1. --DESCRIPTION

The DL9089 is a CMOS digital multifunction watch integrated circuit with five alarms, calendar (auto calculating day of week), countdown, stopwatch and dual time function; designed to for a 13-digit liquid crystal display (1:4 duty, 1:2 bias).

1.1 FUNCTION

- 7 Functions: Year, Month, Date, Day-of-Week, Hour, Minute, Second
- Dual time
- 8-digit Chronograph
- Split and Lap Functions of Chronograph
- User selectable 12-hour/24-hour format
- Five independent alarms(snooze and one-time alarms)
- 4-digit year calendar(2000 – 2099) in Timekeeping Mode
- Chime on every hour

1.2 FEATURES

- Single-chip CMOS construction
- Drives 14-digit LCD (1:4 duty, 1:2 bias)
- Single 3.0V battery operation
- Low power dissipation
- Debounce circuitry on switch inputs
- Fast advance for time set
- Protection against electrostatic discharge

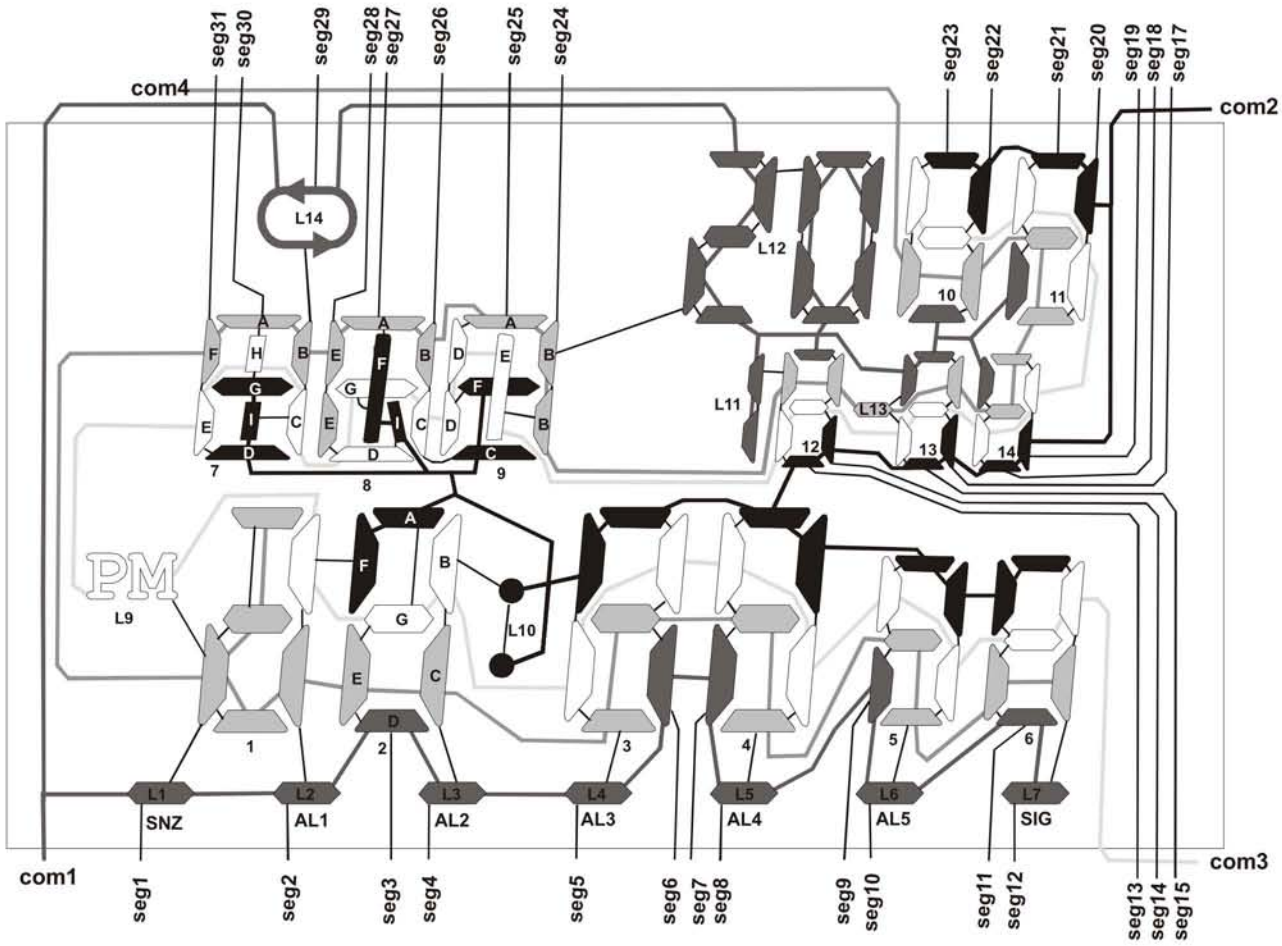
2. ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage, U_{CC1}	U_{CC1}	- 0.3 ~ + 4.0	V
Operating Temperature	T_{opr}	- 20 ~ + 70	°C
Storage Temperature	T_{stg}	- 55 ~ + 125	°C

3. ELECTRICAL CHARACTERISTICS (Ta = 25oC, V_{SS} = 0V, U_{CC1} = 2.4V unless otherwise specified)

Characteristic		Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage		U_{CC1}		2.4	3.0	3.3	V
Supply Current		I_{CC1}	U_{CC1} =3.3V without load, wait mode		2	3.5	μA
Oscillator Start Voltage		U_{OSC}	U_{CC1}=2.4V within 3 sec			2.4	V
Output Current HIGH	AL, NAL	I_{0H1}	$U_{OH} = U_{CC1} - 0.2V$	-0.2			mA
	IND	I_{OH2}	$U_{OH} = U_{CC1} - 0.8V$	-0.4		-1.2	
Output Current LOW	AL, NAL	I_{OL1}	U_{OL} = 0.2V	0.2			
	IND	I_{OL2}	U_{OL} = 0.8V	10			
Oscillator Frequency		F_{OSC}	C_L = 6 pF; $R_S \leq$ 35 kOm		32,768		Hz
Pump Frequency		F_{PUMP}	IND output		16,384		Hz

4. LCD FORMAT



SEG	COM1	COM2	COM3	COM4	SEG	COM1	COM2	COM3	COM4
SEG1	L1		L9	ADEG1	SEG17	A13	C13	G13	B13
SEG2	L2	F2	B1	C1	SEG18	F14	D14	E14	G14
SEG3	D2	A2	G2	E2	SEG19		C14	B14	A14
SEG4	L3	L10	B2	C2	SEG20		B11	C11	D11
SEG5	L4	F3	E3	D3	SEG21	E11	A11	F11	G11
SEG6	C3	A3	B3	G3	SEG22	D10	B10	G10	C10
SEG7	E4	A4	F4	G4	SEG23		A10	F10	E10
SEG8	L5	B4	C4	D4	SEG24	L12		E9	B9
SEG9	E5	A5	F5	G5	SEG25		F9	D9	A9
SEG10	L6	B5	C5	D5	SEG26		C9	C8	B8
SEG11	D6	F6	G6	E6	SEG27		F8	G8	A8
SEG12	L7	A6	B6	C6	SEG28		I8	D8	E8
SEG13	L11	D12	E12	F12	SEG29	L14	I7	C7	B7
SEG14	A12	C12	G12	B12	SEG30		G7	H7	A7
SEG15	F13	D13	E13	L13	SEG31		D7	E7	F7

5. SETTING SEQUENCE AND SWITCH OPERATION

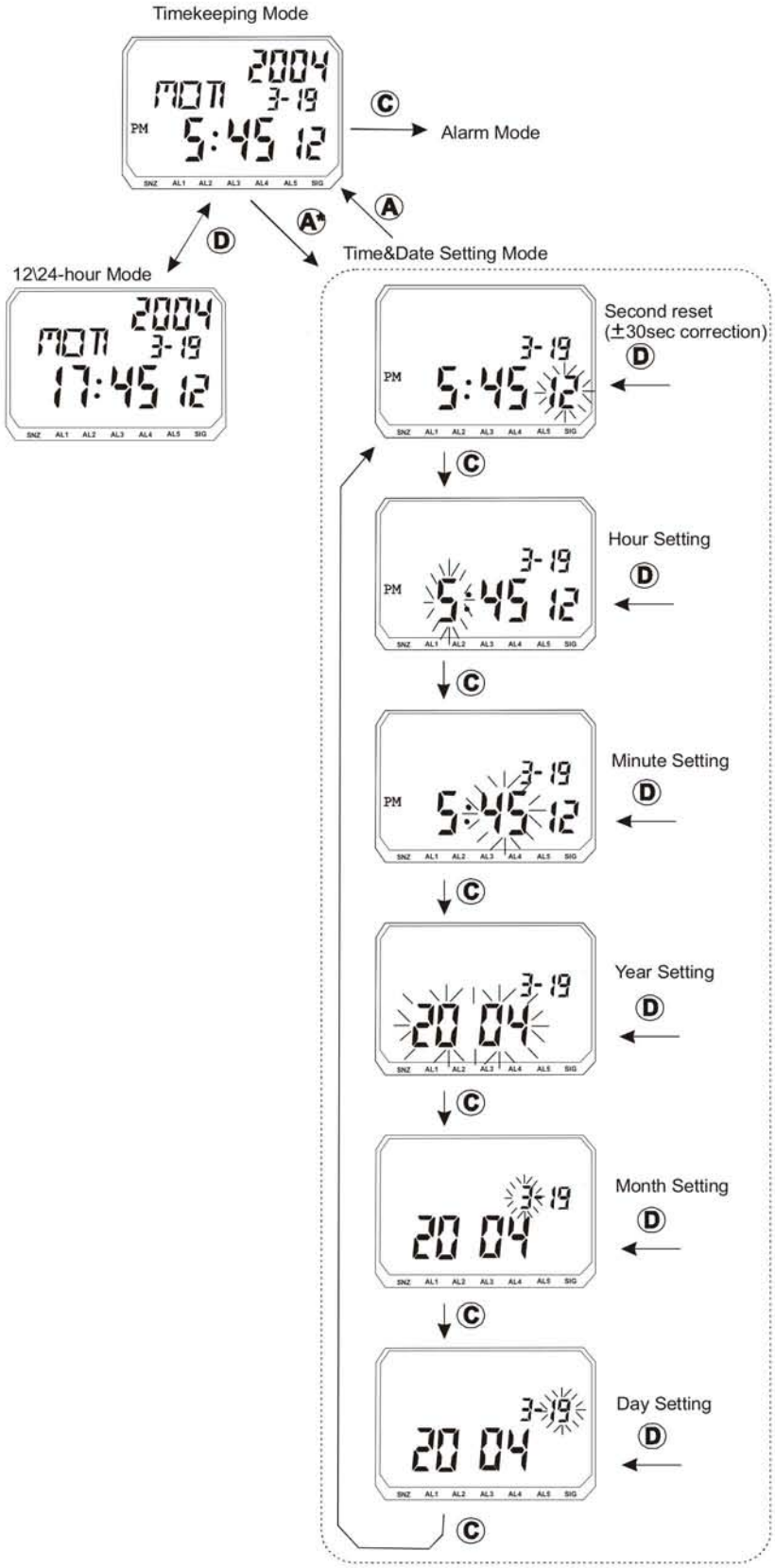
The buttons location are shown on image.

NOTES:

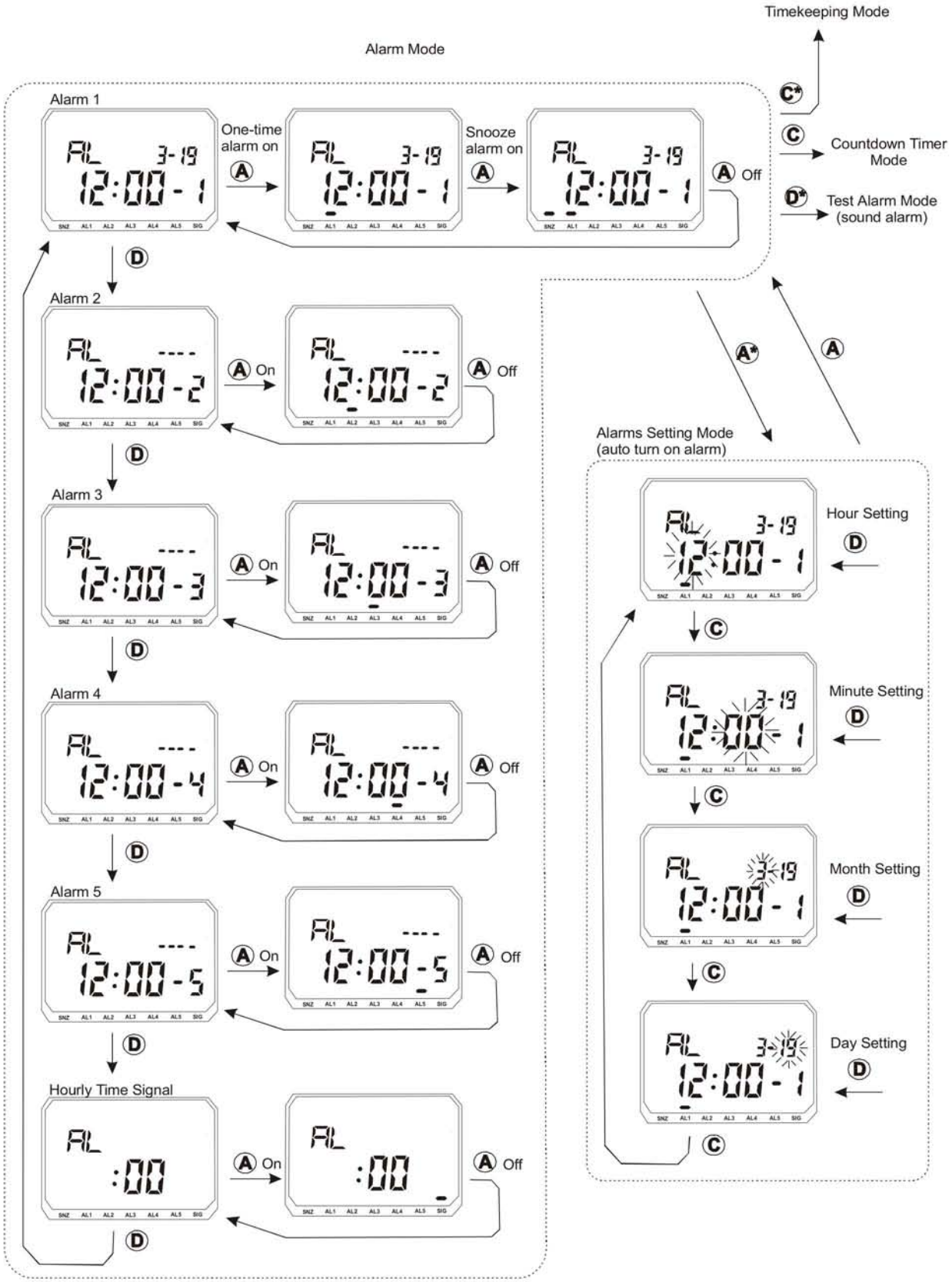
1. * - The button is pressed more than one sec.
2. In any mode, press **C*** button to return to Timekeeping Mode.
3. In any mode, press **B** button to illuminate the display.

5.1 MAIN OPERATION SEQUENCE

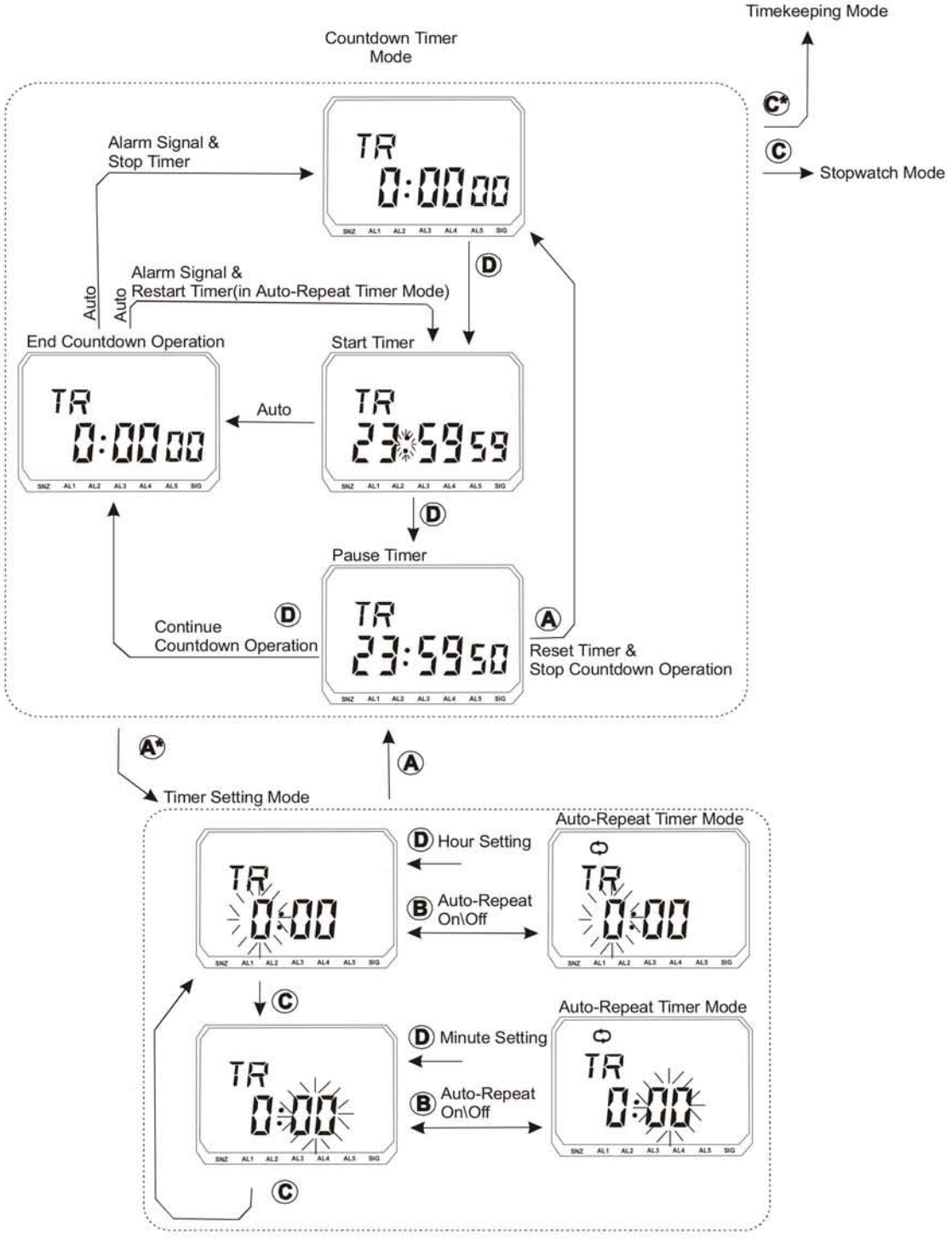
5.2 TIMEKEEPING MODE AND TIME&DATA SETTING



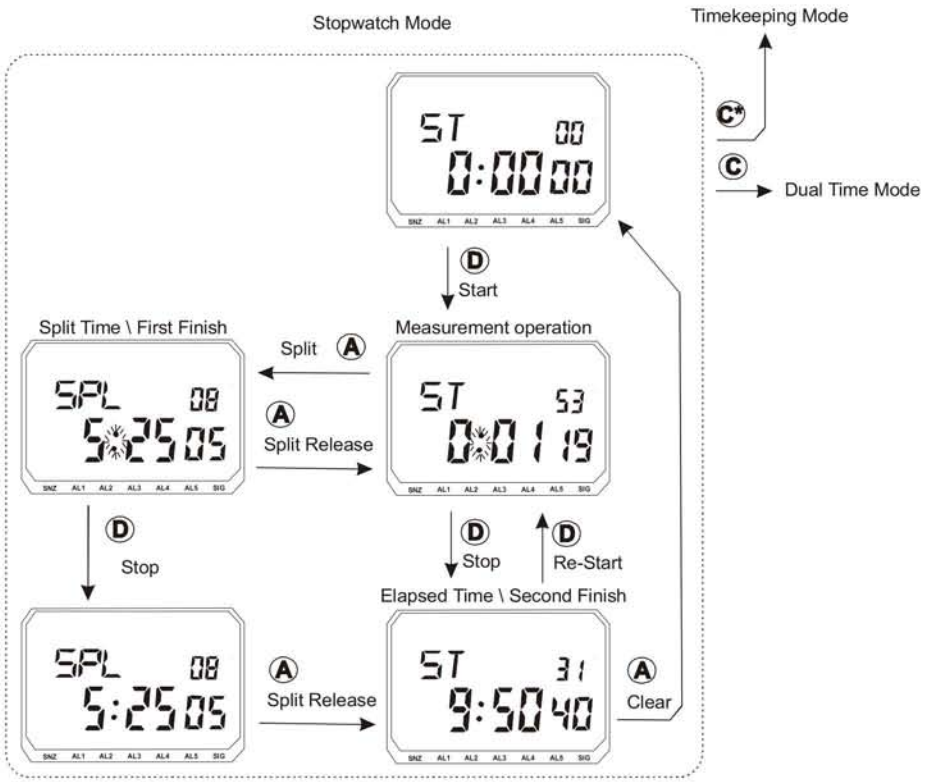
5.3 ALARMS OPERATION AND SETTING



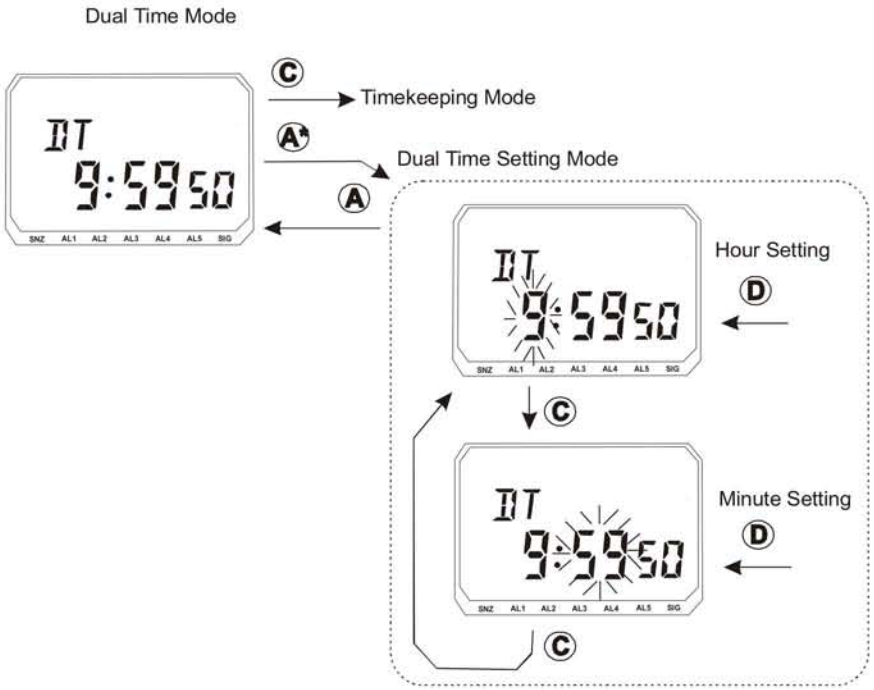
5.4 TIMER OPERATION AND SETTING



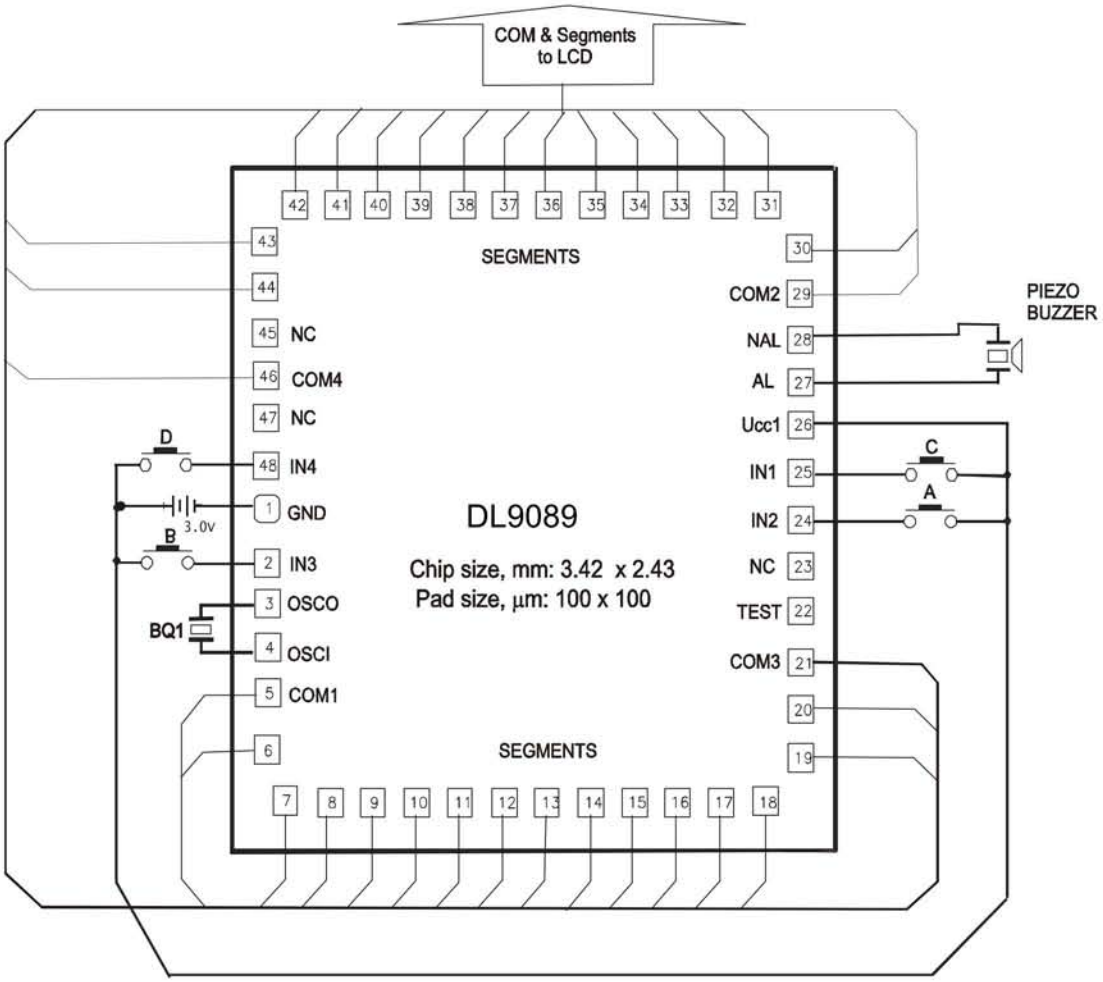
5.5 STOPWATCH OPERATION AND SETTING



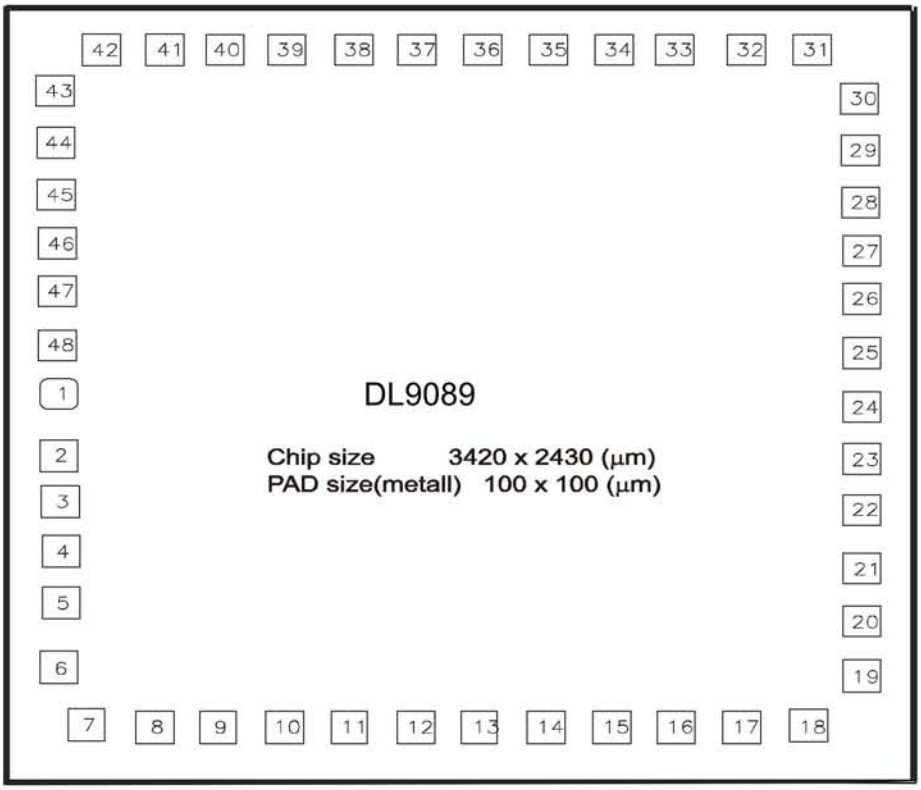
5.6 DUAL TIME OPERATION AND SETTING



6. APPLICATION CIRCUIT



7. PAD DIAGRAM



Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
01	GND	105.6	1068.4	17	S12	2659.2	105.2	33	S20	2454	2224.4
02	IN3	105.6	890.8	18	S13	2883.2	105.2	34	S21	2230	2224.4
03	OSCO	105.6	721.2	19	S14	3216	274.8	35	S22	2006	2224.4
04	OSCI	105.6	551.6	20	S15	3216	444.4	36	S23	1782	2224.4
05	COM1	105.6	382	21	COM3	3216	614	37	S24	1558	2224.4
06	S01	105.6	212.4	22	TEST	3216	783.6	38	S25	1334	2224.4
07	S02	419.2	105.2	23	NC	3216	953.2	39	S26	1110	2224.4
08	S03	643.2	105.2	24	IN2	3216	1122.8	40	S27	886	2224.4
09	S04	867.2	105.2	25	IN1	3216	1292.4	41	S28	662	2224.4
10	S05	1091.2	105.2	26	U_{CC1}	3216	1462	42	S29	438	2224.4
11	S06	1315.2	105.2	27	AL	3216	1631.6	43	S30	105.6	2078
12	S07	1539.2	105.2	28	NAL	3216	1801.2	44	S31	105.6	1908.4
13	S08	1763.2	105.2	29	COM2	3216	1970.8	45	S32(NC)	105.6	1738.8
14	S09	1987.2	105.2	30	S17	3216	2140.4	46	COM4	105.6	1569.2
15	S10	2211.2	105.2	31	S18	2902	2224.4	47	NC(Z)	105.6	1399.6
16	S11	2435.2	105.2	32	S19	2678	2224.4	48	IN4	105.6	1230

NOTE: The chip substrate is electrically connected to GND.

Pad No	Identification	Purpose
01	GND	Common output
02	IN3	Control input
03	OSCO	Output for connection of the quartz resonator
04	OSCI	Input for connection of the quartz resonator
05	COM1	Control output for the LCD common electrode
06	SEG1	Control output for the LCD segment electrode
07	SEG2	Control output for the LCD segment electrode
08	SEG3	Control output for the LCD segment electrode
09	SEG4	Control output for the LCD segment electrode
10	SEG5	Control output for the LCD segment electrode
11	SEG6	Control output for the LCD segment electrode
12	SEG7	Control output for the LCD segment electrode
13	SEG8	Control output for the LCD segment electrode
14	SEG9	Control output for the LCD segment electrode
15	SEG10	Control output for the LCD segment electrode
16	SEG11	Control output for the LCD segment electrode
17	SEG12	Control output for the LCD segment electrode
18	SEG13	Control output for the LCD segment electrode
19	SEG14	Control output for the LCD segment electrode
20	SEG15	Control output for the LCD segment electrode
21	COM3	Control output for the LCD common electrode
22	TEST	Testing
23	NC	
24	IN2	Control input
25	IN1	Control input
26	U_{CC1}	Supply voltage outlet from the voltage source
27	AL	Alarm control output
28	NAL	Inverse output for the alarm control
29	COM2	Control output for the LCD common electrode
30	SEG17	Control output for the LCD segment electrode
31	SEG18	Control output for the LCD segment electrode
32	SEG19	Control output for the LCD segment electrode
33	SEG20	Control output for the LCD segment electrode
34	SEG21	Control output for the LCD segment electrode
35	SEG22	Control output for the LCD segment electrode
36	SEG23	Control output for the LCD segment electrode
37	SEG24	Control output for the LCD segment electrode
38	SEG25	Control output for the LCD segment electrode
39	SEG26	Control output for the LCD segment electrode
40	SEG27	Control output for the LCD segment electrode
41	SEG28	Control output for the LCD segment electrode
42	SEG29	Control output for the LCD segment electrode
43	SEG30	Control output for the LCD segment electrode
44	SEG31	Control output for the LCD segment electrode
45	SEG32	Control output for the LCD segment electrode
46	COM4	Control output for the LCD common electrode
47	IN5	Control input
48	IN4	Control input
LCD – liquid crystal display.		