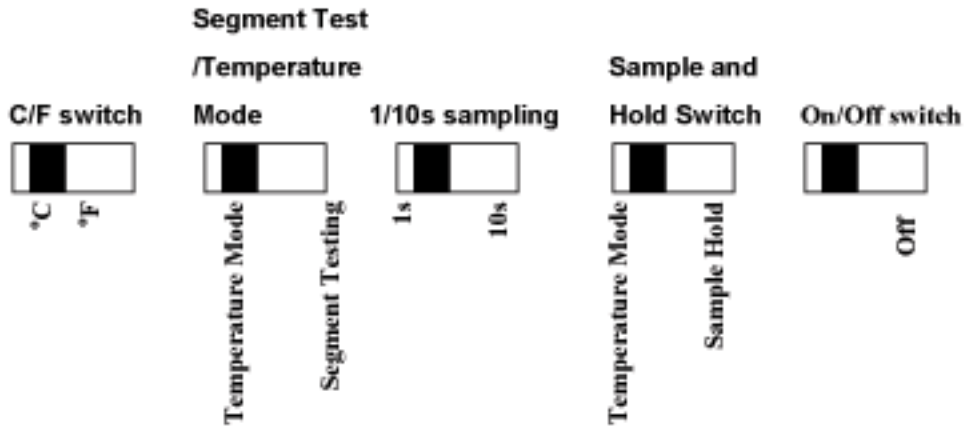
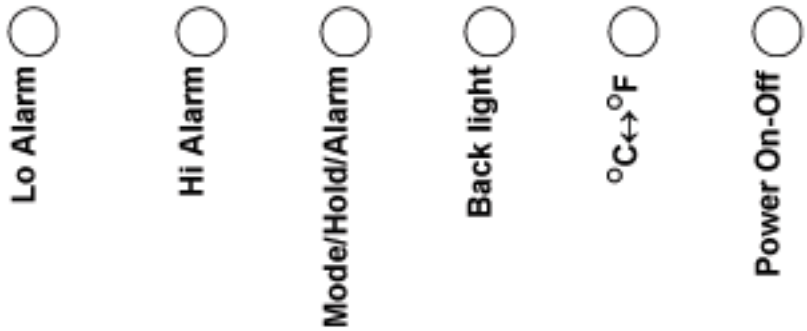
SS0117

Wide Range Thermometer
–50°C to +150°C (-58°F to +302°F)





FEATURES:

- 1.5V battery operation with very low power consumption
- High and Low temperature alarms
- Selectable 1 second and 10 seconds temperature sampling rate
- Temperature data hold function
- Measurement ranging from –50°C to +150°C (-58°F to +302°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 range from –50°C to +150°C (-58°F to +302°F). The temperature is displayed on a 3½-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.

Keys and Switches:

Bonding Options	Descriptions
Auto Power Off	Available = Close Unavailable = Open

Slide Switches	Descriptions	
C/F switch	°F = Closed	°C = Open
Segment Test / Temperature Mode	All segment Testing = Close	Temperature Mode = Open
1/10s Sampling	1 second sampling = Close	10 seconds sampling = Open
Sample and Hold switch	Hold = Close	Sample = Open
On/Off switch	On =Close	Off = Open

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

Function Description:

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.

Sample and Hold

The **Sample/Hold switch** and the **Mode/Hold/Alarm key** are used to change the mode the thermometer. When the **Sample/Hold switch** is closed, the temperature reading is hold and the hold icon will be displayed to indicate this mode. No other keys are activated except the C/F key and Power On/Off key. When the **Sample/Hold switch** is open, the thermometer is

	sampling the temperature. The Sample/Hold/Alarm key is used to change the mode between Hold and Sample. It also used to activate the alarm function.
All segment tests	All segments on LCD are turned on, when **Segment Test /Temperature Mode switch** is slid to All Segment Test Mode.
Alarm on – off	Holding the **Low Alarm key** or **High Alarm Key** and pressing **Mode/Hold/Alarm** 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 **High Alarm key** 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 **Low Alarm key** 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 **Back Light key** is pressed.

Mode Description:

1. Temperature Mode

- The temperature mode is sampling the temperature and display the temperature between –50° C to +150 ° C. The "EEE" will be display when the temperature is out of this range.
- Press **Low Alarm key** or **High Alarm key** to enter Low Temperature Alarm Mode or High Temperature Alarm Mode respectively. At this time, low Alarm or high Alarm is activated.
- Press **Mode/Hold/Alarm key** to enter to Sample and Hold Mode. At this time, °C or °F's icon is flashing to indicate the hold mode. To return to the Temperature Mode, simply press **Mode/Hold/Alarm key** once.

- Press **Back Light key** to turn on back light and last for 5 seconds.
- Press **Power On-Off key** to enter sleep mode. Press any keys to wake it up.

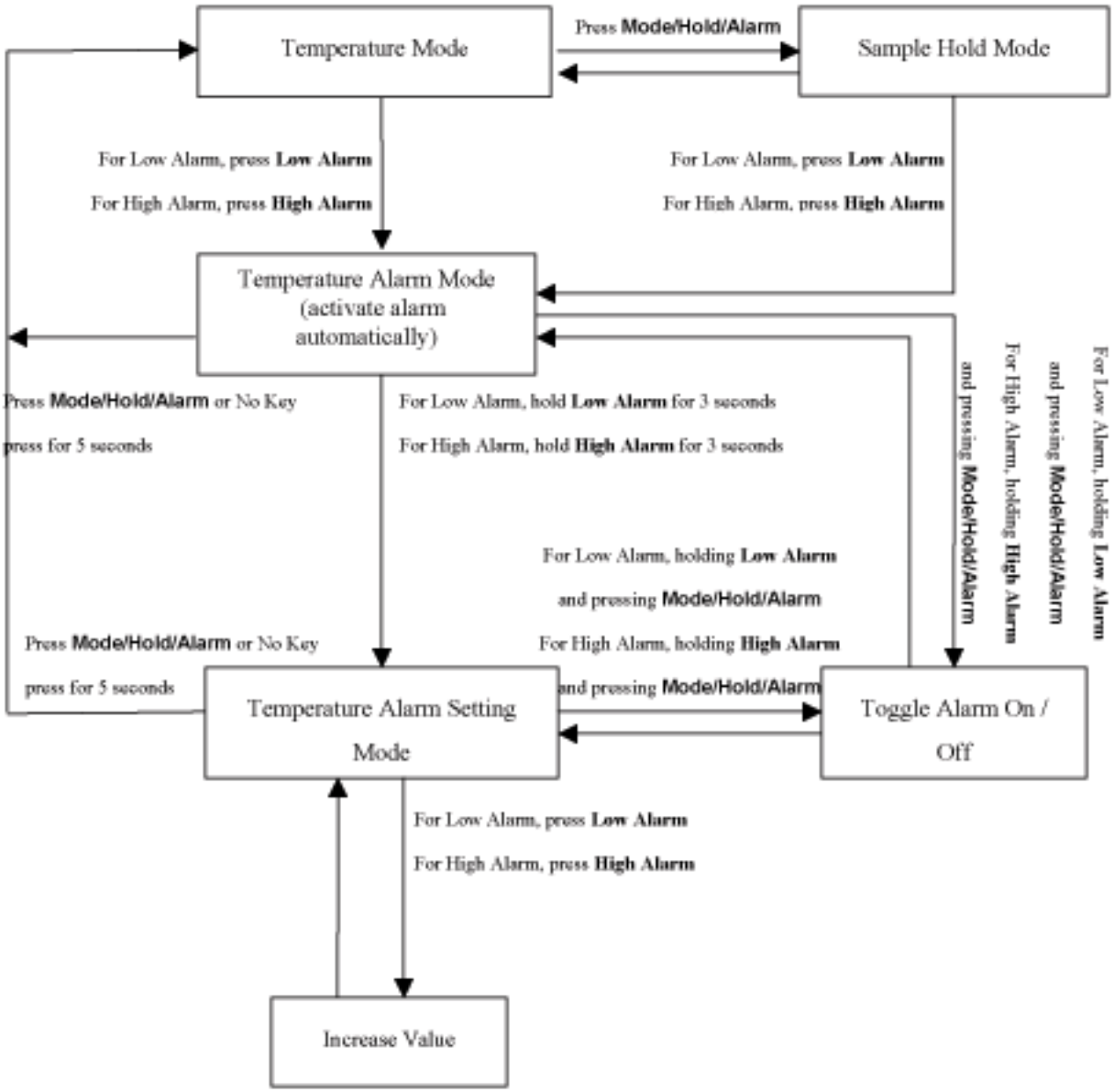
2. Low Temperature Alarm Mode

- Press and hold **Low Alarm key** to enter to Low Temperature Alarm Setting Mode.
- In this mode, press **Low Alarm key** to increase the alarm setting value. The setting value will increase at 8Hz rate when **Low Alarm** key is held for 1-2 seconds.
- Press **Mode/Hold/Alarm key** to exit Temperature Alarm Setting Mode.
- To deactivate the temperature alarm: holding **Low Alarm key** and press the **Mode/Hold/Alarm key** at the same time.

3. High Temperature Alarm Mode

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

Mode Operation:



4. °C / °F interchange

- We have 2 methods to interchange °C and °F:
  1. C/F set for default unit by bonding option.
  2. The C/F switch as a C/F interchange slide switch by user.
- The **C/F switch** & **°C↔°F** key is mutually exclusive.

5. 1 Second or 10 Seconds Sampling

- The 1s/10s Sampling rate can be chosen by bonding option.

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.

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 threshold voltage. The following table is the values of R5 and R6 and their corresponding low battery voltage (for reference only).

Low Battery Voltage	R5	R6
1.35	10k	22k
1.27	10k	27k
1.2	10k	33k

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.

ABSOLUTE RATINGS:

at Ta = 25°C (R1= 50k), VDD = 1.5V

Parameters	Symbol	Min	Max	Unit
Maximum Supply Voltage	V_{DD}	-0.3	+5.5	V
Maximum Input Voltage	V_{in}	-0.3	VDD+0.3	V
Maximum Output Voltage	V_{out}	-0.3	VDD+0.3	V
Maximum Operating Temperature	T_{opg}	0	70	°C
Maximum Storage Temperature	T_{stg}	-25	125	°C

DC ELECTRICAL CHARACTERISTICS

at Ta = 25°C (R1= 50k) , VDD = 1.5V

Parameters	Symbol	Min	Typ.	Max	Unit
Operating Voltage	VDD	1.2	1.5	1.8	V
Operating Current	Id		Depends on measuring temperature		µA
Standby Current	Ist		3		µA
LCD Supply Voltage	Vlcd		3		V
LCD Frame Frequency	Flcd		32		Hz
Operating Frequency	Fopg		32.768		KHz

Accuracy and Resolution

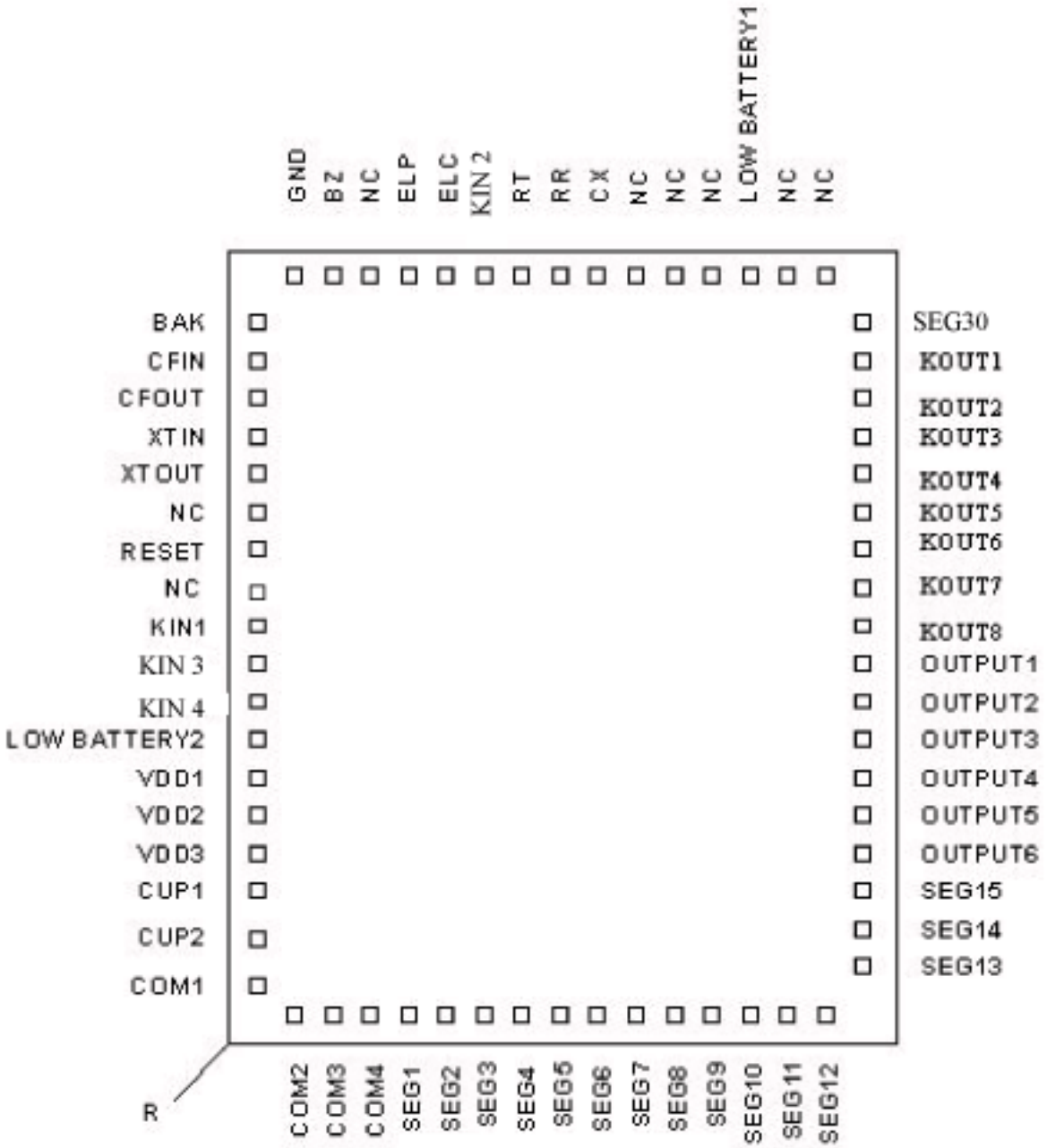
Parameters	
Measurement Resolution	0.1° for –9.9 to +150.0° , 1.0° otherwise
Measurement Accuracy	± 1.0°C (-10°C to 100°C) , ±2.0°C otherwise

LCD CHARACTERISTICS REQUIREMENT

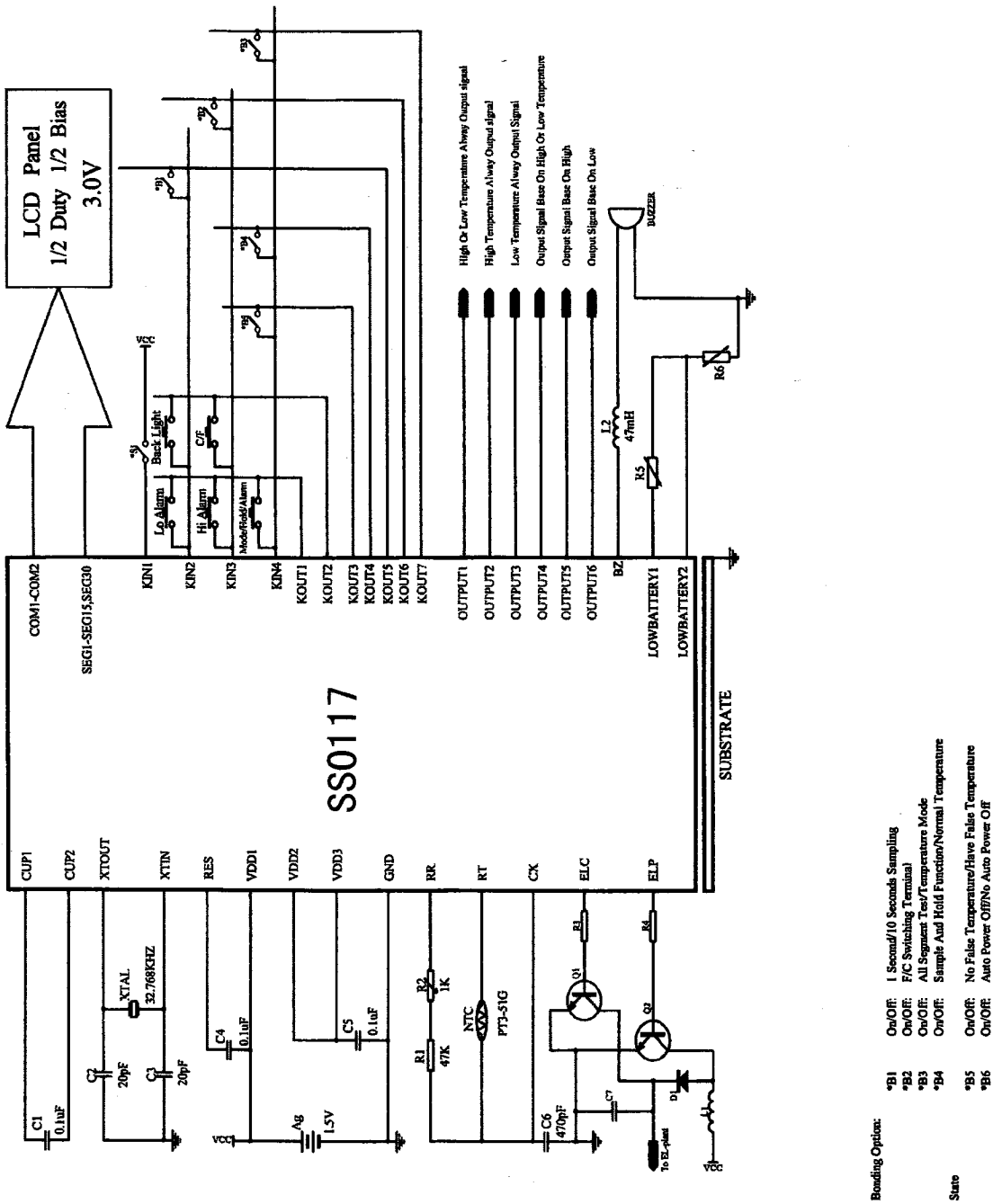
Parameters	Symbol	Min	Typ.	Max	Unit
Operating Voltage	Vop		3.0		V
Duty			1/2		
Bias			1/2		

CHIP INFORMATION

Chip size	2040 x 2335 (μm^2)	or	84.65 x 96.45 (mil^2)
Pad size	90 x 90 (μm^2)		
Pad pitch	min. 115μm		



APPLICATION CIRCUIT I



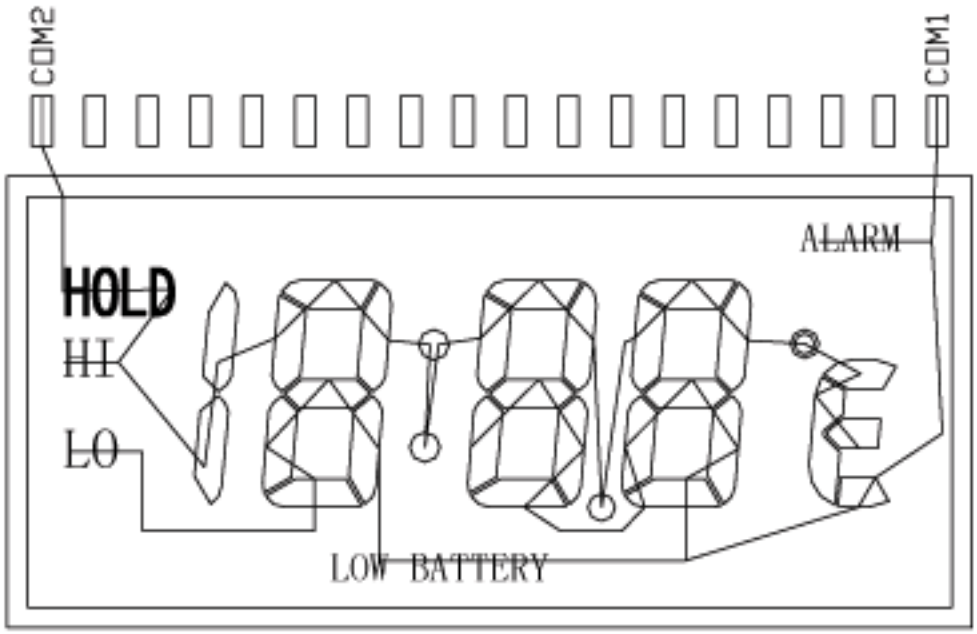
PIN/PAD Assignment

Unit : μm

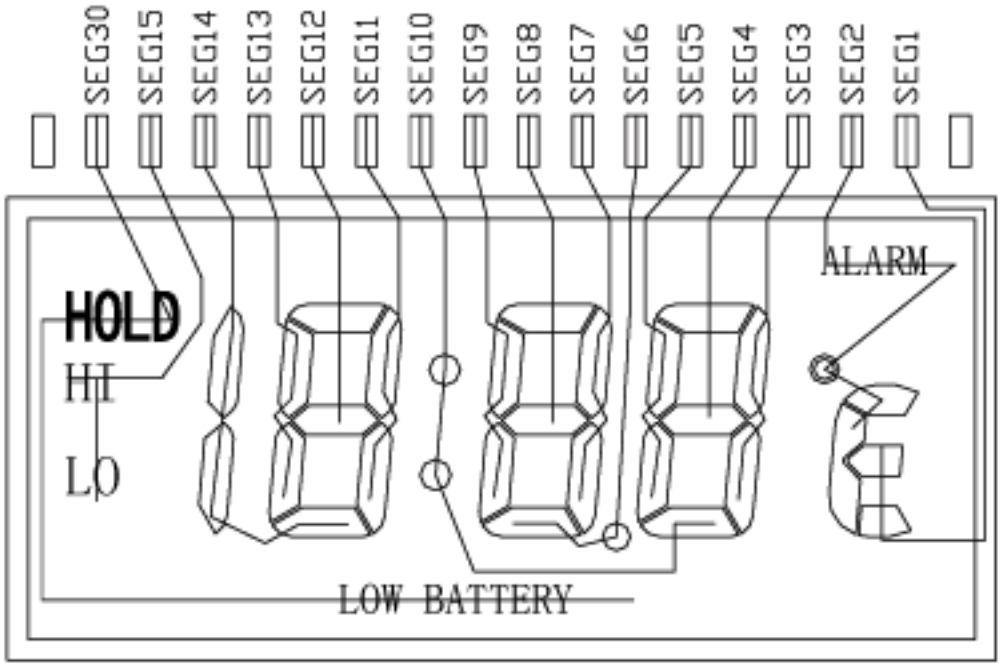
Pad No.	Pad Name	Coordinate X	Coordinate Y	Pad No.	Pad Name	Coordinate X	Coordinate Y
1	BAV	70.0	2175.0	34	SEG13	1970.0	160.0
2	CFIN	70.0	2045.0	35	SEG14	1970.0	290.0
3	CFOUT	70.0	1915.0	36	SEG15	1970.0	420.0
4	XTIN	70.0	1800.0	37	OUTPUT6	1970.0	535.0
5	XTOUT	70.0	1685.0	38	OUTPUT5	1970.0	650.0
6	NC	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	996.0
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	FLC	675.0	2265.0
30	SEG9	1480.0	70.0	63	FLP	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

LCD Layout



Common



Segments

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