Clock with Thermometer and Hygrometer Functions

GENERAL DESCRIPTION

The SS0203 is a clock IC with a temperature and a humidity measuring function.

FEATURES

- Clock function display of "hour", "minute", and "AM/PM". Time format switchable (12 hours format or 24 hours format).
- Temperature measuring function

  Temperature measuring ranges : -40.0℃ to 70.0℃ (-22℉ ~ 158℉)

  Resolution : 0.1℃ (0.1℉ or 0.2℉)

  Precision : 1℃ (over -10℃)

  Measuring period : Every 10 seconds or every 1minute.
- Humidity measuring function

  Humidity measuring ranges : 20 to 90% (Display Between 20% ~ 99%)

  Resolution : 1%

  Precision : Under examination

  Measuring period : Every 10 seconds or every 1minute.
- Daily alarm and hourly chime.
- 10 digits+16 indicators, 1/4 duty 1/3 bias LCD drive
- Memorization of maximum/minimum temperature and maximum/minimum humidity.
- Operating voltage 1.5V

OPERATIONAL DESCRIPTION

Time Mode

In time mode:

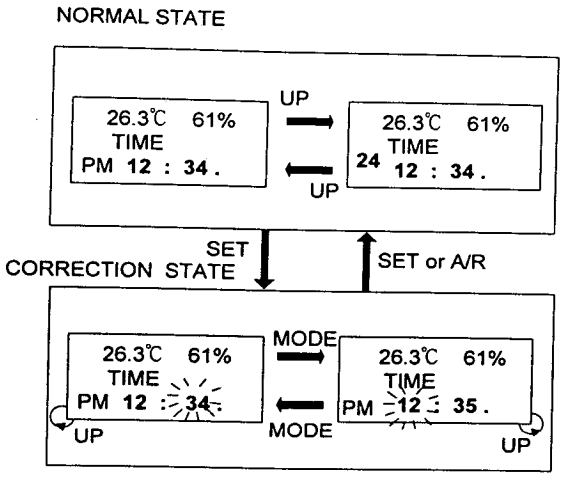
(1) clock display and correction,

(2) temperature measurement and display, and

(3) humidity measurement and display are performed.

The following is the transition diagram for the time/measurement mode.

[Change Time System]



When the **<UP>** switch is pressed in normal state, the time system is exchanged (12-hour/24-hour).

[Minute Correction]

When the **<SET>** switch is pressed in the normal state, the device changes into minute correction state. During the correction, the minute digit flashes in a 1Hz period.

When the **<UP>** switch is pressed in the correction state, the minute digit is increased by 1 and the second digit is set to 0.

When the **<UP>** switch is pressed continuously, the minute digit is continuously increased by 1 in a 8Hz cycle.

When the **<SET>** switch is pressed, normal state is restored.

When no switch pressed for 1 to 2 minutes, normal state is restored (A/R function).

[Hour Correction]

When the **<MODE>** switch is pressed in the minute correction state, the device changes into hour correction state. During the correction, the hour digit and the "AM" or "PM" or "24" flashes in a 1HZ Period.

When the **<UP>** switch is pressed in the correction state, the hour digit is increased by 1.

When the **<UP>** switch is pressed continuously, the hour digit is continuously increased by 1 in a 8Hz cycle.

When the **<SET>** switch is pressed, normal state is restored.

When no switch is pressed for 1 to 2 minutes, normal state is restored (A/R function).

When the **<MODE>** switch is pressed, minute correction state is restored.

Alarm Mode

In alarm mode, three functions are performed. These are:

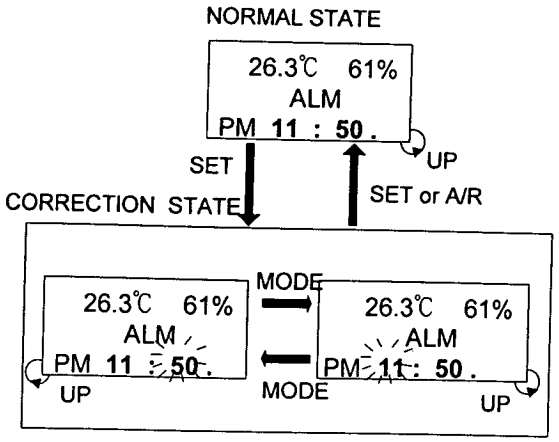
(1) alarm time display and correction,

(2) temperature measurement and display, and

(3) humidity measurement and display.

The time system operates in the same way as time/measurement mode.

The following is the transition diagram for the alarm mode.



[Minute Correction]

When the **<SET>** switch is pressed in normal state, the device changes into alarm minute correction state.

During the correction state, the minute digit flashes in a 1Hz cycle.

When the **<UP>** switch is pressed in correction state, the minute digit is increased by 1.

When the **<UP>** switch is pressed continuously, the minute digit continuously increases by 1 in a 8Hz cycle.

When the **<SET>** switch is pressed, normal state is restored.

When no switch is pressed for 1 to 2 minutes, normal state is restored (A/R function).

[Hour Correction]

When the **<MODE>** switch is pressed in alarm minute correction state, the device switches into hour correction state.

During the correction, the hour digit and the "AM" or "PM" or "24" flag flashes in a 1Hz period.

When the **<UP>** switch is pressed in correction state, hour digit is increased by 1.

When the **<UP>** switch is pressed continuously, the hour digit continuously increases in a 8Hz cycle.

When **<SET>** switch is pressed, normal state is restored.

When no switch is pressed for 1 to 2 minutes, normal state is restored (A/R function).

When **<MODE>** switch is pressed, minute correction state is restored.

[Setting Alarm/Hourly Chime]

Setting the status (alarm and hourly chime) changes when the **<UP>** switch is pressed in the alarm normal state.

The alarm function is effective while the alarm symbol is visible, and the chime function is effective while the chime symbol is visible.

[Alarm Sound]

If the alarm set and clock time are the same and if the alarm function is activated, then the SS0203 outputs a 4kHz 50% duty alarm sound. 20 seconds later, or when any switch is pressed, the alarm sound stops immediately.

When deactivating the alarm, the pressed switch ignores its original function.

The alarm function is ineffective in time/alarm correction status.

[Chime Sound]

When the minutes reach 00 and if the chime sound function is activated, the SS0203 outputs a 2kHz 50% duty chime sound. It sounds for 2 seconds. The alarm function is inoperative in time correction status and alarm correction status.

Memory Mode

In memory mode, four functions are performed. These are:

(1) maximum temperature and humidity display and clear,

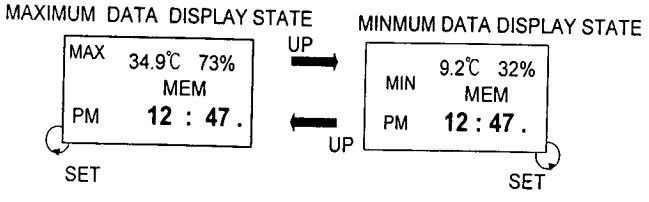
(2) minimum temperature and humidity display and clear,

(3) measurement of temperature and humidity and

(4) time display.

The time system operates in the same way as time/measurement mode.

The following is the transition diagram for the memory mode.



[Maximum data display & clear]

When the **<MODE>** switch is pressed in alarm mode and normal state, or when the **<UP>** switch is pressed in minimum data display state, the mode changes into memory mode and maximum data display state. During this state, maximum temperature data and maximum humidity data are displayed. (There is no relationship between maximum temperature and maximum humidity.)

When the **<SET>** switch is pressed, all data is cleared and the SS0203sounds to confirm. The sound is the same as chime. The current temperature and humidity then become new maximum data.

[Minimum data display & clear]

When the **<UP>** switch is pressed in maximum data display state, the mode changes into minimum data display

state.

During this state, minimum temperature data and minimum humidity data are displayed. (There is no relationship between minimum temperature and minimum humidity.)

When the **<SET>** switch is pressed, all data is cleared and the SS0203 sounds to confirm. The sound is the same as chime. The current temperature and humidity then become new minimum data.

LCD Test Mode

When the SS0203 is reset, it starts LCD test mode (all LCD segments light). When any switch is pressed, the MS491 completes the LCD test mode and enters the time/measurement mode.

FUNCTIONAL DESCRIPTION

Temperature Measuring Function

- **Setting of temperature measuring function**

Temperatures can be displayed by either Celsius or Fahrenheit. Display is determined by the state of **C / F** switch as follows:

C / F = L level: degree Celsius display

C / F = H level: degree Fahrenheit display

Temperature measuring cycle is determined by the state of **SMP** switch as follows.

SMP = L level: 10-seconds cycle

SMP = H level: 1-minute cycle

However, temperature measuring is suspended during buzzer output or in the time/alarm correction state.

- **Measuring timing**

The MS491 measures temperature at every cycle as set by the **SMP** switch. When the **<Q_SMP>** switch is pressed, the SS0203 measures temperature regardless of the measuring cycle. However, note that the **<Q_SMP>** switch is ineffective in the time/alarm correction state and the buzzer output state.

Humidity measuring Function

- **Setting of humidity measuring function**

The humidity measuring cycle is determined by the state of **SMP** switch as follows:

SMP = L level: 10-second cycle

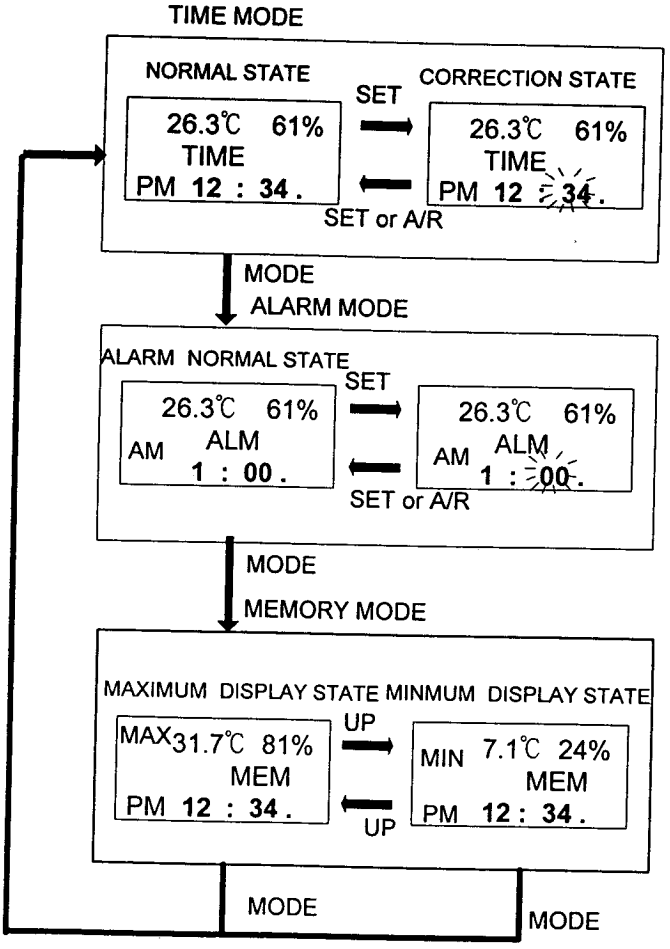
SMP = H level: 1-minute cycle

However, humidity measuring is suspended during buzzer output or in the time/alarm correction state.

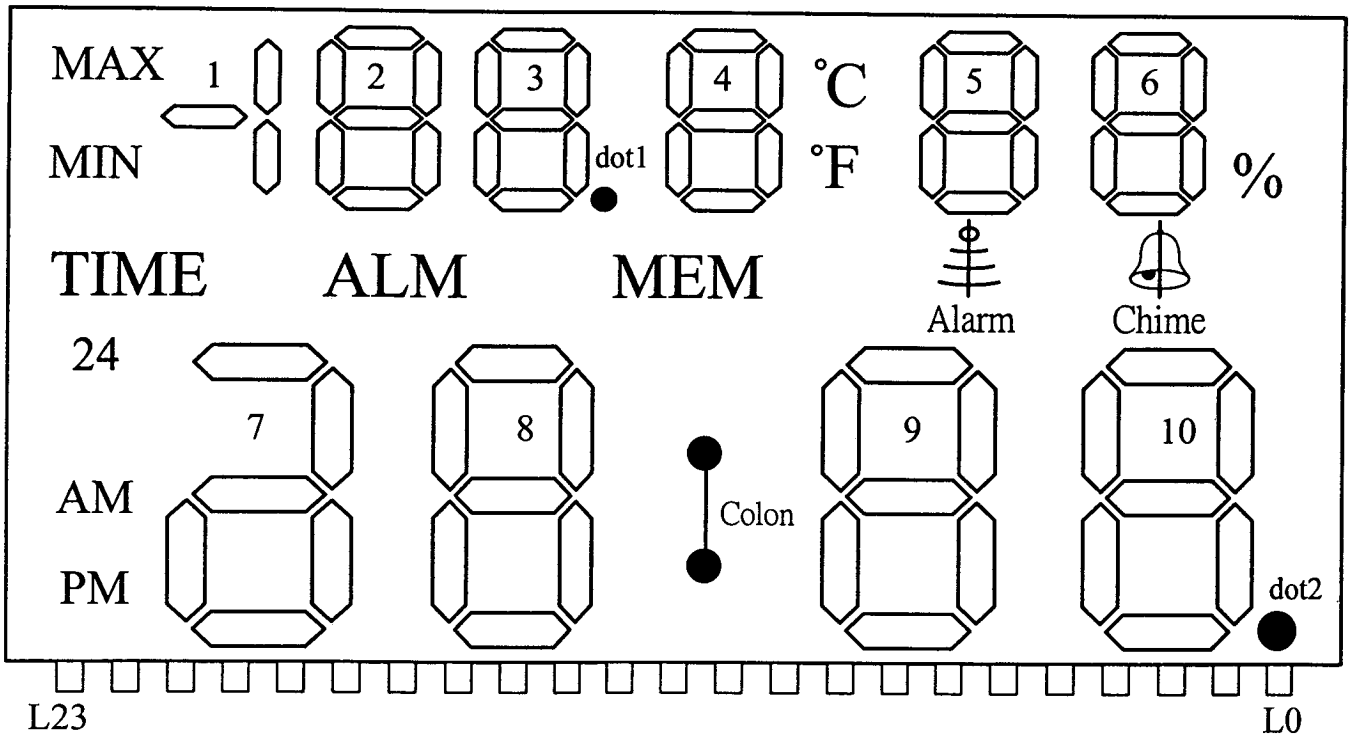
- **Measuring timing**

The SS0203 measures humidity at every cycle as set by the **SMP** switch. When the **<Q_SMP>** switch is pressed, the SS0203 measures humidity regardless of the measuring cycle. However, note that the **<Q_SMP>** switch is ineffective in time/alarm correction state and the buzzer output state.

Mode Transition Diagram

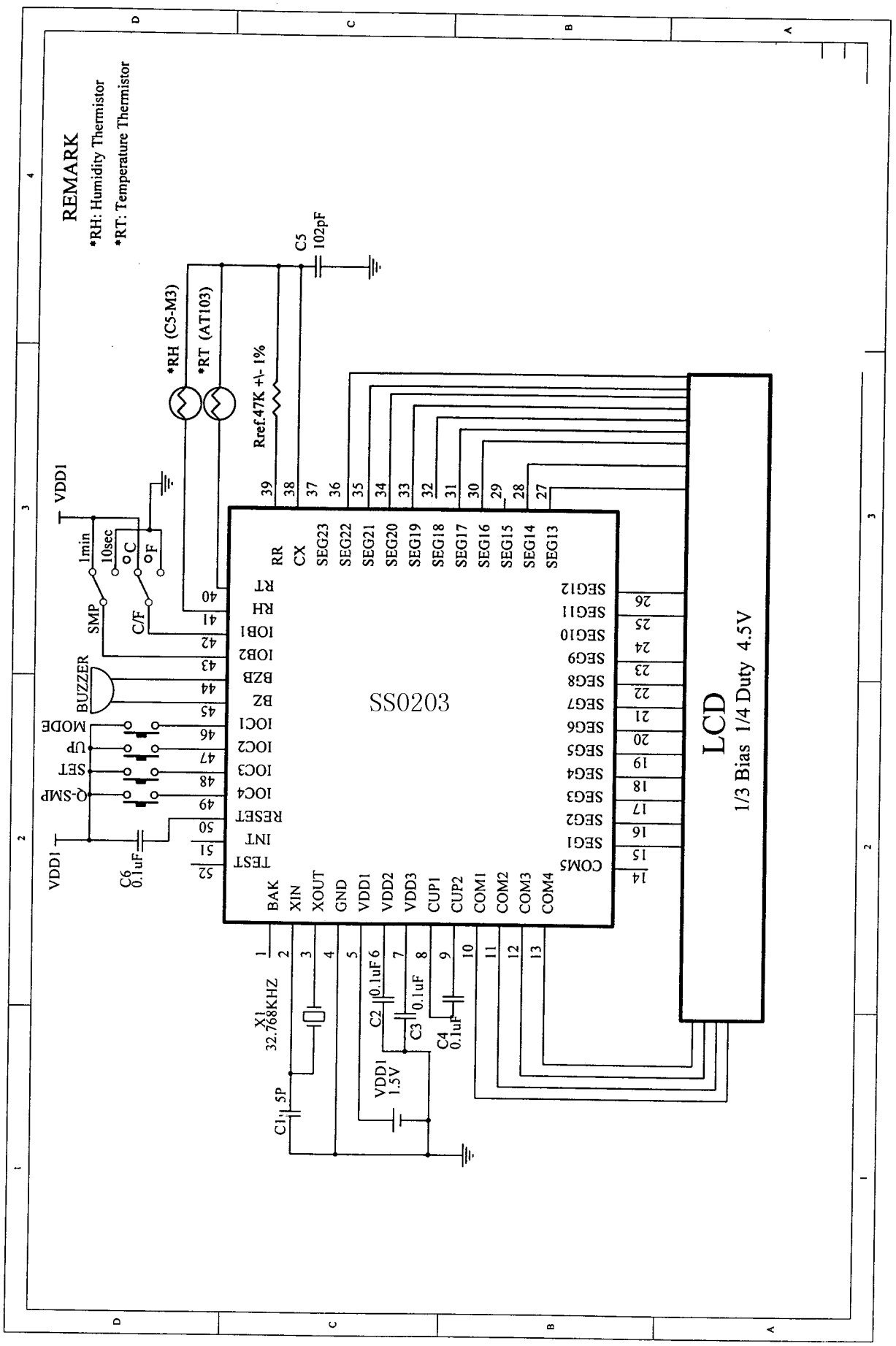


LCD Layout Diagram

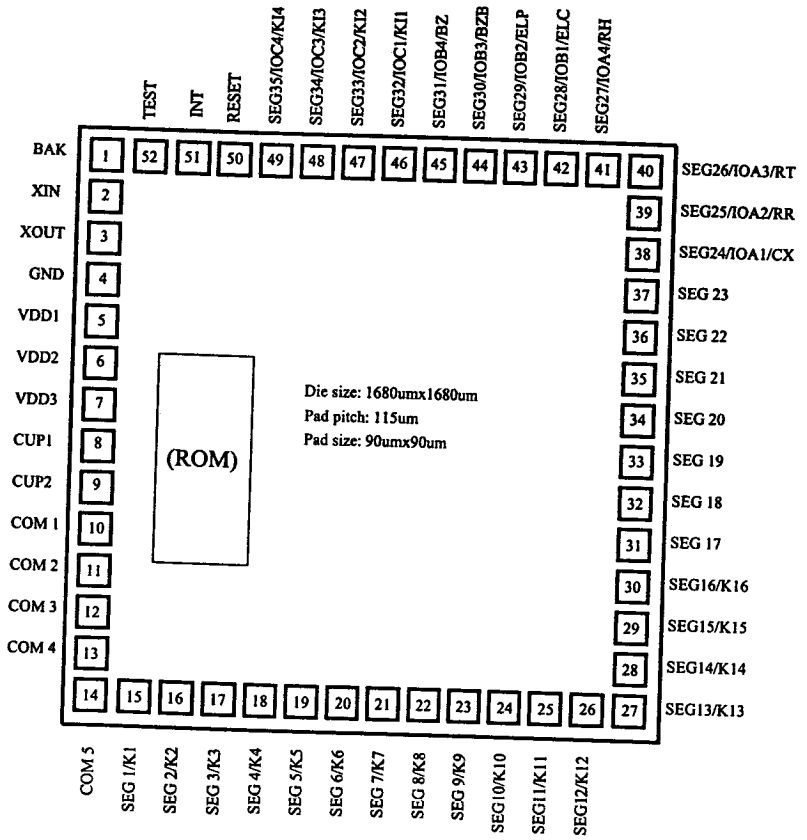


LCD Segment Assignment

LCD PIN	IC PIN				
L0	SEG1	RH %	6c	6b	5a
L1	SEG2	Chime	6d	6g	6a
L2	SEG3		Alarm	6e	6f
L3	SEG4	dot2	10a	5c	5b
L4	SEG5	10b	10f	5d	5g
L5	SEG6	10c	10g	5e	5f
L6	SEG7	10d	10e	MEM	4a
L7	SEG8		9a	°F	℃
L8	SEG9	9b	9f	4c	4b
L9	SEG11	9c	9g	4d	4g
L10	SEG12	9d	9e	4e	4f
L11	SEG13	colon	8a	ALM	dot1
L12	SEG14	8b	8f	3c	3b
L13	SEG16	8c	8g	3d	3g
L14	SEG17	8d	8e	3e	3f
L15	SEG18		7b	2c	2b
L16	SEG19	7c	7adeg	2d	2g
L17	SEG20	PM	TIME	2e	2f
L18	SEG21	AM	MIN	1bc	2a
L19	SEG22	24	MAX	1g	3a
L20	COM4	COM4			
L21	COM3		COM3		
L22	COM2			COM2	
L23	COM1				COM1


REMARK
*RH: Humidity Thermistor
*RT: Temperature Thermistor
*RH (C5-M3)
*RT (AT103)
Rref.47K +\- 1%
C5 102pF
VDD1
1min
10sec
C
F
SMP
C/F
BUZZER
MODE
UP
SET
Q-SMP
C6 0.1uF
SS0203
RR CX SEG23 SEG22 SEG21 SEG20 SEG19 SEG18 SEG17 SEG16 SEG15 SEG14 SEG13
RT RH IOB1 IOB2 BZB BZ IOC1 IOC2 IOC3 IOC4 RESET INT TEST
SEG12 SEG11 SEG10 SEG9 SEG8 SEG7 SEG6 SEG5 SEG4 SEG3 SEG2 SEG1 COM5
BAK XIN XOUT GND VDD1 VDD2 VDD3 CUP1 CUP2 COM1 COM2 COM3 COM4
LCD
1/3 Bias 1/4 Duty 4.5V
X1 32.768KHZ
C1 5P
C2 0.1uF
C3 0.1uF
C4 0.1uF
VDD1 1.5V

PAD DIAGRAM


TEST
INT
RESET
SEG35/IOC4/KI4
SEG34/IOC3/KI3
SEG33/IOC2/KI2
SEG32/IOC1/KI1
SEG31/IOB4/BZ
SEG30/IOB3/BZB
SEG29/IOB2/ELP
SEG28/IOB1/ELC
SEG27/IOA4/RH
BAK
XIN
XOUT
GND
VDD1
VDD2
VDD3
CUP1
CUP2
COM 1
COM 2
COM 3
COM 4
(ROM)
Die size: 1680umx1680um
Pad pitch: 115um
Pad size: 90umx90um
SEG26/IOA3/RT
SEG25/IOA2/RR
SEG24/IOA1/CX
SEG 23
SEG 22
SEG 21
SEG 20
SEG 19
SEG 18
SEG 17
SEG16/K16
SEG15/K15
SEG14/K14
SEG13/K13
COM 5
SEG 1/K1
SEG 2/K2
SEG 3/K3
SEG 4/K4
SEG 5/K5
SEG 6/K6
SEG 7/K7
SEG 8/K8
SEG 9/K9
SEG10/K10
SEG11/K11
SEG12/K12

PIN ASSIGNMENT

No.	Name	X	Y	No.	Name	X	Y
1	BAK	77.5	1602.5	27	SEG13/K13	1602.5	77.5
2	XIN	77.5	1472.5	28	SEG14/K14	1602.5	207.5
3	XOUT	77.5	1357.5	29	SEG15/K15	1602.5	322.5
4	GND	77.5	1242.5	30	SEG16/K16	1602.5	437.5
5	VDD1	77.5	1127.5	31	SEG17	1602.5	552.5
6	VDD2	77.5	1012.5	32	SEG18	1602.5	667.5
7	VDD3	77.5	897.5	33	SEG19	1602.5	782.5
8	CUP1	77.5	782.5	34	SEG20	1602.5	897.5
9	CUP2	77.5	667.5	35	SEG21	1602.5	1012.5
10	COM1	77.5	552.5	36	SEG22	1602.5	1127.5
11	COM2	77.5	437.5	37	SEG23	1602.5	1242.5
12	COM3	77.5	322.5	38	SEG24/IOA1/CX	1602.5	1357.5
13	COM4	77.5	207.5	39	SEG25/IOA2/RR	1602.5	1472.5
14	COM5	77.5	77.5	40	SEG26/IOA3/RT	1602.5	1602.5
15	SEG1/K1	207.5	77.5	41	SEG27/IOA4/RH	1472.5	1602.5
16	SEG2/K2	322.5	77.5	42	SEG28/IOB1/ELC	1357.5	1602.5
17	SEG3/K3	437.5	77.5	43	SEG29/IOB2/ELP	1242.5	1602.5
18	SEG4/K4	552.5	77.5	44	SEG30/IOB3/BZB	1127.5	1602.5
19	SEG5/K5	667.5	77.5	45	SEG31/IOB4/BZ	1012.5	1602.5
20	SEG6/K6	782.5	77.5	46	SEG32/IOC1/KI1	897.5	1602.5
21	SEG7/K7	897.5	77.5	47	SEG33/IOC2/KI2	782.5	1602.5
22	SEG8/K8	1012.5	77.5	48	SEG34/IOC3/KI3	667.5	1602.5
23	SEG9/K9	1127.5	77.5	49	SEG35/IOC4/KI4	552.5	1602.5
24	SEG10/K10	1242.5	77.5	50	RESET	437.5	1602.5
25	SEG11/K11	1357.5	77.5	51	INT	322.5	1602.5
26	SEG12/K12	1472.5	77.5	52	TEST	207.5	1602.5

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