

One-Decimal Clinical Thermometer

Features

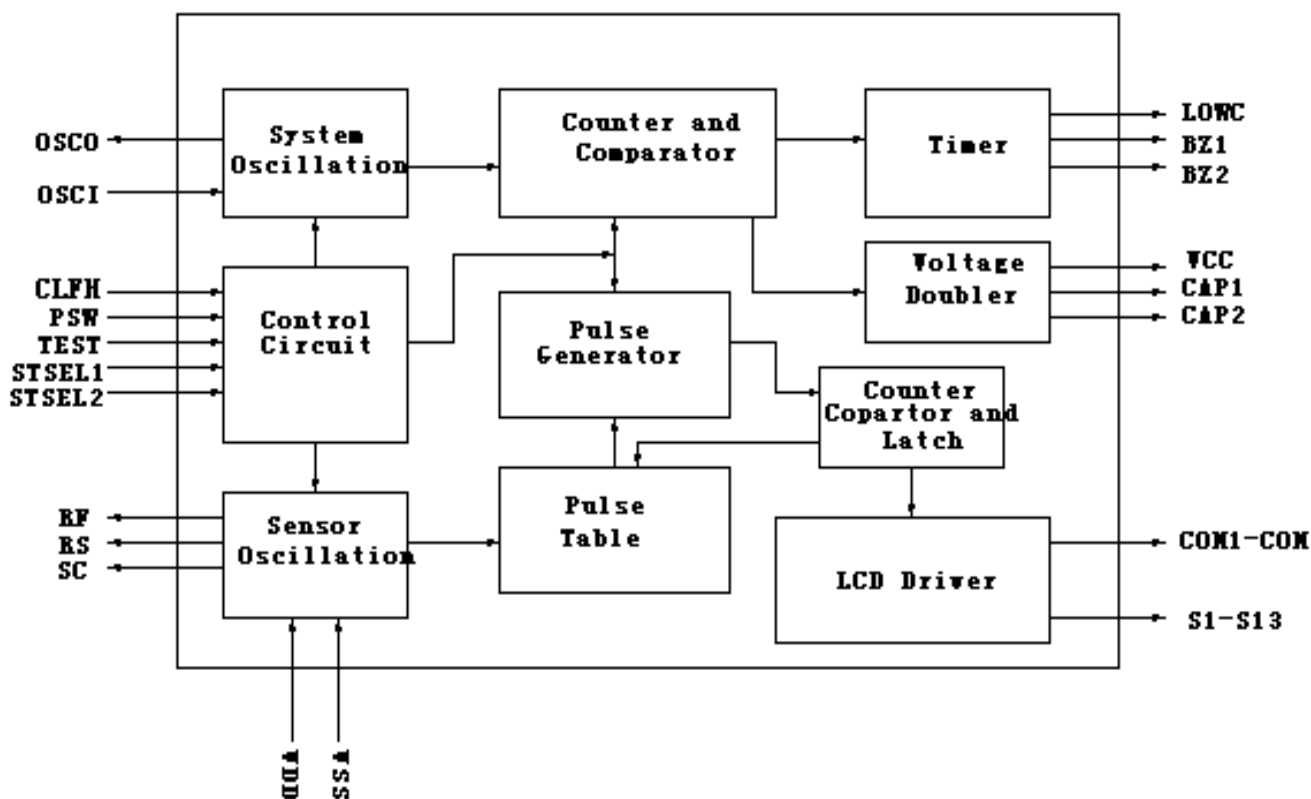
- | | |
|---|---|
| <ul style="list-style-type: none"> Single-chip CMOS construction Measurement range: 32.0 ~42.9°C (90°F ~109.9°F) Measurement accuracy: $\pm 0.1^{\circ}\text{C}$ ($\pm 0.2^{\circ}\text{F}$) Resolution: 0.1°C (0.1°F) Single 1.5V battery operation Highest temperature hold Round off function Multi stable time selection: 4s/8s/16s/32s | <ul style="list-style-type: none"> Automatic power off One ON/OFF switch input ke Bonding option for °C and °F Display the last time measured temperature Alarm warning for fever Buzzer output: 6k/8kHz For various sensor application, change one layer only |
|---|---|

General Description

The DL7016E is CMOS digital clinical thermometer IC for measuring body temperature from 32.0°C ~ 42.9°C (90°F ~ 109.9°F). It also provides stable alarm, fever alarm, automatic power off and the memory function of the last time measured

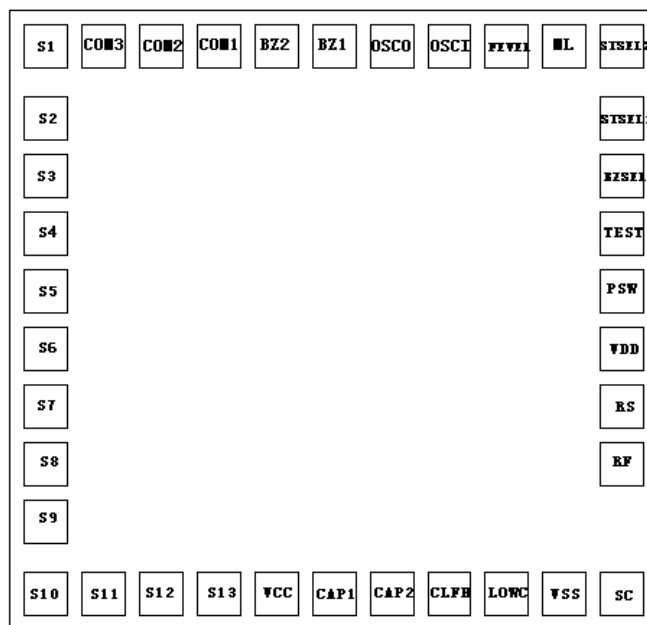
temperature. The chip provides multi stable time for various of the mister also. The other electronic components are LCD display, the mister, 1.5V battery, ON/OFF switch, buzzer, resistors and capacitors.

Block Diagram



One-Decimal Clinical Thermometer

Pad Assignment



Note: The IC substrate should be connect to VSS

Pad Coordinates

Pad No.	Pad Name	X (um)	Y (um)	Pad No.	Pad Name	X (um)	Y (um)
1	S1	-575.00	559.90	20	SC	575.00	-560.00
2	S2	-575.00	415.45	21	RF	575.00	-274.55
3	S3	-575.00	300.45	22	RS	575.00	-159.55
4	S4	-575.00	185.45	23	VDD	575.00	-44.55
5	S5	-575.00	70.45	24	PSW	575.00	70.45
6	S6	-575.00	-44.55	25	TEST	575.00	185.45
7	S7	-575.00	-159.55	26	BZSEL	575.00	300.45
8	S8	-575.00	-274.55	27	STSEL1	575.00	415.45
9	S9	-575.00	-389.55	28	STSEL2	575.00	559.90
10	S10	-575.00	-560.00	29	ML	460.00	559.90
11	S11	-460.00	-560.00	30	FEVEL	345.00	559.90
12	S12	-345.00	-560.00	31	OSCI	230.00	559.90
13	S13	-230.00	-560.00	32	OSCO	115.00	559.90
14	VCC	-115.00	-560.00	33	BZ1	0.00	559.90
15	CAP1	0.00	-560.00	34	BZ2	-115.00	559.90
16	CAP2	115.00	-560.00	35	COM1	-230.00	559.90
17	CLFH	230.00	-560.00	36	COM2	-345.00	559.90
18	LOWC	345.00	-560.00	37	COM3	-460.00	559.90
19	VSS	460.00	-560.00				

Pad Description

Pad No.	Pad Name	I/O	Function
---------	----------	-----	----------

One-Decimal Clinical Thermometer

1~13	S1~S13	O	LCD segment driver
14	VCC	O	Generated 3V voltage
15	CAP1	O	For positive voltage pumping, NMOS open drain output
16	CAP2	O	For positive voltage pumping, inverter output
17	CLFH	I	Selection of °C or °F CLFH = open or VDD: °C CLFH = VSS: °F
18	LOWC	I/O	For the supply voltage detector; output?
19	VSS	-	Negative power supply
20	SC	I/O	Common point, NMOS open drain
21	RF	O	Connect to reference resistor, PMOS open drain
22	RS	O	Connect to sensor resistor, PMOS open drain
23	VDD	-	Positive power supply
24	PSW	I	Power ON/OFF input, toggle active
25	TEST	I	For the test of production. TEST = open or VDD: LCD display the highest value TEST = VSS: LCD display the real time value
26	BZSEL	I	Buzzer output frequency selection BZSEL = open or VDD: 8KHz BZSEL = VSS: 6KHz
27	STSEL1	I	Stable time selection (STSEL1, STSEL2 is bonding option)
28	STSEL2		
29	ML	I	Memory function option ML = open or VDD: Without memory function ML = VSS: With memory function. The last measurement value Will be displayed after power on.
30	FEVEL	I	Fever function option FEVEL = open or VDD: with fever function FEVEL = VSS: without fever function
31	OSCI	I	For system oscillator input
32	OSCO	O	For system oscillator input
33	BZ1	O	Buzzer output 1
34	BZ2	O	Buzzer output 2
35~37	COM1~ COM3	O	LCD common driver

Absolute Maximum Ratings

Supply voltage..... 0V to 2.0V

Operation Temperature..... -20°C to +75°C

Input voltage..... VSS-0.5V to VDD+0.5V

Storage Temperature..... -55°C to +125°C

*Note: Stress above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device.

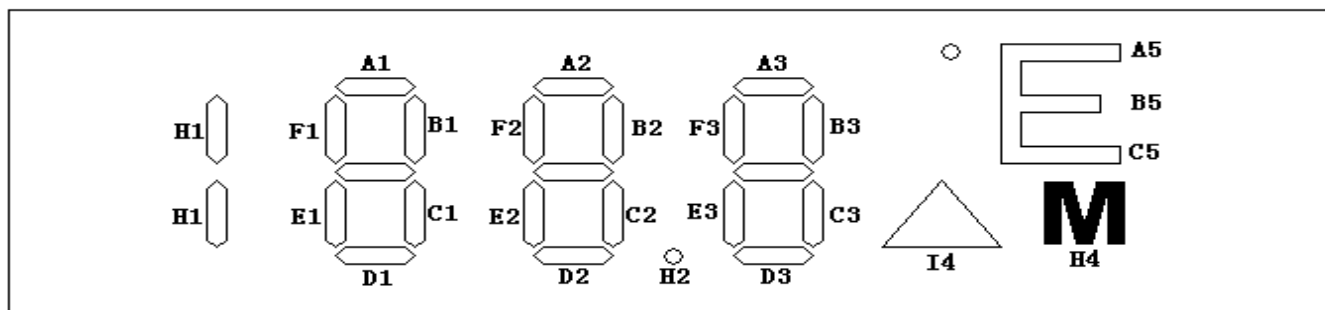
One-Decimal Clinical Thermometer

These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		VDD	Conditions				
VDD	Operating voltage	-	-	1.3	1.5	1.65	V
IDD	Operating current	1.5V	No load	-	20	50	uA
ISTB	Standby current	1.5V	OSC OFF	-	-	1.0	uA
Fosc		1.5V	ROSC = 1MΩ	25.6	32	38.4	KHz
R°C	Temperature measurement Accuracy at range 35 °C~39 °C	-	VDD = 1.3V~1.5V	-0.1	-	0.1	°C
R°F	Temperature measurement Accuracy at range 95°F ~102°F	-	VDD = 1.3V~1.5V	-0.2	-	0.2	°F

LCD Electrode Pattern –



Name	-	-	-	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13
COM1	COM1	-	-	F1	A1	B1	F2	A2	B2	F3	A3	B3				A5
COM2	-	COM2	-	E1	G1	C1	E2	G2	C2	E3	G3	C3				B5
COM3	-	-	COM3	H1	D1			D2	H2	H4	D3	I4				C5

Note: The LCD uses 3V and 1/3 duty, 1/2 bias

For one-digit decimal: COM1, COM2, COM3, S1, S2, S3, S4, S5, S6, S7, S8, S9, S13.

Functional Description

Power SW: push PSW switch to power on or power off.

When power on: push the switch, a "BI" sound for 0.125sec will be generated.

- a. The LCD firstly all segments are on about 2sec.
- b. After a. LCD shows the last-time temperature about 2sec. (If the memory function is optioned)
- c. After b., LCD shows the self-test temperature (37.0±0.1°C) about 1 sec. The °C or °F mark will flash at the speed of 1Hz.
- d. After c., LCD shows the higher measured temperature always, the °C (°F) mark will flash at the speed of 1Hz.
- e. If the temperature < 32.0°C (or 90.0°F), the display show Lo°C (or Lo °F).
- f. If the temperature ≥ 43.0°C (or 109.9°F), The display show Hi °C (or Hi °F).

One-Decimal Clinical Thermometer

- g. The LCD always show the higher temperature during the temperature measurement.
- h. After power on, the measurement time is over 16 sec and the measured temperature does not change within the stable time, the measurement will be over and the °C (°F) mark flash stop.
- i. For TDH31106E, when measurement is over and if the temperature ≥ 37.8 °C (100°F). In this case the buzzer alarms “BI-BI-BI--- BI-BI-BI---” for 10 sec, as follows:

BI --- BI --- BI ----- BI ---

BI: 0.125sec

---: 0.125sec

-----: 0.375sec

if the temperature < 37.80°C (100°F), the buzzer alarms “BI-BI-BI-BI-” for 10 sec, as follows:

BI --- BI---

BI: 0.5sec

---: 0.5sec

j. It will automatically power off after measurement is stable and the system is still on more than 8 min 40sec($F_{sys}=32kHz$)

k. When measurement is over and the beep sound is terminated, if the temperature rises within 8 min 40 sec, the measurement will start again, but the °C mark will not flash and the buzzer will not output also.

l. During bi sound is on 10 sec, the temperature is not measurement.

When power off: the stand-by current $\leq 1\mu A$.

The frequency of buzzer is 6k(VSS) or 8kHz (Open or VDD) by pin option.

Measurement to 0.1 degree at °C.

Sensor use 503ET.

Reference resistor is the value sensor in 37.0 °C.

The low battery and “M” flag can not display when the temperature show Hi or Lo.

When battery voltage is low, the battery mark “▲” flashes at the speed of 1Hz and the measurement maybe not accurate. The low TEST pin connect to Vss, the measured temperature will be the actual temperature of voltage detect: $1.35V \pm 0.05V$.

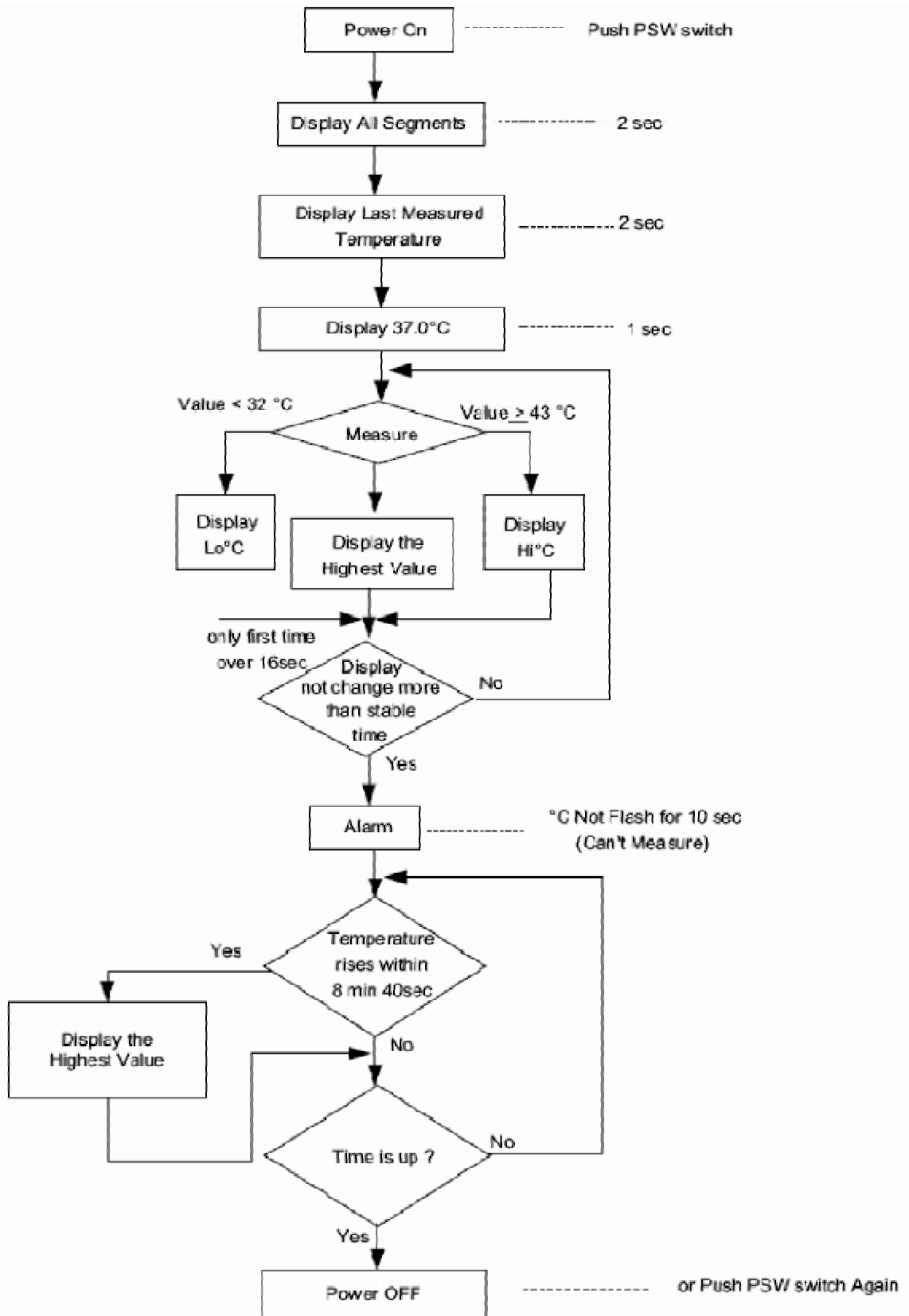
During the process of mass production, in order to adjust the reference resistance (RF), let the measured environment. The LCD can be up or down changed, not always show the higher one.

There are 4 kinds of stable time to be selected; 4 sec, 8 sec, 16 sec and 32 sec.

Time	STSEL1	STSEL2
4 sec	VSS	VDD/or open
8 sec	VDD/or open	VSS
16 sec	VDD/or open	VDD/or open
32 sec	VSS	VSS

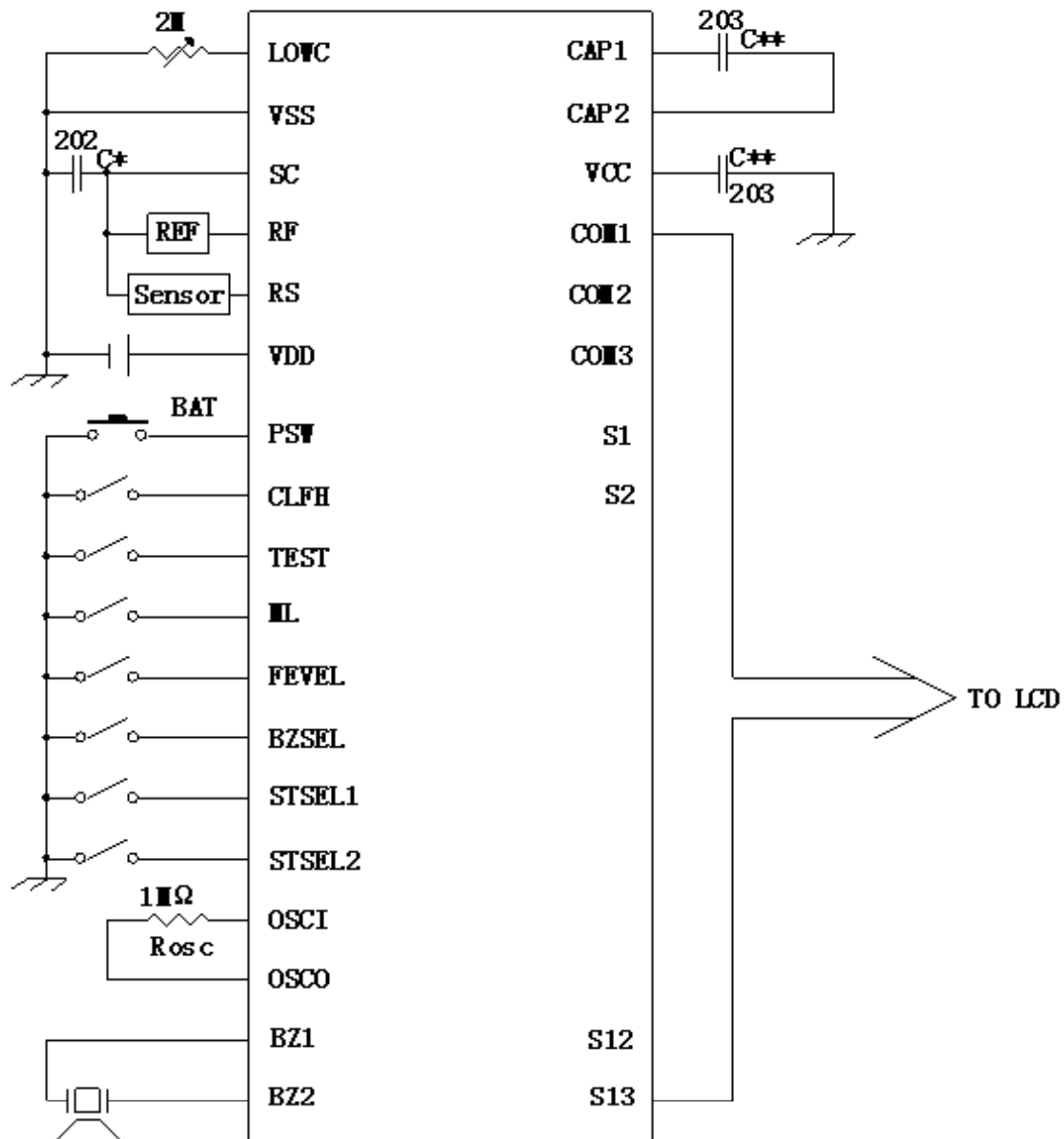
One-Decimal Clinical Thermometer

Flow Chart



One-Decimal Clinical Thermometer

Application Circuit



Note:

- REF=30.01k Ω
- C* = 272~202
- C** = 103~104
- RBAT = 2M
- 1.35V \pm 0.05V