

Evaluation Board for the ADR1001 Ultrastable, Buried Zener, Voltage Reference in 20-Terminal LCC

FEATURES

- ▶ Easy to carry and power-up pocket calibrator style
- ▶ Edge mounted SMA connector
- ▶ Simple connection to test equipment and other circuits
- ▶ RoHS compliant

EVALUATION KIT CONTENTS

- ▶ ADR1001E-EBZ

EQUIPMENT NEEDED

- ▶ USB-C-compatible charger/power supply or benchtop lab supply
- ▶ Several digit digital multimeters (DMMs) (such as HP3458 or Keithley 2001)
- ▶ 2 banana plug cables or 1 SMA to meter-compatible cable

EVALUATION BOARD PHOTOGRAPH

GENERAL DESCRIPTION

The ADR1001E-EBZ allows the evaluation of the ADR1001, an ultrastable 6.6 V shunt voltage reference with a resistor divider in a 20-terminal LCC package.

Isolated power means that the reference output is effectively floated, removing possible ground loops. The isolation is bridged only by a 1 MΩ resistor. Power can be supplied via a USB-C cable, or 5 V can be applied to VUSB, or power can be back driven onto the regulator outputs at VPRE or V+. The ultrastable 6.6 V output is divided down to a precision trimmed 5 V, which is routed to both banana jacks and an edge mounted SMA connector.

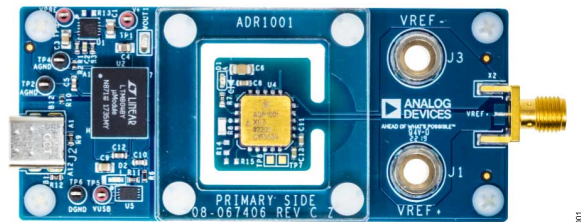


Figure 1. ADR1001E-EBZ Primary Side

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REVISION HISTORY

1/2024—Revision 0: Initial Version

EVALUATION BOARD QUICK START PROCEDURES

The following sections outline the basic prepopulated configuration of the ADR1001E-EBZ required to test the basic functionality of the device.

POWER SUPPLY CONSIDERATIONS

The evaluation board can be powered using a USB-C charger or other USB-C source. A green LED indicator must be visible. Alternatively, a 5 V can be applied between VUSB and DGND from a bench supply. This application powers the isolating LMT8048 module, providing isolated power downstream. Alternatively, the downstream regulators can be back driven at VPRE/AGND (maximum of 20 V) or at V+/AGND (maximum of 16 V). AGND is the reference ground. Thus, this approach is not isolated.

INITIAL EVALUATION BOARD CONFIGURATION

The ADR1001E-EBZ is preconfigured with no jumpers or other settings. Power the board using one of the methods described in the [Power Supply Considerations](#) section, and start monitoring the 5 V output at either the SMA output or the banana jacks, or both. For optimal investigation, a 6-digit or higher meter, such as the HP3458 or Keithley 2001, or an equivalent, is required.

When the board is powered, both a green and a red LED illuminate. When the chip reaches temperature, the red LED turns off.

USING THE EVALUATION BOARD FOR TESTING

The evaluation board is designed along the lines of a simple pocket calibrator, and thus alternative methods for supplying the device under test (DUT) were not thoroughly provided for. For example, the Heater- (HTR_GND) is directly grounded, and thus there is no means of providing a -15 V supply to Heater- for an overall 30 V heater supply.

The evaluation board is straightforward to use. Power the board using one of the methods discussed in the [Power Supply Considerations](#) section and start measuring the output DC voltage. When measuring the supply current, observe the initial fairly high current as the heater brings the ADR1001 to its set temperature (approximately 70°C). The ADR1001 has an internal current limit of about 100 mA. However, the on-board [LT3045](#) devices are configured to limit available current to 75 mA. After losses and transformer, this limits the 5 V USB input current to about 250 mA.

The TSET pin is brought out to R14 and R15 resistors to allow for adjustment of the chip temperature. The INV1 and INV2 pins are brought out to TP7 and TP8 pins, allowing access to the on-chip matched resistor pair. However, no simple means of using them in circuit is provided, because the focus is on optimizing the 5 V reference and avoiding the introduction of more thermocouples.

EVALUATION BOARD SCHEMATIC AND ARTWORK

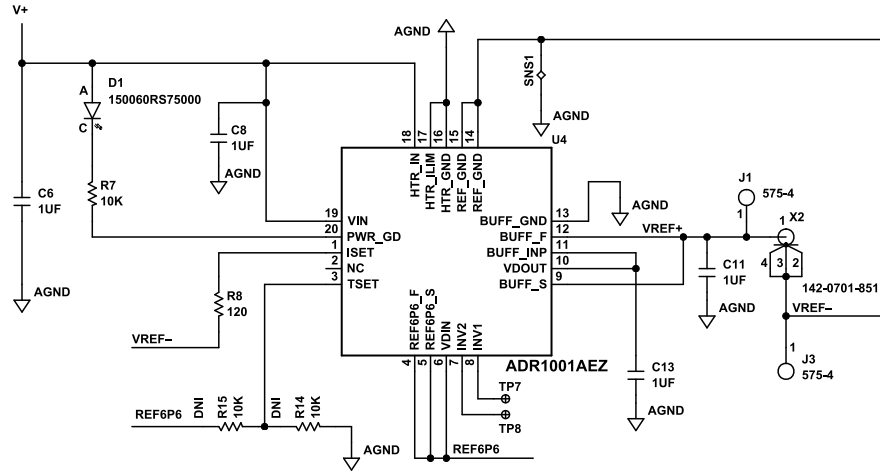


Figure 2. ADR1001E-EBZ Schematic, DUT Section

EVALUATION BOARD SCHEMATIC AND ARTWORK

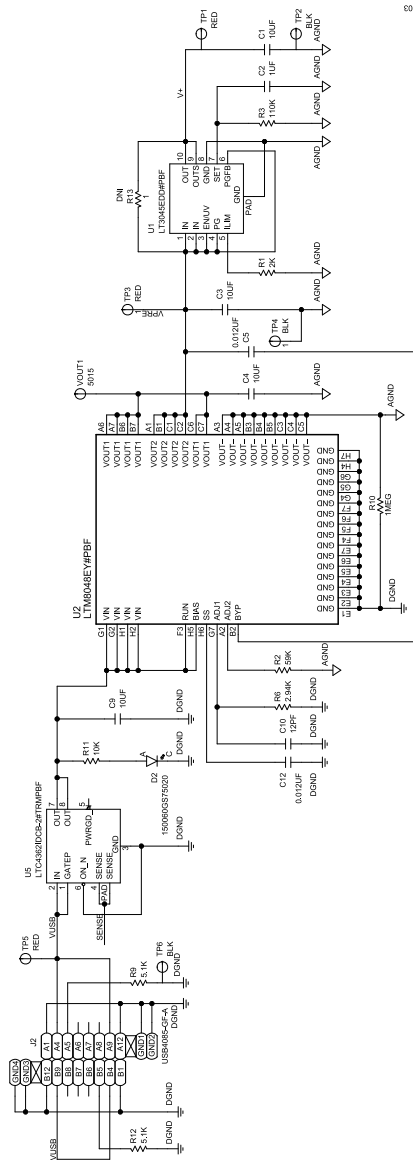


Figure 3. ADR1001E-EBZ Schematic, USB Conditioning, Isolated Power, and Regulator Sections

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. Bill of Materials

| Qty. | Reference Designator | Description | Value | Manufacturer | Part No. |
|------|----------------------|---|----------------------|------------------------|--------------------------------------|
| 1 | | PCB | | Analog Devices, Inc. | 08_067406c |
| 4 | C1, C3, C4, C9 | Capacitor, ceramic, 10 μ F, 25 V, 10%, X5R, 0805 | 10 μ F | Murata | GRM21BR61E106KA73L |
| 1 | C10 | Capacitor, ceramic, 12 pF, 50 V, 5%, C0G, 0603 | 12 pF | AVX Corporation | 06035A120JAT2A |
| 4 | C2, C8, C11, C13 | Capacitor, ceramic, 1 μ F, 25 V, 10%, X5R, 0603 | 1 μ F | AVX Corporation | 06033D105KAT2A |
| 2 | C5, C12 | Capacitor, ceramic, 0.012 μ F, 50 V, 5%, X7R, 0603 | 0.012 μ F | AVX Corporation | 06035C123JAT2A |
| 1 | C6 | Capacitor, ceramic, 1 μ F, 50 V, 10%, X7R, 1206, AEC-Q200 | 1 μ F | Murata | GCJ31MR71H105KA12L |
| 1 | D1 | LED, red, surface-mount device (SMD), monocolour, waterclear | 150060RS7500 0 | Würth Elektronik | 150060RS75000 |
| 1 | D2 | LED, SMD, green, 525 nm, 3.2 V, 0603 | 150060GS7502 0 | Würth Elektronik | 150060GS75020 |
| 2 | J1, J3 | Connector, printed circuit board (PCB), banana jack | 575-4 | Keystone Electronics | 575-4 |
| 1 | J2 | Connector, PCB, 16 position, USB 2.0, Type C, receptacle, right angle, 0.85 mm pitch | USB4085-GF-A | GCT | USB4085-GF-A |
| 1 | R1 | Resistor, SMD, 2 k Ω 1%, 1/10 W, 0603 | 2K | Yageo | RC0603FR-072KL |
| 1 | R10 | Resistor, SMD, 1 M Ω 1%, 1/10 W, 0402, AEC-Q200 | 1 M Ω | Panasonic | ERJ-2RKF1004X |
| 1 | R11 | Resistor, SMD, 10 k Ω 1%, 1/10 W, 0603, AEC-Q200 | 10 k Ω | Panasonic | ERJ-3EKF1002V |
| 2 | R9, R12 | Resistor, SMD, 5.1 k Ω , 1%, 1/10 W, 0603 | 5.1 k Ω | Bourns | CR0603-FX-5101ELF |
| 1 | R2 | Resistor, SMD, 59 k Ω , 1%, 1/10 W, 0402, AEC-Q200 | 59 k Ω | Panasonic | ERJ-2RKF5902X |
| 1 | R3 | Resistor, SMD, 110 k Ω , 1%, 1/10 W, 0603, AEC-Q200 | 110 k Ω | Panasonic | ERJ-3EKF1103V |
| 1 | R6 | Resistor, SMD, 2.94 k Ω , 0.1%, 1/10 W, 0603, AEC-Q200, high reliability | 2.94 k Ω | Panasonic | ERA-3AEB2941V |
| 1 | R7 | Resistor, SMD, 10 k Ω , 5%, 1/10 W, 0603 | 10 k Ω | Yageo | RC0603JR-0710KL |
| 1 | R8 | Resistor, SMD, 120 Ω , 0.02%, 1/10 W, 0805 | 120 Ω | Vishay Precision Group | Y1629120R000Q9R |
| 3 | TP1, TP3, TP5 | Connector, PCB, test point, red | Red | Vero Technologies | 20-313137 |
| 3 | TP2, TP4, TP6 | Connector, PCB, test point, black | Black | Keystone Electronics | 5001 |
| 1 | U1 | IC-LIN 20 V, 500 mA, ultralow noise, ultrahigh power supply rejection ratio (PSRR) linear regulator | LT3045EDD#PBF | Linear Technology | LT3045EDD#PBF |
| 1 | U2 | IC-LIN isolated micromodule DC/DC converter with low dropout (LDO) postregulator | LTM8048EY#PBF | Linear Technology | LTM8048EY#PBF |
| 1 | U4 | IC, Analog Devices oven controlled, buried Zener, precision voltage reference | ADR1001AEZ | Analog Devices | ADR1001AEZ |
| 1 | U5 | IC, 1.2 A, overvoltage/overcurrent protector | LTC4362IDCB-2#TRMPBF | Linear Technology | LTC4362IDCB-2#TRMPBF |
| 1 | VOUT1 | Connector, PCB, SMT test points | 5015 | Keystone Electronics | 5015 |
| 1 | X2 | Connector, PCB, jack assembly end launch SMA 62 mils thick board | 142-0701-851 | CINCH | 142-0701-851 |

Table 2. Mechanical Parts

| Qty. | Description | Manufacturer | Part No. |
|------|---|----------------------|--------------------|
| 2 | Cover, solid acrylic cover, clear, square, 1.40 inches | Pololu | 1J70474 |
| 2 | Spacer, 3 mm, clear hollow acrylic | Pololu | 1J70475 |
| 4 | Hex nut, 5.51 mm, M3X0.5 nylon | Keystone Electronics | 4688 |
| 4 | Screw, pan slotted 20 mm length, M3X0.5 thread | Essentra | 50M030050N020 |
| 4 | Screw machine, nylon, pan head Phillips, 4-40 thread, 1/4 inch long | B&F Fastener Supply | NY PMS 440 0025 PH |
| 4 | Standoff, nylon hex female 6.35 mm outer diameter, 4-40 thread, 1/2 inch long | Keystone Electronics | 1902C |

ORDERING INFORMATION

Table 3. Do Not Install¹

| Qty. | Reference Designator | Description | Value | Manufacturer | Part No. |
|------|----------------------|--|-------|-----------------|---------------------|
| 1 | R13 | Resistor, SMD, 1 Ω, 1%, 1/10 W, 0603, AEC-Q200 | 1 | Panasonic | ERJ-U03F1R00V |
| 2 | R14, R15 | Resistor, SMD, 10 kΩ, 1%, 1/16 W, 0603 | 10 kΩ | MULTICOMP (SPC) | MC0603WGF1002T5E-TC |

¹ These components are part of the PCB or are not to be installed.

**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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