

General Description

The MAX34462 evaluation kit (EV kit) provides the hardware and software graphical-user interface (GUI) necessary to evaluate the MAX34462 PMBus™ 16-channel monitor/sequencer with differential inputs and margining DACs. The EV kit includes a MAX34462 installed as well as four power supplies that can be sequenced, monitored, and margined by the device.

EV Kit Contents

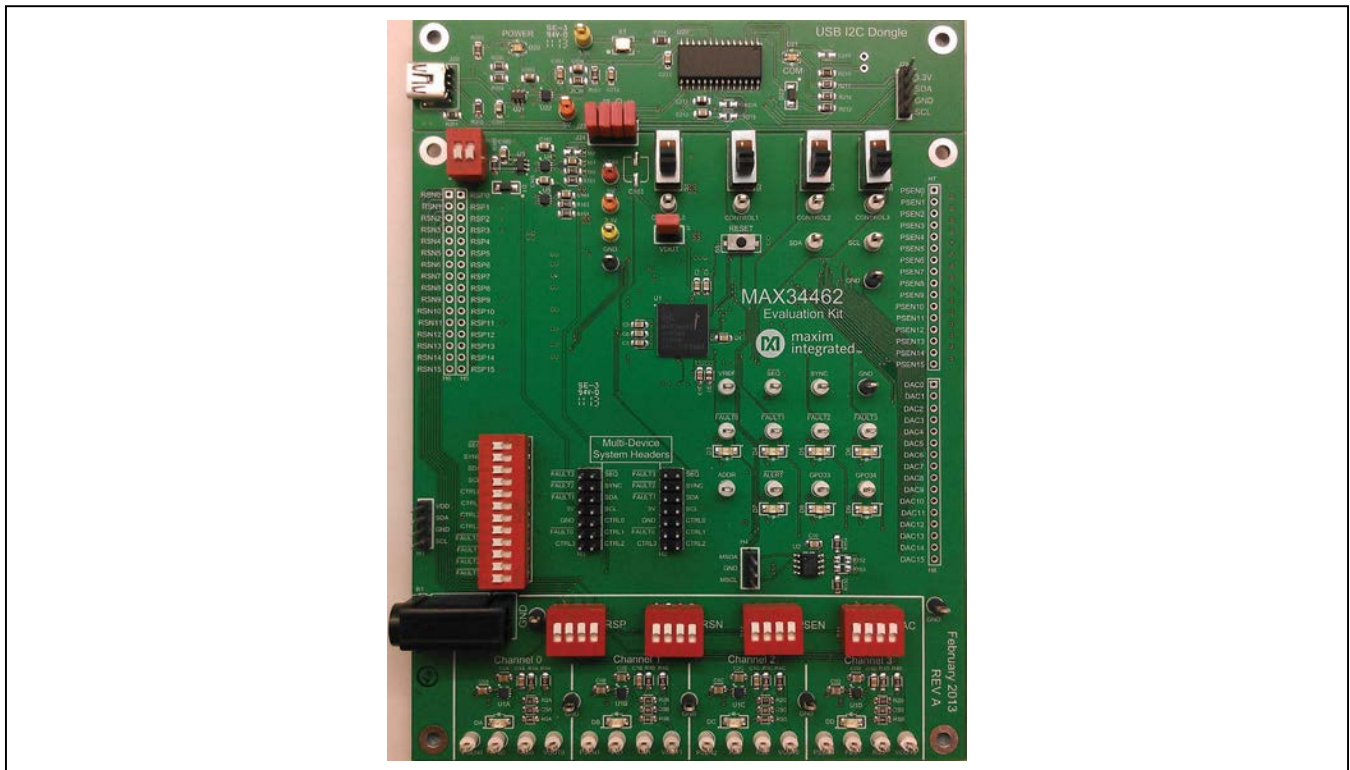
- Assembled Circuit Board Including MAX34462
- Mini USB Cable

Ordering Information appears at end of data sheet.

Features

- Easy Evaluation of the MAX34462
- Four Power-Supply Channels
- One Current-Sense Amplifier
- EV Kit Hardware is USB Powered (USB Cable Included)
- USB HID interface
- Windows XP®- and Windows® 7-Compatible Software
- RoHS Compliant
- Proven PCB Layout
- Fully Assembled and Tested

MAX34462 EV Kit Photo



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PMBus is a trademark of SMIF, Inc.

Component List

DESIGNATION	QTY	DESCRIPTION
B1	1	Black banana jack (GND)
C0A–C0D, C2A–C2D, C160, C162, C165, C201, C202, C204	14	10 μ F, X5R ceramic capacitors (0805)
C1	1	22nF, X7R ceramic capacitor (0805)
C1A–C1D, C17, C18, C161, C164, C203, C214	10	0.01 μ F, X7R ceramic capacitors (0805)
C2, C3, C4 C7–C15, C212	13	0.1 μ F, X7R ceramic capacitors (0805)
C5, C6, C166, C211	4	1 μ F, X7R ceramic capacitors (0805)
C16, C20–C35, C215	0	Do not populate, ceramic capacitors (0805)
C163	0	Do not populate, 470 μ F aluminum capacitor
C213	1	220nF, X7R ceramic capacitor (0805)
D1, D2, D22	3	Schottky diodes
D3–D9	6	Red LEDs (1206)
D20, D21	2	Red/green dual LEDs
DA–DD	4	Green LEDs (1206)
H1, J22–J24	4	4-pin headers, 2.54mm pitch
H2, H3	2	14-pin (2 x 7) headers, 2.54mm pitch
H4	1	3-pin header, 2.54mm pitch
H5–H8, J21	0	Do not populate, headers
J1	1	2-pin header, 2.54mm pitch
J1A–J1D	4	Solder bridges
J20	1	5-pin female Mini-USB
J80–J95	0	Do not populate, solder bridges
Q1–Q4	4	nMOS (3 SOT23)
R0–R15, R80–R95	32	0 Ω \pm 1% resistors (0603)
R1A–R1D	4	8.66k Ω \pm 1% resistors (0805)
R2A–R2D	4	3.09k Ω \pm 1% resistors (0805)
R3A–R3D	4	49.9 Ω \pm 1% resistors (0805)
R4A–R4D	4	267 Ω \pm 1% resistors (0805)
R5A–R5D	4	1k Ω \pm 1% resistors (0805)

DESIGNATION	QTY	DESCRIPTION
R20–R35, R116–R118, R152, R153, R162, R215, R216	0	Do not populate, resistors (0805)
R40–R55, R126, R128, R130, R161, R164, R170–R185, R207	38	10k Ω \pm 1% resistors (0805)
R56–R63, R100, R102, R104, R106, R108, R110, R112, R114, R120, R133, R134, R154, R155, R204	22	100k Ω \pm 1% resistors (0805)
R101, R125, R127, R129, R135	5	100 Ω \pm 1% resistors (0805)
R103, R105, R107, R109, R111, R113, R115, R211, R212	9	330 Ω \pm 1% resistors (0805)
R119, R121, R122, R132, R201, R202, R214	7	0 Ω \pm 1% resistors (0805)
R123, R124, R213	3	2.2k Ω \pm 1% resistors (0805)
R131, R150, R151, R210	4	4.7k Ω \pm 1% resistors (0805)
R160, R163, R206	3	45.3k Ω \pm 1% resistors (0805)
R165	1	0.1 Ω \pm 1% resistor (0805)
R203, R205	2	560 Ω \pm 1% resistors (0805)
S1–S4	4	SPDT slide switches
S5	1	Single-pole pushbutton switch
S6	1	12-pole DIP switch
S7	1	2-pole DIP switch
S8–S11	4	4-pole DIP switches
TP1	1	Red test point
TP2–TP6, TP9–TP11	8	Black test points
TP7, TP44	2	Orange test points
TP8, TP43	2	Yellow test points
TP27–TP42, TP100–TP116	33	White test points
U1	1	PMBus 16-channel monitor/sequencer (100 CSBGA) Maxim MAX34462EXQ+

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
U1A–U1D, U4, U5, U22	7	500mA LDO regulators (8 TDFN-EP*) Maxim MAX8902BATA+
U2	1	Digital temperature sensor (8 SO, 150mil) Maxim DS75LV5+
U3	1	25V/V precision current-sense amplifier (SOT23) Maxim MAX9938TEUK+

DESIGNATION	QTY	DESCRIPTION
U20	1	Microcontroller (28 SO) Microchip PIC18LF2550-I/SO
U21	1	50mA to 600mA current-limit switch (6 SOT23) Maxim MAX4995AAUT+
X1	1	48MHz, 3.3V oscillator (SMD) AVX KC3225A48.0000C30E00
—	5	Jumpers/shunts
—	1	Mini-USB cable
—	1	PCB: MAX34462 EV Kit

*EP = Exposed pad.

MAX34462 EV Kit Files

FILE	DESCRIPTION
MAX34462EVKitSoftwareInstall.EXE	Application program

Note: The .EXE file is downloaded as a .ZIP file.

Quick Start

Required Equipment

- MAX34462 EV kit hardware
- Windows XP or Windows 7 PC
- USB port
- Mini-USB cable (included)

Note: In the following sections, software-related items are identified by **bolding**. Text in bold refers to items directly from the install or EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

- 1) Ensure that jumpers/shunts on J23 and J1 are installed.
Note: The GND planes of the USB I²C dongle and the EV kit are not connected. The GND jumper on J23 must be connected for proper communication.
- 2) Ensure that the 4-pole DIP switches RSP, RSN, PSEN, and DAC are in the on position.
- 3) Set the EV kit hardware on a nonconductive surface to ensure that nothing on the PCB gets shorted together.
- 4) Prior to starting the GUI, connect the EV kit hardware to a PC using the supplied Mini-USB cable, or equivalent. The power LED (D20) should be green and the com LED (D21) should be red and slowly flash orange.

- 5) Windows should automatically begin installing the necessary device driver. The USB interface of the EV kit hardware is configured as an HID device and therefore does not require a unique/custom device driver. Once the driver installation is complete, a Windows message appears near the **System Icon** menu, indicating that the hardware is ready to use. Do not attempt to run the GUI prior to this message. If you do, you must close the application and restart it once the driver installation is complete. On some versions of Windows, administrator privileges may be required to install the USB device.
- 6) Once the device driver installation is complete, visit www.maximintegrated.com/evkitsoftware to download the latest version of the EV kit software, MAX34462EVKitSoftwareInstall.ZIP. Save the EV kit software to a temporary folder.
- 7) Open the .ZIP file and double-click the .EXE file to run the installer. A message box stating: **The publisher could not be verified. Are you sure you want to run this software?** may appear. If so, click **Yes**.
- 8) The installer GUI appears. Click **Next** and then **Install**. Once complete, click **Close**.
- 9) Go to **Start | All Programs**. Look for the **MAX34462EVKitSoftware** folder and click on the MAX34462EVKitSoftware.EXE inside the folder.
- 10) When the GUI appears, the text to the left of the Maxim logo should display **EV Kit Hardware Connected**. The com LED (D21) on the EV kit board should turn green.

Detailed Description of Software

Software Startup

If the MAX34462 EV kit is connected when the software is opened, the software first initializes the hardware to communicate. The software then searches for all slave addresses on the I²C bus and connects to the first valid slave address. The GUI displays **EV Kit Hardware Connected** to the left of the Maxim logo. If the EV kit is not connected on software startup, then the GUI populates with default EV kit values. Once the EV kit is connected, the GUI executes the sequence above.

Menu and Status Bar

The **File** menu item contains **Save**, **Load**, and **Exit** options. To save the current GUI configuration, click **Save Project As**. This saves the device name, pin names, and the RAM CRC to an XML file and saves PMBus configurations to a HEX file. If a device is connected, this reads and saves data directly from the device; otherwise, it saves the configuration that is currently displayed on the GUI. The STORE_DEFAULT_ALL (11h) command is appended to the end of the HEX file so that the configuration is saved to the main flash when the HEX file is loaded. **Load Project** updates the GUI with the XML file, writes the HEX file to the device, performs a STORE_DEFAULT_ALL (11h), and then reads current values from the device. The RAM CRC and main flash CRC are then read and compared to the CRC saved in the XML file. If a device is not connected, the HEX file is written to a virtual device. The HEX file only contains data for the PMBus commands that are stored in flash. **Create Report** saves a CSV file that contains all the configuration tables.

The **Connection** menu item allows the user to connect to a desired device. **Find Slave Addresses** searches for all slave addresses connected to the I²C bus. To select a device, click **Device1 Slave Address** and all the slave addresses found are shown and are selectable. Slave addresses 18h and 34h are not selectable to prevent communicating with the alert response address and factory-programmed address. If multiple devices are connected, then the number of devices to read/write is selected with the **Number of Devices** option.

The **Auto Polling** menu item allows the user to set the automatic polling rate. Select the delay between reads by choosing **300ms**, **600ms**, **800ms**, **1000ms**, **1500ms**, or **2000ms**. Press the **Auto Polling On** button in the status bar to start the polling. Each poll reads the **Power Status** (STATUS_WORD 79h), **Fault Status** (STATUS_WORD 79h), and the polled values for the **Data Log Graph** tab. The **Status** and **Margining** tabs are only polled if the tab is currently selected. If multiple devices are being polled, then selected polling rate options can be disabled to account for the longer time it takes to read all devices.

To stop polling, press the **Auto Polling Off** button on the status bar. Polling automatically stops if items in the **File** menu or **Connection** menu are selected. Polling also stops if any buttons that involve action with the NV fault log or flash are pressed.

The **GUI Lock** menu item allows the user to safely browse a configuration by preventing all controls from writing to registers. The **Clear Faults** button in the status bar sends the CLEAR_FAULTS (03h) command to clear any faults or warnings. To turn the power supplies on or off, select the **Power On/Power Off** button, which writes a value to the OPERATION (01h) command. The supplies power on with margining off and power off based on the **Power Down Action** drop-down list on the **Sequencing** tab.

Status Log

The status log below the tabs displays all the actions that the GUI performs. Whenever a PMBus command is read or written, the action is confirmed by the log. To save the log, press the **Save Log** button and the text in the box is saved to a .TXT file. The log can also be cleared by pressing the **Clear Log** button.

Sequencing Tab

The **Sequencing** tab sheet (Figure 1) includes all the sequence configuration and delays. All values on the tab are read when the tab is selected. The **On/Off Config** group box controls write to the ON_OFF_CONFIG (02h) command to set when the power supplies sequence on or off. The power supplies can be turned on with bias, with the CONTROL0/1/2/3 pin, or with the OPERATION (01h) command by selecting the option on the **Turn Power Supplies ON** drop-down list. To change the Control pins' polarity, select the **Active Low** or **Active High** radio buttons. The channels can be powered down simultaneously or with a TOFF delay by selecting the option in the **Power Down Action** drop-down list. The **SYNC pin Select** radio buttons set the pin as a **Master** or **Slave** by writing to MFR_MODE (D1h). To edit the sequencing table, the **Output Select** on the **PSEN/GPO** tab must be set to **Power Supply Enable (PSEN)** and the **Input Select** on the **Monitoring** tab must be set to **Sequence + Voltage Monitor**. The **Sequence On Select**, **Sequence Group**, **PG/GPI Select**, and **SEQ Match** columns read/write to MFR_SEQ_CONFIG (E8h). The **PG/GPI Select** columns can only be edited if the **Sequence On Select** for that channel is set to the **PG/GPI combo** options. To edit the **SEQ Match** column the **Sequence On Select** for that channel must be set to the **SEQ Pin Match** options. The sequencing delays can be set by writing values to **TON Delay** (TON_DELAY 60h), **TON Max** (TON_MAX_FAULT_LIMIT 62h), **TON Seq Max** (MFR_TON_SEQ_MAX E6h), and **TOFF Delay** (TOFF_DELAY 64h).

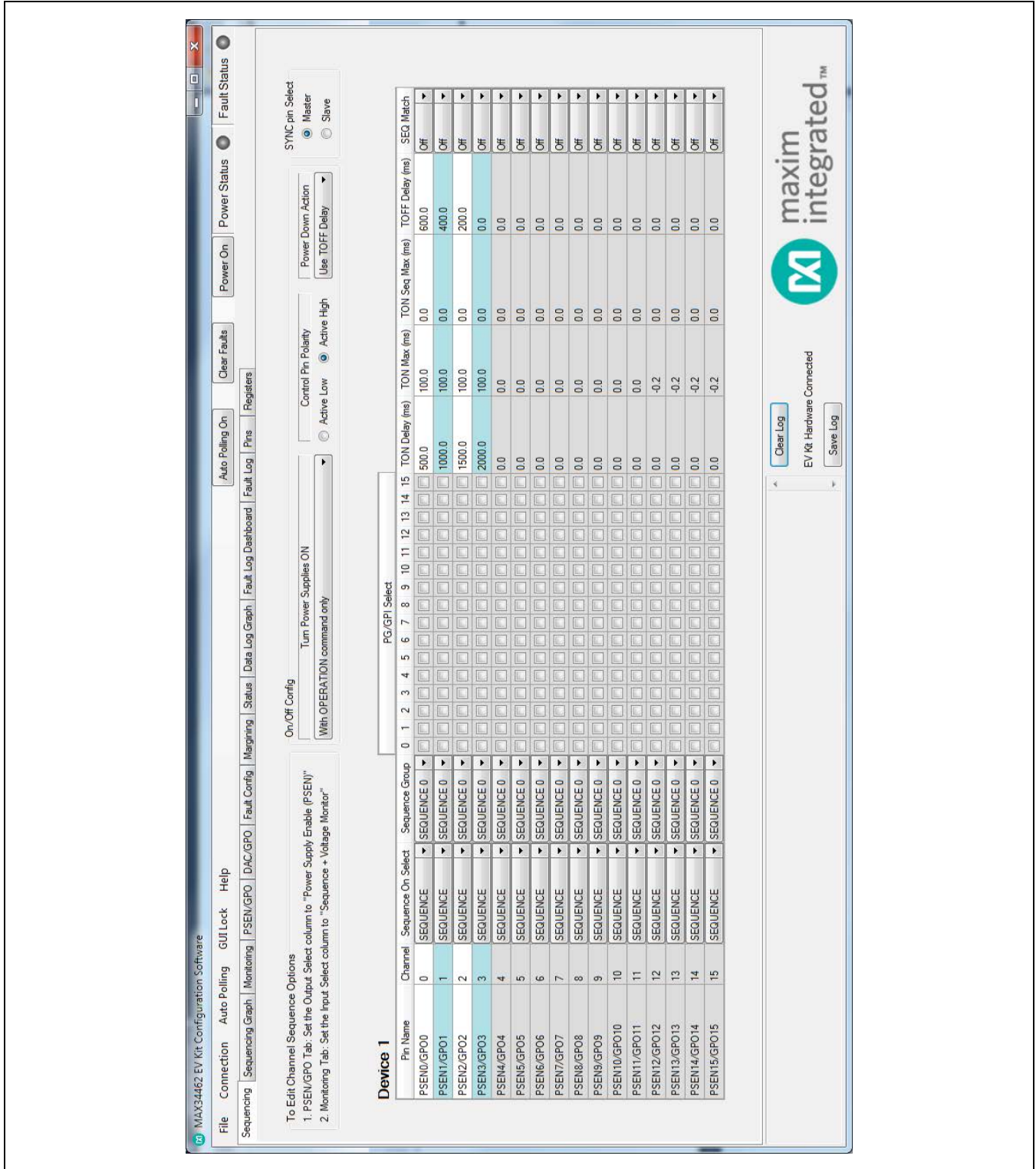


Figure 1. MAX34462 EV Kit GUI (Sequencing Tab)

Sequencing Graph Tab

The **Sequencing Graph** tab sheet (Figure 2) displays the timing diagrams for all the sequencing channels. To edit a channel's sequencing timing, the **Output Select** on the **PSEN/GPO** tab must be set to **Power Supply Enable (PSEN)** and the **Input Select** on the **Monitoring** tab must be set to **Sequence + Voltage Monitor**. When the **Power Up** radio button is selected, the **TON Delay** (TON_DELAY 60h) and **TON Max** (TON_MAX_FAULT_LIMIT 62h) values are displayed on the graph. To change **TON Delay**, click and drag the green vertical bar; to change **TON Max**, click and drag the red vertical bar. If **TON Max** is set to 0ms, then this limit is and the red bar are disabled. To set a precise time with the graph, click and hold the green or red vertical bar for a zoomed-in timeline. If a channel is set up to generate a SEQ on the **Monitoring** tab, a yellow GEN tag is displayed to show which sequence is generated. The **Sequence On Select** column is read from the **Sequencing** tab. If this column is set to a SEQ pin match option, a SEQ yellow tag appears at the time location displayed in the **Event Tag** column. If there is a GEN tag that matches the SEQ tag, the SEQ tag is lined up with the GEN tag to have the same time. If there is not a GEN tag that matches the SEQ tag, the tag can be moved to a location where the user expects this signal to occur by dragging the yellow tag or editing the value in the **Event Tag** column. If the **Sequence On Select** is set to a PG/GPI combo option, the **PG/GPI Select** columns on the **Sequencing** tab are read to see which channel combination triggers the sequence. If any of these checked channels are set to GPI in the **Input Select** column on the **Monitoring** tab, a yellow GPI tag appears at the time location in the **Event Tag** column, which can be edited. If the checked channels are not set to GPI, a PG yellow tag appears. This PG tag is placed at the last TON Delay to occur in the checked channels. The **Power Down** graph displays the **TOFF Delay** (TOFF_DELAY 64h) and can be changed by clicking and dragging the green vertical bar. To view more of the time in the diagram, click and drag the timeline at the bottom, or use the zooming controls in the upper right-hand corner. To change the order of

the channels, press the **Sort By Time** button or the **Sort By Device** button for multiple devices. When in Sort By Device mode, the channels can be reordered by clicking and dragging the gripper box in the upper left-hand corner of the channel row. The sequencing graph also has the ability to detect circular dependence errors.

Monitoring Tab

The **Monitoring** tab sheet (Figure 3) displays the fault/warn limit settings for each channel and for each temperature sensor. To read the settings, click on the **Monitoring** tab and all the values are automatically read. To write to a value, click on the corresponding cell, type in a valid value, and either click another cell or press Enter on the keyboard. In the **VOLTAGE and CURRENT** table, the **Input Select** and **SEQ Generate** columns write to MFR_CHANNEL_CONFIG (E4h). Some columns might be grayed out depending on what is selected in the **Input Select** column. The **Nominal** and **V Ratio** columns are calculated based on a nominal ADC level of 1.8V to set the VOUT_SCALE_MONITOR (2Ah). The resistive **V Ratio** is found by dividing 1.8V by the **Nominal** value. The **C Gain** column writes to IOUT_CAL_GAIN (38h) to set the ratio of the voltage at the ADC input to the sensed current. The fault/warn limits can be set by entering the voltage/current level or the percent of the nominal in the **UV Fault** (VOUT_UV_FAULT_LIMIT 44h), **UV Warn** (VOUT_UV_WARN_LIMIT 43h), **OV Warn** (VOUT_OV_WARN_LIMIT 42h), **OV Fault** (VOUT_OV_FAULT_LIMIT 40h), **PG On** (POWER_GOOD_ON 5Eh), **PG Off** (POWER_GOOD_OFF 5Fh), **OC Warn** (IOUT_OC_WARN_LIMIT 46h), or **OC Fault** (IOUT_OC_FAULT_LIMIT 4Ah) columns. In the **TEMPERATURE** table, the sensors can be enable/disable in the **Enable** column, which writes to a bit in MFR_TEMP_SENSOR_CONFIG F0h). The OT warn/fault limits can be set by entering a value in the **OT Warn** (OT_WARN_LIMIT 51h) or **OT Fault** (OT_FAULT_LIMIT 4Fh) columns. The ADC and averaging settings can be adjusted with the **ADC Conversion Time**, **ADC Averaging**, or **IOUT Averaging** drop-down lists, which all write to MFR_MODE (D1h).

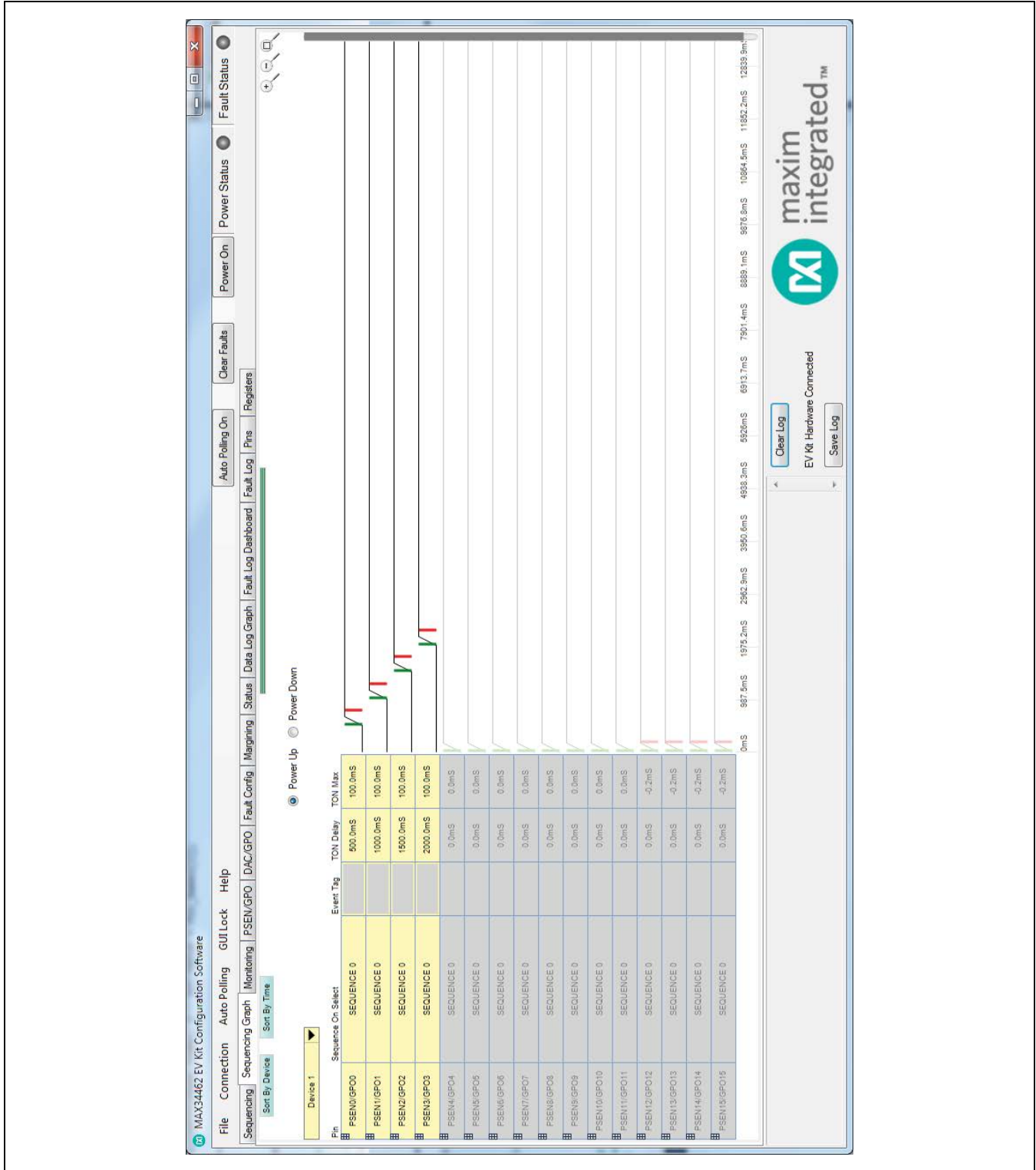


Figure 2. MAX34462 EV Kit GUI (Sequencing Graph Tab)

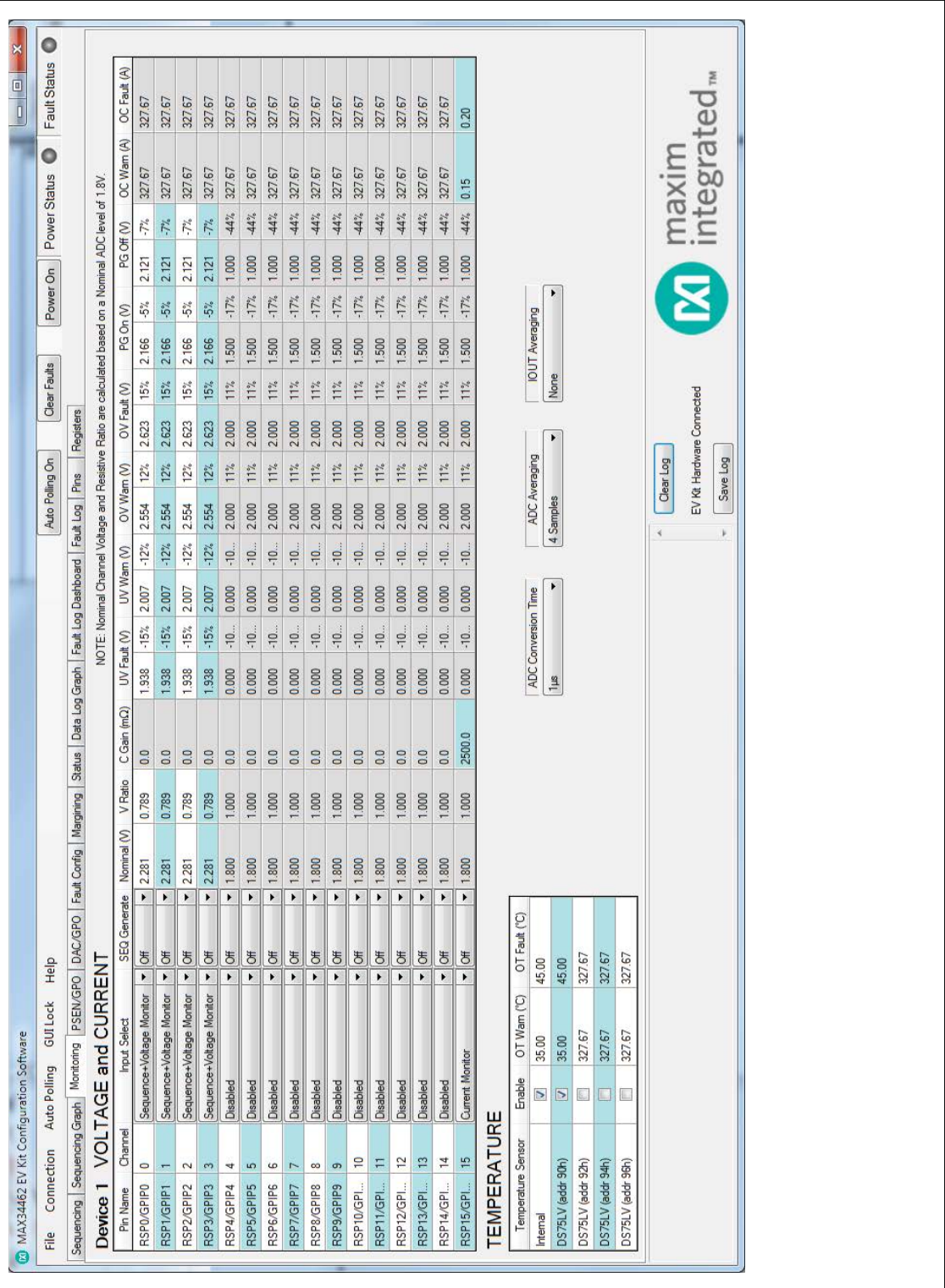


Figure 3. MAX34462 EV Kit GUI (Monitoring Tab)

PSEN/GPO Tab

The **PSEN/GPO** tab sheet (Figure 4) sets the function of the PSENn pins. The **Output Select**, **PG/GPI or Alarm Channel Select**, and **PSEN/GPO Output Type** columns write to bits in the MFR_PSEN_CONFIG (D2h) command. **Output Select** sets the function of the PSENn pin and the **PSEN/GPO Output Type** column sets the output logic of the pin. The **PG/GPI or Alarm Channel Select**, **TON Delay** (TON_DELAY 60h) and **TOFF Delay** (TOFF_DELAY 64h) columns can only be edited when the **Output Select** is set to **PG/GPI Combination** or **ALARM**.

DAC/GPO Tab

The **DAC/GPO** tab sheet (Figure 5) sets the function of the DAC and GPO pins. All the columns in the DAC table write to the MFR_DAC_CONFIG (E9h) command. The GPO table on the bottom writes to the MFR_GPO_CONFIG (F8h). The **Output Select** sets the function of the DAC or GPO pin and the **Output Type** sets the output logic of the pin. The **PG/GPI or Alarm Channel Select**, **ON Delay**, and **OFF Delay** columns can only be edited when the **Output Select** is set to **PG/GPI Combination** or **ALARM**.

Fault Config Tab

The **Fault Config** tab sheet (Figure 6) contains all the fault configuration settings. The **Fault Retry** time sets the value in MFR_FAULT_RETRY (DAh). The fault configuration table writes to a channel's MFR_FAULT_RESPONSE (D9h). To edit a channel's configuration, the **Input Select** on the **Monitoring** tab must be set to monitor voltage or

current. To edit the **FAULT Pin Assertion** or **FAULT Pin Response** columns, set the **Global** column to **Global**.

Margining Tab

The **Margining** tab sheet (Figure 7) includes the margin configurations, margin fault status, and a DAC calculator. All values on the tab are read when the tab is selected. To edit a channel's margin options, the **Output Select** on the **PSEN/GPO** tab must be set to **Power Supply Enable (PSEN)** and the **Input Select** on the **Monitoring** tab must be set to **Sequence + Voltage Monitor**. For channels 0–11, the **Output Select** on the **DAC/GPO** tab must also be set to **DAC Operation**. The **Margin** column turns the margin on/off by writing to the OPERATION (01h) command. To force all the channels to the same margin, select the state in the **Margin All Control** drop-down list. The **Slope**, **Open Loop**, and **DAC Value** configure the DACn outputs by writing bits in the MFR_MARGIN_CONFIG (DFh) command. The margining limits can be set by entering the voltage level or the percent of the nominal in the **Margin Low** (VOUT_MARGIN_LOW 26h) and **Margin High** (VOUT_MARGIN_HIGH 25h) columns. When the margining is turned on, the margin fault status is shown in the **Status** column read from STATUS_MFR_SPECIFIC (80h). The **Polled** column displays the channel voltage read from READ_VOUT (8Bh). To read the **Status** and **Polled** values, press the **Read Status and Vout** button or turn on polling with the **Auto Polling On** button. The margin faults can be cleared by pressing the **Clear Faults** button in the status bar.

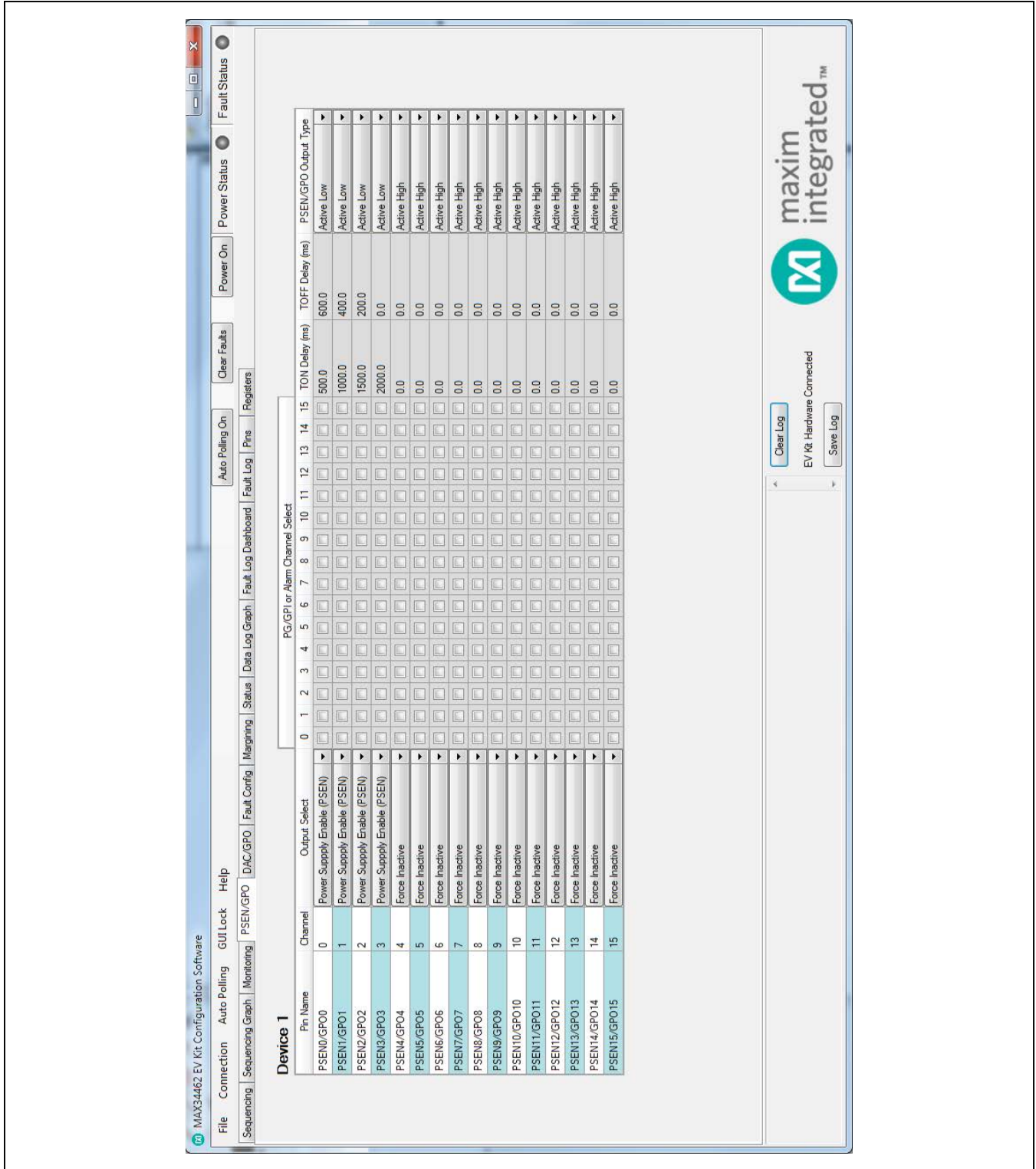


Figure 4. MAX34462 EV Kit GUI (PSEN/GPO Tab)

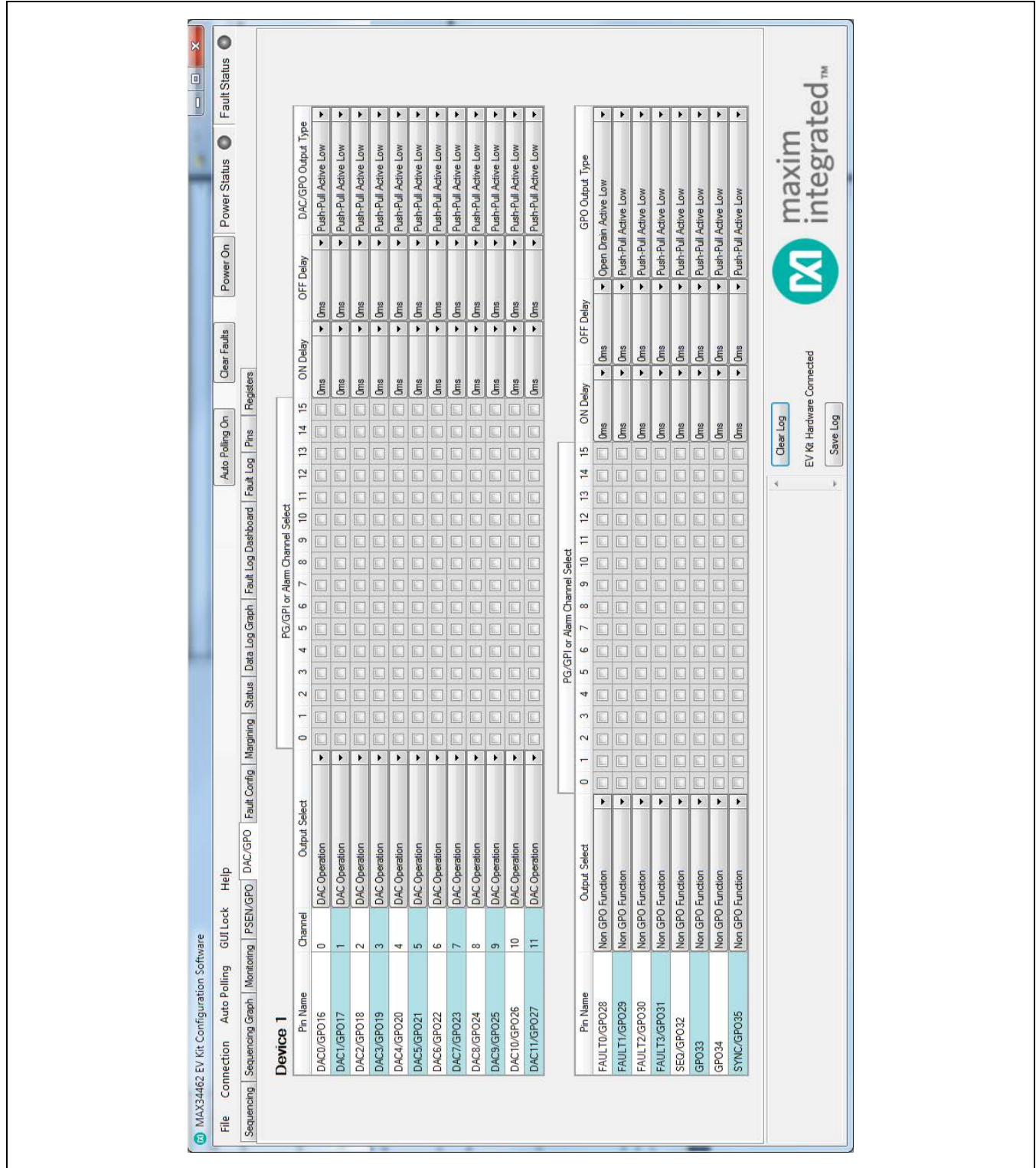


Figure 5. MAX34462 EV Kit GUI (DAC/GPO Tab)

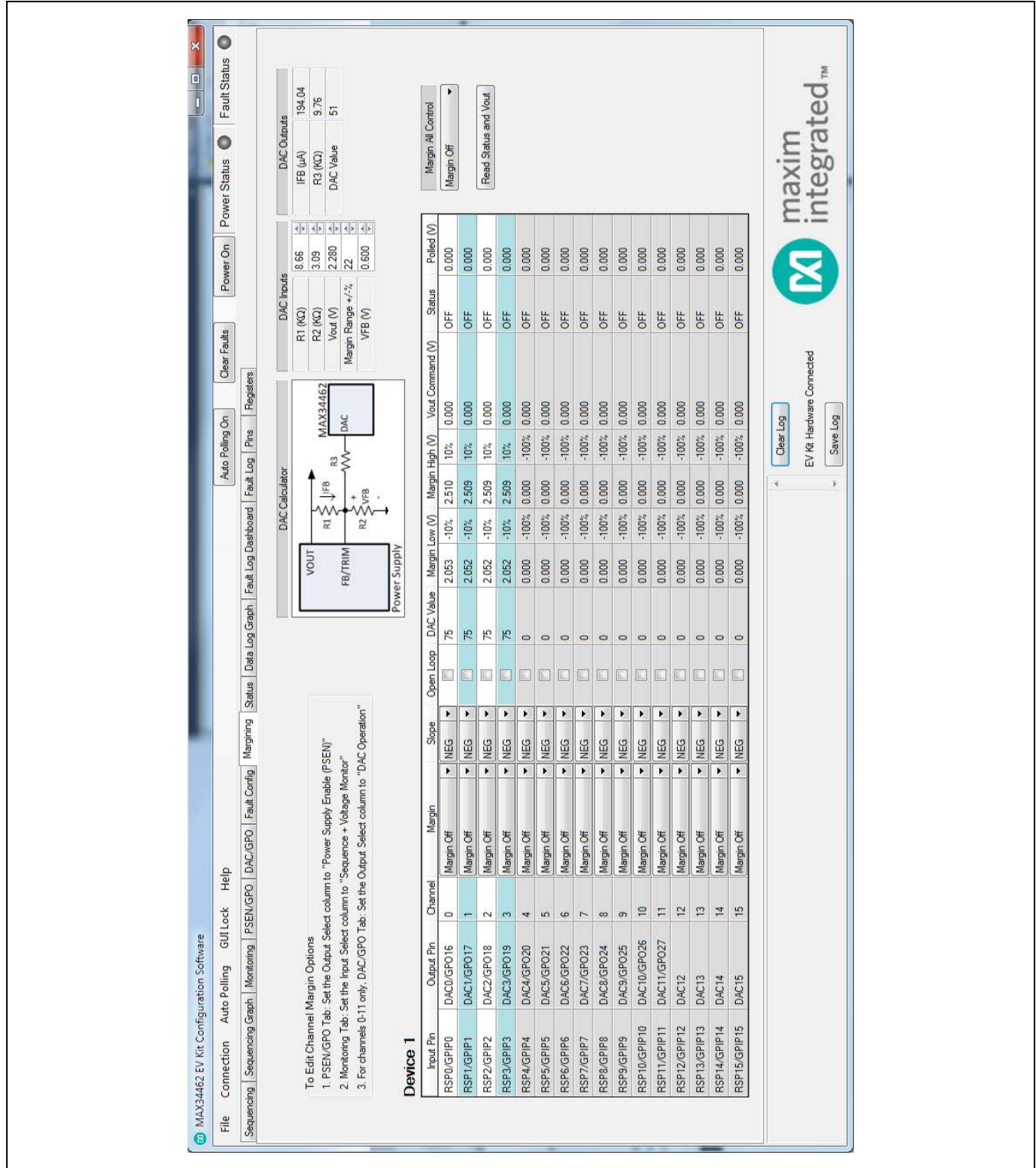


Figure 7. MAX34462 EV Kit GUI (Margining Tab)

The **DAC Calculator** is used to find the series resistance (R3) and DAC value. The equations used to calculate the outputs are given in Table 1.

Status Tab

The **Status** tab sheet (Figure 8) displays all the faults, warning, and device ID information. To read all the output values, faults, and warnings, press the **Read Device 1 Status** button or turn on polling with the **Auto Polling On** button. The fault and warning bits are read from STATUS_VOUT (7Ah), STATUS_IOUT (7Bh), STATUS_MFR_SPECIFIC (80h), and STATUS_TEMPERATURE (7Dh). The **Polled** values are read from READ_VOUT (8Bh), READ_IOUT (8Ch), and READ_TEMPERATURE (8Dh). Each color indicator turns green if the status is good, red if there is a fault, or yellow to indicate a warning. The **Polled** value might not reflect the fault or warning because some bits are latches and have to be cleared. To clear the faults and warnings, press the **Clear Faults** button in the status bar to send the CLEAR_FAULTS (03h) command. The **Time Count** displays the 32-bit counter read from the MFR_TIME_COUNT (DDh) command. The **ID COMMANDS** table displays all the ID information of the device. Press the **Read ID** button to read all the commands in the table.

Data Log Graph Tab

The **Data Log Graph** tab sheet (Figure 9) plots the polled values in a graph and keeps track of the minimum and maximum values for each channel voltage or current and each temperature sensor. To read the polled values, press the **Data Log Read** button. Each data log

reads every channel's voltage (READ_VOUT 8Bh) or current (READ_IOUT 8Ch) and every temperature sensor (READ_TEMPERATURE 8Dh). The software finds the minimum and maximum values over multiple reads. To plot the value being read, press the **Auto Polling On** button and the **Poll Count** displays the number of reads that have been tracked in the data log. When the polled count reaches 10,000, the graph deletes the oldest polled values and adds a new polled value. The min/max values are still based on all the poll-count values, but the graph only displays the latest 10,000 polled values. To reset the **Poll Count** and all the min/max values, select **Data Log Reset**. To turn off data logging during polling, check the **Data Log Off** checkbox. The **Select Data** drop-down list is used to select the voltage, current, or temperature data to display on the graph and in the **MIN/MAX Data** table. To save all the data graphed to a CSV file, press the **Save Data Log** button.

Fault Log Dashboard Tab

The **Fault Log Dashboard** tab sheet (Figure 10) displays all 15 NV fault logs in table format. When the tab is selected, the **Overwrite** and **Fault Log Depth** are read. When the fault log is full, the **Enable Overwrite** can be checked to automatically overwrite previous logs. The fault log depth can be adjusted with the **Fault Log Depth** drop-down list. The **Enable Overwrite** and **Fault Log Depth** are read from bits in MFR_NV_LOG_CONFIG (D8h). To read all 15 fault logs, press the **Read All Fault Logs** button. This command takes at least 10s to complete. For each channel within a fault log, the **VOLTAGE/CURRENT** table shows the fault/warning status, minimum value, maximum value, and the last three black box readings. The **TEMPERATURE** table shows the OT fault status, the peak value, and the last temperature reading. To clear or force the fault log, press the **Clear NV Fault Log** or **Force NV Fault Log** buttons, respectively. These buttons write to a bit in MFR_NV_LOG_CONFIG (D8h). The **Dump Logs to File** button saves all the fault log tables in a CSV file.

Table 1. DAC Calculator

OUTPUT EQUATIONS
$I_{FB} = (V_{OUT}) / (R1 + R2)$
$R3 = (V_{FB} - 0.1) / (I_{FB} \times \text{Margining Range} \times 120\%)$
$DAC \text{ Value} = 256 \times (V_{FB} / 2.048)$

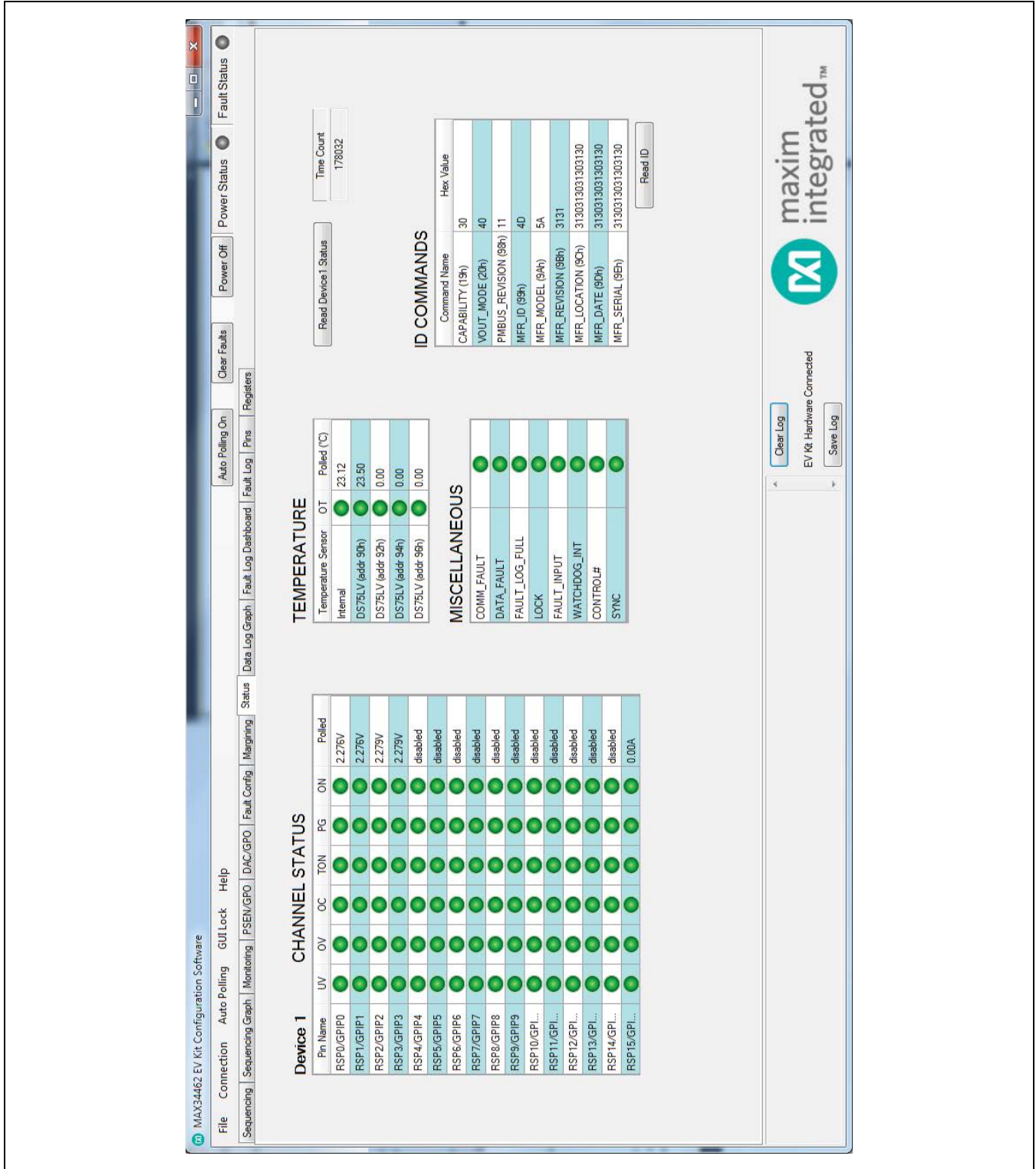


Figure 8. MAX34462 EV Kit GUI (Status Tab)

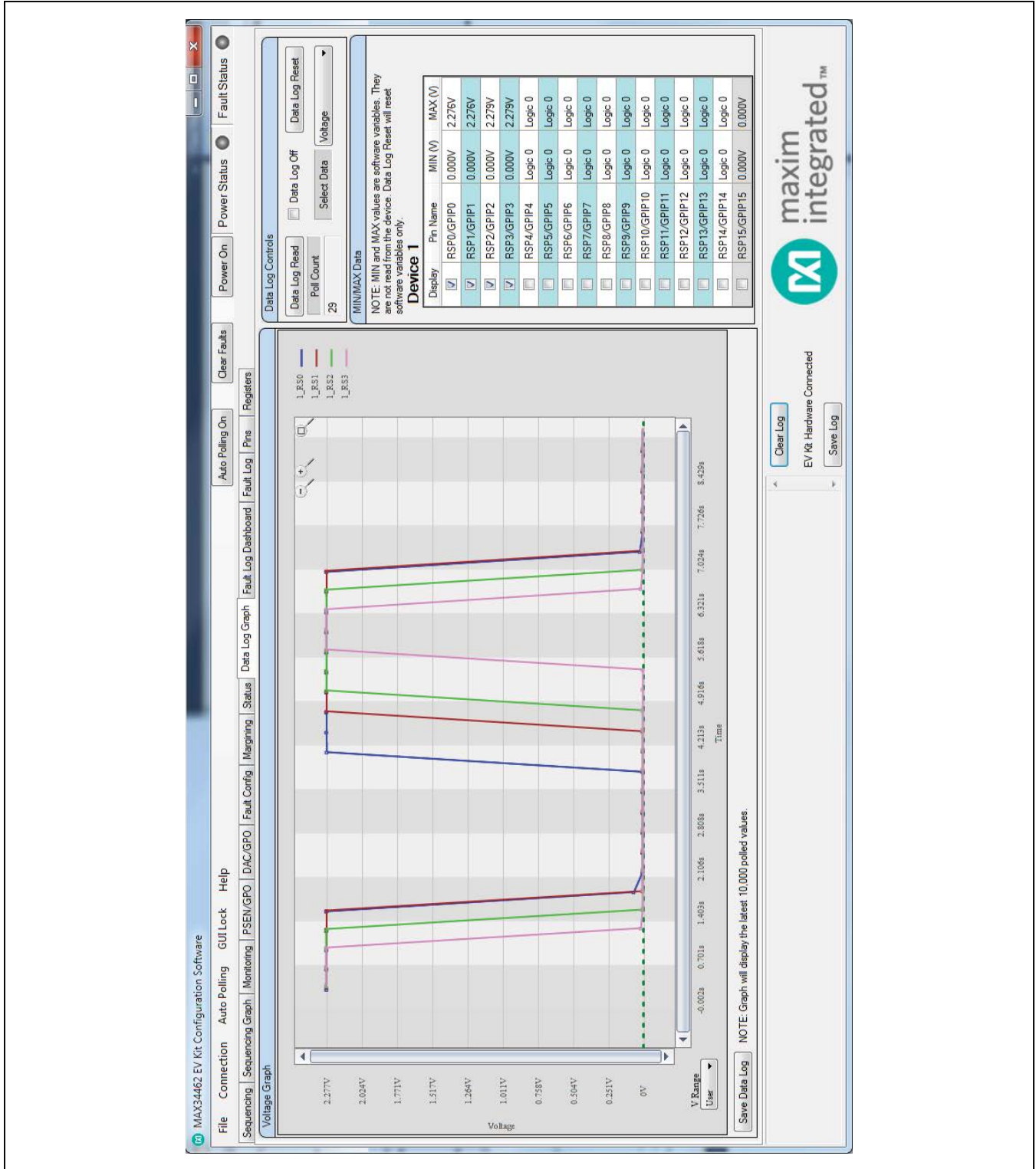


Figure 9. MAX34462 EV Kit GUI (Data Log Graph Tab)

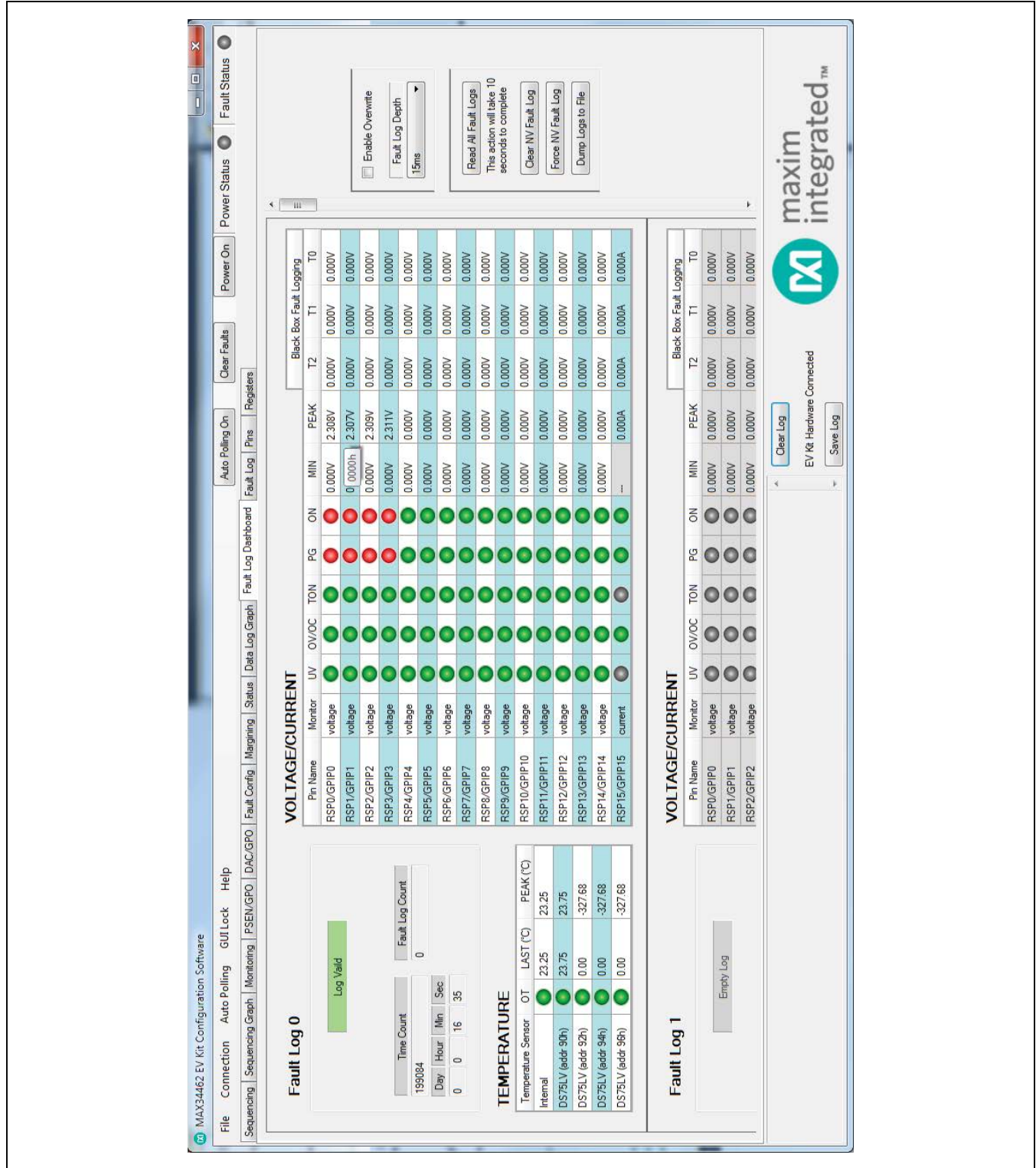


Figure 10. MAX34462 EV Kit GUI (Fault Log Dashboard Tab)

Fault Log Tab

The **Fault Log** tab sheet (Figure 11) displays a single log in the NV fault log. To read the fault log, press the **Read NV Fault Log** button and all 255 bytes from MFR_NV_FAULT_LOG (DCh) are displayed in the table. The fault log number is displayed above the **Read NV Fault Log** button. To save the current fault log displayed in the table, press the **Dump to a File** button and the table is saved as a CSV file.

Pins Tab

The **Pins** tab sheet (Figure 12) shows all the pin names, pin numbers, and pin descriptions. The **Pin Name** and **Description** columns can be edited to specify how the pin is configured. The pin names listed in the **Pin Name** column are copied to the **Pin Name** columns on the other tabs and are saved in the XML file when a project is saved.

Registers Tab

The **Registers** tab sheet (Figure 13) displays all the PMBus commands and their current data. To read the registers, select a page in the top drop-down list and all the PMBus commands valid for that page are automatically read. The commands not valid for that page are grayed out. Press the **Read All** button to read the registers again. To write to a command, enter the hex value in the cell and click another cell or press Enter on the keyboard. The CRC of all four memory arrays in

the device can be read by pressing the **Read CRC of All Memory Arrays** button, which reads/writes to the MFR_CRC (FEh) command. The **Flash Commands** section allows the user to copy data from one memory array to another using the drop-down list. When copying from RAM to flash memory, the MFR_STORE_ALL (EEh) command is written. When copying from flash memory to RAM, the MFR_RESTORE_ALL (EEh) command is written. The **STORE_DEFAULT_ALL** and **RESTORE_DEFAULT_ALL** buttons store/restore data from main flash to the operating RAM. To reset the device, press the **Soft Reset** button to write to a bit in MFR_MODE (D1h). The **Command Description** shows the bitmap for selected PMBus commands. Select the command in the drop-down list and the table below shows a description of each bit for that command.

Multiple Devices

The GUI has the ability to display data for up to four devices. If multiple slave addresses are detected, the **Number of Devices** option in the **Connection** menu allows the user to choose how many devices to display. To choose the order of devices, select the appropriate slave address in the **DeviceX Slave Address** options. Most tabs have separate tables and controls for each device. The **Fault Log Dashboard**, **Fault Log**, and **Register** tabs all have a drop-down list to select the device to read/write if the number of devices is greater than one.

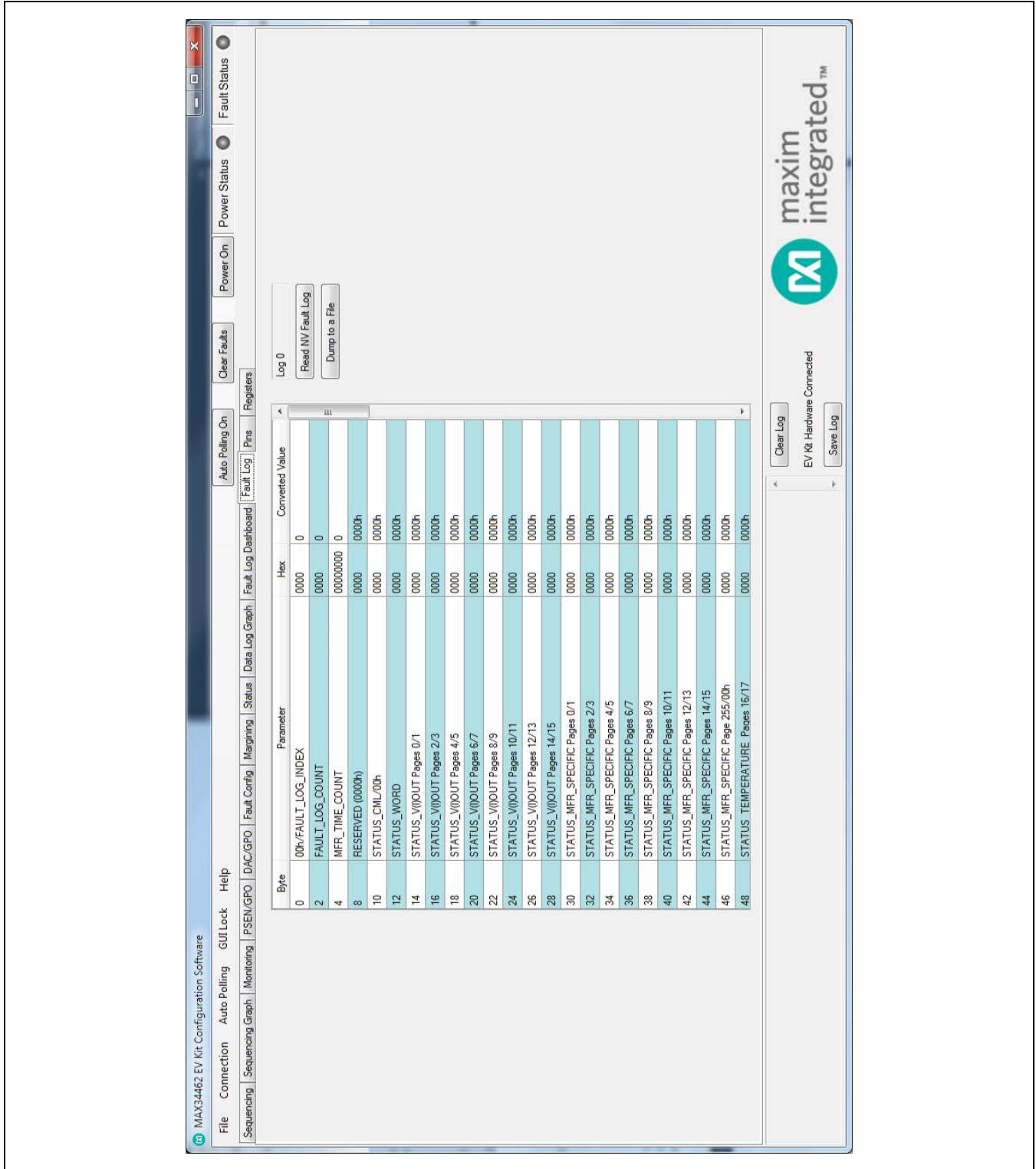


Figure 11. MAX34462 EV Kit GUI (Fault Log Tab)

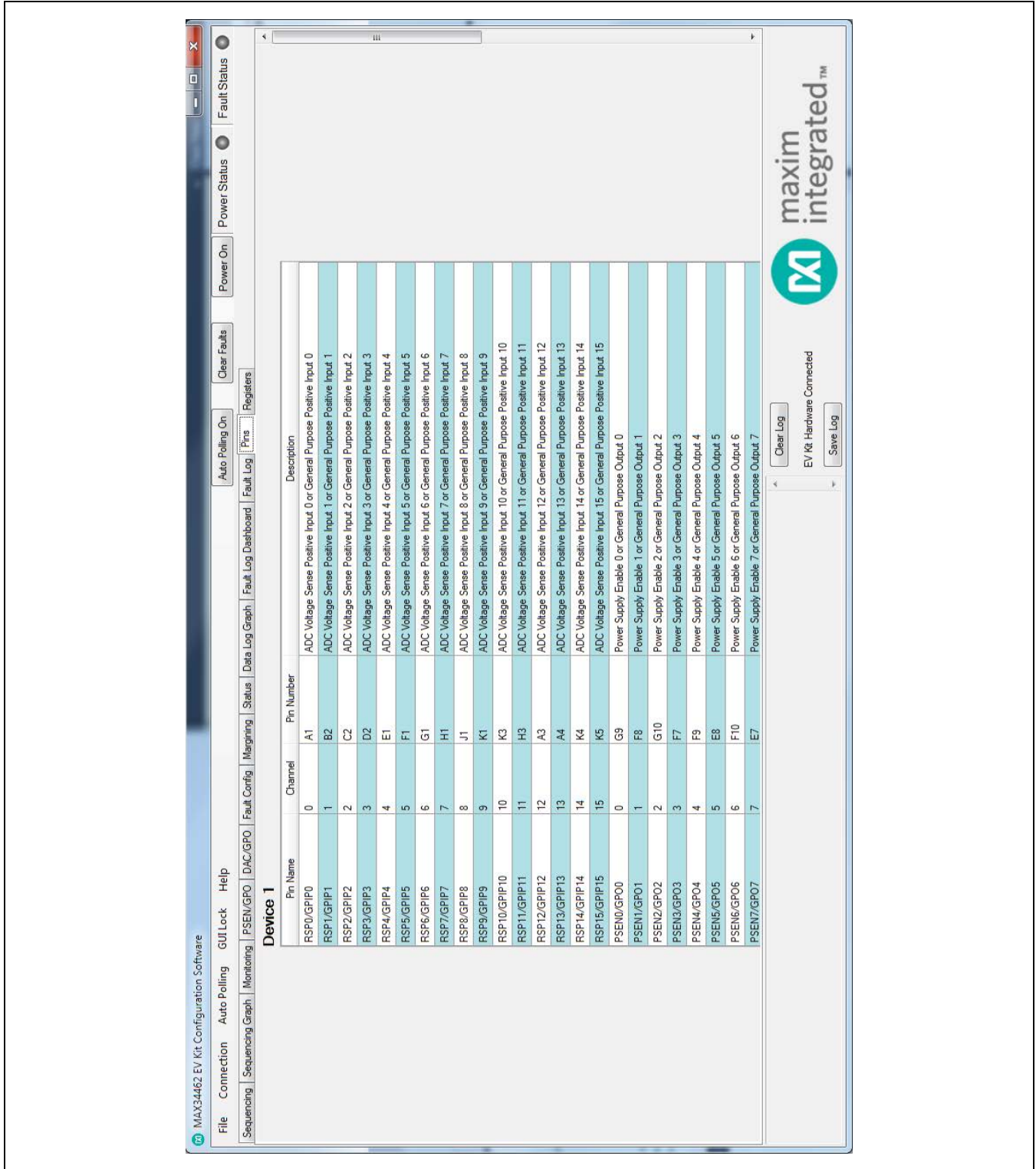


Figure 12. MAX34462 EV Kit GUI (Pins Tab)

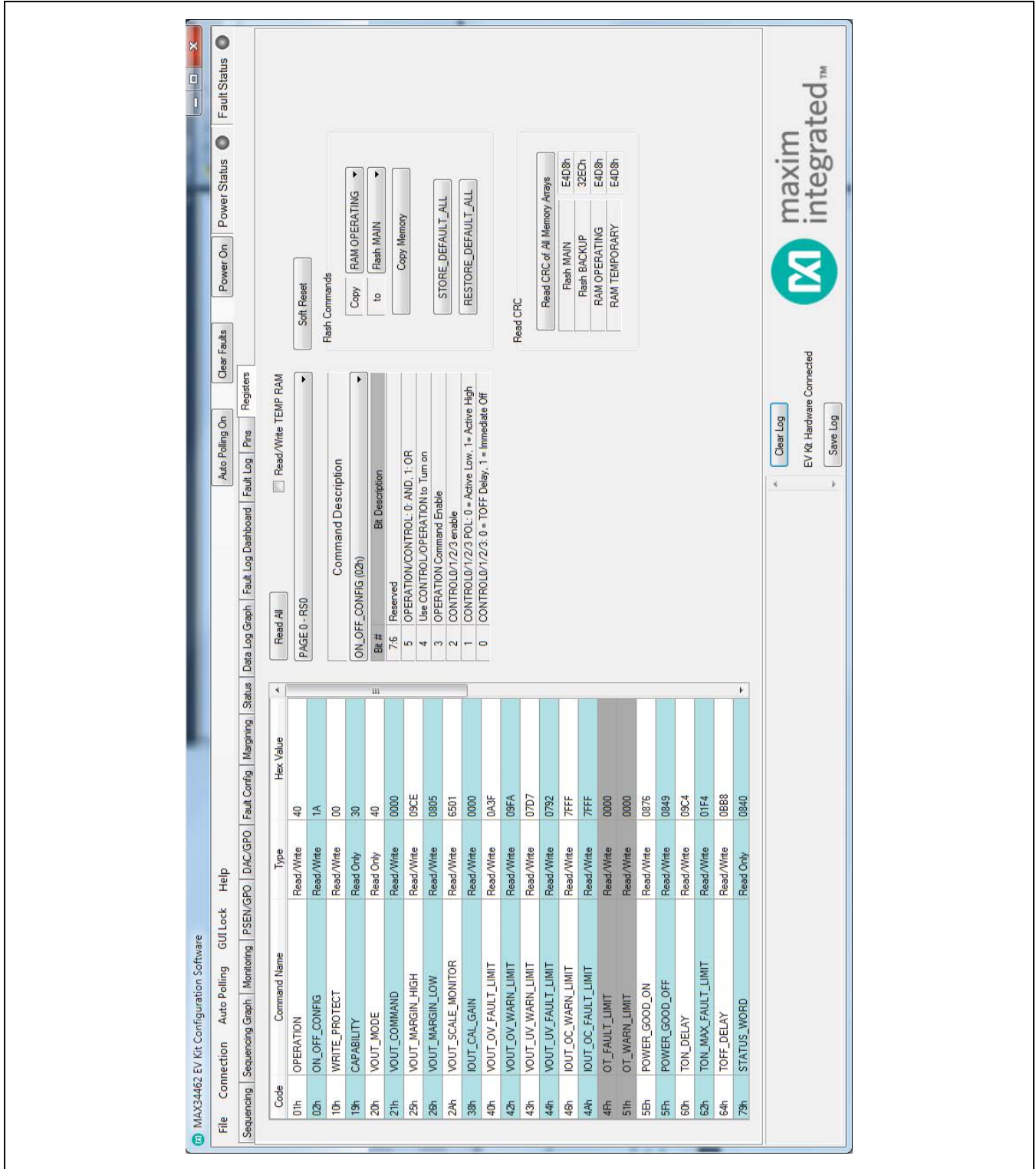


Figure 13. MAX34462 EV Kit GUI (Registers Tab)

Detailed Description of Hardware

User-Supplied I²C Interface

To communicate with the MAX34462 with a user-supplied I²C interface, first remove J23 jumpers to disconnect the USB I²C dongle. If the dongle is no longer desired, it can be separated from the EV kit by snapping the PCB at the scored line. Connect test points SDA, SCL, GND, and 5V to the off-board I²C interface. The I²C interface should operate at 3.3V.

User-Supplied Power Supplies

To disconnect the on-board power supplies, turn off 4-pole DIP switches RSP, RSN PSEN, and DAC. The power supplies' GND should be connected to the banana jack (GND). Connect the desired PSEN_n pins to the enable pin on the power supply, and the RSP_n pins to a voltage-divider on the output of the power supply. The voltage-divider is only required if the output voltage is greater than 1.8V. Connect the RSN_n pins to the ground of the power supply. For DAC margining, the DAC_n outputs can be connected to the feedback of the power supply. Resistors R170–R173 should be adjusted to match the power-supply feedback circuitry. Refer to the MAX34462 IC data sheet for details or use the DAC calculator to determine the proper values.

User-Supplied DS75LV

To use an off-board digital temperature sensor, connect MSDA, MSCL, and GND on H4 to the DS75LV. The slave

address for the user-supplied DS75LV should be 92h, 94h, or 96h. The on-board DS75LV has slave address 90h.

Current-Sense Amplifier

The EV kit comes with an on-board 25V/V current-sense amplifier (U3) to demonstrate how the device can monitor current. The output of the amplifier is connected to RS15 and can be removed by turning both switches on the CSA 2-pole DIP switch to off.

Multiple Device System

To chain multiple MAX34462 EV kits together as one system, follow the steps below. **Note:** Do not chain more than four EV kits together.

- 1) Remove power to all EV kits.
- 2) On one EV kit, populate the four jumpers on J23. For all other boards, remove the four jumpers on J23.
- 3) For all EV kits, switch the SDA and SCL signals on the 12-pole DIP switch (S4) to on.
- 4) If using the other signals on the 12-pole DIP, then switch those signals to on; otherwise, turn the switches off.
- 5) Connect the EV kit signals together using ribbon-cable connectors on H2 or H3. To power and communicate to another EV kit, ensure that 5V, GND, SDA, and SCL are all connected on H2 or H3. All other signals are optional.
- 6) Connect the EV kit with the four jumpers on J23 to a PC using the USB cable.

Table 2. Description of LEDs

LED	COLOR	DESCRIPTION
D3	Red	$\overline{\text{FAULT0}}$: A fault has occurred.
D4	Red	$\overline{\text{FAULT1}}$: A fault has occurred.
D5	Red	$\overline{\text{FAULT2}}$: A fault has occurred.
D6	Red	$\overline{\text{FAULT3}}$: A fault has occurred.
D7	Red	ALERT: A fault or warning has occurred.
D8	Red	GP033: Active-low GP033 pin state.
D9	Red	GP034: Active-low GP034 pin state.
DA	Green	VOUT0: Channel 0 is on.
DB	Green	VOUT1: Channel 1 is on.
DC	Green	VOUT2: Channel 2 is on.
DD	Green	VOUT3: Channel 3 is on.
D20 (Power)	Red	USB Power Fault: A fault occurred due to overvoltage limit, current limit, or thermal limit.
	Green	USB Power: USB power supply is on.
D21(Com)	Red	Communication: After the software has initialized the hardware, the LED flashes red when an I ² C command is received.
	Green	Initialized: Hardware has been initialized by software.

Table 3. Description of Switches

SWITCH	SWITCH POSITION	DESCRIPTION
S1	On*	CONTROL0: Pulls the CONTROL0 pin high.
S2	On*	CONTROL1: Pulls the CONTROL1 pin high.
S3	On*	CONTROL2: Pulls the CONTROL2 pin high.
S4	On*	CONTROL3: Pulls the CONTROL3 pin high.
S5	Pressed	Reset: Pulls the RST pin low to reset the device.
S6	On*	Multiple Devices: Connects all the multiple device signals to headers H2 and H3.
S7	On*	CSA: Connects RSP15 and RSN15 to the current-sense amplifier (U3)
S8	On*	RSP0–RSP3: Connects RSPn of the device to the output of the power-supply channel.
S9	On*	RSN0–RSN3: Connects RSNn of the device to the ground of the power-supply channel.
S10	On*	PSEN0–PSEN3: Connects PSENn of the device to the enable pin of the power-supply channel.
S11	On*	DAC0–DAC3: Connects DACn of the device to the feedback of the power-supply channel.

*Default position.

Table 4. Description of Jumpers

JUMPER	JUMPER POSITION	DESCRIPTION
J1	VDD-VDUT	Connects VDD to VDUT (U1).
J23	5V-5V	Supplies 5V from the USB I ² C dongle to the EV kit board.
	SDA-SDA	Connects SDA from the USB I ² C dongle to the U1 device SDA.
	GND-GND	Connects GND from the USB I ² C dongle to the EV kit board GND.
	SCL-SCL	Connects SCL from the USB I ² C dongle to the U1 device SCL.

*Default position.

Troubleshooting

All efforts have been made to ensure that each kit works on the first try, right out of the box. In the rare occasion that a problem is suspected, see Table 5 to help troubleshoot the issue.

Table 5. Troubleshooting

SYMPTOM	CHECK	SOLUTION
GUI says hardware not found.	Is the LED labeled D20 red?	If yes, then the electronic fuse is in a fault state. Inspect for electrical shorts on the PCB and make sure that the PCB is not sitting on a conductive surface.
	Does the LED labeled D21 turn green when the GUI is running?	If not, then exit the GUI and try running it again. If D20 still does not turn green, then exit the GUI and try connecting the USB cable to a different USB port on the PC and wait for a Windows message that states the hardware is ready to use. Run the GUI again.
	Are any of the LEDs illuminated?	If not, then the PCB may not be getting power from the USB. Try a different USB cable or a different USB port.
No slave address found and read/writes fail	Jumper J1	Make sure jumper J1 is installed to power the U1 device.
	Jumper J23	Make sure four jumpers on J23 are installed.
Channels do not turn on	Is there a CONTROL# fault on the Status tab of the GUI?	If the ON_OFF_CONFIG command is set as turn-on power supplies with the CONTROL0/1/2/3 pin, then make sure S1–S4 are in on position.
	Is the ALERT LED on and all channel LEDs off?	If so, make sure switch PSEN (S6) is in the on position to connect the PSENs of U1 device to channel power supplies.
	Is the ALERT LED on and at least one channel LED on?	If so, make sure switch RSP and RSN are in the on position to connect the power-supply outputs to the U1 device.
Margining is not working, voltage is not changing	S11 (DAC)	Make sure the DAC switch is in the on position to connect the DACs of the U1 device to the FB of channels 0–3.
Chaining multiple EV kits together using H2 and H3 does not seem to work	S6	Make sure that all the switches on the 12-pole DIP switch are in the on position.
The current monitored on RS15 does not work	S7 (CSA)	Make sure the switches on CSA (S7) are on to connect the output of the current-sense amplifier to RSP15.

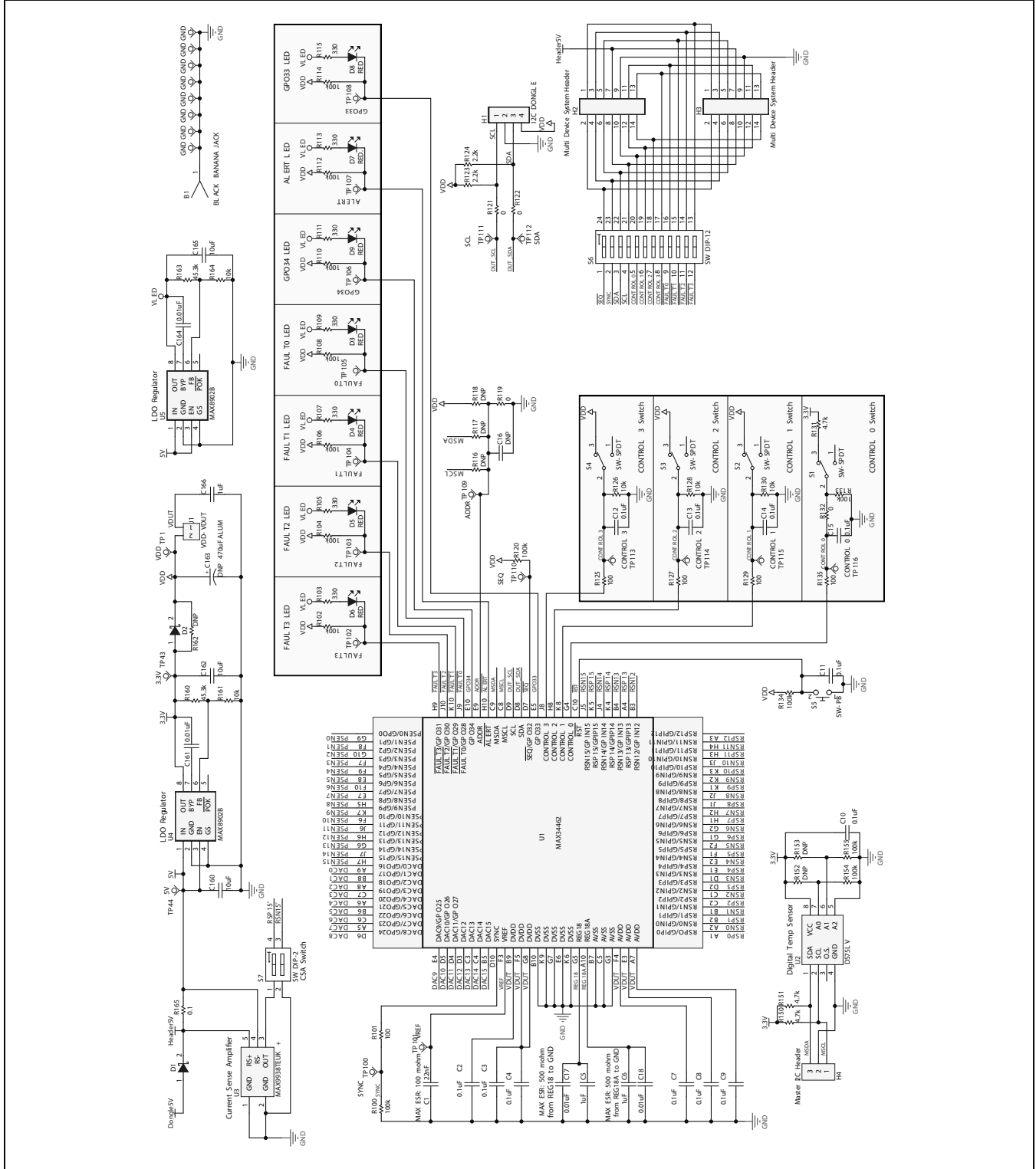
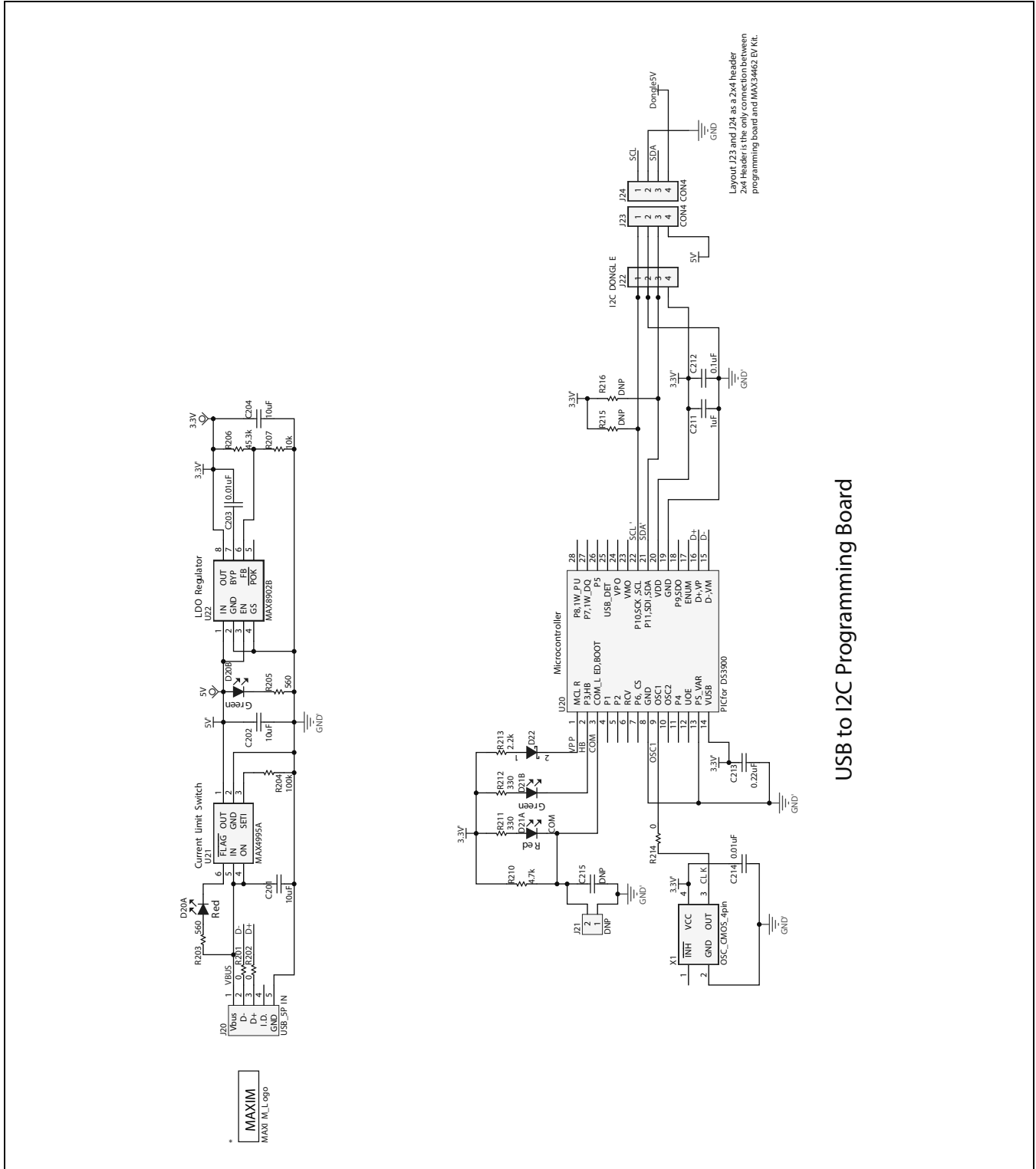


Figure 14a. MAX34462 EV Kit Schematic (Sheet 1 of 3)



USB to I2C Programming Board

Layout J23 and J24 as a 2x4 header
2x4 Header is the only connection between
programming board and MAX34462 EV Kit.

Figure 14c. MAX34462 EV Kit Schematic (Sheet 3 of 3)

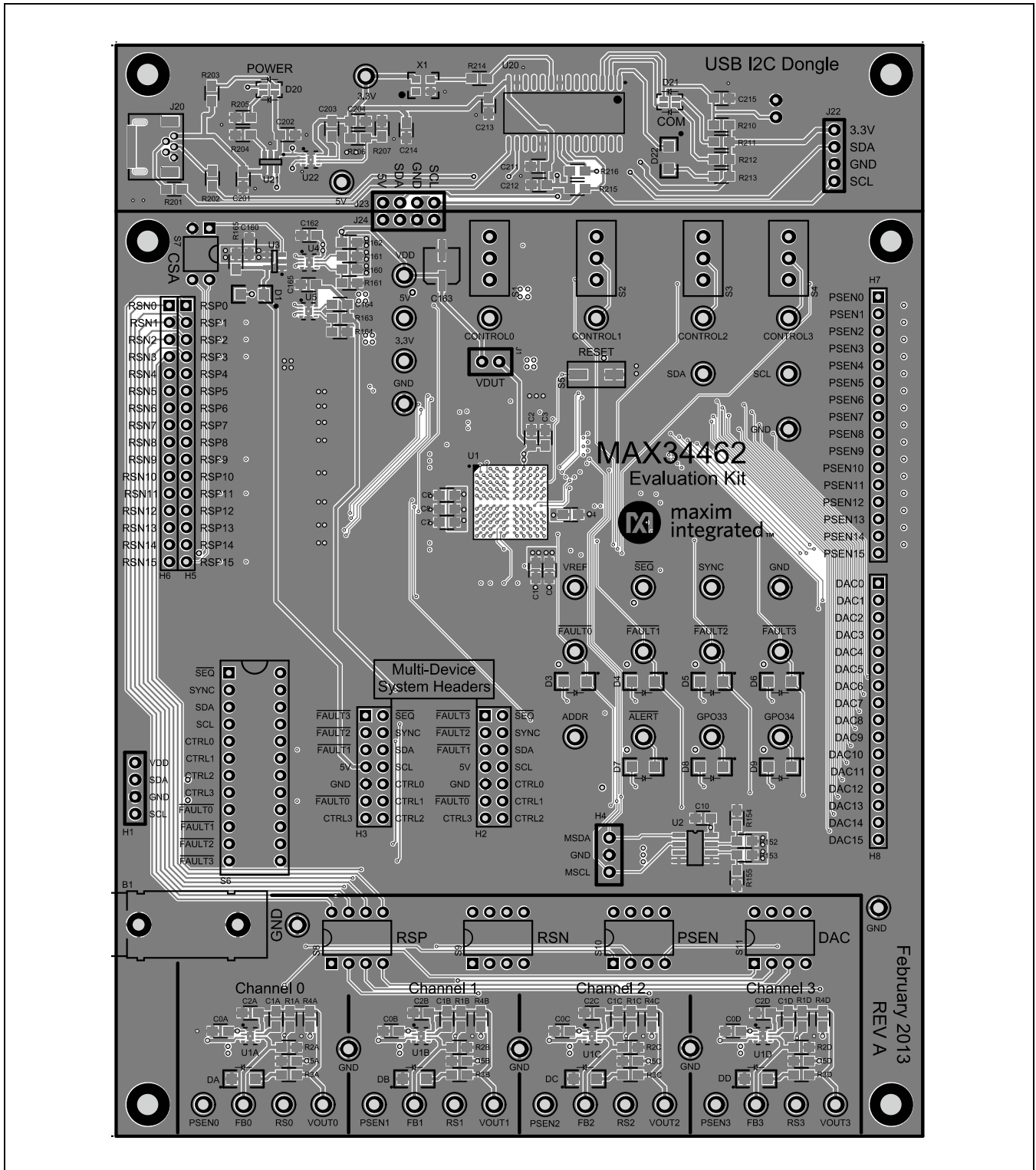


Figure 15. MAX34462 EV Kit PCB Layout—Top Layer

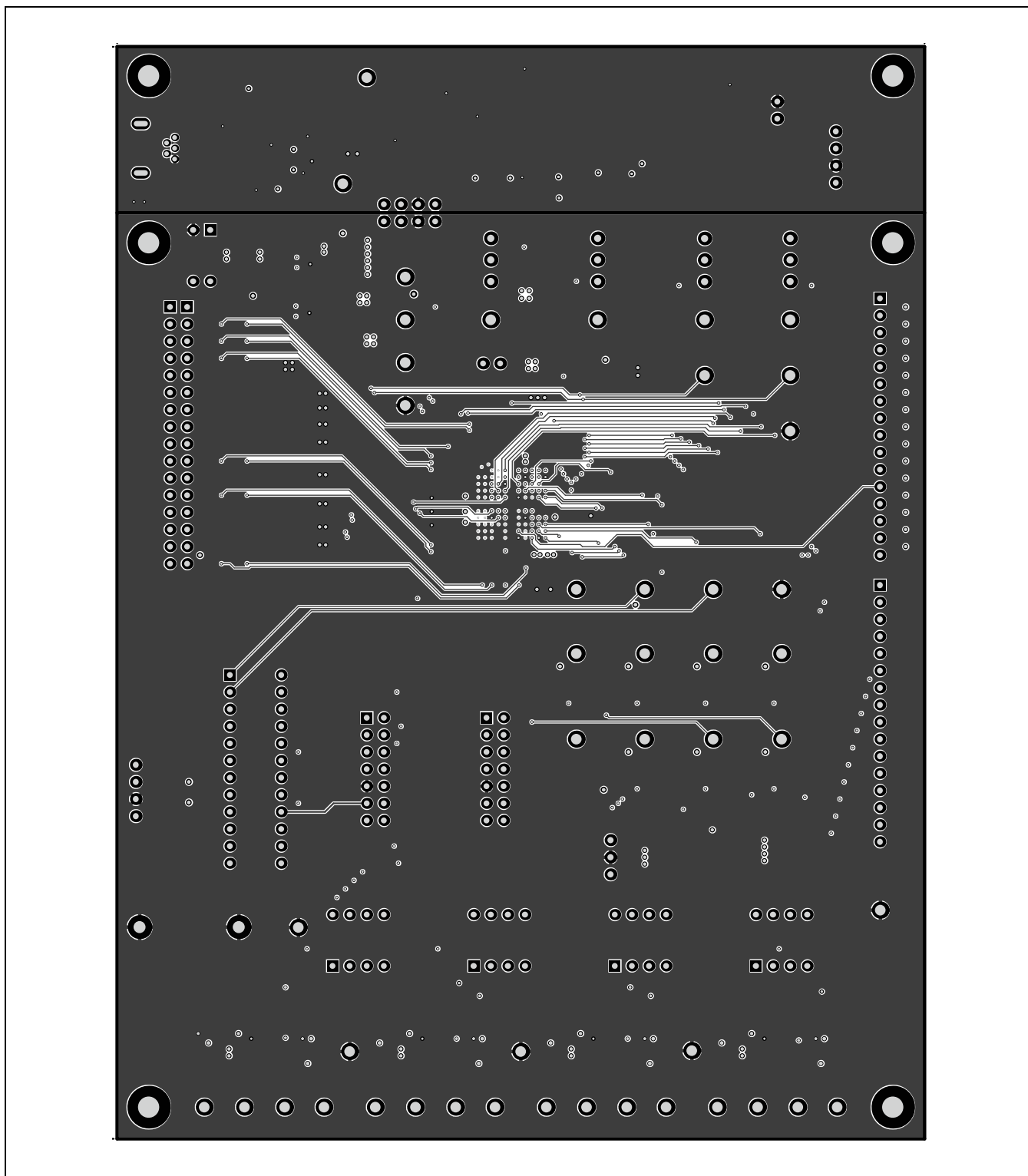


Figure 16. MAX34462 EV Kit PCB Layout—Internal Signal Layer 1

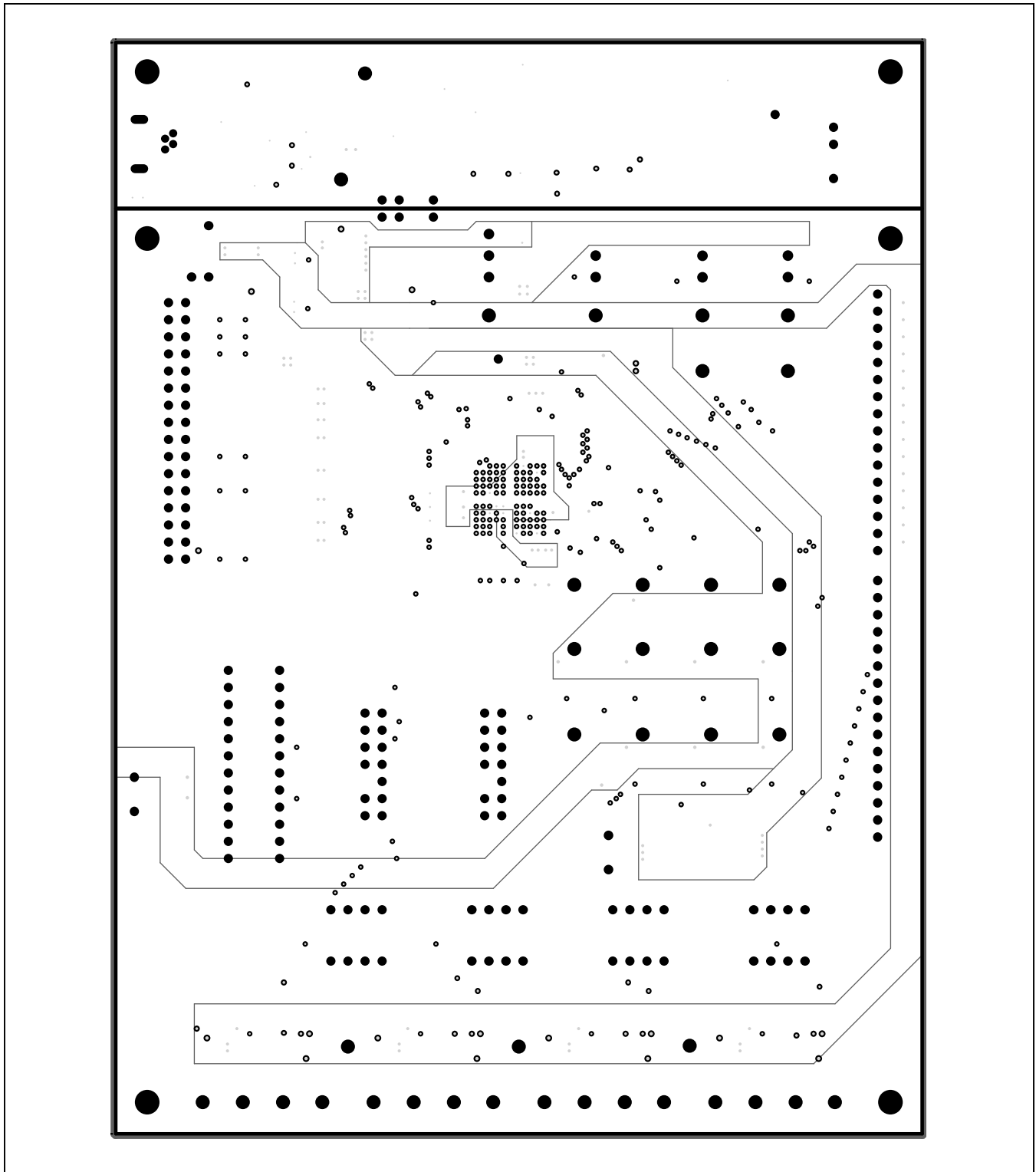


Figure 17. MAX34462 EV Kit PCB Layout—Internal Plane Layer 1

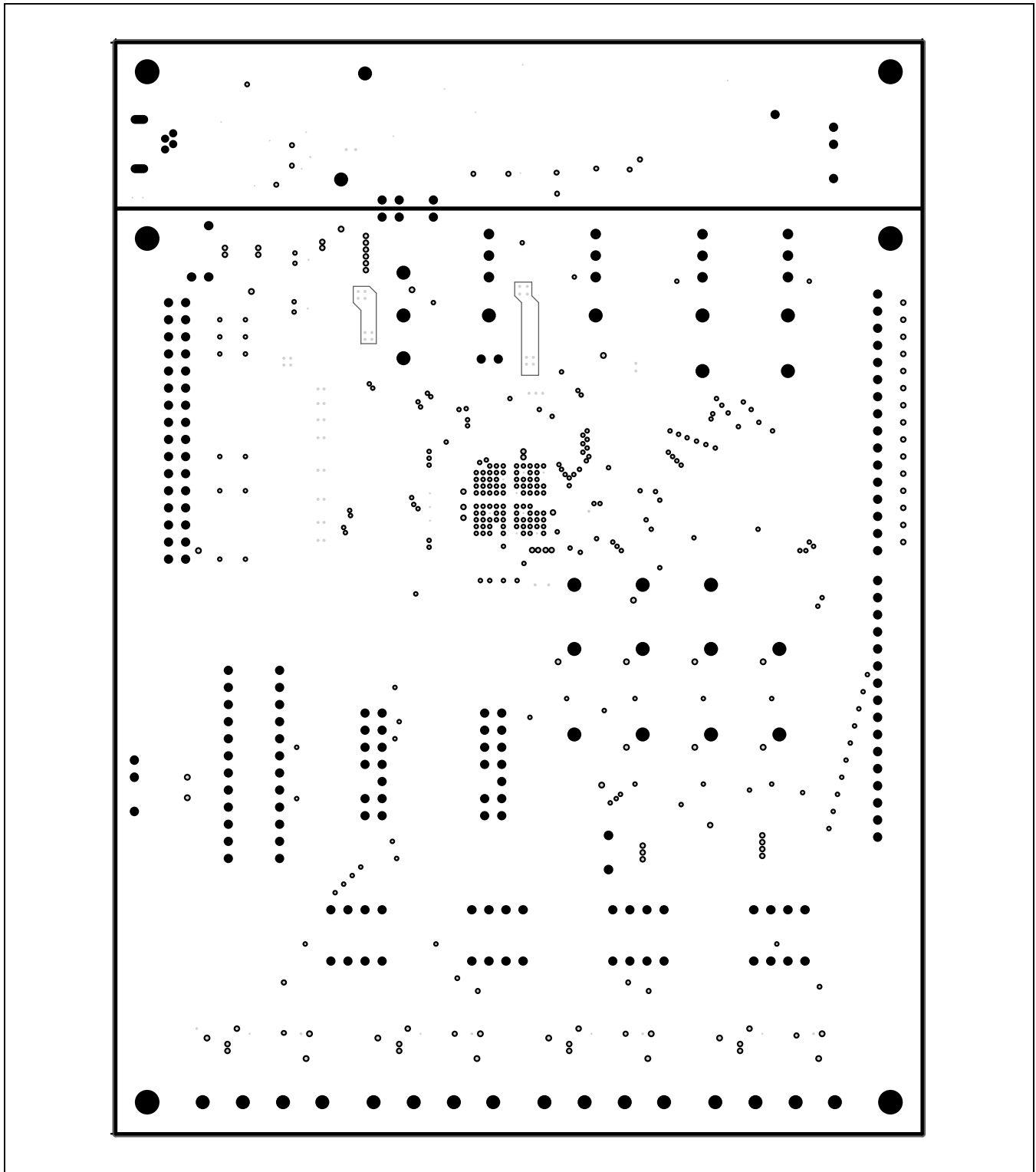


Figure 18. MAX34462 EV Kit PCB Layout—Internal Plane Layer 2

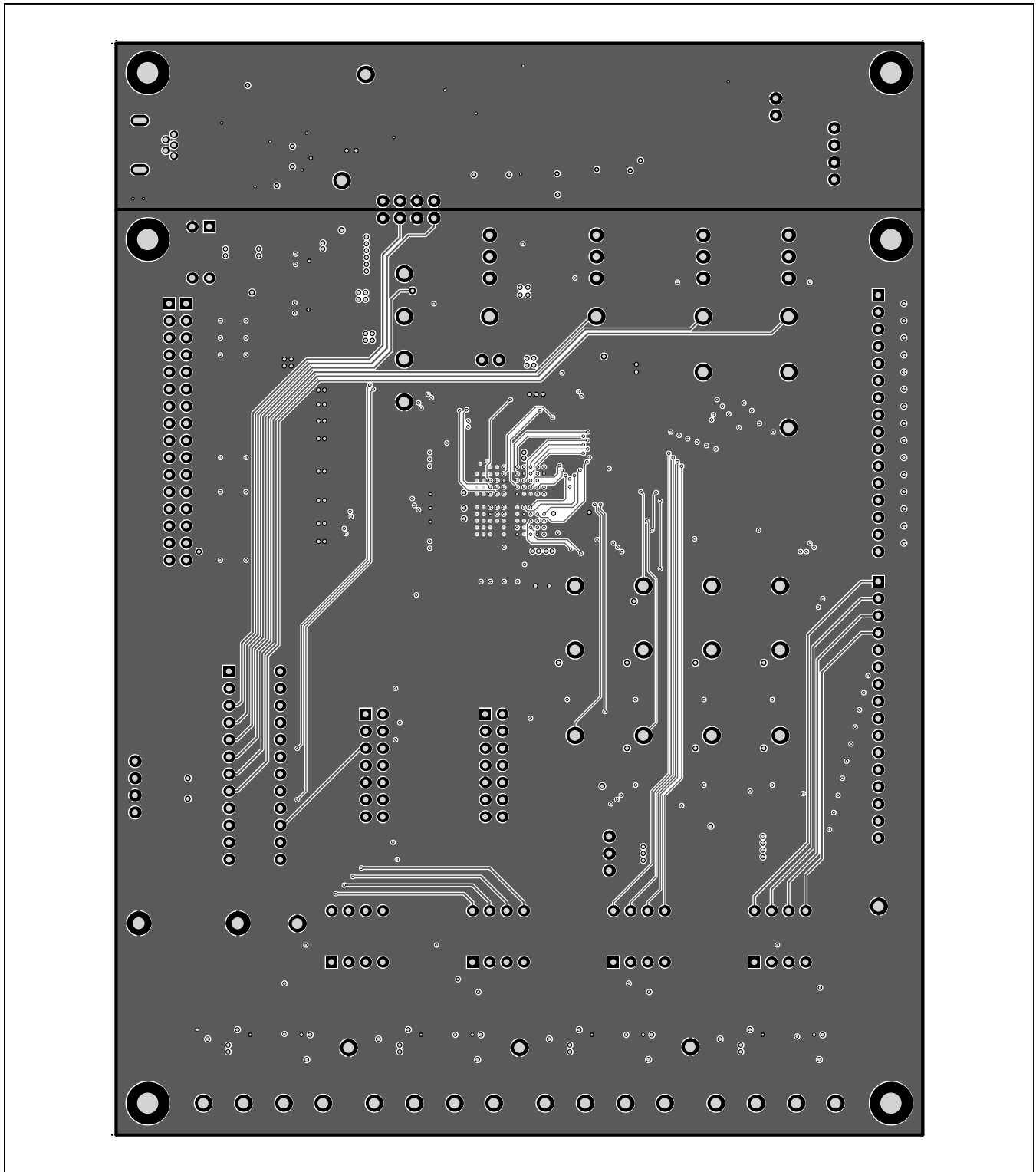


Figure 19. MAX34462 EV Kit PCB Layout—Internal Signal Layer 2

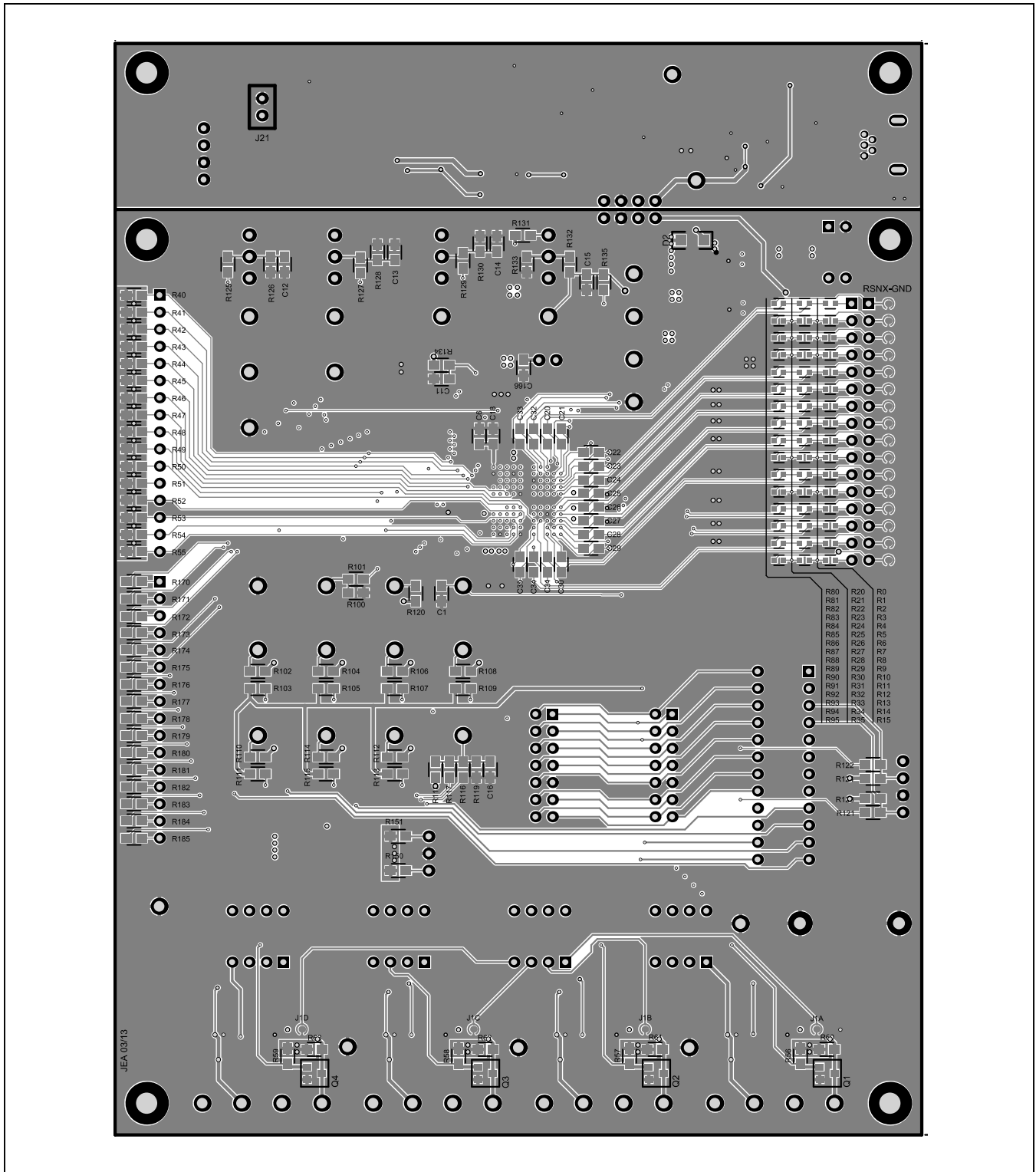


Figure 20. MAX34462 EV Kit PCB Layout—Bottom Layer

Ordering Information

PART	TYPE
MAX34462EVKIT#	EV Kit

#Denotes an RoHS-compliant device that may include lead(Pb), which is exempt under the RoHS requirements

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/13	Initial release	—

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