# 1.6V Low-Voltage Communication, 5 Channels (1 Local Channel & 4 Remote Channels) Digital Temperature Sensor

## 1 Features

- Remote four-channel diode temperature sensor
- Temperature range: −55°C to +150°C
- Temperature measurement accuracy (−40°C to +125°C):
  – Local channel: ±0.5°C
  – Remote channel: ±1°C
- Supply voltage range: 2.7V to 5.5V
- I2C communication voltage: 1.6V to 5.5V
- Low quiescent current (@3.3V, 27°C)：
  –Local channel: 180μA
  –Remote channel: 360uA
  –Shutdown mode: 1.2μA
- Resolution: 16 bits, 0.0078125°C
- Digital output：compatible with SMBus, I2C interface
- Support register block read
- Remote diode: features series resistance elimination, η factor correction, temperature offset correction, open circuit detection and other functions

## 2 Applications

- Servers, computers and switches
- Secure data center
- Highly-integrated medical system
- Precision instruments and testing equipment
- MCU, GPU, FPGA, DSP and CPU temperature monitoring

## 3 Description

GD30TS304T is a high-precision, low-power digital temperature sensor compatible with SMBus and I2C interfaces. In addition to the local temperature of the chip, up to four remote diode areas can be monitored simultaneously. The typical application scenario of GD30TS304T is real-time remote temperature monitoring of complex systems such as MCU, GPU and FPGA. With functions such as series resistance elimination, programmable η factor correction, programmable temperature offset correction and programmable temperature threshold, GD30TS304T provides a reliable temperature monitoring solution with high precision and low power consumption.

The local channel and 4 remote channels of GD30TS304T can be independently programmed and controlled. When the temperature of the measured location exceeds the corresponding temperature threshold, an alarm will be triggered. Each channel of GD30TS304T has a programmable temperature threshold hysteresis setting to avoid repeated alarms caused by the measured temperature being near the temperature threshold.

The typical temperature measurement accuracy of the local channel and remote channel of GD30TS304T is ±0.5°C and ±1°C respectively, and both provide a temperature measurement resolution of 0.0078125°C and a temperature measurement range of −55°C to +150°C. The power supply voltage range of GD30TS308 is 2.7V to 5.5V, and it provides 3.00mm×3.00mm 16 Pin QFN package for integration into various systems.

**Device Information[1]**

| PART NUMBER | PACKAGE | BODY SIZE (NOM) |
|---|---|---|
| GD30TS304T | QFN16 | 3.00mm × 3.00mm |

1. For packaging details, see *Package Information* section.

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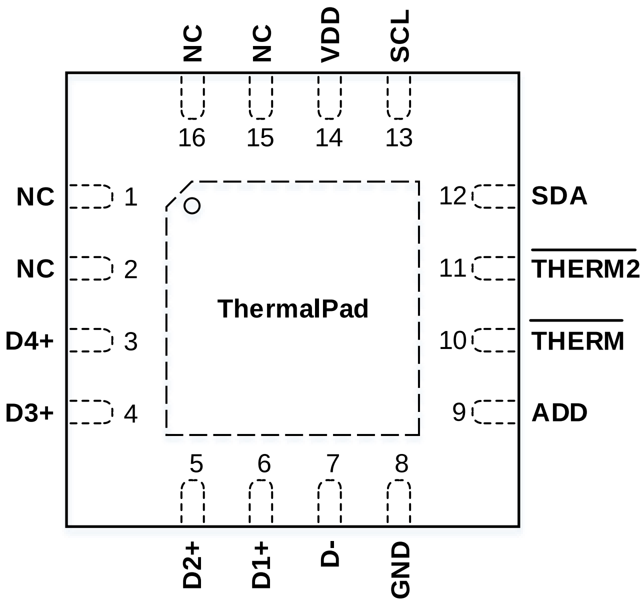
# 4 Device Overview

## 4.1 Pinout and Pin Assignment

16-Pin QFN Package
Top View




## 4.2 Pin Description

| PINS | | PIN TYPE[1] | FUNCTION |
|---|---|---|---|
| NAME | NUM | | |
| NC | 1,2,15,16 | | No connection, can be left float or tied to power or ground pin. |
| D4+ | 3 | AI | Remote temperature measurement channel 4 positive input voltage pin. Please connect to D- when this channel is not used. |
| D3+ | 4 | AI | Remote temperature measurement channel 3 positive input voltage pin. Please connect to D- when this channel is not used. |
| D2+ | 5 | AI | Remote temperature measurement channel 2 positive input voltage pin. Please connect to D- when this channel is not used. |
| D1+ | 6 | AI | Remote temperature measurement channel 1 positive input voltage pin. Please connect to D- when this channel is not used. |
| D- | 7 | AI | Remote temperature measurement 1 to 4 channels negative input voltage pin. |
| GND | 8 | G | Chip ground pin. |
| ADD | 9 | DI | IIC slave address selection pin which can be connected to SDA, SCL, VDD and GND pins. |
| $\overline{\text{THERM}}$ | 10 | DO | The first over-temperature alarm pin. Low active. Open-drain output, requires a pull-up resistor to connect to a 1.6V to 5.5 V power supply. |
| $\overline{\text{THERM2}}$ | 11 | DO | The second over-temperature alarm pin. Low active. Open drain output, |

| PINS | | PIN TYPE[1] | FUNCTION |
|---|---|---|---|
| NAME | NUM | | |
| | | | requires a pull-up resistor to connect to a 1.6V to 5.5 V power supply. |
| SDA | 12 | I/O | I2C communication serial data pin. Open drain output, requires a pull-up resistor to connect to a 1.6V to 5.5V power supply. |
| SCL | 13 | DI | I2C communication serial clock pin. Open drain output, requires a pull-up resistor to connect to a 1.6V to 5.5 V power supply. |
| VDD | 14 | P | Chip power pin. voltage range is 2.7V to 5.5 V. |

1. P = power, G = Ground, DI = Digital input, AI = Analog input, DO = Digital Output, IO=input and output.

# 5 Parameter Information

## 5.1 Absolute Maximum Ratings

Exceeding the operating temperature range (unless otherwise noted)[1]

| SYMBOL | PARAMETER | MIN | MAX | UNIT |
| --- | --- | --- | --- | --- |
| $V_+$ | Power Supply Voltage VDD | −0.3 | 6 | V |
| | $\overline{\text{THERM}}$, $\overline{\text{THERM2}}$, SCL, SDA and ADD Pin Voltage | −0.3 | 6 | V |
| | D1+ ~D4+ Pin Input Voltage | −0.3 | ((V+)+0.3) and ≤ 6 | V |
| | D- | −0.3 | 0.3 | V |
| $T_J$ | Junction Temperature | | 150 | °C |
| $T_A$ | Operating Range | −55 | 160 | °C |
| $T_{stg}$ | Storage temperature | −60 | 150 | °C |

1. Unless otherwise specified, the specifications in the above table apply within the atmospheric temperature range. Stresses beyond the range may cause permanent damage to the device.

## 5.2 Recommended Operation Conditions

| SYMBOL[1] | PARAMETER | MIN | TYP | MAX | UNIT |
| --- | --- | --- | --- | --- | --- |
| $V_+$ | Power Supply Voltage | 2.7 | 3.3 | 5.5 | V |
| $T_A$ | Operating Temperature | −50 | | 150 | °C |

1. Unless otherwise specified, the specifications in the above table apply within the atmospheric temperature range.

## 5.3 Electrical Sensitivity

| SYMBOL[1] | CONDITIONS | VALUE | UNIT |
| --- | --- | --- | --- |
| $V_{ESD(HBM)}$ | Human Body Mode (HBM), per ANSI/ESDA/JEDEC JS-001 | ±2500 | V |
| $V_{ESD(MM)}$ | Machine Mode (MM), per JEDEC-STD Classification | 300 | V |
| LU | Latch-Up, Per JESD78F, Class IA | ±200 | mA |

1. Unless otherwise stated, over operating free-air temperature range.

## 5.4 Electrical Characteristics

Unless otherwise specified, the following data are characteristics of the chip at −40°C to +125°C and the power supply voltage in the range of 2.7V to 5.5V.

| SYMBOL | PARAMETER | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $T_{RANGE}$ | Local Channel Temperature Measurement Accuracy | $T_L$ = −40°C to +125°C<br>VDD = 2.7V to 5.5V | | ±0.5 | ±1 | °C |
| $T_{ERROR}$ | Remote Channel Temperature Measurement Accuracy | $T_L$ = 0°C to +80°C<br>$T_R$ = −40°C to + 125°C<br>VDD = 2.7 to 5.5V | | ±0.5 | ±1 | °C |
| | | $T_L$ = −40°C to +125°C<br>$T_R$ = −40°C to + 125°C<br>VDD = 2.7V to 5.5V | | ±1 | ±1.5 | °C |
| | Local Channel Supply Voltage Sensitivity | VDD = 2.7V to 5.5V | | ±0.05 | ±0.2 | °C/V |
| | Remote Channel Supply Voltage Sensitivity | VDD = 2.7V to 5.5V | | ±0.1 | ±0.3 | °C/V |
| | Resolution | | | 0.0078125 | | °C |
| | | | | 16 | | bits |
| $t_{CON}$ | Conversion Time | Single channel | | 16 | 17 | ms |
| | Bias Current of Remote Temperature Measurement Probe | High | | 120 | | μA |
| | | Medium | | 45 | | |
| | | Low | | 7.5 | | |
| | η Value of Remote Temperature Measurement Probe | | | 1.008 | | |
| $f_C$ | Bus Communication Frequency | Fast mode | 0.001 | | 0.4 | MHz |
| | | High-speed mode | 0.001 | | 2.5 | |
| $V_+$ | Power Supply Operating Voltage | | 2.7 | 3.3 | 5.5 | V |
| $I_Q$ | Quiescent Current | Local channel continuous conversion | | 180 | | μA |
| | | Remote channel continuous conversion | | 360 | | |
| | | Idle mode | | 20 | | |
| | | Shutdown mode | | 1.2 | | |

# 6 Functional Description

## 6.1 Chip Function Mode

### 6.1.1 Continuous Conversion Mode

The default operating mode of the GD30TS304T is continuous conversion mode. In this mode, GD30TS304T will perform continuous conversions in the order of local channel and remote 1~4 channels. Typical conversion time of each channel is 16ms. The REN4: REN1 bit and LEN bit in the configuration register (30h) will control the channel enable during the continuous conversion process. If some channels are not activated, the above unactivated channels will be skipped. The conversion rate bits CR2, CR1 and CR0 in the configuration register can configure GD30TS304T to different conversion rates. For details of the above configuration, please refer to *Configuration Register*.

All channels of GD30TS304T can output 16-bit temperature measurement results with a temperature measurement resolution of 0.0078125°C. Negative temperature measurement results will be presented in binary complement form, as shown in Table 1. The temperature measurement results of all channels of GD30TS304T are stored in the temperature register of the corresponding channel using two bytes. The recommended temperature measurement range of all channels of GD30TS304T is −50°C to 150°C.

**Table 1. GD30TS304T 16-bit Temperature Measurement Data Format for all channels**

| Temperature (°C) | Digital Output (Binary) | Hexadecimal |
|---|---|---|
| −50 | 1110 0111 0000 0000 | E700 |
| −25 | 1111 0011 1000 0000 | F380 |
| −1 | 1111 1111 1000 0000 | FF80 |
| −0.5 | 1111 1111 1100 0000 | FFC0 |
| −0.0078125 | 1111 1111 1111 1111 | FFFF |
| 0 | 0000 0000 0000 0000 | 0000 |
| 0.0078125 | 0000 0000 0000 0001 | 0001 |
| 0.5 | 0000 0000 0100 0000 | 0040 |
| 1 | 0000 0000 1000 0000 | 0080 |
| 5 | 0000 0010 1000 0000 | 0280 |
| 10 | 0000 0101 0000 0000 | 0500 |
| 25 | 0000 1100 1000 0000 | 0C80 |
| 50 | 0001 1001 0000 0000 | 1900 |
| 100 | 0011 0010 0000 0000 | 3200 |
| 125 | 0011 1110 1000 0000 | 3E80 |
| 150 | 0100 1011 0000 0000 | 4B00 |

### 6.1.2 Shutdown Mode

Shutdown mode of GD30TS304T can conserve power by shutting down all device circuitry except the serial interface, thereby reducing the current of GD30TS304T to less than 1μA (typical). The shutdown mode is initiated when the SD bit in the configuration register (30h) is set to 1; after such configuration, GD30TS304T will terminate the current temperature conversion and immediately enter shutdown mode. To exit shutdown mode, write SD bit to 0, GD30TS304T will re-enter continuous conversion mode. In particular, writing the REN4: REN1 bit and the LEN bit in the configuration register to 0 at the same time also puts GD30TS304T into shutdown mode. Under this situation, to exit shutdown mode, write any one or more of the REN4: REN1 bit and the LEN bit to 1.

### 6.1.3 One-Shot Mode

GD30TS304T can be configured in One-Shot mode. When GD30TS304T is in shutdown mode (SD = 1), writing 1 to the OS bit in the configuration register (30h) can start a single temperature conversion. The specific channels included in this temperature conversion are determined by the values of the REN4: REN1 bit and the LEN bit. To ensure that the above single temperature conversion is carried out smoothly, at least one of the REN4: REN1 bit and the LEN bit should be written to 1. After the single temperature conversion is completed, GD30TS304T will return to the shutdown mode. When continuous temperature measurement is not required, this function can greatly reduce the power consumption of the chip.

### 6.1.4 Filter and Series Resistance Elimination

In actual use, it is recommended to input the four remote temperature measurement channel pins D1+ to D4+ and D-, connect a filter resistor $R_S$ of no more than 1kΩ in series, and cross-connect a filter capacitor $C_F$ of 100pF to 1nF, so that GD30TS304T can better filter out the irrelevant coupling signals between pins, as shown in Figure 7. In some specific applications, in order to obtain better remote temperature measurement accuracy, the size of the above filter resistor and capacitor can be appropriately adjusted. The recommended filter resistor and capacitor values are 50Ω and 100pF respectively.

GD30TS304T has a filter resistor elimination function, which can automatically eliminate the temperature measurement error caused by the above filter resistor. In actual use, it should be ensured that the filter resistor value is less than 1kΩ.

### 6.1.5 Sensor Misconnection Detection

GD30TS304T can detect the misconnection of remote temperature probes mounted on all remote channels. When the voltage of any D+ pin is higher than (VDD − 0.3V), GD30TS304T will determine that the pin is open, and the corresponding status bit RxOP in the remote channel open status register (23h) will be set to 1. At this time, the temperature measurement result of the remote channel will return 8000h (−256°C).

GD30TS304T can also detect any short-circuit misconnection between any D+ pin and GND. When any D+ pin is short-circuited to GND, the temperature measurement result of the remote channel will also return 8000h (−256°C), but the corresponding RxOP bit will still read as 0. When the remote temperature measurement function of GD30TS304T is not used, the D+ pin and D- pin of the corresponding channel must be shorted to prevent meaningless misconnection detection.

### 6.1.6 THERM Mode

GD30TS304T provides constant temperature monitoring mode $\overline{\text{THERM}}$ and $\overline{\text{THERM2}}$. In this mode, the temperature measurement results of the local channel and all remote channels of GD30TS304T are compared with the constant temperature threshold register of the corresponding channel inside the chip. The comparison result will change the corresponding constant temperature status register (21h, 22h) and the constant temperature pin. For details, see Table 4.

In $\overline{\text{THERM}}$ mode, the temperature measurement results of the local channel and remote channels 1 to 4 are compared with the corresponding $\overline{\text{THERM}}$ threshold registers (39h、42h、4Ah、52h、5Ah). If the temperature measurement result of a channel exceeds the corresponding value of the $\overline{\text{THERM}}$ threshold register, the corresponding status bit in the status $\overline{\text{THERM}}$ register will read as 1. The above status bits will always remain activated until the temperature measurement result of the corresponding channel is lower than the value that $\overline{\text{THERM}}$ threshold register minus $\overline{\text{THERM}}$ hysteresis register, after which the above status bits will read as 0. After any bit in the $\overline{\text{THERM}}$ status register is activated, $\overline{\text{THERM}}$ pins of the chip will be activated at the same time ($\overline{\text{THERM}}$=0). $\overline{\text{THERM}}$ pins will always remain activated until all flag bits in the $\overline{\text{THERM}}$ status register are reset to 0, after which $\overline{\text{THERM}}$ pins will be reset to 1.

The $\overline{\text{THERM}}$ and $\overline{\text{THERM2}}$ modes of GD30TS304T share a $\overline{\text{THERM}}$ hysteresis register (38h) to prevent the thermostat status register and the thermostat pin from repeatedly jumping when the temperature measurement result is close to the value of the thermostat threshold register.

The above process is shown in Figure 1.

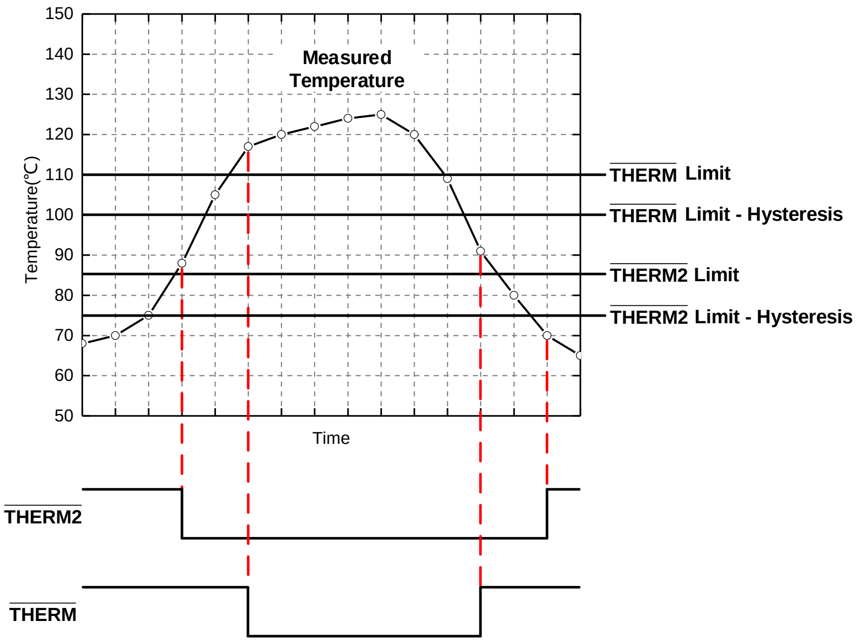



**Figure 1. Status Variation of Constant Temperature Pins in Different Constant Temperature Modes**

## 6.2 Serial Interface

### 6.2.1 Bus Overview

GD30TS304T is compatible with SMBus and I2C interfaces. In the SUMBus protocol, the device that initiates the transfer is called a master, and the devices controlled by the master are slaves. The bus must be controlled by a master device that generates the serial clock (SCL), controls the bus access, and generates the START and STOP conditions. To address a specific device, a START condition is initiated, indicated by pulling the data line (SDA) from a high- to low-logic level when the SCL pin is high. All slaves on the bus receive the 8-bits slave address on the rising edge of the clock, and the last bit indicates whether a read or write operation is intended. During the ninth clock pulse, the addressed slave generates an acknowledge and pulls the SDA pin low to respond to the master. A data transfer is then initiated and sent over eight clock pulses followed by an acknowledge bit. When all data are transferred, the master generate a STOP signal to end the communication by pulling SDA from low to high when SCL is high. During the data transfer, the SDA pin must remain stable when the SCL pin is high because any change in the SDA pin when the SCL pin is high is interpreted as a START or STOP signal.

GD30TS304T supports two-wire bus in fast mode (1kHz to 400kHz) or high-speed mode (1kHz to 2.5MHz). All data are transmitted with the MSB first.

### 6.2.2 Serial Bus Address

To communicate with GD30TS304T, the host must address the corresponding slave by sending slave address bytes. The slave address byte consists of seven address bits and a read-write (R/W) bit that indicates the intent of executing a read or write operation. GD30TS304T has an address pin that can generate up to four different slave addresses, allowing the host to address up to four different addresses of GD30TS304T on a single bus. Table 2 shows the connection method of the ADD pin corresponding to each slave address.

**Table 2. Slave Addresses Corresponding to Four Different Connection Methods of ADD Pin**

| SLAVE ADDRESS | ADD PIN CONNECTION |
|---|---|
| 1001000 | GND |
| 1001001 | VDD |
| 1001010 | SDA |
| 1001011 | SCL |

### 6.2.3 Low-Voltage Communication

The operating voltage of GD30TS304T is 2.7V to 5.5V. GD30TS304T supports the high level of the two-wire bus generated by the host to be lower (or higher) than the operating voltage of the chip. In this application scenario, the SCL and SDA pins of GD30TS304T can be connected to the power supply voltage of 1.6V to 5.5V through pull-up resistors, so that the high-level range of the two-wire bus controlled by the host is also 1.6V to 5.5V. GD30TS304T supports data transmission at any voltage within the respective voltage ranges of the chip (2.7V to 5.5V) and the two-wire bus (1.6V to 5.5V).

### 6.2.4 Writing and Reading Operation

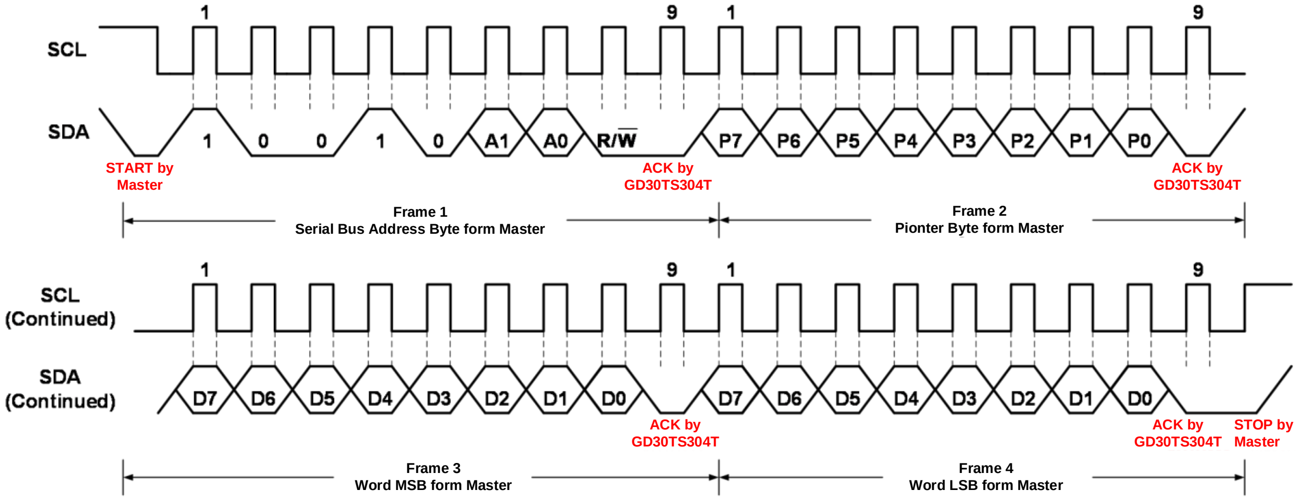



Figure 2. Two-wire Write Command Timing Diagram

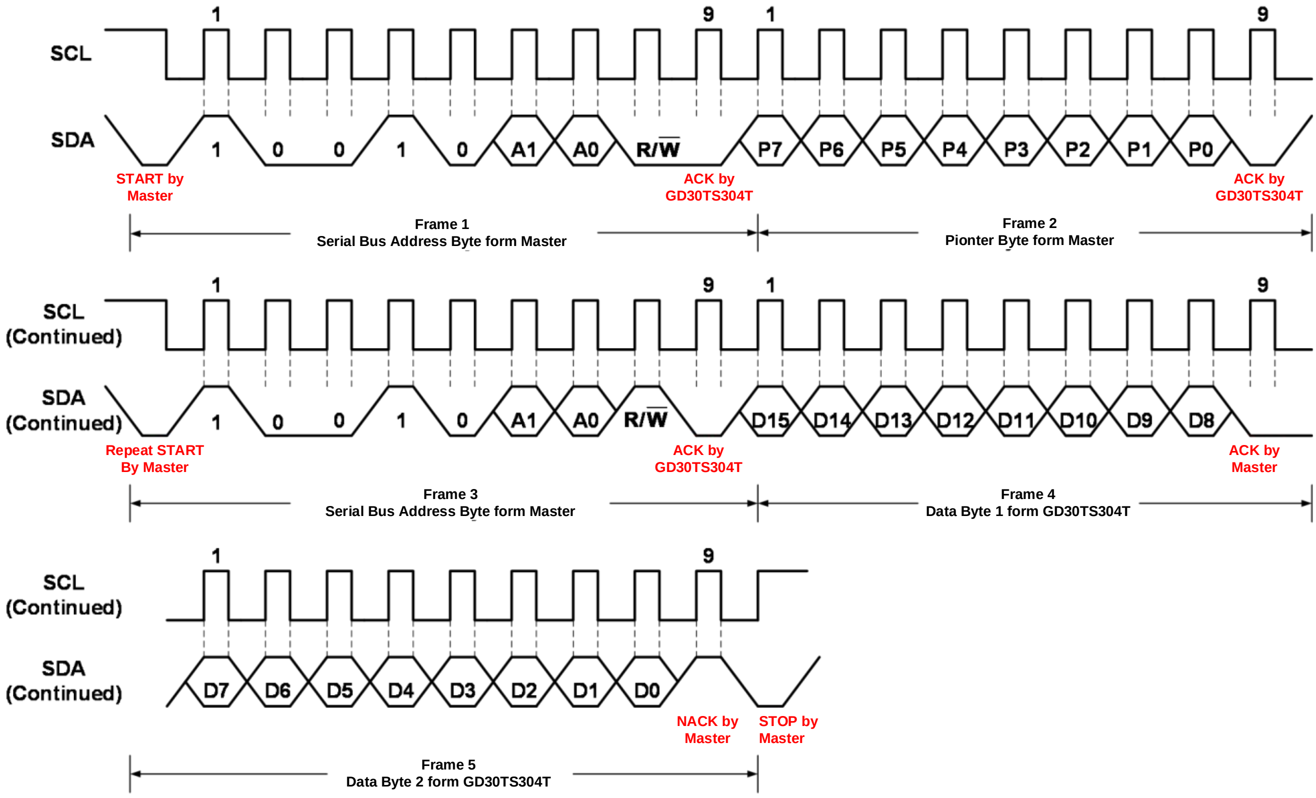



Figure 3. Two-wire Read Command (2 Byte) Timing Diagram

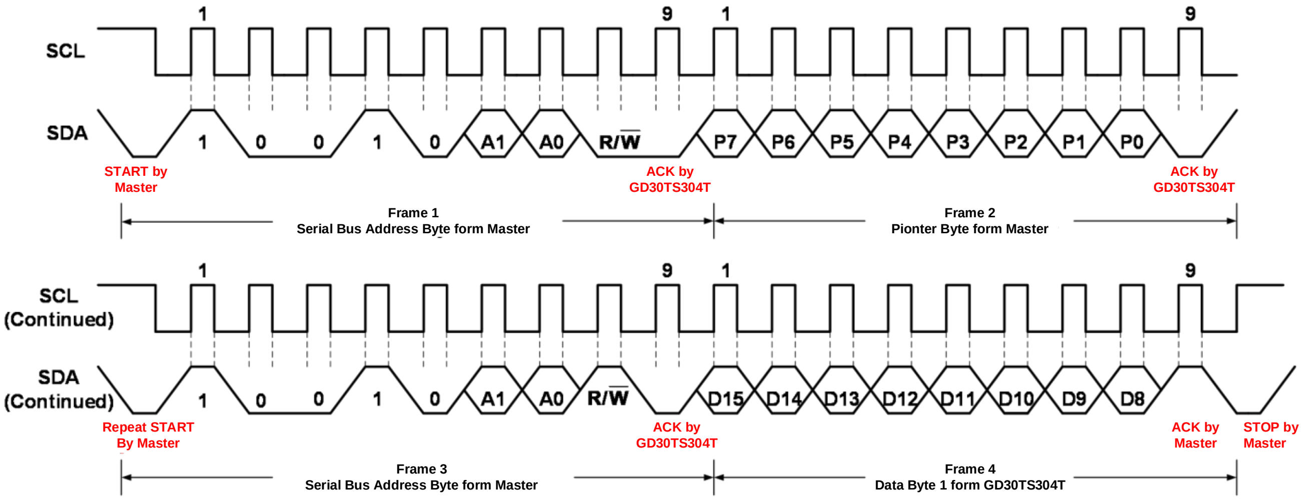



**Figure 4. Two-Wire Read Command (1 Byte) Timing Diagram**

GD30TS304T allows the host to access specific registers inside the chip by writing the target value into the pointer register.

When writing data to GD30TS304T, after sending the slave address byte with the low $R/\overline{W}$ bit, the corresponding pointer register byte needs to be sent to write the data into a specific register in GD30TS304T. Each write operation to GD30TS304T requires sending the pointer register byte.

When reading data from GD30TS304T, send the corresponding pointer register byte after sending the slave address byte with the low $R/\overline{W}$ bit; then the host generates the Start signal again and sends the slave address byte with the high $R/\overline{W}$ bit to start the read command. If you need to read data from the same register repeatedly, you do not need to send the pointer byte of the register repeatedly. GD30TS304T allows the host to automatically read data from the register specified by the previous pointer byte. When the data reading is completed, the host needs to send a NACK bit at the end of the last byte read to terminate the read operation. All internal registers in GD30TS304T are two bytes, and the MSB is transmitted first. If only a single byte (MSB) needs to be read, the NACK bit can be sent in advance at the end of the MSB transmission.

The above read and write operations are shown in Figure 2 to Figure 4.

### 6.2.5 Block Register Reads

GD30TS304T supports register reads. The register block storing the temperature output of each local and remote channel in GD30TS304T consists of 5 registers with pointers of 80h~84h. When the pointer register is written to any value between 80h~84h for reading operation, GD30TS304T will automatically add 1 to the pointer byte and read the values in the registers corresponding to each pointer byte respectively until the value in the 84h register is read out, as shown in Figure 5. In the above process, if the communication is terminated before the value in the 84h register is read out, the read command can be resent (without resending the pointer byte), and GD30TS304T will automatically add 1 to the pointer byte before the communication is terminated, and continue to read the data in the corresponding register, as shown in Figure 6.

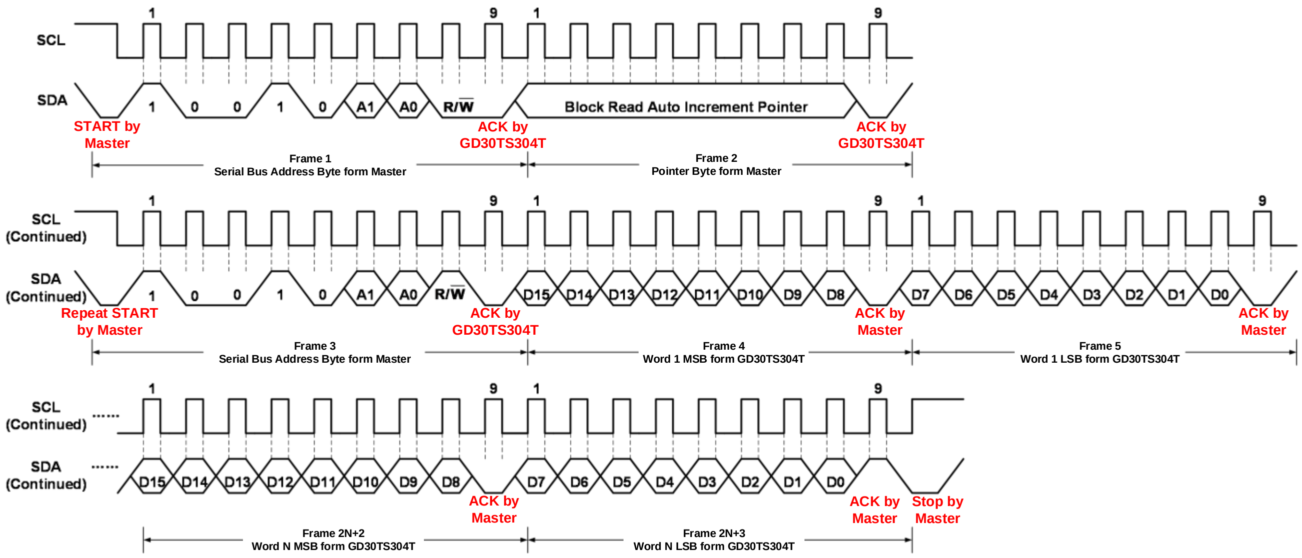



**Figure 5. Timing Diagram of Two-line Register Block Reads**

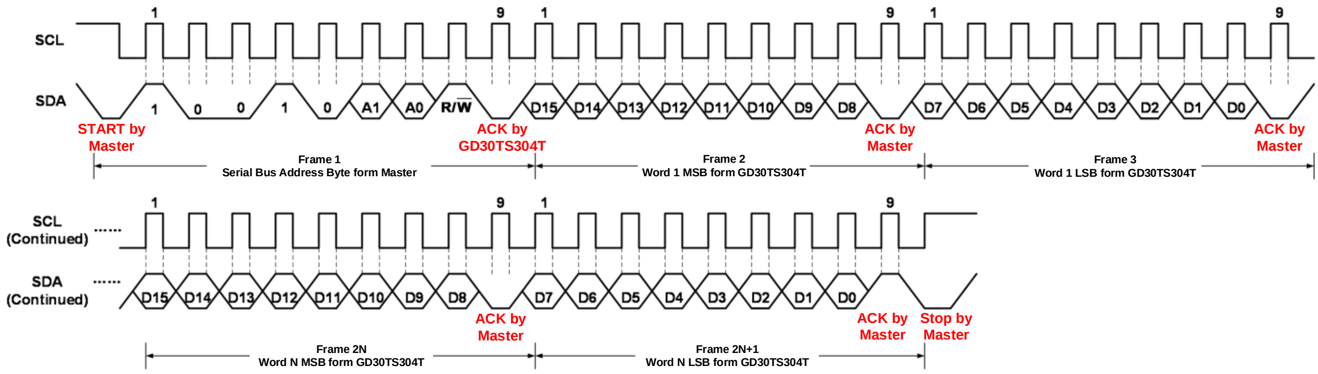



**Figure 6. Timing Diagram of Two-line Register Block without Pointer Bytes**

### 6.2.6 General Call Reset

Writing the RST bit (bit 15) of the GD30TS304T global reset register (20h) to 1 can reset all registers inside the chip to their power-on default values and terminate any current temperature conversion.

### 6.2.7 High-Speed Mode

GD30TS304T supports the two-wire bus to operate at frequencies above 400kHz, the host device must issue a high-speed mode host code (0000 1xxxb) as the first byte after a START condition to switch the bus to high-speed operation. GD30TS304T device does not acknowledge this byte, but it does switch the input filters on the SDA and SCL and the output filters on the SDA to operate in High-Speed mode, allowing the bus to transmit data at frequencies up to 2.75MHz. After the High-Speed mode host code is issued, the host transmits a two-wire device address to initiate a data transfer operation. The bus continues to operate in high-speed mode until a STOP condition occurs on the bus. Upon receiving the STOP condition, GD30TS304T switches the input and output filters back to fast-mode operation.

### 6.2.8 Time-Out Function

If SCL keeps low level for 18ms (typical) between START and STOP signals, GD30TS304T will reset its serial interface, release SDA and wait for START signal. To avoid activating time-out function, SCL's operating frequency should be more than 1kHz.

### 6.2.9 Time-Out Function

GD30TS304T provides a register lock function to reduce the possibility of wrong operation of some important internal registers. Register locking(C4h) can be configured to lock and unlock the register. See *Register Descriptions* for the registers that can be locked. The above registers will not respond to write operations during the lock period, but they can still be read. Writing 0x5CA6 to the lock register can lock the register, and the lock register reads 0x8000; writing 0xEB19 to the lock register can unlock the register, and the lock register reads 0x0000. GD30TS304T will return to the locked state after the chip is powered on again or responds to a global reset.

### 6.3 Register Descriptions

**Table 3. GD30TS304T Register List**

| PTR | POR | Lock | GD30TS304T Functional Registers – BIT Description | | | | | | | | | | | | | | | | Register |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HEX | HEX | Y/N | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Description |
| 00 | 0000 | N | LT15 | LT14 | LT13 | LT12 | LT11 | LT10 | LT9 | LT8 | LT7 | LT6 | LT5 | LT4 | LT3 | LT2 | LT1 | LT0 | Local temperature |
| 01 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temperature 1 |
| 02 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temperature 2 |
| 03 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temperature 3 |
| 04 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temperature 4 |
| 20 | 0000 | N | RST | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Software Reset Register |
| 21 | N/A | N | R8TH | R7TH | R6TH | R5TH | R4TH | R3TH | R2TH | R1TH | LTH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | THERM Status |
| 22 | N/A | N | R8TH2 | R7TH2 | R6TH2 | R5TH2 | R4TH2 | R3TH2 | R2TH2 | R1TH2 | LTH2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | THERM2 Status |
| 23 | N/A | N | R8OPN | R7OPN | R6OPN | R5OPN | R4OPN | R3OPN | R2OPN | R1OPN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Remote channel OPEN Status |
| 30 | 0F9C | Y | REN8 | REN7 | REN6 | REN5 | REN4 | REN3 | REN2 | REN1 | LEN | OS | SD | CR2 | CR1 | CR0 | BUSY | 0 | Configuration Register |
| 38 | 0080 | Y | 0 | HYS14 | HYS13 | HYS12 | HYS11 | HYS10 | HYS9 | HYS8 | HYS7 | HYS6 | HYS5 | HYS4 | HYS3 | HYS2 | HYS1 | HYS0 | THERM hysteresis |
| 39 | 7FC0 | Y | LTH1_15 | LTH1_14 | LTH1_13 | LTH1_12 | LTH1_11 | LTH1_10 | LTH1_9 | LTH1_8 | LTH1_7 | LTH1_6 | LTH1_5 | LTH1_4 | LTH1_3 | LTH1_2 | LTH1_1 | LTH1_0 | Local temp THERM limit |
| 3A | 7FC0 | Y | LTH2_15 | LTH2_14 | LTH2_13 | LTH2_12 | LTH2_11 | LTH2_10 | LTH2_9 | LTH2_8 | LTH2_7 | LTH2_6 | LTH2_5 | LTH2_4 | LTH2_3 | LTH2_2 | LTH2_1 | LTH2_0 | Local temp THERM2 limit |
| 40 | 0000 | Y | ROS15 | ROS14 | ROS13 | ROS12 | ROS11 | ROS10 | ROS9 | ROS8 | ROS7 | ROS6 | ROS5 | ROS4 | ROS3 | ROS2 | ROS1 | ROS0 | Remote temp 1 offset |
| 41 | 0000 | Y | RNC7 | RNC6 | RNC5 | RNC4 | RNC3 | RNC2 | RNC1 | RNC0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Remote temp 1 η-factor correction |
| 42 | 7FC0 | Y | RTH1_15 | RTH1_14 | RTH1_13 | RTH1_12 | RTH1_11 | RTH1_10 | RTH1_9 | RTH1_8 | RTH1_7 | RTH1_6 | RTH1_5 | RTH1_4 | RTH1_3 | RTH1_2 | RTH1_1 | RTH1_0 | Remote temp 1 THERM limit |
| 43 | 7FC0 | Y | RTH2_15 | RTH2_14 | RTH2_13 | RTH2_12 | RTH2_11 | RTH2_10 | RTH2_9 | RTH2_8 | RTH2_7 | RTH2_6 | RTH2_5 | RTH2_4 | RTH2_3 | RTH2_2 | RTH2_1 | RTH2_0 | Remote temp 1 THERM2 limit |
| 48 | 0000 | Y | ROS15 | ROS14 | ROS13 | ROS12 | ROS11 | ROS10 | ROS9 | ROS8 | ROS7 | ROS6 | ROS5 | ROS4 | ROS3 | ROS2 | ROS1 | ROS0 | Remote temp 2 offset |
| 49 | 0000 | Y | RNC7 | RNC6 | RNC5 | RNC4 | RNC3 | RNC2 | RNC1 | RNC0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Remote temp 2 η-factor correction |
| 4A | 7FC0 | Y | RTH1_15 | RTH1_14 | RTH1_13 | RTH1_12 | RTH1_11 | RTH1_10 | RTH1_9 | RTH1_8 | RTH1_7 | RTH1_6 | RTH1_5 | RTH1_4 | RTH1_3 | RTH1_2 | RTH1_1 | RTH1_0 | Remote temp 2 THERM limit |
| 4B | 7FC0 | Y | RTH2_15 | RTH2_14 | RTH2_13 | RTH2_12 | RTH2_11 | RTH2_10 | RTH2_9 | RTH2_8 | RTH2_7 | RTH2_6 | RTH2_5 | RTH2_4 | RTH2_3 | RTH2_2 | RTH2_1 | RTH2_0 | Remote temp 2 THERM2 limit |
| 50 | 0000 | Y | ROS15 | ROS14 | ROS13 | ROS12 | ROS11 | ROS10 | ROS9 | ROS8 | ROS7 | ROS6 | ROS5 | ROS4 | ROS3 | ROS2 | ROS1 | ROS0 | Remote temp 3 offset |
| 51 | 0000 | Y | RNC7 | RNC6 | RNC5 | RNC4 | RNC3 | RNC2 | RNC1 | RNC0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Remote temp 3 η-factor correction |
| 52 | 7FC0 | Y | RTH1_15 | RTH1_14 | RTH1_13 | RTH1_12 | RTH1_11 | RTH1_10 | RTH1_9 | RTH1_8 | RTH1_7 | RTH1_6 | RTH1_5 | RTH1_4 | RTH1_3 | RTH1_2 | RTH1_1 | RTH1_0 | Remote temp 3 THERM limit |

| PTR | POR | Lock | GD30TS304T Functional Registers – BIT Description | | | | | | | | | | | | | | | | Register |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HEX | HEX | Y/N | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Description |
| 53 | 7FC0 | Y | RTH2_15 | RTH2_14 | RTH2_13 | RTH2_12 | RTH2_11 | RTH2_10 | RTH2_9 | RTH2_8 | RTH2_7 | RTH2_6 | RTH2_5 | RTH2_4 | RTH2_3 | RTH2_2 | RTH2_1 | RTH2_0 | Remote temp 3 THERM2 limit |
| 58 | 0000 | Y | ROS15 | ROS14 | ROS13 | ROS12 | ROS11 | ROS10 | ROS9 | ROS8 | ROS7 | ROS6 | ROS5 | ROS4 | ROS3 | ROS2 | ROS1 | ROS0 | Remote temp 4 offset |
| 59 | 0000 | Y | RNC7 | RNC6 | RNC5 | RNC4 | RNC3 | RNC2 | RNC1 | RNC0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Remote temp 4 η-factor correction |
| 5A | 7FC0 | Y | RTH1_15 | RTH1_14 | RTH1_13 | RTH1_12 | RTH1_11 | RTH1_10 | RTH1_9 | RTH1_8 | RTH1_7 | RTH1_6 | RTH1_5 | RTH1_4 | RTH1_3 | RTH1_2 | RTH1_1 | RTH1_0 | Remote temp 4 THERM limit |
| 5B | 7FC0 | Y | RTH2_15 | RTH2_14 | RTH2_13 | RTH2_12 | RTH2_11 | RTH2_10 | RTH2_9 | RTH2_8 | RTH2_7 | RTH2_6 | RTH2_5 | RTH2_4 | RTH2_3 | RTH2_2 | RTH2_1 | RTH2_0 | Remote temp 4 THERM2 limit |
| 80 | 0000 | N | LT15 | LT14 | LT13 | LT12 | LT11 | LT10 | LT9 | LT8 | LT7 | LT6 | LT5 | LT4 | LT3 | LT2 | LT1 | LT0 | Local temperature (Block Register) |
| 81 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temp 1 (Block Register) |
| 82 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temp 2 (Block Register) |
| 83 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temp 3 (Block Register) |
| 84 | 0000 | N | RT15 | RT14 | RT13 | RT12 | RT11 | RT10 | RT9 | RT8 | RT7 | RT6 | RT5 | RT4 | RT3 | RT2 | RT1 | RT0 | Remote temp 4 (Block Register) |
| C4 | 8000 | N | Write 0x5CA6 to lock registers; Read back: 0x8000 | | | | | | | | | | | | | | | | Lock Register |
| | | | Write 0xEB19 to unlock registers; Read back: 0x0000 | | | | | | | | | | | | | | | | |
| FE | 5449 | N | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | Manufacturers Identification Register |
| FF | 0468 | N | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | Device Identification / Revision Register |

### 6.3.1 Pointer Register

Table 3 shows the pointer register bytes corresponding to each register in GD30TS304T. The default value of the pointer register is 0000h. GD30TS304T reads the local temperature register by default. When writing data to a register not defined in Table 3, the chip will still return the ACK bit for the write operation, but the data will not be written into the chip; when reading data from a register not defined in Table 3, the chip will return FFFFh.

### 6.3.2 THERM Status Register

GD30TS304T has two THERM status registers, which respectively represent the comparison results between the temperature output of the chip local channel and remote channel and the corresponding channel THERM threshold register.

For $\overline{\text{THERM}}$ status register (21h), when the temperature measurement results of the local channel and the remote channel are higher than $\overline{\text{THERM}}$ values in the threshold registers (39h, 42h, 4Ah, 52h, 5Ah) of the corresponding channels, the LTH bit and the R1TH~R4TH bits will be read as 1 respectively; when the temperature measurement results of the above channels are lower than the values that $\overline{\text{THERM}}$ threshold register minus $\overline{\text{THERM}}$ hysteresis register (38h) of the corresponding channels, the LTH bit and the R1TH~R4TH bits will be reset to 0 respectively. The behavior of $\overline{\text{THERM2}}$ status register (22h) is consistent with the $\overline{\text{THERM}}$ status register, see Table 4 and Table 5.

**Table 4. $\overline{\text{THERM}}$ Status Register Bit Description**

| Bit Number | Bit Name | Description |
|---|---|---|
| 15:12 | | Reserved |
| 11 | R4TH | 1 = Remote 4 channel temperature > the channel $\overline{\text{THERM}}$ threshold value |
| 10 | R3TH | 1 = Remote 3 channel temperature > the channel $\overline{\text{THERM}}$ threshold value |
| 9 | R2TH | 1 = Remote 2 channel temperature > the channel $\overline{\text{THERM}}$ threshold value |
| 8 | R1TH | 1 = Remote channel 1 temperature > the channel $\overline{\text{THERM}}$ threshold value |
| 7 | LTH | 1 = Local channel temperature > the channel $\overline{\text{THERM}}$ threshold value |
| 6:0 | | Reserved |

**Table 5. $\overline{\text{THERM2}}$ Status Register Bit Description**

| Bit Number | Bit Name | Description |
|---|---|---|
| 15:12 | | Reserved |
| 11 | R4TH2 | 1 = Remote 4- channel temperature > the channel $\overline{\text{THERM2}}$ threshold value - $\overline{\text{THERM}}$ hysteresis register value |
| 10 | R3TH2 | 1 = Remote 3 channel temperature > the channel $\overline{\text{THERM2}}$ threshold value - $\overline{\text{THERM}}$ hysteresis register value |
| 9 | R2TH2 | 1 = Remote 2 channel temperature > the channel $\overline{\text{THERM2}}$ threshold value - $\overline{\text{THERM}}$ hysteresis register value |
| 8 | R1TH2 | 1 = Remote 1 channel temperature > the channel $\overline{\text{THERM2}}$ threshold value - $\overline{\text{THERM}}$ hysteresis register value |

| Bit Number | Bit Name | Description |
|---|---|---|
| 7 | LTH2 | 1 = Local channel temperature > the channel $\overline{\text{THERM2}}$ threshold value - $\overline{\text{THERM}}$ hysteresis register value |
| 6:0 | | Reserved |

### 6.3.3 Remote Channel Open Status Register

GD30TS304T supports open circuit detection of temperature probes of all remote channels, and records the detection results in the remote channel open circuit status register, see Table 6. When a channel is detected as open circuit, the temperature measurement result of the channel will return 8000h (−256° C). This register will not directly affect the state of $\overline{\text{THERM}}$ and $\overline{\text{THERM2}}$ pins, but will indirectly affect the and pins by changing the value of the $\overline{\text{THERM}}$ status register.

**Table 6. Remote Channel Open Circuit Status Register Bit Description**

| Bit Number | Bit Name | Description |
|---|---|---|
| 15:12 | | Reserved |
| 11 | R4OPN | 1 = Remote 4 channel temperature probe open circuit |
| 10 | R3OPN | 1 = Remote 3 channel temperature probe open circuit |
| 9 | R2OPN | 1 = Remote 2 channel temperature probe open circuit |
| 8 | R1OPN | 1 = Remote 1 channel temperature probe open circuit |
| 7:0 | | Reserved |

### 6.3.4 Configuration Register

The configuration register of GD30TS304T controls the enable of each channel, conversion rate, shutdown mode and One-Shot mode of the chip, and indicates whether the chip is in the conversion process. BUSY is a read-only bit, and the rest are read-write bits. See Table 7 for details.

**Table 7. Configuration Register Bit Description**

| Bit Number | Bit Name | Description | POR Value |
|---|---|---|---|
| 15:12 | | Reserved | 0000 |
| 11:8 | REN4:REN1 | 1 = Enable remote channel to realize temperature conversion | 1111 |
| 7 | LEN | 1 = Enable local channel to realize temperature conversion | 1 |
| 6 | OS | 1 = Enable the channel to realize single temperature conversion | 0 |
| 5 | SD | 1 = Start shutdown mode | 0 |
| 4:2 | CR2:CR0 | Conversion rate control bits, see Table 9 for details | 111 |
| 1 | BUSY | 1 = The chip is in temperature conversion (read only) | 0 |
| 0 | | Reserved | 0 |

In the default register configuration, GD30TS304T will always perform continuous conversions in the order of local channel, remote 1 to 4 channels. If any bit in LEN or REN4: REN1 is written as 0, the temperature conversion of the channel corresponding to that bit will be skipped. If both LEN and REN4: REN1 are written as 0, the chip will enter shutdown mode, and the chip behavior is the same as if SD is written as 1 and OS bit is written as 0. See Table 8 for details of the above situation

**Table 8. GD30TS304T Temperature Conversion Description**

| WRITE | | | READ | | | Function |
|---|---|---|---|---|---|---|
| REN<4:1> & LEN | OS | SD | REN<4:1> & LEN | OS | SD | |
| All are 0 | | | All are 0 | 0 | 1 | Shutdown mode |
| At least one digit is 1 | | 0 | The value written | 0 | 0 | Continuous conversion mode |
| At least one digit is 1 | 0 | 1 | The value written | 0 | 1 | Shutdown mode |
| At least one digit is 1 | 1 | 1 | The value written | 1 | 1 | One-shot conversion mode |

The CR2:CR0 bit in the configuration register controls the temperature conversion rate of the GD30TS304T. When CR2:CR0 changes, the time of a single temperature conversion remains unchanged, but the time interval between two adjacent temperature conversions changes accordingly. For specific configurations, see Table 9 and Table 10. When CR2:CR0=111, there is no time interval between two adjacent temperature conversions, and the temperature conversion rate of the chip is determined by the number of enabled channels.

**Table 9. GD30TS304T Temperature Conversion Rate Description**

| CR2:CR0 | Frequency (Hz) | Time (s) |
|---|---|---|
| 000 | 0.0625 | 16 |
| 001 | 0.125 | 8 |
| 010 | 0.25 | 4 |
| 011 | 0.5 | 2 |
| 100 | 1 | 1 |
| 101 | 2 | 0.5 |
| 110 | 4 | 0.25 |
| 111 | There is no time interval between adjacent conversions. The single conversion time is shown in Table 10. | |

**Table 10. GD30TS304T Single Conversion Time**

| NUMBER OF REMOTE CHANNELS ENABLED | CONVERSION TIME (ms) | |
|---|---|---|
| | LOCAL DISABLED | LOCAL ENABLED |
| 0 | 0 | 16 |
| 1 | 16 | 32 |
| 2 | 32 | 48 |
| 3 | 48 | 64 |
| 4 | 64 | 80 |

### 6.3.5 η Factor Correction Register

GD30TS304T supports remote temperature measurement using remote temperature probes with different η factors. By configuring the four η factor correction registers (41h、49h、51h、59h) according to the actual remote temperature probe used, a more accurate remote temperature measurement result can be obtained. The specific configuration of the η factor correction register is shown in Table 11; where $\eta_{eff}$ is the η factor value of the actual remote temperature probe used, N is the value of the η factor correction register, and negative values are represented in binary complement form, with an adjustment range of -128 ~ +127. The corresponding relationship between the two is shown in the following formula:

$$\eta_{eff} = \frac{1.008 \times 2048}{2048 + N}, \quad N = \frac{1.008 \times 2048}{\eta_{eff}} - 2048 \tag{1}$$

Table 11 shows the corresponding values of the η factor correction register under different $\eta_{eff}$ values.

**Table 11. η Factor Correction Register Bit Description**

| Binary | HEX | DECIMAL | ηeff |
|---|---|---|---|
| 0111 1111 | 7F | 127 | 0.949142 |
| 0000 1010 | 0A | 10 | 1.003102 |
| 0000 1000 | 08 | 8 | 1.004078 |
| 0000 0110 | 06 | 6 | 1.005056 |
| 0000 0100 | 04 | 4 | 1.006035 |
| 0000 0010 | 02 | 2 | 1.007017 |
| 0000 0001 | 01 | 1 | 1.007508 |
| 0000 0000 | 00 | 0 | 1.008(Default) |
| 1111 1111 | FF | -1 | 1.008492 |
| 1111 1110 | FE | -2 | 1.008985 |
| 1111 1100 | FC | -4 | 1.009973 |
| 1111 1010 | FA | -6 | 1.010962 |
| 1111 1000 | F8 | -8 | 1.011953 |
| 1111 0110 | F6 | -10 | 1.012946 |
| 1000 0000 | 80 | -128 | 1.07520 |

### 6.3.6 Remote Temperature Offset Correction Register

All remote channels of GD30TS304T have remote temperature offset correction registers (40h, 48h, 50h, 58h) to store the correction value of the remote temperature offset of the channel. The value in this register is added to the result of the temperature conversion after each remote channel temperature measurement to form the final remote channel temperature, so as to further improve the accuracy of the remote channel temperature measurement result. The data format of this register is the same as that of the remote channel temperature register, with a temperature resolution of 0.0078125°C and a temperature range of −256°C to+255.9921875°C. Negative temperature is implemented using binary complement.

### 6.3.7 THERM Hysteresis Register

The THERM hysteresis register (38h) participates in the generation of the lower temperature limit in the constant temperature mode to prevent repeated alarms caused by the temperature measurement result being near the temperature threshold. $\overline{\text{THERM}}$ and $\overline{\text{THERM2}}$ modes share the same THERM hysteresis register. The resolution of this register is 0.0078125°C, the highest bit is always read as 0, and the temperature range is 0°C to +255.9921875°C.

### 6.3.8 THERM Threshold Register

The $\overline{\text{THERM}}$ threshold registers (39h, 42h, 4Ah, 52h, 5Ah) and $\overline{\text{THERM2}}$ threshold registers (3Ah, 43h, 4Bh, 53h, 5Bh) of the two constant temperature modes of GD30TS304T are used to store the temperature comparison thresholds of different remote channels. The data format of the above registers is the same as that of the remote channel temperature register, with a temperature resolution of 0.0078125°C and a temperature range of −256°C to +255.9921875°C. Negative temperature is implemented using binary complement.

When some channels do not need to monitor the temperature output, it is recommended to set the THERM threshold register of the channel to 7FFF (+255.9921875°C). After this setting, the bit in the corresponding THERM status register and the THERM output pin will not be activated because of this channel.

### 6.3.9 Temperature Register Block

The register block for storing the local and remote channel temperature output in GD30TS304T consists of 5 registers with pointers from 80h to 84h. The values stored in the above registers are mirror images of the local and remote channel temperature registers (00h to 04h). The register block supports reading the values in the above registers separately through only one I2C communication, see *Block Register Reads* for details.

# 7 Application Information

The typical application diagram of GD30TS304T is shown in Figure 7. D1+ to D4+ pins are positive input pin of each remote channel, and the D- pin is the negative input pin of each remote channel. When some remote channels do not need to measure temperature, the D+ pin of the channel must be shorted to the D- pin. The SCL, SDA, $\overline{\text{THERM}}$ and $\overline{\text{THERM2}}$ pins are open-drain output and should be connected to 1.6V to 5.5V power supply through a pull-up resistor RPULLUP. GD30TS304T supports the high level (1.6V to 5.5V) of the two-wire bus to be lower than the chip power supply (2.7V to 5.5V). See *Low-Voltage Communication* for details.

GD30TS304T's D+ and D- pins are recommended to mount $R_S$ and filter capacitor $C_F$. The resistance of the filter resistor should be less than 1kΩ, and the capacitance of the filter capacitor should be less than 1nF. For details, see *Filter and Series Resistance Elimination*.

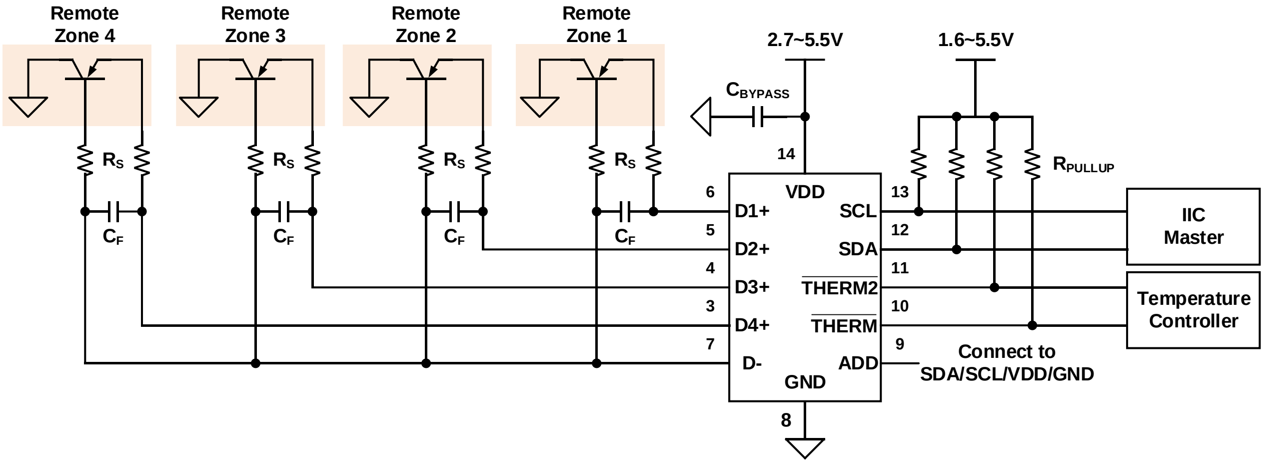



**Figure 7. Diagram of GD30TS304T's Typical Connection**

GD30TS304T's temperature measurement probe of each remote channel can select isolation components, or be integrated in the processor chip, FPGA, ASIC and other circuit modules. Remote temperature measurement probe can select PNP or NPN devices. Each remote channel of GD30TS304T can be selected as separate original devices or integrated in the circuit modules such as processor chip, FPGA, ASIC, etc. The remote temperature probe can be selected as PNP or NPN devices; NPN must be connected by diode, and PNP can be connected by diode or transistor, as shown in Figure 8. Some applications specify the range of bias current on the remote temperature probe. The maximum bias current provided by GD30TS304T for the remote temperature probe is 120μA and the minimum value is 7.5μA. For temperature probes with different η factor values, the η factor correction register can be configured to obtain more accurate remote temperature measurement results. See *η Factor* Correction Register for details. The default η factor value of GD30TS304T is 1.008. When the selected temperature probe ηeff≠1.008, the error value of the temperature measurement result T at this time can be calculated according to the following formula, where the unit of T must be °C.

$$T_{ERROR} = \left(\frac{\eta_{eff} - 1.008}{1.008}\right) \times (T + 273.15) \quad (2)$$

When using isolation components as the remote temperature measurement probe of GD30TS304T, the device selection can be carried out according to the following standards to obtain higher temperature measurement accuracy:

- At the highest measured temperature and bias current of 7.5μA, VBE >0.25V;
- At the lowest measured temperature and bias current of 120μA, VBE <0.95V;
- Base resistance < 100 Ω;
- h FE variation range is as small as possible (50 ~ 150);

Based on the above standards, the recommended remote temperature probe model is MMBT3904 (NPN) or MMBT3906 (PNP).

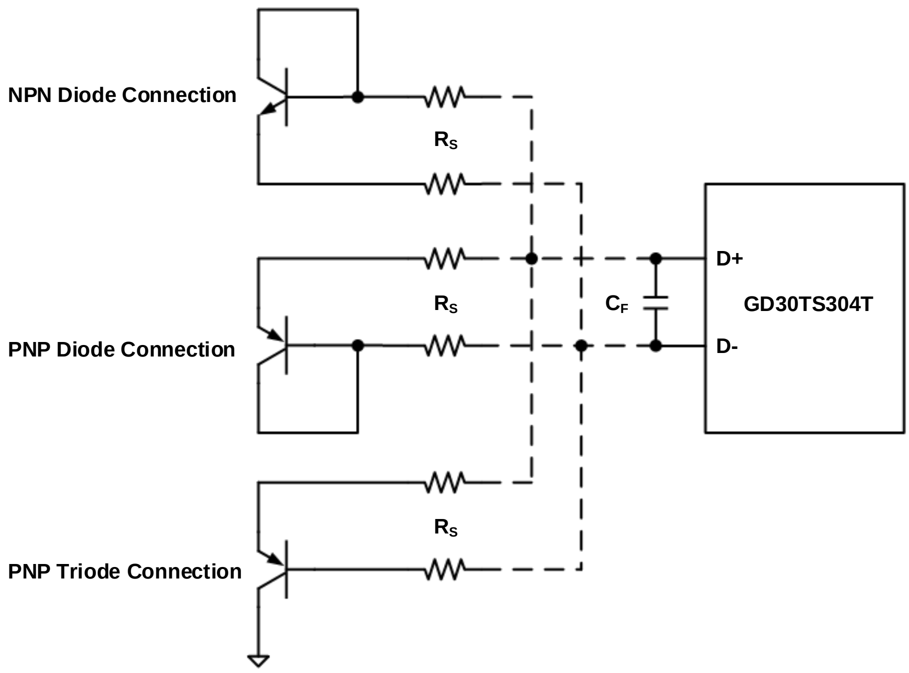
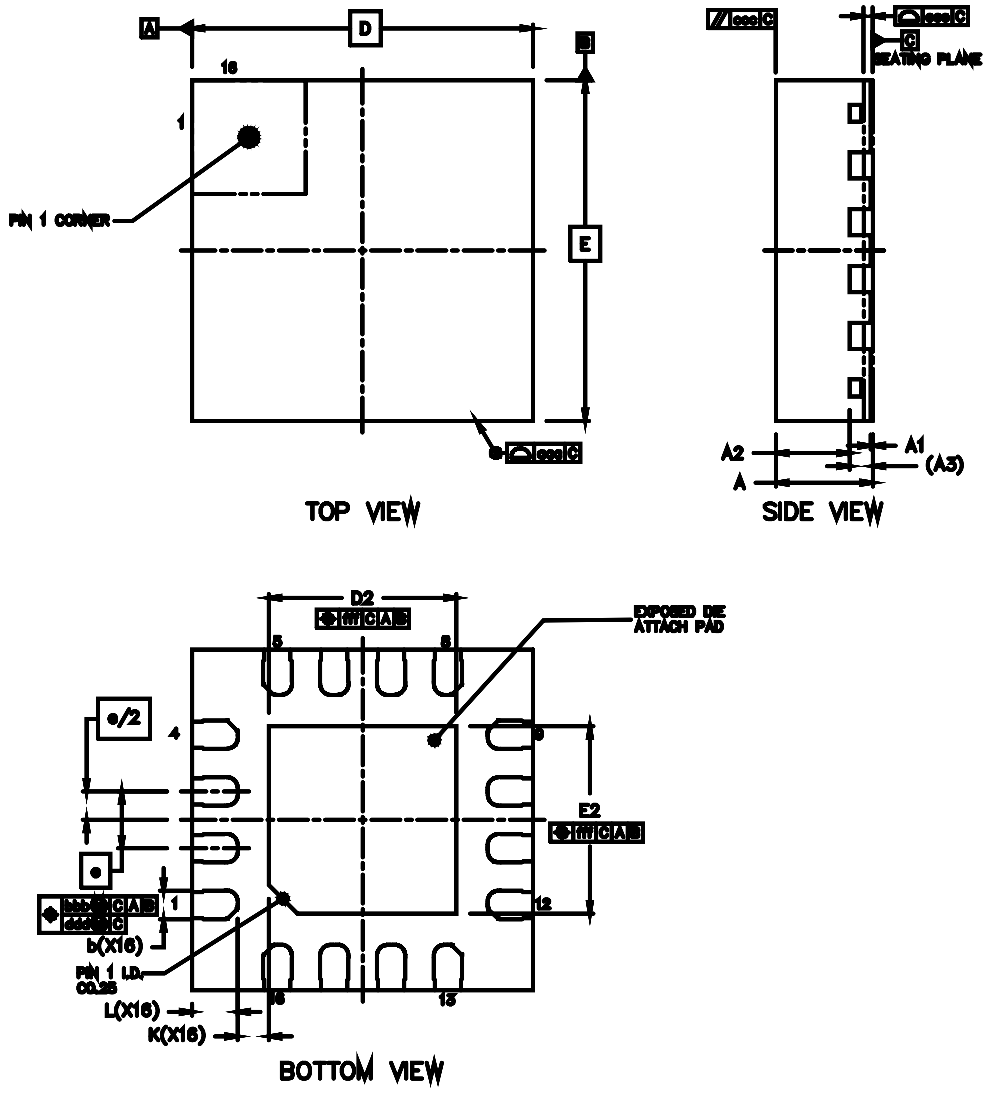



**Figure 8. Diagram of Remote Temperature Probe with Different Connection Methods**

# 8 Package Information

## 8.1 Outline Dimensions

QFN16 Package Outline




NOTES: (continued)

1. All dimensions are in millimeters.
2. Package dimensions does not include mold flash, protrusions, or gate burrs.
3. Refer to the Table 12 *QFN16 dimensions(mm)*.

Table 12. QFN16 dimensions(mm)

| SYMBOL | MIN | NOM | MAX |
|---|---|---|---|
| A | 0.8 | 0.85 | 0.9 |
| A1 | 0 | 0.02 | 0.05 |
| A2 | | 0.65 | |
| A3 | | 0.23 REF | |
| b | 0.2 | 0.25 | 0.3 |
| D | | 3 BSC | |
| E | | 3 BSC | |
| e | | 0.5 BSC | |
| D2 | 1.55 | 1.65 | 1.75 |
| E2 | 1.55 | 1.65 | 1.75 |
| L | 0.3 | 0.4 | 0.5 |
| K | | 0.2 MIN | |
| aaa | | 0.1 | |
| ccc | | 0.1 | |
| eee | | 0.08 | |
| bbb | | 0.1 | |
| ddd | | 0.05 | |
| fff | | 0.1 | |

# 9 Ordering Information

| Ordering Code | Package Type | ECO Plan | Packing Type | MOQ | OP Temp(°C) |
|---|---|---|---|---|---|
| GD30TS304TLUTR-I | QFN16 | Green | Tape & Reel | 3000 | −40°C to +125°C |

# 10 Revision History

| REVISION NUMBER | DESCRIPTION | DATE |
|---|---|---|
| 1.0 | Initial release and device details | 2024 |

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