INA826EVM

This user's guide describes the characteristics, operation, and use of the evaluation module (EVM) for the INA826. The EVM is designed to evaluate the performance of the device in both single and dual-supply configurations. This document also includes the schematic, printed circuit board (PCB) layouts, and a complete bill of materials (BOM). Throughout this document the terms *evaluation board*, *evaluation module*, and *EVM* are synonymous with the INA826EVM.

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1 Introduction and Overview

1.1 INA826

The INA826 is a low-power, wide-supply voltage instrumentation amplifier that can operate in both single and dual supply configurations. A single external resistor sets the gain from 1 to 1000. The input voltage range extends from the negative power supply to 1.0 V below the positive power supply. The rail-to-rail output allows for use in low-voltage applications. The device operates with a supply voltage between 2.7 V and 36 V and draws a maximum quiescent current of 250 µA. The device is available in MSOP-8, SO-8, and DFN-8 packages.

1.2 INA826EVM

The INA826EVM is intended to provide basic functional evaluation of the INA826. It provides the following features:

- Intuitive evaluation with the silkscreen schematic
- Easy access to nodes with surface-mount test points
- Advanced evaluation with two prototype areas
- Reference voltage source flexibility
- Convenient input and output filtering

The schematic and component sides of the EVM are shown in Figure 1 and Figure 2, respectively.

NOTE: Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing INA826EVM PCBs.

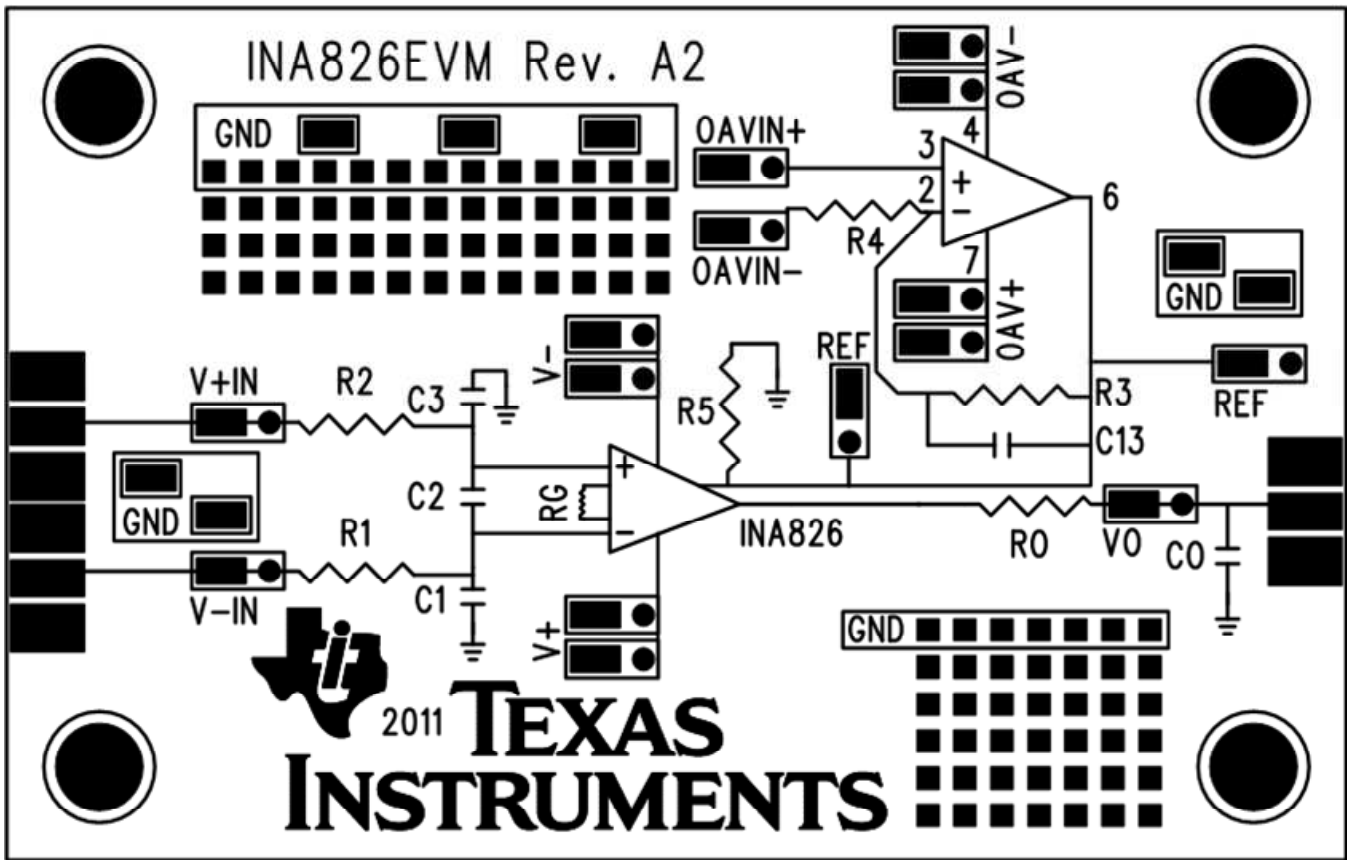

Figure 1. INA826EVM Schematic Side

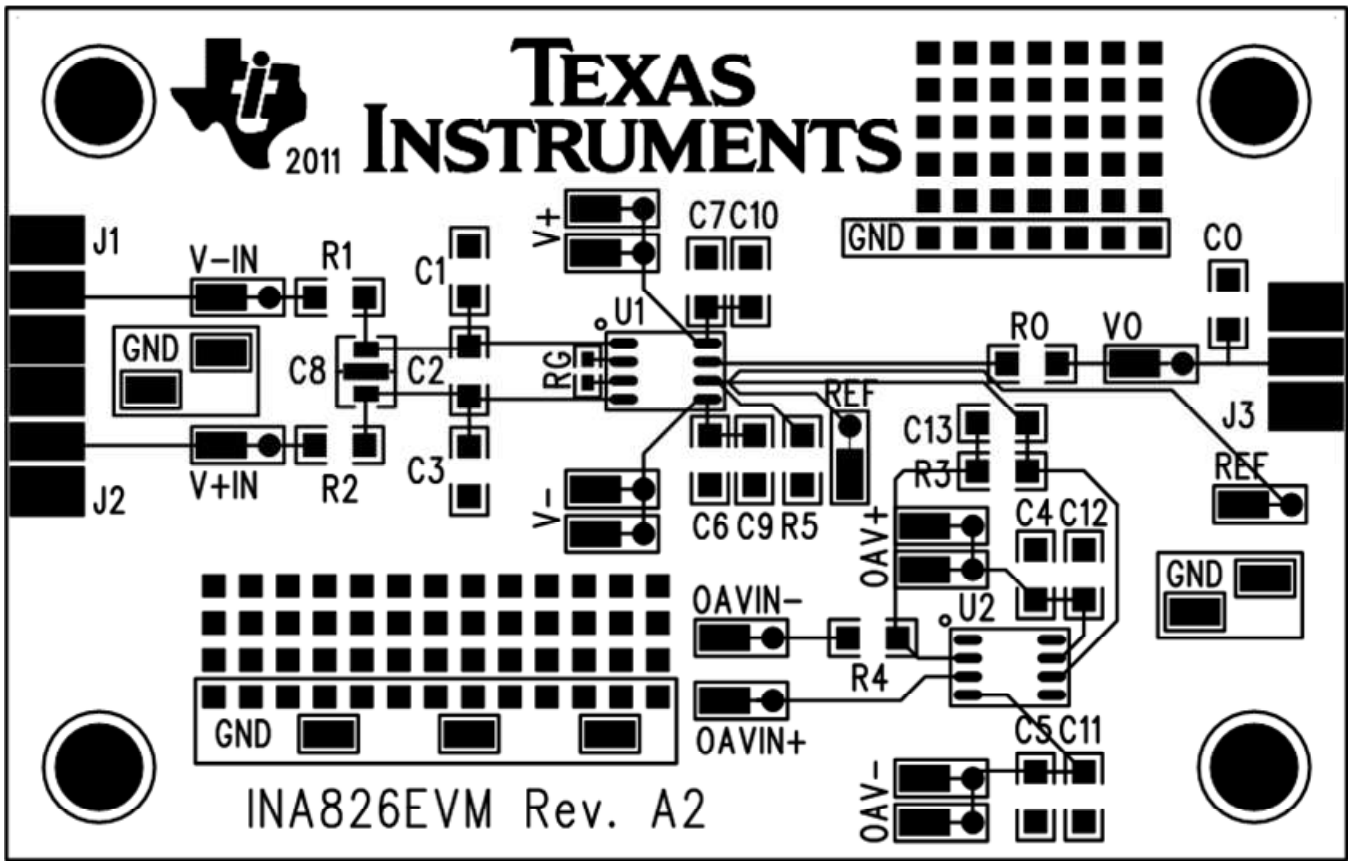

Figure 2. INA826EVM Component Side

2 Quick Start

The procedures presented in this section describe how to quickly set up and use the INA826EVM for evaluation in dual-supply and single-supply configurations.

2.1 Dual Supply

Make the following connections to set up the INA826EVM for dual-supply operation.

1. +15 V to V+ test point
2. –15 V to V– test point
3. Ground to REF test point or install a 0 Ω resistor as R5
4. Differential input (for example, a 1-V_{PP} sine wave) to V–IN and V+IN test points
5. Oscilloscope to VO test point

Ensure that R1 = R2 = RO = 0 Ω and that R_G and CO are not populated. Figure 3 depicts a proper dual-supply configuration.

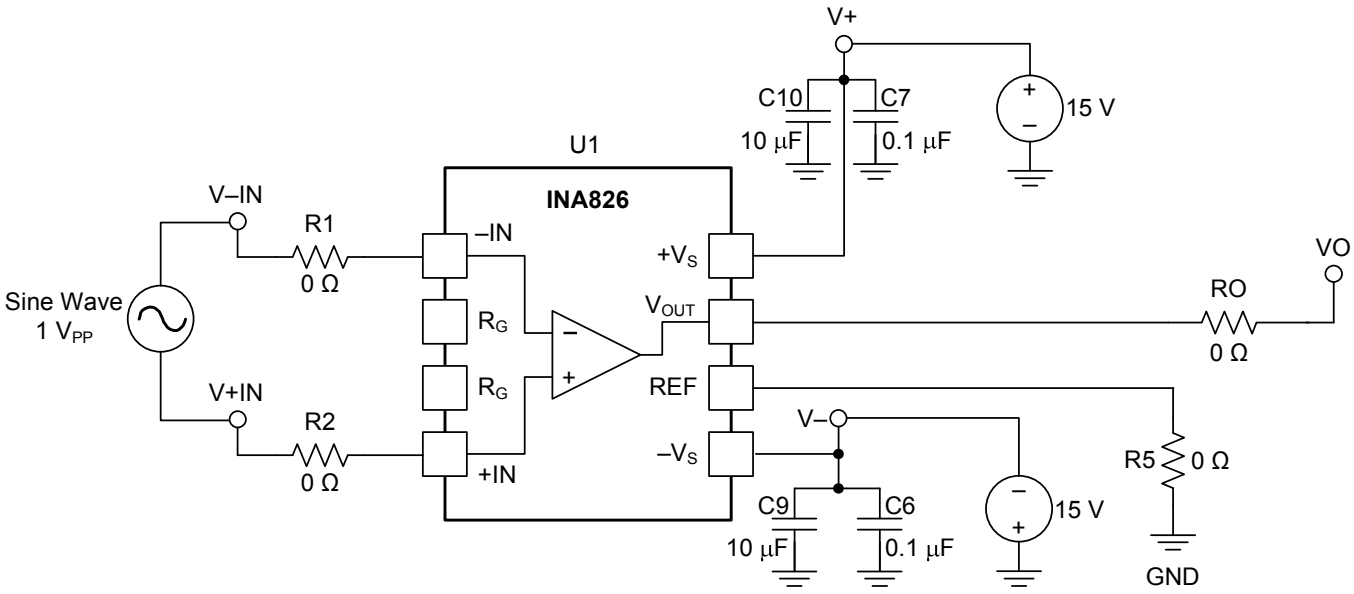

Figure 3. INA826EVM: Dual-Supply Configuration

2.2 Single Supply

Make the following connections to set up the INA826EVM for single-supply operation with a direct connection for the reference voltage.

1. +5 V to V+ test point
2. GND to V– test point
3. +2.5 V to REF test point
4. Differential input (for example, a 1-V_{PP} sine wave) to V–IN and V+IN test points
5. Oscilloscope to VO test point

Ensure that R1 = R2 = RO = 0 Ω and that R_G , R5, and CO are not populated. Figure 4 depicts a proper single-supply configuration with a direct REF connection.

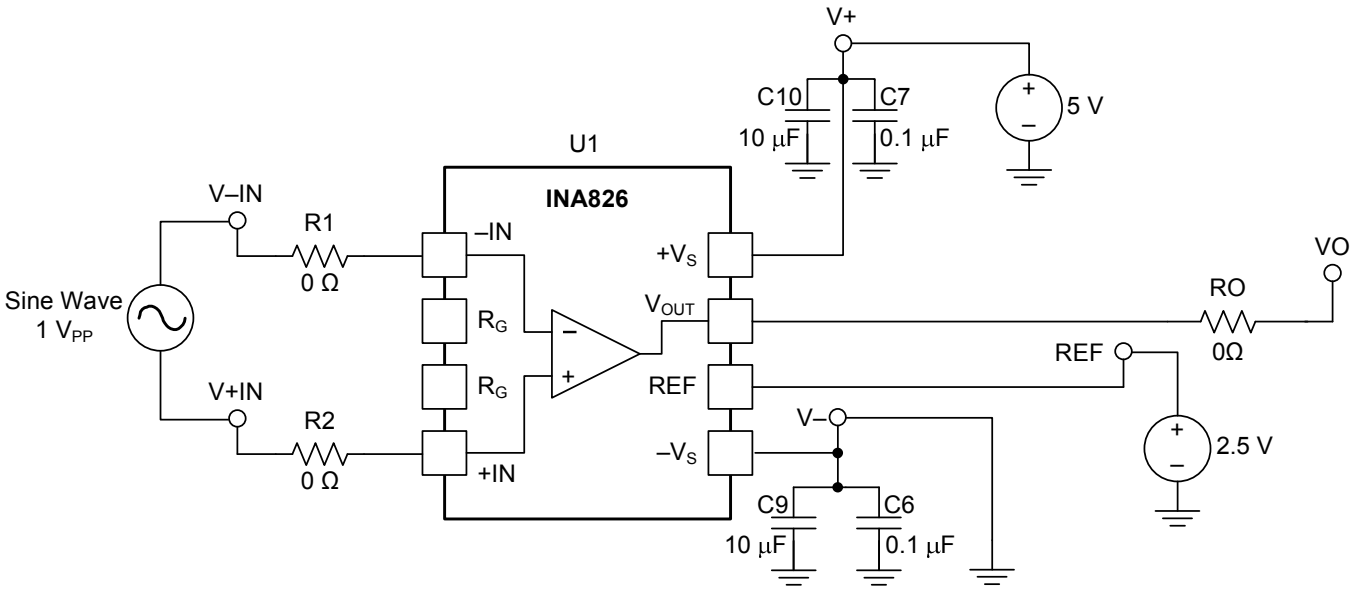

Figure 4. INA826EVM: Single-Supply Configuration, Direct REF Connection

Make the following connections to set up the INA826EVM for single-supply operation with a buffered reference voltage. This example uses an OPA376 as the buffer operational amplifier. Depending on the application, alternate single-supply buffer operational amplifiers include the OPA330 and OPA378. The OPA277 is a good choice for high-voltage applications. The buffered configuration is useful when the source impedance is high (for example, a voltage divider). Buffering a high-impedance source with an operational amplifier provides a low-impedance source, which preserves common-mode rejection.

1. +5 V to V+ and OAV+ test points
2. GND to V– and OAV– test points
3. +2.5 V to OAVIN+ test point
4. Populate R3 with a 0-Ω resistor
5. Populate C4, C5, C11, and C12 with bypass capacitors
6. Differential input (for example, a 1-V_{PP} sine wave) to V–IN and V+IN test points
7. Oscilloscope to VO test point

Ensure that R1 = R2 = RO = 0 Ω and that R_G, CO, R4, and R5 are not populated. Figure 5 depicts a proper dual-supply configuration with a buffered REF voltage.

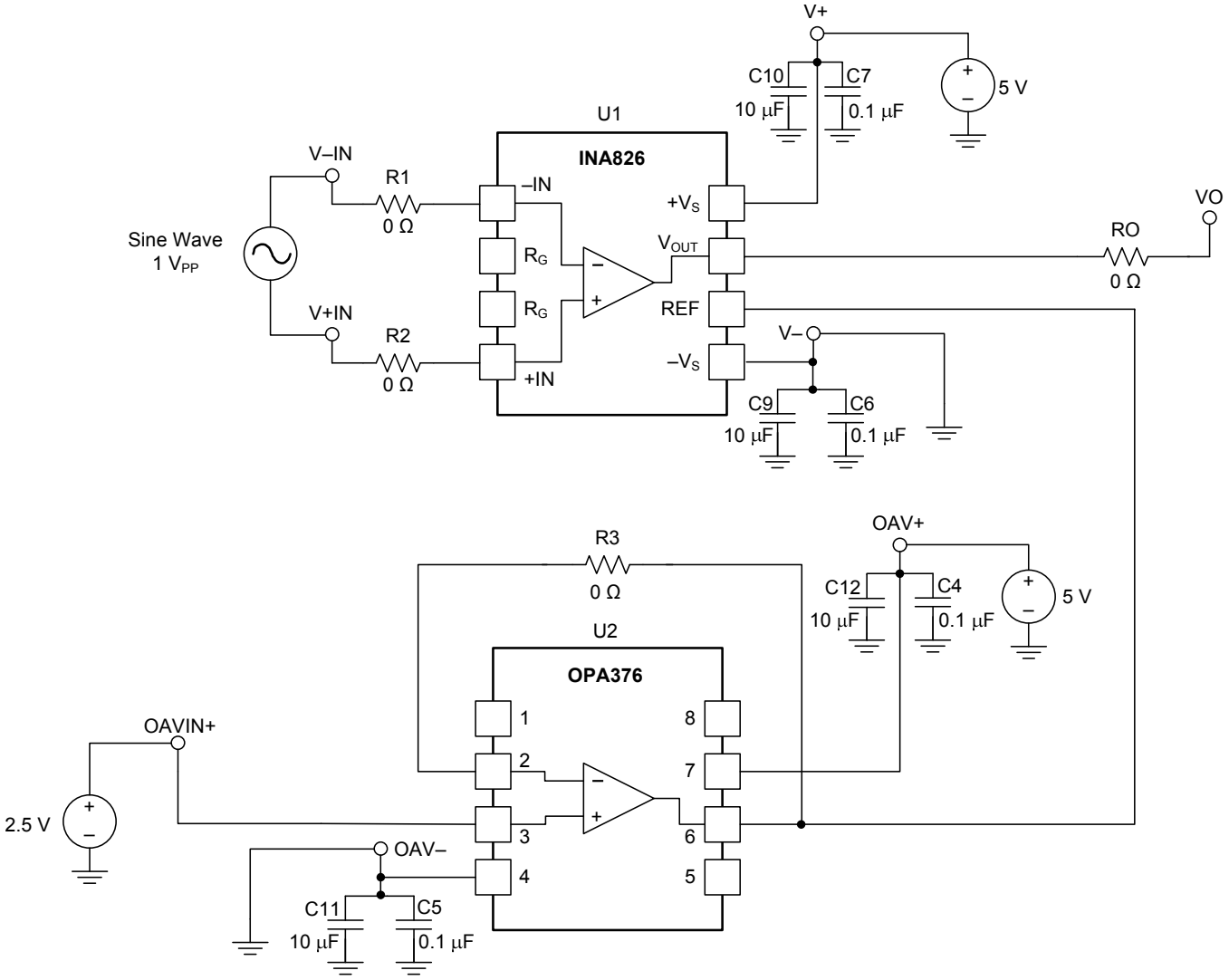

Figure 5. INA826EVM: Single-Supply Configuration, Buffered REF Connection

3 EVM Components

This section summarizes the INA826EVM components.

3.1 Power

Power is applied to the INA826 with test points V+ and V–. For the unpopulated device (U2), power is applied using test points OAV+ and OAV–.

3.2 Inputs

Inputs are applied to the INA826 using test points V+IN and V–IN. Alternately, they can be applied by populating the input SMA connectors (J1 and J2). The inputs for U2 are applied via test points OAVIN+ and OAVIN–.

3.2.1 Input Filtering

R1, R2, and C1 through C3 provide the ability to apply common-mode and differential-mode filtering to the inputs. The cutoff frequencies for the filters are shown in Equation 1 and Equation 2. It is recommended to make C2 approximately ten times larger than C1 and C3. These calculations presume R1 = R2 and C1 = C3.

Common-mode cutoff frequency:

$$f_{c-cm} = \frac{1}{2\pi \cdot R1 \cdot C1} \tag{1}$$

Differential-mode cutoff frequency:

$$f_{c-dm} = \frac{1}{2\pi(R1+R2)\left(C2+\frac{C1}{2}\right)} \tag{2}$$

3.3 Outputs

The output of the INA826 can be accessed with test point VO. Alternately, it can be accessed by populating the output SMA connector (J3).

3.3.1 Output Filtering

RO and CO provide the ability to apply a single-pole RC output filter. The cutoff frequency of the output filter can be calculated as shown in Equation 3.

$$f_{c-o} = \frac{1}{2\pi \cdot RO \cdot CO} \tag{3}$$

3.4 Reference

There are multiple methods of applying a reference voltage to the INA826. A straightforward approach is to apply a voltage to the REF test point with U2 not populated. If a buffered voltage is desired, U2 can be populated with an operational amplifier in an appropriate SO-8 package and pinout.

3.5 Prototype Area

Two prototype areas are provided for flexible evaluation. For example, they could be used to prototype a voltage divider for a buffered reference voltage or to supply a direct reference voltage with a device such as the REF3225.

3.6 Miscellaneous

C6, C7, C9, and C10 are the supply bypass capacitors for the INA826. Similarly, C4, C5, C11, and C12 can be populated to provide supply bypassing for U2. C8 is available for the use of an X2Y® capacitor.

4 Schematic

4.1 Schematic

Figure 6 shows the schematic for the INA826EVM PCB.

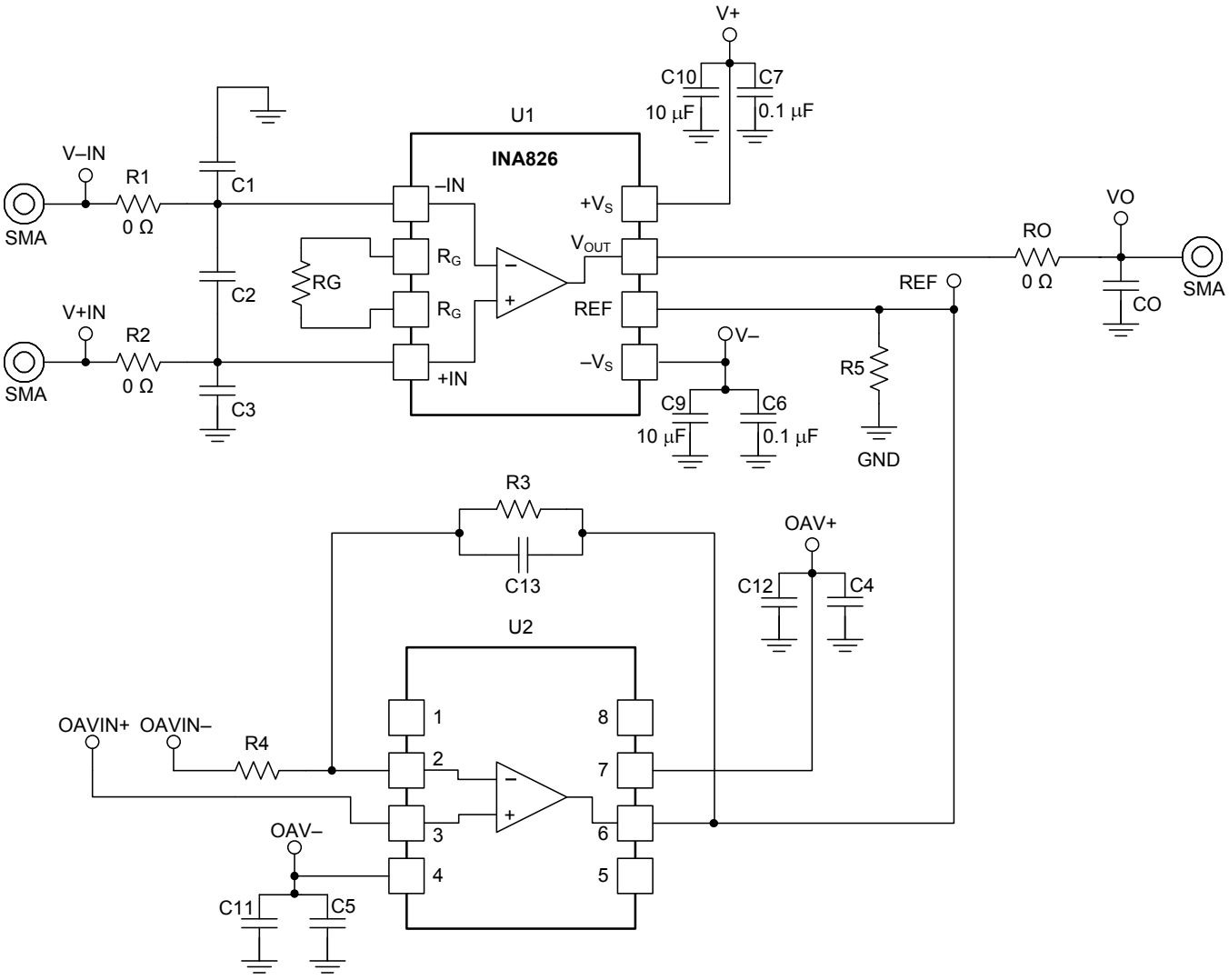

Figure 6. INA826EVM Schematic

5 Bill of Materials

Table 1 provides the parts list for the INA826EVM.

Table 1. INA826EVM Bill of Materials

Count	RefDes	Value	Description	Part Number	MFR
1	U1	N/A	INA826, SO-8	INA826AID	Texas Instruments
3	R1, R2, RO	0 Ω	Resistor, 1/4W, 1206	RMCF1206ZT0R00	Stackpole Electronics
2	C9, C10	10 µF	Ceramic bypass capacitors, 50 V, X5R, 10%, 1206	GRM31CR61H106KA2L	Murata
2	C6, C7	0.1 µF	Ceramic bypass capacitors, 50 V, X7R, 20%, 1206	12065C104MAT2A	AVX Corporation
34	Various	N/A	Surface Mount Test Points	5015	Keystone Electronics
8	N/A	N/A	Bumpon, cylindrical, 0.375 X 0.135, Black	SJ61A8	3M

6 Related Documentation from Texas Instruments

The following documents provide information regarding Texas Instruments' integrated circuits and support tools for the INA826EVM. This user's guide is available from the TI web site under literature number ***SBOU115***. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site, or call the Texas Instruments' Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Related Documentation

Document	Literature Number
INA826 Product Data Sheet	SBOS562
OPA376 Product Data Sheet	SBOS406
OPA277 Product Data Sheet	SBOS079
OPA330 Product Data Sheet	SBOS432
OPA378 Product Data Sheet	SBOS417
REF3225 Product Data Sheet	SBVS058

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of –18 V to +17 V and the output voltage range of –14 V to +14 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than +30°C. The EVM is designed to operate properly with certain components above +30°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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