HOLTEK

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
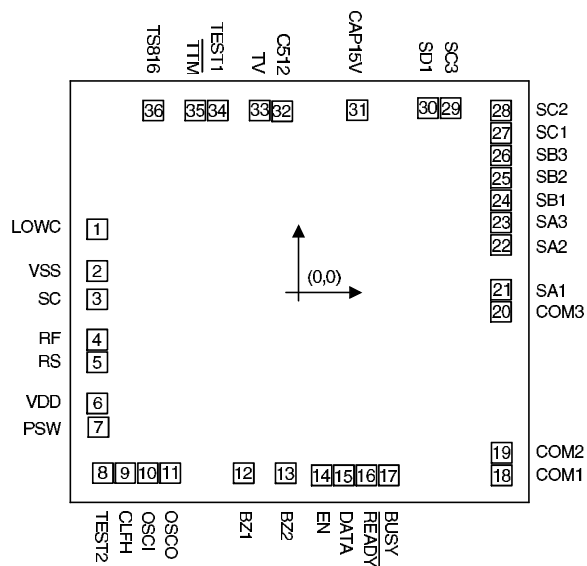
HT84018-0D, HT7510 can provide voice report function. It also provides alarm and auto power off functions. The other electronic components are LCD display, thermister, 3.0V battery, ON/OFF switch, buzzer, resistors and capacitors.

Block Diagram
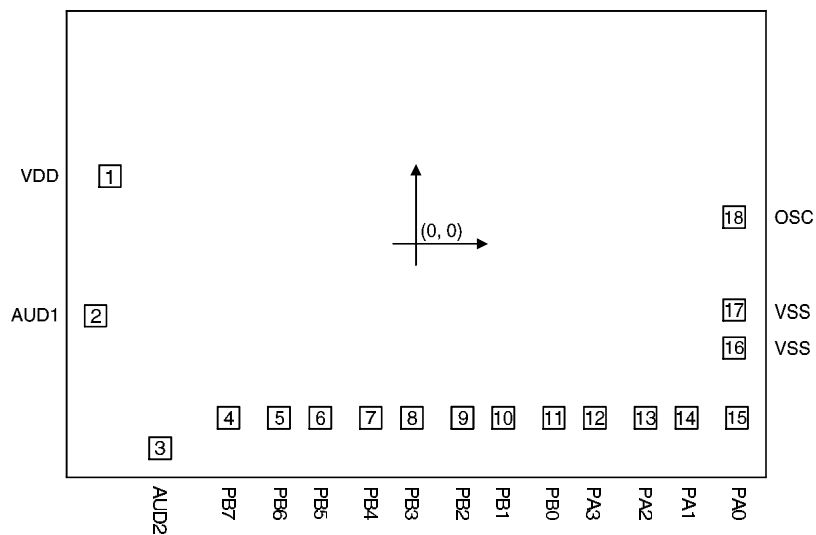
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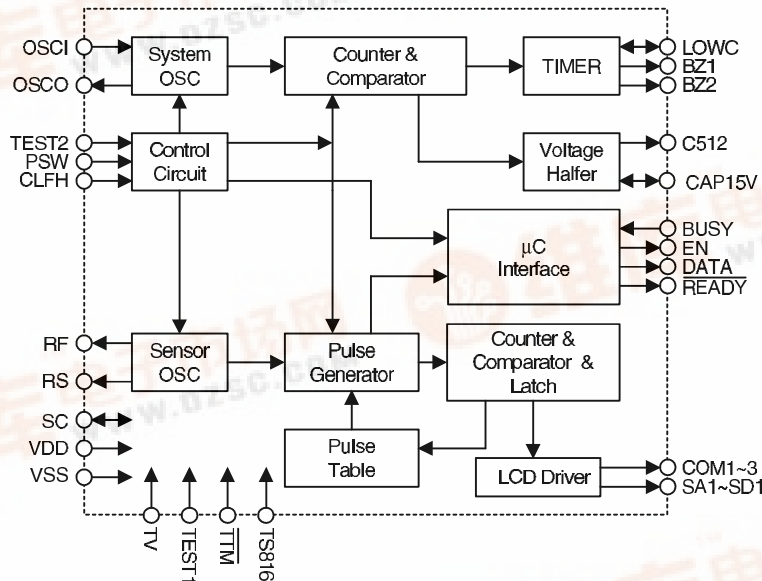
Pad Assignment

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.

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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

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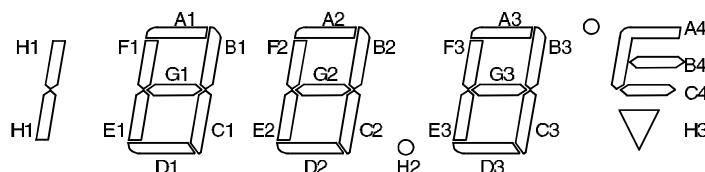
	SA1	SA2	SA3	SB1	SB2	SB3	SC1	SC2	SC3	SD1
COM1	F1	A1	B1	F2	A2	B2	F3	A3	B3	A4
COM2	E1	G1	C1	E2	G2	C2	E3	G3	C3	B4
COM3	H1	D1	—	—	D2	H2	—	D3	H3	C4

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

Interface with HT84018-0D
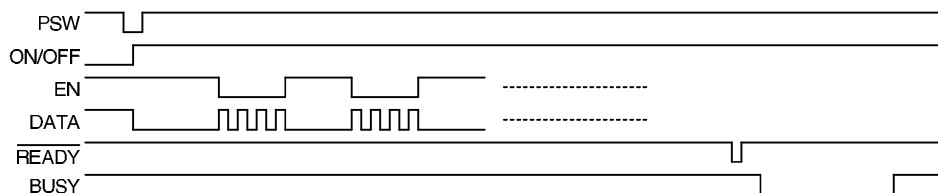
Functional Description

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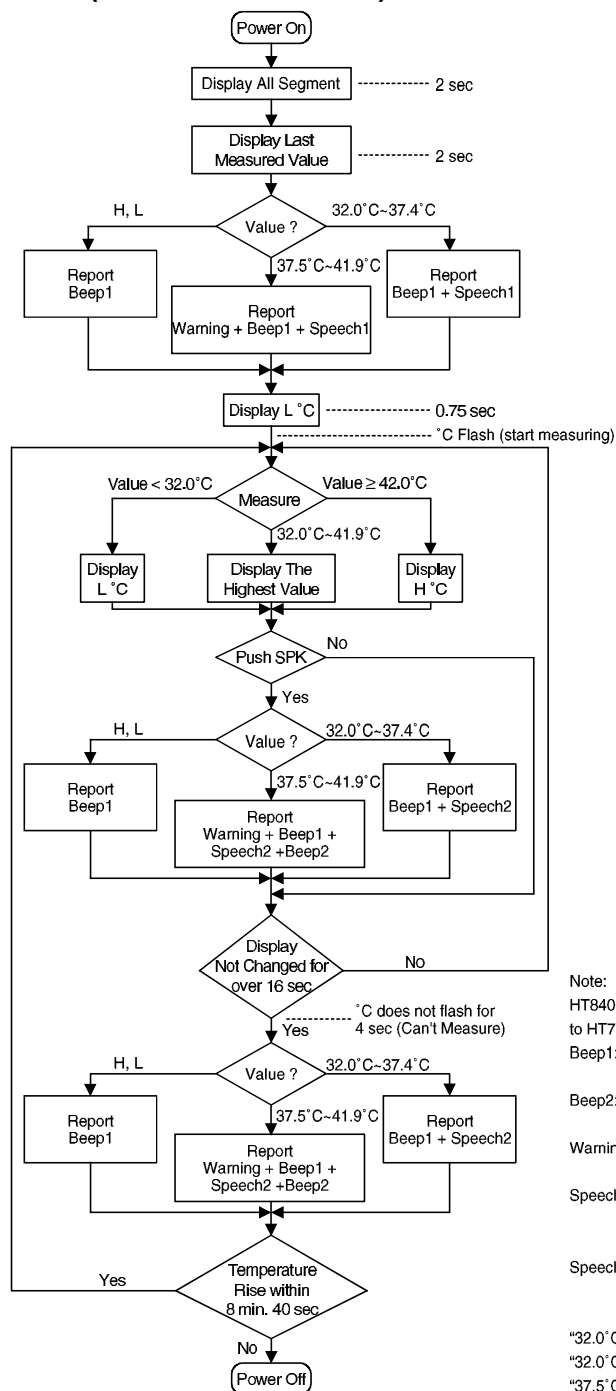if the temperature ≤ 37.5 °C (or 99.5 °F), the buzzer alarms "Beep-Beep-Beep-Beep-" for 4 sec, as follows:

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 "V" 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)

Power On

Display All Segment ------------- 2 sec

Display Last Measured Value ------------- 2 sec

Value ?
- H, L → Report Beep1
- 32.0°C~37.4°C → Report Beep1 + Speech1
- 37.5°C~41.9°C → Report Warning + Beep1 + Speech1

Display L °C ------------------ 0.75 sec

---------------------------- °C Flash (start measuring)

Measure
- Value < 32.0°C → Display L °C
- 32.0°C~41.9°C → Display The Highest Value
- Value ≥ 42.0°C → Display H °C

Push SPK — No

Yes

Value ?
- H, L → Report Beep1
- 32.0°C~37.4°C → Report Beep1 + Speech2
- 37.5°C~41.9°C → Report Warning + Beep1 + Speech2 + Beep2

Display Not Changed for over 16 sec — No

Yes ------------- °C does not flash for 4 sec (Can't Measure)

Value ?
- H, L → Report Beep1
- 32.0°C~37.4°C → Report Beep1 + Speech2
- 37.5°C~41.9°C → Report Warning + Beep1 + Speech2 + Beep2

Temperature Rise within 8 min. 40 sec
- Yes (loop back)
- No → Power Off

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"

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Application Circuits

HT84018-0D

HT7510

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)