RCL Semiconductors Ltd.

Six Functions LCD Watch CMOS IC C1966

With Alarm and Chronograph

GENERAL DESCRIPTION

C1966 is a CMOS digital 6-function watch integrated circuit with alarm and chronograph function; It can directly drive 6 digits 1/3 duty multiplexed LCD and display Hours,Minutes, Seconds,Month,Date and Day of the Week.

C1966 is typically used in wrist watch and suitable for many other watch applications.

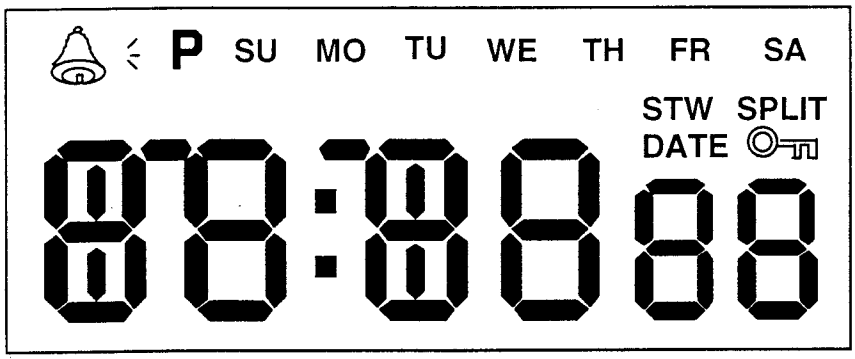
KEY DESCRIPTION

- LIGHT Key - In normal time mode, press [LIGHT] and [DATE/ADJ] key to turn on/off the keylock..
- MODE Key - used to select Time Mode, Alarm Mode and Stopwatch Mode.
- DATE/ADJ Key - used to display current day and month, or adjust the value during all setting modes.
- SPLIT/SET Key - enable split function in Stopwatch Mode, or enter Time Setting Mode and Alarm Setting mode.

ADDITIONAL FUNCTION

- In any modes, Hold [MODE], [DATE/ADJ] & [SPLIT/SET] key to enter Factory Testing Mode. During Factory Testing Mode, all segments will turn on and the buzzer beeps until any one key released.
- In any modes, excepting Stopwatch Mode, if no key is pressed within 30 seconds (in Setting modes), 5 seconds ((in Date mode) and 2 minutes (in other modes except stopwatch), the unit will be timeout and back to Time Mode.
- No key tone is provided except in stopwatch mode.
- Default setting is 12-hour format with Month-Date display format.
- 3V operating voltage.

LCD FORMAT



ABSOLUTE MAXIMUM RATINGS

(T_2 = 25 °C)

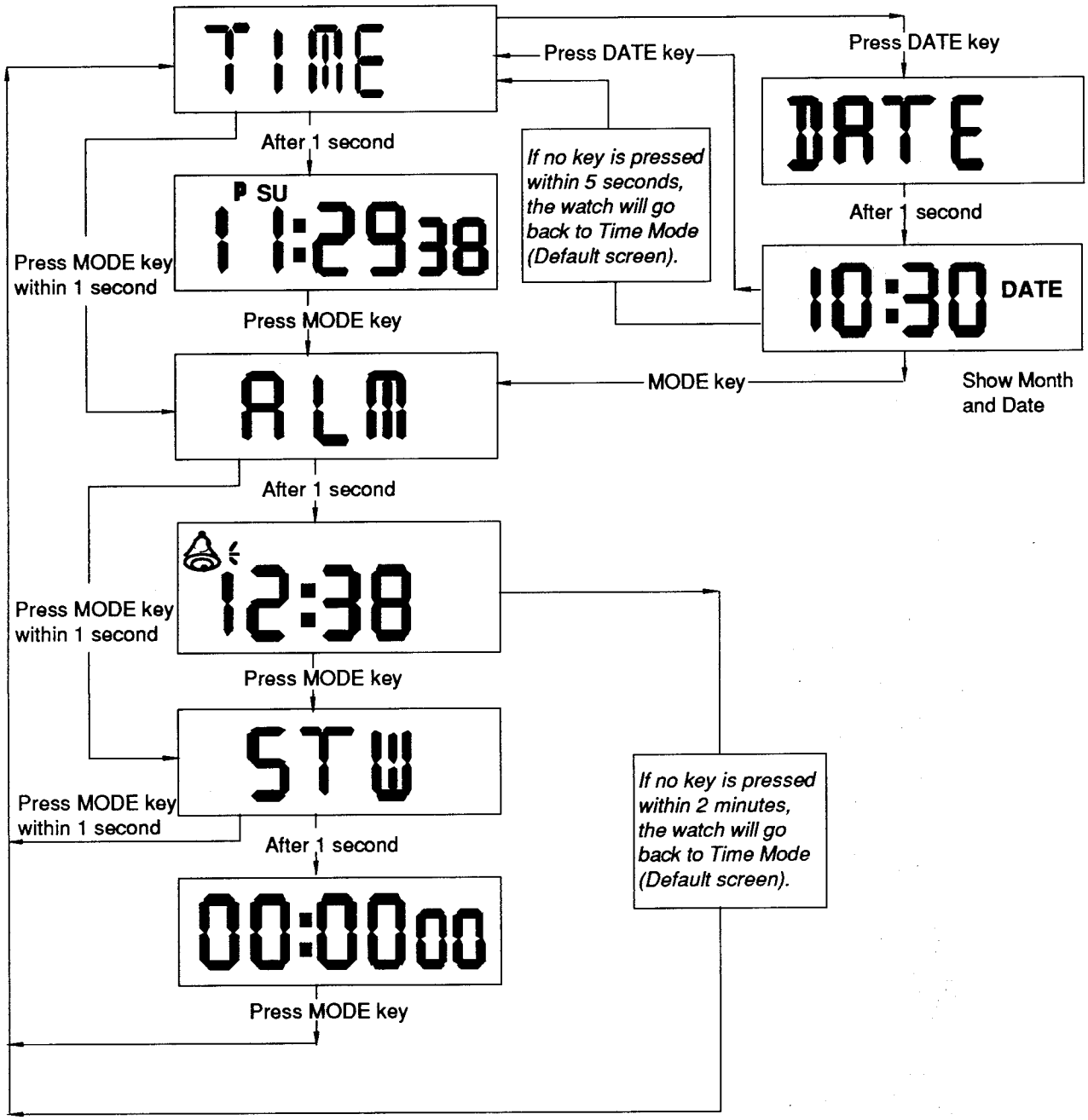
Parameter	Symbol	Limits
Supply Voltage (V_{DD2} - V_{SS})	V_{DS2}	- 0.3 V to +4.0V
Supply Voltage (V_{DD1} - V_{SS})	V_{DS1}	- 0.3V to +2.0V
Operating Temperature	T_2	-10°C to +70°C
Storage Temperature	Tstg	-55°C to +125°C

DC ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta = 25°C, V_{SS} = 0V, V_{DD1} = 1.5V, V_{DD2} = 3.0V, Fosc = 32768Hz)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	
Operating voltage	V_{DD2}	2.4	3.0	3.6	V	-	
Operating voltage	V_{DD1}	1.25	1.5	1.8	V	-	
Current consumption	I_{SUP}	-	-	3.0	µA	Time Mode and No load	
Output current	I_{OH1}	-	-	-3.0	µA	V_{OH1} = 2.95V	V_{DD2}
(COM1, COM2, COM3)	I_{OL1}	3.0	-	-		V_{OL1} = 0.05V	= 3.0V
Output current	I_{OH2}	-	-	-0.15	µA	V_{OH2} = 2.95V	V_{DD2}
(Segment)	I_{OL2}	0.15	-	-		V_{OL2} = 0.05V	= 3.0V
Output current	I_{OH3}	-	-	-12	µA	V_{OH3} = 2.90V	V_{DD2}
(BD, \BD)	I_{OL3}	12	-	-		V_{OL3} = 0.10V	= 3.0V
Input current	I_{IH1}	0.08	-	10.00	µA	V_{IH1} = 3.0V	V_{DD2}
([Light], [Mode], [Date/ADJ], [SPlit/Set])	I_{IL1}	-0.10	-	-		V_{IL1} = 1.5V	= 3.0V
Input current	I_{IH2}	-	-	60	µA	V_{IH2} = 3.0V	V_{DD2}
(T_1, T_2, T_3, AC INPUT)	I_{IL2}	-	-	-		V_{IL2} = 0V	= 3.0V
Osc starting voltage	V_{STA}	-	-	2.4	V	-	
Alarm output current (ALO-)	I_{AL}	-	-	-500	µA	V_{OH} = 1.50V, V_{DD2} = 3.0V	
Alarm output current	I_{OHB}	-	-	-4.0	mA	V_{OH} = 1.50V	V_{DD2}
(BD, \BD)	I_{OLB}	4.0	-	-		V_{OL} = 1.50V	= 3.0V
DC-DC Conversion Frequency	Foon	-	1024	-	Hz	C1 = C2 = 0.1µF	
Switch Debouncing Time	Tdeb	-	-	31.25	mSec	-	

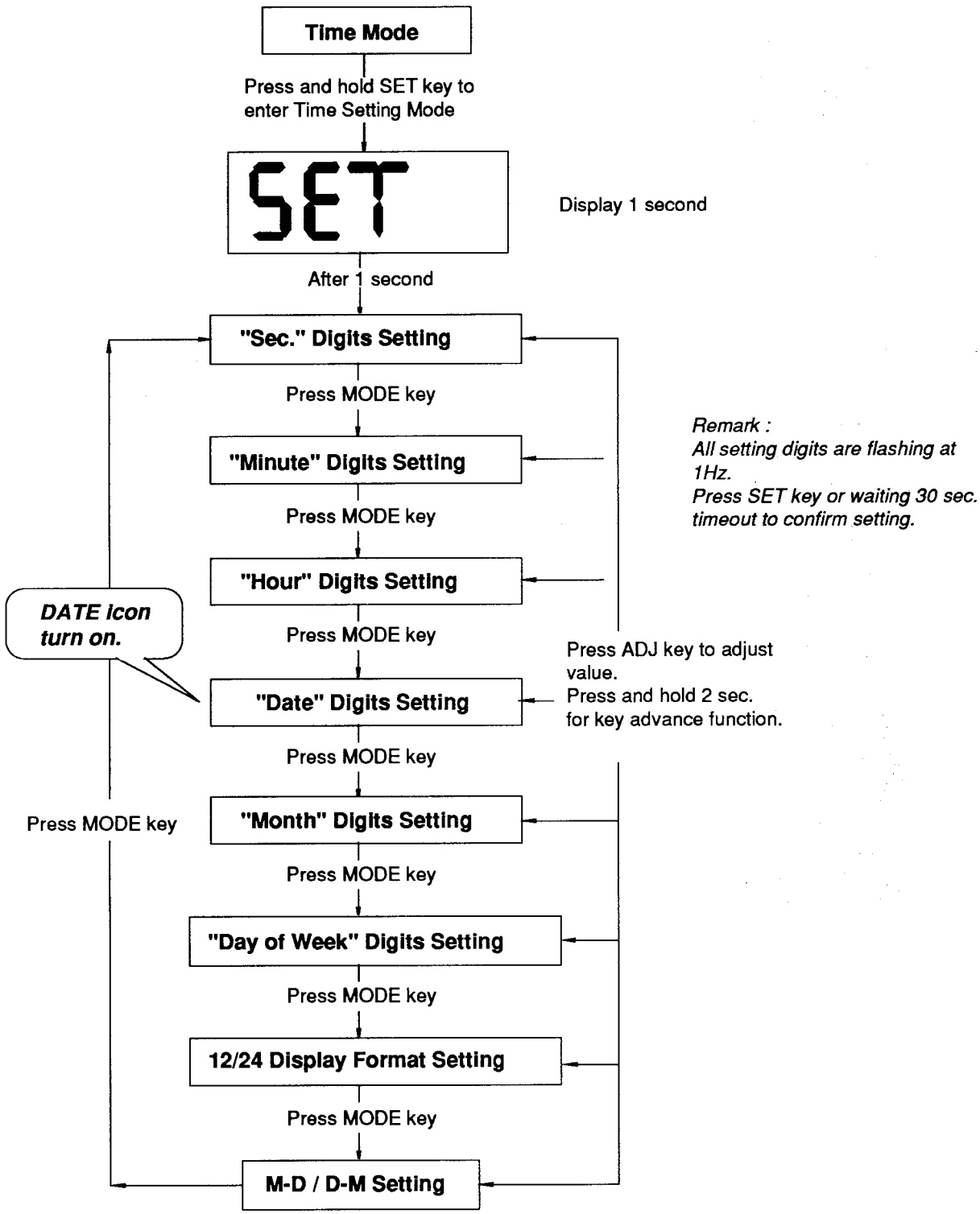
MODE SEQUENCE OPERATION



TIME MODE

- In Time Mode, current time and day-of-week are shown.
- If alarm or chime function is enabled, the corresponding icon (alarm icon , chime icon) will be shown.
- If stopwatch is enabled and keep on counting, icon "STW" will be displayed.

TIME SETTING MODE

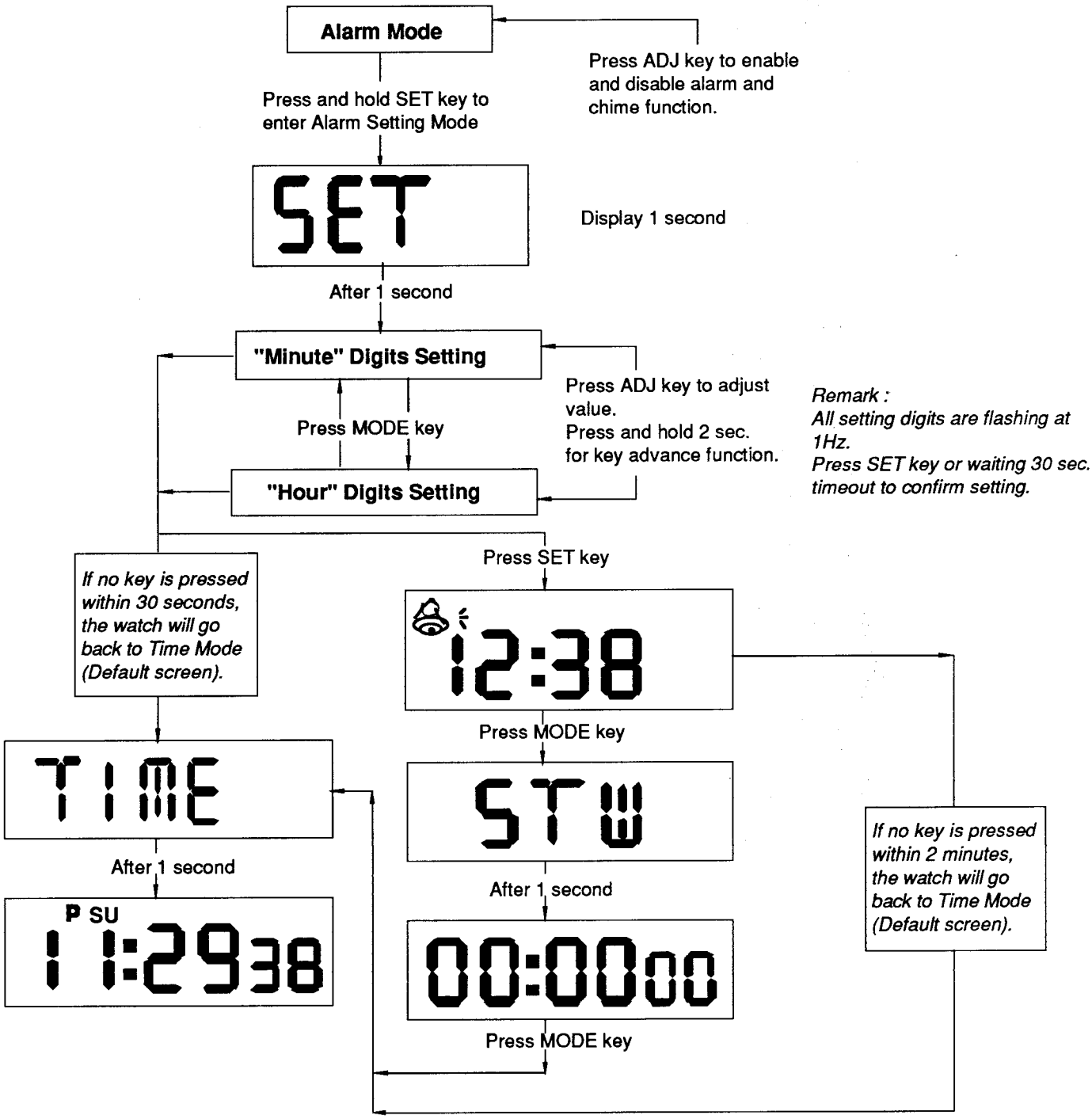


ALARM MODE

- Alarm icon and chime icon show in any mode when they are enabled.
- Press ADJ key to enable and disable alarm/chime function. The sequence will be :

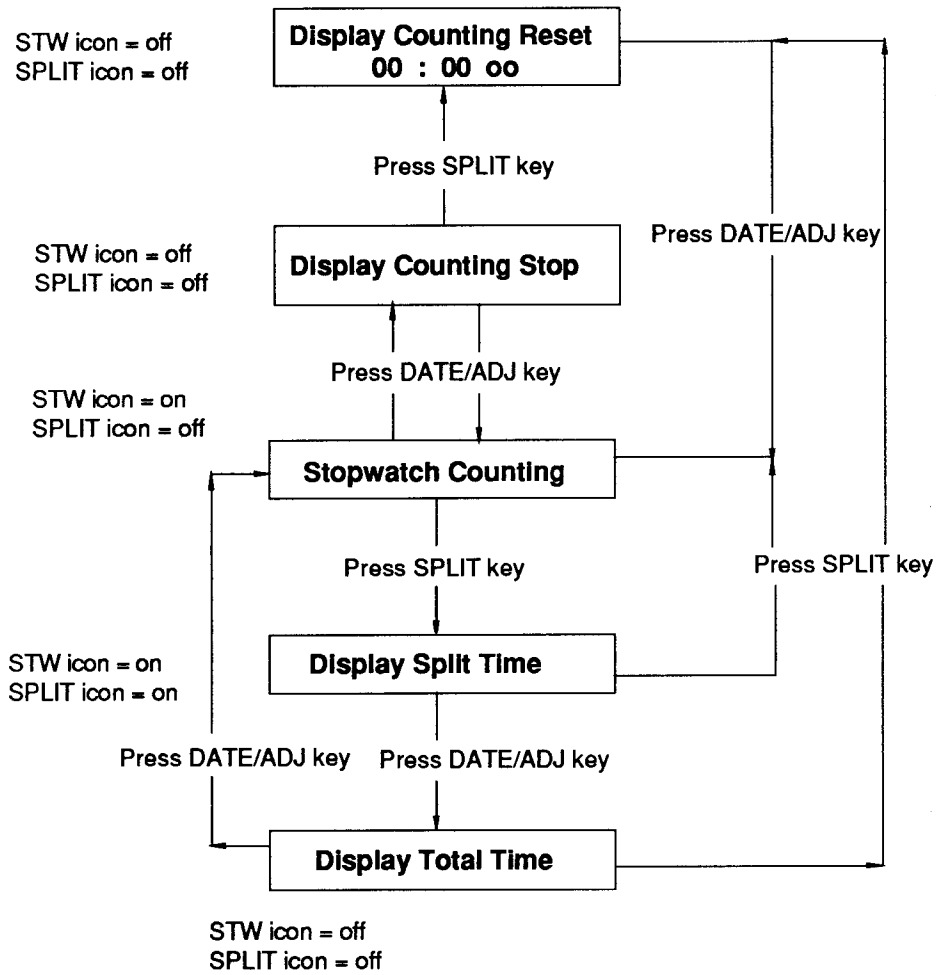
Sequence	Alarm Function	Chime Function
1	OFF	OFF
2	ON	OFF
3	OFF	ON
4	ON	ON

ALARM SETTING MODE



STOPWATCH MODE

- The counting range of stopwatch is from 00:00:00 to 59:59:99. The counting will be rolling-over once the maximum counting 59:59:99 is reached.
- In any modes, except all setting modes, icon "STW" will be displayed if Stopwatch is counting.
- In stopwatch counting, if SPLIT key is pressed, split time is shown.
- During showing split time, if MODE key is pressed, the split time will not be kept even switching back to Stopwatch mode.



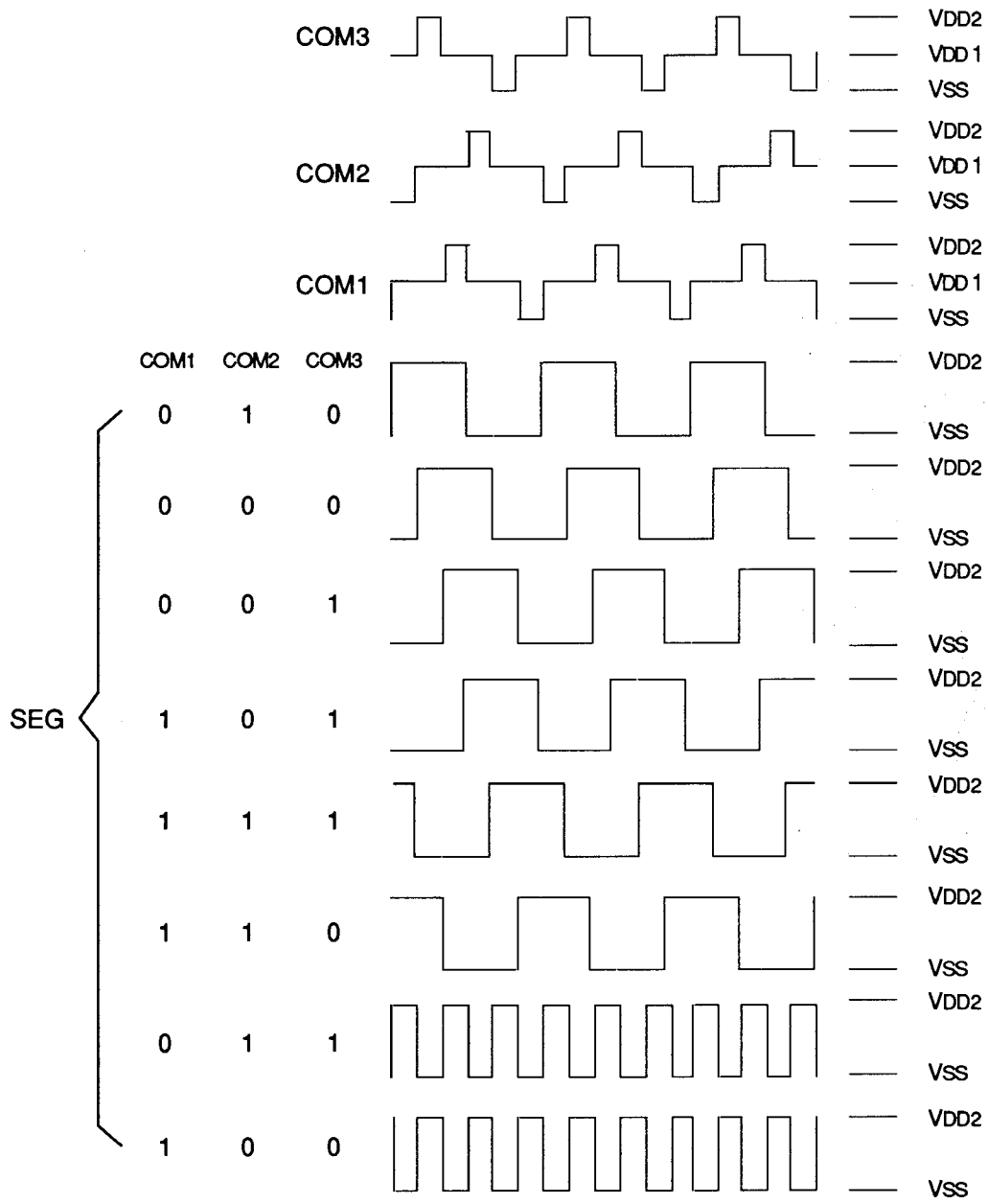
1. The auto-return time to normal time :
   In Date mode : 5 seconds
   In Setting modes : 30 seconds
   Other modes except stopwatch : 2 minutes

2. Keylock option : In normal time mode, press [LIGHT] and [DATE/ADJ] key to turn on/off the keylock.
   If the [LIGHT] pad is not bonding, the default option is keylock turn off.
   When the keylock is turn on, the keylock icon is shown and [MODE], [DATE/ADJ] & [SPLIT/SET] key is not enable until the keylock is turn off.

3. In any modes, Hold [MODE], [DATE/ADJ] & [SPLIT/SET] key to enter Factory Testing Mode. During Factory Testing Mode, all segments will turn on and the buzzer beeps until any one key released.

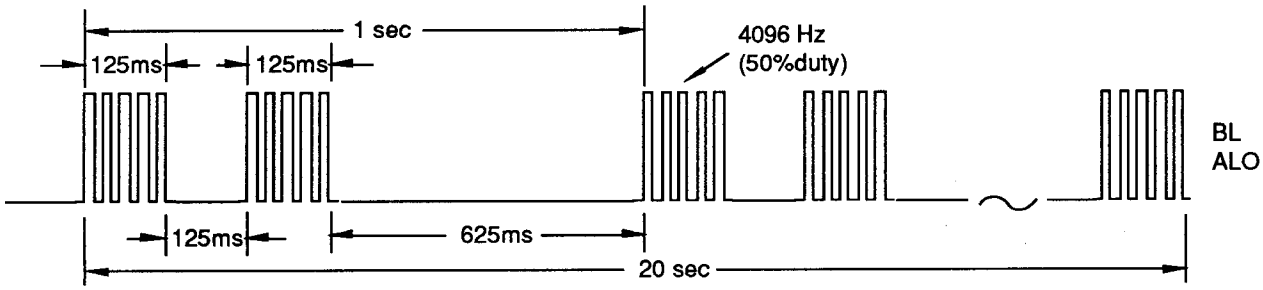
LCD PANEL WAVEFORM

Multiplex drive with ternary voltage: VDD2 , VDD1 , VSS
Frame frequency : 32Hz

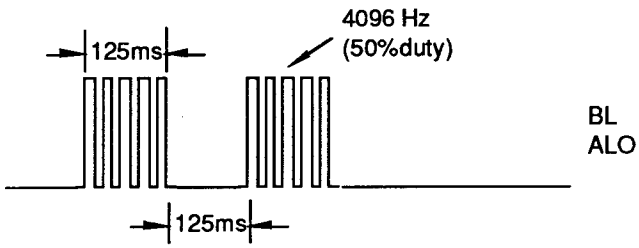


ALARM, CHIME AND STOPWATCH "BEEP" SIGNAL OUTPUT WAVEFORM

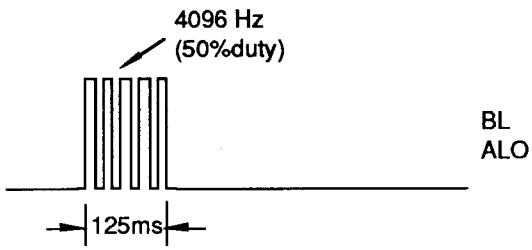
a) ALARM OUTPUT WAVEFORM



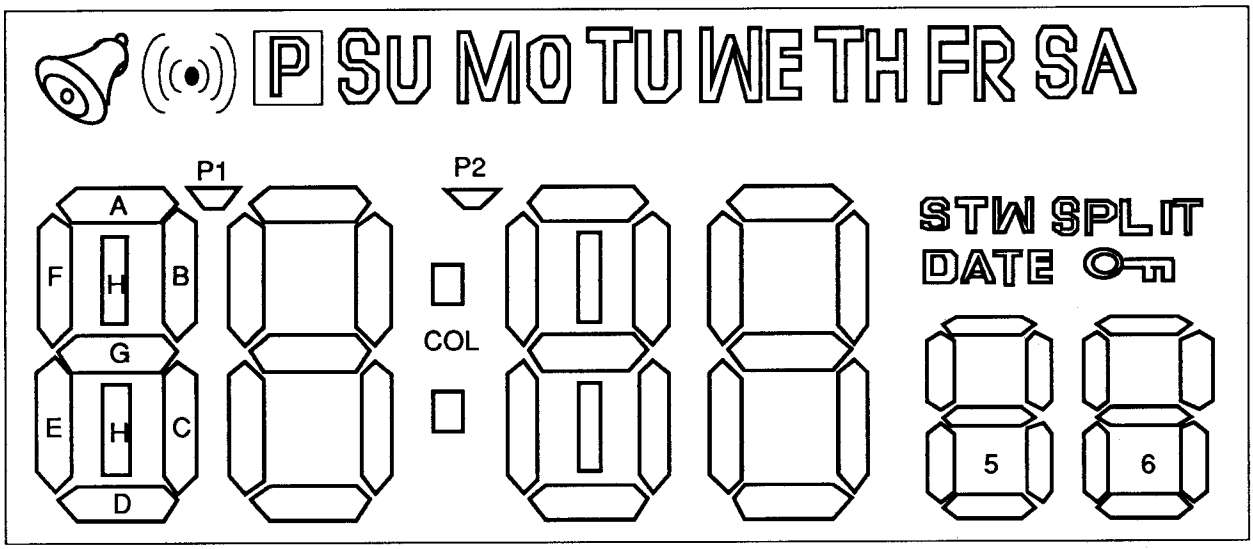
b) CHIME OUTPUT WAVEFORM

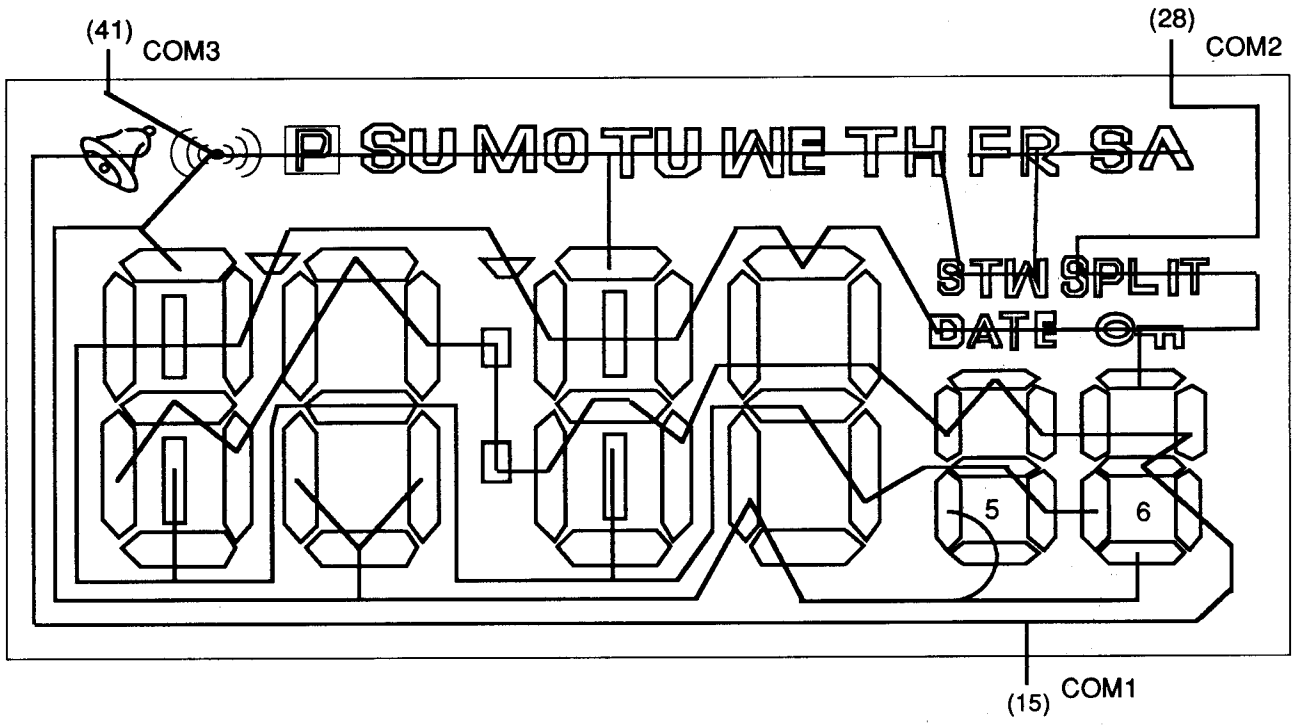


c) STOPWATCH "BEEP" SIGNAL OUTPUT WAVEFORM

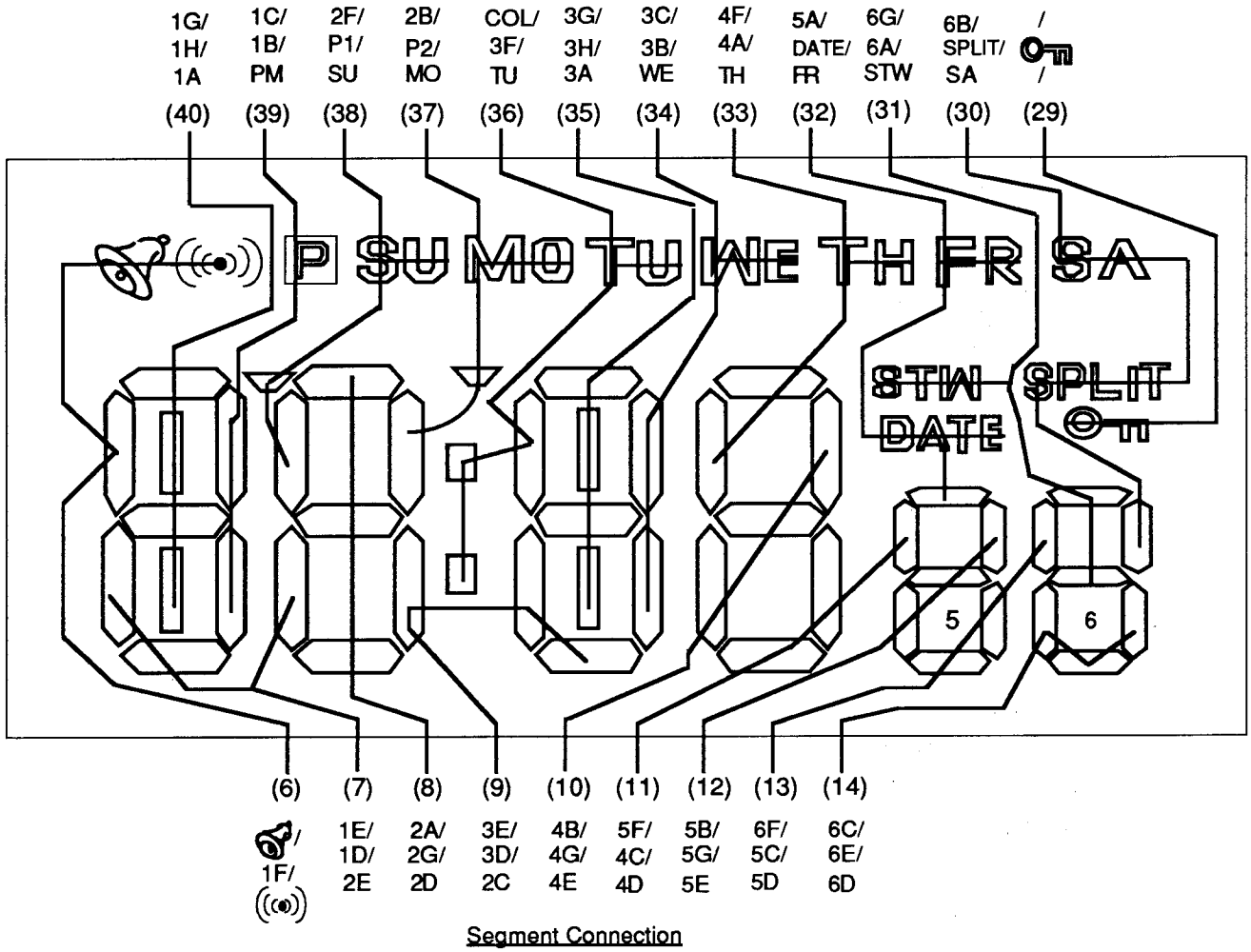


LCD CONNECTOR





Backplanes Connection



Segment Connection

LCD DRIVE OUTPUT PIN

PIN	41	40	39	38	37	36	35	34	33	32	31	30	29	28
COM1		1G	1C	2F	2B	COL	3G	3C	4F	5A	6G	6B		
COM2		1H	1B	P1	P2	3F	3H	3B	4A	DATE	6A	SPLIT		COM2
COM3	COM3	1A	PM	SU	MO	TU	3A	WE	TH	FR	STW	SA		

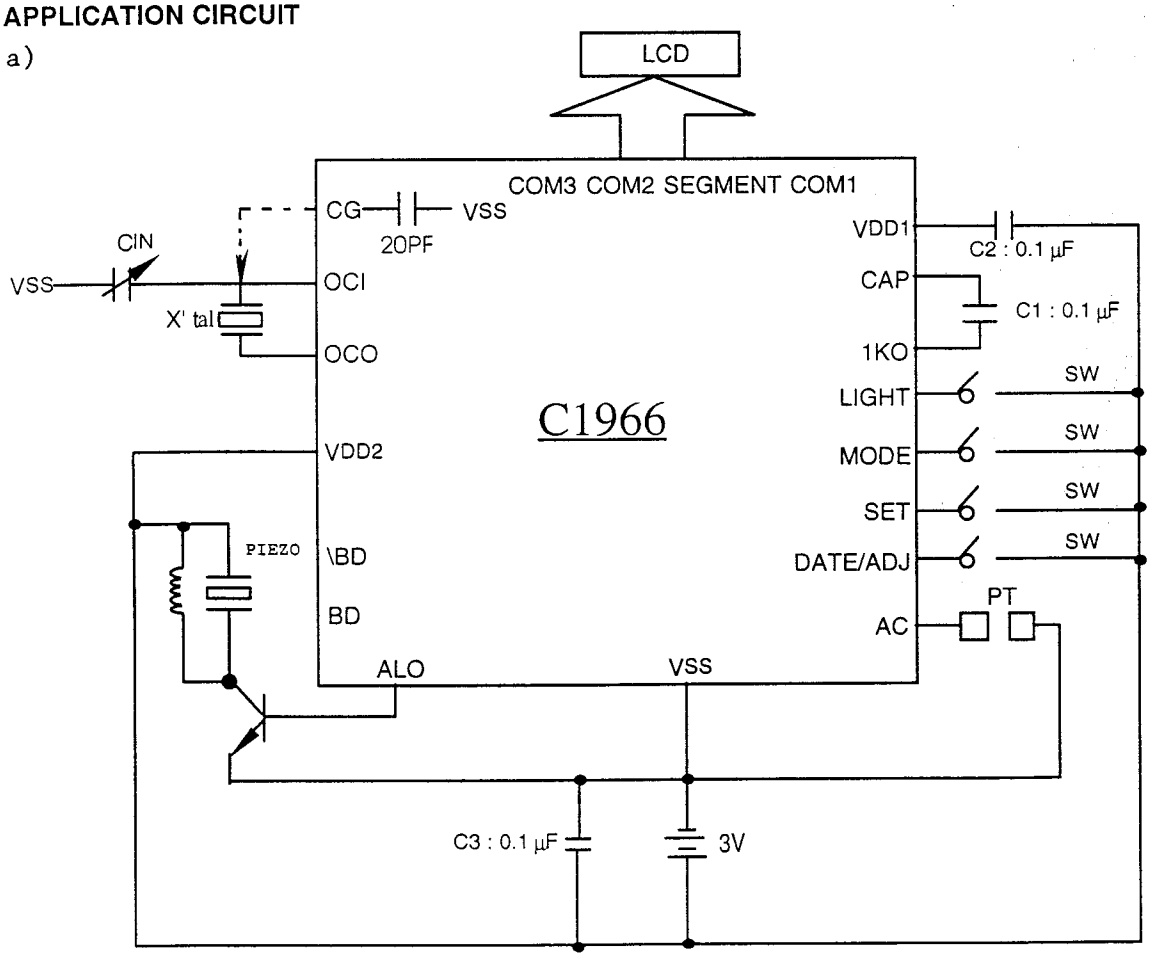
PIN	6	7	8	9	10	11	12	13	14	15
COM1		1E	2A	3E	4B	5F	5B	6F	6C	COM1
COM2	1F	1D	2G	3D	4G	4C	5G	5C	6E	
COM3		2E	2D	2C	4E	4D	5E	5D	6D	

PIN DESCRIPTION

Function	Pin Name	Pin No.	Pin Description
Switches	[LIGHT]	42	Active "H" (Internal connect to "VSS")
	[MODE]	43	Active "H" (Internal connect to "VSS")
	[DATE/ADJ]	26	Active "H" (Internal connect to "VSS")
	[SPLIT/SET]	25	Active "H" (Internal connect to "VSS")
Oscillator stage	OCO	3	Oscillator output internal capacitor 20pf (TYP)
	OCI	4	Oscillator input trim capacitor 5 - 20pf
	CG	5	Oscillator output internal capacitor 20pf (TYP) CG connected to OCI by bonding
Test input	T3	27	Test input, Active "H" (Internal connect to "VSS")
	T2	21	Test input, Active "H" (Internal connect to "VSS")
	T1	20	Test input, Active "H" (Internal connect to "VSS")
	AC	44	All clear, Active "L" (Internal connect to "VDD")
Alarm output	\BD	19	
	BD	17	
	ALO	18	
Power	VDD2	16, 45	VDD2 = 3V
	VDD1	2, 22	VDD1 = 1.5V (half voltage power)
	VSS	1	GND
Voltage reducer Ouputs	CAP	24	
	1KO	23	
Led outputs	SEGMENTS	6-14, 29-40	
	COM1, COM2, COM3 (32HZ)	15, 28, 41	

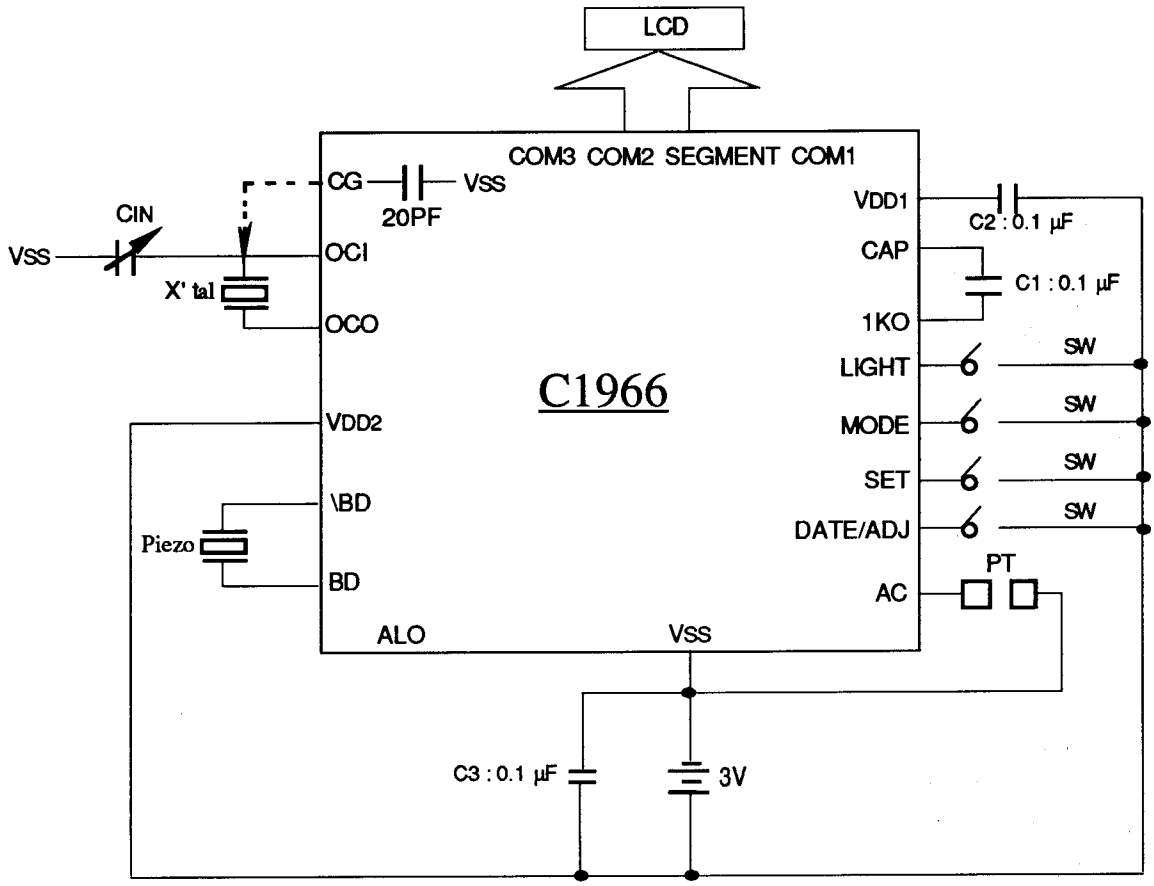
APPLICATION CIRCUIT

a)



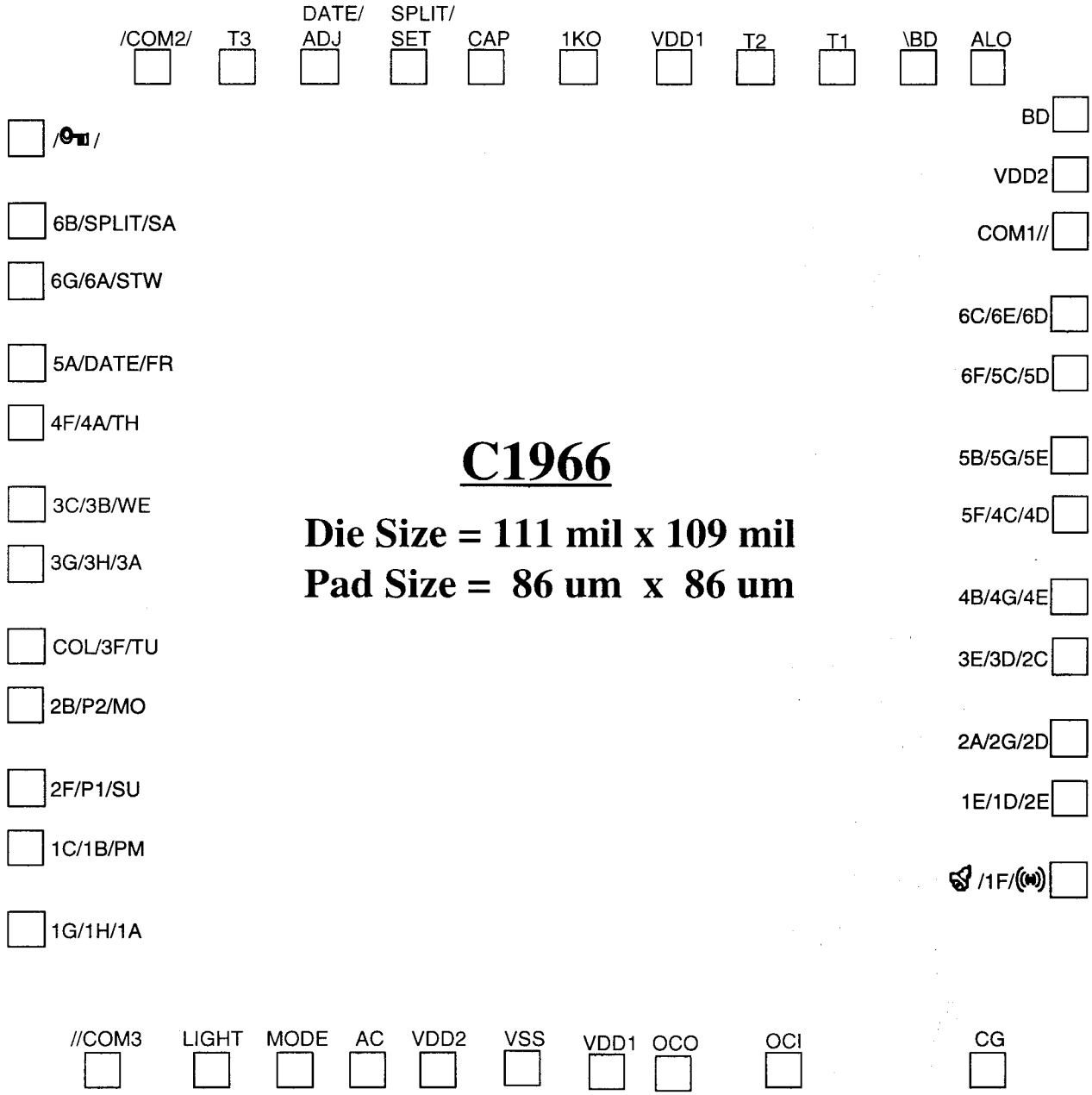
Note : Substrate should be connected to Vss.

b)



Note : Substrate should be connected to Vss.

PAD DIAGRAM



The Co-ordinates for Lower Left Corner of Each Pad

//COM3	(-1138.1, -1288.0)	/1F/	(1242.3, -816.0)
LIGHT	(-868.5, -1288.0)	1E/1D/2E	(1242.3, -610.7)
MODE	(-666.2, -1288.0)	2A/2G/2D	(1242.3, -462.8)
AC	(-488.6, -1288.0)	3E/3D/2C	(1242.3, -257.5)
VDD2	(-315.9, -1288.1)	4B/4G/4E	(1242.3, -109.6)
VSS	(-108.5, -1285.7)	5F/4C/4D	(1242.3, 95.7)
VDD1	(98.4, -1292.5)	5B/5G/5E	(1242.3, 243.6)
OCO	(264.0, -1296.5)	6F/5C/5D	(1242.3, 448.9)
OCI	(537.8, -1291.2)	6C/6E/6D	(1242.3, 596.8)
CG	(1039.5, -1288.4)	COM1//	(1242.3, 802.6)
		VDD2	(1242.3, 945.2)
		BD	(1242.3, 1094.3)
ALO	(1036.1, 1210.3)	/	(-1328.4, 1030.3
\BD	(866.3, 1210.3)	6B/SPLIT/SA	(-1328.4, 825.0
T1	(668.7, 1210.3)	6G/6A/STW	(-1328.4, 677.1)
T2	(465.9, 1210.3)	5A/DATE/FR	(-1328.4, 471.8)
VDD1	(262.5, 1210.3)	4F/4A/TH	(-1328.4, 323.8)
1KO	(30.6, 1210.3)	3C/3B/WE	(-1328.4, 118.6)
CAP	(-197.2, 1210.3)	3G/3H/3A	(-1328.4, -29.3)
SPLIT/SET	(-388.4, 1210.3)	COL/3F/TU	(-1328.4, -234.6)
DATE/ADJ	(-606.8, 1210.3)	2B/P2/MO	(-1328.4, -382.5)
T3	(-807.2, 1210.3)	2F/P1/SU	(-1328.4, -587.8)
/COM2/	(-1015.2, 1210.3)	1C/1B/PM	(-1328.4, -735.7)
		1G/1H/1A	(-1328.4, -941.0)