



**UM3206A**

**3 1/2-Digit Countdown/Up Timer**

**Features**

- 3 1/2-digit LCD display
- Maximum countdown 20 hours
- Count-up cycle time 20 minutes
- Count-down timer repeat function by bonding option
- Hours and minutes set independently
- Timer resets when depressing MSET and HSET simultaneously

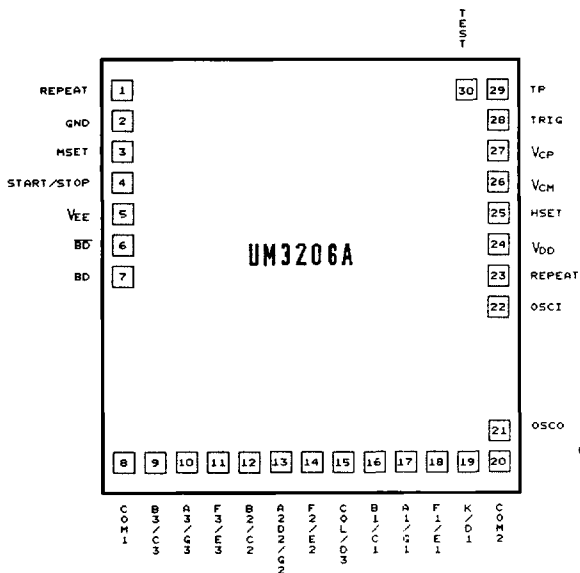
- Directly drives piezoelectric buzzer
- Special alarm trigger output for switch control or for driving another melody IC
- 5-minute and 10-minute pre-alarm function
- Internal voltage doubler
- 32,768 Hz quartz crystal time base
- Single 1.5V battery operation

**General Description**

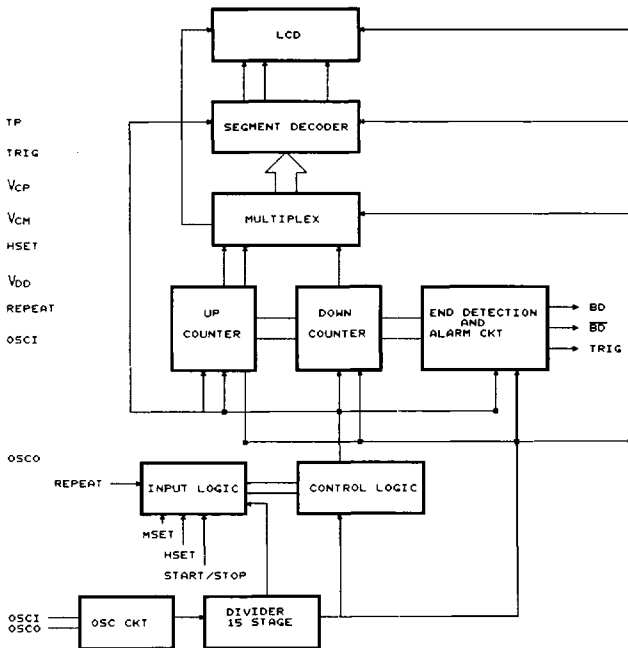
The UM3206A is an Up/Down timer IC. It can directly drive a standard 3 1/2-digit LCD. Maximum countdown time is 20 hours and count-up cycle time is 20

minutes. Feasible input options and universal functions give this chip many uses such as parking alarm timer, pillbox timer, kitchen timer, etc.

**Pad Configuration**



**Block Diagram**



**Absolute Maximum Ratings\***

Supply Voltage $V_{DD} - GND$ . . . . .	0V to 6V
Supply Voltage $V_{DD} - V_{EE}$ . . . . .	0V to 6V
Input Voltage $V_{IN}$ . . . . .	GND to $V_{DD}$
Operating Temperature $T_{OP}$ . . . . .	-20°C to 60°C
Storage Temperature $T_{ST}$ . . . . .	-40°C to 70°C

**\*Comments**

Stresses above those shown under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**DC Electrical Characteristics** (GND = 0V,  $V_{DD} = 1.5V$ ,  $F_{osc} = 32768$  Hz,  $T_A = 25^\circ C$ , unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	$V_{DD}$	1.2	1.5	1.65	V	
Supply Current	$I_{DD}$	-	-	3	$\mu A$	LCD Unload BD, BD, TRIG Open, No Trigger Input
Voltage Doubler Supply	$V_{EE}$	-1.1	-1.44	-	V	
Buzzer Driving Current	$I_{BD}$	200	-	-	$\mu A$	$V_{BD} = 1V$
TRIG Driving Current	TRIG	200	-	-	$\mu A$	$V_{OH} = 1.2V$
Frequency Stability	$\Delta f/f$	-	-	1	PPM	$V_{DD} = 1.35V$ to $1.65V$
Oscillator Built-in Capacitor	$C_D$	-	20	-	pF	
Alarm Output Frequency	$F_{BD}$	-	4096 $\times 8 \times 1$	-	Hz	
LCD Driving Current	$I_{LCD}$	0.1	-	-	$\mu A$	
Oscillator Start up Time	$T_{OS}$	-	-	2	sec	$V_{DD} = 1.2V$



## Pad Description

### A. HSET — Hour Setting Input Pin

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

### B. MSET — Minute Setting Input Pin

This input pin sets minute time for the countdown timer. Like the HSET pin, the minute setting time function can be carried out only when the countdown timer has been stopped or reset.

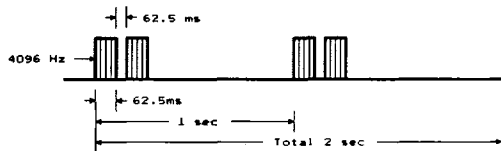
This pin is used, with the HSET pin, to execute the reset function. It has been internally pulled low.

### C. START/STOP — Start or Stop Input Pin

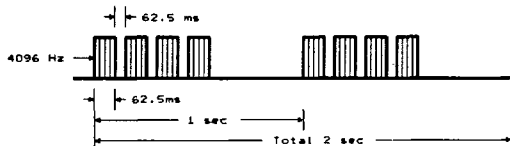
This input pin acts as Start/Stop function for the Up/Down timer. After power-on or reset, the chip will be in a stop state. When it is triggered, the timer will be enabled, and another trigger will stop the timer. In other words, this pin uses a toggling structure to implement the Start/Stop function. It has been internally pulled low.

### D. BD, $\overline{BD}$ — Piezo Buzzer Driving Output Pin

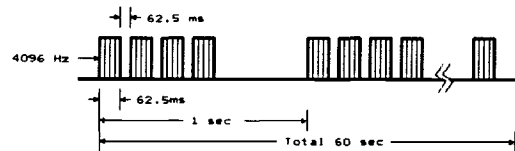
These two output pins are used to drive the piezo buzzer directly.  $\overline{BD}$  is the inverting output of BD. BD sends out the following signal, 10 minutes before the countdown time reaches zero.



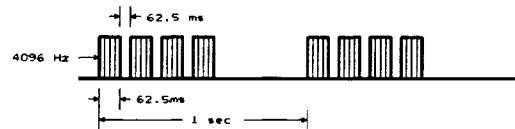
BD sends out the following signal 5 minutes before the countdown time reaches zero.



BD output signal will be as follows when the countdown time reaches zero.

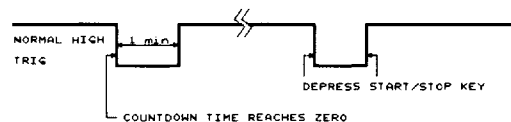


The above alarm signals will be stopped if Start/Stop is triggered during this time period. When HSET and MSET are depressed simultaneously, BD will send out the above signal successively until these keys are released.



### E. TRIG — Timer Trigger Output Pin

This output pin sends out a high level signal in normal condition, including countdown, count-up and standby. If countdown time reaches zero, a low level output appears in this 1-minute alarm interval; then goes back to high level while alarm stops or START/STOP key is pressed.



### F. REPEAT — Repeat Control Input Pin

This input pin controls the repeat function. If this pin is connected to GND, the chip won't execute the repeat function. A trigger of the Start/Stop pin will start the countup timer after countdown time has reached zero. If this pin is connected to VDD, the countdown timer will operate repeatedly by triggering the Start/Stop pin when the countdown timer is zero. (i.e., when countdown timer has reached zero, a simulation of Start/Stop makes the countdown timer start to count from the time previously set). To execute the count up function when the repeat pin is high, a reset (depressing HSET and MSET simultaneously) has to be carried out first.

**G. VDD - GND and VEE - Power Pins**

These are power pins for positive power supply — VDD, ground — GND and voltage doubler supply — VEE.

**H. VCP and VCM — Voltage Doubler Capacitor Pins**

These two pins are used to generate the voltage doubler. A capacitor should be connected between these pins. VCP connects to capacitor's positive terminal and VCM the negative terminal.

**I. OSCI and OSCO — Oscillator Input and Output Pins**

A 32768 Hz quartz crystal oscillator is connected to these pins to generate the system timing. Both XT and XT<sub>B</sub> have a built in capacitance.

**J. COM1, COM2, K/D1, A1/G1, B1/C1, COL/D3, F2/E2, A2D2/G2, B2/C2, F3/E3, A3/G3 and B3/C3 — CLD Display Pins**

These are LCD display pins. COM1 and COM2 are backplane pins and the others segment driving pins.

**K. TP and TEST— Test 1 and Test 2 Input Pins**

These test pins are used for high speed testing.

**Functional Description**
**(1) Countdown Timer Mode**

- a. After power-on, LCD will display **18:88** for about one second and then return to **0:00**.
- b. Time is set by the HSET 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 two seconds, the timer will count one digit for every 1/4 second. The hour setting and minute setting are independent. Colon will be on but will not flash during the time setting.
- c. In this mode, the timer will reset to 0:00 and generate an alarm test, if HSET and MSET are depressed simultaneously. This alarm signal will be on as long as these pins are depressed.
- d. 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).

e. When the timer is counting, it will be stopped by another triggering of the Start/Stop pin. In this stop state, the colon will be on, but it will 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 which it displays.

f. As countdown time remains 10 minutes and 5 minutes, BD and  $\overline{BD}$  will send out the pre-alarm signal which is described in the pin description. A trigger of Start/Stop, or depressing HSET and MSET at the same time during this output period, will truncate the output.

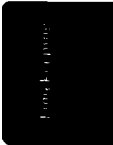
g. When countdown time is reached, the LCD displays 0:00 and the colon will be on but will not flash. At this moment, BD and  $\overline{BD}$  will send out a 4K x 8 x 1 signal for one minute. During this alarm period, triggering Start/Stop or triggering reset (depress MSET and HSET) will stop the output. If the repeat function is enabled. The triggering of Start/Stop will restart the countdown timer from the previous setting time. In no repeat mode, Start/Stop trigger will only stop the output.

h. When the countdown timer reaches zero and the alarm signal ends (one minute), time can be set. If no repeat function, the timer reaches zero and alarms for one minute, a trigger of Start/Stop will execute previous setting time. If there is repeat function, in the above case, a trigger of Start/Stop will start the count-up timer.

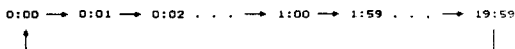
i. When this chip is in countdown timer mode. DCO will send out a DC high level signal and can not be stopped until the timer reaches zero or reset is triggered.

**(2) Countup Timer Mode**

- a. If repeat function exists, count-up timer will start only when the chip has been reset and powered on without a set time. If there is no repeat function, depressing Start/Stop key will start the count-up timer when the countdown time has reached zero and the alarm output has finished. However, the countup timer will start by triggering Start/Stop after reset. One special case, if you set time to 0:00 after reset or the count down timer reaches zero with no repeat function, a trigger of the Start/Stop count-up timer will start.



b. The count-up timer has a cyclical count of 20 minutes after being started. The counting sequences are listed below:

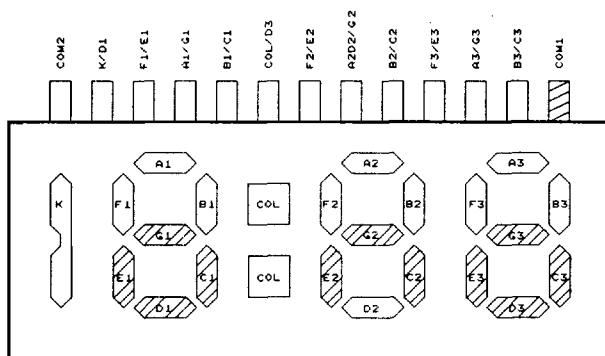


In this mode, it will always display minutes and seconds. In addition, colon is always on and not flashing.

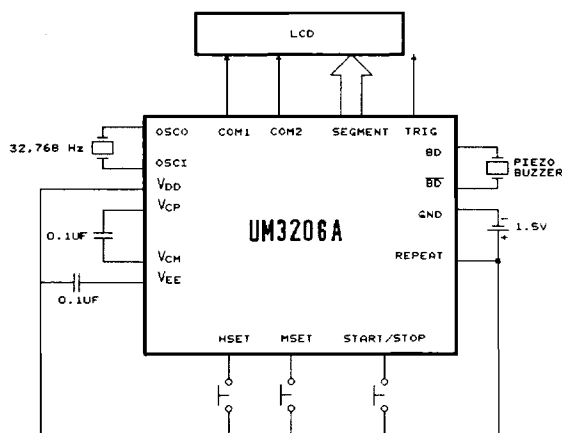
c. While the countup timer is counting, depressing the Start/Stop key will stop it. Another trigger of Start/Stop will start the timer continuously counting.

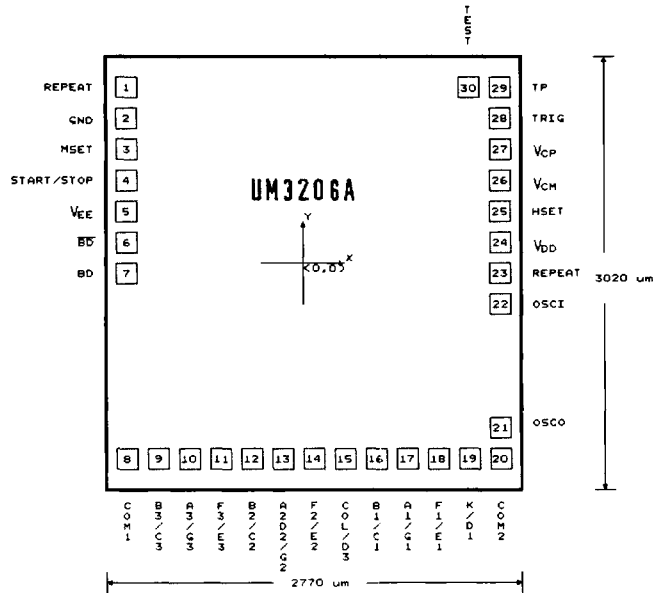
d. When the chip is in count up timer mode, the chip can change to count down timer mode after the countup timer is reset by depressing MSET and HSET at the same time.

### LCD Format



### Application Circuit (for reference only)



**Bonding Diagram**


\* Substrate connect to VDD.

Unit:  $\mu\text{m}$

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	REPEAT	-1221	1120	16	B1/C1	463	-1355
2	GND	-1221	922	17	A1/G1	653	-1355
3	MSET	-1221	663	18	F1/E1	843	-1355
4	START/STOP	-1221	374	19	K/D1	1033	-1355
5	VEE	-1221	159	20	COM2	1233	-1355
6	BD	-1221	- 36	21	OSCO	1222	-1150
7	BD	-1221	- 227	22	OSCI	1222	- 432
8	COM1	-1056	-1355	23	REPEAT	1222	- 240
9	B3/C3	- 866	-1355	24	VDD	1222	2
10	A3/G3	- 676	-1355	25	HSET	1222	198
11	F3/E3	- 486	-1355	26	VCM	1222	472
12	B2/C2	- 296	-1355	27	VCP	1222	662
13	A2D2/G2	- 106	-1355	28	TRIG	1222	942
14	F2/E2	23	-1355	29	TP	1206	1346
15	COL/D3	273	-1355	30	TEST	962	1346

**Ordering Information**

Part No.	Package
UM3206A	CHIP FORM