UM3273 Series

3 1/2-Digit Multiplexed LCD Clock with Alarm

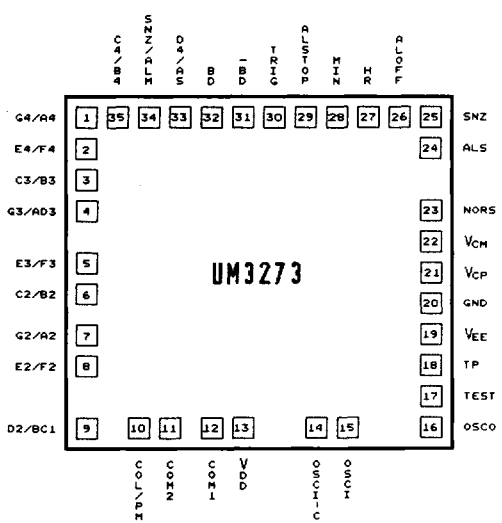
Features

- 3 1/2-digit 2-function clock: hours and minutes
- Alarm clock: hours and minutes
- Snooze function
- Direct driving of 3 1/2-digit, 1/2-duty multiplexed LCD and 3 information flags
- Single 1.5V battery operation
- Built-in voltage doubler
- Alarm sound demonstration capability
- Direct driving of piezoelectric buzzer
- 7 switches (with pull-down resistors)
- Low power dissipation
- 32,768 Hz quartz crystal time base
- Push-pull driving buffer for buzzer
- Special alarm trigger output for switch control
- Power-on reset
- Colon flash or freeze is available

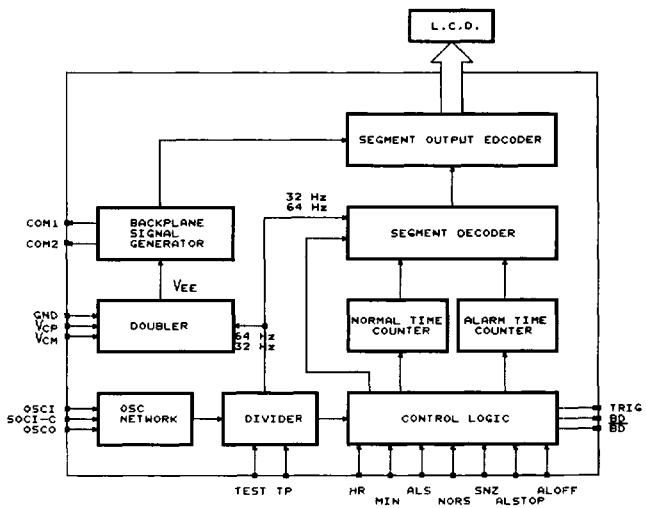
General Description

UM3273 is a low threshold voltage, metal-gate CMOS IC that provides all signals needed to drive a 1/2-duty multiplexed LCD clock of 3 1/2 digits.
The circuit time base of UM3273 is a 32,768 Hz quartz crystal controlled oscillator. Oscillator RC network components are built into the circuit. The UM3273 operates on a single 1.5V battery, and is supplied in chip form.

Pad Configuration



Block Diagram



Absolute Maximum Ratings*

DC Supply Voltage . . . . . -0.3V to 5.0V

Input Voltage . . . . . GND -0.2V to V_{DD} +0.2V

Operating Ambient Temperature . . . . . -10°C to 60°C

Storage Temperature . . . . . -55°C to 125°C

*Comments

Stresses above those listed 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} = 32,768 Hz, T_A = 25 °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	μA	LCD Unload BD, $\overline{BD}$, TRIG Open
Voltage Doubler Supply	V_{EE}	-1.1	-1.44	-	V	
Oscillator Starting Time	T_{OSC}	-	-	1.0	sec	V_{DD} = 1.45V
Alarm Output Drive Current	I_{BD}	200	-	-	μA	V_{BD} = 1V
Frequency Stability	△F/F	-	-	1	PPM	V_{DD} = 1.35 - 1.65V
Trigger Output Current	I_{TRIG}	200	250	-	μA	V_{DD} = 1.5V, V_{OH} = 1.2V
LCD Drive Current	I_{LCD}	0.1	-	-	μA	
Switch Chatter Time	Tct	-	-	60	ms	
Oscillator Built-in Capacitance	C_D	-	20	-	pF	
Alarm Output Frequency	F_{BD}	-	4096x8x1 2048x8x	-	Hz	

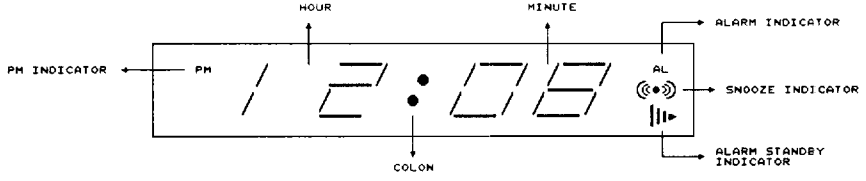
Pad Description

Pad No.	Designation	Description
1	G4/A4	LCD segment drive
2	E4/F4	
3	C3/B3	
4	G3/AD3	
5	E3/F3	
6	C2/B2	
7	G2/A2	
8	E2/F2	
9	D2/BC1	
10	COL/PM	
11	COM2	Backplane common 2
12	COM1	Backplane common 1
13	V_{DD}	Positive power supply
14	OSCI-C	Oscillator input with built-in capacitance
15	OSCI	Oscillator input
16	OSCO	Oscillator output
17	TEST	Test
18	TP	Test
19	V_{EE}	Voltage doubler supply
20	GND	Ground
21	V_{CP}	Voltage doubler capacitor positive
22	V_{CM}	Voltage doubler capacitor negative
23	NORS	Normal time mode set
24	ALS	Alarm time mode set

Pad Description (continued)

Pad No.	Designation	Description
25	SNZ	Snooze operation
26	ALOFF	Alarm off
27	HR	Hour digit set
28	MIN	Minute digit set
29	ALSTOP	Alarm stop pin
30	TRIG	Alarm trigger output pin for switch control
31	BD	Piezo buzzer driving
32	BD	Piezo buzzer driving
33	D4/AS	LCD segment drive
34	SNZ/ALM	
35	C4/B4	

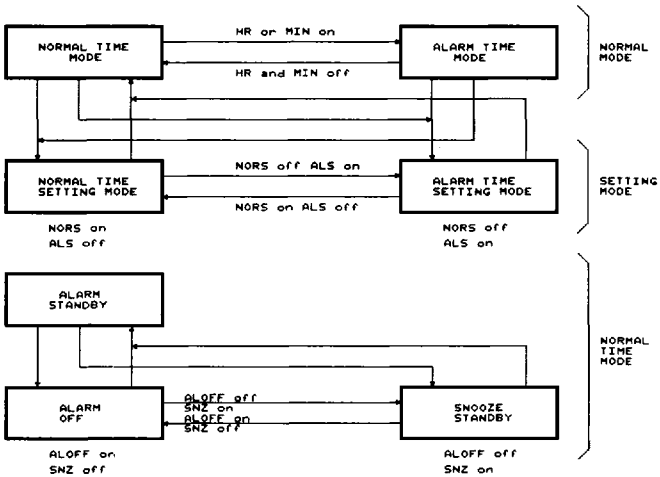
Functional Description



- PM indicator is on from 12:00 PM to 11:59 PM off from 12:00 AM to 11:59 AM
- Colon on in "alarm time" mode, and 0.5 sec on, 0.5 sec off in "normal time" mode
- Alarm time indicator on in "alarm time" mode, off in "normal time" mode
- Snooze indicator on in "snooze stand-by" mode, 0.5 sec on, 0.5 sec off in "snooze" mode, and off in "alarm off " mode
- Alarm indicator is on in "alarm on" mode, off in "alarm off " mode
- In "setting" mode, hour digit advances by + 1 when HR switch is depressed
- In "setting" mode, minute digit advances by + 1 when MIN switch is depressed
- In "setting" mode, digit (hour or minute) advances automatically at 4 Hz rate by keeping HR switch or MIN switch depressed more than 2 seconds

(1) Mode Select

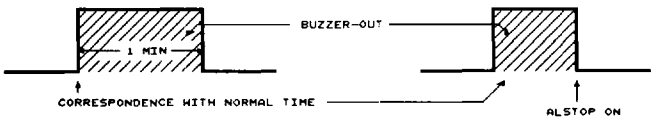
Alarm time is displayed while HR or MIN switch is depressed; "setting" mode is selected by depressing either NORS or ALS switch; and "alarm" is selected by pressing ALMOFF and SNZ switches simultaneously.

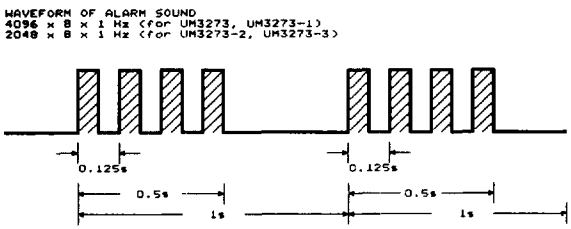


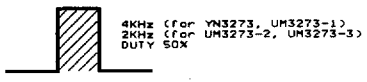
(2) Alarm Function

Alarm buzzer sounds for 1 minute in either alarm standby or snooze standby mode when normal time corresponds to set alarm time. A momentary closure of ALSTOP, or changing of any mode switches, will stop the alarm buzzer sound.

Alarm function can be operated in all modes except alarm off mode.







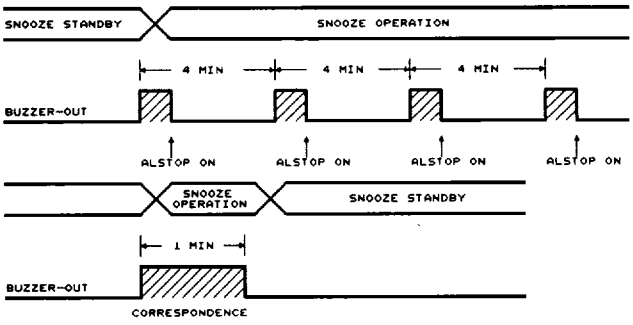
(3) Snooze Function

Snooze function can be operated in alarm time mode, alarm time setting mode, and normal time setting mode. When snooze standby mode is selected and normal time corresponds to alarm time, buzzer sound will output and snooze indicator will flash at 1 Hz rate, 0.5 sec. on, 0.5 sec off, and snooze function will operate.

If ALSTOP switch is turned on while buzzer is sounding, alarm sound will be suspended once, but buzzer sound will start 4 minutes later and will continue.

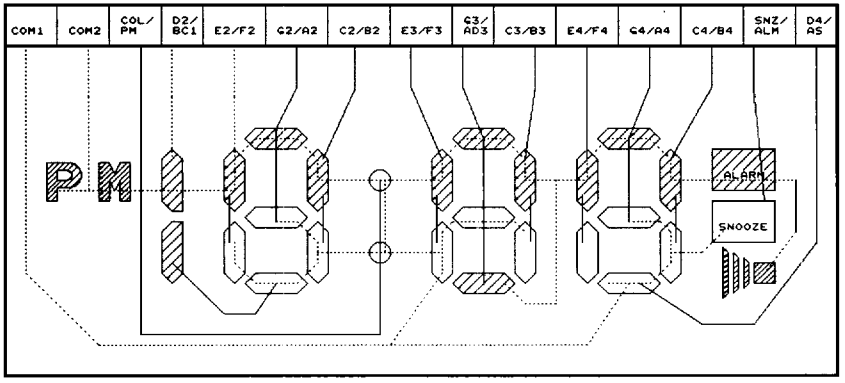
If ALSTOP switch is not turned on while buzzer is sounding, buzzer sound will stop after 1 minute, and snooze operation will be released, returning the clock to snooze standby mode.

Snooze function can be also cancelled by changing of any mode switch.

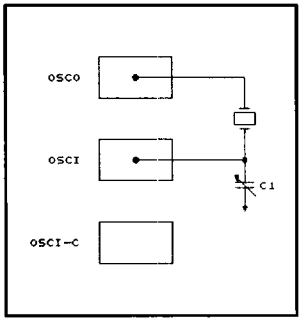


(4) Trigger Output Function (Trigger output is high while alarm sounds, except for alarm caused by depressing HR and MIN keys simultaneously.)

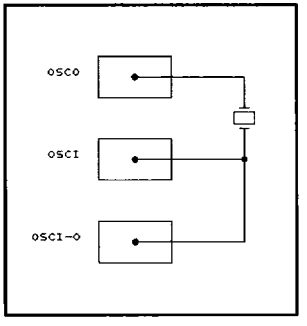
(5) LCD Layout



(6) Built-in Oscillator

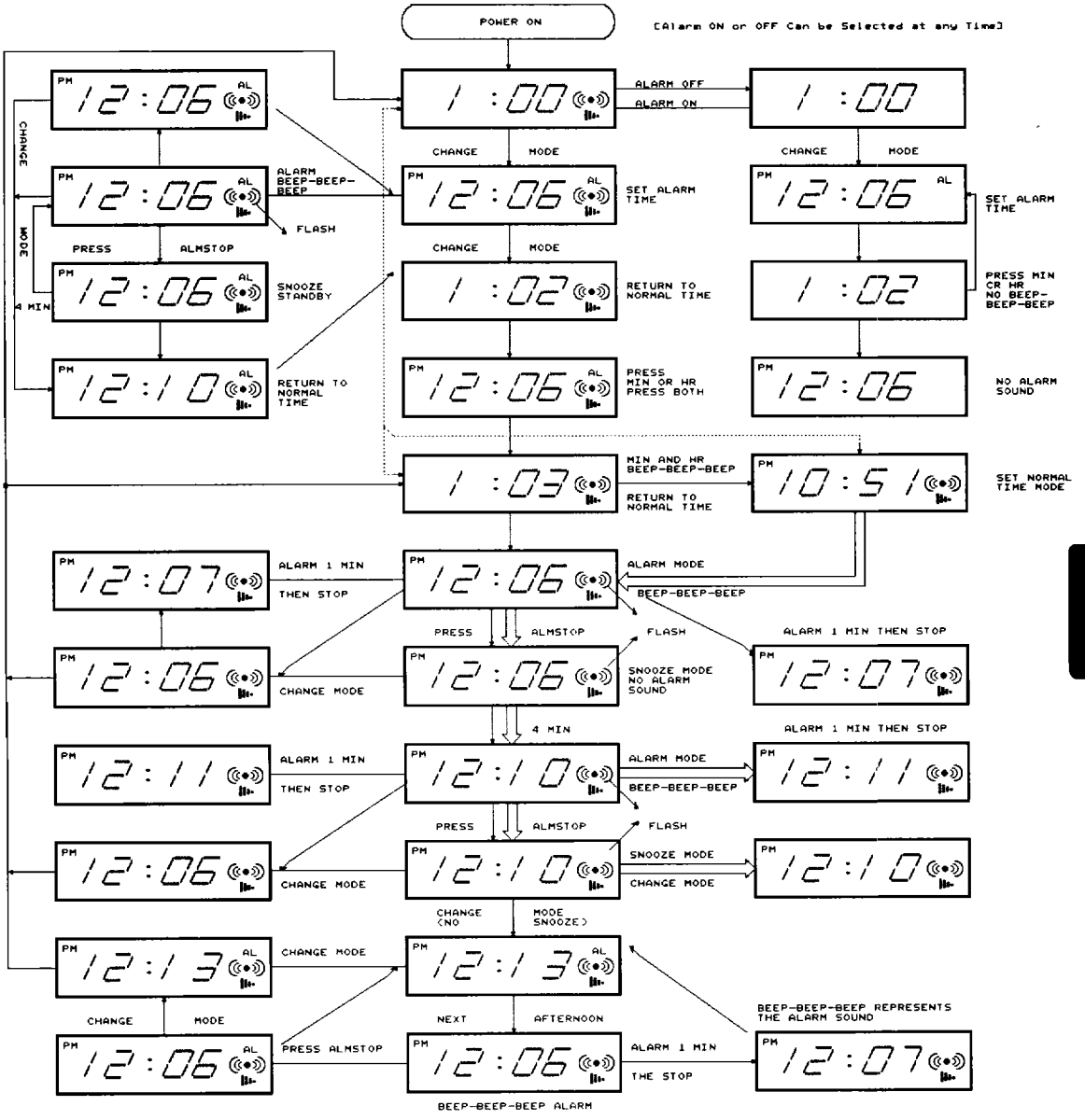


a) With Trimmer

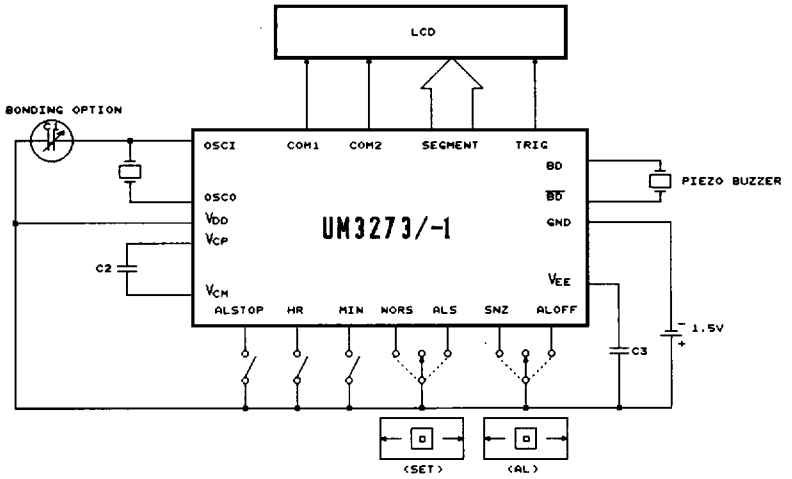


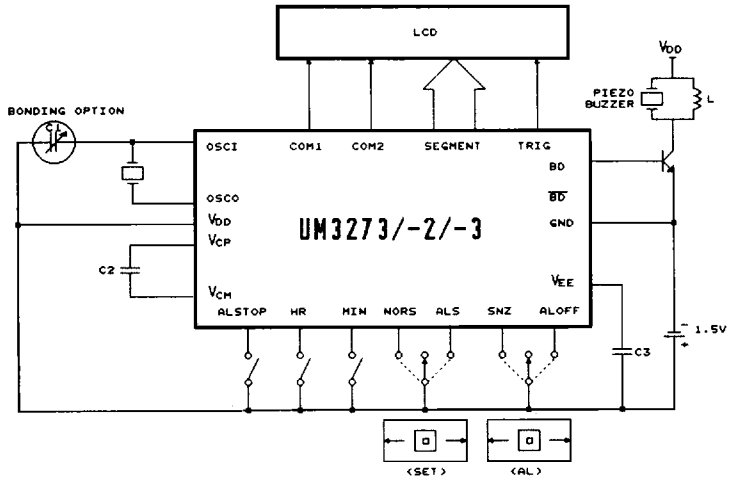
b) Without Trimmer

Operation Flow Chart



Application Circuits (for reference only)

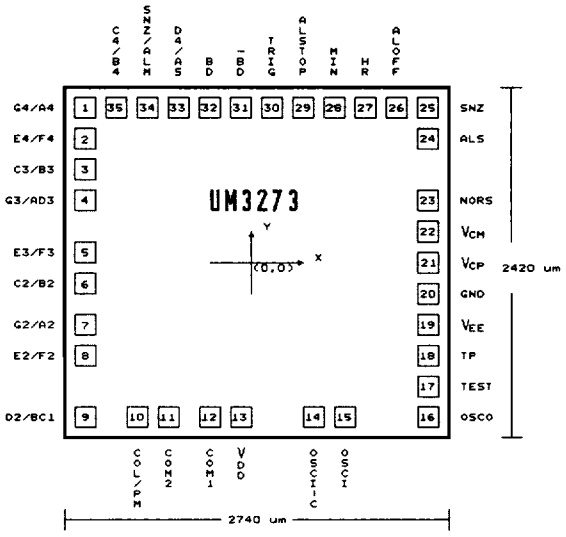




C1 = 5 - 35pF
C2, C3 - 0.1μF
* There is a bonding option capacitance (20pF) that can replace C1 (refer to (6) Built-in Oscillator).

* Connecting the IC substrate to VDD is recommended.

Bonding Diagram



* Substrate connect to V_{DD}.

unit: μm

Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	G4/A4	-1204	1005	19	V_{EE}	1158	-401
2	E4/F4	-1204	803	20	GND	1204	-202
3	C3/B3	-1204	549	21	V_{CP}	1204	-1
4	G3/AD3	-1204	349	22	V_{CM}	1204	199
5	E3/F3	-1204	27	23	NORS	1204	398
6	C2/B2	-1204	-73	24	ALS	1204	687
7	G2/A2	-1201	-491	25	SNZ	1204	942
8	E2/F2	-1202	-691	26	ALOFF	980	955
9	D2/BC1	-1202	-1011	27	HR	752	975
10	COL/PM	-944	-1011	28	MIN	462	1012
11	COM2	-744	-1012	29	ALSTOP	244	1018
12	COM1	-416	-1011	30	TRIG	-4	983
13	V_{DD}	-277	-1012	31	$\overline{BD}$	-204	983
14	OSCI-C	316	-1012	32	BD	-404	983
15	OSCI	502	-1011	33	D4/AS	-604	1005
16	OSCO	1204	-1012	34	SNZ/ALM	-804	1005
17	TEST	1204	-801	35	C4/B4	-1004	1005
18	TP	1204	-601				

Ordering Information

Items / Part No.	Alarm Output		LCD Colon		Package
	4096x8x1 Hz	2048x8x1 Hz	Flash	Freeze	
UM3273	√		√		CHIP FORM
UM3273-1	√			√	CHIP FORM
UM3273-2		√	√		CHIP FORM
UM3273-3		√		√	CHIP FORM