Nuvoton

Hardware Monitoring IC

NCT7802Y

with PECI 3.0 interface

Date: Feb/2012 Revision: 1.2

新唐科技 NUVOTON INTELLECTUAL PROPERTY

Table of Content-

1. GENERAL DESCRIPTION 1
2. FEATURES 1
   - 2.1 Temperature Measurement 1
   - 2.2 Voltage Measurement 1
   - 2.3 Fan Control 1
   - 2.4 Event Notification 1
   - 2.5 General 2
3. KEY SPECIFICATIONS 2
4. PIN CONFIGURATION 3
5. PIN DESCRIPTION 3
   - 5.1 PIN TYPE DISCRIPTION 3
   - 5.2 PIN DISCRIPTION 4
6. DESCRIPTION 6
   - 6.1 GENERAL DESCRIPTION 6
   - 6.2 ACCESS INTERFACE 6
     - 6.2.1 Data write to the internal register 6
     - 6.2.2 Data read from the internal register 6
   - 6.3 ADDRESS SETTING 7
   - 6.4 TEMPERATURE MONITOR DATA FORMAT 7
     - 6.4.1 The local temperature (on-die) data with 8-bit 2`s complement format 7
     - 6.4.2 The remote temperature data with 11-bit 2's complement format 8
   - 6.5 VOLTAGE SENSE DATA FORMAT 8
   - 6.6 FAN_IN Count Calculation 8
   - 6.7 FAN_OUT Duty Cycle / DC Level Calculation 9
   - 6.8 SMART FAN^{TM} IV Control Parameters 9
     - 6.8.1 Step Up Time / Step Down Time 9
     - 6.8.2 Fan Output Start-up Value 9
     - 6.8.3 Fan Output Nonstop 9
     - 6.8.4 Fan Output Stop Time 9
   - 6.9 SMART FAN^{TM} IV 10
   - 6.10 PECI 11
   - 6.11 ALERT# Output 13
     - 6.11.1 ALERT# Output Mechanism 13
     - 6.11.2 ALERT# Response Address 14
   - 6.12 T_CRIT# Output 14
   - 6.13 SMI# Output 14
     - 6.13.1 Temperature 14
     - 6.13.2 Voltage 16

6.13.3 Fan 16
6.14 RESET# Output 16
6.15 Programming from EEPROM 16
7. REGISTER DESCRIPTION 17
7.1 BANK0 REGISTER MAP 17
7.2 BANK 0 REGISTER DETAIL 22
7.2.1 Bank Select Register 22
7.2.2 Remote Diode 1 Temperature Readout Register (MSB) 22
7.2.3 Remote Diode 2 Temperature Readout Register (MSB) 22
7.2.4 Remote Diode 3 Temperature Readout Register (MSB) 22
7.2.5 Local Diode Temperature Readout Register (MSB) 23
7.2.6 Temperature Readout Register (LSB) 23
7.2.7 PECI 0 Temperature Readout Register (MSB) 23
7.2.8 PECI 1 Temperature Readout Register (MSB) 23
7.2.9 Read PECI Temperature Readout Register (LSB) 24
7.2.10 VCC Readout Register (MSB) 24
7.2.11 VCore Readout Register (MSB) 24
7.2.12 VSEN1 Readout Register (MSB) 24
7.2.13 VSEN2 Readout Register (MSB) 25
7.2.14 VSEN3 Readout Register (MSB) 25
7.2.15 Voltage Readout Register (LSB) 25
7.2.16 Fan Count 1 Readout Register (MSB) 25
7.2.17 Fan Count 2 Readout Register (MSB) 26
7.2.18 Fan Count 3 Readout Register (MSB) 26
7.2.19 Fan Count Readout Register (LSB) 26
7.2.20 MNTIMON Percent Register 26
7.2.21 Diode Fault Alert Status Register 27
7.2.22 Temperature Low Alert Status Register 27
7.2.23 Temperature High Alert Status Register 27
7.2.24 Fan Alert Status Register 28
7.2.25 T_CRIT# Alert Status Register 28
7.2.26 GPIO Alert Status Register 28
7.2.27 Temperature SMI Status Register 29
7.2.28 Voltage SMI Status Register 29
7.2.29 Fan SMI Status Register 29
7.2.30 T_CRIT# Real Time Status Register 30
7.2.31 Start Register 30
7.2.32 Mode Selection Register 30
7.2.33 PECI Enable Register 30
7.2.34 Fan Enable Register 31
7.2.35 Voltage Monitor Enable Register 31
7.2.36 Conversion Rate Register 31
7.2.37 Fault Queue Register 31

7.2.38 Alert# High Limit Link to T_CRIT# Register 32
7.2.39 Reset Time Setting Register 32
7.2.40 Reset Limit Low Byte Register 32
7.2.41 Reset Limit High Byte Register 32
7.2.42 SMI# Control Register 33
7.2.43 RTD1 Temperature High Limit Register 33
7.2.44 RTD1 Temperature Low Limit Register 33
7.2.45 RTD2 Temperature High Limit Register 34
7.2.46 RTD2 Temperature Low Limit Register 34
7.2.47 RTD3 Temperature High Limit Register 34
7.2.48 RTD3 Temperature Low Limit Register 34
7.2.49 LTD Temperature High Limit Register 34
7.2.50 LTD Temperature Low Limit Register 35
7.2.51 DTS Temperature High Limit Register 35
7.2.52 DTS Temperature Low Limit Register 35
7.2.53 RTD1 TCRIT Threshold Register 35
7.2.54 RTD2 TCRIT Threshold Register 35
7.2.55 RTD3 TCRIT Threshold Register 36
7.2.56 LTD TCRIT Threshold Register 36
7.2.57 DTS TCRIT Threshold Register 36
7.2.58 VSEN1 High Limit Low Byte Register 36
7.2.59 VSEN1 Low Limit Low Byte Register 36
7.2.60 VSEN2 High Limit Low Byte Register 37
7.2.61 VSEN2 Low Limit Low Byte Register 37
7.2.62 VSEN3 High Limit Low Byte Register 37
7.2.63 VSEN3 Low Limit Low Byte Register 37
7.2.64 VCC High Limit Low Byte Register 37
7.2.65 VCC Low Limit Low Byte Register 38
7.2.66 VSEN Limit High Byte 1 Register 38
7.2.67 VSEN Limit High Byte 2 Register 38
7.2.68 FANIN1 Limit Low Byte Register 38
7.2.69 FANIN2 Limit Low Byte Register 39
7.2.70 FANIN3 Limit Low Byte Register 39
7.2.71 FANIN1 Limit High Byte Register 39
7.2.72 FANIN2 Limit High Byte Register 39
7.2.73 FANIN3 Limit High Byte Register 40
7.2.74 ALERT Mask Register Register 40
7.2.75 ALERT/SMI Mask Temperature Channel Register 40
7.2.76 ALERT/SMI Mask Fan Channel Register 41
7.2.77 SMI Mask Voltage Channel Register 41
7.2.78 T_CRIT# Mask Register 41
7.2.79 GPIO Alert Mask Register 42
7.2.80 GPIO Enable Register 42
7.2.81 GPIO Mode Register 42

7.2.82 GPIO Output Type Register....43
7.2.83 GPIO Input Data Register....43
7.2.84 GPIO Output Data Register....43
7.2.85 BEEP Voltage Channel Enable Register....44
7.2.86 BEEP Fan Channel Enable Register....44
7.2.87 BEEP Temperature Channel Enable Register....44
7.2.88 BEEP Enable Register....45
7.2.89 Fan Control Output Type....45
7.2.90 Fan Control Output Mode....45
7.2.91 Fan Control 1 Output Value....46
7.2.92 Fan Control 2 Output Value....46
7.2.93 Fan Control 3 Output Value....46
7.2.94 Close-Loop Fan Control RPM mode Register and Configure Register of PECI Error (CRPE) 46
7.2.95 Temperature to Fan mapping Relationships Register....47
7.2.96 Temperature to Fan mapping Relationships Register....47
7.2.97 Fan Control Configuration Register 1....48
7.2.98 Fan Control Configuration Register 2....48
7.2.99 Fan Control Configuration Register 3....49
7.2.100 Fan Control Configuration Register 4....49
7.2.101 Close-Loop Fan Control RPM mode Tolerance Register....49
7.2.102 FANCTL Step Up Time Register....50
7.2.103 FANCTL Step Down Time Register....50
7.2.104 Default Fan Speed Register....50
7.2.105 FANCTL1 PWM Prescalar Register....50
7.2.106 FANCTL2 PWM Prescalar Register....51
7.2.107 FANCTL3 PWM Prescalar Register....52
7.2.108 Temp1 Hystersis Register....52
7.2.109 Temp2 Hystersis Register....52
7.2.110 Temp3 Hystersis Register....52
7.2.111 FANCTL Start Duty Cycle Register....53
7.2.112 FANCTL Stop Time Register....53
7.2.113 NonStop Disable Register....53
7.2.114 Fan Output Min Value when PECI Error Register (FOMV)....53
7.2.115 Table 1 X-axis Transition Point 1 Register....54
7.2.116 Table 1 X-axis Transition Point 2 Register....54
7.2.117 Table 1 X-axis Transition Point 3 Register....54
7.2.118 Table 1 X-axis Transition Point 4 Register....54
7.2.119 Table 1 X-axis Critical Point Register....55
7.2.120 Table 1 Y-axis Transition Point 1 Register....55
7.2.121 Table 1 Y-axis Transition Point 2 Register....55
7.2.122 Table 1 Y-axis Transition Point 3 Register....55
7.2.123 Table 1 Y-axis Transition Point 4 Register....56
7.2.124 Table 2 X-axis Transition Point 1 Register....56

7.2.125 Table 2 X-axis Transition Point 2 Register 56
7.2.126 Table 2 X-axis Transition Point 3 Register 56
7.2.127 Table 2 X-axis Transition Point 4 Register 57
7.2.128 Table 2 X-axis Critical Point Register 57
7.2.129 Table 2 Y-axis Transition Point 1 Register 57
7.2.130 Table 2 Y-axis Transition Point 2 Register 57
7.2.131 Table 2 Y-axis Transition Point 3 Register 58
7.2.132 Table 2 Y-axis Transition Point 4 Register 58
7.2.133 Table 3 X-axis Transition Point 1 Register 58
7.2.134 Table 3 X-axis Transition Point 2 Register 58
7.2.135 Table 3 X-axis Transition Point 3 Register 59
7.2.136 Table 3 X-axis Transition Point 4 Register 59
7.2.137 Table 3 X-axis Critical Point Register 59
7.2.138 Table 3 Y-axis Transition Point 1 Register 59
7.2.139 Table 3 Y-axis Transition Point 2 Register 60
7.2.140 Table 3 Y-axis Transition Point 3 Register 60
7.2.141 Table 3 Y-axis Transition Point 4 Register 60
7.2.142 TD1 Offset Register 60
7.2.143 TD2 Offset Register 61
7.2.144 TR1 Offset Register 61
7.2.145 TR2 Offset Register 61
7.2.146 TR3 Offset Register 61
7.2.147 Digital Filter Level Select Register 62
7.2.148 Programmable Temperature 1 Register 62
7.2.149 Programmable Temperature 2 Register 62
7.2.150 Software Reset Register 62
7.2.151 Vendor ID Register 63
7.2.152 Chip ID Register 63
7.2.153 Version ID Register 63
7.3 BANK 1 REGISTER MAP 64
7.4 BANK 1 REGISTER DETAIL 66
7.4.1 PECI Control Register 1 66
7.4.2 PECI Control Register 2 66
7.4.3 PECI Control Register 3 66
7.4.4 Report Temperature Style Register 67
7.4.5 Address Content for Manual Command Register 67
7.4.6 Write Length for Manual Command Register 67
7.4.7 Read Length for Manual Command Register 68
7.4.8 Command Code for Manual Command Register 68
7.4.9 Agent0 Base Temperature Register 68
7.4.10 Agent1 Base Temperature Register 68
7.4.11 Generic Write in Data 1 to Client Register 69
7.4.12 Generic Write in Data 2 to Client Register 69

7.4.13 Generic Write in Data 3 to Client Register 69
7.4.14 Generic Write in Data 4 to Client Register 69
7.4.15 Generic Write in Data 5 to Client Register 70
7.4.16 Generic Write in Data 6 to Client Register 70
7.4.17 Generic Write in Data 7 to Client Register 70
7.4.18 Generic Write in Data 8 to Client Register 70
7.4.19 Generic Write in Data 9 to Client Register 71
7.4.20 Generic Write in Data 10 to Client Register 71
7.4.21 Generic Write in Data 11 to Client Register 71
7.4.22 Generic Write in Data 12 to Client Register 71
7.4.23 Agent Relative Temperature Register 72
7.4.24 Agent Characteristic Register 73
7.4.25 Generic Read Out Data 1 from Client Register 73
7.4.26 Generic Read Out Data 2 from Client Register 74
7.4.27 Generic Read Out Data 3 from Client Register 74
7.4.28 Generic Read Out Data 4 from Client Register 74
7.4.29 Generic Read Out Data 5 from Client Register 74
7.4.30 Generic Read Out Data 6 from Client Register 75
7.4.31 Generic Read Out Data 7 from Client Register 75
7.4.32 Generic Read Out Data 8 from Client Register 75
7.4.33 Generic Read Out Data 9 from Client Register 75
8. ELECTRICAL CHARACTERISTICS 76
8.1 Absolute Maximum Ratings 76
8.2 DC Characteristics 76
8.3 AC Characteristics 77
9. ORDERING INFORMATION 78
10. TOP MARKING SPECIFICATIONS 78
11. PACKAGE DRAWING AND DIMENSIONS 79
12. REVISION HISTORY 80

1. GENERAL DESCRIPTION

NCT7802Y is a Nuvoton Hardware Monitor IC, which can monitor several critical hardware parameters of the systems, including power supply voltages, fan speeds, and temperatures, to make the system work stably and efficiently, especially for server and workstation applications.

NCT7802Y supports one on-die and up to 5 remote temperature sensors with SMBus interface. There's a 10-bit analog-to-digital converter (ADC) is built inside NCT7802Y, to convert the monitored temperature values. The remote inputs can be connected to CPU/GPU thermal diode or any thermal diode sensors and thermistor, it also can get the Intel® CPU temperature directly via Intel ®PECI3.0 interface.

Additionally, the NCT7802Y can monitor up to 5 analog voltage inputs, 3 fan tachometer inputs and supports up to 6 multifunctional GPIO. The SMART FAN™ IV mode provides 4 sets of temperature setting points, and they can also control the duty cycle of fan outputs. It provides an easy method to implement quiet and cooling solution with maximum safety and flexibility.

Meanwhile, there're 5 pure hardware event pins for independent alarm signals, and the all threshold values could be set for system protection without any timing delay.

2. FEATURES

2.1 Temperature Measurement

- Measure the temperature with high accuracy
- One local on-die thermal sensor
- Two pairs thermal diode (current mode) temperature channels
- Three thermistor mode temperature channels
- Support Intel® PECI 3.0 interfaces for reading Intel®CPU temperature

2.2 Voltage Measurement

- Up to five voltage inputs, three multi-functions with thermal diode pair

2.3 Fan Control

- Three fan control outputs multi-function (PWM mode supported)
- Two fan control outputs support DC mode
- Three fan tachometer input multi-function
- SMART FAN™ IV mode or Manual mode to control the fan speed

2.4 Event Notification

- Support 5 alarm outputs: ALERT#, T_CRIT#, RESET#, SMI#, BEEP signals to activate system protection.
- ALERT# output supports SMBus™ 2.0 ARA function

2.5 General

- Provide up to 6 GPIO pins (multi-function with fan control).
- I^2C® Compatible System Management bus (SMBus)
- Support 8 SMBus address selection
- Programming from EEPROM support
- 3.3V±5% V_{CC} operation
- 20-pin QFN package (Halogen free)

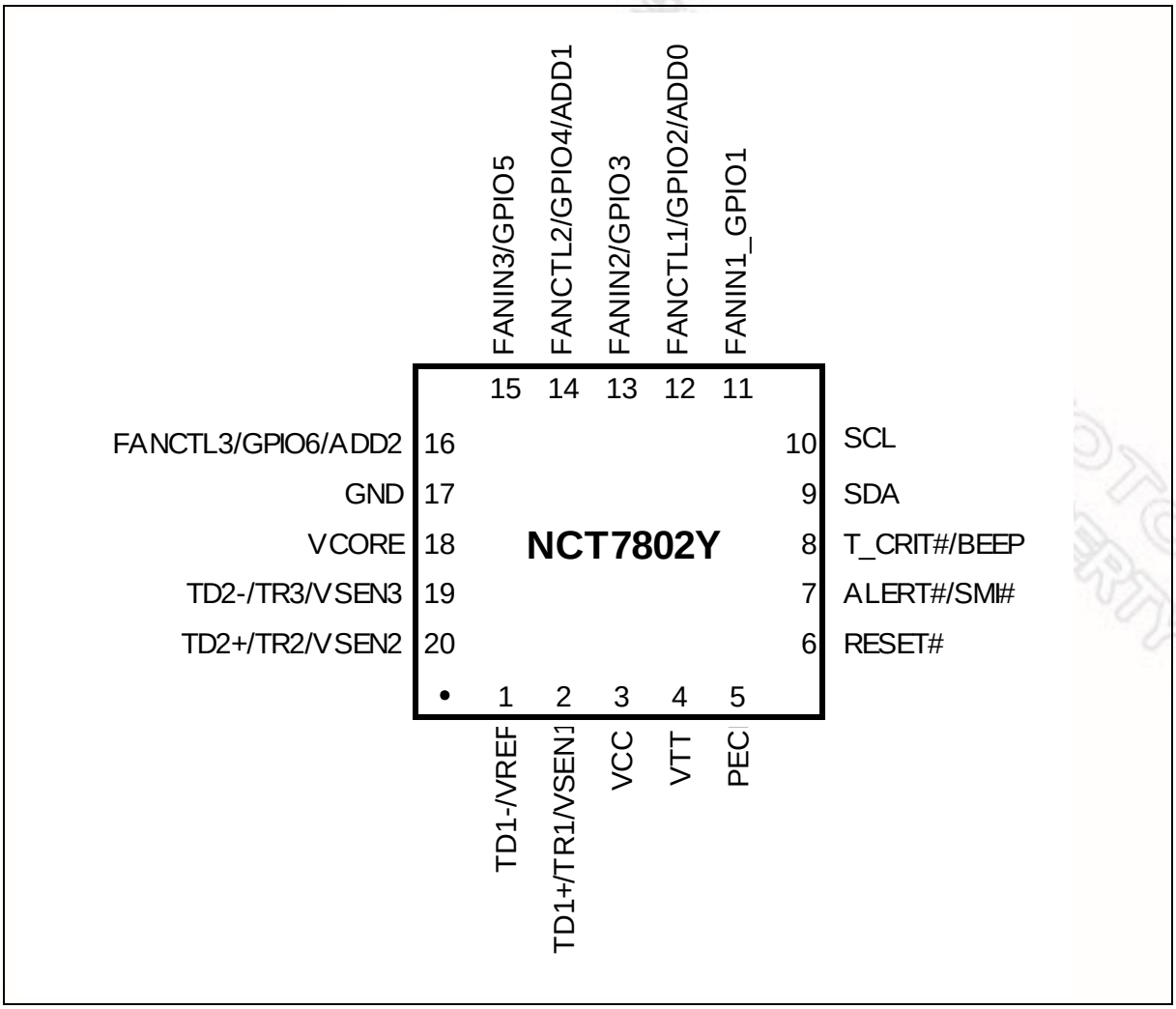
3. KEY SPECIFICATIONS

● Voltage monitoring accuracy	
VSEN input	±10mV
VCC input	±80mV
● Temperature Sensor Accuracy	
Remote Diode Sensor Accuracy (25~85°C)	± 1°C typ.
On-chip Temperature Sensor Accuracy (25~70°C)	± 2°C typ.
Remote Temperature Sensor Resolution	0.125°C
On-chip Temperature Sensor Resolution	1 °C
● Supply Voltage	3.3V ± 5%
● Operating Supply Current	
VCC	5mA typ.
VTT	< 1mA
● Operating Temperature Range	-40°C ~ 85°C *1

*1 Guaranteed by design from -40~85 degree C, 100% tested at 85 degree C.

新唐科技 nuvoTon INTELLECTUAL PROPERTY

4. PIN CONFIGURATION



5. PIN DESCRIPTION

5.1 PIN TYPE DISCRIPTION

PIN TYPE	PIN ATTRIBUTE
OD_{12}	Open-drain output pin with 12 mA sink capability
IN_{ts}	TTL level input pin and schmitt trigger, with 5V tolerance support
V1	Type of PECI
AIN	Input pin (Analog)
OUT_{12}	Output pin with 12 mA sink/source capability
AOUT	Output pin (Analog)
P	Power or Ground Pin

5.2 PIN DISCRIPTION

PIN NO.	PIN NAME	I/O	FUNCTION
1	**TD1-**	AIN	Connect to Thermal Diode 1 Cathode
	VREF	AOUT	VREF output for Thermistor function
2	**TD1+**	AIN	Connect to Thermal Diode 1 Anode
	TR1		Thermistor 1 sensing input
	VSEN1		Voltage sensing input. Detection range is 0~2.048V
3	**VCC**	P	Power supply, Voltage input 3.3V±5% It is also a voltage sensing input
4	**VTT**	P	Intel® CPU Vtt power
5	**PECI**	V1	Intel® CPU PECI interface
6	**RESET#**	OD_{12}	Reset alarm output, for detect VCC power fault
7	**ALERT#**	OD_{12}	Alarm output, for interrupt control (default)
	SMI#		Alarm output, for interrupt control
8	**T_CRIT#**	OD_{12}	T_CRIT alarm output, for interrupt or shutdown control. (default)
	BEEP		BEEP output when abnormal event occurs (Frequency:300Hz/600Hz, Tone=500mS)
9	**SDA**	IN_{ts}/OD_{12}	SMBus bi-directional data
10	**SCL**	IN_{ts}	SMBus Clock
11	**FANIN1**	IN_{ts}	Fan tachometer input (default)
	GPIO1	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function
12	**FANCTL1**	OUT_{12}/OD_{12} /AOUT	Fan speed control PWM/DC output It can be configured to PWM/DC mode by registers. Default is PWM output As DC output, 256 steps output voltage scaled to 0~VCC
	GPIO2	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function
13	**FANIN2**	IN_{ts}	Fan tachometer input (default)
	GPIO3	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function

PIN NO.	PIN NAME	I/O	FUNCTION
14	**FANCTL2**	OUT_{12}/OD_{12} /AOUT	Fan speed control PWM/DC output It can be configured to PWM/DC mode by registers. Default is PWM output As DC output, 256 steps output voltage scaled to 0~VCC
	GPIO4	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function
15	**FANIN3**	IN_{ts}	Fan tachometer input (default)
	GPIO5	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function
16	**FANCTL3**	OUT_{12}/OD_{12}	Fan speed control PWM output
	GPIO6	IN_{ts} /OD_{12} /OUT_{12}	General purpose I/O function
17	**GND**	P	Power supply ground
18	**VCORE**	AIN	Voltage sensing input. Detection range is 0~2.048V
19	**TD2-**	AIN	Connect to Thermal Diode 2 Cathode
	TR3		Thermistor 3 sensing input
	VSEN3		Voltage sensing input. Detection range is 0~2.048V
20	**TD2+**	AIN	Connect to Thermal Diode 2 Anode
	TR2		Thermistor 2 sensing input
	VSEN2		Voltage sensing input. Detection range is 0~2.048V

新唐科技 nuvoTon INTELLECTUAL PROPERTY

6. DESCRIPTION

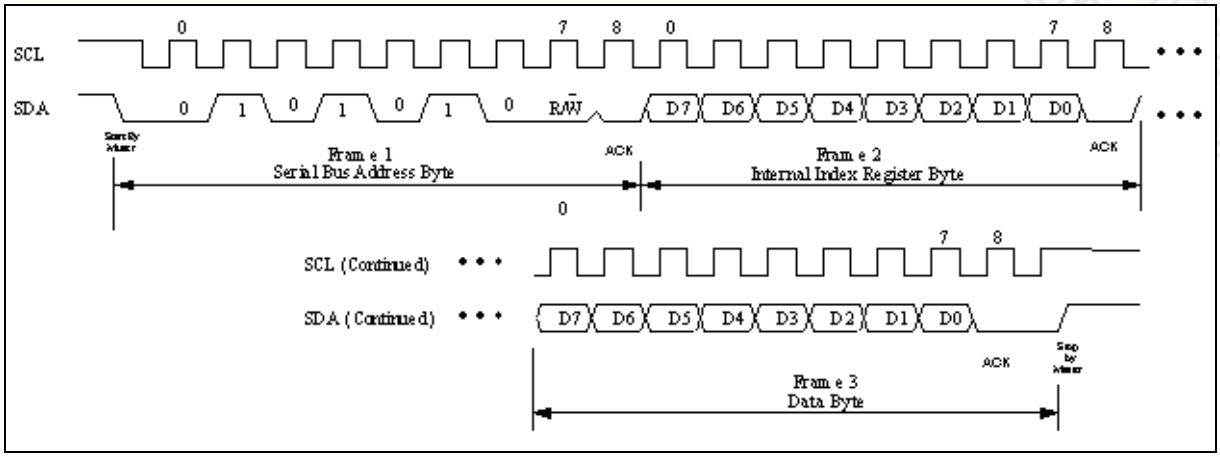
6.1 GENERAL DESCRIPTION

The NCT7802Y is a Nuvoton Hardware Monitor IC, contains one on-die and up to 5 remote temperature sensors, with SMBus and Intel PECI3.0 interface. There're also five voltage monitoring channels, 3 fan control groups, and GPIO functions with SMBus interface. NCT7802Y supports up to 8 sets SMBus address selection, it also provides ALERT#/SMI#/T_CRIT#/BEEP and RESET# alarm signals for event notification.

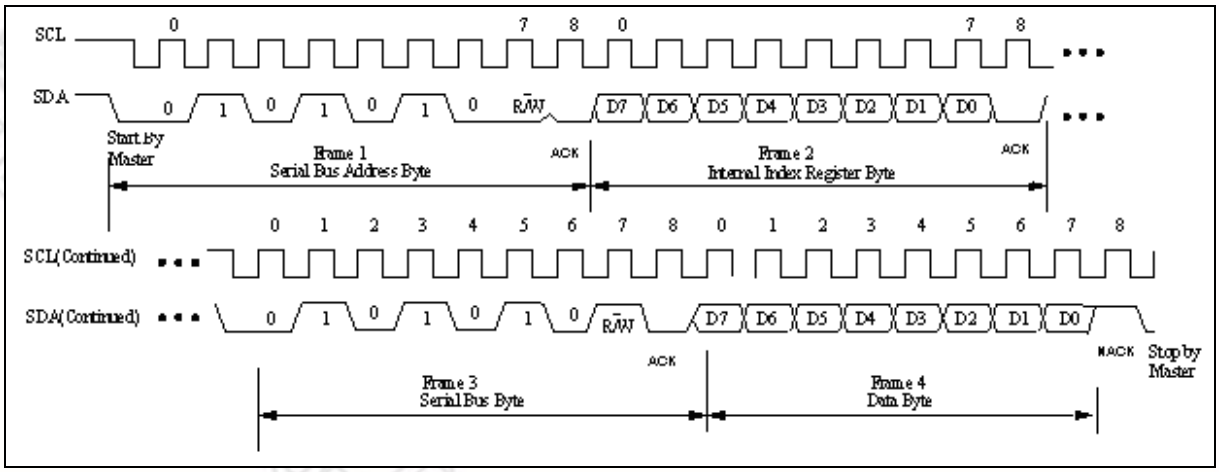
6.2 ACCESS INTERFACE

NCT7802Y provides SMBus to access the internal register, supports SMBus byte write and byte read protocols.

6.2.1 Data write to the internal register



6.2.2 Data read from the internal register



6.3 ADDRESS SETTING

NCT7802Y has three address pins and multi-function with FANCTRL1~3, the SMBus address will be strapped when VCC ready 100mS, during the 100mS, the level of strapping pins must be fixed. The address will be retained as long as the VCC of NCT7802Y is maintained. The pull-up power plane must be the same as the VCC power of NCT7802Y.

ADD0(FANCTRL1)	ADD1(FANCTRL2)	ADD2(FANCTRL3)	ADDRESS
0	0	0	0101 000X
0	0	1	0101 001X
0	1	0	0101 010X
0	1	1	0101 011X
1	0	0	0101 100X
1	0	1	0101 101X
1	1	0	0101 110X*1
1	1	1	0101 111X*2

X=Read/Write# Bit

*1 When set the NCT7802Y to address 5Ch, EEPROM loading function will be enabled, EEPROM address has to be ACh, refer to section 6.15.

*2 When set the NCT7802Y to address 5Eh, EEPROM loading function will be enabled, EEPROM address has to be AEh, refer to section 6.15.

6.4 TEMPERATURE MONITOR DATA FORMAT

6.4.1 The local temperature (on-die) data with 8-bit 2`s complement format

TEMPERATURE	8-BIT DIGITAL OUTPUT
+127°C	0111,1111
+25°C	0001,1001
+2°C	0000,0010
+1°C	0000,0001
+0°C	0000,0000
- 1°C	1111,1111
- 2°C	1111,1110
- 25°C	1110,0111
- 128°C	1000,0000

6.4.2 The remote temperature data with 11-bit 2's complement format

TEMPERATURE	8-BIT DIGITAL OUTPUT HIGH BYTE	3-BIT DIGITAL OUTPUT LOW BYTE
+127.875°C	0111,1111	111X,XXXX
+25.750°C	0001,1001	110X,XXXX
+2.250°C	0000,0010	010X,XXXX
+1.125°C	0000,0001	001X,XXXX
+0.000°C	0000,0000	000X,XXXX
- 1.125°C	1111,1110	111X,XXXX
- 2.250°C	1111,1101	110X,XXXX
- 25.750°C	1110,0110	010X,XXXX
- 127.875°C	1000,0000	001X,XXXX

6.5 VOLTAGE SENSE DATA FORMAT

MNTVSEN Low Byte together with MNTVSEN High Byte forms the 10-bit count value. If MNTVSEN High Byte readout is read successively, the NCT7802Y will latch the MNTVSEN Low Byte for next read. Then voltage readout high byte and low byte are combined to *10-bitVoltageValue*.

For VSEN1~3 and Vcore monitoring, real voltage calculations should follow the formula:

$$Voltage(V) = 10bitCountValue \times 0.002$$

VOLTAGE	MNTVSEN HIGH BYTE	MNTVSEN LOW BYTE
+2 V	1111,1010	00XX,XXXX
+1 V	0111,1101	00XX,XXXX
+0.036 V	0000,0100	10XX,XXXX
+0 V	0000,0000	00XX,XXXX

For VCC monitoring, real voltage calculations should follow the formula:

$$Voltage(V) = 10bitCountValue \times 0.004$$

6.6 FAN_IN Count Calculation

The FAN_IN tachometer high byte and low byte are combined to 13-bitCountValue. Real RPM (Rotate per Minute) calculation should follow the formula:

$$FanSpeed(RPM) = \frac{1.35 \times 10^6}{(13 - bitCountValue) \times (FanPoles/4)}$$

In this formula, FanPoles stands for the number of NS pole pairs inside the fan. Normally an N-S-N-S Fan (FanPoles=4) generates 2 pulses after completing one rotation.

6.7 FAN_OUT Duty Cycle / DC Level Calculation

The NCT7802Y provides 3 set of PWM for fan speed control. The duty cycle of PWM can be programmed by an 8-bit register. The expression of duty cycle can be represented as follow formula:

$$\text{Duty}-\text{cycle}(\%) = \frac{\text{Programmed 8-bit Register Value}}{255} \times 100\%$$

The NCT7802Y provides 2 set of DC output for fan speed control on FANCTL1 and FANCTL2. The DC output can be programmed by an 8-bit register. The expression of DC level can be represented as follow formula:

$$\text{Output Voltage (V)} = VCC \times \frac{\text{Programmed 8-bit Register Value}}{255}$$

6.8 SMART FAN™ IV Control Parameters

In SMART FAN™ IV Mode, there are some Fan control parameters as below descriptions:

6.8.1 Step Up Time / Step Down Time

SMART FAN™ IV is designed for the smooth operation of the fan. The Up Time / Down Time register defines the time interval between successive duty increases or decreases. If this value is set too small, the fan will not have enough time to speed up after tuning the duty and sometimes may result in unstable fan speed. On the other hand, if Up Time / Down Time is set too large, the fan may not work fast enough to dissipate the heat. This register should never be set to 0, otherwise, the fan duty will be abnormal.

6.8.2 Fan Output Start-up Value

From still to rotate, the fan usually needs a higher fan output value to generate enough torque to conquer the restriction force. Thus the Fan Output Start-up Value is used to turn on the fan with the specified output value.

6.8.3 Fan Output Nonstop

It takes some time to bring a fan from still to working state. Therefore, Nonstop value are designed with first FANCTL step output to keep the fan working when the system does not require the fan to help reduce heat but still want to keep the fast response time to speed up the fan.

6.8.4 Fan Output Stop Time

A time interval is specified to turn off the fan if SMART FAN™ IV continuously requests to slow down the fan which has already reached the Stop time.

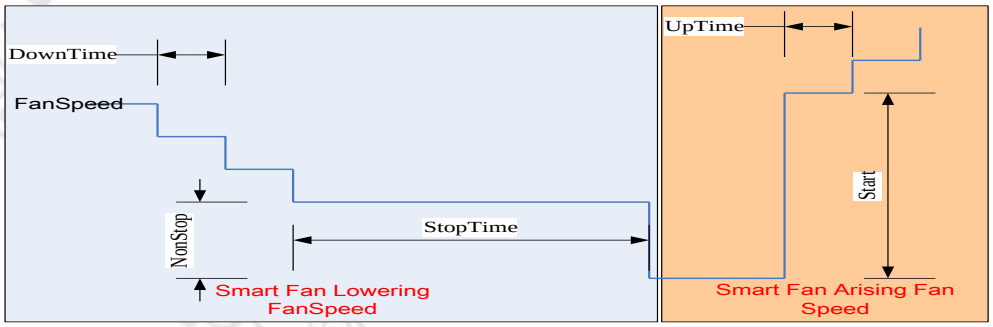


Figure 6-1 SMART FAN™ IV Control Parameters

6.9 SMART FAN™ IV

SMART FAN™ IV supports Fan Duty Outputs Mode and Close Loop Fan Control (RPM) Mode to control the fan speed.

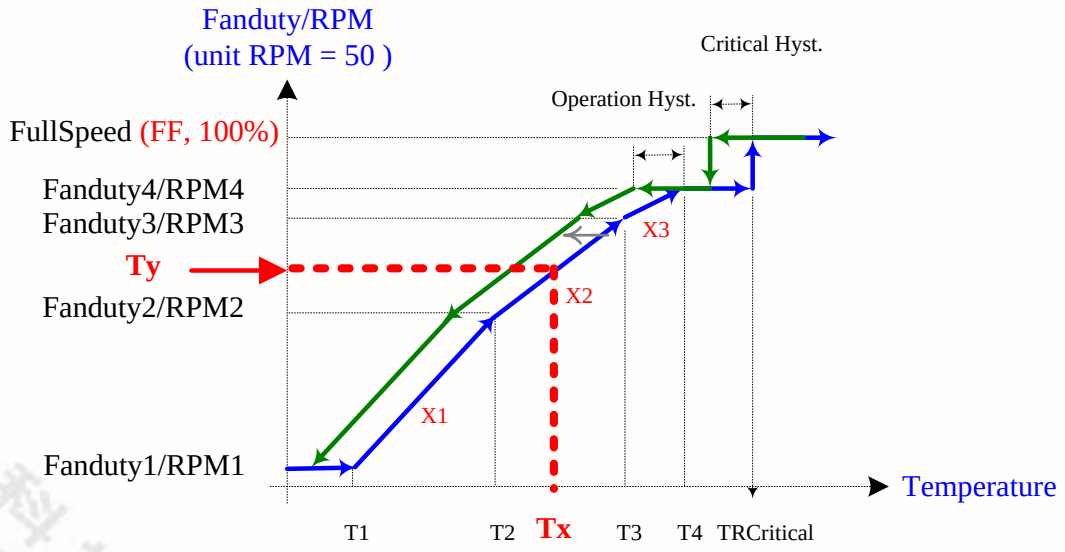
There're 3 slopes can be obtained by setting FanDuty/RPM1~FanDuty/RPM4 and T1~T4 through the registers. When the temperature rises, FAN Output will calculate the target FanDuty/RPM based on the current slope. For example, assuming Tx is the current temperature and FanDuty/RPM is the target, then the slope:

$$X2 = \frac{(FanDuty3/RPM3) - (FanDuty2/RPM2)}{(T3 - T2)}$$

Fan Output:

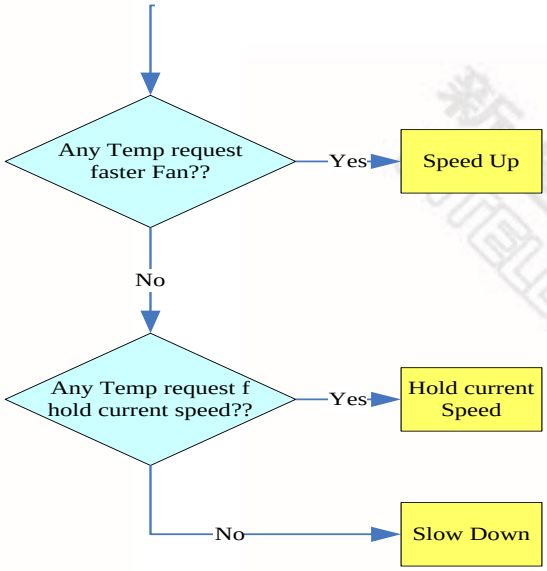
$$Target\ FanDuty\ or\ RPM = (FanDuty2\ or\ RPM2) + (Tx - T2) \cdot X2$$

Figure 6-2 SMART FAN™ IV Mechanism



In addition, SMART FAN™ IV can also set up Critical Temperature and Hysteresis. If the current temperature exceeds Critical Temperature, external fan will be forced by maximum FanDuty to meet the largest target FanDuty or RPM, Which is 0xFF. The target FanDuty & RPM value will be determined in accordance to the slope only when the temperature falls below (TCritical – Critical Hyst).

NCT7802Y provide 3 temperature sources selection to map the fan, the algorithm will make a decision to control the fan as below figure:



6.10 PECI

PECI (Platform Environment Control Interface) is a new digital interface to read the CPU temperature of Intel® CPUs. With a bandwidth ranging from 2 Kbps to 2 Mbps, PECI uses a single wire for self-clocking and data transfer. By interfacing to the Digital Thermal Sensor (DTS) in the Intel® CPU, PECI reports a negative temperature (in counts) relative to the processor's temperature at which the thermal control circuit (TCC) is activated. At the TCC Activation temperature, the Intel CPU will operate at reduced performance to prevent the device from thermal damage.

PECI is one of the temperature sensing methods that the NCT7802Y supports. The NCT7802Y contains a PECI master and reads the CPU PECI temperature. The CPU is a PECI client.

The PECI temperature values returning from the CPU are in "counts" which are approximately linear in relation to changes in temperature in degrees centigrade. However, this linearity is approximate and cannot be guaranteed over the entire range of PECI temperatures. For further information, refer to the PECI specification. All references to "temperature" in this section are in "counts" instead of "°C".

Figure 6-3 shows a typical fan speed (PWM duty cycle) and PECI temperature relationship.

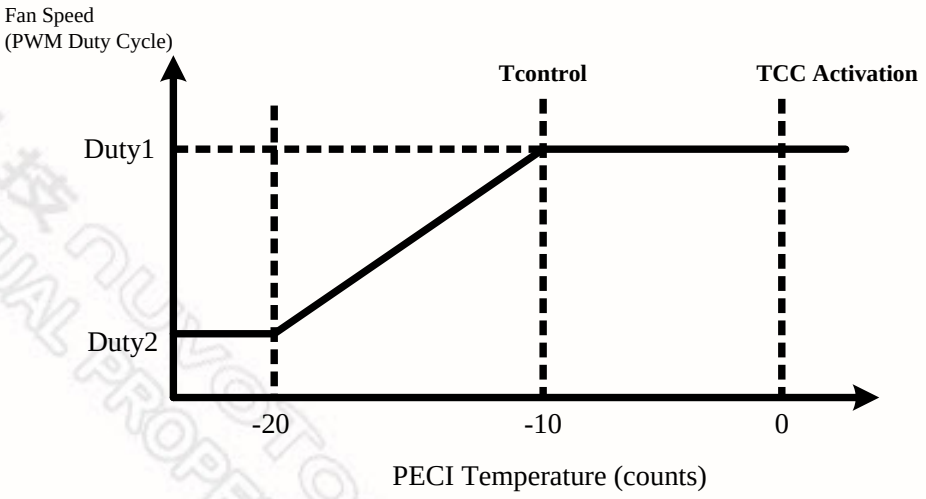


Figure 6-3 PECI Temperature

In this illustration, when PECI temperature is -20, the PWM duty cycle for fan control is at Duty2. When CPU is getting hotter and the PECI temperature is -10, the PWM duty cycle is at Duty1.

At Tcontrol PECI temperature, the recommendation from Intel is to operate the CPU fan at full speed. Therefore Duty1 is 100% if this recommendation is followed. The value of Tcontrol can be obtained by reading the related Machine Specific Register (MSR) in the Intel CPU. The Tcontrol MSR address is usually in the BIOS Writer's guide for the CPU family in question. Refer to the relevant CPU documentation from Intel for more information. In this example, Tcontrol is -10.

When the PECI temperature is below -20, the duty cycle is fixed at Duty2 to maintain a minimum (and constant) RPM for the CPU fan.

NCT7802Y's fan control circuit can only accept positive real-time temperature inputs and limits setting (when SMART FAN™ IV mode). The device provides offset registers to 'shift' the negative PECI readings to positive values otherwise the fan control circuit will not function properly. The offset registers are the Tbase registers located at Bank1, Index09h and Index0Ah. All default values of these Tbase registers are 8'h00.These registers should be programmed with (positive) values so that the resultant value (Tbase + PECI) is always positive. The unit of the Tbase register contents is "count" to match that of PECI values. The resultant value (Tbase + PECI) should not be interpreted as the "temperature" (whether in count or °C) of the PECI client (CPU).

Figure 6-4 Temperature and Fan Speed Relation after Tbase Offsets shows the temperature/fan speed relationship after Tbase offsets are applied (based on Figure 6-3 PECI Temperature). This view is from the perspective of the NCT7802Y fan control circuit.

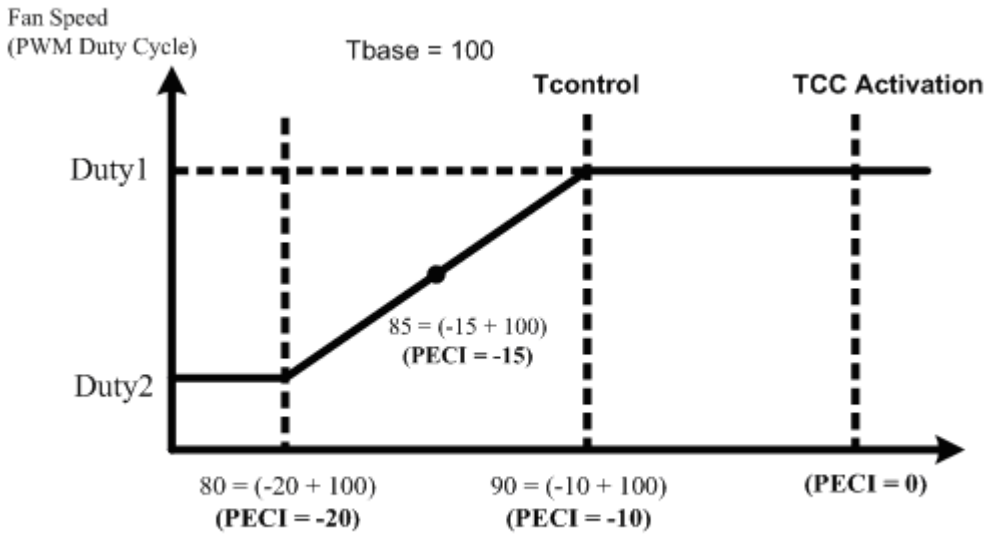


Figure 6-4 Temperature and Fan Speed Relation after Tbase Offsets

Assuming Tbase is set to 100 and the PECI temperature is -15 , the real-time temperature value to the fan control circuit will be 85 (-15 + 100). The value of 55 (hex) will appear in the relevant real-time temperature register.

While using SMART FAN™ IV control function of NCT7802Y, BIOS/software must include Tbase in determining the thresholds (limits). In this example, assuming Tcontrol is -10 and Tbase is set to 100,

the threshold temperature value corresponding to the “100% fan duty cycle” event is 90 (-10+100). The value of 5A (hex) should be written to the relevant threshold register.

Tcontrol is typically -10 to -20 for PECI-enabled CPUs. Base on that, a value of 85 ~100 for Tbase could be set for proper operation of the fan control circuit. This recommendation is applicable for most designs. In general, the concept presented in this section could be used to determine the optimum value of Tcontrol to match the specific application.

6.11 ALERT# Output

The NCT7802Y ALERT# pin is an active-low open-drain output pin which is triggered when temperature measured and fan exceeds the limitation defined in the limit registers.

6.11.1 ALERT# Output Mechanism

Figure 6-5 shows the mechanism of the ALERT# output. In this mode, the NCT7802Y will set the ALERT mask bit of Configuration Register during a read of the Status Register if any flag in Status Register, except the ADC_Busy flag and Remote Diode Open flag, is set. This prevents further ALERT# triggering until the master has reset the ALERT mask bit (write 0 to Alert_MSK in Bank0 CR[21h] Bit7), at the end of the interrupt service routine. The Status Register flags are cleared only upon a read Status Register command from the master and will be re-alerted at the end of the next temperature conversion if the measured temperature still falls outside of the allowed range.

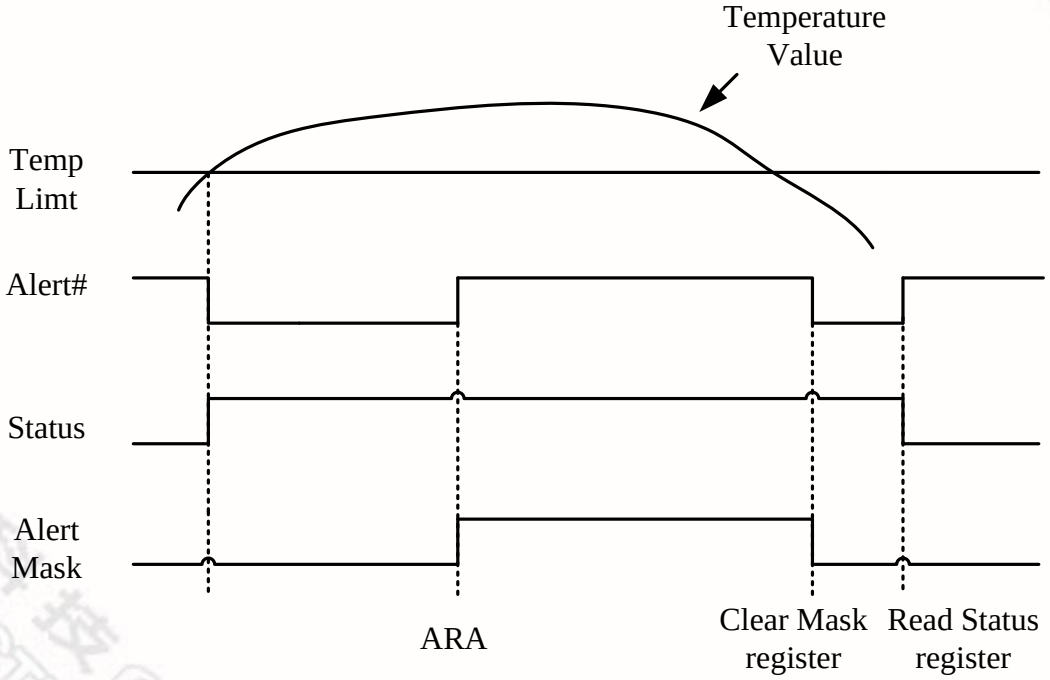


Figure 6-5 ALERT# Output Mechanism

6.11.2 ALERT# Response Address

Figure 6-6 shows the mechanism of the SMBus ALERT# Response Address (ARA) support on ALERT# output. In this mode, the ALERT# output of the NCT7802Y is connected to the SMBus alert line which has more than one device connected to it. Through such and implementation, SMBus alert mode can assist the master in resolving which salve generates an interrupt. When the measured temperature falls outside of the allowed range, the ALERT# pin will be pulled low and the corresponding alert flags in Status Register will be set to 1. The ALERT# mask bit will just be set if there is a read command for Status Register or when ARA occurs from master (Alert Response Address is 0001100x). Meanwhile, the NCT7802Y will generate and return its own address to the master. If the temperature never falls outside of the allowed range, the latched ALERT# pin can release by the reset ALERT mask bit and the latched corresponding alert flags in Status Register can release by reading command for Status Register.

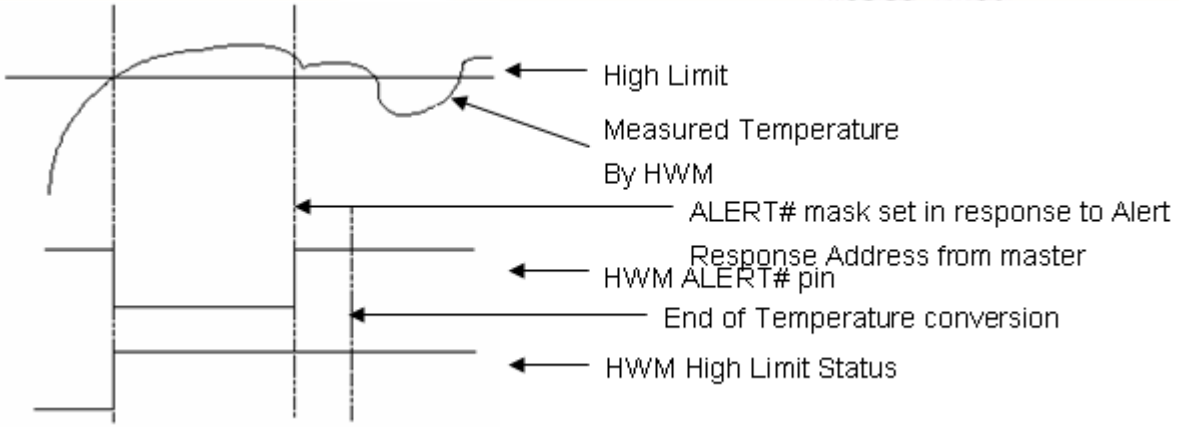


Figure 6-6 SMBus ARA Mechanism

6.12 T_CRIT# Output

T_CRIT# output pulls low when the measured temperature exceeds the critical temperature threshold point. Once the T_CRIT# output pulls low, it will not be set high until the measured temperature is lower than critical temperature threshold point.

6.13 SMI# Output

6.13.1 Temperature

SMI# for temperature monitoring provides 3 modes: Comparator Interrupt Mode, Two-Times Interrupt Mode, and the One-Time Interrupt Mode.

6.13.1.1. Comparator Interrupt Mode

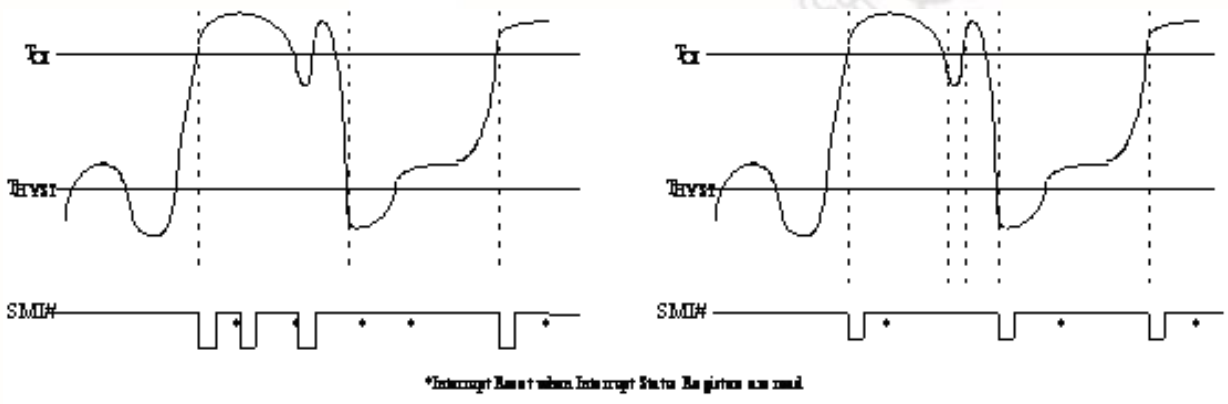
Temperature exceeding T_O causes an interrupt and this interrupt will be reset when reading all of the Interrupt Status Registers. Once an interrupt event has occurred by exceeding T_O, then reset, if the temperature remains above the T_{HYST}, the interrupt will occur again when the next conversion has completed. If an interrupt event has occurred by exceeding T_O and not reset, the interrupts will not occur again. The interrupts will continue to occur in this manner until the temperature goes below T_{HYST}.

6.13.1.2. Two-Times Interrupt Mode

Temperature exceeding T_O causes an interrupt and then temperature going below T_{HYST} will also cause an interrupt if the previous interrupt has been reset by reading all the interrupt Status Register. Once an interrupt event has occurred by exceeding T_O, then reset, if the temperature remains above the T_{HYST}, the interrupt will not occur.

6.13.1.3. One-Time Interrupt Mode

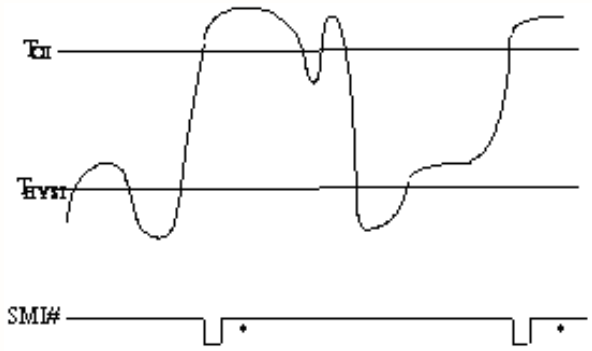
Temperature exceeding T_O causes an interrupt and then temperature going below T_{HYST} will not cause an interrupt. Once an interrupt event has occurred by exceeding T_O, then going below $T_{HYST,}$ an interrupt will not occur again until the temperature exceeding T_O.



*Interrupt Reset when Interrupt Status Register are read.

Comparator Interrupt Mode

Two-Times Interrupt Mode



*Interrupt Reset when Interrupt Status Register are read.

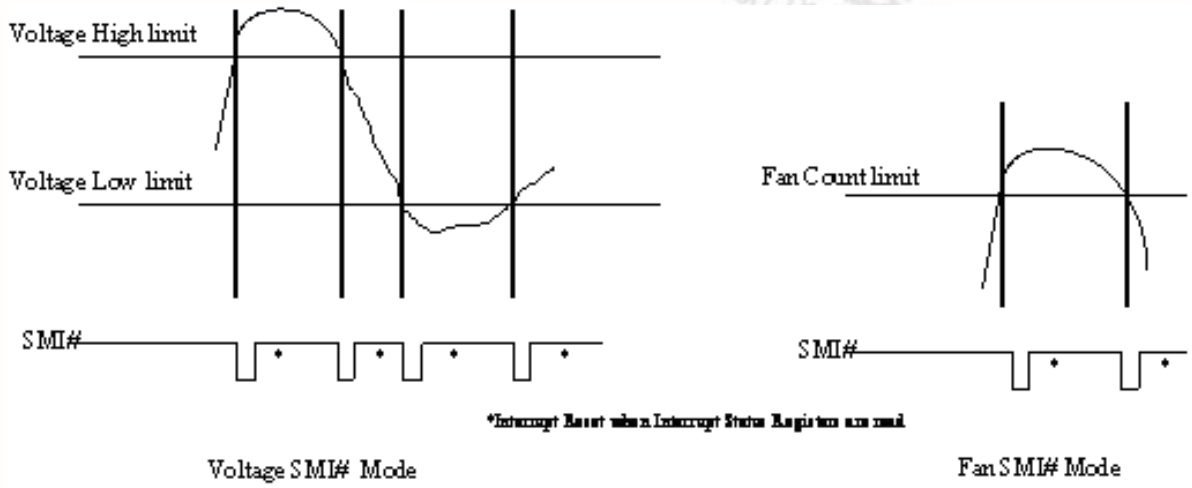
One-Time Interrupt Mode

6.13.2 Voltage

SMI# interrupt for voltage is Two-Times Interrupt Mode. Voltage exceeds high limit or going below low limit, it will causes an interrupt if the previous interrupt has been reset by reading all the interrupt Status Register.

6.13.3 Fan

SMI# interrupt for fan is Two-Times Interrupt Mode. Fan count exceeds the limit, or exceeding and then going below the limit, it will cause an interrupt if the previous interrupt has been reset by reading all the interrupt Status Register.



6.14 RESET# Output

The NCT7802Y provides a reset controller for the system's 3.3V supply rail. The RESET# pin will pull low pulse when the measured VCC below the threshold voltage. The RESET# pin set to '1' after the 3.3V VCC supply rises above its threshold voltage.

6.15 Self-Programming from EEPROM

The NCT7802Y supports self-programming through an external I2C EEPROM during NCT7802Y power-on. The EEPROM is recommended to be 24C02 type. During 200ms period after power on, NCT7802Y will detect if the external EEPROM exists by issuing the SMBus Byte Read command with 50KHz SMBus clock frequency. If a NACK of SMBus protocol is detected, NCT7802Y will stop self-programming, otherwise, NCT7802Y will keep loading data from external EEPROM sequentially to Bank0 Index 00h~E2h registers. Therefore, other SMBus master has to avoid from accessing NCT7802Y during the 200ms after power-on.

Please also refer to NCT7802Y APN for self-programming implementation.

7. REGISTER DESCRIPTION

7.1 BANK0 REGISTER MAP

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
0	Bank Select	R/W	00	RSV							BKSEL
1	Read RTD1 High Byte	R	00	MNTRTD1[10:3]							
2	Read RTD2 High Byte	R	00	MNTRTD2[10:3]							
3	Read RTD3 High Byte	R	00	MNTRTD3[10:3]							
4	Read LTD High Byte	R	00	MNTLTD[7:0]							
5	Read Temp Low Byte	R	00	MNTTD_Lsb[2:0]			RSV				
6	Read PECI 0 Temp High Byte	R	00	MNTPECI0[9:2]							
7	Read PECI1 Temp High Byte	R	00	MNTPECI1[9:2]							
8	Read PECI Low Byte	R	00	MNTPECI_Lsb[1:0]		RSV					
9	Read VCC	R	00	MNTVCC[9:2]							
A	Read VCore	R	00	MNTVCore[9:2]							
C	Read VSEN1	R	00	MNTVSEN1[9:2]							
D	Read VSEN2	R	00	MNTVSEN2[9:2]							
E	Read VSEN3	R	00	MNTVSEN3[9:2]							
F	Read Volt Low Byte	R	00	MNTV_Lsb[1:0]		RSV					
10	Read Fan Count 1High Byte	R	FF	MNTFAN1[12:5]							
11	Read Fan Count 2High Byte	R	FF	MNTFAN2[12:5]							
12	Read Fan Count 3High Byte	R	FF	MNTFAN3[12:5]							
13	Read Fan Count 1Low Byte	R	F8	MNTFAN_Lsb[4:0]					RSV		
15	MNTIMON_Percent	R	00	MNTIMON_Percent							
17	Diode Fault Alert Status	R	00	RSV					STS_DF3	STS_DF2	STS_DF1
18	Low Alert Status	R	00	RSV		STS_PECI1	STS_PECI0	STS_AL4	STS_AL3	STS_AL2	STS_AL1
19	High Alert Status	R	00	RSV		STS_PECI1	STS_PECI0	STS_AH4	STS_AH3	STS_AH2	STS_AH1
1A	Fan Alert Status	R	00	RSV	FAN_TAR3	FAN_TAR2	FAN_TAR1	RSV	FAN_FC3	FAN_FC2	FAN_FC1
1B	TCRIT Alert Status	R	00	RSV		STS_PECI1	STS_PECI0	STS_TC4	STS_TC3	STS_TC2	STS_TC1
1C	GPIO Alert Status	R	00	RSV		STS_GPIO6	STS_GPIO5	STS_GPIO4	STS_GPIO3	STS_GPIO2	STS_GPIO1
1D	SMI Temp Status	R	00	RSV		STS_PECI1	STS_PECI0	STS_LTD	STS_RTD3	STS_RTD2	STS_RTD1
1E	SMI Voltage status	R	00	RSV				STS_VCC	STS_VSEN3	STS_VSEN2	STS_VSEN1
1F	SMI FAN status	R	00	RSV	FAN_TAR3	FAN_TAR2	FAN_TAR1	RSV	FAN_FC3	FAN_FC2	FAN_FC1
20	TCRIT Real Time Status	R	00	RSV				LTD_Texc	RTD3_Texc	RTD2_Texc	RTD1_Texc

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
21	START	R/W	01	Msk_Alert	RSV						START
22	Mode Selection	R/W	7F	RSV	EnLTD	RTD3_MD		RTD2_MD		RTD1_MD	
23	PECI Enable	R/W	00	RSV						EnPECI1	EnPECI0
24	Fan Enable	R/W	07	RSV					EnFan3	EnFan2	EnFan1
25	Voltage monitor Enable	R/W	03	RSV						EnVCore	EnVCC
26	Conversion Rate	R/W	03	RSV						ConvRate[1:0]	
27	Fault Queue	R/W	03	RSV						FaultQueue[1:0]	
28	Alert High link to T_CRIT#	R/W	00	RSV					SYS3	SYS2	SYS1
29	Reset time setting	R/W	04	RSV					SetResetTime		
2A	Reset Limit Low Byte	R/W	EE	ResetLimit[7:0]							
2B	Reset Limit High Byte	R/W	80	ResetLimit[9:8]		RSV					
2F	SMI Control	R/W	00	ALERT_SMI_Sel	TCRIT_BEEP_Sel	SMI_MOD	SMI_POL	OVT_MOD	En_SMI	TempSmiMode	
30	RTD1 Temp High Limit	R/W	55	RTD1_HL							
31	RTD1 Temp Low Limit	R/W	00	RTD1_LL							
32	RTD2 Temp High Limit	R/W	55	RTD2_HL							
33	RTD2 Temp Low Limit	R/W	00	RTD2_LL							
34	RTD3 Temp High Limit	R/W	55	RTD3_HL							
35	RTD3 Temp Low Limit	R/W	00	RTD3_LL							
36	LTD Temp High Limit	R/W	55	LTD_HL							
37	LTD Temp Low Limit	R/W	00	LTD_LL							
38	DTS Temp High Limit	R/W	55	DTS_HL							
39	DTS Temp Low Limit	R/W	00	DTS_LL							
3A	RTD1 TCRIT Threshold	R/W	64	TCRIT_RTD1							
3B	RTD2 TCRIT Threshold	R/W	64	TCRIT_RTD2							
3C	RTD3 TCRIT Threshold	R/W	64	TCRIT_RTD3							
3D	LTD TCRIT Threshold	R/W	64	TCRIT_LTD							
3E	DTS TCRIT Threshold	R/W	64	TCRIT_DTS							
3F	Vsen1 High Limit Low Byte	R/W	FF	VSEN1_HL[7:0]							
40	Vsen1 Low Limit low Byte	R/W	00	VSEN1_LL[7:0]							
41	Vsen2 High Limit low Byte	R/W	FF	VSEN2_HL[7:0]							
42	Vsen2 Low Limit low sByte	R/W	00	VSEN2_LL[7:0]							
43	Vsen3 High Limit low Byte	R/W	FF	VSEN3_HL[7:0]							
44	Vsen3 Low Limit low Byte	R/W	00	VSEN3_LL[7:0]							
45	VCC High limit low byte	R/W	FF	VCC_HL[7:0]							
46	VCC Low limit low byte	R/W	00	VCC_LL[7:0]							
47	VSEN high Byte 1	R/W	CC	VSEN1_HL[9:8]		VSEN1_LL[9:8]		VSEN2_HL[9:8]		VSEN2_LL[9:8]	

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
48	VSEN high Byte 2	R/W	CC	VSEN3_HL[9:8]		VSEN3_LL[9:8]		VCC_HL[9:8]		VCC_LL[9:8]	
49	FANIN1 Limit low Byte	R/W	FF	FANIN1_HL[7:0]							
4A	FANIN2 Limit low Byte	R/W	FF	FANIN2_HL[7:0]							
4B	FANIN3 Limit low Byte	R/W	FF	FANIN3_HL[7:0]							
4C	FANIN1 Limit high byte	R/W	F8	FANIN1_HL[12:8]					RSV		
4D	FANIN2 Limit high byte	R/W	F8	FANIN2_HL[12:8]					RSV		
4E	FANIN3 Limit high byte	R/W	F8	FANIN3_HL[12:8]					RSV		
4F	Alert Mask function	R/W	7F	RSV	Msk_TC	Msk_GPIO	Msk_TART	Msk_FC	Msk_AH	Msk_AL	Msk_DF
50	Alert / SMI Mask Temp Channel	R/W	3F	RSV		Msk_Peci1	Msk_Peci0	Msk_LTD	Msk_RTD3	Msk_RTD2	Msk_RTD1
51	Alert / SMI Mask FAN Channel	R/W	07	RSV					Msk_Fan3	Msk_Fan2	Msk_Fan1
52	SMI Mask Voltage Channel	R/W	8F	Msk_Reset	RSV			Msk_VCC	Msk_VSEN3	Msk_VSEN2	Msk_VSEN1
53	TCRIT Mask	R/W	BF	Msk_ALL	RSV	Msk_Peci1	Msk_Peci0	Msk_LTD	MSk_RTD3	Msk_RTD2	Msk_RTD1
54	GPIO Alert Mask	R/W	3F	RSV		Msk_GPIO6	Msk_GPIO5	Msk_GPIO4	Msk_GPIO3	Msk_GPIO2	Msk_GPIO1
55	GPIO Enable	R/W	00	RSV		EnGPIO6	EnGPIO5	EnGPIO4	EnGPIO3	EnGPIO2	EnGPIO1
56	GPIO mode	R/W	3F	RSV		GPIO6 Mode	GPIO5 Mode	GPIO4 Mode	GPIO3 Mode	GPIO2 Mode	GPIO1 Mode
57	GPIO output type	R/W	00	RSV		GPIO6 OB	GPIO5 OB	GPIO4 OB	GPIO3 OB	GPIO2 OB	GPIO1 OB
58	GPIO input data	R	00	RSV		GPIO6 in	GPIO5 in	GPIO4 in	GPIO3 in	GPIO2 in	GPIO1 in
59	GPIO output data	R/W	00	RSV		GPIO6 out	GPIO5 out	GPIO4 out	GPIO3 out	GPIO2 out	GPIO1 out
5A	Beep voltage Enable	R/W	00	RSV			EnBP_Reset	EnBP_VCC	EnBP_V3	EnBP_V2	EnBP_V1
5B	Beep Fan Enable	R/W	00	RSV					EnBP_Fan3	EnBP_Fan2	EnBP_Fan1
5C	Beep Temp Enable	R/W	00	RSV		EnBP_Peci1	EnBP_Peci0	EnBP_LTD	EnBP_RTD3	EnBP_RTD2	EnBP_RTD1
5D	Beep Enable	R/W	00	RSV		EnBP_SMI	EnBP_DF	EnBP_AL	EnBP_AH	EnBP_TC	Beep_En
5E	Fan Control Output Type	R/W	00	RSV						EnDCFAN2	EnDCFAN1
5F	Fan Control Output Mode	R/W	00	RSV	PWM3_Pol	PWM2_Pol	PWM1_Pol	RSV	PWM3_OD	PWM2_OD	PWM1_OD
60	Fan Control 1 Output Value	RW	7F	FANDuty1							
61	Fan Control 2 Output Value	RW	7F	FANDuty2							
62	Fan Control 3 Output Value	RW	7F	FANDuty3							
63	Close-Loop Fan Control RPM mode Register and Configure Register of PECI Error	RW	00	TwoDimension			RPM_HIGH_EN			PECIERR	
64	Temperature to Fan mapping Relationships	RW	00	RSV	Temp2FanSelect			RSV	Temp1FanSelect		
65	Temperature to Fan mapping Relationships	RW	00	RSV					Temp3FanSelect		
66	Configuration Register 1	RW	00	Temp2_Share_En	Temp2_Share_Sel			Temp1_Share_En	Temp1_Share_Sel		
67	Configuration Register 2	RW	00	RSV				Temp3_Share_En	Temp3_Share_Sel		
68	Configuration Register 3	RW	00	RSV	Temp2_Sour_Sel			RSV	Temp1_Sour_Sel		

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
69	Configuration Register 4	RW	00	RSV					Temp3_Sour_Sel		
6D	Close-Loop Fan Control RPM mode Tolerance	RW	02	RSV				Generic_Tol_RPM			
6E	Fanctl Step Up Time	RW	0A	UpTime							
6F	Fanctl Step Down Time	RW	0A	DownTime							
70	DefaultFanSpeed	RW	7F	DefaultFanSpeed							
71	PWM1 Prescalar	RW	84	FanOutDivisor1[7]	FanOutDivisor1[6:0]						
72	PWM2 Prescalar	RW	84	FanOutDivisor2[7]	FanOutDivisor2[6:0]						
73	PWM3 Prescalar	RW	84	FanOutDivisor3[7]	FanOutDivisor3[6:0]						
74	Temp1 Hystersis	RW	53	RSV	Criti_HysT1			RSV	Oper_HysT1		
75	Temp2 Hystersis	RW	53	RSV	Criti_HysT2			RSV	Oper_HysT2		
76	Temp3 Hystersis	RW	53	RSV	Criti_HysT3			RSV	Oper_HysT3		
77	Fanctl Start Duty Cycle	RW	30	StartDutyCycle							
78	Stop Time of Fanctl	RW	FF	StopTime							
79	NonStop Enable	RW	00	RSV					NonStop		
7A	Fan Output Min Value when PECI Error	RW	80	MinDuty_PECIERR							
80	Table 1 Transition Point 1	RW	19	Temp1Table_TR1							
81	Table 1 Transition Point 2	RW	23	Temp1Table_TR2							
82	Table 1 Transition Point 3	RW	2D	Temp1Table_TR3							
83	Table 1 Transition Point 4	RW	37	Temp1Table_TR4							
84	Table 1 Critical Point	RW	3C	Temp1Table_TRCritical							
85	Table 1 Y-axis Transition Point 1	RW	8C	Temp1Table_FL1							
86	Table 1 Y-axis Transition Point 2	RW	AA	Temp1Table_FL2							
87	Table 1 Y-axis Transition Point 3	RW	C8	Temp1Table_FL3							
88	Table 1 Y-axis Transition Point 4	RW	E6	Temp1Table_FL4							
90	Table 2 Transition Point 1	RW	19	Temp2Table_TR1							
91	Table 2 Transition Point 2	RW	23	Temp2Table_TR2							
92	Table 2 Transition Point 3	RW	2D	Temp2Table_TR3							
93	Table 2 Transition Point 4	RW	37	Temp2Table_TR4							
94	Table 2 Critical Point	RW	3C	Temp2Table_TRCritical							
95	Table 2 Y-axis Transition Point 1	RW	8C	Temp2Table_FL1							
96	Table 2 Y-axis Transition Point 2	RW	AA	Temp2Table_FL2							
97	Table 2 Y-axis Transition Point 3	RW	C8	Temp2Table_FL3							
98	Table 2 Y-axis Transition Point 4	RW	E6	Temp2Table_FL4							
A0	Table 3 Transition Point 1	RW	19	Temp3Table_TR1							
A1	Table 3 Transition Point 2	RW	23	Temp3Table_TR2							

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
A2	Table 3 Transition Point 3	RW	2D	Temp3Table_TR3							
A3	Table 3 Transition Point 4	RW	37	Temp3Table_TR4							
A4	Table 3 Critical Point	RW	3C	Temp3Table_TRCritical							
A5	Table 3 Y-axis Transition Point 1	RW	8C	Temp3Table_FL1							
A6	Table 3 Y-axis Transition Point 2	RW	AA	Temp3Table_FL2							
A7	Table 3 Y-axis Transition Point 3	RW	C8	Temp3Table_FL3							
A8	Table 3 Y-axis Transition Point 4	RW	E6	Temp3Table_FL4							
C1	TD1 Offset	R/W	3D	RSV		Offset_TD1					
C2	TD2 Offset	R/W	3D	RSV		Offset_TD2					
C4	TR1 Offset	R/W	00	RSV				Offset_TR1			
C5	TR2 Offset	R/W	00	RSV				Offset_TR2			
C6	TR3 Offset	R/W	00	RSV				Offset_TR3			
CB	Filter Level Select	R/W	00	LDT		RT3		RT2		RT1	
E3	Programmable Temperature 1	R/W	00	PGM_TEMP1[7:0]							
E4	Programmable Temperature 2	R/W	00	PGM_TEMP2[7:0]							
FC	SOFT RESET	W	--	INIT	RSV						
FD	Vendor ID	R	50	Vendor ID							
FE	ChipID	R	C3	ChipID							
FF	Version ID	R	2x	Version ID (x=1,2,3…)							

新唐科技 nuvoTon INTELLECTUAL PROPERTY

7.2 BANK 0 REGISTER DETAIL

7.2.1 Bank Select Register

Location : Index 00h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV							BKSEL
FUNC.	**BKSEL :** Bank selection , 0=Bank0 , 1=Bank1							

7.2.2 Remote Diode 1 Temperature Readout Register (MSB)

Location : Index 01h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTRTD1[10:3]							
FUNC.	**MNTRTD1[10:3] :** Readout of RTD1 High Byte							

7.2.3 Remote Diode 2 Temperature Readout Register (MSB)

Location : Index 02h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTRTD2[10:3]							
FUNC.	**MNTRTD2[10:3] :** Readout of RTD2 High Byte							

7.2.4 Remote Diode 3 Temperature Readout Register (MSB)

Location : Index 03h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTRTD3[10:3]							
FUNC.	**MNTRTD3[10:3] :** Readout of RTD3 High Byte							

7.2.5 Local Diode Temperature Readout Register (MSB)

Location : Index 04h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTLTD[7:0]							
FUNC.	**MNTLTD[7:0] :** Readout of LTD Temperature							

7.2.6 Temperature Readout Register (LSB)

Location : Index 05h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTTD_LSB[2:0]			RSV				
FUNC.	**MNTTD_LSB[2:0] :** Readout of TD Low Byte							

7.2.7 PECI 0 Temperature Readout Register (MSB)

Location : Index 06h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTPECI0[9:2]							
FUNC.	**MNTPECI0[9:2] :** Readout of PECI0 High Byte							

7.2.8 PECI 1 Temperature Readout Register (MSB)

Location : Index 07h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTPECI1[9:2]							
FUNC.	**MNTPECI1[9:2] :** Readout of PECI1 High Byte							

7.2.9 Read PECI Temperature Readout Register (LSB)

Location : Index 08h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTPECI_LSB[1:0]		RSV					
FUNC.	**MNTPECI_LSB[1:0] :** Readout of PECI Low Byte							

7.2.10 VCC Readout Register (MSB)

Location : Index 09h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTVCC[9:2]							
FUNC.	**MNTVCC[9:2] :** Readout of VCC High Byte							

7.2.11 VCore Readout Register (MSB)

Location : Index 0Ah

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTVCore[9:2]							
FUNC.	**MNTVCore[9:2] :** Readout of VCore High Byte							

7.2.12 VSEN1 Readout Register (MSB)

Location : Index 0Ch

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTVSEN1[9:2]							
FUNC.	**MNTVSEN1[9:2] :** Readout of VSEN1 High Byte							

新唐科技 nuvoTon INTELLECTUAL PROPERTY

7.2.13 VSEN2 Readout Register (MSB)

Location : Index 0Dh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTVSEN2[9:2]							
FUNC.	**MNTVSEN2[9:2] :** Readout of VSEN2 High Byte							

7.2.14 VSEN3 Readout Register (MSB)

Location : Index 0Eh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTVSEN3[9:2]							
FUNC.	**MNTVSEN3[9:2] :** Readout of VSEN3 High Byte							

7.2.15 Voltage Readout Register (LSB)

Location : Index 0Fh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTV_LSB[1:0]		RSV					
FUNC.	**MNTV_LSB[1:0] :** Readout of Voltage Low Byte							

7.2.16 Fan Count 1 Readout Register (MSB)

Location : Index 10h

Type : Read Only

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	MNTFAN1[12:5]							
FUNC.	**MNTFAN1[12:5] :** Readout of Fan Count 1 High Byte							

7.2.17 Fan Count 2 Readout Register (MSB)

Location : Index 11h

Type : Read Only

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	MNTFAN2[12:5]							
FUNC.	**MNTFAN2[12:5] :** Readout of Fan Count 2 High Byte							

7.2.18 Fan Count 3 Readout Register (MSB)

Location : Index 12h

Type : Read Only

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	MNTFAN3[12:5]							
FUNC.	**MNTFAN3[12:5] :** Readout of Fan Count 3 High Byte							

7.2.19 Fan Count Readout Register (LSB)

Location : Index 13h

Type : Read Only

Power on default value : F8h

BIT	7	6	5	4	3	2	1	0
NAME	MNTFAN_LSB[4:0]					RSV		
FUNC.	**MNTFAN_LSB[4:0] :** Readout of Fan Count Low Byte							

7.2.20 MNTIMON Percent Register

Location : Index 15h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	MNTIMON_Percent							
FUNC.	**MNTIMON_Percent :** IMON Percent, the voltage input is VCore (0.9V=100%)							

7.2.21 Diode Fault Alert Status Register

Location : Index 17h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					STS_DF3	STS_DF2	STS_DF1
FUNC.	**STS_DF3 :** 1 indicates the TD3 fault **STS_DF2 :** 1 indicates the TD2 fault **STS_DF1 :** 1 indicates the TD1 fault							

7.2.22 Temperature Low Alert Status Register

Location : Index 18h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		STS_PECI1	STS_PECI0	STS_AL4	STS_AL3	STS_AL2	STS_AL1
FUNC.	**STS_PECI1 :** 1 indicates the PECI1 over low limit **STS_PECI0 :** 1 indicates the PECI0 over low limit **STS_AL4 :** 1 indicates the LTD over low limit **STS_AL3 :** 1 indicates the RTD3 over low limit **STS_AL2 :** 1 indicates the RTD2 over low limit **STS_AL1 :** 1 indicates the RTD1 over low limit							

7.2.23 Temperature High Alert Status Register

Location : Index 19h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		STS_PECI1	STS_PECI0	STS_AH4	STS_AH3	STS_AH2	STS_AH1
FUNC.	**STS_PECI1 :** 1 indicates the PECI1 over high limit **STS_PECI0 :** 1 indicates the PECI0 over high limit **STS_AH4 :** 1 indicates the LTD over high limit **STS_AH3 :** 1 indicates the RTD3 over high limit **STS_AH2 :** 1 indicates the RTD2 over high limit **STS_AH1 :** 1 indicates the RTD1 over high limit							

7.2.24 Fan Alert Status Register

Location : Index 1Ah
Type : Read Only
Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	FAN_TAR 3	FAN_TAR 2	FAN_TAR 1	RSV	FAN_FC3	FAN_FC2	FAN_FC1
FUNC.	**FAN_TAR3 :** 1 indicates the FAN3 is drived to fully speed over 3 minutes **FAN_TAR2 :** 1 indicates the FAN2 is drived to fully speed over 3 minutes **FAN_TAR1 :** 1 indicates the FAN1 is drived to fully speed over 3 minutes **FAN_FC3 :** 1 indicates the FAN3 over limit. **FAN_FC2 :** 1 indicates the FAN2 over limit **FAN_FC1 :** 1 indicates the FAN1 over limit							

7.2.25 T_CRIT# Alert Status Register

Location : Index 1Bh
Type : Read Only
Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		STS_PE CI1	STS_PE CI0	STS_TC4	STS_TC3	STS_TC2	STS_TC1
FUNC.	**STS_PECI1 :** 1 indicates the PECI1 T_CRIT# asserts **STS_PECI0 :** 1 indicates the PECI0 T_CRIT# asserts **STS_TC4 :** 1 indicates the LTD T_CRIT# asserts **STS_TC3 :** 1 indicates the RTD3 T_CRIT# asserts **STS_TC2 :** 1 indicates the RTD2 T_CRIT# asserts **STS_TC1 :** 1 indicates the RTD1 T_CRIT# asserts							

7.2.26 GPIO Alert Status Register

Location : Index 1Ch
Type : Read Only
Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		STS_GPIO 6	STS_GPIO 5	STS_GPIO 4	STS_GPIO 3	STS_GPIO 2	STS_GPIO 1
FUNC.	**STS_GPIO6 :** 1 indicates the GPIO6 event asserts **STS_GPIO5 :** 1 indicates the GPIO5 event asserts **STS_GPIO4 :** 1 indicates the GPIO4 event asserts **STS_GPIO3 :** 1 indicates the GPIO3 event asserts **STS_GPIO2 :** 1 indicates the GPIO2 event asserts **STS_GPIO1 :** 1 indicates the GPIO1 event asserts							

7.2.27 Temperature SMI Status Register

Location : Index 1Dh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		STS_PECI1	STS_PECI0	STS_LTD4	STS_RTD3	STS_RTD2	STS_RTD1
FUNC.	**STS_PECI1 :** 1 indicates the PECI1 SMI event asserts **STS_PECI0 :** 1 indicates the PECI0 SMI event asserts **STS_LTD :** 1 indicates the LTD SMI event asserts **STS_RTD3 :** 1 indicates the RTD3 SMI event asserts **STS_RTD2 :** 1 indicates the RTD2 SMI event asserts **STS_RTD1 :** 1 indicates the RTD1 SMI event asserts							

7.2.28 Voltage SMI Status Register

Location : Index 1Eh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				STS_VCC	STS_VSEN3	STS_VSEN2	STS_VSEN1
FUNC.	**STS_VCC :** 1 indicates the VCC over limit **STS_VSEN3 :** 1 indicates the VSEN3 over limit **STS_VSEN2 :** 1 indicates the VSEN2 over limit **STS_VSEN1 :** 1 indicates the VSEN1 over limit							

7.2.29 Fan SMI Status Register

Location : Index 1Fh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	FAN_TAR3	FAN_TAR2	FAN_TAR1	RSV	FAN_FC3	FAN_FC2	FAN_FC1
FUNC.	**FAN_TAR3 :** 1 indicates the FAN3 is drived to fully speed over 3 minutes **FAN_TAR3 :** 1 indicates the FAN2 is drived to fully speed over 3 minutes **FAN_TAR3 :** 1 indicates the FAN1 is drived to fully speed over 3 minutes **FAN_FC3 :** 1 indicates the FAN3 over limit **FAN_FC2 :** 1 indicates the FAN2 over limit **FAN_FC1 :** 1 indicates the FAN1 over limit							

7.2.30 T_CRIT# Real Time Status Register

Location : Index 20h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				LTD_Texc	RTD3_Texc	RTD2_Texc	RTD1_Texc
FUNC.	**LTD_Texc :** 1 indicates the LTD over the shutdown threshold **RTD3_Texc :** 1 indicates the RTD3 over the shutdown threshold **RTD2_Texc :** 1 indicates the RTD2 over the shutdown threshold **RTD1_Texc :** 1 indicates the RTD1 over the shutdown threshold							

7.2.31 Start Register

Location : Index 21h

Type : Read/Write

Power on default value : 01h

BIT	7	6	5	4	3	2	1	0
NAME	MSK_ALERT	RSV						START
FUNC.	**MSK_ALERT :** 1 indicates the ALERT# output is masked **START :** 1 indicates the ADC is operating							

7.2.32 Mode Selection Register

Location : Index 22h

Type : Read/Write

Power on default value : 7Fh

BIT	7	6	5	4	3	2	1	0
NAME	RSV	EnLTD	RTD3_MD		RTD2_MD		RTD1_MD	
FUNC.	**EnLTD :** 1 indicates the LTD function enabled **RTD3_MD :** 00=Closed , 01=Reserved , 10=Thermistor mode , 11=Voltage sense **RTD2_MD :** 00=Closed , 01=Current mode , 10=Thermistor mode , 11=Voltage sense **RTD1_MD :** 00=Closed , 01=Current mode , 10=Thermistor mode , 11=Voltage sense							

7.2.33 PECI Enable Register

Location : Index 23h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						EnPECI1	EnPECI0
FUNC.	**EnPECI1 :** 1 indicates the PECI1 enabled **EnPECI0 :** 1 indicates the PECI0 enabled							

7.2.34 Fan Enable Register

Location : Index 24h

Type : Read/Write

Power on default value : 07h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					EnFan3	EnFan2	EnFan1
FUNC.	**EnFan3 :** 1 indicates the FANIN3 enabled **EnFan2 :** 1 indicates the FANIN2 enabled **EnFan1 :** 1 indicates the FANIN1 enabled							

7.2.35 Voltage Monitor Enable Register

Location : Index 25h

Type : Read/Write

Power on default value : 03h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						EnVCore	EnVCC
FUNC.	**EnVCore :** 1 indicates the VCore enabled **EnVCC :** 1 indicates the VCC enabled							

7.2.36 Conversion Rate Register

Location : Index 26h

Type : Read/Write

Power on default value : 03h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						ConvRate[1:0]	
FUNC.	**ConvRate[1:0] :** 00=1Hz , 01=2Hz , 10= 4Hz , 11=Free Run							

7.2.37 Fault Queue Register

Location : Index 27h

Type : Read/Write

Power on default value : 03h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						FaultQueue[1:0]	
FUNC.	**FaultQueue[1:0] :** Fault Queue of Thermal Shutdown **,** 00=1 , 01=2 , 10=3 , 11=4							

7.2.38 Alert# High Limit Link to T_CRIT# Register

Location : Index 28h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					SYS3	SYS2	SYS1
FUNC.	**SYS3 :** 1 indicates the External Diode3 channel high limit will be linked to T_CRIT# **SYS2 :** 1 indicates the External Diode2 channel high limit will be linked to T_CRIT# **SYS1 :** 1 indicates the External Diode1 channel high limit will be linked to T_CRIT#							

7.2.39 Reset Time Setting Register

Location : Index 29h

Type : Read/Write

Power on default value : 04h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					SetResetTime		
FUNC.	**SetResetTime :** 000=1ms , 001=12.5ms , 010=50ms , 011=100ms 100=200ms , 101=400ms , 110=800ms , 111=1600ms							

7.2.40 Reset Limit Low Byte Register

Location : Index 2Ah

Type : Read/Write

Power on default value : EEh

BIT	7	6	5	4	3	2	1	0
NAME	ResetLimit[7:0]							
FUNC.	**ResetLimit[7:0] :** Reset Limit Low Byte							

7.2.41 Reset Limit High Byte Register

Location : Index 2Bh

Type : Read/Write

Power on default value : 80h

BIT	7	6	5	4	3	2	1	0
NAME	ResetLimit[9:8]		RSV					
FUNC.	**ResetLimit[9:8] :** Reset Limit High Byte							

The Reset voltage threshold formula = Vreset-thd / 0.004

For example, the Reset voltage shreshold is 3.0V, the registers setting will be:

3.0 / 0.004 = 750, the Index[2Bh]=80h, Index[2Ah]=EEh.

7.2.42 SMI# Control Register

Location : Index 2Fh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	ALERT_SMI_Sel	TCRIT_BEEP_Sel	SMI_MOD	SMI_POL	TCRIT_MOD	En_SMI	TempSmiMode	
FUNC.	**ALERT_SMI_Sel :** 0= ALERT , 1= SMI **TCRIT_BEEP_Sel :** 0= TCRIT , 1= BEEP **SMI_MOD : 1**= Level mode, 0= Pulse mode (Pulse width is 200uS) **SMI_POL :** Refer to below table. **TCRIT_MOD :** 0= Active low , 1= Active high **En_SMI :** 0= Disable , 1= Enable SMI **TempSmiMode :** 00= Comparator mode , 01= One time mode 10= Two times mode , 11= Two times mode							

SMI_MD	SMI_POL	SMI#
0	0	Low pulse
0	1	High pulse
1	0	High level
1	1	Low level

7.2.43 RTD1 Temperature High Limit Register

Location : Index 30h

Type : Read/Write

Power on default value : 55h

BIT	7	6	5	4	3	2	1	0
NAME	RTD1_HL							
FUNC.	**RTD1_HL :** RTD1 Temperature High Limit setting for ALERT# and SMI#							

7.2.44 RTD1 Temperature Low Limit Register

Location : Index 31h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RTD1_LL							
FUNC.	**RTD1_LL :** RTD1 Temperature Low Limit setting for ALERT# and SMI#							

7.2.45 RTD2 Temperature High Limit Register

Location : Index 32h

Type : Read/Write

Power on default value : 55h

BIT	7	6	5	4	3	2	1	0
NAME	RTD2_HL							
FUNC.	**RTD2_HL :** RTD2 Temperature High Limit setting for ALERT# and SMI#							

7.2.46 RTD2 Temperature Low Limit Register

Location : Index 33h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RTD2_LL							
FUNC.	**RTD2_LL :** RTD2 Temperature Low Limit setting for ALERT# and SMI#							

7.2.47 RTD3 Temperature High Limit Register

Location : Index 34h

Type : Read/Write

Power on default value : 55h

BIT	7	6	5	4	3	2	1	0
NAME	RTD3_HL							
FUNC.	**RTD3_HL :** RTD3 Temperature High Limit setting for ALERT# and SMI#							

7.2.48 RTD3 Temperature Low Limit Register

Location : Index 35h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RTD3_LL							
FUNC.	**RTD3_LL :** RTD3 Temperature Low Limit setting for ALERT# and SMI#							

7.2.49 LTD Temperature High Limit Register

Location : Index 36h

Type : Read/Write

Power on default value : 55h

BIT	7	6	5	4	3	2	1	0
NAME	LTD_HL							
FUNC.	**LTD_HL :** LTD Temperature High Limit setting for ALERT# and SMI#							

7.2.50 LTD Temperature Low Limit Register

Location : Index 37h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	LTD_LL							
FUNC.	**LTD_LL :** LTD Temperature Low Limit setting for ALERT# and SMI#							

7.2.51 DTS Temperature High Limit Register

Location : Index 38h

Type : Read/Write

Power on default value : 55h

BIT	7	6	5	4	3	2	1	0
NAME	DTS_HL							
FUNC.	**DTS_HL :** DTS Temperature High Limit setting for ALERT# and SMI#							

7.2.52 DTS Temperature Low Limit Register

Location : Index 39h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	DTS_LL							
FUNC.	**DTS_LL :** DTS1 Temperature Low Limit setting for ALERT# and SMI#							

7.2.53 RTD1 TCRIT Threshold Register

Location : Index 3Ah

Type : Read/Write

Power on default value : 64h

BIT	7	6	5	4	3	2	1	0
NAME	TCRIT_RTD1							
FUNC.	**TCRIT_RTD1 :** RTD1 Temperature Threshold of T_CRIT#							

7.2.54 RTD2 TCRIT Threshold Register

Location : Index 3Bh

Type : Read/Write

Power on default value : 64h

BIT	7	6	5	4	3	2	1	0
NAME	TCRIT_RTD2							
FUNC.	**TCRIT_RTD2 :** RTD2 Temperature Threshold of T_CRIT#							

7.2.55 RTD3 TCRIT Threshold Register

Location : Index 3Ch

Type : Read/Write

Power on default value : 64h

BIT	7	6	5	4	3	2	1	0
NAME	TCRIT_RTD3							
FUNC.	**TCRIT_RTD3 :** RTD3 Temperature Threshold of T_CRIT#							

7.2.56 LTD TCRIT Threshold Register

Location : Index 3Dh

Type : Read/Write

Power on default value : 64h

BIT	7	6	5	4	3	2	1	0
NAME	TCRIT_LTD							
FUNC.	**TCRIT_LTD :** LTD Temperature Threshold of T_CRIT#							

7.2.57 DTS TCRIT Threshold Register

Location : Index 3Eh

Type : Read/Write

Power on default value : 64h

BIT	7	6	5	4	3	2	1	0
NAME	TCRIT_DTS							
FUNC.	**TCRIT_DTS :** DTS Temperature Threshold of T_CRIT#							

7.2.58 VSEN1 High Limit Low Byte Register

Location : Index 3Fh

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	VSEN1_HL[7:0]							
FUNC.	**VSEN1_HL :** VSEN1 High Limit Low Byte							

7.2.59 VSEN1 Low Limit Low Byte Register

Location : Index 40h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	VSEN1_LL[7:0]							
FUNC.	**VSEN1_LL :** VSEN1 Low Limit Low Byte							

7.2.60 VSEN2 High Limit Low Byte Register

Location : Index 41h

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	VSEN2_HL[7:0]							
FUNC.	**VSEN2_HL :** VSEN2 High Limit Low Byte							

7.2.61 VSEN2 Low Limit Low Byte Register

Location : Index 42h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	VSEN2_LL[7:0]							
FUNC.	**VSEN2_LL :** VSEN2 Low Limit Low Byte							

7.2.62 VSEN3 High Limit Low Byte Register

Location : Index 43h

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	VSEN3_HL[7:0]							
FUNC.	**VSEN3_HL :** VSEN3 High Limit Low Byte							

7.2.63 VSEN3 Low Limit Low Byte Register

Location : Index 44h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	VSEN3_LL[7:0]							
FUNC.	**VSEN3_LL :** VSEN3 Low Limit Low Byte							

7.2.64 VCC High Limit Low Byte Register

Location : Index 45h

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	VCC_HL[7:0]							
FUNC.	**VCC_HL :** VCC High Limit Low Byte							

7.2.65 VCC Low Limit Low Byte Register

Location : Index 46h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	VCC_LL[7:0]							
FUNC.	**VCC_LL :** VCC Low Limit Low Byte							

7.2.66 VSEN Limit High Byte 1 Register

Location : Index 47h

Type : Read/Write

Power on default value : CCh

BIT	7	6	5	4	3	2	1	0
NAME	VSEN1_HL[9:8]		VSEN1_LL[9:8]		VSEN2_HL[9:8]		VSEN2_LL[9:8]	
FUNC.	**VSEN1_HL[9:8] :** VSEN1 High Limit High Byte **VSEN1_LL[9:8] :** VSEN1 Low Limit High Byte **VSEN2_HL[9:8] :** VSEN2 High Limit High Byte **VSEN2_LL[9:8] :** VSEN2 Low Limit High Byte							

7.2.67 VSEN Limit High Byte 2 Register

Location : Index 48h

Type : Read/Write

Power on default value : CCh

BIT	7	6	5	4	3	2	1	0
NAME	VSEN3_HL[9:8]		VSEN3_LL[9:8]		VCC_HL[9:8]		VCC_LL[9:8]	
FUNC.	**VSEN3_HL[9:8] :** VSEN3 High Limit High Byte **VSEN3_LL[9:8] :** VSEN3 Low Limit High Byte **VCC_HL[9:8] :** VCC High Limit High Byte **VCC_LL[9:8] :** VCC Low Limit High Byte							

7.2.68 FANIN1 Limit Low Byte Register

Location : Index 49h

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	FANIN1_HL[7:0]							
FUNC.	**FANIN1_HL[7:0] :** FANIN1 Limit Low Byte							

7.2.69 FANIN2 Limit Low Byte Register

Location : Index 4Ah

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	FANIN2_HL[7:0]							
FUNC.	**FANIN2_HL[7:0] :** FANIN2 Limit Low Byte							

7.2.70 FANIN3 Limit Low Byte Register

Location : Index 4Bh

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	FANIN3_HL[7:0]							
FUNC.	**FANIN3_HL[7:0] :** FANIN3 Limit Low Byte							

7.2.71 FANIN1 Limit High Byte Register

Location : Index 4Ch

Type : Read/Write

Power on default value : F8h

BIT	7	6	5	4	3	2	1	0
NAME	FANIN1_HL[12:8]					RSV		
FUNC.	**FANIN1_HL[12:8] :** FANIN1 Limit High Byte							

7.2.72 FANIN2 Limit High Byte Register

Location : Index 4Dh

Type : Read/Write

Power on default value : F8h

BIT	7	6	5	4	3	2	1	0
NAME	FANIN2_HL[12:8]					RSV		
FUNC.	**FANIN2_HL[12:8] :** FANIN2 Limit High Byte							

新唐科技 nuvoTon INTELLECTUAL PROPERTY

7.2.73 FANIN3 Limit High Byte Register

Location : Index 4Eh

Type : Read/Write

Power on default value : F8h

BIT	7	6	5	4	3	2	1	0
NAME	FANIN3_HL[12:8]					RSV		
FUNC.	**FANIN3_HL[12:8] :** FANIN3 Limit High Byte							

7.2.74 ALERT Mask Register Register

Location : Index 4Fh

Type : Read/Write

Power on default value : 7Fh

BIT	7	6	5	4	3	2	1	0
NAME	RSV	MSK_TC	MSK_GPIO	MSK_TART	MSK_FC	MSK_AH	MSK_AL	MSK_DF
FUNC.	**MSK_TC :** 1 indicates the ALERT# from T_CRIT event will be masked **MSK_GPIO :** 1 indicates the ALERT# from GPIO event will be masked **MSK_TART :** 1 indicates the ALERT# from TART event will be masked **MSK_FC :** 1 indicates the ALERT# from FAN event will be masked **MSK_AH :** 1 indicates the ALERT# from High ALERT event will be masked **MSK_AL :** 1 indicates the ALERT# from Low ALERT event will be masked **MSK_DF :** 1 indicates the ALERT# from Diode Fault event will be masked							

7.2.75 ALERT/SMI Mask Temperature Channel Register

Location : Index 50h

Type : Read/Write

Power on default value : 3Fh

BIT	7	6	5	4	3	2	1	0
NAME	RSV		MSK_PECI1	MSK_PECI0	MSK_LTD	MSK_RTD3	MSK_RTD2	MSK_RTD1
FUNC.	**MSK_PECI1 :** 1 indicates the ALERT#/SMI from PECI1 event will be masked **MSK_PECI0 :** 1 indicates the ALERT#/SMI from PECI0 event will be masked **MSK_LTD :** 1 indicates the ALERT#/SMI from LTD event will be masked **MSK_RTD3 :** 1 indicates the ALERT#/SMI from RTD3 event will be masked **MSK_RTD2 :** 1 indicates the ALERT#/SMI from RTD2 event will be masked **MSK_RTD1 :** 1 indicates the ALERT#/SMI from RTD1 event will be masked							

7.2.76 ALERT/SMI Mask Fan Channel Register

Location : Index 51h

Type : Read/Write

Power on default value : 07h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					MSK_FAN3	MSK_FAN2	MSK_FAN1
FUNC.	**MSK_FAN3 :** 1 indicates the ALERT#/SMI from FAN3/TART3 event will be masked **MSK_FAN2 :** 1 indicates the ALERT#/SMI from FAN2/TART2 event will be masked **MSK_FAN1 :** 1 indicates the ALERT#/SMI from FAN1/TART1 event will be masked							

7.2.77 SMI Mask Voltage Channel Register

Location : Index 52h

Type : Read/Write

Power on default value : 8Fh

BIT	7	6	5	4	3	2	1	0
NAME	MSK_RESET	RSV			MSK_VCC	MSK_VSEN3	MSK_VSEN2	MSK_VSEN1
FUNC.	**MSK_RESET :** 1 indicates the RESET# (Pin 6)output will be masked **MSK_VCC :** 1 indicates the SMI from VCC event will be masked **MSK_VSEN3 :** 1 indicates the SMI from VSEN3 event will be masked **MSK_VSEN2 :** 1 indicates the SMI from VSEN2 event will be masked **MSK_VSEN1 :** 1 indicates the SMI from VSEN1 event will be masked							

7.2.78 T_CRIT# Mask Register

Location : Index 53h

Type : Read/Write

Power on default value : BFh

BIT	7	6	5	4	3	2	1	0
NAME	MSK_ALL	RSV	MSK_PECI1	MSK_PECI0	MSK_LTD4	MSK_RTD3	MSK_RTD2	MSK_RTD1
FUNC.	**MSK_ALL :** 1 indicates the T_CRIT# from ALL event will be masked **MSK_PECI1 :** 1 indicates the T_CRIT# from PECI1 event will be masked **MSK_PECI0 :** 1 indicates the T_CRIT# from PECI0 event will be masked **MSK_LTD :** 1 indicates the T_CRIT# from LTD event will be masked **MSK_RTD3 :** 1 indicates the T_CRIT# from RTD3 event will be masked **MSK_RTD2 :** 1 indicates the T_CRIT# from RTD2 event will be masked **MSK_RTD1 :** 1 indicates the T_CRIT# from RTD1 event will be masked							

7.2.79 GPIO Alert Mask Register

Location : Index 54h
Type : Read/Write
Power on default value : 3Fh

BIT	7	6	5	4	3	2	1	0
NAME	RSV		MSK_GPIO6	MSK_GPIO5	MSK_GPIO4	MSK_GPIO3	MSK_GPIO2	MSK_GPIO1
FUNC.	**MSK_GPIO6 :** 1 indicates the ALERT# from GPIO6 event will be masked **MSK_GPIO5 :** 1 indicates the ALERT# from GPIO5 event will be masked **MSK_GPIO4 :** 1 indicates the ALERT# from GPIO4 event will be masked **MSK_GPIO3 :** 1 indicates the ALERT# from GPIO3 event will be masked **MSK_GPIO2 :** 1 indicates the ALERT# from GPIO2 event will be masked **MSK_GPIO1 :** 1 indicates the ALERT# from GPIO1 event will be masked							

7.2.80 GPIO Enable Register

Location : Index 55h
Type : Read/Write
Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		EnGPIO6	EnGPIO5	EnGPIO4	EnGPIO3	EnGPIO2	EnGPIO1
FUNC.	**EnGPIO6 :** 1 indicates the GPIO6 enabled **EnGPIO5 :** 1 indicates the GPIO5 enabled **EnGPIO4 :** 1 indicates the GPIO4 enabled **EnGPIO3 :** 1 indicates the GPIO3 enabled **EnGPIO2 :** 1 indicates the GPIO2 enabled **EnGPIO1 :** 1 indicates the GPIO1 enabled							

7.2.81 GPIO Mode Register

Location : Index 56h
Type : Read/Write
Power on default value : 3Fh

BIT	7	6	5	4	3	2	1	0
NAME	RSV		GPIO6 Mode	GPIO5 Mode	GPIO4 Mode	GPIO3 Mode	GPIO2 Mode	GPIO1 Mode
FUNC.	**GPIO6 Mode :** 0= Input , 1= Output **GPIO5 Mode :** 0= Input , 1= Output **GPIO4 Mode :** 0= Input , 1= Output **GPIO3 Mode :** 0= Input , 1= Output **GPIO2 Mode :** 0= Input , 1= Output **GPIO1 Mode :** 0= Input , 1= Output							

7.2.82 GPIO Output Type Register

Location : Index 57h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		GPIO6 OB	GPIO5 OB	GPIO4 OB	GPIO3 OB	GPIO2 OB	GPIO1 OB
FUNC.	**GPIO6 Output Type :** 0= Push Pull , 1= Open Drain **GPIO5 Output Type :** 0= Push Pull , 1= Open Drain **GPIO4 Output Type :** 0= Push Pull , 1= Open Drain **GPIO3 Output Type :** 0= Push Pull , 1= Open Drain **GPIO2 Output Type :** 0= Push Pull , 1= Open Drain **GPIO1 Output Type :** 0= Push Pull , 1= Open Drain							

7.2.83 GPIO Input Data Register

Location : Index 58h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		GPIO6 IN	GPIO5 IN	GPIO4 IN	GPIO3 IN	GPIO2 IN	GPIO1 IN
FUNC.	**GPIO6 IN :** Input data register of GPIO6 **GPIO5 IN :** Input data register of GPIO5 **GPIO4 IN :** Input data register of GPIO4 **GPIO3 IN :** Input data register of GPIO3 **GPIO2 IN :** Input data register of GPIO2 **GPIO1 IN :** Input data register of GPIO1							

7.2.84 GPIO Output Data Register

Location : Index 59h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		GPIO6 OUT	GPIO5 OUT	GPIO4 OUT	GPIO3 OUT	GPIO2 OUT	GPIO1 OUT
FUNC.	**GPIO6 OUT :** Output data register of GPIO6 **GPIO5 OUT :** Output data register of GPIO5 **GPIO4 OUT :** Output data register of GPIO4 **GPIO3 OUT :** Output data register of GPIO3 **GPIO2 OUT :** Output data register of GPIO2 **GPIO1 OUT :** Output data register of GPIO1							

7.2.85 BEEP Voltage Channel Enable Register

Location : Index 5Ah

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV			EnBP_RESET	EnBP_VCC	EnBP_VSEN3	EnBP_VSEN2	EnBP_VSEN1
FUNC.	**EnBP_RESET :** 1 indicates the BEEP is enabled for RESET event **EnBP_VCC :** 1 indicates the BEEP is enabled for VCC event **EnBP_VSEN3 :** 1 indicates the BEEP is enabled for VSEN3 event **EnBP_VSEN2 :** 1 indicates the BEEP is enabled for VSEN2 event **EnBP_VSEN1 :** 1 indicates the BEEP is enabled for VSEN1 event							

7.2.86 BEEP Fan Channel Enable Register

Location : Index 5Bh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					EnBP_FAN3	EnBP_FAN2	EnBP_FAN1
FUNC.	**EnBP_FAN3 :** 1 indicates the BEEP is enabled for FAN3 event **EnBP_FAN2 :** 1 indicates the BEEP is enabled for FAN2 event **EnBP_FAN1 :** 1 indicates the BEEP is enabled for FAN1 event							

7.2.87 BEEP Temperature Channel Enable Register

Location : Index 5Ch

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		EnBP_PECI1	EnBP_PECI0	EnBP_LTD	ENBP_RTD3	EnBP_RTD2	EnBP_RTD1
FUNC.	**EnBP_PECI1 :** 1 indicates the BEEP is enabled for PECI1 event **EnBP_PECI0 :** 1 indicates the BEEP is enabled for PECI0 event **EnBP_LTD :** 1 indicates the BEEP is enabled for LTD event **EnBP_RTD3 :** 1 indicates the BEEP is enabled for RTD3 event **EnBP_RTD2 :** 1 indicates the BEEP is enabled for RTD2 event **EnBP_RTD1 :** 1 indicates the BEEP is enabled for RTD1 event							

7.2.88 BEEP Enable Register

Location : Index 5Dh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV		EnBP_SMI	EnBP_DF	EnBP_AL	ENBP_AH	EnBP_TC	EnBP_En
FUNC.	**EnBP_SMI :** 1 indicates the BEEP is enabled for SMI# event **EnBP_DF :** 1 indicates the BEEP is enabled for Diode Fault event **EnBP_AL :** 1 indicates the BEEP is enabled for Low Alert event **EnBP_AH :** 1 indicates the BEEP is enabled for High Alert event **EnBP_TC :** 1 indicates the BEEP is enabled for T_CRIT# event **EnBP_En :** 1 indicates the BEEP is enabled							

7.2.89 Fan Control Output Type

Location : Index 5Eh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						EnDCFAN2	EnDCFAN1
FUNC.	**EnDCFAN2 :** 0 indicates the FANCTL2 output is PWM type 1 indicates the FANCTL2 output is DC type **EnDCFAN1 :** 0 indicates the FANCTL1 output is PWM type 1 indicates the FANCTL1 output is DC type							

7.2.90 Fan Control Output Mode

Location : Index 5Fh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	PWM3_POL	PWM2_POL	PWM1_POL	RSV	PWM3_OD	PWM2_OD	PWM1_OD
FUNC.	**PWM3_POL :** 1 indicates the FANCTL3 PWM output is inverted **PWM2_POL :** 1 indicates the FANCTL2 PWM output is inverted **PWM1_POL :** 1 indicates the FANCTL1 PWM output is inverted **PWM3_OD :** 0 indicates the FANCTL3 PWM output is push pull 1 indicates the FANCTL3 PWM output is open drain **PWM2_OD :** 0 indicates the FANCTL2 PWM output is push pull 1 indicates the FANCTL2 PWM output is open drain **PWM1_OD :** 0 indicates the FANCTL1 PWM output is push pull 1 indicates the FANCTL1 PWM output is open drain							

7.2.91 Fan Control 1 Output Value

Location : Index 60h

Type : Read/Write for Manual mode , Read only for SMART FAN™ IV control

Power on default value : $7F_{HEX.}$

BIT	7	6	5	4	3	2	1	0
NAME	FANDuty1							
FUNC.	**FANDuty1 :** FANCTL1 output value							

7.2.92 Fan Control 2 Output Value

Location : Index 61h

Type : Read/Write for Manual mode , Read only for SMART FAN™ IV control

Power on default value : $7F_{HEX.}$

BIT	7	6	5	4	3	2	1	0
NAME	FANDuty2							
FUNC.	**FANDuty2 :** FANCTL2 output value							

7.2.93 Fan Control 3 Output Value

Location : Index 62h

Type : Read/Write for Manual mode , Read only for SMART FAN™ IV control

Power on default value : $7F_{HEX.}$

BIT	7	6	5	4	3	2	1	0
NAME	FANDuty3							
FUNC.	**FANDuty3 :** FANCTL3 output value							

7.2.94 Close-Loop Fan Control RPM mode Register and Configure Register of PECI Error (CRPE)

Location : Index 63h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	TwoDimension			RPM_HIGH_EN			PECIERR	
FUNC.	**TwoDimension :** Close_Loop Fan Control Enable Bit7 : 1 indicated the FAN3 group enables Close-Loop Fan Control RPM mode Bit6 : 1 indicated the FAN2 group enables Close-Loop Fan Control RPM mode Bit5 : 1 indicated the FAN1 group enables Close-Loop Fan Control RPM mode **RPM_HIGH_EN :** Changing default unit of all RPM setting from 50 RPMs to 100 RPMs. It benefits to control ultra high RPM fan Bit4 : 1 indicated the FAN3 group support ultra high RPM fan Bit3 : 1 indicated the FAN2 group support ultra high RPM fan Bit2 : 1 indicated the FAN1 group support ultra high RPM fan **PECIERR :** Refer the table 7-1 PECI Error Condition Table to fan output value							

Table 7-1 PECI Error Condition Table

BIT [1-0]	PECI ERROR CONDITION
00_{BIN}	Fan output value keeps at its current value
01_{BIN}	Fan output value will be set to **FOMV** (Fan Output Min Value when PECI Error)
$1x_{BIN}$	Fan output value will be set to the full speed value (FFh)

7.2.95 Temperature to Fan mapping Relationships Register

Location : Index 64h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	Temp2FanSelect			RSV	Temp1FanSelect		
FUNC.	**Temp2FanSelect , Temp1FanSelect :** Enable FANCTL3 – FANCTL1 SMART FAN™ IV 0 = FANCTL has no relation with this temperature source. FANCTL is controlled by Manual mode (Default) 1 = Applies SMART FAN™ IV control for SMART FAN™ IV on FANCTL and this temperature							

7.2.96 Temperature to Fan mapping Relationships Register

Location : Index 65h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					Temp3FanSelect		
FUNC.	**Temp3FanSelect :** Enable FANCTL3 – FANCTL1 SMART FAN™ IV 0 = FANCTL has no relation with this temperature source. FANCTL is controlled by Manual mode (Default) 1 = Applies SMART FAN™ IV control for SMART FAN™ IV on FANCTL and this temperature							

7.2.97 Fan Control Configuration Register 1

Location : Index 66h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2_Share_En	Temp2_Share_Sel			Temp1_Share_En	Temp1_Share_Sel		
FUNC.	**Temp2_Share_En :** Enable temperature2 sharing table function **Temp2_Share_Sel :** Select which temperature2 source could share control table in SMART FAN^{TM} IV **Temp1_Share_En :** Enable temperature1 sharing table function **Temp1_Share_Sel :** Select which temperature1 source could share control table in SMART FAN^{TM} IV Refer to the Table 7-2 Sharing Table							

Table 7-2 Sharing Table

BIT [2-0]	SHARE_SEL CONDITION
000_{BIN}	Remote 1 temperature will be referred
001_{BIN}	Remote 2 temperature will be referred
010_{BIN}	Remote 3 temperature will be referred
011_{BIN}	Local temperature will be referred
100_{BIN}	PECI Agent 0 temperature will be referred
101_{BIN}	PECI Agent 1 temperature will be referred
110_{BIN}	Programmable temperature 1 will be referred
111_{BIN}	Programmable temperature 2 will be referred

7.2.98 Fan Control Configuration Register 2

Location : Index 67h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				Temp3_Share_En	Temp3_Share_Sel		
FUNC.	**Temp3_Share_En :** Enable temperature3 sharing table function **Temp3_Share_Sel :** Select which temperature3 source could share control table in SMART FAN^{TM} IV Refer to the Table 7-2 Sharing Table							

7.2.99 Fan Control Configuration Register 3

Location : Index 68h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	Temp2_Source_Sel			RSV	Temp1_Source_Sel		
FUNC.	**Temp2_Source_Sel :** Temperature 2 source selection **Temp1_Source_Sel :** Temperature 1 source selection Refer to the Table 7-3 Source Table							

Table 7-3 Source Table

BIT [2-0]	SOURCE_SEL CONDITION
000_{BIN}	Remote 1 temperature will be referred
001_{BIN}	Remote 2 temperature will be referred
010_{BIN}	Remote 3 temperature will be referred
011_{BIN}	Local temperature will be referred
100_{BIN}	PECI Agent 0 temperature will be referred
101_{BIN}	PECI Agent 1 temperature will be referred
110_{BIN}	Programmable temperature 1 will be referred
111_{BIN}	Programmable temperature 2 will be referred

7.2.100 Fan Control Configuration Register 4

Location : Index 69h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					Temp3_Source_Sel		
FUNC.	**Temp3_Source_Sel :** Temperature 3 source selection Refer to the Table 7-3 Source Table							

7.2.101 Close-Loop Fan Control RPM mode Tolerance Register

Location : Index 6Dh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				Generic_Tol_RPM			
FUNC.	**Generic_Tol_RPM :** Tolerance of RPM mode, unit 50 RPM							

7.2.102 FANCTL Step Up Time Register

Location : Index 6Eh

Type : Read/Write

Power on default value : 0Ah

BIT	7	6	5	4	3	2	1	0
NAME	UpTime							
FUNC.	**UpTime :** In SMART FAN^{TM} IV mode, this register determines the amount of time FANOUT takes to increase its value by one step The units are intervals of 0.1 second. The default time is 1 second							

7.2.103 FANCTL Step Down Time Register

Location : Index 6Fh

Type : Read/Write

Power on default value : 0Ah

BIT	7	6	5	4	3	2	1	0
NAME	DownTime							
FUNC.	**DownTime :** In SMART FAN^{TM} IV mode, this register determines the amount of time FANOUT takes to decrease its value by one step The units are intervals of 0.1 second. The default time is 1 second							

7.2.104 Default Fan Speed Register

Location : Index 70h

Type : Read/Write

Power on default value : 7Fh

BIT	7	6	5	4	3	2	1	0
NAME	DefaultFanSpeed							
FUNC.	**DefaultFanSpeed :** Default Fan Speed at Power-on							

7.2.105 FANCTL1 PWM Prescalar Register

Location : Index 71h

Type : Read/Write

Power on default value : 84h

BIT	7	6	5	4	3	2	1	0
NAME	CLKSEL	Divisor[6:0]						
FUNC.	**CKSEL :** Clock source select **Divisor :** Clock frequency Divisor Refer the Table 7-4 Divisor table A & Table 7-5 Divisor table B							

The clock source selected by CKSEL will be divided by the divisor and used as a fan PWM output frequency.

If CKSEL equals **1**, then the output clock is simply equal to **125/ (Divisor [6:0]+1) KHz**

MappedDivisor depends on **Divisor [6:0]** and is described in the table below.

Table 7-4 Divisor Table A (CKSEL=1)

DIVISOR[6:0]	MAPPED DIVISOR	OUTPUT FREQUENCY	DIVISOR[6:0]	MAPPED DIVISOR	OUTPUT FREQUENCY
0000000	1	125KHz	RSV		
0000001	2	62.5KHz			
0000010	3	41.6KHz			
0000011	4	31.2KHz			
0000100	5	25KHz	0001111	16	7.8KHz
0000101	6	20.8KHz	0011111	32	3.9KHz
0000110	7	17.8KHz	0111111	64	1.9KHz
0000111	8	15.6KHz	1111111	128	976Hz

If CKSEL equals **0**, then the output clock is simply equal to **1000/ Mapped Divisor Hz**

MappedDivisor depends on **Divisor [3:0]** and is described in the table below.

Table 7-5 Divisor Table B (CKSEL=0)

DIVISOR[3:0]	MAPPED DIVISOR	OUTPUT FREQUENCY	DIVISOR[3:0]	MAPPED DIVISOR	OUTPUT FREQUENCY
0000	1	1000Hz	1000	12	83Hz
0001	2	500Hz	1001	16	62.5Hz
0010	3	333Hz	1010	32	31.25Hz
0011	4	250Hz	1011	64	15.6Hz
0100	5	200Hz	1100	128	7.8Hz
0101	6	166Hz	1101	256	3.9Hz
0110	7	142Hz	1110	512	1.9Hz
0111	8	125Hz	1111	1024	0.97Hz

7.2.106 FANCTL2 PWM Prescalar Register

Location : Index 72h

Type : Read/Write

Power on default value : 84h

BIT	7	6	5	4	3	2	1	0
NAME	CLKSEL	Divisor[6:0]						

FUNC.	**CKSEL :** Clock source select **Divisor :** Clock frequency Divisor Refer the Table 7-4 Divisor table A & Table 7-5 Divisor table B

7.2.107 FANCTL3 PWM Prescalar Register

Location : Index 73h

Type : Read/Write

Power on default value : 84h

BIT	7	6	5	4	3	2	1	0
NAME	CLKSEL	Divisor[6:0]						
FUNC.	**CKSEL :** Clock source select **Divisor :** Clock frequency Divisor Refer the Table 7-4 Divisor table A & Table 7-5 Divisor table B							

7.2.108 Temp1 Hystersis Register

Location : Index 74h

Type : Read/Write

Power on default value : 53h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	Criti_HysT1			RSV	Oper_HysT1		
FUNC.	**Criti_HysT1 :** Hystersis value of SMART FAN™ IV Critical Temperature **Oper_HysT1 :** Hystersis value of SMART FAN™ IV Operating Temperature							

7.2.109 Temp2 Hystersis Register

Location : Index 75h

Type : Read/Write

Power on default value : 53h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	Criti_HysT2			RSV	Oper_HysT2		
FUNC.	**Criti_HysT2 :** Hystersis value of SMART FAN™ IV Critical Temperature **Oper_HysT2 :** Hystersis value of SMART FAN™ IV Operating Temperature							

7.2.110 Temp3 Hystersis Register

Location : Index 76h

Type : Read/Write

Power on default value : 53h

BIT	7	6	5	4	3	2	1	0
NAME	RSV	Criti_HysT3			RSV	Oper_HysT3		
FUNC.	**Criti_HysT3 :** Hystersis value of SMART FAN™ IV Critical Temperature **Oper_HysT3 :** Hystersis value of SMART FAN™ IV Operating Temperature							

7.2.111FANCTL Start Duty Cycle Register

Location : Index 77h

Type : Read/Write

Power on default value :30h

BIT	7	6	5	4	3	2	1	0
NAME	StartDutyCycle							
FUNC.	**StartDutyCycle :** control the FANCTL1-FANCTL3 fan output start-up value							

7.2.112 FANCTL Stop Time Register

Location : Index 78h

Type : Read/Write

Power on default value : FFh

BIT	7	6	5	4	3	2	1	0
NAME	StopTime							
FUNC.	**StopTime :** control the FANCTL1-FANCTL3 fan stop time Unit in 0.1sec. Ranges from 0.1sec to 25.5 sec If set to 0, the fan will never stop							

7.2.113 NonStop Disable Register

Location : Index 79h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV					NonStop_Fan3	NonStop_Fan2	NonStop_Fan1
FUNC.	**NonStop_FAN3 :** 1 indicates the FAN3 NonStop function disabled **NonStop_FAN2 :** 1 indicates the FAN2 NonStop function disabled **NonStop_FAN1 :** 1 indicates the FAN1 NonStop function disabled							

7.2.114 Fan Output Min Value when PECI Error Register (FOMV)

Location : Index 7Ah

Type : Read/Write

Power on default value : 80h

BIT	7	6	5	4	3	2	1	0
NAME	MinDuty_PECIERR							
FUNC.	**MinDuty_PECIERR :** control the FANCTL1-FANCTL3 fan output min value when PECI error condition is occurred. Also see **CRPE** (Configure Register of PECI Error)							

7.2.115Table 1 X-axis Transition Point 1 Register

Location : Index 80h

Type : Read/Write

Power on default value : 19h

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_TR1							
FUNC.	**Temp1Table_TR1 :** Temperature point 1 of SMART FAN™ IV table 1							

7.2.116 Table 1 X-axis Transition Point 2 Register

Location : Index 81h

Type : Read/Write

Power on default value : 23h

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_TR2							
FUNC.	**Temp1Table_TR2 :** Temperature point 2 of SMART FAN™ IV table 1							

7.2.117 Table 1 X-axis Transition Point 3 Register

Location : Index 82h

Type : Read/Write

Power on default value : 2Dh

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_TR3							
FUNC.	**Temp1Table_TR3 :** Temperature point 3 of SMART FAN™ IV table 1							

7.2.118 Table 1 X-axis Transition Point 4 Register

Location : Index 83h

Type : Read/Write

Power on default value : 37h

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_TR4							
FUNC.	**Temp1Table_TR4 :** Temperature point 4 of SMART FAN™ IV table 1							

7.2.119 Table 1 X-axis Critical Point Register

Location : Index 84h

Type : Read/Write

Power on default value : 3Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_TRCritical							
FUNC.	**Temp1Table_TRCritical :** Critical Temperature point of SMART FAN™ IV table 1							

7.2.120 Table 1 Y-axis Transition Point 1 Register

Location : Index 85h

Type : Read/Write

Power on default value : 8Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_FL1							
FUNC.	**Temp1Table_FL1 :** FANCTL point 1 of SMART FAN™ IV table 1							

7.2.121 Table 1 Y-axis Transition Point 2 Register

Location : Index 86h

Type : Read/Write

Power on default value : AAh

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_FL2							
FUNC.	**Temp1Table_FL2 :** FANCTL point 2 of SMART FAN™ IV table 1							

7.2.122 Table 1 Y-axis Transition Point 3 Register

Location : Index 87h

Type : Read/Write

Power on default value : C8h

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_FL3							
FUNC.	**Temp1Table_FL3 :** FANCTL point 3 of SMART FAN™ IV table 1							

7.2.123Table 1 Y-axis Transition Point 4 Register

Location : Index 88h

Type : Read/Write

Power on default value : E6h

BIT	7	6	5	4	3	2	1	0
NAME	Temp1Table_FL4							
FUNC.	**Temp1Table_FL4 :** FANCTL point 4 of SMART FAN™ IV table 1							

7.2.124 Table 2 X-axis Transition Point 1 Register

Location : Index 90h

Type : Read/Write

Power on default value : 19h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_TR1							
FUNC.	**Temp2Table_TR1 :** Temperature point 1 of SMART FAN™ IV table 2							

7.2.125Table 2 X-axis Transition Point 2 Register

Location : Index 91h

Type : Read/Write

Power on default value : 23h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_TR2							
FUNC.	**Temp2Table_TR2 :** Temperature point 2 of SMART FAN™ IV table 2							

7.2.126 Table 2 X-axis Transition Point 3 Register

Location : Index 92h

Type : Read/Write

Power on default value : 2Dh

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_TR3							
FUNC.	**Temp2Table_TR3 :** Temperature point 3 of SMART FAN™ IV table 2							

新唐科技 nuvoTon INTELLECTUAL PROPERTY

7.2.127 Table 2 X-axis Transition Point 4 Register

Location : Index 93h

Type : Read/Write

Power on default value : 37h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_TR4							
FUNC.	**Temp2Table_TR4 :** Temperature point 4 of SMART FAN™ IV table 2							

7.2.128 Table 2 X-axis Critical Point Register

Location : Index 94h

Type : Read/Write

Power on default value : 3Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_TRCritical							
FUNC.	**Temp2Table_TRCritical :** Critical Temperature point of SMART FAN™ IV table 2							

7.2.129Table 2 Y-axis Transition Point 1 Register

Location : Index 95h

Type : Read/Write

Power on default value : 8Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_FL1							
FUNC.	**Temp2Table_FL1 :** FANCTL point 1 of SMART FAN™ IV table 2							

7.2.130 Table 2 Y-axis Transition Point 2 Register

Location : Index 96h

Type : Read/Write

Power on default value : AAh

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_FL2							
FUNC.	**Temp2Table_FL2 :** FANCTL point 2 of SMART FAN™ IV table 2							

7.2.131 Table 2 Y-axis Transition Point 3 Register

Location : Index 97h

Type : Read/Write

Power on default value : C8h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_FL3							
FUNC.	**Temp2Table_FL3 :** FANCTL point 3 of SMART FAN™ IV table 2							

7.2.132 Table 2 Y-axis Transition Point 4 Register

Location : Index 98h

Type : Read/Write

Power on default value : E6h

BIT	7	6	5	4	3	2	1	0
NAME	Temp2Table_FL4							
FUNC.	**Temp2Table_FL4 :** FANCTL point 4 of SMART FAN™ IV table 2							

7.2.133 Table 3 X-axis Transition Point 1 Register

Location : Index A0h

Type : Read/Write

Power on default value : 19h

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_TR1							
FUNC.	**Temp3Table_TR1 :** Temperature point 1 of SMART FAN™ IV table 3							

7.2.134 Table 3 X-axis Transition Point 2 Register

Location : Index A1h

Type : Read/Write

Power on default value : 23h

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_TR2							
FUNC.	**Temp3Table_TR2 :** Temperature point 2 of SMART FAN™ IV table 3							

7.2.135 Table 3 X-axis Transition Point 3 Register

Location : Index A2h

Type : Read/Write

Power on default value : 2Dh

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_TR3							
FUNC.	**Temp3Table_TR3 :** Temperature point 3 of SMART FAN™ IV table 3							

7.2.136 Table 3 X-axis Transition Point 4 Register

Location : Index A3h

Type : Read/Write

Power on default value : 37h

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_TR4							
FUNC.	**Temp3Table_TR4 :** Temperature point 4 of SMART FAN™ IV table 3							

7.2.137 Table 3 X-axis Critical Point Register

Location : Index A4h

Type : Read/Write

Power on default value : 3Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_TRCritical							
FUNC.	**Temp3Table_TRCritical :** Critical Temperature point of SMART FAN™ IV table 3							

7.2.138 Table 3 Y-axis Transition Point 1 Register

Location : Index A5h

Type : Read/Write

Power on default value : 8Ch

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_FL1							
FUNC.	**Temp3Table_FL1 :** FANCTL point 1 of SMART FAN™ IV table 3							

7.2.139 Table 3 Y-axis Transition Point 2 Register

Location : Index A6h

Type : Read/Write

Power on default value : AAh

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_FL2							
FUNC.	**Temp3Table_FL2 :** FANCTL point 2 of SMART FAN™ IV table 3							

7.2.140 Table 3 Y-axis Transition Point 3 Register

Location : Index A7h

Type : Read/Write

Power on default value : C8h

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_FL3							
FUNC.	**Temp3Table_FL3 :** FANCTL point 3 of SMART FAN™ IV table 3							

7.2.141Table 3 Y-axis Transition Point 4 Register

Location : Index A8h

Type : Read/Write

Power on default value : E6h

BIT	7	6	5	4	3	2	1	0
NAME	Temp3Table_FL4							
FUNC.	**Temp3Table_FL4 :** FANCTL point 4 of SMART FAN™ IV table 3							

7.2.142 TD1 Offset Register

Location : Index C1h

Type : Read/Write

Power on default value : 3Dh

BIT	7	6	5	4	3	2	1	0
NAME	RSV		Offset_TD1					
FUNC.	**Offset_TD1 :** TD1 function offset register							

7.2.143 TD2 Offset Register

Location : Index C2h

Type : Read/Write

Power on default value : 3Dh

BIT	7	6	5	4	3	2	1	0
NAME	RSV		Offset_TD2					
FUNC.	**Offset_TD2 :** TD2 function offset register							

7.2.144 TR1 Offset Register

Location : Index C4h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				Offset_TR1			
FUNC.	**Offset_TR1 :** TR1 function offset register							

7.2.145 TR2 Offset Register

Location : Index C5h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				Offset_TR2			
FUNC.	**Offset_TR2 :** TR2 function offset register							

7.2.146 TR3 Offset Register

Location : Index C6h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV				Offset_TR3			
FUNC.	**Offset_TR3 :** TR3 function offset register							

7.2.147Digital Filter Level Select Register

Location : Index CBh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	LDT		RT3		RT2		RT1	
FUNC.	**00 :** No filter selected. (Default) 01: Filter Level 1 selected. 10: Filter Level 2 selected. 11: Filter Level 3 selected. Higher level will slow down the temperature sensor response.							

7.2.148 Programmable Temperature 1 Register

Location : Index E3h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PGM_TEMP1[7:0]							
FUNC.	**PGM_TEMP1[7:0] :** Programmable Temperature 1							

7.2.149 Programmable Temperature 2 Register

Location : Index E4h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PGM_TEMP2[7:0]							
FUNC.	**PGM_TEMP2[7:0] :** Programmable Temperature 2							

7.2.150 Software Reset Register

Location : Index FCh

Type : Write Only

BIT	7	6	5	4	3	2	1	0
NAME	INIT	RSV						
FUNC.	**INIT :** Write 1 to reset the NCT7802Y							

7.2.151Vendor ID Register

Location : Index FDh

Type : Ready Only

Power on default value : 50h

BIT	7	6	5	4	3	2	1	0
NAME	VendorID							
FUNC.	**VendorID:** Vendor ID of NCT7802Y							

7.2.152 Chip ID Register

Location : Index FEh

Type : Ready Only

Power on default value : C3h

BIT	7	6	5	4	3	2	1	0
NAME	ChipID							
FUNC.	**ChipID:** Chip ID of NCT7802Y							

7.2.153 Version ID Register

Location : Index FFh

Type : Ready Only

Power on default value : 2xh

BIT	7	6	5	4	3	2	1	0
NAME	VersionID							
FUNC.	**VersionID:** Versin ID of NCT7802Y, the value is 2xh (x=0,1,2…)							

7.3 BANK 1 REGISTER MAP

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
0	Bank Select	R/W	00	RSV							BKSEL
1	PECI Control Reg-1	RW	10	PECI_En	RSV					Manual_En	Routine_En
2	PECI Control Reg-2	RW	00	RSV		TN_Extend[1:0]		RSV			
3	PECI Control Reg-3	RW	00	RSV		En_Agt[1:0]		RSV		Dmn1_Agt[3:0]	
4	Report Temp Style 1	RW	00	RSV			Clamp	RSV	RtDmn_Agt[1:0]		RtHigher
5	Address content for manual command	RW	00	Addr							
6	Write Length for manual command	RW	00	Write_Length							
7	Read Length for manual command	RW	00	Read_Length							
8	Command Code for manual command	RW	00	Command_Code							
9	Agent0 Base Temperature	RW	00	RSV	Tbase0[6:0]						
0A	Agent1 Base Temperature	RW	00	RSV	Tbase1[6:0]						
0B	Generic write in data 1 to client	RW	00	WrData_1							
0C	Generic write in data 2 to client	RW	00	WrData_2							
0D	Generic write in data 3 to client	RW	00	WrData_3							
0E	Generic write in data 4 to client	RW	00	WrData_4							
0F	Generic write in data 5 to client	RW	00	WrData_5							
10	Generic write in data 6 to client	RW	00	WrData_6							
11	Generic write in data 7 to client	RW	00	WrData_7							
12	Generic write in data 8 to client	RW	00	WrData_8							
13	Generic write in data 9 to client	RW	00	WrData_9							
14	Generic write in data 10 to client	RW	00	WrData_10							
15	Generic write in data 11 to client	RW	00	WrData_11							
16	Generic write in data 12 to client	RW	00	WrData_12							
17	Agt0_D0 Relative Temp (HB)	RO	F8	RTH_Agt0_D0							
18	Agt0_D0 Relative Temp (LB)	RO	80	RTL_Agt0_D0							
19	Agt0_D1 Relative Temp (HB)	RO	F8	RTH_Agt0_D1							
1A	Agt0_D1 Relative Temp (LB)	RO	80	RTL_Agt0_D1							
1B	Agt1_D0 Relative Temp (HB)	RO	F8	RTH_Agt1_D0							
1C	Agt1_D0 Relative Temp (LB)	RO	80	RTL_Agt1_D0							
1D	Agt1_D1 Relative Temp (HB)	RO	F8	RTH_Agt1_D1							
1E	Agt1_D1 Relative Temp (LB)	RO	80	RTL_Agt1_D1							

Idx	Register Name	Att	Df	7	6	5	4	3	2	1	0
1F	Agent Characteristic	RO	00	RSV						Alive_Agt[1:0]	
2A	Generic read out data 1 from client	RO	00	RdData_1							
2B	Generic read out data 2 from client	RO	00	RdData_2							
2C	Generic read out data 3 from client	RO	00	RdData_3							
2D	Generic read out data 4 from client	RO	00	RdData_4							
2E	Generic read out data 5 from client	RO	00	RdData_5							
2F	Generic read out data 6 from client	RO	00	RdData_6							
30	Generic read out data 7 from client	RO	00	RdData_7							
31	Generic read out data 8 from client	RO	00	RdData_8							
32	Generic read out data 9 from client	RO	00	RdData_9							

新唐科技 nuvoTon INTELLECTUAL PROPERTY

7.4 BANK 1 REGISTER DETAIL

7.4.1 PECI Control Register 1

Location : Index 01h

Type : Read/Write

Power on default value : 10h

BIT	READ / WRITE	DESCRIPTION
7	R / W	Enable PECI Function (**PECI_En**)
6~2	R / W	Reserved
1	R / W	Enable PECI Manual Command Function (**Manual_En**)
0	R / W	Enable PECI GetTemp Routine Function (**Routine_En**)

7.4.2 PECI Control Register 2

Location : Index 02h

Type : Read/Write

Power on default value : 00h

BIT	READ / WRITE	DESCRIPTION
7~6	R / W	Reserved
5	R / W	**TN_Extend[1:0]** Adjust Transaction Rate 00_{BIN} = 1.5 MHz 01_{BIN} = 750 KHz 10_{BIN} = 375 KHz 11_{BIN} = 187.5 KHz
4	R / W	
3 ~ 0	R / W	Reserved

7.4.3 PECI Control Register 3

Location : Index 03h

Type : Read/Write

Power on default value : 00h

BIT	READ / WRITE	DESCRIPTION
7 ~ 6	R / W	Reserved
5	R / W	**En_Agt[1:0]** PECI host to process related agents enable or disable agent PECI host to process related agents enable or disable agent0
4	R / W	
3 ~ 2	R / W	Reserved
1	R / W	**Dmn1_Agt[1:0]** Indicate which agent with domain1

BIT	READ / WRITE	DESCRIPTION
0	R / W	0 = Agent does not have domain 1 1 = Agent has domain 1 (Do not set to 1 , if the CPU does not exist domain 1)

7.4.4 Report Temperature Style Register

Location : Index 04h

Type : Read/Write

Power on default value : 00h

BIT	READ / WRITE	DESCRIPTION
7 ~ 5	R / W	Reserved
4	R / W	When temperature data reading is positive or less than -128, can enable this function to clamp temperature data.(**Clamp**)
3	R / W	Reserved
2	R / W	**RtDmn_Agt[1:0]** Agent 1 - Agent 0 always return the relative domain Temperature 0 = Agent always returns the relative temperature from domain 0 1 = Agent always returns the relative temperature from domain 1
1	R / W	
0	R / W	Return High Temperature of doamin0 or domain1.(**RtHigher**) 0 = The temperature of each agent is returned from domain 0 or domain 1, which is controlled by (CR 04_{HEX}) 1 = Return the highest temperature in domain 0 and domain 1 of individual Agent

7.4.5 Address Content for Manual Command Register

Location : Index 05h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Command Address							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.6 Write Length for Manual Command Register

Location : Index 06h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Command Write Length							

DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.7 Read Length for Manual Command Register

Location : Index 07h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Command Read Length							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.8 Command Code for Manual Command Register

Location : Index 08h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Command Code							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.9 Agent0 Base Temperature Register

Location : Index 09h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	Reserved	Tbase 0						
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.10 Agent1 Base Temperature Register

Location : Index 0Ah

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	Reserved	Tbase 1						
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.11 Generic Write in Data 1 to Client Register

Location : Index 0Bh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 1							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.12 Generic Write in Data 2 to Client Register

Location : Index 0Ch

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 2							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.13 Generic Write in Data 3 to Client Register

Location : Index 0Dh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 3							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.14 Generic Write in Data 4 to Client Register

Location : Index 0Eh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 4							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.15 Generic Write in Data 5 to Client Register

Location : Index 0Fh

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 5							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.16 Generic Write in Data 6 to Client Register

Location : Index 10h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 6							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.17 Generic Write in Data 7 to Client Register

Location : Index 11h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 7							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.18 Generic Write in Data 8 to Client Register

Location : Index 12h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 8							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.19 Generic Write in Data 9 to Client Register

Location : Index 13h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 9							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.20 Generic Write in Data 10 to Client Register

Location : Index 14h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 10							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.21 Generic Write in Data 11 to Client Register

Location : Index 15h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 11							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.22 Generic Write in Data 12 to Client Register

Location : Index 16h

Type : Read/Write

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Write Data 12							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be sent to client							

7.4.23 Agent Relative Temperature Register

Location : Index 17h ~ 1Eh

Type : Read Only

Power on default value : F880h

These registers return the raw data retrieved from PECI GetTemp(). The data may be the error code (range: 8000H~81FFH) or relative temperatures to process the defined **Tbase**. The error code will only be update in **ARTR** and absolute Temperature will not be updated when the error code is received. If the **RtHigher** mechanism is activated, the normal temperature will always be returned first. In case both 2 domains return errors, the return priority will be Overflow Error > Underflow Error > Missing Diode > General Error. The reset value is $8001_{HEX,}$ in that PECI is defaulted to be off. In PECI, 8001_{HEX} means the diode is missing.

INDEX 17-1E	DESCRIPTION
17h[15:8],18h[7:0]	Domain0 Relative Temperature Agent0 [15:0]
19h[15:8],1Ah[7:0]	Domain1 Relative Temperature Agent0 [15:0]
1Bh[15:8],1Ch[7:0]	Domain0 Relative Temperature Agent1 [15:0]
1Dh[15:8],1Eh[7:0]	Domain1 Relative Temperature Agent1 [15:0]

GetTemp() PECI Temperature format

BIT	DESCRIPTION
15	Sign Bit. **(Sign)** In PECI Protocol, this bit should always be 1 to represent a negative temperature.
14-6	The integer part of the relative temperature. (**Temperature[8:0]**)
5	**TEMP_2**. 0.5℃ unit.
4	**TEMP_4**. 0.25℃ unit.
3	**TEMP_8**. 0.125℃ unit.
2	**TEMP_16**. 0.0625℃ unit.
1	**TEMP_32**. 0.03125℃ unit.
0	**TEMP_64**. 0.015625℃ unit.

GetTemp() Response Definition

RESPONSE	MEANING
General Sensor Error (GSE)	Thermal scan did not complete in time. Retry is appropriate.
0x0000	Processor is running at its maximum temperature or is currently being reset.
All other data	Valid temperature reading, reported as a negative offset from the TCC activation temperature. The valide temperature reading is referred to GetTemp() PECI Temperature format

ERROR CODE	DESCRIPTION	HOST OPERATION
8000_{HEX}	General Sensor Error	No further processing.
8001_{HEX}	Sensing Device Missing	
8002_{HEX}	Operational, but the temperature is lower than the sensor operation range.	Compulsorily write 0℃ back to the temperature readouts.
8003_{HEX}	Operational, but the temperature is higher than the sensor operation range.	Compulsorily write 127℃ back to the temperature readouts.
8004_{HEX} ~ $81FF_{HEX}$	Reserved	No further operation.

7.4.24 Agent Characteristic Register

Location : Index 1Fh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	RSV						PECI Alive Agent	
DEFAULT	0	0	0	0	0	0	0	0

BIT	DESCRIPTION
7~2	Reserved
1	1: agent1 is able to respond to Ping() command. Agent alive 0: agent1 isn't able to respond to Ping() command. Agent is not alive
0	1: agent0 is able to respond to Ping() command. Agent alive 0: agent0 isn't able to respond to Ping() command. Agent is not alive

7.4.25 Generic Read Out Data 1 from Client Register

Location : Index 2Ah

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 1							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.26 Generic Read Out Data 2 from Client Register

Location : Index 2Bh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 2							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.27 Generic Read Out Data 3 from Client Register

Location : Index 2Ch

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 3							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.28 Generic Read Out Data 4 from Client Register

Location : Index 2Dh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 4							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.29 Generic Read Out Data 5 from Client Register

Location : Index 2Eh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 5							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.30 Generic Read Out Data 6 from Client Register

Location : Index 2Fh

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 6							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.31 Generic Read Out Data 7 from Client Register

Location : Index 30h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 7							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.32 Generic Read Out Data 8 from Client Register

Location : Index 31h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 8							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

7.4.33 Generic Read Out Data 9 from Client Register

Location : Index 32h

Type : Read Only

Power on default value : 00h

BIT	7	6	5	4	3	2	1	0
NAME	PECI Read Data 9							
DEFAULT	0	0	0	0	0	0	0	0
DESCRIPTION	The data would be got from client							

8. ELECTRICAL CHARACTERISTICS

8.1 Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage	3.3V ± 5%	V
Input Voltage	-0.3 to +3.6	V
Operating Temperature	-40 to +85	° C
Storage Temperature	-55 to +150	° C

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

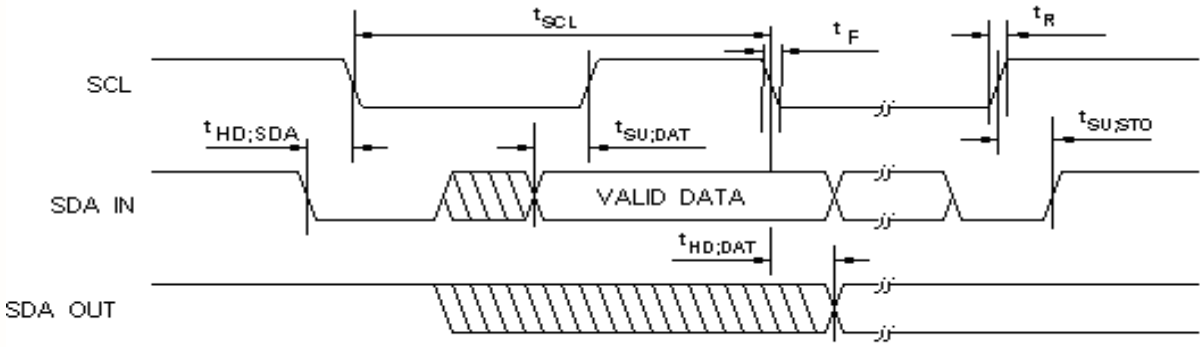
8.2 DC Characteristics

(Ta = 0° C to 70° C, VDD = 3.3V ± 5%, GND = 0V)

PARAMETER	SYM.	MIN.	TYP.	MAX.	UNIT	CONDITIONS
OD_{12} – Open-drain output pin with source-sink capability of 12 mA, with 5V tolerance support.						
Output Low Voltage	V_{OL}			0.4	V	I_{OL} = 12 mA
OUT_{12} - Output buffer pin with source-sink capability of 12 mA, with 5V tolerance support.						
Output Low Voltage	V_{OL}			0.4	V	I_{OL} = 12 mA
Output High Voltage	V_{OH}	2.4			V	I_{OH} = -12 mA
IN_{ts} - TTL level Schmitt-triggered input pin, with 5V tolerance support.						
Input Low Voltage	V_{IL}			0.8	V	VDD = 3.3V
Input High Voltage	V_{IH}	2.0			V	VDD = 3.3V
Input High Leakage	I_{LIH}			+10	μA	VIN=3.3V
Input Low Leakage	I_{LIL}			-10	μA	VIN=0V
V1 – Bi-direction pin for INTEL™ PECI						
Input Low Voltage	V_{IL}	$0.275V_{tt}$		$0.5V_{tt}$	V	
Input High Voltage	V_{IH}	$0.55V_{tt}$		$0.725V_{tt}$	V	
Output Low Voltage	V_{OL}			$0.25V_{tt}$	V	
Output High Voltage	V_{OH}	$0.75V_{tt}$			V	

8.3 AC Characteristics

SMBus Interface



Serial Bus Timing Diagram

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
SCL clock period	t_{SCL}	2.5		uS
Start condition hold time	$t_{HD;SDA}$	1.5		uS
Stop condition setup-up time	$t_{SU;STO}$	1		uS
DATA to SCL setup time	$t_{SU;DAT}$	120		nS
DATA to SCL hold time	$t_{HD;DAT}$	5		nS
SCL and SDA rise time	t_R		1.0	uS
SCL and SDA fall time	t_F		300	nS

9. ORDERING INFORMATION

PART NUMBER	PACKAGE	REMARKS
NCT7802Y	QFN20	Green Package (Halogen-free)

10. TOP MARKING SPECIFICATIONS

1st Line : Nuvoton Logo

2nd Line : Part number- **NCT7802Y**

3rd Line : Assembly tracking code

1 13: packages made in year 2011, week 13

T : Assembly house code

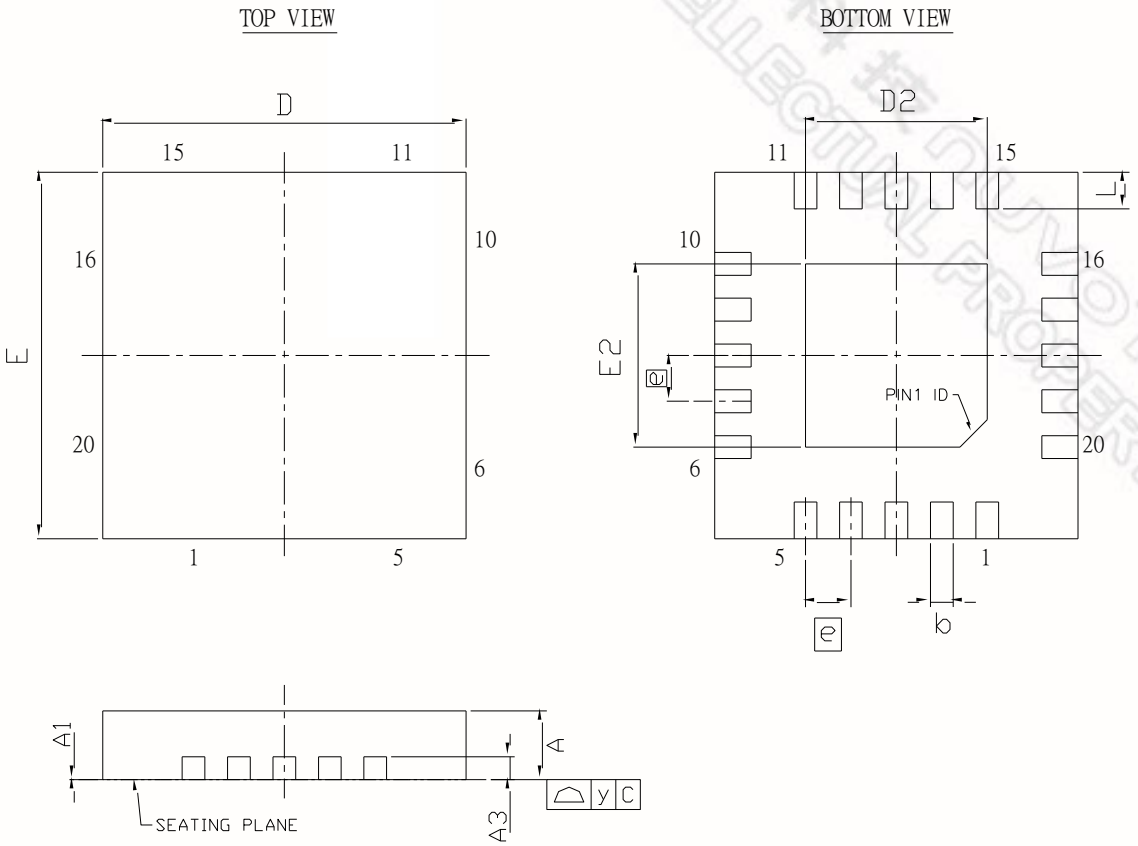
A : IC version

BA : Nuvoton internal use code

新唐科技 nuvoTon INTELLECTUAL PROPERTY

11. PACKAGE DRAWING AND DIMENSIONS

QFN20 4x4 MM^2



Controlling Dimension :Millimeters

SYMBOL	DIMENSION (MM)			DIMENSION (Inch)		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.02756	0.02953	0.03150
A1	0	0.02	0.05	0	0.0079	0.00197
A3	0.203 REF			0.0079 REF		
b	0.18	0.25	0.30	0.00709	0.00984	0.01181
D	3.90	4.00	4.10	0.1535	0.1575	0.1614
D2	1.90	2.00	2.10	0.0748	0.0787	0.0827
E	3.90	4.00	4.10	0.1535	0.1575	0.1614
E2	1.90	2.00	2.10	0.0748	0.0787	0.0827
e	0.50 BSC			0.01969 BSC		
L	0.30	0.40	0.50	0.01181	0.01574	0.01969
y	0.08			0.00315		

Note:D2,E2 by die size difference .

12. REVISION HISTORY

VERSION	DATE	PAGE	DESCRIPTION
1.0	07/13/2011	N.A.	Public released, all versions before 1.0 are preliminary versions.
1.1	1/5/2012	2	Added VCC monitoring accuracy item.
1.2	2/2/2012	7,16	Added Programming from EEPROM description.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

Please note that all data and specifications are subject to change without notice.
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.