AN-780
APPLICATION NOTE

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Monitoring Negative Voltages with the ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 Super Sequencer Devices

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INTRODUCTION

The ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 Super Sequencer® devices accurately monitor a number of input rails. The ADM1062 to ADM1067, ADM1166, and ADM1260 have 10 input pins dedicated to monitoring (VH, VP1 to VP4, VX1 to VX5), and the ADM1068/ADM1069/ADM1168/ADM1169 have eight (VH, VP1 to VP3, VX1 to VX4). Each of these pins has two internal programmable comparator circuits. It is possible to set up trip points around each monitored supply by programming the comparator circuits as undervoltage only, overvoltage only, or undervoltage and overvoltage. These trip points are 1% accurate at all allowable voltages and across the entire operational temperature range of these devices.

The VH pin is a high voltage input, and it can detect voltages as high as 14.4 V and as low as 2.5 V. This range is broken down to two smaller selectable ranges for better resolution.

The VP1 to VP3 pins can monitor from 0.573 V to 6 V. This range is broken down to three smaller selectable ranges for better resolution, which is especially important for accuracy at low voltages.

The VX1 to VX4 pins are dual purpose pins. They can be configured as normal voltage monitors. In this instance, they have a single programmable range of 0.573 V to 1.375 V, which is identical to the lowest range on the VP1 to VP4 pins. The VP1 to VP4 pins can also be set up as digital input pins that monitor for logic signals to trigger a certain event.

If any of the VX1 to VX5 pins are set up as logic inputs, their undervoltage and overvoltage comparators are not being used. These unused circuits can then be mapped onto the corresponding VP1 to VP4 pins and used to set up a second undervoltage and overvoltage window around the supply on that pin. This configuration is useful for setting up a warning window around a supply and an outside fault window.

Each input pin on the ADM1062, ADM1063, ADM1064, ADM1066, ADM1069, ADM1166, ADM1169, and ADM1260 is multiplexed to an internal 12-bit analog-to-digital converter

(ADC) to add another degree of monitoring. The ADC can be programmed to detect another undervoltage or overvoltage threshold on each supply. The ADC can operate in a round robin fashion when enabled. Note that the ADM1066 and ADM1166 offer two auxiliary ADC inputs that allow 12 supplies to be connected to the ADC.

There are several ways for the user to obtain information based on the monitoring circuits. The simplest method to determine the status of the input is to look at the outputs of a programmed ADM1062 to ADM1069, ADM1166 to ADM1169, and ADM1260 device to see which inputs are faulting and which are not. Some of the outputs can be programmed as dedicated status signals, such as a power-good or an interrupt.

All devices have an on-board fault register that stores information on which inputs are reporting faults. For example, a user can poll the device over the SMBus to find out which faulting supply generated an interrupt or warning. The ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 Configuration Tool displays this information for the user. To download the ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 Configuration Tool visit http://www.analog.com/sequencers.

The devices with an on-board 12-bit ADC (ADM1062, ADM1063, ADM1064, ADM1066, ADM1069, ADM1166, ADM1169, and ADM1260) offer voltage readback over SMBus. An SMBus master can poll the device at any time to read back the current voltage level on any or all of the inputs (up to a total of 12 in the ADM1066 and ADM1166). These readings are accurate to 0.25% for all allowable voltages and across the entire operational temperature range of the devices. Note that the ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 Configuration Tool also displays this information.

This application note describes how the ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 can be configured to monitor negative supplies.

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REVISION HISTORY

MONITORING NEGATIVE VOLTAGES

In certain systems, it is necessary to monitor negative voltage rails. The ADM1062 to ADM1069, ADM1166, ADM1168, ADM1169, and ADM1260 devices can be configured to provide this function.

An external resistor divider between the negative rail and the 2.048 V (±0.05% accurate) reference can be used to bring the negative voltage into range for monitoring. Figure 1 shows a −12 V supply being level shifted for monitoring at the VX1 pin, which can detect voltages in the range of 0.573 V to 1.375 V. The programmed undervoltage and overvoltage thresholds correspond to a ±5% window around the scaled down −12 V supply. When programming undervoltage and overvoltage thresholds around negative supplies, this configuration dictates that these two parameters be reversed so that an overvoltage fault on the −12 V is detected with the undervoltage circuitry, and the undervoltage fault is detected with the overvoltage circuitry.

Only the VXx pin can be used with an external resistor divider. The maximum current sourced from REFOUT must not exceed 100 μA.

An error is introduced by the external resistors, which affects the accuracy of the desired thresholds and the accuracy of voltage readback if a 12-bit ADC is included. Accurate resistors minimize this error.
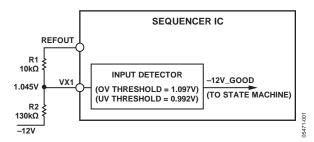

Figure 1. Monitoring a −12 V Supply on a VX1 Pin via a Resistor Divider

For more information on Analog Devices, Inc., Super Sequencer devices, visit http://www.analog.com/sequencers.

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