

AMC23CxxEVM Isolated Comparator Evaluation Module



ABSTRACT

This user's guide describes the characteristics, operation, and use of the AMC23CxxEVM. This evaluation module (EVM) is an evaluation and development kit for evaluating the AMC23C1x family of reinforced isolated comparators (AMC23C14, AMC23C12, AMC23C11, and AMC23C10). A complete circuit description as well as schematic diagram and bill of materials are included.

Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with all variations of the AMC23CxxEVM. Additionally, the designator *AMC23CxxEVM* and *AMC23Cxx* are used when a description is applicable to any of the AMC23C14, AMC23C12, AMC23C11, or AMC23C10 devices.

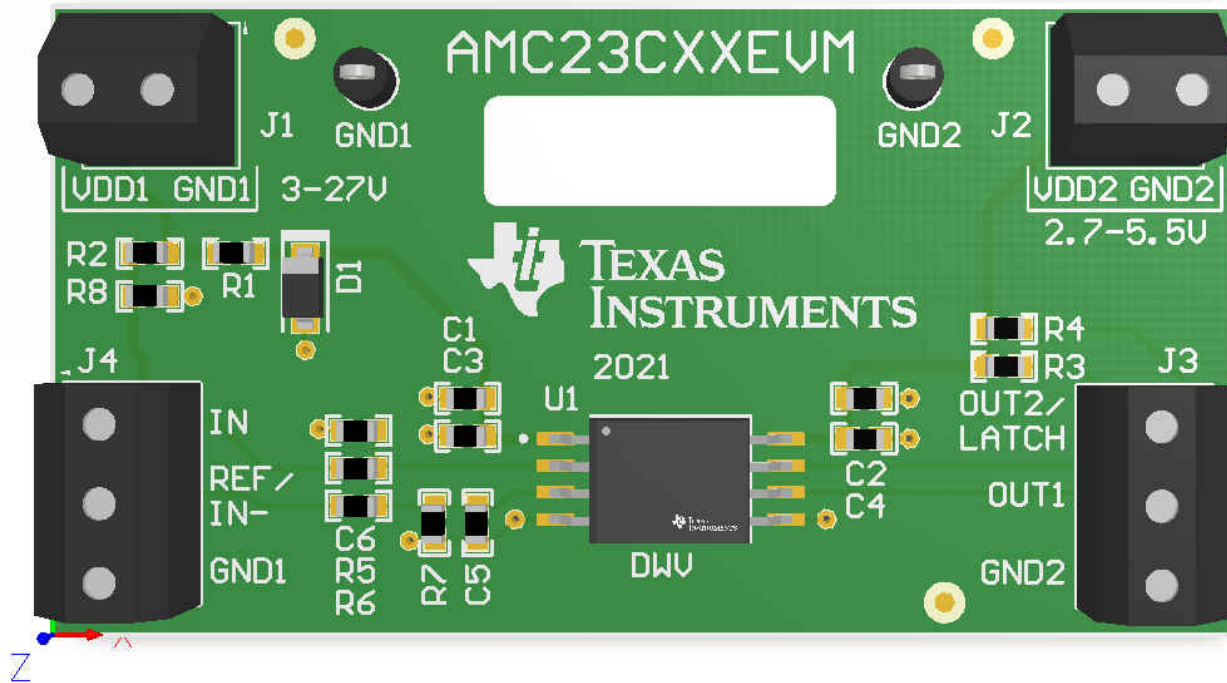


Table of Contents

| | |
|---------------------------------|---|
| 1 EVM Overview | 3 |
| 1.1 Introduction..... | 3 |
| 2 Analog Interface | 3 |
| 2.1 Analog Inputs..... | 3 |
| 2.2 Comparator Outputs..... | 4 |
| 3 Power Supplies | 5 |
| 3.1 VDD Inputs..... | 5 |
| 4 EVM Operation | 6 |
| 4.1 Analog Inputs: J4..... | 6 |
| 4.2 User Power: J1 and J2..... | 6 |
| 4.3 Comparator Outputs: J3..... | 6 |

| | |
|--|----------|
| 4.4 Device Operation..... | 7 |
| 5 Layout, BOM, and Schematic..... | 7 |
| 5.1 Layout..... | 7 |
| 5.2 Bill of Materials (BOM)..... | 8 |
| 5.3 Schematic..... | 9 |

List of Figures

| | |
|---|---|
| Figure 2-1. AMC23C14EVM Schematic: Analog Input Section..... | 3 |
| Figure 2-2. AMC23CxxEVM Schematic: Comparator Output Section..... | 4 |
| Figure 3-1. VDD Inputs..... | 5 |
| Figure 5-1. AMC23CxxEVM Top Layer Silkscreen..... | 7 |
| Figure 5-2. AMC23C14EVM Schematic..... | 9 |

List of Tables

| | |
|---|---|
| Table 2-1. Comparator Outputs..... | 4 |
| Table 4-1. J4: Analog Inputs..... | 6 |
| Table 4-2. J1: VDD1 Power..... | 6 |
| Table 4-3. J2: VDD2 Power..... | 6 |
| Table 4-4. J3: Comparator Outputs..... | 6 |
| Table 5-1. AMC23C14EVM Bill of Materials..... | 8 |

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1 EVM Overview

1.1 Introduction

The AMC23C14, AMC23C12, AMC23C11, or AMC23C10 are reinforced isolated comparators with an output separated from the input circuitry by a silicon dioxide (SiO₂) barrier that is highly resistant to magnetic interference. This barrier has been certified to provide basic galvanic isolation of up to 7000 V_{PEAK} according to UL1577 and IEC60747-5-2 specifications.

This EVM supports the following features:

- Full-featured evaluation board for the AMC23C14, AMC23C12, AMC23C11, or AMC23C10 reinforced isolated comparators
- Screw terminals for easy access to analog inputs and digital outputs

The following related documents are available through the Texas Instruments web site at www.ti.com.

Related Documentation

| Device | Literature Number |
|--------------------------|-------------------------|
| AMC23C14 | SBAS945 |
| AMC23C12 | SBASAB2 |
| AMC23C11 | SBASAC9 |
| AMC23C10 | SBASAD0 |

2 Analog Interface

The analog inputs to the AMC23Cxx are routed from the three-wire screw terminal at J4. These screw terminals provide access to the comparator input and reference pins of the AMC23C14, AMC23C12, and AMC23C11 devices. On the AMC23C10EVM, J4 provides access to the positive and negative differential comparator inputs.

2.1 Analog Inputs

The analog input to the AMC23CxxEVM printed circuit board (PCB) varies depending on the EVM selected. Each of the single-ended isolated comparators (AMC23C14, AMC23C12, and AMC23C11) has its comparator input pin and external reference pin connected directly to the three-wire screw terminal at J4. For these devices, R7 is populated with a 2.55-kΩ resistor to ground to set the reference voltage to 255 mV. Figure 2-1 shows an analog input schematic for the AMC23C14EVM.

The differential isolated comparator, AMC23C10, has its positive and negative input pins connected directly to the three-wire screw terminal at J4, and R7 is left unpopulated.

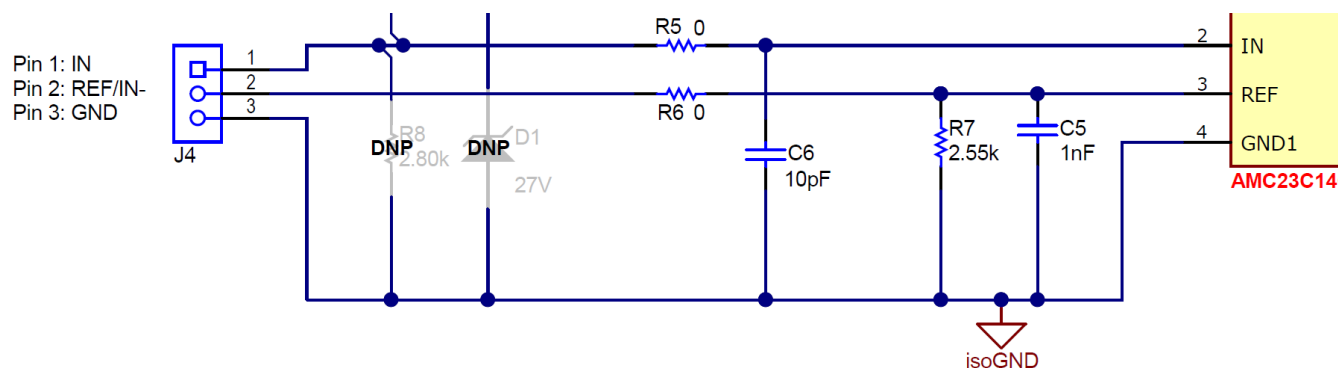


Figure 2-1. AMC23C14EVM Schematic: Analog Input Section

2.2 Comparator Outputs

The comparator outputs are accessible on the three-wire screw terminal J3 on pins 2 and 3. [Table 2-1](#) lists the pin connections to the J3 screw terminal for each of the AMC23Cxx devices.

Table 2-1. Comparator Outputs

| Device | J3.2 | J3.3 |
|----------|-------------------|-------------------|
| AMC23C14 | OUT1 (open-drain) | OUT2 (open-drain) |
| AMC23C12 | OUT (open-drain) | LATCH (input) |
| AMC23C11 | OUT1 (open-drain) | LATCH (input) |
| AMC23C10 | OUT1 (open-drain) | OUT2 (push-pull) |

Depending on the isolated comparator device, each output may be an open-drain or push-pull configuration. The OUT1/OUT pin is open-drain in all cases, and the 4.7-k Ω resistor R4 is used to pull the output up to VDD2. For the AMC23C11EVM and the AMC23C12EVM, the OUT2/LATCH pin is an input and the pullup resistor R3 is left unpopulated. For the AMC23C10EVM, the OUT2/LATCH pin is a push-pull output, with no pullup resistor populated on R3. For the AMC23C14EVM, the OUT2 pin is an open-drain output, and R3 is populated with a 4.7-k Ω resistor pulling the pin up to VDD2.

[Figure 2-2](#) shows the comparator output section of the AMC23CxxEVM schematic.

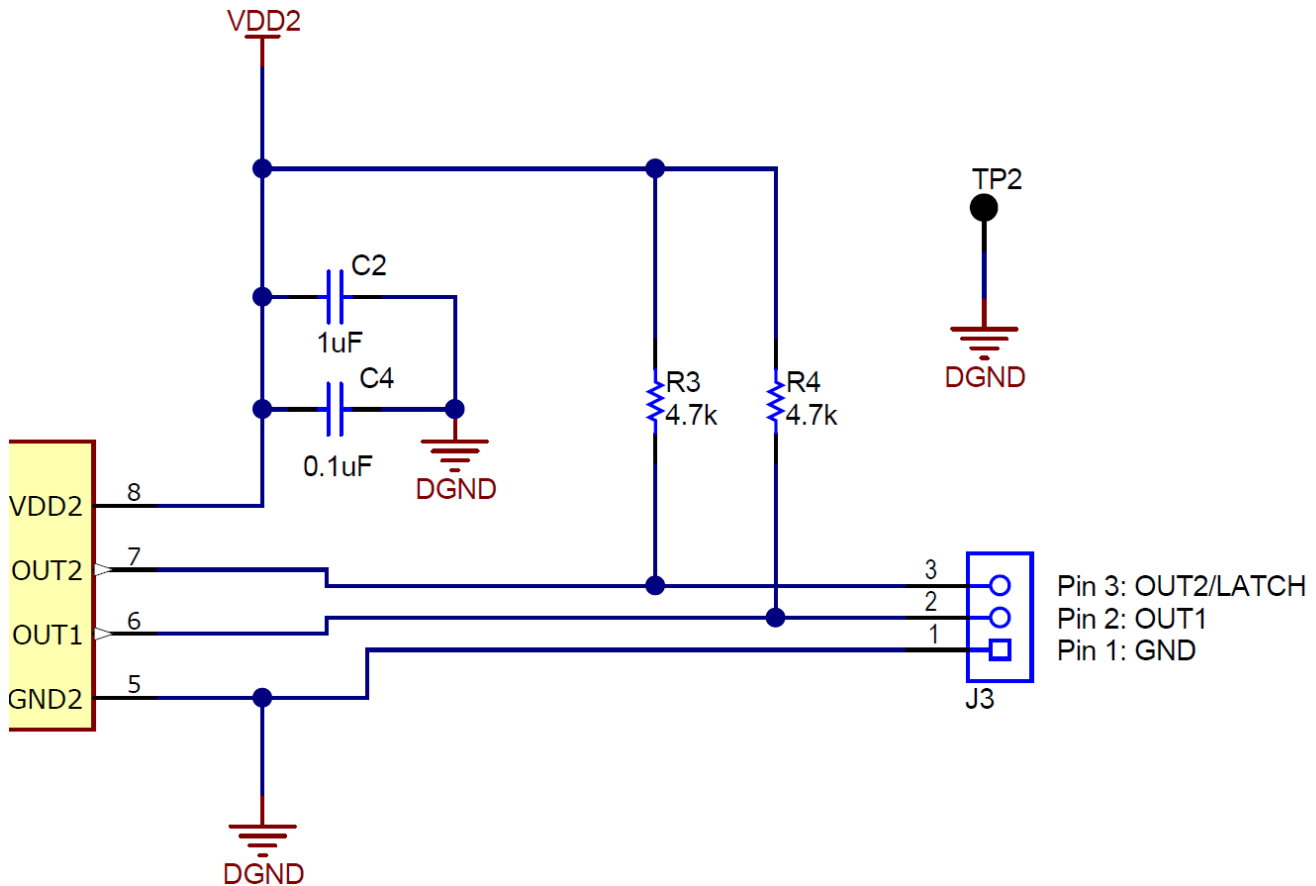


Figure 2-2. AMC23CxxEVM Schematic: Comparator Output Section

3 Power Supplies

The AMC23CxxEVM requires two independent power supplies, VDD1 and VDD2. VDD1 is on the high-voltage side of the comparator, and VDD2 is on the low-voltage side.

3.1 VDD Inputs

J1 provides access to the VDD1 supply, and J2 provides access to the VDD2 supply. Apply a voltage from 3 VDC to 27 VDC between J1.2 and J1.1 to power VDD1. To power VDD2, apply a voltage between 2.7 VDC and 5.5 VDC to J2.2 and J2.1. [Figure 3-1](#) shows the input power.

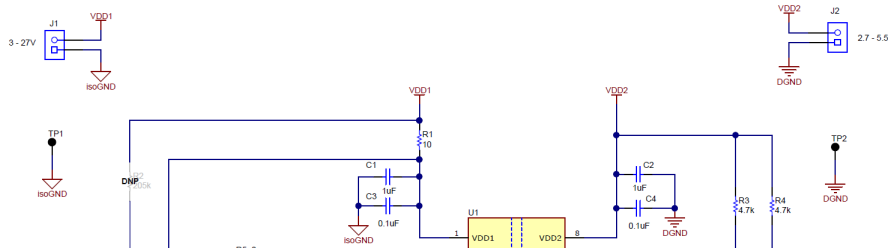


Figure 3-1. VDD Inputs

4 EVM Operation

This section describes the general operation of the AMC23CxxEVM.

4.1 Analog Inputs: J4

The analog input to the AMC23CxxEVM board can be applied directly to the three-wire screw terminal J4.

[Table 4-1](#) summarizes the details of J2.

Table 4-1. J4: Analog Inputs

| Pin Number | Signal | Description |
|------------|---------|--|
| J4.1 | IN/IN+ | Single-ended comparator input or positive differential comparator input (AMC23C10 only) to the AMC23Cxx device (pin 2) |
| J4.2 | REF/IN- | Comparator reference input or negative differential comparator input (AMC23C10 only) to the AMC23Cxx device (pin 3) |

On the AMC23C14EVM, AMC23C12EVM, and AMC23C11EVM, the resistor R7 is used to set the external comparator reference voltage, V_{REF} . By default R7 has a value of 2.55 k Ω , which sets a V_{REF} of 255 mV when combined with the internal 100- μ A current source of the AMC23Cxx device.

4.2 User Power: J1 and J2

The VDD1 power input to the AMC23CxxEVM PCB can be applied directly to J1, pins 1 and 2. [Table 4-2](#) lists the details of J1.

Table 4-2. J1: VDD1 Power

| Pin Number | Signal | Description |
|------------|--------|---|
| J1.1 | GND1 | Connection to the AM23Cxx GND1 terminal (pin 4) |
| J1.2 | VDD1 | Connection to the AM23Cxx VDD1 terminal (pin 1) |

The VDD2 power input to the AMC23CxxEVM PCB can be applied directly to J2, pins 1 and 2. [Table 4-3](#) lists the details of J2.

Table 4-3. J2: VDD2 Power

| Pin Number | Signal | Description |
|------------|--------|---|
| J1.1 | GND2 | Connection to the AM23Cxx GND2 terminal (pin 5) |
| J1.2 | VDD2 | Connection to the AM23Cxx VDD1 terminal (pin 8) |

4.3 Comparator Outputs: J3

The comparator outputs are made available at the three-wire screw terminal J3, pins 2 and 3. [Table 4-4](#) summarizes the details of J3.

Table 4-4. J3: Comparator Outputs

| Pin Number | Signal | Description |
|------------|------------|---|
| J3.1 | GND1 | Connection to the AM23Cxx GND2 terminal (pin 5) |
| J3.2 | OUT/OUT1 | Connection to the AM23Cxx OUT/OUT1 terminal (pin 6) |
| J3.3 | OUT2/LATCH | Connection to the AM23Cxx OUT2 terminal or LATCH input (AMC23C12 and AMC23C11 only) (pin 7) |

4.4 Device Operation

After the VDD1 and VDD2 power supplies are applied to the AMC23CxxEVM, the internal current source turns on, setting V_{REF} to 255 mV, and the comparator outputs become active.

An analog input signal can be applied directly at screw terminal J4. See [Figure 2-1](#) and [Table 4-1](#) for details.

The digital comparator outputs are available at J3 and are pulled high to VDD2, or low to GND2 based on the analog input voltage relative to either the internal reference or to V_{REF} , depending on the AMC23Cxx device being tested. See the corresponding [AMC23Cxx device data sheet](#) for a detailed description of the comparator output behavior.

5 Layout, BOM, and Schematic

This sections contains the PCB layout, [bill of materials \(BOM\)](#), and [schematic](#) of the AMC23CxxEVM.

5.1 Layout

[Figure 5-1](#) shows the AMC23CxxEVM PCB layout.

Note

Board layout is not to scale. This figure is intended to show how the board is laid out, and is not intended to be used for manufacturing AMC23CxxEVM PCBs.

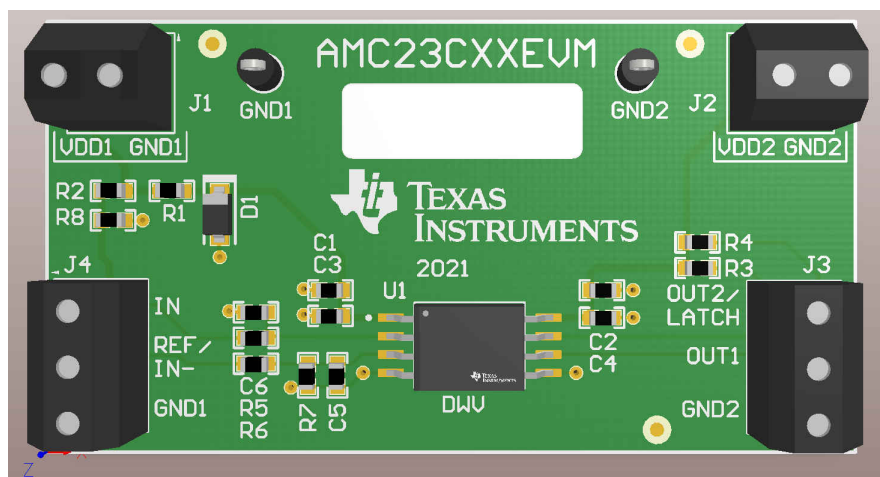


Figure 5-1. AMC23CxxEVM Top Layer Silkscreen

5.2 Bill of Materials (BOM)

Table 5-1 lists the bill of materials for the AMC23C14EVM.

Note

All components must be RoHS compliant. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS compliant.

Table 5-1. AMC23C14EVM Bill of Materials

| Item | Qty | Ref Des | Description | Manufacturer | Part Number |
|------|-----|------------------|--|----------------------|------------------|
| 1 | 2 | C1, C2 | CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603 | AVX | 06033C105KAT2A |
| 2 | 2 | C3, C4 | CAP, CERM, 0.1 uF, 25 V, +/- 5%, X7R, 0603 | AVX | 06033C104JAT2A |
| 3 | 1 | C5 | CAP, CERM, 1000 pF, 50 V, +/- 5%, X7R, 0603 | Kemet | C0603C102J5RACTU |
| 4 | 1 | C6 | CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0, 0603 | Kemet | C0603C100J5GACTU |
| 5 | 2 | J1, J2 | Terminal Block, 3.5mm Pitch, 2x1, TH | On-Shore Technology | ED555/2DS |
| 6 | 2 | J3, J4 | Terminal Block, 3.5mm Pitch, 3x1, TH | On-Shore Technology | ED555/3DS |
| 7 | 1 | LBL1 | Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll | Brady | THT-14-423-10 |
| 8 | 1 | R1 | RES, 10, 5%, 0.1 W, AEC-Q200 Grade 0, 0603 | Vishay-Dale | CRCW060310R0JNEA |
| 9 | 2 | R3, R4 | RES, 4.7 k, 5%, 0.1 W, 0603 | Yageo | RC0603JR-074K7L |
| 10 | 2 | R5, R6 | RES, 0, 5%, 0.1 W, 0603 | Rohm | MCR03EZPJ000 |
| 11 | 1 | R7 | RES, 2.55 k, 0.1%, 0.1 W, 0603 | Yageo America | RT0603BRD072K55L |
| 12 | 2 | TP1, TP2 | Test Point, Miniature, Black, TH | Keystone | 5001 |
| 13 | 1 | U1 | Dual, Fast Response, Reinforced Isolated Window Comparator with Adjustable Threshold, SOICW8 | Texas Instruments | AMC23C14QDRQ1 |
| 14 | 0 | D1 | Diode, Zener, 27 V, 500 mW, AEC-Q101, SOD-123 | Vishay-Semiconductor | MMSZ4711-HE3-08 |
| 15 | 0 | FID1, FID2, FID3 | Fiducial mark. There is nothing to buy or mount. | N/A | N/A |
| 16 | 0 | R2 | RES, 205 k, 1%, 0.1 W, 0603 | Yageo | RC0603FR-07205KL |
| 17 | 0 | R8 | RES, 2.80 k, 1%, 0.1 W, 0603 | Yageo | RC0603FR-072K8L |

5.3 Schematic

Figure 5-2 shows the AMC23C14EVM schematic.

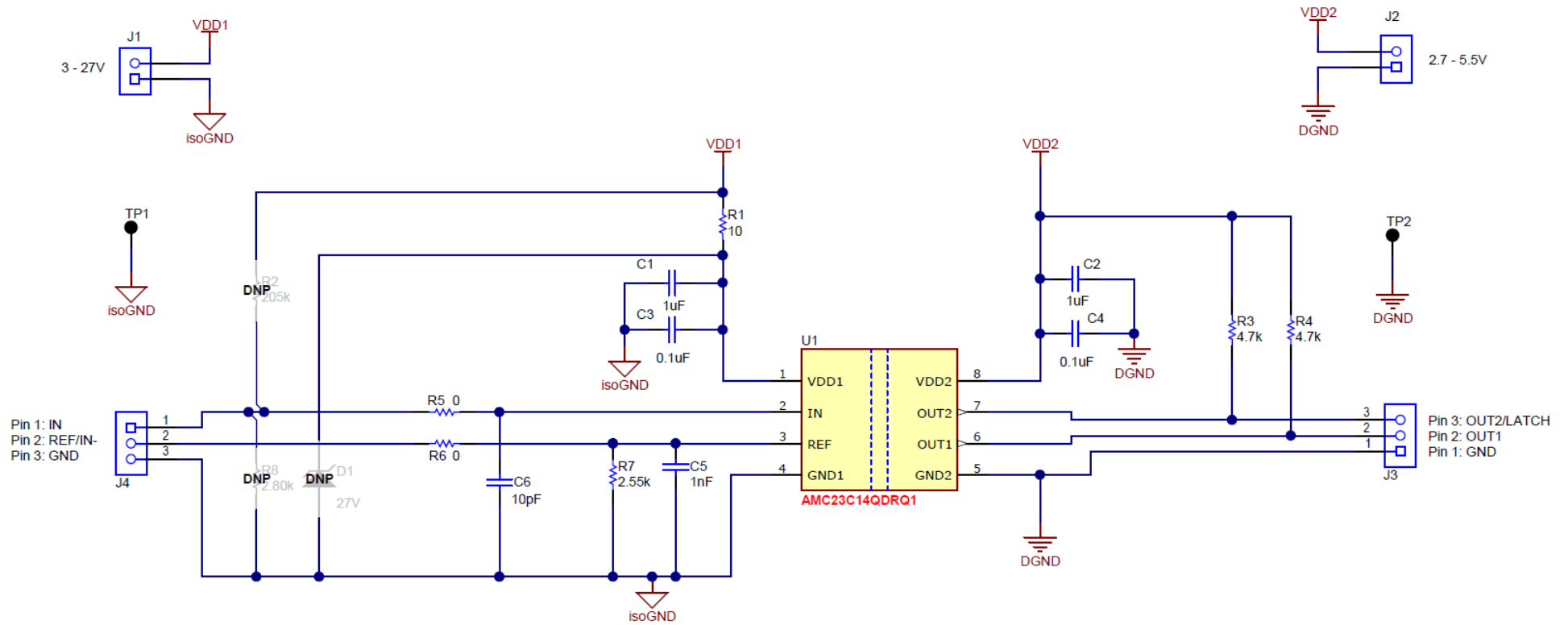


Figure 5-2. AMC23C14EVM Schematic

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