I T M D PWM F C

The ADM1031 is an ACPI-compliant, three-channel digital thermometer and under/overtemperature alarm for use in personal computers and thermal management systems. Optimized for the Pentium III, the part offers a 1 C higher accuracy, which allows system designers to safely reduce temperature guard-banding and increase system performance.

Two PWM fan control outputs control the speed of two cooling fans by varying output duty cycle. Duty cycle values between 33% and 100% allow smooth control of the fans. The speed of each fan can be monitored via TACH inputs, which can be reprogrammed as analog inputs to allow speeds for 2-wire fans to be measured via sense resistors. The device also detects a stalled fan. A dedicated fan speed control loop provides control without the intervention of CPU software. It also ensures that if the CPU or system locks up, each fan can still be controlled based on temperature measurements, and the fan speed is adjusted to correct any changes in system temperature. Fan speed can also be controlled using existing ACPI software.

Two inputs (4 pins) are dedicated to remote temperature-sensing diodes with an accuracy of 1 C, and an on-chip temperature sensor allows ambient temperature to be monitored. The device has a programmable INT output to indicate error conditions, and a dedicated FAN_FAULT output to signal fan failure. The THERM pin is a fail-safe output for overtemperature conditions that can be used to throttle a CPU clock.

Features

Optimized for Pentium III Reduced Guard-banding Software Automatic Fan Speed Control, Independent of CPU Intervention After Initial Setup 0.125 C Resolution on External Temperature Channels

Control Loop to Minimal Acoustic Noise and Battery Consumption Remote Temperature Measurement Accurate to 1 C $\,$

Using Remote Diode (Two Channels)

Local Sensor with 0.25 C Resolution



Figure 1. Functional Block Diagram

Table 3. PIN ASSIGNMENT

Pin No.	Mnemonic	Description
1	PWM_OUT1	Digital Output, Open-Drain. Pulse width modulated output to control fan speed. Requires pullup resistor (10 k Ω typical).
2	TACH1/AIN1	Digital/Analog Input. Fan tachometer input to measure FAN1 fan speed. Can be reprogrammed as an analog input to measure speed of a 2-wire fan via a sense resistor (2 Ω typical).
3	PWM_OUT2	Digital Output, Open-Drain. Pulse width modulated output to control FAN2 fan speed. Requires pullup resistor (10 k Ω typical).
4	TACH2/AIN2	Digital/Analog Input. Fan tachometer input to measure FAN2 fan speed. Can be reprogrammed as an analog input to measure speed of a 2-wire fan via a sense resistor (2 Ω typical).
5	GND	System Ground.
6	VCC	Power. Can be powered by 3.3 V standby power if monitoring in low power states is required.
7	THERM	Digital I/O, Open-Drain. An active low thermal overload output that indicates a violation of a temperature set point (overtemperature). Also acts as an input to provide external fan control. When this pin is pulled low by an external signal, a status bit is set, and the fan speed is set to full-on. Requires pullup resistor (10 k Ω).
8	FAN_FAULT	Digital Output, Open-Drain. Can be used to signal a fan fault. Drives second fan to full speed if one fan fails. Requires pullup resistor (typically 10 k Ω).
9	D1-	Analog Input. Connected to cathode of first remote temperature-sensing diode. The temperature-sensing element is either a Pentium III substrate transistor or a general-purpose 2N3904.
10	D1+	Analog Input. Connected to anode of first remote temperature-sensing diode.
11	D2-	Analog Input. Connected to cathode of second remote temperature-sensing diode.
12	D2+	Analog Input. Connected to anode of second remote temperature-sensing diode.
13	ADD	Three-State Logic Input. Sets two lower bits of device SMBus address.
14	INT(SMBALERT)	Digital Output, Open-Drain. Can be programmed as an interrupt (SMBus $\overline{\text{ALERT}}$) output for temperature/fan speed interrupts. Requires pullup resistor (10 k Ω typical).
15	SDA	Digital I/O, Serial Bus Bidirectional Data. Open-drain output. Requires pullup resistor (2.2 k Ω typical).
16	SCL	Digital Input, Serial Bus Clock. Requires pullup resistor (2.2 k Ω typical).

Table 4. ELECTRICAL CHARACTERISTICS ($T_A = T_{MIN}$ to T_{MAX} , $V_{CC} = V_{MIN}$ to V_{MAX} , unless otherwise noted.) (Note 1)

Parameter	Test Conditions/Comments	Min	Тур	Max	Unit	
POWER SUPPLY	POWER SUPPLY					
Supply Voltage, V _{CC}		3.0	3.3	3.6	V	
Supply Current, I _{CC}	Interface inactive, ADC active Standby mode		1.4 32	3.0 50	mA μA	
TEMPERATURE-TO-DIGITAL CONVERTER						
Local Sensor Accuracy		-	1.0	3.0	С	
Resolution		-	0.25	-	С	
Remote Diode1 Sensor Accuracy	60 C T _D 100 C	-	0.5	1.0	С	
Remote Diode2 Sensor Accuracy	60 C T _D 100 C	-	0.5	1.75	С	
Resolution		-	0.125	-	С	
Remote Sensor Source Current	High level Low level	-	180 11	-	μΑ	
OPEN-DRAIN DIGITAL OUTPUTS (THERM, INT, FAN_FAULT, PWM_OUT)						
Output Low Voltage, V _{OL}	$I_{OUT} = -6.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.4	V	
High-Level Output Leakage Current, IOH	$V_{OUT} = V_{CC}; V_{CC} = 3.0 V$	-	0.1	1.0	μA	

Table 4. ELECTRICA	L CHARACTERISTICS	$(T_A = T_{MIN} \text{ to } T_{MA})$	A_{X} , $V_{CC} = V_{MIN}$ to V_{MAX} ,	unless otherwise noted.) (Note 1)
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Parameter	Test Conditions/Comments		Тур	Max	Unit
OPEN-DRAIN SERIAL DATA BUS OUTPUT (SDA)					
Output Low Voltage, V _{OL}	$I_{OUT} = -6.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.4	V

TYPICAL PERFORMANCE CHARACTERISTICS



Figure 9. Temperature Error vs. Differential-mode Noise Frequency Figure 10. Standby Supply Current vs. Supply Voltage

Figure 11. Local Sensor Temperature Error

Figure 12. Remote Temperature Sensor Error

Figure 13. Supply Current vs. Supply Voltage

Figure 14. Response to Thermal Shock

Functional Description

The ADM1031 is a temperature monitor and dual PWM fan controller for microprocessor-based systems. The device communicates with the system via a serial System Management Bus (SMBus). The serial bus controller has a hardwired address pin for device selection (Pin 13), a serial data line for reading and writing addresses and data (Pin 15), and an input line for the serial clock (Pin 16). All control and programming functions of the ADM1031 are performed over



Figure 16. Writing to the Address Pointer Register Only



Figure 18. Signal Conditioning

environment, a capacitor of value up to 1000 pF can be placed between the D+ and D- inputs to filter the noise.

To measure ΔV_{BE} , the sensor is switched between operating currents of I and N I. The resulting waveform is passed through a 65 kHz low-pass filter to remove noise, then to a chopper-stabilized amplifier that performs the functions of amplification and rectification of the waveform to produce a dc voltage proportional to ΔV_{BE} . This voltage is measured by the ADC to give a temperature output in 11-bit twos complement format. To further reduce the effects of noise, digital filtering is performed by averaging the results of 16 measurement cycles. An external temperature measurement nominally takes 9.6 ms.

Layout Considerations

Digital boards can be electrically noisy environments and care must be taken to protect the analog inputs from noise, particularly when measuring the very small voltages from a remote diode sensor. The following precautions should be taken:

- 1. Place the ADM 1031 as close as possible to the remote sensing diode. Provided that the worst noise sources such as clock generators, data/address buses, and CRTs are avoided, this distance can be 4 to 8 inches.
- 2. Route the D+ and D- tracks close together, in parallel, with grounded guard tracks on each side. Provide a ground plane under the tracks if possible.
- 3. Use wide tracks to minimize inductance and reduce noise pickup. Ten mil track minimum width and spacing is recommended.





4. Try to minimize the number of copper/solder joints, which can cause thermocouple effects. Where copper/solder joints are used, make sure that they are in both the D+ and D- path and at the same temperature.

Thermocouple effects should not be a major problem as 1 C corresponds to about 200 μ V, and thermocouple voltages are about 3 μ V/ C of temperature difference. Unless there are two thermocouples with a big temperature differential between them, thermocouple voltages should be much less than 200 μ V.

5. Place a 0.1 μF bypass capacitor close to the ADM1031.

- 6. If the distance to the remote sensor is more than 8 inches, the use of twisted pair cable is recommended. This works up to about 6 to 12 feet.
- 7. For extra long distances (up to 100 feet), use a shielded twisted pair cable, such as the Belden #8451 microphone cable. Connect the twisted pair to D+ and D- and the shield to GND close to the ADM1031. Leave the remote end of the shield unconnected to avoid ground loops.

Because the measurement technique uses switched current sources, excessive cable and/or filter capacitance can affect the measurement. When using long cables, the filter capacitor C1 can be reduced or removed. In any case the total shunt capacitance should not exceed 1000 pF.

Cable resistance can also introduce errors. One ohm series resistance introduces about 0.5 C error.

Addressing the Device

ADD (Pin 13) is a three-state input. It is sampled, on powerup to set the lowest two bits of the serial bus address. Up to three addresses are available to the systems designer via this address pin. This reduces the likelihood of conflicts with other devices attached to the system management bus.

The Interrupt System

The ADM1031 has two interrupt outputs, INT and THERM. These have different functions. INT responds to violations of software programmed temperature limits and is maskable.

THERM is intended as a "fail-safe" interrupt output that cannot be masked. If the temperature is below the low temperature limit, the INT pin is asserted low to indicate an out-of-limit condition. If the temperature exceeds the high temperature limit, the INT pin is also asserted low. A third limit, THERM limit, can be programmed into the device to set the temperature limit above which the overtemperature THERM pin is asserted low. The behavior of the high limit Tw7kERM asserted low. In this case, both throttling and active cooling take place. If the high temperature limit is programmed to a lower value than the THERM limit, exceeding the high temperature limit asserts INT low. Software could change the speed of the fan depending on temperature readings. If the temperature continues to increase and exceeds the THERM limit, THERM asserts low to throttle the CPU and the fan runs full-speed. This allows the system to run in performance mode, where active cooling takes place and the CPU is only throttled at high temperature.

Using the high temperature limit and the THERM limit in this way allows the user to gain maximum performance from the system by only slowing it down, should it be at a critical temperature.

Although the ADM1031 does not have a dedicated interrupt mask register, clearing the appropriate enable bits in Configuration Register 2 clears the appropriate interrupts and masks out future interrupts on that channel. Disabling interrupt bits prevents out-of-limit conditions from generating an interrupt or setting a bit in the status registers. How Does the Control Loop Work?

The automatic fan speed control loop is shown in Figure 21.



Figure 21. Automatic Fan Speed Control Loop

 T_{MIN} is the temperature at which the fan should switch on and run at minimum speed. The fan only turns on once the temperature being measured rises above the T_{MIN} value programmed. The fan spins up for a predetermined time (default = 2 seconds). See the Fan Spin-Up section for more details.

 T_{RANGE} is the temperature range over which the ADM1031 automatically adjusts the fan speed. As the temperature increases beyond T_{MIN} , the PWM_OUT duty cycle increases accordingly. The T_{RANGE} parameter actually defines the fan speed vs. temperature slope of the control loop.

 T_{MAX} is the temperature at which the fan is at its maximum speed. At this temperature, the PWM duty cycle driving the fan is 100%. T_{MAX} is given by T_{MIN} + T_{RANGE} . Since this parameter is the sum of the T_{MIN} and T_{RANGE} parameters, it does not need to be programmed into a register on-chip.

A hysteresis value of 5 C is included in the control loop to prevent the fan continuously switching on and off if the temperature is close to T_{MIN} . The fan continues to run until the temperature drops 5 C below T_{MIN} .

Figure 22 shows the different control slopes determined by the T_{RANGE} value chosen, and programmed into the ADM1031. T_{MIN} is set to 0 C to start all slopes from the same point. The figure shows how changing the T

Fan Spin-Up

As mentioned in the How Does the Control Loop Work? section, once the temperature being measured exceeds the T_{MIN} value programmed, the fan turns on at minimum speed (default = 33% duty cycle). However, the problem with fans being driven by PWM is that 33% duty cycle is not enough to reliably start the fan spinning. The solution is to spin the fan up for a predetermined time, and once the fan has spun up, its running speed can be reduced in line with the temperature being measured.

The ADM1031 allows fan spin-up times between 200 ms and 8 seconds. Bits <2:0> of Fan Characteristics Register 1 (Register 0 20) and Fan Characteristic Register 2 (Register 0 21) program the fan spin-up times.

Table 9. FAN SPIN-UP TIMES

Bits 2:0	Spin-Up Time (Fan Characteristics Registers 1, 2)
000	200 ms
001	400 ms
010	600 ms
011	800 ms
100	1 sec
101	2 sec (Default)
110	4 sec
111	8 sec

Once the automatic fan speed control loop parameters



Programming the Automatic Fan Speed Control Loop

Relevant Regc7T

Calculate T_{MAX}

$$\begin{split} T_{MAX} &= T_{MIN} + ((Max DC - Min DC) \times T_{RANGE}/10) \\ T_{MAX} &= 0 + ((100\% DC - 53\% DC) \times 40/10) \quad (eq. 3) \\ T_{MAX} &= 0 + ((15 - 8) \times 4) = 28 \end{split}$$

 $T_{MAX} = 28 \ C$ (As seen on Slope 2 of Figure 26)

Example 2:

 $\begin{array}{ll} T_{MIN} &= 0 \ \text{C}, \ \text{T}_{\text{RANGE}} = 40 \ \text{C} \\ Min \ DC &= 73\% = 11 \ \text{decimal} \ (\text{Table 11}) \\ \text{Calculate} \ \text{T}_{\text{MAX}} \\ \text{T}_{\text{MAX}} &= \ \text{T}_{\text{MIN}} + ((\text{Max DC} - \text{Min DC}) \times \text{T}_{\text{RANGE}}/10) \\ \text{T}_{\text{MAX}} &= \ 0 + ((100\% \ \text{DC} - 73\% \ \text{DC}) \times 40/10) \quad (\text{eq. 4}) \\ \text{T}_{\text{MAX}} &= \ 0 + ((15 - 11) \times 4) = 16 \end{array}$

 $T_{MAX} = 16 \, \ensuremath{^{\circ}\!\!\!C}$ (As seen on Slope 3 of Figure 26)

Example 3:

$$\begin{split} T_{MIN} &= 0 \text{ C}, \text{ } \text{T}_{\text{RANGE}} = 40 \text{ C} \\ Min \ DC &= 33\% = 5 \text{ decimal (Table 11)} \\ \text{Calculate T}_{MAX} \\ \text{T}_{MAX} &= \text{T}_{MIN} + ((\text{Max DC} - \text{Min DC}) \times \text{T}_{\text{RANGE}}/10) \\ \text{T}_{MAX} &= 0 + ((100\% \text{ DC} - 33\% \text{ DC}) \times 40/10) \quad (\text{eq. 5}) \\ \text{T}_{MAX} &= 0 + ((15 - 5) \times 4) = 40 \end{split}$$

T_{MAX} =40 °C (As seen on Slope 1 of Figure 26)

In this case, since the Minimum Duty Cycle is the default 33%, the equation for T_{MAX} reduces to:

$$\begin{split} T_{MAX} &= T_{MIN} + ((Max DC - Min DC) \times T_{RANGE}/10) \\ T_{MAX} &= T_{MIN} + ((15 - 5) \times T_{RANGE}/10) \\ T_{MAX} &= T_{MIN} + (10 \times T_{RANGE}/10) \\ T_{MAX} &= T_{MIN} + T_{RANGE} \end{split}$$
 (eq. 6)

Register 0×24 Local Temperature T_{MIN}/T_{RANGE}

- <7:3> Local Temperature T_{MIN} . These bits set the temperature at which the fan turns on when under auto fan speed control. T_{MIN} can be programmed in 4 C increments. 00000 = 0 C 00001 = 4 C 00011 = 12 C | 01000 = 32 C (Default) | 11110 = 120 C11111 = 124 C
- <2:0> Local Temperature T



Figure 31. Filtered Mode with Ramp Rate = 2

Relevant Registers for Filtered Automatic Fan Speed Control Mode In addition to the registers used to program the normal 6na57 -1.1962 T61 speed up due to aging, the RPM feedback slows the fan down to maintain the correct RPM speed. The value to be programmed into each fan tach high limit register is given by:

 $Count = (f \times 60)/R \times N \qquad (eq. 7)$

where:

f = 11.25 kHz R =desired RPM value N =Speed Range; MUST be set to 2

The speed range, N, really determines what the slowest fan speed measured can be before generating an interrupt. The slowest fan speed is measured when the count value reaches 255.

$$\begin{split} & \text{Since N} = 2 \\ & \text{Count} = (f \times 60)/R \times N \\ & \text{R} = (f \times 60)/\text{Count} \times N \\ & \text{R} = (11250 \times 60)/255 \times 2 \\ & \text{R} = (675000)/510 \\ & \text{R} = 1324 \text{ RPM, fan fail detect speed.} \end{split}$$

Programming RPM Values in RPM Feedback Mode

Rather than writing a value such as 5000 to a 16-bit register, an 8-bit count value is programmed instead. The count to be programmed is given by:

$$Count = (f \times 60)/R \times N$$
 (eq. 9)

where:

f = 11.25 kHz R = desired RPM valueN = Speed Range = 2

display the correct fan speed, and also to program the correct count value in RPM feedback mode.

Fan Speed Measurement Equations For a 4-pole fan (2 tach pulses/rev):	
Fan RPM = (f \times 60)/Count \times N	(eq. 14)
For a 6-pole fan (3 tach pulses/rev):	
Fan RPM = $(f \times 60)/(Count \times N \times 1.5)$	(eq. 15)
For an 8-pole fan (4 tach pulses/rev):	
Fan RPM = (f \times 60)/(Count \times N \times 2)	(eq. 16)
If in doubt as to the number of poles the fa	ans used have,

1 1 1

Figure 38. Operation of FAN_FAULT and Interrupt Pins

Table 16. REGISTERS

Register Name	Address A7 A0 in Hex	Comments
Value Registers	0x08–0x1E	See Table 17.
Device ID Register	0x3D	This location contains the device identification number. Since this device is the ADM1031, this register contains 0x31. This register is read only.
Company ID THERM	0x3E	This location contains the company identification number (0x41). This register is read only.
Behavior/Revision	0x3F	This location contains the revision number of the device. The lower four bits reflect device revisions [3:0]. Bit 7 of this register is the THERM-to-fan enable bit. See Table 30.
Configuration Register 1	0x00	See Table 18. (Power-On Value = 1001 0000)
Configuration Register 2	0x01	See Table 19. (Power-On Value = 0111 1111)

Table 18. REGISTER 0X00 CONFIGURATION REGISTER 1 POWER-ON DEFAULT = 90H

Bit	Name	R/W	Description
0	MONITOR	R/W	Setting this bit to a "1" enables monitoring of temperature and enables measurement of the fan tach signals. (Powerup Default = 0)
1	INT Enable	R/W	Setting this bit to a "1" enables the \overline{INT} output. 1 = Enabled 0 = Disabled (Powerup Default = 0)
2	TACH/AIN	R/W	Clearing this bit to "0" selects digital fan speed measurement via the TACH pins. Setting this bit to "1" configures the TACH pins as analog inputs that can measure the speed of 2-wire fans via a sense resistor. (Powerup Default = 0)
3	PWM Invert	R/W	Setting this bit to "1" inverts the PWM signal on the output pins. (Powerup Default = 0)
4	FAN_FAULT Enable	R/W	Logic 1 enables FAN_FAULT pin; Logic 0 disables FAN_FAULT output. (Powerup Default = 1)
6–5	PWM Mode	R/W	These two bits control the behavior of the fans in auto fan speed control mode. 00 = Remote Temp 1 controls Fan 1; Remote Temp 2 controls Fan 2. 01 = Remote Temp 1 controls Fan 1 and Fan 2. 10 = Remote Temp 2 controls Fan 1 and Fan 2. 11 = Max of Local Temp and Remote Temp 1 and 2 drives Fans 1 and 2. These two bits have the following effect in software control mode. 00 = Program PWM duty cycles for Fans 1 and 2. 11 = Program RPM Speeds for Fans 1 and 2.
7	Auto/SW Ctrl	R/W	Logic 1 selects automatic fan speed control; Logic 0 selects SW control. (Powerup Default = 1). When under software control, PWM duty cycle or RPM values can be programmed for each fan.

Table 19. REGISTER 0X01 CONFIGURATION 2 POWER-ON DEFAULT = 7FH

Bit	Name	R/W	Description
0	PWM 1 En	R/W	Enables Fan 1 PWM output when this bit is a "1."
1	PWM 2 En	R/W	Enables Fan 2 PWM output when this bit is a "1."
2	TACH 1 En	R/W	Enables Tach 1 input when set to "1."
3	TACH 2 En	R/W	Enables Tach 2 input when set to "1."
4	Loc Temp En	R/W	Enables Interrupts on local temperature channel when set to "1."
5	Remote 1 Temp En	R/W	Interrupts on Remote 1 Channel when set to "1." Default is normally enabled, except when a diode fault is detected on powerup.
6	Remote 2 Temp En	R/W	Enables Interrupts on Remote 2 Channel when set to "1." Default is normally enabled, except when a diode fault is detected on powerup.
7	SW Reset	R/W	When set to "1," resets the device. Self-clears. Powerup Default = 0.

Table 20. REGISTER 0X02 STATUS REGISTER 1 POWER-ON DEFAULT = 00H

Bit	Name	R/W	Description
0	Alarm 1 Speed	R	This bit is set to "1" when fan is running at alarm speed. Once read, this bit is not reasserted on next monitoring cycle, even if the fan is still running at alarm speed.
1	Fan 1 Fault	R	This bit is set to "1" if Fan 1 becomes stuck or is running under speed.
2	Remote 1 High	R	"1" indicates Remote 1 high temperature limit has been exceeded. If the temperature is still outside the Remote 1 Temp High Limit, this bit reasserts on next monitoring cycle.
3	Remote 1 Low	R	"1" indicates Remote 1 low temperature limit exceeded (below). If the temperature is still outside the Remote 1 Temp Low Limit, this bit reasserts on next monitoring cycle.
4	Remote 1 THERM		

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Table 23. REGISTER 0X20 FAN CHARACTERISTICS REGISTER 1 POWER-ON DEFAULT = 5DH

Bit	Name	R/W	Description
<2:0>	Fan 1 Spin-Up	R/W	These bits contain the fan spin-up time to allow Fan 1 to overcome its own inertia. 000 = 200 ms 001 = 400 ms 010 = 600 ms 011 = 800 ms 100 = 1 sec 101 = 2 sec (Default) 110 = 4 sec 111 = 8 sec
<5:3>	PWM 1 Frequency	-	

Table 26. REGISTER 0X23 FAN FILTER REGISTER POWER-ON DEFAULT = 50H

Bit	Name	R/W	Description
<7>	Spin-Up Disable	R/W	When set to 1, disables fan spin-up.
<6:5>	Ramp Rate	R/W	These bits set the ramp rate. (Default = 31 Hz) 00 = 1 01 = 2 10 = 4 (Default) 11 = 8

<4:2>

Table 28. REGISTER 0X25 REMOTE 1 TEMP T_{MIN}/T_{RANGE} POWER-ON DEFAULT = 61H

Bit	Name	R/W	Description	
<7:3>	Remote 1 Temp T _{MIN}	R/W	Contains the minimum temperature value for automatic fan speed control based on local temperature readings. T _{MIN} can be programmed to positive values only in 4 C increments. Default is 32 C. 00000 = 0 C 00001 = 4 C 00010 = 8 C 00011 = 12 C 01100 = 48 C 11110 = 120 C 11111 = 124 C	
<2:0>	Remote 1 Temp T _{RANGE}	R/W	This nibble contains the temperature range value for automatic fan speed control based on the Remote 1 Temp Readings. 000 = 5 C 001 = 10 C (Default) 010 = 20 C 011 = 40 C 100 = 80 C	

Table 29. REGISTER 0X26 REMOTE 2 TEMP T_{MIN}/T_{RANGE} POWER-ON DEFAULT = 61H

Bit	Name	R/W	Description
<7:3>	Remote 2 Temp T _{MIN}	R/W	Contains the minimum temperature value for automatic fan speed control based on Remote 2 Temperature Readings. T _{MIN} can be programmed to positive values only in 4 C increments. Default is 32 C. 00000 = 0 C 00001 = 4 C 00010 = 8 C 00011 = 12 C 01100 = 48 C (Default) 11110 = 120 C 11111 = 124 C
<2:0>	Remote 2 Temp T _{RANGE}	R/W	This nibble contains the temperature range value for automatic fan speed control based on the Remote 2 Temp Readings. 000 = 5 C 001 = 10 C (Default) 010 = 20 C 011 = 40 C 100 = 80 C

Table 30. REGISTER 0X3F THERM BEHAVIOR/REVISION POWER-ON DEFAULT = 80H

Bit	Name	R/W	Description
<7>	THERM-to-Fan En	R/W	Setting this bit to 1, enables the fan to run full-speed when THERM is asserted low. This allows the system to be run in performance mode. Clearing this bit to 0 disables the fan from running full-speed whenever THERM is asserted low. This allows the system to run in silent mode. (Power-On Default = 1).
<3:0>	Revision	R	This nibble contains the revision number for the ADM1031.

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DATE 23 MAR 2011



DETÁIL A

	INC	HĔ	
DIM	MIN	MA	
Α	0.053	0.069	
A1	0.004	0.010	
	0.008	0.012	
١	0.007	0.010	

	0.025	BSC	
	0.009	0.020	
L	0.016	0.050	
М	0	8	

SCALE 2:1

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