

## Evaluating the ADM1062 to ADM1169 for Complex Sequencing

### FEATURES

Full-featured evaluation kits for ADM1062 to ADM1169  
 I<sup>2</sup>C interface supports all product-related software  
 10 adjustable voltages reference for input emulation  
 Switch-controlled, open-drain/push-pull digital inputs  
 Extra headers for easy probing  
 Includes point to point patch cables for easy wiring  
 Multiboard cascade support

### EVALUATION KIT CONTENTS

EVAL-ADM1062CASZ to EVAL-ADM1169CASZ  
 evaluation board  
 ADM1062 to ADM1169 device socket  
 8-way, 150 mm Micromatch ribbon cable  
 Patch cables

### ADDITIONAL EQUIPMENT NEEDED

USB-to-I<sup>2</sup>C dongle [USB-SMBUS-CABLEZ](#)  
 9 V to 14.4 V power supply

### RELATED DOCUMENTS

ADM1062 to ADM1169 data sheets

### SOFTWARE NEEDED

ADM1062 to ADM1169 evaluation software

### GENERAL DESCRIPTION

This user guide describes how to use the [ADM1062](#) to [ADM1169](#) evaluation kits. The kits provide all of the support circuitry required to operate the [ADM1062/ADM1063/ADM1064/ADM1065/ADM1066/ADM1067/ADM1068/ADM1069/ADM1166/ADM1168/ADM1169](#) (hereafter referred to as ADM1062 to ADM1169) in their various modes and configurations, including multiple board setups. The [ADM1062](#) to [ADM1169](#) data sheets, available at [www.analog.com](http://www.analog.com), provide additional information, and should be consulted when using the evaluation board. All documents and software tools are available at [www.analog.com/power-management](http://www.analog.com/power-management).

Note that USB-SMBUS-CABLEZ is not included in the evaluation kit and should be ordered separately. Only one dongle is required in multiboard cascade setup. One device socket is included in each kit. Sockets for different device packages are not included. Refer to the Socket Selection Guide section for details regarding the corresponding socket types.

### EVALUATION KIT SELECTION GUIDE

Table 1. Contents of Available Evaluation Kits

| Evaluation Kit Model | Contains Evaluation Board | Contains IC Socket | Corresponding Devices |
|----------------------|---------------------------|--------------------|-----------------------|
| EVAL-ADM1062TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1062ASUZ           |
| EVAL-ADM1063TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1063ASUZ           |
| EVAL-ADM1064TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1064ASUZ           |
| EVAL-ADM1065TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1065ASUZ           |
| EVAL-ADM1066TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1066ASUZ           |
| EVAL-ADM1067TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1067ASUZ           |
| EVAL-ADM1068LQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xLQZ  | ADM1068ASTZ           |
| EVAL-ADM1069LQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xLQZ  | ADM1069ASTZ           |
| EVAL-ADM1166TQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xTQZ  | ADM1166ASUZ           |
| EVAL-ADM1168LQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xLQZ  | ADM1168ASTZ           |
| EVAL-ADM1169LQEBZ    | EVAL-ADM1062-69CASZ       | SOCKET-ADM106xLQZ  | ADM1169ASTZ           |

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**REVISION HISTORY**

**7/13—Rev. A to Rev. B**

|   |    |
|---|----|
| Changes to Power Supplies Section and Figure 1..... | 3  |
| Changes to Demo 2 Section .....                     | 13 |

**9/11—Rev. 0 to Rev. A**

|   |    |
|---|----|
| Changes to Package Contents Section, changes to General<br>Description Section, and Added Table 1 ..... | 1  |
| Changes to Output Signals Section and Changes to Figure 1 ....  | 3  |
| Changes to Figure 2.....  | 4  |
| Changes to Table 2.....   | 5  |
| Changes to Table 5.....   | 7  |
| Added Evaluation Kits Quick Start Guide, added Figure 4 to<br>Figure 16, Renumbered Sequentially .....  | 10 |

**2/10—Revision 0: Initial Version**

## EVALUATION BOARD HARDWARE

The EVAL-ADM1062-69CASZ evaluation board is designed for advanced evaluation of [ADM1062](#) to [ADM1169](#) SuperSequencer® ICs. The board is easy to use, easy to probe, allows flexible wiring, and offers multiple board cascadability.

### SUPPORTED DEVICES

The evaluation board is designed to support all [ADM1062](#) to [ADM1169](#) devices in various packages. A device socket is generally required for use with this board.

Devices can be easily fitted and changed using the [ADM1062](#) to [ADM1169](#) device sockets. Solder pads for a single 48-lead thin, plastic quad flat package (TQFP) is also available on the board, allowing the user to solder parts onto the board.

Note the labeling on the board. For example, VP1/VX4 indicates a change in function depending on the [ADM1062](#) to [ADM1169](#) device in use. The text on the left, VP1, is for use with the [ADM1062](#) to [ADM1067](#) and [ADM1166](#), whereas the text on the right, VX4, is for use with the [ADM1068/ADM1069/ADM1168/ADM1169](#).

### POWER SUPPLIES

The evaluation board can accept 9 V to 14.4 V from a bench power supply through Connector J1 and Connector J2. It also supports a wall-mountable switching power supply with the same voltage range using Connector J3. J3 is grounded in the core and has polarity protection circuits to prevent damage due to incorrect polarity setup. The current consumption of the board depends on the exact configuration but is typically less than 200 mA.

### INPUTS EMULATION

Ten onboard adjustable voltage regulators from Analog Devices, Inc., provide input supply emulation for all different setups supported by the [ADM1062](#) to [ADM1169](#) devices. Each regulator operates independently and output voltages can be easily adjusted by hand using an on-board rotating potentiometer.

Every regulator can be enabled or disabled by the user or by the [ADM1062](#) to [ADM1169](#) device, depending on the jumper configuration. Each regulator has an LED assigned to it to indicate its status.

All regulators have a feedback pin that allows the user to evaluate the margining function of the [ADM1062](#) to [ADM1169](#) devices.

An additional on-board two-way, push-pull/open-drain switch, S3, can be used by the user to emulate digital inputs, if required.

### OUTPUT SIGNALS

PDO output signals from the [ADM1062](#) to [ADM1169](#) devices can be easily wired across to the regulator enable control circuits to control the on-board voltage regulators. This allows the board to perform simulations for real-world sequencing applications. The DAC output signals can also be wired to the feedback node of the regulators to achieve supply margining.

The wiring is made easy with the point-to-point patch cables included in the evaluation kit. The user can easily cross link the PDO output to a regulators enable input or connect DAC outputs to a regulator's feedback node.

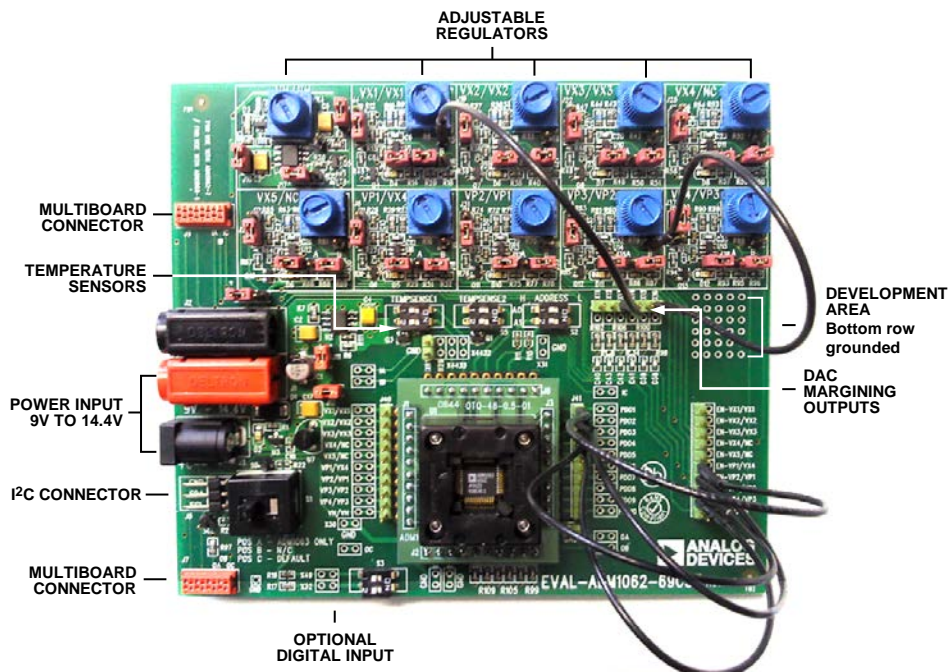


Figure 1. Evaluation Board Wiring with Point-To-Point Patch Cables

08644-001

## I<sup>2</sup>C INTERFACE

The evaluation board supports an I<sup>2</sup>C interface. The user can connect from the PC USB port to the board using the USB-SMBUS-CABLEZ dongle from Analog Devices. The dongle has internal pull-ups for the SDA and SCL bus. Users can use their own I<sup>2</sup>C cable. The evaluation board can provide on-board 3.3 V voltage pull-up by populating R21 and R22.

The board is compatible with all [ADM1062](#) to [ADM1169](#) evaluation software.

## MULTIPLE BOARD SETUP

Connector J7 and Connector J9, along with the eight-way ribbon cable, allow multiple EVAL-ADM1062-69CASZ boards to be connected together to evaluate complex cascade sequencing setups.

The connection cable carries both power and I<sup>2</sup>C communication signals across every board that is connected. The user only needs to connect the power and I<sup>2</sup>C cable to one board. It is recommended to connect the power supply to the board in the middle of the multiple board setup to avoid uneven power dissipation in the traces/cables.

Apart from power and I<sup>2</sup>C signals, the cable also links three independent GPIO signal lines between the two boards that it connects. The user can connect them to the inputs and/or outputs of the [ADM1062](#) to [ADM1169](#) devices to achieve sequencing across multiple boards. This allows multiple [ADM1062](#) to [ADM1169](#) devices to work together to increase the number of supply rails to be sequenced and monitored.

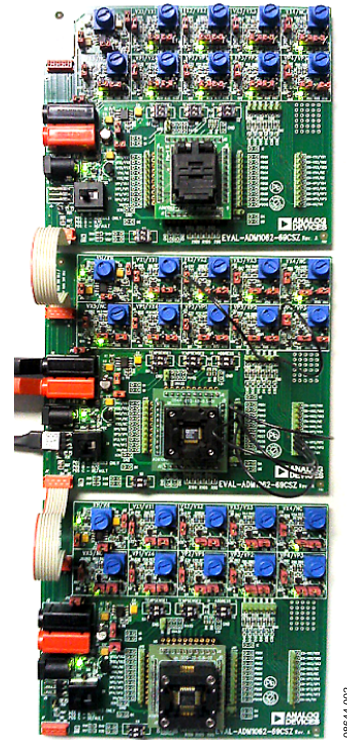


Figure 2. Multiple Boards Connection

**SWITCH, JUMPER, AND LED FUNCTIONS****Table 2. Connector Functions**

| Switch           | Description   | Default                 |
|------------------|---|-------------------------|
| S1<br>S1-A       | I <sup>2</sup> C/mode control switch.<br>Position A allows the use of the ADM1063 device.<br>Position B allows the board to be isolated from I <sup>2</sup> C communications.<br>Position C allows the use of the ADM1062, ADM1064 to ADM1069, ADM1166, ADM1168, and ADM1169 devices. | Position C              |
| S2<br>S2-1       | Device address switch.<br>On: Address Pin A0 pulled down to ground.<br>Off: Address Pin A0 pulled up to VDDCAP.   | Off                     |
| S2-2             | On: Address Pin A1 pulled down to ground.<br>Off: Address Pin A1 pulled up to VDDCAP.   | Off                     |
| S3<br>S3-1       | Optional digital input switch.<br>Use in conjunction with X49.<br>X49 connected: push-pull.<br>X49 disconnected: open-drain.<br>On: X49 pulled to ground.<br>Off: X49 pulled to 3.3 V/high impedance.   | Disconnected<br><br>Off |
| S3-2             | Use in conjunction with X32.<br>X32 connected: push-pull.<br>X32 disconnected: open-drain.<br>On: X32 pulled to ground.<br>Off: X32 pulled to 3.3 V/high impedance.   | Disconnected<br><br>Off |
| S4<br>S4-1, S4-2 | External Temperature Sensor 1 control switch (for use with the ADM1062 and ADM1063).<br>Both on: External Temperature Sensor 1 connected.<br>Both off: External Temperature Sensor 1 disconnected.  | Both off                |
| S5<br>S5-1, S5-2 | External Temperature Sensor 2 control switch (for use with the ADM1063 only).<br>Both on: External Temperature Sensor 2 connected.<br>Both off: External Temperature Sensor 2 disconnected.   | Both off                |

**Table 3. Jumper Functions**

| Jumper | Corresponding Regulator/Rails | Description   | Default   |
|--------|-------------------------------|---|-----------|
| J13    | VH/VH                         | Rail isolation jumper. Disconnect to isolate the corresponding regulators from its power supply. Can be used for debug. | Connected |
| J6     | VX1/VX1                       |   |           |
| J20    | VX2/VX2                       |   |           |
| J23    | VX3/VX3                       |   |           |
| J26    | VX4/NC                        |   |           |
| J29    | VX5/NC                        |   |           |
| J14    | VP1/VX4                       |   |           |
| J32    | VP2/VP1                       |   |           |
| J35    | VP3/VP2                       |   |           |
| J38    | VP4/VP3                       |   |           |
| J11    | 7 V (intermediate)            |   |           |
| J12    | 3.3 V (pull-up)               |   |           |

| Jumper | Corresponding Regulator/Rails | Description  | Default      |
|--------|-------------------------------|--|--------------|
| J10    | VH                            | Controls the output of the VH regulator.   | Connected    |
| J15    | ADM1062 to ADM1169 VH pin     | Controls the source voltage connected to the VH pin of the ADM1062 to ADM1169 device.<br>Connect left: connect VH pin to on-board VH regulator.<br>Connect right: connect VH pin directly to board supply.<br>Leave unconnected: leave VH pin unconnected. | Connect left |
| J17    | VH/VH                         | Regulator control jumpers. Position A: regulator always on. Position B: regulator controlled by the PDO output signal of the ADM1062 to ADM1169. Unplugged: regulator shutdown.  | Position A   |
| J16    | VX1/VX1                       |  |              |
| J21    | VX2/VX2                       |  |              |
| J24    | VX3/VX3                       |  |              |
| J27    | VX4/NC                        |  |              |
| J30    | VX5/NC                        |  |              |
| J18    | VP1/VX4                       |  |              |
| J33    | VP2/VP1                       |  |              |
| J36    | VP3/VP2                       |  |              |
| J39    | VP4/VP3                       |  |              |
| J4     | VX1/VX1                       | Regulator output voltage divider control jumpers. Position A: normal regulator output. Position B: 1/3 of normal regulator output. Unplugged: disconnect regulator output.   | Position A   |
| J19    | VX2/VX2                       |  |              |
| J22    | VX3/VX3                       |  |              |
| J25    | VX4/NC                        |  |              |
| J28    | VX5/NC                        |  |              |
| J8     | VP1/VX4                       |  |              |
| J31    | VP2/VP1                       |  |              |
| J34    | VP3/VP2                       |  |              |
| J37    | VP4/VP3                       |  |              |
| J40    | VXx/VPx/VH                    |  |              |
| J41    | PDOx                          | Connector used for device outputs probing.   |              |

Table 4. LED Functions

| LED | Rails                  | Description   |
|-----|------------------------|---|
| D3  | VH/VH                  | Power indication LEDs. On position indicates voltage on corresponding rail. |
| D4  | VX1/VX1                |   |
| D6  | VX2/VX2                |   |
| D7  | VX3/VX3                |   |
| D8  | VX4/NC                 |   |
| D9  | VX5/NC                 |   |
| D5  | VP1/VX4                |   |
| D10 | VP2/VP1                |   |
| D11 | VP3/VP2                |   |
| D12 | VP4/VP3                |   |
| D2  | Board main power input |   |

**Table 5. Patching Through-Hole Connection Points**

| Connection Points  | Connected To   | Description   |
|--|--|---|
| VX1/VX1<br>VX2/VX2<br>VX3/VX3<br>VX4/NC<br>VX5/NC<br>VP1/VX4<br>VP2/VP1<br>VP3/VP2<br>VP4/VP3<br>VH/VH                               | VX1/VX1 pin of the ADM1062 to ADM1169<br>VX2/VX2 pin of the ADM1062 to ADM1169<br>VX3/VX3 pin of the ADM1062 to ADM1169<br>VX4/NC pin of the ADM1062 to ADM1169<br>VX5/NC pin of the ADM1062 to ADM1067 and ADM1166<br>VP1/VX4 pin of the ADM1062 to ADM1169<br>VP2/VP1 pin of the ADM1062 to ADM1169<br>VP3/VP2 pin of the ADM1062 to ADM1169<br>VP4/VP3 pin of the ADM1062 to ADM1067 and ADM1166<br>VH/VH pin of the ADM1062 to ADM1169 | Input connections of the ADM1062 to ADM1169.  |
| PDO1<br>PDO2<br>PDO3<br>PDO4<br>PDO5<br>PDO6<br>PDO7<br>PDO8<br>PDO9<br>PDO10  | PDO1 pin of the ADM1062 to ADM1169<br>PDO2 pin of the ADM1062 to ADM1169<br>PDO3 pin of the ADM1062 to ADM1169<br>PDO4 pin of the ADM1062 to ADM1169<br>PDO5 pin of the ADM1062 to ADM1169<br>PDO6 pin of the ADM1062 to ADM1169<br>PDO7 pin of the ADM1062 to ADM1169<br>PDO8 pin of the ADM1062 to ADM1169<br>PDO9 pin of the ADM1062 to ADM1067 and ADM1166<br>PDO10 pin of the ADM1062 to ADM1067 and ADM1166                          | Output connections of the ADM1062 to ADM1169.   |
| EN-VX1/VX1<br>EN-VX2/VX2<br>EN-VX3/VX3<br>EN-VX4/NC<br>EN-VX5/NC<br>EN-VP1/VX4<br>EN-VP2/VP1<br>EN-VP3/VP2<br>EN-VP4/VP3<br>EN-VH/VH | VX1/VX1 regulator<br>VX2/VX2 regulator<br>VX3/VX3 regulator<br>VX4/NC regulator<br>VX5/NC regulator<br>VP1/VX4 regulator<br>VP2/VP1 regulator<br>VP3/VP2 regulator<br>VP4/VP3 regulator<br>VH/VH regulator   | Connected to the enable circuit of the regulators; connect to PDO outputs directly to allow the ADM1062 to ADM1169 device to take control of the regulator. |
| X11<br>X12<br>X13<br>X14   | DAC1 pin of the ADM1062, ADM1066, ADM1067, ADM1069, ADM1166, and ADM1169<br>DAC2 pin of the ADM1062, ADM1066, ADM1067, ADM1069, ADM1166, and ADM1169<br>DAC3 pin of the ADM1062, ADM1066, ADM1067, ADM1069, ADM1166, and ADM1169<br>DAC4 pin of the ADM1062, ADM1066, ADM1067, ADM1069, ADM1166, and ADM1169   | DAC outputs of the ADM1062, ADM1066, ADM1067, ADM1069, ADM1166, and ADM1169   |
| X15<br>X16   | DAC5 pin of the ADM1062, ADM1066, ADM1067, and ADM1166<br>DAC6 pin of the ADM1062, ADM1066, ADM1067, and ADM1166   | DAC outputs of the ADM1062, ADM1066, ADM1067, and ADM1166   |

| Connection Points  | Connected To  | Description   |
|--|---|---|
| T4<br>T5<br>T6<br>T7<br>T8<br>T9<br>T10<br>T11<br>T12<br>T13 | SET pin of VH/VH regulator (ADP3367)<br>Feedback pin of the VX1/VX1 regulator<br>Feedback pin of the VX2/VX2 regulator<br>Feedback pin of the VX3/VX3 regulator<br>Feedback pin of the VX4/NC regulator<br>Feedback pin of the VX5/NC regulator<br>Feedback pin of the VP1/VX4 regulator<br>Feedback pin of the VP2/VP1 regulator<br>Feedback pin of the VP3/VP2 regulator<br>Feedback pin of the VP4/VP3 regulator | Connected to the feedback pin of the regulators; connect to the X11 to X16 inputs for supply margining (see the Margining Guide section). |
| X49<br>X32   | S3-1<br>S3-2  | Optional digital inputs can be set as open-drain or push-pull.  |
| IA<br>IB<br>IC   | J9 (OA of the connected board)<br>J9 (OB of the connected board)<br>J9 (OC of the connected board)  | I/Os for multiple board setup.  |
| OA<br>OB<br>OC   | J7 (IA of the connected board)<br>J7 (IB of the connected board)<br>J7 (IC of the connected board)  | I/Os for multiple board setup.  |

## SOCKET SELECTION GUIDE

Table 6.

| Model             | Description                          | Corresponding Devices                         |
|-------------------|--------------------------------------|---|
| SOCKET-ADM106xTQZ | ADM1062TQ to ADM1166TQ daughter card | ADM1062 to ADM1067 and ADM1166 in TQFP        |
| SOCKET-ADM106xLFZ | ADM1062LF to ADM1166LF daughter card | ADM1062 to ADM1067 and ADM1166 in LFCSP       |
| SOCKET-ADM106xLQZ | ADM1068LQ to ADM1169LQ daughter card | ADM1068, ADM1069, ADM1168 and ADM1169 in LQFP |
| SOCKET-ADM1069LFZ | ADM1069LF daughter card              | ADM1069 and ADM1169 in LFCSP                  |



## MARGINING GUIDE

The [ADP3331](#) LDO is used to provide adjustable  $V_X$  and  $V_P$  input voltages.

The feedback topology for this part is different from other regulators (see Figure 3). Another voltage divider is used inside the part to provide feedback voltage to the error amplifier. This causes margining calculation in the ADM1062 to ADM1169 evaluation software tool to be different.

A separate Excel tool has been created for users to calculate the settings for margining function.

Note that closed-loop margining is less affected by this topology, although the margining range may differ from the calculated values in the software tool. For the  $V_H$  pin, the use of [ADP3367](#) results in the margining functions performing correctly with both open and closed loop.

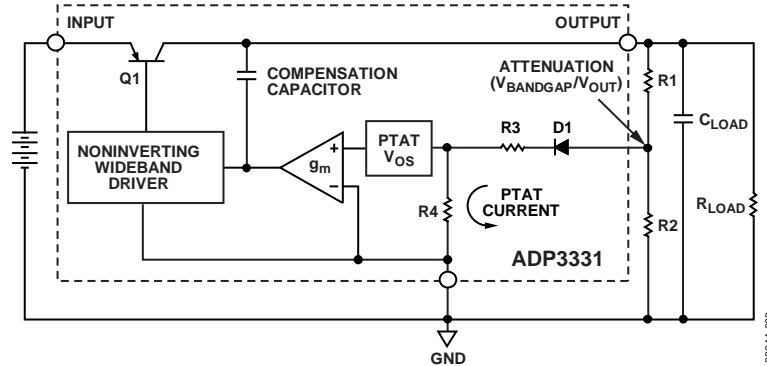


Figure 3. [ADP3331](#) Functional Diagram

# EVALUATION KIT QUICK START GUIDE

## HARDWARE SETUP

### For ADM1062 to ADM1067 and ADM1166 Evaluation Kits

1. Put jumpers J4, J19, J22, J25, and J28 into Position A. This puts the output of LDOs connected to VXx inputs to lower voltage ranges.
2. Put jumpers J16, J21, J24, J27, J30, J18, J33, J36, and J39 into Position B. This makes the LDOs connected to VXx and VPx inputs enabled by external signals.
3. Use the point-to-point patch cables to connect the PDOx pins to the enable pins of the LDOs as shown in Figure 4 and Figure 5.

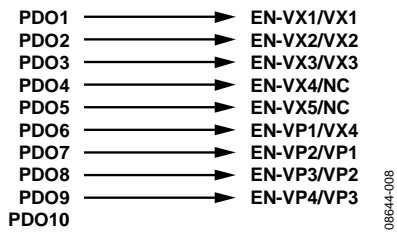


Figure 4. Demo Patch Connection 1

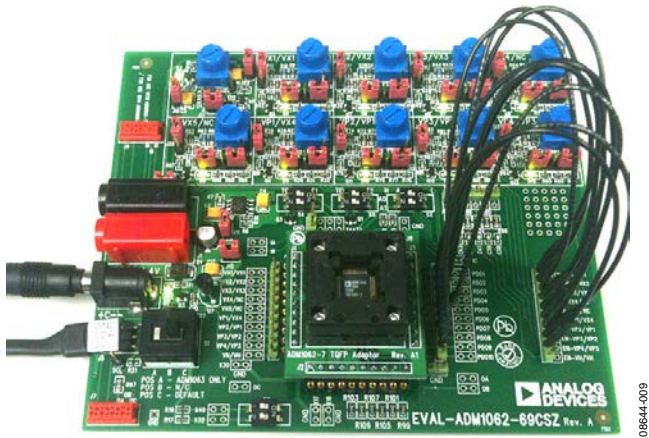


Figure 5. Evaluation Kit Quick Start Setup

### For ADM1068 to ADM1069 and ADM1168 to ADM1169 Evaluation Kits

1. Put jumpers J4, J19, and J22 into Position A. This puts the output of LDOs connected to VXx inputs to a lower voltage range.
2. Remove the jumpers J27 and J30 to disable the LDOs that are not used.
3. Put jumpers J16, J21, J24, J18, J33, J36, and J39 into Position B. This makes the LDOs connected to VXx and VPx inputs enabled by external signals.
4. Use the point-to-point patch cables to connect the PDOx pins to the enable pins of the LDOs as shown in Figure 6.

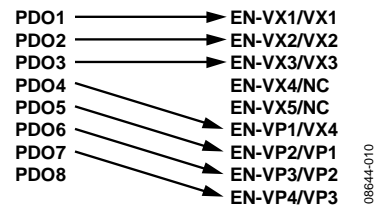


Figure 6. Demo Patch Connection 2

5. For the [ADM1063](#) evaluation kit, switch S1 to Position A.
6. Keep every other switch and jumper in the default positions.
7. Place the device into the IC socket, and connect the board to the PC using the USB-to-I<sup>2</sup>C dongle.
8. Apply power to the board.

**SOFTWARE SETUP**

1. Download and install the ADM106x and ADM116x Super-Sequencer [evaluation software](#) from analog.com. The software package includes a GUI evaluation tool, a command-line based Prog106x tool, and USB-to-I<sup>2</sup>C dongle drivers.
2. Download the [Supersequencer quick start demo configurations.zip](#) file; this contains the device configuration files for the demo. There are two demo configurations for each device types, demo1 and demo2. Each configuration is saved in both \*.txt and \*.hex format. Users can use the GUI evaluation software to load the \*.txt file or use the Prog106x tool to load the \*.hex file. This user guide describes the former; for details of the Prog106x tool refer to user guide UG-049.
3. Run the GUI ADM106x and ADM116x SuperSequencer evaluation software, and select the appropriate I<sup>2</sup>C interface, then click **Work Online** as shown in Figure 7.

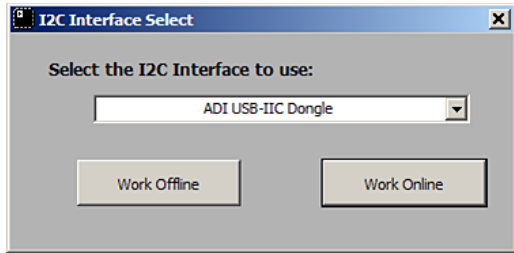


Figure 7. I<sup>2</sup>C Interface Select

4. The software searches for all the [ADM1062](#) to [ADM1169](#) devices connected to the interface. Verify the device and address that appears in the device list and click **Continue**.

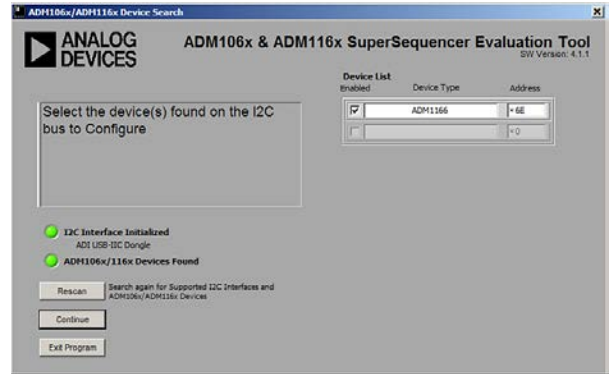


Figure 8. Device Search

5. Click **No** in the pop-up window to prevent usage of information from the previous session.

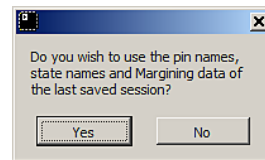


Figure 9. Prevent Usage of Previous Information

**DEMO 1**

1. Use the menu bar and navigate to **File->Recall Settings From File**, or use the shortcut key **Ctrl + R**.

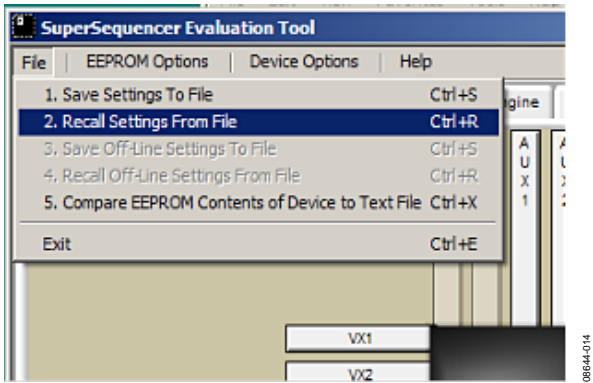


Figure 10. Recall Settings

2. Click **Recall** and then navigate to and select the Demo1 .txt file of the appropriate device.

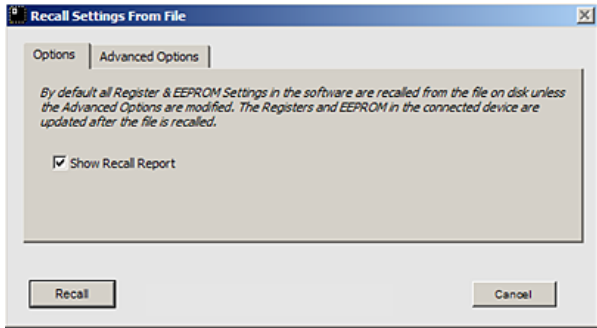


Figure 11. Recall Settings

3. Verify the checksums and click **OK**.



Figure 12. Verify Checksums

4. Observe the LEDs on the evaluation board flashing in periodic sequence. The Demo 1 configuration simply uses the timeout exit condition of the sequencing engine to sequence the enable signals of the LDOs.
5. Examine the details of the device outputs configuration and sequencing engine content in the **Outputs and Sequencing Engine** tabs of the GUI as shown in Figure 13 and Figure 14.

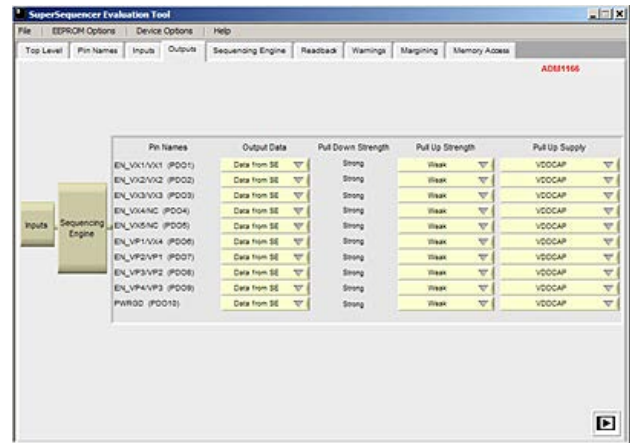


Figure 13. Outputs Tab

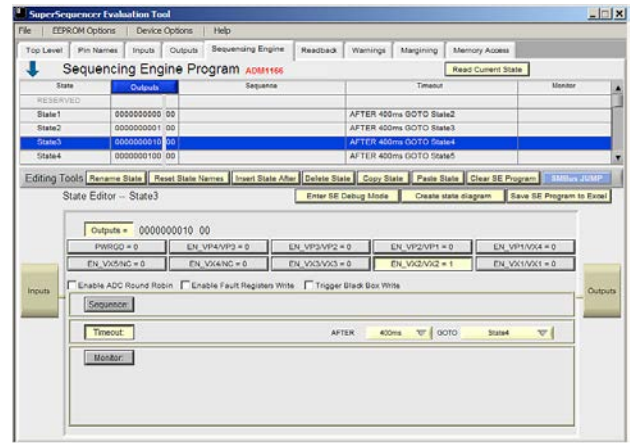


Figure 14. Sequencing Engine Tab

**DEMO 2**

Use the same method described in the Demo 1 section to load the corresponding Demo 2 configuration .txt file into the device.

The sequencing engine configuration in Demo 2 is more complex and closely resembles the setup for a real application. Most of the sequencing engine states use all three exit conditions, namely sequence, timeout, and monitor. The status of each supply being enabled is checked, ensuring that all supplies are powered up to the correct level and are stable before advancing the sequencing engine.

If the supply did not rise to the expected level after the timeout period, the sequencing engine can exit to a user-defined fault state. In each state, the sequencing engine also monitors the status of the supplies being enabled in previous states to ensure the integrity of the supply chain. The status of each inputs can be defined using the **Inputs** tab shown in Figure 15.

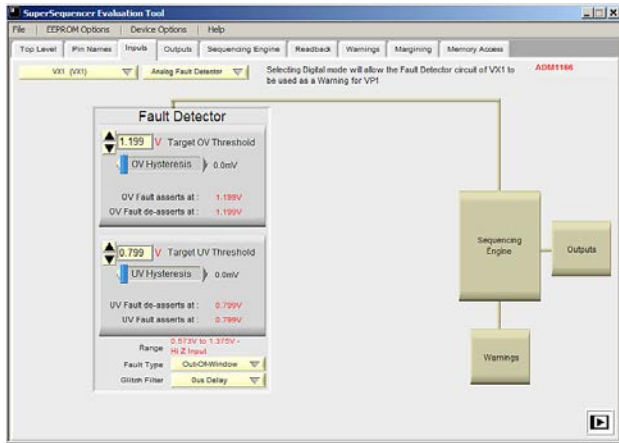


Figure 15. Inputs Tab

In Demo 2, a window comparator is applied to each of the inputs except for VH. Use the knob of on-board potentiometer to adjust the voltages on VXx and VPx inputs to the exact level in order to advance the sequencing engine, starting from VX1.

Observe the sequencing engine advancement based on the status of the on-board LEDs, or use a DMM to probe each VXx and VPx inputs while tweaking the knob to get the accurate voltage reading. For devices with ADC functions, use the **Readback** tab to continuously read the voltage level on each inputs as shown in Figure 16. Note that the J4, J19, J22, J25, J28 jumpers may need to be in Position B to achieve low voltage on the VXx inputs.

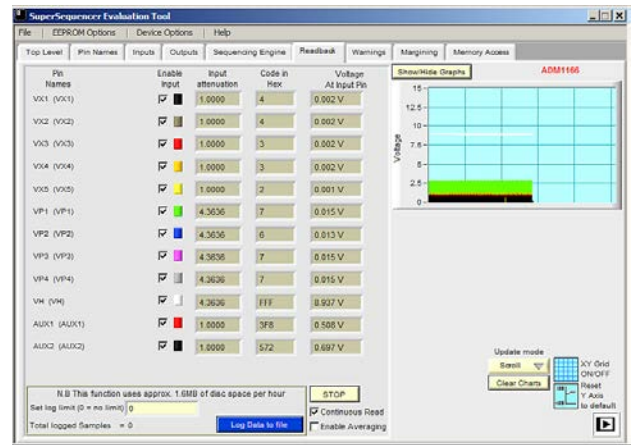
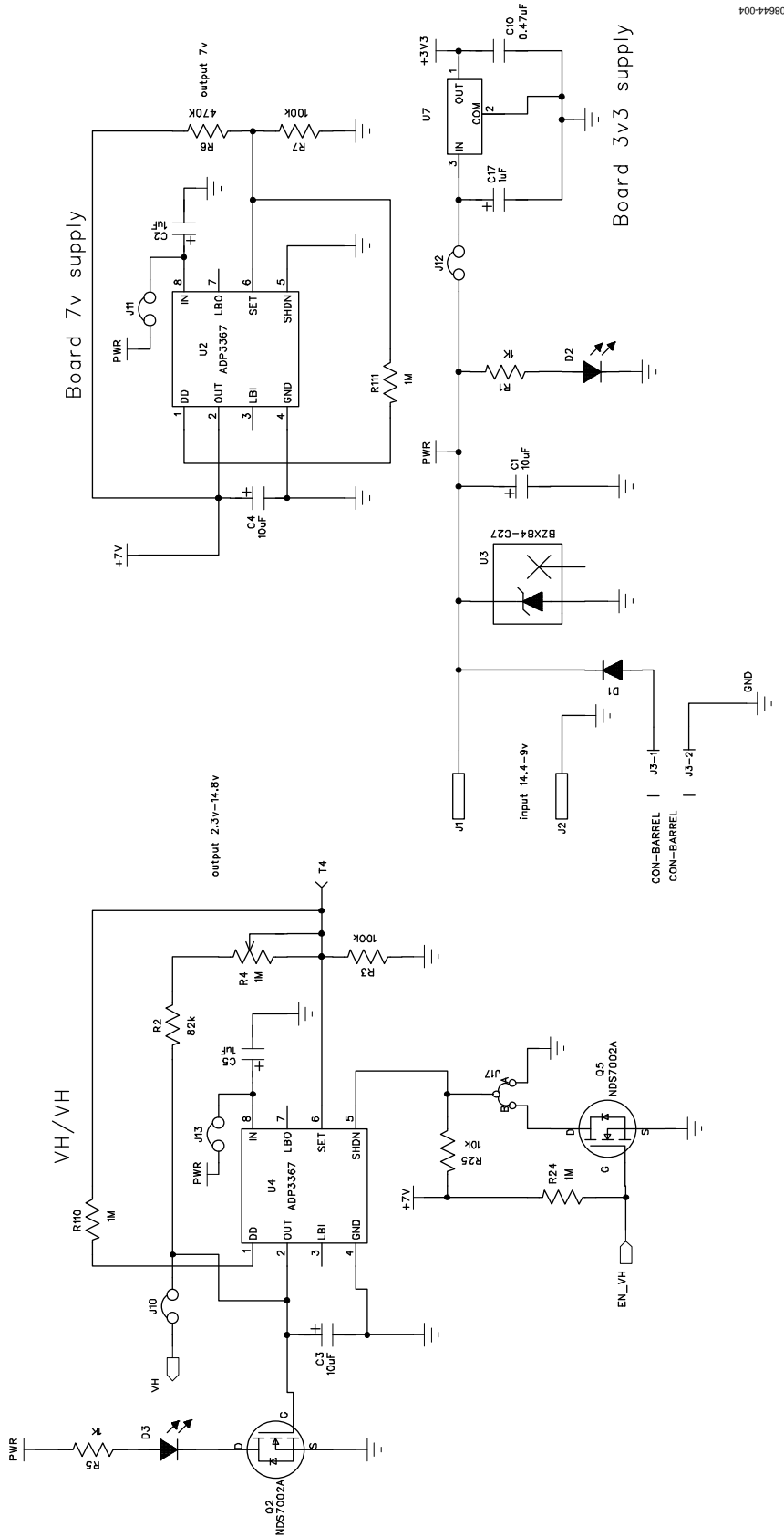


Figure 16. Readback Tab

EVALUATION BOARD SCHEMATICS



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Figure 17. Board Schematic 1  
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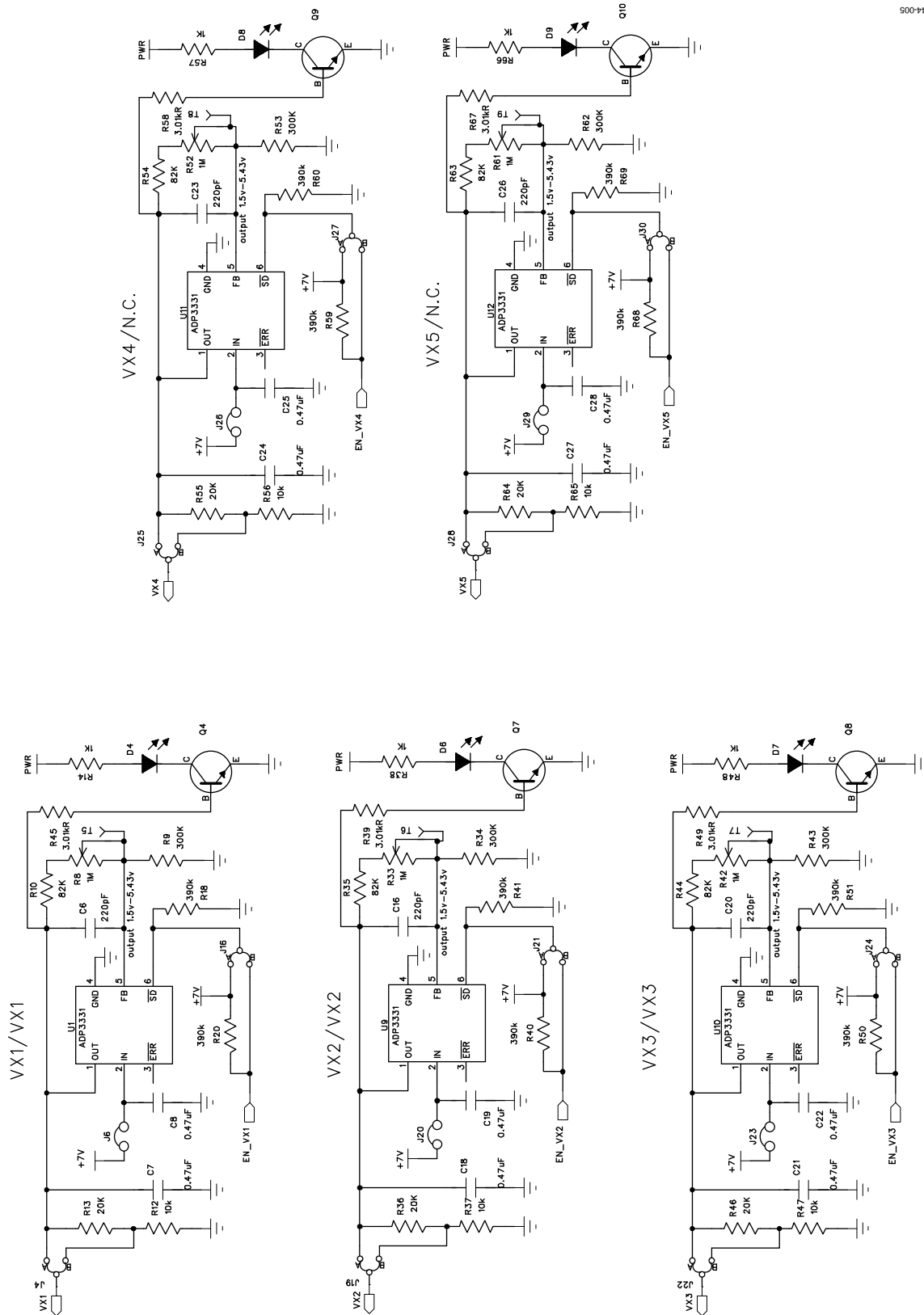


Figure 18. Board Schematic 2

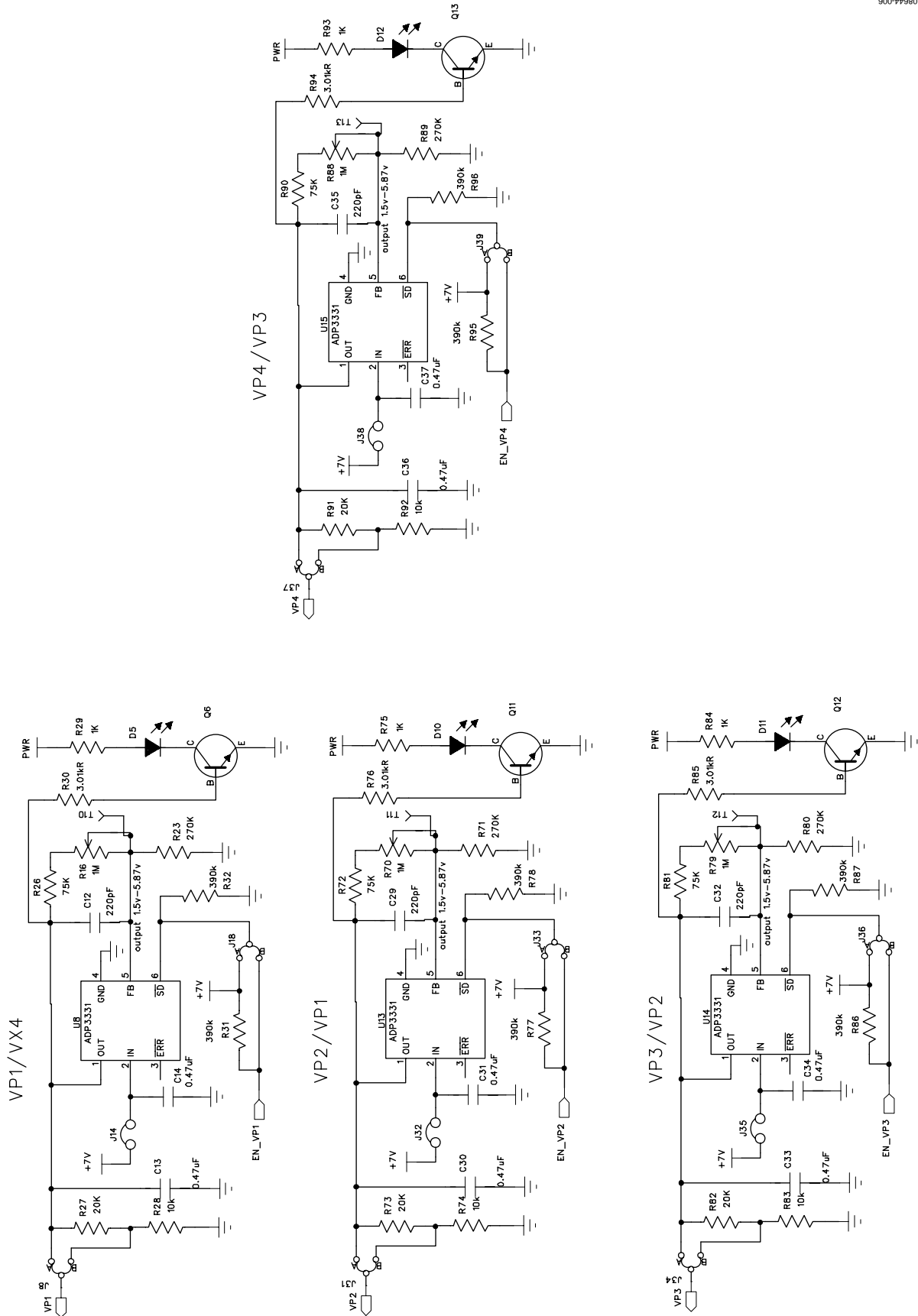


Figure 19. Board Schematic 3



09844-007

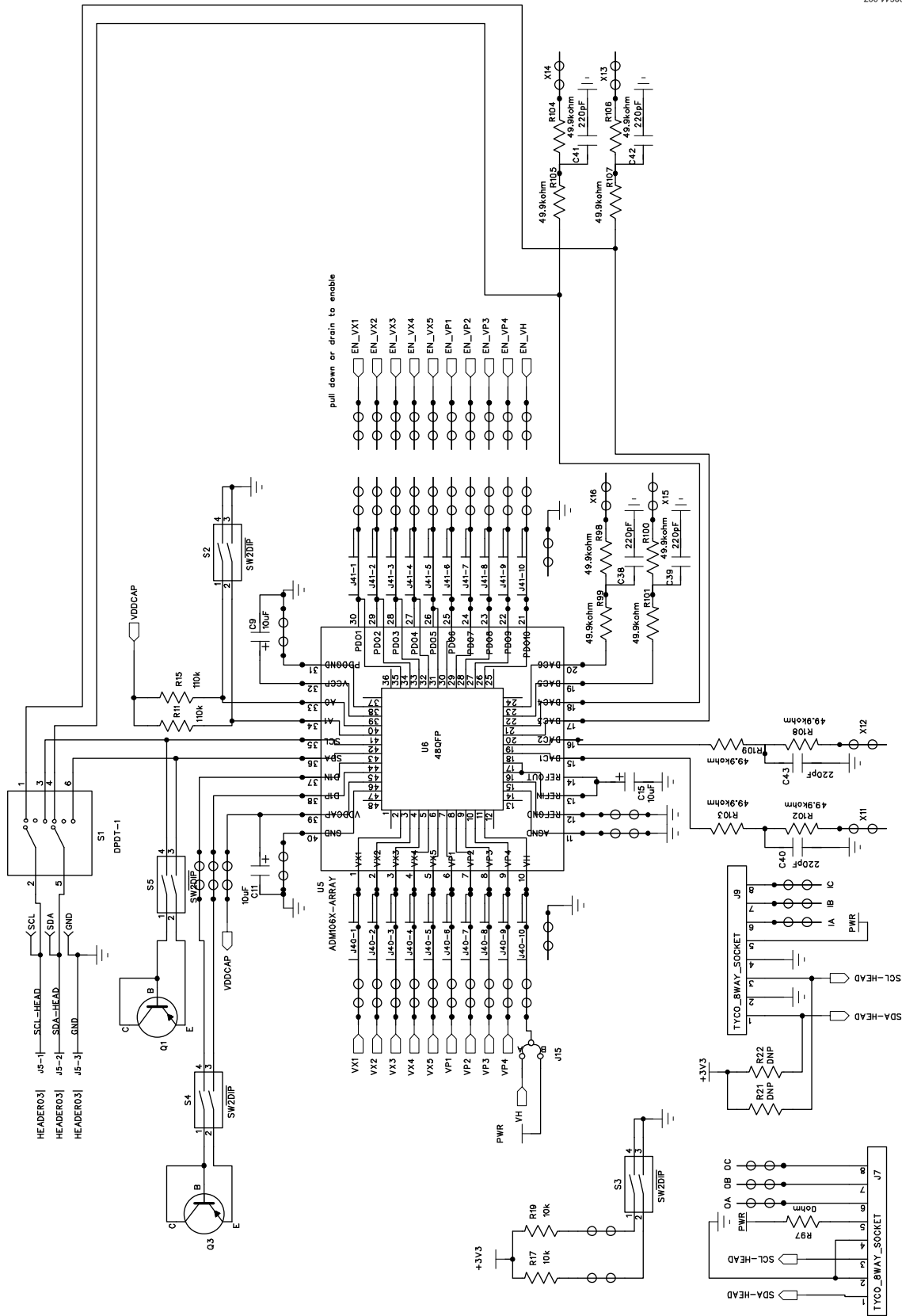


Figure 20. Board Schematic 4

## ORDERING INFORMATION

## BILL OF MATERIALS

Table 7.

| Reference Designator   | Description   | Manufacturer         | Part Number            | Stock Code <sup>1</sup>  |
|--|---|----------------------|------------------------|--------------------------|
| C1   | Aluminum electrolytic capacitor, Case C, 35 V, 10 $\mu$ F           | Panasonic            | EEE1VA100SR            | FEC 9697012              |
| C7, C8, C10, C13, C14, C18, C19, C21, C22, C24, C25, C27, C28, C30, C31, C33, C34, C36, C37                        | SMD capacitor, 0.47 $\mu$ F, 20%                                    | Phycomp              | CC0603MRY5V7BB474      | FEC 3188851              |
| C3, C4, C9, C11, C15   | 16 V SMD tantalum capacitor, 10 $\mu$ F, 10%                        | AVX                  | TAJB106K016R           | FEC 498-737              |
| C6, C12, C16, C20, C23, C26, C29, C32, C35, C38, C39, C40 to C43   | SMD capacitor, 220 pF, 5%   | Phycomp              | CC0603JRNPO9BN221      | FEC 430948               |
| C2, C5, C17  | Capacitor, Case B, 1.0 $\mu$ F, 35 V, 10%                           | Kemet                | B45196E6105K209        | FEC 9754032              |
| D1   | Diode, Schottky, 2 A, 20 V, SMB                                     | Vishay               | SL22                   | FEC 9550780              |
| D2 to D12  | Green 0805 chip LED   | Kingbright           | KP-2012SGC             | FEC 1318243              |
| EN-VH/VH, EN-VP1/VX4, EN-VP2/VP1, EN-VP3/VP2, EN-VP4/VP3, EN-VX1/VX1, EN-VX2/VX2, EN-VX3/VX3, EN-VX4/NC, EN-VX5/NC | Patchwork area, not populated                                       | N/A                  | N/A                    | N/A                      |
| GND, IA, IB, IC  | Plated hole, keep free of solder                                    | N/A                  | N/A                    | N/A                      |
| J1   | Red 4 mm banana socket  | Deltron              | 571-0500-01            | FEC 1101127              |
| J2   | Black 4 mm banana socket  | Deltron              | 571-0100-01            | FEC 1101128              |
| J6, J10 to J14, J20, J23, J26, J29, J32, J35, J38  | 2-pin (0.1" pitch) header and shorting shunt                        | Harwin               | M20-9990246, M7566-05  | FEC 1022247, FEC 150-411 |
| J4, J8, J15 to J19, J21, J22, J24, J25, J27, J28, J30, J31, J33, J34, J36, J37, J39                                | 3-pin (0.1" pitch) header and shorting shunt inserted in Position A | Harwin               | M20-9990346, M7566-05  | FEC 1022249, FEC 150-411 |
| J3   | 2.1 mm dc barrel power connector                                    | Cliff                | DC10A                  | FEC 224-959              |
| J40, J41   | Header, 1-row, 10-way   | Tyco Electronics     | 1-826629-0             | FEC 3418376              |
| J5   | Header, right angle, 1-row, 3-way                                   | Harwin               | M22-2030305            | FEC 672129               |
| J7, J9   | 8-way top entry socket (board-to-board)                             | Tyco Electronics/Amp | 7-215079-8             | FEC 148593               |
| OA, OB, OC, PDO1 to PDO10  | Patchwork area, not populated                                       | N/A                  | N/A                    | N/A                      |
| Q1, Q3   | Transistor, PNP, SOT-23   | NXP                  | BC807-40               | FEC 1081222              |
| Q2, Q5   | N-channel, enhancement mode, TMOSFET                                | Fairchild            | NDS7002A               | FEC 984-5437             |
| Q4, Q6 to Q13  | General-purpose NPN SMD transistor                                  | NXP                  | BC850C                 | FEC 1081241              |
| R1, R5, R14, R29, R38, R57, R48, R66, R75, R84, R93  | Resistor, RC22H, 0603, 1 k $\Omega$ , 1%                            | Phycomp              | RC0603FR-071KL         | FEC 9238484              |
| R2, R10, R35, R44, R54, R63  | Resistor, 0603, 82 k $\Omega$ , 1%                                  | Multicomp            | MC 0.063W 0603 1% 82K  | FEC 9331573              |
| R3, R7   | Resistor, RC22H, 0603, 100 k $\Omega$ , 1%                          | Phycomp              | RC0603FR-07100KL       | FEC 9238727              |
| R4, R8, R16, R33, R42, R52, R61, R70, R79, R88   | 3/8" square (10 mm) single-turn potentiometer, 1 M $\Omega$         | Vishay               | M63M105KB30T607        | FEC 9608290              |
| R6   | Resistor, RC22H, 0603, 470 k $\Omega$ , 1%                          | Phycomp              | RC0603FR-07470KL       | FEC 9238808              |
| R11, R15   | Resistor, 110 k $\Omega$ , 1%                                       | Multicomp            | MC 01W 0603 1% 110K    | FEC 9332464              |
| R12, R17, R19, R25, R28, R37, R47, R56, R65, R74, R83, R92   | 10 k $\Omega$ resistor, 1%  | Vishay Dale          | CRCW060310K0FKEA       | FEC 1469748              |
| R13, R27, R36, R46, R55, R64, R73, R82, R91  | Resistor, 0603, 20 k $\Omega$ , 1%                                  | Multicomp            | MC 0.063W 0603 1% 20K  | FEC 9330771              |
| R18, R20, R31, R32, R40, R41, R50, R51, R59, R60, R68, R69, R77, R78, R86, R87, R95, R96                           | Resistor, 0603, 390 k $\Omega$ , 1%                                 | Multicomp            | MC 0.063W 0603 1% 390K | FEC 9331166              |

| Reference Designator  | Description  | Manufacturer       | Part Number            | Stock Code <sup>1</sup> |
|---|--|--------------------|------------------------|-------------------------|
| R21, R22  | DNP  | N/A                | N/A                    | Not assembled           |
| R23, R71, R80, R89  | Resistor, 0603, 270 k $\Omega$ , 1%  | Multicomp          | MC 0.063W 0603 1% 270K | FEC 9330941             |
| R24, R110, R111   | Resistor, RC21, 0603, 1 M $\Omega$ , 5%                                    | Phycomp            | RC0603JR-071ML         | FEC 9233741             |
| R26, R72, R81, R90  | Resistor, 0603, 75 k $\Omega$ , 1%   | Multicomp          | MC 0.063W 0603 1% 75K  | FEC 9331522             |
| R30, R39, R45, R49, R58, R67, R76, R85, R94   | Resistor, 0603, 3.01 k $\Omega$ , 1%                                       | Vishay Dale        | CRCW06033K01FKEA       | FEC 1469791             |
| R9, R34, R43, R53, R62  | Resistor, 0603, 300 k $\Omega$ , 1%  | Multicomp          | MC 0.063W 0603 1% 300K | FEC 9330992             |
| R98, R99, R100 to R109  | Resistor, 0805, 49.9 k $\Omega$ , 1%                                       | Vishay Dale        | CRCW080549K9FKEA       | FEC 1469934             |
| R97   | Resistor, RC11, 0805, 0 $\Omega$ , 1%                                      | Phycomp            | 9233750RL              | FEC 9233750RL           |
| S1  | DPDT switch  | Multicomp          | 6MD1S4M2RE             | FEC 1550249             |
| S2 to S5  | 2-way, dual-in-line switch   | Grayhill           | 78B02T                 | FEC 9479031             |
| SCL, SDA, T4 to T13   | Plated hole, keep free of solder   | N/A                | N/A                    | N/A                     |
| U1, U8, U9, U10 to U15  | Adjustable LDO regulator   | Analog Devices     | ADP3331ARTZ            | ADP3331ARTZ             |
| U2, U4  | LDO  | Analog Devices     | ADP3367ARZ             | ADP3367ARZ              |
| U3  | Diode, Zener, 27 V, 250 mW   | NXP                | BZX84-C27              | FEC 1081413             |
| U5  | 10-pin single-in-line socket terminal strip (eight 10-pin strips required) | Tyco               | 510-AG91D10-ESL        | FEC 1172526             |
| U6  | DNP  | N/A                | N/A                    | Not assembled           |
| U7  | Voltage regulator, 3.3 V   | STMicroelectronics | L78L33ACZ              | FEC 1467768             |
| VH/VH, VP1/VX4, VP2/VP1, VP3/VP2, VP4/VP3, VX1/VX1, VX2/VX2, VX3/VX3, VX4/NC, VX5/NC, X11 to X18, X29 to X32, X49, X4432, X4433 | Patchwork area, not populated  | N/A                | N/A                    | N/A                     |
| X60, X61  | Header, straight, 2-way  | Tyco               | 826926-2               | FEC 1248140             |

<sup>1</sup> FEC = Farnell ordering code.

## NOTES

I<sup>2</sup>C refers to a communications protocol originally developed by Philips Semiconductor (now NXP Semiconductors).

**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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