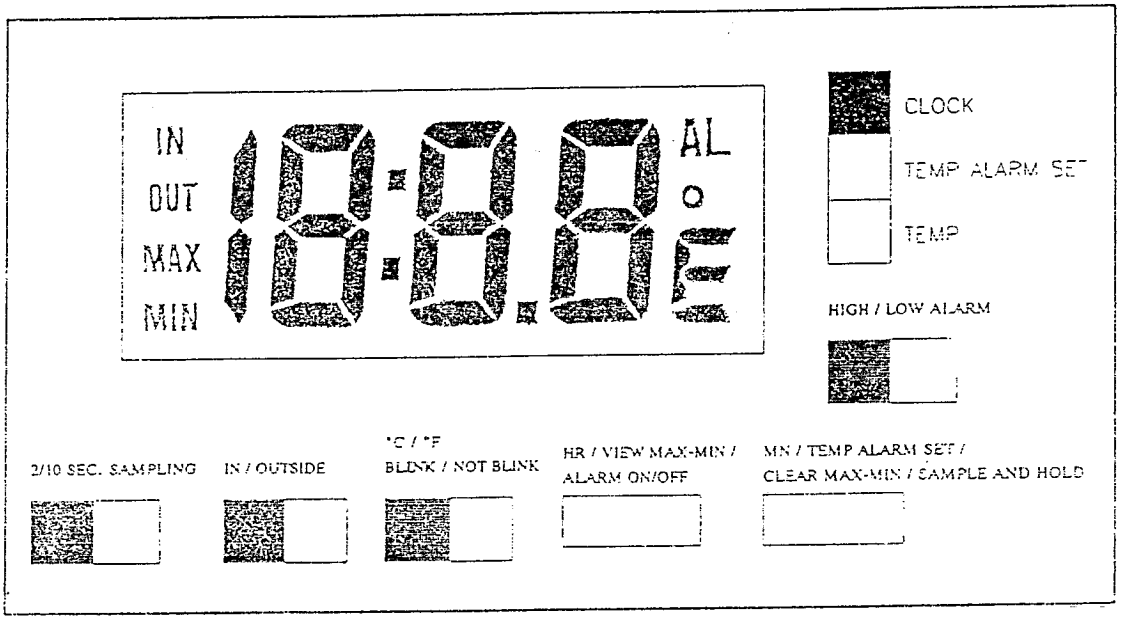
SS0102

CLOCK WITH THERMOMETER
-50°C(-58°F) ~ +70°C(+158°F)



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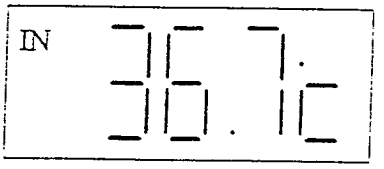
Features:

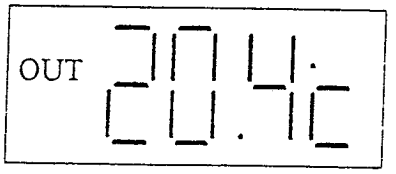
1. 1.5 Volts battery power supply
2. 12 HOUR clock function (Hour-Minute Display)
3. High and Low temperature alarms
4. Temperature sensing rate (2 sec. /10 sec.)
5. Max-min record of two areas and can be reset
6. Temperature data hold
7. Measure range from -50°C(-58°F) to +70°C(158°F)

- Maximum and Minimum OUTSIDE temperatures can be shown in the same way.
- INSIDE and OUTSIDE temperature is selected by switching S_3.

  For INSIDE, S_3 = OPEN(V_{SS1})



For OUTSIDE, $S_3 = V_{DD}$

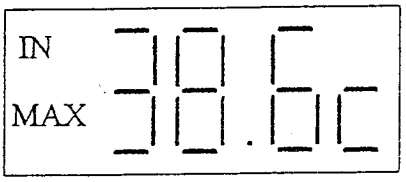


- The max-min record can be clear by pushing S_2 when display shows max or min as above.
- Function of Temperature Mode (K_1, K_2 = OPEN(V_{SS1}))

Terminal	Level	Function
K_4	V_{DD} OPEN(V_{SS1})	°F is chosen °C is chosen
S_1	V_{DD}	View max-min temp.
S_2	V_{DD}	Clear max-min temp.
S_3	V_{DD} OPEN(V_{SS1})	OUTSIDE temp. INSIDE temp.
S_4	V_{DD} OPEN(V_{SS1})	2 sec. sampling 10 sec. sampling

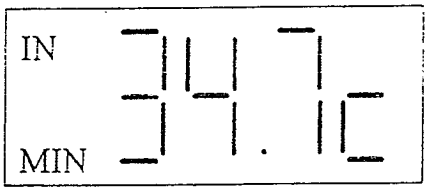
3.2 Temperature Mode (K_1, K_2 = OPEN(V_{SS1}))

- This mode is activated by keeping K_1 and K_2 OPEN(V_{SS1}).
- User can choose between °C and °F by switching K_4.
  For °F, $K_4 = V_{DD}$.
  For °C, K_4 = OPEN(V_{SS1}).
- Sampling rate can choose by switching S_4.
  For 2 sec. sampling, $S_4 = V_{DD}$.
  For 10 sec. sampling, S_4 = OPEN(V_{SS1}).
- Sampling and hold function is activated by pushing S_2 once. This is indicated by a flashing °C or °F flag. To return to temperature mode, just push S_2 again.
- Push S_1 at temperature mode, the display will show (Assume INSIDE)



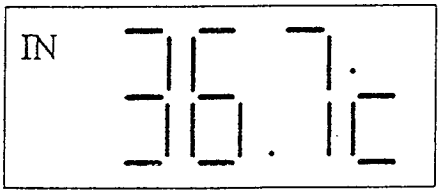
It means the highest (Max.) temperature record is 38.6°C.

- Push S_1 again, the display will show



It means the lowest (Min.) temperature record is 34.7°C.

- If push S_1 once more, it will back to the normal, and the display will show



It means the current surrounding temperature is 36.7°C.

I. General Description

SS0102 is a CMOS integrated circuit that has a temperature measuring function and a clock function. Temperature ranging from -50°C(-58°F) to +70°C(+158°F) is detected by employing a thermistor as sensor. Measured temperature is displayed on a 3½ digits liquid crystal display. It operates at 1.5V with a very low power consumption and interfaces with and LCD. Clock is display in 12-Hour format.

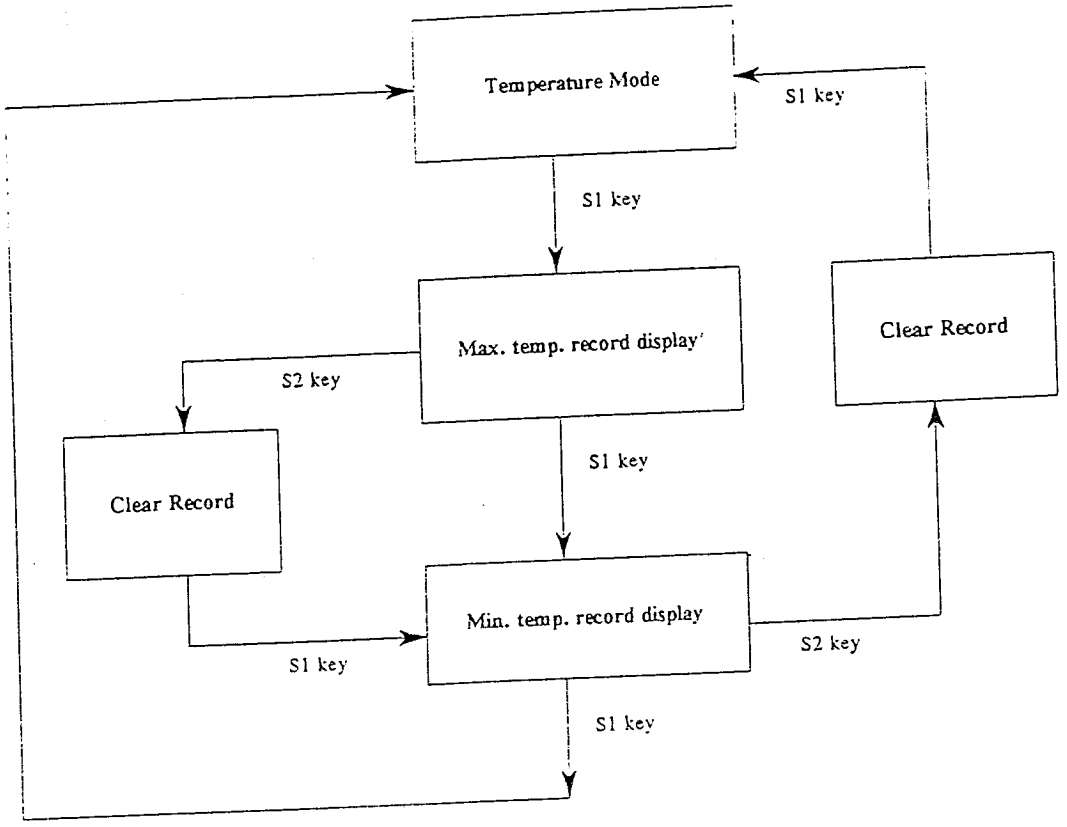
II. Features

- Measurement of temperature by thermistor. (Ishizuka 103AT-2B, 413ET-1 available from VSL)
- 3½ Digits LCD with MAX, MIN, AL, °C, °F, IN, OUT indicators. (LCD VCD 0101-1)
- Measurement range : -50°C(-58°F) to +70°C(+158°F)

Resolution	0.1° (-19.9° to 70°)	° (Otherwise)
Accuracy	about 1° to 2°C	

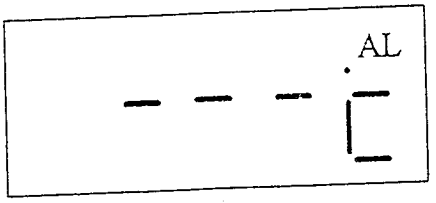
- High and Low temperature alarms set by 1°C(1°F).
- 12 HOUR clock function. (Hour-Minute Display)
- Temperature sensing rate (2 sec./ 10 sec.) selectable.
- Temperature data hold.
- Temperature alarm function that allows the user to select either a high alarm or low alarm.
- Maximum and minimum temperature of both inside and outside environments can be recorded and cleared.
- Rate : 10 mW when no temperature is being measured.
- 1.5 V battery operation.

max-min temperature record can be displayed or cleared by the following sequence.



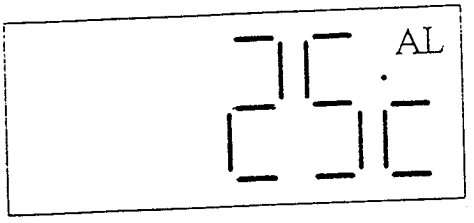
3.3 Temperature Alarm Setting Mode ($K_2 = V_{DD}$)

- This mode is selected by connecting K_2 to V_{DD}.
- For high alarm, $K_3 = V_{DD}$.
- For low alarm, K_3 = OPEN(V_{SS1}).
- When K_2 is switch to V_{DD} and the display will show

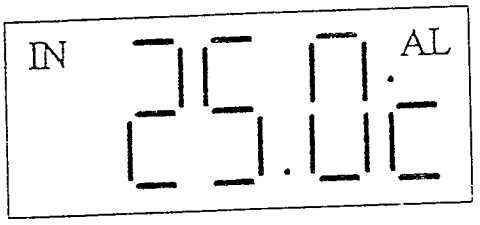


• For example if the user wants to be alarmed when measured temperature is below 25°C.
The user can select Low temperature alarm by the following steps.

1. Press S_2 until 25°C is reached.



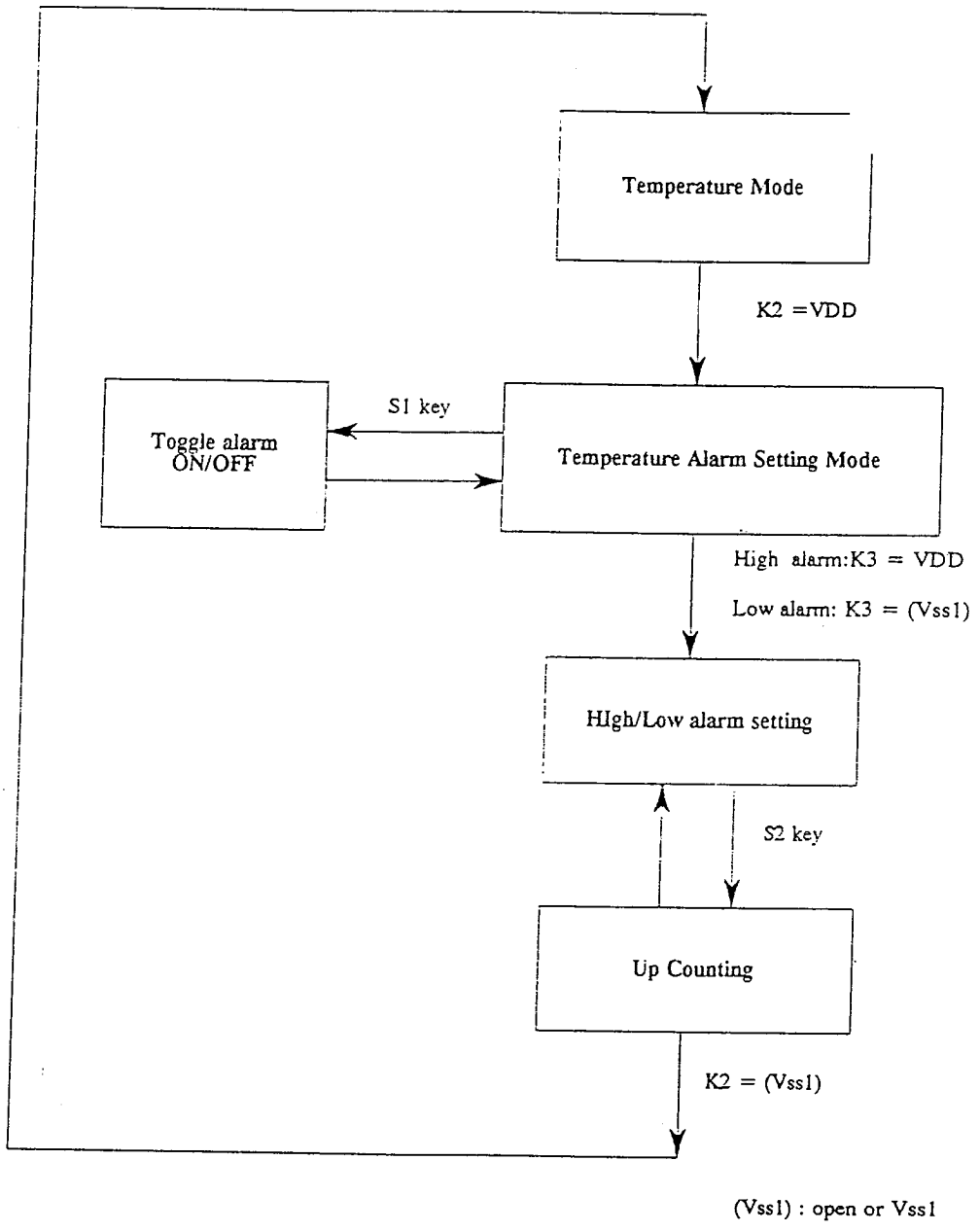
2. Select Low temperature alarm by connecting K_3 to OPEN(V_{SS1}).
3. Enable or disable of temperature alarm is toggled by pushing S_1. When it is enable, "AL" flag will appear.
4. Switch K_2 to temperature mode.



• Function of Temperature Alarm Setting Mode ($K_2 = V_{DD}$)

Terminal	Level	Function
K_3	V_{DD} OPEN(V_{SS1})	High alarm Low alarm
S_1	V_{DD}	Toggle alarm On/Off
S_2	V_{DD}	High /Low Temp. alarm set

• The temperature alarm value can be set by the following sequence.

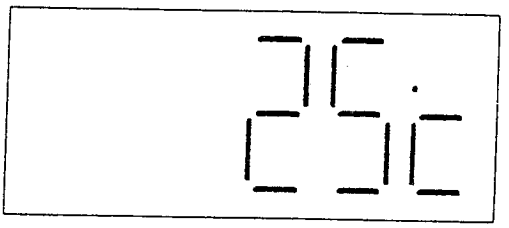


IV. Alarm Operation

When temperature exceeds the High temperature alarm value (Max) or temperature drops below the Low temperature value (Min), alarm sound is output from BD OUT for 5 seconds. The alarm sound composes of 5 beeps of one second duration within one minutes.

During the alarm sounding, if either S_1 or S_2 is pushed, the alarm sound will be stopped. Otherwise, the 5 beeps / minute buzzer sound will continue. Even then, the alarm cannot be disabled, the alarm will activate when it crosses the alarm temperature.

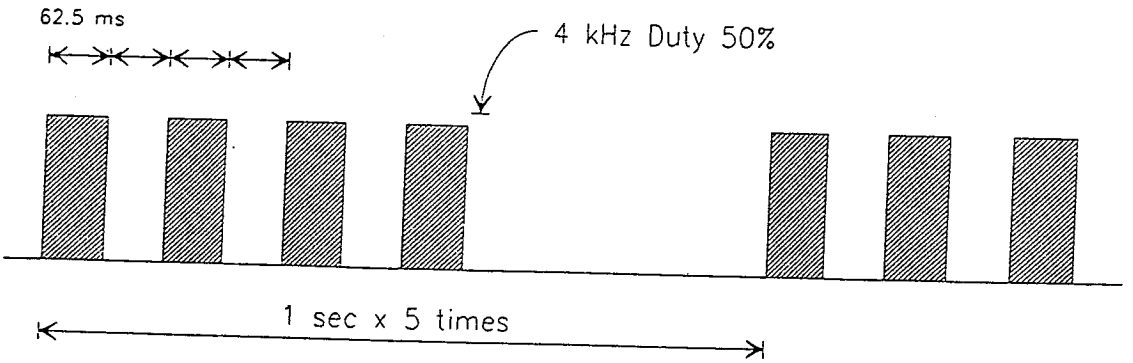
If the user wants to disable alarm in temperature mode, the user must go to temperature alarm mode and press S_1 once to remove 'AL' flag -- (Cancel alarm function). The display shows as follows.



M_1 change to V_{DD} when temperature exceed Max or temperature drops below Min. It keeps at V_{DD} unless

(1) temperature drops below the High temperature value,
(2) temperature rises above the Low temperature value or
(3) either S_1 or S_2 is pushed during the alarm sounding.

The alarm output signal is shown as follows.



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V. Function of Terminals

Terminal	Level	Function
K_4	OPEN(V_{SS1}) = °C / Colon Blink V_{DD} = °F / Colon Not Blink	°C/°F and Colon Blinking terminal
*K_3	OPEN(V_{SS1}) = Low alarm V_{DD} = High alarm	High/Low Temperature Alarm switching terminal
K_2	V_{DD}	Temperature Alarm Setting Mode
K_1	V_{DD}	Clock Mode
K_1 & K_2	OPEN(V_{SS1})	Temperature Mode
S_4	OPEN(V_{SS1}) = 10 sec. sampling V_{DD} = 2 sec. sampling	Sampling data adjusting terminal
S_3	OPEN(V_{SS1}) = INSIDE V_{DD} = OUTSIDE	INSIDE/OUTSIDE temperature switching terminal
S_2	V_{DD}	MN set, temp alarm set, clear max-min, sample and hold
S_1	V_{DD}	HR set, toggle alarm on/off, view max-min

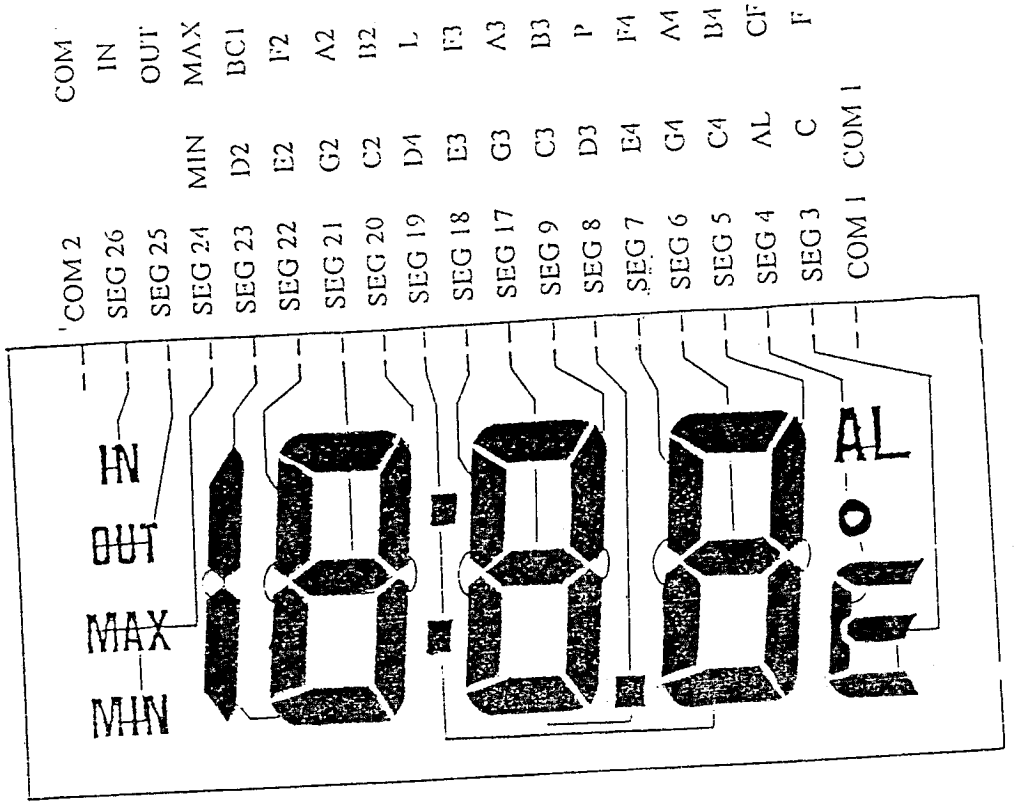
*Only one temperature alarm is available, user can select it as a low or high alarm.

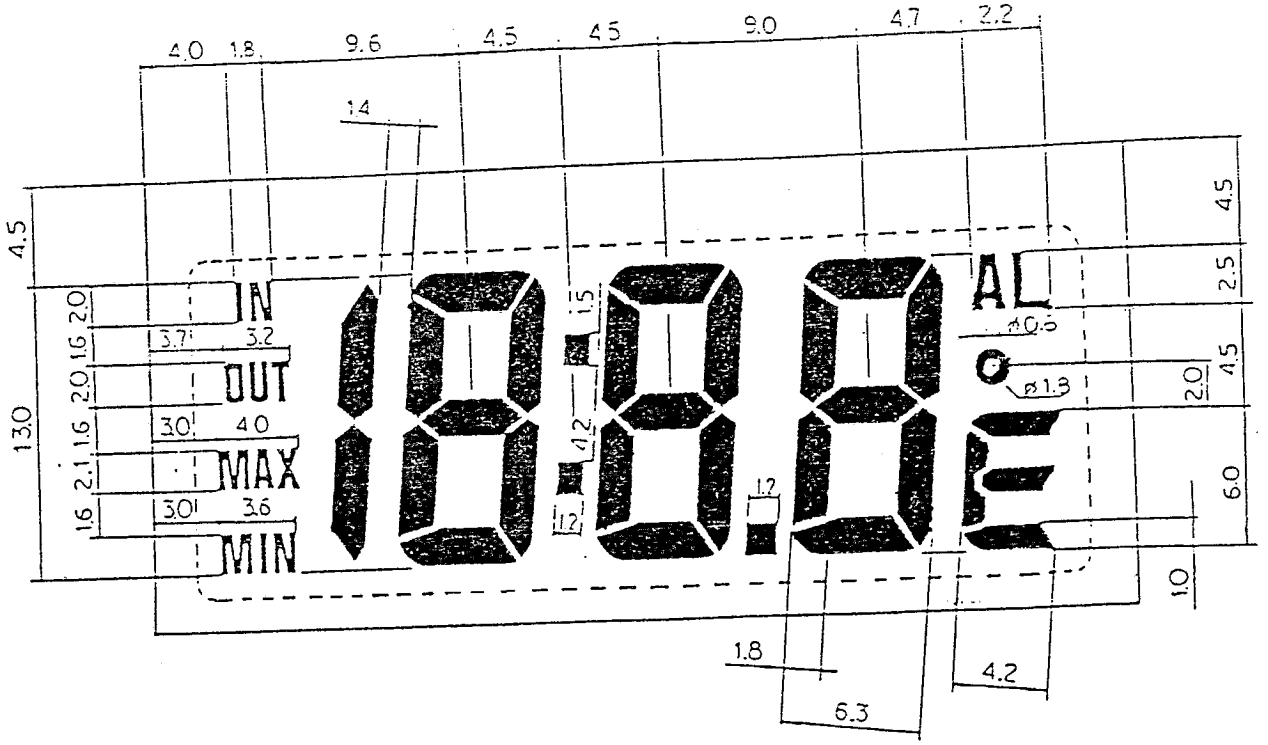
IX. PAD Layout

No.	Signal	X	Y
1	S_4	-2230	-2,025
2	M_1	-1,940	-2,025
3	M_2	-1,510	-2,025
4	M_3	-1,330	-2,025
5	M_4	-900	-2,025
6	LD	-720	-2,025
7	K_1	-400	-2,025
8	K_2	-62	-2,025
9	K_3	118	-2,025
10	K_4	456	-2,025
11	C	778	-2,025
12	IN	1,190	-2,025
13	R	1,600	-2,025
14	TH	2,042	-2,025
15	V_{SS1}	2,230	-1,615
16	V_{SS2}	2,230	-1,435
17	V_{DD}	2,230	-1,225
18	BD	2,230	-1,025
19	T_5	2,230	-615
20	T_4	2,230	-335
21	T_2	2,230	-155
22	T_1	2,230	125
23	T_3	2,230	305
24	COM_1	2,230	1,475
25	NC	2,230	1,655
26	NC	2,230	1,835
27	SEG 3	2,230	2,025
28	SEG 4	2,020	2,025
29	SEG 5	1,840	2,025
30	SEG 6	1,660	2,025
31	SEG 7	1,480	2,025
32	SEG 8	1,300	2,025
33	SEG 9	1,120	2,025
34	NC	940	2,025
35	NC	760	2,025
36	NC	580	2,025
37	NC	400	2,025
38	NC	-400	2,025
39	NC	-580	2,025
40	NC	-760	2,025
41	SEG 17	-940	2,025
42	SEG 18	-1,120	2,025
43	SEG 19	-1,300	2,025
44	SEG 20	-1,480	2,025
45	SEG 21	-1,660	2,025
46	SEG 22	-1,840	2,025
47	SEG 23	-2,020	2,025
48	SEG 24	-2,230	2,025
49	SEG 25	-2,230	1,835
50	SEG 26	-2,230	1,655
51	COM_2	-2,230	1,475
52	OSC_3	-2,230	1,295
53	NC	-2,230	1,033
54	OSC_1	-2,230	805
55	V_{DD}	-2,230	205
56	AC	-2,230	25
57	V_{CP}	-2,230	-295
58	V_{CM}	-2,230	-885
59	S_1	-2,230	-1,169
60	S_2	-2,230	-1,507
61	S_3	-2,230	-1,687

Chip size: 4.77 x 4.36 [mm]
PAD size: 110 x 110 [μm]

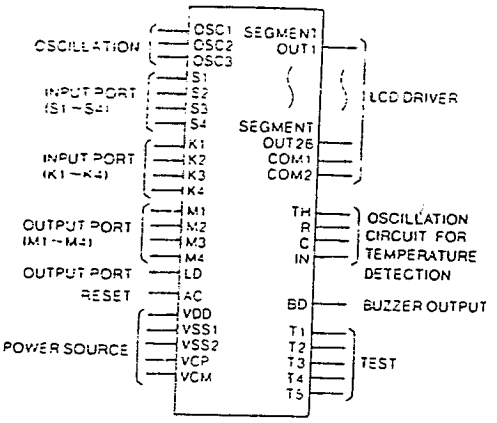
VIII. LCD Format (LCD VCD0102-1)





Not in scale
Unit : mm

VI. Logic symbol



Figure

VII. Chip PAD Layout

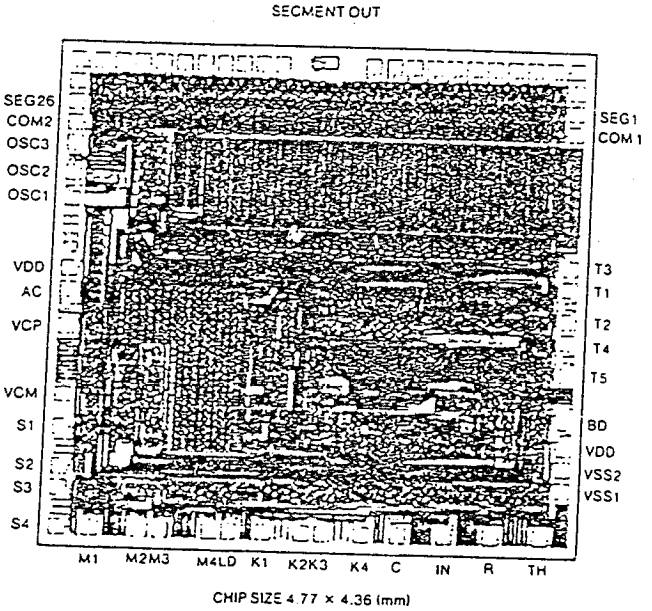


Figure 2.