# 3.5 Digit Count Down/Up Timer and Watch C6003

## GENERAL DESCRIPTION

C6003 is a 3.5 digits count-down/up timer with watch CMOS LSI circuit. It can directly drive a 3.5 digits biplexed LCD and alarm piezoelectric buzzer. The maximum count-down time is 20 hours and count-up cycle time is 20 hours, but LCD normally displays a maximum period of count-up time 19 minuets and 59 seconds.

C6003 can be widely applied as a parking timer, an alarm timer, a pill box timer, a kitchen timer, a sports timer, etc.

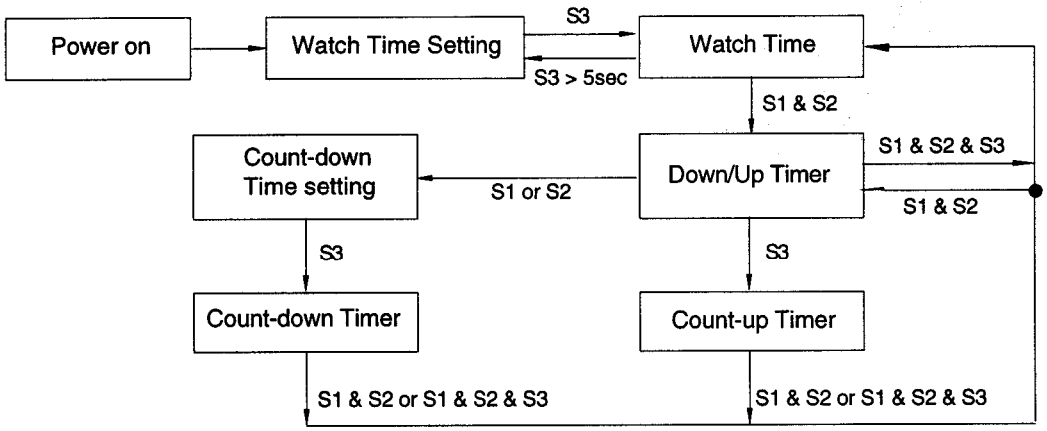
## FUNCTION

- 3.5 digits LCD display count-down/up timer with watch function.
- Watch time display in count-down/up timer mode.
- Maximum count-down time 20 hours with the accuracy of 1 second.
- 5 minutes /10 minutes pre-alarm before count-down to zero.
- Buzzer output and DC output. "BUSY" output keeps high during timer counting.
- Auto recycle or manual re-set the count-down timer by "OP" option. When "OP" floated, it will auto recycle; when "OP" connected to Vdd, it will have to be manual re-set.
- Hours and minutes set independently
- Fast setting hour or minute by depressing key S1 or S2 continuously for 2 seconds
- 20 minutes count-up cycle time with maximum count-up time 20 hours
- Timer reset when two keys S1 & S2 depressed simultaneously

## FEATURES

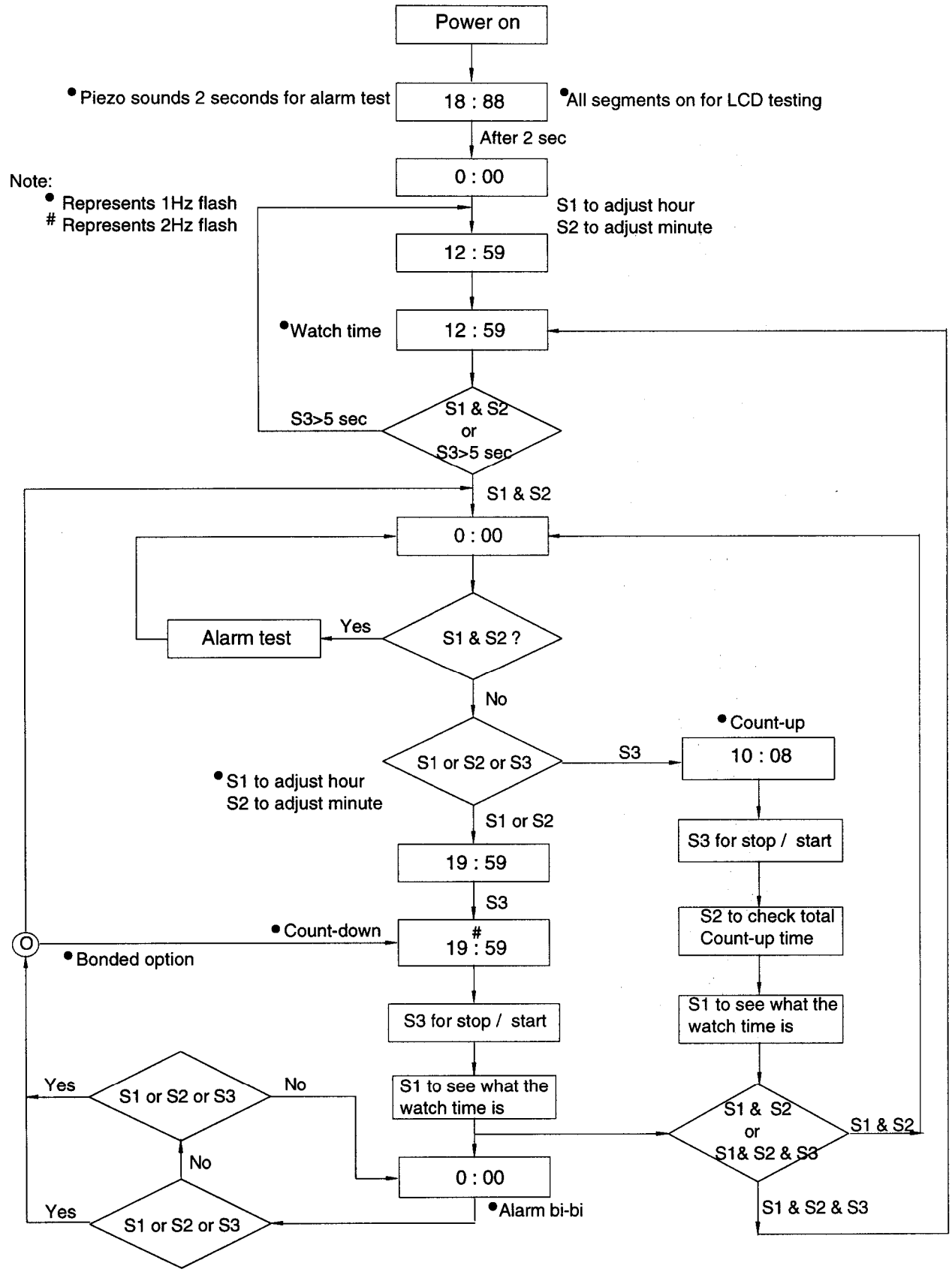
- Single 1.5V battery operation
- 32768Hz quartz crystal oscillator
- 3.5 digits LCD display
- An internal voltage doubler
- LCD test and alarm sound test
- Fast testing mode for production
- CMOS structure and low power consumption

## OPERATION SEQUENCE



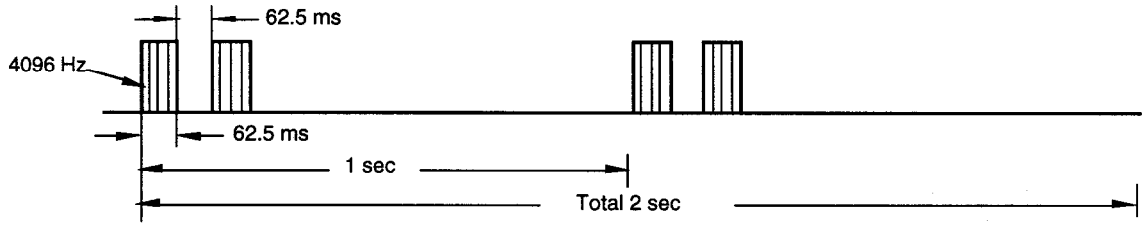

Notes:
1. S1 for Hour and S2 for Minute setting.
2. S3 to Start/Stop the timer.
3. S3 > 5 seconds into the watch time setting mode.
4. S1 & S2 to reset the timer to the initial state (0:00).
5. S1 & S2 & S3 to return to the watch mode.

## OPERATIONAL FLOW CHART

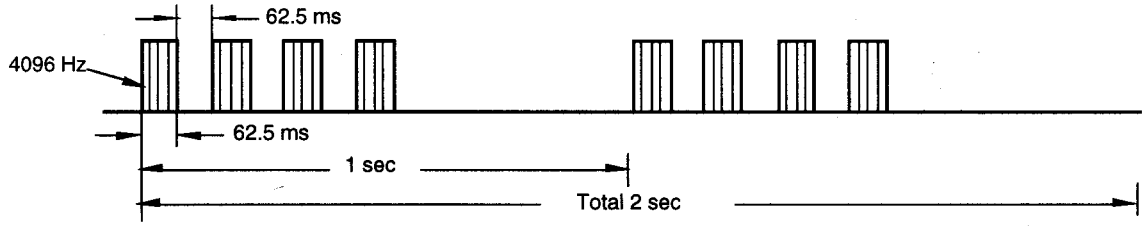


## OUTPUT WAVEFORM

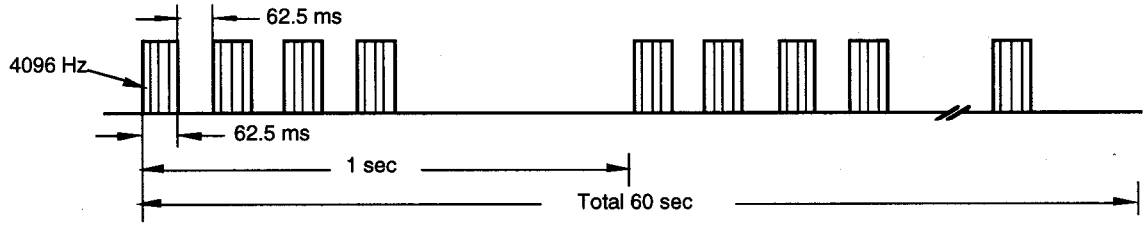
10 minutes before count-down time is over



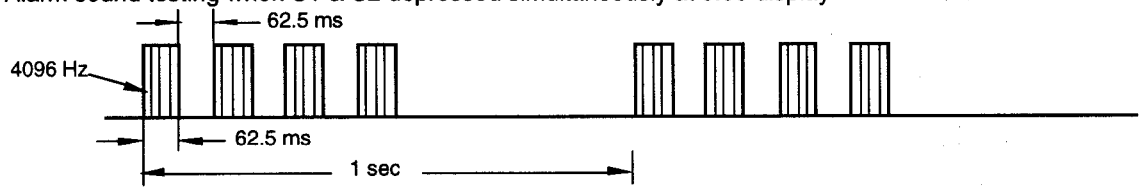

5 minutes before count-down time is over




Count-down time is over

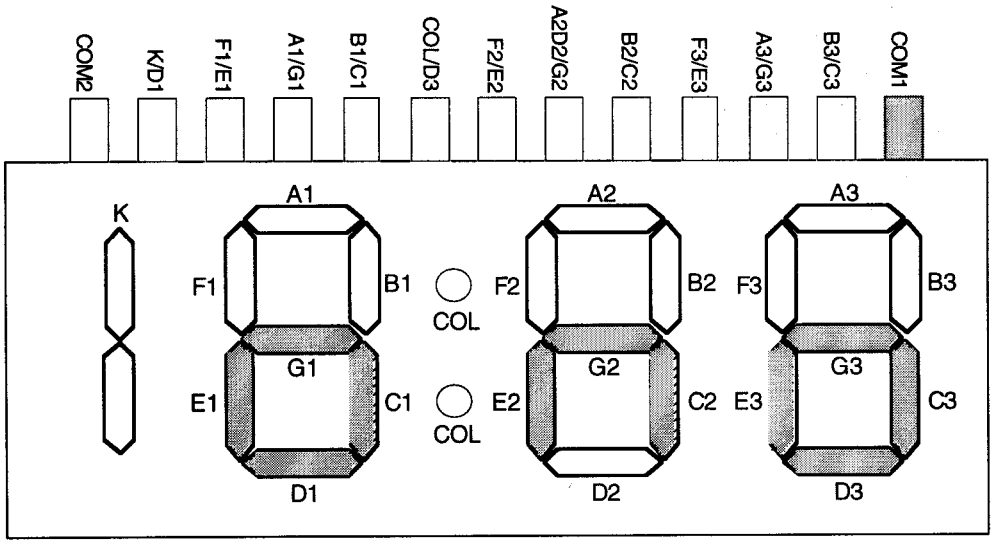



Alarm sound testing when S1 & S2 depressed simultaneously at 0:00 display




Timer busy flag output


## LCD FORMAT



## PAD DESCRIPTION

| Pad No. | Pad Name | I/O | Description |
|---|---|---|---|
| 1 | S3 | I | Input to start/stop the timer |
| 2 | S2 | I | Input for minute setting |
| 3 | S1 | I | Input for hour setting |
| 4 | VEE | - | Negative voltage supply for LCD display |
| 5 | CAP2 | O | For voltage doubling capacitor |
| 6 | CAP1 | O | For voltage doubling capacitor |
| 7 | COM1 | O | Common 1 drive |
| 8 | BC3 | O | Segment drive |
| 9 | AG3 | O | Segment drive |
| 10 | FE3 | O | Segment drive |
| 11 | BC2 | O | Segment drive |
| 12 | ADG2 | O | Segment drive |
| 13 | FE2 | O | Segment drive |
| 14 | COD3 | O | Segment drive |
| 15 | BC1 | O | Segment drive |
| 16 | AG1 | O | Segment drive |
| 17 | FE1 | O | Segment drive |
| 18 | KD1 | O | Segment drive |
| 19 | COM2 | O | Common 2 drive |
| 20 | OSC1 | I | Oscillator input |
| 21 | OSC2 | O | Oscillator output |
| 22 | BUSY | O | Timer busy flag, active high |
| 23 | T2 | I/O | Chip test pin |
| 24 | T1 | I/O | Fast-test control pin |
| 25 | VSS | - | Negative power supply |
| 26 | VDD | - | Positive power supply |
| 27 | OP | I | Option pin for countdown recycle |
| 28 | BZ | O | Buzzer drive |
| 29 | BZB | O | Buzzer drive |

## TESTING MODE FOR PRODUCTION

LCD and Alarm Sound Testing:

When power is turned on, all the LCD segments are illuminated to display "18:88" and the alarm sounds for 2 seconds.

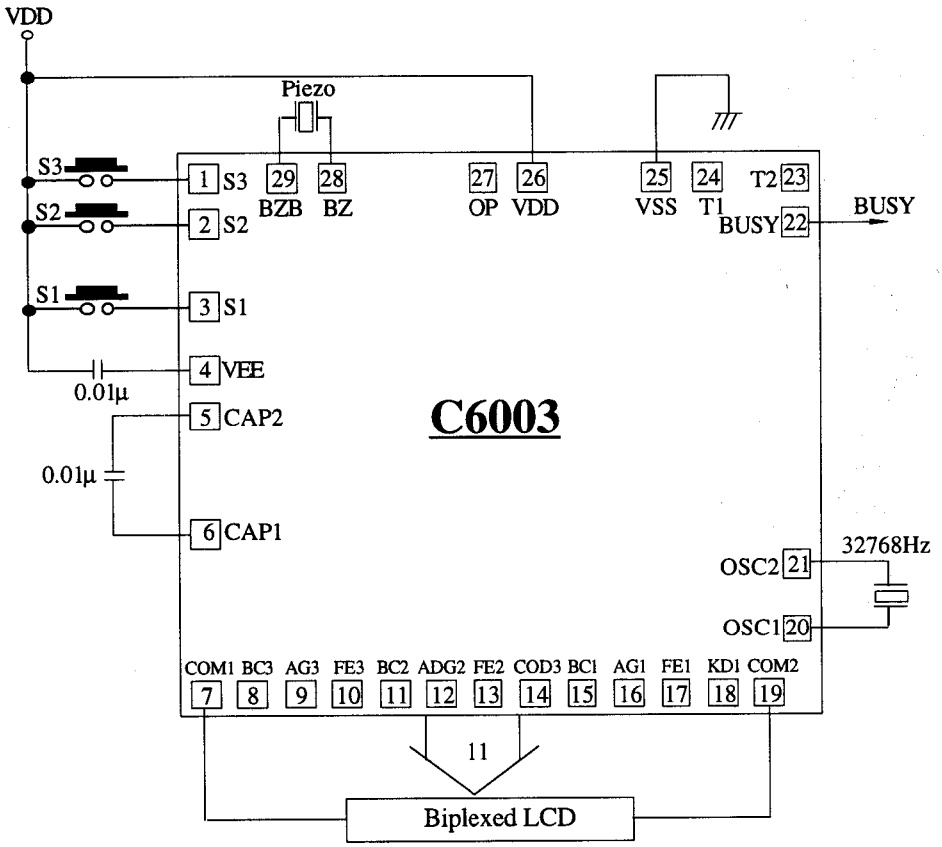
In addition, in count-down/up timer mode, depressing S1 & S2 simultaneously resets timer to the initial state (LCD displaying 0:00). In this case, the alarm sound also can be tested by depressing S1 & S2 at the same time. The alarm sound with the waveform shown in the diagram "OUTPUT WAVEFORM" wouldn't stop until S1 or S2 key is released.

## DC ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25°C, $V_{DD}$ = 1.5V, $V_{SS}$ = 0V, Fosc = 32768Hz)

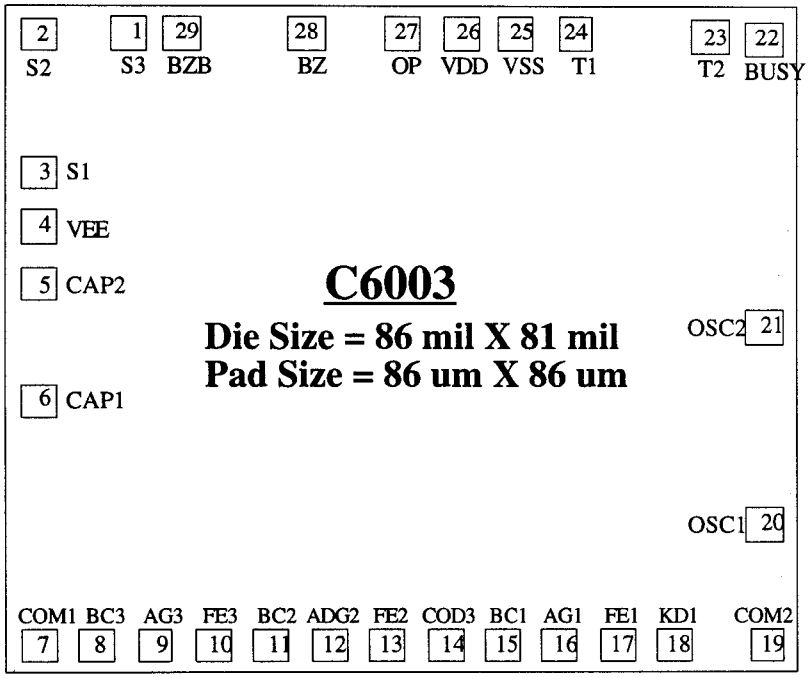
| Characteristics | Symbol | Min. | Typ. | Max. | Unit | Test Condition | |
|---|---|---|---|---|---|---|---|
| | | | | | | $V_{DD}$ | Condition |
| Supply Voltage | $V_{DD}$ | 1.25 | 1.5 | 1.7 | V | 1.5V | - |
| Display Voltage | $V_{EE}$ | -1.2 | -1.5 | -1.7 | V | 1.25~1.7V | - |
| Osc Starting Voltage | $V_{STR}$ | 1.35 | - | - | V | - | Within 3 secs |
| Alarm Output Drive Current | $I_{OHA}$ | -500 | - | - | μA | 1.5V | $V_{OH}$ = 1.35V |
| Alarm Output Frequency | $F_{OUT}$ | - | 4096 | - | Hz | 1.5V | - |
| Busy Flag Output Drive Current | $I_{OHF}$ | -500 | - | - | μA | 1.5V | $V_{OH}$ = 1.35V |

## APPLICATION CIRCUIT




**NOTE:** Substrate should be connected to VDD.

## PAD DIAGRAM




### The Co-ordinate for Low Left Corner of Each Pad

| | | |
|---|---|---|
| COM1 (-978.3, -938.6) | OSC1 ( 917.7, -623.6) | VEE (-1003.7, 356.5) |
| BC3 (-837.3, -938.6) | OSC2 ( 917.7, -84.0) | CAP2 (-1003.7, 214.7) |
| AG3 (-686.6, -938.6) | BUZY ( 917.7, 852.5) | CAP1 (-1003.7, -118.3) |
| FE3 (-536.1, -938.6) | T2 ( 763.7, 852.5) | |
| BC2 (-385.4, -938.6) | T1 ( 464.9, 852.5) | |
| ADG2 (-234.9, -938.6) | VSS ( 316.3, 852.5) | |
| FE2 ( -84.2, -938.6) | VDD ( 150.0, 852.5) | |
| COD3 ( 66.3, -938.6) | OP ( -1.1, 852.5) | |
| BC1 ( 217.0, -938.6) | BZ ( -254.5, 852.5) | |
| AG1 ( 367.5, -938.6) | BZB ( -613.3, 852.5) | |
| FE1 ( 518.2, -938.6) | S3 ( -764.6, 852.5) | |
| KD1 ( 668.7, -938.6) | S2 (-1003.7, 852.5) | |
| COM2 ( 917.7, -938.6) | S1 (-1003.7, 508.0) | |