



## INTRODUCTION

The DL6172 watch (the product name is arbitrary) is a CMOS IC with functions of a wrist watch, alarm, stopwatch and calendar. It is designed for a duplexes 50 - segment liquid-crystal display. With EL-backlight Driver.

## FUNCTIONS

- Normal time counting and setting: hours, minutes, seconds.
- Calendar count and setting: month, date, day of week.
- Alarm time setting: hours, minutes.
- Setting Alarm times with 4÷5 minute snooze.
- Alarm output for melody (mask option).
- 6-digit Stopwatch with 0.01 sec. counting accuracy before 30 minutes and 1 second accuracy after 30 minutes.
- Selectable 12/24-hour format.
- Time-error correction within  $\pm 30$  seconds.
- Fast advance for time and alarm time setting.
- Chime on every hour.
- 4-switch operation.
- LCD test.
- EL backlight Driver.

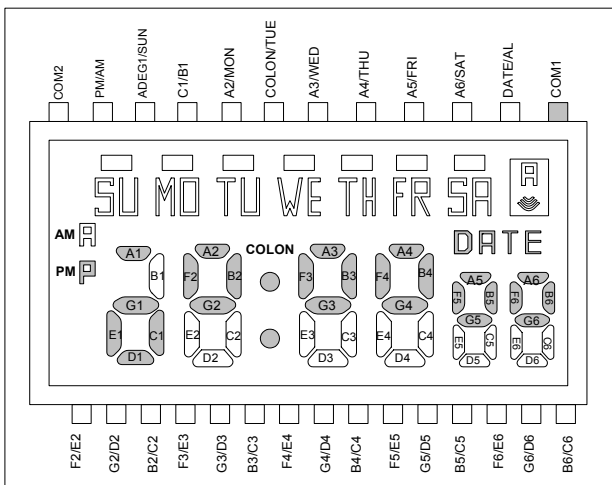
## FEATURES

- Single-chip CMOS construction.
- Drives 6-digit duplexes 50 - segment LCD with a separating colon for hours and minutes (39 segments), 7 day mark (7 segments), date mark (1 segment), AM/PM mark (2 segments), Alarm mark.
- Two buzzer driver (differential).
- On-chip oscillator with resistor and capacitor.
- Voltage doubler.
- Debounce circuitry on switch inputs.
- Protection against static discharge ( 2000V ).
- Low power consumption.
- Single 1.5V battery operation.
- External 32,768 crystal frequency.
- 3 ÷ 4 second EL-backlight timer.

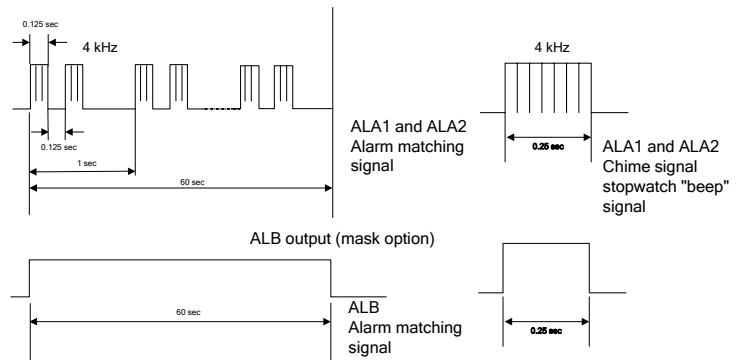
## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , $V_{DD} = 1.5\text{V}$ , $V_{SS} = 0\text{V}$ ; unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	$V_{DD}$		1.2	1.5	1.8	V
Supply Current	$I_{DD}$	Without Load		1.0	1.5	$\mu\text{A}$
Input High Voltage	$V_{IH}$		$V_{DD} - 0.3$		$V_{DD}$	V
Input Low Voltage	$V_{IL}$		$V_{SS}$		$V_{SS} + 0.3$	V
Switch Activation Current	$I_{SW}$	$V_{in} = V_{DD}$	0.1	0.5	4	$\mu\text{A}$
Oscillator Start Voltage	$V_{OSC}$	Within 2 sec			1.2	V
Alarm Drive Current	$I_{ALA1(\text{drive/sink})}$		0.75/5	1.0/7		mA
	$I_{ALA2}$	$V_{sat} = 0.5\text{V}$ (Both Ditection)	0.75	1.5		
	$I_{alb}$	$V_{sat} = 0.5\text{V}$	0.75	1.5		
Output Voltage for EL Driver	$V_{EL}$			110		V
Oscillator Frequency	$F_{OSC}$			32,768		Hz
LCD Frequency	$F_d$			32		Hz
Oscillator Input Capacitor	$C_{IN}$			22		pF
Oscillator Output Capacitor	$C_{OUT}$			22		pF
Time Stability	$T_{stb}$	$V_{DD} = +1.2\sim+1.8$		1	2	ppm
Switch Debunking Time	$T_{deb}$				31.25	msec

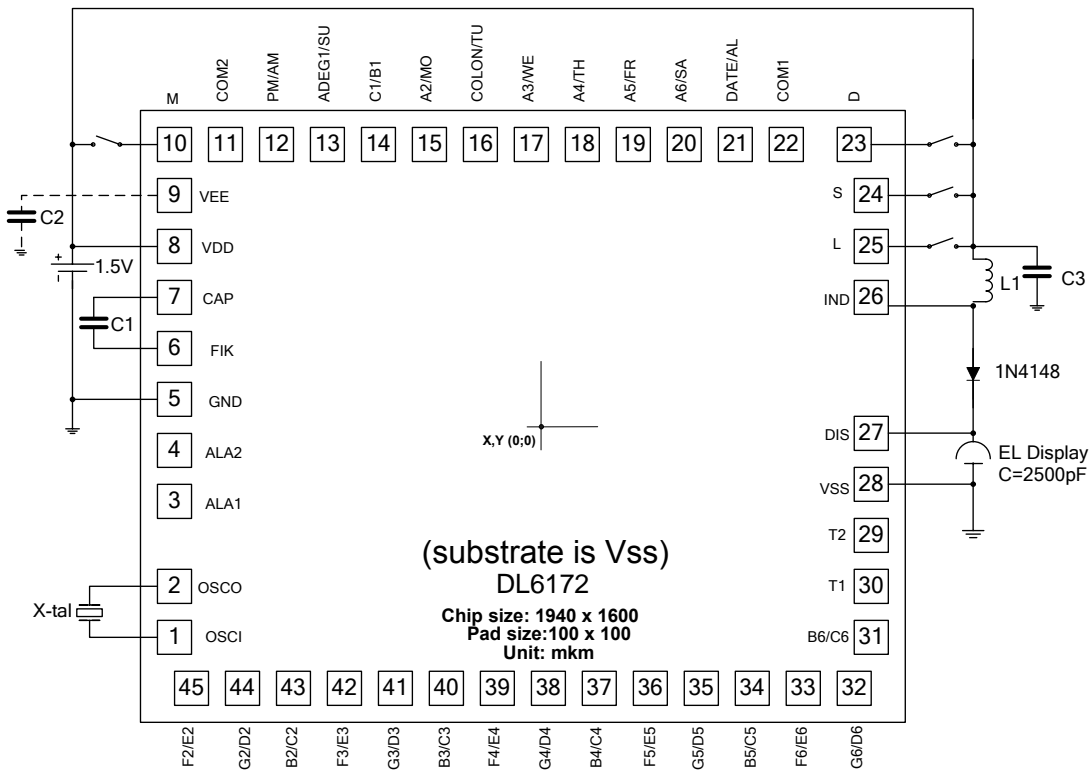
## LCD FORMAT



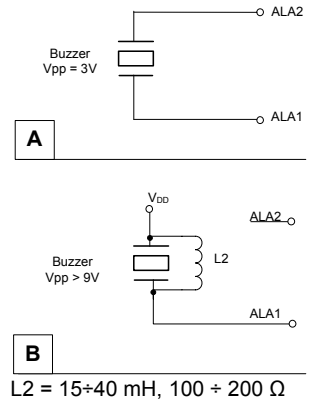
## OUTPUT WAVEFORMS ALA1 and ALA2 outputs



### APPLICATION CIRCUIT



### Piezo Drive Method



- NOTE: 1. L1 = 1.0 + 3 mH, 10 + 20 Ω.  
2. Piezo Drive Method  
3. C1, C2, C3 = 0.1 uF

### PAD DESCRIPTION

Pad No	Pad Name	I/O	Description	X(μm)	Y(μm)	Pad No	Pad Name	I/O	Description	X(μm)	Y(μm)
1	OSCI	I	Crystal oscillator	-845	-520.5	24	S	I p.d.	Switch input	845	545
2	OSCO	O	Crystal oscillator	-845	-400.5	25	L	I p.d.	Switch input	845	425
3	ALA1	O	Direct Alarm signal driver	-845	-213.5	26	IND	O	EL Driver IND output	845	305
4	ALA2 (ALB)	O	Inverted Alarm signal driver (out for melody IC – mask option)	-845	-93.5	27	DIS	O	EL Driver DIS output	845	-115
5	Vss	-	Ground	-845	26.5	28	Vss	-	Ground	845	-235
6	FIK	I	Voltage doubler output	-845	146.5	29	T2	I p.d.	Test input	845	-345
7	CAP	O	Voltage doubler capacitor	-845	266.5	30	T1	I p.d.	Test input	845	-445
8	Vdd	-	1.5V battery source	-845	386.5	31	B6/C6	O	B6/C6 LCD segment output	845	-555
9	Vee	-	Voltage doubler	-845	506.5	32	G6/D6	O	G6/D6 LCD segment output	798.5	-675
10	M	I p.d.	Switch input	-845	675	33	F6/E6	O	F6/E6 LCD segment output	645	-675
11	COM2	O	LCD common output	-725	675	34	B5/C5	O	B5/C5 LCD segment output	525	-675
12	PM/AM	O	PM/AM LCD segment output	-605	675	35	G5/D5	O	G5/D5 LCD segment output	405	-675
13	ADEG1/SU	O	ADEG1/SUN LCD segment output	-485	675	36	F5/E5	O	F5/E5 LCD segment output	285	-675
14	C1/B1	O	B1/C1 LCD segment output	-365	675	37	B4/C4	O	B4/C4 LCD segment output	165	-675
15	A2/MO	O	A2/MON LCD segment output	-245	675	38	G4/D4	O	G4/D4 LCD segment output	45	-675
16	COL/TU	O	COLON/TUE LCD segment output	-125	675	39	F4/E4	O	F4/E4 LCD segment output	-75	-675
17	A3/WE	O	A3/WED LCD segment output	-5	675	40	B3/C3	O	B3/C3 LCD segment output	-195	-675
18	A4/TH	O	A4/THU LCD segment output	115	675	41	G3/D3	O	G3/D3 LCD segment output	-315	-675
19	A5/FR	O	A5/FRI LCD segment output	545	545	42	F3/E3	O	F3/E3 LCD segment output	-435	-675
20	A6/SA	O	A6/SAT LCD segment output	425	425	43	B2/C2	O	B2/C2 LCD segment output	-555	-675
21	DATE/AL	O	DATE/AL LCD segment output	305	305	44	G2/D2	O	G2/D2 LCD segment output	-675	-675
22	COM1	O	LCD common output	-115	-115	45	F2/E2	O	F2/E2 LCD segment output	-795	-675
23	D	I p.d.	Switch input	-235	-235						

p.d. - pull-down, p.u. - pull-up