# HT7510
# Clinical Thermometer

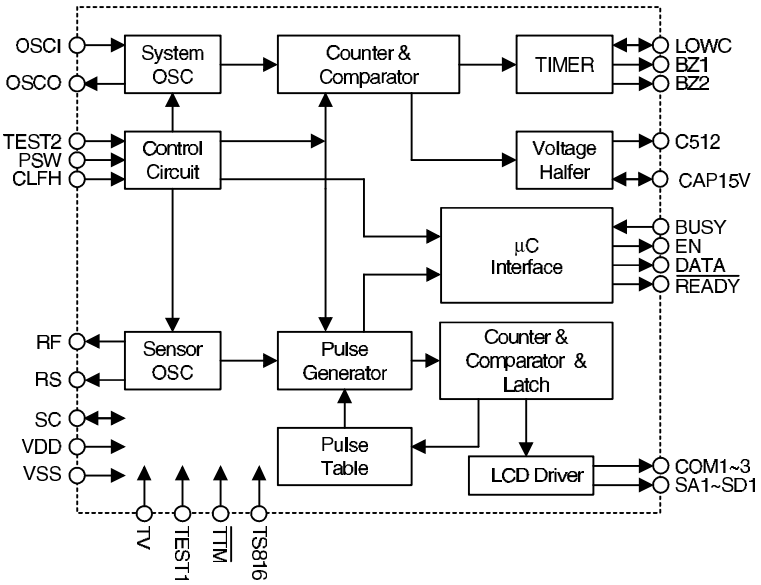
## Features

- Single-chip CMOS construction
- Measurement range: +32.0°C~+42.0°C (+90.0~+108.0°F)
  Measurement accuracy: ±0.1°C (±0.2°F)
  Resolution: 0.1°C (0.1°F)
- Single 3.0V battery operation
- Bonding option for Centigrade/Fahrenheit measurement
- Highest temperature hold
- Auto power off after 8 min. 40 sec
- One key input switch ON/OFF
- Display the last measured temperature
- Low voltage detection for 2.4V
- Interface with HT84018-0D to provide voice report function (Refer to HT84XXX data sheet for detail specification)

## General Description

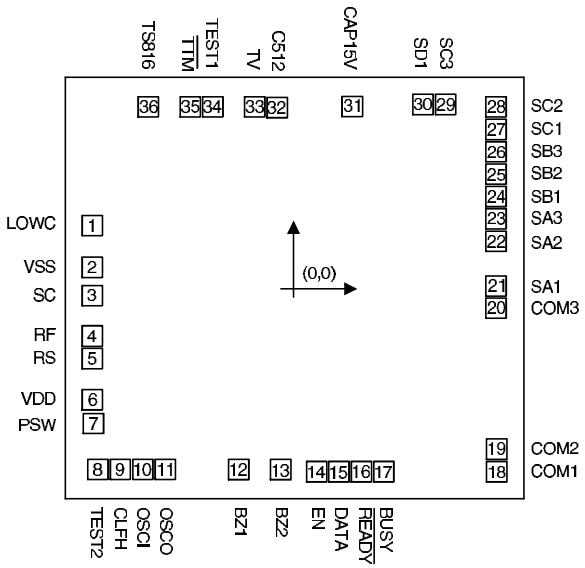
The HT7510 is a CMOS digital clinical thermometer IC for measuring body temperature in Centigrade (°C) or Fahrenheit (°F) mode by its bonding option. The main function of HT7510 is the same as HT7500. When interfaced with HT84018-0D, HT7510 can provide voice report function. It also provides alarm and auto power off functions. The other electronic components are LCD display, thermister, 3.0V battery, ON/OFF switch, buzzer, resistors and capacitors.

## Block Diagram



## Pad Assignment

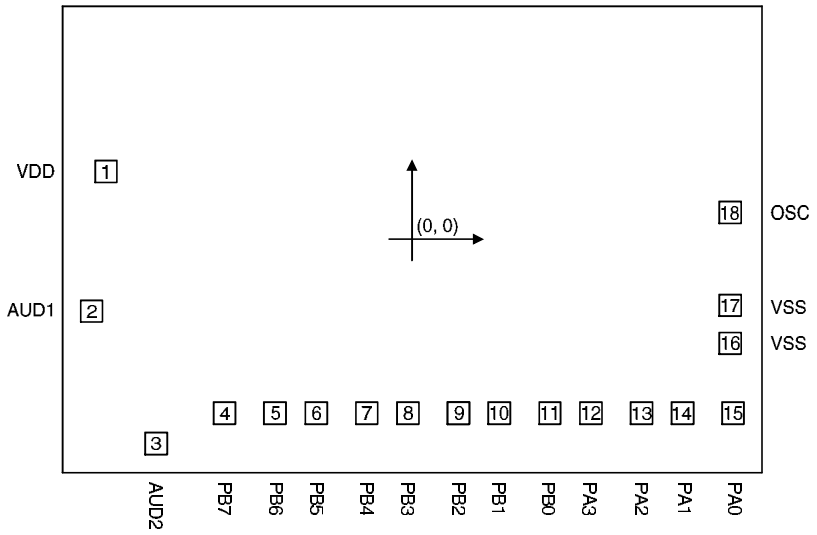
### HT7510




Chip size: $132 \times 121$ (mil)$^2$

* The IC substrate should be connected to VDD in the PCB layout artwork.

### HT84018




Chip size: $2735 \times 1835$ ($\mu$m)$^2$

* The IC substrate should be connected to VSS in the PCB layout artwork.

## Pad Coordinates

**HT7510** Unit: mil

| Pad No. | X | Y | Pad No. | X | Y |
|---|---|---|---|---|---|
| 1 | –59.50 | 18.78 | 19 | 60.05 | –47.43 |
| 2 | –59.58 | 6.38 | 20 | 59.88 | –5.74 |
| 3 | –59.58 | –2.00 | 21 | 59.88 | 0.89 |
| 4 | –59.58 | –13.98 | 22 | 59.88 | 14.07 |
| 5 | –59.58 | –20.61 | 23 | 59.88 | 20.70 |
| 6 | –59.58 | –32.81 | 24 | 59.88 | 27.33 |
| 7 | –59.24 | –39.87 | 25 | 59.88 | 33.96 |
| 8 | –57.88 | –53.42 | 26 | 59.88 | 40.59 |
| 9 | –51.26 | –53.42 | 27 | 59.88 | 47.22 |
| 10 | –44.63 | –53.42 | 28 | 59.88 | 53.85 |
| 11 | –37.99 | –53.42 | 29 | 44.97 | 54.61 |
| 12 | –16.28 | –53.47 | 30 | 38.33 | 54.61 |
| 13 | –3.83 | –53.47 | 31 | 17.38 | 53.97 |
| 14 | 6.80 | –54.06 | 32 | –4.89 | 53.63 |
| 15 | 13.43 | –54.06 | 33 | –11.52 | 53.85 |
| 16 | 20.06 | –54.06 | 34 | –23.93 | 53.85 |
| 17 | 26.69 | –54.06 | 35 | –30.56 | 53.85 |
| 18 | 60.05 | –54.06 | 36 | –42.97 | 53.85 |

**HT84018** Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---|---|---|---|---|---|
| 1 | –1125.31 | 249.74 | 10 | 320.15 | –639.24 |
| 2 | –1177.49 | –263.79 | 11 | 505.75 | –639.24 |
| 3 | –939.68 | –749.61 | 12 | 656.55 | –639.24 |
| 4 | –689.05 | –639.24 | 13 | 842.15 | –639.24 |
| 5 | –503.45 | –639.24 | 14 | 992.95 | –639.24 |
| 6 | –352.65 | –639.24 | 15 | 1178.55 | –639.24 |
| 7 | –167.05 | –639.24 | 16 | 1167.43 | –382.18 |
| 8 | –16.25 | –639.24 | 17 | 1167.53 | –242.08 |
| 9 | 169.35 | –639.24 | 18 | 1167.53 | 99.04 |

## Pad Description

| Pad No. | Pad Name | I/O | Description |
|---|---|---|---|
| 1 | LOWC | B | For low voltage detector, open the pin when not in use. |
| 2 | VSS | I | Power supply GND |
| 3 | SC | B | Common point, NMOS open drain |
| 4 | RF | O | Connect reference resistor, PMOS open drain |
| 5 | RS | O | Connect sensor resistor, PMOS open drain |
| 6 | VDD | I | Power supply positive |
| 7 | PSW | I | Pull-low input pin, press switch to turn the power on or off |
| 8 | TEST2 | I | Pull-low test pin, for production, floating test, LCD displays the real time value, when connected to VDD, LCD displays the highest value. |
| 9 | CLFH | I | Connecting VSS for °C, connect to VDD for °F |
| 10 | OSCI | I | For system oscillator in |
| 11 | OSCO | O | For system oscillator out |
| 12 | BZ1 | O | Buzzer output 1 |
| 13 | BZ2 | O | Buzzer output 2 |
| 14 | EN | O | Interface with HT84018-0D |
| 15 | DATA | O | Interface with HT84018-0D |
| 16 | $\overline{\text{READY}}$ | O | Interface with HT84018-0D |
| 17 | BUSY | I | Interface with HT84018-0D |
| 18~20 | COM1~COM3 | O | LCD backplane drive, 3 level voltage out |
| 21~23 | SA1~SA3 | O | LCD segment drive |
| 24~26 | SB1~SB3 | O | LCD segment drive |
| 27~29 | SC1~SC3 | O | LCD segment drive |
| 30 | SD1 | O | LCD segment drive |
| 31 | CAP15V | O | 1.5V output for LCD display |
| 32 | C512 | O | Test pin for IC (512Hz output) |
| 33 | TV | B | Test pin for IC |
| 34 | TEST1 | I | Test pin for IC |
| 35 | $\overline{\text{TTM}}$ | I | Test pin for IC |
| 36 | TS816 | I | Test pin for IC |

## Absolute Maximum Ratings

Supply voltage.....0V to 5V
Input voltage.....$V_{SS}$–0.5V to $V_{DD}$+0.5V
Operation Temperature.....–20°C to +75°C
Storage Temperature.....–55°Cto +125°C

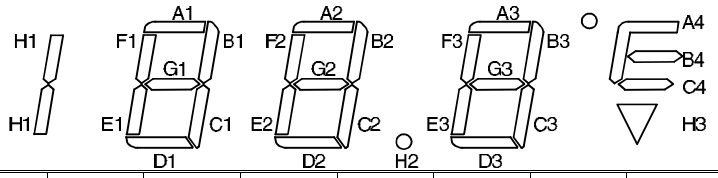
Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

## Electrical Characteristics

Ta=25°C

| Symbol | Parameter | Test Conditions | | min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{DD}$ | Conditions | | | | |
| $V_{DD}$ | Operating Voltage | — | — | 2.2 | 3.0 | 3.6 | V |
| $I_{DD}$ | Operating Current | 3V | No load | — | 200 | 300 | μA |
| $I_{STB}$ | Standby Current | 3V | — | — | — | 1.0 | μA |
| $f_{OSC}$ | Oscillating Frequency | 3V | $R_{OSC}$=1MΩ | 25.6 | 32 | 38.4 | kHz |
| R°C | Temperature Measurement Accuracy at Range 35°C~39°C | — | — | –0.1 | — | 0.1 | °C |
| R°F | Temperature Measurement Accuracy at Range 95°F~102°F | — | — | –0.2 | — | 0.2 | °F |

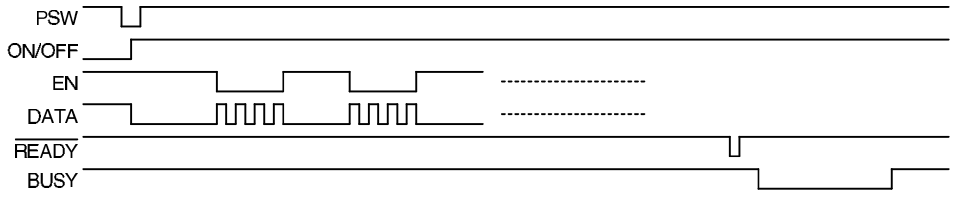
## LCD Electrode Pattern




| | SA1 | SA2 | SA3 | SB1 | SB2 | SB3 | SC1 | SC2 | SC3 | SD1 |
|---|---|---|---|---|---|---|---|---|---|---|
| COM1 | F1 | A1 | B1 | F2 | A2 | B2 | F3 | A3 | B3 | A4 |
| COM2 | E1 | G1 | C1 | E2 | G2 | C2 | E3 | G3 | C3 | B4 |
| COM3 | H1 | D1 | — | — | D2 | H2 | — | D3 | H3 | C4 |

Note: 1/3 duty, 1/2 bias (LCD uses 3V)

### Interface with HT84018-0D



## Functional Description

The following description is for HT7510 only.

- Power switch: press switch to turn the power on or off.
- When power is on: press the switch, then it will generate a "beep" sound for 0.125 sec.
  a. Displays all the segments first for 2 sec.
  b. After a. shows the temperature of the last reading for 2 sec.
  c. After b. shows L °C (or °F ) for 0.75 sec.
  d. After c. displays the measurement temperature, the °C (or °F) mark will flash at a speed of 1Hz.
  e. If the temperature < 32 °C (or 90 °F), the display shows L °C (or °F).
  f. If the temperature ≥ 42 °C (or 108 °F), the display shows H °C (or °F).
  g. The display always show the higher temperature during the measurement.
  h. If the measured temperature does not change for more than 16 sec, the measurement is over and the °C (or °F) mark flash stops.
  i. When measurement is over, if the temperature > 37.5 °C (or 99.5 °F),the buzzer alarms

BI --------- BI -------- BI -------- ---------
0.125S 0.125S 0.125S 0.125S 0.125S 0.125S 0.375S

"Beep-Beep-Beep---Beep-Beep-Beep---" for 4 sec, as follows:
if the temperature ≤ 37.5 °C (or 99.5 °F), the buzzer alarms "Beep-Beep-Beep-Beep-" for 4 sec, as follows:

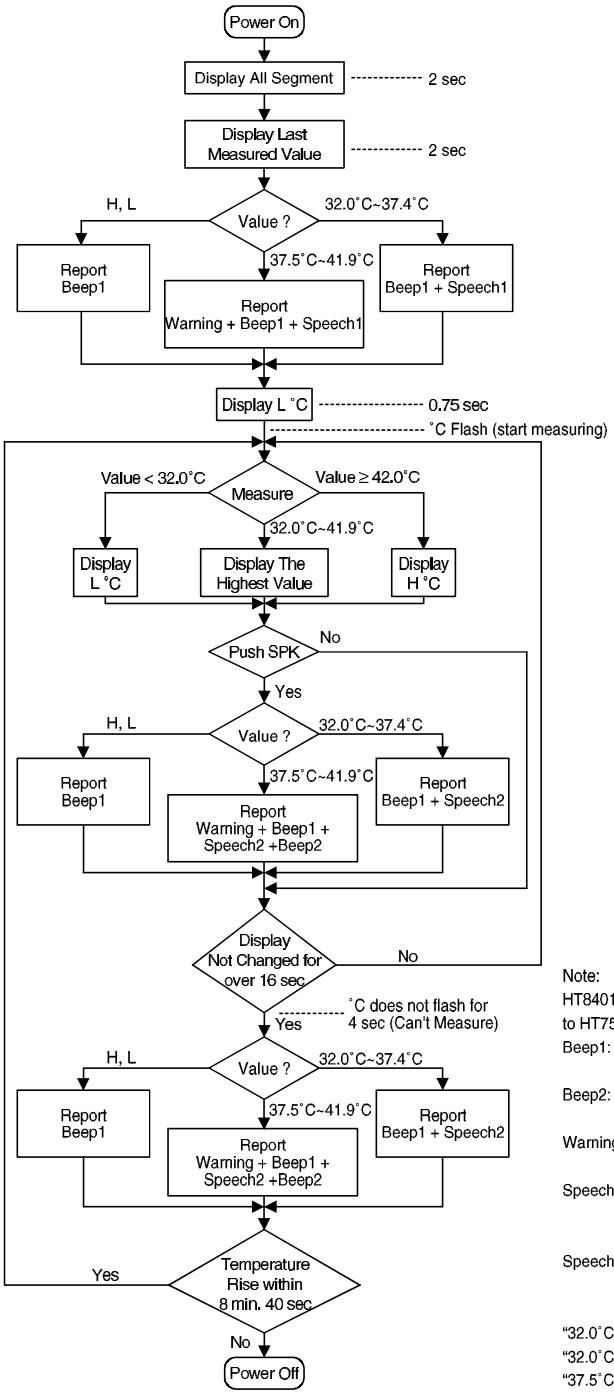
BI --------
0.5S 0.5S

  j. If the measurement is over 8 min. 40 sec. the power will automatically turn off
  k. When the measurement is over and the temperature rises within 8 min. 40 sec, the °C (or °F) mark will flash again (repeat from step 2-d), and starts to count again until 8 min. 40 sec.
  l. When beep sound is on for 4 sec, the temperature is not measured.
- When power is off: the standby current ≤ 1μA.
- The frequency of the buzzer is 5.3kHz
- Bonding option: °C or °F.
- Measurement to 0.1 degree in either °C or °F.
- Sensor use 503ET.
- Reference resistor value (sensor in 37.0 °C)
- When battery voltage is low, the battery mark "∇" flashes at a speed of 1 Hz and the measurement may not be accurate. The low voltage detect: 2.4V ± 0.05V.
- During the process of mass production, in order to adjust the reference resistance (RF), let test 2 be floating, the measured temperature will be the actual temperature of the measured environment. It can be up or down, not always the higher one.

**Selection table for clinical thermometer**

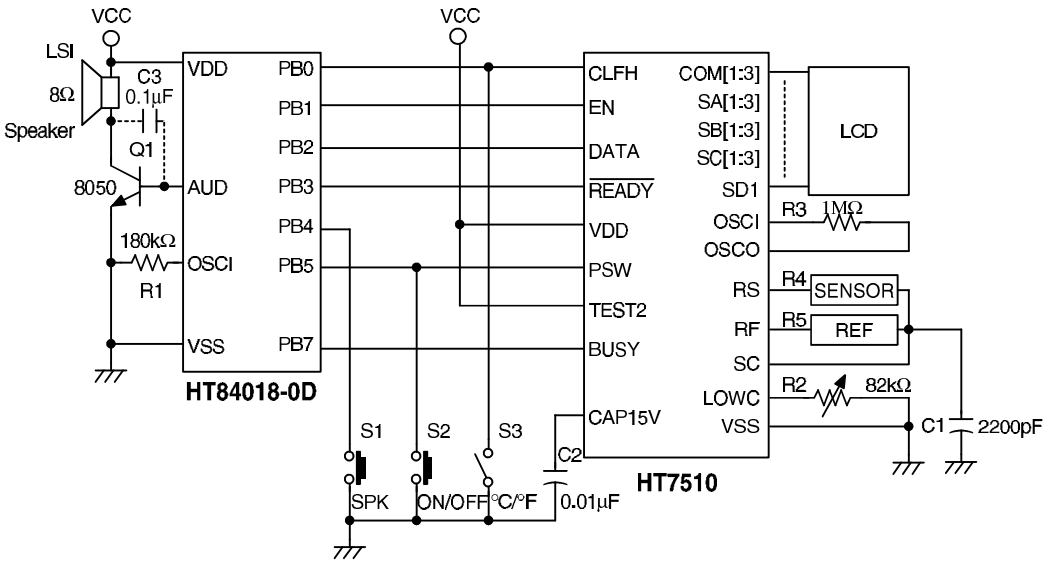
| Part No. | Voice Language |
|---|---|
| HT84018-0D | English |

## Flow Chart (HT7510/HT84018-0D)




Note:
HT84018-0D provides English voice source to HT7510, the contents of voice is shown below.
Beep1: "Beep Beep silence"
136ms 136ms 200ms
Beep2: repeat 4 times "Beep Beep Beep silence"
125ms 125ms 125ms 200ms
Warning: "warning sound"
1298ms
Speech1: "Your last temperature was
32.0~41.9/90.0~107.9 degree
Centigrade/Farenheit"
Speech2: "Your current temperature is
32.0~41.9/90.0~107.9 degree
Centigrade/Farenheit"
"32.0˚C~41.9˚C" is equal to "90.0˚F~107.9˚F"
"32.0˚C~37.4˚C" is equal to "90.0˚F~99.4˚F"
"37.5˚C~41.9˚C" is equal to "99.5˚F~107.9˚F"

## Application Circuits




Notes: HT7510's substrate connected to VDD and HT84018-0D's substrate connected to VSS.

LOWC is connected to an external resistor for adjusting the detector level of a low voltage detector. Open the pin when not in use.

OSCI, OSCO are connected to an external resistor, and form an RC oscillator with a built-in capacitor for SYSTEM clock (32kHz)

RS, RF, SC constitute an alternating RC oscillator, which allows one oscillator, namely RS or RF, active at a time.

REF (reference resistor) is a resistor value equal to 503ET sensor in 37.0 °C or 98.6°F

RENSOR is a 503ET thermistor.

S3 (open=for °F, short=for °C)