Kernel driver lm63

Supported chips:

- National Semiconductor LM63

  Prefix: 'lm63'

  Addresses scanned: I2C 0x4c

  Datasheet: Publicly available at the National Semiconductor website

    http://www.national.com/pf/LM/LM63.html

- National Semiconductor LM64

  Prefix: 'lm64'

  Addresses scanned: I2C 0x18 and 0x4e

  Datasheet: Publicly available at the National Semiconductor website

    http://www.national.com/pf/LM/LM64.html

- National Semiconductor LM96163

  Prefix: 'lm96163'

  Addresses scanned: I2C 0x4c

  Datasheet: Publicly available at the National Semiconductor website

    http://www.national.com/pf/LM/LM96163.html

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Thanks go to Tyan and especially Alex Buckingham for setting up a remote access to their S4882 test platform for this driver.

  https://www.tyan.com/

Description

The LM63 is a digital temperature sensor with integrated fan monitoring and control.

The LM63 is basically an LM86 with fan speed monitoring and control capabilities added. It misses some of the LM86 features though:

- No low limit for local temperature.
- No critical limit for local temperature.
- Critical limit for remote temperature can be changed only once. We will consider that the critical limit is read-only.

The datasheet isn't very clear about what the tachometer reading is.

An explanation from National Semiconductor: The two lower bits of the read value have to be masked out. The value is still 16 bit in width.

All temperature values are given in degrees Celsius. Resolution is 1.0 degree for the local temperature, 0.125 degree for the remote temperature.

The fan speed is measured using a tachometer. Contrary to most chips which store the value in an 8-bit register and have a selectable clock divider to make sure that the result will fit in the register, the LM63 uses 16-bit value for measuring the speed of the fan. It can measure fan speeds down to 83 RPM, at least in theory.

Note that the pin used for fan monitoring is shared with an alert out function. Depending on how the board designer wanted to use the chip, fan speed monitoring will or will not be possible. The proper chip configuration is left to the BIOS, and the driver will blindly trust it. Only the original LM63 suffers from this limitation, the LM64 and LM96163 have separate pins for fan monitoring and alert out. On the LM64, monitoring is always enabled; on the LM96163 it can be disabled.

A PWM output can be used to control the speed of the fan. The LM63 has two PWM modes: manual and automatic. Automatic mode is not fully implemented yet (you cannot define your custom PWM/temperature curve), and mode change isn't supported either.

The lm63 driver will not update its values more frequently than configured with the update_interval sysfs attribute; reading them more often will do no harm, but will return 'old' values. Values in the automatic fan control lookup table (attributes pwm1_auto_*) have their own independent lifetime of 5 seconds.

The LM64 is effectively an LM63 with GPIO lines. The driver does not support these GPIO lines at present.

The LM96163 is an enhanced version of LM63 with improved temperature accuracy and better PWM resolution. For LM96163, the external temperature sensor type is configurable as CPU embedded diode(1) or 3904 transistor(2).