

# Preliminary Specification

## RCL Semiconductors Ltd.



### Three and Half Digits Countdown Timer

C6001A-1

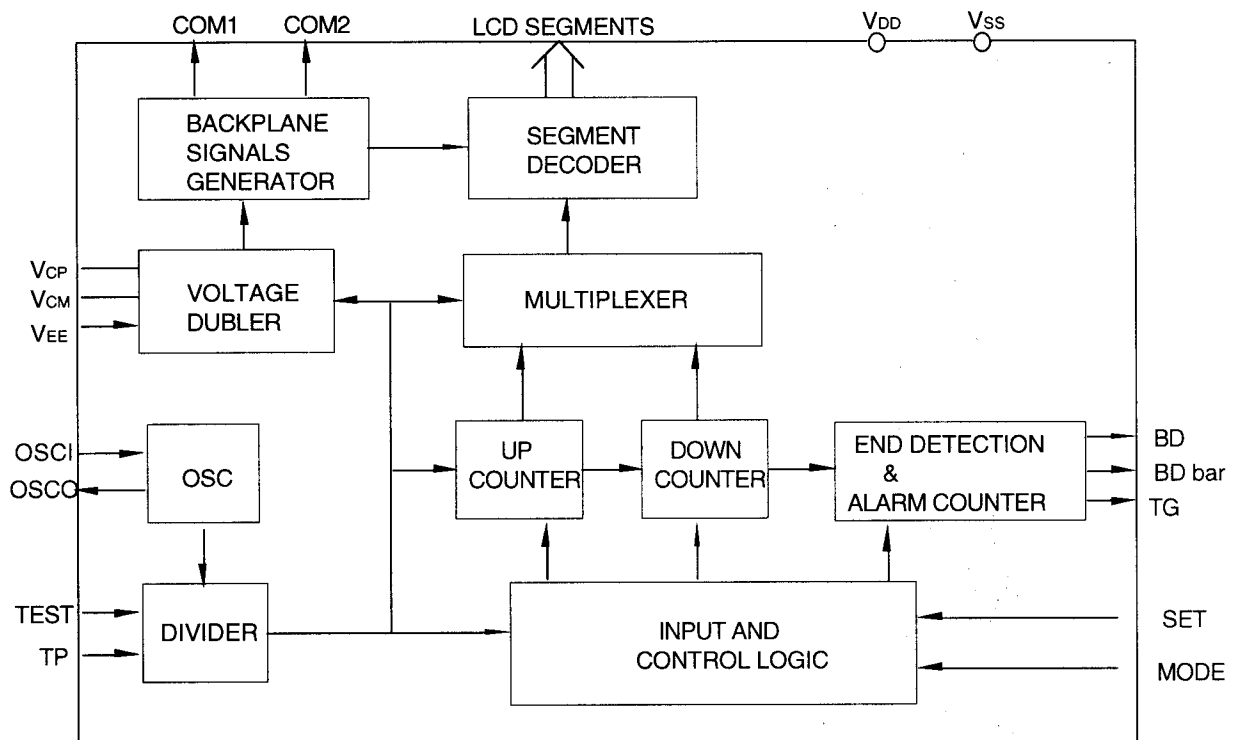
#### GENERAL DESCRIPTION

The C6001A-1 is a three and half digits count-down timer CMOS LSI circuit. It can directly drive three and half digits LCD and alarm piezoelectric buzzer. The maximum countdown time is 20 hours.

#### FEATURES

- Single 1.5V battery operation
- 32768 Hz quartz crystal time base
- Three and half digits LCD display
- Directly drive LCD and alarm piezoelectric buzzer
- Maximum countdown time 20 hours
- 5 minutes and 10 minutes pre-alarm function
- alarm for 30 seconds when the countdown time reaches zero
- Timer count advances 15 minutes by each SET pressing

#### BLOCK DIAGRAM



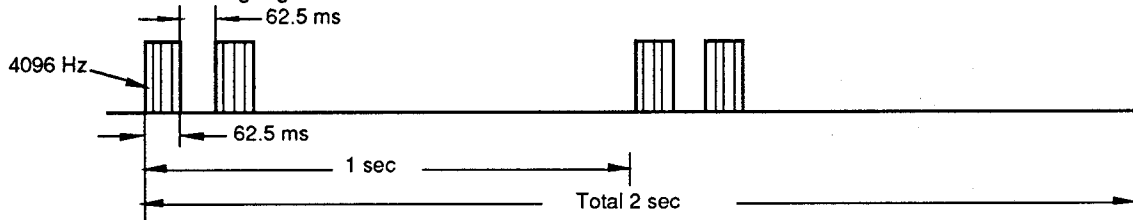
#### PIN DESCRIPTION

- 1,24,26 NC
- 2 V<sub>SS</sub> - Ground
- 3 SET - Time setting input, each pressing of this pin will make the timer count advance 15 minutes
- 4 MODE - Mode selecting input, its function is START/STOP/RESET
- 5 V<sub>EE</sub> - Voltage Doubler supply
- 6,7 BD, BD bar - Buzzer output pins
- 8,21 COM1, COM2 - back plane pins for LCD display
- 9~20 Segment driving pins for LCD display
- 22,23 OSCI, OSCO - Oscillator input and output pins

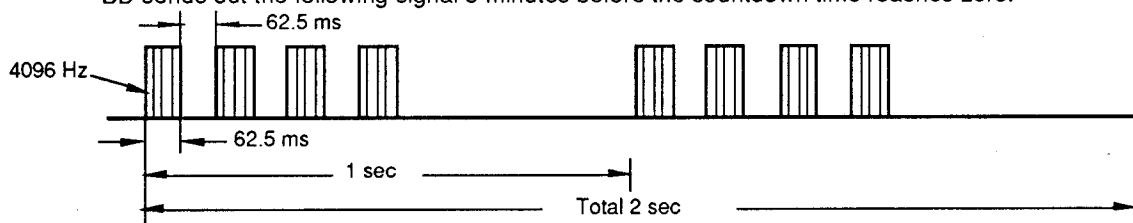
- 25  $V_{DD}$  - Positive power supply
- 27,28  $V_{CP}, V_{CM}$  - Voltage doubler capacitor pins
- 29 TG - Trigger Output
- 30,31 Test1 and Test2 input pins

**BD, BD bar - Piezo Buzzer Driving Output**

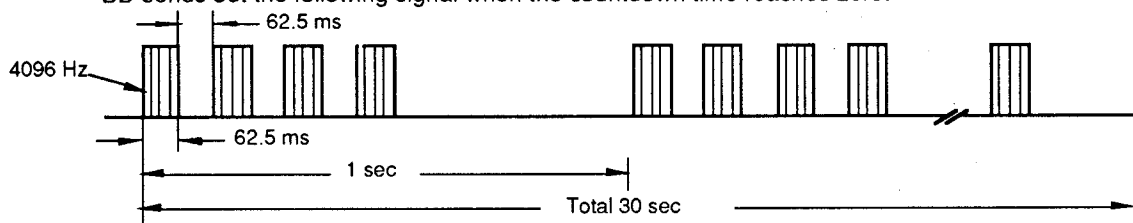
These two pins are used to drive the piezo buzzer directly. BD bar is the inverting output of BD. BD sends out the following signal 10 minutes before the countdown time reaches zero:



BD sends out the following signal 5 minutes before the countdown time reaches zero.



BD sends out the following signal when the countdown time reaches zero.



The above alarm signals will be stopped if MODE is triggered during this period of time.

**FUNCTIONAL DESCRIPTION**

- a. After power on, LCD will display 18:55 for about one second and then return to 0:00.
- b. Time is set by SET pin. Time setting is only effective in RESET state and ineffective in RUN or STOP state. Each pressing of this pin will make the timer count advance 15 minutes. Colon will be on but will not flash during time setting.
- c. After time has been set, triggering MODE pin will start the timer and colon with digits will begin to flash. If time is set to 0:00, the MODE pin will be disable.
- d. When the timer is counting, it will be stopped by another trigger of MODE pin, LDD displays the time on which the timer is stopped. In this stop state, the colon with digits will be on but will not flash. An additional trigger to MODE pin will reset the countdown timer and make LCD display 0:00. The timer can also be set during this state.
- e. As countdown time remains 10 minutes and 5 minutes, the timer will send out pre-alarm signal. During this period, a trigger of MODE will truncate the pre-alarm output and stop the timer. Another trigger of MODE will reset the countdown timer.
- f. When countdown time is reached, LCD displays 0:00 and the colon with digits will be on but will not flash. From this moment, the timer will alarm for 30 seconds. A trigger of MODE will truncate the alarm output.
- g. When the countdown timer reaches zero and the alarm signal ends(after 30 seconds), the timer can be set after it is reset by triggering MODE pin.
- i. When the countdown timer reaches zero, TG will send out a DC high level signal until MODE is triggered.

**ABSOLUTE MAXIMUM RATINGS( Ta = 25 °C)**

Parameter	Symbol	Limits
Power supply voltage range	VDD - Vss	-0.3 V to +3.0V
Input voltage range	Vin	Vss -0.3 to VDD+0.3
Operating temperature range	TA	-20 to +60°C
Storage temperature range	Tstg	-40 to +70°C

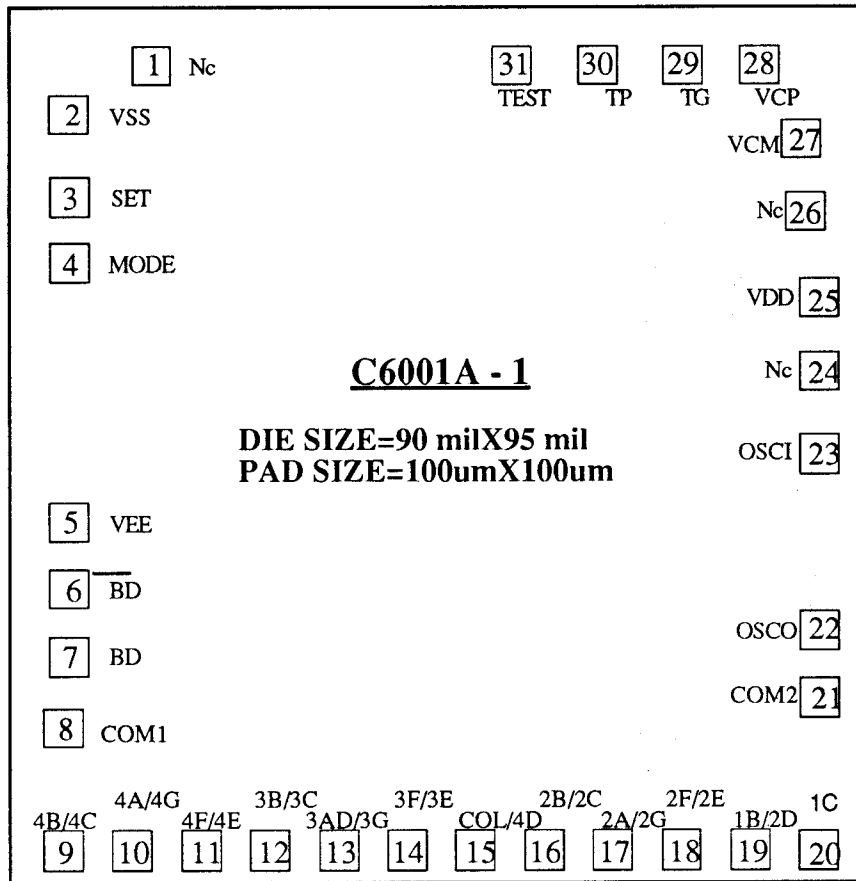
**DC ELECTRICAL CHARACTERISTICS**

Unless otherwise specified, Ta = 25°C, VDD = 1.5V, Vss = 0V, Fosc = 32768 Hz

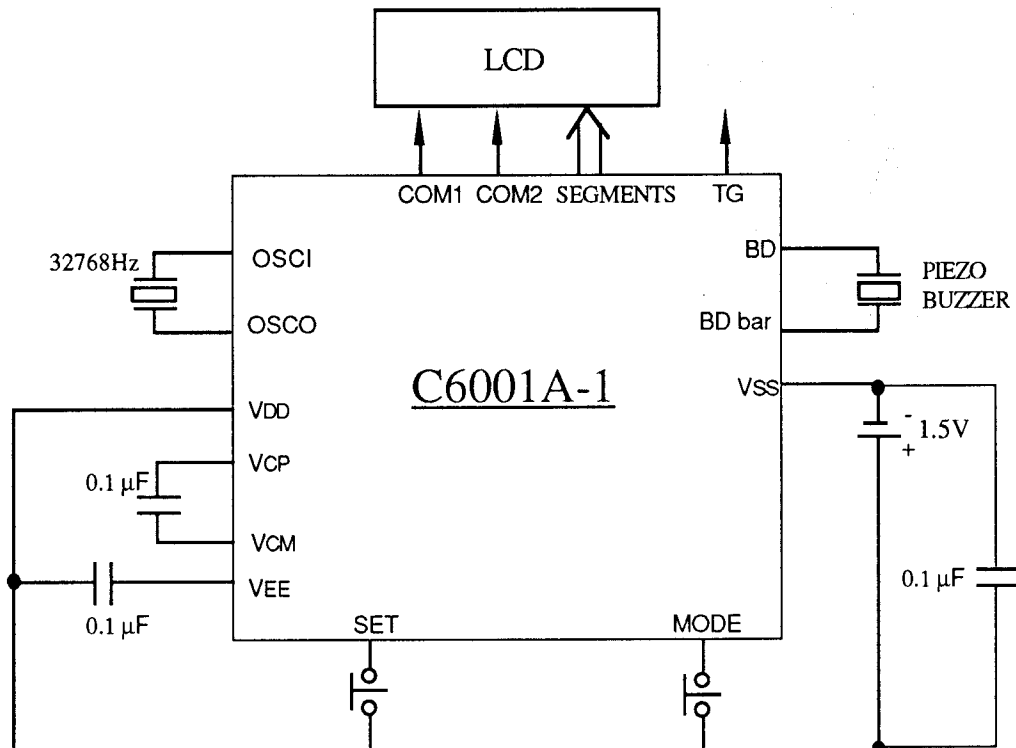
Characteristics	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Operating voltage range	VDD	1.2	1.5	1.8	V	-
Voltage Doubler Supply	VEE	-1.8	-1.5	-1.2	V	-
Supply current	IDD	-	-	3	μA	**no load
Buzzer Driving Current	IBD	200			μA	VBD =1V
TRIG Driving Current	IT	200			μA	VOH =1.2V
Frequency Stability	Δf/f	-	-	1	ppm	VDD =1.35V to 1.65V
Oscillator Built-in Capacitor	CD	-	20	-	pF	-
Alarm Output Frequency	FBD	4096x8x 1		-	Hz	-
LCD Driving Current	ILCD	0.1	-	-	μA	
Oscillator Start up Time	Tosc	-	-	2	sec	VDD = 1.2V

**Note:** \*\* refers to LCD unload, BD & BD bar & TG open. No trigger input.

PAD ASSIGNMENT

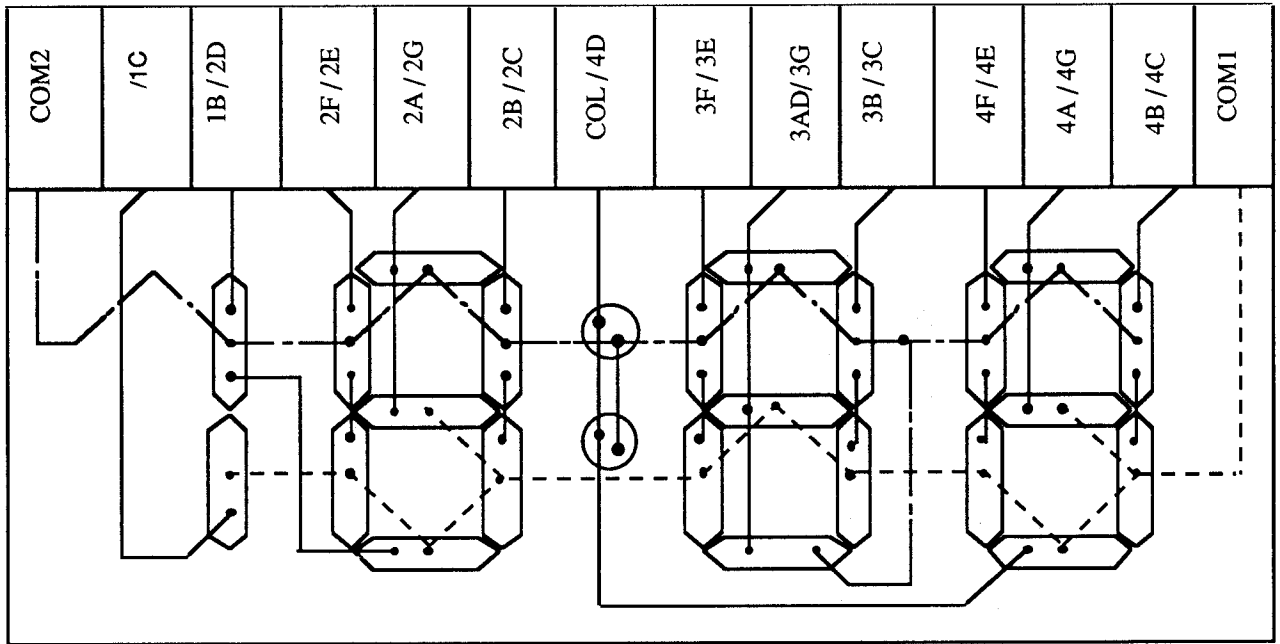


APPLICATION CIRCUIT



Jun 7, 1997

**4-DIGITS LCD FORMAT**



12 LCD SEGMENT OUTPUT PADS:

- /1C                      1B / 2D                      2F / 2E
- 2A / 2G                      2B / 2C                      COL / 4D
- 3F / 3E                      3AD / 3G                      3B / 3C
- 4F / 4E                      4A / 4G                      4B / 4C

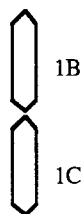
2 LCD BACKPLANES OUTPUT PADS

- COM1                      COM2

**LCD BIPLEX SEGMENT ARRANGEMENT**

Pad NO. in IC	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	COM1	4B	4A	4F	3B	3AD	3F	COL	2B	2A	2F	1B		
		4C	4G	4E	3C	3G	3E	4D	2C	2G	2E	2D	1C	COM2

The 1th half digit



The 2th - 4th digits

