

JT6P24-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.

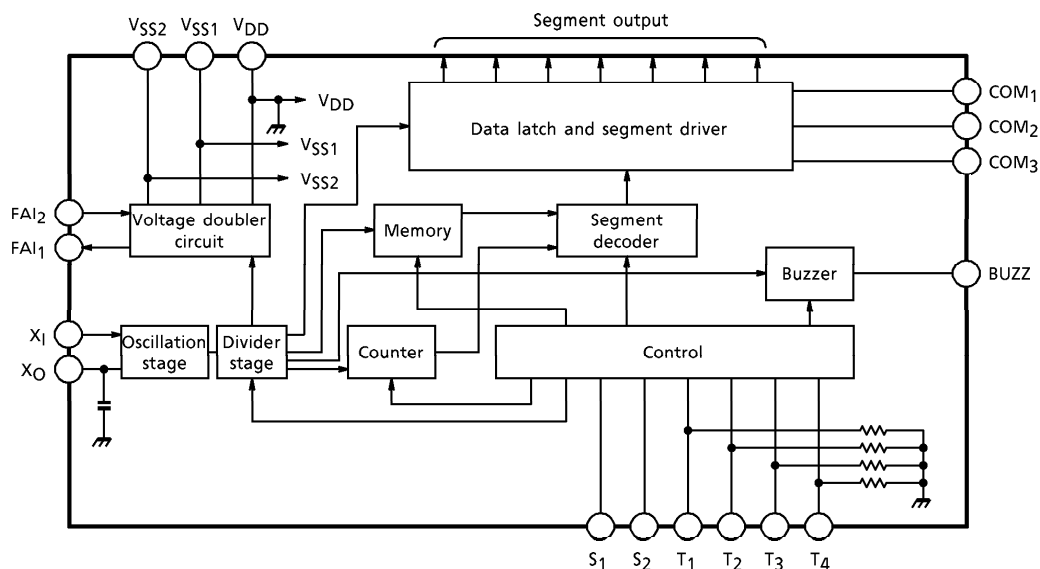
APPLICATIONS

- Pedometers
- Counters

FEATURES

- 32.768kHz 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 $0.1\mu F$ -external capacitors)

BLOCK DIAGRAM



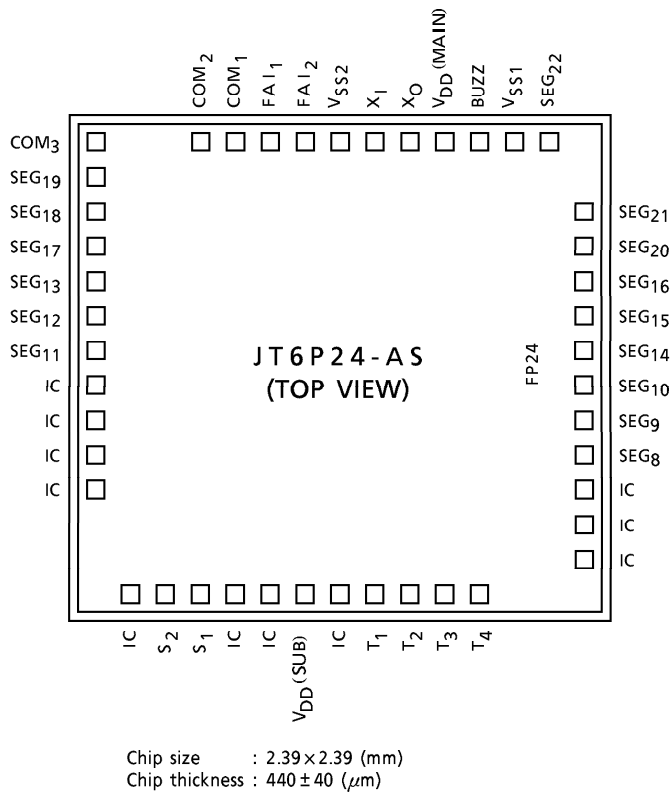
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PIN DESCRIPTIONS (44PINS)

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	$COM_{1\sim3}$, SEG (15)	18
Test Pins	$T_1\sim4$	4
Voltage Doubler Pins	FAI_1 , FAI_2	2
IC (Do Not Use)	—	11

PAD LAYOUT



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

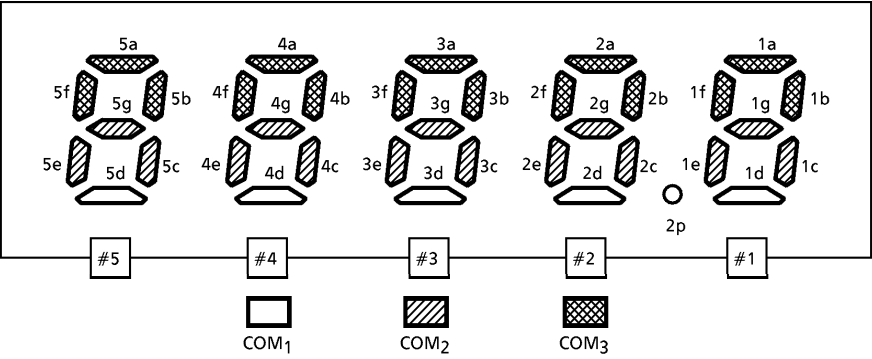
PAD LOCATION TABLE

(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

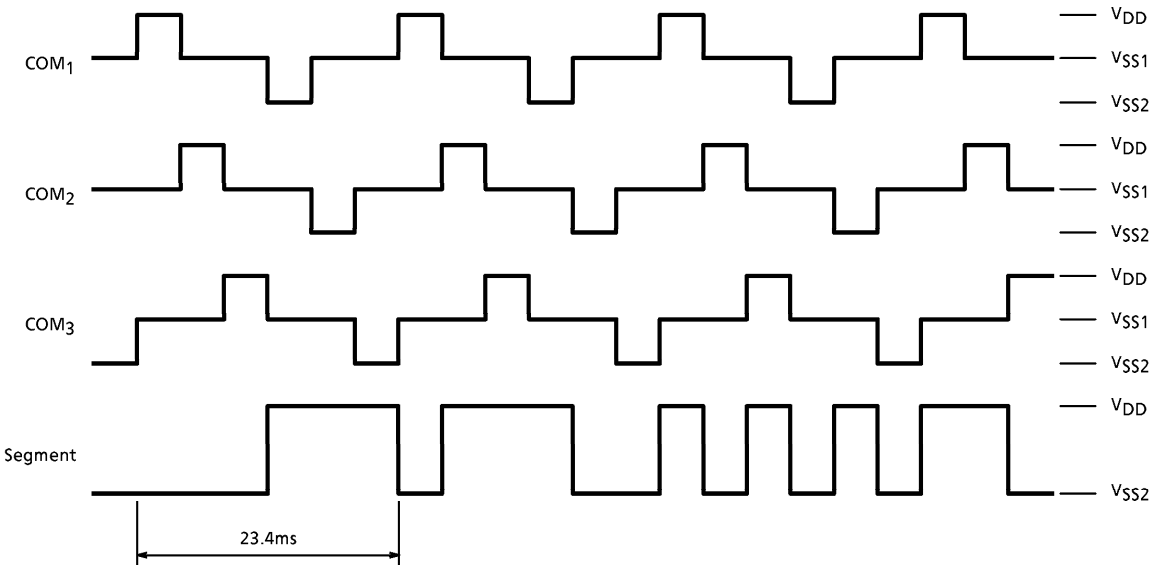
FUNCTION SPECIFICATIONS

1. LCD segment pattern



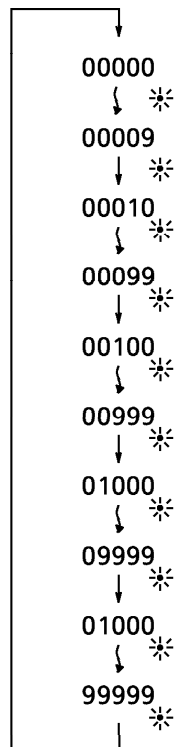
	COM ₁	COM ₂	COM ₃		COM ₁	COM ₂	COM ₃
SEG ₈	—	5e	5f	SEG ₁₆	—	3c	3b
SEG ₉	5d	5g	5a	SEG ₁₇	—	2e	2f
SEG ₁₀	—	5c	5b	SEG ₁₈	2d	2g	2a
SEG ₁₁	—	4e	4f	SEG ₁₉	2p	2c	2b
SEG ₁₂	4d	4g	4a	SEG ₂₀	—	1e	1f
SEG ₁₃	—	4c	4b	SEG ₂₁	1d	1g	1a
SEG ₁₄	—	3e	3f	SEG ₂₂	—	1c	1b
SEG ₁₅	3d	3g	3a				

2. LCD drive waveform



3. Display modes and display sequences

Counter display mode



✱ : Counter mode sign flashes at 1Hz.

4. Input setting

S_1 , S_2 : Normally, pulled down to the V_{SS1} level by external resistance. S_1 and S_2 perform their specified functions when connected to the V_{DD} 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. (Around 30~60ms) The drive frequency is 4kHz.
	S_2 : Count reset	

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, $T_a = 25^\circ\text{C}$)

PARAMETER	SYMBOL	RATING	UNIT
Power Supply Voltage (1)	$V_{SS1}-V_{DD}$	$-3.0\sim 0.2$	V
Power Supply Voltage (2)	$V_{SS2}-V_{DD}$	$-4.5\sim 0.2$	V
Input Voltage (1)	V_{IN1}	$V_{SS1} - 0.2\sim V_{DD} + 0.2$	V
Input Voltage (2)	V_{IN2}	$V_{SS2} - 0.2\sim V_{DD} + 0.2$	V
Output Voltage (1)	V_{OUT1}	$V_{SS1} - 0.2\sim V_{DD} + 0.2$	V
Output Voltage (2)	V_{OUT2}	$V_{SS2} - 0.2\sim V_{DD} + 0.2$	V
Operating Temperature	T_{opr}	$-10\sim 60$	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-40\sim 125$	$^\circ\text{C}$

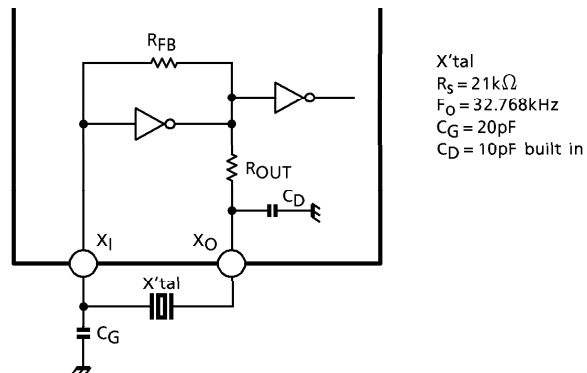
ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, $V_{DD} = 0.00\text{V}$, $V_{SS1} = -1.55\text{V}$, $V_{SS2} = -3.00\text{V}$, $C_G = 20\text{pF}$, $C_D = \text{built-in (10pF)}$, $C_{IMAX} = 21\text{k}\Omega$, $F_O = 32768\text{Hz}$)

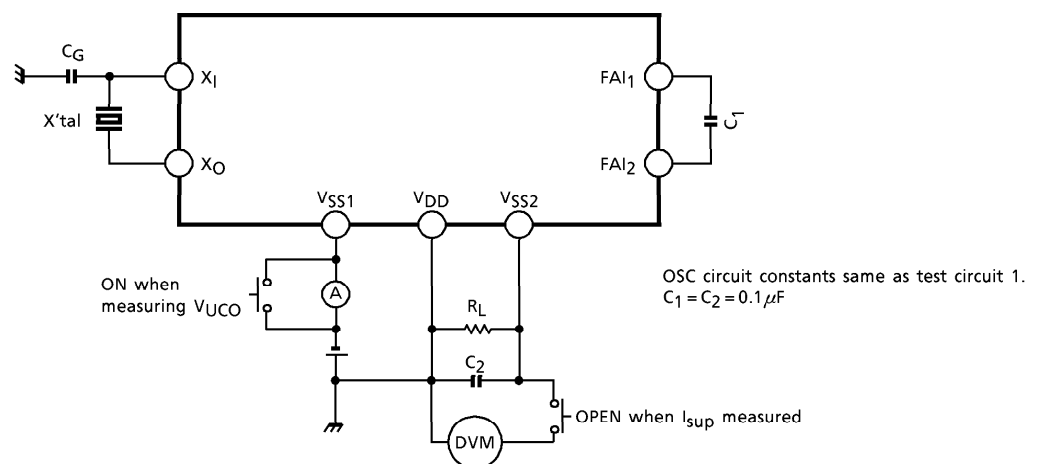
PARAMETER	SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Voltage	$ V_{SS1}-V_{DD} $	3	—	1.25	1.55	1.80	V
Operating Current Consumption	$ I_{sup} $	2	No LCD load	—	—	3.0	μA
Oscillation Start Voltage	$ V_{STA} $	3	$t_{STA} \ 10\text{s}$	—	—	1.40	V
Output Current (1) Segment	I_{OH1}	4	$V_{OH1} = -0.2\text{V}$	—	—	-0.5	μA
	I_{OL1}	4	$V_{OL1} = -2.8\text{V}$	0.5	—	—	
Output Current (2) Common	I_{OH2}	4	$V_{OH2} = -0.2\text{V}$	—	—	-4.0	μA
	I_{OL2}	4	$V_{OL2} = -2.8\text{V}$	4.0	—	—	
Output Current (3) Buzzer	I_{OH3}	4	$V_{SS1} = -1.25\text{V}$ $V_{OH3} = -0.5\text{V}$	—	—	-100	μA
	I_{OL3}	4	$V_{SS2} = -2.8\text{V}$ $V_{OL3} = -0.75\text{V}$	100	—	—	
Input Current (2) T_1, T_3, T_4	I_{IH2}	4	$V_{IH2} = 0\text{V}$	—	—	0.1	μA
	I_{IL2}	4	$V_{IL2} = -1.55\text{V}$	—	-50	—	
Input Current (3) T_2	I_{IH3}	4	$V_{IH3} = 0\text{V}$	—	—	0.1	μA
	I_{IL3}	4	$V_{IL3} = -1.55\text{V}$	-15.5	—	—	
Input Current (4) S_1, S_2	I_{IH4}	4	$V_{IH4} = 0\text{V}$	—	—	0.1	μA
	I_{IL4}	4	$V_{IL4} = -1.55\text{V}$	-0.1	—	—	
Voltage Doubler Output	$ V_{ucol} $	2	$C_1 = C_2 = 0.1\mu\text{F}$, $R_L = 3\text{M}\Omega$	3.0	—	—	V

TEST CIRCUIT

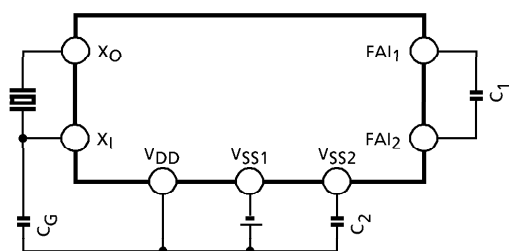
1. Oscillation circuit



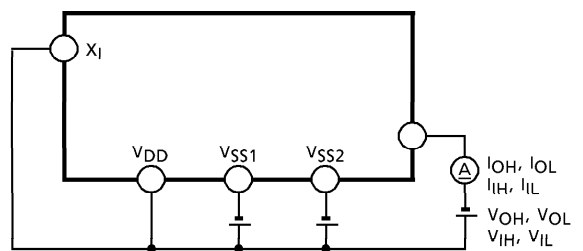
2. Measuring I_{sup} and V_{UCO}



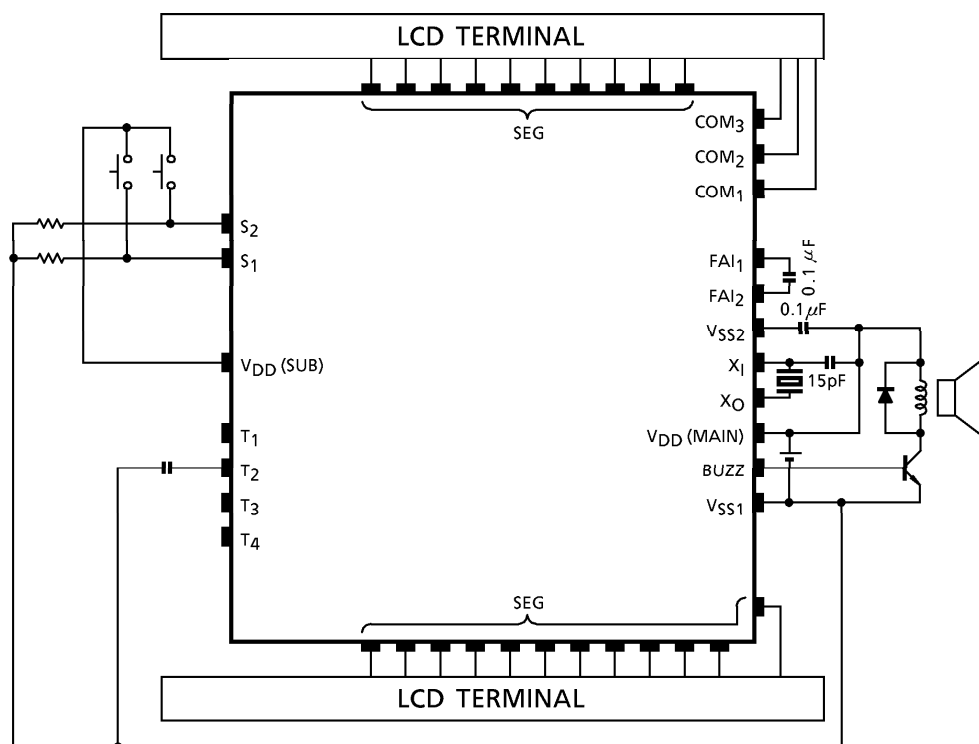
3.



4.



APPLICATION CIRCUIT EXAMPLE



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