

## *PRODUCT SPECIFICATION*

**C u s t o m e r :** \_\_\_\_\_  
**P r o d u c t N a m e :** Temperature and Humidity Sensor  
**P a r t N O :** FHTC3  
**I s s u e D a t e :** \_\_\_\_\_

| Prepared | Checked | Customer Check |
|----------|---------|----------------|
| ChenTT   | Zelig   |                |

## 1 Features

- Ultra-low power consumption
- I<sup>2</sup>C protocol compatibility
- Wide supply voltage range (1.6V-5.5V)
- Small DFN6 package (2×2×0.75mm<sup>3</sup>)
- Typical accuracy: ±3 %RH and ±0.3 °C
- Factory calibrated and reflow solderable

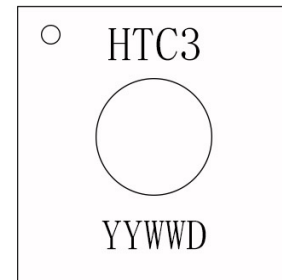
## 2 Applications

- Consumer electronics
- Cold chain transportation
- Smart home
- Smart agriculture
- Communication equipment
- Photovoltaic energy storage

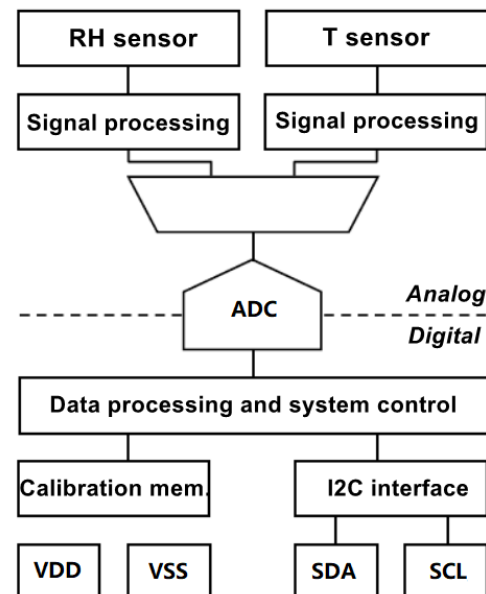
## 3 Description

The FHTC3 is a temperature and humidity sensor designed for consumer electronics applications. It fulfills requirements of the consumer electronics field in terms of package size, power consumption, supply voltage range and cost performance. The FHTC3 implements a complete temperature and humidity sensor system on a single chip, including capacitive humidity sensing unit, PN junction temperature measurement unit, 16-bit ADC, digital signal processing circuit, calibration data storage unit and I<sup>2</sup>C digital communication interface circuit.

The FHTC3 adopts a miniaturized DFN6 package with a size of 2×2×0.75mm<sup>3</sup>, which enables applications in the most limited of spaces. The FHTC3 covers a humidity measurement range of 0 ~ 100%RH and a temperature measurement range of -45°C ~ 135°C. The supply voltage range is 1.60 ~ 5.5V and the energy consumption of 2μJ make the FHTC3 suitable for mobile or wireless communication devices powered by batteries. Each FHTC3 is fully calibrated before leaving the factory to ensure the consistency and accuracy of the chip. Tape and reel packaging together with suitability for standard SMD production process requirements.



**Figure 1. Chip Rendering**



**Figure 2. Functional block diagram of the FHTC3.**

## Table of Contents

|     |                                            |    |      |                                                |    |
|-----|--------------------------------------------|----|------|------------------------------------------------|----|
| 1   | Features .....                             | 2  | 7.7  | Soft Reset.....                                | 12 |
| 2   | Applications .....                         | 2  | 7.8  | General Call Reset .....                       | 13 |
| 3   | Description .....                          | 2  | 7.9  | Readout of ID Register.....                    | 13 |
| 4   | Sensor Performance .....                   | 4  | 7.10 | CRC Checksum.....                              | 13 |
| 5   | Specifications .....                       | 6  | 7.11 | Conversion of Sensor Output .....              | 14 |
| 5.1 | Electrical Characteristic Parameters ..... | 6  | 8    | Quality Control.....                           | 15 |
| 5.2 | Absolute Maximum Ratings .....             | 6  | 8.1  | Environmental Stability.....                   | 15 |
| 5.3 | Sensor System Timings .....                | 7  | 8.2  | Material Contents .....                        | 15 |
| 5.4 | Communication Timings.....                 | 7  | 9    | Packaging Information.....                     | 15 |
| 6   | Pin Assignment .....                       | 9  | 9.1  | Product Traceability.....                      | 15 |
| 7   | Communication and Operation .....          | 10 | 9.2  | Technical Drawings .....                       | 16 |
| 7.1 | I <sup>2</sup> C Address .....             | 10 | 9.3  | Metal Land Pattern .....                       | 17 |
| 7.2 | Power-Up, Sleep, Wake up.....              | 10 | 9.4  | Tape and Reel Package.....                     | 17 |
| 7.3 | Measurement Commands.....                  | 10 | 10   | Chip description and Ordering information..... | 18 |
| 7.4 | Measuring and Reading the Signals .....    | 11 | 11   | Important Notices .....                        | 19 |
| 7.5 | Measurement Process .....                  | 12 |      |                                                |    |
| 7.6 | Readout of Measurement Results .....       | 12 |      |                                                |    |

## 4 Sensor Performance

Each sensor is individually calibrated, and the calibrated instrument has passed the metrological calibration of ISO/IEC17025 accredited laboratory.

**Table 1. Humidity Sensor Specifications.**

| PARAMETER       | CONDITION     | VALUE        | UNIT  |
|-----------------|---------------|--------------|-------|
| Accuracy        | Typ.          | $\pm 3.0$    | %RH   |
|                 | Max.          | See Figure 3 | %RH   |
| Resolution      | -             | 0.01         | %RH   |
| Hysteresis      | -             | $\pm 1.0$    | %RH   |
| Specified range | -             | 0-100        | %RH   |
| Response time   | $\tau_{63\%}$ | 8            | s     |
| Long-term drift | Typ.          | <0.5         | %RH/y |

**Table 2. Temperature Sensor Specifications.**

| PARAMETER       | CONDITION     | VALUE        | UNIT  |
|-----------------|---------------|--------------|-------|
| Accuracy        | Typ.          | $\pm 0.3$    | °C    |
|                 | Max.          | See Figure 5 | -     |
| Resolution      | -             | 0.01         | °C    |
| Hysteresis      | -             | $\pm 1.0$    | °C    |
| Specified range | -             | -45 to +130  | °C    |
| Response time   | $\tau_{63\%}$ | < 5-30       | s     |
| Long-term drift | Typ.          | <0.02        | °C /y |

## Temperature and Humidity sensor performance diagram

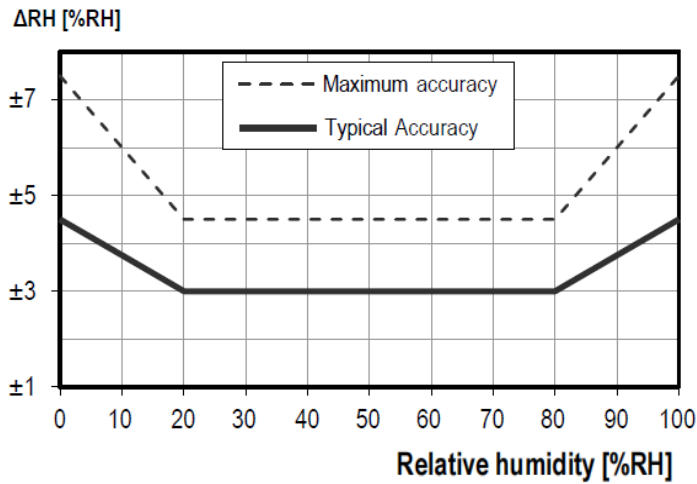


Figure 3. Tolerance of RH at 25°C for FHTC3

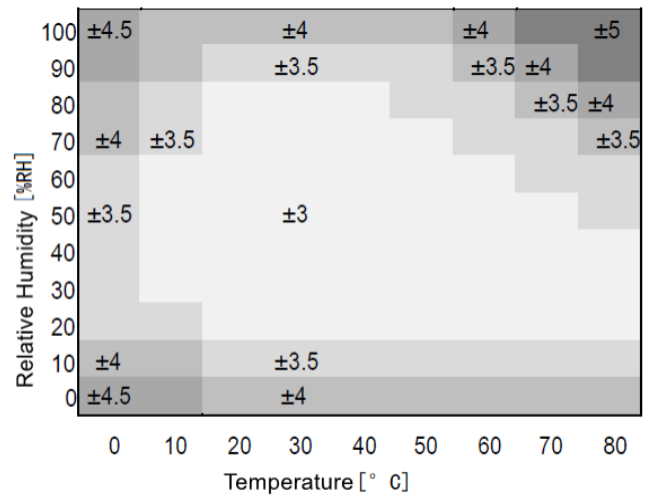


Figure 4. Typical accuracy of relative humidity measurements for different temperatures.

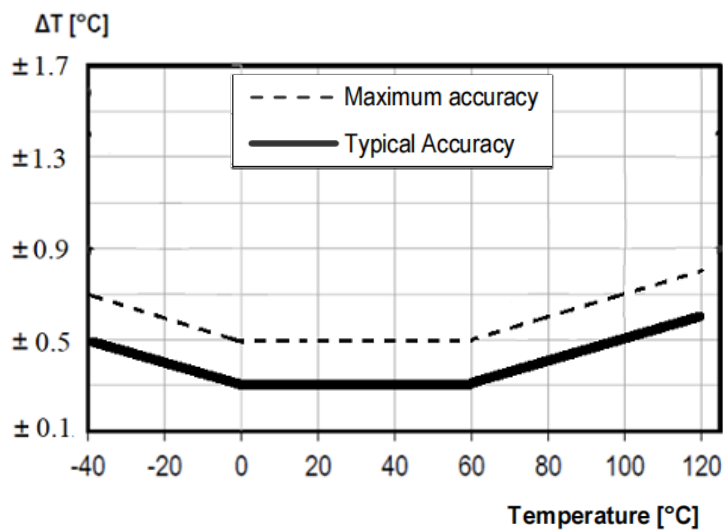


Figure 5. Temperature accuracy of FHTC3

### Recommended Operating Condition

The sensor shows optimum performance when operating within the recommended normal temperature and humidity ranges (5°C ~ 60°C and 20%RH ~ 80%RH, respectively). Long-term exposure to conditions outside the normal range, especially at high humidity, may temporarily shift the relative humidity signal. After returning to normal temperature and humidity ranges, the sensor will slowly return to calibration state by itself.

## 5 Specifications

### 5.1 Electrical Characteristic Parameters

**Table 3. Electrical characteristic parameters (@25°C, 3.3V)**

| PARAMETER                | SYMBOL           | CONDITIONS          |           | MIN. | TYP.               | MAX.               | UNIT | COMMENTS                                                                                      |
|--------------------------|------------------|---------------------|-----------|------|--------------------|--------------------|------|-----------------------------------------------------------------------------------------------|
| Supply voltage           | V <sub>DD</sub>  | -                   |           | 1.6  | 3.3                | 5.5                | V    | -                                                                                             |
| Power-up level           | V <sub>POR</sub> | Static power supply |           | 1.3  | 1.4                | 1.5                | V    | -                                                                                             |
| Supply current           | I <sub>DD</sub>  | Idle state          |           | -    | 45                 | 80                 | μA   | After power-up the sensor remains in idle state unless a sleep or measurement command is sent |
|                          |                  | Sleep mode          |           |      | 0.2                | 0.3                | μA   | When in sleep mode, the sensor requires a wake-up command to enable other commands            |
|                          |                  | Measur<br>ement     | Normal    | -    | 500                | 860                | μA   | Average current consumption while the sensor is measuring                                     |
|                          |                  |                     | Low power |      | 320                | 620                | μA   |                                                                                               |
|                          |                  | Average             | Normal    |      | 3                  |                    | μA   | Average current consumption (continuous operation with one measurement per second)            |
|                          |                  |                     | Low power | -    | 1                  | -                  | μA   |                                                                                               |
| Low level input voltage  | V <sub>IL</sub>  | -                   |           | -    | -                  | 0.4V <sub>DD</sub> | V    |                                                                                               |
| High level input voltage | V <sub>IH</sub>  | -                   |           | -    | 0.7V <sub>DD</sub> | -                  | V    |                                                                                               |
| Low level output voltage | V <sub>OL</sub>  | 3mA sink current    |           | -    | -                  | 0.2V <sub>DD</sub> | V    |                                                                                               |

### 5.2 Absolute Maximum Ratings

**Table 4. Absolute Maximum Ratings.**

| PARAMETER                         | RATING       | UNIT |
|-----------------------------------|--------------|------|
| Supply voltage                    | -0.3 to +6   | V    |
| Operating temperature range       | -45 to 130   | °C   |
| Storage temperature range         | -45 to 130   | °C   |
| ESD HBM (human body mode)         | -4 to +4     | kV   |
| ESD CDM (charge device mode)      | -500 to +500 | V    |
| Latch up, JEDEC78 Class II, 125°C | -100 to +100 | mA   |

NOTE: The extreme conditions mentioned in Table 4 may cause permanent damage to the sensor, and the performance of the sensor under these extreme conditions cannot be guaranteed.

## 5.3 Sensor System Timings

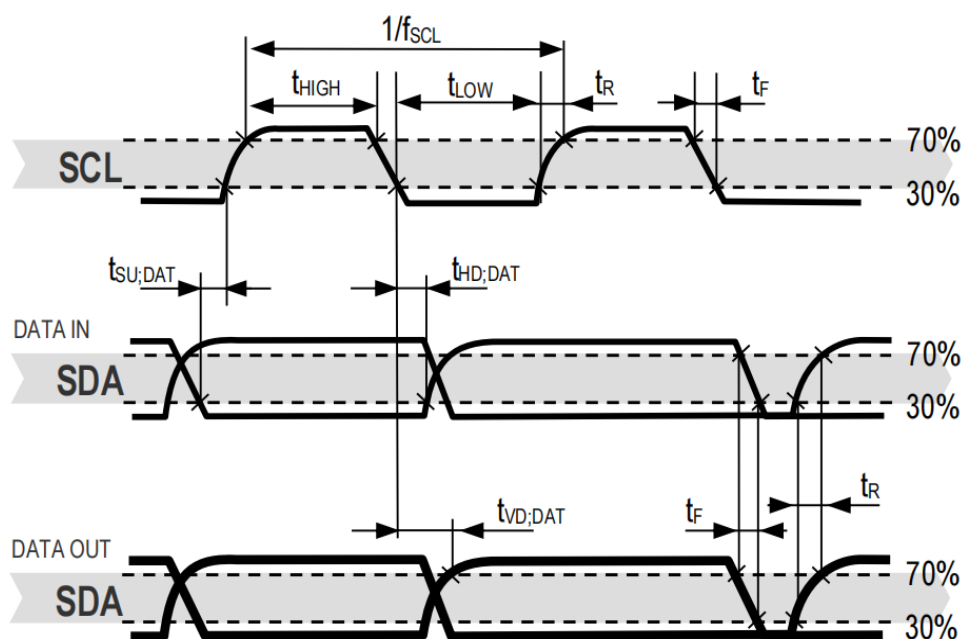
**Table 5. Sensor System Timing Specifications (@ 25°C , 3.3V)**

| PARAMETER            | SYMBOL     | CONDITIONS                             |           | MIN. | TYP. | MAX. | UNIT    | COMMENTS                                                                  |
|----------------------|------------|----------------------------------------|-----------|------|------|------|---------|---------------------------------------------------------------------------|
| Power-up time        | $t_{PU}$   | After hard reset<br>$V_{DD} > V_{POR}$ |           | -    | 180  | 500  | $\mu s$ | Time from power-up to the voltage reaches $V_{POR}$                       |
| Soft reset time      | $t_{SR}$   | After soft reset.                      |           | -    | 180  | 500  | $\mu s$ | Time between ACK of soft reset command and sensor entering the idle state |
| Measurement duration | $t_{MEAS}$ | Average                                | Normal    | -    | 10   | 11   | ms      | Duration for a humidity and temperature measurement                       |
|                      |            |                                        | Low power | -    | 1.5  | 2    | ms      |                                                                           |

## 5.4 Communication Timings

**Table 6. Communication Timing Specifications (@ 25°C , 3.3V)**

| PARAMETER                                  | SYMBOL        | CONDITIONS                                          | NORMAL |      | LOW POWER |      | UNIT    |
|--------------------------------------------|---------------|-----------------------------------------------------|--------|------|-----------|------|---------|
|                                            |               |                                                     | Min.   | Max. | Min.      | Max. |         |
| SCL clock frequency                        | $f_{SCL}$     | -                                                   | 0      | 100  | 0         | 1000 | KHz     |
| Hold time START condition                  | $t_{HD;STA}$  | After this period, the first SCL pulse is generated | 4.0    | -    | 0.6       | -    | $\mu s$ |
| Low period of the SCL clock                | $t_{LOW}$     | -                                                   | 4.5    | -    | 0.5       | -    | $\mu s$ |
| High period of the SCL clock               | $t_{HIGH}$    | -                                                   | 4.0    | -    | 0.26      | -    | $\mu s$ |
| Set-up time for a repeated START condition | $t_{SU;STA}$  | -                                                   | 4.7    | -    | 0.5       | -    | $\mu s$ |
| SDA hold time                              | $t_{HD;DAT}$  | -                                                   | 0      | -    | 0         | -    | $\mu s$ |
| SDA set-up time                            | $t_{SU;DAT}$  | -                                                   | 250    | -    | 50        | -    | ns      |
| SCL/SDA rise time                          | $t_R$         | -                                                   | -      | 1000 | -         | 120  | ns      |
| SCL/SDA fall time                          | $t_F$         | -                                                   | -      | 300  | -         | 120  | ns      |
| SDA valid time                             | $t_{VD; DAT}$ | -                                                   | -      | 3.5  | -         | 0.5  | $\mu s$ |
| Set-up time for STOP condition             | $t_{SU;STO}$  | -                                                   | 4      | -    | 0.26      | -    | $\mu s$ |
| Capacitive load on bus line                | $C_B$         | -                                                   | -      | 500  | -         | 400  | pF      |



**Figure 6. Timing diagram for digital input/output pads.**

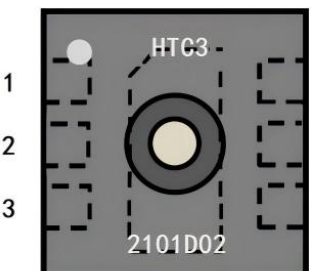
NOTE: SDA direction refers from the sensor. Bold SDA lines are controlled by the sensor, and the plain SDA lines are controlled by the microprocessor. Note that the valid time of SDA is calculated from the falling edge of SCL.

## 6 Pin Assignment

The FHTC3 supports I<sup>2</sup>C Normal, Fast Mode and Fast Mode Plus (SCL clock frequency up to 1MHz) with clock stretching. Users can choose the mode according to actual needs. For detailed information on the I<sup>2</sup>C protocol, refer to NXP I<sup>2</sup>C bus specification and user manual UM10204, Rev. 6, April 4th, 2014.

The FHTC3 comes in DFN6 package, see Table 7 for detailed description.

**Table 7. Pin Assignment (the center pad is grounded).**

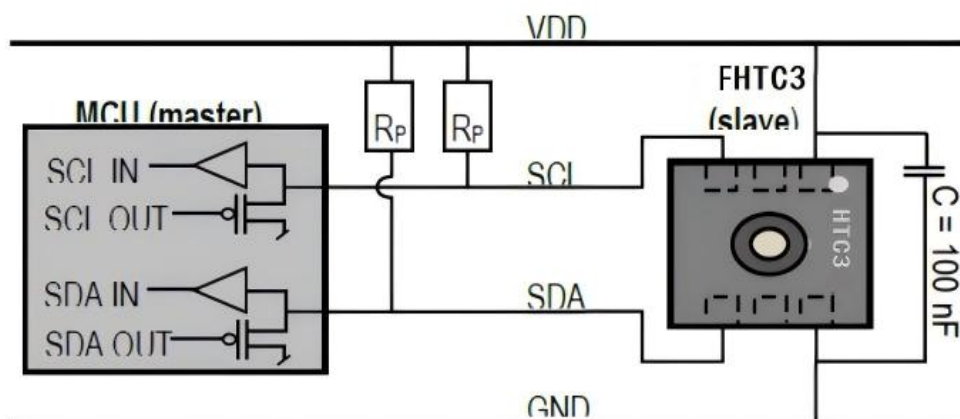
| PIN  | NAME            | DESCRIPTION    |  |
|------|-----------------|----------------|-------------------------------------------------------------------------------------|
| 1    | V <sub>DD</sub> | Supply voltage |                                                                                     |
| 3    | SCL             | Serial clock   |                                                                                     |
| 4    | SDA             | Serial data    |                                                                                     |
| 6    | GND             | Ground         |                                                                                     |
| 2, 5 | NO USE          |                |                                                                                     |

V<sub>DD</sub> and GND must be decoupled with a 100nF capacitor that should be placed as close to the sensor as possible, see Figure 7.

SCL is used to synchronize the communication between the microcontroller and the sensor. The microcontroller must keep the SCL clock frequency below 1MHz. The FHTC3 may pull down the SCL clock line in clock stretching mode.

SDA is used for the data input and output of the sensor. For reliable communication, its timing must meet the requirements in the I<sup>2</sup>C specification.

To avoid signal contention, the microcontroller can only pull down the SDA and SCL buses, and the high level of the bus is realized by the pull-up resistor. The selection of the pull-up resistor needs to be determined according to the bus capacity requirements. Note that some microcontroller I/O circuits may include pull-up resistors.



**Figure 7. Typical application circuit for FHTC3( including pull-up resistors and decoupling capacitors)**

NOTE:For mechanical stress considerations, the center pad must be soldered to ground

## 7 Communication and Operation

All commands and memory locations of the FHTC3 are mapped to a 16-bit address space which can be accessed via the I<sup>2</sup>C protocol.

### 7.1 I<sup>2</sup>C Address

**Table 8. FHTC3 I<sup>2</sup>C device address.**

| FHTC3                    | HEX  | BINARY   |
|--------------------------|------|----------|
| I <sup>2</sup> C address | 0x70 | 111'0000 |

According to the I<sup>2</sup>C protocol, each communication starts with a START signal and ends with a STOP signal.

### 7.2 Power-Up, Sleep, Wake up

When the power supply voltage  $V_{DD}$  reaches the power-up voltage level  $V_{POR}$ , the FHTC3 enters the idle state. Then the sensor should be set to sleep mode to reduce the power consumption. The format of the sleep command is shown in Table 9:

**Table 9. Sleep command of the sensor.**

| COMMAND | HEX    | BINARY                |
|---------|--------|-----------------------|
| Sleep   | 0xB098 | 1011'0000' 1001' 1000 |

When the sensor is in sleep mode, it requires the following wake-up command before other operations, see Table 10.

**Table 10. Wake-up command of the sensor.**

| COMMAND | HEX    | BINARY              |
|---------|--------|---------------------|
| Wake up | 0x3517 | 0011'0101'0001'0111 |

### 7.3 Measurement Commands

The FHTC3 provides clock stretching option and the order of temperature and humidity data. These parameters can be implemented with the different commands in Table 11. Each command triggers a temperature and humidity conversion.

**Table 11. Measurement commands.**

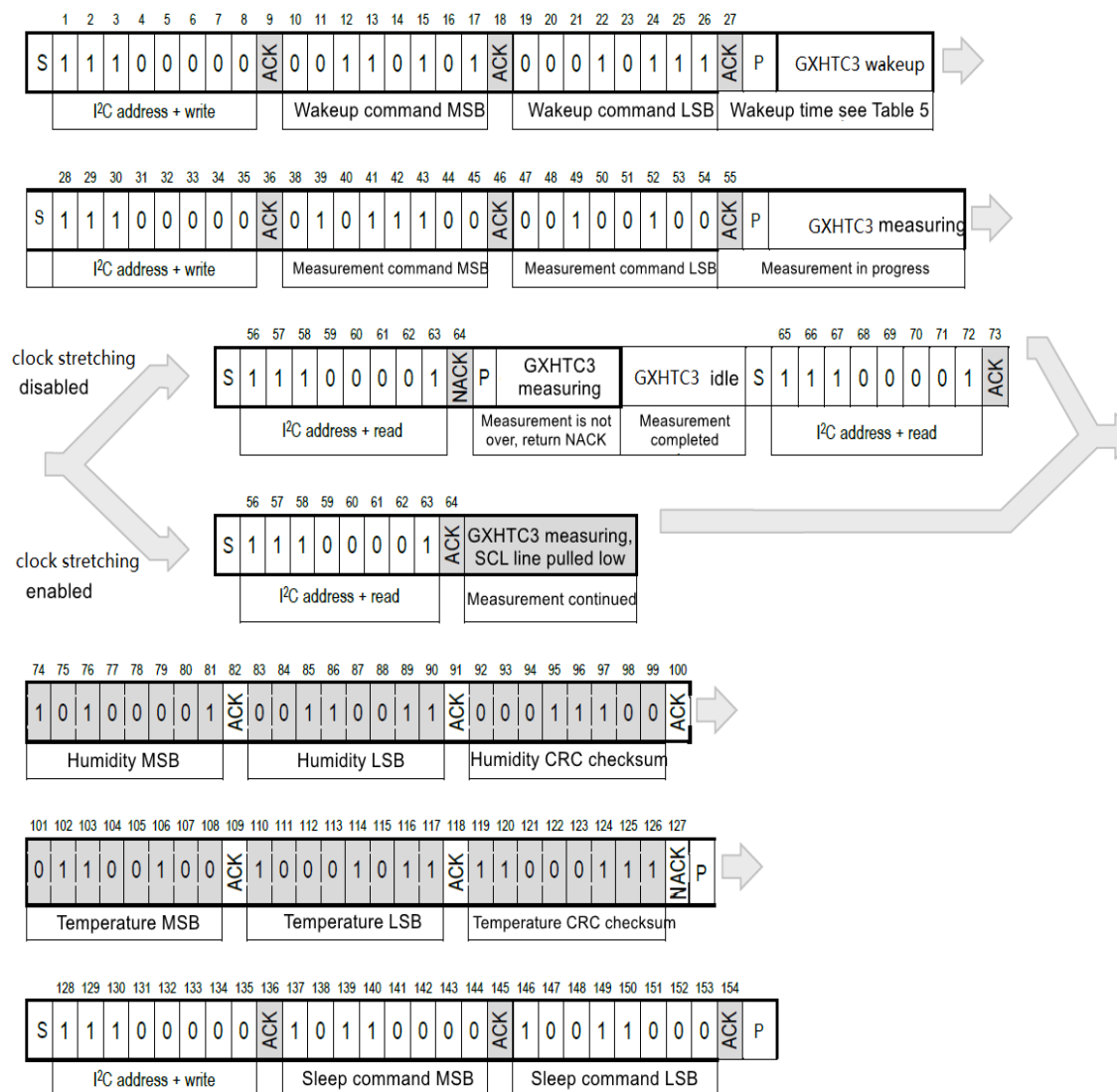
| Mode      | Clock stretching on |          | Clock stretching off |          |
|-----------|---------------------|----------|----------------------|----------|
|           | T first             | RH first | T first              | RH first |
| Normal    | 0x7CA2              | 0x5C24   | 0x7866               | 0x58E0   |
| Low power | 0x6458              | 0x44DE   | 0x609C               | 0x401A   |

## 7.4 Measuring and Reading the Signals

Each measurement consists four commands, starting with a STRAT signal and ending with a STOP signal. The specific execution sequence is as follows:

- 1) Wake-up command
- 2) Measurement command
- 3) Read command
- 4) Sleep command

The specific typical command sequence is shown in Figure 8:



**Figure 8. Wake-up, start temperature and humidity measurement, temperature and humidity conversion and sleep command execution sequence diagram.**

NOTE: This example shows that the humidity data is sent first. The actual humidity data is 63% and the temperature is 23.7°C. The white box is controlled by the microcontroller and the gray box is controlled by the sensor.

## 7.5 Measurement Process

In general, the sensor will not respond to any I<sup>2</sup>C communication request during the temperature and humidity measurement process. For example, the microcontroller will receive a NACK signal when sending read and write commands. However, when the clock stretching mode is enabled, the sensor responds to the read command of the microcontroller with an ACK signal and pulls down the SCL line until the measurement is complete. At this time, the sensor starts sending the measurement results.

The power consumption during measurement is shown in Table 3. In order to ensure the repeatability of the temperature and humidity measurement, it is recommended to avoid any I<sup>2</sup>C communication during the measurement.

## 7.6 Readout of Measurement Results

After the microcontroller sends the temperature and humidity measurement command, the sensor starts to perform temperature and humidity conversion, and the conversion time is shown in Table 5. After the conversion is completed, the microcontroller can read the measurement results by sending the START signal and the I<sup>2</sup>C read header. The sensor will acknowledge the reception of the I<sup>2</sup>C read header, and send 2 bytes of temperature/humidity data and 1 byte of CRC checksum. Then continue to send two bytes of humidity/temperature data and 1 byte of CRC check data. The microcontroller must generate an ACK response signal for each received byte. If the sensor does not receive the ACK signal sent by the microcontroller, it will not continue to transmit subsequent data.

If the I<sup>2</sup>C master is not concerned about the subsequent data, it can abort the data transmission with a NACK signal.

If the user needs temperature and humidity data and is unwilling to process CRC data, it is recommended to read the first two bytes of data with the CRC byte after reading the second two data bytes with a NACK to abort data transmission.

## 7.7 Soft Reset

The FHTC3 provides a soft reset mechanism to force the system into an idle state without power loss. It acts the same as power-on reset.

The send command for soft reset is shown in Table 12:

**Table 12. Soft reset command.**

| COMMAND    | HEX    | BINARY               |
|------------|--------|----------------------|
| Soft reset | 0x805D | 1000'0000'0101' 1101 |

## 7.8 General Call Reset

Sensors can also be reset using General Call in the I<sup>2</sup>C specification, which acts as an on-power reset. It is important to note that this reset is not for FHTC3, it resets slave devices on all I<sup>2</sup>C buses, but it requires that the slave devices be able to respond to this command. The specific reset commands are shown in Table 13:

**Table 13. General call reset command.**

| Command                                      | Code   |
|----------------------------------------------|--------|
| Address byte                                 | 0x00   |
| Second byte                                  | 0x06   |
| Reset command using the general call address | 0x0006 |

## 7.9 Readout of ID Register

The FHTC3 has an ID register for storing the product code of FHTC3. The readout of the ID register can be used to verify the communication between the sensor and the microcontroller. The commands for reading the ID register are shown in Table 14:

**Table 14. Readout command of ID register.**

| COMMAND | HEX    | BINARY                 |
|---------|--------|------------------------|
| Read ID | 0xEFC8 | 1110' 1111' 1100' 1000 |

This command needs to be followed by I<sup>2</sup>C write header, then the microcontroller can send the I<sup>2</sup>C read header to read the 16-bit ID and one byte CRC check data.

## 7.10 CRC Checksum

The CRC check algorithm for data transfer is shown in Table 15. The CRC check object is the two bytes of data transferred before it.

**Table 15. CRC check algorithm.**

| PROPERTY       | VALUE                 |
|----------------|-----------------------|
| Name           | CRC-8                 |
| Width          | 8 位                   |
| Polynomial     | $0x31(x^8+x^5+x^4+1)$ |
| Initialization | 0xFF                  |
| Reflect input  | false                 |
| Reflect output | false                 |
| Example        | CRC (0xBEEF) = 0x92   |

## 7.11 Conversion of Sensor Output

The output temperature and humidity data are transferred as 16-bit unsigned binary values. These values are linearized and temperature compensated inside the sensor. The following formulas are needed to convert these original data into true temperature and humidity data:

Relative Humidity Conversion (%RH):

$$RH = 100 \cdot \frac{S_{RH}}{2^{16}}$$

Temperature Conversion Formula (°C):

$$T = -45 + 175 \cdot \frac{S_T}{2^{16}}$$

$S_{RH}$  and  $S_T$  denote the raw sensor output for humidity and temperature output, respectively. It is important to note that the raw output is converted to decimal in formula calculation.

## 8 Quality Control

### 8.1 Environmental Stability

The qualification of the FHTC3 is based on the JEDEC JESD47 qualification test method.

### 8.2 Material Contents

The FHTC3 is fully RoHS, REACH and Halogen compliant, free of Pb, Cd and Hg.

## 9 Packaging Information

The FHTC3 is packaged in a miniaturized DFN6 package with an outline size of  $2 \times 2 \times 0.75 \text{ mm}^3$  and a pin pitch of 0.5mm. DFN stands for 2-sided no-lead form. The device is made of silicon wafers and fastened to the lead frame. The lead frame consists of copper and Ni/Pd/Au. The device and lead frame are molded by epoxy resin compound.

The device complies with the Small Outline Plastic Leadless Specification as described in 4.22 of JEDEC95 and in Small Outline (QFN/SON) Specification D.01.2009. The FHTC3 complies with IPC/JEDEC J-STD-020 moisture sensitive Class 1 standards.

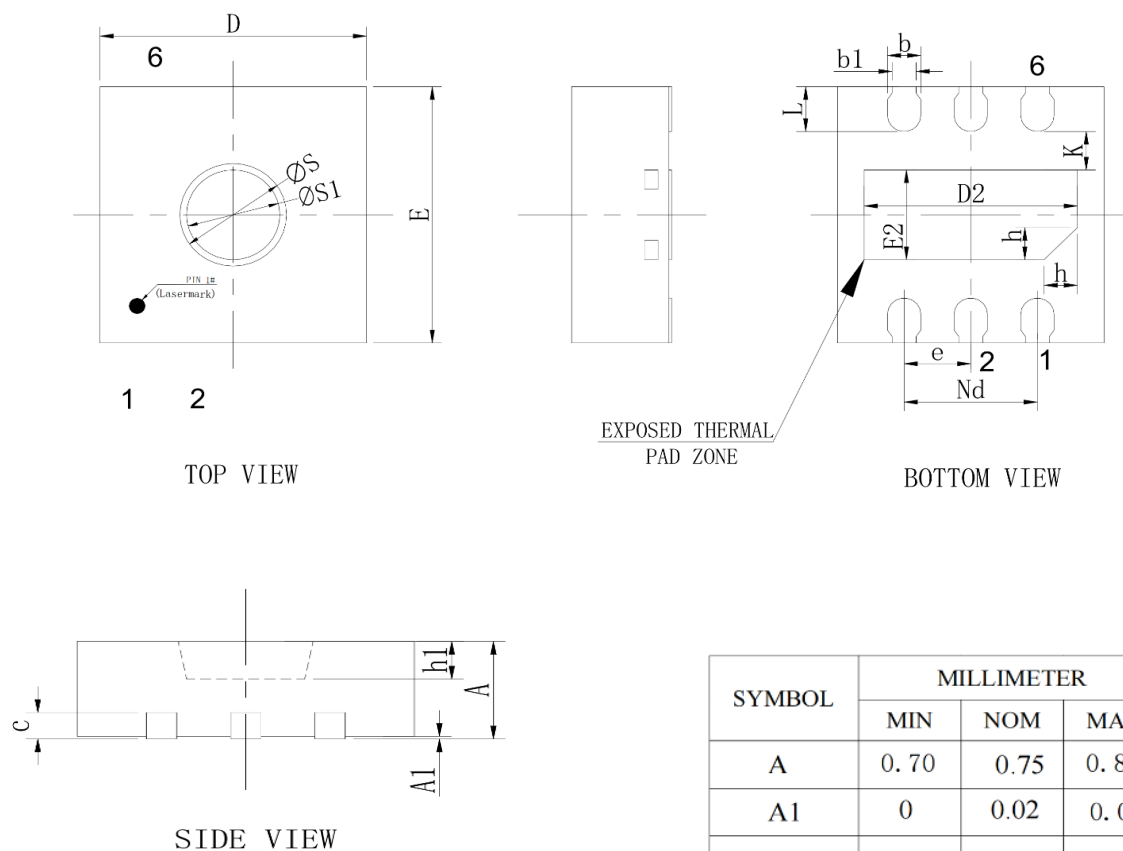
### 9.1 Product Traceability

All FHTC3 front faces are laser marked for identification and traceability. As shown in [Figure 8](#), the upper left corner of the front of the sensor is the pin 1 mark and the sensor model mark. The bottom mark contains 7 characters. The first four YYWW characters represent the production date, YY represent year, WW present month. The latter D represents product ID code. Batch mark decoding is processed by NYFEA, which can track the production, calibration and test information of products. If there is a reasonable request, you can apply to NYFEA for decoding the batch mark to trace the source of the product.



**Figure 9. FHTC3 front laser marking**

## 9.2 Technical Drawings



| SYMBOL           | MILLIMETER |      |      |
|------------------|------------|------|------|
|                  | MIN        | NOM  | MAX  |
| A                | 0.70       | 0.75 | 0.80 |
| A1               | 0          | 0.02 | 0.05 |
| b                | 0.20       | 0.25 | 0.30 |
| b1               | 0.18REF    |      |      |
| c                | 0.203REF   |      |      |
| D                | 1.90       | 2.00 | 2.10 |
| D2               | 1.50       | 1.60 | 1.70 |
| Nd               | 1.00BSC    |      |      |
| E                | 1.90       | 2.00 | 2.10 |
| E2               | 0.60       | 0.70 | 0.80 |
| e                | 0.50BSC    |      |      |
| K                | 0.30REF    |      |      |
| L                | 0.30       | 0.35 | 0.40 |
| h                | 0.20       | 0.25 | 0.30 |
| $\varnothing S$  | 0.80BSC    |      |      |
| $\varnothing S1$ | 0.70BSC    |      |      |
| <b>h1</b>        | -          | 0.29 | -    |



## 10 Chip description and Ordering information

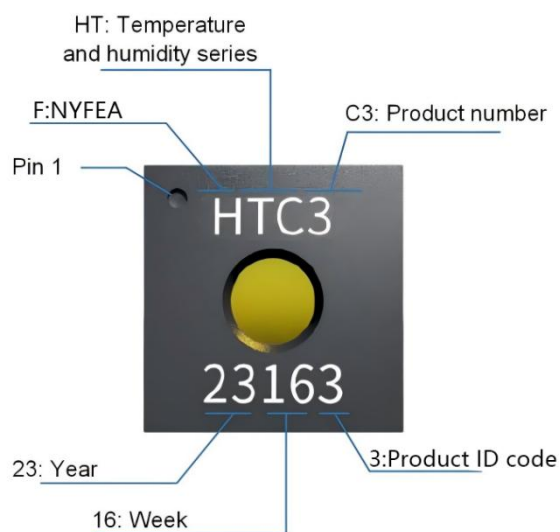
### Order number description:

FHTC3-TR: FHTC3 represents the product number, TR represents packaged form is tape and reel.

### Model Coding:

(1) FHTC3 : F represents the trademark of the company NYFEA ; HT represents temperature and humidity series products; C3: represents the chip number

### FHTC3 LOGO description:



### Ordering Information:

| Purchase Number | Device | Package         | SPQ  | Note                                                    |
|-----------------|--------|-----------------|------|---------------------------------------------------------|
| FHTC3-TR        | FHTC3  | DFN6<br>2mm*2mm | 2000 | Tape and reel; covered with a dustproof breathable film |

## 11 Important Notices

### (1) ESD Precautions

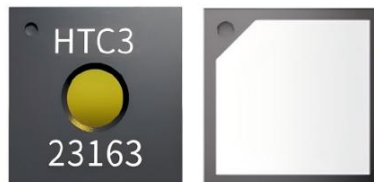
The inherent design of this part makes it very sensitive to electrostatic discharge (ESD). To prevent damage or degradation caused by electrostatic discharge, operate the sensor in an Electrostatic Protected Area (EPA) and take proper measures (operator should be grounded by wrist strap, and all non-insulated or conductive objects should be grounded).

### (2) Exposure to Chemicals

The temperature and humidity sensors of NYFEA are high-sensitivity environmental sensor, not ordinary electronic components. The sensors should not be in close contact with volatile chemicals, such as chemical solvents or organic compounds, especially high concentrations and prolonged exposure are more dangerous. (Ethyl)ketene, acetone, isopropanol, ethanol, toluene, etc., have been shown to cause a shift in humidity readings that is irreversible in most cases.

### (3) Dustproof Breathable Film

The temperature and humidity sensors are different from the general sensor chips. The sensors are very sensitive, so their opening part are easily polluted by dust and impurities. For customers in outdoor applications, it is recommended to order our products with a dust-proof and breathable film, which can prevent dust. It can protect the sensor, resist pollution, improve the life and reliability of the sensor, and must not be torn off.



### (4) Applications in Extreme Environments

Some applications require the temperature and humidity sensor to be exposed to harsh environments. In many cases, the suitability of the sensor is not considered. There are some situations that require special attention.

a) The sensor needs to return to the normal environment to recover for a period of time after working under abnormal temperature and humidity conditions ( $> 90$ ).

b) In some application environments, the sensor may be exposed to a high concentration of volatile organic solvents for a long time, which may occur in both the assembly process and the application process. Such applications require attention.

c) In some application environments, the sensor may be exposed to an acidic or alkaline environment, but only a certain concentration will cause harm to the sensor. For bases,  $\text{pH} > 9$  will cause damage to the sensor. Etching

materials, such as H<sub>2</sub>O<sub>2</sub>, NH<sub>3</sub>, etc., can also harm the sensor in high concentrations.

d) There may be corrosive gases in some application environments. If the concentration is relatively low, it will not affect the sensor, but it will affect the connection of the solder joints. Higher concentrations can also cause damage to the sensor.

## **(5) Spraying of Conformal Coating**

The paint itself is contaminating to the temperature and humidity sensor. For customers who must spray the paint on the board, they need to order our products with a conformal coating film, after spraying the conformal coating, tear off the conformal coating film before normal testing of temperature and humidity. When spraying the conformal coating, keep at least thirty centimeters away from the sensor and move the can slowly to ensure an even coating, the surface will dry in about thirty minutes and the second spraying can be carried out. Allow the paint to dry fully, approximately 24 hours, then gently remove the film.



## **(6) Packaging and Storage**

Before use, it is strongly recommended to store the sensor in its original packaging in the following environment: temperature 10 °C ~ 50 °C (0 °C - 125 °C for a limited time), 20% ~ 65% RH.

## **(7) Assemblage**

The sensor can be stored for 1 year in normal storage environment, and the sensor has a moisture resistance level of 1.