



4-DIGIT COUNTDOWN/UP TIMER

GENERAL DESCRIPTION

The **DL6702** is an UP/DOWN timer IC. It can directly drive a standard 4 digit 1/4 duty cycle LCD. Maximum countdown time is 59:59 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.

FUNCTIONS

- Special alarm trigger output for switch control or for driving another melody IC
- Internal voltage doubler
- 32768Hz quartz crystal time base
- Single 1.5V battery operation
- Direct drive buzzer
- 4 digit LCD display
- Maximum count 59:59 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)

PIN DESCRIPTION

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.

2) MSET-minute setting input

This pin sets minute time for the countdown mode. Like the SSET 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.

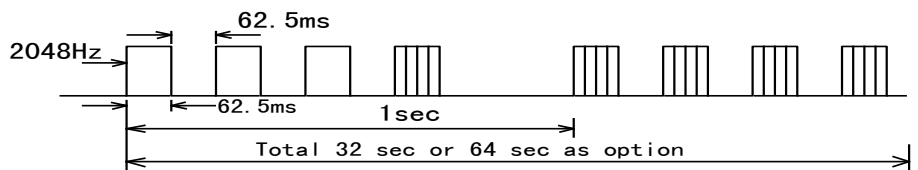
3) START/STOP-start or stop input

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) BZ- alarm output

This pin (n-channel, open drain) is used to drive the buzzer or speaker. BZ output signal will be as follows when the countdown time reaches zero.





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

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.

6) VDD, GND & VC

VDD- power pins for positive power supply

GND- ground

VC- voltage doubler supply for LCD driving

7) VA & VB- voltage doubler capacitor

A capacitor should be connected between these pins.

8) OSCI & OSCO- oscillator input and output

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

9) SEG1 – SEG8 (LCD segments driving pins)

10) COM1- COM4 (LCD backplane pins)

11) TEST (test input pins)

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 GND.

13) OPT2 (bonding 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 GND.

14) OPT3 (bonding option for maximum count)

When it is disconnected the maximum MINUTE count is 99:59 and when it is connected to GND, the maximum- MINUTE count is 59:59.

FUNCTIONAL DESCRIPTION

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 of 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 these 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 WTART/STOP will terminate this state and start to count from the time which is 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 $2048 \times 8 \times 1\text{Hz}$ signal for 32 second (or 64 sec by bonding option). During this



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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.

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.

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply voltage	VDD- GND	-0.3~5.0	V
Input voltage	V _{IN}	GND -0.2 to VDD +0.3	V
Operating temperature	T _A	-20 ~ +60	°C
Storage temperature	T _{stg}	-55 ~ +125	°C

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, GND = 0V, VDD = 1.5V, F_{OSC} = 32768Hz; unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating voltage	VDD		1.25	1.5	1.70	V
Display voltage	VC		2.4	3.0	3.4	V
Supply current	I _{CC}	With out load		3.0	5.0	uA
Output drive current (BZ, TRIG Output)	I _{OH}	V _{OH} = 1.35V (TRIG output)	-500			uA
		V _{OL} = 0.15V (TRIG output)	500			
	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			10		pF
Alarm output frequency	F _{BZ}		2048 × 4 × 1			Hz
Oscillator start up time	T _{OS}	V _{CC} = 1.30V			2	sec



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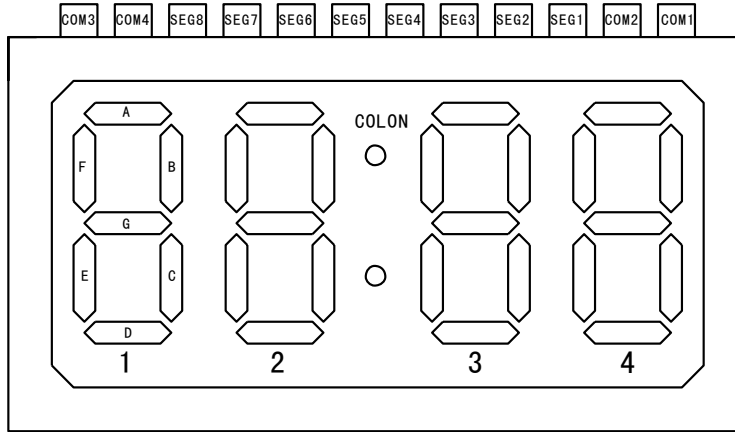
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4-DIGIT COUNTDOWN/UP TIMER

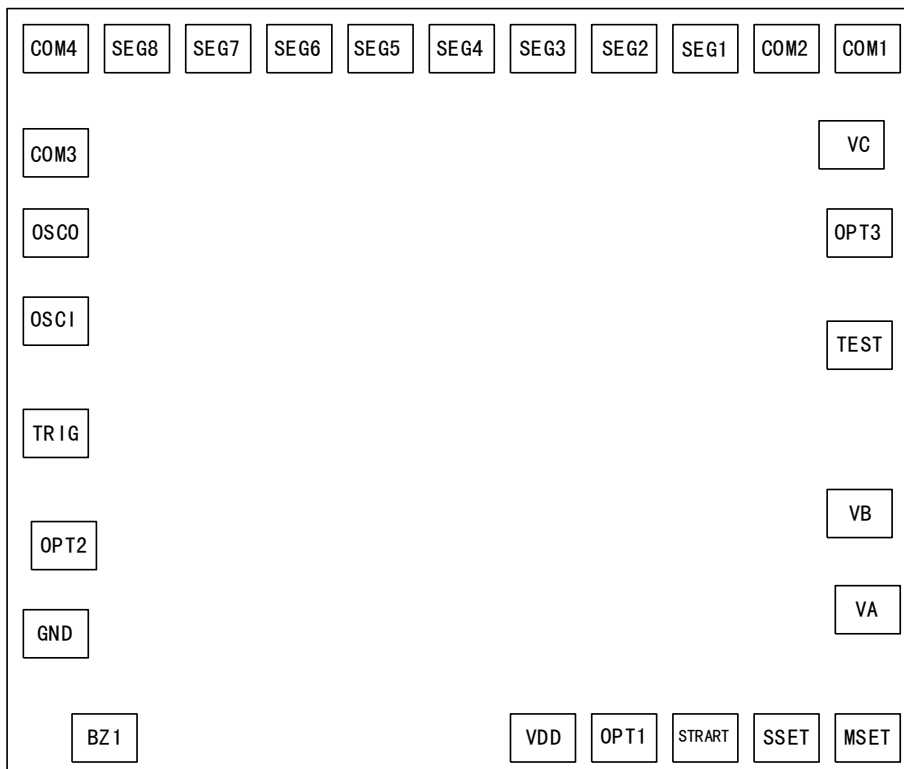
LCD FORMAT



	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

3.0V 1/4 Duty 1/2 Bias

PAD LOCATION





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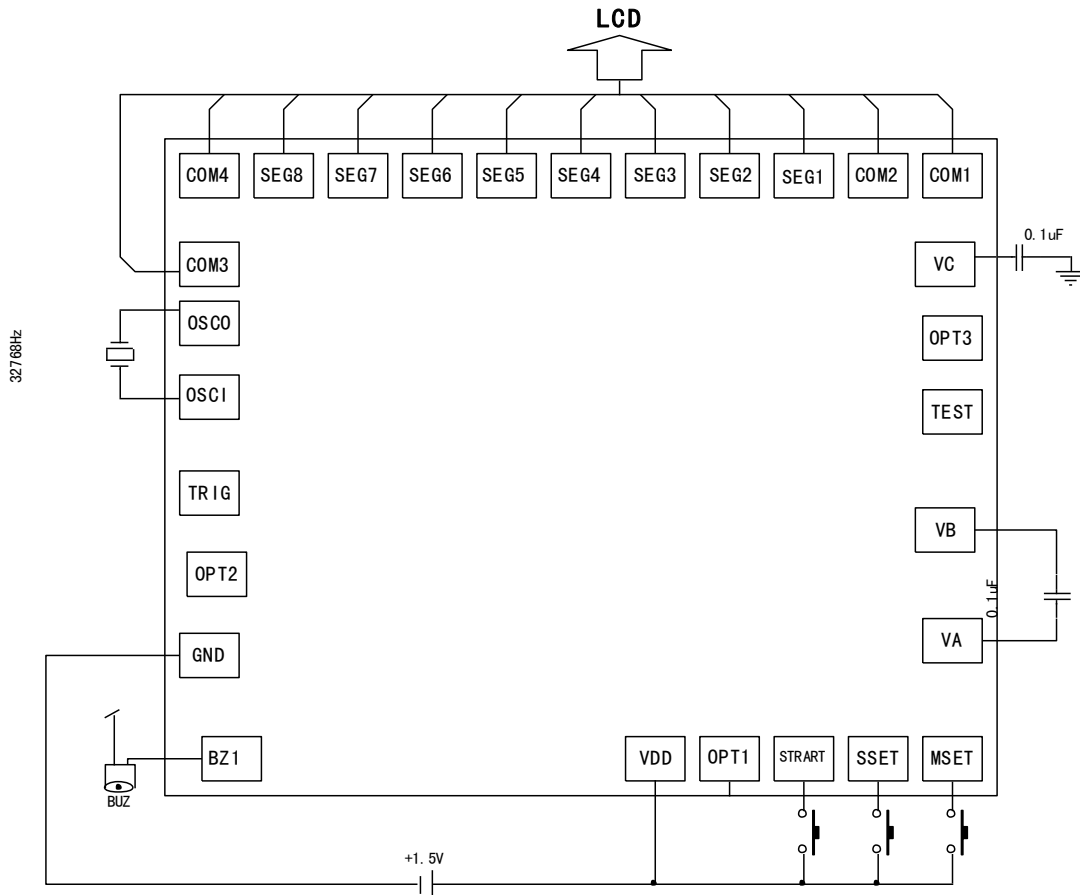
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NO.	Name	X	Y	NO.	Name	X	Y
1	BZ1	132.20	80.80	15	SEG2	934.95	1325.00
2	VDD	821.00	87.00	16	SEG3	812.65	1325.00
3	OPT1	941.00	87.00	17	SEG4	690.35	1325.00
4	STRART	1061.00	87.00	18	SEG5	568.05	1325.00
5	SSET	1181.00	87.00	19	SEG6	445.75	1325.00
6	MSET	1301.00	87.00	20	SEG7	323.45	1325.00
7	VA	1303.25	314.80	21	SEG8	201.15	1325.00
8	VB	1294.95	500.40	22	COM4	78.85	1325.00
9	TEST	1292.40	815.15	23	COM3	78.85	1133.85
10	OPT3	1292.40	1003.00	24	OSCO	78.85	1012.85
11	VC	1273.85	1139.25	25	OSCI	78.85	834.70
12	COM1	1301.85	1325.00	26	TRIG	75.00	558.25
13	COM2	1179.55	1325.00	27	OPT2	87.20	375.85
14	SEG1	1057.25	1325.00	28	GND	75.00	250.80

APPLICATION CIRCUIT

(1) Three keys application: MSET SSET START/STOP





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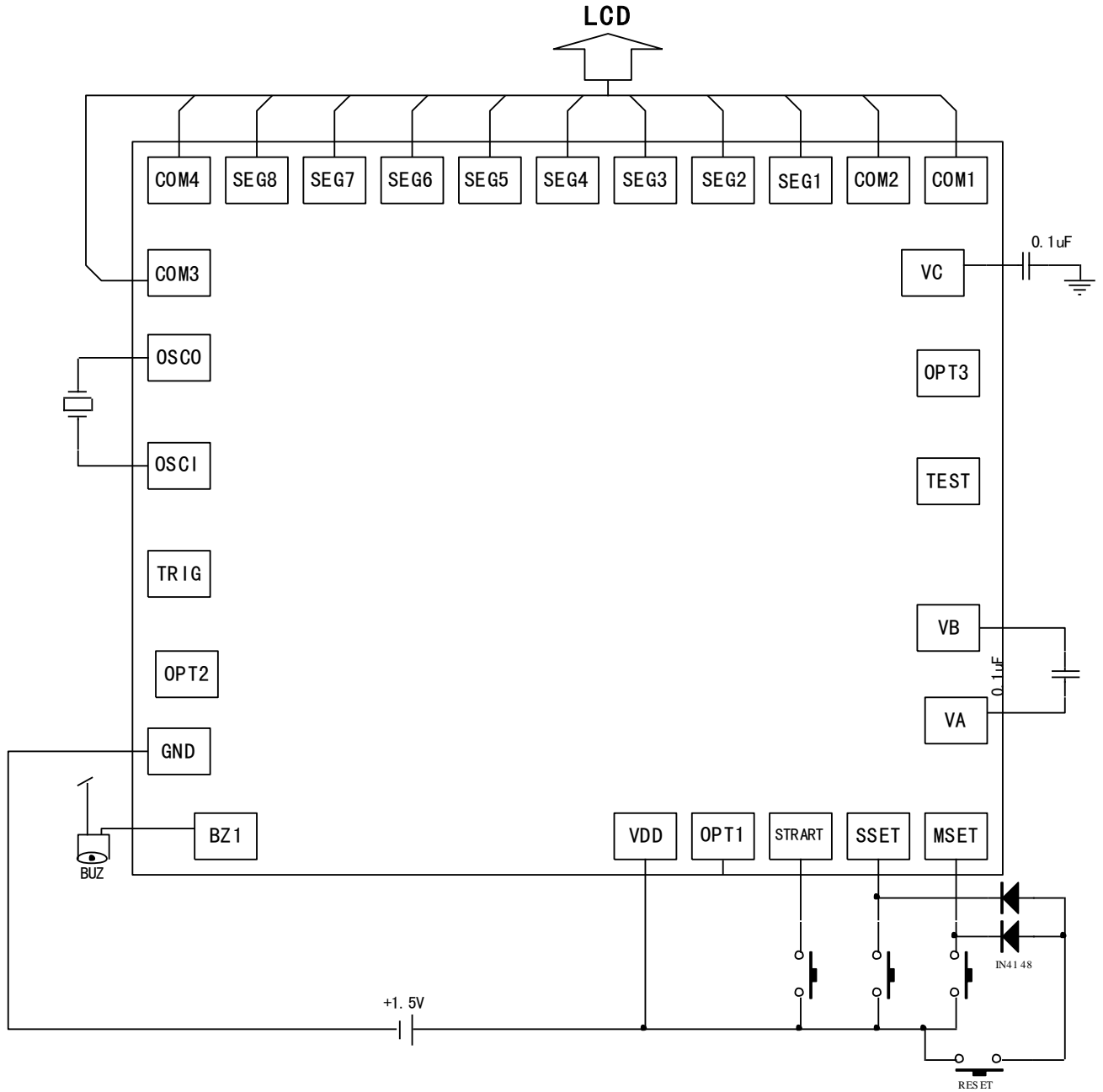
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4-DIGIT COUNTDOWN/UP TIMER

(2) Four keys application: MSET SSET START/STOP RESET



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

NOTICE:

1. The information contained herein could be changed without notice owing to product and or technical improvements. Please make sure before using the product that the information you are referring to is up-to-date.
2. No responsibility is assumed by us for any consequence resulting from any wrong or improper operation, etc. of the product.