

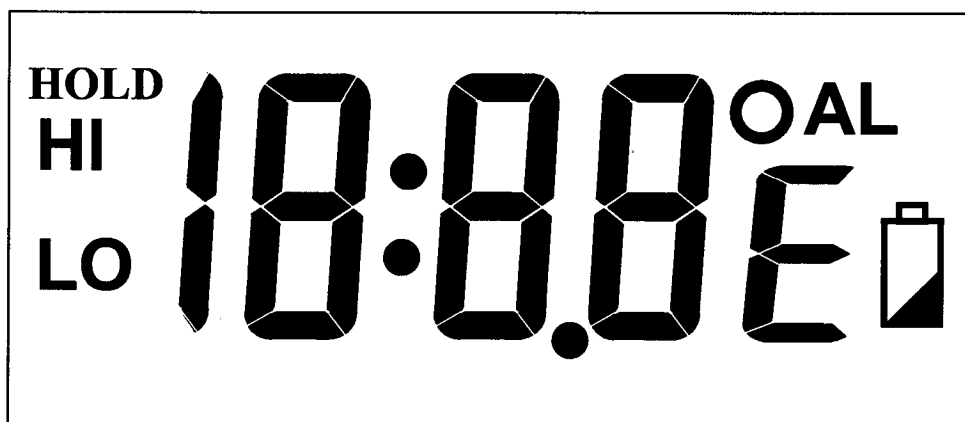
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SS0117

SS0117

# Wide Range Thermometer

-50°C to +150°C (-58°F to +302°F)



## Segment Test

### /Temperature

#### C/F switch



°C

°F

#### Mode



Temperature Mode

Segment Testing

#### 1/10s sampling



1s

10s

### Sample and

#### Hold Switch



Temperature Mode

Sample Hold

#### On/Off switch



Onn

Off



Lo Alarm



Hi Alarm



Mode/Hold/Alarm



Back light



°C↔°F



Power On-Off

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**MODE DESCRIPTIONS**

## a. Keys and Switches definitions

| Bonding Options | Descriptions                                              |
|-----------------|-----------------------------------------------------------|
| Auto Power Off  | Available = CLOSE                      Unavailable = OPEN |

| Slide Switches                 | Descriptions                                               |
|--------------------------------|------------------------------------------------------------|
| C/F switch                     | °C or °F switching terminal                                |
| Segment Test /Temperature Mode | All segment testing or Temperature Mode                    |
| 1/10s Sampling                 | 1 second sampling = CLOSE    10 seconds sampling = OPEN    |
| Sample and Hold switch         | Sample and Hold Function ( Sample = OPEN and Hold = CLOSE) |
| On/Off switch                  | On or Off switching terminal( On =CLOSE and Off = OPEN)    |

| Keys            | Descriptions                                 |
|-----------------|----------------------------------------------|
| Low Alarm       | Low temperature alarm                        |
| High Alarm      | High temperature alarm                       |
| Mode/Hold/Alarm | Temperature / Sample and Hold / Alarm on-off |
| Back light      | Back light                                   |
| °C↔°F           | °C or °F push button                         |
| Power On-Off    | Power on/off                                 |

**Power On and Off**      Both of the **On/Off switch** and **Power On/Off key** are used to switch on and off the device. The **On/Off switch** should be closed to allow the user to use **Power On/Off key** to operate the device and .

**Sample and Hold**      Sample and hold function is activated by pushing the **Mode/Hold/Alarm Key** or sliding the **Sample and Hold switch**. After the **Sample and Hold Switch** is closed, the device will change to Hold mode. No other modes can be used after in this state, except the **Segment Test Mode** and **Power On/Off**. The **Mode/Hold/Alarm Key** can also be used to switch the sample, alarm and hold mode. The

## **FEATURES**

- 1.5V battery operation with very low power consumption
- High and Low temperature alarms
- Selectable 1 second and 10 seconds temperature sensing rate
- Temperature data hold function
- Measurement ranging from  $-50^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$  to  $+302^{\circ}\text{F}$ )
- Segment test function
- 10 minutes auto-power off function by bonding option
- Back light

## **DESCRIPTIONS**

The SS0117 is a low power consumption CMOS IC to measure wide temperature range. By using a specific made thermistor SE239 as sensor, SS0117 can measure temperature ranging from  $-50^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$  to  $+302^{\circ}\text{F}$ ). The temperature is displayed on a  $3\frac{1}{2}$ -digit liquid crystal display (LCD). Besides, the SS0117 is embedded with high and low temperature alarm function for monitoring the measured temperature. Data hold function is also available. Segment test function is included in SS0117 for production testing.

The application for SS0117 is cooking thermometer, laboratory thermometer and any other applications where wide range, digital temperature measurement is required.

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|                        |                                                                                                                                                                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | sample mode is the mode for sampling the temperature. The hold mode is used to hold the temperature reading. The LCD will display the icon to indicate this mode. The alarm mode is used to set the low temperature and high temperature with low alarm key and high alarm key respectively. |
| All segment tests      | All segments on LCD are turned on, when <b>Segment Test /Temperature Mode switch</b> is slid to All Segment Test Mode.                                                                                                                                                                       |
| Alarm on – off         | Holding the <b>Low Alarm key</b> or <b>High Alarm Key</b> and pressing <b>Mode/Hold/Alarm</b> to turn on/off the High or Low Temperature Alarm. When user enters the Temperature Alarm Mode, the alarm will enable automatically.                                                            |
| High Temperature Alarm | Holding <b>High Alarm</b> for 3 seconds, High Temperature Alarm value will increase at 8Hz rate until the button is released. The default High Temperature Alarm value is +150°C (+302°F)                                                                                                    |
| Low Temperature Alarm  | Holding the <b>Low Alarm</b> for 3 seconds, Low Temperature Alarm value will increase at 8Hz rate until the button is released. The default Low Temperature Alarm value is – 50°C (-58°F)                                                                                                    |
| Back light             | The back light emits for 5 seconds when <b>Back Light</b> is pressed.                                                                                                                                                                                                                        |

b. Temperature Mode (**Segment Test /Temperature Mode** = Open)

Press **Low Alarm** or **High Alarm** to enter Low Temperature Alarm Mode or High Temperature Alarm Mode respectively. At this time, low Alarm or high Alarm is activated automatically.

Press **Mode/Hold/Alarm** to enter to Sample and Hold Mode. At this time, °C or °F's segments will flashing. To return to the Temperature Mode, simply press **Mode/Hold/Alarm** once again.

Press **Back Light** to turn on back light and last for 5 seconds.

Press **Power On-Off** to enter sleep mode. Press any keys to wake it up.

c. Low Temperature Alarm Mode

Press and hold **Low Alarm** for 3 seconds to enter to Low Temperature Alarm Setting Mode. In this mode, press **Low Alarm** to increase the alarm setting value. The setting

value will increase at 8Hz rate when **Low Alarm** is held for 1-2 seconds. Press **Mode/Hold/Alarm** to exit Temperature Alarm Setting Mode.

Enable or disable of low temperature alarm are toggled by holding **Low Alarm** and pushing **Mode/Hold/Alarm**.

Press **High Alarm** to enter to High Temperature Alarm Mode

Press **Back Light** to turn on light and it last for 5 seconds.

Press **Mode/Hold/Alarm** to return to Temperature Mode

Press **Power On-Off** to enter Sleep Mode. Press any key to wake it up.

d. High Temperature Alarm Mode

Press and hold **High Alarm** for 3 seconds to enter to High Temperature Alarm Setting Mode. In this mode, press **High Alarm** to increase the setting value. The setting value can be increased at 8Hz rate when **High Alarm** is held for 1-2 seconds. Press **Mode/Hold/Alarm** to exit Temperature Alarm Setting Mode.

Enable or disable of high temperature alarm are toggled by holding **High Alarm** and pushing **Mode/Hold/Alarm**.

Press **Low Alarm** to enter to Low Temperature Alarm Mode

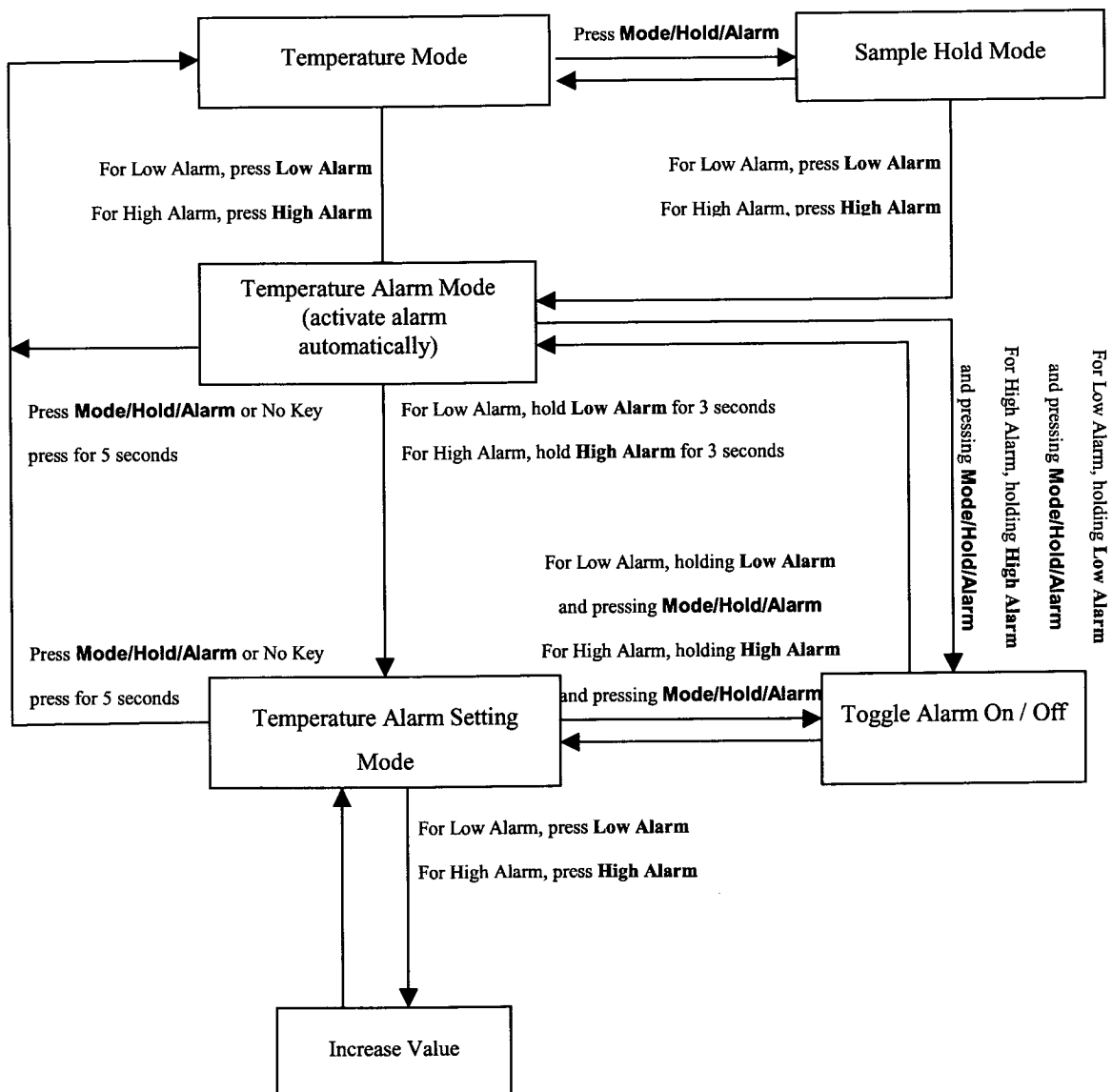
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Press **Back Light** to turn on the back light and it last for 5 seconds.

Press **Mode/Hold/Alarm** to return to Temperature Mode

Press **Power On-Off** to enter to Sleep Mode. Press any key to wake it up.



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e. °C / °F interchange

In this IC, we have 2 methods to interchange °C and °F:

- i) **C/F switch** as a bonding option to set default unit (open is °C, close is °F). At this time, use °C↔°F to interchange the °C and °F in each mode.
- ii) **C/F switch** as a C/F interchange slide switch.

The **C/F switch** & °C↔°F key is mutually exclusive. (i.e. they cannot use at the same time.)

## 1 Second or 10 Seconds Sampling

Sample rate can be chosen by bonding option:

For 10 seconds temperature sampling period, **1/10s Sampling** =Open.

For 1 second temperature sampling period, **1/10s Sampling** =Close.

## ALARM OPERATIONS

When Temperature exceeds the high temperature alarm value (HIGH) or temperature drops below the low temperature value (LOW), the temperature alarm will be activated and beep tones will be heard at 5 times per minutes. These beep tones repeat until any key is pressed.

## ALARM SIGNAL PINS

6 signal pins are available to trigger external peripheral. The triggering conditions are shown as below:

- Output 6 – it will be changed to VDD when temperature drops below low temperature alarm value. If temperature rises over the low temperature alarm value, it will be changed to GND.
- Output 5 – it will changed to VDD when temperature exceeds high temperature alarm value. If temperature drops below the high temperature alarm value, it will be changed to GND.

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- Output 4 – it will be changed to VDD when temperature exceeds high temperature alarm value or drops below low temperature alarm value. It keeps at VDD unless the measured temperature is fall within the low and high temperature alarm values.
- Output 3 – it will be changed to VDD when temperature drops below low temperature alarm value. Once the pin changed to VDD, it will not be changed to GND unless resetting the IC.
- Output 2 – it will be changed to VDD when temperature exceeds high temperature alarm value. Once the pin changed to VDD, it will not be changed to GND unless resetting the IC.
- Output 1 – it will be changed to VDD when temperature exceeds high temperature alarm value or drops below low temperature alarm value. Once the pin changed to VDD, it will not be changed to GND unless resetting the IC.

### LOW BATTERY DETECTOR

Low battery detector is provided to indicate low battery voltage. When the battery voltage is low, LCD will show a “” icon. Adjust R5 & R6 to in the application circuit define the low battery thershold voltage.

### AUTO POWER OFF

When auto power off function is selected by bonding options, 10 minutes auto-power off is activated. The IC will be turned off if no key is pressed within 10 minutes. When any key is pressed, the IC will be turned on immediately.

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**ABSOLUTE RATINGS**

at Ta = 25°C, VDD = 1.5V

| Parameters                    | Symbol           | Min  | Max     | Unit |
|-------------------------------|------------------|------|---------|------|
| Maximum Supply Voltage        | V <sub>DD</sub>  | -0.3 | +5.5    | V    |
| Maximum Input Voltage         | V <sub>in</sub>  | -0.3 | VDD+0.3 | V    |
| Maximum Output Voltage        | V <sub>out</sub> | -0.3 | VDD+0.3 | V    |
| Maximum Operating Temperature | T <sub>opg</sub> | 0    | 70      | °C   |
| Maximum Storage Temperature   | T <sub>stg</sub> | -25  | 125     | °C   |

**DC ELECTRICAL CHARACTERISTICS**

at Ta = 25°C, VDD = 1.5V

| Parameters          | Symbol           | Min | Typ.                             | Max | Unit |
|---------------------|------------------|-----|----------------------------------|-----|------|
| Operating Voltage   | VDD              | 1.2 | 1.5                              | 1.8 | V    |
| Operating Current   | I <sub>d</sub>   |     | Depends on measuring temperature |     | μA   |
| Standby Current     | I <sub>st</sub>  |     | 3                                |     | μA   |
| LCD Supply Voltage  | V <sub>lcd</sub> |     | 3                                |     | V    |
| LCD Frame Frequency | F <sub>lcd</sub> |     | 32                               |     | Hz   |
| Operating Frequency | F <sub>opg</sub> |     | 32.768                           |     | KHz  |

**Accuracy and Resolution**

| Parameters             |                                             |
|------------------------|---------------------------------------------|
| Measurement Resolution | 0.1° for -19.9 to +199.9°, 1.0° otherwise   |
| Measurement Accuracy   | ± 1.0°C (-10°C to 100°C) , ±2.0°C otherwise |

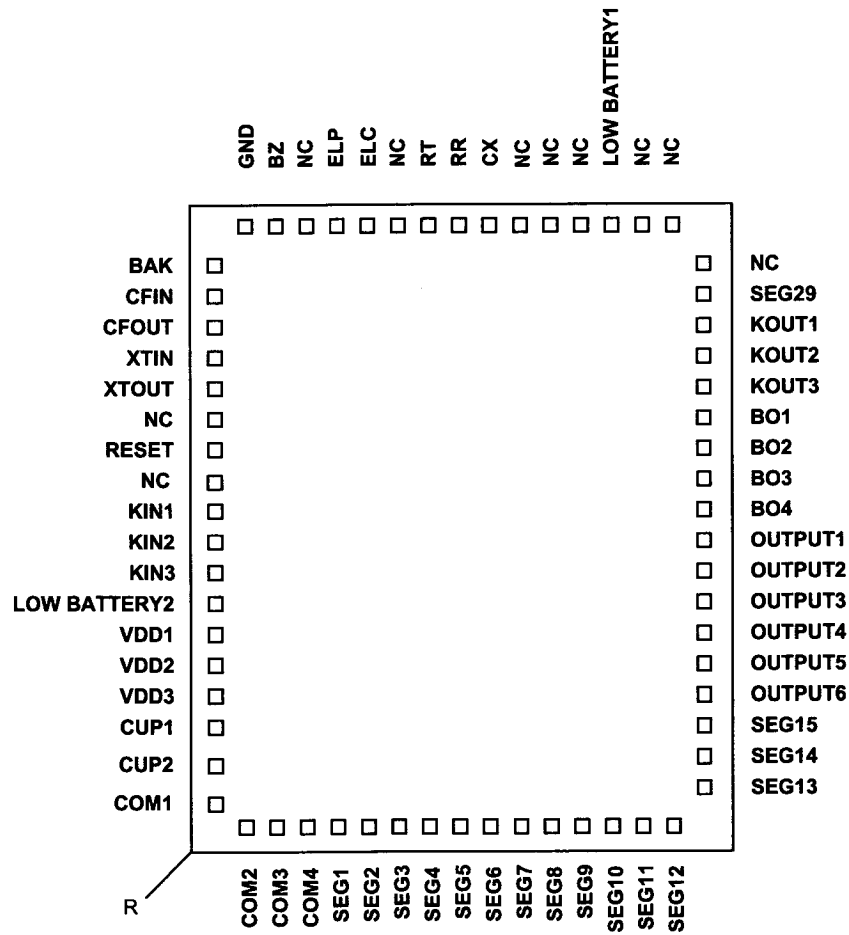
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## CHIP INFORMATION

Chip size 2040 x 2335 ( $\mu\text{m}^2$ ) or 84.65 x 96.45 (mil<sup>2</sup>)  
 Pad size 90 x 90 ( $\mu\text{m}^2$ )  
 Pad pitch min. 115 $\mu\text{m}$

## PIN/PAD DIAGRAM



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**LCD CHARACTERISTICS REQUIREMENT**

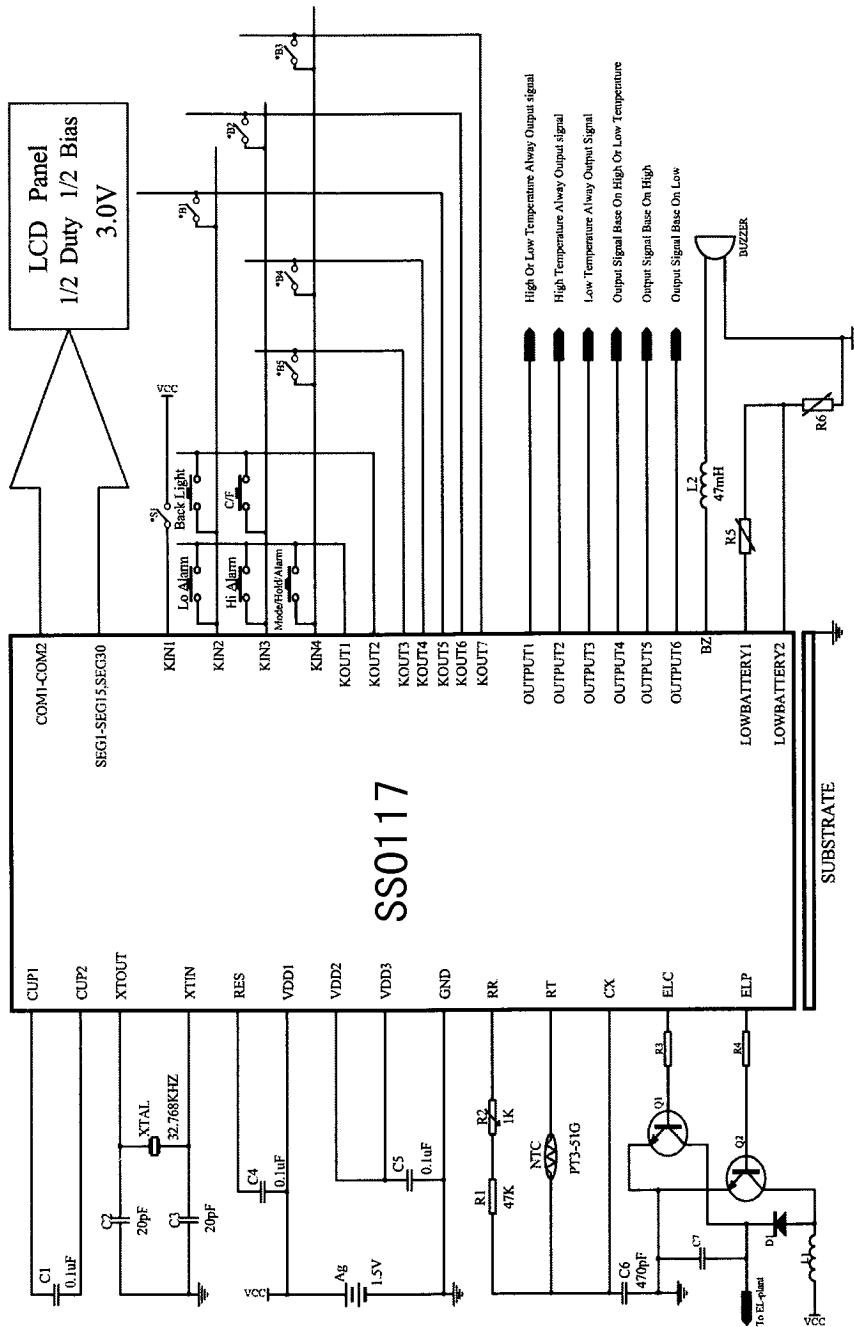
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| Parameters        | Symbol | Min | Typ. | Max | Unit |
|-------------------|--------|-----|------|-----|------|
| Operating Voltage | Vop    |     | 3.0  |     | V    |
| Duty              |        |     | 1/2  |     |      |
| Bias              |        |     | 1/2  |     |      |

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# APPLICATION CIRCUIT I

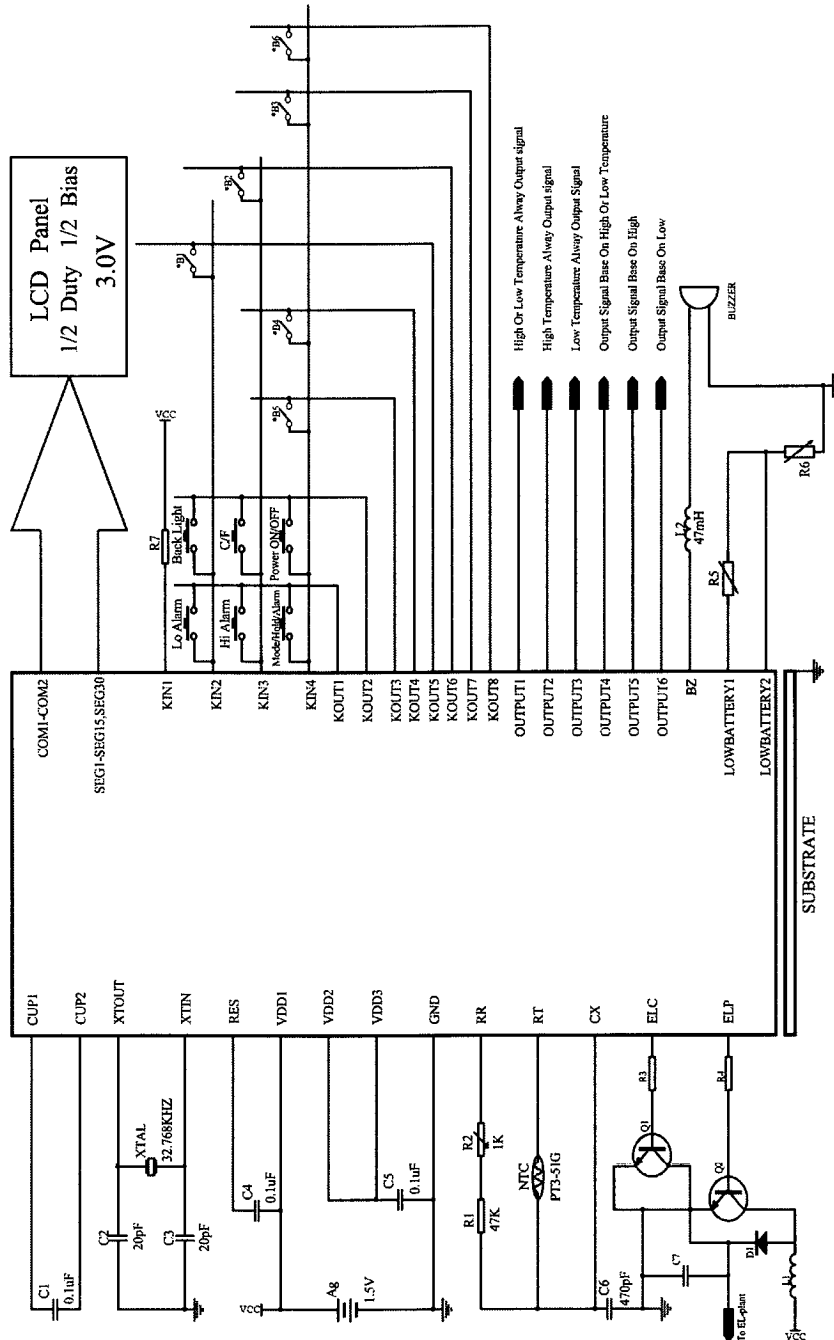


|                 |     |         |                                             |
|-----------------|-----|---------|---------------------------------------------|
| Bonding Option: | *B1 | On/Off: | 1 Second/10 Seconds Sampling                |
|                 | *B2 | On/Off: | F/C Switching Terminal                      |
|                 | *B3 | On/Off: | All Segment Test/Temperature Mode           |
|                 | *B4 | On/Off: | Sample And Hold Function/Normal Temperature |
| State           | *B5 | On/Off: | No False Temperature/Have False Temperature |
|                 | *B6 | On/Off: | Auto Power Off/No Auto Power Off            |

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## APPLICATION CIRCUIT II



N.B. The Auto-power On/Off(B6) is the bonding option

|                 |     |         |                                             |
|-----------------|-----|---------|---------------------------------------------|
| Bonding Option: | *B1 | On/Off: | 1 Second/10 Seconds Sampling                |
|                 | *B2 | On/Off: | F/C Switching Terminal                      |
|                 | *B3 | On/Off: | All Segment Test/Temperature Mode           |
|                 | *B4 | On/Off: | Sample And Hold Function/Normal Temperature |
|                 | *B5 | On/Off: | No False Temperature/Have False Temperature |
|                 | *B6 | On/Off: | Auto Power Off/No Auto Power Off            |
| State           |     |         |                                             |

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**PIN/PAD Assignment**Unit :  $\mu\text{m}$ 

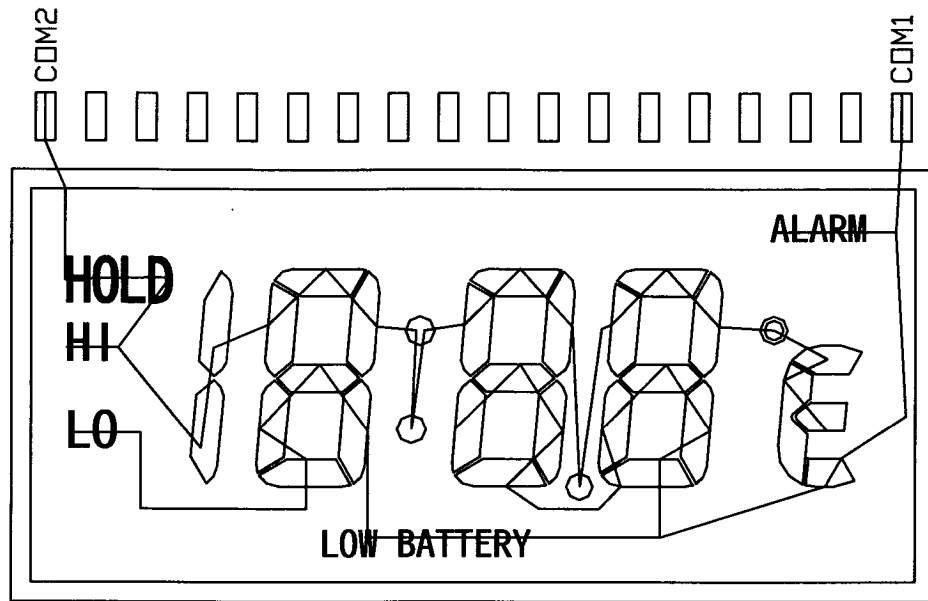
| Pad No. | Pad Name     | Coordinate |        | Pad No. | Pad Name     | Coordinate |        |
|---------|--------------|------------|--------|---------|--------------|------------|--------|
|         |              | X          | Y      |         |              | X          | Y      |
| 1       | BAK          | 70.0       | 2175.0 | 34      | SEG13        | 1970.0     | 160.0  |
| 2       | CFIN         | 70.0       | 2045.0 | 35      | SEG14        | 1970.0     | 290.0  |
| 3       | CFOUT        | 70.0       | 1915.0 | 36      | SEG15        | 1970.0     | 420.0  |
| 4       | XTIN         | 70.0       | 1800.0 | 37      | OUTPUT6      | 1970.0     | 535.0  |
| 5       | XTOUT        | 70.0       | 1685.0 | 38      | OUTPUT5      | 1970.0     | 650.0  |
| 6       | NC           | 70.0       | 1570.0 | 39      | OUTPUT4      | 1970.0     | 765.0  |
| 7       | RESET        | 70.0       | 1455.0 | 40      | OUTPUT3      | 1970.0     | 880.0  |
| 8       | NC           | 70.0       | 1340.0 | 41      | OUTPUT2      | 1970.0     | 995.0  |
| 9       | KIN1         | 70.0       | 1225.0 | 42      | OUTPUT1      | 1970.0     | 1110.0 |
| 10      | KIN3         | 70.0       | 1110.0 | 43      | KOUT8        | 1970.0     | 1225.0 |
| 11      | KIN4         | 70.0       | 985.0  | 44      | KOUT7        | 1970.0     | 1340.0 |
| 12      | LOW BATTERY2 | 70.0       | 880.0  | 45      | KOUT6        | 1970.0     | 1455.0 |
| 13      | VDD1         | 70.0       | 765.0  | 46      | KOUT5        | 1970.0     | 1570.0 |
| 14      | VDD2         | 70.0       | 650.0  | 47      | KOUT4        | 1970.0     | 1685.0 |
| 15      | VDD3         | 70.0       | 535.0  | 48      | KOUT3        | 1970.0     | 1800.0 |
| 16      | CUP1         | 70.0       | 420.0  | 49      | KOUT2        | 1970.0     | 1915.0 |
| 17      | CUP2         | 70.0       | 290.0  | 50      | KOUT1        | 1970.0     | 2045.0 |
| 18      | COM1         | 70.0       | 160.0  | 51      | SEG30        | 1970.0     | 2175.0 |
| 19      | COM2         | 200.0      | 70.0   | 52      | NC           | 1840.0     | 2265.0 |
| 20      | COM3         | 330.0      | 70.0   | 53      | NC           | 1710.0     | 2265.0 |
| 21      | COM4         | 445.0      | 70.0   | 54      | LOW BATTERY1 | 1595.0     | 2265.0 |
| 22      | SEG1         | 560.0      | 70.0   | 55      | NC           | 1480.0     | 2265.0 |
| 23      | SEG2         | 675.0      | 70.0   | 56      | NC           | 1365.0     | 2265.0 |
| 24      | SEG3         | 790.0      | 70.0   | 57      | NC           | 1250.0     | 2265.0 |
| 25      | SEG4         | 905.0      | 70.0   | 58      | CX           | 1135.0     | 2265.0 |
| 26      | SEG5         | 1020.0     | 70.0   | 59      | RR           | 1020.0     | 2265.0 |
| 27      | SEG6         | 1135.0     | 70.0   | 60      | RT           | 905.0      | 2265.0 |
| 28      | SEG7         | 1250.0     | 70.0   | 61      | KIN2         | 790.0      | 2265.0 |
| 29      | SEG8         | 1365.0     | 70.0   | 62      | ELC          | 675.0      | 2265.0 |
| 30      | SEG9         | 1480.0     | 70.0   | 63      | ELP          | 560.0      | 2265.0 |
| 31      | SEG10        | 1595.0     | 70.0   | 64      | NC           | 445.0      | 2265.0 |
| 32      | SEG11        | 1710.0     | 70.0   | 65      | BZ           | 330.0      | 2265.0 |
| 33      | SEG12        | 1840.0     | 70.0   | 66      | GND          | 200.0      | 2265.0 |

N.B : The Substrate must be connected to GND

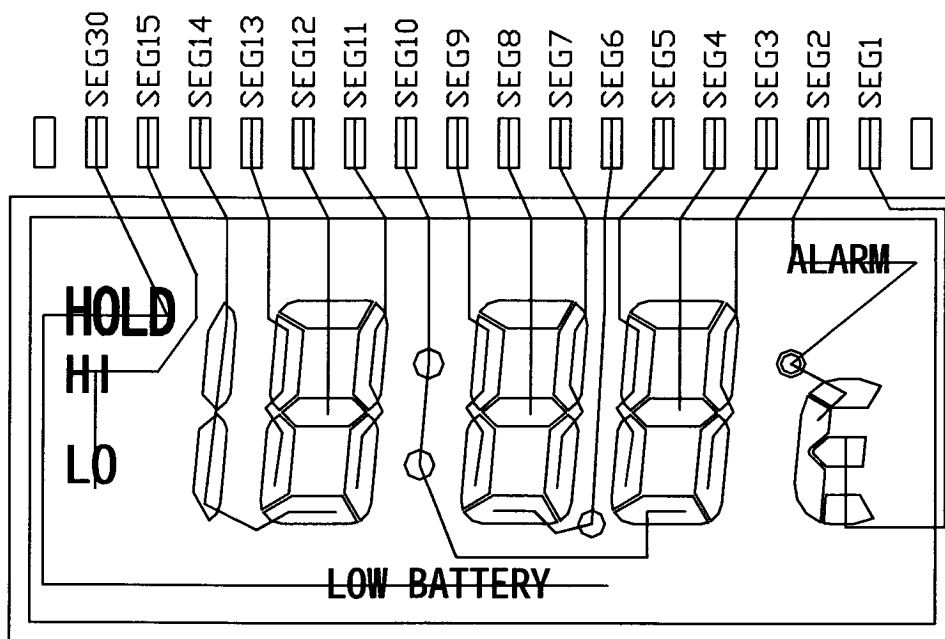
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**LCD Layout**



Common



Segments

欢迎索取免费详细资料、设计选型指南和光盘、样品；产品繁多未能尽录，欢迎来电查询。

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