UM3204

4-Digit Multiplexed LCD Watch

Features

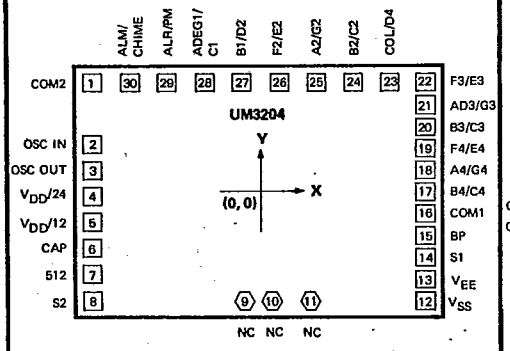
- 5 functions (month, date, hour, minute, and second.)
- 4-year calendar.
- Alarm watch: hour, minute.
- 12 or 24 hour format by bonding option.
- Two buttons control all functions.
- Set rate by depression or at automatic 4 Hz rate.
- Power-on reset.
- Direct drives a standard 4-digit multiplexed LCD and 3 information flags.
- Alarm sound demonstration, hourly chime and 6 minute snooze capability.

General Description

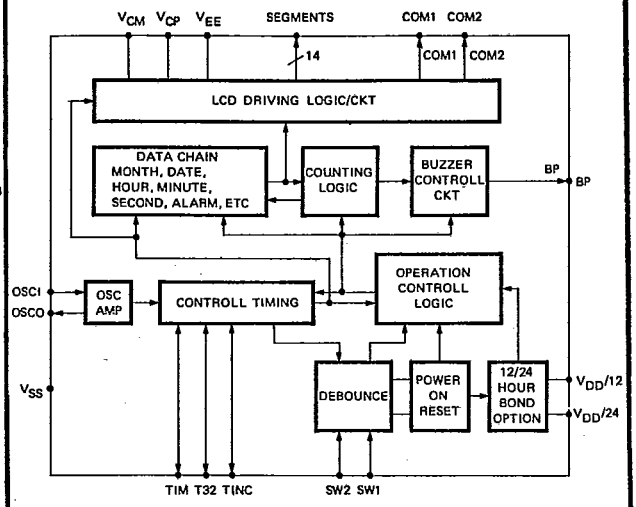
The UM3204 is a single-chip time keeping CMOS integrated circuit for use in 5-function, 4 digit and ½ duty multiplexed LCD watches. The watch circuit is based on a 32768 Hz quartz crystal controlled oscillator. An oscillator-amplifier with an internal feedback resistor and a π – network output capacitor were designed in. Subsequent count-down logic and display sections provide the basic five functions, alarm, chime, and 6 minute snooze capability.

The display and setting operations are controlled via two switches. All switch inputs have integrated pull-down resistors and are debounced by internal circuitry. Only a single 1.5V battery is needed to power the entire circuit. The UM3204 is supplied in chip form.

Pad Configuration



Block Diagram



Absolute Maximum Ratings*

Supply Voltage $V_{DD} - V_{SS}$ ..... 0V to 6V
Supply Voltage $V_{DD} - V_{EE}$ ..... 0V to 6V
Input Voltage ..... V_{SS} to V_{DD}
Operating Temperature ..... 0°C to 60°C
Storage Temperature ..... −20°C to 70°C

*Comments

Stress 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.

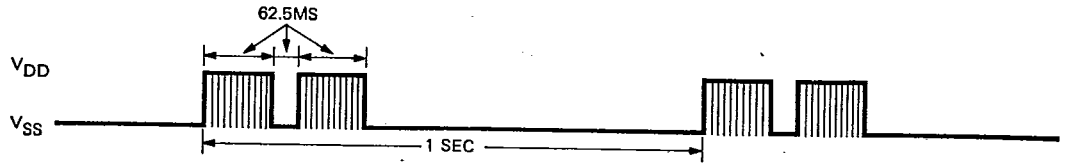
Electrical Characteristics

(T_A = 25°C, V_{SS} = 0V, V_{DD} = 1.5V, F_{OSC} = 32768 Hz, $C_1 = C_2$ = 0.02μf, unless otherwise specified.)

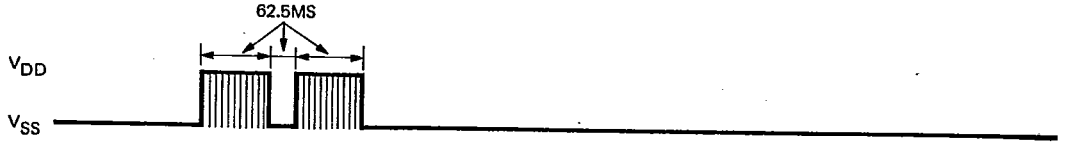
Parameter	Symbol	Limits			Unit	Test Condition
		Min.	Typ.	Max.		
Supply Voltage	V_{DD}	1.35	1.55	1.65	V	
Supply Current	I_{DD}	–	–	3.00	μA	LCD unloaded
Generated Display	$-V_{EE}$	1.35	1.45	–	V	
Oscillator Starting Time	t_{OSC}	–	1.00	10.00	S	V_{DD} = 1.45V
Oscillator Input Capacitance	C_{IN}	–	20	–	pF	
Output Driving Current	I_{OH}	150	–	–	μA	V_{OH} = 1.51V
	I_{OL}	150	–	–	μA	V_{OL} = 0.4V

Output Waveforms

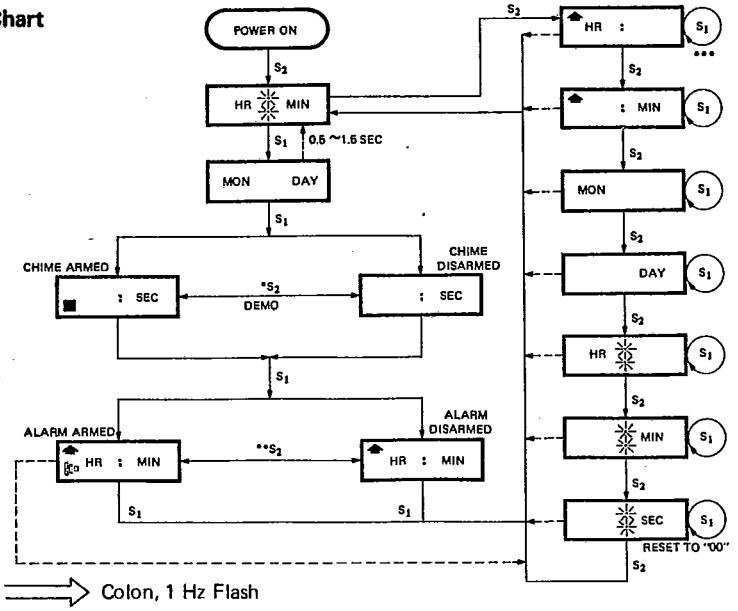
(A) ALARM, DEMO: (4 KHZ, 50% DUTY)



(B) CHIME: (4 KHZ, 50% DUTY)



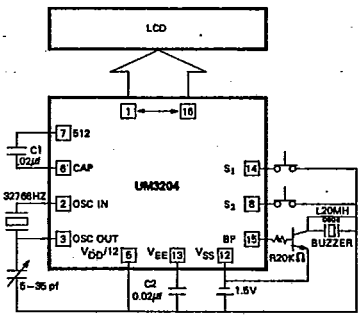
Operation Flow Chart



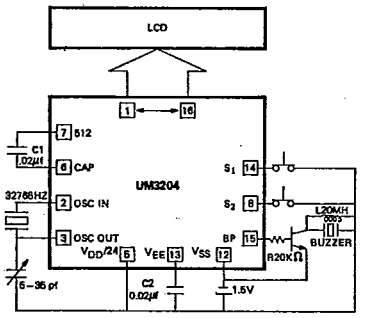
Notes:
1. Colon, 1 Hz Flash
2. Colon, No Flash
3. Alarm Mode Flag
4. Alarm Armed Flag
5. Chime Armed Flag
6. Auto Return 0.5 ~1.5 min
7. Momentary Switch
8. Momentary Switch for Advancing Digit in set mode.
9. In displaying second mode [*], chime armed or disarmed will be toggled by pushing S_2 switch and demo at the same time until S_2 is off.
10. In displaying alarm mode [**], alarm armed or disarmed will be toggled by pushing S_2 switch.
11. In displaying alarm setting mode [***], alarm time is armed as setting is advanced.
12. When alarm signal is activated by depressing S_1 switch, the snooze time period can be extended an additional 6 minutes from the minute after S_1 is activated. If S_1 is depressed twice within a 6 minute period while in the snooze mode or while the alarm signal is activated, the watch will return to the normal mode with the alarm circuit enabled.

Typical Application

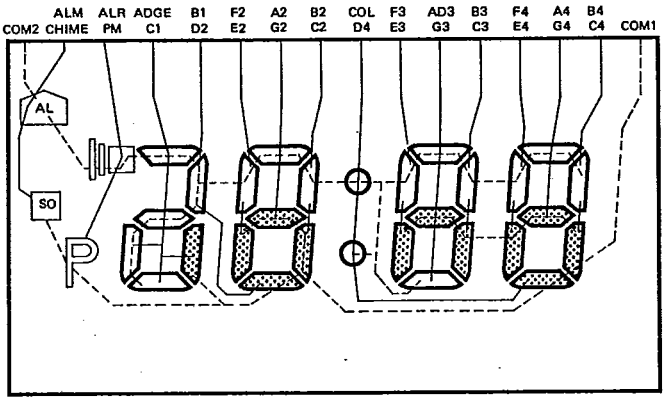
(1) 12 HOUR



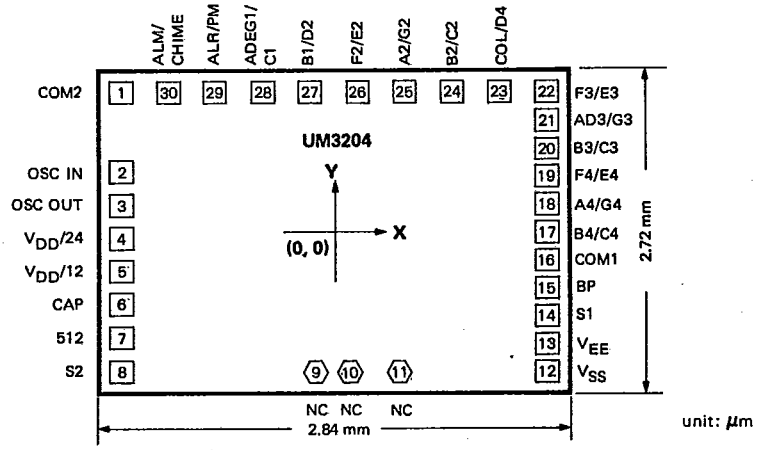
(2) 24 HOUR



LCD Format



Bonding Diagram



Pad No.	Designation	X	Y	Pad No.	Designation	X	Y
1	COM2	−1244.60	1181.10	16	CMO1	1247.14	− 323.85
2	OSC IN	−1247.14	723.90	17	B4/C4	1247.14	7.62
3	OSC OUT	−1247.14	218.44	18	A4/G4	1247.14	233.68
4	$V_{DD}/24$	−1247.14	− 153.67	19	F4/E4	1247.14	541.02
5	$V_{DD}/12$	−1247.14	− 339.09	20	B3/C3	1247.14	756.92
6	CAP	−1247.14	− 532.13	21	AD3/G3	1247.14	1071.88
7	512	−1247.14	− 970.28	22	F3/E3	1244.60	1181.10
8	S2	−1247.14	−1178.56	23	COL/D4	916.39	1181.10
9	NC	− 666.75	−1192.78	24	B2/C2	651.51	1181.10
10	NC	− 455.93	−1192.53	25	A2/G2	425.45	1181.10
11	NC	490.22	−1192.53	26	F2/E2	115.57	1181.10
12	V_{SS}	1247.14	−1178.56	27	B1/D2	− 100.33	1181.10
13	V_{EE}	1247.14	− 965.20	28	ADEG1/C1	− 415.29	1181.10
14	S1	1247.14	− 751.84	29	ALR/PM	− 631.19	1181.10
15	BP	1247.14	− 537.21	30	ALM/CHIME	− 946.15	1181.10

Notes:
1. Pad number is assigned counter clockwise from the lower center of the chip.
2. All dimensions are in μm.
3. All bond pad dimensions are 114 x 114 μm^2 except pad No. 3, 4, 5 and 6, which are 114 x 102 μm^2 and pad No. 9, 10 and 11, which are 76 x 76 μm^2