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Using the Hot Swap and Power Monitoring Evaluation Software

FEATURES

Hot swap and power monitoring evaluation software to enable full evaluation of ADM1275, ADM1276, ADM1278, and ADM1075
Fully compatible with ADM1275, ADM1276, ADM1278, and ADM1075 evaluation boards

EQUIPMENT NEEDED

EVAL-ADM1275EBZ, EVAL-ADM1276EBZ, EVAL-ADM1278EBZ, or EVAL-ADM1075EBZ evaluation board
USB-SDP-CABLEZ dongle
Minimum PC system requirements
Windows® XP SP2
1 GHz processor
200 MB free disk space
512 MB RAM
1024 × 768 high color (16-bit version)

DOCUMENTS NEEDED

ADM1075, ADM1275, ADM1276, ADM1278 data sheets
UG-304, UG-548, UG-263, UG-601, UG-353 user guides

GENERAL DESCRIPTION

The hot swap and power monitoring evaluation software is compatible with the ADM1275, ADM1276, ADM1278, and ADM1075 devices. It can be used in conjunction with the relevant evaluation board to demonstrate the functionality of the part. This document describes the software installation steps required and provides information about how to use this evaluation tool.

The screenshots are based on the GUI appearance when an ADM1278 or ADM1075 evaluation board is connected. The GUI appearance and functionality when an ADM1275 or ADM1276 evaluation board is connected is very similar.

TABLE OF CONTENTS

REVISION HISTORY

5/14—Rev. 0 to Rev. A

Added ADM1278 ... Universal
Updated Software ... Universal
Changes to Equipment Needed and Documents Needed Sections ... 1
Changes to Software Setup Section ... 3
Deleted Figure 1; Renumbered Sequentially ... 3
Changes to Figure 3; Added Figure 4 ... 4
Changes to Basic Operation, Hot Swap Control, and Hot Swap Setup Sections ... 5
Added Figure 5 ... 5
Changes to Evaluation Board Section ... 6
Added Figure 6 and Figure 7; Changes to Figure 8 ... 6
Added Figure 9; Changes to Figure 10 ... 7
Added Sense Resistor and ADC Input Resistor Sections ... 8
Added Figure 11 and Figure 12 ... 8
Changes to Power Monitor Button Section ... 9
Changes to Figure 13; Added Figure 14 and Figure 15 ... 9
Changes to Voltage Input(s) to Measure and Voltage Range Sections ... 10
Added Figure 16 to Figure 19 ... 10
Changes to V/I Averaging Section; Added Power Averaging Section ... 11
Added Figure 20 to Figure 22 ... 11
Added Sample Temperature and Enable Temperature Filter Section and Show Energy Meter Section; Changes to Show Historical Min/Max Section ... 12
Added Figure 23 to Figure 25 ... 12
Added Figure 26 to Figure 28 ... 13
Added Show HS Data Monitor Section; Changes to Select Log File Section ... 14
Added Figure 29 and Figure 30 ... 14
Changes to GPOs and Alerts Section ... 15
Changes to Figure 31; Added Figure 32 and Figure 33 ... 15
Changes to Faults and Warnings Section ... 16
Changes to Figure 34 ... 16
Changes to Number Conversions Section ... 17
Changes to Figure 35 ... 17

10/12—Revision 0: Initial Version

SOFTWARE INSTALLATION

The Analog Devices, Inc., website provides a one-stop shop for product search and support. After deciding which product is best for your design, use the relevant product page on the Analog Devices website to access technical documentation, such as the data sheet, Circuits from the Lab®, application notes, evaluation board user guides, and software reference manuals to support and enhance your design experience.

To install the evaluation software for the relevant product, select the **Evaluation Boards & Kits** section from the appropriate product page, click the **Software and Tools** heading, and follow these steps:

1. Download the common run-time installer. This run-time installer is shared between the super sequencer devices and the I²C-based hot swap and power monitor devices. It contains the driver support for the USB-SDP-CABLEZ interface connector. The run-time installer needs to be downloaded and installed one time only for use with any of these products.
2. Download and install the **HS-PM_Evaluation_Tool_Installer**. This installer is a graphical user interface (GUI) for evaluating the ADM1275, ADM1276, ADM1278, and ADM1075 devices.

SOFTWARE SETUP

1. Run the hot swap and power monitoring evaluation software. It can be found in the **Start > All Programs > Analog Devices > Hot Swap Power Monitors** folder.
2. Connect the evaluation board to the USB port of the PC using a USB-SDP-CABLEZ connector (see the USB-SDP-CABLEZ user guide for more information). This connector must be purchased separately and is not included with the evaluation board; details can be found on any of the applicable evaluation board pages.
3. From the **Select Interface…** window, select the **ADI USB-SDP-CABLEZ Interface** from the pull-down box.
4. Click **Work Online** (see Figure 1). Note that to enable the I²C link,
   a. The USB dongle must be connected to the PC and to the evaluation board.
   b. The evaluation board must be powered (including 5 V isolated power on the ADM1075; see the ADM1075 user guide for more information).
5. To view the functionality and description of each control, enable **Show Context help** from the **Help** menu. Then use the mouse to point to a control, and the relevant functionality and description is displayed.
6. The software searches to identify which device is connected to the interface. The top right section of the GUI shows whether the I²C link is operational, indicated by the green **I2C Status** indicator (see Figure 2). The device that is detected on the evaluation board is listed in the box to the right of this indicator (see Figure 2). Click the drop-down arrow to show a list of all active devices detected by the software.
7. Assuming that the I²C link is operational and that the device is detected by the software, the software is ready to use.
   a. If either the I²C link is not operational or the device is not detected by the software, check the board power (indicated by the LEDs on board). Check that the dongle is connected to both the evaluation board and the USB port of the PC running the software.
   b. If problems persist, disconnect and reconnect the USB dongle, and then close and reopen the evaluation tool.
   c. The I²C link can be reinitialized by clicking the green **I2C Status** indicator.
   d. The selected device can be reinitialized by clicking the **Device Refresh** button, located to the right of the **Select Device** box.

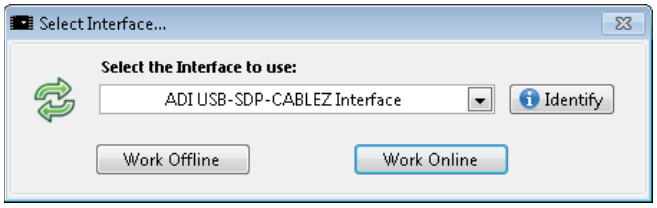

Figure 1. I²C Interface

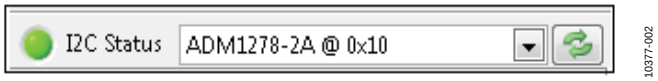

Figure 2. I²C Status Indicator and Active Device List

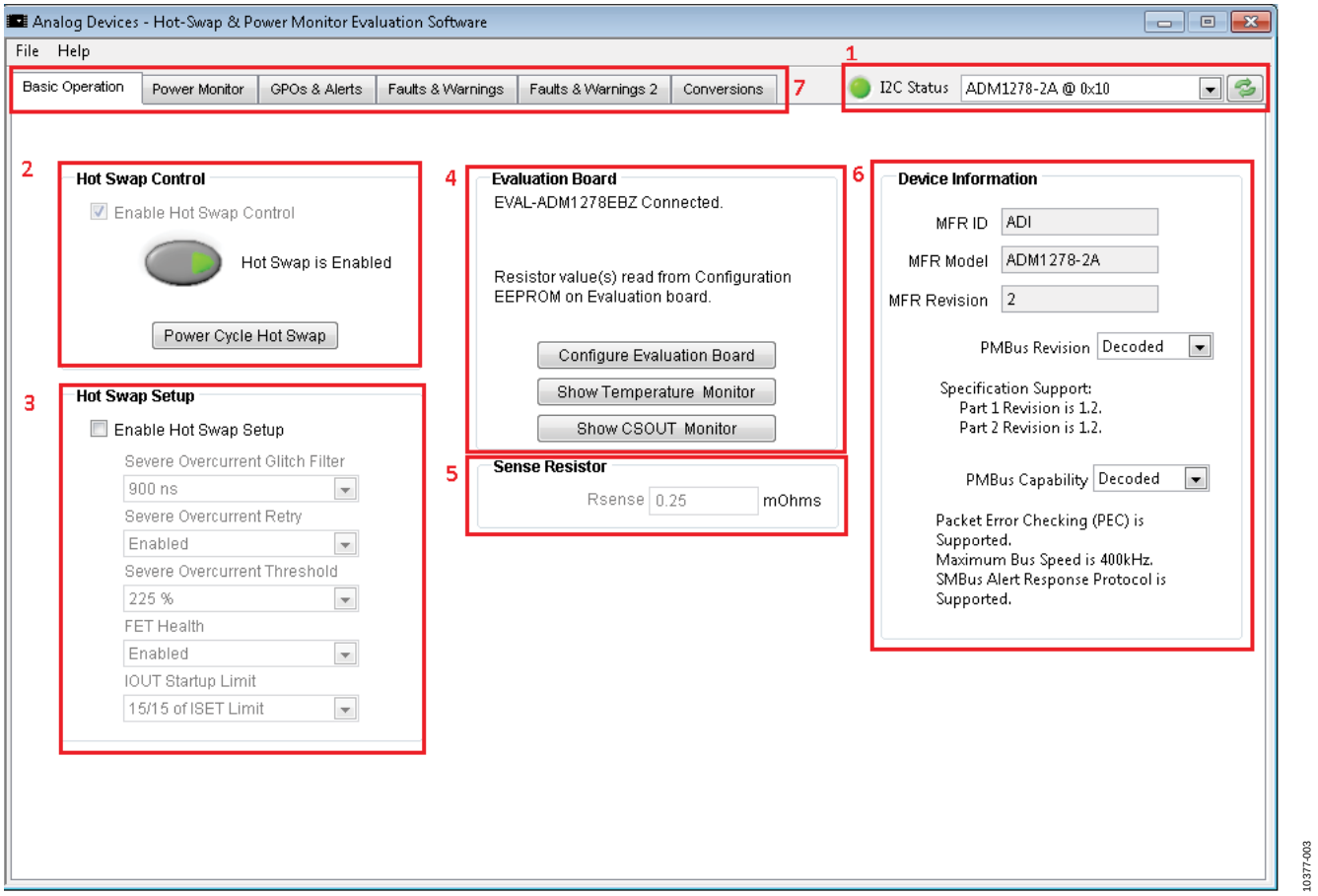

Figure 3. GUI Main Window When Connected to an ADM1278 Evaluation Board

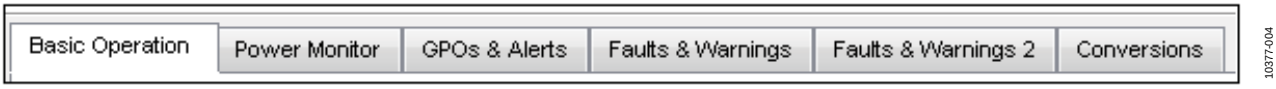

Figure 4. GUI Main Window Tabs (Available Options)

BASIC OPERATION

The **Basic Operation** tab includes a number of settings for

- Hot swap control
- Hot swap setup
- Evaluation board
- Sense resistor
- ADC input resistor dividers (ADM1075 only)
- Device information

HOT SWAP CONTROL

The **Hot Swap is Enabled** button (see Section 2 of Figure 3) is equivalent to the PMBus operation command on the device. It can be used to enable or disable the hot swap. To activate this button, select **Enable Hot Swap Control**. This enables the OPERATION_CMD_ENABLE bit in the DEVICE_CONFIG register, which must occur before the OPERATION command can be used (not required for ADM1278).

In normal operation, hot swap is always enabled; therefore, selecting **Enable Hot Swap Control** is required only if the user intends to disable the hot swap.

The **Power Cycle Hot Swap** button is equivalent to the PMBus POWER_CYCLE command on the chip.

HOT SWAP SETUP

The **Severe Overcurrent Glitch Filter**, **Foldback Status** (ADM1275 and ADM1276 only), **Severe Overcurrent Retry**, **Severe Overcurrent Threshold** (ADM1075 and ADM1278 only), **FET Health**, and **IOUT Startup Limit** (ADM1278 only) settings can be changed from the default values in the **Hot Swap Setup** section of the **Basic Operation** tab (see Section 3 of Figure 3). The **Enable Hot Swap Setup** check box must be selected to allow the user to change the default values.

These settings affect the external FET during a hot swap event; therefore, care must be taken when changing these settings to ensure sufficient protection for the FET. See the relevant data sheets for more information.

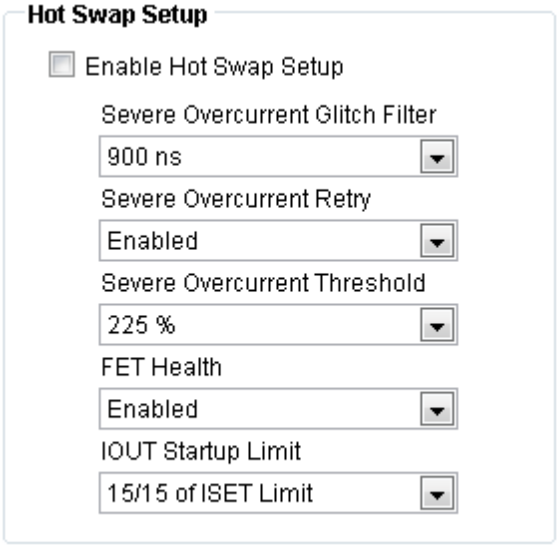

Figure 5. Hot Swap Setup Settings for ADM1278

EVALUATION BOARD

Clicking **Configure Evaluation Board** (see Figure 6 and Section 4 of Figure 3) opens the **Update Evaluation Board Configuration EEPROM** window, which allows the user to change the default sense resistor values, ADC resistor divider values (only for ADM1075), and CSOUT configuration resistor values (only for ADM1278) to match the evaluation board configuration.

The sense resistor value and any resistor divider values are

- Used when calculating current, voltage, and power measurements.
- Required when converting direct format PMBus data to real-world measurements.
- Stored in the evaluation board EEPROM.

The existing EEPROM values are displayed on the GUI, as shown in Figure 7. To reprogram the values in the EEPROM, enter the desired values and click **Program** in the GUI window shown in Figure 7. **Value Updated** appears below the **Program** button after the EEPROM is updated. The EEPROM configuration is performed by clicking **Done**.

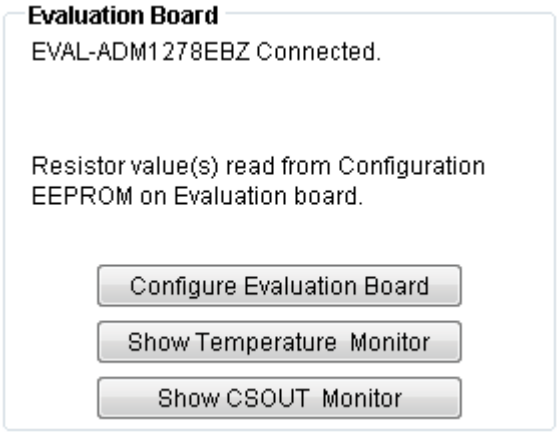

Figure 6. Evaluation Board Settings for ADM1278

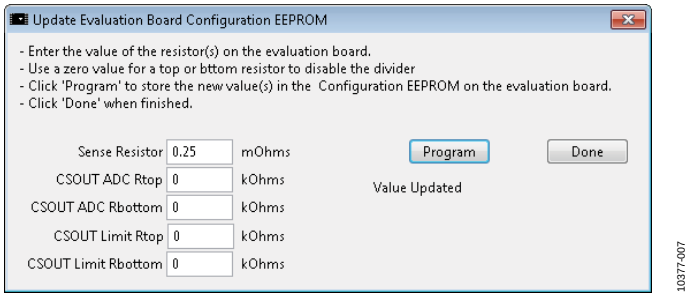

Figure 7. Update Evaluation Board Configuration EEPROM Window for ADM1278

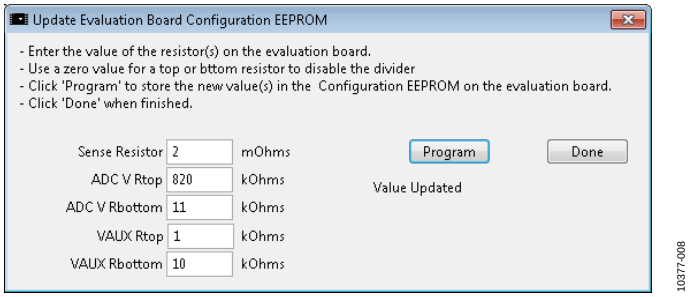

Figure 8. Update Evaluation Board Configuration EEPROM Window for ADM1075

Clicking **Show Temperature Monitor** (see Section 4 of Figure 3) opens the **Temperature Monitor** window (see Figure 9), which displays the temperature of the evaluation board. When the ADM1278 evaluation board is connected, the temperature measurement at the external transistor is reported. The latest temperature measurement is reported and a graphical history of temperature measurements is also displayed. The x- and y-axis scales can be reconfigured by typing new range values directly on the axes.

When the ADM1075, ADM1276, and ADM1275 evaluation boards are connected, the **Temperature Monitor** window shows the temperature measured at each of the ADT75 temperature sensors on the board (see Figure 10). This window also offers the capability of setting a warning temperature limit for the ADM1075 and ADM1275 evaluation boards (see Figure 10).

The **Configure Evaluation Board** and **Show Temperature Monitor** options are disabled for the EVAL-ADM1075MEBZ.

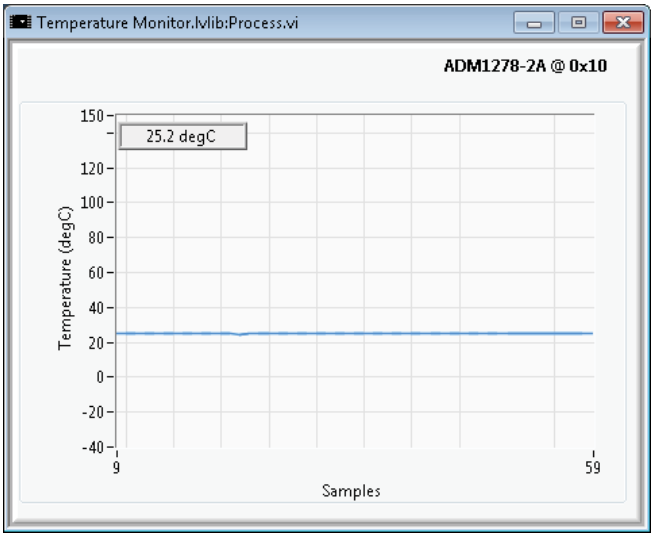

Figure 9. Temperature Monitor Window for ADM1278

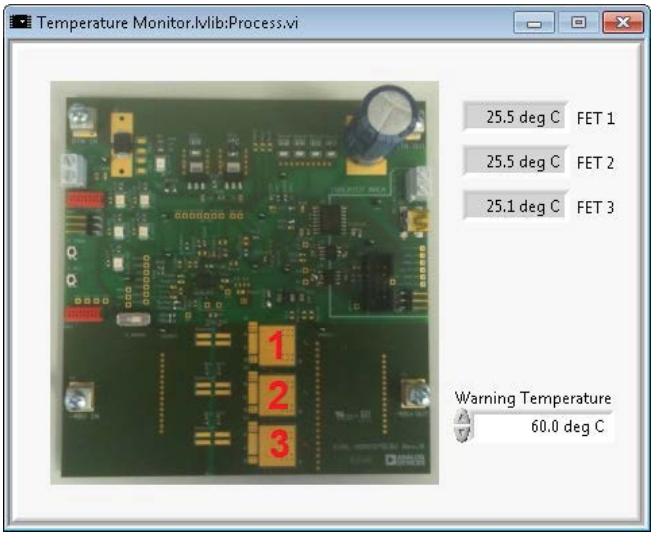

Figure 10. Temperature Monitor Window for ADM1075

Clicking **Show CSOUT Monitor** (see Section 4 of Figure 3) opens the **CSOUT Monitoring** window (see Figure 12), which allows the user to set the programmable threshold limit for CSOUT and displays the CSOUT measurements from the ADC on the board. This window also shows the resistor values used; these values are programmed in EEPROM, as shown in Figure 7, and are used to divide down the CSOUT voltage for the ADC and comparator inputs. The CSOUT feature is available only for the ADM1278.

SENSE RESISTOR

The **Sense Resistor** box of the main window (see Section 5 of Figure 3) displays the sense resistor value read from the EEPROM. The user can also change this value to overwrite the EEPROM value.

ADC INPUT RESISTOR DIVIDERS

An example of the ADC input resistor divider values read from the EEPROM is shown in Figure 11. This feature is available only for the EVAL-ADM1075EBZ board. The user can change these values if the EEPROM is not available or if the board is not found by the software.

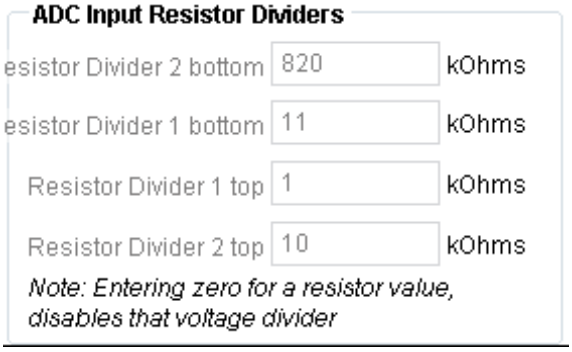

Figure 11. ADC Input Resistor Divider for ADM1075

DEVICE INFORMATION

The device information commands are displayed in the **Basic Operation** tab and provide information regarding the manufacturing identification number (**MFR ID** box), the model number (**MFR Model** box), and the revision number (**MFR Revision** box).

In addition, the PMBus revision and PMBus capability commands are viewable as raw data or as decoded PMBus specifications. See Section 6 of Figure 3 for an example of the **Device Information** section of the **Basic Operation** tab.

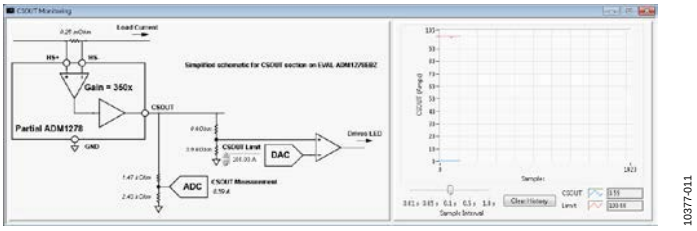

Figure 12. CSOUT Monitoring Window for ADM1278

POWER MONITOR

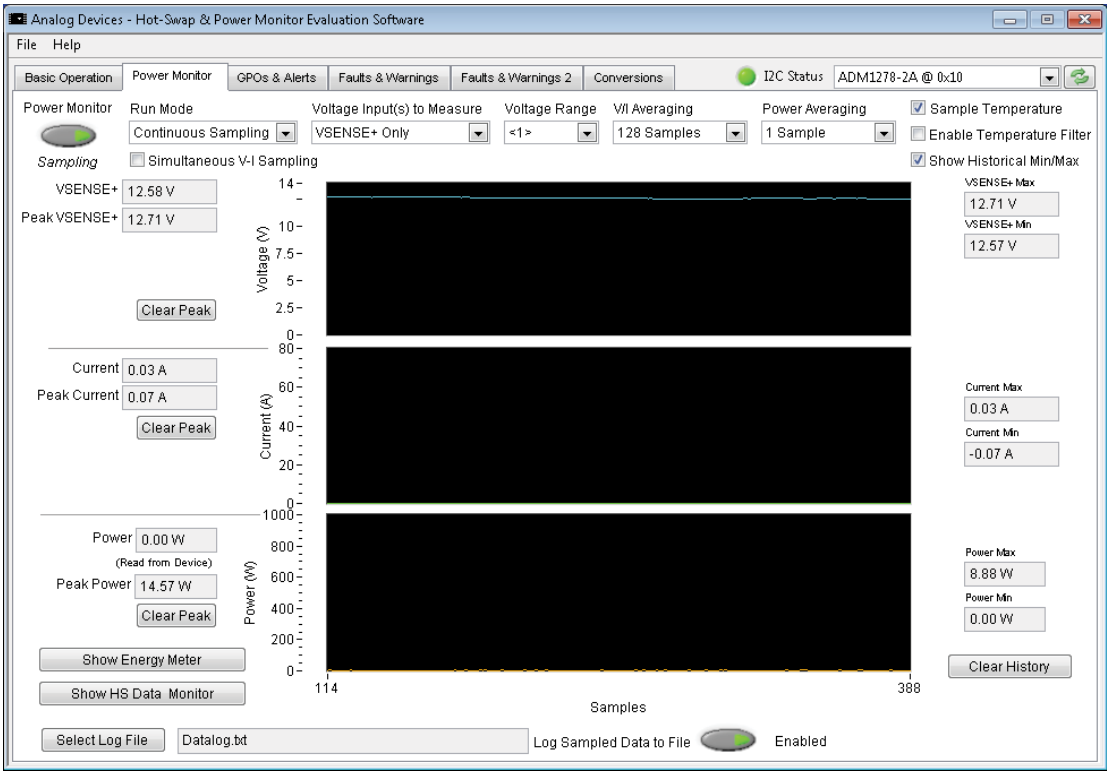

Figure 13. Power Monitor for ADM1278

POWER MONITOR BUTTON

The **Power Monitor** button is equivalent to the CONVERT bit in the power monitor control (PMON_CONTROL) register. This button can indicate the state of the power monitor, as shown in Figure 14. The power monitor tab shows the voltage, current, and power data that is read back from the device (the ADM1275 does not report power; therefore, the power data is calculated from the voltage and current data in the evaluation software for the ADM1275). In continuous sampling mode, this button enables or disables continuous sampling. In single sample mode, this button must be clicked each time the user wants the ADC to sample the voltage, current, or temperature.

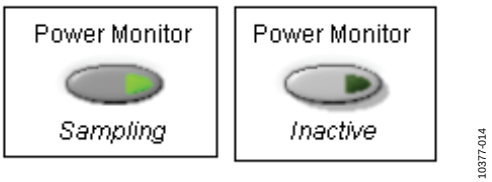

Figure 14. Power Monitor Button Options

RUN MODE

The **run mode** can be set to continuous sampling or single sample mode. This is equivalent to the PMON_MODE bit setting in the power monitor configuration (PMON_CONFIG) register.

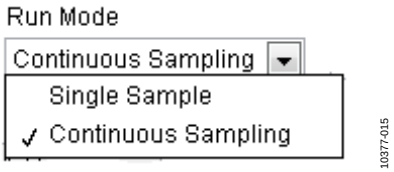

Figure 15. Run Mode Configuration Settings

VOLTAGE INPUT(S) TO MEASURE

The **Voltage Input(s) to Measure** drop-down box allows the user to select the voltage or voltages to be sampled. The available options (see Figure 16) depend on which device is active. The ADM1275 can monitor only one ADC voltage input at a time. However, the ADM1276, ADM1278, and ADM1075 can each monitor two voltage inputs simultaneously.

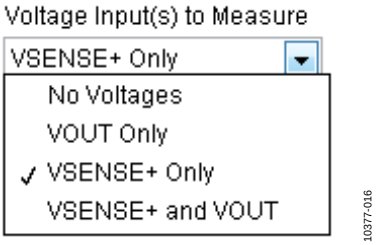

Figure 16. Voltage Input to Measure Settings

The waveforms in Figure 18 and Figure 19 show the voltage and current measured using the ADM1278. The scale of the waveform can be changed by selecting the maximum or minimum scale value and typing the desired value.

Figure 18 shows that the voltage input to measure is selected as VSENSE+ and VOUT. Clicking **Clear Peak** clears the peak value previously read by the software.

Figure 19 shows the current measured on the active device.

VOLTAGE RANGE

If there are different voltage range options for the active device, the range can be selected using the **Voltage Range** drop-down box (see Figure 17).

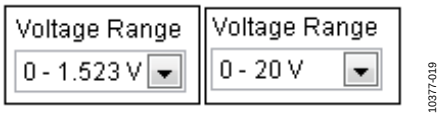

Figure 17. Voltage Range Selection Options

Figure 18. Voltage Monitoring Fucntion and Waveform

Figure 19. Current Monitoring Fucntion and Waveform

V/I AVERAGING

Using the **V/I Averaging** drop-down box is equivalent to configuring the averaging bits in the PMON_CONFIG register. The user can select the averaging to be used for voltage and current. The various options available are shown in Figure 20.

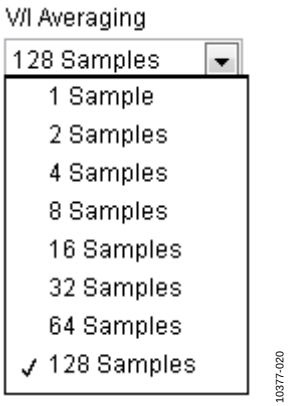

Figure 20. V/I Averaging Settings

POWER AVERAGING

Using the **Power Averaging** drop-down box is equivalent to configuring the PWR_AVG bits in the PMON_CONFIG register. This box is available for only the ADM1278. The user can select the averaging to be used for power calculations. The various options available are shown in Figure 21. The power measured on the active device is displayed, as shown in Figure 22.

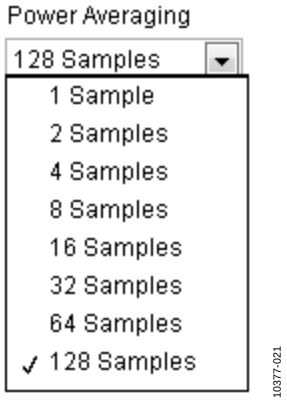

Figure 21. Power Averaging Settings

Figure 22. Power Monitoring Fucntion and Waveform

SAMPLE TEMPERATURE AND ENABLE TEMPERATURE FILTER

Selecting **Sample Temperature** enables the sampling of temperature at the external transistor. The user must set this to read temperature.

Selecting **Enable Temperature Filter** enables on-chip filtering of the temperature readings.

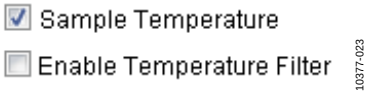

Figure 23. ADM1278 Temperature Monitoring Settings

SHOW HISTORICAL MIN/MAX

Selecting **Show Historical Min/Max** tracks the minimum and maximum voltage, current, and power values read by the evaluation software. Click **Clear History** to reset this data.

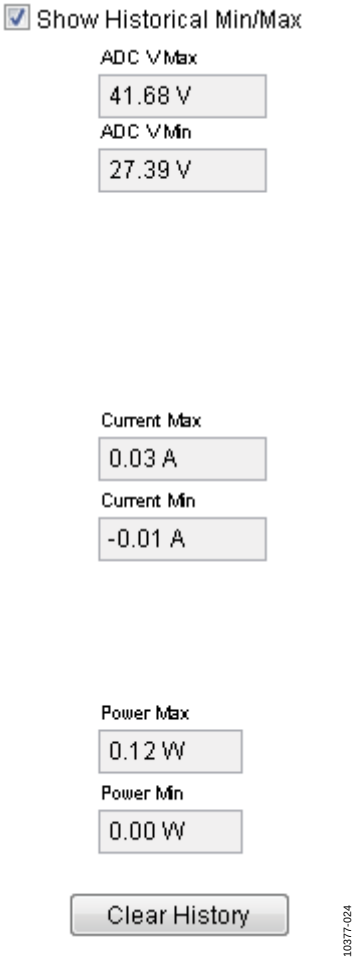

Figure 24. Historical Min/Max Display Window

SHOW ENERGY METER

Clicking **Show Energy Meter** opens a window that shows the energy usage reported by the active device. This is equivalent to how energy calculations would be performed using a microcontroller. The window displays register data, as well as power and energy metering calculations based on time stamps from the PC running the evaluation software. The energy metering options available in this window are shown in Figure 25.

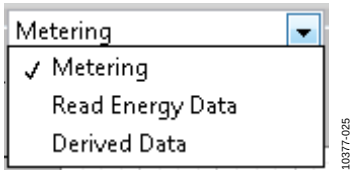

Figure 25. Energy Metering Options

See the ADM1278 data sheet for more information about energy metering.

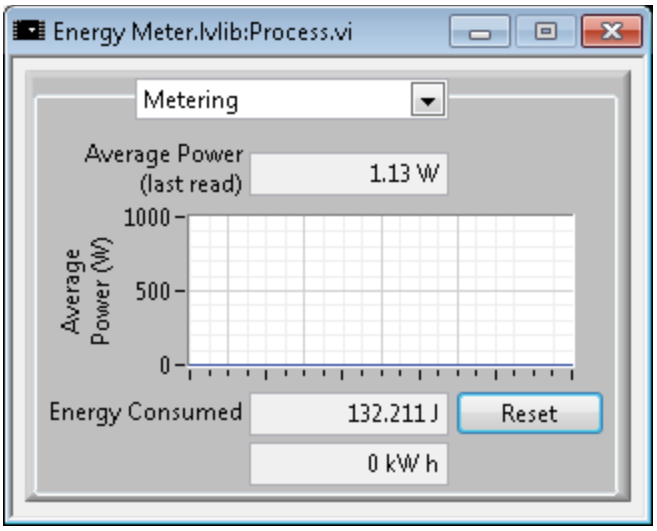

Figure 26. Energy Meter Settings for Metering

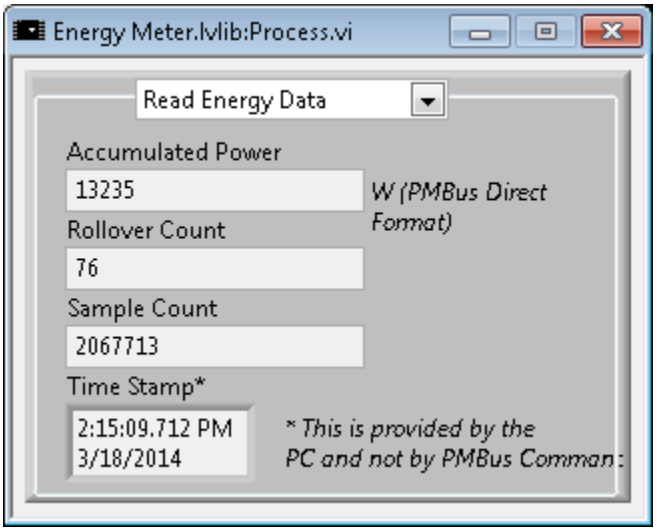

Figure 27. Energy Meter Settings for Read Energy Data

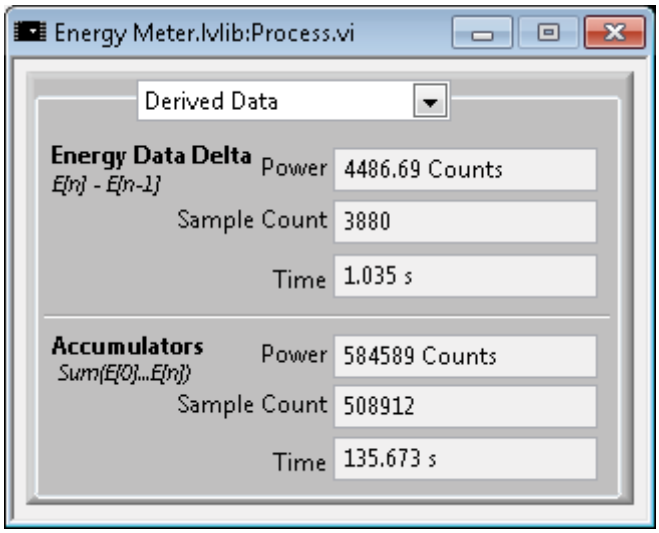

Figure 28. Energy Meter Settings for Derived Data

SHOW HS DATA MONITOR

Clicking **Show HS Data Monitor** opens the **High Speed Data Monitor** window, which displays all of the ADC data read back over the SPI bus. See the ADM1278 data sheet for more information about the SPI functionality.

SELECT LOG FILE

Clicking **Select Log File** prompts the user to select a new or existing file to log power monitor data with corresponding time stamps from the PC. Click **Log Sampled Data to File** to begin and end the data log.

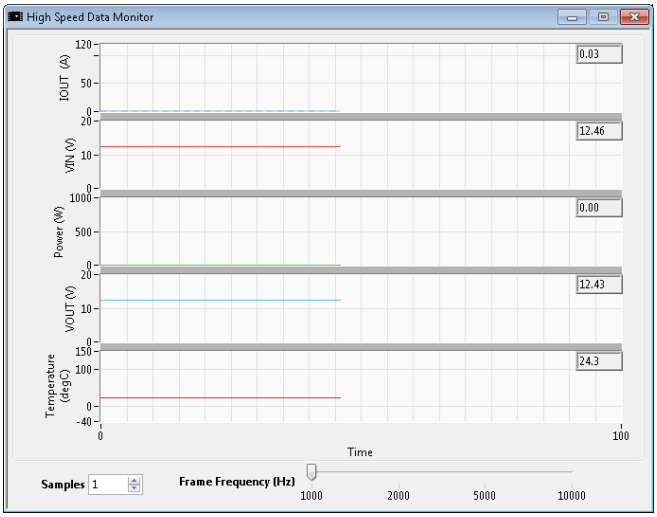

Figure 29. ADC Data Monitoring Via SPI Interface

Figure 30. Data Logging Settings

GPOs AND ALERTS

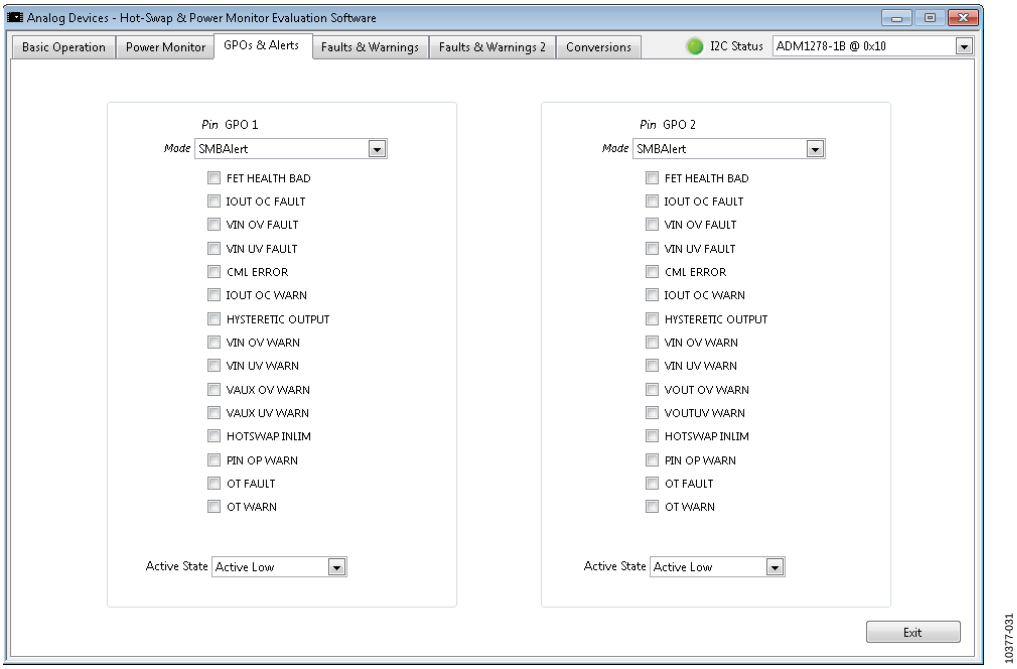

Figure 31. GPOs and Alerts for ADM1278

The **GPOs & Alerts** tab allows the user to configure each GPO pin as SMBAlert, GPO, convert input, or digital comparator mode (see Figure 32), depending on the device under evaluation. See the relevant data sheet for more information.

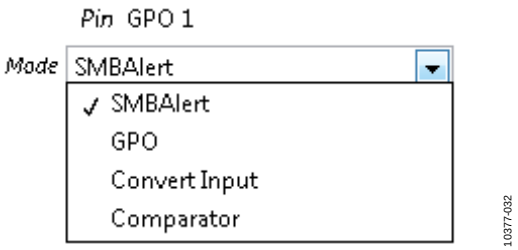

Figure 32. GPO Configuration Modes

When **SMBAlert** or **Comparator** is selected, the faults and warnings that drive the pin can be selected using the check boxes displayed in this section (see Figure 31). This is an OR operation; therefore, if any one of the selected faults or warnings becomes active, the pin is asserted. The pin can also be configured to invert the output compared to normal operation (active high instead of active low).

When the pin is selected as a general-purpose output, the pin can be set to output a logic low or logic high. The number of GPO pins depends on the active device. See the relevant data sheet for more information.

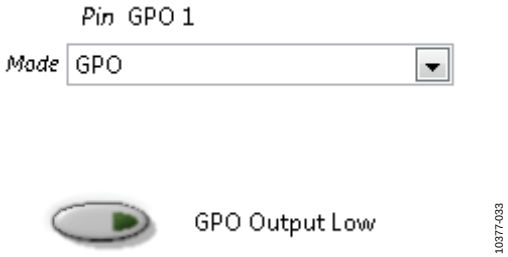

Figure 33. When Pin GPO 1 Is Selected as General-Purpose Output

FAULTS AND WARNINGS

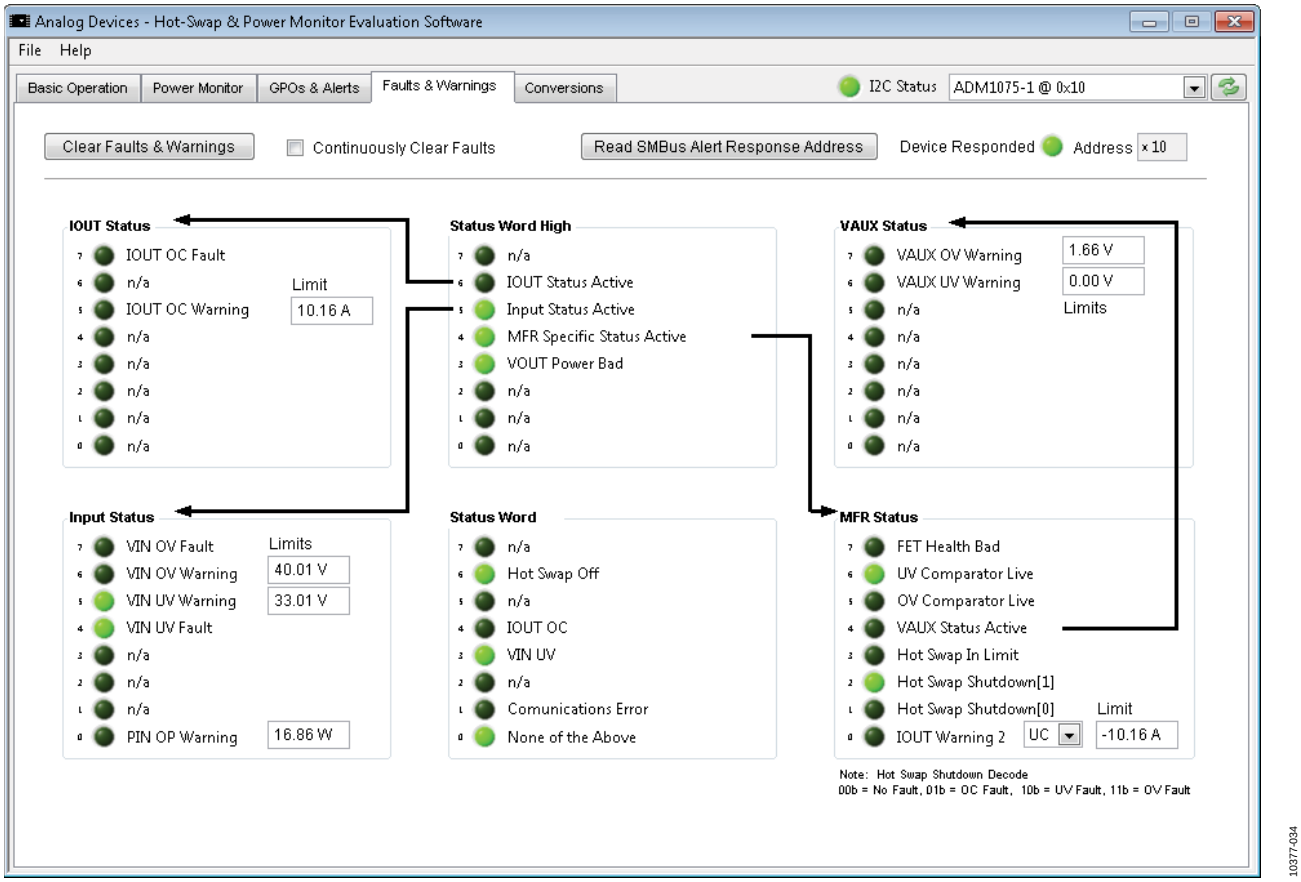

Figure 34. Faults and Warnings for ADM1075

Any fault or warning condition that occurs is displayed in the **Faults & Warnings** tab. There may be one or two **Faults & Warnings** tabs, depending on the device. See the relevant data sheet for more information. This is a useful tool for fault recording and debugging. The HS_SHUTDOWN_CAUSE bits (Bits[2:1]) of the manufacturing specific status (STATUS_MFR_SPECIFIC) register provide information on the type of fault that caused the hot swap to shut down. The specific fault that occurred can then be deciphered from the other registers, if required.

After the fault condition has been cleared, click **Clear Faults & Warnings** to clear the registers (CLEAR_FAULTS PMBus command). To continuously clear faults, select **Continuously Clear Faults** before clicking **Clear Faults & Warnings**.

The user can set each warning level independently. By default, all warning levels are set to minimum levels (for UV/UC warnings) or to maximum levels (for OV/OC/OP warnings) to avoid nuisance warnings.

In the event of an SMBAlert signal, the host processor can issue an SMBus alert response address to determine which device has an active alert. In the case of the GUI shown in Figure 34, which uses the ADM1075 model as its example, clicking **Read SMBus Alert Response Address** shows that a device has responded and that the device is at Address 0x10 (that is, the ADM1075 device on the evaluation board).

NUMBER CONVERSIONS

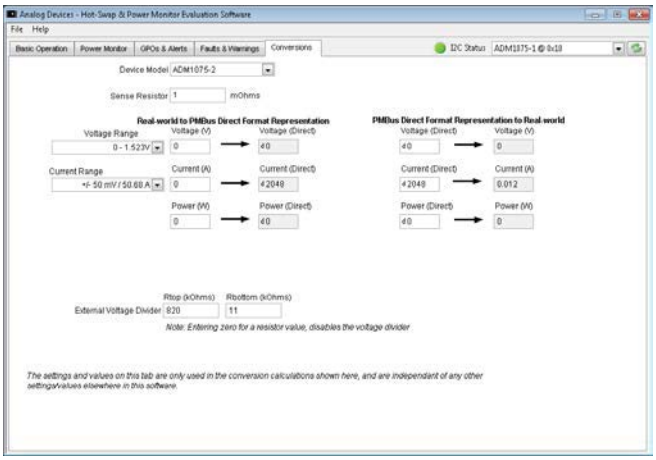

Figure 35. Number Conversions

The **Conversions** tab allows the user to enter real-world values to obtain corresponding PMBus direct format values or vice versa. Any of the hot swap devices can be selected for conversion. However, to initiate a conversion calculation, the user must enter the sense resistor value and the desired voltage, current, or temperature (real-world value or ADC code). The ADM1075 also requires the user to enter the external resistor divider values used on the ADC voltage input pin. This is not required on the ADM1275, ADM1276, or ADM1278 because voltage scaling is accomplished internally.

RELATED LINKS

Resource	Description
ADM1075	Product Page—ADM1075: −48 V Hot Swap Controller and Digital Power Monitor with PMBus Interface
ADM1275	Product Page—ADM1275: Hot Swap Controller and Digital Power Monitor with PMBus Interface
ADM1276	Product Page—ADM1276: Hot Swap Controller and Digital Power and Energy Monitoring with PMBus Interface
ADM1278	Product Page—ADM1278: Hot Swap Controller and Digital Power and Energy Monitoring with PMBus Interface
AN-1135	Application Note—ADC Sampling Information ADM1275/ADM1276/ADM1075
UG-304	User Guide—Evaluating the ADM1075 −48 V Hot-Swap Controller and Digital Power Monitor with PMBus Interface
UG-241	User Guide—Using Analog Devices Hot Swap Controller Simulation Models
UG-263	User Guide—Evaluating the ADM1275 and ADM1276
Video	Webcast—Hot Swap Design, How to Get it Right

NOTES

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

UG10377-0-5/14(A)

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