

W83782D / 783S

Application Notice 1

Feature Brief

W83782D / 783S : Hardware Monitor

1. PIN differences between W83781D and W83782D

Product Difference	W83781D	W83782D	New Function Description
PIN 26	BEEP/GPO#	BEEP/GPO#	W83781D BEEP: Disable; Enable & Normal: High-Z Enable & Abnormal: Low <-> High-Z W83782D BEEP: Disable; Enable & Normal: Low Enable & Abnormal:High-Z <-> Low
PIN18	FAN3IO	FAN3IO/PWMOUT2	PWMOUT can control the speed of fan through some external circuit. This is a multi-function pin controlled by register.
PIN 23	RSTOUT#	PWMOUT1	PWMOUT can control the speed of fan through some external circuit.
PIN 29	-5VOUT	VSB3	Able to monitor 3VSB voltage; and still able to monitor -5V voltage by ONLY PIN 28.
PIN 30	-12VOUT	VBAT	Able to monitor BATTERY voltage; and still able to monitor -12V voltage by ONLY PIN 31.
PIN 38 PIN 39 PIN 40	VTIN3 VTIN2 VTIN1	VTIN3/PIITD3 VTIN2/PIITD2 VTIN1/PIITD1	Able to monitor temperature by thermistor or PII(D+,D-). These are multi-function pins controlled by register.
PIN 43	IRQ	ARDMSEL	To select PIN 45-47 's function
PIN 45 PIN 46 PIN 47	SA2 SA1 SA0	IA2/SA2 IA1/SA1 IA0/SA0	These are multi-function pins. PIN43(ARDMSEL)=0: The 3 lowest order bits of ISA address bus. PIN43(ARDMSEL)=1: The 3 least significant bits of 7 bits I ² C serial address.

NOTE:

1. PIN26:

Whenever BEEP function is disabled or enabled, if there is no abnormal event, the output is **high-impedance** at **W83781D** but it is **low** at **W83782D**. When BEEP is enabled and abnormal event happens, the output of **W83781D** is **LOW --> HIGH-Z --> LOW --> HIGH-Z** . But the output of **W83782D** is **HIGH-Z --> LOW --> HIGH-Z --> LOW** . At **W83781D**, the BEEP output pin directly connects the speaker, but at **W83782D**, it connects a transistor and serves as a switch of the speaker. Please refer the different application circuit about this pin of **W83781D** and **W83782D**.

2. PIN18:

The function FANIN / FANOUT of **W83781D** still exists in **W83782D**. And there adds a new function -- **PWMOUT** to **W83782D**. This can control the fan in various speed, from 0 RPM to full speed.

3. PIN43, PIN45-47:

If **PIN43** is connected to **GND**, **PIN45-47** are the 3 lowest order bits of **ISA** address bus and **SMBus** interface still works with the default address **0x5a**, **0x92** (temperature 2) and **0x90**(temperature 3). In addition, these serial address are programmable by programming their Serial Bus Address Register.

If **PIN43** is connected to **VCC**, **PIN45-47** are the 3 least significant bits of 7 bits **I²C** serial address and **ISA** bus doesn't work at this time.

2. Function difference between W83781D and W83782D/783S

Product / Function	W83781D	W83782D	W83783S	New Function Description
Fan speed control	ON/OFF	PWM control	PWM control	W83781D only can turn of/off fans; W83782D/783S can control the speed of fans.
Fan speed monitor	at least 661 RPM	at least 41 RPM	at least 41 RPM	W83782D/783S can monitor much slower fan because fan divisor is up to 128.
Case Open Latch Circuit	External	Internal	None	W83782D build case-open latch circuit in it. This can reduce cost for customers.
Positive Voltage Sensor	Without Battery and VSB voltage	Include Battery and VSB voltage	Without Battery and VSB voltage	
Negative Voltage Sensor Method	Translated by OP AMP	Translated by Resistors	Translated by Resistors	Please see the application circuit schematic diagram.
Hardware setting of I²C 7 bits serial address	NO	YES	NO	W83782D I ² C 7 bits serial address can be set by hardware or software.

NOTE:

1. Fan Speed Monitor:

Fan divisor is 1,2,4,8 in W83781D and is 1,2,4,8,16,32,64,128 in W83782D & W83783S. Thus the minimum speed W83781D can detect is 661 RPM and W83782D is 41RPM.

2. Negative Voltage Sensor Method :

W83781D detect negative voltage -12V and -5V by two OP AMP(this needs 4 pins). W83782D & W83783S detect negative voltage -12V and -5V by resistors (this only needs two pins). Thus W83782D & W83783S have two extra pins than W83781D to detect 5VSB voltage and battery voltage.

3.Pins PIITDx for Thermal Diode Input

3-1. Description

Winbond's H/W Monitoring IC W83782D & W83783S equip the functions for detecting the temperature by thermistor, or 2N3904 NPN-type transistors, or Pentium™ II Deschutes thermal diode output. The temperature accuracy of each method can be analyzed as:

a) Thermistor: Depending on the accuracy of the thermistor. Also if measuring the temperature of CPU (or specific devices), the contacting of thermistors to CPU is very important. Usually when applying the thermistor with +/- 1% or +/- 3% inaccuracy and a good contacting, the temperature measured will be very precise. Also this method has been proven very accurate and reliable with W83781D's mass delivery.

b) 2N3904 NPN-type transistors: It will very much depend on the transistor characteristics and PCB layout. The characteristics of transistors varies a lot with different circuit design and processing parameters. It might differ from different brand-name transistors; or even differs from lot to lot of the same brand-name transistors.

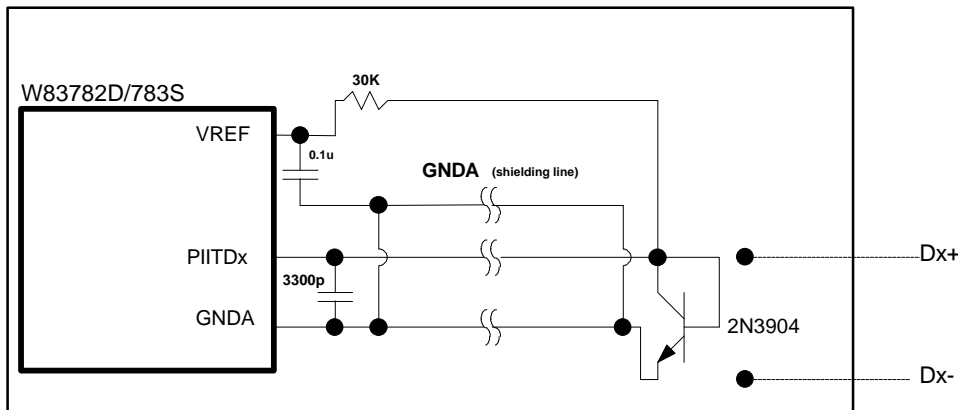
c) Direct output from Deschutes CPU: This will depending on the thermal diode characteristics that is built inside Pentium™ II Deschutes CPU. The is the same situation as the item 2) above.

Below is the method of measuring the temperature with transistor:

3-2. Measuring Temperature by Transistor (Thermal Diode)

By measuring the voltage across the base and emitter (as the figure herewith), we can have a formula as

$$dV/dT = -2.2mV / ^\circ C$$



3-3. How to Measure Temperature More Accurately ?

When applying 2N3904 as the temperature sensor or directly adopting the thermal diode output from Deschutes CPU, there are several reminding to follow:

- a) Place remote diode as close as possible to W83782D or W83783S.
- b) Route PIITDx and GNDA lines away from high voltages, clock generators, memory buses, and ISA/PCI/AGP buses.
- c) Place shield traces, which are connecting to ground(GNDA), flanking PIITDx to shield the noise.
- d) It is recommended that the bypass capacitor with 3300pF should be added to filter the noise from motherboard digital signals.
- e) It is better to use pull-up resistor 30K with 1% precision and to place it near the W83782D.

3-4. Why not Accurate ?

- a) Route PIITDx and GNDA through high noise area, such as high voltage, clock generators, memory buses, and ISA/PCI/AGP buses.
- b) Transistors characteristics varies from vendor to vendors. Sometimes even the same vendor's transistors, the characteristics might differ from lot to lot. In this situation, a software fine tuning is necessary from time to time. This might cause troubles in mass production.

W83782D/783S Application Notice List

	Date	Version	Remark
1	04/29/98	AP1	1)W8378X Family Pins & Functions Comparison List 2)Transistors(PII Thermal Diode) Application Circuit