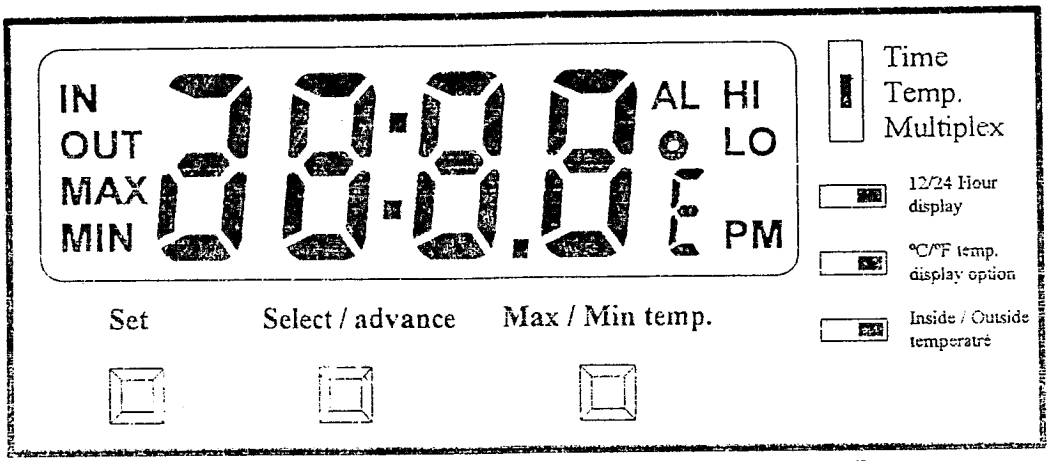
SS0108

CLOCK WITH THERMOMETER
-40°C(-40°F) ~ +110°C(+230°F)



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Features :

1. 1.5 Volts battery power supply
2. 12 (Hour, Minute & PM flag) / 24 (Hour & Minute) HOUR User option Display
3. High and low temperature alarms
4. Clock alarm
5. 10 sec. temperature sensing rate
6. Measure range from -40°C(-40°F) to +110°C(230°F)
7. Time, temperature and Multiplex mode display
8. Record Max and Min temperature (With data reset)
9. °C / °F bonding option
10. In / Out temp. user option
11. Serial data out
12. Power on all segment test with buzzer sound on

IV. Clock Alarm Operation

When the time reaches alarm time and the alarm flag is enable, and the buzzer will be on for 1 minute. The buzzer can be stoped by press any key.

V. Temperature Alarm Operation

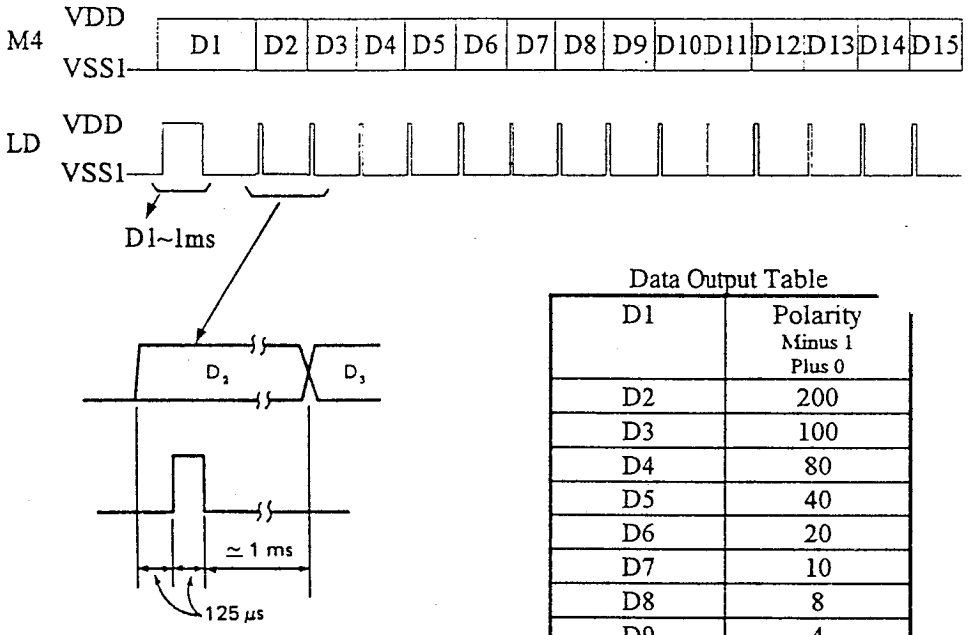
When temperature exceeds the preset High alarm temperature with the High temperature alarm flag is on, M1 becomes VDD level and alarm sound is output from BD OUT for 5 seconds. It works similarily for Low temperature alarm but only the M2 becomes VDD instead of M1. M3 becomes VDD level for 1 second if wither high or low alarm triggered. Temperature alarm can operate in any mode.

Output status of M1 and M2 will remain unchanged for 70 seconds after temperature alarm condition is changed from high to low or vice versa. Temperature alarm will not operate within a minute after the preset alarm temperature is changed.

Within the 5 seconds alarm sound, user can press S1 to stop the alarm. If user want to stop the alarm and reset M1 and M2, please press S2..

VI. Serial output

Temperature data converted serially by M4 and LD terminals is output at every measurement. Temperature data is output as total 15-bit data. Duration of clock pluse LD is set as 1m sec. for facilitating interruption.



Note: (1) Data "1" is V_{DD} level and "0" is V_{SS1} level.
(2) Data of all "1" is output when data exceeds the measurement range.

Data Output Table

D1	Polarity Minus 1 Plus 0
D2	200
D3	100
D4	80
D5	40
D6	20
D7	10
D8	8
D9	4
D10	2
D11	1
D12	0.8
D13	0.4
D14	0.2
D15	0.1

Temperature is displayed up to one decimal place. Inside or Outside temperature can be selected by setting S3. By holding S1 for more than 2 seconds to enter high temperature alarm setting mode. HI flag is on with flashing digits then press S2 to increase the value. Press S1 again, AL flag will flash. This AL flag indicates if the alarm is enabled. User can press S1 to toggle this AL flag. Press S1 again to enter the low temperature alarm setting mode. LO flag is on with flashing digits. It works simularily as High temperature alarm setting mode. User can press S1 repetitibely so as to return to temp display.

In temperature display mode, press S2 will enter alarm display mode and then press S2 again to enter time display mode. To return to temperature display mode, press S2 again. It will get back to temperature display mode if no key is pressed for 2 seconds.

°C or °F system can be selected by the bonding option pin K4. If °C is selected, the temperature is valid immediately after power on. If °F is selected, the temperature shown within 10 seconds after power on is invalid.

Range	-40°C (-40°F) to +110°C (+230°F)	
Resolution	0.1° (-19.9° to 199.9°)	1° (Otherwise)
Accuracy	±1°C (-20°C to +70°C)	±2°C (Otherwise)

3.3 Multiplex Display Mode (K1 = OPEN, K2 = VDD)

The display will toggle between time display mode and temperature display mode with a 3-second toggling time. Setting and mode selection operation is similar as above. Please refer to the flow chart attached.

3.4 Alarm Display Mode

Alarm time is shown with a flozen colon, AL flag indicates if alarm is enable. Hold S1 for more than 2 seconds to enter alarm setting mode. AL flag is on with a flashing hour-digit and press S2 to increase the value. Press S1 again to enter alarm minute setting mode. Minute-digit flashs and press S2 to increase the values. Press S1 again to enter alarm enable flag setting mode. AL flag will flash and it is toggled by pressing S2. To return to alarm display mode, press S1 again.

3.5 Temperature Record Mode

Under time display mode, temperature display mode or alarm display mode, it will get into Maximum temperature display mode by pressing K3. MAX flag is on with maximum temperature showed, the Max. record can be reset by holding S1 for more than 2 seconds. Press K3 again to entry Minimum temperature display mode. MIN flag is on with minimum tempreature showed and the Min. record can also be reset by holding S1 for more than 2 seconds.

It will back to the orginal mode if K3 is pressed or no key is pressed for 2 seconds.

When S3 pin is changed, both Maximum and Minimum record will be reset.

I. General Description

SS0108 is a CMOS integrated circuit provided with clock and digital thermometer function. It provides two keys operation with temperature alarm and clock alarm function, and with one user option key to implement Max and Min temperature record function. Temperature range is -40°C (-40°F) to +110°C (+230°F) by employing a thermistor (103AT-2B) as a temperature sensor. The LCD display is a 3½ digits with icons HI, LO, IN, OUT, MAX, MIN, PM, AL and °C/°F flags.

II. Function of Terminals

Terminal	Level	Function
S1	Toggle	Time,temp & alarm setting
S2	Toggle	Time, temp & alarm display Setting advance key
S3	V_{DD} OPEN(V_{SS1})	Outside temp. (User option) Inside temp. (User option)
S4	V_{DD} OPEN(V_{SS1})	24 hours (User option) 12 hours (User option)
K1 , k2	Open, Open VDD, Open Open, VDD	Time display mode Temperature display mode Multiplex display mode
K3	Toggle	Max. min temp
K4	V_{DD} OPEN(V_{SS1})	°F is chosen (Bonding option) °C is chosen (Bonding option)

III. Mode Description

After power up all the LCD segments will be on for about a second and the alarm will be turned on for 5 seconds. After initialization, the IC will enter different mode depending on the setting of K1 and K2.

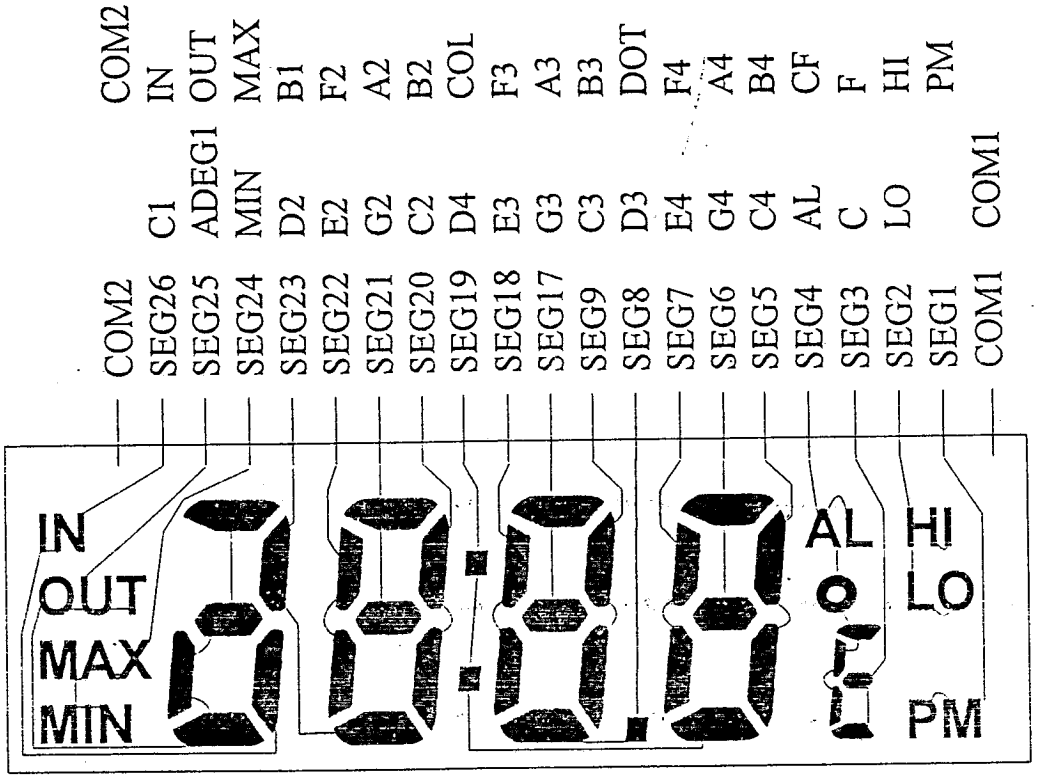
3.1 Time Display Mode (K1 = OPEN , K2 = OPEN)

Hour and Minute is displayed with a flashing colon. 12-hour or 24-hour system can be selected by S4. Hold S1 more than 2 seconds to entry hour setting mode, and hour digits will flash. Then press S2 to increase the value. Then, press S1 to entry minute setting mode and minute digits will flash. Similarly, press S2 to increase the value. Pressing S1 again, you can go back to time display mode.

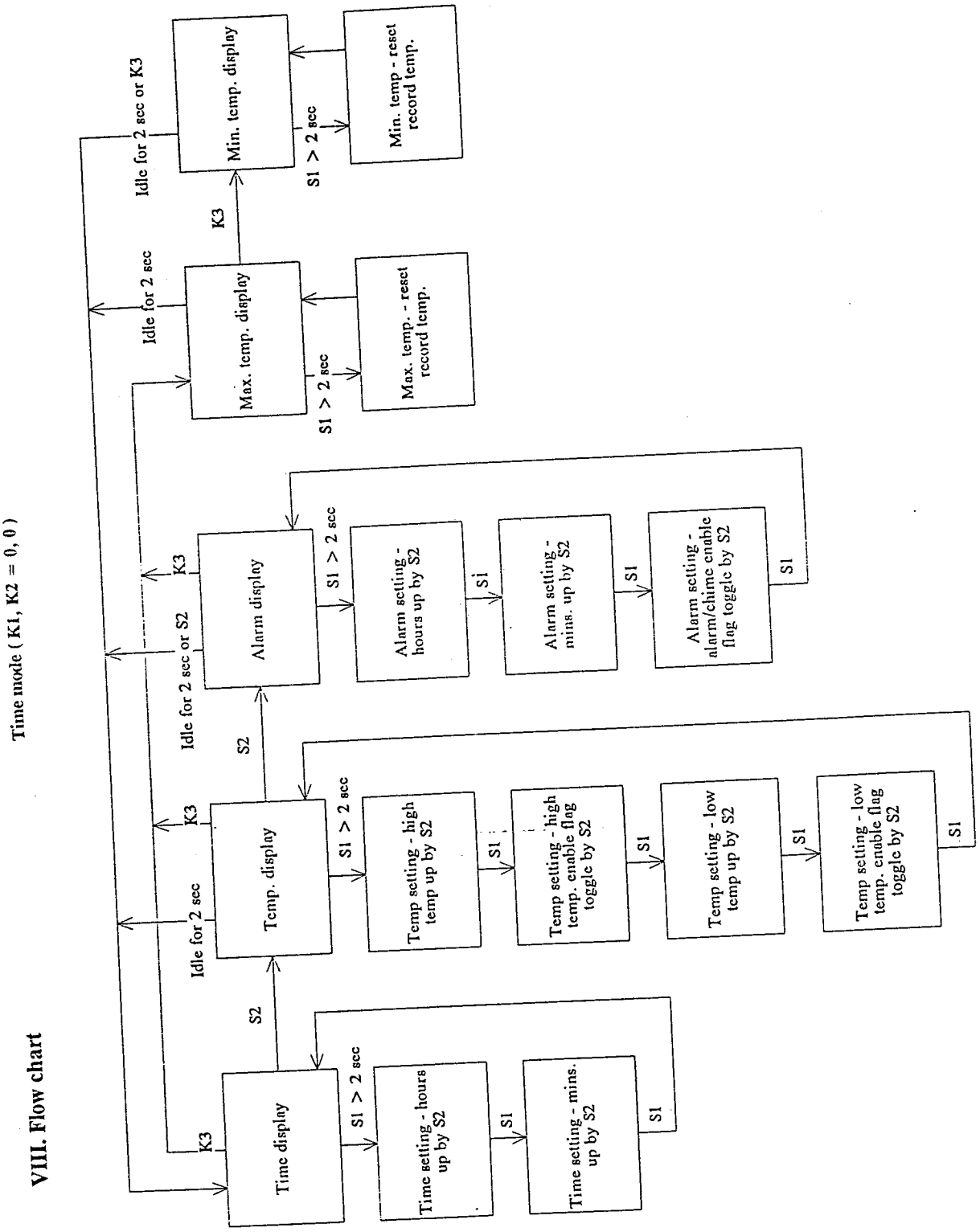
In time display mode, press S2 will enter temperature display mode and then press S2 again to entry alarm display mode. To return to time display mode, press S2. In temperature display mode or alarm display mode, it will return to time display mode if no key is pressed for 2 seconds.

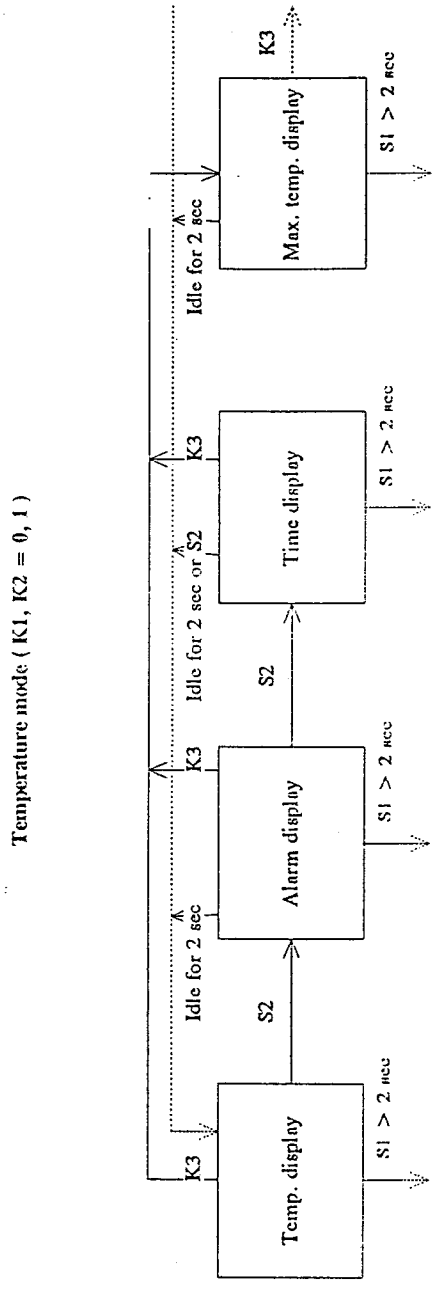
3.2 Temperature Display Mode (K1 = VDD, K2 = OPEN)

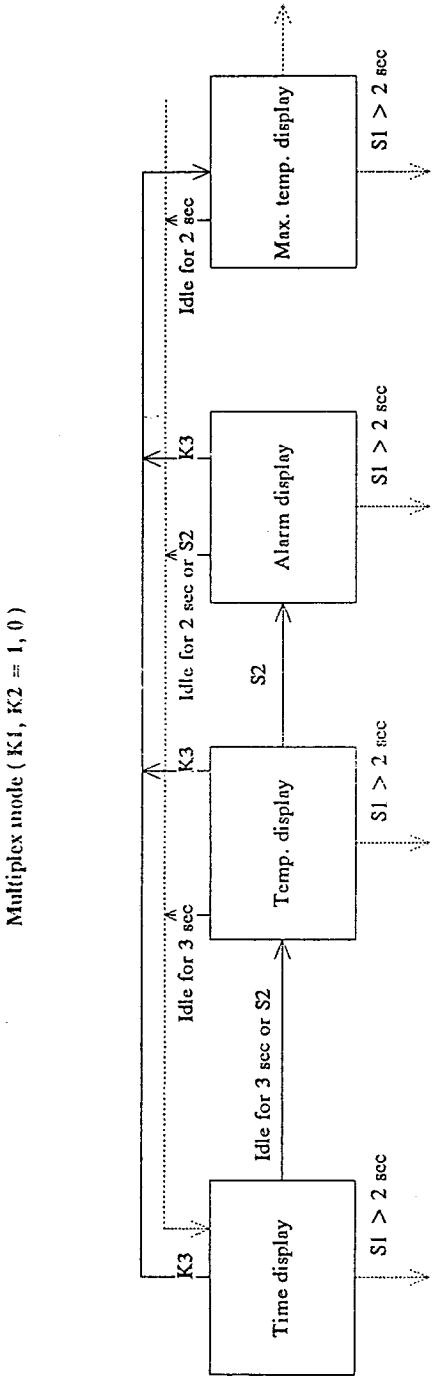
VII. LCD Format (LCD VCD 0108)



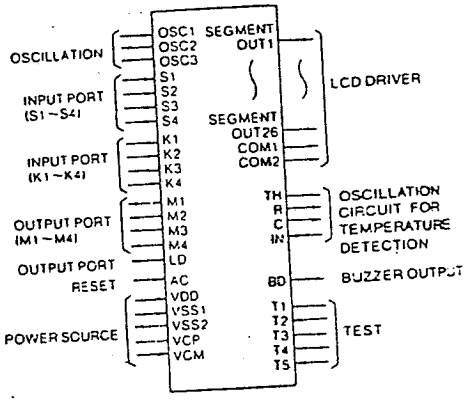
VIII. Flow chart



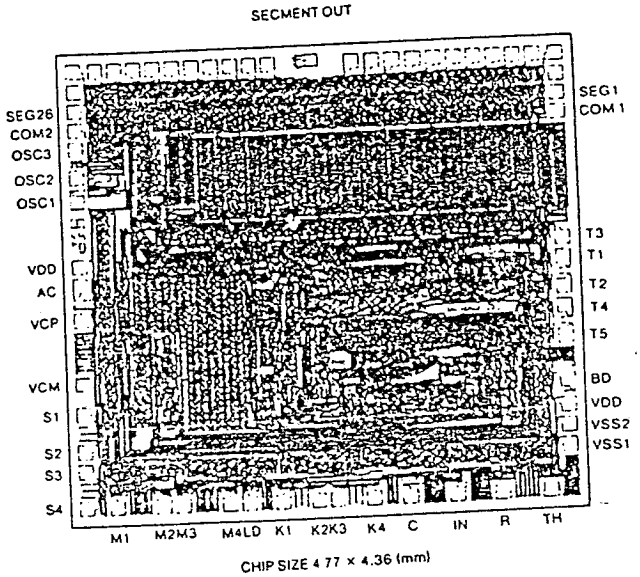




IX. Login symbol



X. Chip PAD Layout



XI. Pin description

Designation	Function
V_{DD}	Circuit ground potential
V_{SS1}	Power source (-1.5V)
V_{SS2}	Power source for LCD driver (-3.0V) This terminal is connected to V_{DD} terminal through a 0.1μF capacitor.
V_{CP}, V_{CM}	Booster capacitor connection terminals V_{CP} terminal is connected to V_{CM} terminal through a 0.1μF capacitor.
OSC1, OSC3	Input and output terminals of oscillator inverter. 32.768 kHz crystal is connected to these terminals.
$T_1 \sim T_5$	Terminals to test internal logic, $T_1 \sim T_3$ and T_5 are pulled down to V_{SS1}. T_4 is output. Test pins must be normally open.
AC	Terminal to clear internal logic pulled down to V_{SS1}. After power is turned on, the VIC0203 must be reset by this terminal.
BD	Buzzer output
TH, R, C, IN	Terminal to CR oscillation circuit for temperature detection, fundamental resistor, thermistor, capacitor connection terminal.

XII. PAD Layout

No.	Signal	X	Y
1	S4	-2,230	-2,025
2	M1	-1,940	-2,025
3	M2	-1,510	-2,025
4	M3	-1,330	-2,025
5	M4	-900	-2,025
6	LD	-720	-2,025
7	K1	-400	-2,025
8	K2	-62	-2,025
9	K3	118	-2,025
10	K4	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	VSS1	2,230	-1,615
16	VSS2	2,230	-1,435
17	VDD	2,230	-1,225
18	BD	2,230	-1,025
19	T5	2,230	-615
20	T4	2,230	-335
21	T2	2,230	-155
22	T1	2,230	125
23	T3	2,230	305
24	COM1	2,230	1,475
25	SEG1	2,230	1,655
26	SEG2	2,230	1,835
27	SEG3	2,230	2,025
28	SEG4	2,020	2,025
29	SEG5	1,840	2,025
30	SEG6	1,660	2,025
31	SEG7	1,480	2,025
32	SEG8	1,300	2,025
33	SEG9	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	SEG17	-940	2,025
42	SEG18	-1,120	2,025
43	SEG19	-1,300	2,025
44	SEG20	-1,480	2,025
45	SEG21	-1,660	2,025
46	SEG22	-1,840	2,025
47	SEG23	-2,020	2,025
48	SEG24	-2,230	2,025
49	SEG25	-2,230	1,835
50	SEG26	-2,230	1,655
51	COM2	-2,230	1,475
52	OSC3	-2,230	1,295
53	NC	-2,230	1,033
54	OSC1	-2,230	805
55	VDD	-2,230	205
56	AC	-2,230	25
57	VCP	-2,230	-295
58	VCM	-2,230	-885
59	S1	-2,230	-1,169
60	S2	-2,230	-1,507
61	S3	-2,230	-1,687

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

XIII. Suggested Circuit