F75386M/F75386SG Datasheet

Dual ±1°C Accuracy Temperature Sensor IC with Fan Speed Control

Release Date: July, 2007
Revision: V0.27P

Downloaded from Elcodis.com electronic components distributor

F75386 Datasheet Revision History

Version	Date	Page	Revision History
0.20P	Feb.,2005		Original version
0.21P	Mar.,2005	17	Add ARA register Index FDh
0.22P	Mar.,2005	11,13,18,23	(1) Revise Index 02/Index 16/Index 10-2Fh (2) Add MSOP Package and delete SOP package
0.23P	Dec.,2005		Revise typo
0.24P	Feb.,2006		Add SOP Green package description
0.25P	Dec, 2006	1	Add Taiwan patent certification number
0.26P	Jan, 2007	15	Register-0x4C description correction
0.27P	July, 2007	-	Company readdress

Fintek Confidential
Do Not Copy

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

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Fintek for any damages resulting from such improper use or sales.

Downloaded from Elcodis.com electronic components distributor

Table of Contents

1. General Description 1
2. Features 1
3. Key Specifications 2
4. Pin Configuration 2
5. Pin Descriptions 2
6. Functional Description 3
6.1 General Description 3
6.2 Access Interface 3
6.3 Typical Operating Characteristics 5
6.4 Temperature Monitoring 6
6.4 Alert# Signal 7
6.5 Temperature Fault Queue 9
7. Registers Description 9
7.1 Configuration Register — Index 03h (09h) 9
7.2 Status Register 1— Index 02h 10
7.3 Status Register 2— Index 18h 10
7.4 Real-Time Status Register — Index 2Eh 11
7.5 Conversion Rate Register — Index 04h (0Ah) 11
7.6 Serial Interface Timeout Register — Index 22h 12
7.7 ALERT MASK Register 1 — Index 16h 12
7.8 ALERT MASK Register 2— Index 17h 13
7.9 PWM Control Register — Index 30h 13
7.10 FINTEK PWM Control Register — Index 31h (Fintek Mode) 14
7.11 PWM Control and Fan Monitor Register— Index 4Ah 14
7.12 Fan Spin-Up Configuration Register — Index 4Bh 14
7.13 PWM Value Register — Index 4Ch 15
7.14 FAN PWM Frequency Register — Index 4Dh 15
7.15 Lookup Table Hysteresis Register — Index 4Fh 16
7.16 Temperature vs. PWM Duty Lookup Table Registers — Index 50h to 5Fh 16
7.17 ALERT Mode and Temperature Filter Control Register -- Index BFh 16
7.18 ARA Register--- Index FDh 16
7.19 Vendor ID II (Manufacturer ID) Register — Index FEh 17
7.20 Temperature and Fan Count Value Registers— Index 10h- 2Fh 17
8. PCB Layout Guide 17
9. Electrical characteristic 19

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

9.1 Absolute Maximum Ratings 19
9.2 DC Characteristics 19
9.3 AC Characteristics 20
10 Ordering Information 21
11 Package Dimensions 22
12 Application Circuit 1

Fintek Confidential
Do Not Copy

Downloaded from Elcodis.com electronic components distributor

1. General Description

The F75386 is a temperature sensor IC with fan speed monitoring and controlling function which is specific designed for notebook etc. An 11-bit analog-to-digital converter (ADC) was built inside F75386. The F75386 can provide 2 remote temperature sensor and 1 local temperature sensor. The remote temperature sensor can be performed by CPU/GPU thermal diode or transistor 2N3906. The F75386 can also provide alert signals for system protection which is optional with fan speed monitoring and controlling. The users can set up the upper and lower limits (alarm thresholds) of all monitored parameters and this chip will issue warning messages for system protection if there is something wrong with monitored items. As for fan speed control, the fan speed will be related to temperature variations. The F75386 can use PWM duty cycle output to automatically control fan speed. There are 8 steps PWM duty cycle output for users to program according to the temperature variations.

Through the BIOS or application software, the users can read all the monitored parameters of system all the time. And a pop-up warning can be also activated when the monitored item was out of the proper/pre-setting range. The F75386 is in the green package of 8-pin MSOP/SOP and powered by 3.3V.

2. Features

- Provide 1 on-chip local and 2 remote temperature sensing
  - ✓ ±1 °C accuarcy on remote channel(+60 °C to +126 °C)
- Integrated fan speed monitoring function and PWM duty cycle output for automatic fan speed control
- User selectable multi-function pin for either tachometer input or ALERT# output function
- User selectable multi-function pin for either PWM duty cycle output or THERM# output function
- ALERT# output for SMBus alert
- THERM# output for over temperature alert or for system shut down
- Programmable THERM# limits and THERM# hysteresis
- Programmable alert queue and limited and setting points(alert threshold) for monitored items
- 2 wire SMBus interface
- 3VCC operation and in 8-MSOP/SOP green package

Patented: TW235231, TWI263778

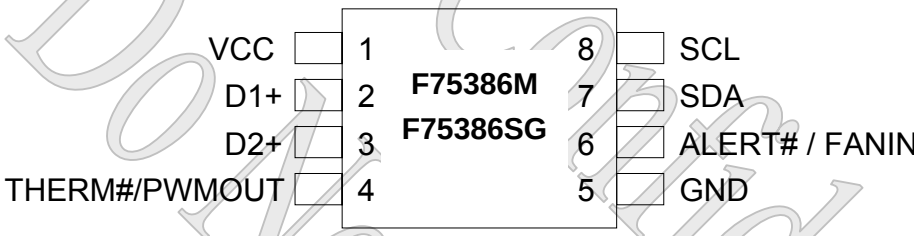
Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

3. Key Specifications

- Supply Voltage 3.0~3.6V
- Supply Current 630 uA (@ conversion rate = 16Hz)
- Measured Range 0 ~ 145.75 °C
- Remote Diode Temperature Accuracy ±1 °C from +60°C to +126°C
- Local Temperature Accuracy ±3 °C from 0°C to +100°C

4. Pin Configuration



5. Pin Descriptions

POD_{12} - Pure Open-drain output pin with 12 mA sink capability

IN_{ts} - TTL level input pin and schmitt trigger

AIN - Input pin(Analog)

PWR - Power

PIN NO	PIN NAME	TYPE	PWR	DESCRIPTION
1	VCC	PWR	VCC	Power Pin
2	D1+	AIN	VCC	Positive connection to remote temperature sensor (ex: thermal diode anode)
3	D2+	AIN	VCC	Positive connection to remote temperature sensor (ex: thermal diode anode)
4	THERM# PWMOUT	POD_{12} (5V-tolerance)	VCC	This is a multi-function pin. Power-on default is THERM# function. When it acts as PWMOUT function, it uses PWM duty cycle output to control the fan speed. When it acts as THERM# function, it will be asserted when the temperature exceeds its THERM limit.

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

5	GND	PWR	VCC	Ground
6	ALERT# FANIN	OD_{12} / IN_{ts} (5V-tolerance)	VCC	This is a multi-function pin. Power-on default is ALERT# function. When it acts as ALERT# function, it will be asserted when the temperature exceeds its high limit or goes below its low limit. When it is as FANIN function, it is for monitoring the fan speed.
7	SDA	IN_{ts}/OD_{12} (5V-tolerance)	VCC	Serial bus data
8	SCL	IN_{ts} (5V-tolerance)	VCC	Serial bus clock

6. Functional Description

6.1 General Description

The F75386 is a temperature sensor IC with fan speed monitoring and controlling function which is specific designed for notebook etc. An 11-bit analog-to-digital converter (ADC) was built inside F75386. The F75386 can provide 2 remote temperature sensor and 1 local temperature sensor. The remote temperature sensor can be performed by CPU/GPU thermal diode or transistor 2N3906. The F75386 can also provide alert signals for system protection which is optional with fan speed monitoring and controlling. The users can set up the upper and lower limits (alarm thresholds) of all monitored parameters and this chip will issue warning messages for system when there is something wrong with monitored items. As for fan speed control, the fan speed will be related to temperature variation. The F75386 can use PWM duty cycle output to automatically control fan speed. There are 8 steps PWM duty cycle output for users to program according to the temperature variation.

6.2 Access Interface

The F75386 can be connected to a compatible 2-wire serial system management bus as a slave device under the control of the master device, using two device terminals SCL and SDA. The F75386 supports SMBus protocol of, “Write Byte”, “Read Byte”, both with or without Packet Error checking(PEC) which is calculated using CRC-8. For detail information about PEC, please check SMBus 1.1 specification. The F75386 supports 25ms timeout for no activity on the SMBus. This timeout function is programmed at 22h bit7 and default is disabled. F75386 also supports Alert Response Address(ARA) protocol.The operation of the protocol is described with details in the following sections.

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

(a) SMBus write to internal address register followed by the data byte

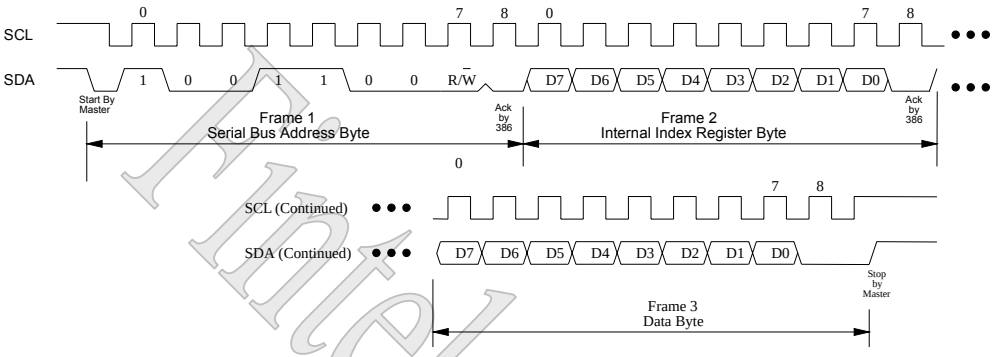


Figure 1. Serial Bus Write to Internal Address Register followed by the Data Byte

(b) Serial bus write to internal address register only

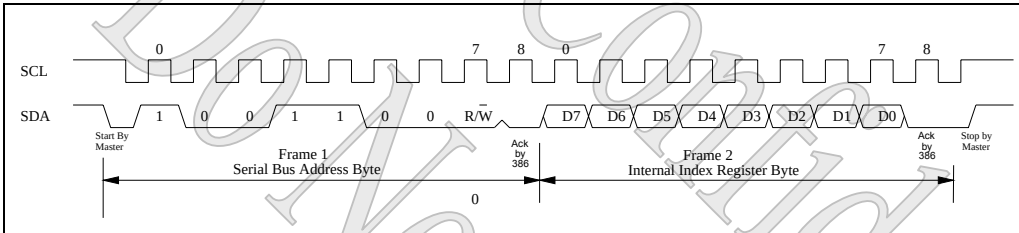


Figure 2. Serial Bus Write to Internal Address Register Only

(c) Serial bus read from a register with the internal address register prefer to desired location

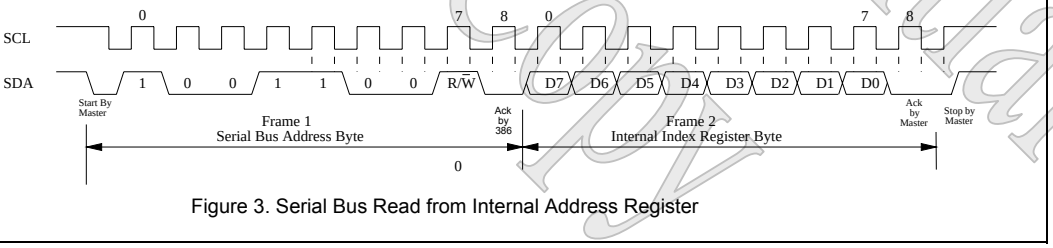


Figure 3. Serial Bus Read from Internal Address Register

(d) Alert Response Address

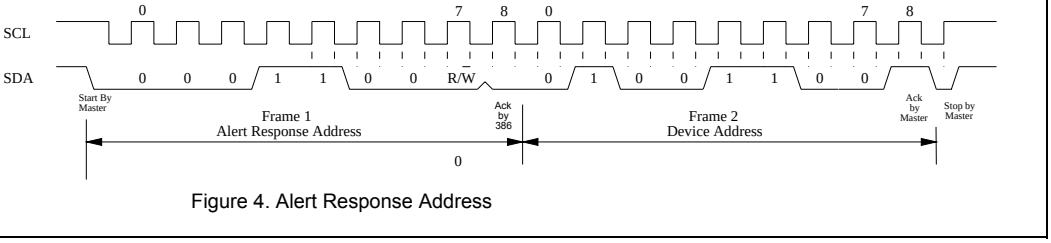


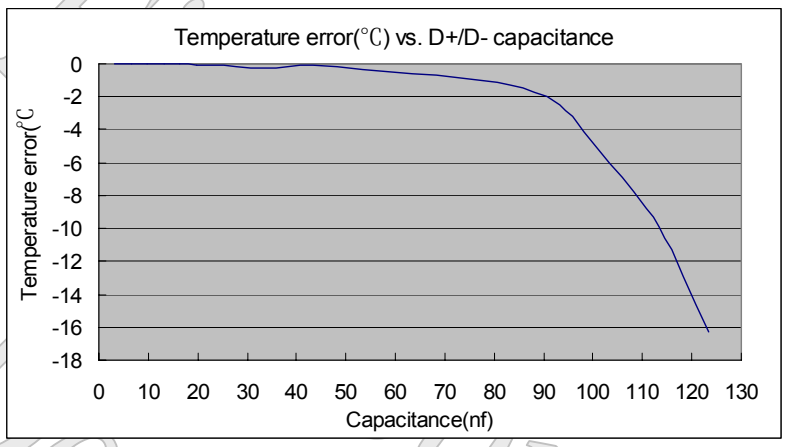
Figure 4. Alert Response Address

Fintek Confidential Do Not Copy

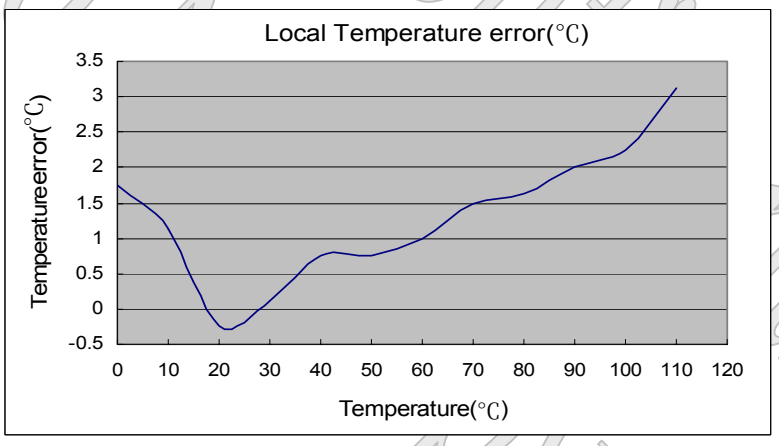
Downloaded from Elcodis.com electronic components distributor

6.3 Typical Operating Characteristics

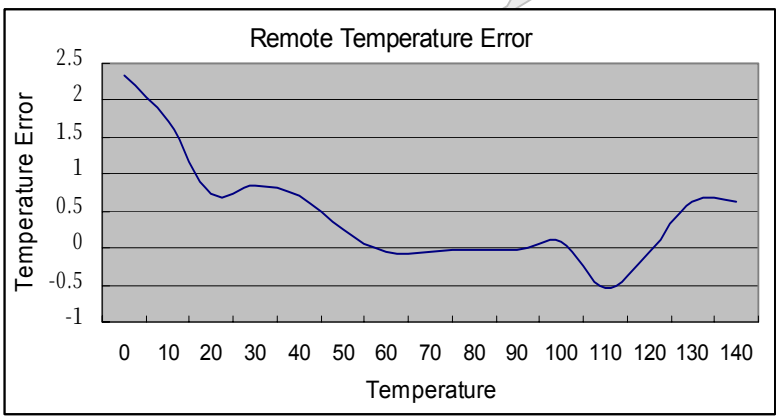
(a) Temperature Error vs.D+/D- Capacitance



(b) Local Temperature Error vs. Die Temperature



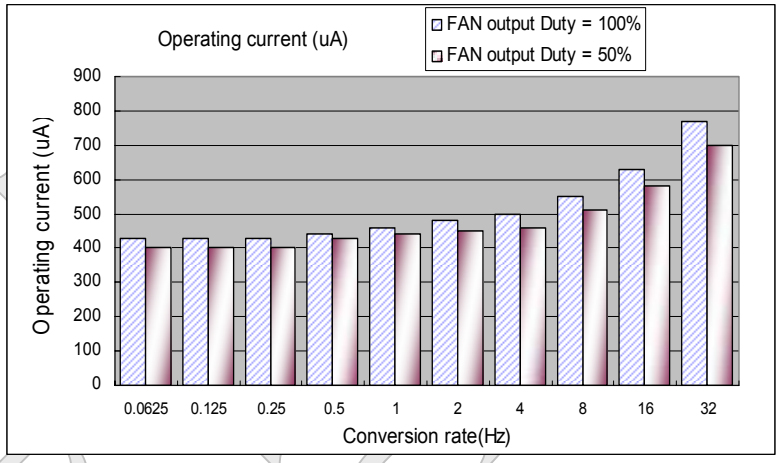
(c) Remote Diode Error vs. Remote Temperature Error



Preliminary Document

Downloaded from Elcodis.com electronic components distributor

(d) Operating Supply Current vs. Conversion Rate



6.4 Temperature Monitoring

The F75386 can provide one local and two remote temperature sensors. Both can be measured from 0°C to 126.75°C. The temperature format is as the following table:

Temperature (High Byte)	Digital Output	Temperature (Low Byte)	Digital Output
0°C	0000 0000	0°C	000 0 0000
1°C	0000 0001	0.125°C	001 0 0000
25°C	0001 1001	0.250°C	010 0 0000
50°C	0011 0010	0.375°C	011 0 0000
75°C	0100 1011	0.500°C	100 0 0000
90°C	0101 1010	0.625°C	101 0 0000
100°C	0110 0100	0.750°C	110 0 0000
126°C	0111 1110	0.875°C	111 0 0000

Remote-sensor transistor manufacturers

Manufacturer	Model Number
Panasonic	2SB0709 2N3906
Philips	PMBT3906

Fintek Confidential Do Not Copy

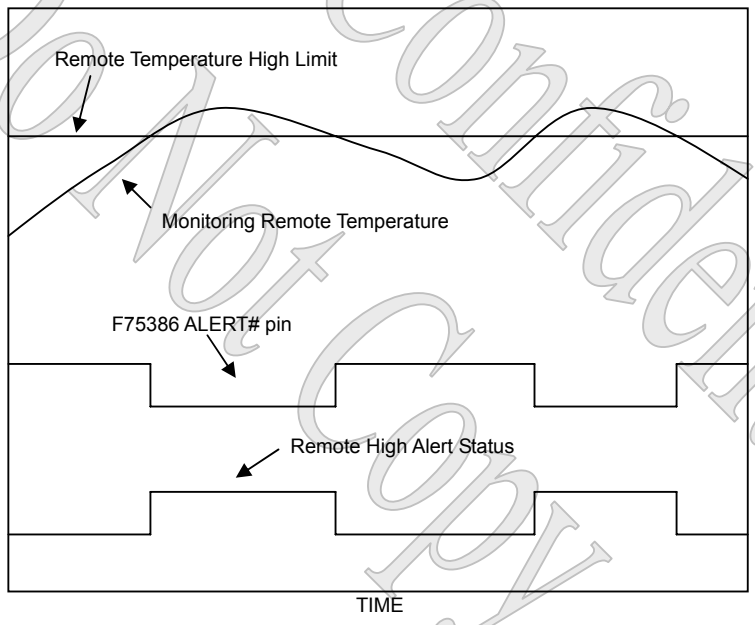
Downloaded from Elcodis.com electronic components distributor

6.4 Alert# Signal

ALERT#/FANIN (pin 6) can be used as ALERT# output or fan tachometer input by setting Configuration Register (index 03h). When pin 6 is used as ALERT# output, there are three different alert functions can be used. The interrupt methods that ALERT# pin can act are (1) Comparator mode (2) Interrupt mode (3) Alert Response Address mode.

6.4.1 Comparator mode

When the Comparator Mode bit in Configuration Register (index BFh) is asserted, ALERT# is used as a temperature comparator. If the triggering conditions occur, ALERT# will go to low and relative alert status will be asserted until those conditions are no longer present. This mode is not the power-on default state. Note that the triggering conditions do not include BUSY and OPEN status in Configuration Register (index 02h).

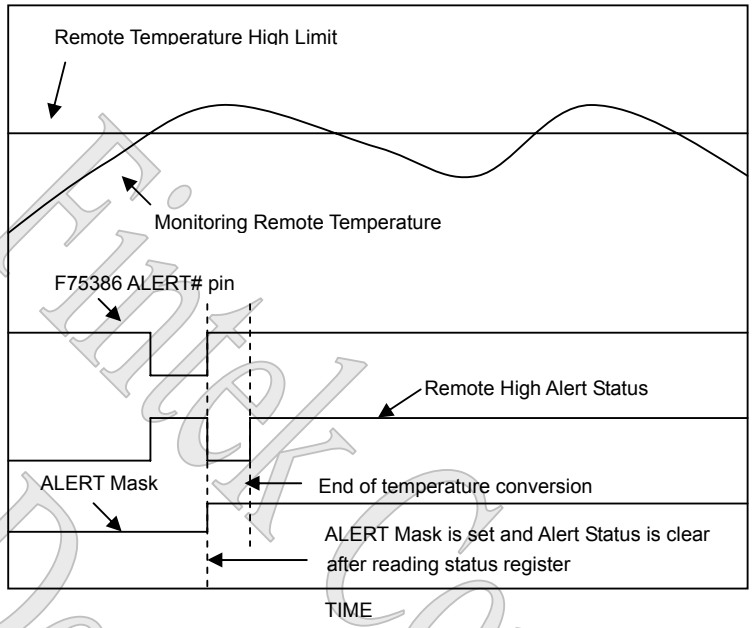


6.4.2 Interrupt mode

The F75386's ALERT# output can be used as a simple interrupt signal if Comparator Mode bit is not asserted. If the triggering conditions occur, relative alert status will be asserted and ALERT# will go to low. The F75386 will set the ALERT Mask bit and relative alert status will be cleared after master's reading of the Status Register (Index 02h or 18h). The ALERT Mask bit is set in order to prevent further ALERT# triggering after the end of one temperature conversion if the triggering conditions are still present. At the end of interrupt service routine, the master has to reset ALERT Mask bit in configuration register. Note that the triggering conditions do not include BUSY and OPEN status in Configuration Register (index 02h).

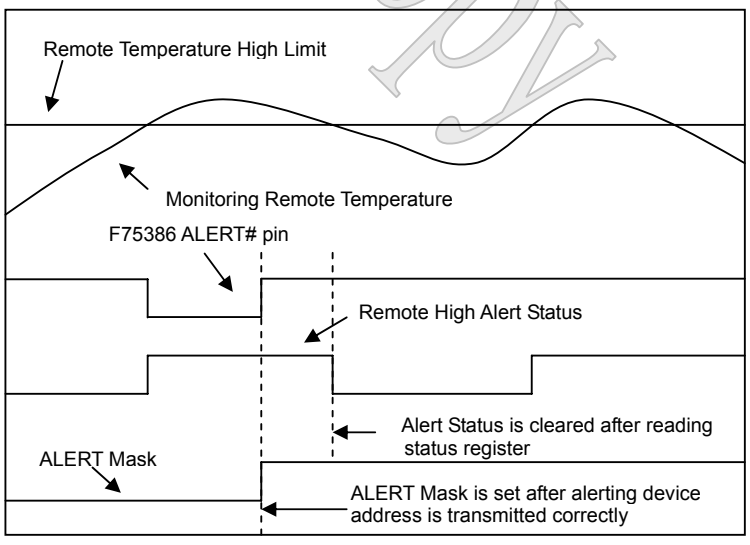
Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor



6.4.3 Alert Response Address mode

If ALERT# is connected to one or more ALERT# outputs of SMBus compatible devices, the master may send an ARA command to ask that which device is pulling ALERT# to low. When the ALERT# is pulled to low by F75386 and F75386 receives the ARA command sent by the master, F75386 will send its address to the master. The F75386 will reset its ALERT# output and set the ALERT Mask bit once the master acknowledges its response of device address. The master may read F75386's status registers to check what the triggering conditions occur. At the end of interrupt service routine, the master has to reset ALERT Mask bit in configuration register. Note that the triggering conditions do not include BUSY and OPEN status in Configuration Register (index 02h). The ARA, 000 1100, is a general call address and is defined in SMBus specifications. No devices should be assigned to this address.

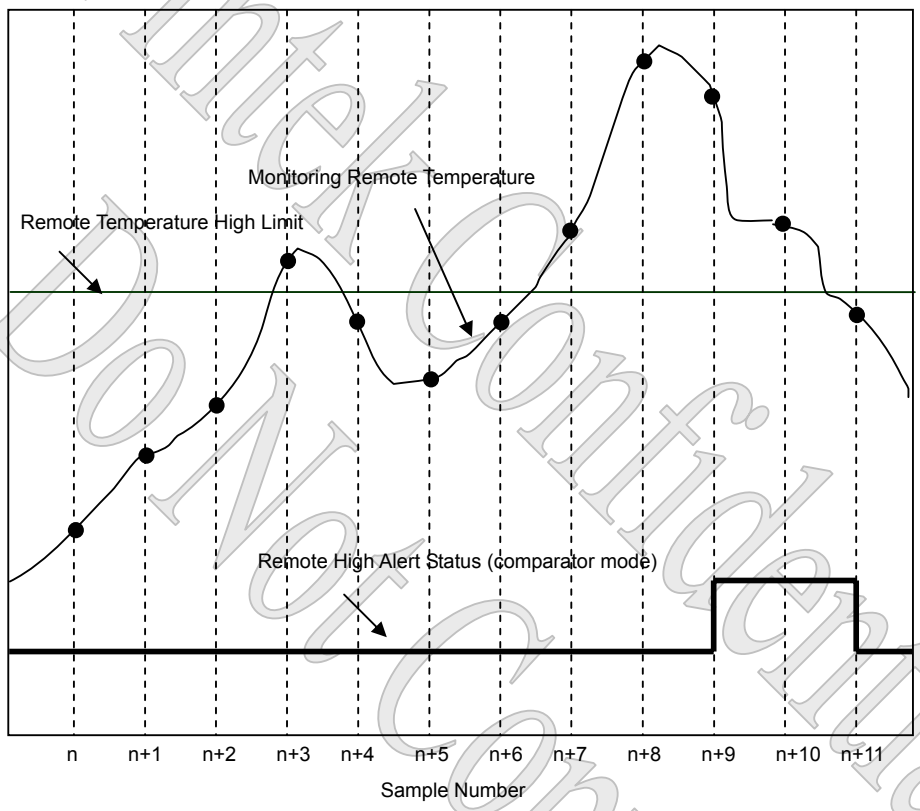


Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

6.5 Temperature Fault Queue

The F75386 provides a Fault Queue bit in Configuration Register (index 03h) to prevent false alert triggering. By setting Fault Queue bit to a 1, the F75386 will require **three** consecutive triggering conditions of temperature readings to set relative alert status bits to 1. The power-on default value of Fault Queue bit is 0.



Fintek Confidential Do Not Copy

7. Registers Description

7.1 Configuration Register — Index 03h (09h)

Power on default <7:0> = 00h

Bit	Name	Attribute	Description
7	ALERT_MASK	R/W	Set to 1, mask ALERT# signal output.
6	RUN_STOP	R/W	Set to 0, monitor. Set to 1, stop monitor (in standby).
5	PWM_DIS_STBY	R/W	Set to 1, PWMOUT will be disabled while in standby. (when bit 6 is set to 1)

Downloaded from Elcodis.com electronic components distributor

			Set to 0, the F75386's PWM output continues to output the control signal while in standby. (when bit 6 is set to 1)
4~3	Reserved	RO	These bits are unused and always set to 0
2	ALERT_TACH_SEL	R/W	Set to 1, pin6 acts as fan Tachometer input. Set to 0, pin6 acts as ALERT output.
1	Reserved	RO	This bit is unused and always set to 0
0	ALERT_QUEUE	R/W	Set to 1, an ALERT# will be generated if consecutive abnormal events occur three times. Set to 0, an ALERT# will be generated if any abnormal event occurs.

7.2 Status Register 1— Index 02h

Power on default <7:0> = 00h

T1 = On-chip temperature sensor (Local) T2 = Pin 2 external temperature sensor (Remote)

Bit	Name	Attribute	Description
7	ADC_BUSY	RO	Set to 1, ADC is converting.
6	T1_HIGH_STS	RO	Set to 1, T1 temperature exceeds high limit. Set to 0, T1 temperature does not exceed high limit.
5	T1_LOW_STS	RO	Set to 1, T1 temperature goes below low limit. Set to 0, T1 temperature does not go below low limit.
4	T2_HIGH_STS	RO	Set to 1, T2 temperature exceeds high limit. Set to 0, T2 temperature does not exceed high limit.
3	T2_LOW_STS	RO	Set to 1, T2 temperature goes below low limit. Set to 0, T2 temperature does not go below low limit.
2	T2_OPEN_STS	RO	Set to 1, T2 is open-circuit Set to 0, T2 is not open-circuit
1	T2_THERM_STS	RO	Set to 1, T2 temperature exceeds its thermal limit. Set to 0, T2 temperature does not exceed its thermal limit.
0	FAN_ALARM	RO	Set to 1, FAN count is higher than the FAN limit value Set to 0, FAN count is equal or lower than the FAN limit value.

7.3 Status Register 2— Index 18h

Power on default <7:0> = 00h

T1 = On-chip temperature sensor (Local) T3= Pin 3 external temperature sensor (Remote)

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

Bit	Name	Attribute	Description
7	T1_THERM_STS	RO	Set to 1, T1 temperature exceeds its THERM limit. Set to 0, T1 temperature does not exceed its THERM limit.
6	Reserved	RO	This bit is unused and always set to 0
5	Reserved	RO	This bit is unused and always set to 0
4	T3_HIGH_STS	RO	Set to 1, T3 temperature exceeds high limit. Set to 0, T3 temperature does not exceed high limit.
3	T3_LOW_STS	RO	Set to 1, T3 temperature goes below low limit. Set to 0, T3 temperature does not go below low limit.
2	T3_OPEN_STS	RO	Set to 1, T3 is open-circuit or shorted to VDD. Set to 0, T3 is not open-circuit and not shorted to VDD
1	T3_THERM_STS	RO	Set to 1, T3 temperature exceeds its THERM limit. Set to 0, T3 temperature does not exceeds its THERM limit.
0	Reserved	RO	This bit is unused and always set to 0

7.4 Real-Time Status Register — Index 2Eh

Power on default <7:0> = 00h

T1 = On-chip temperature sensor (Local)

T2 = Pin 2 external temperature sensor (Remote) T3= Pin 3 external temperature sensor (Remote)

Bit	Name	Attribute	Description
7-3	Reserved	RO	These bits are unused and always set to 0
2	T3_THERM	RO	Set to 1, T3 temperature exceeds its thermal limit This is a real-time event status
1	T2_THERM	RO	Set to 1, T2 temperature exceeds its thermal limit This is a real-time event status
0	T1_THERM	RO	Set to 1, T1 temperature exceeds its thermal limit This is a real-time event status

7.5 Conversion Rate Register — Index 04h (0Ah)

Power on default <7:0> = 08h

Bit	Name	Attribute	Description			
7-0	CONV_RATE	R/W	Set conversion times per second.			
			Value	Conversion/Sec	Value	Conversion/Sec

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

			00h	0.0625	06h	4
			01h	0.125	07h	8
			02h	0.25	08h	16
			03h	0.5	09h	32
			04h	1	0Ah ~ FFh	Reserved
			05h	2		

7.6 Serial Interface Timeout Register — Index 22h

Power on default <7:0> = 00h

Bit	Name	Attribute	Description
7	EN_I2CTMOUT	R/W	Set to 1, enable serial interface timeout function. (25ms). Set to 0, disable.
6-0	Reserved	RO	These bits are unused and always set to 0

7.7 ALERT MASK Register 1 — Index 16h

Power on default <7:0> = A4h

T1 = On-chip temperature sensor (Local) T2 = Pin 2 external temperature sensor (Remote)

Bit	Name	Attribute	Description
7	Reserved	RO	This bit is unused and always set to 1
6	T1H_MASK	RO	Set to 1, T1 temperature exceeds high limit will not generate an ALERT. Set to 0, T1 temperature exceeds high limit will generate an ALERT.
5	T1L_MASK	RO	Set to 1, T1 temperature goes below low limit will not generate an ALERT. Set to 0, T1 temperature goes below low limit will generate an ALERT.
4	T2H_MASK	RO	Set to 1, T2 temperature exceeds high limit will not generate an ALERT. Set to 0, T2 temperature exceeds high limit will generate an ALERT.
3	T2L_MASK	RO	Set to 1, T2 temperature goes below low limit will not generate an ALERT. Set to 0, T2 temperature goes below low limit will generate an ALERT.
2	Reserved	RO	This bit is unused and always set to 1
1	T2_THR_MASK	RO	Set to 1, T2 temperature exceeds its thermal limit will not generate an ALERT. Set to 0, T2 temperature exceeds its thermal limit will generate an ALERT.
0	FAN_MASK	RO	Set to 1, FAN count exceeds its limit will not generate an ALERT. Set to 0, FAN count exceeds its limit will generate an ALERT.

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

7.8 ALERT MASK Register 2— Index 17h

Power on default <7:0> = 00h

T3 = Pin 3 external temperature sensor (Remote)

Bit	Name	Attribute	Description
7	T1_THR_MASK	RO	Set to 1, T3 temperature exceeds its THERM limit will not generate an ALERT. Set to 0, T3 temperature exceeds its THERM limit will generate an ALERT.
6-5	Reserved	RO	These bits are unused and always set to 0
4	T3H_MASK	RO	Set to 1, T3 temperature exceeds high limit will not generate an ALERT. Set to 0, T3 temperature exceeds high limit will generate an ALERT.
3	T3L_MASK	RO	Set to 1, T3 temperature goes below low limit will not generate an ALERT. Set to 0, T3 temperature goes below low limit will generate an ALERT.
2	Reserved	RO	This bit is unused and always set to 0
1	T3_THR_MASK	RO	Set to 1, T3 temperature exceeds its THERM limit will not generate an ALERT. Set to 0, T3 temperature exceeds its THERM limit will generate an ALERT.
0	Reserved	RO	This bit is unused and always set to 0

7.9 PWM Control Register — Index 30h

Power on default <7:0> = 20h

Bit	Name	Attribute	Description
7	FTK_MODE	R/W	Set method of controlling PWM duty and frequency to FINTEK mode.
6	Reserved	RO	This bit is unused and always set to 0
5-4	FLT_SEL	R/W	When bit7 set to 0, tachometer input filter can be selected here. 2'b00: Filter time = 177.6us 2'b01: Filter time = 355.2us 2'b10: Filter time = 888us 2'b11: Filter time = 1.776ms
3	Reserved	RO	This bit is unused and always set to 0
2	DIS_CLKCTRL	R/W	Set to 1, disable the clock adjustment for different operating temperature. Set to 0, enable the clock adjustment for different operating temperature.
1	PT_SEL	R/W	Set to 1, select PWMOUT output. Set to 0, select THERM# output.
0	ONE_T	R/W	Set to 1, select only one external thermal diode. At this mode, T3(2nd external) 's reading and status will be set to FFh and 00h. Set to 0, select two external thermal diodes.

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

7.10 FINTEK PWM Control Register — Index 31h (Fintek Mode)

Power on default <7:0> = 00h

Bit	Name	Attribute	Description
7	FTK_PWMCLK_SEL	R/W	Set to 0, PWM source clock is 2 MHz. Set to 1, PWM source clock is 200 kHz.
6-0	FTK_PREDIV	R/W	Set to 0 or 1 makes no different. PWM clock is divided by this value. PWM clock = PWMOUT source clock/FTK_PREDIV

7.11 PWM Control and Fan Monitor Register— Index 4Ah

Power on default <7:0> = 20h

Bit	Name	Attribute	Description
7-6	Reserved	RO	These bits are not used and always set to 0
5	PWM_MODE	R/W	**0:** operates in **TEMPERATURE** mode. PWMOUT duty-cycle is automatically adjusted according to the T-P (Temperature vs. PWM) lookup table. Look-up table is locked. **1:** operates in **MANUAL** mode. Software set the PWMOUT duty-cycle directly. Look-up table is programmable.
4	PWM_INV	R/W	0: PWM output will be 0 V to turn off FAN and open (High-Z) to turn on fan. 1: PWM output will be open to turn off FAN and 0 V to turn on fan.
3	PWM_CLK_SEL	R/W	1: PWMOUT frequency source is 333 kHz. 0: PWMOUT frequency source is 1.4 kHz.
2	Reserved	R/W	This bit is not used and always set to 0
1-0	Tachometer Mode	R/W	00: Traditional Tachometer Input Mode 01: Improved Traditional Tachometer Input Mode 10: Most Accurate Mode 11: Least Effort Mode Note: If the PWM Clock is 333 kHz, Traditional Tachometer Input Mode is always used.

7.12 Fan Spin-Up Configuration Register — Index 4Bh

Power on default<7:0> = 3Fh

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

Bit	Name	Attribute	Description
7-6	Reserved	RO	These bits are not used and always set to 0.
5	Fast Tachometer Spin-up	R/W	0: The spin-up time and duty depends on bit 4-0. 1: Sets the PWMOUT to 100% until the spin-up times out or the minimum RPM limit is reached. When this bit is set, the spin-up duty cycle is always 100%. If PWM spin up time (bit2-0) = 000, the spin-up process is bypassed.
4-3	PWM Spin-Up Duty Cycle	R/W	00: No spin-up (unless bit5 is set to 0) 01: 50% 10: 75%~81%. Depends on PWM frequency select. 11: 100%.(default)
2-0	PWM Spin-Up Time	R/W	The time unit is 0.5 second. The default time is 3.5 seconds 000: No Spin-up. 001: 0.5 seconds 010: 1.0second 011: 1.5 second 100: 2.0 second 101: 2.5 second 110: 3.0 second 111: 3.5 second

7.13 PWM Value Register — Index 4Ch

Power on default<7:0> =00h

Bit	Name	Attribute	Description
7-0	PWM_DUTY	R/W	If PWM_MODE is set to 0, this register is read only and reflects the current PWM duty-cycle value from the T-P lookup table. If PWM_MODE is set to 1, this register is read/write and the software programs this register directly.

7.14 FAN PWM Frequency Register — Index 4Dh

Power on default<7:0> =17h

Bit	Name	Attribute	Description
7-5	Reserved	RO	These bits are unused and always set to 0
4-0	PWM_FREQ	R/W	PWM frequency = PWM_CLK / 2n (PWM_CLK = 333 kHz or 1.4 kHz , n = value of this register)

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

7.15 Lookup Table Hysteresis Register — Index 4Fh

Power on default<7:0> = 04h

Bit	Name	Attribute	Description
7-5	Reserved	RO	These bits are unused and always set to 0
4-0	LOOKUP HYST	R/W	Lookup table hysteresis. (Default 4°C ; 1LSB = 1°C)

7.16 Temperature vs. PWM Duty Lookup Table Registers — Index 50h to 5Fh

Power on default<7:0> = 7Fh and 3Fh

Index	Name	Bits	Description
50(52,54,56,58, 5A,5C,5E)	TEMP(x)	7	This bit is unused and always set to 0
		6-0	When T2 (external) temperature exceeds (greater than) this value, PWM output will be the value of INDEX 5(y)h register.
51(53,55,57,59, 5B,5D,5F)	DUTY(y)	7-6	These bits are unused and always set to 0
		5-0	PWM output value corresponds to the temperature entry in INDEX 5(x)h.

7.17 ALERT Mode and Temperature Filter Control Register -- Index BFh

Power on default<7:0> = 00h

Bit	Name	Attribute	Description
7-3	Reserved	RO	These bits are unused and always set to 0
2-1	Reserved	R/W	Rewriteable register
0	Comparator Mode	R/W	0: ALERT# is INTERRUPT mode 1: ALERT# is COMPARATOR mode

7.18 ARA Register--- Index FDh

Power on default: 0Ch. (ARA address = 18h)

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

7.19 Vendor ID II (Manufacturer ID) Register — Index FEh

Power on default: 23h.

7.20 Temperature and Fan Count Value Registers— Index 10h- 2Fh

T1: Local Temperature. T2: External Temperature 1. T3:External Temperature 2

The value in quota is its power-on default value.

Description	Attribute	Address (High Byte)	Address (Low Byte)
T1 reading	RO	00h	1Ah
T2 reading	RO	01h	10h
T3 reading	RO	28h	29h
T1 High Limit	R/W	05h/0Bh (46h)	1Bh (00h)
T1 Low Limit	R/W	06h/0Ch (00h)	1Ch (00h)
T2 High Limit	R/W	07h/0Dh (55h)	13h (00h)
T2 Low Limit	R/W	08h/0Eh (55h)	14h (00h)
T3 High Limit	R/W	2Ah (55h)	2Ch (00h)
T3 Low Limit	R/W	2Bh (00h)	2Dh (00h)
T1 Thermal Limit	R/W	20h (55h)	
T1 Thermal Hysteresis	R/W	23h (0Ah)	
T2 Thermal Limit	R/W	19h (64h)	
T2 Thermal Hysteresis	R/W	21h (0Ah)	
T3 Thermal Limit	R/W	24h (55h)	
T3 Thermal Hysteresis	R/W	25h (0Ah)	
FAN Tachometer Count	R/W	47h (FFh)	46h (FFh)
FAN Tachometer Limit	R/W	49h (FFh)	48h (FFh)

8. PCB Layout Guide

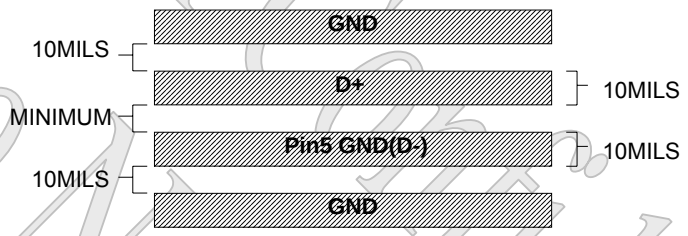
PCB can be electrically noisy environments, and the F75386 is measuring very small voltage from the remote sensor, so care must be taken to minimize noise which is occurred at the sensor inputs. The following guideline should be taken to reduce the measurement error of the temperature sensors:

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

1. Place the F75386 as close as practical to the remote sensing diode. In noisy environments, such as a computer main-board, the distance can be 4 to 8 inches. (typ). This length can be increased if the worst noise sources are avoided. Noise sources generally include clock generators, CRTs, memory buses and PCI/ISA bus etc.

2. Route the D+ and Pin5 GND(D-) tracks close together, in parallel, with grounded guard tracks on each side. Provide a ground plane under the tracks if possible. Do not route D+ & Pin5 GND(D-) lines next to the deflection coil of the CRT. And also don't route the trace across fast digital signals which can easily induce bigger error.



3. Use wide tracks to minimize inductance and reduce noise pickup. 10 mil track minimum width and spacing is recommended.

4. Try to minimize the number of copper/solder joints, which can cause thermocouple effects. Where copper/solder joints are used, make sure that they are in both the D+ and Pin5 GND(D-) path and at the same temperature. Thermocouple effects should not be a major problem as 1℃ corresponds to about 200μV. It means that a copper-solder thermocouple exhibits 3μV/℃, and takes about 200μV of the voltage error at D+ & Pin5 GND(D-) to cause a 1℃ measurement error. Adding a few thermocouples causes a negligible error.

5. Place a 0.1μF bypass capacitor close to the V_{DD} pin. In very noisy environments, place an external 3300pF input filter capacitors across D+, Pin5 GND(D-) close to the F75386.

6. If the distance to the remote sensor is more than 8 inches, the use of twisted pair cable is recommended. It will work up to around 6 to 12 feet.

7. Because the measurement technique uses switched current sources, excessive cable and/or filter capacitance will affect the measurement accuracy. When using long cables, the filter capacitor may be reduced or removed. Cable resistance can also induce errors. 1 Ω series resistance introduces about

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

0.5℃ error.

Fintek Confidential Do Not Copy

9. Electrical characteristic

9.1 Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Power Supply Voltage	-0.5 to 5.5	V
Input Voltage	-0.5 to VDD+0.5	V
Operating Temperature	0 to +140	° 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

9.2 DC Characteristics

(T_A = 0° C to 70° C, VDD = 3.3V ± 10%, VSS = 0V)

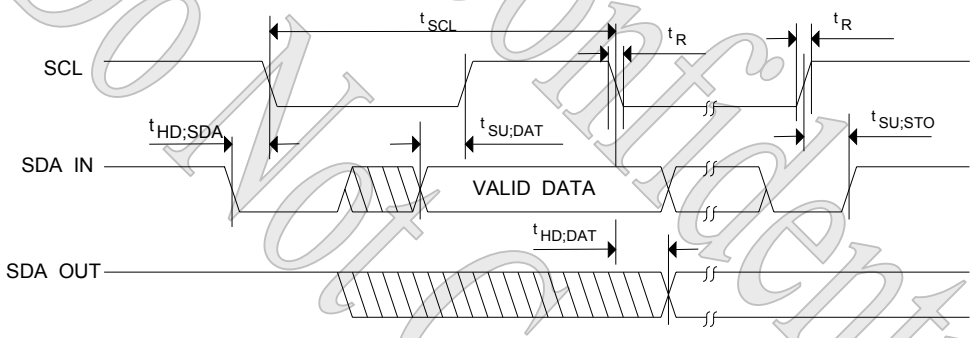
Parameter	Conditions	MIN	TYP	MAX	Unit
Temperature Error, Remote Diode	60 °C < T_D < 126 °C, VCC = 3.0V to 3.6V		± 1		°C
	0 °C <T_D < 60 °C; 126 °C <T_D < 145 °C;		± 1	± 3	
Temperature Error, Local Diode	0 °C < T_A < 100 °C, VCC = 3.0V to 3.6V		± 1	± 3	°C
Supply Voltage range		3.0	3.3	3.6	V
Average operating supply current	16 Conversions / Sec Rate		630		uA
	0.0625 Conversions / Sec Rate		430		uA
Standby supply current			5		uA
Resolution			0.125		°C
Under-voltage lockout threshold	VDD input, Disables ADC , Rising Edge		2.55		V
Power on reset threshold			2.2	2.4	V
Diode source current	High Level		95		uA
	Low Level		10		uA

Downloaded from Elcodis.com electronic components distributor

(T_A = 0° C to 70° C, VDD = 3.3V ± 10%, VSS = 0V)

PARAMETER	SYM.	MIN.	TYP.	MAX.	UNIT	CONDITIONS
OD_{16} - Open-drain output pin with sink capability of 16 mA						
Output Low Current	IOL	10	12		mA	VOL = 0.4V
IN_{ts} - TTL level Schmitt-triggered input pin						
Input Low Threshold Voltage	Vt-	0.4	0.8		V	VDD = 3.3V
Input High Threshold Voltage	Vt+		2.0	2.4	V	VDD = 3.3V
Input High Leakage	ILIH			1	μA	VIN = VDD
Input Low Leakage	ILIL			1	μA	VIN = 0 V

9.3 AC Characteristics



Serial Bus Timing Diagram

Serial Bus Timing

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
SCL clock period	t_{SCL}	0.5	10000	uS
Start condition hold time	$t_{HD;SDA}$	0.5		uS
Stop condition setup-up time	$t_{SU;STO}$	0.5		uS
DATA to SCL setup time	$t_{SU;DAT}$	50		nS
DATA to SCL hold time	$t_{HD;DAT}$	50		nS
SCL and SDA rise time	t_R		0.4	uS
SCL and SDA fall time	t_F		0.4	uS

Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor

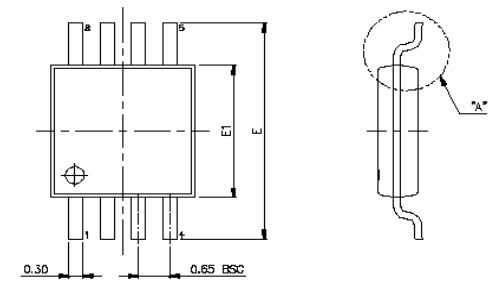
10 Ordering Information

Part Number	Package Type	Production Flow
F75386M	8 pin MSOP Green Package	Commercial, 0°C to +70°C
F75386SG	8 pin SOP Green Package	Commercial, 0°C to +70°C

Fintek Confidential
Do Not Copy

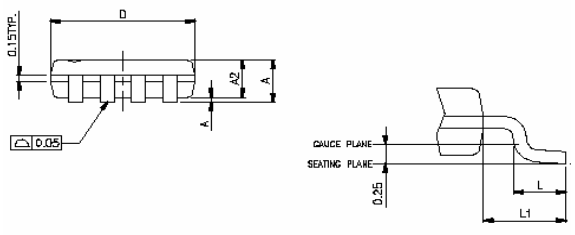
Downloaded from Elcodis.com electronic components distributor

11 Package Dimensions



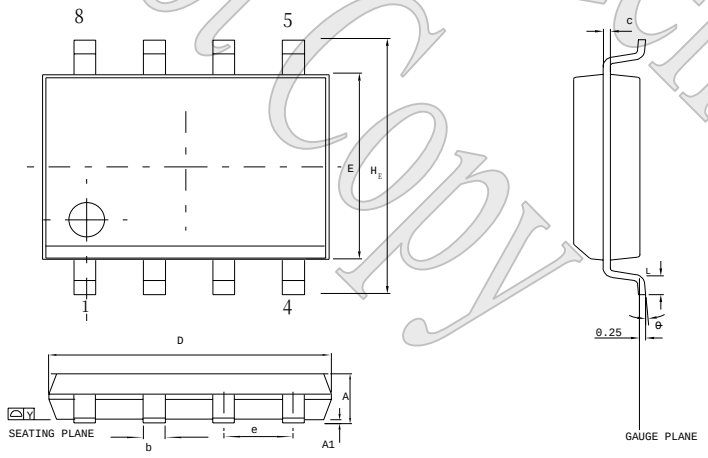
SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.10
A1	0.00	—	0.15
A2	0.75	0.85	0.95
D		3.00 BSC	
E		4.90 BSC	
E1		3.00 BSC	
L	0.40	0.60	0.80
L1		0.95 REF	
θ°	0	—	8

UNIT : MM



NOTES:
1.JEDEC OUTLINE : MO-187 AA
2.DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.
3.DIMENSION "E1" DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 PER SIDE.
4.DIMENSION "0.22" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 MM TOTAL IN EXCESS OF THE "0.22" DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT. MINIMUM SPAC BETWEEN PROTRUSION AND ADJACENT LEAD IS 0.07 MM.
5.DIMENSIONS "D" AND "E1" TO BE DETERMINED AT DATUM PLANE H.

(F75386M 8-MSOP Package)



Control demensions are in milmeters .

SYMBOL	DIMENSION IN MM		DIMENSION IN INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
b	0.33	0.51	0.013	0.020
c	0.19	0.25	0.008	0.010
E	3.80	4.00	0.150	0.157
D	4.80	5.00	0.188	0.196
e	1.27 BSC		0.050 BSC	
H_E	5.80	6.20	0.228	0.244
Y	——	0.10	——	0.004
L	0.40	1.27	0.016	0.050
θ	0	10	0	10

(F75386SG 8-SOP Package)

Not Confidential Copy

Downloaded from Elcodis.com electronic components distributor

Feature Integration Technology Inc.

Headquarters
3F-7, No 36, Tai Yuan St.,
Chupei City, Hsinchu, Taiwan 302, R.O.C.
TEL : 886-3-5600168
FAX : 886-3-5600166

Taipei Office
Bldg. K4, 7F, No.700, Chung Cheng Rd.,
Chungho City, Taipei, Taiwan 235, R.O.C.
TEL : 866-2-8227-8027
FAX : 866-2-8227-8037

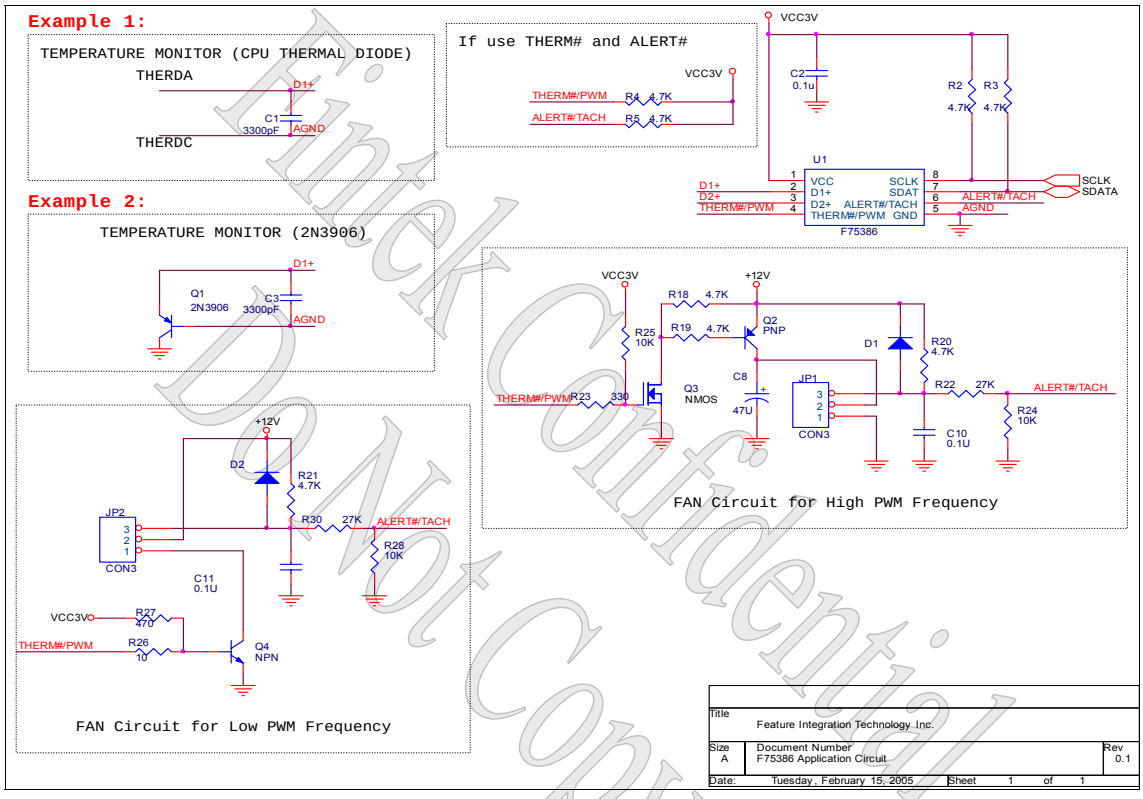
www: http://www.fintek.com.tw

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

Fintek Confidential
Do Not Copy

Downloaded from Elcodis.com electronic components distributor

12 Application Circuit



Fintek Confidential Do Not Copy

Downloaded from Elcodis.com electronic components distributor