Evaluation Board User Guide

EVAL-ADPM12200

Evaluating the ADPM12200 Nonisolated Quarter-Brick DC-DC Power Module

General Description

The EVAL-ADPM12200 evaluation (EV) board is a proven design that evaluates the ADPM12200 2000W, nonisolated quarter-brick DC-DC power module with a PMBus digital interface. The EV board comes with the ADPM12200CMLZCH installed as the default.

The EV board is designed to evaluate the performance of an ADPM12200 module or two, three, or four ADPM12200 modules in parallel operation.

The EV board operates over a 40V to 60V input voltage range and supports a 12V output voltage.

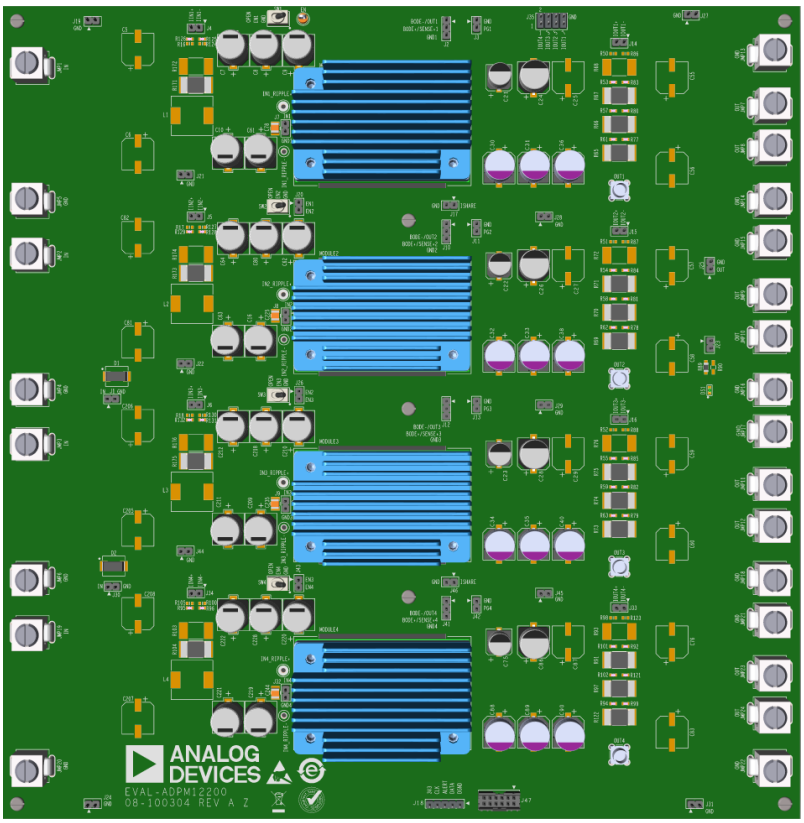
The MAX34451 16-channel V/I monitor is used as the PMBus controller for voltage and current telemetry in the ADPM12200 module. The MAX34451 EV kit and its Windows®-based graphical user interface (GUI) software are used for the communication between the EVAL-ADPM12200 board and PC.

Features and Benefits

- 40V to 60V Input Voltage Range
- 12V Output Voltage
- ADPM12200CMLZCH Installed by Default
- Active-High Logic
- Supports One Module or Two, Three, or Four Modules in Parallel Operation
- -40°C to +85°C Temperature Range
- High-Current PCB Lugs for Input and Output Voltage Connection
- Current-Sense Resistors for Input and Output Current Monitoring
- PMBus Interface
- Fully Assembled and Tested

Ordering Information **appears at the end of the data sheet.**

EVAL-ADPM12200 Board



One Analog Way, Wilmington, MA 01887-2356, U.S.A. | Tel: 781.329.4700

Quick Start

Required Equipment

- EVAL-ADPM12200 board
- 80V DC power supply (PS1) with 4kW or higher power delivering capability, determined by the quantity of installed modules
- E-load capable of sinking 300A or higher current, determined by the quantity of installed modules
- Fan capable of providing 500LFM or higher airflow
- One power supply (PS2) to supply the fan
- Digital voltmeters
- Oscilloscope and probes
- MAX34451 EV kit hardware (must be ordered separately)
- Mini-USB cable
- MAX34451 graphical user interface (GUI software)

Procedure

The EVAL-ADPM12200 board is fully assembled and tested and can be run without PMBus communication. Use the following steps to verify module operation:

Caution: Do not turn on the power supply until all connections are completed.

1. Visit the *MAX34451 product page* under the Tools & Simulations tab to download the latest version of the MAX34451 EV kit software. (Contact your Analog Devices representative for other software versions.) Save the EV kit software to a temporary folder and run it to install the MAX34451 GUI software.
2. Verify that the necessary jumpers are installed:
   - EVAL-ADPM12200-1: No jumpers are installed.
   - EVAL-ADPM12200-2: Jumper on J43 is installed to tie the REM pin of MODULE3 and MODULE4 together.
   - EVAL-ADPM12200-3: Jumpers on J26 and J43 are installed to tie the REM pin of MODULE2, MODULE3, and MODULE4 together.
   - EVAL-ADPM12200-4: Jumpers on J20, J26, J43 are installed to tie the REM pin of all modules together.
3. Verify that all of the switches (SW1 ~ SW4, if installed) are at the OFF position.
4. Set the power supply (PS1) to 54V, connect the positive terminal of the power supply (PS1) to the VIN connectors at the input side on the EVAL-ADPM12200 board, and connect the negative terminal of the power supply (PS1) to the GND connectors at the input side on the EVAL-ADPM122000 board.
5. Set the E-load to 0A, connect the positive terminal of the E-load to the VOUT connectors at the output side on the EVAL-ADPM12200 board, and connect the negative terminal of the E-load to the GND connectors at the output side on the EVAL-ADPM12200 board.
6. Set the power supply (PS2) to a proper voltage to supply the fan so that the fan can provide a 500LFM or higher airflow to cool the ADPM12200 modules.
7. If needed, connect the digital voltmeters and oscilloscope probes as shown in *Figure 1*.
8. If needed, connect the MAX34451 EV kit as shown in *Figure 2* for PMBus communication between the EVAL-ADPM12200 board and PC. On the MAX34451 EV kit, the power LED (D20) should be green, and the com LED (D21) should be red and slowly flash orange. When the GUI appears, the com LED (D21) should turn green.
9. Turn on power supplies PS1 and PS2.
10. Position the SW1~SW4 switches to ON to enable the power modules.
11. Verify that the voltage between VOUT and GND is 12V.

The EVAL-ADPM12200 board is now ready for additional evaluations.

Detailed Description of Hardware

This EVAL-ADPM12200 board should be used with the following documents:

- ADPM12200 data sheet
- EVAL-ADPM12200 data sheet (this document)
- MAX34451 data sheet
- MAX34451 EV kit data sheet

The EVAL-ADPM12200 board is a proven design that evaluates the ADPM12200CMLZCH 2000W, nonisolated quarter-brick DC-DC power module with a PMBus digital interface.

The EVAL-ADPM12200 EV board includes four sockets of quarter-brick modules, and Analog Devices offers an option with one module installed or an option with two, three, or four modules installed in parallel operation. The EV board configurations vary according to the quantity of installed modules, but each module configuration is the same. See *Figure 1* for the hardware configurations.

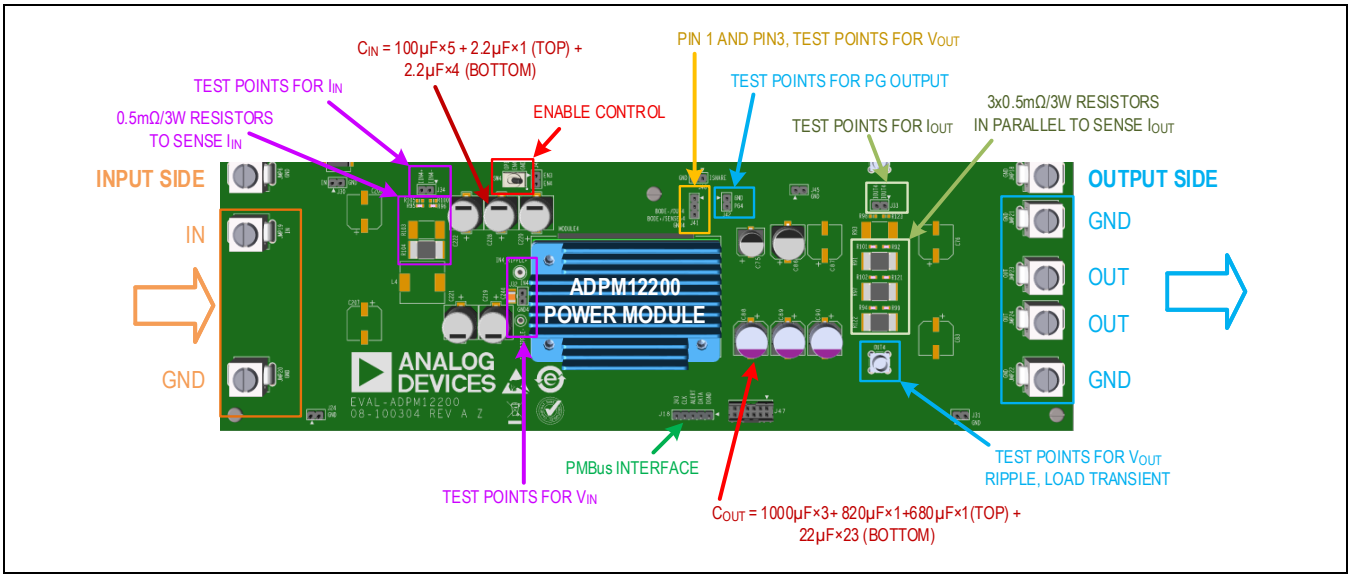


Figure 1. EVAL-ADPM12200 Board Configurations (One Module Is Shown)

Table 1. Used Sockets for 1/2/3/4-Module Operation

PART NUMBER	USED SOCKETS	R_{ADDR} (kΩ)	DEFAULT PMBus ADDRESS	
			(7 BIT)	(8 BIT)
EVAL-ADPM12200-1	MODULE 4	35.7	64h	C8h
EVAL-ADPM12200-2	MODULE 3	28	63h	C6h
	MODULE 4	35.7	64h	C8h
EVAL-ADPM12200-3	MODULE 2	21	62h	C4h
	MODULE 3	28	63h	C6h
	MODULE 4	35.7	64h	C8h
EVAL-ADPM12200-4	MODULE 1	15	61h	C2h
	MODULE 2	21	62h	C4h
	MODULE 3	28	63h	C6h
	MODULE 4	35.7	64h	C8h

Enable Input for ADPM12200 Modules

Each module on the EVAL-ADPM12200 board has its own EN_ input to enable/disable the output of the module, SW1~SW4. Position SW_ to OPEN to float the REM pin of the module to enable the output, and GND to short the REM pin of the module to GND to disable the output.

By installing jumpers on J20, J26, and J43, SW1~SW4 can be tied together. For two, three, or four modules in parallel operation, use any of the switches (SW1~SW4, if installed) to enable or disable all of the modules at the same time.

PMBus Interface

The PMBus interface of all four modules is tied together through respective RC filters, then connected to J18; see the *EVAL-ADPM12200 Schematic* section for more details. Connect DGND/DATA/CLK/3V3 of J18 on the EVAL-ADPM12200

board to GND/SDA/SCL/3.3V of J22 on the MAX34451 EV kit for PMBus communication. Make sure that no jumpers are installed on J23 on the MAX34451 EV kit; see *Figure 2* for the connections.

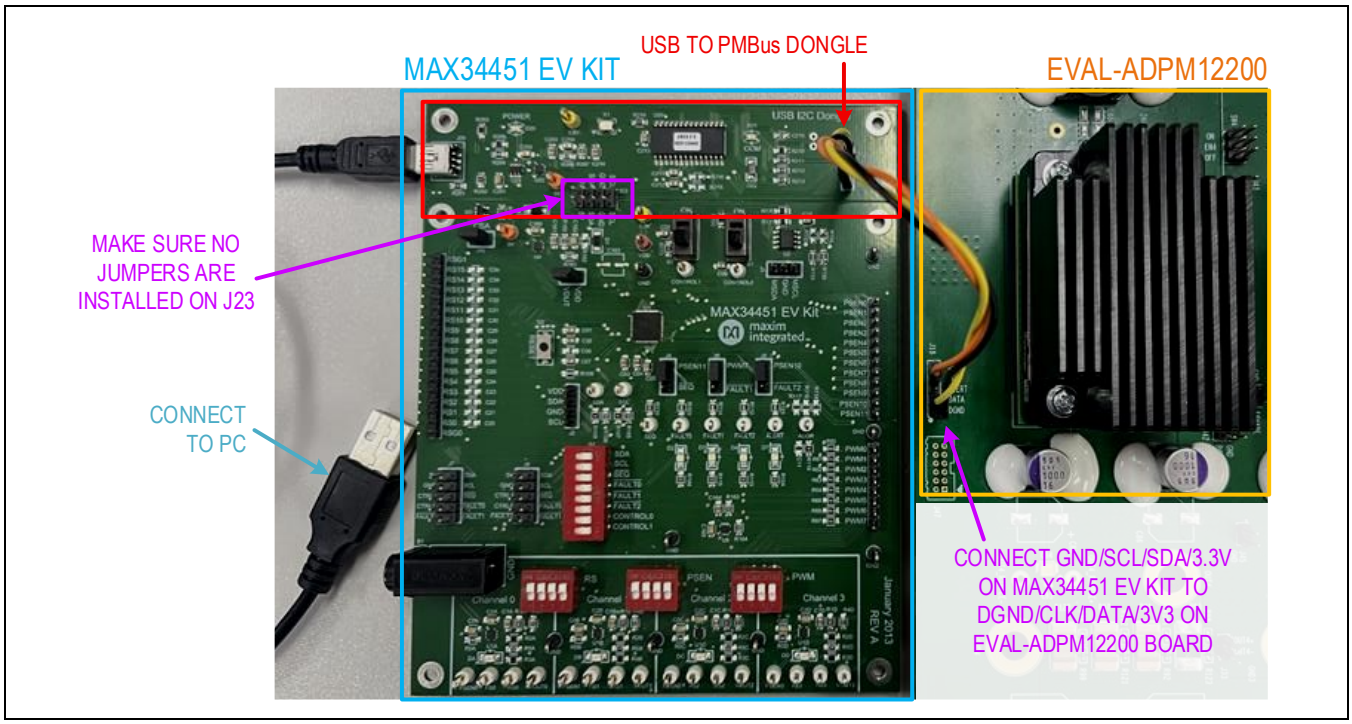


Figure 2. PMBus Connections from EVAL-ADPM12200 to PC for PMBus Communication

Detailed Description of Software

Caution: Do not make any changes to the grayed-out values shown in Figure 3 through Figure 14, which are for internal use only.

Note: In the following sections, text in **bold** refers to items directly from the EV kit software.

Software Startup

If the EVAL-ADPM12200 board and MAX34451 EV kit are connected when the software is opened, the software first initializes the hardware to communicate. The software then searches for all target addresses on the PMBus and connects to the first valid target address. If the EVAL-ADPM12200 board and MAX34451 EV kit are not connected upon software startup, the GUI populates with default MAX34451 EV kit values. Once connected, the GUI executes the sequence above.

Menu and Status Bar

The **File** menu contains options related to saving, loading, and creating reports of the GUI/module configurations. To save the current GUI configuration, click **Save Project As**. This saves the device name, pin names, and RAM CRC to an XML file and saves PMBus configurations to a HEX file. If a module is connected, this reads and saves data directly from the module; otherwise, it saves the configuration that is currently displayed on the GUI. The STORE_DEAULT_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. To load a configuration file while the module is connected, click the **Load Project** option. This operation updates the GUI with the XML file, writes the HEX file to the RAM of the module, performs a STORE_DEFAULT_ALL (11h) to write the content of the RAM to the main flash, and then reads current values from the module. The RAM CRC and main flash CRC are then read and compared to the CRC saved in the XML file.

To load a configuration file into module RAM without performing the STORE_DEFAULT_ALL (11h) command, click the **Load Project without Save** option. This option is also used to load the configuration on the GUI when the module is not connected. By doing so, the contents of the HEX file are written to a virtual device. Thereafter, if the GUI is closed, the contents stored in the virtual device are lost and are replaced by the default values of the GUI. **Create Report** saves a CSV file that contains all of the configuration tables.

The **Connection** menu item allows the user to connect to a desired module. **Find Target Addresses** searches for all target addresses connected to the PMBus and displays them in the **Status Log** group box. To select a module, click **Device1 Target Address** and all the target addresses found are shown and are selectable. Target addresses 18h and 34h are not selectable to prevent communicating with the alert response address and factory-programmed address. If multiple modules are connected, then the number of modules 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 **Turn 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), STATUS_MFR_SPECIFIC (80h)), 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 modules are being polled, then the selected polling rate options can be disabled to account for the longer time it takes to read all of the modules. To stop polling, press the **Turn 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 version of the GUI software and the module firmware can be checked by clicking the **About** option in the **Help** menu item in the status bar.

The **Clear Faults** button in the status bar sends the CLEAR_FAULTS (03h) command to clear any faults or warnings.

When the OPERATION (01h) command is available by using the ON_OFF_CONFIG (02h) command, select the **Turn Power On/Turn Power Off** button to turn the module on or off, which writes a value to the OPERATION (01h) command. The module powers on with margining off and powers off based on the **Power Down Action** drop-down list on the **Sequencing** tab.

The **Power Status** indicator reflects the overall power status of the connected system as a combination of bit 6 (SYS_OFF) and bit 11 (POWER_GOOD#) of the STATUS_WORD (79h) register. The **Fault Status** indicator turns red if any flags related to the fault or STATUS_MFR_SPECIFIC (for PAGE = 255) are set in the STATUS_WORD (79h) register. Both the **Power Status** and **Fault Status** indicators turn gray if the automatic polling has not been switched on.

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.

Pin Name in GUI vs. Module Signals

Each pin name shown in the GUI represents a different signal of the module; see *Table 2* for details.

Table 2. Pin Name in GUI vs. Signal of Module

PIN NAME IN GUI	SIGNAL OF MODULE
RS2/GPI2	Output voltage, V_{OUT}
PSEN2/GPO2	
PSEN3/GPO3	PGOOD output
RS4/GPI4	Output current, I_{OUT}, for output current OC configuration only
RS5/GPI5	Output current of phase 1, $I_{PH}1$
RS6/GPI6	Output current of phase 2, $I_{PH}2$
RS7/GPI7	Output current of phase 3, $I_{PH}3$
RS8/GPI8	Output current of phase 4, $I_{PH}4$
RS9/GPI9	Input voltage, V_{IN}
RS10/GPI10	Input current, I_{IN}
RS14/GPI14	Output current, I_{OUT}, for accurate output current monitoring only
others	For internal use

Sequencing Tab

The **Sequencing** tab (*Figure 3*) includes all of the sequence configuration and delays. All of the values on the tab are read when the tab is selected. The **Turn Power Supplies On - ON_OFF_CONFIG** group box controls the write to the ON_OFF_CONFIG (02h) command in order to set when the module turns on or off. The module can be turned on when bias is present **With CONTROL 0/1 Pin only** (the REM pin of the module) or with the OPERATION (01h) command by selecting the option on the **Turn Power Supplies On - ON_OFF_CONFIG** drop-down list.

When the module is commanded off, its output can be powered down immediately or with a TOFF delay by selecting the **Simultaneous** or **Use TOFF Delay** radio button.

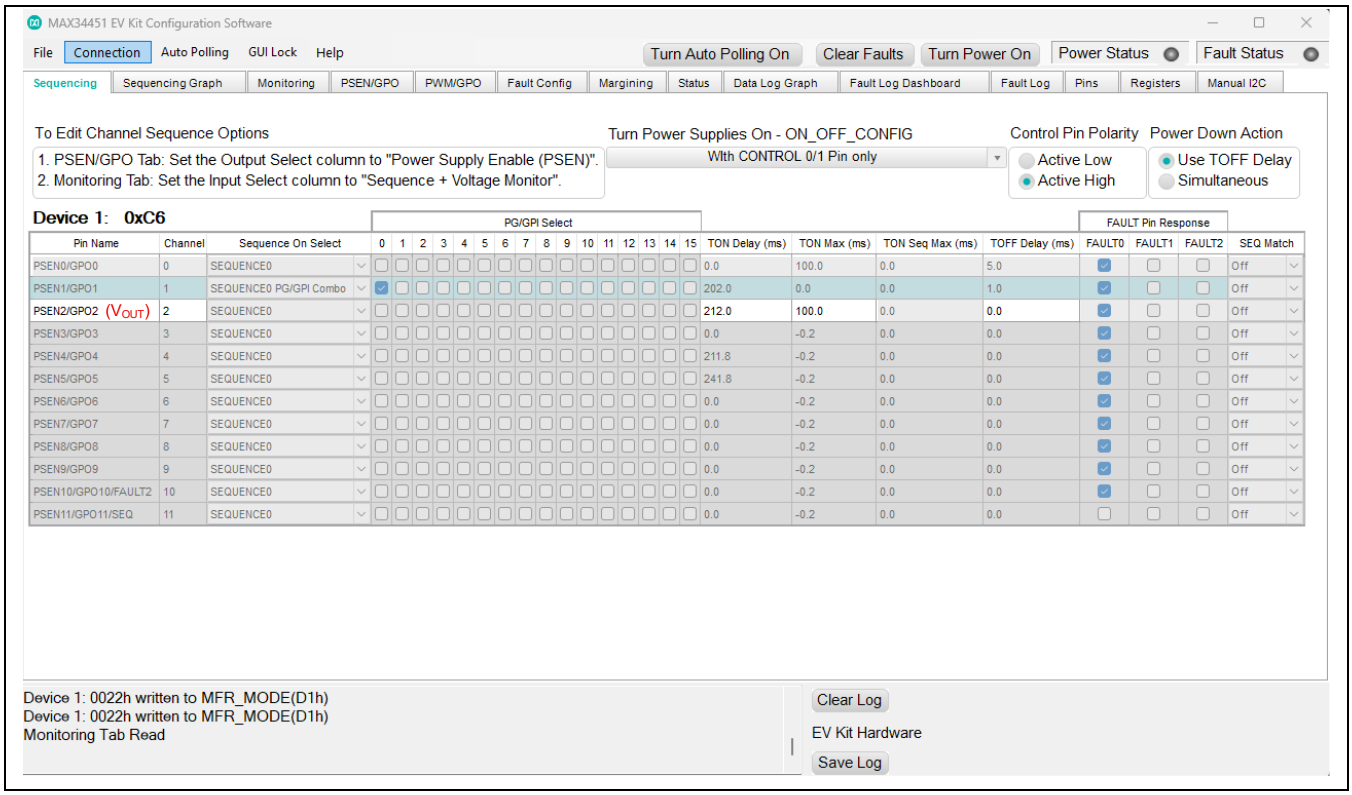


Figure 3. MAX34451 EV Kit GUI—Sequencing Tab

Sequencing Graph Tab

The **Sequencing Graph** tab (*Figure 4*) displays the timing diagrams for V_{OUT}.

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, this limit 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. 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 corner.

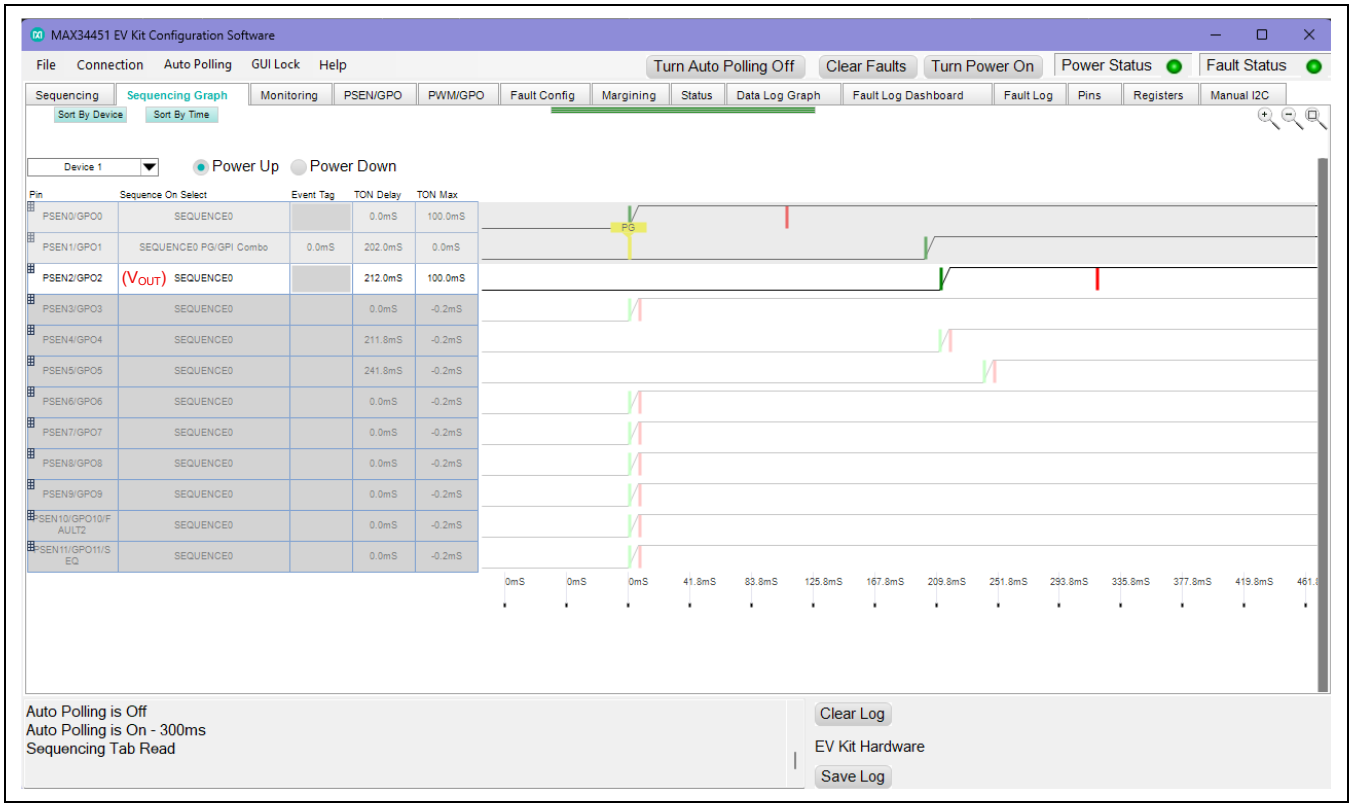


Figure 4. MAX34451 EV Kit GUI—Sequencing Graph Tab

Monitoring Tab

The **Monitoring** tab (*Figure 5*) displays the fault/warn limit settings for the voltage, current, and temperature. To read the settings, click on the **Monitoring** tab and all of 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. Some columns are grayed out depending on what is selected in the **Input Select** column (**Voltage Monitor** or **Current Monitor**). The fault/warn limits can be set by entering the voltage/current level or the percent of the nominal value 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 temperature sensor can be enable/disabled 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.

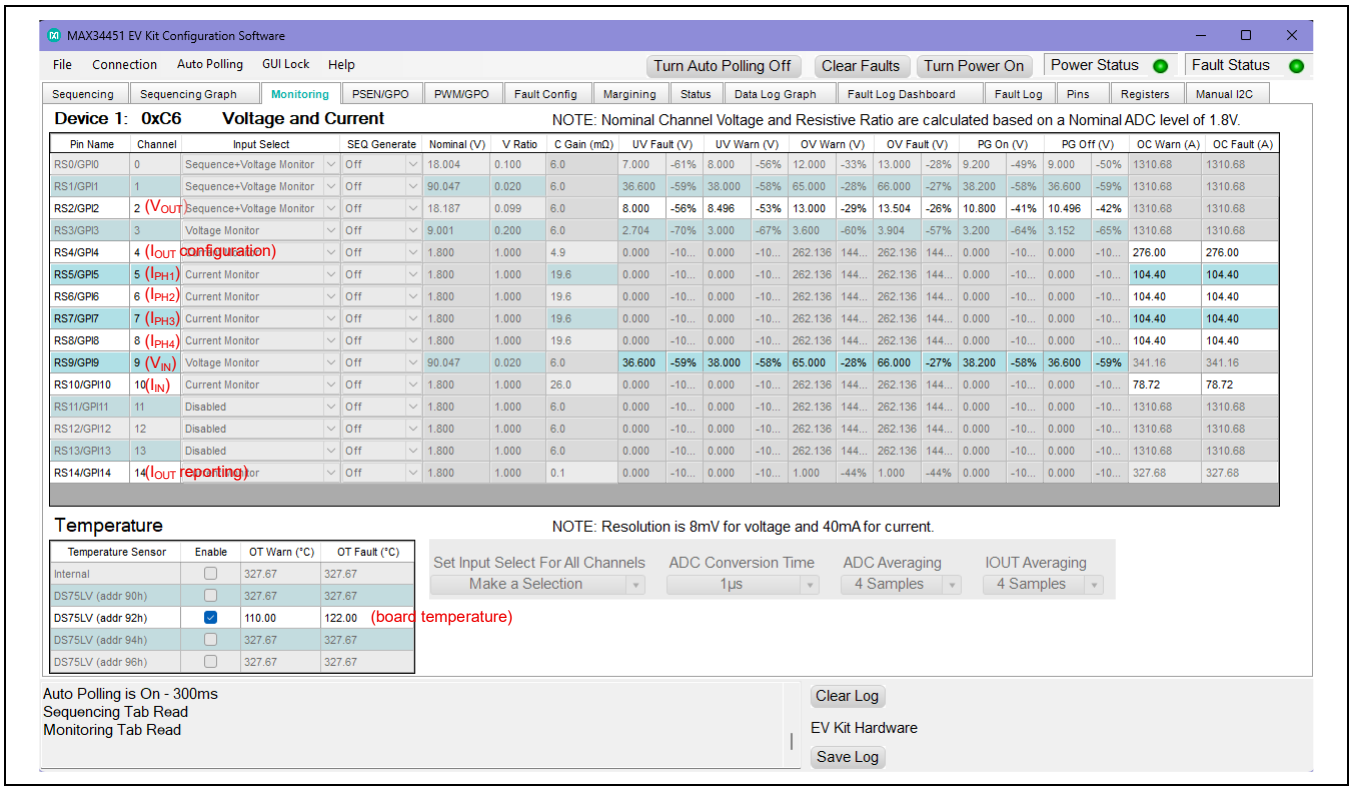


Figure 5. MAX34451 EV Kit GUI (Monitoring Tab)

PSEN/GPO Tab

The **PSEN/GPO** tab (*Figure 6*) sets the delay time for the PGOOD output with **TON Delay** (TON_DELAY (60h)) and **TOFF Delay** (TOFF_DELAY (64h)).

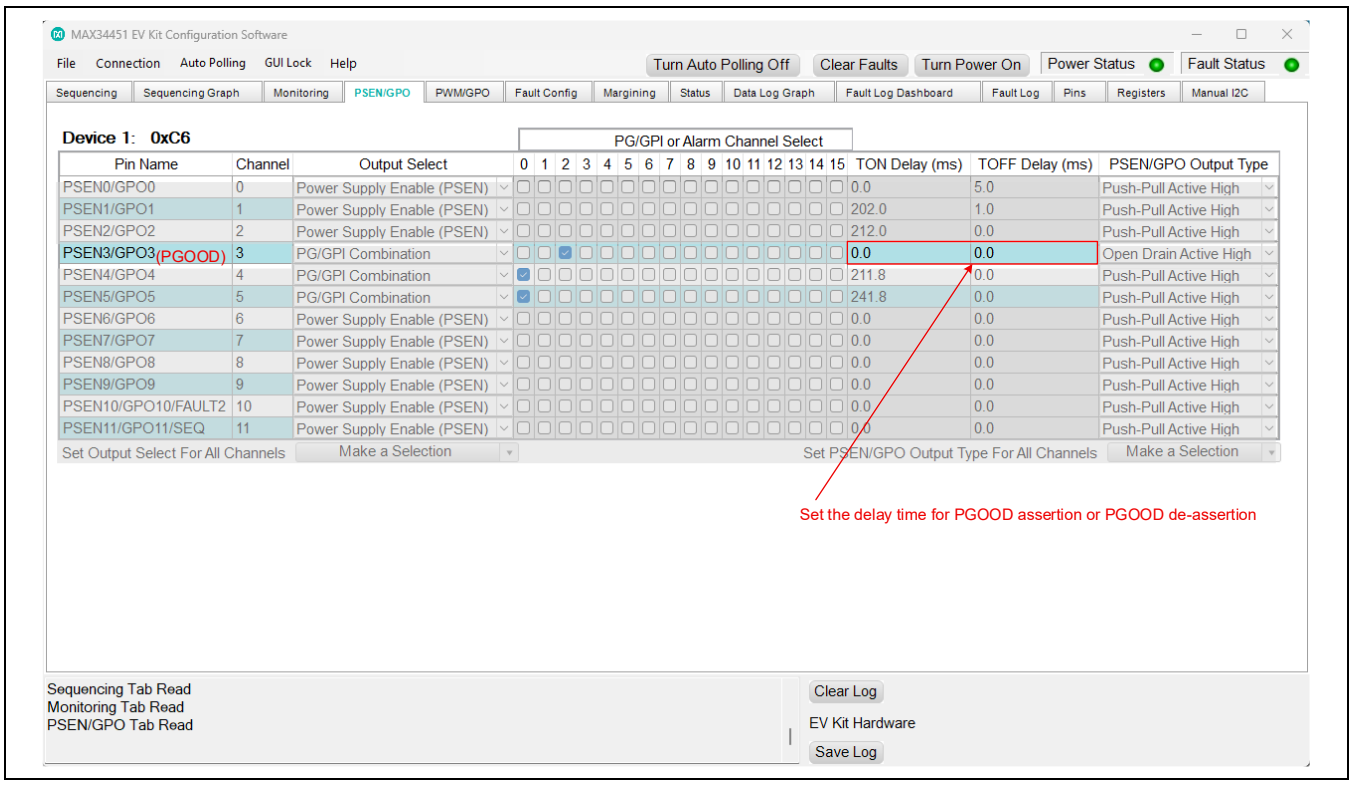


Figure 6. MAX34451 EV Kit GUI (PSEN/GPO Tab)

PWM/GPO Tab

The **PWM/GPO** tab is not used for ADPM12200 configurations.

Fault Config Tab

The **Fault Config** tab (*Figure 7*) sets the fault response of the UV/OV fault of a voltage and the OC fault of a current. The **Fault Retry** time sets the delay between retries when a fault is configured to **Retry** mode; greater than 1s delay is recommended.

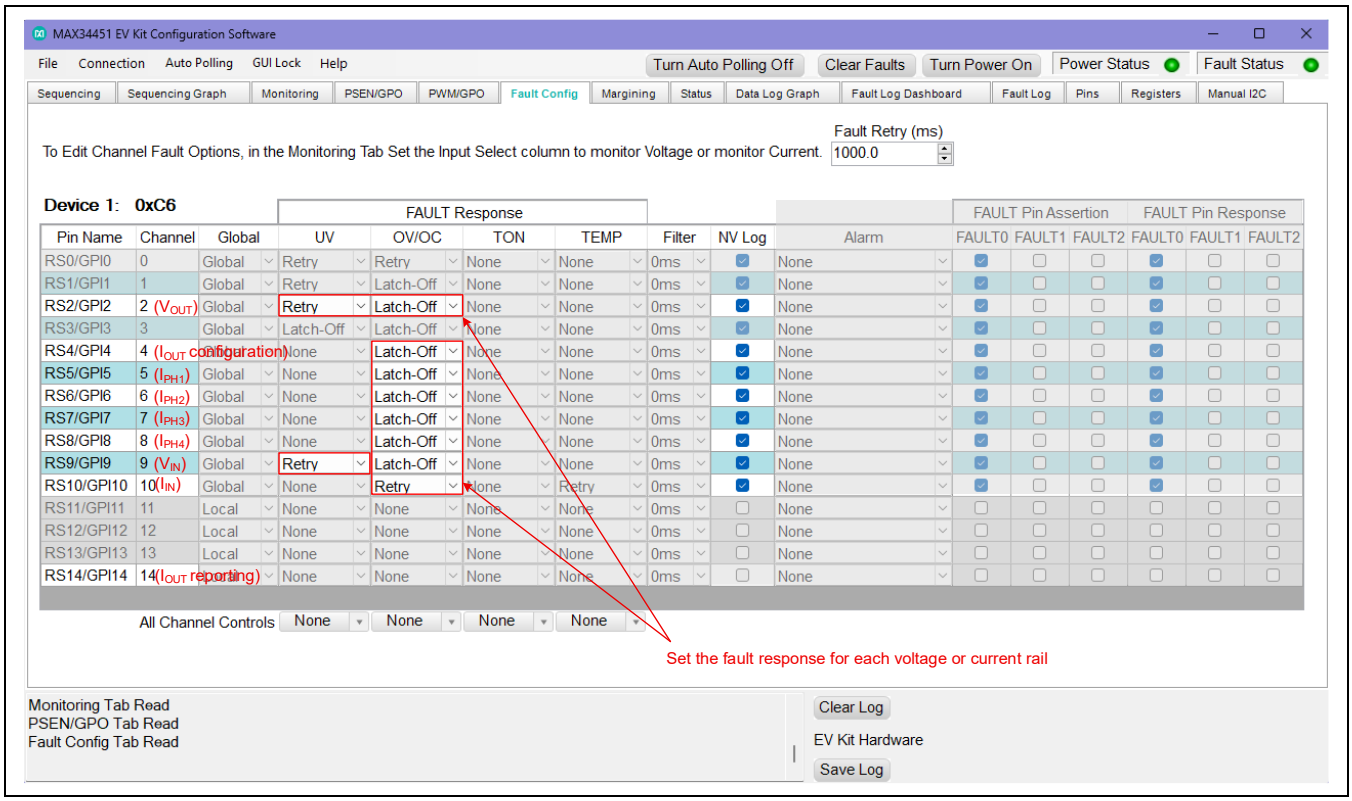


Figure 7. MAX34451 EV Kit GUI (Fault Config Tab)

Margining Tab

The **Margining** Tab (*Figure 8*) includes the margin configurations to adjust the output voltage.

To adjust the output voltage:

1. Enable the margin function by selecting **Low** or **High** from the drop-down list of the **Margin** column. **Act on Faults** following **Low** or **High** indicates whether any warning or fault on the output is detected when adjusting the V_{OUT}; the module treats this as warning or fault and responds as programmed. **Ignore Faults** following **Low** or **High** means that all warnings and faults are ignored when adjusting V_{OUT}.
2. Enter the **PWM Level** value (decimal) to get the desired V_{OUT_TARGET}, which is calculated by:

   PWM Level = 626.4 – 47.23 × V_{OUT_TARGET}

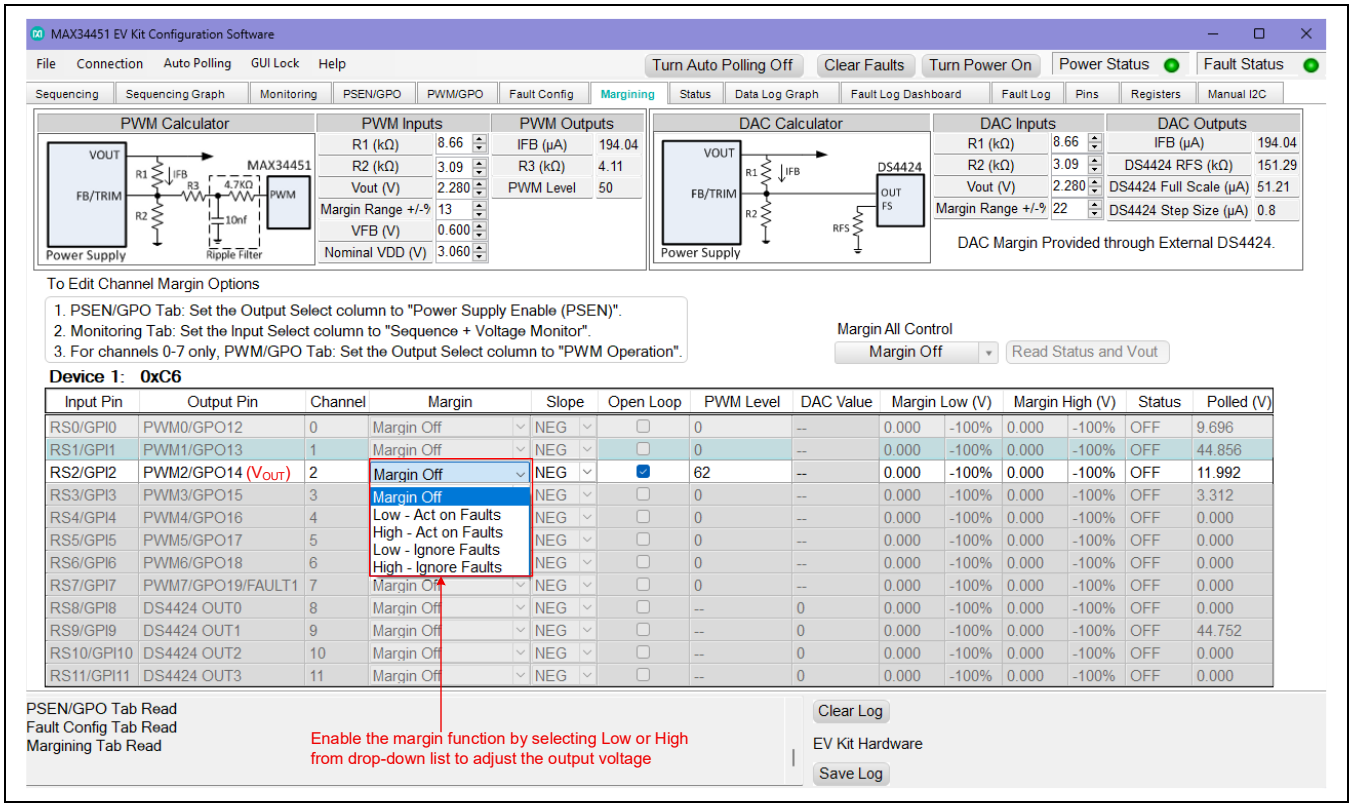


Figure 8. MAX34451 EV Kit GUI (Margining Tab)

Status Tab

The **Status** tab (*Figure 9*) displays all of the faults, warnings, and device ID information. To read all of 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 may not reflect the fault or warning because some bits are latches and must 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.

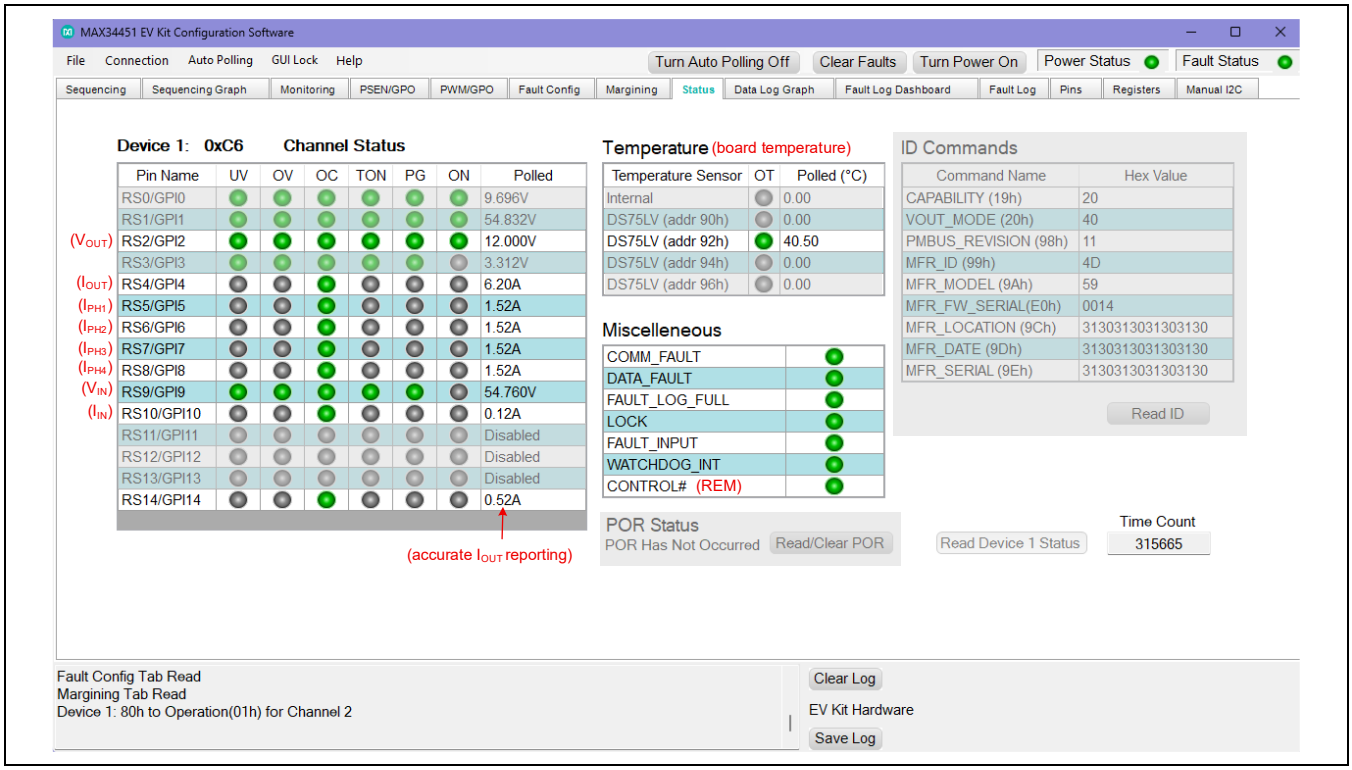


Figure 9. MAX34451 EV Kit GUI (Status Tab)

Data Log Graph Tab

The **Data Log Graph** tab (*Figure 10*) plots the polled values in a graph and keeps track of the minimum and maximum values for each voltage, current, and temperature. To read the polled values, press the **Data Log Read** button. Each data log reads every voltage (READ_VOUT (8Bh)), current (READ_IOUT (8Ch)), and 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 of the poll-count values, but the graph only displays the latest 10,000 polled values. To reset the **Poll Count** and all of the min/max values, select **Data Log Reset**. To turn off data logging during polling, click 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 of the data graphed to a CSV file, press the **Save Data Log** button.

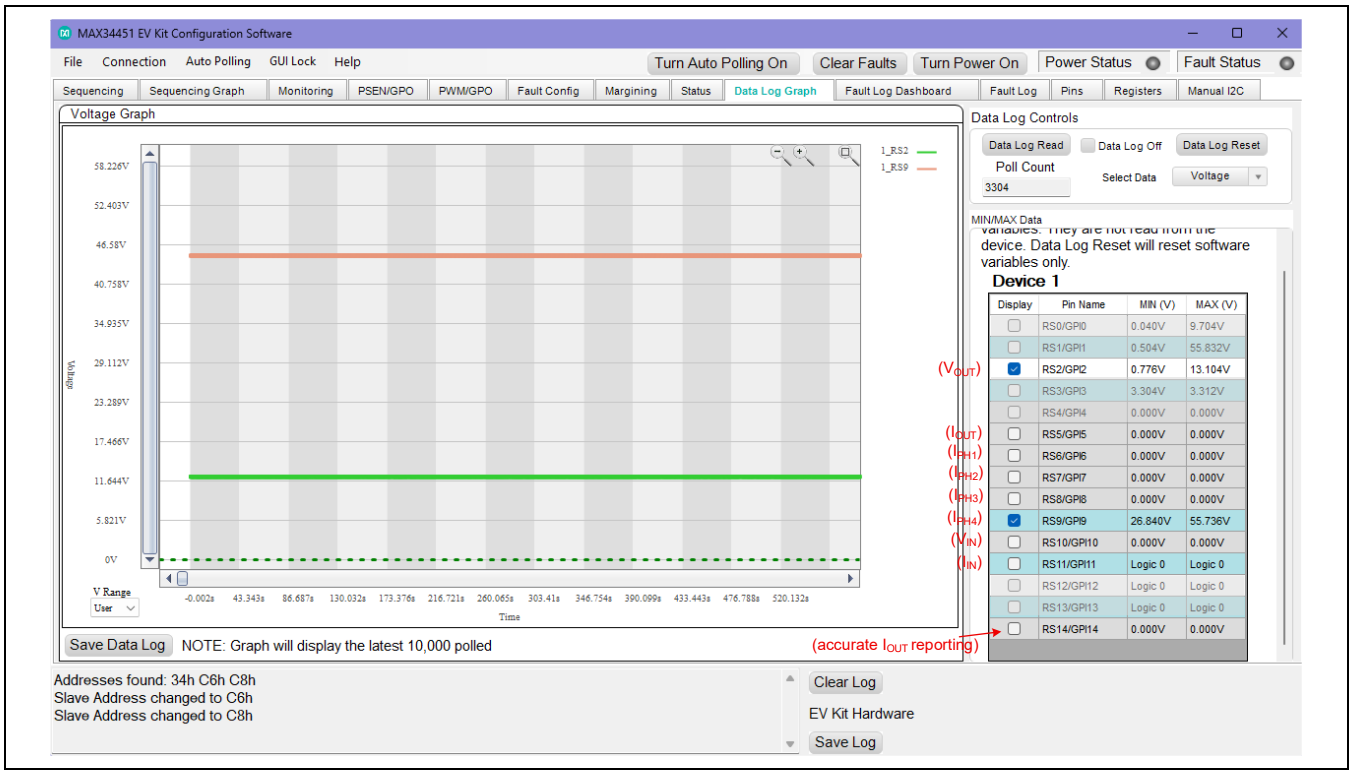


Figure 10. MAX34451 EV Kit GUI (Data Log Graph Tab)

Fault Log Dashboard Tab

The **Fault Log Dashboard** tab (*Figure 11*) displays all 15 NV fault logs in table format. When the tab is selected, the **Overwrite** and **Fault Log** 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** drop-down list. The **Enable Overwrite** and **Fault Log** 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 last three black box readings. The **Temperature** table shows the OT fault status, peak value, and 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 of the fault log tables in a CSV file.

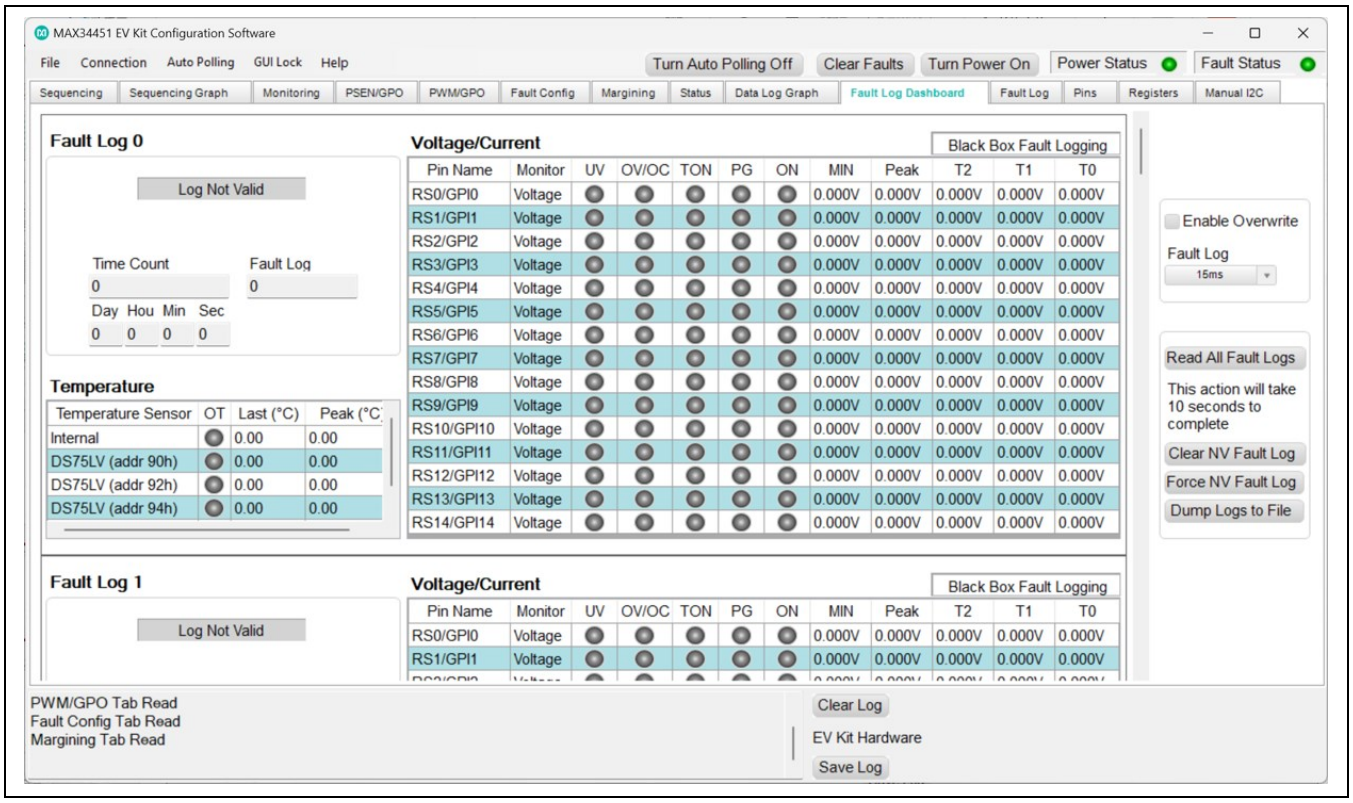


Figure 11. MAX34451 EV Kit GUI (Fault Log Dashboard Tab)

Fault Log Tab

The **Fault Log** tab sheet (*Figure 12*) 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 **Save Log to File** button and the table is saved as a CSV file.

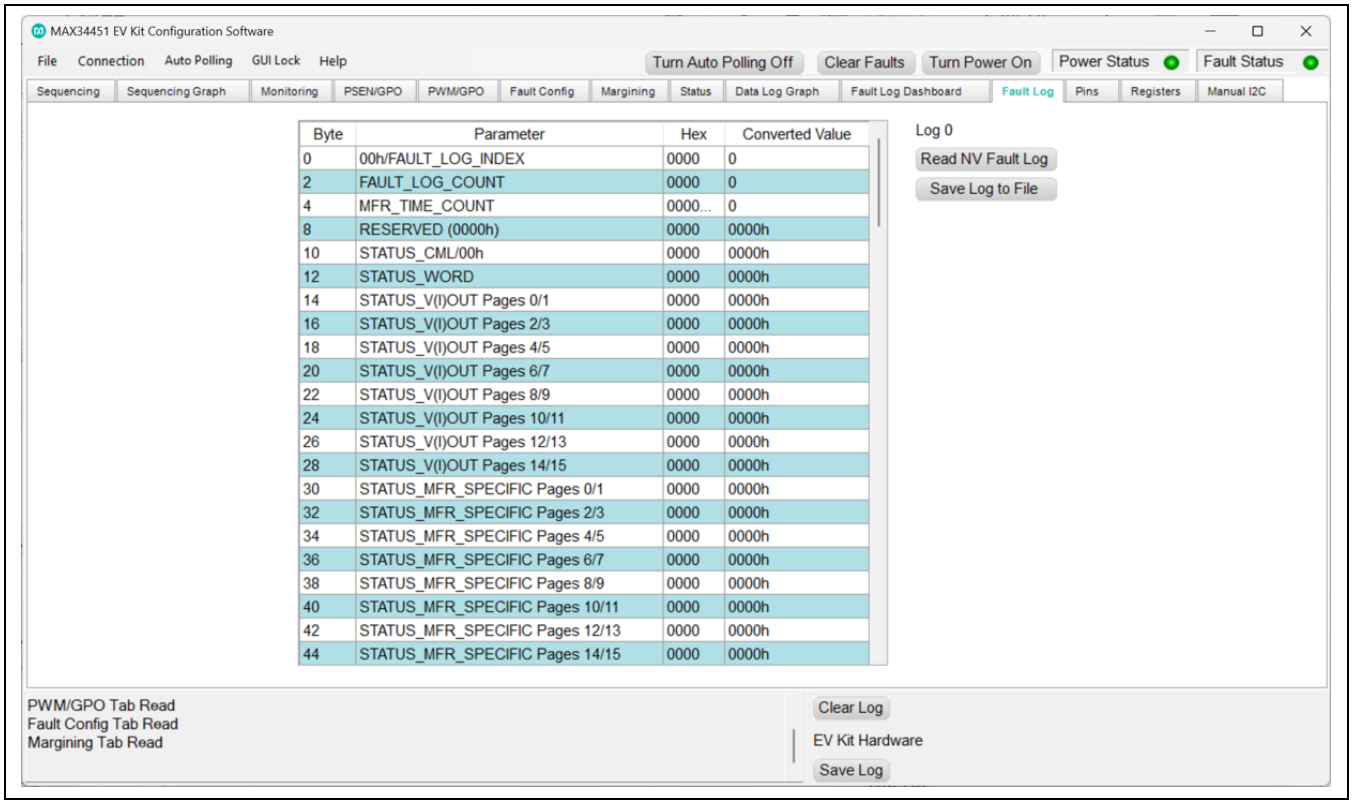


Figure 12. MAX34451 EV Kit GUI (Fault Log Tab)

Pins Tab

The **Pins** tab sheet is not used for ADPM12200 configurations.

Registers Tab

The **Registers** tab (*Figure 13*) displays all of the PMBus commands and their current data. To read the registers, select a page in the top drop-down list and all of the PMBus commands that are valid for that page are automatically read. The commands that are 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 three memory arrays in the module can be read by pressing the **Read CRC of All Memory Arrays** button, which reads/writes to the MFR_CRC (FEh) command. The current register configuration can be saved to MAIN flash by pressing the **Save To Main Flash** button, which sends the STORE_DEFAULT_ALL (11h) command. The configuration can also be saved to BACKUP flash by pressing the **Save To Back Up Flash** button, which reads/writes to the MFR_STORE_ALL (EEh) command. To return the module to the configuration in MAIN flash, press the **Restore From Main Flash** button, which sends the RESTORE_DEFAULT_ALL (12h) command. The module can also be returned to the configuration stored in BACKUP flash by pressing the **Restore From Back Up Flash** button to read/write to the MFR_RESTORE_ALL (EFh) command. To reset the module, 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 it shows a description of each bit for that command (*Figure 13*).

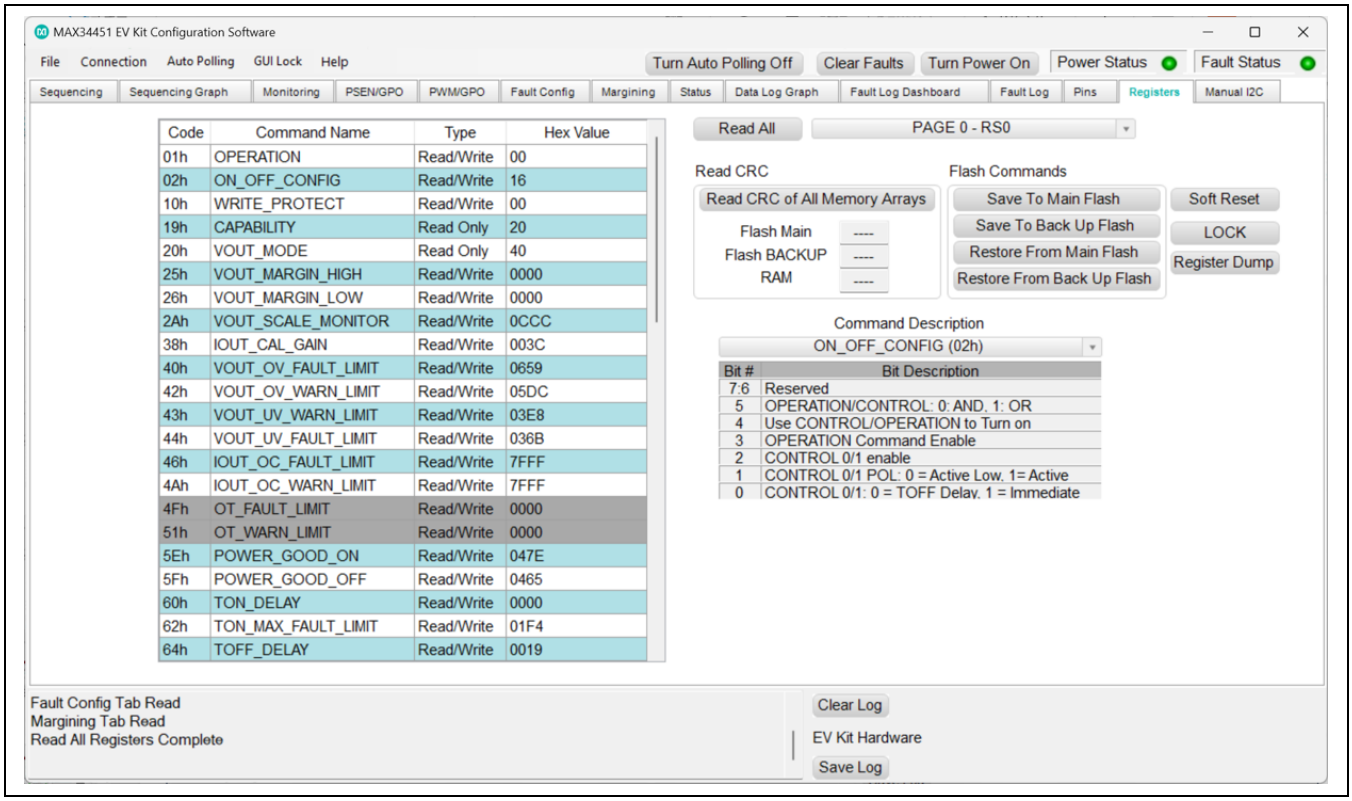


Figure 13. MAX34451 EV Kit GUI (Registers Tab)

Manual I²C Tab

The **Manual I²C** tab (*Figure 14*) allows the user to read/write data from/to the module(s) connected on the PMBus. Before starting to communicate with the module using this tab, be sure to enter the correct target address in the **Software Target Address** field and click **Change**.

The **One and Two Byte Operations** section allows the user to read or write data to the module. The **Addr** field corresponds to the hex code of the PMBus command register to which the data is being written. The **One and Two Byte Operations** section allows the user to view as many as three read/write operations. The **Manual 2-Wire Control** section enables the PMBus protocol to manually send read or write commands to the module. The **Manual 2-Wire Control** section should not be used if the bus is configured for a timeout. The **Bitwise Read/Write** section allows the user to read or write individual bits in the data field of a command register.

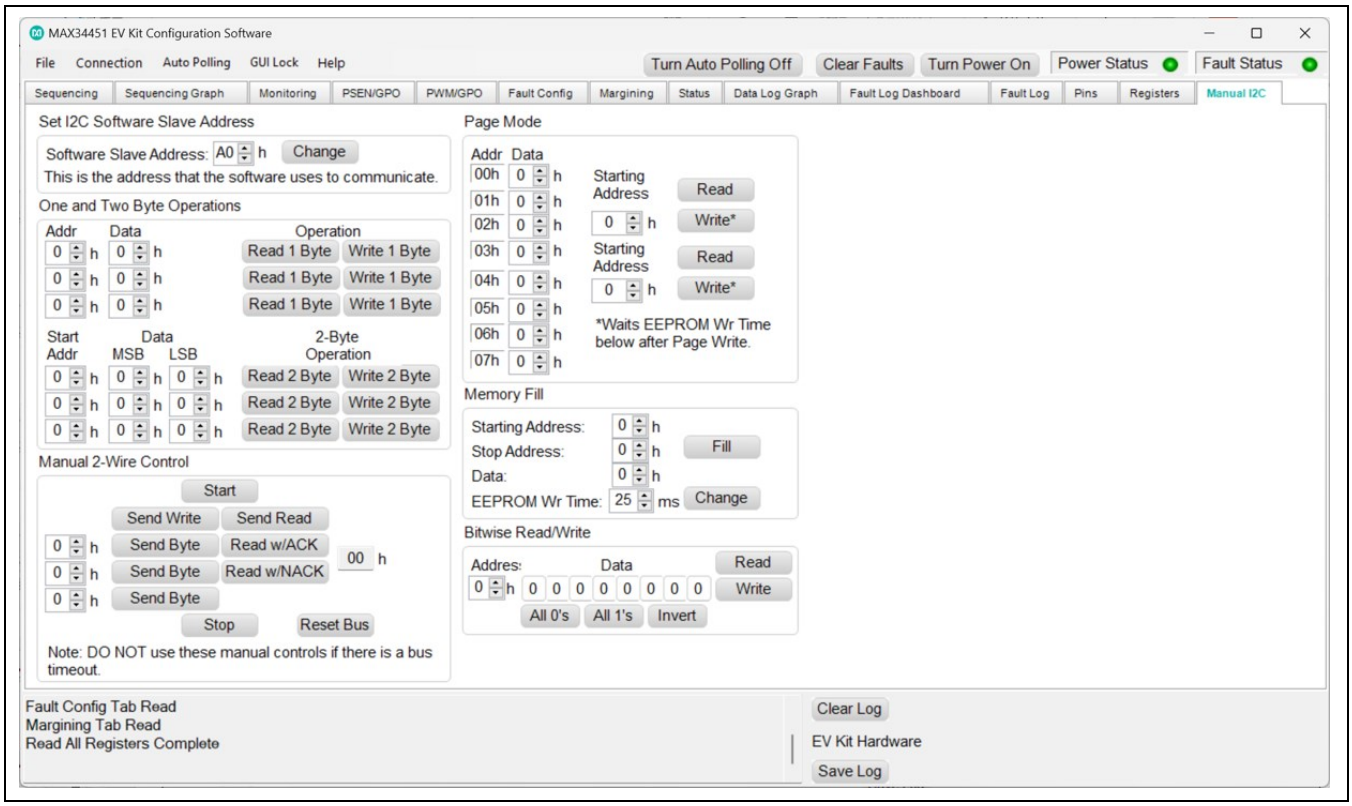


Figure 14. MAX34451 EV Kit GUI (Manual I²C Tab)

Multiple Modules

The GUI has the ability to display data for up to four devices. If multiple target 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 target address in the **DeviceX Target 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.

Ordering Information

PART NUMBER	TYPE	DESCRIPTION
EVAL-ADPM12200-1	EV board	One ADPM12200CMLZCH module is installed, active high
EVAL-ADPM12200-2		Two ADPM12200CMLZCH modules are installed, active high
EVAL-ADPM12200-3		Three ADPM12200CMLZCH modules are installed, active high
EVAL-ADPM12200-4		Four ADPM12200CMLZCH modules are installed, active high

EVAL-ADPM12200 Bill of Materials

REF DES				MANUFACTURER PART #	MANUFACTURER	VALUE	DESCRIPTION
EVAL-ADPM12200-4	EVAL-ADPM12200-3	EVAL-ADPM12200-2	EVAL-ADPM12200-1				
C7-C10, C16, C61-C64, C80, C209-C212, C218-C222, C228	C16, C62-C64, C80, C209-C212, C218-C222, C228	C209-C212, C218-C222, C228	C219-C222, C228	EEQZS1K101UP	PANASONIC	100UF	CAP; ALUM ELECT; 100UF; 80V; 20%; 10X16.5mm
C43, C44, C91, C92, C97-C110, C112-C116, C122-C139, C141-C145, C151-C168, C170-C174, C180-C197, C199-C203	C122-C145, C151-C168, C170-C174, C180-C197, C199-C203	C151-C168, C170-C174, C180-C197, C199-C203	C180-C197, C199-C203	GRM32ER71E226KE15K	MURATA	22UF	CAP CER 22UF 25V 10% X7R 1210
C15, C65, C66, C77, C78, C216, C217, C223-C225, C231-C235, C240-C244	C216, C217, C223-C225, C231-C235, C240-C244	C231-C235, C240-C244	C240-C244	GRM32ER72A225KA35	MURATA	2.2UF	CAP; SMT (1210); 2.2UF; 10%; 100V; X7R; CERAMIC
C2-C4, C18-C20, C52-C54, C93, C95, C96	C18-C20, C52-C54, C93, C95, C96	C52-C54, C93, C95, C96	C93, C95, C96	C0603C101J5GAC	KEMET	100PF	CAP; SMT (0603); 100PF; 5%; 50V; C0G; CERAMIC
C21-C23, C75	C22, C23, C75	C23, C75	C75	16SVPG680M	PANASONIC	680UF	CAP; SMD; 680UF; 20%; 16V; ALUMINUM POLYMER
C24, C26, C28, C86	C26, C28, C86	C28, C86	C86	16SVPG820M	PANASONIC	820UF	CAP; SMD; 820UF; 20%; 16V; ALUMINUM POLYMER
C245, C248, C251, C254, C257	C245, C251, C254, C257	C245, C254, C257	C245, C257	GCM188R71E105KA64	MURATA	1UF	CAP; SMT (0603); 1UF; 10%; 25V; X7R; CERAMIC
C246	C246	C246	C246	GRM21BR71C475KA73	MURATA	4.7UF	CAP; SMT (0805); 4.7UF; 10%; 16V; X7R; CERAMIC
C249, C252, C255, C258	C252, C255, C258	C255, C258	C258	C0603C153K5RAC	KEMET	0.015UF	CAP; SMD; 0603; 0.015UF; 10%; 50V; X7R; CERAMIC
C30-C36, C38, C40, C88, C89, C90	C32-C35, C38, C40, C88, C89, C90	C34-C35, C40, C88, C89, C90	C88, C89, C90	16SVF1000M	PANASONIC	1000UF	CAP; SMD; 1000UF; 20%; 16V; POLYMER ALUMINUM
C46, C47, C48, C85	C47, C48, C85	C48, C85	C85	GCM21BR71E105KA56L	MURATA	1UF	CAP CER 1uF 25V 10% X7R 0805 AEC-Q200
C49-C51, C84	C50, C51, C84	C51, C84	C84	TAJB106K016RNJ	AVX	10UF	CAP TANT 10uF 16V 10% 3528-20
D1, D2	D1, D2	D2	D2	5.0SMDJ58A	BOURNS	58V	DIODE; TVS; SMC (DO-214AB); VRM=58V; IPP=53.5A
DS1	DS1	DS1	DS1	HSMG-C190	BROADCOM LIMITED	HSMG-C190	DIO; LED; SMD; GREEN; 2.6V; 0.02A
EN	—	—	—	5013	KEYSTONE	5013	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; ORANGE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH
J1, J3-J9, J11, J13-J17, J19-J34, J42-J46	J1, J5, J6, J8, J9, J11, J13, J15, J16, J21-J26, J28-J34, J42-J46	J6, J9, J13, J16, J22-J25, J29-J34, J42-J46	J23-J25, J30-J34, J42, J44, J45	PEC02SAAN	SULLINS	PEC02SAAN	CONN-PCB 2.54MM HEADER SINGLE STR 2POS
J2, J10, J12, J41	J10, J12, J41	J12, J41	J41	PEC03SAAN	SULLINS	PEC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY HEADER; STRAIGHT; 3PINS
J18	J18	J18	J18	PEC05SAAN	SULLINS	PEC05SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 5PINS
J35	J35	J35	J35	PEC04DAAN	SULLINS	PEC04DAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 8PINS

REF DES				MANUFACTURER PART #	MANUFACTURER	VALUE	DESCRIPTION
EVAL-ADPM12200-4	EVAL-ADPM12200-3	EVAL-ADPM12200-2	EVAL-ADPM12200-1				
J47	J47	J47	J47	98414-G06-12ULF	AMPHENOL	98414-G06-12ULF	CON; MALE; STRAIGHT; TH; 12P; SHROUDED HEADER; 650V; 2A
JMP1-JMP24	JMP2-JMP4, JMP6, JMP9-JMP12, JMP15-JMP24	JMP3, JMP6, JMP11, JMP12, JMP17-JMP24	JMP19-JMP24	B2A PCB	INTERNATIONAL HYDRAULICS INC	B2A PCB	CONNECTOR BUSS STAPLE; TOTAL LENGTH=0.565; TIN; BODY = BRASS COPPER; TIN PLATED
MISC1, MISC2, MISC3, MISC4, MISC5, MISC6, MISC7	MISC1, MISC2, MISC3, MISC4, MISC5, MISC6, MISC7	MISC1, MISC2, MISC3, MISC4, MISC5, MISC6, MISC7	MISC1, MISC2, MISC3, MISC4, MISC5, MISC6, MISC7	24427	GENERIC PART	24427	STANDOFF; FEMALE-THREADED; HEX; M2.5; 20MM; ALUMINUM
MISC8, MISC9, MISC10, MISC11, MISC12, MISC13, MISC14	MISC8, MISC9, MISC10, MISC11, MISC12, MISC13, MISC14	MISC8, MISC9, MISC10, MISC11, MISC12, MISC13, MISC14	MISC8, MISC9, MISC10 ,MISC11, MISC12, MISC13, MISC14	29301	KEYSTONE	29301	MACHINE SCREW; SLOTTED; PAN; M2.5; 6MM; STEEL; ZINC PLATE
MISC15, MISC16, MISC17	MISC16, MISC17	MISC17		SX1100-B	KYCON	SX1100-B	CONNECTOR; MINI SHUNT; 2.54 MM PITCH; 650V RMS; 3A
MODULE1-MODULE4	MODULE2-MODULE4	MODULE3, MODULE4	MODULE4	ADPM12200CMLZCH	ANALOG DEVICES	ADPM12200CMLZCH	2000W, QUARTERBRICK POWER MODULE, ACTIVE HIGH
OUT1-OUT4	OUT2-OUT4	OUT3, OUT4	OUT4	131-3701-261	CINCH CONNECTIVITY SOLUTIONS	131-3701-261	CONN-PCB COAX SMB JACK RF VERTICAL PCMNT GOLD
R1, R3, R4, R6, R11, R19, R21, R22, R24, R29, R34, R36, R37, R39, R44, R47, R107, R109, R110, R112, R120, R133-R135	R19, R21, R22, R24, R29, R34, R36, R37, R39, R44, R47, R107, R109, R110, R112, R120, R133-R135	R34, R36, R37, R39, R44, R47, R107, R109, R110, R112, R120, R133-R135	R47, R107, R109, R110, R112, R120, R133-R135	RC0603JR-070RL	YAGEO	0	RES SMD 0 Ohm JUMPER 1/10W 0603
R8-R10, R26-R28, R41-R43, R114, R115, R118	R26-R28, R41-R43, R114, R115, R118	R41-R43, R114, R115, R118	R114, R115, R118	CRCW060349R9FK	VISHAY DALE	49.9	RES; SMT (0603); 49.9; 1%; +/-100PPM/DEGC; 0.1000W
R53-R55, R57-R59, R61-R63, R77-R85, R92, R94-R96, R99, R101, R102, R121, R125, R126, R128, R129, R131, R132, R138, R139, R142, R143, R146, R147, R150, R151	R54, R55, R58, R59, R62, R63, R78, R79, R81, R82, R84, R85, R92, R94-R96, R99, R101, R102, R121, R128, R129, R131, R132, R142, R143, R146, R147, R150, R151	R55, R59, R63, R79, R82, R85, R92, R94-R96, R99, R101, R102, R121, R131, R132, R146, R147, R150, R151	R92, R94-R96, R99, R101, R102, R121, R150, R151	CRCW060310R0FK	VISHAY	10	RES; SMT (0603); 10; 1%; +/-100PPM/DEGC; 0.1000W
R65-R67, R69-R71, R73-R75, R91, R97, R104, R122, R171, R173, R175	R69-R71, R73-R75, R91, R97, R104, R122, R173, R175	R73-R75, R91, R97, R104, R122, R175	R91, R97, R104, R122	WSL3921L5000FEA	VISHAY	0.0005	RES; SMD; 3921; CURRENT SENSING; 0.0005; 1%; METAL STRIP
R113	R113	R113	R113	ERJ-3EKF3572	PANASONIC	35.7K	RES; SMT (0603); 35.7K; 1%; +/-100PPM/DEGC; 0.1000W
R14, R32, R48, R116	R32, R48, R116	R48, R116	R116	CRCW060310K0FK	VISHAY	10K	RES; SMT (0603); 10K; 1%; +/-100PPM/DEGC; 0.1000W
R15, R33, R49, R117	R33, R49, R117	R49, R117	R117	TNPW06033K83BE	VISHAY DALE	3.83K	RES; SMT (0603); 3.83K; 0.10%; +/-100PPM/DEGC; 0.1000W
R136	R136	R136	R136	ERJ-3EKF5902	PANASONIC	59K	RES; SMT (0603); 59K; 1%; +/-100PPM/DEGC; 0.1000W
R137	R137	R137	R137	CRCW0603267KFK	VISHAY	267K	RES; SMT (0603); 267K; 1%; +/-100PPM/DEGC; 0.1000W
R140, R144, R148, R152	R144, R148, R152	R148, R152	R152	RK73H1J4990FT	KOA	499	RES; SMT (0603); 499; 1%; +/-100PPM/DEGC; 0.1000W
R25	R25	—	—	CRCW060321K0FK	VISHAY	21K	RES; SMT (0603); 21K; 1%; +/-100PPM/DEGC; 0.1000W

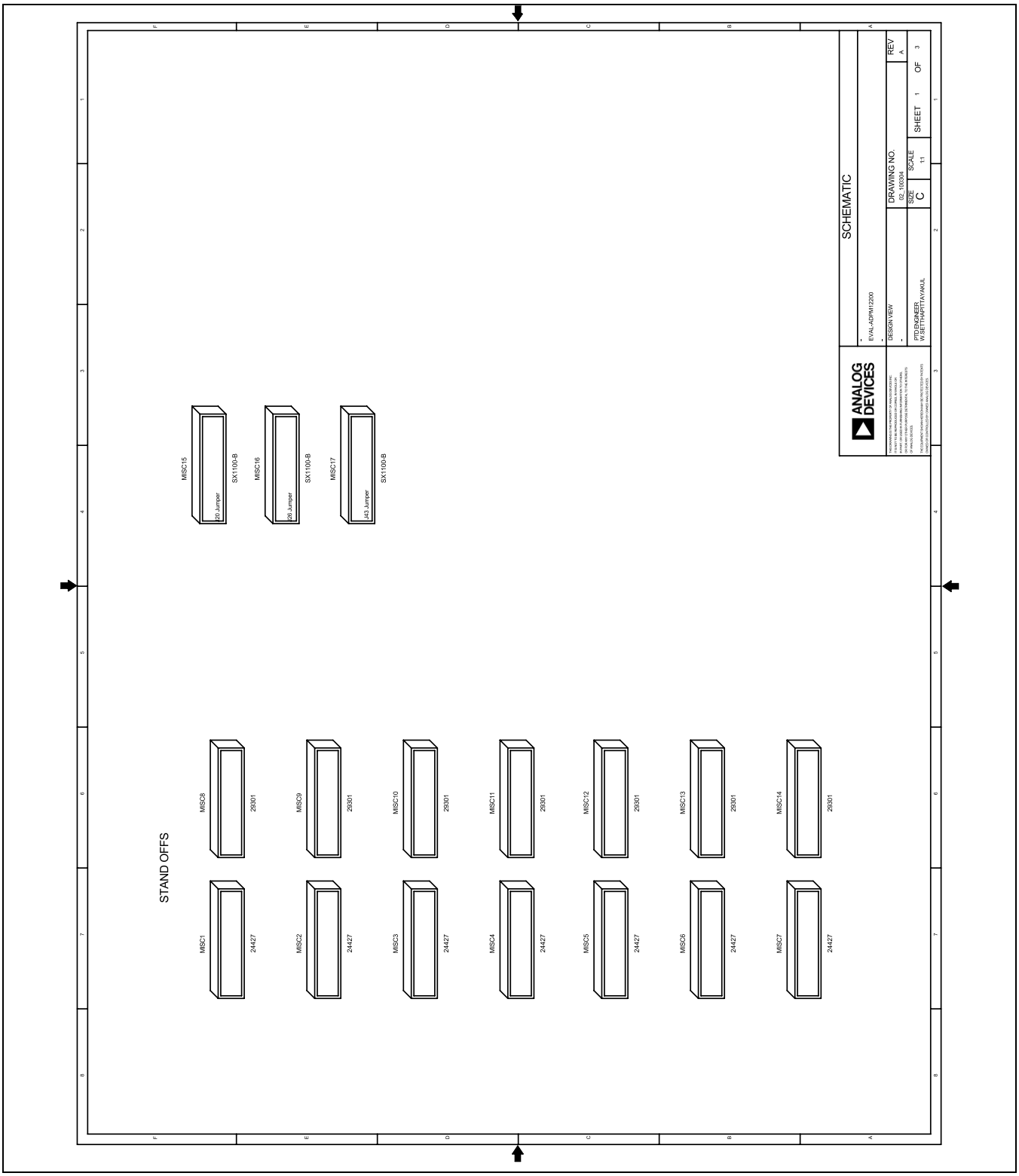
REF DES				MANUFACTURER PART #	MANUFACTURER	VALUE	DESCRIPTION
EVAL-ADPM12200-4	EVAL-ADPM12200-3	EVAL-ADPM12200-2	EVAL-ADPM12200-1				
R40	R40	R40	—	CRCW060328K0FKEA	VISHAY	28K	RES SMD 28K Ohm 1% 1/10W 0603 AEC-Q200
R56, R60, R64	R56, R60, R64	R56, R60, R64	R56, R60, R64	CRCW06031K00FK	VISHAY	1K	RES; SMT (0603); 1K; 1%; +/- 100PPM/DEGC; 0.1000W
R7	—	—	—	CRCW060315K0FK	VISHAY DALE	15K	RES; SMT (0603); 15K; 1%; +/- 100PPM/DEGC; 0.1000W
R89	R89	R89	R89	CRCW12061K00FKEAHP	VISHAY	1K	RES SMD 1K Ohm 1% 3/4W 1206 AEC-Q200 PULSE PROOF
SW1-SW4	SW2-SW4	SW3, SW4	SW4	GT21MCBE	C&K	GT21MCBE	SWITCH; DPDT; THROUGH HOLE; 20V; 0.4VA; GT SERIES; SEALED ULTRAMINIATURE TOGGLE SWITCH; RCOIL= 0.05 OHM; RINSULATION=10G OHM; C&K COMPONENTS
U1	U1	U1	U1	ADPL44001AZT+T	ANALOG DEVICES	ADPL44001AZT+T	IC; 4V TO 40V; 0.1A; ULTRA-LOW QUIESCENT CURRENT; LINEAR REGULATOR
U2-U5	U3-U5	U4, U5	U5	MAX40010FAUT+	ANALOG DEVICES	MAX40010FAUT+	IC; AMP; 76V PRECISION; HIGH-VOLTAGE; CURRENT-SENSE AMPLIFIER; GAIN=50V/V; SOT23-6
PCB	PCB	PCB	PCB	EVAL-ADPM12200	ANALOG DEVICES	PCB	PCB: 6 LAYERS, 2OZ THICKNESS

Components in the following table are not installed:

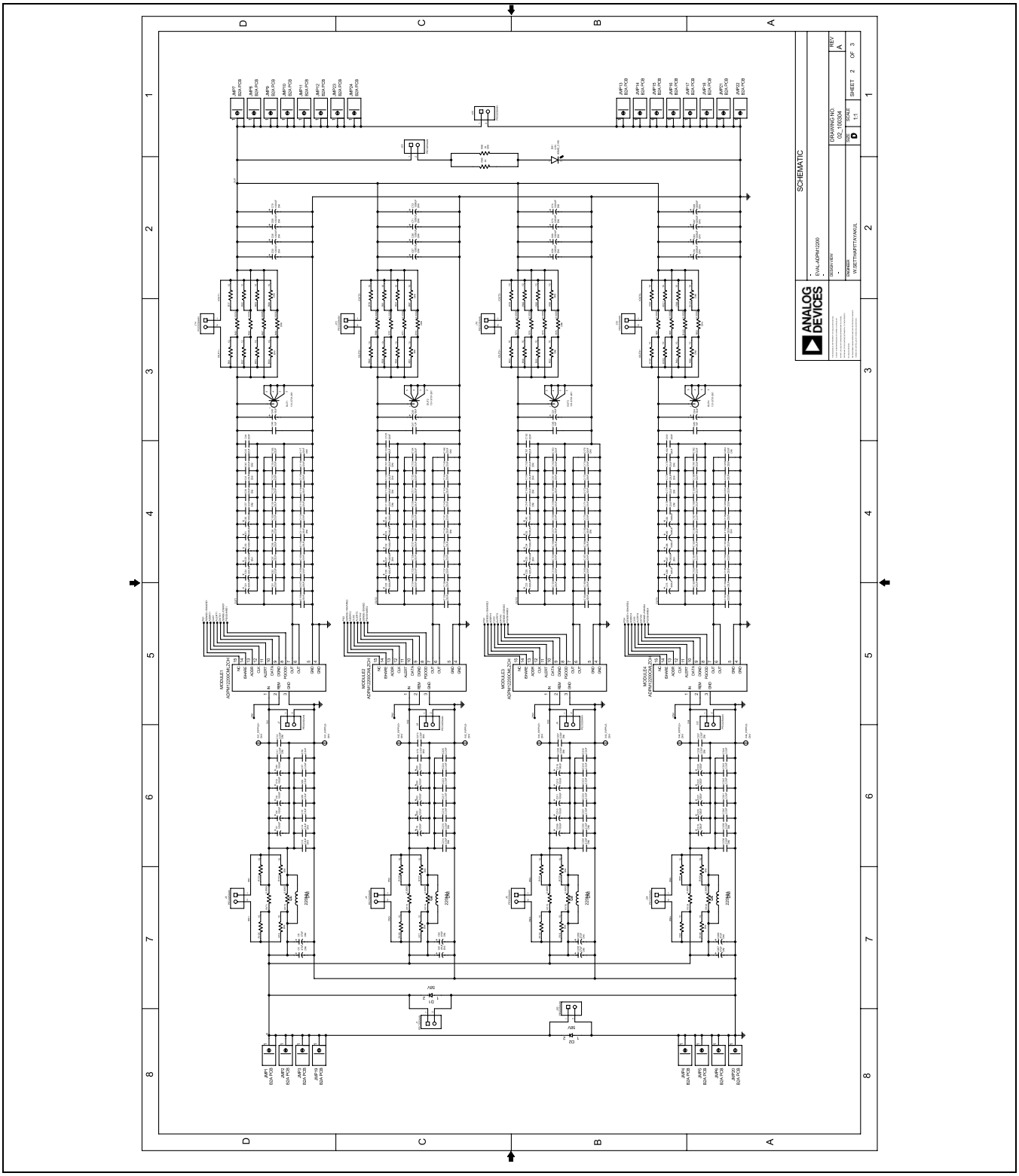
REF DES				DESCRIPTION
EVAL-ADPM12200-4	EVAL-ADPM12200-3	EVAL-ADPM12200-2	EVAL-ADPM12200-1	
C1, C17, C45, C94, C247, C250, C253, C256	C1-C4, C17, C45, C94, C247-C250, C253, C256	C1-C4, C17-C20, C45, C94, C247-C253, C256	C1-C4, C17-C20, C45, C52-C54, C94, C247-C256	CAP; SMT (0603)
C5, C6, C81, C82, C205-C208	C5-C10, C61, C81, C82, C205-C208	C5-C10, C16, C61-C64, C80-C82, C205-C208	C5-C10, C16, C61-C64, C80-C82, C205-C212, C218	CAP; SMT (10mm)
C11-C14, C37, C39, C41, C42, C79, C111, C117-C121, C140, C146-C150, C169, C175-C179, C198, C204, C213-C215, C226, C227, C229, C230, C236-C239	C11-C15, C37, C39, C41-C44, C65, C66, C77-C79, C91, C92, C97-C121, C140, C146-C150, C169, C175-C179, C198, C204, C213-C215, C226, C227, C229, C230, C236-C239	C11-C15, C37, C39, C41-C44, C65, C66, C77-C79, C91, C92, C97-C150, C169, C175-C179, C198, C204, C213-C217, C223-C227, C229, C230, C236-C239	C11-C15, C37, C39, C41-C44, C65, C66, C77-C79, C91, C92, C97-C179, C198, C204, C213-C217, C223-C227, C229-C239	CAP; SMT (1210)
—	C21	C21, C22	C21, C22, C23	CAP; SMD (CASE_E12)
—	C24	C24, C26	C24, C26, C28	CAP; SMD (CASE_F10)
C25, C27, C29, C55-C60, C67-C74, C76, C83, C87	C25, C27, C29, C30, C31, C36, C55-C60, C67-C74, C76, C83, C87	C25, C27, C29-C33, C36, C38, C55-C60, C67-C74, C76, C83, C87	C25, C27, C29-C36, C38, C40, C55-C60, C67-C74, C76, C83, C87	CAP; SMD (CASE_F12)
—	C46	C46, C47	C46-C48	CAP; SMT (0805)
—	C49	C49, C50	C49-C51	CAP; SMT (3528)
—	—	D1	D1	TVS DIODE; SMC (DO-214AB)
IN1_RIPPLE+-IN4_RIPPLE+, IN1_RIPPLE--IN4_RIPPLE-	EN, IN1_RIPPLE+-IN4_RIPPLE+, IN1_RIPPLE--IN4_RIPPLE-	EN, IN1_RIPPLE+-IN4_RIPPLE+, IN1_RIPPLE--IN4_RIPPLE-	EN, IN1_RIPPLE+-IN4_RIPPLE+, IN1_RIPPLE--IN4_RIPPLE-	TEST POINT; PIN DIA=0.125IN
—	J3, J4, J7, J14, J17, J19, J20, J27	J1, J3-J5, J7, J8, J11, J14, J15, J17, J19-J21, J26-J28	J1, J3-J9, J11, J13-J17, J19-J22, J26-J29, J43, J46	CONNECTOR; 2PINS
—	J2	J2, J10	J2, J10, J12	CONNECTOR; 3PINS
—	JMP1, JMP5, JMP7, JMP8, JMP13, JMP14	JMP1, JMP2, JMP4, JMP5, JMP7-JMP10, JMP13-JMP16	JMP1-JMP18	CONNECTOR
L1, L2, L3, L4	L1, L2, L3, L4	L1, L2, L3, L4	L1, L2, L3, L4	INDUCTOR
—	MISC15	MISC15, MISC16	MISC15, MISC16, MISC17	JUMPER
—	MODULE1	MODULE1, MODULE2	MODULE1-MODULE3	QUARTERBRICK POWER MODULE
—	OUT1	OUT1, OUT2	OUT1-OUT3	CONN-PCB COAX SMB JACK RF VERTICAL
R68, R72, R76, R93, R103, R172, R174, R176	R65-R68, R72, R76, R93, R103, R171, R172, R174, R176	R65-R72, R76, R93, R103, R171-R174, R176	R65-R76, R93, R103, R171-R176	RESISTOR; SMT (3921)
R90	R90	R90	R90	RES; SMT (1206)
R2, R5, R12, R13, R16-R18, R20, R23, R30, R31, R35, R38, R45, R46, R50-	R1-R18, R20, R23, R30, R31, R35, R38, R45, R46, R50-R53, R57, R61, R77,	R1-R33, R35, R38, R45, R46, R50-R54, R57, R58, R61, R62, R77, R78, R80,	R1-R46, R48-R55, R57-R59, R61-R63, R77-R88, R98, R100, R105, R106,	RES; SMT (0603)

REF DES				DESCRIPTION
EVAL-ADPM12200-4	EVAL-ADPM12200-3	EVAL-ADPM12200-2	EVAL-ADPM12200-1	
R52, R86-R88, R98, R100, R105, R106, R108, R111, R119, R123, R124, R127, R130, R141, R145, R149, R153	R80, R83, R86-R88, R98, R100, R105, R106, R108, R111, R119, R123-R127, R130, R138-R141, R145, R149, R153	R81, R83, R84, R86-R88, R98, R100, R105, R106, R108, R111, R119, R123-R130, R138-R145, R149, R153	R108, R111, R119, R123-R132, R138-R149, R153	
—	SW1	SW1, SW2	SW1-SW3	SWITCH, DPDT
—	U2	U2, U3	U2-U4	IC; SOT-23

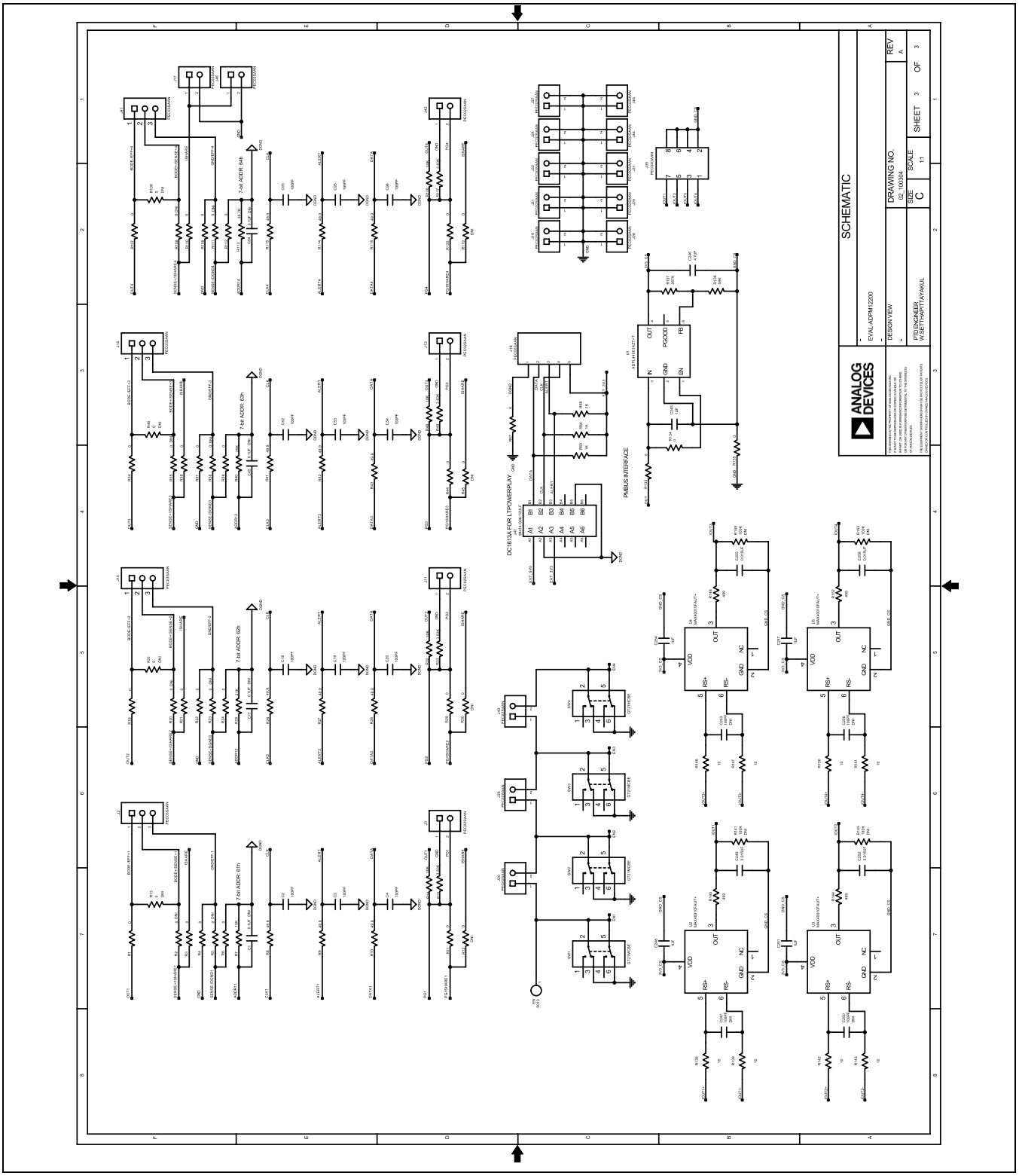
EVAL-ADPM12200 Schematics



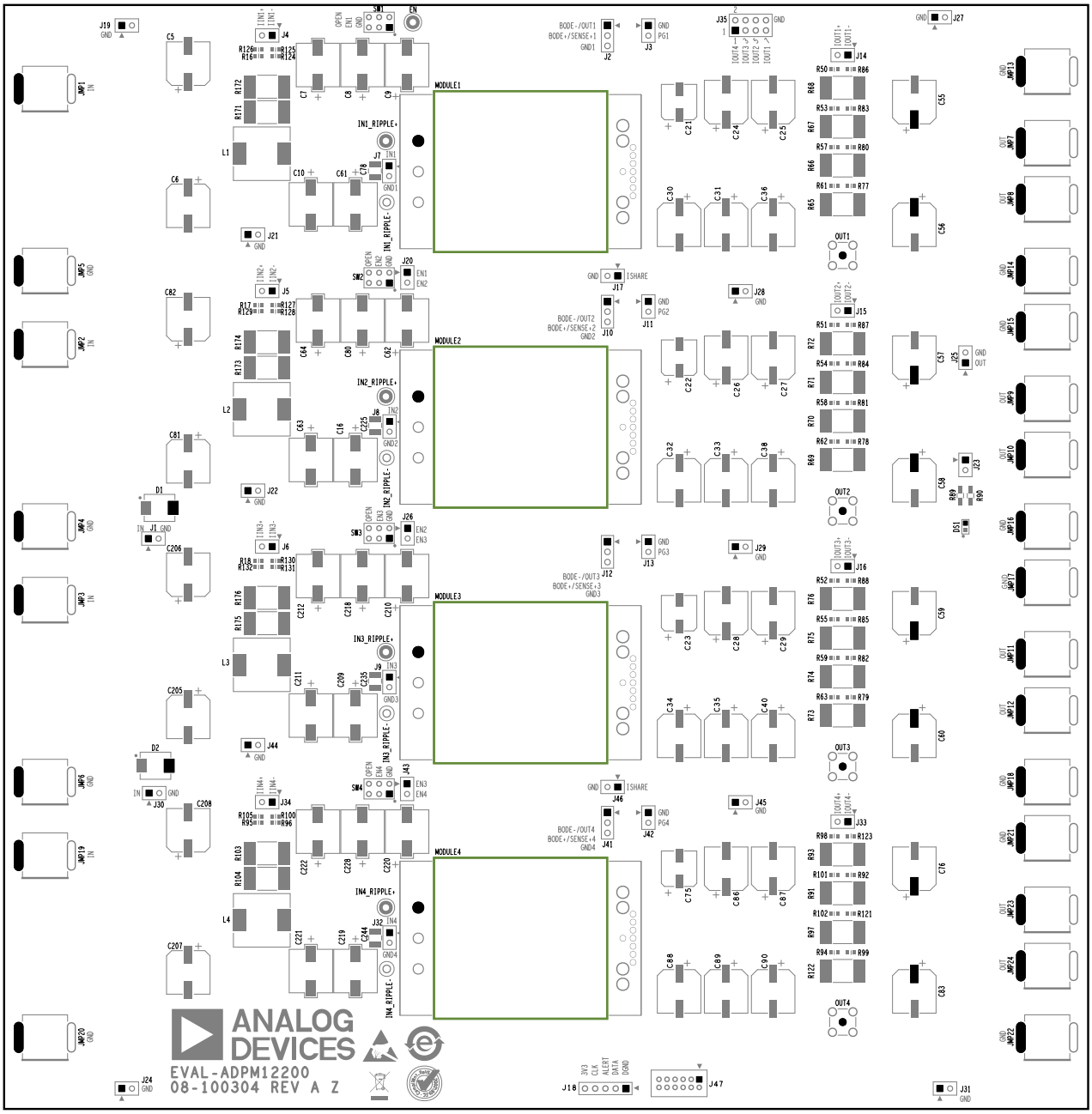
EVAL-ADPM12200 Schematics (continued)



EVAL-ADPM12200 Schematics (continued)

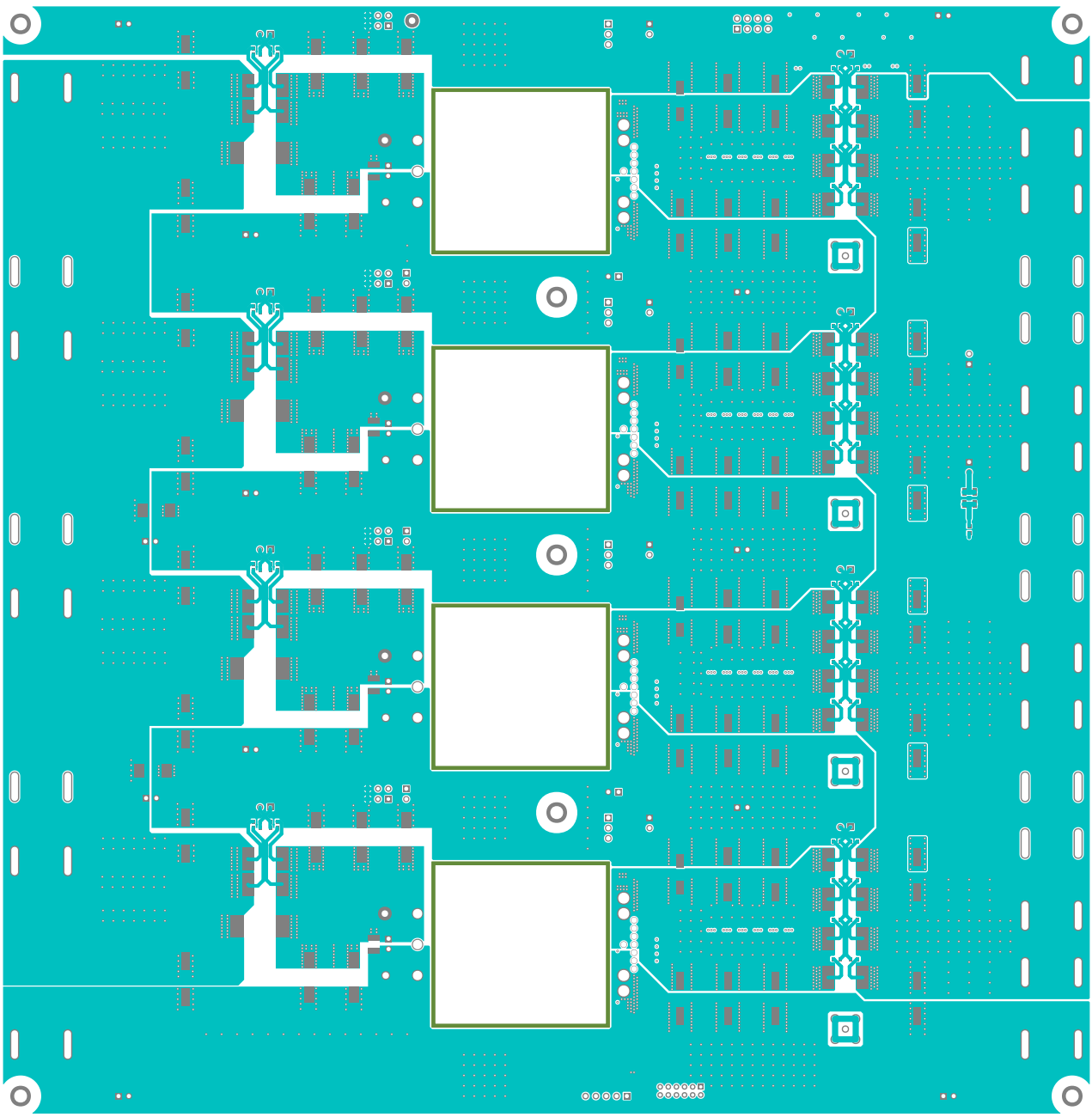


EVAL-ADPM12200 PCB Layouts



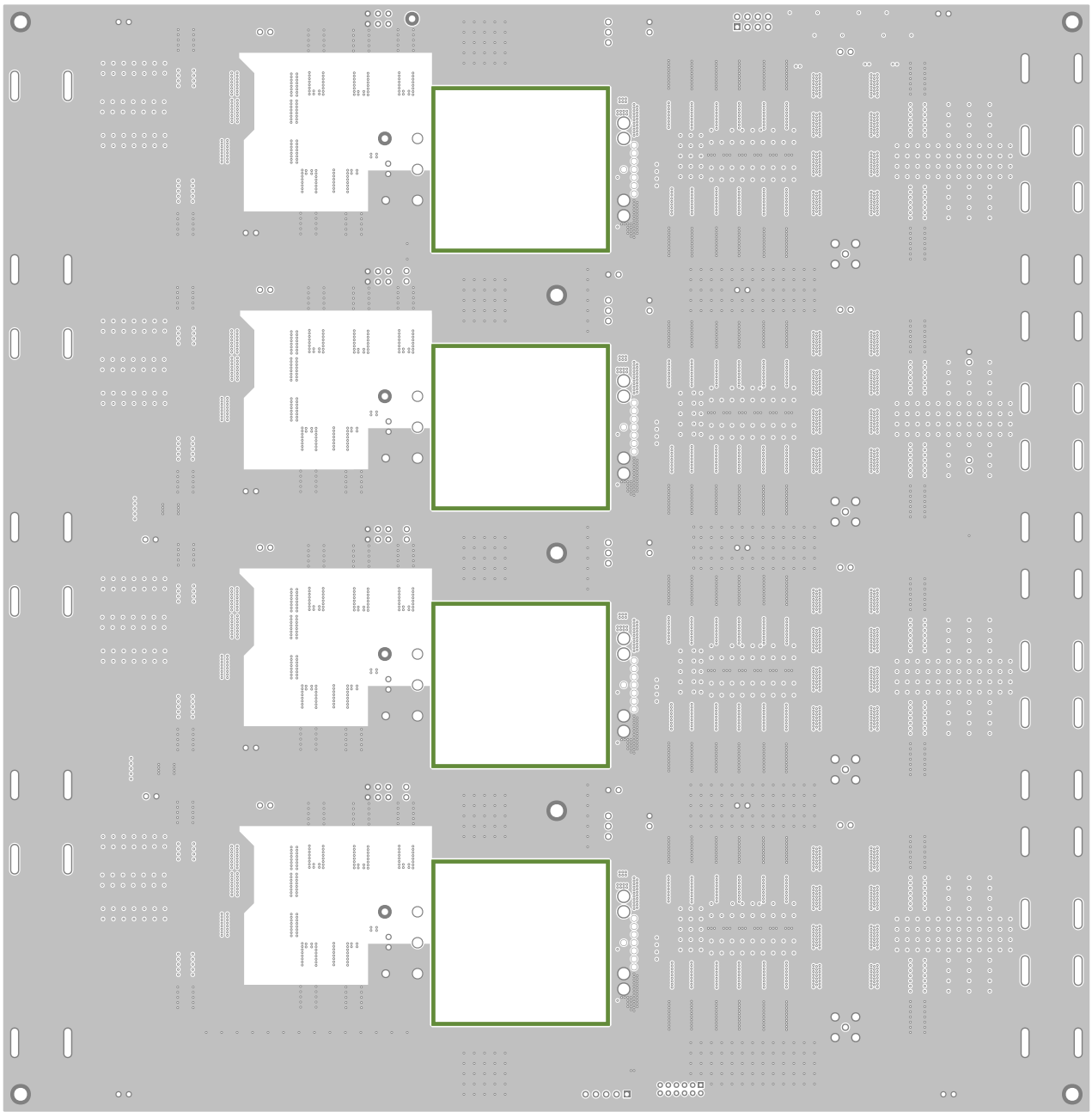
EVAL-ADPM12200 Component Placement —Top Silkscreen

EVAL-ADPM12200 PCB Layouts (continued)



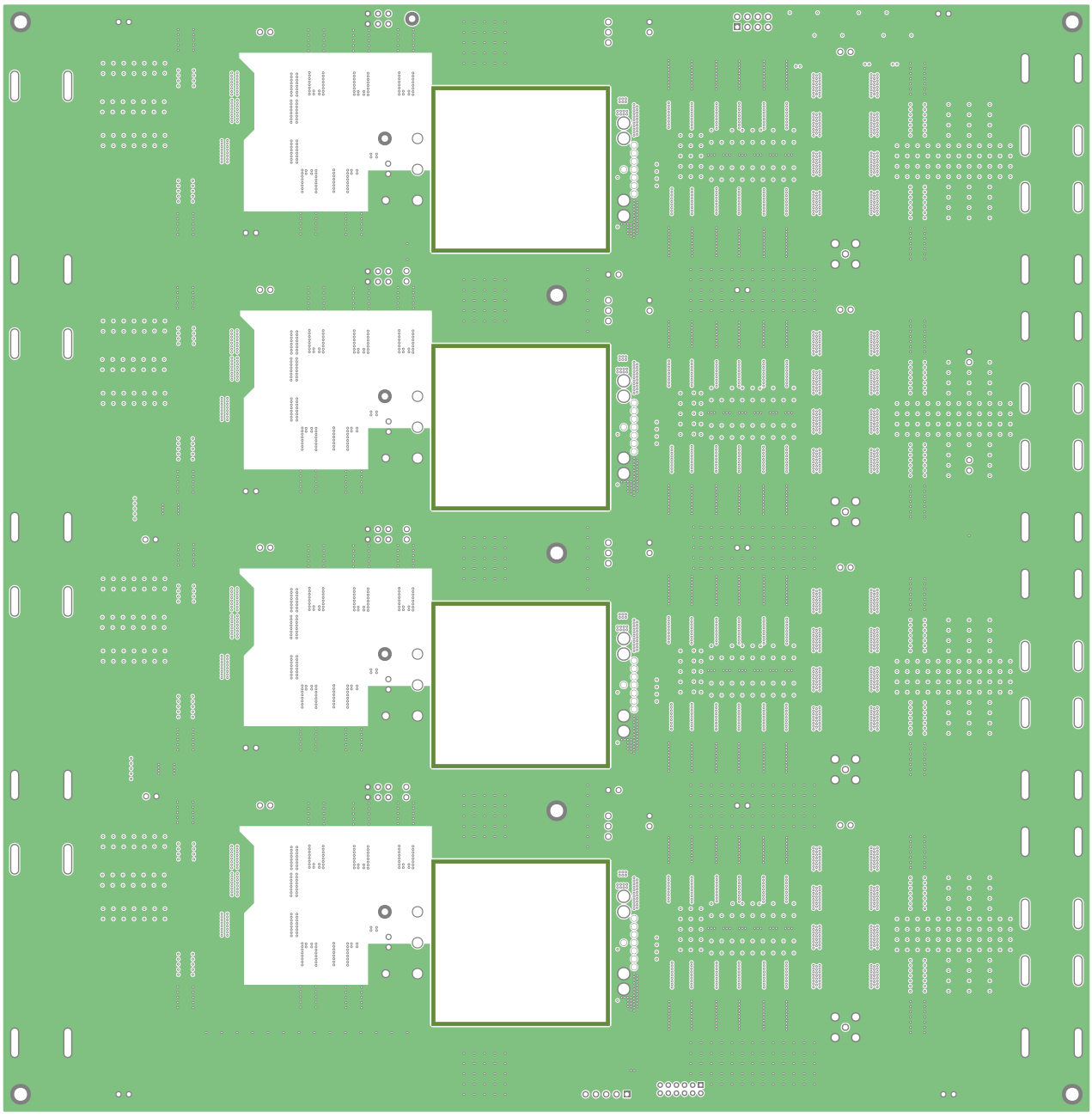
EVAL-ADPM12200 PCB Layout—Top

EVAL-ADPM12200 PCB Layouts (continued)



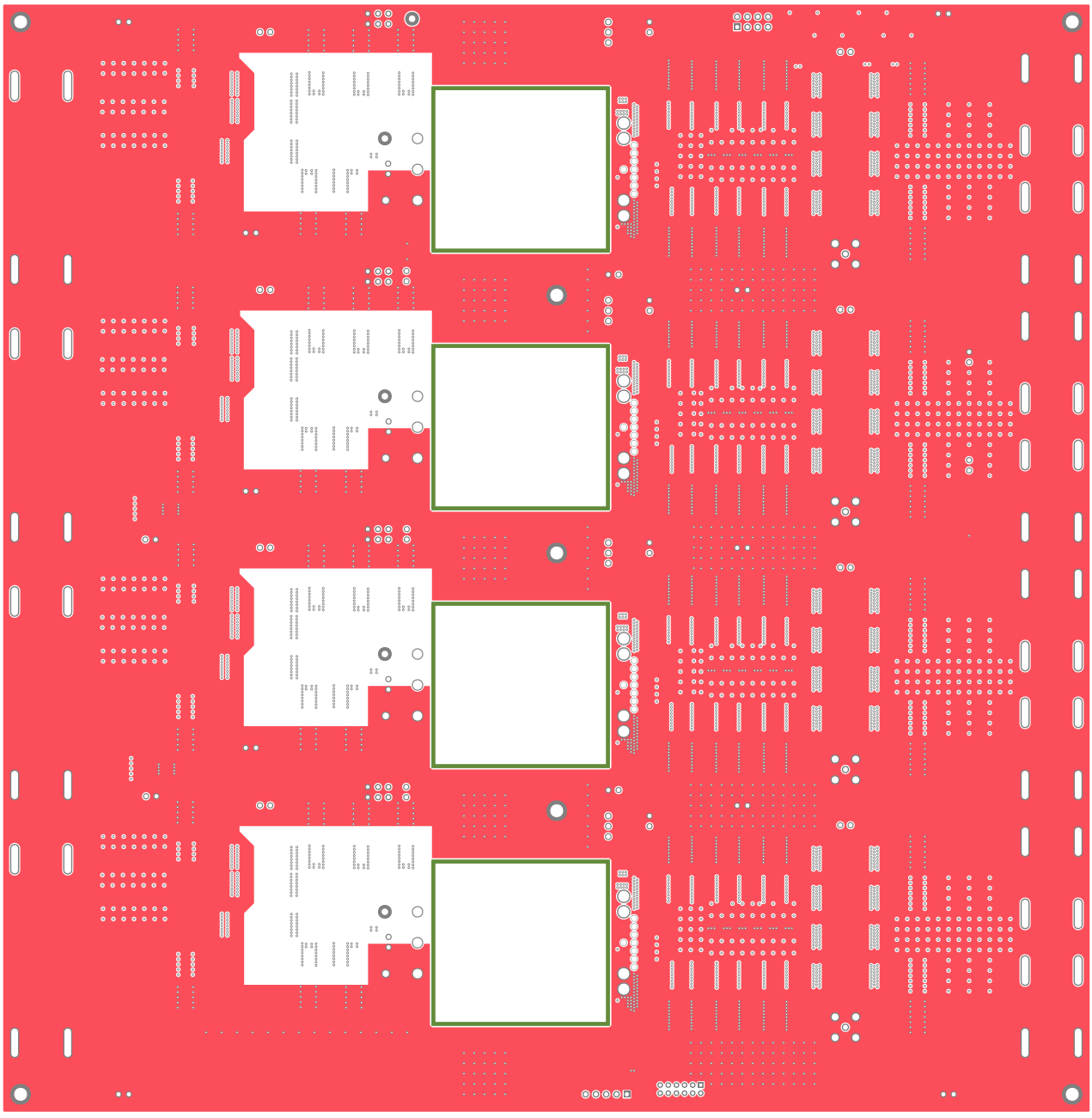
EVAL-ADPM12200 PCB Layout—Layer 2

EVAL-ADPM12200 PCB Layouts (continued)



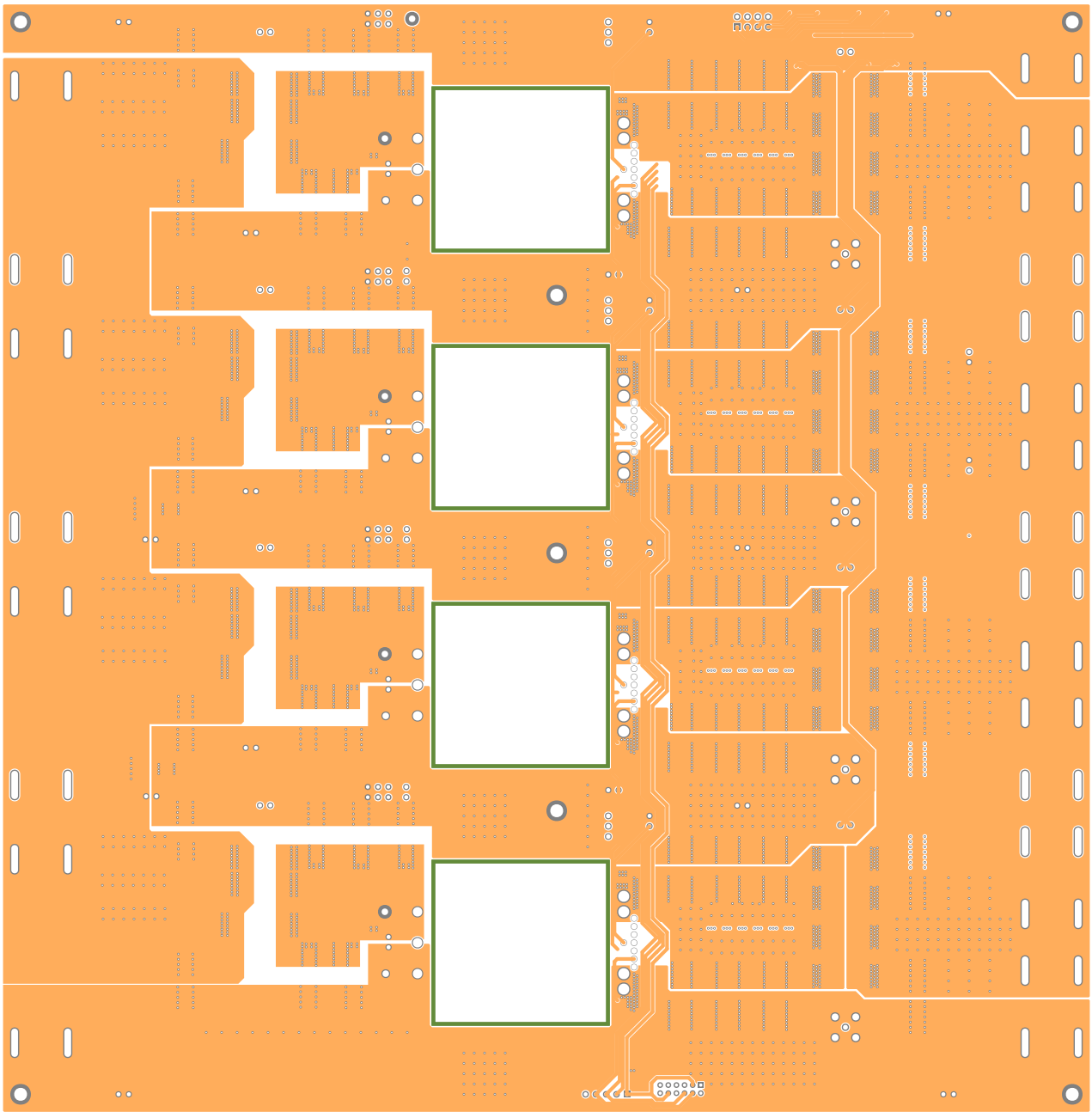
EVAL-ADPM12200 PCB Layout—Layer 3

EVAL-ADPM12200 PCB Layouts (continued)



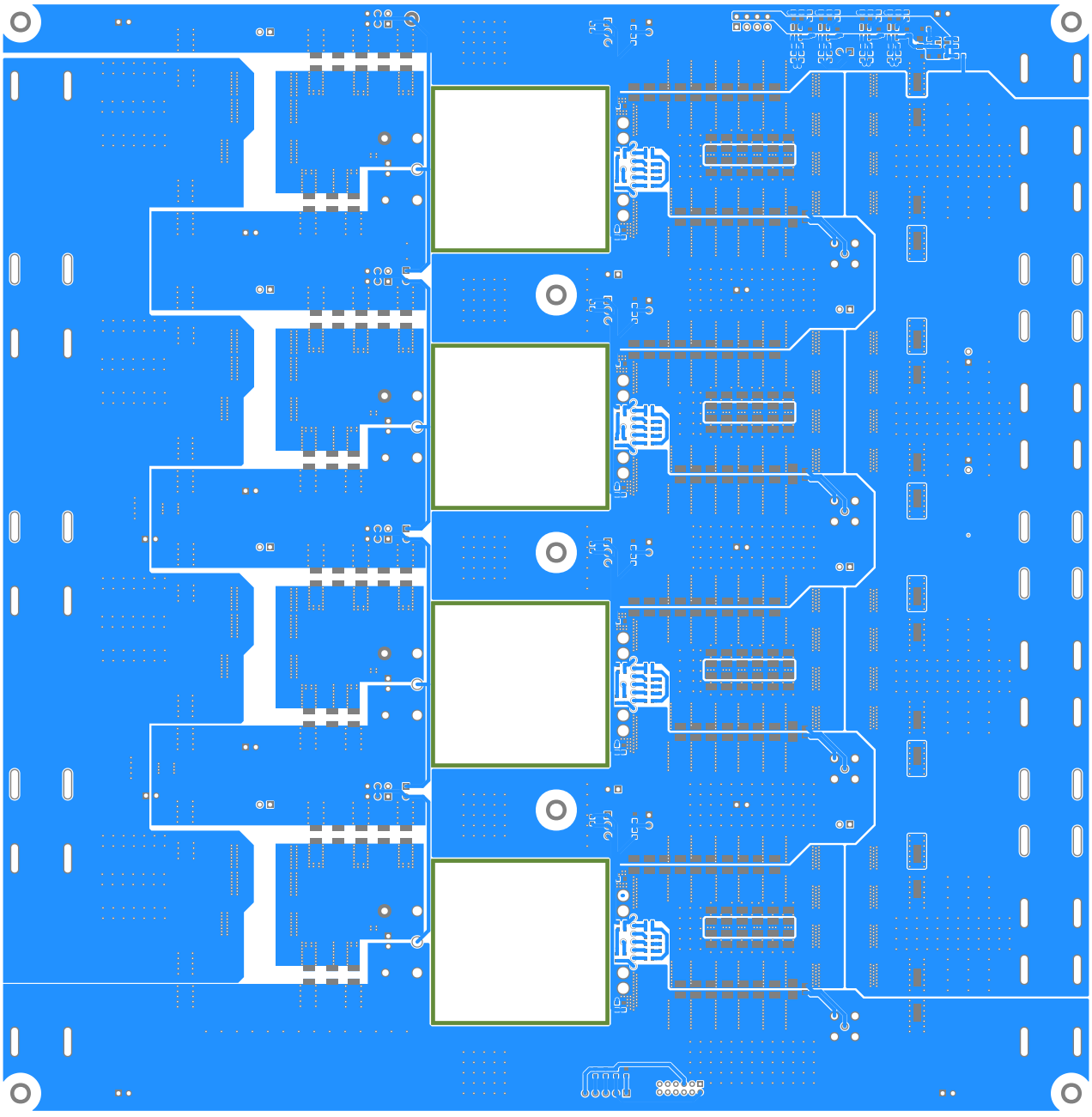
EVAL-ADPM12200 PCB Layout—Layer 4

EVAL-ADPM12200 PCB Layouts (continued)



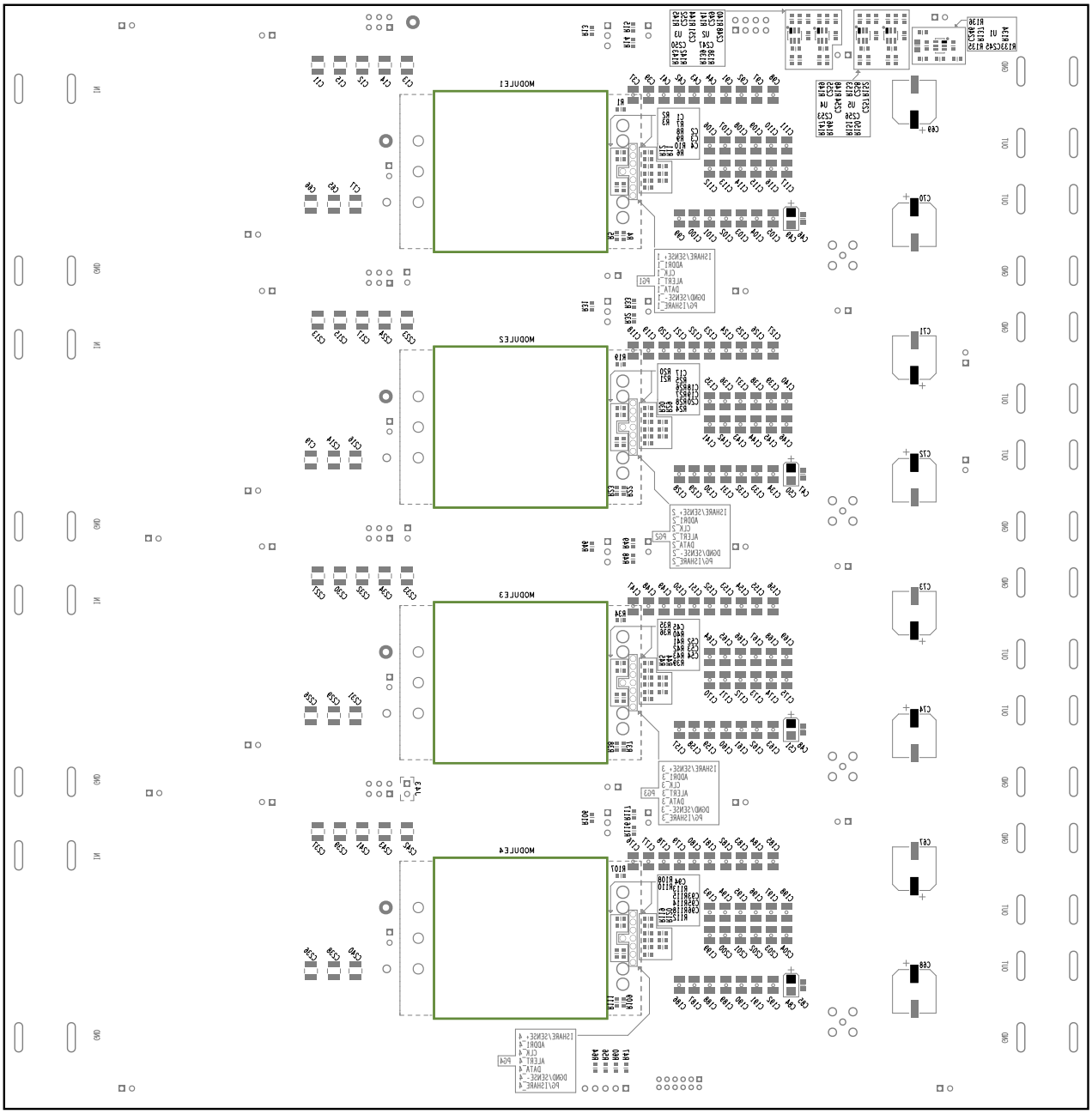
EVAL-ADPM12200 PCB Layout—Layer 5

EVAL-ADPM12200 PCB Layouts (continued)



EVAL-ADPM12200 PCB Layout—Bottom

EVAL-ADPM12200 PCB Layouts (continued)



EVAL-ADPM12200 Component Placement—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/26	Initial release	—

Notes