

1. GENERAL DESCRIPTION

The SS0804 is an UP/DOWN timer IC. It can directly drive a standard 4 digit 1/4 duty cycle LCD. Maximum countdown time is 79:59 or 99:59. Count up cycle time is 60 or 100 minutes by bonding option. Also bonding option is for alarm time 32 or 64 seconds, 2kHz, and up/down or just down function. Feasible input options and universal functions give this chip many uses such as parking alarm timer, pillbox timer, kitchen timer, etc.

1.1 FUNCTIONS

- Special alarm trigger output for switch control or for driving another melody IC
- Internal voltage doubler
- 32,768Hz quartz crystal time base
- Single 1.5V battery operation
- Direct drive buzzer

1.2 FEATURES

- 4 digit LCD display
- Maximum count 79:59 min or 99:59 min (bonding option)
- Just count-down timer repeat function by bonding option
- Minutes and Seconds set independently
- Timer reset when depressing MSET and SSET simultaneously
- Alarm sound 2kHz, 32 or 64 second (bonding option)

2. ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V _{CC} - V _{SS}	-0.3 ~ 5.0	V
Input Voltage	V _{IN}	V _{SS} - 0.2 to V _{CC} + 0.3	V
Operating Temperature	T _A	- 20 ~ + 60	°C
Storage Temperature	T _{stg}	- 55 ~ + 125	°C

3. ELECTRICAL CHARACTERISTICS

(T_a = 25°C, V_{SS} = 0V, V_{CC} = 1.5V, F_{OSC} = 32768 Hz; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V _{CC}		1.25	1.5	1.70	V
Display Voltage	V _{DD}		2.4	3.0	3.4	V
Supply Current	I _{CC}	Without Load		3.0	5.0	μA
Output Drive Current (BD, TRIG Output)	I _{OH}	V _{OH} = 1.35V (TRIG Output)	-500			μA
		V _{OL} = 0.15V (TRIG Output)	500			μA
	I _{OL}	V _{OL} = 0.5V (BZ Output)	5	10		mA
Frequency Stability	Δf/f	V _{CC} = 1.25V to 1.70V			10	ppm
Oscillator Built-in Capacitor	CD			20		pF
Alarm Output Frequency	F _{BZ}		2048 x 4 x 1			Hz
Oscillator Start up Time	T _{OS}	V _{CC} = 1.30V			2	sec

4. PIN DESCRIPTION

4.1 SSET - Second Setting Input

This pin sets the seconds time for countdown mode. The setting function will only be effective when the countdown mode has been stopped or reset. If this pin is pulled high with the MSET pin simultaneously, the Timer will be reset. This pin has been internally pulled low.

4.2 MSET - Minute Setting Input

This pin sets minute time for the countdown mode. Like the HSET pin, the minute setting function can be carried out only when the countdown mode has been stopped or reset. This pin is used, with the SSET pin, to execute the reset function. It has been internally pulled low.

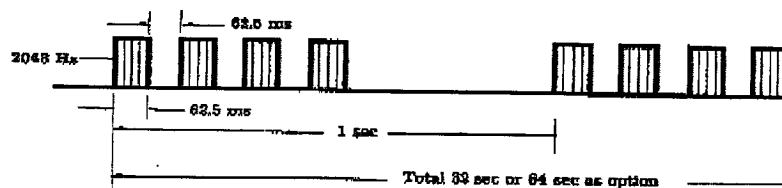
4.3 START/STOP - Start or Stop Input

This pin acts as Start/Stop function for the Up/Down timer. After power-on or reset, the Timer will be in a stop state. When it is triggered, the Timer will be enable, and another trigger will stop the Timer. It has been internally pulled low.

NOTE: The short alarm signal, 62.5ms is sounded when any input beep will be pressed.

4.4 BD - Alarm Output

This pin used to drive the piezo buzzer or speaker is external transistor. BD output signal will be as follows when the countdown time reaches zero.



The above alarm signals will be stopped if any key is triggered during this time period.

4.5 TRIG - Trigger Output

This output pin sends out a low level signal in normal condition, including countdown, count-up and standby. If countdown time reaches zero, a high level output appears in this 32 or 64 sec alarm interval; then goes back to low level while alarm stops or any key is pressed.

4.6 V_{DD} , V_{SS} & V_{CC}

V_{DD} - voltage doubler supply for LCD driving

V_{SS} - ground

V_{CC} - power pins for positive power supply

4.7 CAP1 & CAP2 - Voltage Doubler Capacitor

A capacitor should be connected between these pins.

4.8 OSCI & OSCO - Oscillator Input and Output

A 32,768Hz quartz crystal oscillator is connected to these pins.

4.9 SEG1 - SEG8 (LCD Segments Driving Pins)

4.10 COM1 - COM4 (LCD Backplane Pins)

4.11 TEST1 - TEST2 (Test Input Pins)

4.12 OPT1 (Bonding option for alarm time)

The alarm time will be 32 sec when this pin is disconnected and 64 sec when this pin is connected to V_{SS} .

4.13 OPT2 (Bonding option for up/down or input down)

The up/down mode will be up when this pin is disconnected and down just mode when this pin is connected to V_{SS} .

4.14 OPT3 (Bonding option for maximum count)

When it is disconnected the maximum MINUTE count is 99:59 and when it is connected to V_{SS} , the maximum MINUTE count is 79:59.

5. FUNCTIONAL DESCRIPTION

5.1 Countdown Timer Mode

1. After power-on, LCD will display 00:00.
2. Time is set by the SSET and MSET pins. Time setting is only effective in this mode and the timer must be in the stop or reset state. Each depression of these pins will make the timer count advance one digit and if it is depressed more than one second, the timer will count one digit for every 1/8 second. The second and minute setting are independent. Colon will be on but not flash during the setting.
3. The timer will reset to 00:00, if SSET and MSET are depressed simultaneously.
4. After the time has been set, triggering the START/STOP pin will start the timer and colon will begin to flash (0.5 sec on, 0.5 sec off).
5. When the timer is counting, it will be stopped by triggering off any key pin. When the timer is stopped by pressing MSET or SSET key, the preset time will be the time of last pressing one of this keys. In this stop state, the colon will be on, but not flash. The timer can also be set during this state. An additional trigger to START/STOP will terminate this state and start to count from the time which it displays.
6. When countdown time is reached, the LCD displays 00:00 and the colon will be on but not flash. At this moment, BD will send out a 2048 x 8 x 1Hz signal for 32 second (or 64 sec by bonding option). During this alarm period, depress any pin will stop the output.
7. When the countdown timer reaches zero and the alarm signal ends (32 or 64 sec), the LCD will be returned to preset time. If alarm signal is stopped by depressing START/STOP, the LCD will be returned to preset time. If alarm is stopped by the SSET or MSET pin, the LCD displays 00:00 and then depressing START/STOP pin will be returned the LCD to preset time.

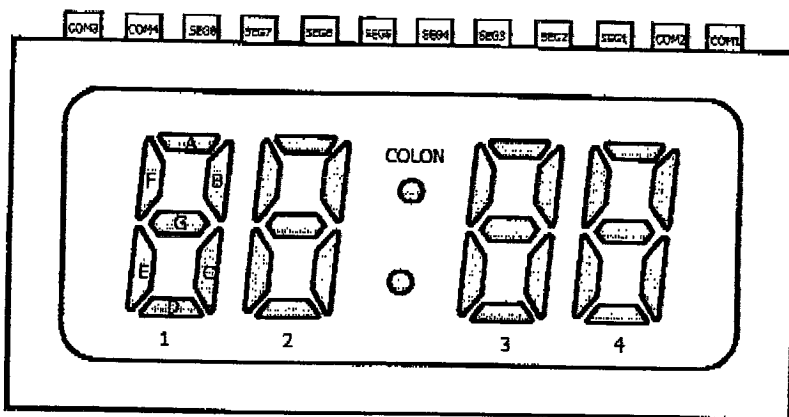
5.2 Countup Timer Mode

1. The count-up timer will be triggering START/STOP start only when the chip has been reset and powered on without a set time. The countup timer will start by triggering Start/Stop after reset.
2. The countup timer has a cyclical count of 59 minutes (or 99 minutes by bonding option) after being started.
3. While the countup timer is counting, depressing the any key will stop it. Another trigger of START/STOP will start the timer continuously counting.
4. When the chip is in count up timer mode, the chip can change to count down timer mode after the countup timer is stopped by any key and then preset by MSET and SSET.

4-DIGIT COUNTDOWN/UP TIMER

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6. LCD FORMAT



	SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1
COM1	A1	B1	A2	B2	A3	B3	A4	B4
COM2	F1	G1	F2	G2	F3	G3	F4	G4
COM3	E1	C1	E2	C2	E3	C3	E4	C4
COM4	-	D1	-	D2	COLON	D3	-	D4

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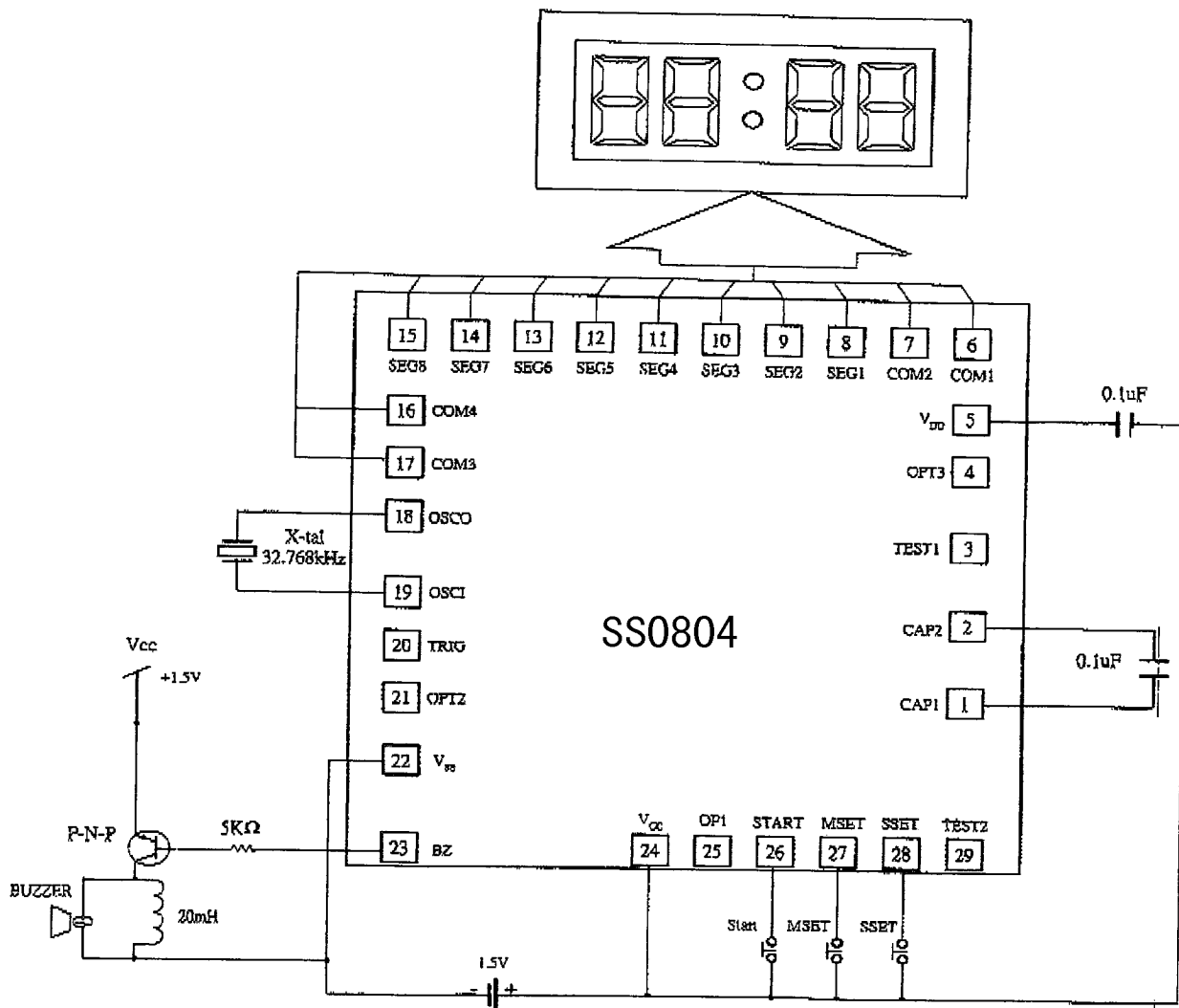
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7. APPLICATION CIRCUIT I



NOTE: The chip substrate must be floated or connected to Vss.

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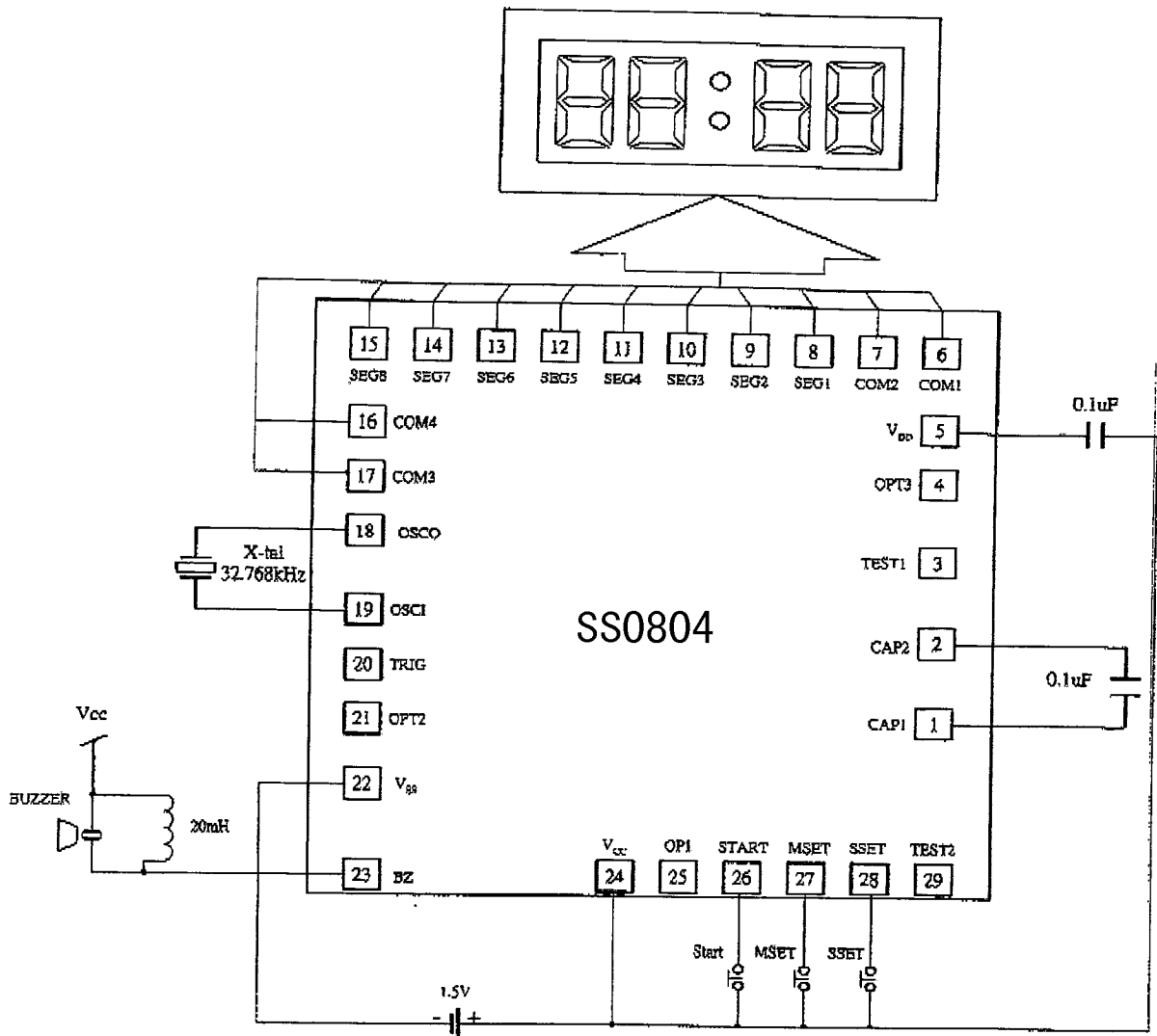
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8. APPLICATION CIRCUIT II



NOTE: The chip substrate must be floated or connected to Vss.

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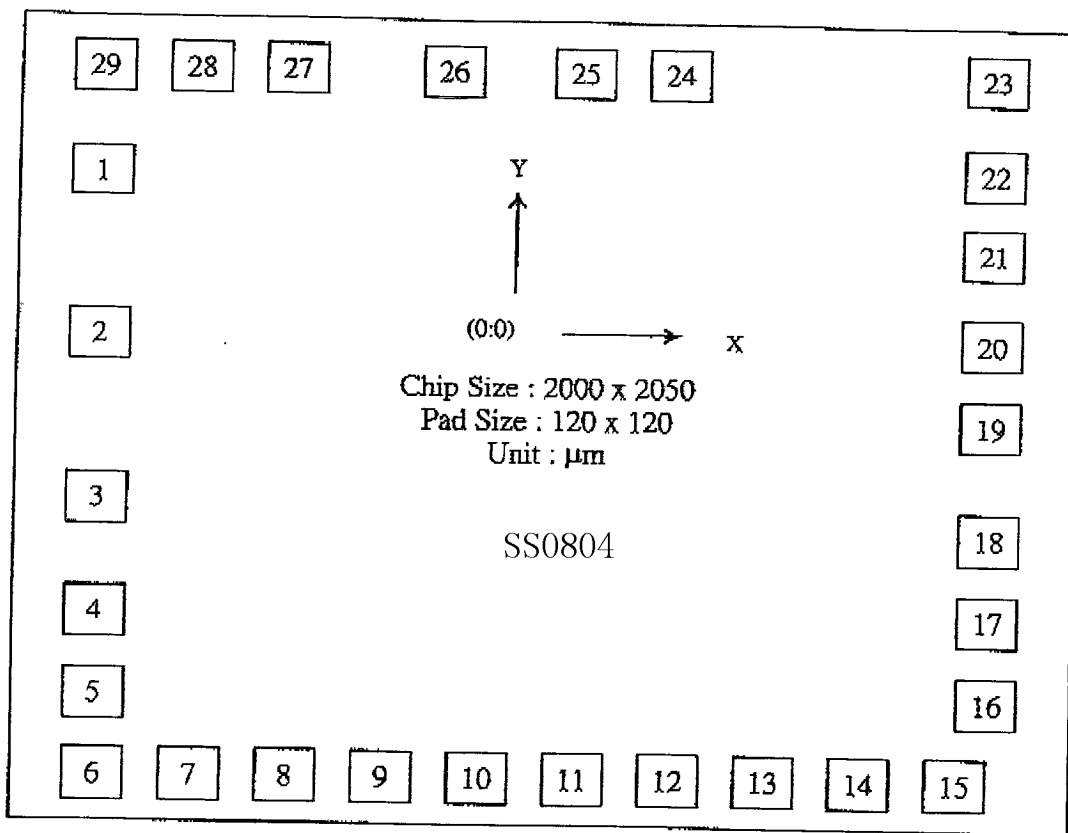
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9. PAD LAYOUT



10. PAD LOCATION (Unit: μm)

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	CAP1	-840	545	16	COM4	840	-655
2	CAP2	-840	160	17	COM3	840	-455
3	TEST1	-840	-235	18	OSCO	840	-275
4	OPT3	-840	-485	19	OSCI	840	-15
5	V _{DD}	-840	-665	20	TRIG	840	205
6	COM1	-840	-865	21	OPT2	840	445
7	COM2	-660	-865	22	V _{SS}	840	625
8	SEG1	-480	-865	23	BD	840	865
9	SEG2	-300	-865	24	V _{CC}	265	865
10	SEG3	-120	-865	25	OPT1	75	865
11	SEG4	60	-865	26	START/STOP	-145	865
12	SEG5	240	-865	27	MSET	-615	865
13	SEG6	420	-865	28	SSET	-395	865
14	SEG7	600	-865	29	TEST2	-840	865
15	SEG8	780	-865				

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