

# Kernel driver adt7475

Supported chips:

- Analog Devices ADT7473  
Prefix: 'adt7473'  
Addresses scanned: I2C 0x2C, 0x2D, 0x2E  
Datasheet: Publicly available at the On Semiconductors website
- Analog Devices ADT7475  
Prefix: 'adt7475'  
Addresses scanned: I2C 0x2E  
Datasheet: Publicly available at the On Semiconductors website
- Analog Devices ADT7476  
Prefix: 'adt7476'  
Addresses scanned: I2C 0x2C, 0x2D, 0x2E  
Datasheet: Publicly available at the On Semiconductors website
- Analog Devices ADT7490  
Prefix: 'adt7490'  
Addresses scanned: I2C 0x2C, 0x2D, 0x2E  
Datasheet: Publicly available at the On Semiconductors website

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## Description

This driver implements support for the Analog Devices ADT7473, ADT7475, ADT7476 and ADT7490 chip family. The ADT7473 and ADT7475 differ only in minor details. The ADT7476 has additional features, including extra voltage measurement inputs and VID support. The ADT7490 also has additional features, including extra voltage measurement inputs and PECI support. All the supported chips will be collectively designed by the name "ADT747x" in the rest of this document.

The ADT747x uses the 2-wire interface compatible with the SMBus 2.0 specification. Using an analog to digital converter it measures three (3) temperatures and two (2) or more voltages. It has four (4) 16-bit counters for measuring fan speed. There are three (3) PWM outputs that can be used to control fan speed.

A sophisticated control system for the PWM outputs is designed into the ADT747x that allows fan speed to be adjusted automatically based on any of the three temperature sensors. Each PWM output is individually adjustable and programmable. Once configured, the ADT747x will adjust the PWM outputs in response to the measured temperatures without further host intervention. This feature can also be disabled for manual control of the PWM's.

Each of the measured inputs (voltage, temperature, fan speed) has corresponding high/low limit values. The ADT747x will signal an ALARM if any measured value exceeds either limit.

The ADT747x samples all inputs continuously. The driver will not read the registers more often than once every other second. Further, configuration data is only read once per minute.

## Chip Differences Summary

ADT7473:

- 2 voltage inputs
- system acoustics optimizations (not implemented)

ADT7475:

- 2 voltage inputs

ADT7476:

- 5 voltage inputs
- VID support

ADT7490:

- 6 voltage inputs
- 1 Imon input (not implemented)
- PECI support (not implemented)
- 2 GPIO pins (not implemented)
- system acoustics optimizations (not implemented)

## Sysfs Mapping

in	ADT7490	ADT7476	ADT7475	ADT7473
in0	2.5VIN (22)	2.5VIN (22)	•	•
in1	VCCP (23)	VCCP (23)	VCCP (14)	VCCP (14)
in2	VCC (4)	VCC (4)	VCC (4)	VCC (3)
in3	5VIN (20)	5VIN (20)		
in4	12VIN (21)	12VIN (21)		
in5	VTT (8)			

## Special Features

The ADT747x has a 10-bit ADC and can therefore measure temperatures with a resolution of 0.25 degree Celsius. Temperature readings can be configured either for two's complement format or "Offset 64" format, wherein 64 is subtracted from the raw value to get the temperature value.

The datasheet is very detailed and describes a procedure for determining an optimal configuration for the automatic PWM control.

## Fan Speed Control

The driver exposes two trip points per PWM channel.

- point1: Set the PWM speed at the lower temperature bound
- point2: Set the PWM speed at the higher temperature bound

The ADT747x will scale the PWM linearly between the lower and higher PWM speed when the temperature is between the two temperature boundaries. Temperature boundaries are associated to temperature channels rather than PWM outputs, and a given PWM output can be controlled by several temperature channels. As a result, the ADT747x may compute more than one PWM value for a channel at a given time, in which case the maximum value (fastest fan speed) is applied. PWM values range from 0 (off) to 255 (full speed).

Fan speed may be set to maximum when the temperature sensor associated with the PWM control exceeds `temp#_max`.

At `Tmin - hysteresis` the PWM output can either be off (0% duty cycle) or at the minimum (i.e. `auto_point1_pwm`). This behaviour can be configured using the `pwm[1-*_]_stall_disable sysfs attribute`. A value of 0 means the fans will shut off. A value of 1 means the fans will run at `auto_point1_pwm`.

The responsiveness of the ADT747x to temperature changes can be configured. This allows smoothing of the fan speed transition. To set the transition time set the value in ms in the `temp[1-*_]_smoothing sysfs attribute`.

## Notes

The nVidia binary driver presents an ADT7473 chip via an on-card i2c bus. Unfortunately, they fail to set the i2c adapter class, so this driver may fail to find the chip until the nvidia driver is patched.