Kernel driver adm1026

Supported chips:

- Analog Devices ADM1026

  Prefix: 'adm1026'

  Addresses scanned: I2C 0x2c, 0x2d, 0x2e

  Datasheet: Publicly available at the Analog Devices website

  https://www.onsemi.com/PowerSolutions/product.do?id=ADM1026

Authors:

- Philip Pokorny <ppokorny@penguincomputing.com> for Penguin Computing
- Justin Thiessen <jthiessen@penguincomputing.com>

Module Parameters

- gpio_input: int array (min = 1, max = 17)
  List of GPIO pins (0-16) to program as inputs
- gpio_output: int array (min = 1, max = 17)
  List of GPIO pins (0-16) to program as outputs
- gpio_inverted: int array (min = 1, max = 17)
  List of GPIO pins (0-16) to program as inverted
- gpio_normal: int array (min = 1, max = 17)
  List of GPIO pins (0-16) to program as normal/non-inverted
- gpio_fan: int array (min = 1, max = 8)
  List of GPIO pins (0-7) to program as fan tachs

Description

This driver implements support for the Analog Devices ADM1026. Analog Devices calls it a "complete thermal system management controller."

The ADM1026 implements three (3) temperature sensors, 17 voltage sensors, 16 general purpose digital I/O lines, eight (8) fan speed sensors (8-bit), an analog output and a PWM output along with limit, alarm and mask bits for all of the above. There is even 8k bytes of EEPROM memory on chip.

Temperatures are measured in degrees Celsius. There are two external sensor inputs and one internal sensor. Each sensor has a high and low limit. If the limit is exceeded, an interrupt (#SMBALERT) can be generated. The interrupts can be masked. In addition, there are over-temp limits for each sensor. If this limit is exceeded, the #THERM output will be asserted. The current temperature and limits have a resolution of 1 degree.

Fan rotation speeds are reported in RPM (rotations per minute) but measured in counts of a 22.5kHz internal clock. Each fan has a high limit which corresponds to a minimum fan speed. If the limit is exceeded, an interrupt can be generated. Each fan can be programmed to divide the reference clock by 1, 2, 4 or 8. Not all RPM values can accurately be represented, so some rounding is done. With a divider of 8, the slowest measurable speed of a two pulse per revolution fan is 661 RPM.

There are 17 voltage sensors. An alarm is triggered if the voltage has crossed a programmable minimum or maximum limit. Note that minimum in this case always means 'closest to zero'; this is important for negative voltage measurements. Several inputs have integrated attenuators so they can measure higher voltages directly. 3.3V, 5V, 12V, -12V and battery voltage all have dedicated inputs. There are several inputs scaled to 0-3V full-scale range for SCSI terminator power. The remaining inputs are not scaled and have a 0-2.5V full-scale range. A 2.5V or 1.82V reference voltage is provided for negative voltage measurements.

If an alarm triggers, it will remain triggered until the hardware register is read at least once. This means that the cause for the alarm may already have disappeared! Note that in the current implementation, all hardware registers are read whenever any data is read (unless it is less than 2.0 seconds since the last update). This means that you can easily miss once-only alarms.

The ADM1026 measures continuously. Analog inputs are measured about 4 times a second. Fan speed measurement time depends on fan speed and divisor. It can take as long as 1.5 seconds to measure all fan speeds.

The ADM1026 has the ability to automatically control fan speed based on the temperature sensor inputs. Both the PWM output and the DAC output can be used to control fan speed. Usually only one of these two outputs will be used. Write the minimum PWM or DAC value to the appropriate control register. Then set the low temperature limit in the tmin values for each temperature sensor. The range of control is fixed at 20 Â°C, and the largest difference between current and tmin of the temperature sensors sets the control output. See the datasheet for several example circuits for controlling fan speed with the PWM and DAC outputs. The fan speed sensors do not have PWM compensation, so it is probably best to control the fan voltage from the power lead rather than on the ground lead.

The datasheet shows an example application with VID signals attached to GPIO lines. Unfortunately, the chip may not be connected to the VID lines in this way. The driver assumes that the chips *is* connected this way to get a VID voltage.