CH2112S 3 1/2 BIT CLINICAL THERMOMETER

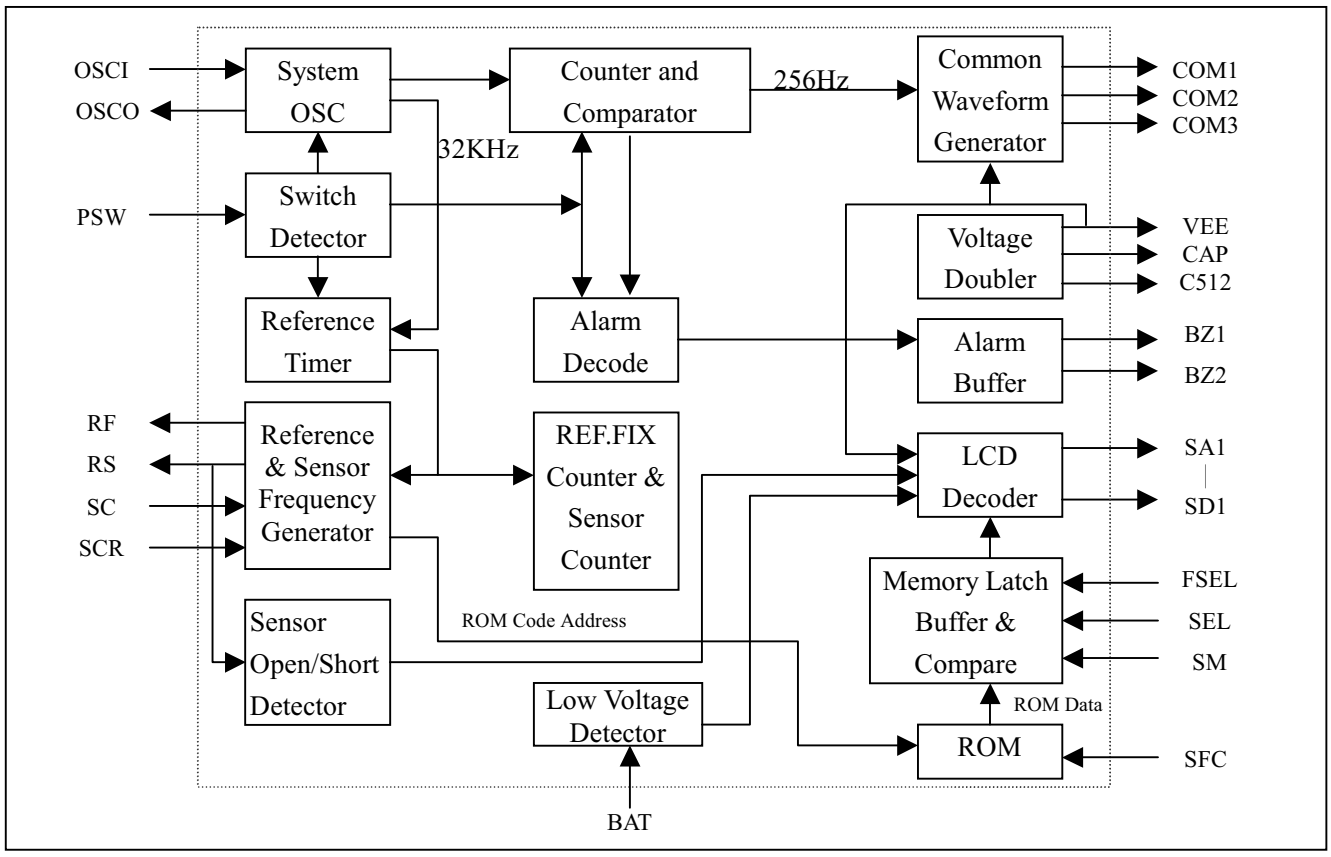
1. General Descriptions

CH2112S is a CMOS digital clinical thermometer IC for measuring body temperature in Centigrade(℃) or Fahrenheit(℉) mode by its bonding option. It also provides alarm and auto power off functions. The other electronic components are LCD display, thermistor, 1.5V battery, ON/OFF switch, buzzer, resistors and capacitors.

2. Features

- Single 1.5V battery operation.
- Single-chip CMOS construction.
- Bonding option for Centigrade/ Fahrenheit measurement.
- Measurement range: +32.0～+42.0℃(+89.6～+107.6 ℉). Resolution: 0.1℃(0.1℉).
  Measurement accuracy: ±0.1℃(±0.2℉).
- One-key input switch for ON/OFF.
- Alarm warning for fever.
- Highest temperature hold.
- Auto power off after 10 min.
- Displays last time measured temperature.

3. Function Block Diagram



4. Pin Descriptions

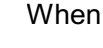
Pin	Name	I/O	Function
1	SC	I	Reference and sensor frequency input pad. The reference & sensor frequency generator consists of pad 1,2,3,4.
2	SCR	I	Inner resistor about 470 ohm connect to SC pad.
3	RF	O	PMOS open drain, connect to the reference resistance.
4	RS	O	PMOS open drain, connect to the sensor.
5	TEST1	I	Test pad, for IC test only.
6	ISCI	I	System frequency input pad.
7	ISCO	O	System frequency output pad.
8	BZ1	O	Output pad, the buffer of buzzer.
9	BZ2	O	Output pad, the buffer of buzzer.
10~12	COM1~COM3	O	LCD backplane drive, 3-level voltage out
13~15	SA1~SA3	O	LCD segment drive
16~18	SB1~SB3	O	LCD segment drive
19~21	SC1~SC3	O	LCD segment drive
22	SD1	O	LCD segment drive
23	C512	O	PAD 23,24 IS DOUBLER VOLTAGE 3V CAPACITOR CONNECT.
24	CAP	O	For negative voltage, NMOS output
25	VEE	O	THE VOLTAGE IS 3V.
26	VDD	I	1.5V
27	FSEL	I	Function select pad. No connect: for CH2112S-1 function. Connect to VDD: for CH2112S-2 function
28	TEST2	I	Pull low test pad, for the test of production. When connect to VDD, LCD display the real-time value (not the highest value).
29	PSW	I	Pull low input pad, push switch to power on or power off.
30	SEL	I	For CH2112S-1 function. No connect: when detecting low voltage, the battery mark will blink at the speed of 1Hz. Connect to VSS: when detecting low voltage, LCD display will blink at the speed of 1Hz.
31	Rlowcc	I/O	For the low voltage detecting.
32	SM		For CH2112S-2 function. No connect: memory function. Connect to VSS: no memory function.
33	VSS	I	Power supply GND
34	CLFH	I	Select temperature show ℃ or ℉. No connect: memory function. Connect to VSS: no memory function.

5. Function Descriptions

I. WHEN FSEL=NC (FOR CH2112S-1)

<1> Power SW: Push switch to power on or power off.

<2> When power on:

A. The LCD display  When SEL=NC) or  (When SEL=0) about 2 sec.

B. After A, show the temperature of last measure (and “M” When SEL=0) about 2 sec.

C. After B, Show L ℃ (or ℉) about 0.6 sec (Don’t show “M” when SEL=0).

D. After C, when it is measuring. The ℃ (or ℉) will flash at the speed of 1 Hz.

E. If the temperature ＜ 32.0 ℃(89.6 ℉), then display L ℃(℉).

F. If the temperature ＞ 42.0 ℃(107.6 ℉), then display H ℃(℉).

G. When measuring, the LCD will always display the highest temperature.

H. If the measure temperature is not changed more than 16 second, the measurement is over and

mark ℃(℉) flash stop.

I. When measurement is over, if the temperature ＞ 37.5 ℃(99.5 ℉), the buzzer alarms "Bi-Bi-Bi——Bi-Bi-Bi——" for 4 sec, as follows:

Bi———————Bi———————Bi————————————
0.125S 0.125S 0.125S 0.125S 0.125S 0.375S

If the temperature ≦ 37.5 ℃(99.5 ℉), the buzzer alarms "Bi-Bi-Bi-Bi-" for 4 sec, as follows:

Bi———————
0.5S 0.5S

J. It will auto power off when measurement is over than 10 minutes.

K. When measurement is over, if the temperature rises within 10 min, the ℃ (℉) mark will flash again (repeat form the step of 2-D).

<3> When push switch, buzzer will alarm "Bi" about 0.125 sec.

<4> When power off: the stand-by current ≦ 0.5 uA.

<5> The frequency of buzzer is 5.3KHz.

<6> After <2>-A, if detect low voltage(1.35 ± 0.05 V):

A: When SEL=1 or NC:

The battery mark ' ▮ " flashes at the speed of 1Hz and the measurement maybe not accurate, means thermometer must be changed battery.

B: When SEL=0:

The LCD display flashes at the speed of 1Hz and the measurement maybe not accurate, means thermometer must be changed battery.

<7> When TEST2 pin is connected to VDD, the LCD display the realtime value not the highest value, in order to adjust the reference resistance RF during the process of producing.

<8> ℃／℉(SFC Pad) fuction is used pad option.

	PAD CONNECT TO VSS	PAD NO CONNECT
SFC Pad	℉	℃

SM Pad: no connect.

<9> Thermometer others charter is below:

Temperature range	32.0℃ ~42.0℃	89.6℉ ~ 107.6℉
Accurancy	± 0.1 ℃	± 0.2 ℉
Resolution	0.1 ℃	0.1 ℉

SEL Pad: no connect.

<10> Themometer others charter is below:

Teperature range	32.0℃ ~44.0℃	89.6℉ ~ 111.2℉
Accurancy	± 0.1 ℃	± 0.2 ℉
Resolution	0.1 ℃	0.1 ℉

II. When FSEL=1: (FOR CH2112S-2)

<1> Power SW: Push switch to power on or power off.

<2> When power on:

A. The 1CD display 88.8℃M (or 88.8℉M) about 2 sec. If non-memory function the “M”will not display.

B. After A, with memory function push switch more than 2 sec, LCD will display the stable-temperature of last measure, and “M” will display.

C. After B, LCD display 36.5℃(97.7℉) about 1 sec.

D. After C, when it is measuring. The ℃ (or ℉) will flash at the speed of 1HZ.

E. With memory function, the stable-temperature time will be counted after releaseing switch for 8 sec.

Without memory function, the stable-temperature time will be counted after turn on 8 sec.

F. If the temperature＜ 32.0 ℃(89.6 ℉), then displaly L ℃(℉).
G. If the temperature＞ 44.0 ℃(111.2 ℉), then display H ℃(℉).
H. When measuring, the LCD will always display the highest temperature.
If the measure temperature is not changed more than 16 sec, the measurement is over and mark ℃(℉) flash stop.
J. When measurement is over, if the temperature＞ 37.5 ℃(99.5 ℉),
The buzzer alarms "Bi-Bi-Bi——Bi-Bi-Bi——" for 4 sec, as follows:
Bi————————Bi————————Bi————————————————
0.125S 0.125S 0.125S 0.125S 0.125S 0.375S
If the temperature ≦ 37.5 ℃(99.5 ℉), the buzzer alarms"Bi-Bi-Bi-Bi-" for 4 sec, as follows:
Bi————————
0.5S 0.5S

K. It will auto power off when measurement is over than 10 minutes.
L. When measurement is over, if the temperature rises within 10 minutes, the remeasure the temperature, but the ℃ (℉) mark will not flash again. When remeasurement is over, the buzzer will not alarm again.

<3> When push switch, buzzer will alarm “Bi” about 0.125 sec.
<4> When power off: the stand-by current ≦ 0.5 uA.
<5> The frequency of buzzer is 4KHz.
<6> After <2>-B, if detect low voltage (1.35 ± 0.05 V), the LCD will only display battery mark” ” and the measurement maybe not accurate, means theremometer must be changed battery.
<7> When sensor circuit detect error, LCD only display”E”, it will not measure normally until the error status cancel.
<8> When TEST2 pin is connected to VDD, the LCD display the realtime value not the highest value, in order to adjust the reference resistance RF during the process of producting
<9> Memory (SM Pad) and ℃／℉(SFC Pad) function is used pad option.

	PAD CONNECT TO VSS	PAD WITHOUT CONNECT
SFC Pad	℉	℃
SM Pad	NO MEMORY FUNCTION	MEMORY FUNCTION

SEL Pad: NO CONNECT.

<10> THERMOMETER OTHERS CHARTER IS BELOW:

TEMPERATURE RANGE	32.0℃ ~44.0℃	89.6℉ ~ 111.2℉
ACCURANCY	± 0.1 ℃	± 0.2 ℉
RESOLUTION	0.1 ℃	0.1 ℉

6. 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}	-2 ~ +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.

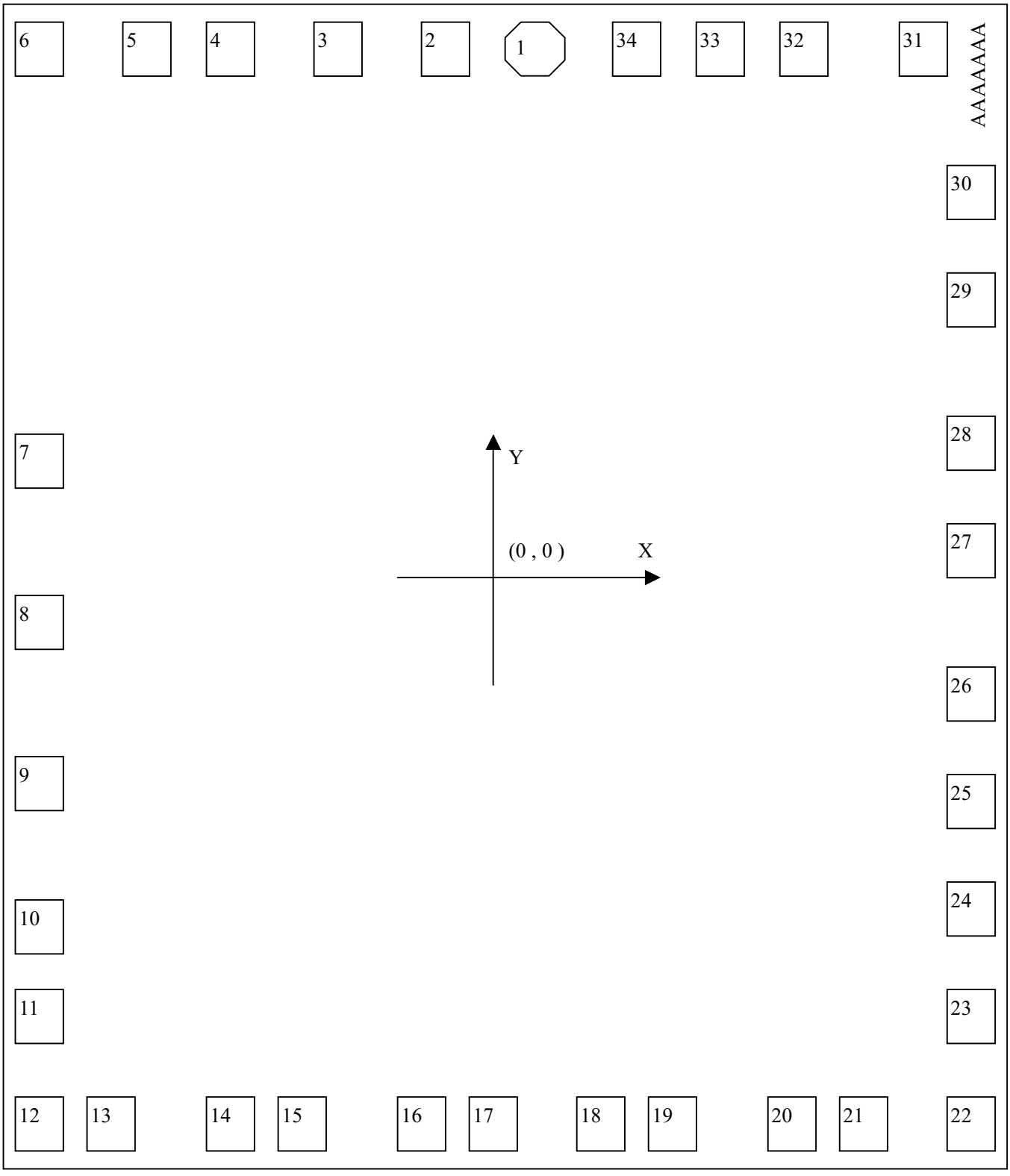
7. Electrical Characteristics

(All voltage referenced to GND, Ambient temperature=25℃, VDD=1.5V)

Parameters	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}		1.3	1.5	1.65	V
Operating Average Current	I_{DD}	V_{DD}=1.5V, No load	--	--	30	μA
Stand-by Current	I_{STB}	V_{DD}=1.5V	--	--	1.0	μA
Input Voltage	V_{IL}		V_{SS}-0.3V			V
	V_{IH}				V_{DD}+0.3V	V
Output Voltage	V_{OL}		V_{SS}-0.1V			V
	V_{OH}				V_{DD}+0.1V	V
Buzzer Driving Current		V_{DS}=1/2 V_{DD}	1			mA
Buzzer Sinking Current		V_{DS}=1/2 V_{DD}	1			mA
Pull-low Resistor		PSW Pad		300		KΩ
		TEST2 Pad		6		KΩ
		TEST1 Pad		30		KΩ

8. PAD Location

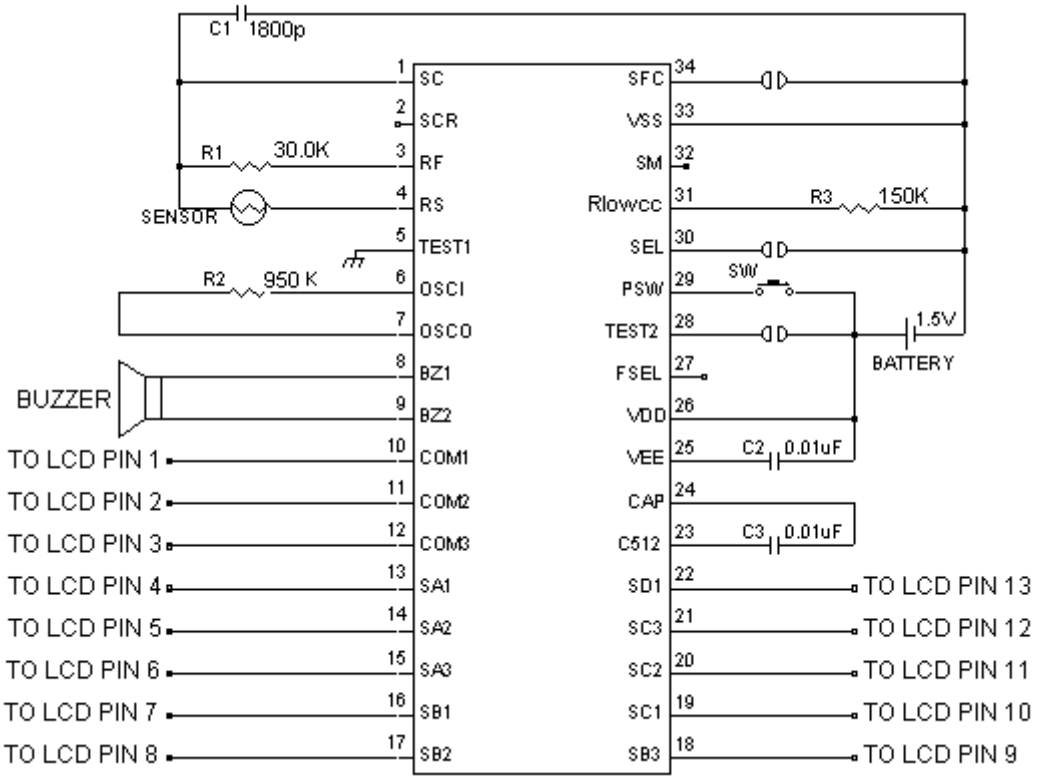
NO.	PADNAME	X	Y	NO.	PADNAME	X	Y
1	SC	103	1176	18	SB3	215	-1177
2	SCR	-93	1176	19	SC1	371	-1177
3	RF	-354	1176	20	SC2	635	-1177
4	RS	-585	1176	21	SC3	773	-1177
5	TEST1	-780	1176	22	SD1	1024	-1177
6	OSCI	-1047	1176	23	C512	1032	-979
7	OSCO	-1044	283	24	CAP	1038	-741
8	BUZ1	-1047	-31	25	VEE	1038	-553
9	BUZ2	-1047	-385	26	VDD	1049	-353
10	COM1	-1047	-695	27	FSEL	1049	4
11	COM2	-1047	-916	28	TEST2	1049	257
12	COM3	-1047	-1177	29	PSW	1049	590
13	SA1	-886	-1177	30	SEL	1049	826
14	SA2	-621	-1177	31	LOWC	970	1176
15	SA3	-470	-1177	32	ML	707	1176
16	SB1	-205	-1177	33	GND	520	1177
17	SB2	-49	-1177	34	CLFH	343	1176



Chip Size: (2490*2750) μ^2m Note: The substrate must be connected to VDD.

9. Application Circuit

- **Application 1**



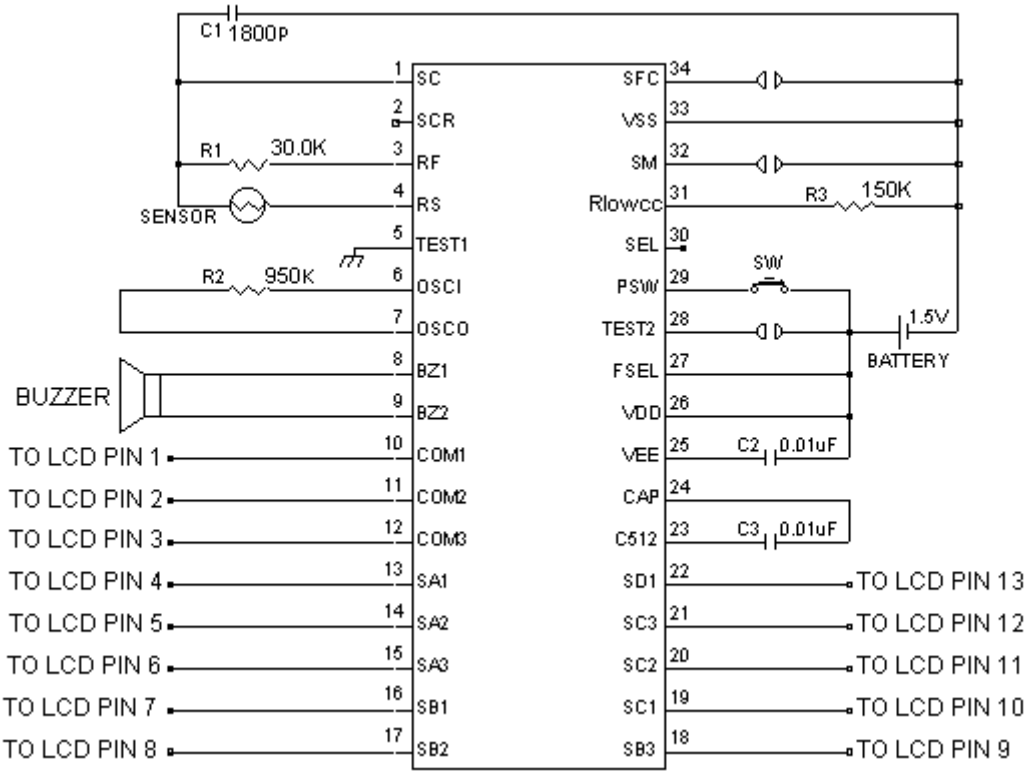
REMARK:

1. Sensor is use ET-503 sensor.
2. RF is selected according to sensor type.
3.

	NC	VSS
SFC pad	°C	°F
SEL pad	LCD-1( )	LCD-2(M)

Note: The value of R_2, R_3, C_1 is allowed the range of ±5%.
The value of R_1 is allowed the range of ±1%.

- **Application 2**



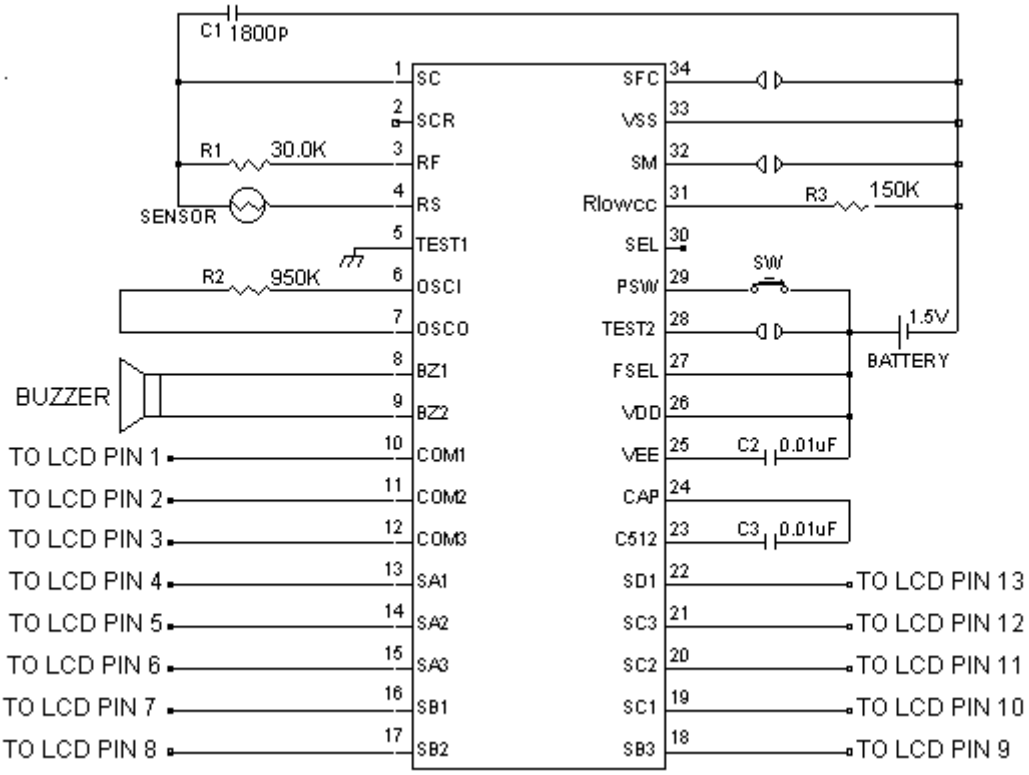
REMARK:

1. Sensor is use ET-503 sensor.
2. RF is selected according to sensor type.
3.

	NC	VSS
SFC pad	°C	°F
SM pad	MEMORY	NO MEMORY

Note: The value of R_2, R_3, C_1 is allowed the range of ±5%.
The value of R_1 is allowed the range of ±1%.

- **Application 3**



REMARK:

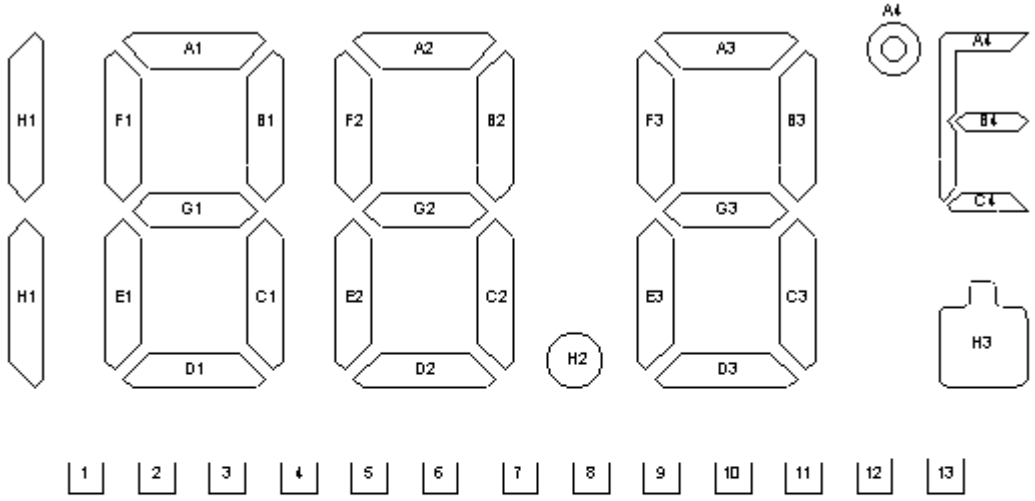
1. Sensor is use ET-503 sensor.
2. RF is selected according to sensor type.
3.

	NC	VSS
SFC pad	°C	°F
SM pad	MEMORY	NO MEMORY

Note: The value of R_2, R_3, C_1 is allowed the range of ±5%.
The value of R_1 is allowed the range of ±1%.

FSEL Pad: no connect

SEL Pad : no connect (LCD-1)



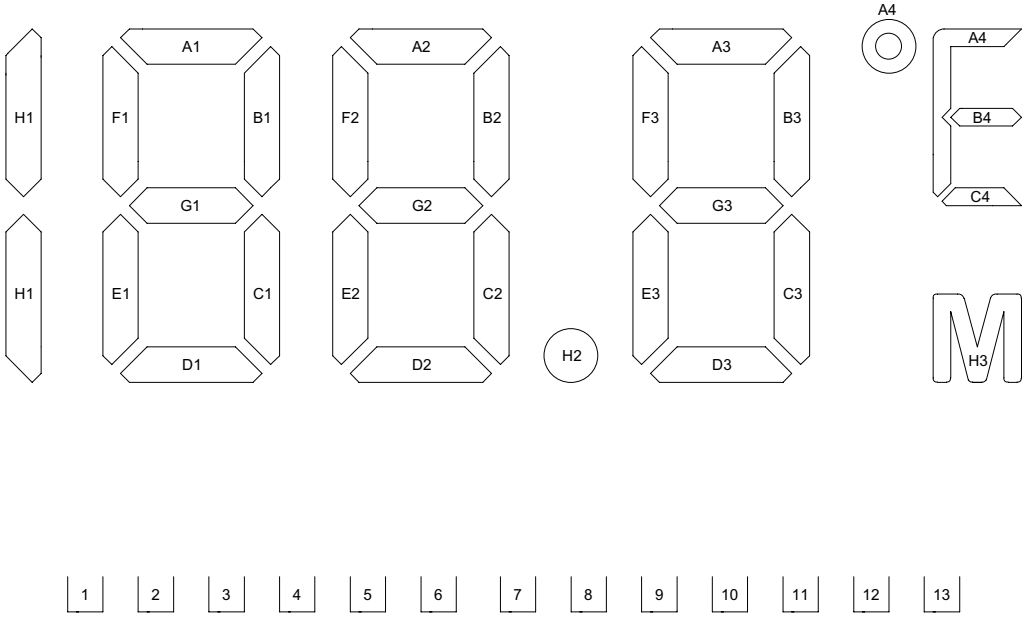
	1	2	3	4	5	6	7	8	9	10	11	12	13
COM1	COM1			F1	A1	B1	F2	A2	B2	F3	A3	B3	A4
COM2		COM2		E1	G1	C1	E2	G2	C2	E3	G3	C3	B4
COM3			COM3	H1	D1			D2	H2		D3	H3	C4

LCD SPEC: A. 1/3 DUTY, 1/2 BIAS. (LCD USES 3V)

B. V_{TN}=1.5V

FSEL Pad: no connect

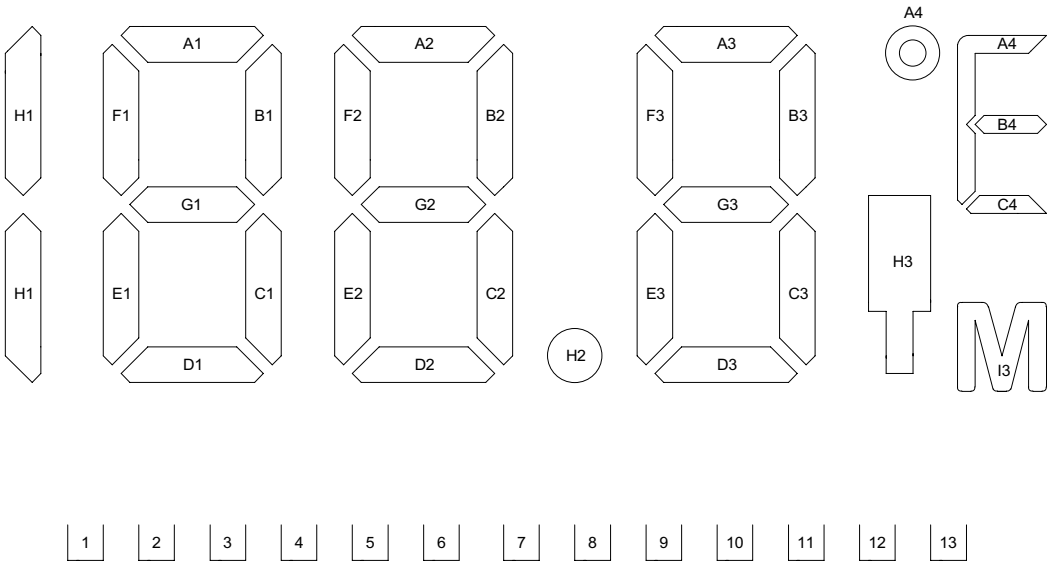
SEL Pad : connect to VSS (LCD-2)



	1	2	3	4	5	6	7	8	9	10	11	12	13
COM1	COM1			F1	A1	B1	F2	A2	B2	F3	A3	B3	A4
COM2		COM2		E1	G1	C1	E2	G2	C2	E3	G3	C3	B4
COM3			COM3	H1	D1			D2	H2		D3	H3	C4

SPEC : A . 1/3 DUTY , 1/2 BIAS . (LCD USES 3 V)

B . V_{TH} = 1.5 V



	1	2	3	4	5	6	7	8	9	10	11	12	13
COM1	COM1			F1	A1	B1	F2	A2	B2	F3	A3	B3	A4
COM2		COM2		E1	G1	C1	E2	G2	C2	E3	G3	C3	B4
COM3			COM3	H1	D1			D2	H2	I 3	D3	H3	C4

SPEC : A . 1/3 DUTY , 1/2 BIAS . (LCD USES 3 V)
B . V_{TH} = 1.5 V

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