

Kernel driver w83627ehf

Supported chips:

- Winbond W83627EHF/EHG (ISA access ONLY)
Prefix: 'w83627ehf'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: not available
- Winbond W83627DHG
Prefix: 'w83627dhg'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: not available
- Winbond W83627DHG-P
Prefix: 'w83627dhg'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: not available
- Winbond W83627UHG
Prefix: 'w83627uhg'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: available from www.nuvoton.com
- Winbond W83667HG
Prefix: 'w83667hg'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: not available
- Winbond W83667HG-B
Prefix: 'w83667hg'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: Available from Nuvoton upon request
- Nuvoton NCT6775F/W83667HG-I
Prefix: 'nct6775'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: Available from Nuvoton upon request
- Nuvoton NCT6776F
Prefix: 'nct6776'
Addresses scanned: ISA address retrieved from Super I/O registers
Datasheet: Available from Nuvoton upon request

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Description

This driver implements support for the Winbond W83627EHF, W83627EHG, W83627DHG, W83627DHG-P, W83627UHG, W83667HG, W83667HG-B, W83667HG-I (NCT6775F), and NCT6776F super I/O chips. We will refer to them collectively as Winbond chips.

The chips implement 3 to 4 temperature sensors (9 for NCT6775F and NCT6776F), 2 to 5 fan rotation speed sensors, 8 to 10

analog voltage sensors, one VID (except for 627UHG), alarms with beep warnings (control unimplemented), and some automatic fan regulation strategies (plus manual fan control mode).

The temperature sensor sources on W82677HG-B, NCT6775F, and NCT6776F are configurable. temp4 and higher attributes are only reported if its temperature source differs from the temperature sources of the already reported temperature sensors. The configured source for each of the temperature sensors is provided in tempX_label.

Temperatures are measured in degrees Celsius and measurement resolution is 1 degC for temp1 and 0.5 degC for temp2 and temp3. For temp4 and higher, resolution is 1 degC for W83667HG-B and 0.0 degC for NCT6775F and NCT6776F. An alarm is triggered when the temperature gets higher than high limit; it stays on until the temperature falls below the hysteresis value. Alarms are only supported for temp1, temp2, and temp3.

Fan rotation speeds are reported in RPM (rotations per minute). An alarm is triggered if the rotation speed has dropped below a programmable limit. Fan readings can be divided by a programmable divider (1, 2, 4, 8, 16, 32, 64 or 128) to give the readings more range or accuracy. The driver sets the most suitable fan divisor itself. Some fans might not be present because they share pins with other functions.

Voltage sensors (also known as IN sensors) report their values in millivolts. An alarm is triggered if the voltage has crossed a programmable minimum or maximum limit.

The driver supports automatic fan control mode known as Thermal Cruise. In this mode, the chip attempts to keep the measured temperature in a predefined temperature range. If the temperature goes out of range, fan is driven slower/faster to reach the predefined range again.

The mode works for fan1-fan4. Mapping of temperatures to pwm outputs is as follows:

```
temp1 -> pwm1
temp2 -> pwm2
temp3 -> pwm3 (not on 627UHG)
prog  -> pwm4 (not on 667HG and 667HG-B; the programmable setting is not
               supported by the driver)
```

/sys files

name

this is a standard hwmon device entry, it contains the name of the device (see the prefix in the list of supported devices at the top of this file)

pwm[1-4]

this file stores PWM duty cycle or DC value (fan speed) in range:

0 (stop) to 255 (full)

pwm[1-4]_enable

this file controls mode of fan/temperature control:

- 1 Manual mode, write to pwm file any value 0-255 (full speed)
- 2 "Thermal Cruise" mode
- 3 "Fan Speed Cruise" mode
- 4 "Smart Fan III" mode
- 5 "Smart Fan IV" mode

SmartFan III mode is not supported on NCT6776F.

SmartFan IV mode is configurable only if it was configured at system startup, and is only supported for W83677HG-B, NCT6775F, and NCT6776F. SmartFan IV operational parameters can not be configured at this time, and the various pwm attributes are not used in SmartFan IV mode. The attributes can be written to, which is useful if you plan to configure the system for a different pwm mode. However, the information returned when reading pwm attributes is unrelated to SmartFan IV operation.

pwm[1-4]_mode

controls if output is PWM or DC level

- 0 DC output (0 - 12v)
- 1 PWM output

Thermal Cruise mode

If the temperature is in the range defined by:

pwm[1-4]_target

set target temperature, unit millidegree Celsius (range 0 - 127000)

pwm[1-4]_tolerance

tolerance, unit millidegree Celsius (range 0 - 15000)

there are no changes to fan speed. Once the temperature leaves the interval, fan speed increases (temp is higher) or decreases if lower than desired. There are defined steps and times, but not exported by the driver yet.

pwm[1-4]_min_output

minimum fan speed (range 1 - 255), when the temperature is below defined range.

pwm[1-4]_stop_time

how many milliseconds [ms] must elapse to switch corresponding fan off. (when the temperature was below defined range).

pwm[1-4]_start_output

minimum fan speed (range 1 - 255) when spinning up

pwm[1-4]_step_output

rate of fan speed change (1 - 255)

pwm[1-4]_stop_output

minimum fan speed (range 1 - 255) when spinning down

pwm[1-4]_max_output

maximum fan speed (range 1 - 255), when the temperature is above defined range.

Note: last six functions are influenced by other control bits, not yet exported

by the driver, so a change might not have any effect.

Implementation Details

Future driver development should bear in mind that the following registers have different functions on the 627EHF and the 627DHG. Some registers also have different power-on default values, but BIOS should already be loading appropriate defaults. Note that bank selection must be performed as is currently done in the driver for all register addresses.

Register(s)	Meaning
0x49	only on DHG, selects temperature source for AUX fan, CPU fan0
0x4a	not completely documented for the EHF and the DHG documentation assigns different behavior to bits 7 and 6, including extending the temperature input selection to SmartFan I, not just SmartFan III. Testing on the EHF will reveal whether they are compatible or not.
0x58	Chip ID: 0xa1=EHF 0xc1=DHG
0x5e	only on DHG, has bits to enable "current mode" temperature detection and critical temperature protection
0x45b	only on EHF, bit 3, vin4 alarm (EHF supports 10 inputs, only 9 on DHG)
0x552	only on EHF, vin4
0x558	only on EHF, vin4 high limit
0x559	only on EHF, vin4 low limit
0x6b	only on DHG, SYS fan critical temperature
0x6c	only on DHG, CPU fan0 critical temperature
0x6d	only on DHG, AUX fan critical temperature
0x6e	only on DHG, CPU fan1 critical temperature
0x50-0x55 and 0x650-0x657	marked as: <ul style="list-style-type: none">• "Test Register" for the EHF• "Reserved Register" for the DHG

The DHG also supports PECI, where the DHG queries Intel CPU temperatures, and the ICH8 southbridge gets that data via PECI from the DHG, so that the southbridge drives the fans. And the DHG supports SST, a one-wire serial bus.

The DHG-P has an additional automatic fan speed control mode named Smart Fan (TM) III+. This mode is not yet supported by the driver.