

1. DESCRIPTION

The DL9153 is a CMOS digital 6-function watch integrated circuit with alarm and auto-ranging chronograph function; designed to for a 6-digit duplexed liquid crystal display, 7-day mark, date mark, AM/PM mark and colon.

1.1 FUNCTIONS

- 6 Functions: Month, Date, Day-of-Week, Hour, Minute, Second
- 6-digit Chronograph: Auto-ranging after 30 minutes to hour, minute; second
- User selectable 12-hour/24-hour format
- 4-year calendar
- One-touch correction of time error within ± 30 seconds
- Fast advance for time and alarm time set
- Chime on every hour
- 3-switch sequential operation

1.2 FEATURES

- Single-chip CMOS construction
- Drives 6-digit duplexed LCD with 7-day mark, AM/PM mark, date mark and alarm mark
- Colon display
- Two outputs to drive piezoelectric transducer (with built-in or external transistor)
- 32,768Hz crystal frequency
- On-chip oscillator, capacitor, resistor and voltage doubler
- Single 1.5V battery operation
- Low power dissipation
- Debounce circuitry on switch inputs
- Protection against static discharge

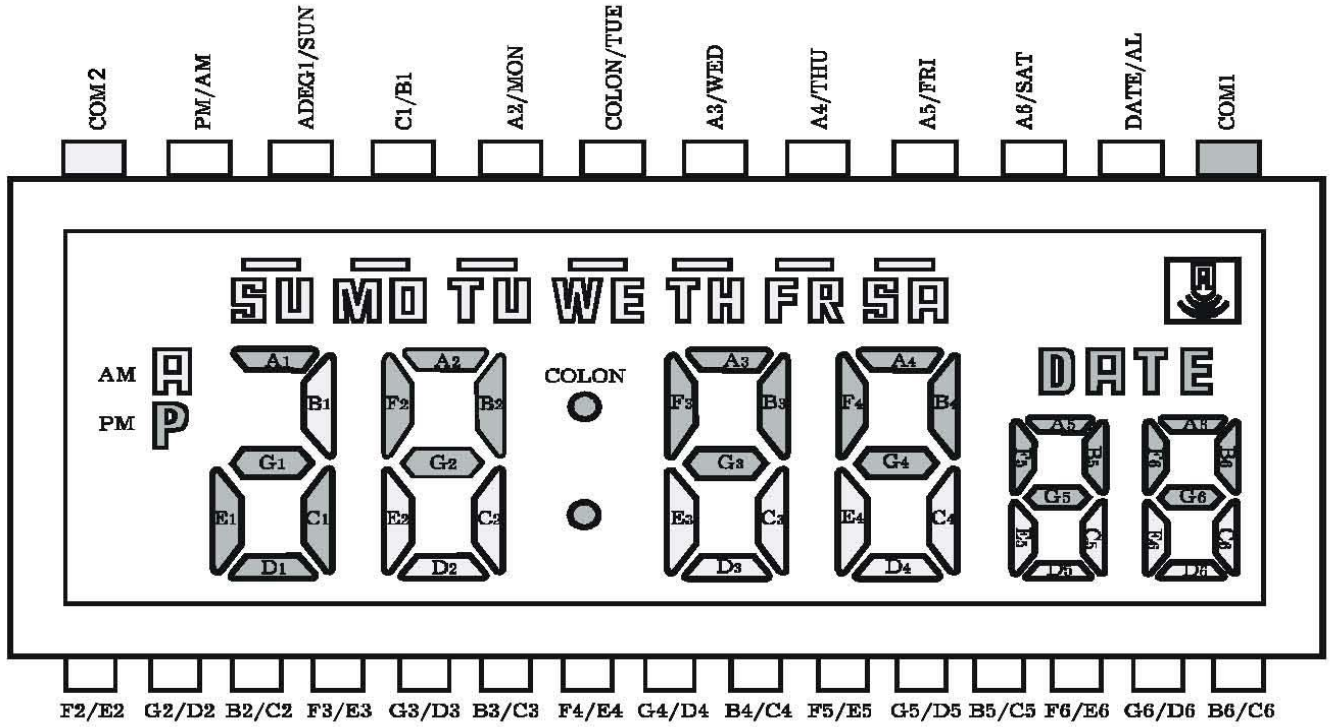
2. ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Value	Unit
Supply Voltage VDD	V _{DD}	- 0.3 ~ + 4.0	V
Operating Temperature	T _{opr}	- 20 ~ + 70	°C
Storage Temperature	T _{stg}	- 55 ~ + 125	°C

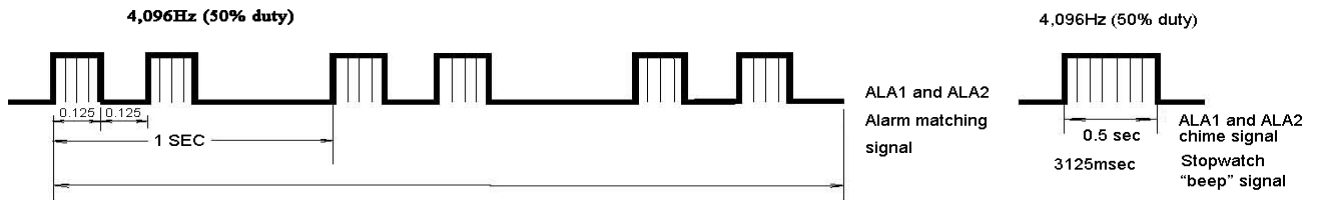
3. ELECTRICAL CHARACTERISTICS (T_a = 25°C, V_{SS} = 0V, V_{DD} = 3V unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V _{CC}		1.2	1.5	1.8	V
Display Voltage	V _{DD}		2.4	3.0	3.6	V
Supply Current	I _{CC}	Without load		1.0	2.0	μA
Input High Voltage	V _{IH}		V _{CC} - 0.3V		V _{CC}	V
Input Low Voltage	V _{IL}		V _{SS}		V _{CC} +0.3	V
Oscillator Start Voltage	V _{OSC}				1.45	V
Oscillator Stop Voltage	V _{OSP}				1.15	V
Alarm Drive Current	I _o	V _{sat} = 0.5V	10	20		mA
Oscillator Frequency	F _{OSC}			32,768		Hz
DC-DC Conversion Frequency	F _{CON}	C1 = C2 = 0.1μF		1,024		Hz
Oscillator Input and Output Capacitors	C _{IN}			25		pF
Time Stability	T _{stb}	V _{DD1} = 1.3 ÷ 1.8V		1	3	ppm
Switch Debouncing Time	T _{deb}				31.25	mSec

4. LCD FORMAT

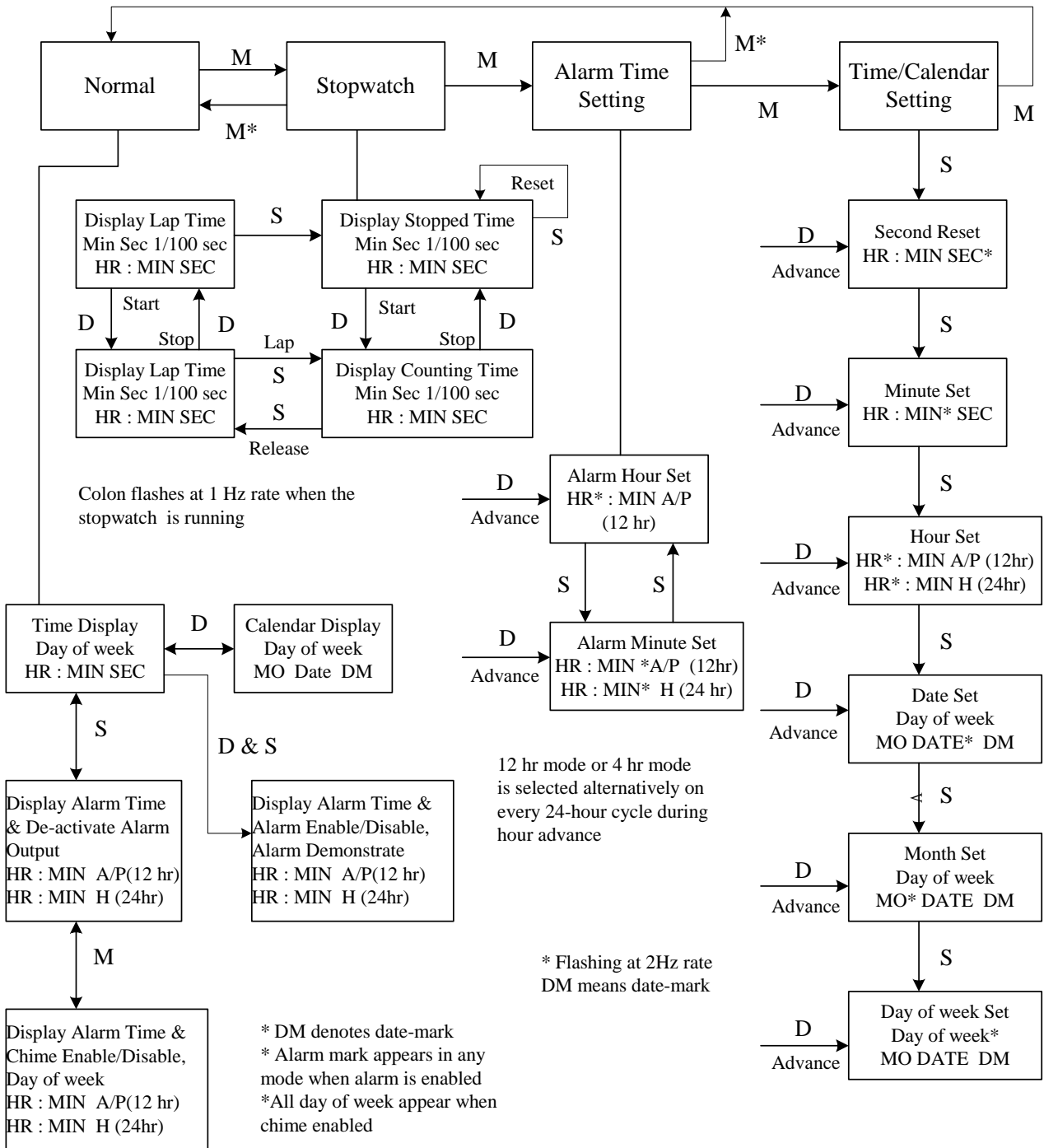


5. ALARM OUTPUT WAVEFORMS

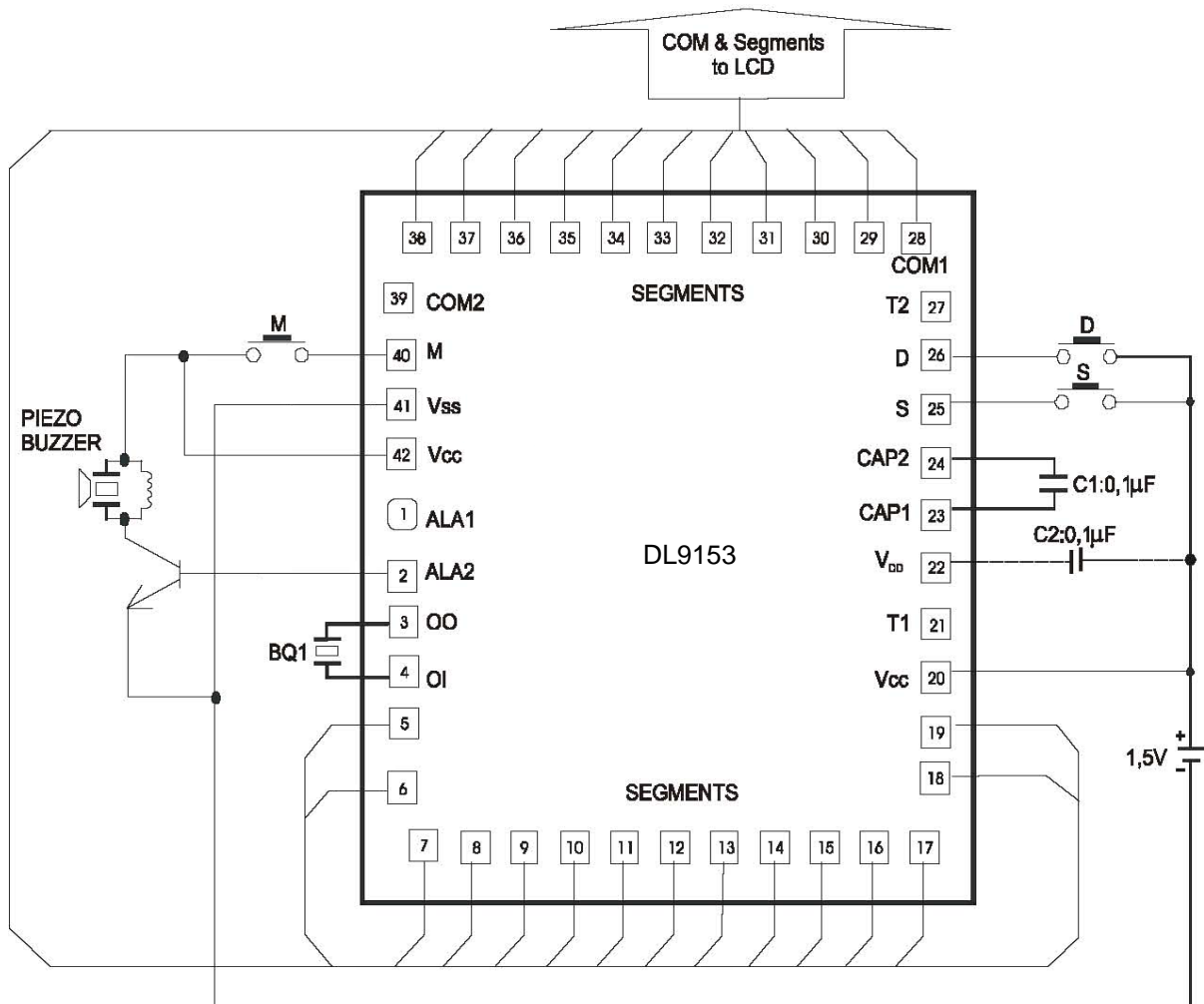


6. SETTING SEQUENCE AND SWITCH OPERATION

When S or D is used in the Stopwatch mode or the Alarm Setting Mode, the normal mode is obtained by pressing M



7. APPLICATION CIRCUIT (Drive of piezobuzzer by external transistor)



NOTE: The die area should be isolated or connected to Vss.

* Quartz Crystal Parameter

Fp = 32,768 Hz

CL = 12.5 pF

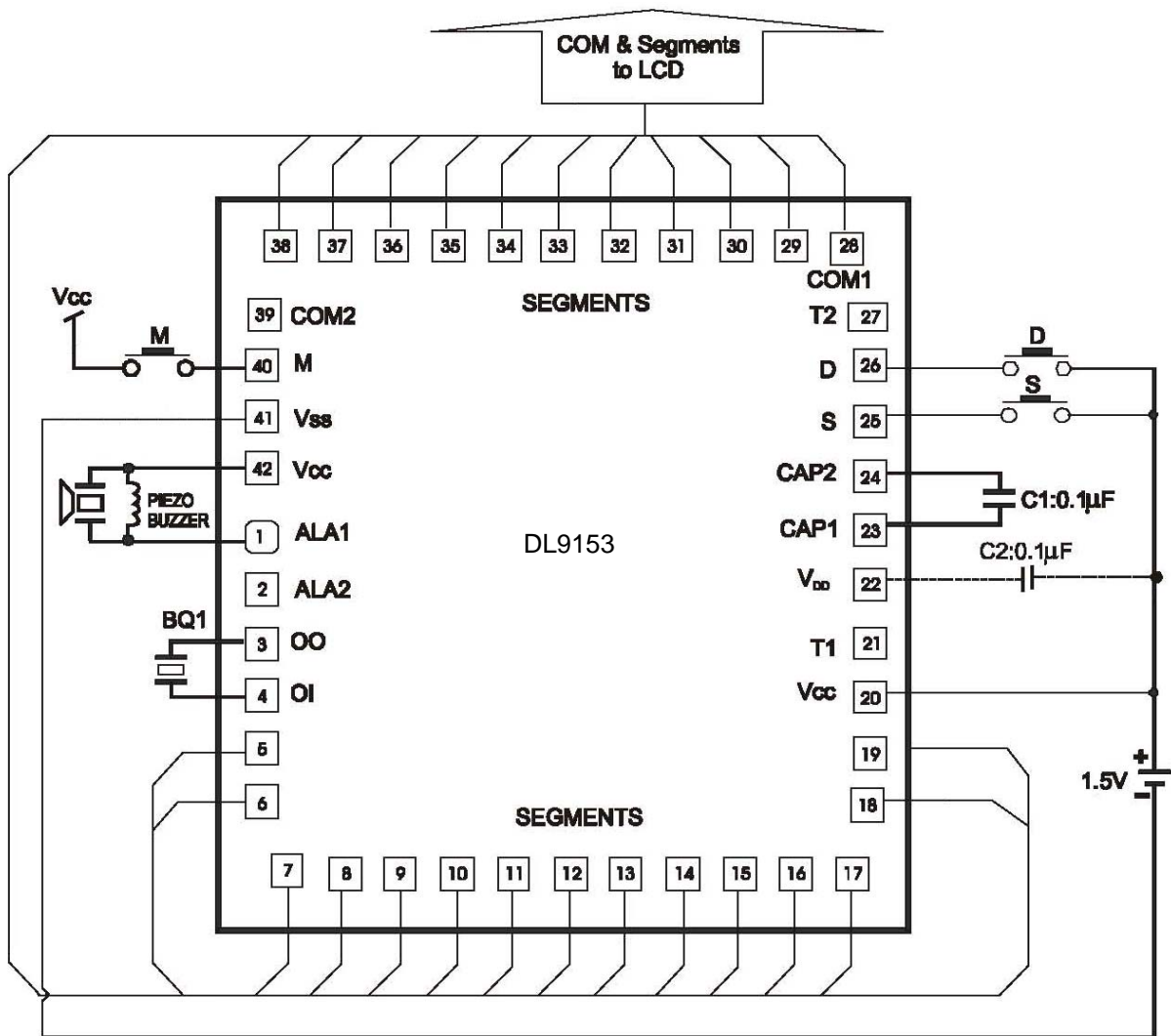
C1 = 4 pF

C0 = 2.5 pF

Rc = 35 KΩ

Q = 35,000

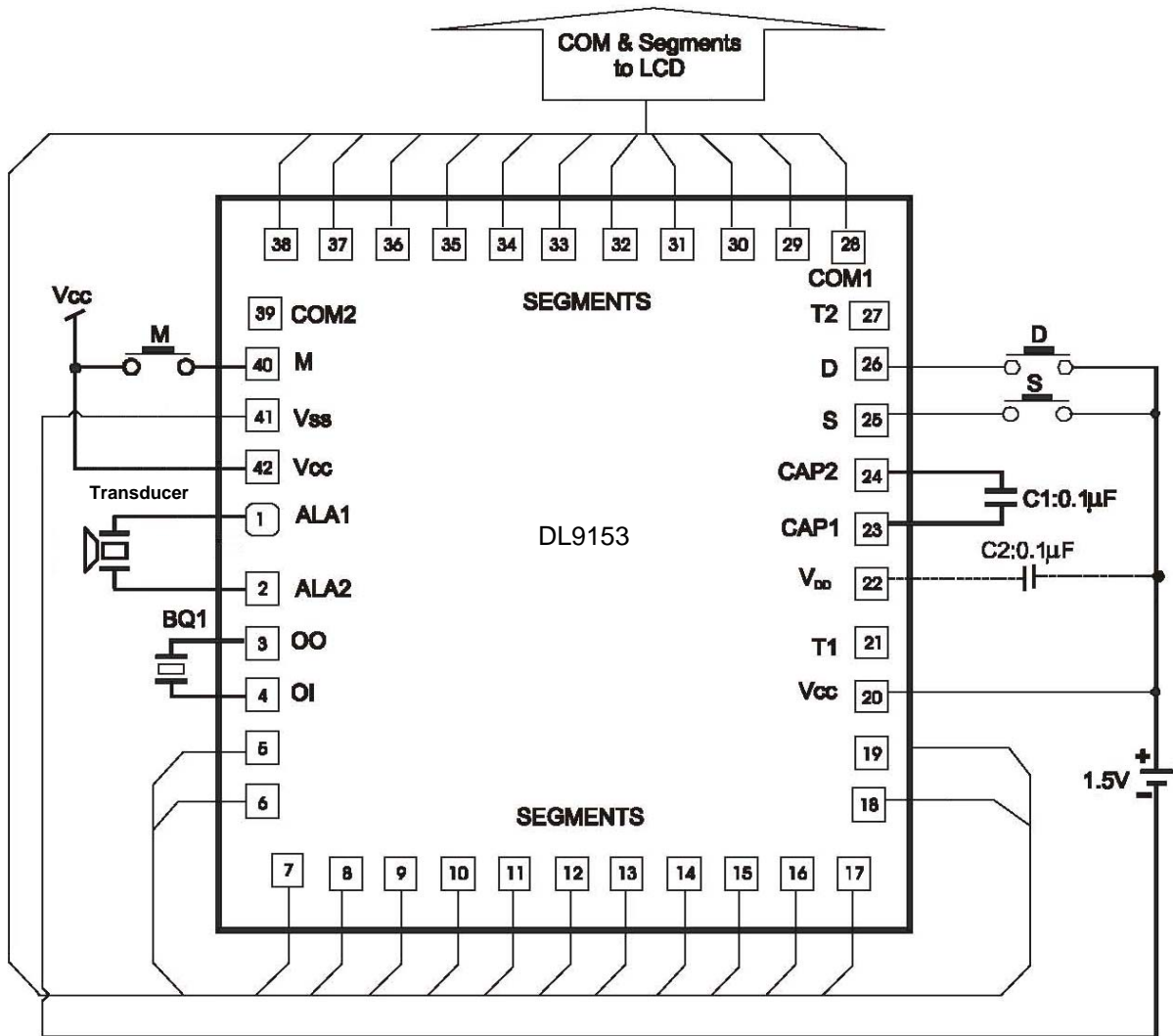
8. APPLICATION CIRCUIT (Drive of piezobuzzer by built-in transistor)



NOTE: The die area should be isolated or connected to Vss.

- * Quartz Crystal Parameter
- Fp = 32,768 Hz
- CL = 12.5 pF
- C1 = 4 pF
- C0 = 2.5 pF
- Rc = 35 KΩ
- Q = 35,000

9. APPLICATION CIRCUIT (Direct Driver)



NOTE: The die area should be isolated or connected to Vss.

* Quartz Crystal Parameter

Fp = 32,768 Hz

CL = 12.5 pF

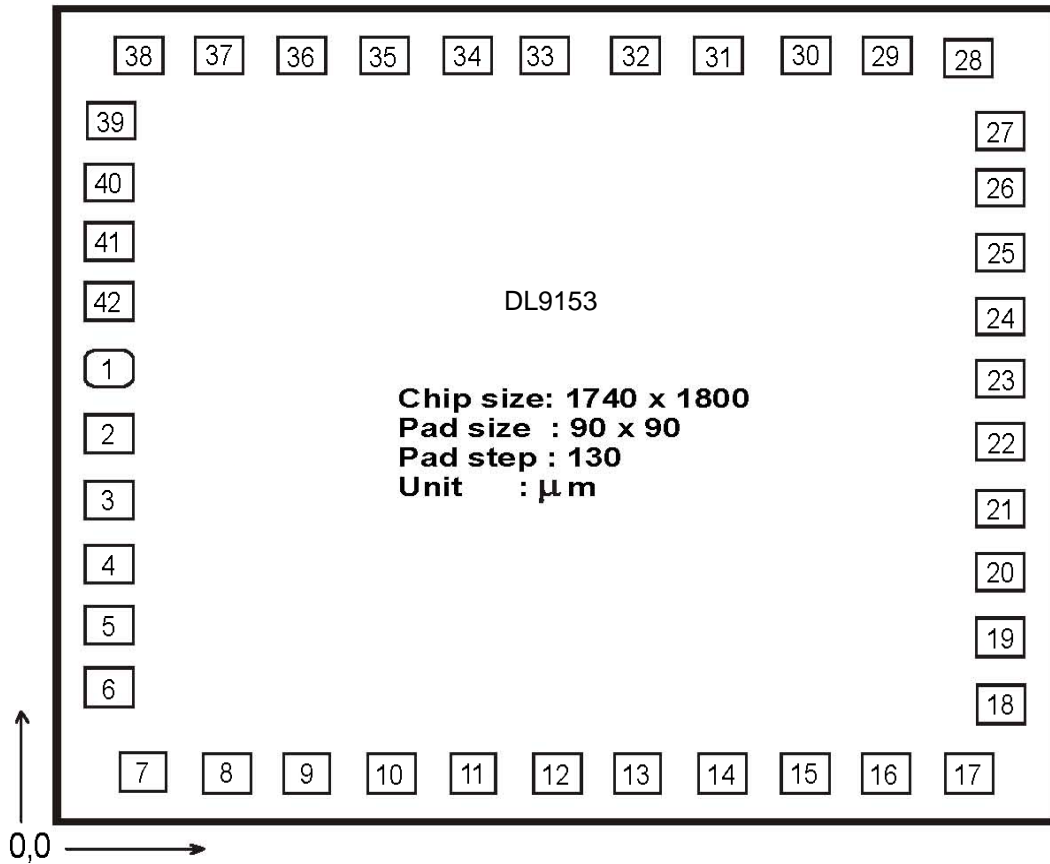
C1 = 4 pF

C0 = 2.5 pF

Rc = 35 KΩ

Q = 35,000

10. PAD DIAGRAM



Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y	Pad No.	Pad Name	X	Y
1	ALA1	105	927	15	G5/D5	1216	105	29	DATE/AL	1345	1605
2	ALA	105	789	16	B5/C5	1346	105	30	A6/SAT	1215	1605
3	OO	105	659	17	F6/E6	1476	105	31	A5/FRI	1085	1605
4	OI	105	529	18	G6/D6	1545	269	32	A4/THU	955	1605
5	F2/E2	105	399	19	B6/C6	1545	399	33	A3/WED	825	1605
6	G2/D2	105	269	20	V _{CC}	1545	529	34	COLON/TUE	695	1605
7	B2/C2	176	105	21	T1	1545	659	35	A2/MON	565	1605
8	F3/E3	306	105	22	V _{DD}	1545	789	36	C1/B1	435	1605
9	G3/D3	436	105	23	CAP1	1545	919	37	ADEG1/SUN	305	1605
10	B3/C3	565	105	24	CAP2	1545	1049	38	PM/AM	175	1605
11	F4/E4	696	105	25	S	1545	1179	39	COM2	105	1439
12	G4/D4	826	105	26	D	1545	1309	40	M	105	1309
13	B4/C4	956	105	27	T2	1545	1439	41	V _{SS}	105	1179
14	F5/E5	1086	105	28	COM1	1475	1605	42	V _{CC}	105	1049

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

Pad size is given as per passivation layer

Thickness of chip is 0,460 ± 0,02 mm