

Kernel driver asc7621

Supported chips:

Andigilog aSC7621 and aSC7621a

Prefix: 'asc7621'

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

Datasheet: <http://www.fairview5.com/linux/asc7621/asc7621.pdf>

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Description provided by Dave Pivin @ Andigilog:

Andigilog has both the PECI and pre-PECI versions of the Heceta-6, as Intel calls them. Heceta-6e has high frequency PWM and Heceta-6p has added PECI and a 4th thermal zone. The Andigilog aSC7611 is the Heceta-6e part and aSC7621 is the Heceta-6p part. They are both in volume production, shipping to Intel and their subs.

We have enhanced both parts relative to the governing Intel specification. First enhancement is temperature reading resolution. We have used registers below 20h for vendor-specific functions in addition to those in the Intel-specified vendor range.

Our conversion process produces a result that is reported as two bytes. The fan speed control uses this finer value to produce a "step-less" fan PWM output. These two bytes are "read-locked" to guarantee that once a high or low byte is read, the other byte is locked-in until after the next read of any register. So to get an atomic reading, read high or low byte, then the very next read should be the opposite byte. Our data sheet says 10-bits of resolution, although you may find the lower bits are active, they are not necessarily reliable or useful externally. We chose not to mask them.

We employ significant filtering that is user tunable as described in the data sheet. Our temperature reports and fan PWM outputs are very smooth when compared to the competition, in addition to the higher resolution temperature reports. The smoother PWM output does not require user intervention.

We offer GPIO features on the former VID pins. These are open-drain outputs or inputs and may be used as general purpose I/O or as alarm outputs that are based on temperature limits. These are in 19h and 1Ah.

We offer flexible mapping of temperature readings to thermal zones. Any temperature may be mapped to any zone, which has a default assignment that follows Intel's specs.

Since there is a fan to zone assignment that allows for the "hotter" of a set of zones to control the PWM of an individual fan, but there is no indication to the user, we have added an indicator that shows which zone is currently controlling the PWM for a given fan. This is in register 00h.

Both remote diode temperature readings may be given an offset value such that the reported reading as well as the temperature used to determine PWM may be offset for system calibration purposes.

PECI Extended configuration allows for having more than two domains per PECI address and also provides an enabling function for each PECI address. One could use our flexible zone assignment to have a zone assigned to up to 4 PECI addresses. This is not possible in the default Intel configuration. This would be useful in multi-CPU systems with individual fans on each that would benefit from individual fan control. This is in register 0Eh.

The tachometer measurement system is flexible and able to adapt to many fan types. We can also support pulse-stretched PWM so that 3-wire fans may be used. These characteristics are in registers 04h to 07h.

Finally, we have added a tach disable function that turns off the tach measurement system for individual tachs in order to save power. That is in register 75h.

aSC7621 Product Description

The aSC7621 has a two wire digital interface compatible with SMBus 2.0. Using a 10-bit ADC, the aSC7621 measures the temperature of two remote diode connected transistors as well as its own die. Support for Platform Environmental Control Interface (PECI) is included.

Using temperature information from these four zones, an automatic fan speed control algorithm is employed to minimize acoustic impact while achieving recommended CPU temperature under varying operational loads.

To set fan speed, the aSC7621 has three independent pulse width modulation (PWM) outputs that are controlled by one, or a combination of three, temperature zones. Both high- and low-frequency PWM ranges are supported.

The aSC7621 also includes a digital filter that can be invoked to smooth temperature readings for better control of fan speed and minimum acoustic impact.

The aSC7621 has tachometer inputs to measure fan speed on up to four fans. Limit and status registers for all measured values are

included to alert the system host that any measurements are outside of programmed limits via status registers.

System voltages of VCCP, 2.5V, 3.3V, 5.0V, and 12V motherboard power are monitored efficiently with internal scaling resistors.

Features

- Supports PECI interface and monitors internal and remote thermal diodes
- 2-wire, SMBus 2.0 compliant, serial interface
- 10-bit ADC
- Monitors VCCP, 2.5V, 3.3V, 5.0V, and 12V motherboard/processor supplies
- Programmable autonomous fan control based on temperature readings
- Noise filtering of temperature reading for fan speed control
- 0.25C digital temperature sensor resolution
- 3 PWM fan speed control outputs for 2-, 3- or 4-wire fans and up to 4 fan tachometer inputs
- Enhanced measured temperature to Temperature Zone assignment.
- Provides high and low PWM frequency ranges
- 3 GPIO pins for custom use
- 24-Lead QSOP package

Configuration Notes

Except where noted below, the sysfs entries created by this driver follow the standards defined in "sysfs-interface".

temp1_source

0	(default) peci_legacy = 0, Remote 1 Temperature peci_legacy = 1, PECI Processor Temperature 0
1	Remote 1 Temperature
2	Remote 2 Temperature
3	Internal Temperature
4	PECI Processor Temperature 0
5	PECI Processor Temperature 1
6	PECI Processor Temperature 2
7	PECI Processor Temperature 3

temp2_source

0	(default) Internal Temperature
1	Remote 1 Temperature
2	Remote 2 Temperature
3	Internal Temperature
4	PECI Processor Temperature 0
5	PECI Processor Temperature 1
6	PECI Processor Temperature 2
7	PECI Processor Temperature 3

temp3_source

0	(default) Remote 2 Temperature
1	Remote 1 Temperature
2	Remote 2 Temperature
3	Internal Temperature
4	PECI Processor Temperature 0
5	PECI Processor Temperature 1
6	PECI Processor Temperature 2
7	PECI Processor Temperature 3

temp4_source

0	(default) peci_legacy = 0, PECI Processor Temperature 0 peci_legacy = 1, Remote 1 Temperature
1	Remote 1 Temperature
2	Remote 2 Temperature
3	Internal Temperature
4	PECI Processor Temperature 0
5	PECI Processor Temperature 1
6	PECI Processor Temperature 2
7	PECI Processor Temperature 3

temp[1-4]_smoothing_enable / temp[1-4]_smoothing_time

Smooths spikes in temp readings caused by noise. Valid values in milliseconds are:

- 35000
- 17600
- 11800
- 7000
- 4400
- 3000
- 1600
- 800

temp[1-4]_crit

When the corresponding zone temperature reaches this value, ALL pwm outputs will got to 100%.

temp[5-8]_input / temp[5-8]_enable

The aSC7621 can also read temperatures provided by the processor via the PECI bus. Usually these are "core" temps and are relative to the point where the automatic thermal control circuit starts throttling. This means that these are usually negative numbers.

pwm[1-3]_enable

0	Fan off.
1	Fan on manual control.
2	Fan on automatic control and will run at the minimum pwm if the temperature for the zone is below the minimum.
3	Fan on automatic control but will be off if the temperature for the zone is below the minimum.
4-254	Ignored.
255	Fan on full.

pwm[1-3]_auto_channels

Bitmap as described in sysctl-interface with the following exceptions...

Only the following combination of zones (and their corresponding masks) are valid:

- 1
- 2
- 3
- 2,3
- 1,2,3
- 4
- 1,2,3,4
- Special values:

0	Disabled.
16	Fan on manual control.
31	Fan on full.

pwm[1-3]_invert

When set, inverts the meaning of pwm[1-3]. i.e. when pwm = 0, the fan will be on full and when pwm = 255 the fan will be off.

pwm[1-3]_freq

PWM frequency in Hz Valid values in Hz are:

- 10
- 15
- 23
- 30 (default)
- 38
- 47
- 62
- 94
- 23000
- 24000
- 25000
- 26000
- 27000
- 28000

- 29000
- 30000

Setting any other value will be ignored.

peci_enable

Enables or disables PECI

peci_avg

Input filter average time.

- 0 0 Sec. (no Smoothing) (default)
- 1 0.25 Sec.
- 2 0.5 Sec.
- 3 1.0 Sec.
- 4 2.0 Sec.
- 5 4.0 Sec.
- 6 8.0 Sec.
- 7 0.0 Sec.

peci_legacy

0	Standard Mode (default) Remote Diode 1 reading is associated with Temperature Zone 1, PECI is associated with Zone 4
1	Legacy Mode PECI is associated with Temperature Zone 1, Remote Diode 1 is associated with Zone 4

peci_diode

Diode filter

0	0.25 Sec.
1	1.1 Sec.
2	2.4 Sec. (default)
3	3.4 Sec.
4	5.0 Sec.
5	6.8 Sec.
6	10.2 Sec.
7	16.4 Sec.

peci_4domain

Four domain enable

0	1 or 2 Domains for enabled processors (default)
1	3 or 4 Domains for enabled processors

peci_domain

Domain

0	Processor contains a single domain (0) (default)
1	Processor contains two domains (0,1)