Evaluation Kit for the ADM1175/ADM1176/ADM1177/ADM1178

EVAL-ADM1175/ADM1176/ADM1177/ADM1178

PRODUCT DESCRIPTION

This evaluation board allows the ADM1175/ADM1176/ ADM1177/ADM1178 devices to be easily evaluated. These parts combine a hot swap controller and an on-board 12-bit ADC-based digital power monitor that reports the power being drawn. The hot swap control circuitry allows the boards to be safely inserted and removed from a live 3.15 V to 16.5 V back-plane. The parts provide precise, robust, current-limiting protection against transient and nontransient short circuits and undervoltage and overcurrent conditions. In addition to the standard hot swap functionality, the on-board power monitoring circuitry allows for precise monitoring of the power profile of each individual line card within a designated rack system. Communication to the power monitor is via an on-board I²C® port.

Order codes for evaluation kits are shown in the Ordering Guide. (Pinouts and detailed package drawings can be found in the individual product data sheets).

GENERAL DESCRIPTION

The ADM1175/ADM1176/ADM1177/ADM1178 hot swap controller and digital power monitor evaluation board can be controlled by the configuration tool allowing the device to be actively stimulated through software. This board requires a bench power supply of between 3.15 V and 16.5 V, connected through J3 and J4. Download the latest version of the configuration tool from Analog Devices, Inc., at www.analog.com/powermonitorsw.

Note that when changing devices the software should first be shutdown and the power supply to the board removed. J7 is an I²C connector that connects the PC to the evaluation board via a 5-pin SMBus cable.

PACKAGE CONTENTS

ADM1175/ADM1176/ADM1177/ADM1178 evaluation board
5-pin SMBus cable
5-pin ADM1175-92 interconnection cable
ADM1175/ADM1176/ADM1177/ADM1178 device samples

DIGITAL PICTURE OF THE EVALUATION BOARD

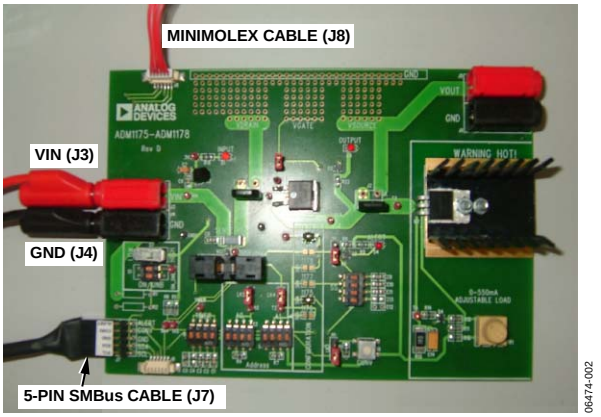


Figure 1.

Rev. 0

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REVISION HISTORY

5/08—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE COMPONENTS

Main Evaluation Board

The evaluation board contains all of the circuitry necessary to simulate real hot swap events, such as a hot swap control FET, sense resistor, and timing components. It also has an adjustable load circuit to evaluate the performance of the device under varying load conditions.

5-Pin SMBus Cable

This cable connects the main evaluation board to a standard PC via J7.

5-Pin Interconnection Cable

This cable is used for multiple evaluation board parallel connection setups. Two or more boards can be connected in parallel through the J8 and J9 connectors using the 5-pin interconnection cable. Each device should be assigned to a different address using address pins. The maximum number of devices that can be interconnected is four for the ADM1175/ADM1177/ADM1178, and 16 for the ADM1176.

Device Samples

Some loose samples of the device to be evaluated are included in a samples box. A single device should be placed in the socket before powering up the evaluation board. The device should be orientated in the socket such that Pin 1 is in the top left corner, near C8 as shown in Figure 2.

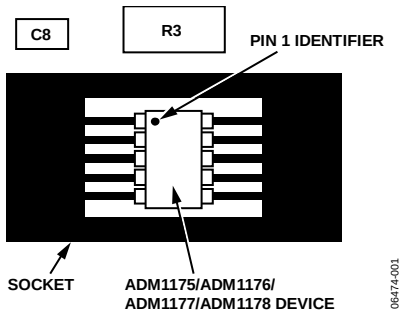


Figure 2. Device Placement Evaluation Kit Order Codes

SWITCH FUNCTIONS

Table 1.

Switch	Description	Default
S1	ON pin setting switch.	
S1-1	Connects resistor divider, R1/R2, to the ON pin of the device, when the switch is closed the voltage divider is connected to the ON pin.	Open
S1-2	Connects S7 to the ON pin of ADM1175/ADM1176/ADM1177/ADM1178 device.	Closed
S2	Timer adjust capacitor. Sets current limit on time.	
S2-1	Connects a 4.7 nF capacitor (C1) to the TIMER pin.	Open
S2-2	Connects a 47 nF capacitor (C2) to the TIMER pin.	Closed
S2-3	Connects a 470 nF capacitor (C3) to the TIMER pin.	Open
S2-4	Connects user-defined capacitors (C4 and C5) to the TIMER pin.	Open
S3	Applies only to the ADM1176. Board address control switch.	
S3-1	Connects the A0 pin of the device to 3.3 V.	Open
S3-2	Pulls the A0 pin of the device to GND through a 150 kΩ resistor.	Open
S3-3	Pulls the A0 pin of the device to GND.	Open
S3-4	No connect.	
S4	Applies only to the ADM1176. Additional board address control switch.	
S4-1	Connects the A1 pin of the ADM1176 to 3.3 V.	Open
S4-2	Pulls the A1 pin of the ADM1176 to GND through a 150 kΩ resistor.	Open
S4-3	Pulls the A1 pin of the ADM1176 to GND.	Open
S4-4	No connect.	
S5	Applies only to the ADM1177. Soft start (SS) capacitor; allows the user to set the profile of the initial current ramp.	
S5-1	Connects a 1 nF SS capacitor (C9) to the SS pin.	Open
S5-2	Connects a 10 nF SS capacitor (C10) to the SS pin.	Closed
S5-3	Connects a 47 nF SS capacitor (C11) to the SS pin.	Open
S5-4	Connects user-defined SS capacitors (C12 and C13) to the SS pin.	Open

Switch	Description	Default
S6	Applies only to the ADM1175 device. Controls the CONV pin, when depressed the CONV pin is high. For Switch S6 to control the CONV pin, the jumper in Link 3 should be in Position B (separate from S7).	Depressed
S7	Switches the ON pin logically high or low. ADM1175-1/ADM1176-1/ADM1177-1/ADM1178-1 or ADM1175-2/ADM1176-2/ADM1177-2/ADM1178-2: switch to 3.3 V to enable the device. ADM1175-3/ADM1175-4: switch to ground to enable the device.	High
VR1	VR1 adjusts a variable load, turning the switch clockwise reduces the load resistance and hence increases the load current to a maximum of 550 mA.	N/A

JUMPER FUNCTIONS

Table 2.

Jumper	Description	Default
LK1	When inserted, the gate of the FET is connected to the GATE pin.	Inserted
LK2	Applies only to ADM1178. In Position A, LK2 connects the ALERTB pin to the I^2C ALERTB line. In Position B, LK2 connects the ALERTB pin to LED (D4).	A
LK3	Applies only to ADM1175. In Position A, LK3 connects the CONV pin to the I^2C CONV line. In Position B, LK3 connects the CONV pin to Switch S6.	A
LK4	ADM1175: Connects the CONV pin to LK3. ADM1176: Connects the A1 pin to S4. ADM1177: Connects the SS pin to S4. ADM1178: Connects the GATE pin to the gate node of the hot swap FET.	Inserted
LK5	Connects A0 Address Switch S3 to Pin ADR/A0 when inserted.	Inserted
J1	In Position A, development Area A (V_{DRAIN}) is connected to the SENSE pin of the devices. In Position B, V_{IN} is connected to V_{DRAIN} of FET Q1.	B
J2	In Position A, V_{SOURCE} of FET Q1 is connected to Development Area C (V_{SOURCE}). In Position B, V_{SOURCE} of FET Q1 is connected to programmable load circuit.	B

LED FUNCTIONS

Table 3.

LED	Name	Description
D1	Input	Indicates supply voltage is present.
D3	Output	Indicates that the FET is on and output voltage is present.
D4	Alert	Indicates an overcurrent alert (ADM1178 only).

CONFIGURATION LINK FUNCTIONS

To configure an evaluation board to a specific device, ensure that the links in Table 4 are inserted.

Table 4.

Link	Description
SL1	Configuration link applies to the ADM1175, ADM1176, and ADM1177.
SL2	Configuration link applies to the ADM1178.
SL3	Configuration link applies to the ADM1178.
SL4	Configuration link applies to the ADM1175.
SL5	Configuration link applies to the ADM1176.
SL6	Configuration link applies to the ADM1177.

EVALUATION BOARD SOFTWARE

The ADM1175/ADM1176/ADM1177/ADM1178 are integrated hot swap controllers and current-sense amplifiers that offer digital current and voltage monitoring via an on-chip 12-bit ADC. These parts communicate through an I²C interface.

An internal current-sense amplifier senses voltage across the sense resistor in the power path via the VCC and SENSE pins. The ADM1175/ADM1176/ADM1177/ADM1178 limit the current through this resistor by controlling the gate voltage of an external N-channel FET in the power path, via the GATE pin. The sense voltage (and hence the inrush current) is kept below a preset maximum. The ADM1175/ADM1176/ADM1177/ADM1178 protect the external FET by limiting the time that it spends with the maximum current running in it. This current limit period is set by the choice of capacitor attached to the TIMER pin.

Additionally, the device provides protection from overcurrent events at times after the hot swap event is complete. In the case of a short-circuit event, the current in the sense resistor exceeds an overcurrent trip threshold, and the FET is switched off immediately by pulling down the GATE pin. A 12-bit ADC can measure the current seen in the sense resistor, and the supply voltage on the VCC pin. An industry standard I²C interface allows a controller to read current and voltage data from the ADC. Measurements can be initiated by an I²C command. Alternatively, the ADC can run continuously and the user can read the latest conversion data whenever it is required.

Up to four (16 for the ADM1176) unique I²C addresses can be created because of the way the ADR pin is connected.

ADDITIONAL FEATURES

ADM1175

Measurements may be initiated using an I²C command or via the convert pin (CONV). This is useful for synchronizing multiple ADM1175 devices.

ADM1176

Up to 16 unique I²C addresses can be created due to the manner in which the A0 and A1 pins are connected.

ADM1177

A soft start (SS) pin is included. This gives the user control over the reference on the current-sense amplifier. An internal current source charges a capacitor on this pin during startup, allowing the user to set the profile of the initial current ramp. A voltage can also be driven on this pin to alter the reference.

ADM1178

An ALERTB pin is included to indicate an overcurrent interrupt.

POWERING THE EVALUATION BOARD

The ADM1175/ADM1176/ADM1177/ADM1178 evaluation board is powered using a bench supply of between 3.15 V and 16.5 V, connected to J3 (VIN) and J4 (GND).

COMMUNICATING WITH THE EVALUATION BOARD

A graphical user interface (GUI) provided by Analog Devices facilitates communication with the ADM1175/ADM1176/ADM1177/ADM1178 device. The latest revision of this software is available to download at www.analog.com/powermonitorsw. The software is compatible with Windows® 98, 2000, and XP.

Communication between a PC and the evaluation board is achieved through the 5-pin header (J7), which should be connected to the PC using the provided cable.

CONFIGURATION TOOL

The configuration tool enables the user to program and monitor the many features of the hot swap controllers, power monitors, and current-sense amplifiers through an intuitive, GUI-based interface. The evaluation kit allows you to verify your configuration before using the parts in system applications. The following are the minimum system requirements:

- Windows 2000
- a 500 MHz processor,
- 80 Mb of free disc space
- 256 MB RAM
- minimum monitor resolution: 800 × 600 high color (16-bit)

The software interface is arranged in a tabbed format, where each tab enables the control of a key feature of the device.

INSTALLING THE EVALUATION SOFTWARE

Install the software using the following steps:

1. Download the .zip file containing the software from the website: www.analog.com/powermonitorsw.
2. Extract the files from the .zip file.
3. Double-click **setup.exe**. The **Installation Wizard** window appears (see Figure 3).

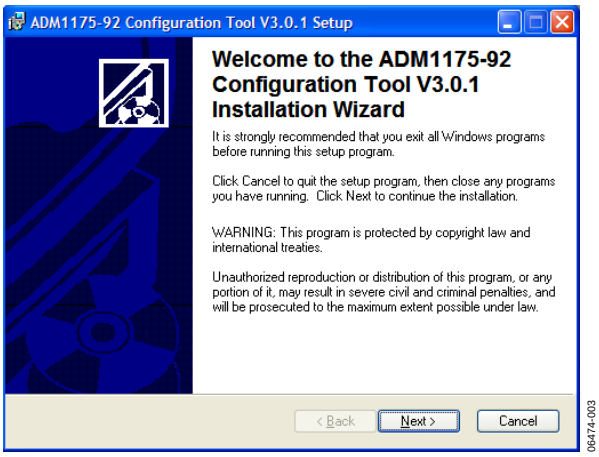


Figure 3. Evaluation Software Installation Wizard

4. Click **Next** to display the **Destination Folder** window (see Figure 4).

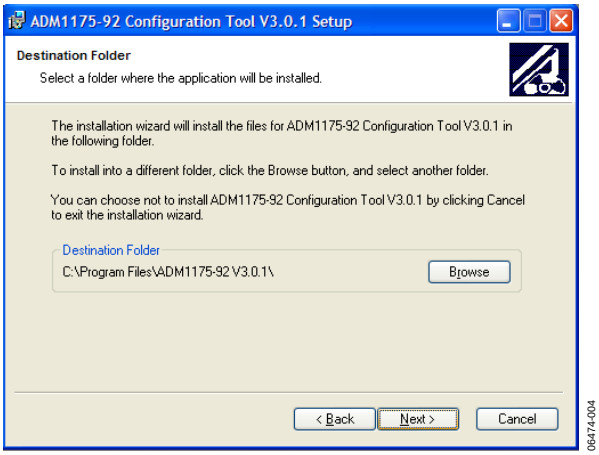


Figure 4. Evaluation Software—Choosing a Destination Folder

5. To change the destination folder, click **Browse** to create a new destination folder. Otherwise, click **Next**. The **Ready to Install the Application** window appears (see Figure 5).

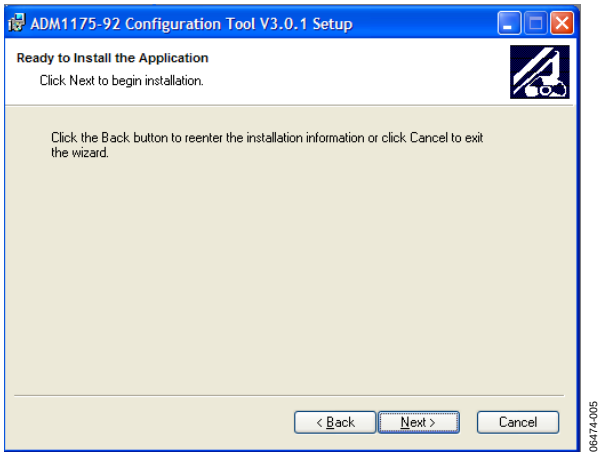


Figure 5. Evaluation Software—Ready to Install

6. This step of the installation gives you the choice to reenter the installation information, to cancel out of the installation altogether, or to begin the installation. To continue with the installation, click **Next**. The installation begins (see Figure 6).

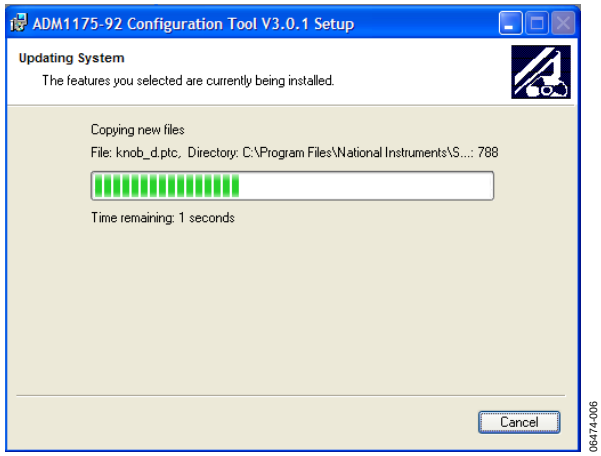


Figure 6. Installation in Progress

7. Upon completion, the following window appears:

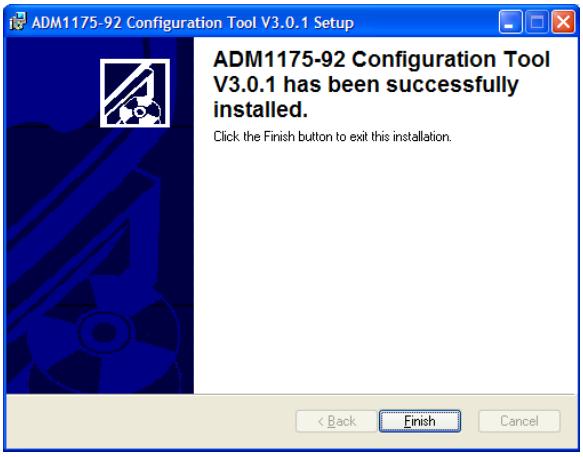


Figure 7. Evaluation Software—Installation Complete

8. Click **Finish**. The **Installer Information** window appears indicating that you should restart the system for the configuration changes to take effect (see Figure 8). It is advised to restart your PC before launching the software. Click **Yes** to restart the PC or click **No** to manually restart later.

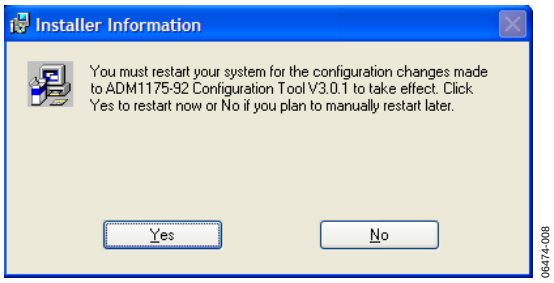


Figure 8. Installation Restart Reminder

UNINSTALLING THE EVALUATION SOFTWARE

Before an updated version of the evaluation software is installed, any previous version must be uninstalled. The software automatically does this once the newly downloaded file is opened. The **Uninstall** window appears notifying you that the previous version will be uninstalled (see Figure 9).

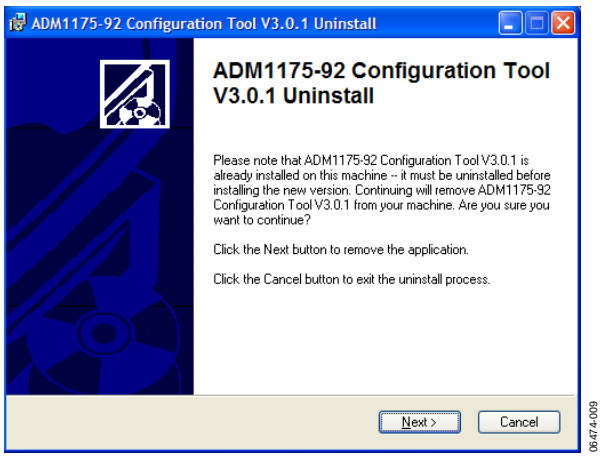


Figure 9. Evaluation Software—Uninstalling

Click **Next.** The software uninstalls, providing status as it does so, and the following window in Figure 10 appears indicating that the previous version has been successfully uninstalled.

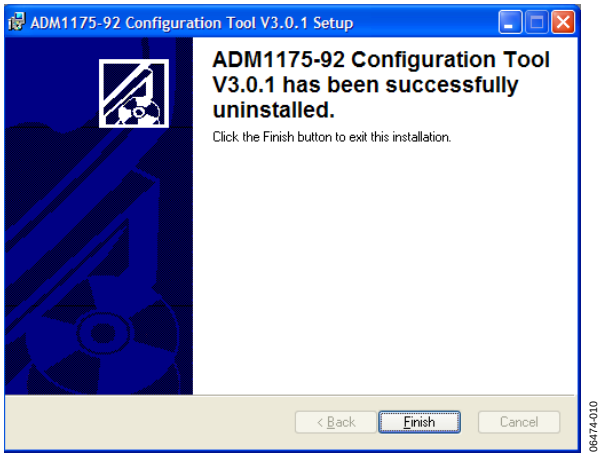


Figure 10. Evaluation Software—Uninstalling Complete

MANUALLY UNINSTALLING THE EVALUATION SOFTWARE

If you wish to uninstall the ADM1175/ADM1176/ADM1177/ADM1178 software (without upgrading it to a newer version), use the following steps:

1. Click **Start**.
2. Click **Control Panel**.
3. Click **Add or Remove Programs**.
4. Highlight the ADM1175/ADM1176/ADM1177/ADM1178 program and click **Remove** to uninstall it.

USB–COMMUNICATING FOR THE FIRST TIME

When the board is launched for the first time using a USB connection, Windows does not recognize the external evaluation board and begins installing drivers automatically. The **Found New Hardware Wizard** window appears (see Figure 11). Select **Install the software automatically (Recommended)**.



Figure 11. Automatically Installing Drivers for the Evaluation Board

In Windows XP, a warning appears indicating that the hardware has not passed Windows logo testing to verify compatibility with Windows XP. However, the evaluation board has been tested and is compatible with Windows XP. To install the necessary drivers, click **Continue Anyway** (see Figure 12).

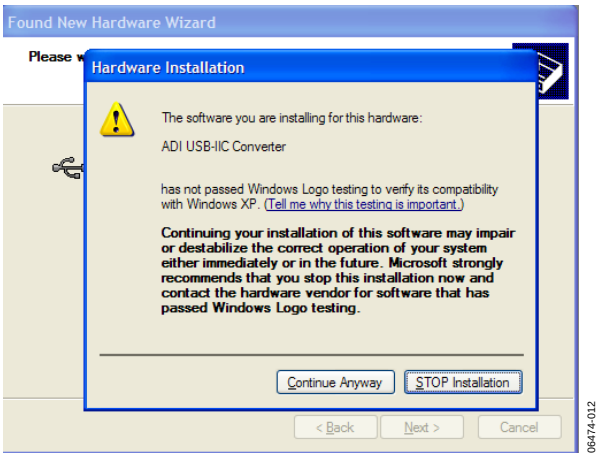


Figure 12. Windows XP Compatibility

Once this is complete, the window in Figure 13 appears. To close the **Installation Wizard**, click **Finish**. You can now open the software and run as normal.



Figure 13. Completing Installation

LAUNCHING THE EVALUATION SOFTWARE

1. To launch the evaluation software, click **Start\All Programs\ ADM1175-92 Configuration Tool 3.0.1\ADM1175-92 Configuration Tool 3.0.1**. Note that the actual folder name is version dependent.
2. Once launched, the **Evaluation Software Agreement** window appears (see Figure 14). Choose **I Agree** to concur with the conditions, then select **Continue**.

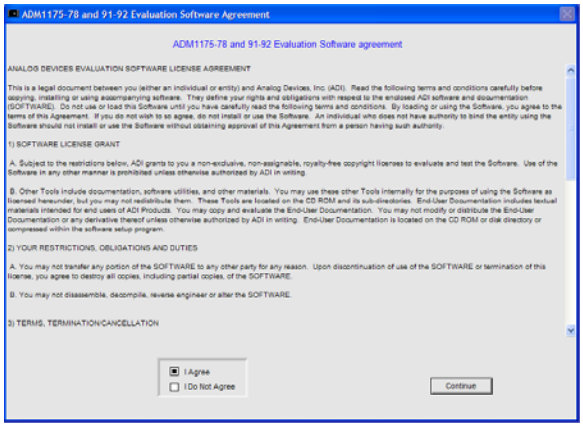


Figure 14. Software Agreement

If the evaluation board is powered up and a ADM1175/ADM1176/ADM1177/ADM1178 device is in the socket, the **Device address search** window appears. A green highlighted box corresponds to the devices I²C address (see Figure 15).

There are four possible I²C addresses for the ADM1175, ADM1177, and ADM1178 while there are 16 possible I²C addresses for the ADM1176. Figure 15 indicates that an ADM1175 has responded, with I²C Address D6h.

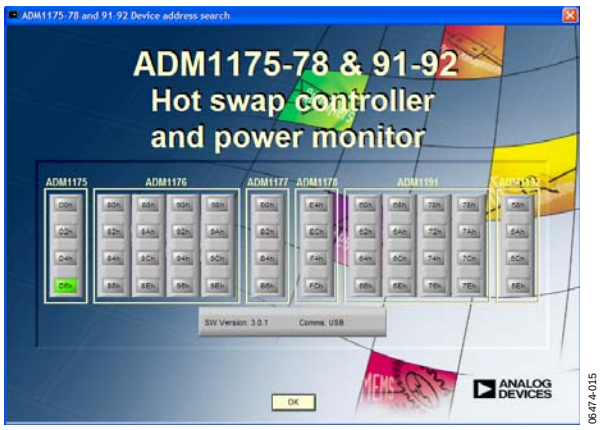


Figure 15. Device Address Detection Screen

3. Click **OK**. The **Enter Sense resistor value** window appears (see Figure 16).

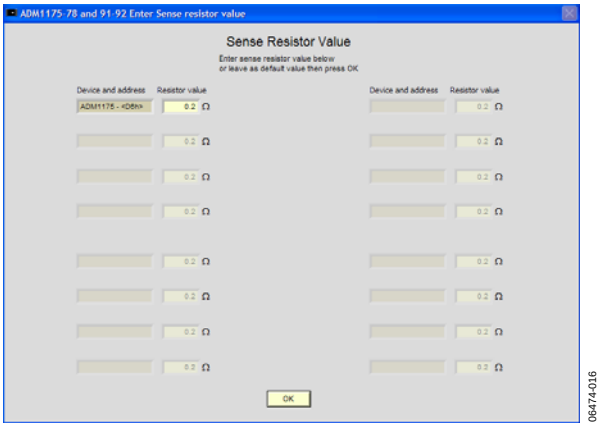


Figure 16. Sense Resistor Value Entry

4. Enter the value of the sense resistor, R_{SENSE} (R3). The default value of R_{SENSE} on the ADM1175/ADM1176/ADM1177/ADM1178 evaluation boards is 0.2 Ω. Select **OK** to continue.

For more information on interconnecting devices, see the Evaluating Multiple Devices in Parallel section.

EVALUATION SOFTWARE—MAIN PANEL TAB

The **Main Panel** tab of the evaluation software is shown in Figure 17. Each aspect of the main panel is discussed in detail in the following sections.

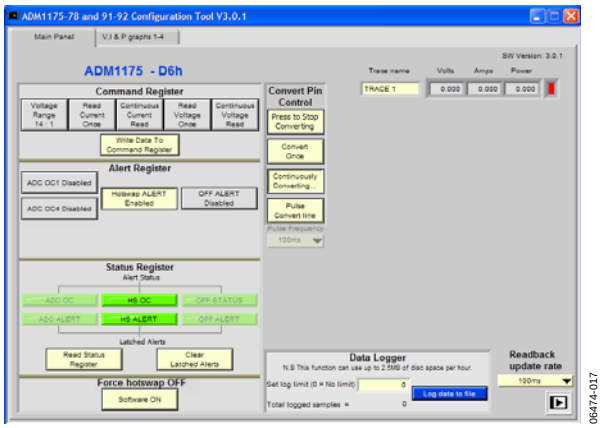


Figure 17. Main Panel on User Interface

COMMAND REGISTER CONTROLS

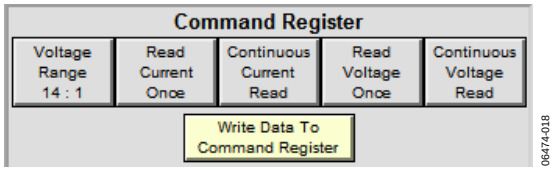


Figure 18. Command Register Panel

The **Command Register** panel allows you to control the way the device reads data. There are five toggle buttons to select the data reading method and voltage range. If the voltage range is set at 14:1 by default (7:2 if the **Voltage Range** button is selected), you may read the current and voltage just once or read them continuously. Once the range and reading method have been selected, click **Write Data To Command Register**.

Note that the **Read Current Once** button and **Continuous Current Read** button cannot be selected simultaneously. The same rule applies to the **Read Voltage Once** and **Continuous Voltage Read** buttons.

ALERT REGISTER CONTROLS

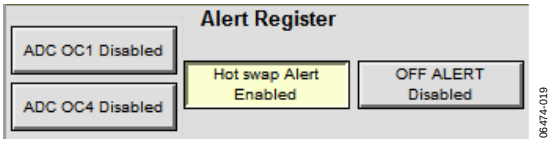


Figure 19. Alert Register Panel

The **Alert Register** panel allows you to enable/disable the different alerts generated by the device using four toggle buttons. The four alert types are ADC OC1, ADC OC4, hot swap alert, and OFF ALERT.

By default, the hot swap alert is enabled while the ADC OC1, ADC OC4, and the OFF ALERT are disabled. An enabled alert is highlighted in yellow, while a disabled alert is gray in color. To enable or disable an alert simply select the corresponding button in the **Alert Register** panel (see Figure 19).

Analog-to-Digital Converter Overcurrent Alert 1 (ADC OC1)

Once enabled a text box appears prompting you to enter the current limit that triggers the alert. The range is between 0 A to 0.529 A. Press **Enter** after entering the value. The ADC overcurrent alert is triggered if a current greater than the programmable level is detected by a single ADC sample.

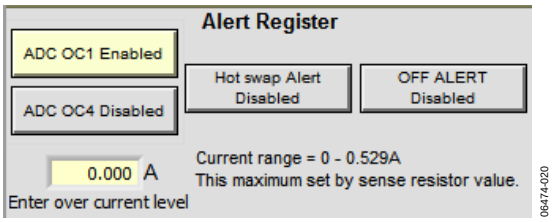


Figure 20. Analog-to-Digital Converter Overcurrent Alert 1

Analog-to-Digital Converter Overcurrent Alert 1 (ADC OC4)

The ADC OC4 alert is similar to the ADC OC1 alert except that it only triggers if a current greater than the programmable level is detected for four consecutive ADC samples. This avoids the situation where a single transient event triggers an ADC over-current condition.

Hot Swap Alert

Hot swap alert is enabled if the hot swap has either latched off or entered a cool-down cycle because of an overcurrent event.

Off Alert

Off alert enables the software off alert.

STATUS REGISTER CONTROLS

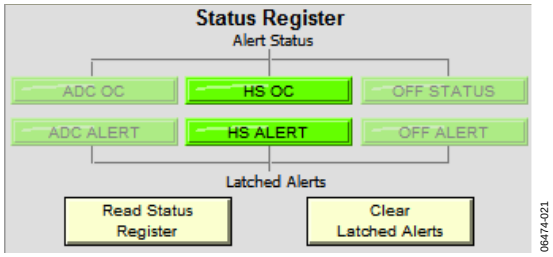


Figure 21. Status Register Panel

The **Status Register** monitors three alert types: ADC overcurrent alert, hot swap overcurrent alert, and software off alert.

The **Status Register** has six alert indicators. The upper row shows the real-time alert status and the lower row shows the latched alert status. Each type of alert may be enabled or disabled in the **Alert Register**, as discussed in the Alert Register Controls section.

To read the alert status, click **Read Status Register**. To clear latched alerts, select **Clear Latched Alerts**. An alert indicator that changes color from green to red indicates that the alert has been triggered.

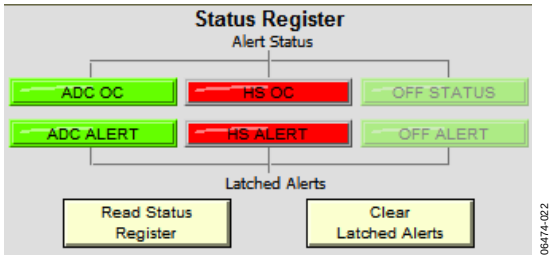


Figure 22. Status Register Showing Triggered Alerts

If the hot swap overcurrent alert has been triggered (see Figure 22), the device goes into an overcurrent protection mode. To reset the board, you can cycle the power, toggle the ON pin of the device through Switch S7, or toggle the **Software ON/OFF** button in the evaluation software.

FORCE HOTSWAP OFF CONTROL

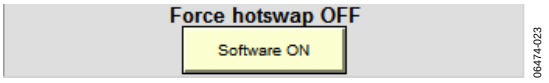


Figure 23. Software On/Off Switching Button

The **Software ON** button manually overrides the on/off control signal for the gate circuitry. Clicking the button manually switches off FET Q1. The **OFF STATUS** alert triggers if the software turns off, and appears in red in the status register.

OVERCURRENT OUTPUT FLAG CONTROL

To the right of the status register, there is an **Overcurrent Output Flag** indicator. For the ADM1178, it is ALERTB. This indicator updates in real time. If an overcurrent condition is detected, the indicator changes from green to red. In Figure 24, the green highlight indicates that an overcurrent has not been detected.



Figure 24. ADM1178 Overcurrent Output Flag

If the overcurrent condition is removed, the highlight changes back to green once the **Read Status Register** button in the **Status Register** is selected.

Note that the position of Jumper LK2 for ADM1178 on the evaluation board affects the status of this flag. If the corresponding jumper is inserted in Position B, the overcurrent output flag is represented by the on-board LEDs and the indicator in the software is continuously green even when an overcurrent event occurs.

TRACE DATA DISPLAY CONTROLS

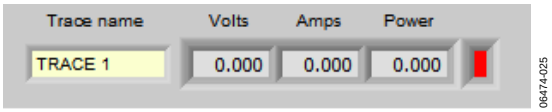


Figure 25. Trace Data Display Panel

The trace data display panel displays the digitized current, voltage, and power data. You can change the name of the trace using the **Trace name** text box.

Note that this software also supports multiple board connections, in which case multiple traces appear. For further information, see the Evaluating Multiple Devices in Parallel section.

READBACK UPDATE RATE CONTROL

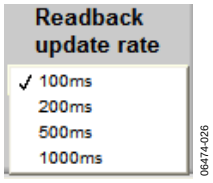


Figure 26. Readback Update Rate Selection Menu

The **Readback update rate** selection menu is set using the drop-down menu shown in Figure 26. There are four options to choose from; every 100 ms, 200 ms, 500 ms, or 1000 ms. This changes the rate at which the data in the data display panel is updated. The **Readback update rate** also sets the rate for the **Data Logger** and the real time graphs.

DATA LOGGER CONTROLS

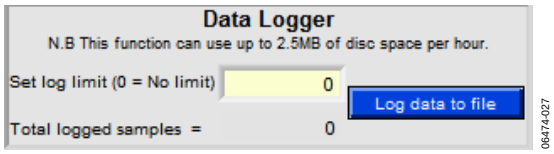


Figure 27. Data Logger Panel

The **Data Logger** panel allows you to log the digitized data collected in a Microsoft® Excel file, giving you more flexibility to monitor and compare data. However, you must set up the data sampling rules using the following steps:

1. Enter the number of times to perform a sample in the **Set log limit (0 = No limit)** text box. The sampling rate is set using the **Readback update rate** drop-down menu, as discussed previously, there are four options to choose from 100 ms, 200 ms, 500 ms, or 1000 ms. In the example in Figure 28, the data logger logs 100 samples, with 100 ms between each sample.

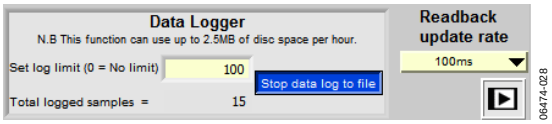


Figure 28. Data Logging

2. Click the **Log data to file** button. A file browser dialog box appears for you to choose the file name and the location where the data will be stored. Press **B** to start logging data to the file. The data will be sampled at the chosen rate and logged to the Excel file.
3. Once the data begins logging, the **Total logged samples** are displayed at the bottom of the panel. This number increases with the sampling rate and the log progress is complete once it reaches the **Set log limit** value. Alternatively, you may press the **Stop data log to file** button to terminate the process. Once the data has been imported to the specified Excel file, the data may be easily evaluated.

CONVERT PIN CONTROLS

The **Convert Pin Control** panel applies only to the ADM1175 device.

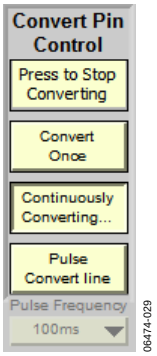


Figure 29. Convert Pin Control Panel

The jumper in LK3 should be in Position A to allow the evaluation software to control the convert pin. If the jumper is in Position B, the on-board switch, S6, can be used to control the conversion.

The **Convert Pin Control** panel allows you to control the analog-to-digital conversion of voltage and/or current. Four buttons on the **Convert Pin Control** panel control the type of data conversion carried out.

- The **Press to Stop Converting** button allows you to stop a continuous conversion.
- The **Convert Once** button carries out a single conversion by issuing a single pulse onto the CONV pin. The result of the conversion appears in the data display panel in the top right hand corner of the **Main Panel**.
- The **Continuously Converting…** button begins a continuous conversion by pulling the CONV pin high. The results of the continuous conversion are displayed in the data display panel.
- Once the **Pulse Convert line** button is pressed, a drop-down menu appears as shown in Figure 30. You can choose from one of four pulse frequencies. The four conversion frequencies to choose from are once every 100 ms, 200 ms, 500 ms, or 1000 ms.
  Note that in the case of the ADM1175 device, if you set the **Pulse Frequency**, then you do not have the option of changing the **Readback update rate**.

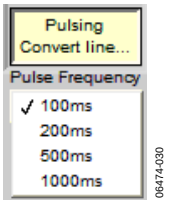


Figure 30. Pulse Frequency Selection Menu

COMMUNICATION STATUS INDICATOR



Figure 31. Device Communication Indicator

Under the **Readback update** rate panel, there is a communication status indicator, see Figure 31. This shows the status of the connection between the software and the device. There are three possible type of indication (see Figure 31).

The first type indicates normal communication. The second type, the spinning logo, indicates data being read to/written from/to the register. The third type indicates that communication between the device and the user interface has been lost. The software should be restarted (use the **Software ON/OFF** button) to reestablish communications with the device.

REAL-TIME GRAPHS OF VOLTAGE, CURRENT, AND POWER

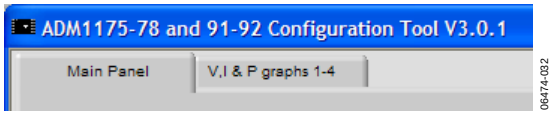


Figure 32. Panel Selection Tabs

The tabs located on the top of the user interface allow you to switch between the **Main Panel** and the voltage, current, and power graphs.

You can monitor the data using the software generated graphs. There are three control panels and three graphs corresponding to voltage, current, and power. Voltage and current graphs are displayed using actual voltage and current data from the device. The values for the power graph are calculated using, $P = V \times I$.

Note that the **Readback update rate**, on the **Main Panel**, sets the speed at which the ADC samples are taken and, consequently, the speed at which the graphs update.

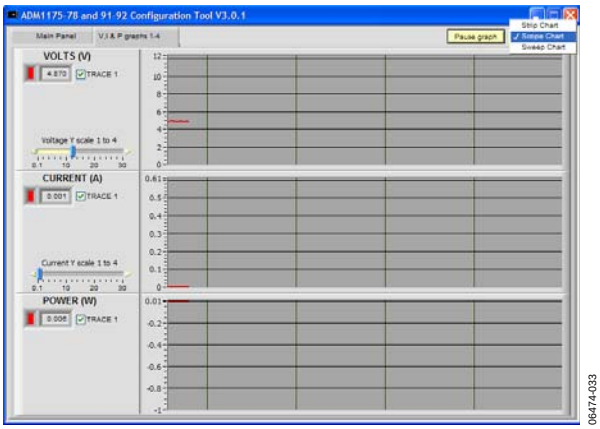


Figure 33. Voltage, Current, and Power Plots

The digitized values for voltage, current, and power are displayed in the control panel on the left where different traces are identified by different colors (see Figure 33 and Figure 34).

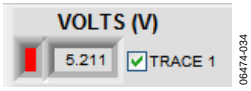


Figure 34. Trace Identifier

Using the scale adjustment bar shown in Figure 35, you can adjust the y-axis scale of the plots to optimize them.

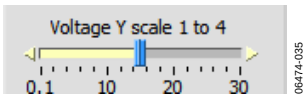


Figure 35. Scale Adjustment Bar

On the top right corner, the **Pulse** button allows you to pulse the graph from real-time plotting. There is also a **Scope Chart** selection drop-down menu that allows you to choose from one of the three graph formats. The graph formats are: **Strip Chart**, **Scope Chart**, and **Sweep Chat**. The default mode is **Scope Chart**.

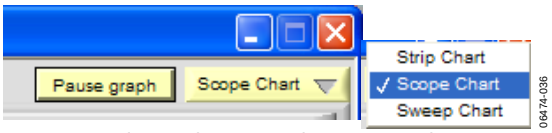


Figure 36. Pulse Graph Button and Scope Type Selection Menu

The screen shot in Figure 37 shows the result of varying the supply voltage. Notice that the power graph also changes as a result.

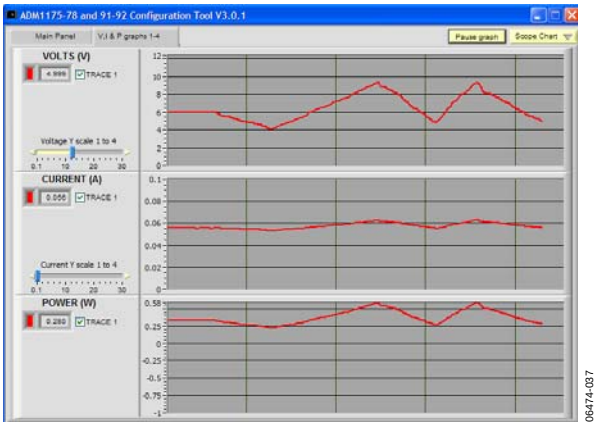


Figure 37. Plot with Voltage Variation

The screen shot in Figure 38 shows that the supply voltage is constant but that the current is changing, as a result of varying the load resistance by turning Switch VR1. Turning VR1 clockwise reduces the load resistance, and hence the current increases. Turning VR1 counterclockwise increases the load resistance, and hence the current decreases. Notice the variation of the power graph as the current graph changes. Also note that once the current limit is reached, the FET is shut down and no current flows through.

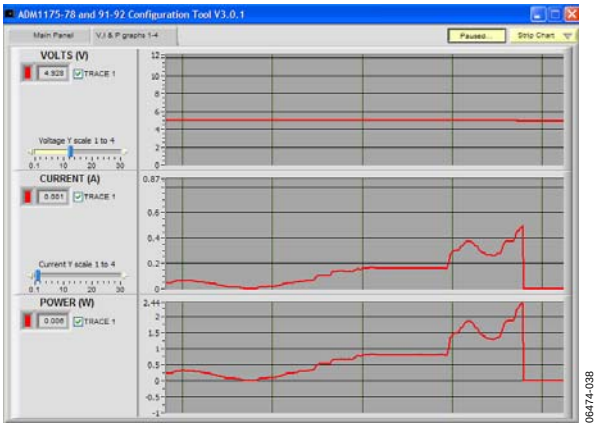


Figure 38. Plot with Current Variation

EVALUATING MULTIPLE DEVICES IN PARALLEL

In the case of the ADM1175, ADM1177, and ADM1178, up to four unique I²C addresses can be created allowing you to interconnect up to four devices. In the case of the ADM1176, up to 16 I²C addresses can be created allowing you to interconnect up to 16 ADM1176 devices.

Each evaluation board is fitted with switches labeled A0 and A1. A0 is used on the ADM1175/ADM1176/ADM1177/ADM1178 devices to assign an address, via the ADR pin, to that particular device. For the ADM1176, A1 is also used in combination with A0 to assign up to 16 I²C addresses. Be sure that each device has a unique I²C address.

When interconnecting the ADM1175/ADM1176/ADM1177/ADM1178 devices, each device is powered using a bench supply of between 3.15 V and 16.5 V, connected to J3 (VIN) and J4 (GND).

The first evaluation board should be connected to the PC using a 5-pin SMBus cable from the 5-pin header labeled J7. Each board is fitted with two MiniMolex® interconnecters, J8 and J9. To interconnect multiple boards use the provided red 5-pin MiniMolex cables.

COMMUNICATING WITH INTERCONNECTED EVALUATION BOARDS

Figure 39 displays the result of the device address search when four ADM1175/ADM1176/ADM1177/ADM1178 boards have been cascaded. Note that the I²C addresses of the four devices are highlighted in green.

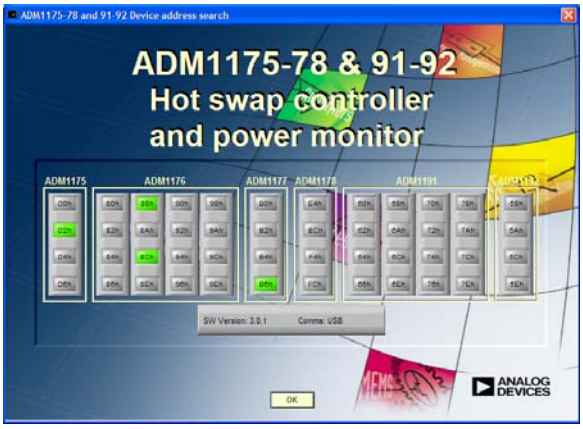


Figure 39. Device Address Search for Four Interconnected ADM1175/ ADM1176/ADM1177/ADM1178 Devices

Click **OK** to access the **Sense Resistor Value** window (see Figure 40). Enter the value of the current-sense resistors; the default value of R3 is 0.2 Ω.

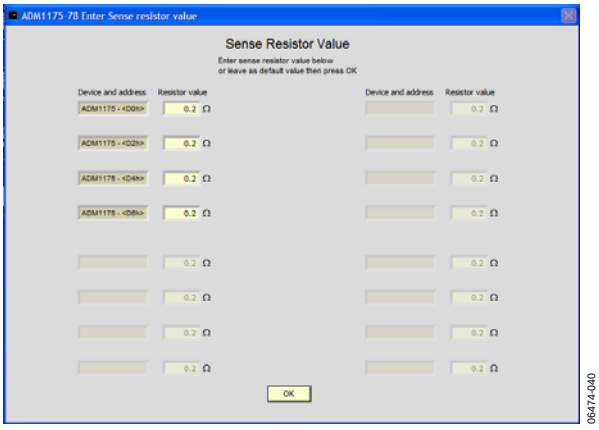


Figure 40. Multi Devices Sense Resistor Value Input Panel

Click **OK** and the evaluation software **Main Panel** appears (see Figure 41).

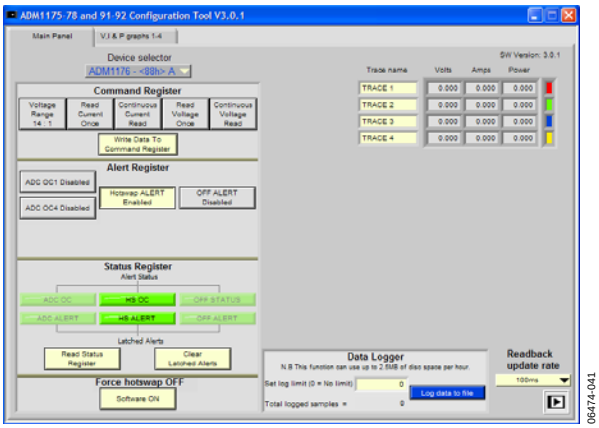


Figure 41. Main Panel for Multiple Devices

Note the presence of a drop-down menu entitled **Device selector** (see Figure 42).

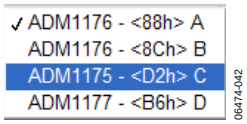


Figure 42. Multidevice Selector

The **Device selector** drop-down menu allows you to select each device individually and select the configuration settings for that device. Select the range and reading method then click **Write Data To Command Register** to pass the change to the register of the device.

The voltage, current, and power graphs can be viewed by selecting the **V, I & P graphs 1-4** tab.

The digitized values for voltage, current, and power are displayed in the control panel on the left (see Figure 43). Select which traces to view by clicking the check box to the left of each trace name. You can also scale the y-axis of the plots for ease of viewing.

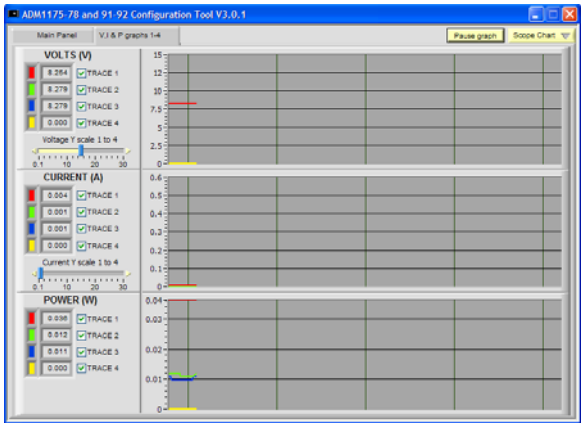


Figure 43. Multiple Device Voltage, Current, and Power Plot

Figure 44 depicts the result of altering the input voltage. Note the corresponding change on the power graph.

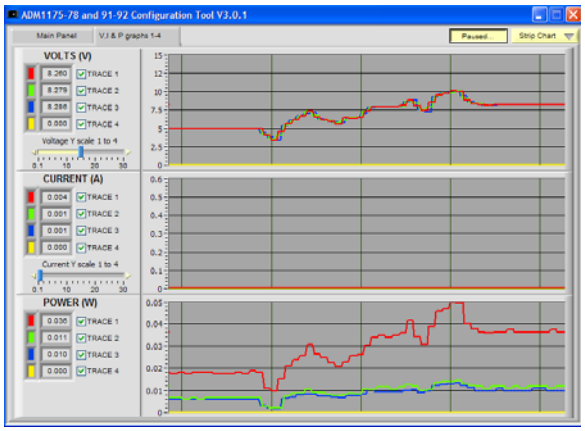


Figure 44. Multiple Device Plot with Voltage Variation

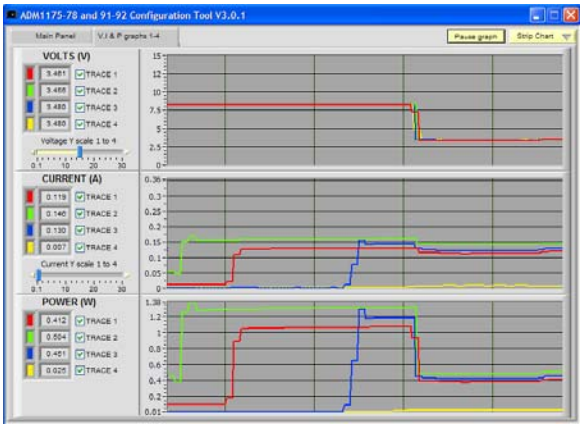


Figure 45. Multiple Device Plot with Current Variation

In Figure 45, the supply voltage is constant. The current associated with traces are varied. The current is varied by changing the load resistance. Turning VR1 clockwise on each respective evaluation board reduces the load resistance, hence the current increases, and vice versa.

In Figure 46, the **Main Panel** is shown for five interconnected boards. Note that there is an extra tab entitled **V, I & P graphs 5-8**.

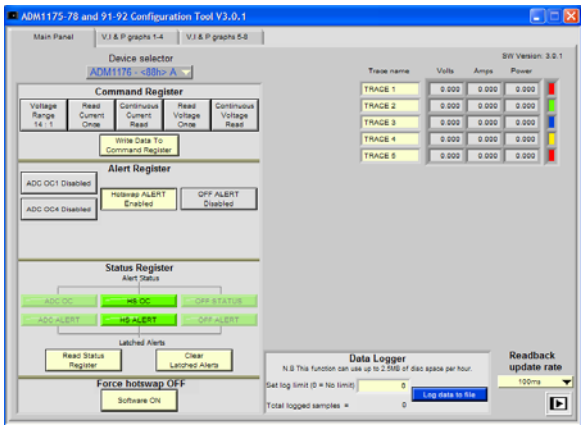


Figure 46. Main Panel for Five Devices

The first four traces are graphed within the tab entitled **V, I & P graphs 1-4**, the next four traces are is graphed in the tab entitled **V, I & P graphs 5-8** as shown in Figure 47.

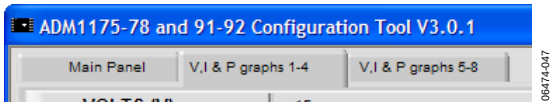


Figure 47. Multiple Device Panel Selection Tab

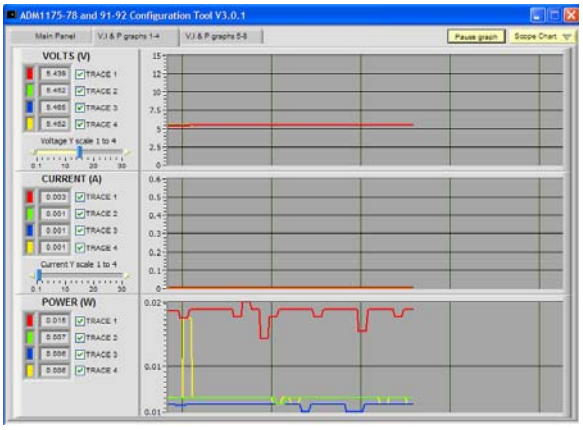


Figure 48. Multiple Devices Plotting Screen for Device 1 to Device 4

Four traces are displayed on each graph tab to a maximum of 16 traces on four graph tabs when 16 ADM1176 devices are set up in parallel.

EVALUATION BOARD SCHEMATIC

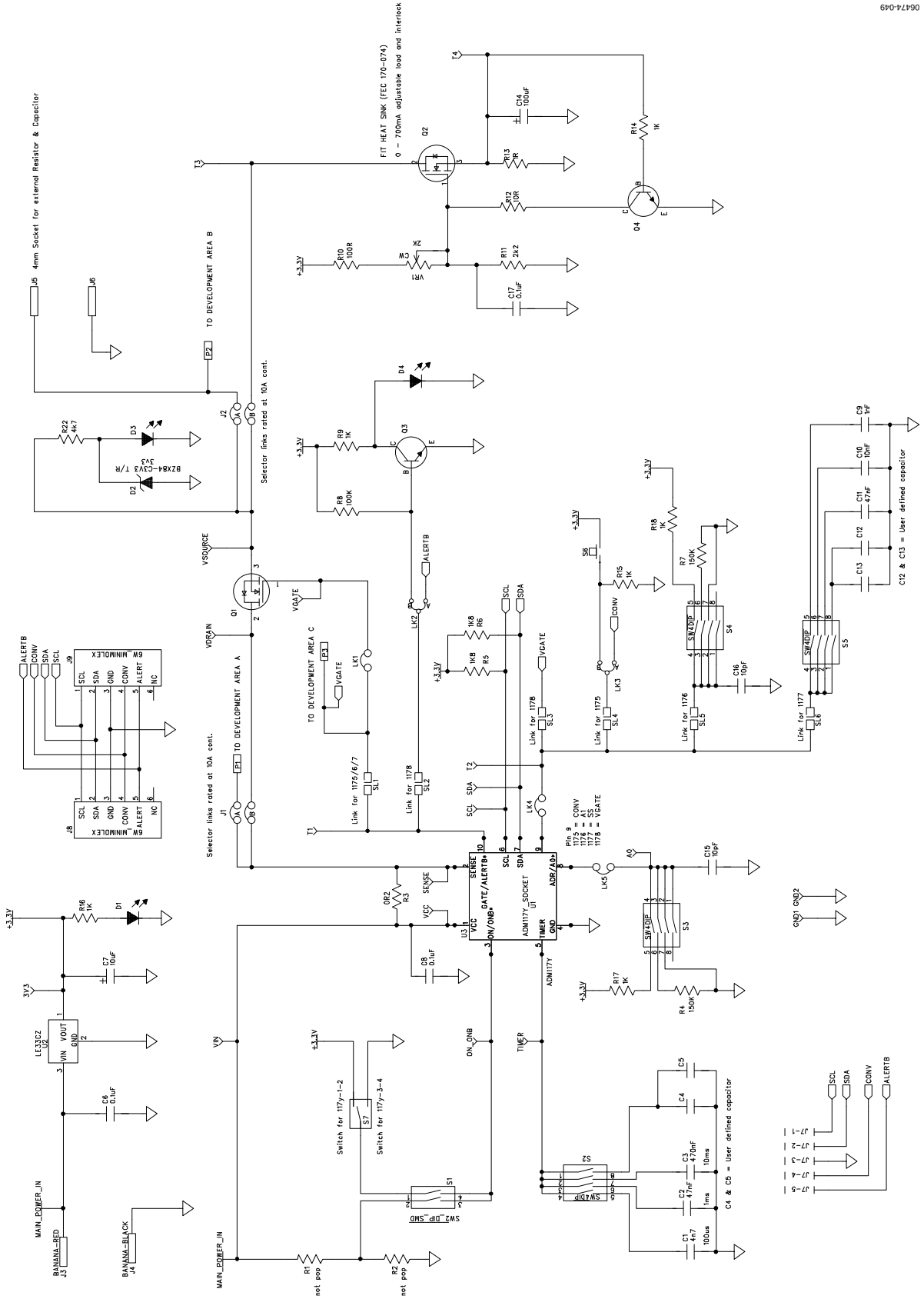


Figure 49. ADM1175/ADM1176/ADM1177/ADM1178 Evaluation Board Schematic

ORDERING INFORMATION

BILL OF MATERIALS

Table 5.

Qty	Reference Designator	Description	Manufacturer	Manufacturer Number	Supplier Number[1]
1	C1	4.7 nF, 10%, 0805 multilayer ceramic capacitor, SMD	Phycomp	2238 580 15632	FEC 3019913
2	C2, C11	47 nF, 10%, 0805 multilayer ceramic capacitor, SMD	Phycomp	2238 580 15645	FEC 718683
1	C3	470 nF, 10%, 0805 multilayer ceramic capacitor, SMD	Multicomp	B0805R474KCT	FEC 9406336
1	C4	User-defined, 0805 capacitor footprint, not inserted, SMD			
1	C5	Through-hole capacitor, not inserted, user-defined, CAP\MR04			Insert low profile sockets
3	C6, C8, C17	0.1 µF, 10%, 0805 multilayer ceramic capacitor, SMD	Multicomp	U0805R104KCT	FEC 9406387
1	C7	10 µF, 10 V tantalum capacitor, 10%, SMD	AVX	TPSA106K010R1800	FEC 1135105
1	C9	1 nF, 5% 0805 multilayer ceramic capacitor, SMD	AVX	08055A102JAT2A	FEC 317457
1	C10	10 nF, 10%, 0805 multilayer ceramic capacitor, SMD	Multicomp	U0805R103KCT	FEC 9406352
1	C12	Through-hole capacitor, not inserted, user-defined, CAP\MR04			Insert low profile sockets
1	C13	0805 capacitor footprint, not inserted, user-defined, SMD			
1	C14	100 µF, 10 V tantalum capacitor, 10%, SMD	AVX	TAJC107K010R	FEC 197180
2	C15, C16	10 pF, 5%, 0603 multilayer ceramic capacitor, SMD	Epcos	B37930K5100J60	FEC 9753478
3	D1, D3, D4	Red SMD LED, 0805	Avago Technologies	HLMP-6000-E0011	FEC 1003354
1	D2	3.3 V, 5%, SOT23, Zener diode, SMD	NXP	BZX84-C3V3	FEC 1081419
2	GND1, GND2	Black testpoint	Vero	20-2137	FEC 8731128
2	J1, J2	4-pin (2 × 2) header and shorting block, PCB_SELECTOR_PLUG_DIP4	Harwin	D3086-98/ H3161-01/ D3086-98	FEC 149318/ FEC 49306
2	J3, J5	Red 4 mm banana socket	Deltron	571-0500-01	FEC 1101127
2	J4, J6	Black 4 mm banana socket	Deltron	571-0100-01	FEC 1101128
1	J7	5 Pin header, HEADER05, SIP-5P-RA	Molex	22-12-2054	FEC 3116890
2	J8, J9	6-way SMD straight mini header	Molex	533980671	FEC 1125368
3	LK1, LK4, LK5	2-pin (0.1" pitch) header and shorting shunt, jumper, SIP-2P	Harwin	M20-9990246/ M7566-05	FEC 1022247/ FEC 150411
2	LK2, LK3	3-pin (0.1" pitch) header and shorting shunt, JUMPER2\SIP3, LINK-3P	Harwin	M20-9990346/ M7566-05	FEC 1022249/ FEC 150411
1	P10	TO-220 heatsink for FET Q2	AAVID Thermalloy	TV40	FEC 170074
1	Q1	MOSFET, N, D2-PAK, IRFR_U3910 triple footprint	International Rectifier	IRF3808SPBF	FEC 1013377
1	Q2	MOSFET, N, logic, TO-220_EXPOSED_PAD_HEATSINK	Fairchild Semiconductor	FDP7030BL	FEC 9845151
2	Q3, Q4	NPN small signal transistor, SOT-23, SMD	On Semiconductors	BC849BLT1G	FEC 9558616
2	R1, R2	Through-hole resistor location, RES-1/4W, not populated			Insert low profile sockets
1	R3	0.2 Ω, 1%, 2512 current-sense SMD resistor	Welwyn	LR2512-R20FW	FEC 1100068
2	R4, R7	150 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 150K	FEC 9332626
2	R5, R6	1.8 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 1K8	FEC 9332715
1	R8	100 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 100K	FEC 9332405
6	R9, R14, R15, R16, R17, R18	1 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 1K	FEC 9332383
1	R10	100 Ω, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 100R	FEC 9332375
1	R11	2.2 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 2K2	FEC 9332812

Qty	Reference Designator	Description	Manufacturer	Manufacturer Number	Supplier Number[1]
1	R12	10 Ω, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 10R	FEC 9332421
1	R13	1 Ω, 5%, 1W, 2512 SMD resistor	Phycomp	232276260108	FEC 9235833
1	R22	4.7 kΩ, 1%, 0805 SMD resistor	Multicomp	MC 0.1W 0805 1% 4K7	FEC 9333266
1	S1	2-way SMD switch	Omron Electronic Components	A6S-2102	FEC 9901850
4	S2, S3, S4, S5	4-way SMD switch	Omron Electronic Components	A6S-4101	FEC 9901868
1	S6	SMD push button switch (sealed)	Omron Electronic Components	B3S-1000	FEC 177807
1	S7	Slide switch	Alps	STSSS9121	FEC 1123875
15	3V3, A0, SCL, SDA, SENSE, T1, T2, T3, T4, TIMER, VCC, VDRAIN, VGATE, VIN, VSOURCE, ON_ONB	Red testpoint	Vero	20-313137	FEC 8731144
1	U1	10-pin MSOP socket, ADM117Y_SOCKET, MSO10-SKT	Wells	656-0102211	Abrel Products 656-0102211
1	U2	3.3 V regulator, TO-923	STMicroelectronics	LE33CZ	FEC 9755349
1	U3	MSO10, SMD, ADM1175-2ARMZ/ADM1176-2ARMZ/ADM1177-2ARMZ/ADM1178-2ARMZ	Analog Devices.	ADM117x-2ARMZ	
1	VR1	Trimmer potentiometer, VRES ROTARY 2K	Vishay Spectrol	63M-T607-202	FEC 9608214

[1] FEC = Farnell Electronics.

ORDERING GUIDE

Model	Description
EVAL-ADM1175EBZ[1]	Evaluation Board
EVAL-ADM1176EBZ[1]	Evaluation Board
EVAL-ADM1177EBZ[1]	Evaluation Board
EVAL-ADM1178EBZ[1]	Evaluation Board
CABLE-SMBUS-5PINZ[1]	5-Pin SMBus Cable (Parallel Port)
USB-5PSMBUS-CABLEZ[1]	5-Pin SMBus Cable (USB Port)

[1] Z = RoHS Compliant Part.

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.

NOTES

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