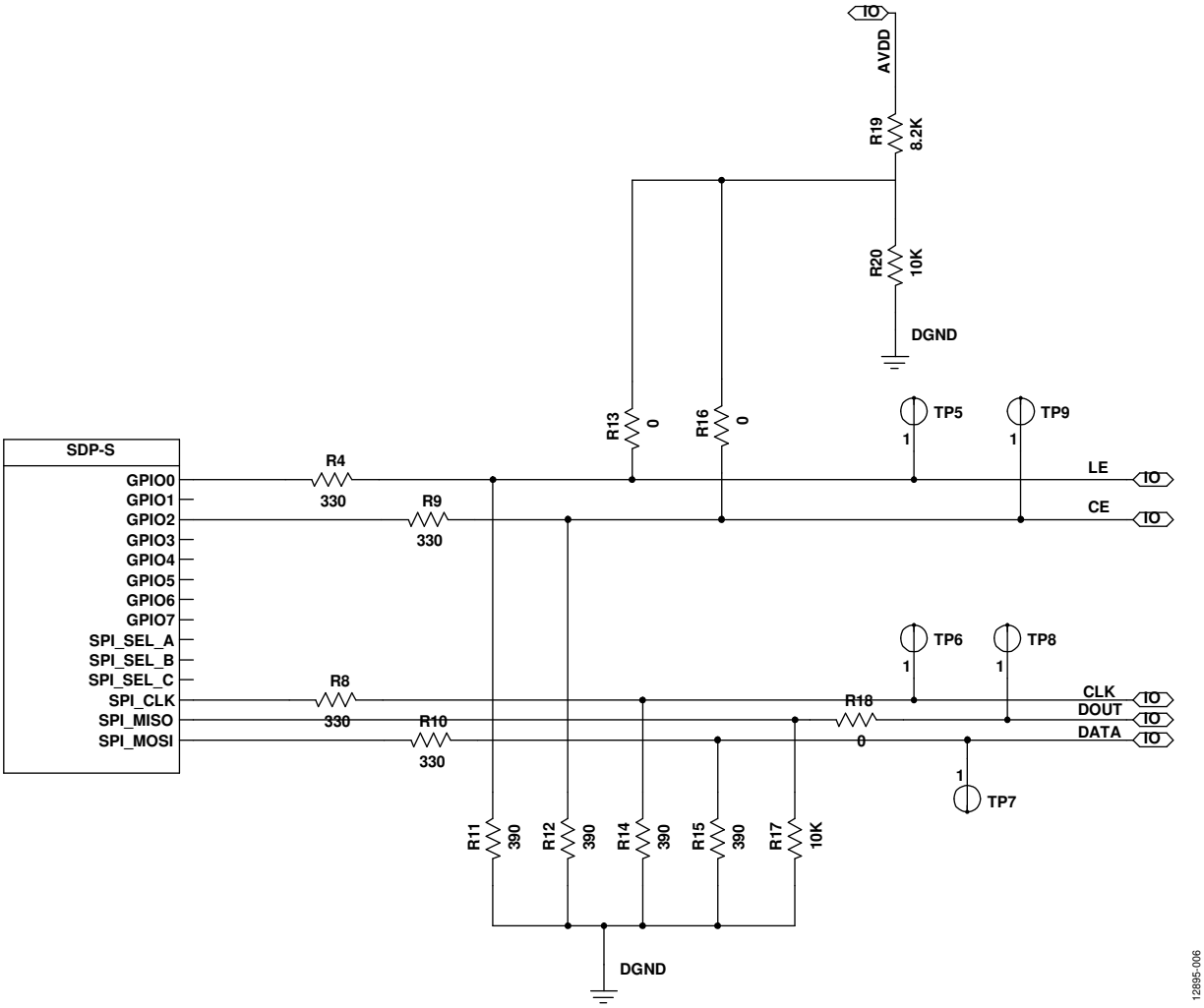

Figure 6. Evaluation Board Schematic (Page 2)

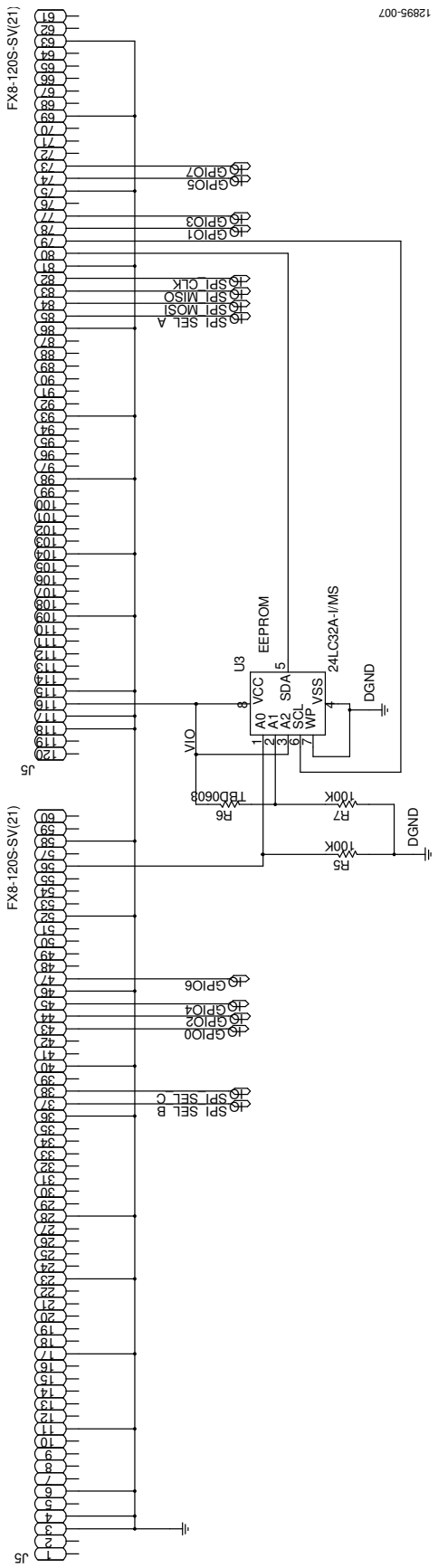

Figure 7. Evaluation Board Schematic (Page 3)

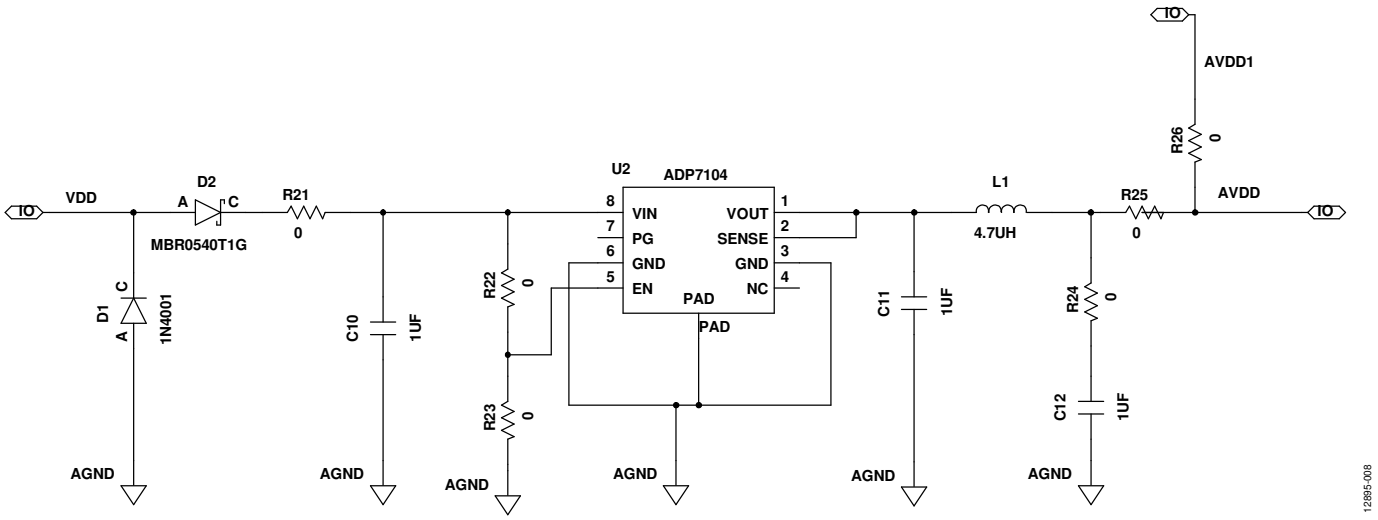

Figure 8. Evaluation Board Schematic (Page 4)

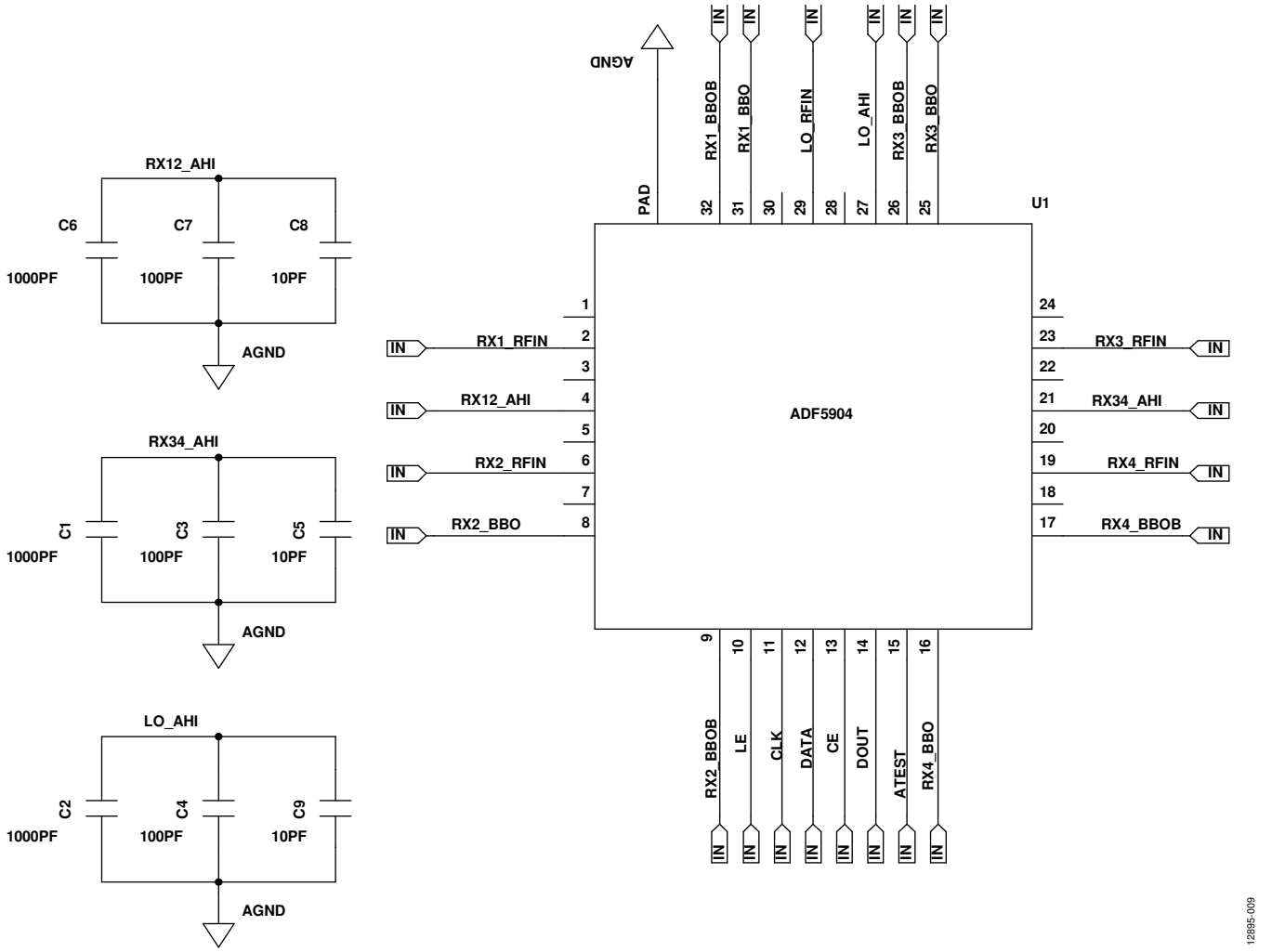

Figure 9. Evaluation Board Schematic (Page 5)

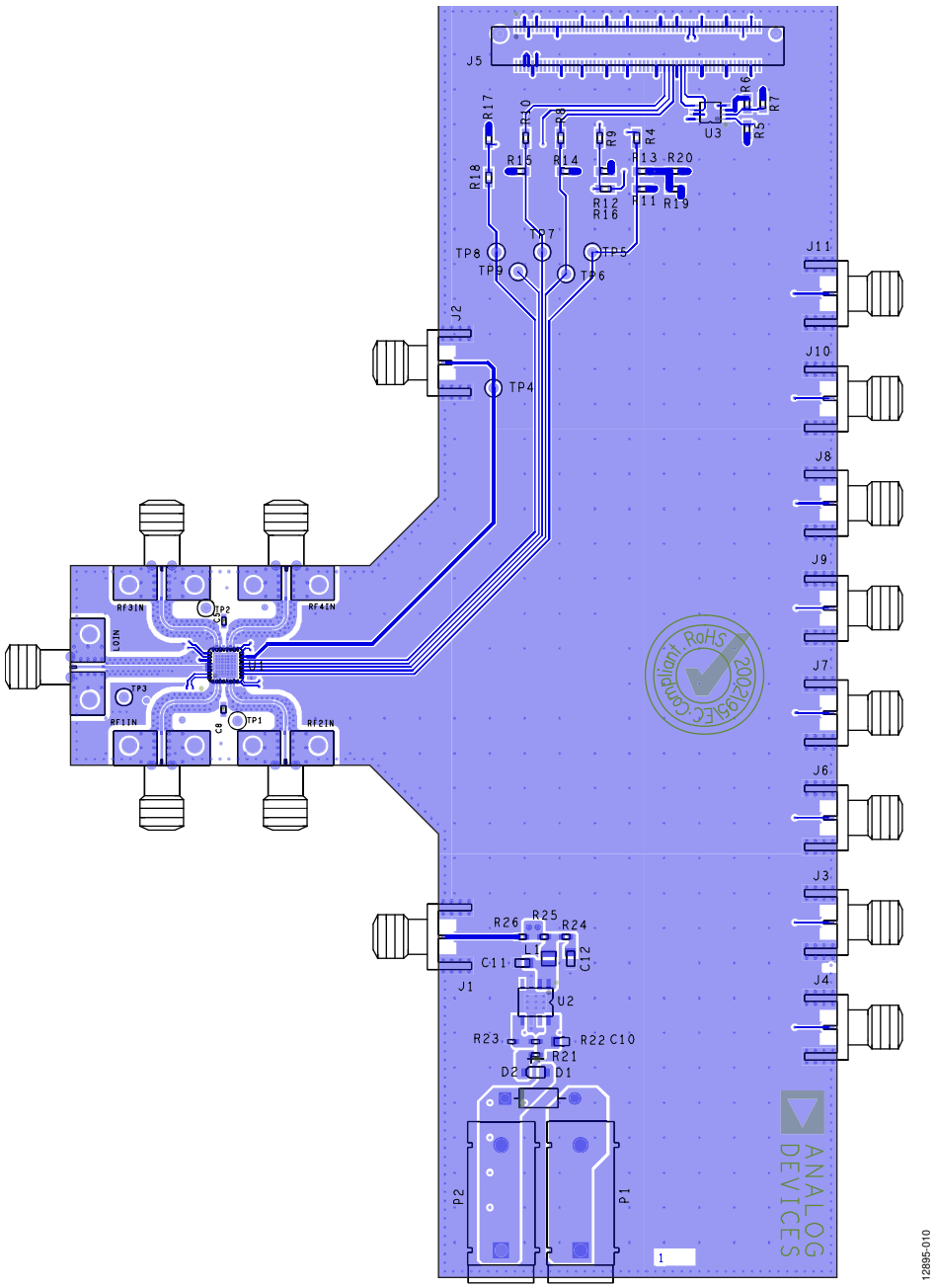

Figure 10. Layer 1 (Component Side)

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Qty	Reference Designator	Description	Manufacturer	Part Number
3	C1, C2, C6	0.1 µF capacitor	AVX	06033C104JAT2A
3	C3, C4, C7	1000 pF capacitor	Murata	GRM1555C1H102JA01
3	C5, C8, C9	10 pF capacitor	AVX	04025U100GAT2A
1	D1	Diode	Multicomp	1N4001
1	D2	Diode	On Semiconductor	MBR0520LT1G
10	J1 to J4, J6 to J11	Connector, PCB, end launch, SMA	Emerson	142-0701-851
1	J5	120-way connector, 0.6 mm pitch	Hirose	FX8-120S-SV(21)
1	L1	4.7 µH inductor	Coilcraft	EPL2014-472ML
5	LOIN, RF1IN to RF4IN	2.92 mm Rosenberger connectors	Rosenberger	02K243-40M
1	P1	Black, 4 mm, banana socket	Deltron	571-0100
1	P2	Red, 4 mm, banana socket	Deltron	571-0500
3	R4, R8, R10	330 Ω resistor	Vishay	CRCW0603330RFKEA
4	R11, R12, R14, R15	390 Ω resistor	Multicomp	MC 0.063W 0603 390R
1	R17	10 kΩ resistor	Multicomp	MC 0.063W 0603 10K
1	R19	8.2kΩ resistor	Multicomp	MC 0.063W 0603 1% 8K2
1	R20	10 kΩ resistor	Multicomp	MC 0.063W 0603 10K
2	R5,R7	100 kΩ resistor	Yageo (Phycomp)	RC0402JR-07100KL
1	R6	Do not populate	Not applicable	Not applicable
9	TP1 to TP9	Connector, PCB, test point, red	Keystone Electronics Corp	5000
1	U2	Linear regulator, 3.3 V, 20 V, 500 mA, ultralow noise	Analog Devices	ADP7104ARDZ-3.3
1	U3	32k, I^2C, serial EEPROM, MSOP8	Microchip	24LC32A-I/MS
2	Screw1, Screw2	Screw, cheese, nylon	Allthread	119030010
2	Nut1, Nut2	Nut/washer, nylon	Duratool	1140030
1	U1	ADF5904 Rx MMIC	Analog Devices	ADF5904BCPZ
4	R21, R22, R25, R26	0 Ω resistor	Multicomp	MC 0.0625W 0402 1% 0R
1	R24	0.33 Ω resistor	Welwyn	LRCS0402-0R33FT5
1	R23	Do not populate	Not applicable	Not applicable
1	C12	100 µF capacitor	Kemet	T520B107M006ATE040
1	C11	10 µF capacitor	Murata	GRM21BR61A106KE19L
1	C10	1 µF capacitor	Taiyo/Yuden	TMK107BJ105KA-T
1	R16	Do not populate	Not applicable	Not applicable
1	R9	Do not populate	Not applicable	Not applicable
5	R1, R2, R3, R13, R18	0 Ω resistor	Multicomp	MC 0.063W 0603 0R

RELATED LINKS

Resource	Description
ADF5904	Product Page, 4-Channel, 24 GHz, Receiver Downconverter
ADP7104	Product Page, 20 V, 500 mA, Low Noise, CMOS LDO

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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