ANALOG DEVICES

EVAL-ADG5249FEBZ User Guide
UG-878

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Evaluation Board for the ADG5249F, Overvoltage Protected Dual 4:1 Multiplexer

FEATURES

- Supply voltages
  - Dual supply: ±5 V to ±22 V
  - Single supply: 8 V to 44 V
- Protected against overvoltage on source pins
  - Signal voltages up to −55 V and +55 V
- LEDs for visual overvoltage indication
- Parallel interface compatible with 3 V logic
- On-board LDO regulator for digital supply and control, if required

EVALUATION KIT CONTENTS

- EVAL-ADG5249FEBZ evaluation board

DOCUMENTS NEEDED

- ADG5249F data sheet
- EVAL-ADG5249FEBZ user guide

EQUIPMENT NEEDED

- DC voltage source
  - ±22 V for dual supply
  - 44 V for single supply
- Optional digital logic supply: 3 V to 5 V
- Analog signal source
- Method to measure voltage, such as a digital multimeter (DMM)

GENERAL DESCRIPTION

The EVAL-ADG5249FEBZ is the evaluation board for the ADG5249F, which features an overvoltage protected dual 4:1 multiplexer. The ADG5249F has overvoltage detection and protection circuitry on the source pins and is protected against signals up to −55 V and +55 V in both the powered and unpowered states.

Figure 1 shows the EVAL-ADG5249FEBZ in a typical evaluation setup. The ADG5249F is soldered to the center of the evaluation board and wire screw terminals are provided to connect to each of the source and drain pins. Three screw terminals power the device, with a fourth terminal used to provide a user defined digital logic supply voltage, if required. Alternatively, a low dropout (LDO) regulator is provided for 5 V digital logic supply and to supply the LEDs, which are mounted to provide visual indication of the fault status of the switch.

Full specifications on the ADG5249F are available in the product data sheet, which should be consulted in conjunction with this user guide when using the evaluation board.

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REVISION HISTORY

9/15—Revision 0: Initial Version

EVALUATION BOARD CONNECTION DIAGRAM

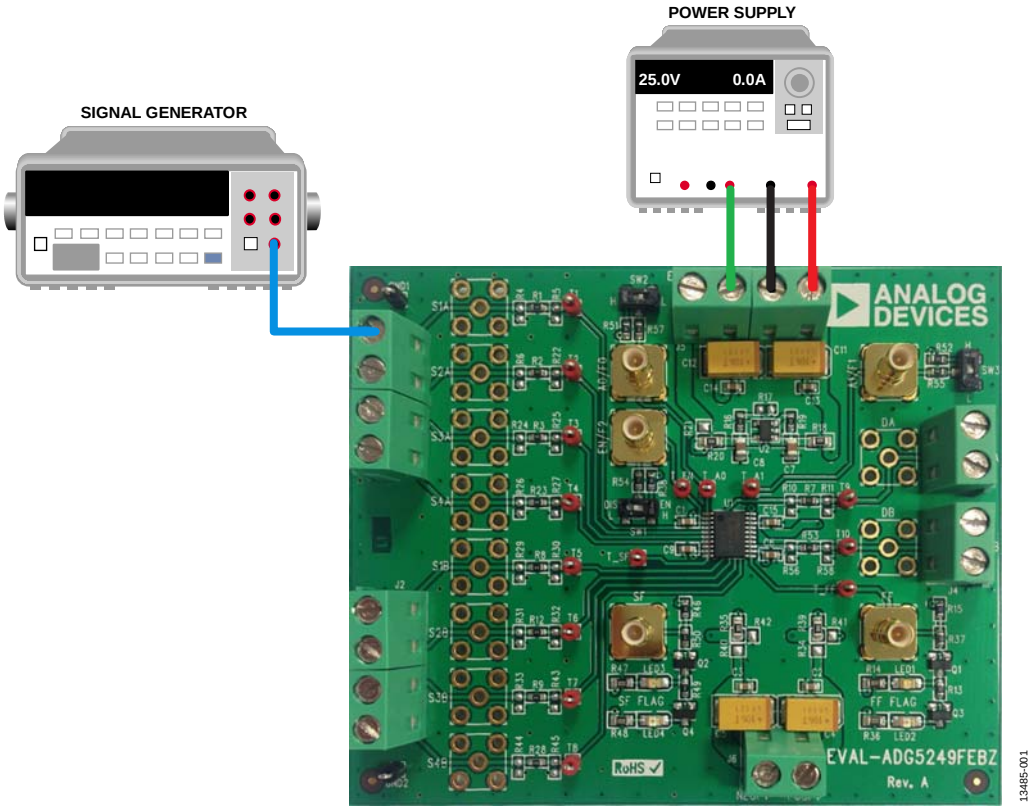

Figure 1. The EVAL-ADG5249FEBZ (on the Right), Power Supply (on the Top Right), and Signal Generator (on the Left)

GETTING STARTED

EVALUATION BOARD SETUP PROCEDURE

The EVAL-ADG5249FEBZ evaluation board is designed to operate independently and does not require any additional evaluation boards or software to operate. An on-board LDO regulator is provided as the digital power supply for the LEDs and to manually control the ADG5249F.

Supply the evaluation board with a dual supply power source of up to ±22 V or a single supply power source of up to 44 V by connecting VSS and GND.

A simple functionality test can be set up as follows:

1. Connect a power supply to J5. Connect VSS and GND together if a single supply is required.
2. Ensure a 0 Ω resistor is inserted into R18 to use the on-board LDO regulator and that a 0 Ω resistor is inserted into R20.
3. SW1 through SW3 control the digital signals for the ADG5249F.
4. LED1 and LED3 illuminate green, indicating that the mux is operating normally.

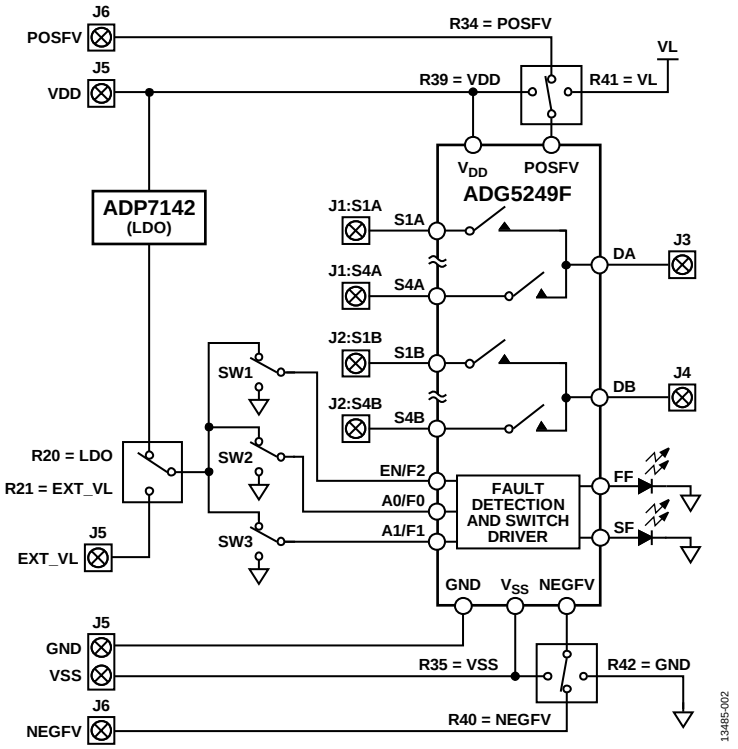

Figure 2. EVAL-ADG5249FEBZ Block Diagram

EVALUATION BOARD HARDWARE

Evaluate the operation of the ADG5249F using the EVAL-ADG5249FEBZ. Figure 1 shows a typical evaluation setup where only a power supply and signal generator are required. Figure 2 shows the block diagram of the main components of the evaluation board.

In this evaluation board, the ADG5249F is used to pass signals from either the source or drain connectors. The source pins have fault detection circuitry that react to an overvoltage event. During an overvoltage event, the channel where the fault occurs turns off, and the FF pin pulls low. When an overvoltage event occurs on the selected source of A0/F0, A1/F1, and EN/F2, the SF pin pulls low. See the ADG5249F data sheet for more details.

POWER SUPPLY

Connector J5 provides access to the supply pins of the ADG5249F. VDD, GND, and VSS link to the appropriate pins on the ADG5249F. For dual supply voltages, the evaluation board can be powered from ±5 V to ±22 V. For single supply voltages, the GND and VSS terminals must be connected together and power the evaluation board with 8 V to 44 V. Additionally, an on-board LDO regulator is provided for digital control voltage. If necessary, a secondary voltage source can connect to EXT_VL and control the digital voltages. To use EXT_VL, move the 0 Ω resistor from R20 to R21. Do not expose the on-board LDO regulator to voltages greater than 28 V. Remove R18 and supply an alternative digital voltage via EXT_VL, if required.

INPUT SIGNALS

Two screw connectors are provided to connect to both the source and drain pins of the ADG5249F. Additional subminiature version B (SMB) connector pads are available if extra connections are required. The ADG5249F is overvoltage protected on the source side and each source terminal (S1 to S8) is protected against voltages greater than the secondary supply rails, up to +55 V or −55 V. See the ADG5249F data sheet for more details.

Each trace on the source and drain side includes two sets of 0603 pads, which can place a load on the signal path to ground. A 0 Ω resistor is placed in the signal path and can be replaced with a user defined value. The resistor combined with the 0603 pads can create a simple resistor/capacitor (RC) filter.

The ADG5249F uses a parallel interface to control the operation of the switches. The switch operation can be manually controlled using the switches SW1 to SW3. However, an external controller can be interfaced directly to the control pins using the SMB connectors A0/F0, A1/F1, and EN/F2 by removing the 0 Ω resistors R38, R51, and R52.

OUTPUT SIGNALS

There are two outputs on the ADG5249F. The FF pin indicates when the device is operating normally or whether there is an overvoltage fault on one of the source pins. The SF pin also indicates when an overvoltage occurs on one of the source pins and transitions low only when an overvoltage occurs on the channel selected by the A0/F0, A1/F1, and EN/F2 inputs.

For visual indication, LEDs are mounted on the evaluation board. When the device is operating normally, the FF and SF pins remain high and LED1 and LED3 are illuminated green. If an overvoltage occurs at any of the source pins, the FF pin pulls low and LED2 illuminates red. If an overvoltage occurs at the source pin selected by A0/F0, A1/F1, and EN/F2, the SF pin pulls low and LED4 illuminates red.

SMB connectors are provided to interface the evaluation board with external controllers.

JUMPER SETTINGS

SWITCHES AND 0 Ω RESITORS

The switches control the ADG5249F manually and 0 Ω resistors configure the digital control voltage, the voltage present on POSFV and NEGFV, and isolate the LED from the rest of the system. Table 2 shows a summary of the switches and 0 Ω resistors and how they are used on the evaluation board.

Use SW2 to SW4 to control the switches of the ADG5249F. Position L is tied to GND and sets the logic low, and Position H is tied to VL and sets the logic high.

Use SW1 to enable or disable the device. Position DIS is tied to GND and disables the device, and Position EN is tied to VL and enables the device.

Table 1. ADG5249F Switch Selection Truth Table

SW1 (EN)	SW2 (A0)	SW3 (A1)	On Switch Pair
DIS	X[1]	X[1]	All switches off
EN	L	L	S1x
EN	H	L	S2x
EN	L	H	S3x
EN	H	H	S4x

[1] X means don't care.

R18 connects the on-board LDO regulator to the VDD supply. Remove this header to protect the LDO regulator from voltages higher than 28 V. Move the 0 Ω resistors, R20 and R21, to use an alternative digital voltage connected to EXT_VL.

Resistors R14, R36, R47, and R48 connect the LEDs to the digital power supply; R37 and R50 connect the FF and SF pins of the ADG5249F to the LED controls.

Resistors R34, R39, and R41 configure POSFV to either the voltage present on POSFV on J6, VDD, or VL. Resistors R35, R40, and R42 configure NEGFV to either VSS, the voltage present on NEGFV on J6, or GND.

SMB CONNECTORS

The parallel interface of the ADG5249F is controlled manually using the link headers of SW1 to SW3, or it can be accessed using the SMB connectors, EN/F2, A0/F0, and A1/F1. To use the SMB connectors, remove the 0 Ω resistors R54, R57, and R55. The FF/SF SMB connectors access the FF/SF digital outputs from the ADG5249F.

Table 2. Switch and 0 Ω Resistor Descriptions

Label	Position	Description
SW1	EN	Logic 1 on EN/F2 pin
	DIS	Logic 0 on EN/F2 pin
SW2	L	Logic 0 on A0/F0 pin
	H	Logic 1 on A0/F0 pin
SW3	L	Logic 0 on A1/F1 pin
	H	Logic 1 on A1/F1 pin
R35/R40/R42	R35	NEGFV set to VSS
	R40	NEGFV set to voltage on J6 NEGFV screw terminal
	R42	NEGFV set to GND
R34/R39/R41	R34	POSFV set to voltage on J6 POSFV screw terminal
	R39	POSFV set to VDD
	R41	POSFV set to VL
R20/R21	R20	On-board LDO regulator digital voltage
	R21	EXT_VL digital voltage
R18	Inserted	LDO regulator powered up
	Removed	LDO regulator unpowered
R37 and R50	Inserted	FF/SF pin connected to LED
	Removed	FF/SF pin disconnected from LED
R14, R36, R47 and R48	Inserted	LED connected to digital supply
	Removed	LED isolated

EVALUATION BAORD SCHEMATICS AND ARTWORK

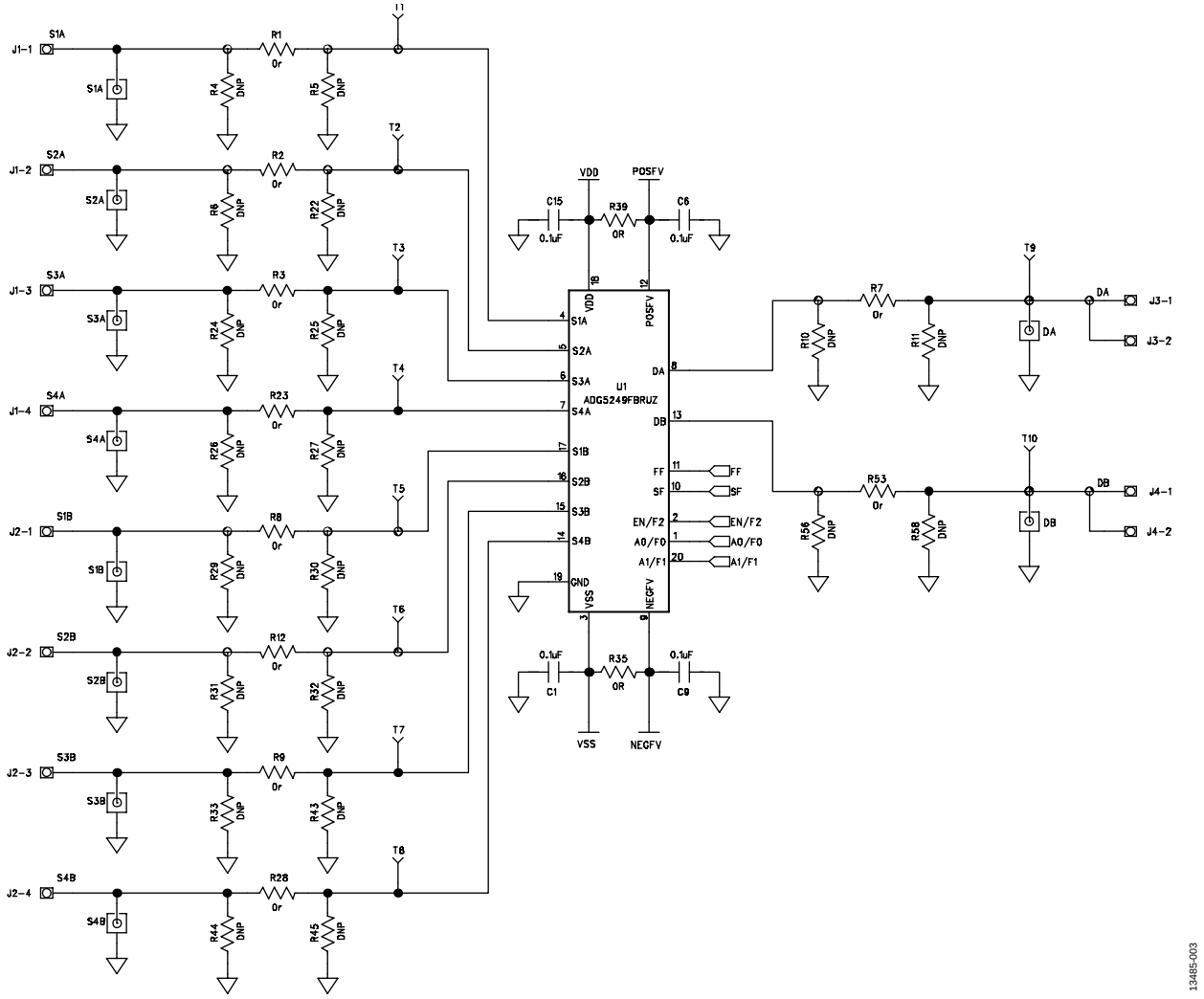

Figure 3. ADG5249F Evaluation Board Schematic (Part 1)

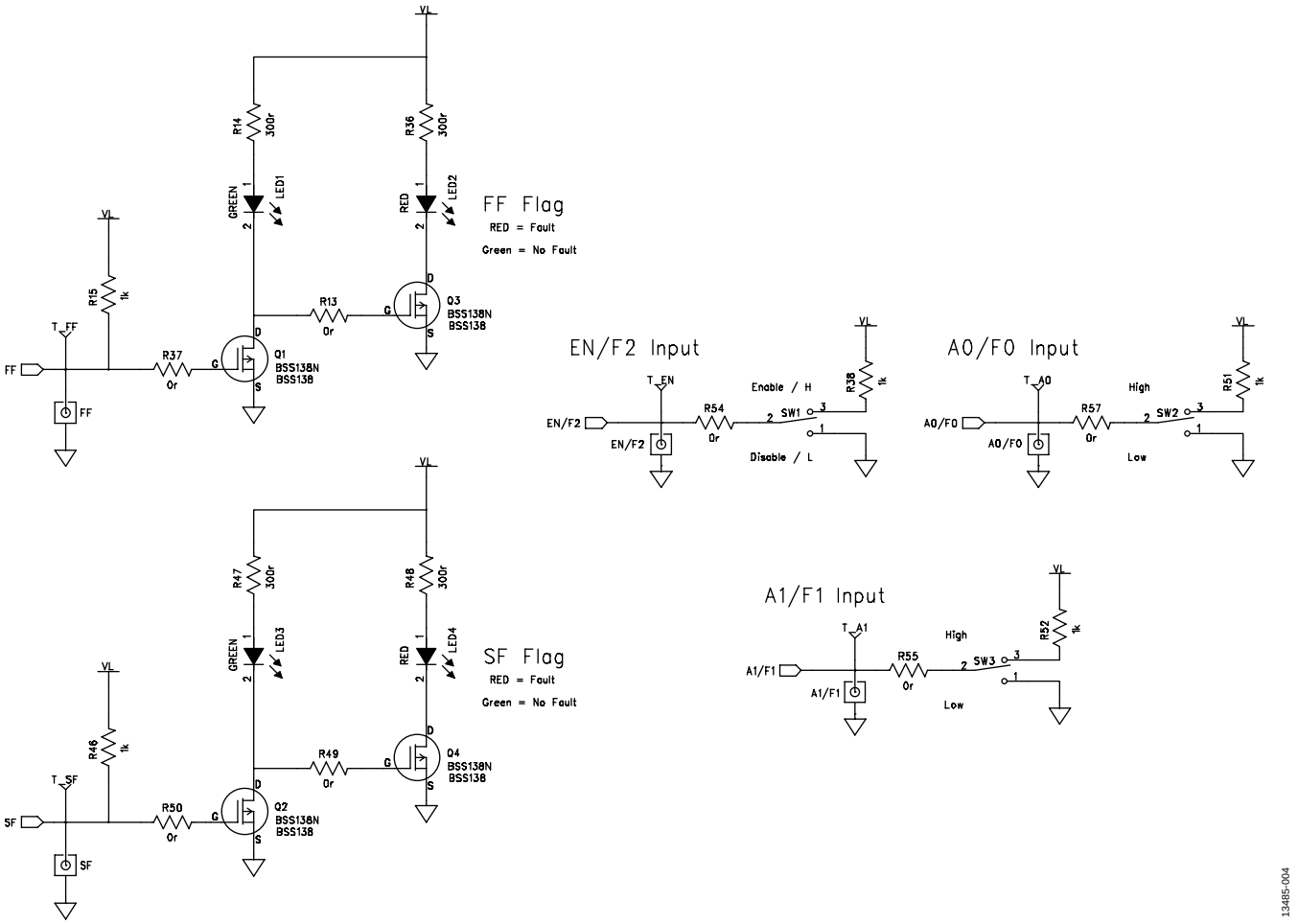

Figure 4. ADG5249F Evaluation Board Schematic (Part 2)

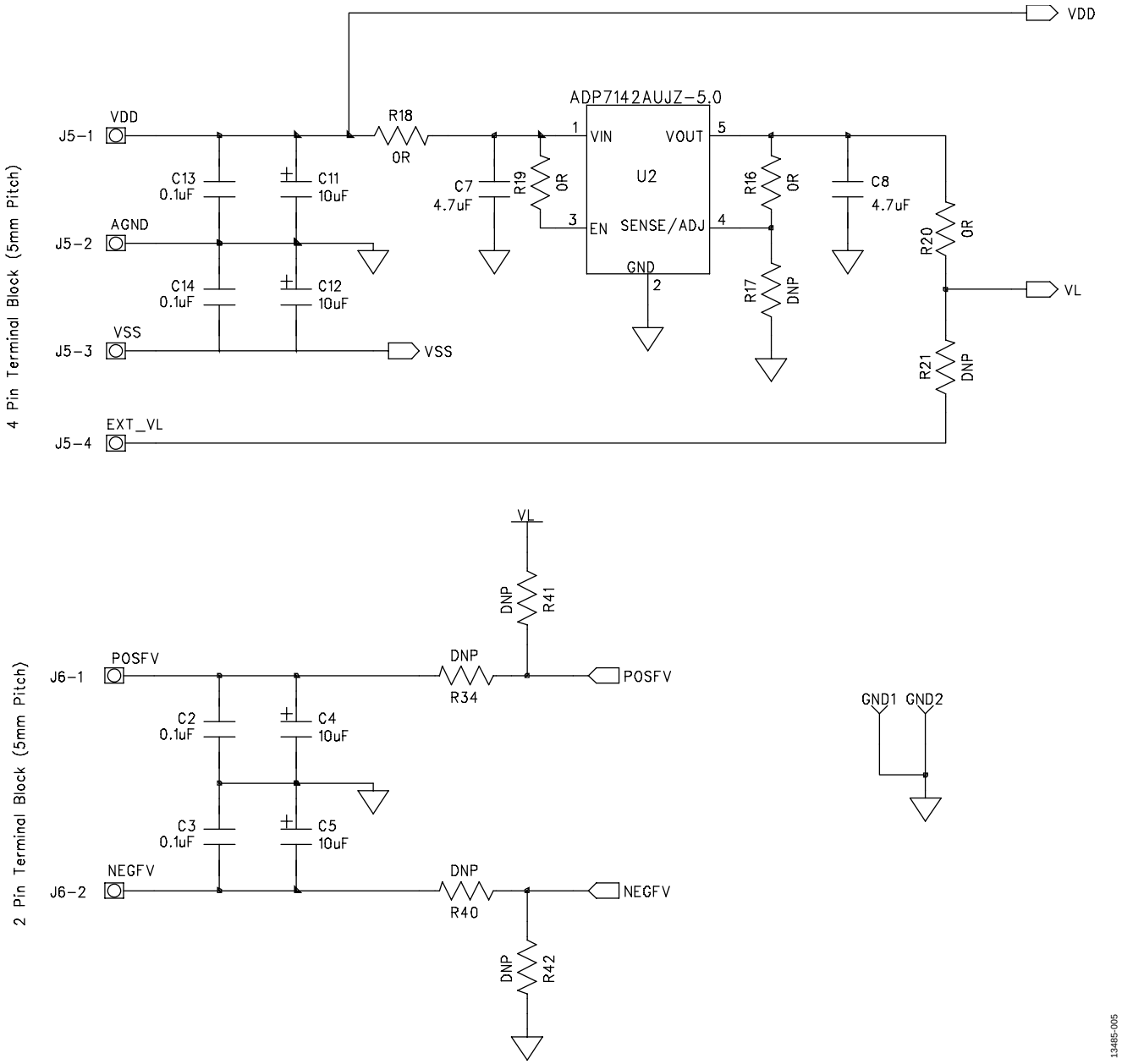

Figure 5. ADG5249F Evaluation Board Schematic (Part 3)

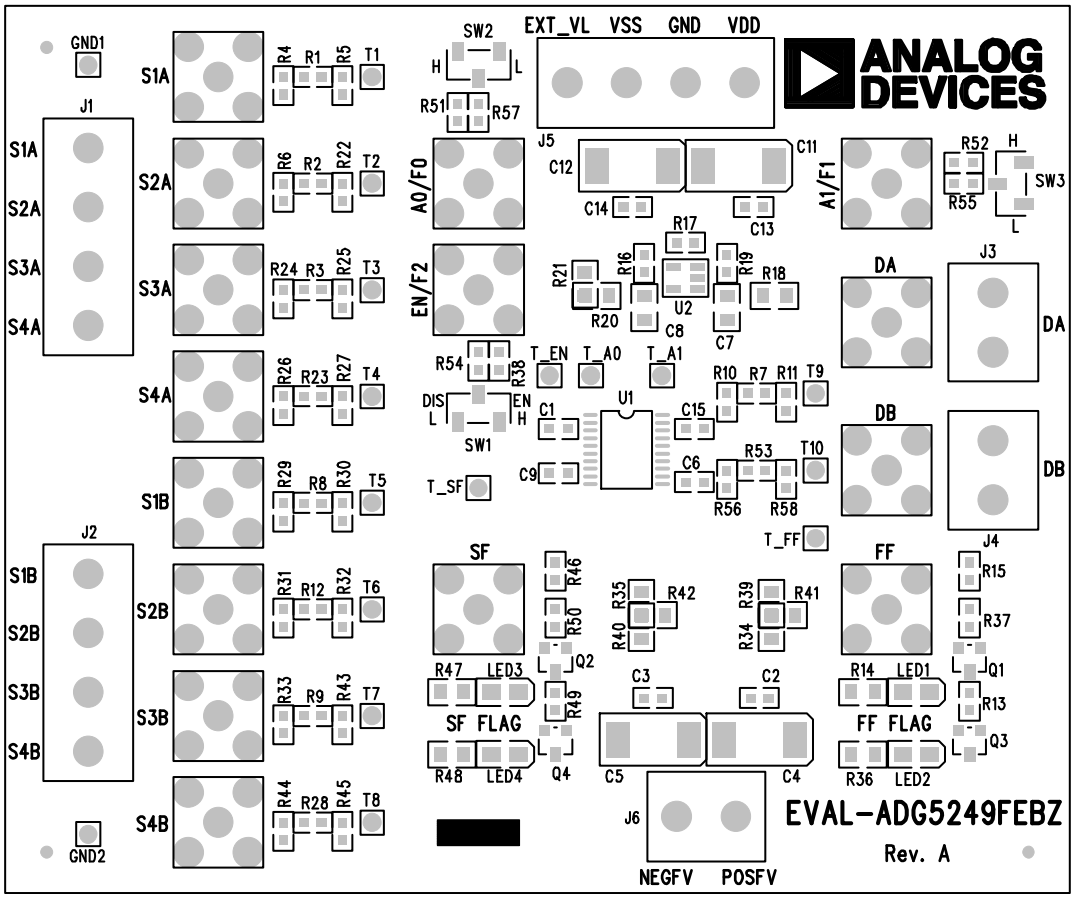

Figure 6. EVAL-ADG5249FEBZ Silk Screen

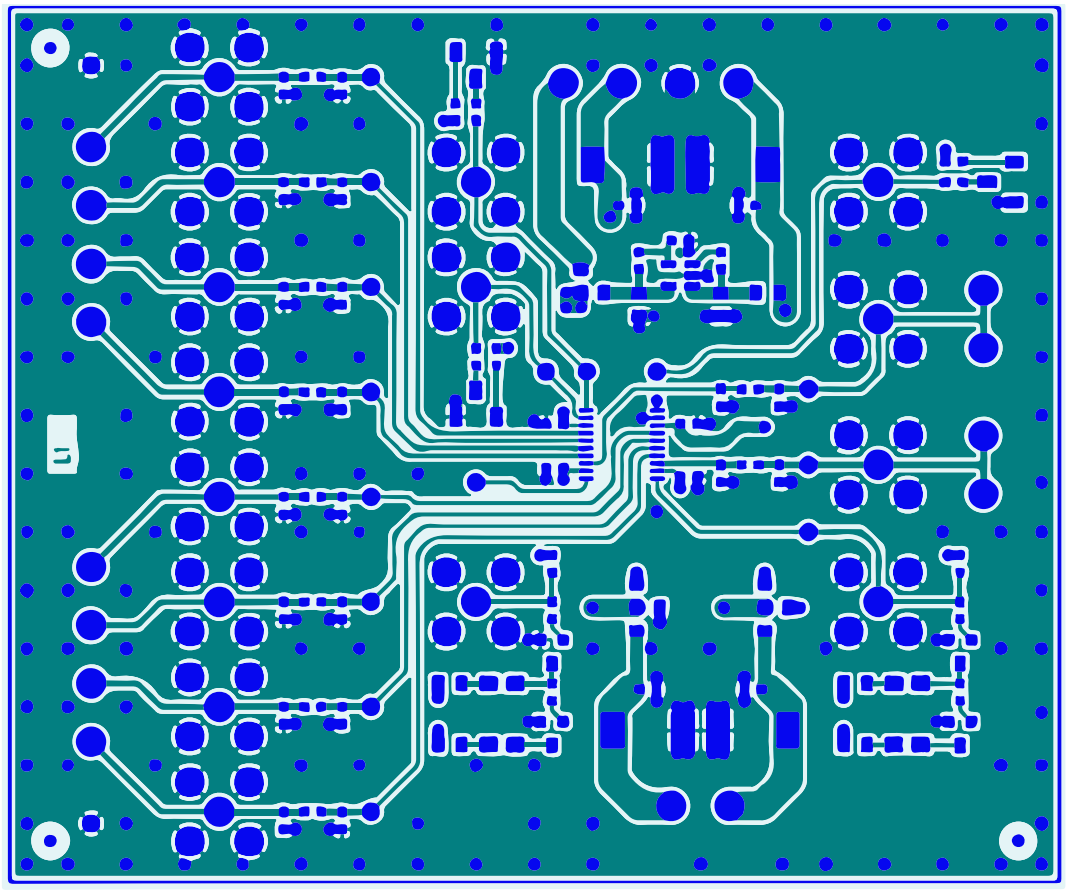

Figure 7. EVAL-ADG5249FEBZ Top Layer

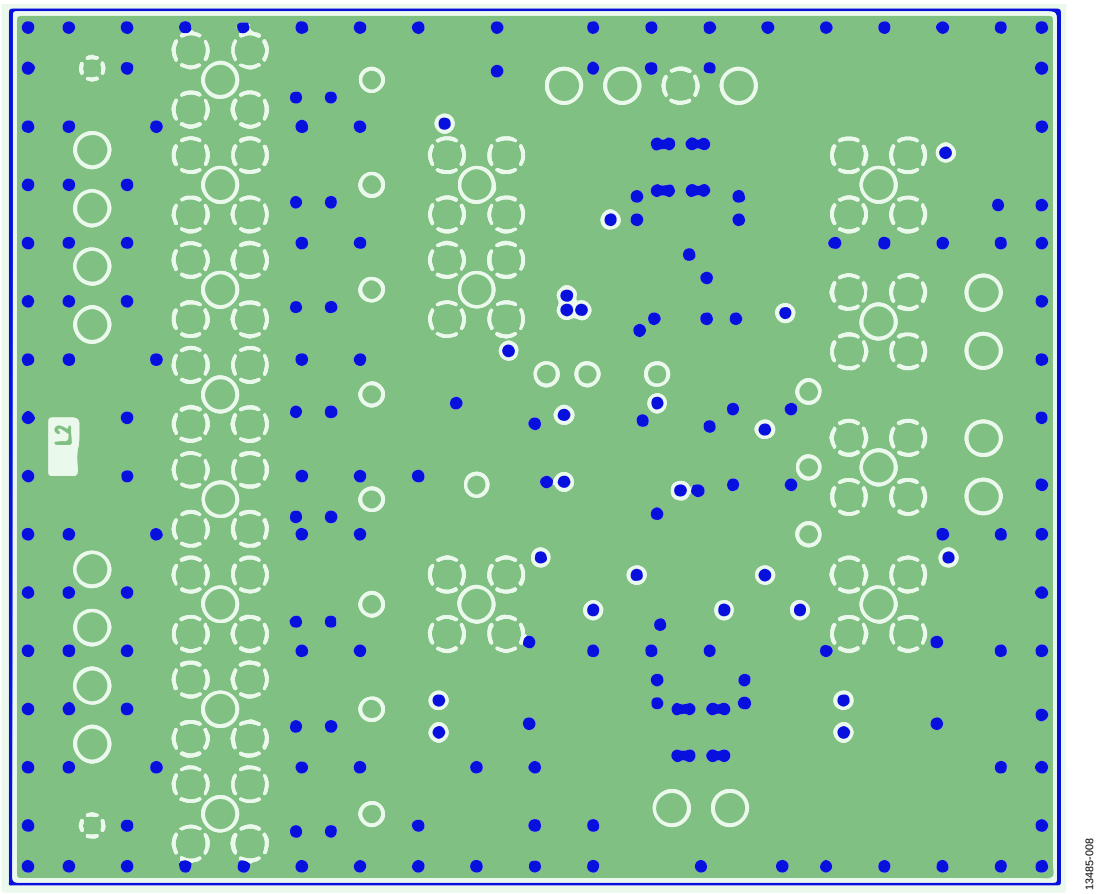

Figure 8. EVAL-ADG5249FEBZ Layer 2

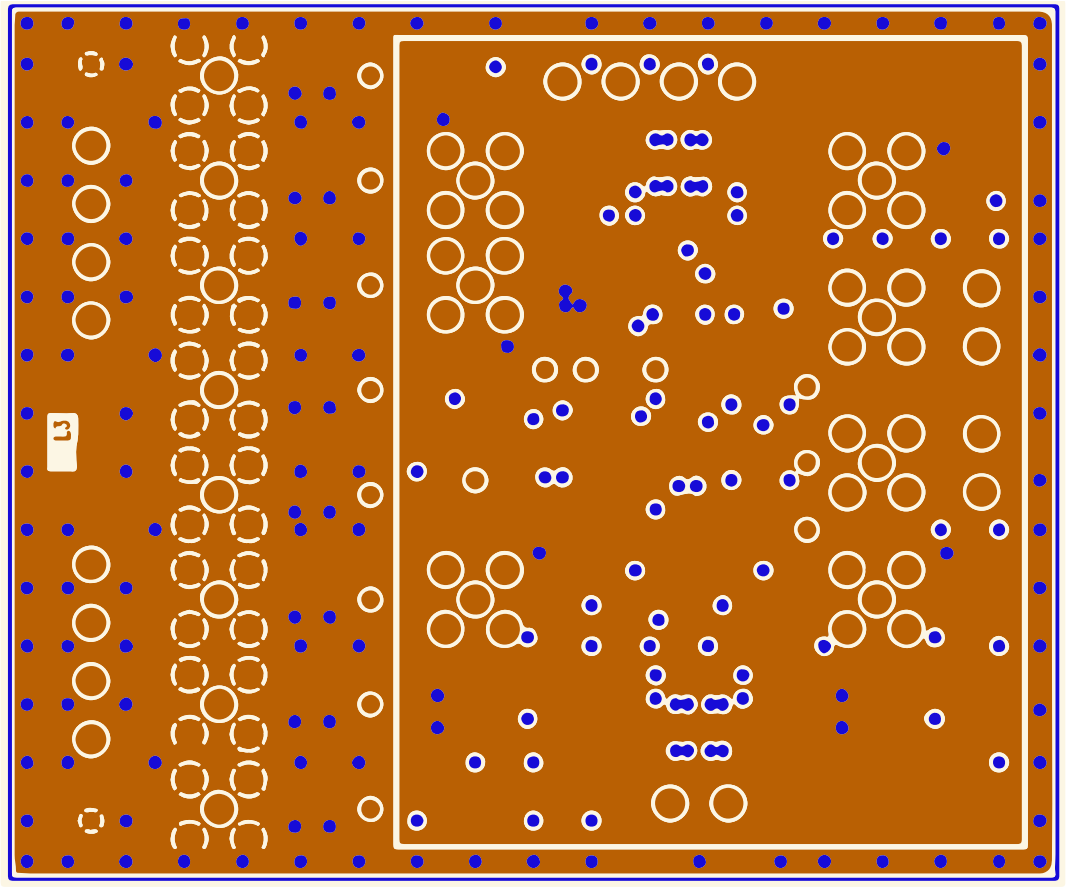

Figure 9. EVAL-ADG5249FEBZ Layer 3

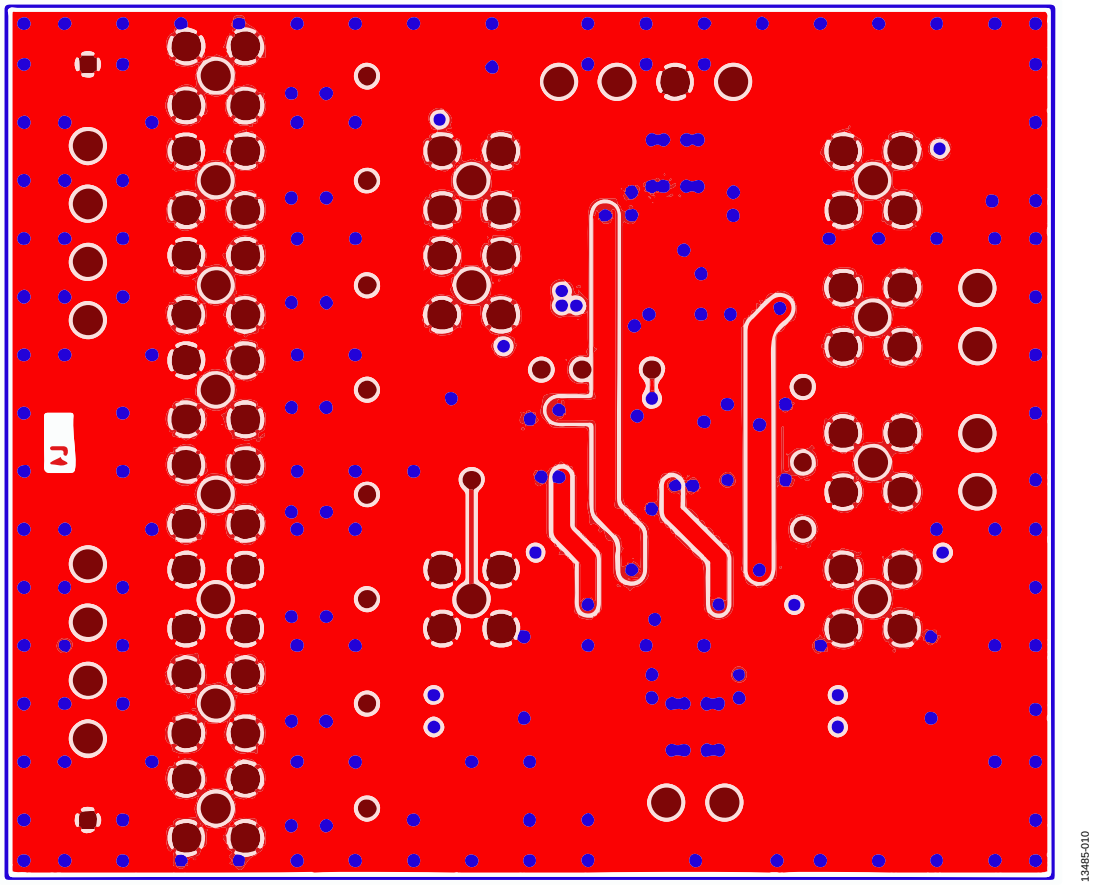

Figure 10. EVAL-ADG5249FEBZ Bottom Layer

ORDERING INFORMATION

BILL OF MATERIALS

Table 3.

Reference Designator	Description	Part Number	Stock Code
A0/F0, A1/F1, EN/F2, FF, SF	50 Ω, straight SMB jacks	SMB1251B1-3GT30G-50	FEC 1111349
C1 to C3, C6, C9, C13 to C15	50 V, X7R, multilayer ceramic capacitors, 0603, 0.1 µF	GRM188R71H104KA93D	FEC 882-0023
C4, C5, C11, C12	50 V tantalum capacitors, D size, 10 µF	TAJD106K050RNJ	FEC 143-2387
C7, C8	Ceramic multilayer capacitors, 4.7 µF	C2012X5R1H475K125AB	FEC 2346932
DA, DB, S1A, S1B, S2A, S2B, S3A, S3B, S4A, S4B	50 Ω, SMB sockets	SMB1251B1-3GT30G-50	Do not insert
GND1, GND2	Black test points	20-2137	FEC 873-1128
J1, J2, J5	4-Pin terminal blocks (5 mm pitch)	CTB5000/4	FEC 151791
J3, J4, J6	2-Pin terminal blocks (5 mm pitch)	CTB5000/2	FEC 151789
LED1, LED3	LEDs, SMD green, 0805	KP-2012SGC	FEC 1318243
LED2, LED4	LEDs, SMD red, 0805	KP-2012SRC-PRV	FEC 1318244
Q1 to Q4	Transistors, N-MOSFET, 60 V, 0.23 A, SOT-23	BSS138N	FEC 115-6434
R1 to R3, R7 to R9, R12, R13, R16, R19, R23, R28, R37, R49, R50, R53 to R55, R57	Resistors, 0603, 1%, 0 Ω	MC0063W06030R	FEC 9331662
R4 to R6, R10, R11, R17, R24 to R27, R29 to R33, R43 to R45, R56, R58	SMD resistors, 0603	Not applicable	Do not insert
R14, R36, R47, R48,	Resistors, 300 Ω, 0.1 W, 1%, 0805	MC01W08051300R	FEC 9332987
R15, R38, R46, R51, R52	Resistors, 1 kΩ, 0.063 W, 1%, 0603	MC0063W060311K	FEC 9330380
R18, R20, R35, R39,	Resistors, 0805, 1%, 0 Ω	MC01W08050R	FEC 9333681
R21, R22, R34, R40 to R42,	SMD resistors, 0805	Not applicable	Do not insert
SW1 to SW3	SPDT SMT slide switches	CAS-120TA	Digikey CAS120JCT-ND
T1 to T10	Red test points	20-313137	FEC 873-1144
T_A0, T_A1, T_EN, T_FF, T_SF	Red test points	20-313137	FEC 8731144
U1	Fault protection and detection, 0.8 pC Q_{INJ}, dual 4:1 multiplexer	ADG5249FBRUZ	ADG5249FBRUZ
U2	Linear regulator, 5.0 V, LDO	ADP7142AUJZ-5.0	ADP7142AUJZ-5.0-R7

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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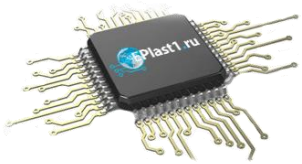

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