

**INTRODUCTION**

The **3086** is a CMOS LSI which contains all the logic necessary to implement a five-function six-digit liquid crystal display watch. The circuit contains an oscillator amplifier with an internal feedback resistor for the use of 32,768Hz quartz crystals. The circuit operates from a single 1.5-volt battery and contains an internal voltage doubler. Only 2 switches are required to control all functions. These switch inputs have a pull down resistor and can be debounced by internal circuitry.

**FUNCTIONS**

- 5-functions: Month, Date, Hour, Minute and Second
- 12-hour format.
- Selectable display for hour, minute, second/month, date.
- One-touch correction of time error within ±30 seconds.
- 2-switch sequential operation.
- 4-year calendar.
- LCD test

**FEATURES**

- Simple Application circuit
- One-chip CMOS construction.
- Drives 5½ -digit triplexes LCD.
- Colon and PM display.
- Low power consumption.
- 32,768Hz ± 20ppm crystal oscillator.
- Single 1.5V battery operation.
- Built-in voltage doubler circuit.
- Built-in crystal oscillator input capacitor.
- Trimmer capacitor included
- Reset on power-on.

**ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)**

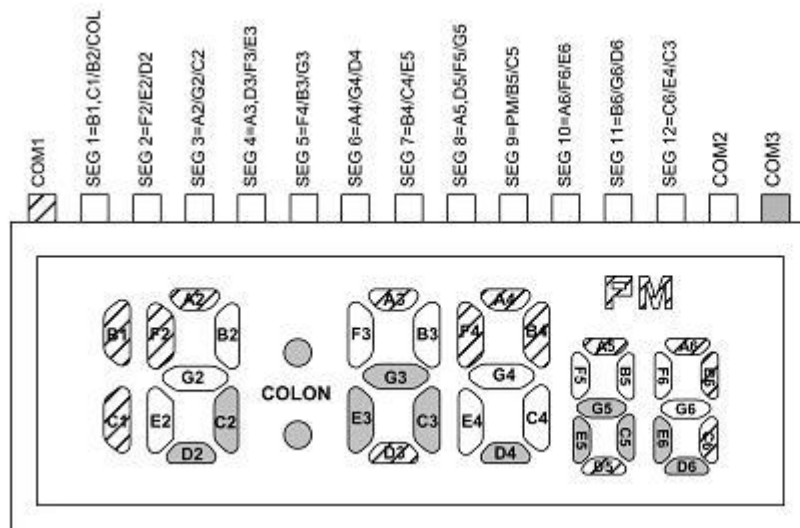
Parameter	Symbol	Value	Unit
Supply Voltage (V <sub>DD</sub> - V <sub>SS</sub> )	V <sub>DS1</sub>	- 0.3 ~ + 2.0	V
Operating Temperature	T <sub>OPR</sub>	- 10 ~ + 70	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	°C

\*Voltage greater than above may damage the circuit.

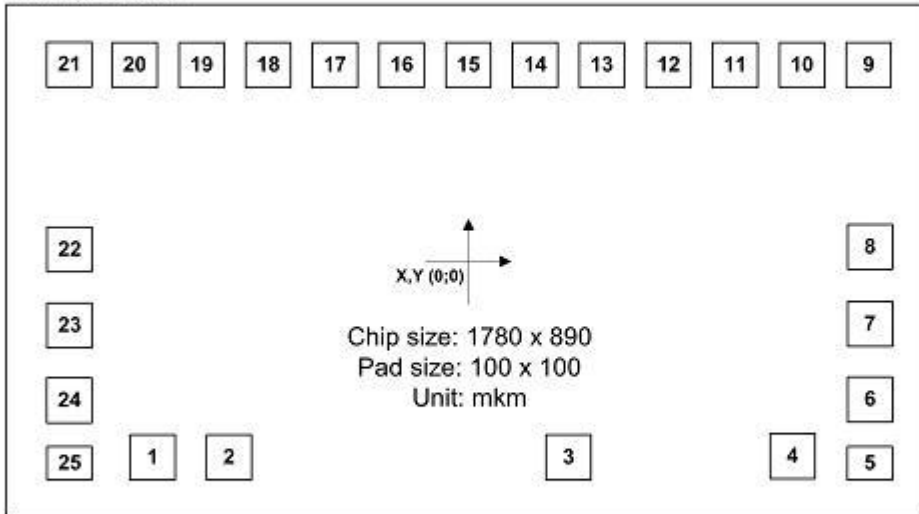
**ELECTRICAL CHARACTERISTICS (Ta =25°C, V<sub>DD</sub>=1.5V, V<sub>SS</sub>=0V; unless otherwise specified)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V <sub>DD</sub>		1.2	1.5	1.8	V
Supply Current	I <sub>DD</sub>	Without Load		1.5	2.0	µA
Input High Voltage	V <sub>IH</sub>		V <sub>DD</sub> - 0.3		V <sub>DD</sub>	V
Input Low Voltage	V <sub>IL</sub>		V <sub>SS</sub>		V <sub>SS</sub> + 0.3	V
Switch Activation Current	I <sub>SW</sub>	V <sub>IN</sub> = V <sub>DD</sub>	0.1	0.5	5	µA
Oscillator Start Voltage	V <sub>Osc</sub>	Within 5 sec			1.45	V
Oscillator Stop Voltage	V <sub>Osc</sub>				1.15	V
Oscillator Frequency	F <sub>Osc</sub>			32.768		Hz
LCD Frequency	F <sub>d</sub>			43		Hz
Oscillator Capacitor	C <sub>IN</sub>			22		pF
	C <sub>OUT</sub>			22		pF
Switch Debouncing Time	T <sub>DEB</sub>				31.25	msec

**LCD FORMAT**



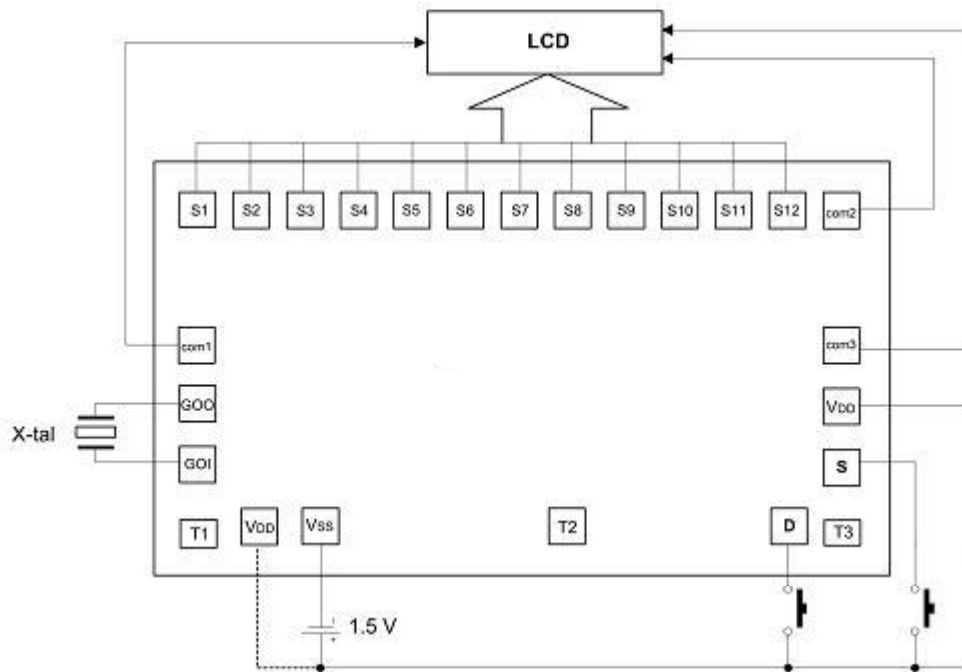
**PAD DIAGRAM**



**PAD LOCATION**

Pad No	Pad name	X(μm)	Y(μm)	Pad No	Pad name	X(μm)	Y(μm)
1	VDD	-610	-330	13	SEG9	258	330
2	VSS	-480	-330	14	SEG8	129	330
3	T2	171	-330	15	SEG7	0	330
4	D	616	-330	16	SEG6	-129	330
5	T3	769	-340	17	SEG5	-258	330
6	S	775	-226	18	SEG4	-387	330
7	VDD	775	-96	19	SEG3	-516	330
8	COM3	775	34	20	SEG2	-645	330
9	COM2	774	330	21	SEG1	-774	330
10	SEG12	645	330	22	COM1	-775	30
11	SEG11	516	330	23	GOO	-775	-100
12	SEG10	387	330	24	GOI	-775	-230
				25	T1	-757	-345

**APPLICATION CIRCUIT**



**Substrate of chip is connected to VDD**