ADL5580-EVALZ Evaluation Board User Guide

UG-1847

One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

Evaluating the ADL5580 Fully Differential, 10 GHz ADC Driver with 10 dB Gain

FEATURES

Full featured evaluation board for the ADL5580
Dual-supply operation
Easy to use interface with ACE

EQUIPMENT NEEDED

+5 V and −1.8 V dc power supplies
System demonstration platform, EVAL-SDP-CS1Z (SDP-S)
Network analyzer
Signal generator
Oscilloscope with high-Z probe (option)
Spectrum analyzer (option)
Windows PC with two or more USB ports

DOCUMENTS NEEDED

ADL5580 data sheet
ADL5580-EVALZ user guide

SOFTWARE NEEDED

ACE software

GENERAL DESCRIPTION

The ADL5580-EVALZ evaluation board allows the manual control of the ADL5580 through the USB port on a Windows® PC via a SDP-S interface board.

Additional information on the ADL5580 is provided in the ADL5580 data sheet. Consult the ADL5580 data sheet in conjunction with this user guide when using the ADL5880-EVALZ evaluation board.

EVALUATION BOARD PHOTOGRAPHS

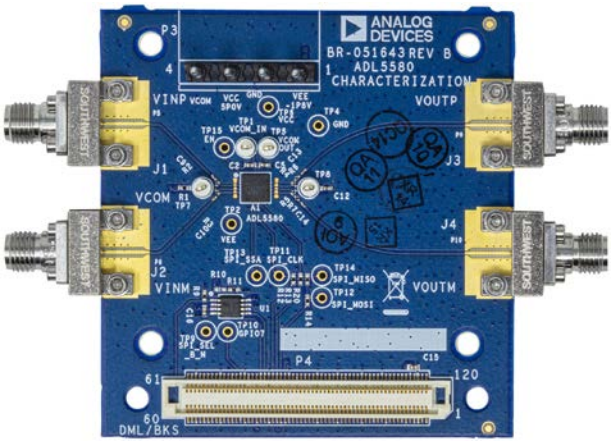

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Figure 1. ADL5580-EVALZ, Top

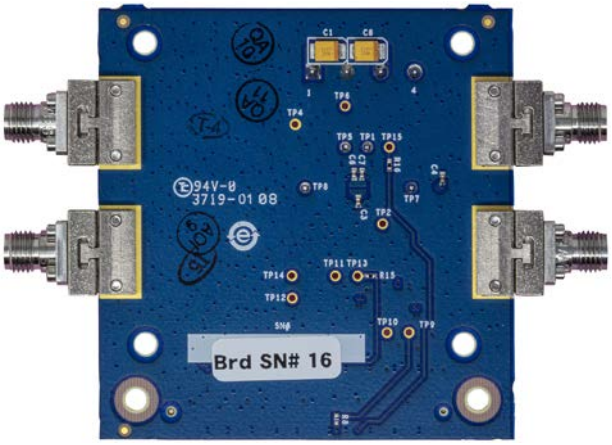

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Figure 2. ADL5580-EVALZ, Bottom

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REVISION HISTORY

12/2020—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE SETUP

The hardware is connected as shown in Figure 3. To power up the ADL5580-EVALZ, use a +5 V and −1.8 V, 300 mA dc power supply. Connect the SDP-S to the PC through a USB cable.

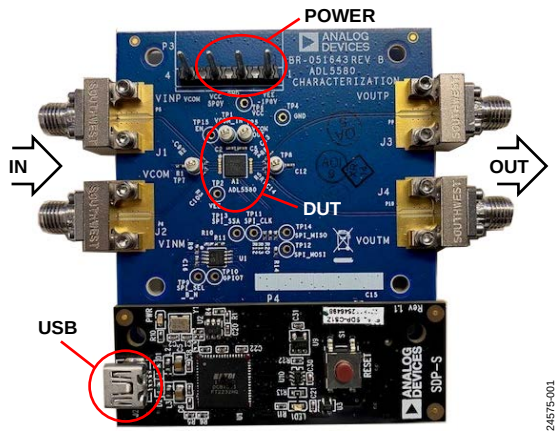

Figure 3. ADL5580-EVALZ USB and SDP-S Connections

See Table 1 and Table 2 to connect the equipment needed to evaluate the ADL5580-EVALZ.

Table 1. ADL5580-EVALZ Connections

Equipment	Connection
Power Supply	P3: Pin 1 (−1.8 V), Pin 2 (GND), and Pin 3 (+5 V)
Signal Source	J1 (VINP) and J2 (VINM)
Network Analyzer	Connect to two ports on the four port network analyzer (see Figure 4)
Signal Generator (Option)	Set the source to a 100 MHz frequency with an output level of −20 dBm (see Figure 5)
Baluns	
1:2	Connect to the differential inputs (J1 and J2) of the ADL5580-EVALZ
2:1	Connect to the differential outputs (J3 and J4) of the ADL5580-EVALZ
SDP-S	P4
Signal Analyzer	J3 (VOUTP) and J4 (VOUTM)
Network Analyzer	Connect two ports on the four port network analyzer (see Figure 4)
Spectrum Analyzer (Option)	Connect to port through a 2:1 balun (see Figure 5)
Oscilloscope (Option)	Measure the voltage levels directly at the ADL5580 pins using a high-Z probe

Table 2. SDP-S Connections

Equipment	Connection
PC USB Cable	J2

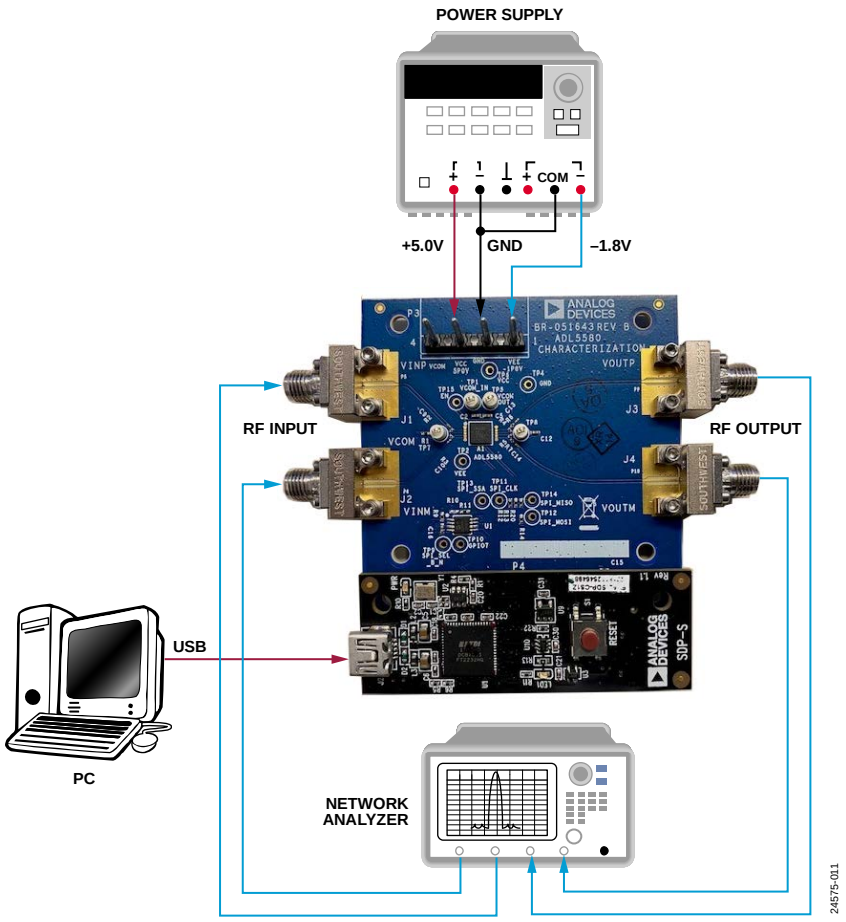

Figure 4. ADL5580-EVALZ Connection Diagram

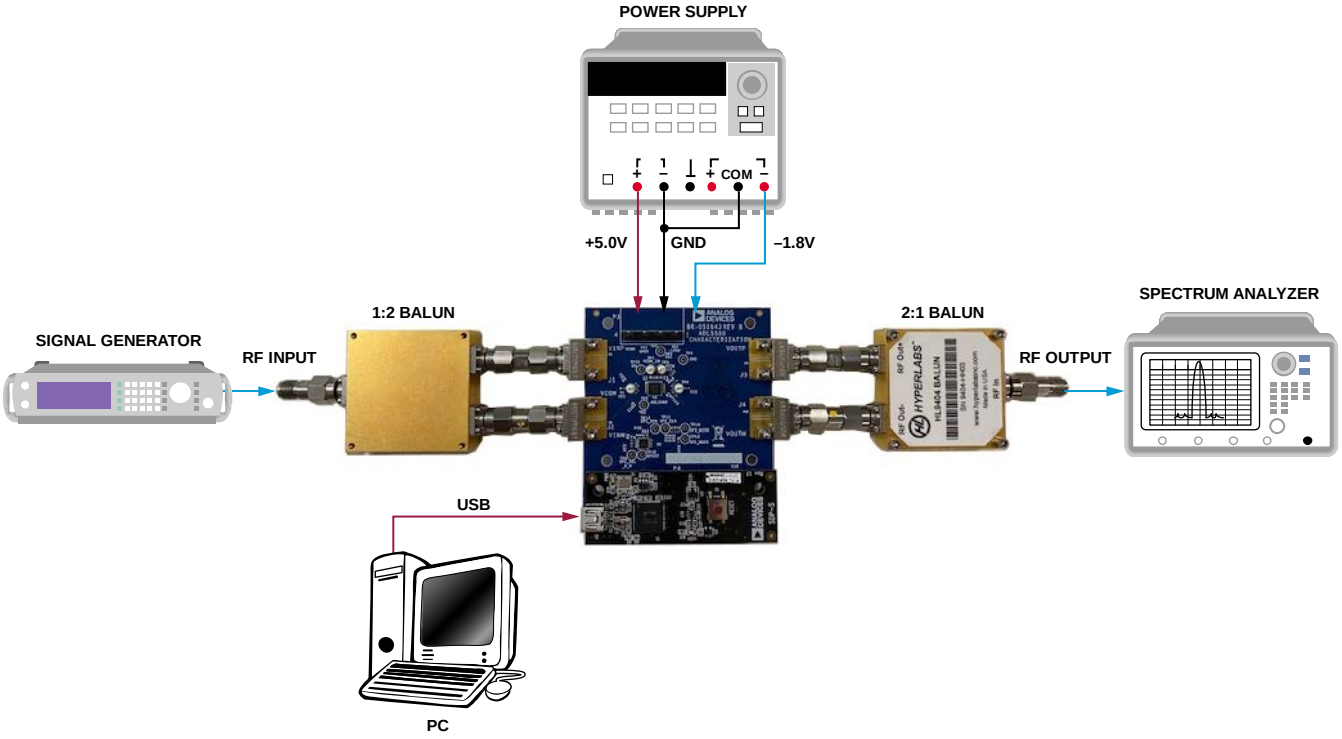

Figure 5. ADL5580-EVALZ Measurement Setup (Option)

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE ACE SOFTWARE AND ADL5580 PLUG-INS

The ADL5580-EVALZ evaluation board connects to the SDP-S for quick evaluation of the ADL5580. The ADL5580-EVALZ is configured over the USB from a panel within the ACE software, which can be downloaded from the ACE software page. When the ACE software installation is complete, the user must install the **ACE Evaluation Board Plug-ins** that are provided with the evaluation package to the hard drive of the PC.

Double-click the **Board.ADL5580.1.2019.22300.acezip** file to install the evaluation board plug-ins.

Ensure that the **Board.ADL5580.1.2019.22300** and **Chip.ADL5580.1.2019.22300** folders are located in the **C:\ProgramData\Analog Devices\ACE\Plugins** folder.

SINGLE-TONE DEMONSTRATION WITH ACE

Use the following settings to configure the ADL5580 to amplify a 100 MHz sine wave using the ACE software:

- Configure the hardware according to the Hardware Setup section and what is shown in Figure 5.
- Set the frequency of the signal generator to 100 MHz and the output level to −20 dBm. Optionally, connect the spectrum analyzer to the J3 and J4 connectors using an external balun (for example, the HYPERLABS 2:1 balun was used).
- Set RF off state.
- Use 2.92 mm, 40 GHz, female Southwest Microwave connectors at J1, J2, J3, and J4 on the ADL5580-EVALZ. Connect these connectors to the Subminiature Version A (SMA), 3.5 mm connector with care. However, it is suggested to use a 2.92 mm, SMA adaptor to avoid any potential damage.
- Power up the ADL5580-EVALZ.
- Launch the ACE application. This action displays the initial ACE start page as shown in Figure 6. The ADL5580-EVALZ is detected automatically and displays under **Attached Hardware**.
- Click the **ADL5580-EVALZ** icon to open the evaluation board level view shown in Figure 7. Because the ADL5580-EVALZ is a simple evaluation board, only the ADL5580 represents as a controllable component.
- Click the **ADL5580** icon to open the IC level view as shown in Figure 8.
- Configure the ADL5580 in the **ChipView** (see Figure 7) as follows:
  - Select the **Pin 19** check box to select **EN**.
  - Ensure that the **Enable Ref** and the **Enable Amp** check boxes are selected. **Enable Ref** enables the internal voltage, and **Enable Amp** enables the amplifier section (see Figure 8).
  - Under the **Input Termination Mode** dropdown menu, select **Internal VCM Enabled, VCMI Pin Disconnected** (see Figure 8).
  - Under the **Output Termination Mode** dropdown menu, select **Internal VCM Enabled, VCMO Pin Disconnected** (see Figure 8).
  - Set **C Peak** (defaults to 3), if necessary (see Figure 8).
  - Set **Input CM Voltage** and **Output CM Voltage**, if necessary (see Figure 8).
- Click **Apply Changes** for the changes to take effect (see Figure 8). Repeat the previous step to enable or disable the ADL5580-EVALZ with the hardware enabled.
- Set RF on state at the signal generator.
- With the signal generator set to an output level of −20 dBm, the power gain is 13 dB at 1 GHz. However, note that this value is affected by cabling and balun losses on the signal path.

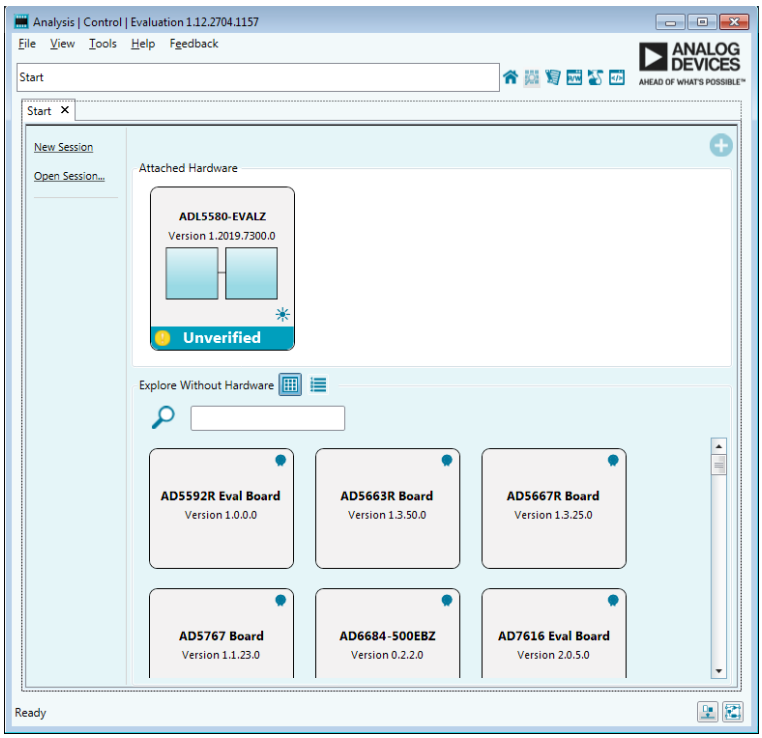

Figure 6. Initial ACE Start Page

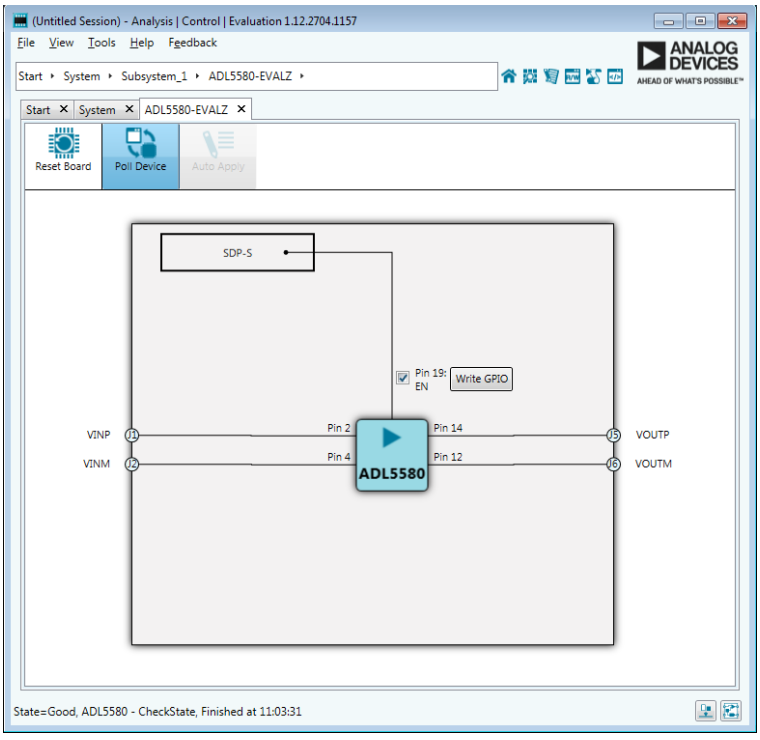

Figure 7. ADL5580-EVALZ Board Level View

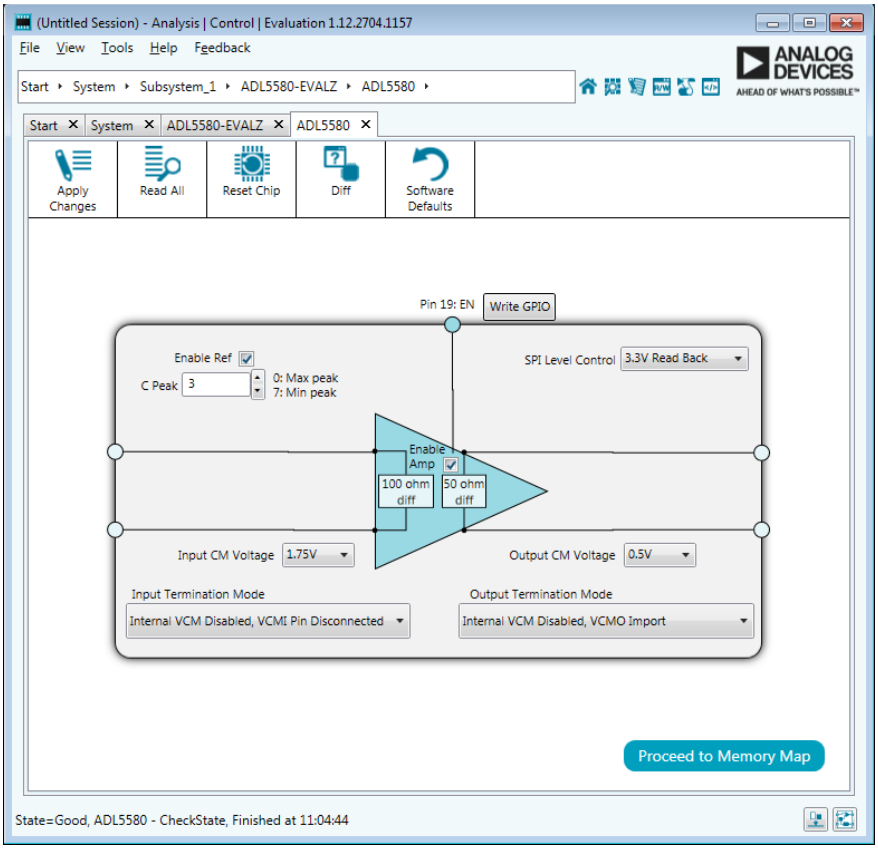

Figure 8. ADL5580 IC Level View

USING THE ADL5580-EVALZ EVALUATION BOARD

LOSSES AND SIGNAL-TO-NOISE RATIO (SNR) DEGRADATION

The ADL5580 provides a nominal 10 dB of voltage gain defined between the input and output pins, which translates to a power gain of 13 dB because the input impedance is twice the output impedance. The resistive impedance matching converts the 50 Ω differential output to a more common 100 Ω. However, this resistive impedance matching adds 7.7 dB of attenuation that must be considered. The miscellaneous components of the ADL5580-EVALZ can add to the signal losses and degrade the SNR as well.

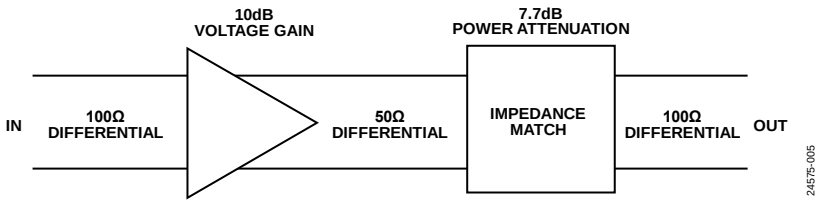

Figure 9. Losses and SNR Degradation

ACE MACRO TOOLS

ACE also contains **Macro Tools** that can record register reads and writes. Use the **Installation Wizard** or click **Proceed to Memory Map** to use these tools. To use the **Macro Tools**, select the **Record Sub-Commands** checkbox and click the **Record** button (see Figure 10). Changes in the memory map remain bolded until these changes are applied to the device. The changes are also recorded as user interface (UI) commands by the **Macro Tools** once the changes are made. Changed register write commands for the controls are also recorded. Click **Apply Changes** to execute the commands and make changes to the memory map. To stop recording, click the **Stop Recording** button. A **Macro Tools** page with the command steps is then created. The macro can be saved using the **Save Macro** button so that the macro can be loaded for future use.

The raw macro file is saved using ACE syntax, which is not easily readable. To remedy this, the ACE software download includes an **ACE Macro/Hex Converter** tool (see Figure 11). The user can choose to include or exclude register write, reads, and/or comments in the conversion. The file pathways for the source and save paths are the same, except the source is an .acemacro file, and the save is a .txt file. The **Convert** button (see Figure 11) converts the macro to hex, which is easier to read, and the conversion tool can also convert .txt files back to .acemacro files, if desired.

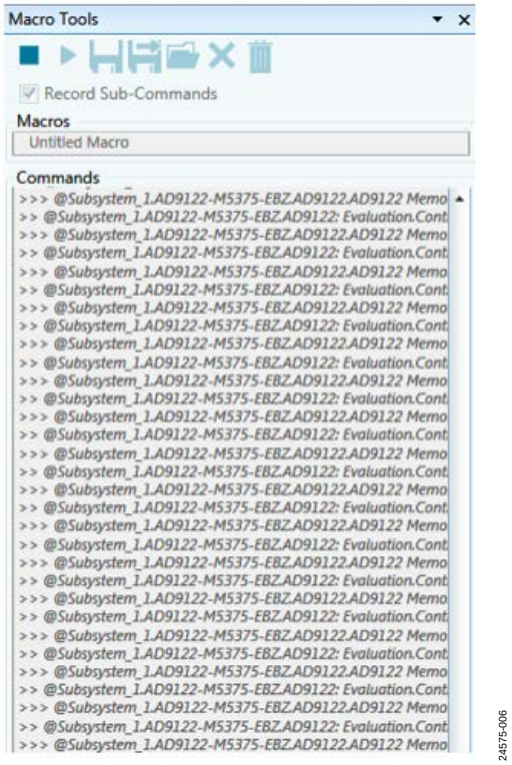

*Figure 10. ACE **Macro Tools***

Figure 11. Conversion Set Up for Macro to Hex

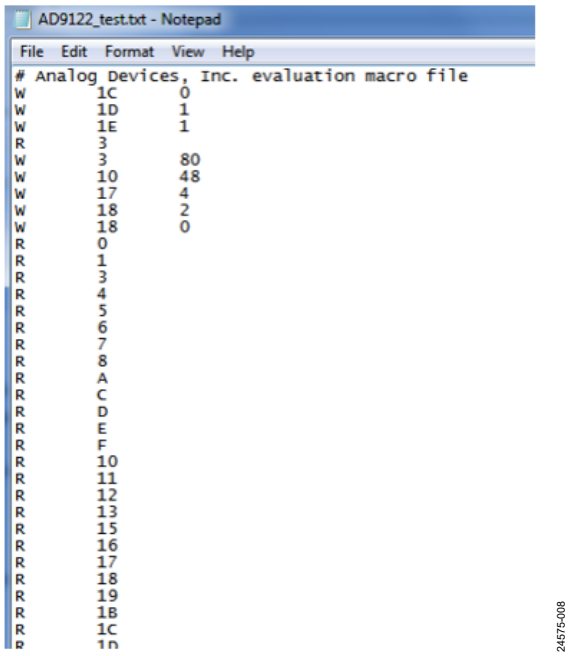

Figure 12. Converted Text File

EVALUATION BOARD SCHEMATICS

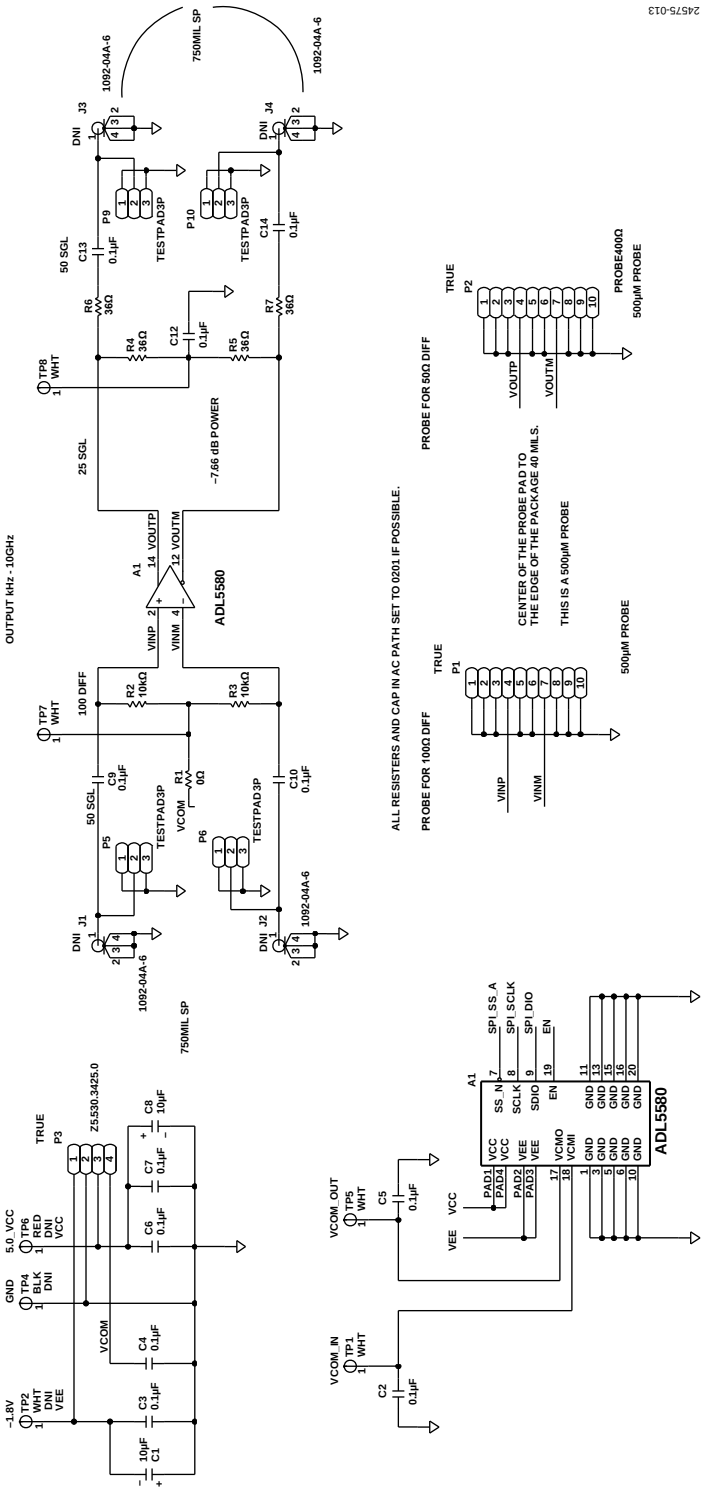

Figure 13. ADL5580-EVALZ Schematic, Page 1

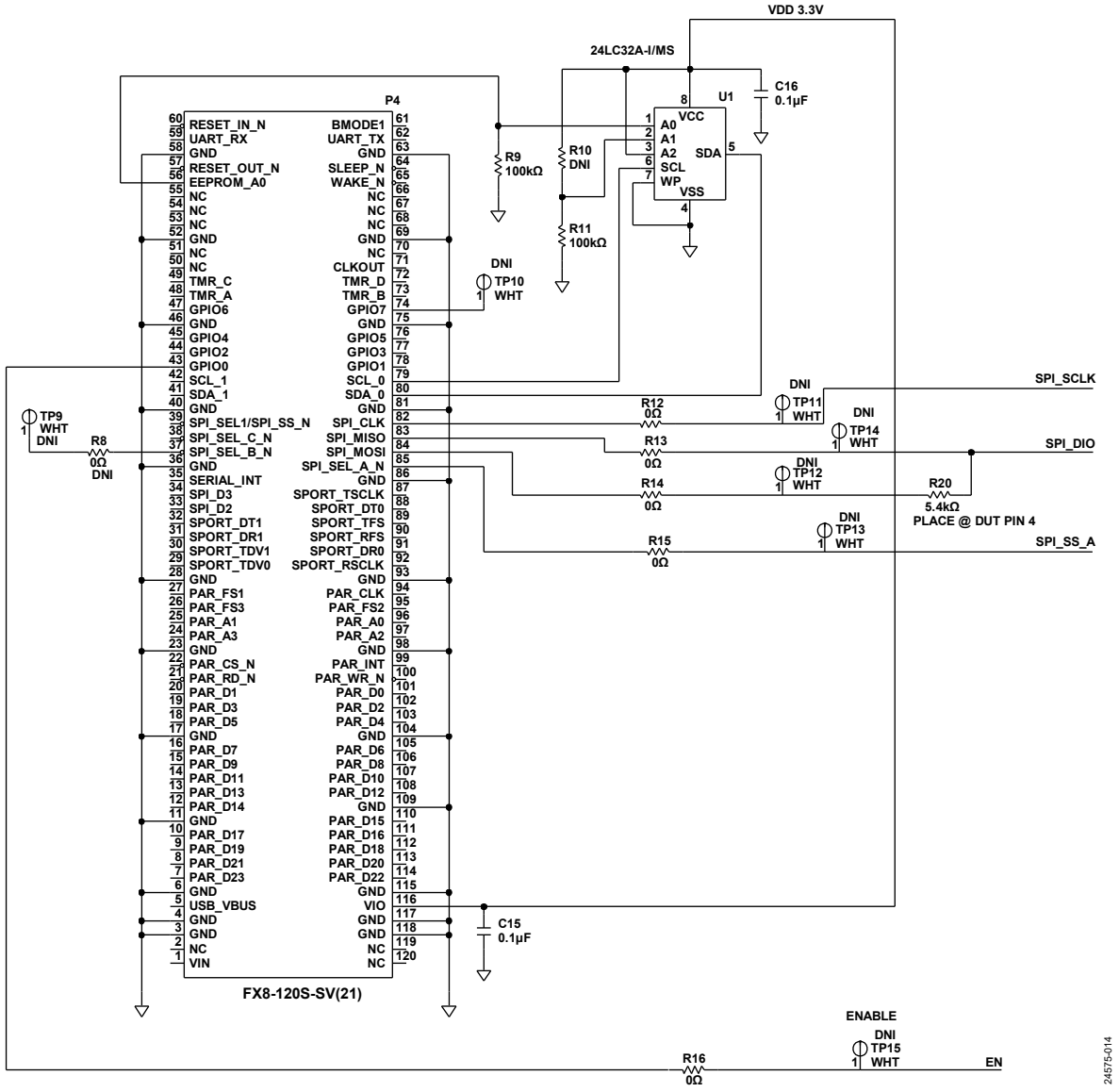

Figure 14. ADL5580-EVALZ Schematic, Page 2

ORDERING INFORMATION

BILL OF MATERIALS

Table 3. Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Part Number
1	Not applicable	PCB	Analog Devices supplied	08_051643b
1	A1	Fully differential, 10 GHz ADC driver with 10 dB gain, 20-terminal land grid array (LGA)	Analog Devices	ADL5580
2	C1, C8	10 µF capacitors, standard tantalum, Case B, C3528	AVX	TAJB106K016RNJ
9	C2 to C7, C12, C15, C16	0.1 µF ceramic capacitors, X7R, general-purpose, C0402, 16 V	KEMET Corporation	C0402C104J4RACTU
4	C9, C10, C13, C14	0.1 µF ceramic capacitors, 10 V, X5R, 0201 (do not substitute)	Murata	GRM033R61A104KE84D
1	P1, P2	CONN-PCB, headers, 4 pole, single throw, pads for probing the integrated PCB, 500 µm spacing	Not applicable	Not applicable
1	P3	CONN-PCB terminal strip header, CNWIELAND3425-2	Wieland Electric GmbH	Z5.530.3425.0
1	P4	CONN-PCB vertical type receptacle for the SDP breakout board (ADZS-BRKOUT-EX3)	HRS	FX8-120S-SV(21)
6	R1, R12 to R16	0 Ω resistors, thick film chip, R0402, 50 V, 1/16 W	Multicomp (SPC)	MC00625W040210R
2	R2, R3	10 kΩ resistors, metal film chip, high reliability, R0201, 1/20 W	Panasonic	ERA-1AEB103C
4	R4 to R7	36 Ω resistors, precision thick film, R0201, 1/20 W	Panasonic	ERJ-1GEF36R0C
1	R8	0 Ω resistor, thick film chip, R0402, DNI	Multicomp (SPC)	MC00625W040210R
2	R9, R11	100 kΩ resistors, precision thick film chip, R0402, 1/16 W	Panasonic	ERJ-2RKF1003X
1	R10	100 Ω resistor, precision thick film chip, R0402, DNI	Panasonic	ERJ-2RKF1003X
1	R20	5.4 kΩ resistor, precision thick film chip, R0402, 1/16 W	Panasonic	ERJ-2RKF5361X
4	TP1, TP5, TP7, TP8	CONN-PCB test points, white, CNKEY5001TP	Keystone Electronics	5002
1	U1	IC 32 Kb serial EEPROM, 24LC32A-I/MS, MSOP8	Microchip Technology	24LC32A-I/MS
4	J1 to J4	CONN-PCB, jacks (female) end launch edge mount, low profile, do not install (DNI)	Southwest Microwave	1092-04A-6
8	TP2, TP9 to TP15	CONN-PCB, test points, white, DNI	Keystone Electronics	5002
1	TP4	CONN-PCB, test point, black, DNI	Keystone Electronics	5001
1	TP6	CONN-PCB, test point, red, DNI	Keystone Electronics	5000

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.

ANALOG DEVICES

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