



1. DESCRIPTION

The DL9148 is a CMOS STOPWATCH IC. It can directly drive a standard 6 digits 1/3 duty cycle LCD. Maximum count time is 99 min 59 sec and 99 (1/100 sec). Two control inputs are: START/STOP and RESET.

1.1 FEATURES

- 6 digits 1/3 duty LCD
- Maximum count 99 min 59.99 sec
- START/STOP and RESET keys
- Touch tone
- Debounce circuitry on control inputs

1.2 FUNCTIONS

- SPLIT function
- Internal voltage doubler
- 32,768Hz quartz crystal time base
- Single 1.5V battery operation
- Direct drive buzzer

2. ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	- 0.3 ~ + 3.0	V
Operating Temperature	T_{opr}	- 20 ~ + 70	°C
Storage Temperature	T_{stg}	- 55 ~ + 125	°C

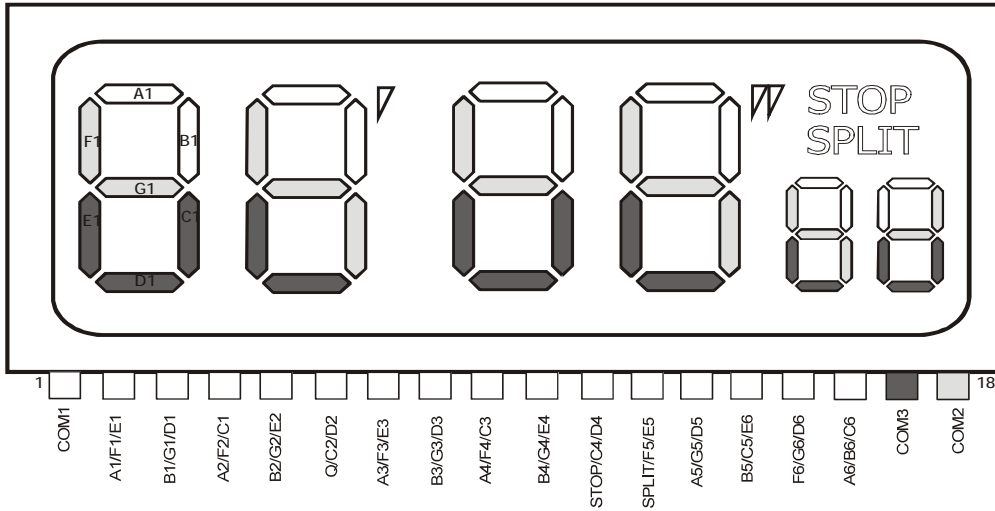
3. ELECTRICAL CHARACTERISTICS

($T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{V}$, $V_{CC} = 1.5\text{V}$, $F_{OSC} = 32768\text{ Hz}$; unless otherwise specified)

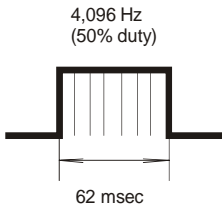
Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V_{CC}		1.25	1.5	1.7	V
Display Voltage	V_{DD}		2.4	3.0	3.4	V
Supply Current	I_{CC}	Without Load		1.5	3.0	μA
Output Drive Current (BZ, BZN)	I_{OH}	$V_{OH} = 1.35\text{V}$	-250	-400		μA
	I_{OL}	$V_{OL} = 0.15\text{V}$	250	400		
Oscillator Start Voltage	V_{OSC}	Within 5 sec			1.35	V
Oscillator Built-in Capacitors	C_D			20		pF



4. LCD FORMAT



5. TOUCH TONE SIGNAL WAVEFORM



6. PAD DESCRIPTION

Power on clear circuit is provided so when power is supplied, counters are reset to zero and mode goes to D-type. Debouncing circuitries are on the both inputs. Timing setting error is unless 1/100 second by each depressing START/STOP or RESET.

START/STOP –internally pulled down input, acts as Start/Stop function. By this input the sequence mode can be selected at setting procedure.

RESET – internally pulled down input, which executes Reset function, and, at Split function also.

BZ, BZN – Piezo Buzzer Driving Complementary Outputs, which are used be drive the piezo buzzer directly for the touch tone signal sounding.

V_{SS}, V_{CC}, V_{DD} – Power pads for ground (V_{SS}), positive power supply, 1.5V (V_{CC}) and voltage doubler 3.0V to drive LCD (V_{DD}).

CAP1, CAP2 – Voltage Doubler capacitor pads.

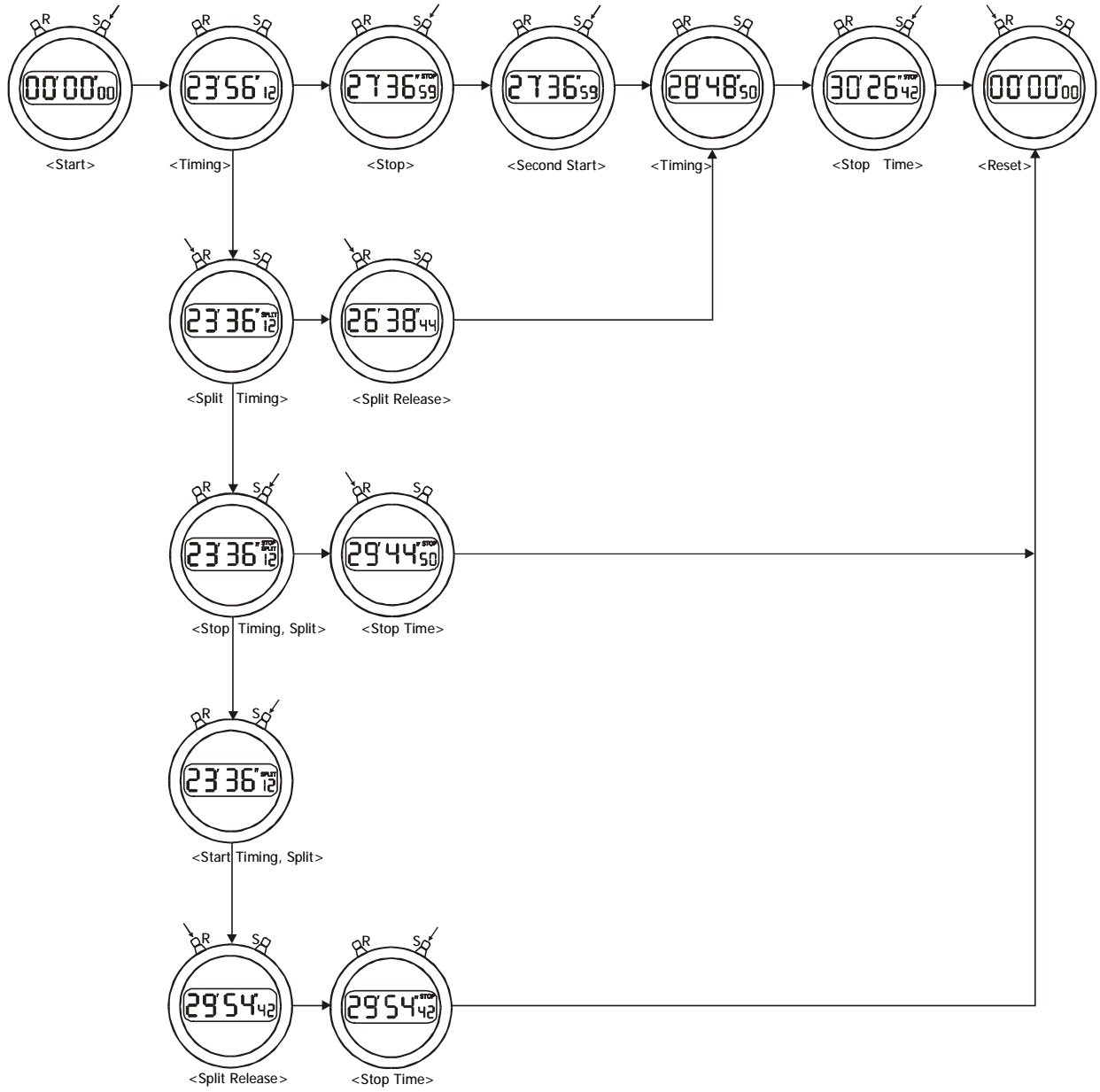
OSCI, OSCO – Oscillator Input and Output. A 32,768 Hz quartz crystal resonator is connected to these pads. Both pads OSCI, OSCO have a built-in capacitance.

COM1, COM2, COM3, SEGMENT 德 – Outputs to drive the LCD.

TEST pads – these pads are used for testing, only.

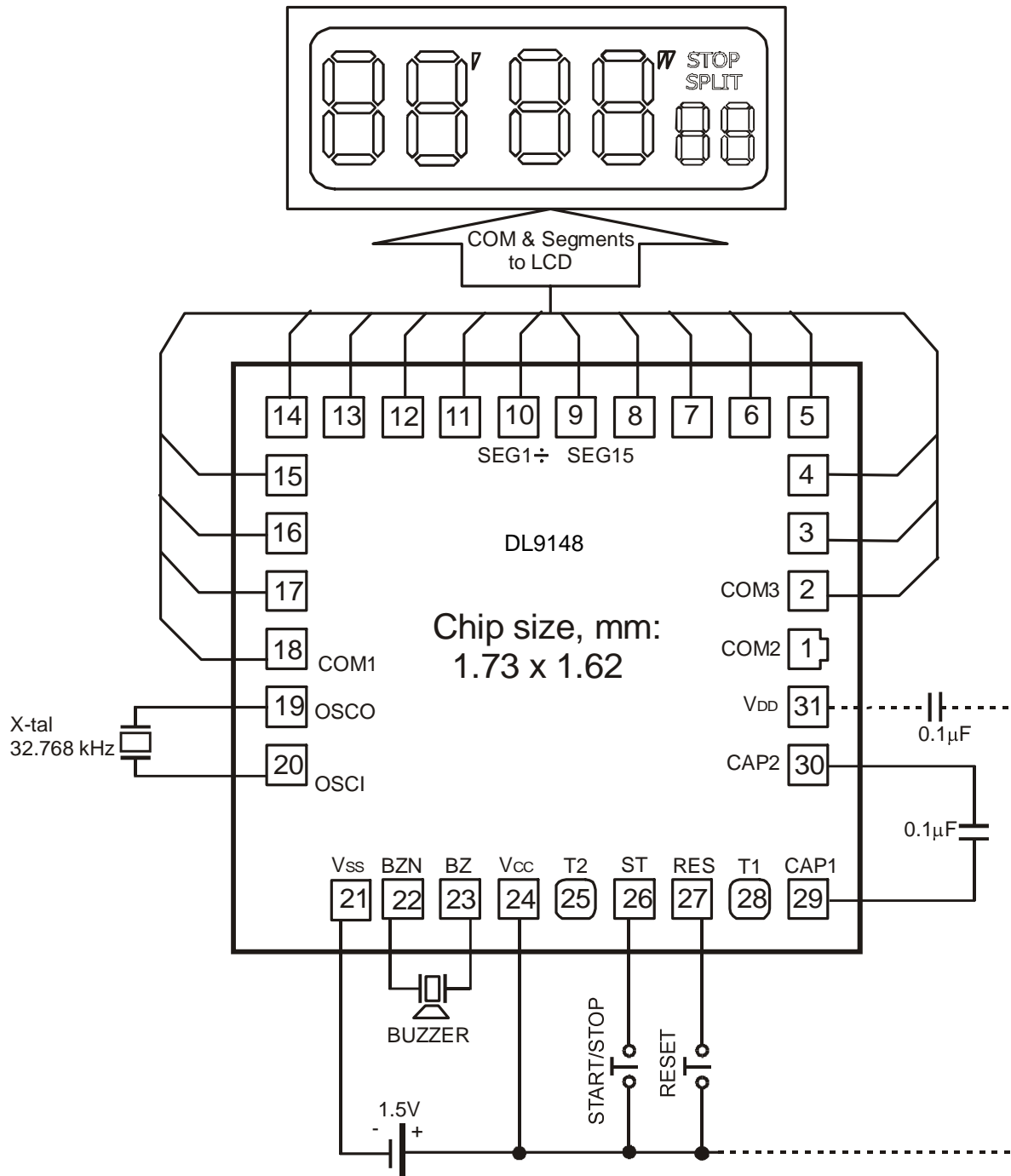


7. OPERATION SEQUENCE





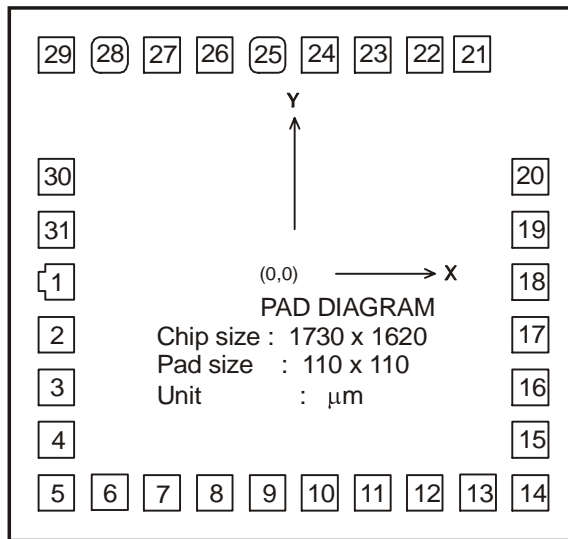
8. APPLICATION CIRCUIT



NOTE: The chip substrate is electrically connected to V_{SS}.



9. PAD DIAGRAM



10. PAD LOCATION

Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	COM2	-720	-25	17	SEG1	720	-185
2	COM3	-720	-185	18	COM1	720	-25
3	SEG15	-720	-345	19	OSCO	720	135
4	SEG14	-720	-505	20	OSCI	720	295
5	SEG13	-720	-665	21	V _{SS}	560	665
6	SEG12	-560	-665	22	BZN	400	665
7	SEG11	-400	-665	23	BZ	240	665
8	SEG10	-240	-665	24	V _{CC}	80	665
9	SEG9	-80	-665	25	T2	-80	665
10	SEG8	80	-665	26	ST	-240	665
11	SEG7	240	-665	27	RES	-400	665
12	SEG6	400	-665	28	T1	-560	665
13	SEG5	560	-665	29	CAP1	-720	665
14	SEG4	720	-665	30	CAP2	-720	295
15	SEG3	720	-505	31	V _{DD}	-720	135
16	SEG2	720	-345				