Evaluating the ADG5462F User Defined Fault Protection and Detection, 10 Ω R_{ONr} Quad Channel Protector

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 low dropout (LDO) regulator for digital supply and control, if required

EVALUATION KIT CONTENTS
EVAL-ADG5462FEBZ evaluation board

DOCUMENTS NEEDED
ADG5462F data sheet
EVAL-ADG5462FEBZ 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-ADG5462FEBZ is the evaluation board for the ADG5462F, which features an overvoltage protected quad channel protector. The ADG5462F 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-ADG5462FEBZ in a typical evaluation setup. The ADG5462F 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 and a fourth terminal provides a user defined digital logic supply voltage, if required. Alternatively, a 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 ADG5462F 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

11/15—Revision 0: Initial Version
TYPICAL EVALUATION BOARD SETUP

Figure 1.
GETTING STARTED

EVALUATION BOARD SETUP PROCEDURE

The EVAL-ADG5462FEBZ operates independently and does not require any additional evaluation boards or software to operate. An on-board LDO regulator is the digital power supply for the LEDs and manually controls the ADG5462F.

Supply the EVAL-ADG5462FEBZ with a dual power source of up to ±22 V or a single supply of up to +44 V by connecting VSS and GND together.

Follow these steps to conduct a functionality test:

1. Connect a power supply to J3. Connect VSS and GND together if a single supply is required.
2. Ensure that a 0 Ω resistor is inserted in R18 to use the on-board LDO regulator and that a 0 Ω resistor is inserted in R20.
3. Control the digital signals for the ADG5462F by using SW1.
4. Verify that LED1 is green; this indicates that the mux is operating normally.

Figure 2. EVAL-ADG5462FEBZ Block Diagram
EVALUATION BOARD HARDWARE

To evaluate the ADG5462F use the EVAL-ADG5462FEBZ.

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 ADG5462F passes 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 on which the fault occurs turns off, and the FF pin pulls low. See the ADG5462F data sheet for more details.

POWER SUPPLY

Connector J3 provides access to the supply pins of the ADG5462F. VDD, GND, and VSS link to the appropriate pins on the ADG5462F. For dual-supply voltages, the EVAL-ADG5462FEBZ is powered from ±5 V to ±22 V. For single-supply voltages, the GND and VSS terminals are connected together to power the EVAL-ADG5462FEBZ from 8 V to 44 V. Additionally, an on-board LDO regulator provides the digital control voltage. If necessary, connect a secondary voltage source to EXT_VL and use it to 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 connect to both the source and drain pins of the ADG5462F. Additional subminiature Version B (SMB) connector pads are available if extra connections are required. The ADG5462F is overvoltage protected on the source side, and each source terminal (S1 to S4) can be presented with a voltage of up to +55 V or to −55 V. See the ADG5462F data sheet for more details.

Each trace on the source and drain side includes two sets of 0603 pads, which 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 creates a simple resistor capacitor (RC) filter.

OUTPUT SIGNALS

The FF pin indicates when the device is operating normally or whether there is an overvoltage fault on one of the source pins.

For visual indication, LEDs are mounted on the EVAL-ADG5462FEBZ. When the device operates normally, the FF pin remains high, and LED1 illuminates green. If an overvoltage occurs at any of the source pins, the FF pin pulls low, and LED2 illuminates red.
JUMPER SETTINGS
SWITCHES AND 0 Ω RESISTORS

The switches manually control the ADG5462F, and 0 Ω resistors configure the digital control voltage, the voltage present on POSFV and NEGFV, to isolate the LED from the rest of the system.

Use SW1 to configure the DR pin. The RAILS position is tied to GND and enables the drain to pull to POSFV or NEGFV during an overvoltage fault condition. The O/C position is tied to VL, and the drain is open-circuit condition.

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

Resistors R14 and R36 connect the LEDs to the digital power supply, and Resistors R37 and R13 connect the FF pin of the ADG5462F to the LED controls.

Resistors R34, R39, and R41 configure POSFV to either the voltage present on POSFV on J4 (VDD) or VL. Resistors R35, R40, and R42 configure NEGFV to either VSS, the voltage present on NEGFV on J4, or GND.

SMB CONNECTORS

The DR SMB connector can allow control via the external control signals.

The FF SMB connector can access the FF digital output from the ADG5462F.

Table 1. Switch and 0 Ω Resistor Descriptions

<table>
<thead>
<tr>
<th>Label</th>
<th>Position</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>SW1</td>
<td>O/C</td>
<td>Logic 1 on DR pin</td>
</tr>
<tr>
<td></td>
<td>RAILS</td>
<td>Logic 0 on DR pin</td>
</tr>
<tr>
<td>R35, R40, R42</td>
<td>R35</td>
<td>NEGFV set to VSS</td>
</tr>
<tr>
<td></td>
<td>R40</td>
<td>NEGFV set to voltage on J4</td>
</tr>
<tr>
<td></td>
<td>R42</td>
<td>NEGFV screw terminal</td>
</tr>
<tr>
<td></td>
<td>R34</td>
<td>POSFV set to voltage on J4</td>
</tr>
<tr>
<td></td>
<td>R39</td>
<td>POSFV set to VDD</td>
</tr>
<tr>
<td></td>
<td>R41</td>
<td>POSFV set to VL</td>
</tr>
<tr>
<td>R20, R21</td>
<td>R20</td>
<td>On-board LDO regulator digital voltage</td>
</tr>
<tr>
<td></td>
<td>R21</td>
<td>EXT_VL digital voltage</td>
</tr>
<tr>
<td>R18</td>
<td>Inserted</td>
<td>LDO regulator powered up</td>
</tr>
<tr>
<td></td>
<td>Removed</td>
<td>LDO regulator unpowered</td>
</tr>
<tr>
<td>R37, R13</td>
<td>Inserted</td>
<td>FF pin connected to LED</td>
</tr>
<tr>
<td></td>
<td>Removed</td>
<td>FF pin disconnected from LED</td>
</tr>
<tr>
<td>R14, R36</td>
<td>Inserted</td>
<td>LED connected to digital supply</td>
</tr>
<tr>
<td></td>
<td>Removed</td>
<td>LED disconnected isolated</td>
</tr>
<tr>
<td>R15</td>
<td>Inserted</td>
<td>1 kΩ pull-up resistor at FF pin</td>
</tr>
<tr>
<td></td>
<td>Removed</td>
<td>No external pull-up resistor at FF pin</td>
</tr>
</tbody>
</table>
EVALUATION BOARD SCHEMATICS AND ARTWORK

Figure 3. EVAL-ADG5462FEBZ Evaluation Board Schematic (Part 1)

Figure 4. EVAL-ADG5462FEBZ Evaluation Board Schematic (Part 2)
Figure 5. EVAL-ADG5462FEBZ Evaluation Board Schematic (Part 3)

Figure 6. EVAL-ADG5462FEBZ Silk Screen
Figure 7. EVAL-ADG5462FEBZ Top Layer

Figure 8. EVAL-ADG5462FEBZ Layer 2
Figure 9. EVAL-ADG5462FEBZ Layer 3

Figure 10. EVAL-ADG5462FEBZ Bottom Layer
### ORDERING INFORMATION

#### BILL OF MATERIALS

<table>
<thead>
<tr>
<th>Reference Designator</th>
<th>Description</th>
<th>Manufacturer Part No.</th>
<th>Stock Code</th>
</tr>
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<tbody>
<tr>
<td>C1 to C3, C6, C9, C13 to C15</td>
<td>50 V, X7R, 0.1 µF multilayer ceramic capacitors, 0603</td>
<td>GRM188R71H104KA93D</td>
<td>FEC 882-0023</td>
</tr>
<tr>
<td>C4, C5, C11, C12</td>
<td>50 V, 10 µF tantalum capacitors, D size</td>
<td>TAJD106K050RNJ</td>
<td>FEC 143-2387</td>
</tr>
<tr>
<td>C7, C8</td>
<td>4.7 µF ceramic multilayer capacitors</td>
<td>C2012XR1H475K125AB</td>
<td>FEC 2346932</td>
</tr>
<tr>
<td>D1 to D4, S1 to S4</td>
<td>50 Ω SMB sockets</td>
<td>Not applicable</td>
<td>Do not insert</td>
</tr>
<tr>
<td>DR, FF</td>
<td>50 Ω straight SMB jacks</td>
<td>SMB1251B1-3GT30G-50</td>
<td>FEC 1111349</td>
</tr>
<tr>
<td>GND1, GND2</td>
<td>Black test points</td>
<td>20-2137</td>
<td>FEC 873-1128</td>
</tr>
<tr>
<td>J1 to J3</td>
<td>4-pin terminal blocks (5 mm pitch)</td>
<td>CTB5000/4</td>
<td>FEC 151791</td>
</tr>
<tr>
<td>J4</td>
<td>2-pin terminal block (5 mm pitch)</td>
<td>CTB5000/2</td>
<td>FEC 151789</td>
</tr>
<tr>
<td>LED1</td>
<td>LED, SMD green, 0805</td>
<td>KP-2012SGC</td>
<td>FEC 1318243</td>
</tr>
<tr>
<td>LED2</td>
<td>LED, SMD red, 0805</td>
<td>KP-2012SRC-PRV</td>
<td>FEC 1318244</td>
</tr>
<tr>
<td>Q1, Q2</td>
<td>Transistors, N-MOSFET, 60 V, 0.23 A, SOT-23</td>
<td>BSS138N</td>
<td>FEC 115-6434</td>
</tr>
<tr>
<td>R1 to R3, R7 to R9, R13, R16, R19, R23, R31, R37, R43</td>
<td>Resistors, 0603, 1%, 0 Ω</td>
<td>MC0063W06030R</td>
<td>FEC 9331662</td>
</tr>
<tr>
<td>R4 to R6, R10 to R12, R17, R22, R24 to R30, R32, R33, R38</td>
<td>SMD resistors, 0603</td>
<td>Not applicable</td>
<td>Do not insert</td>
</tr>
<tr>
<td>R14, R36</td>
<td>Resistors, 300 Ω, 0.1 W, 1%, 0805</td>
<td>MC01W08051300R</td>
<td>FEC 9332987</td>
</tr>
<tr>
<td>R15</td>
<td>Resistor, 1 kΩ, 0.063 W, 1%, 0603</td>
<td>MC0063W060311K</td>
<td>FEC 9330380</td>
</tr>
<tr>
<td>R18, R20, R35, R39</td>
<td>Resistors, 0805, 1%, 0 Ω</td>
<td>MC01W8050R</td>
<td>FEC 9333681</td>
</tr>
<tr>
<td>R21, R34, R40 to R42</td>
<td>SMD resistors, 0805</td>
<td>Not applicable</td>
<td>Do not insert</td>
</tr>
<tr>
<td>SW1</td>
<td>SPDT, SMT slide switch</td>
<td>Digi-Key CAS-120TA</td>
<td>CAS120CT-ND</td>
</tr>
<tr>
<td>T1 to T8, T_DR, T_FF</td>
<td>Red test points</td>
<td>20-313137</td>
<td>FEC 873-1144</td>
</tr>
<tr>
<td>U1</td>
<td>User defined fault protection and detection, 10 Ω RON, quad channel protector</td>
<td>ADG5462F</td>
<td>ADG5462FBRUZ</td>
</tr>
<tr>
<td>U2</td>
<td>40 V, 200 mA, low noise, CMOS LDO linear regulator</td>
<td>ADP7142AUJZ-5.0</td>
<td>ADP7142AUJZ-5.0-R7</td>
</tr>
</tbody>
</table>

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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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