

JT9626-AS

LSI FOR LCD WATCHES

This product is a single-chip CMOS LSI for watches with alarm and chronograph functions. It can directly drive a six-digit LCD and offers six functions.

APPLICATIONS

- Watches with alarms and chronographs
- Watches with alarms
- Chronograph watches

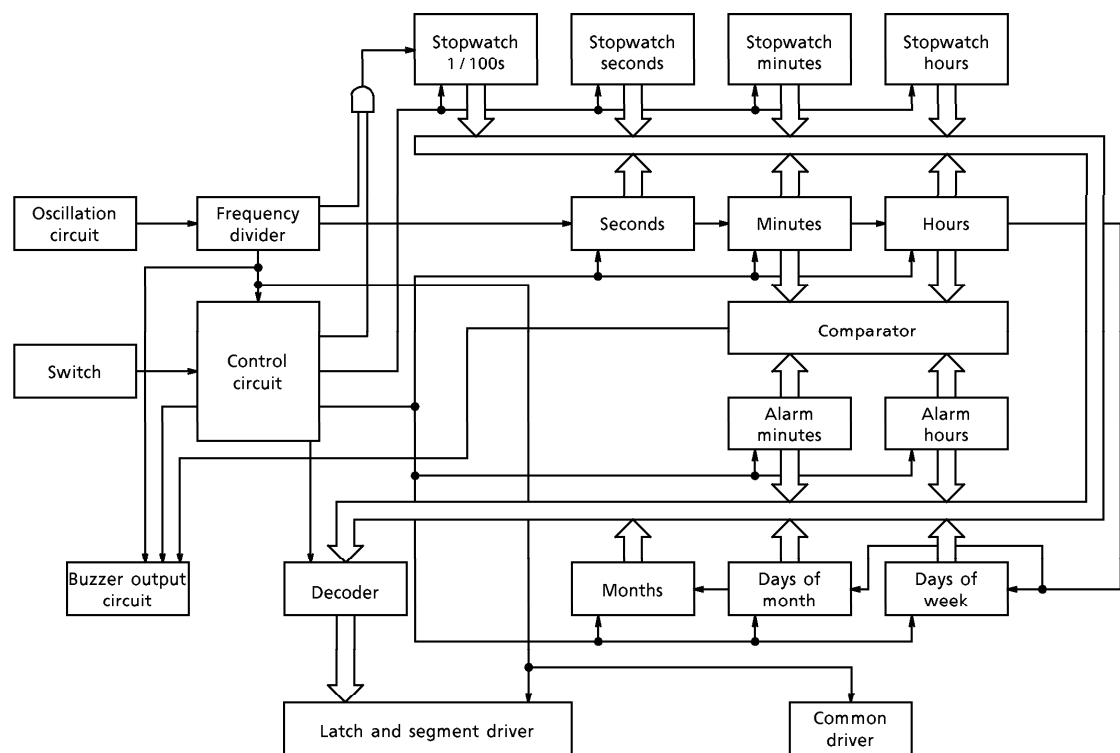
FEATURES

- Alarm function with buzzer drive
- Chronograph function with lap recording
- Time signal function
- Display switchable between 12 hour system, or 24 hour system
- Six-digit display, 10 signs, 1/2-duty LCD drive
- Second, minute, hour, day of month, day of week, month recording function. Four-year auto-calendar function
- Chronograph has 1/100 second, second, minute, and hour counter (1/100 second for up to 30 minutes). Counting up to 24 hours with Lap function and Confirmation buzzer sound
- Directly drives buzzer for alarm and time signal (4kHz)
- Low current consumption
- Selectable 1.55V single power supply / 3.00V single power supply by bonding
- Three-switch operation
- Built-in voltage doubler/halver circuits
- All display lit function for testing
- Built-in power ON clear function
- Alarm settable in one-minute units (Buzzer sounds for 20 seconds)

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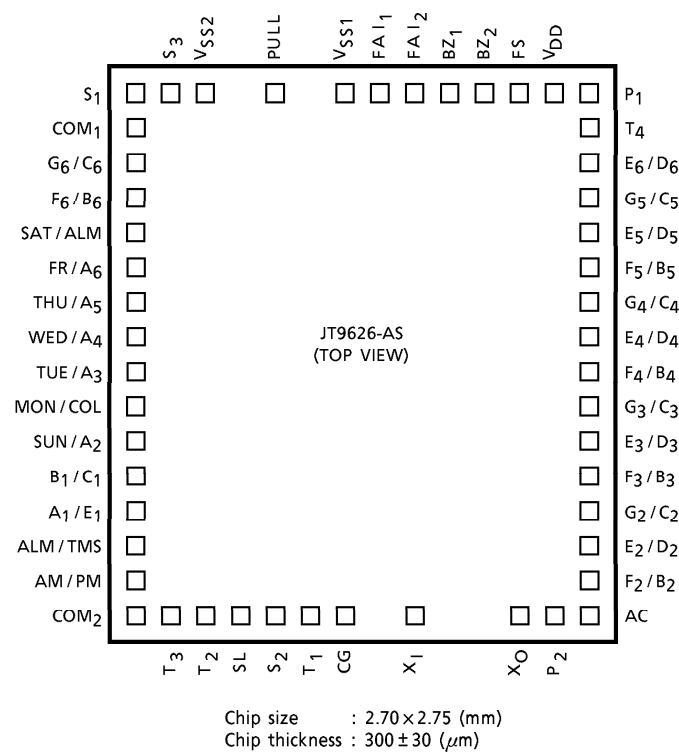
BLOCK DIAGRAM



PIN DESCRIPTIONS (51PINS)

PIN NAME	SYMBOL	No. OF PINS
Power Supply Pins	V _{DD} , V _{SS1} , V _{SS2} , PULL	4
Oscillator Pins	X _I , X _O , C _G	3
Input Pins	S ₁ ~3, SL, P ₁ , P ₂ , AC, FS	8
Output Pins	BZ1, BZ2	2
Display Pins	COM ₁ , COM ₂ , SEG (26)	28
Test Pins	T ₁ ~4	4
Voltage Doubler/Halver Pins	FAI ₁ , FAI ₂ (256Hz, d.f = 50%)	2

PAD LAYOUT

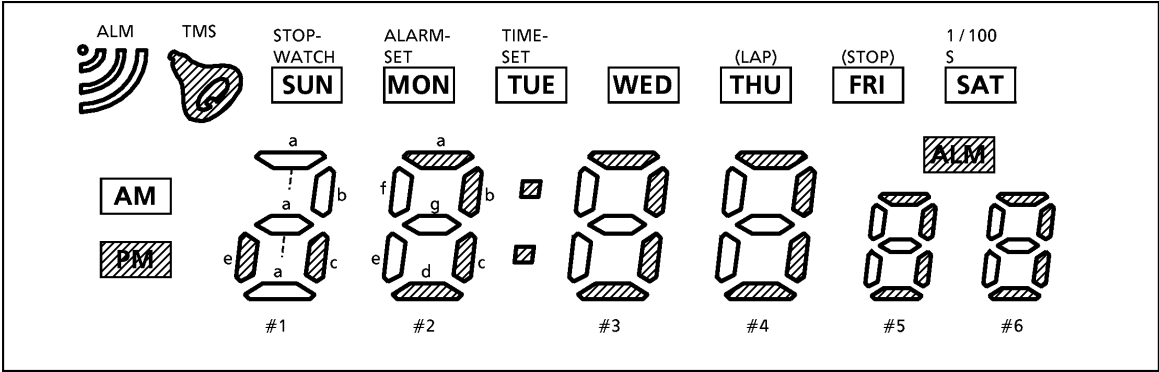


PAD LOCATION TABLE

PIN NAME	X POINT	Y POINT	PIN NAME	X POINT	Y POINT
P ₁	1211	1232	COM ₂	1211	– 1221
T ₄	1211	1058	AM / PM	1211	– 1058
E ₆ / D ₆	1211	895	ALM / TMS	1211	– 895
G ₅ / C ₅	1211	733	A ₁ / E ₁	1211	– 733
E ₅ / D ₅	1211	570	B ₁ / C ₁	1211	– 570
F ₅ / B ₅	1211	407	SUN / A ₂	1211	– 407
G ₄ / C ₄	1211	244	MON / COL	1211	– 244
E ₄ / D ₄	1211	81	TUE / A ₃	1211	– 81
F ₄ / B ₄	1211	– 81	WED / A ₄	1211	81
G ₃ / C ₃	1211	– 244	THD / A ₅	1211	244
E ₃ / D ₃	1211	– 407	FRI / A ₆	1211	407
F ₃ / B ₃	1211	– 570	SAT / ALM	1211	570
G ₂ / C ₂	1211	– 733	F ₆ / B ₆	1211	733
E ₂ / D ₂	1211	– 895	G ₆ / C ₆	1211	895
F ₂ / B ₂	1211	– 1058	COM ₁	1211	1058
AC	1211	– 1232	S ₁	1211	1232
P ₂	982	– 1236	S ₃	– 982	1236
X _O	819	– 1236	V _{SS2}	– 819	1236
X _I	335	– 1236	PULL	– 445	1236
C _G	– 20	– 1236	V _{SS1}	– 158	1236
T ₁	– 183	– 1236	FAI ₁	5	1236
S ₂	– 420	– 1236	FAI ₂	242	1236
SL	– 582	– 1236	BZ ₁	405	1236
T ₂	– 819	– 1236	BZ ₂	642	1236
T ₃	– 982	– 1236	FS	804	1236
			V _{DD}	1021	1236

FUNCTION SPECIFICATIONS

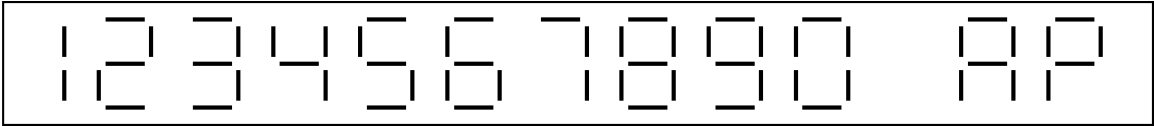
1. LCD layout



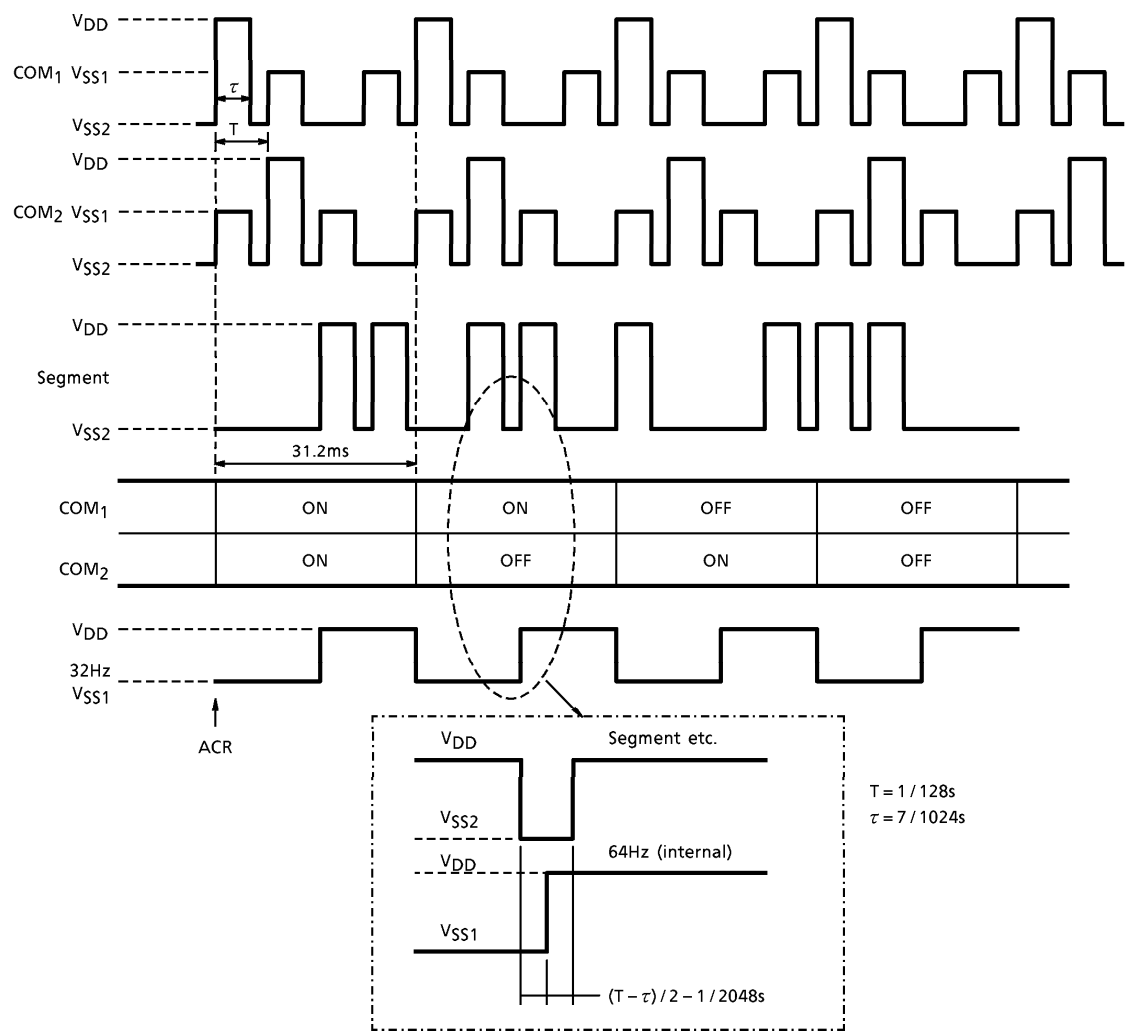
PAD NAME	COM ₁	COM ₂	PAD NAME	COM ₁	COM ₂
2F / 2B	2F	2B	AM / PM	AM	PM
2E / 2D	2E	2D	ALM / TMS	ALM	TMS
2G / 2C	2G	2C	1A / 1E	1A	1E
3F / 3B	3F	3B	1B / 1C	1B	1C
3E / 3D	3E	3D	SUN / 2A	SUN	2A
3G / 3C	3G	3C	MON / COL	MON	COL
4F / 4B	4F	4B	TUE / 3A	TUE	3A
4E / 4D	4E	4D	WED / 4A	WED	4A
4G / 4C	4G	4C	THU / 5A	THU	5A
5F / 5B	5F	5B	FRI / 6A	FRI	6A
5E / 5D	5E	5D	SAT / ALM	SAT	ALM
5G / 5C	5G	5C	6F / 6B	6F	6B
6E / 6D	6E	6D	6G / 6C	6G	6C

(Note) This LSI has two pads for alarm sign. Both pads indicate same state. Use the preferred sign. Delete the other sign from the LCD.

2. Display example



3. LCD drive waveform



4. Function selection specifications

The JT9626-AS uses P₁ and P₂ to disable either the chronograph function or the alarm function. Normally, P₁ and P₂ are pulled up to V_{DD} level. Select according to the table below.

P ₁	H (OPEN)	With CHRONOGRAPH mode
	L (V _{SS1} or V _{SS2})	No CHRONOGRAPH mode
P ₂	H (OPEN)	With ALARM mode
	L (V _{SS1} or V _{SS2})	No ALARM mode

5. Control input specifications

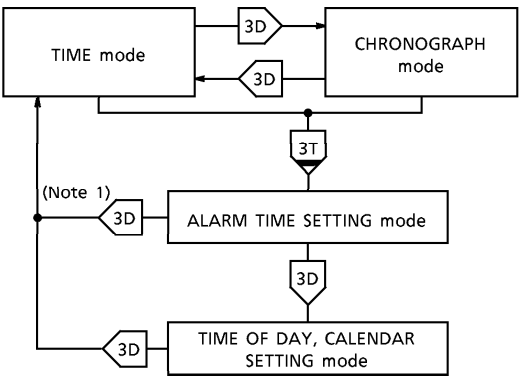
The JT9626-AS is controlled by three switches : S_1 , S_2 , and S_3 .
This control includes both simultaneous pressing, and depressing for two seconds.
The symbols used are shown in the following table.

SYMBOL	OPERATION
  	S_1 , S_2 , or S_3 momentary press
  	S_1 , S_2 , or S_3 released
  	S_1 , S_2 , or S_3 depressed two seconds

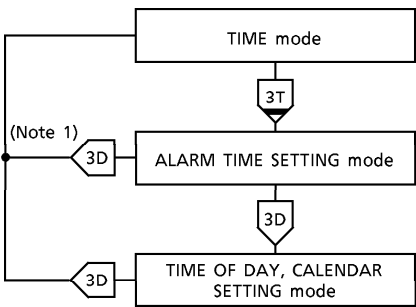
6. Switching Function

Selecting the bonding option

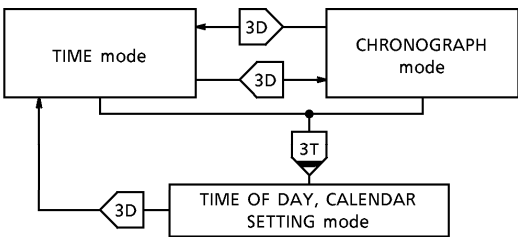
Watch with alarm and chronograph (P_1 , P_2 open)



Watch with alarm ($P_1 = V_{SS}$)

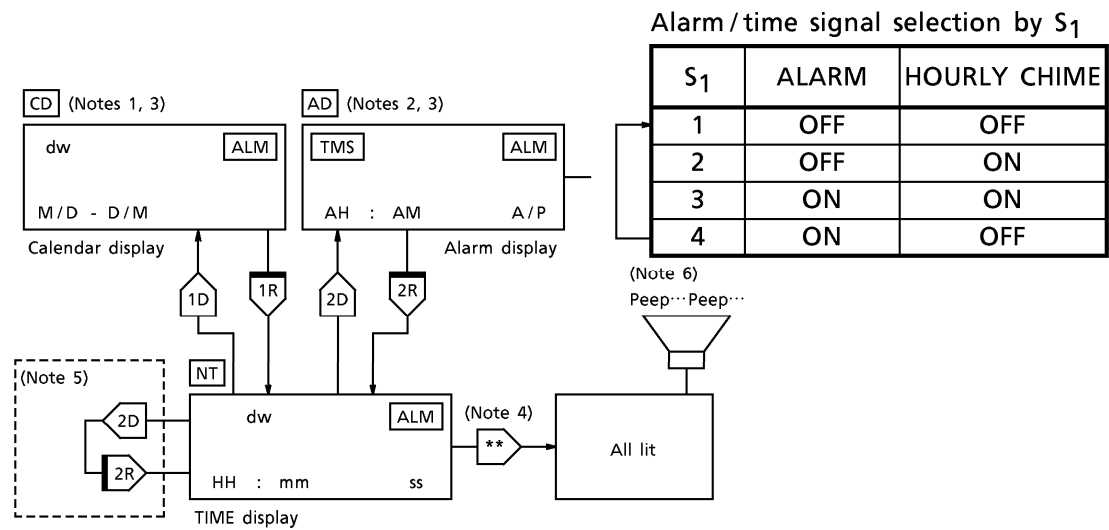


Watch with chronograph ($P_2 = V_{SS}$)

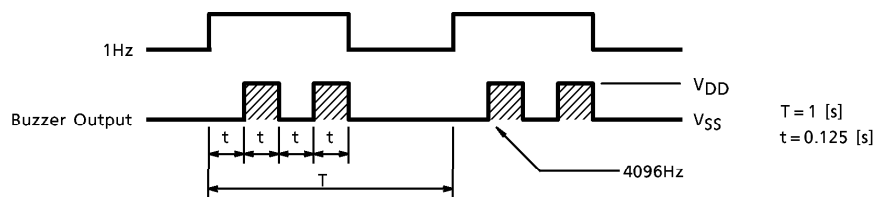


- (Note 1) If you press S_3 after using either S_1 or S_2 in alarm time stting mode, the system returns to the time mode.
(Note 2) Most display switching functions can be performed by pressing S_3 momentarily.

Basic switch operation

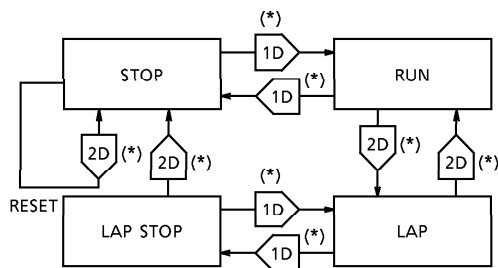


- (Note 1) In CALENDAR DISPLAY mode (press S₁ and hold in TIME mode), pressing S₂ to switch between month-before-day, or day-before-month display.
- (Note 2) Each time you press S₁ in alarm display mode, ALARM and TIME signal turn on or off so you can select the desired on/off states as shown in the table above. When ALM sign is lit, the alarm is ON. When the TMS sign is lit, the time signal is ON.
- (Note 3) In calendar display mode and Alarm display mode, pressing S₃ switches between the 12-hour and 24-hour clock displays.
- (Note 4) In TIME mode, pressing S₁ and S₂ at the same time lights all the displays and turns the alarm sound ON. This function is effective for checking modules.
- (Note 5) In the chronograph watches (no alarm function), pressing S₂ does not switch to the alarm display.
- (Note 6) The alarm sound output waveform is as follows.

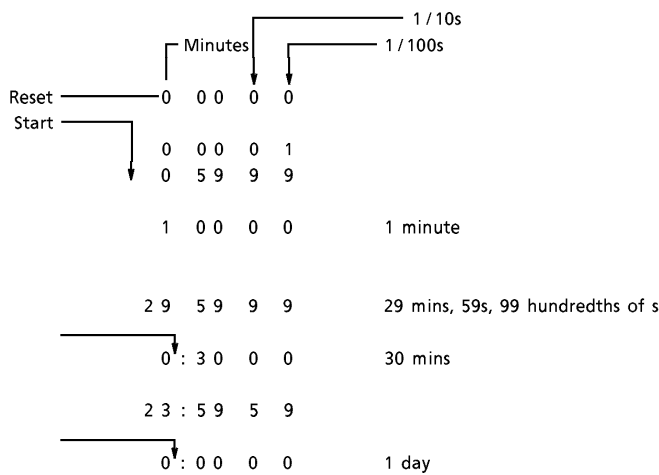


7. Chronograph function

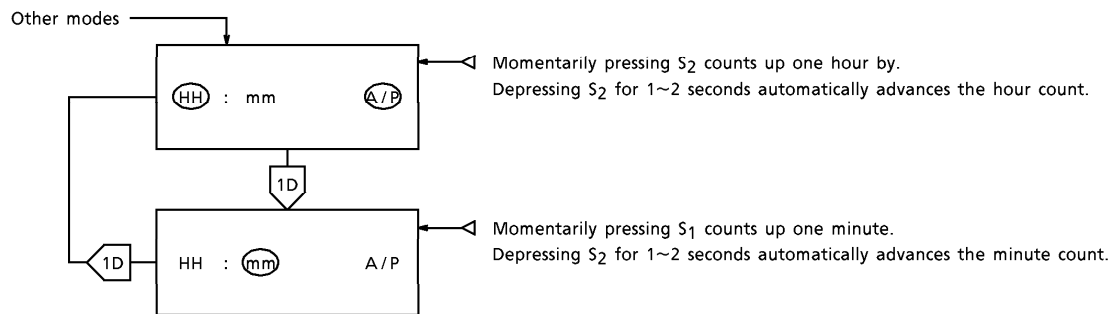
In CHRONOGRAPH mode, pressing S₁ switches between RUN/STOP. Pressing S₂ switches between LAP/LAP RELEASE. In STOP and LAP RELEASE states, pressing S₂ performs a reset. The flow is as follows.



- (Note 1) All day of the week marks are lit, with the relevant mark brinking at 2Hz depending on state. When the LAP display or the LAP STOP display are selected, the LAP sign flashes at 2Hz and shows the lap time. When the STOP display or the LAP STOP display are selected, the STOP sign flashes at 2Hz to show that clocking has stopped.
- (Note 2) During 1 / 100 second display, the 1 / 100 second mark continues blinking at 2Hz until the count reaches 30 minutes.
- (Note 3) Chronograph display flow



8. Alarm set function



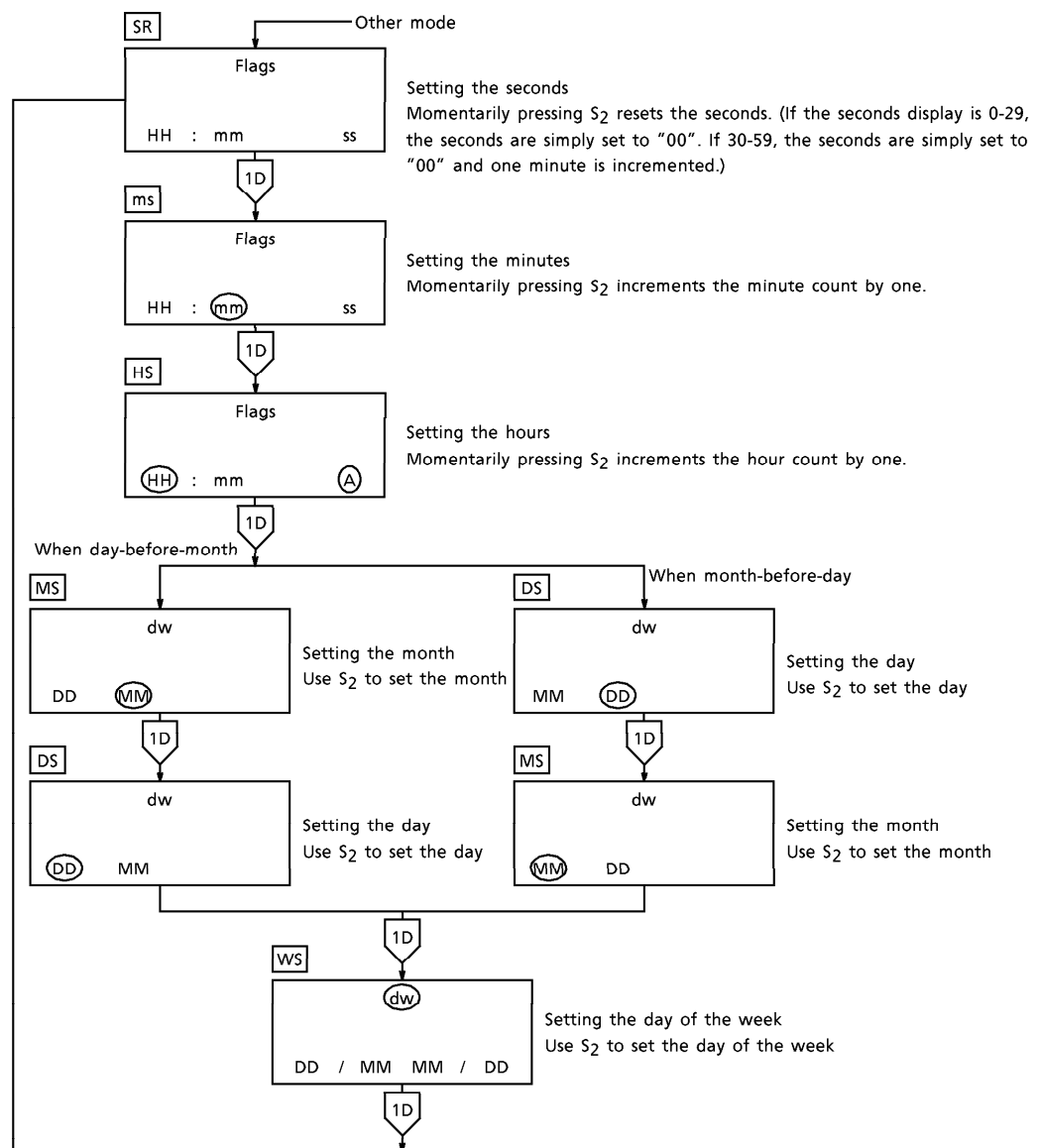
(Note 1) To distinguish between AM and PM, an "A" or a "P" can be displayed in the seconds column. The same is available for the 24-hour SYSTEM.

(Note 2) When the alarm time is set, the alarm is automatically set.

(Note 3) In TIME mode, pressing S₂ while the alarm is sounding stops the alarm.

9. Time/calendar setting function

The following shows the flow when S₁ is momentarily pressed in TIME/CALENDAR SETTING mode.



(Note) In all setting states except for second reset, holding down S₂ automatically advances the count.

10. All clear function

When power is applied or when the supply of power is interrupted (e.g. if the battery is changed), the internal state of the IC may become unstable, even though it appears to be operating normally. For this reason it is vital to verify that the crystal oscillation circuit is oscillating normally and stably (at 32 kHz) and then to use the system reset pin to initialize the IC (i.e. clear it) before use.

Note that a clear operation using the built-in power-on clear circuit should not be used in this case.

MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage (1)	$V_{SS1}-V_{DD}$	- 3.0~0.2	V
Power Supply Voltage (2)	$V_{SS2}-V_{DD}$	- 6.0~0.2	V
Operating Temperature	T_{opr}	- 10~60	°C
Storage Temperature	T_{stg}	- 40~125	°C

ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, $V_{DD}=0V$, $V_{SS1}=-1.55V$, $V_{SS2}=-3.0V$, $T_a=25^{\circ}C$)

PARAMETER	SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Voltage (1)	$V_{SS1}-V_{DD}$	1	—	1.25	1.55	2.00	V
Operating Voltage (2)	$V_{SS2}-V_{DD}$	1	—	2.00	3.00	4.00	V
Output Current (1) (COM)	I_{OH1}	—	$V_{SS2} = -3.0V$	$V_{OH1} = -0.3V$	—	—	μA
	I_{OL1}			$V_{OL1} = -2.7V$	70	—	
Output Current (2) (Segment)	I_{OH2}	—	$V_{SS2} = -3.0V$	$V_{OH2} = -0.3V$	—	—	μA
	I_{OL2}			$V_{OL2} = -2.7V$	6.0	—	
C_D	C_{OUT}	—	—	—	16	—	pF

SILVER OXIDE TYPE (- 1.55V)

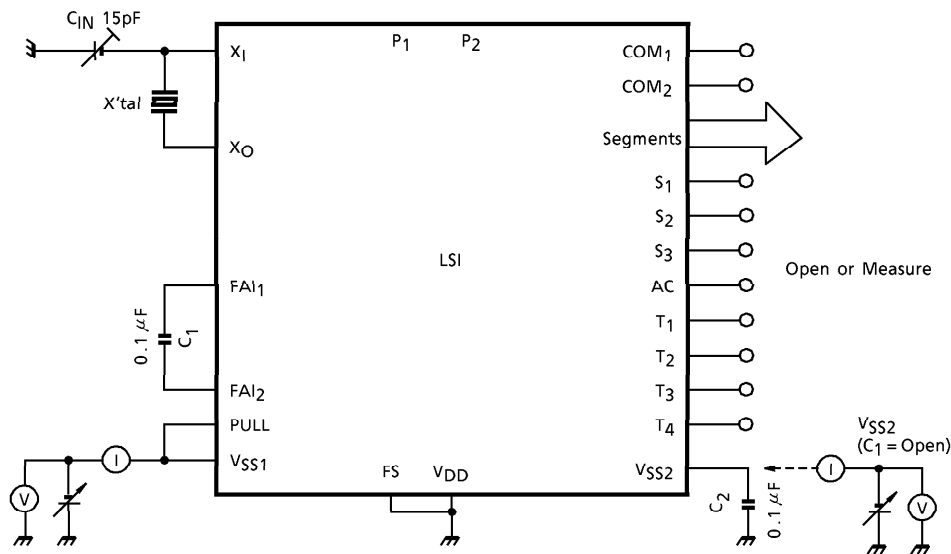
PARAMETER	SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Dissipation Current (1)	$ I_{sup1} $	1	—	—	1.5	2.5	μA
Oscillation Start Voltage (1)	$ V_{STA1} $	1	—	—	—	1.45	V
Output Current (3) (BZ ₁ , BZ ₂)	I_{OH3}	—	$V_{SS1} = -1.25V$ $V_{SS2} = -0.75V$	$V_{OH3} = -0.5V$	—	—	μA
	I_{OL3}			$V_{OL3} = -0.75V$	200	—	
Input Current (1) (S ₁ ~3)	I_{IH1}	—	$V_{SS1} = -0.55V$	$V_{IH1} = 0V$	0.3	—	μA
	I_{IL1}			$V_{IL1} = -1.55V$	- 0.10	—	
Input Current (2) (T ₁ ~4)	I_{IH2}	—	$V_{IH2} = 0V$	—	—	0.1	μA
	I_{IL2}	—	$V_{IL2} = -1.55V$	- 155	—	- 10.0	
Input Current (3) (P ₁ , P ₂)	I_{IH3}	—	$V_{IH3} = 0V, T_4 = V_{SS1}$	—	—	0.1	μA
	I_{IL3}	—	$V_{IL3} = -1.55V, T_4 = V_{SS1}$	- 2.0	—	- 0.1	
Input Current (4) (AC)	I_{IH4}	—	$V_{IH4} = 0V$	10.0	—	155.0	μA
	I_{IL4}	—	$V_{IL4} = -1.55V$	- 0.1	—	—	

LITHIUM TYPE (−3.0V)

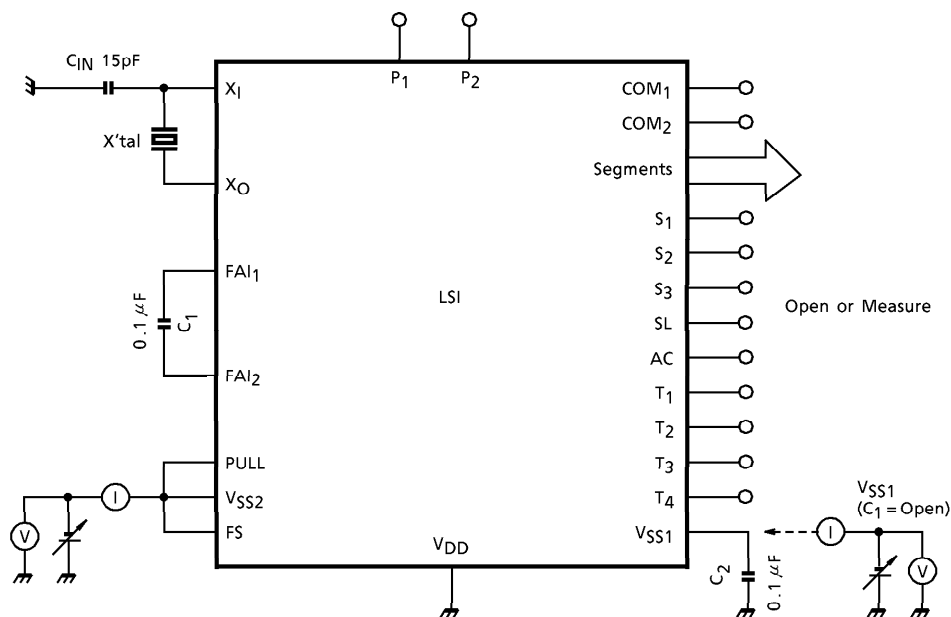
PARAMETER	SYMBOL	TEST CIR- CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Dissipation Current (2)	$ I_{sup2} $	2	—	—	1.00	1.50	μA
Oscillation Start Voltage (2)	$ V_{STA2} $	2	—	—	—	2.40	V
Output Current (4) (BZ ₁ , BZ ₂)	I_{OH4}	—	$V_{SS1} = -1.25V$ $V_{OH4} = -0.5V$	—	—	−200	μA
	I_{OL4}		$V_{SS2} = -2.00V$ $V_{OL4} = -0.75V$	200	—	—	
Input Current (5) (S ₁ ~3, SL)	I_{IH5}	—	$V_{IH5} = 0V$	5.0	—	18.0	μA
	I_{IL5}	—	$V_{IL5} = -3.00V$	−0.10	—	—	
Input Current (6) (T ₁ ~4)	I_{IH6}	—	$V_{IH6} = 0V$	—	—	0.1	μA
	I_{IL6}	—	$V_{IL6} = -3.00V$	−300	—	−7.5	
Input Current (7) (P ₁ , P ₂)	I_{IH7}	—	$V_{IH7} = 0V, T_4 = V_{SS2}$	—	—	0.1	μA
	I_{IL7}	—	$V_{IL7} = -3.00V, T_4 = V_{SS2}$	−2.0	—	−0.10	
Input Current (8) (AC)	I_{IH8}	—	$V_{IH8} = 0V$	7.5	—	300	μA
	I_{IL8}	—	$V_{IL8} = -3.00V$	−0.10	—	—	

TEST CIRCUIT

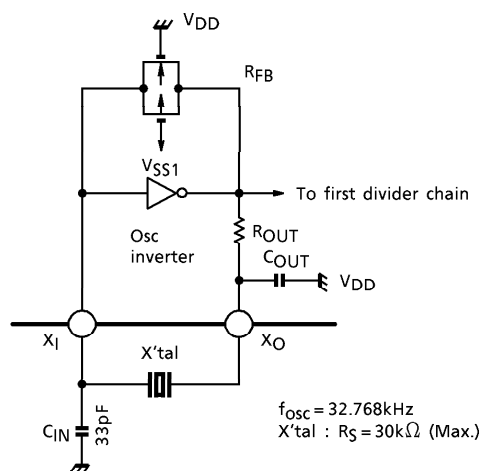
(1) Silver oxide type (−1.55V)



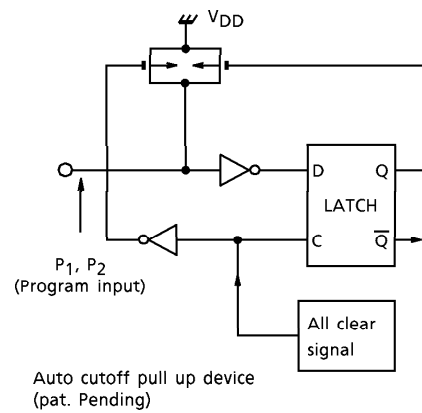
(2) Lithium type (- 3.0V)



(3)

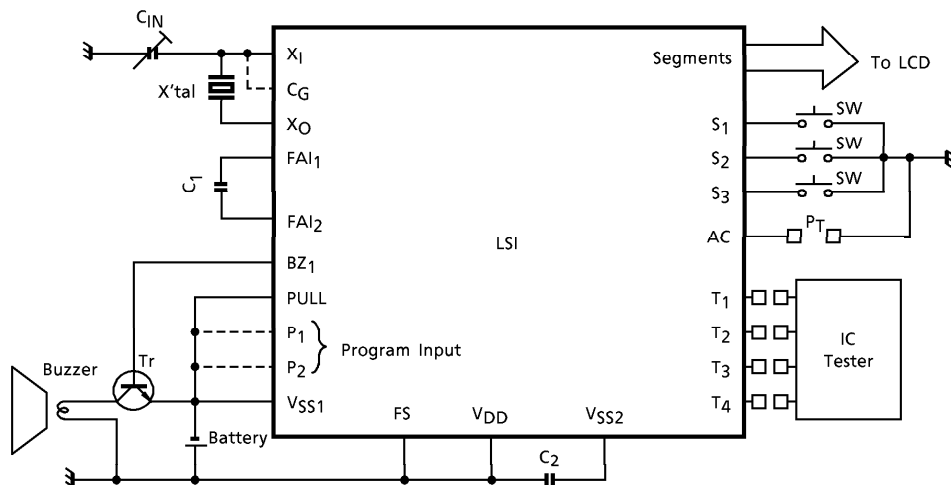


(4)



APPLICATION CIRCUIT EXAMPLE

Silver oxide type (– 1.55V)

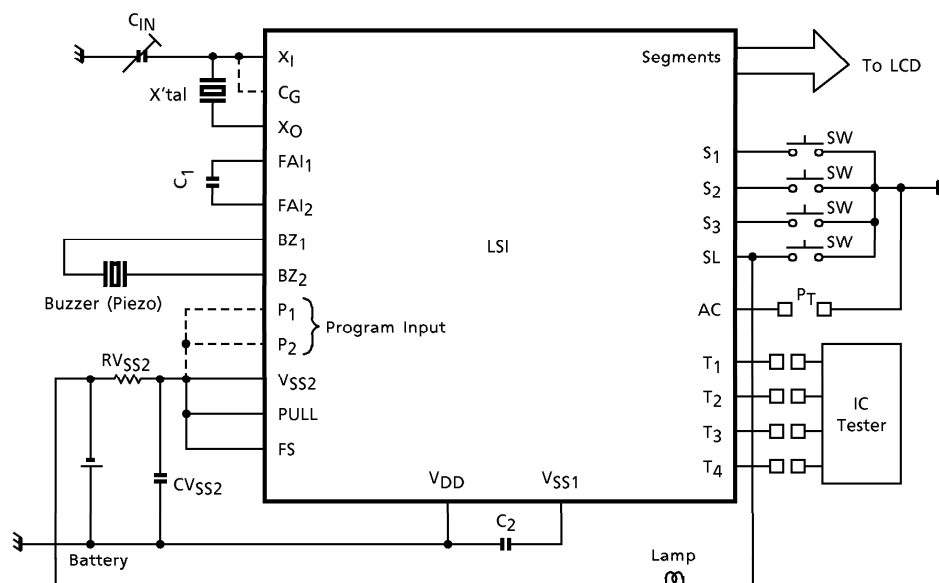


(Note 1) For specifications featuring an alarm, add a transistor and buzzer.

(Note 2) The FS pin is a bonding option. With silver oxide-type circuits, connect to the V_{DD} .

SYMBOL	SUPPLEMENTARY DESCRIPTION	VALUE	UNIT
C_{IN}	Oscillator stage gate capacitance (Variable)	5 – 33	pF
C_{OUT}	Oscillator stage trend capacitance (Built in)	16 (Typ.)	
C_1	Voltage doubler/halver circuit capacitance	0.1	μ F
C_2	Voltage doubler/halver circuit capacitance	0.1	
Battery	Single power supply	1.55 (Typ.)	V
X'tal	$f_O = 32.768\text{kHz}$, $R_S = 30\text{k}\Omega$ (Max.)	—	—
SW	Push-switch (SPST)	—	—
Tr	Buzzer drive transistor (NPN)	—	—
Buzzer	Magnet buzzer	≈ 4	kHz
P_T	Manual reset pin	—	—

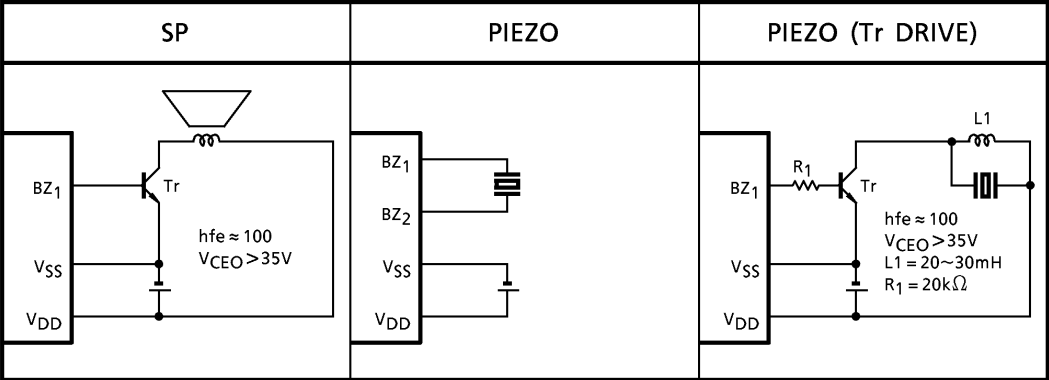
Lithium type (–3.0V)



- (Note 1) For specifications featuring an alarm, add a transistor and buzzer.
- (Note 2) The FS pin is a bonding option. With lithium-type circuits, connect to V_{SS2} .
- (Note 3) To ensure that the system starts up normally, turn on the SL switch before you actually start up the system after setting the battery in place.

SYMBOL	SUPPLEMENTARY DESCRIPTION	VALUE	UNIT
C _{IN}	Oscillator stage gate capacitance (variable)	5 – 33	pF
C _{OUT}	Oscillator stage trend capacitance (built in)	16 (Typ.)	
C ₁	Voltage doubler/halver circuit capacitance	0.1	μF
C ₂	Voltage doubler/halver circuit capacitance	0.1	
X'tal	f ₀ = 32.768kHz, R _S = 30kΩ (Max.)	—	—
SW	Push-switch (SPST)	—	—
Tr	Buzzer drive transistor (NPN)	—	—
P _T	Manual reset pin	—	—
Battery	Internal resistance (– 20°C)	50 (Max.)	Ω
Lamp	Resistance when – 3.0V-drive	500 (Min.)	
RV _{SS2}	Voltage smoothing resistor	1	kΩ
CV _{SS2}	Voltage smoothing capacitance	0.1 (Min.)	μF
Buzzer	Magnet buzzer or piezo buzzer f ₀ = 4kHz	4	kHz

Buzzer drive application circuit



C_G pin (Bonding option)

If the C_G Pin is bonded instead of the X_I Pin, the built-in capcition (18pF) is connected.

