Kernel driver f71805f

Supported chips:
- Fintek F71805F/FG
  Prefix: 'f71805f'
  Addresses scanned: none, address read from Super I/O config space
  Datasheet: Available from the Fintek website
- Fintek F71806F/FG
  Prefix: 'f71872f'
  Addresses scanned: none, address read from Super I/O config space
  Datasheet: Available from the Fintek website
- Fintek F71872F/FG
  Prefix: 'f71872f'
  Addresses scanned: none, address read from Super I/O config space
  Datasheet: Available from the Fintek website

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Thanks to Chris Lin from Jetway for providing wiring schematics and answering technical questions.

Description

The Fintek F71805F/FG Super I/O chip includes complete hardware monitoring capabilities. It can monitor up to 9 voltages (counting its own power source), 3 fans and 3 temperature sensors.

This chip also has fan controlling features, using either DC or PWM, in three different modes (one manual, two automatic).

The Fintek F71872F/FG Super I/O chip is almost the same, with two additional internal voltages monitored (VSB and battery). It also features 6 VID inputs. The VID inputs are not yet supported by this driver.

The Fintek F71806F/FG Super-I/O chip is essentially the same as the F71872F/FG, and is undistinguishable therefrom.

The driver assumes that no more than one chip is present, which seems reasonable.

Voltage Monitoring

Voltages are sampled by an 8-bit ADC with a LSB of 8 mV. The supported range is thus from 0 to 2.040 V. Voltage values outside of this range need external resistors. An exception is in0, which is used to monitor the chip's own power source (+3.3V), and is divided internally by a factor 2. For the F71872F/FG, in9 (VSB) and in10 (battery) are also divided internally by a factor 2.

The two LSB of the voltage limit registers are not used (always 0), so you can only set the limits in steps of 32 mV (before scaling).

The wirings and resistor values suggested by Fintek are as follow:

	pin name	use	R1	R2	divider	expected raw val.	
in0	VCC	VCC3.3V	int.	int.	2.00	1.65 V	
in1	VIN1	VTT1.2V	10K	-	1.00	1.20 V	
in2	VIN2	VRAM	100K	100K	2.00	~1.25 V	(1)
in3	VIN3	VCHIPSET	47K	100K	1.47	2.24 V	(2)
in4	VIN4	VCC5V	200K	47K	5.25	0.95 V	
in5	VIN5	+12V	200K	20K	11.00	1.05 V	
in6	VIN6	VCC1.5V	10K	-	1.00	1.50 V	
in7	VIN7	VCORE	10K	-	1.00	~1.40 V	(1)
in8	VIN8	VSB5V	200K	47K	1.00	0.95 V	
in10	VSB	VSB3.3V	int.	int.	2.00	1.65 V	(3)
in9	VBAT	VBATTERY	int.	int.	2.00	1.50 V	(3)

(1) Depends on your hardware setup.
(2) Obviously not correct, swapping R1 and R2 would make more sense.
(3) F71872F/FG only.

These values can be used as hints at best, as motherboard manufacturers are free to use a completely different setup. As a matter of fact, the Jetway K8M8MS uses a significantly different setup. You will have to find out documentation about your own motherboard, and edit sensors.conf accordingly.

Each voltage measured has associated low and high limits, each of which triggers an alarm when crossed.

Fan Monitoring

Fan rotation speeds are reported as 12-bit values from a gated clock signal. Speeds down to 366 RPM can be measured. There is no theoretical high limit, but values over 6000 RPM seem to cause problem. The effective resolution is much lower than you would expect, the step between different register values being 10 rather than 1.

The chip assumes 2 pulse-per-revolution fans.

An alarm is triggered if the rotation speed drops below a programmable limit or is too low to be measured.

Temperature Monitoring

Temperatures are reported in degrees Celsius. Each temperature measured has a high limit, those crossing triggers an alarm. There is an associated hysteresis value, below which the temperature has to drop before the alarm is cleared.

All temperature channels are external, there is no embedded temperature sensor. Each channel can be used for connecting either a thermal diode or a thermistor. The driver reports the currently selected mode, but doesn't allow changing it. In theory, the BIOS should have configured everything properly.

Fan Control

Both PWM (pulse-width modulation) and DC fan speed control methods are supported. The right one to use depends on external circuitry on the motherboard, so the driver assumes that the BIOS set the method properly. The driver will report the method, but won't let you change it.

When the PWM method is used, you can select the operating frequency, from 187.5 kHz (default) to 31 Hz. The best frequency depends on the fan model. As a rule of thumb, lower frequencies seem to give better control, but may generate annoying high-pitch noise. So a frequency just above the audible range, such as 25 kHz, may be a good choice; if this doesn't give you good linear control, try reducing it. Fintek recommends not going below 1 kHz, as the fan tachometers get confused by lower frequencies as well.

When the DC method is used, Fintek recommends not going below 5 V, which corresponds to a pwm value of 106 for the driver. The driver doesn't enforce this limit though.

Three different fan control modes are supported; the mode number is written to the pwm<n>_enable file.

* 1: Manual mode
  You ask for a specific PWM duty cycle or DC voltage by writing to the pwm<n> file.

* 2: Temperature mode
  You define 3 temperature/fan speed trip points using the pwm<n>_auto_point<m>_temp and _fan files. These define a staircase relationship between temperature and fan speed with two additional points interpolated between the values that you define. When the temperature is below auto_point1_temp the fan is switched off.

* 3: Fan speed mode
  You ask for a specific fan speed by writing to the fan<n>_target file.

Both of the automatic modes require that pwm1 corresponds to fan1, pwm2 to fan2 and pwm3 to fan3. Temperature mode also requires that temp1 corresponds to pwm1 and fan1, etc.