

JT9674-AS

LCD Display 5-Digit Counter LSI

This product is a single-chip CMOS LSI for counters capable of directly driving a 5-digit LCD.

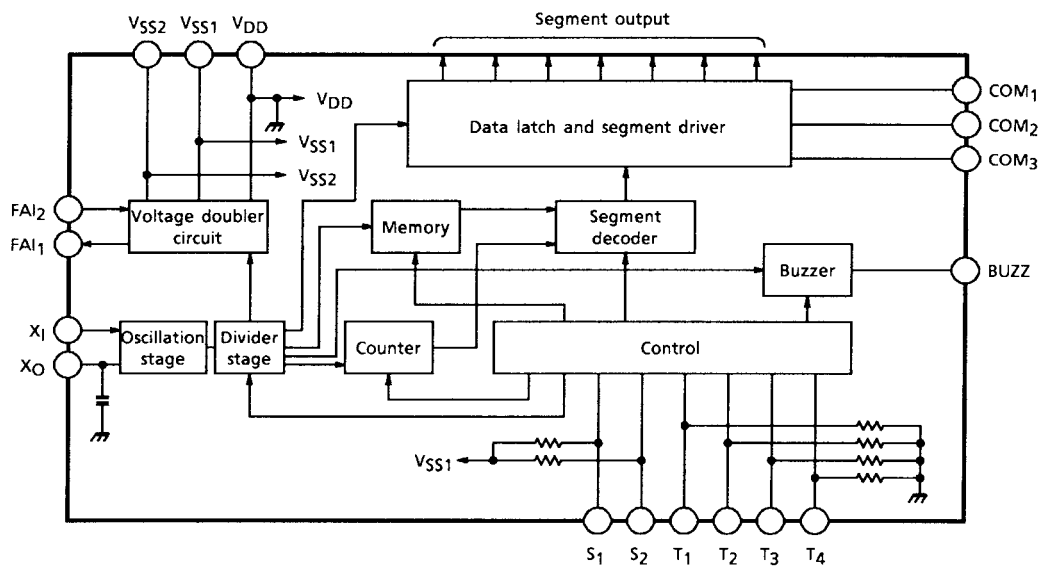
Applications

- Pedometers
- Counters

Features

- 32.768 kHz crystal oscillator
- Counts up to 99999
- 1/3-duty LCD drive, 5-digit display
- Low current consumption ($I_{sup} = 3.0 \mu A$ max)
- Voltage doubler circuit (two external 0.1 μF -capacitors)

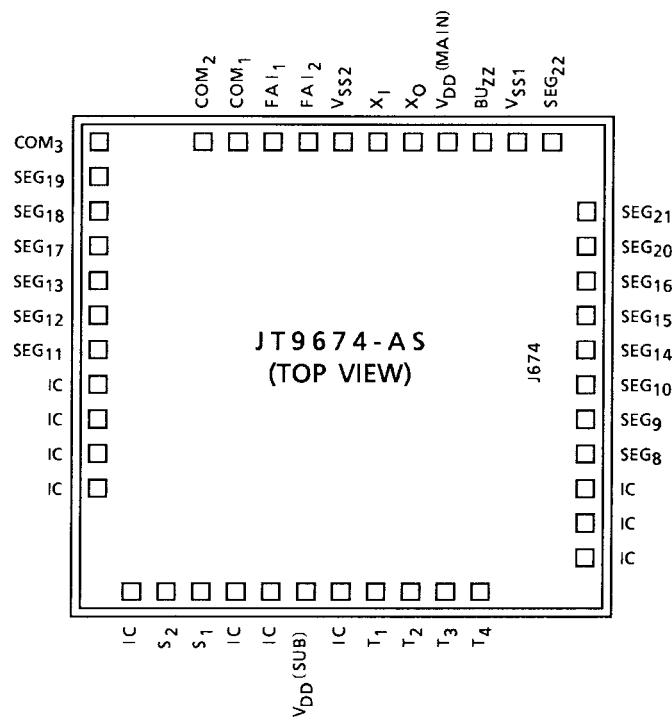
Block Diagram



Pin Descriptions (44 pins)

Pin Name	Symbol	No. of Pins
Power Supply Pins	V _{DD} (2), V _{SS1} , V _{SS2}	4
Oscillator Pins	X _I , X _O	2
Input Pins	S ₁ , S ₂	2
Output Pin	BUZZ	1
Display Pins	COM ₁₋₃ , SEG (15)	18
Test Pins	T ₁₋₄	4
Voltage Doubler Pins	FAI ₁ , FAI ₂	2
IC (do not use)	—	11

Pad Layout



Chip size : 2.39 × 2.39 (mm)
 Chip thickness : 440 ± 40 (μm)

Note 1: Be sure to connect the V_{DD} (MAIN).

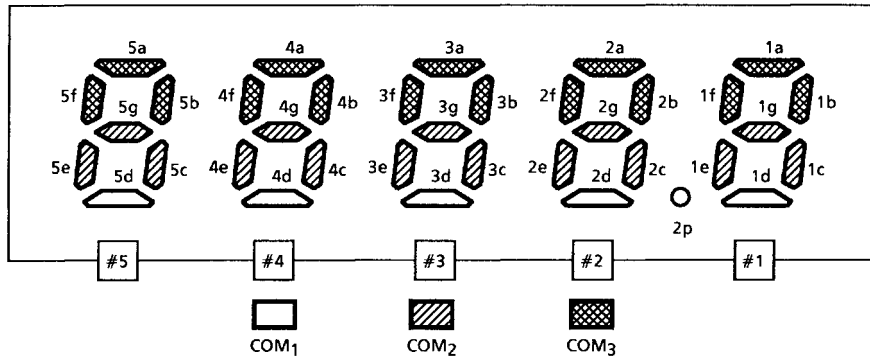
Pad Location Table

(μm)

Pin Name	X Point	Y Point	Pin Name	X Point	Y Point
IC	-1067	-618	SEG ₂₁	1067	618
IC	-1067	-455	SEG ₂₀	1067	455
IC	-1067	-292	SEG ₁₆	1067	292
IC	-1067	-129	SEG ₁₅	1067	130
SEG ₁₁	-1067	33	SEG ₁₄	1067	-33
SEG ₁₂	-1067	196	SEG ₁₀	1067	-196
SEG ₁₃	-1067	359	SEG ₉	1067	-359
SEG ₁₇	-1067	522	SEG ₈	1067	-522
SEG ₁₈	-1067	684	IC	1067	-684
SEG ₁₉	-1067	847	IC	1067	-847
COM ₃	-1067	1010	IC	1067	-1010
COM ₂	-618	1067	T ₄	618	-1067
COM ₁	-455	1067	T ₃	455	-1067
FAI ₁	-292	1067	T ₂	292	-1067
FAI ₂	-129	1067	T ₁	130	-1067
V _{SS2}	33	1067	IC	-33	-1067
X _I	196	1067	V _{DD} (SUB)	-196	-1067
X _O	359	1067	IC	-359	-1067
V _{DD} (MAIN)	522	1067	IC	-522	-1067
BUZZ	684	1067	S ₁	-684	-1067
V _{SS1}	847	1067	S ₂	-847	-1067
SEG ₂₂	1010	1067	IC	-1010	-1067

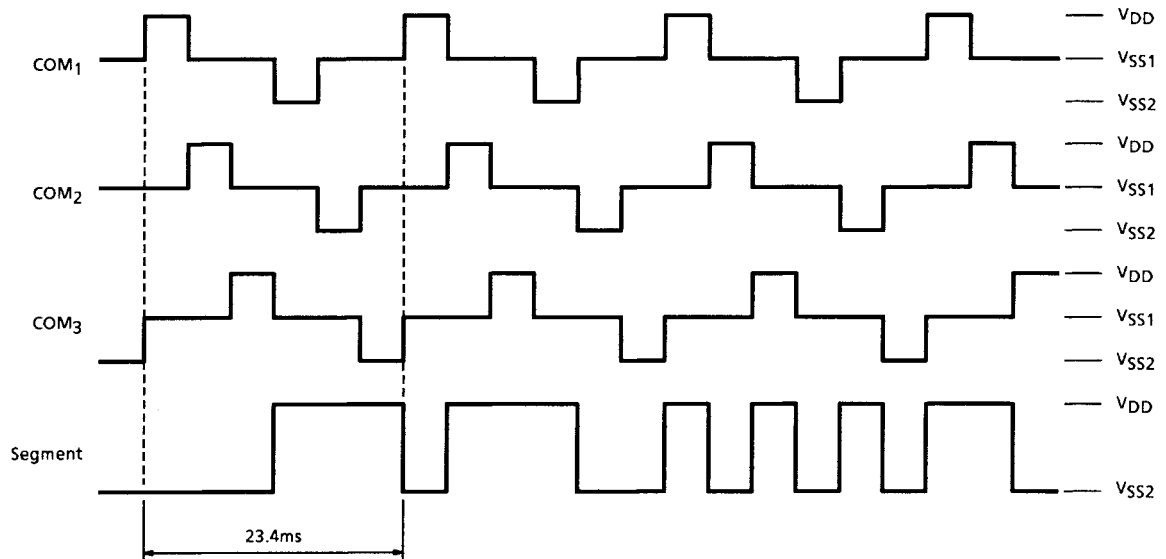
Function Specifications

1. LCD Segment Pattern



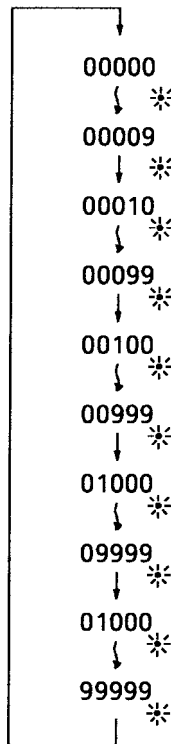
	COM ₁	COM ₂	COM ₃		COM ₁	COM ₂	COM ₃
SEG ₈	—	5e	5f	SEG ₁₆	—	3c	3b
SEG ₉	5d	5g	5a	SEG ₁₇	—	2e	2f
SEG ₁₀	—	5c	5b	SEG ₁₈	2d	2g	2a
SEG ₁₁	—	4e	4f	SEG ₁₉	2p	2c	2b
SEG ₁₂	4d	4g	4a	SEG ₂₀	—	1e	1f
SEG ₁₃	—	4c	4b	SEG ₂₁	1d	1g	1a
SEG ₁₄	—	3e	3f	SEG ₂₂	—	1c	1b
SEG ₁₅	3d	3g	3a				

2. LCD Drive Waveform



3. Display Modes and Display Sequences

Counter display mode



※ : Counter mode sign flashes at 1Hz.

4. Put Setting

S₁, S₂: Normally pulled down to the VSS₁ level by IC internal resistance. S₁ and S₂ perform their specified functions when connected to the VDD by an external switch.

5. Input Functions

Counter display	S ₁ : +1/S ₁	Pressing S ₁ or S ₂ outputs an operating confirmation sound from BUZZ.
	S ₂ : Count reset	(Around 30~60 ms) The drive frequency is 4 kHz.

6. 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 (if no temperature stipulations, Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Power supply voltage (1)	V _{SS1} -V _{DD}	-3.0-0.2	V
Power supply voltage (2)	V _{SS2} -V _{DD}	-4.5-0.2	V
Input voltage (1)	V _{IN1}	V _{SS1} - 0.2-V _{DD} + 0.2	V
Input voltage (2)	V _{IN2}	V _{SS2} - 0.2-V _{DD} + 0.2	V
Output voltage (1)	V _{OUT1}	V _{SS1} - 0.2-V _{DD} + 0.2	V
Output voltage (2)	V _{OUT2}	V _{SS2} - 0.2-V _{DD} + 0.2	V
Operating temperature	T _{opr}	-10-60	°C
Storage temperature	T _{stg}	-40-125	°C

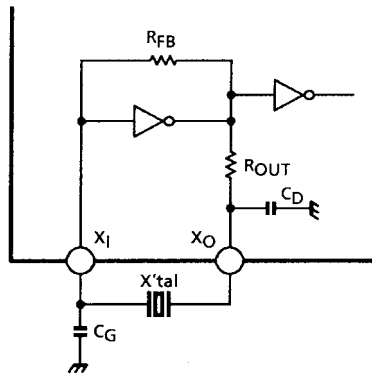
Electrical Characteristics

(unless otherwise stated, V_{DD} = 0.00 V, V_{SS1} = -1.55 V, V_{SS2} = -3.00 V, C_G = 20 pF, C_D = built-in (10 pF), C_{IMAX} = 21 kΩ, F_o = 32768 Hz)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Operating voltage	V _{SS1} -V _{DD}	3	—	1.25	1.55	1.80	V
Operating current consumption	I _{sup}	2	No LCD load	—	—	3.0	μA
Oscillation start voltage	V _{STA}	3	t _{STA} 10 s	—	—	1.40	V
Output current (1)	I _{OH1}	4	V _{OH1} = -0.2 V	—	—	-0.5	μA
Segment	I _{OL1}	4	V _{OL1} = -2.8 V	0.5	—	—	
Output current (2)	I _{OH2}	4	V _{OH2} = -0.2 V	—	—	-4.0	μA
Common	I _{OL2}	4	V _{OL2} = -2.8 V	4.0	—	—	
Output current (3)	I _{OH3}	4	V _{SS1} = -1.25 V V _{OH3} = -0.5 V	—	—	-100	μA
Buzzer	I _{OL3}	4	V _{SS2} = -2.8 V V _{OL3} = -0.75 V	100	—	—	
Input current (2)	I _{IH2}	4	V _{IH2} = 0 V	—	—	0.1	μA
T ₁ , T ₃ , T ₄	I _{IL2}	4	V _{IL2} = -1.55 V	—	-50	—	
Input current (3)	I _{IH3}	4	V _{IH3} = 0 V	—	—	0.1	μA
T ₂	I _{IL3}	4	V _{IL3} = -1.55 V	-15.5	—	—	
Input current (4)	I _{IH4}	4	V _{IH4} = 0 V	15.5	—	150	μA
S ₁ , S ₂	I _{IL4}	4	V _{IL4} = -1.55 V	-0.1	—	—	
Voltage doubler output	V _{UCO}	2	C ₁ = C ₂ = 0.1 μF, R _L = 3 MΩ	3.0	—	—	V

Test Circuit

1. Oscillation Circuit



X'tal

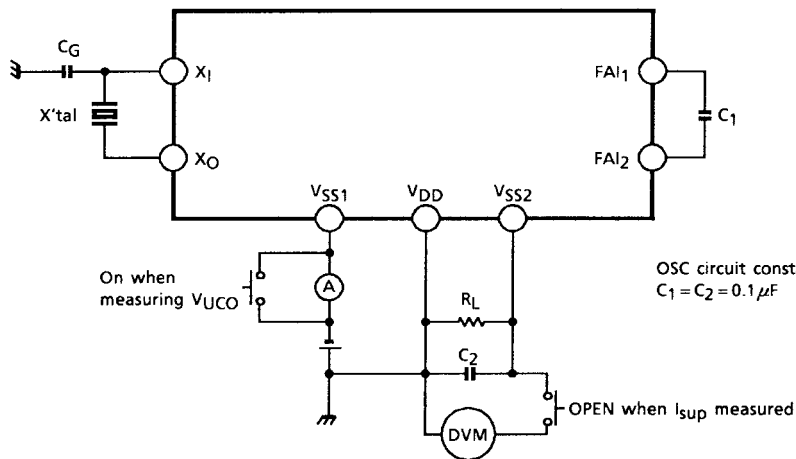
$R_S = 21 \text{ k}\Omega$

$F_0 = 32.768 \text{ kHz}$

$C_G = 20 \text{ pF}$

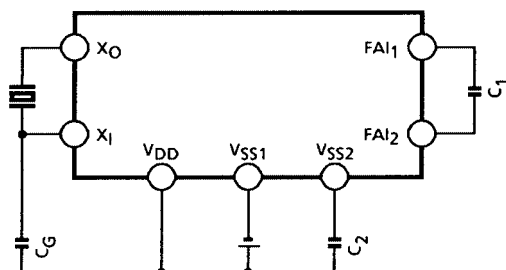
$C_D = 10 \text{ pF}$ built in

2. Measuring I_{sup} and V_{UCO}

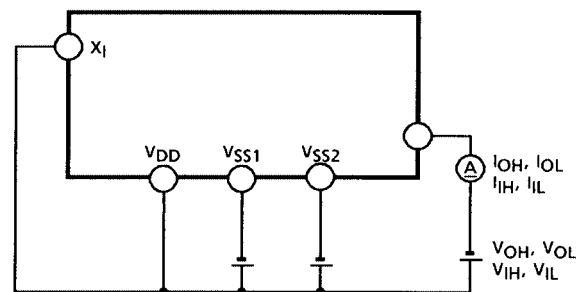


OSC circuit constants same as test circuit 1.
 $C_1 = C_2 = 0.1 \mu\text{F}$

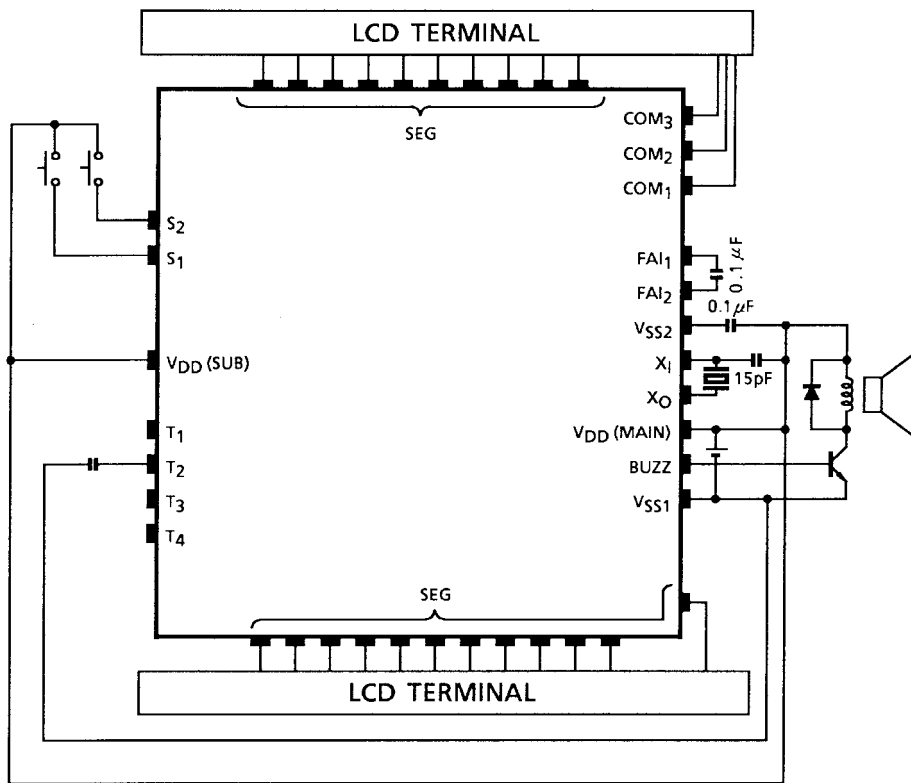
3.



4.



Application Circuit Example



Note: Be sure to connect the V_{DD} (MAIN).

RESTRICTIONS ON PRODUCT USE

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