CH2110S 4 1/2 DIGIT CLINICAL THERMOMETER

1. General Descriptions

C H2110S is a CMOS digital clinical thermometer IC for measuring body temperature in Centigrade(℃) or Fahrenheit(℉) mode by its bonding option. from 32.00°C~42.00°C(90.00℉～108.00℉). It also provides alarm, self-test, auto power off and last time measured temperature functions. The other electronic components are LCD display, thermister, 1.5V battery, ON/OFF switch, buzzer, resistors and capacitors.

preliminary

2. Features

- ◆ Single-chip CMOS construction
- ◆ Single 1.5V battery operation
- ◆ Bonding option for Centigrade/ Fahrenheit measurement.
- ◆ Measurement range: 32.00°C~42.00°C(90.00℉～108.00℉)
- ◆ Measurement accuracy: ±0.1°C
- ◆ Resolution: 0.01°C(0.02℉)
- ◆ Auto self-test
- ◆ Fever alarm
- ◆ Highest temperature hold
- ◆ Auto power off after 8 min 40 sec
- ◆ One-key input for ON/OFF
- ◆ Last time measured temperature value displays

3. Function Block Diagram
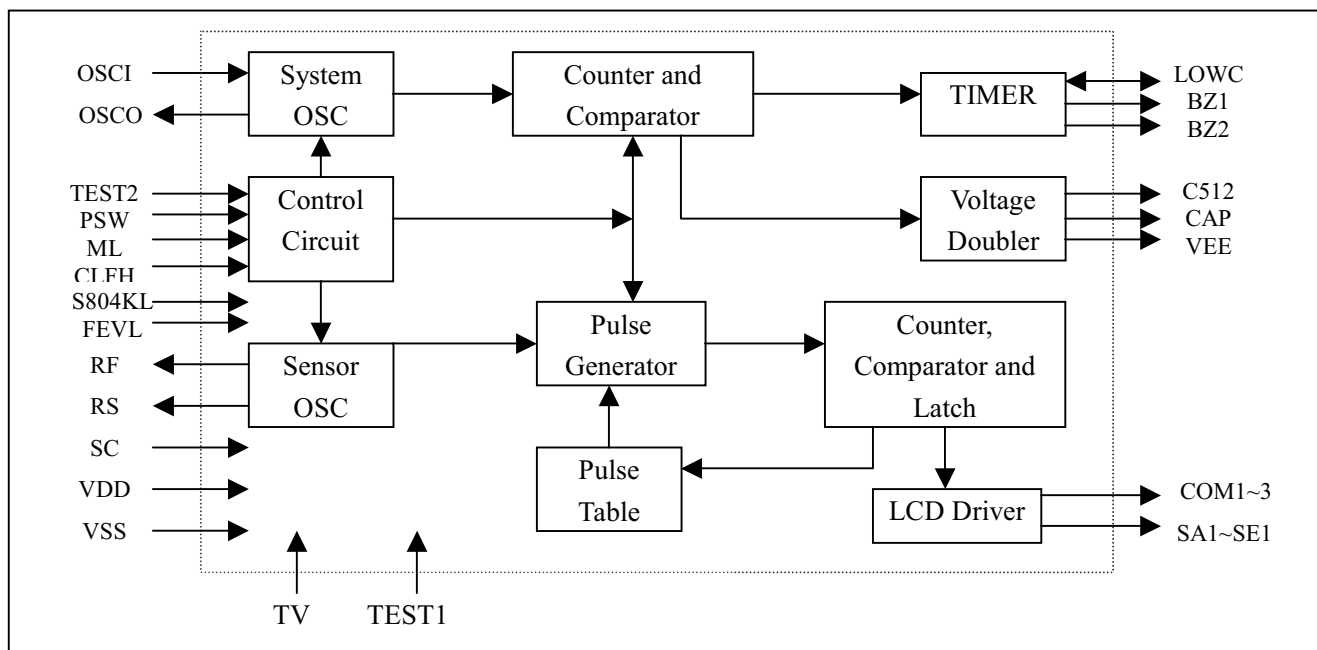
4. Pin Descriptions

Pin	Name	I/O	Function
1~3	SA1~SA3	O	LCD segment drive
4~6	SB1~SB3	O	LCD segment drive
7~9	SC1~SC3	O	LCD segment drive
10~12	SD1~SD3	O	LCD segment drive
13	SE1	O	LCD segment drive
14	VEE	O	Generate negative voltage (-1.5V)
15	CAP	O	For negative voltage, NMOS output
16	C512	O	For negative voltage, inverter output
17	TV	I/O	Test pin for IC
18	TEST1	I	Test pin for IC
19	LOWC	I/O	For the supply voltage detector. Open the pin when not in use.
20	VSS	I	Power supply GND
21	SC	I/O	Common point, NMOS open drain
22	RF	O	Connect reference resistor, PMOS open drain
23	RS	O	Connect sensor resistor, PMOS open drain
24	VDD	I	Positive power supply
25	PSW	I	Pull low input pin, push switch to turn the power on or off
26	TEST2	I	Pull low test pin, for production test, floating LCD displays the real time value, when connected to VDD, LCD displays the highest value.
27	CLFH	I	Floating for ℃, connect to VDD for ℉
28	ML	I	Connect to VDD for memory function, otherwise floating.
29	FEVL	I	Floating with fever function, otherwise connect to VDD
30	S804KL	I	Floating buzzer is 4kHz, connect to VDD if buzzer is 8kHz
31	OSCI	I	For system oscillator in
32	OSCO	O	For system oscillator out
33	BZ1	O	Buzzer output 1
34	BZ2	O	Buzzer output 2
35~37	COM1~COM3	O	LCD back plane drive, 3-level voltage out

5. Function Descriptions

◆ Power sw: push switch to turn the power on or off.

◆ When power on: push the switch, then it will generate a "beep" sound for 0.125 sec.

  a. First displays all the segments on for 2 sec.

  b. After a., as described above, then shows the last-time measured temperature for 2.8 sec.

  c. After b., shows the self-test temperature ($37.00 \pm 0.01°C$) or ($98.60 \pm 0.02℉$) for 1 sec. The °C mark will flash at a speed of 1Hz.

  d. After c., displays the highest measured temperature, then the °C mark will flash at frequence of 1Hz.

  e. If the temperature is $< 32.00°C$ (or $90.00℉$), the display shows Lo °C.

  f. If the temperature is $\geq 42.00°C$ (or $108.00℉$), the display shows Hi °C.

  g. The display always shows the higher temperature during the temperature measurement.

  h. If the measured temperature does not change for more than 8 sec, the measurement is over and the °C mark will stop flashing.

  i. When measurement is over, if the temperature > 37.50°C(or 99.50℉) the buzzer alarms "beep-beep-beep---beep-beep-beep---" for 4 sec,

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

  0.125S 0.125S 0.125S 0.125S 0.125S 0.125S 0.375S

  If the temperature $\leq 37.50℃$(or $99.50℉$), the buzzer alarms " beep-beep-beep-beep-"for 4 sec, as

follows:

    BI -------

  0.5S   0.5S

   j. It will automatically turn the power off when measurement is over for 8 min 40 sec.

   k. When measurement is over, but if the temperature rises within 8 min 40 sec, the °C(or℉) mark will flash again (repeat from step 2-d), and starts to count 8 min 40 sec again.

   l. When beep sound is on for 4 sec, the temperature is not measured.

◆   When power off: the standby current <1μA.

◆   The frequency of the buzzer is 4kHz or 8kHz by pin option.

◆   Fever alarm function can be selected by pin option.

◆   ℃ or ℉ by bonding option

◆   Measurement to 0.01 degree in both ℃ and ℉

◆   Sensor SPEC is 503ET.

◆   Reference resistor is the value (sensor in 37.00°C)

◆   The low battery and "M" indicators do not appear when Hi or Lo is on.

◆   When battery voltage reaches to1.35V ±0.05V, the low battery indicator "∇" will flash at frequency of 1Hz and the measurement may not be accurate.

◆   During the process of mass production, test 2 can be floated to adjust the reference resistance (RF), the measured temperature will be the actual temperature of the measured environment. It can be up or down, not always the higher one.

6. Flow Chart
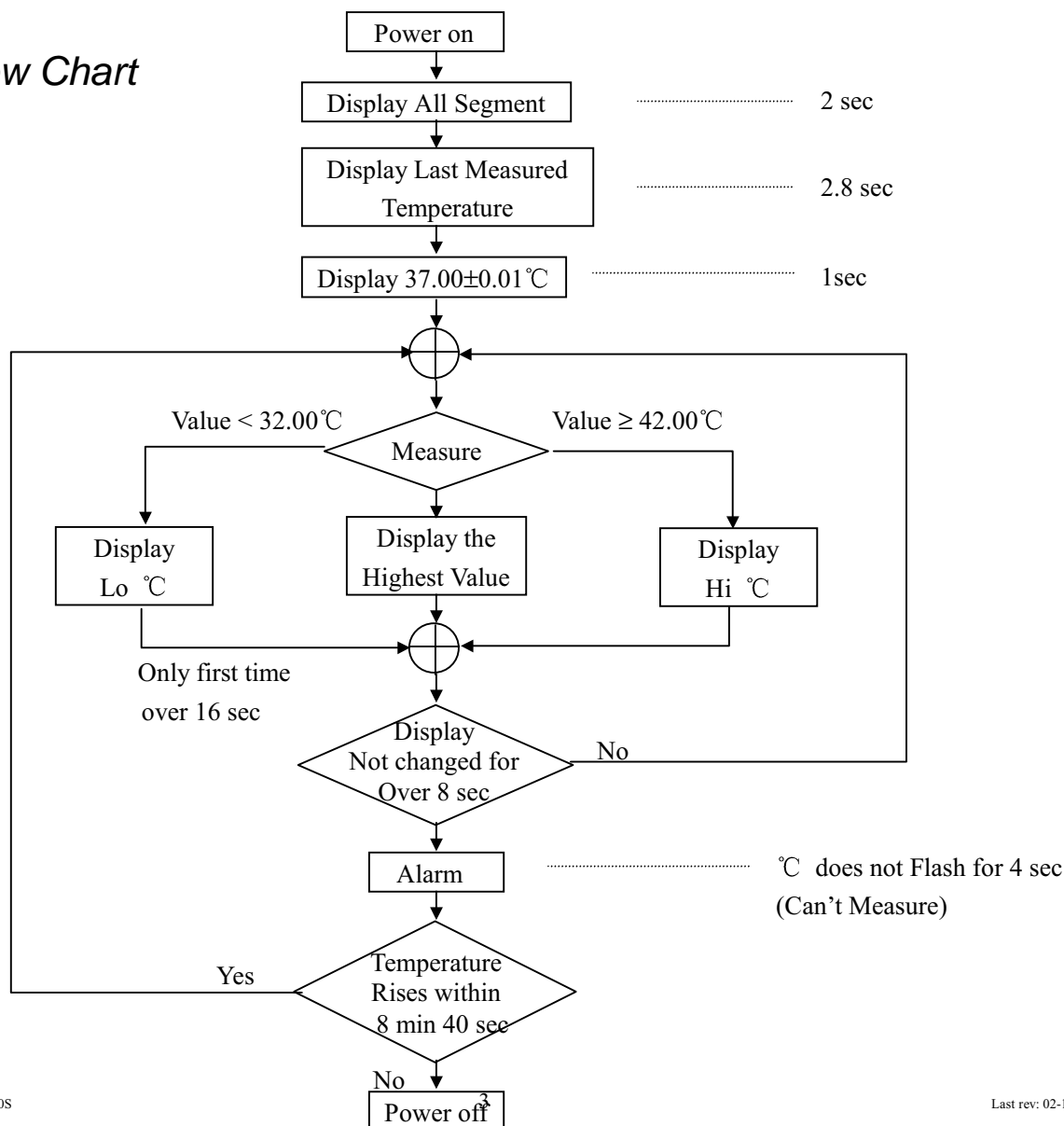
7. Absolute Maximum Ratings

(All voltage referenced to GND)

| Item	Symbol	Rating	Unit
Supply Voltage	V_{DD}	0 ~ 2.0	V
Input / Output Voltage	V_I/V_O	GND-0.5 ~ VDD+0.5	V
Operating Temperature	T_{DD}	-20 ~ +75	℃
Storage Temperature	T_{ST}	-55 ~ +125	℃

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.

8. Electrical Characteristics

(All voltage referenced to GND, Ambient temperature=25℃)

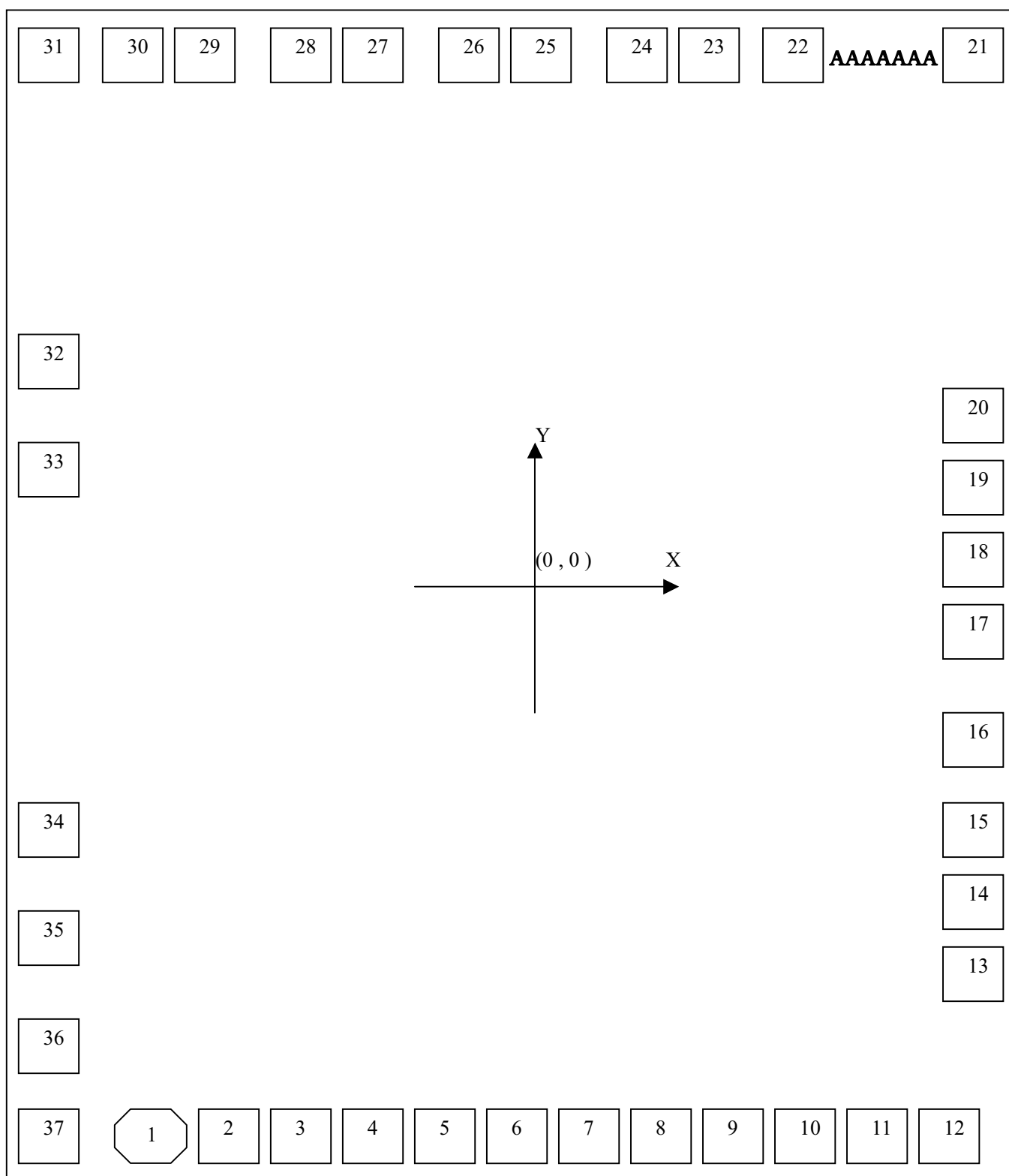| Parameters	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}		1.3	1.5	1.65	V
Operating Current	I_{DD}	VDD=1.5V, No load	--	60	100	µA
Stand-by Current	I_{STB}	VDD=1.5V	--	--	1.0	µA
Oscillating Frequency	F_{OSC}	VDD=1.5V R_{OSC}=820KΩ	25.6	32	38.4	KHz
Temperature Measurement Accuracy at Range 35℃~39℃	R℃	--	-0.1	--	0.1	℃
Temperature Measurement Accuracy at Range 95℉~102℉	R℉	--	-0.2	--	0.2	℉

LCD Electrode Pattern
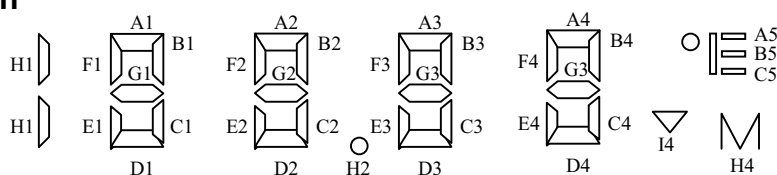
	SA1	SA2	SA3	SB1	SB2	SB3	SC1	SC2	SC3	SD1	SD2	SD3	SE1
COM1	F1	A1	B1	F2	A2	B2	F3	A3	B3	F4	A4	B4	A5
COM2	E1	G1	C1	E2	G2	C2	E3	G3	C3	E4	G4	C4	B5
COM3	H1	D1	---	---	D2	H2	---	D3	---	I4	D4	H4	C5

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

10.Pad Diagram

NO.	PADNAME	X	Y	NO.	PADNAME	X	Y
1	SA1	-879	-1017	20	GND	1057	390
2	SA2	-705	-1017	21	SC	1035	1013
3	SA3	-533	-1017	22	RF	606	1013
4	SB1	-360	-1017	23	RS	374	1013
5	SB2	-186	-1017	24	VDD	240	1013
6	SB3	-13	-1017	25	PSW	4	1013
7	SC1	160	-1017	26	TEST2	-130	1013
8	SC2	332	-1017	27	CLFH	-366	1013
9	SC3	506	-1017	28	ML	-500	1013
10	SD1	679	-1017	29	FEVL	-736	1013
11	SD2	852	-1017	30	S804KL	-870	1013
12	SD3	1026	-1017	31	OSCI	-1064	1013
13	SE1	1061	-709	32	OSCO	-1063	398
14	VEE	1061	-575	33	BUZ1	-1063	153
15	CAP	1061	-407	34	BUZ2	-1063	-311
16	C512	1055	-226	35	COM1	-1063	-577
17	TV	1061	-39	36	COM2	-1063	-823
18	TEST1	1061	102	37	COM3	-1063	-1017
19	LOWC	1061	243				

Chip Size: 2500um*2410um   Note: The chip substrate must be connected to VDD.

11. Application Circuit

CH2110S
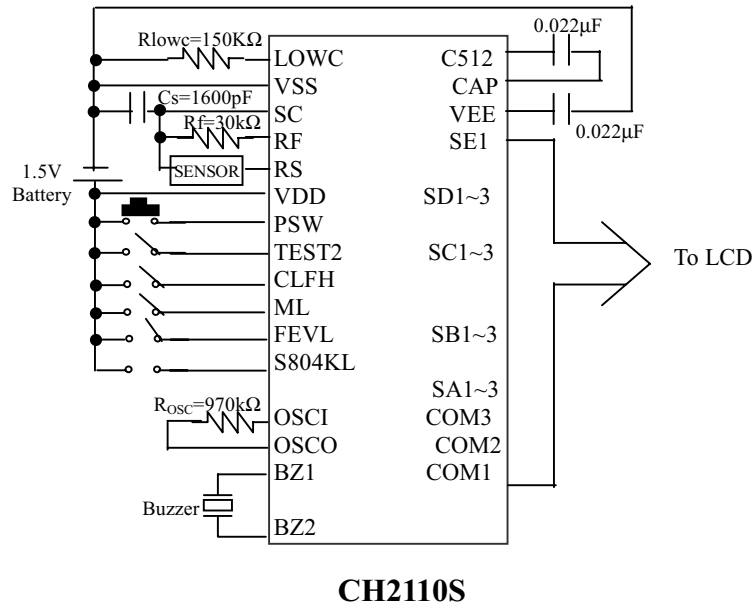
The value of R_{OSC}, Rlowc, Cs is allowed the range of ±5%.
The Value of Rf is allowed the range of ±1%.

Note: Substrate connect to VDD

VEE, CAP, and C512 are externally connected to capacitors for stabilizing V_{EE}(= -1.5V).

BZ1 and BZ2 are connected to an external buzzer to generate sounds.

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 is value in 37.0℃ or 98.6℉.

SENSOR is a 503ET thermistor.

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2. No responsibility is assumed by us for any consequence resulting from any wrong or improper operation, etc.of the product.