INTRODUCTION

The Watch IC DL2095 is a low-threshold-voltage CMOS integrated circuit that provides signals to drive a 4-digit duplexed liquid crystal display with colon, PM/AM-Time mark and AL/CH mark. The IC include internal buzzer driver.

FEATURES

- Single-chip CMOS construction
- Drives 4-digit duplexed LCD with PM/AM-Time, alarm mark and chime mark
- Two buzzer driver (differential)
- Alarm frequency 3.3 kHz (best sound)
- Low power dissipation
- 32,768Hz crystal frequency
- On-chip oscillator, capacitor and resistors
- On-chip voltage doubler
- Single 1.5V battery operation
- Debounce circuitry on Switch inputs
- Protection against static discharge

FUNCTIONS

- 5 Functions: month, date, hour, minute, second.
- Setting alarm time.
- 30-second alarm sound.
- Chime on every hour.
- User selectable 12-hour/24-hour format.
- 4 year calendar.
- One-touch correction of time error within ±30 seconds.
- Alarm, Chime enable/disable operation.
- 2-switch sequential operation.
- LCD test.

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

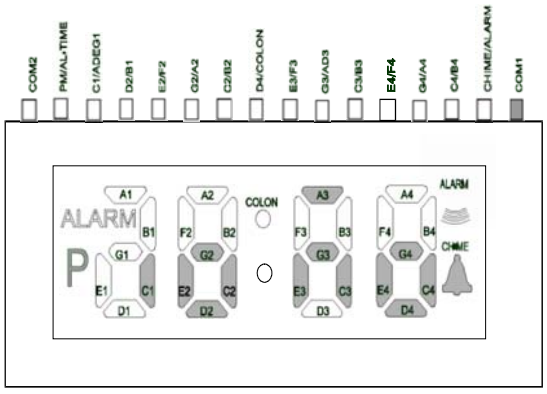
Parameter	Symbol	Value	Unit
Supply Voltage (V_{DD} – V_{SS})	V_{DS}	-0.3 < +6.0	V
Supply Voltage (V_{EE} – V_{SS})	V_{ES}	-0.3 < +6.0	V
Storage Temperature	Tstor	-60 < +150	°C

- Voltage greater than above may result in damage the circuit.
- **SUBSTRATE should be connected to VSS.**

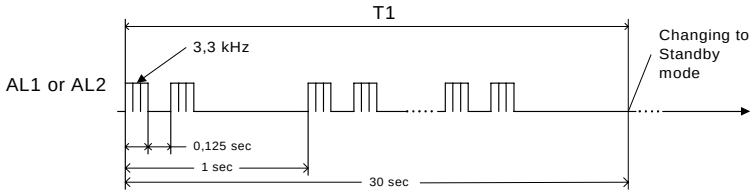
ELECTRICAL CHARACTERISTICS (Ta=25°C, V_{DD}=1.5V, V_{SS}= 0V; unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operation Voltage	$\|V_{DD}-V_{SS}\|$		1.2	1.5	1.8	V
	$\|V_{EE}-V_{SS}\|$		2.4	3.0	3.6	V
Supply Current	I_{DD}	Without Load		1.0	2.0	∝A
Input High Voltage	V_{IH}		V_{DD}-0.3		V_{DD}+0.3	V
Input Low Voltage	V_{IL}		V_{SS}-0.3		V_{SS}+0.3	V
Switch Activation Current	I_{SW}	$V_{IN}=V_{DD}$	1.0	4.0	10.0	∝A
Oscillator Start Voltage	$\|V_{OSC}\|$	Within 5 sec			1.45	V
Oscillator Stop Voltage	$\|V_{OSP}\|$				1.15	V
Alarm Drive Current	$I_{ALA1(drive/sink)}$		0.75/5	1.0/7		mA
	I_{ALA2}	V_{sat} = 0.5V (Both Ditection)	0.75	1.5		
Oscillator Frequency	F_{OSC}			32.768		Hz
LCD Frequency	F_D			32		Hz
Oscillator Input / Output Capacitor	C_{IN}/C_{OUT}			22		pF
Time Stability	T_{STB}	V_{DD}=-1.2 -1.8 V		1	3	ppm
Switch Debauching Time	T_{DEB}				62.5	msec

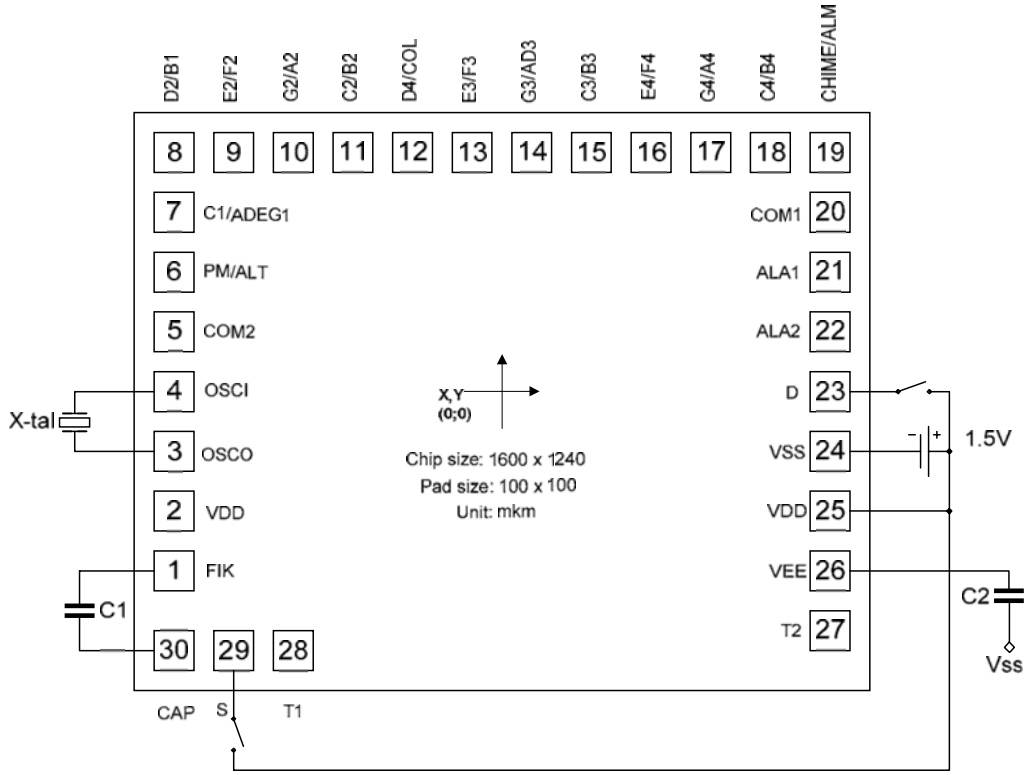
LCD FORMAT



ALARM OUTPUT WAVEFORM



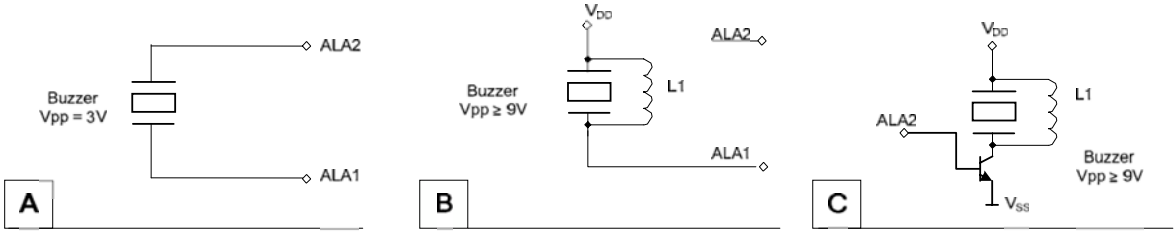
APPLICATION CIRCUIT



SUBSTRATE should be connected to VSS

- **L1 - 10÷40mH, 100÷200 Ω.**
- **C1 – 10÷20nF**
- **C2 – 0,1uF (ceramic 104).**
- **C1 and C2 used necessary.**

Piezo Drive Method



PAD DESCRIPTION

Pad No	Pad Name	I/O	Description	X(∝m)	Y(∝m)	Pad No	Pad Name	I/O	Description	X(∝m)	Y(∝m)
1	FIK	I	Voltage doubler output	-675	-375	16	E4F4	O	LCD segment output	285	495
2	Vdd	-	1.5V battery source	-675	-255	17	G4A4	O	LCD segment output	405	495
3	GOO	I	Crystal oscillator	-675	-135	18	C4B4	O	LCD segment output	525	495
4	GOI	O	Crystal oscillator	-675	-15	19	CHIME /ALM	O	LCD segment output	675	495
5	COM2	O	LCD common output	-675	105	20	COM1	O	LCD common output	675	375
6	PMALT	O	LCD segment output	-675	225	21	ALA1	O	Direct Alarm signal driver	675	255
7	C1ADEG1	O	LCD segment output	-675	345	22	ALA2	O	Inverted Alarm signal driver	675	135
8	D2B1	O	LCD segment output	-675	495	23	D	I p.d.	Switch input	675	15
9	E2F2	O	LCD segment output	-555	495	24	Vss	-	Ground	675	-105
10	G2A2	O	LCD segment output	-435	495	25	Vdd	-	1.5V battery source	675	-225
11	C2B2	O	LCD segment output	-315	495	26	Vee		Voltage doubler	675	-345
12	D4COL	O	LCD segment output	-195	495	27	T2	I p.d.	Test input	675	-465
13	E3F3	O	LCD segment output	-75	495	28	T1	I p.d.	Test input	-410	-495
14	G3AD3	O	LCD segment output	45	495	29	S	I p.d.	Switch input	-520	-495
15	C3B3	O	LCD segment output	165	495	30	CAP	O	Voltage doubler capacitor	-675	-495

p.d. - pull-down