

**SANYO**

No.3030A

**LB8901M**

CCD Clock Driver

**Overview**

- The LB8901M is a monolithic IC designed to drive large-capacity clock gates of a CCD image sensor (LC9900 series) at a high speed.

**Features**

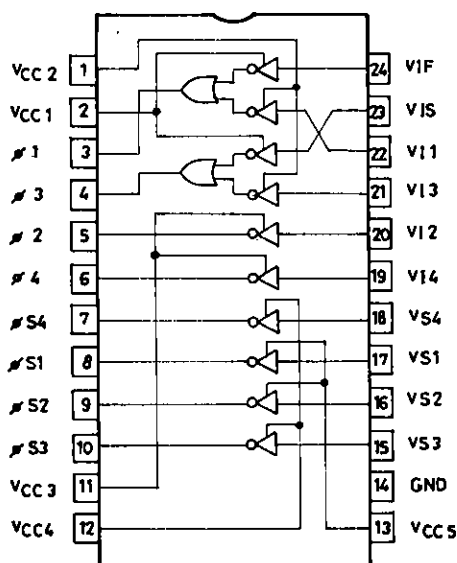
- Capable of driving large-capacity gates of a CCD, etc.
- On-chip eight-block driver, two of which are capable of providing drive on the three-value level (LC9900 series). No more than one chip is required to drive vertical gates.
- Placed in a 24-pin miniflat package (MFP24S), facilitating miniaturization of equipment.
- Capable of being driven direct with TTL, CMOS, etc.
- A power save circuit can be connected to permit less power dissipation.

**Absolute Maximum Ratings at  $T_a = 25^\circ\text{C}$** 

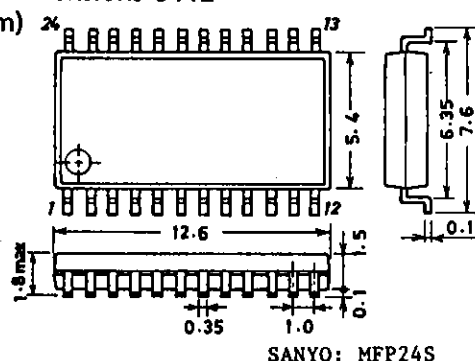
				unit
Maximum Supply Voltage	$V_{CC}$ max	Each $V_{CC}$ pin	-0.3 to +18.0	V
Input Supply Voltage	$V_{IN}$	Each input pin	-0.3 to +6.0	V
Maximum Output Current	$I_{OUT}$	Each output pin	250	mA
Allowable Power Dissipation	$P_d$ max		620	mW
Operating Temperature	$T_{opr}$		-10 to +70	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

**Allowable Operating Conditions at  $T_a = 25^\circ\text{C}$** 

				unit
Supply Voltage	$V_{CC}$	Each $V_{CC}$ pin	5 to 18	V
	$\Delta V_{CC1-2}$	$ V_{CC1} - V_{CC2} $ voltage difference	0 to 6.0	V
Input 'H'-Level Voltage	$V_{IH}$	Each input pin	2.5 to 6.0	V
Input 'L'-Level Voltage	$V_{IL}$	Each input pin	-0.3 to +0.3	V

**Equivalent Circuit Block Diagram****Package Dimensions 3112**

(unit : mm)



# LB8901M

Electrical Characteristics at Ta = 25°C, V <sub>CC1</sub> = 9.0V, V <sub>CC2</sub> to 5 = 13.0V			min	typ	max	unit
Input 'H'-Level Current	I <sub>IH1</sub>	V <sub>I1</sub> , V <sub>I3</sub> inputs of blocks 1,2 V <sub>IN</sub> = 5.0V		1.0	2	mA
	I <sub>IH2</sub>	V <sub>IF</sub> , V <sub>IS</sub> inputs of blocks 1,2 V <sub>IN</sub> = 5.0V		1.0	2	mA
	I <sub>IH3</sub>	V <sub>I2</sub> , V <sub>I4</sub> inputs of blocks 3,4 V <sub>IN</sub> = 5.0V		1.0	2	mA
	I <sub>IH4</sub>	V <sub>S1</sub> to 4 inputs of blocks 5 to 8 V <sub>IN</sub> = 5.0V		1.0	2	mA
Input 'L'-Level Current	I <sub>IL1</sub>	V <sub>I1</sub> to 4, V <sub>S1</sub> to 4 inputs of blocks 1 to 8 V <sub>IN</sub> = 0V	-30			μA
	I <sub>IL2</sub>	V <sub>IF</sub> , V <sub>IS</sub> inputs of blocks 1,2 V <sub>IN</sub> = 0V	-100	-20		μA
Supply Current	I <sub>CCH1</sub>	Each input ; V <sub>IN</sub> = 5.0V		0.5	1	mA
	I <sub>CCH2</sub>	Each input ; V <sub>IN</sub> = 5.0V		4.0	8	mA
	I <sub>CCH3</sub>	Each input ; V <sub>IN</sub> = 5.0V		4.0	8	mA
	I <sub>CCH4</sub>	Each input ; V <sub>IN</sub> = 5.0V		4.0	8	mA
	I <sub>CCH5</sub>	Each input ; V <sub>IN</sub> = 5.0V		4.0	8	mA
	I <sub>CCL1</sub>	Each input ; V <sub>IN</sub> = 0V			300	μA
	I <sub>CCL2</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCL3</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCL4</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCL5</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
Output Voltage	V <sub>OH1</sub>	V <sub>I1</sub> = 0V, V <sub>IF</sub> = 5V	V <sub>CC2</sub> - 2.0			V
	V <sub>OH2</sub>	V <sub>I1</sub> = 0V, V <sub>IF</sub> = 0V	V <sub>CC1</sub> - 1.0			V
	V <sub>OH3</sub>	V <sub>I3</sub> = 0V, V <sub>IS</sub> = 5V	V <sub>CC2</sub> - 2.0			V
	V <sub>OH4</sub>	V <sub>I3</sub> = 5V, V <sub>IS</sub> = 0V	V <sub>CC1</sub> - 1.0			V
	V <sub>OH5</sub>	V <sub>I2</sub> , V <sub>I4</sub> = 0V	V <sub>CC3</sub> - 2.0			V
	V <sub>OH6</sub>	V <sub>S3</sub> , V <sub>S4</sub> = 0V	V <sub>CC4</sub> - 2.0			V
	V <sub>OH7</sub>	V <sub>S1</sub> , V <sub>S2</sub> = 0V	V <sub>CC5</sub> - 2.0			V
	V <sub>OL</sub>	Each input V <sub>IN</sub> = 5V			1.0	V

Switching Characteristics at Ta = 25°C, V<sub>CC1</sub> = 9.0V, V<sub>CC2</sub> to 5 = 13.0V, V<sub>IN</sub> = 5.0V, t<sub>r</sub>, t<sub>f</sub> ≤ 10ns

			min	typ	max	unit
Propagation Time 'L'-Level → 'H'-Level	t <sub>PLH1</sub>	Ø1,3 outputs ; V <sub>IF</sub> , V <sub>IS</sub> = 5.0V fixed		30		ns
	t <sub>PLH2</sub>	Ø1,3 outputs ; V <sub>I1</sub> , V <sub>I3</sub> = 5.0V fixed		2		μs
	t <sub>PLH3</sub>	Ø2,4, ØS1 to 4 outputs		30		ns
Propagation Time 'H'-Level → 'L'-Level	t <sub>PHL1</sub>	Ø1,3 outputs ; V <sub>IF</sub> , V <sub>IS</sub> = 5.0V fixed		30		ns
	t <sub>PHL2</sub>	Ø1,3 outputs ; V <sub>I1</sub> , V <sub>I3</sub> = 5.0V fixed		1		μs
	t <sub>PHL3</sub>	Ø2,4, ØS1 to 4 outputs		30		ns
Transient Rise Time	t <sub>r1</sub>	Ø1,3 outputs ; V <sub>IF</sub> , V <sub>IS</sub> = 5.0V fixed		30		ns
	t <sub>r2</sub>	Ø1,3 outputs ; V <sub>I1</sub> , V <sub>I3</sub> = 5.0V fixed		6		μs
	t <sub>r3</sub>	Ø2,4, ØS1 to 4 outputs		30		ns
Transient Fall Time	t <sub>f1</sub>	Ø1,3 outputs ; V <sub>IF</sub> , V <sub>IS</sub> = 5.0V fixed		30		ns
	t <sub>f2</sub>	Ø1,3 outputs ; V <sub>I1</sub> , V <sub>I3</sub> = 5.0V fixed		300		ns
	t <sub>f3</sub>	Ø2,4, ØS1 to 4 outputs		30		ns

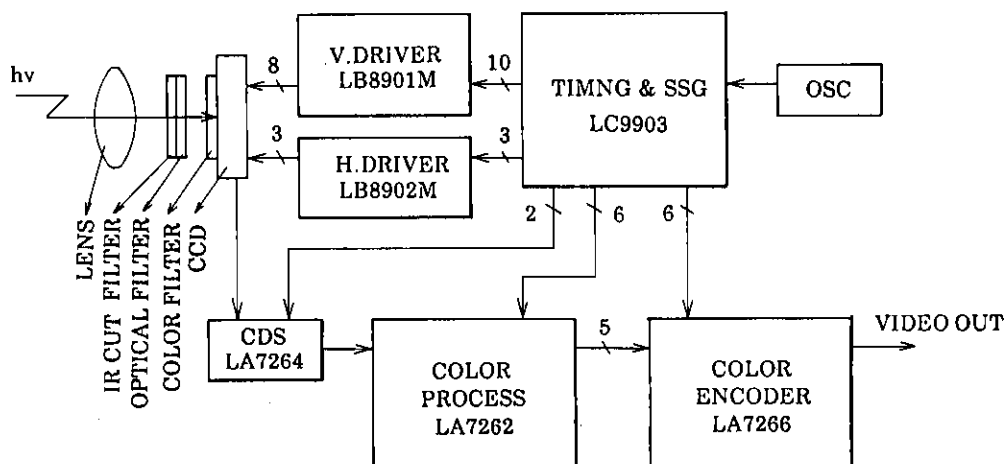
Note : Load conditions

- Positive three-value driver (Ø1,3) ----- RS = 16Ω, C<sub>L</sub> = 1200pF
- Positive two-value driver (Ø2,4, ØS1 to 4) ----- RS = 20Ω, C<sub>L</sub> = 1300pF

## LB8901M Pin Assignment

Pin No.	Pin Name	Pin Description
1	V <sub>CC2</sub>	Power supply for frame shift pulse at $\phi 1,3$
2	V <sub>CC1</sub>	Power supply for three-value pulse at $\phi 1,3$
3	$\phi 1$	Positive three-value drive output, for $\phi 1$ of CCD
4	$\phi 3$	Positive three-value drive output, for $\phi 3$ of CCD
5	$\phi 2$	Positive two-value drive output, for $\phi 2$ of CCD
6	$\phi 4$	Positive two-value drive output, for $\phi 4$ of CCD
7	$\phi S4$	Positive two-value drive output, for $\phi S4$ of CCD
8	$\phi S1$	Positive two-value drive output, for $\phi S1$ of CCD
9	$\phi S2$	Positive two-value drive output, for $\phi S2$ of CCD
10	$\phi S3$	Positive two-value drive output, for $\phi S3$ of CCD
11	V <sub>CC3</sub>	Power supply for $\phi 2,4$
12	V <sub>CC4</sub>	Power supply for $\phi S3, S4$
13	V <sub>CC5</sub>	Power supply for $\phi S1, S2$
14	GND	Ground pin
15	V <sub>S3</sub>	Clock input for $\phi S3$ driver
16	V <sub>S2</sub>	Clock input for $\phi S2$ driver
17	V <sub>S1</sub>	Clock input for $\phi S1$ driver
18	V <sub>S4</sub>	Clock input for $\phi S4$ driver
19	V <sub>I4</sub>	Clock input for $\phi 4$ driver
20	V <sub>I2</sub>	Clock input for $\phi 2$ driver
21	V <sub>I3</sub>	Clock input for $\phi 3$ driver
22	V <sub>I1</sub>	Clock input for $\phi 1$ driver
23	V <sub>IS</sub>	Three-value pulse input for $\phi 3$ driver
24	V <sub>IF</sub>	Three-value pulse input for $\phi 1$ driver

## Sample Application Circuit : Camera Block Diagram



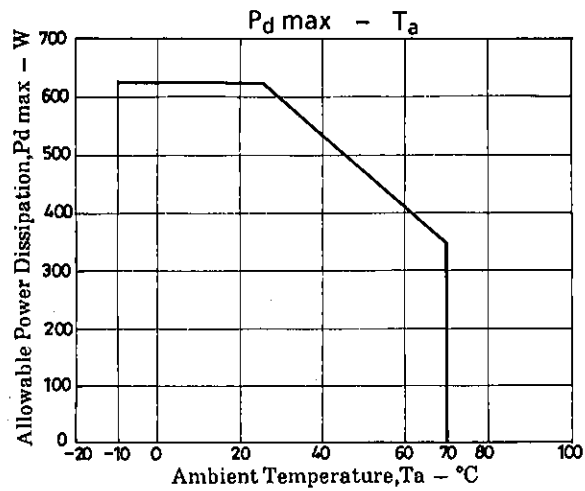
## Proper Cares to be Taken in Designing a Printed Circuit Board

The LB8901M draws a large instantaneous current when it drives a load. The LB8901M is also designed to drive a load at a very high speed. When designing a printed circuit board, keep in mind the following points to prevent the output waveforms from being adversely affected.

- 1) Make the pattern of the power supply, GND lines as large as possible.
- 2) Place the bypass capacitor as close to the IC as possible (less than 1cm).
- 3) Make the wiring of the input signal line as short as possible to minimize the effect of stray capacitance.
- 4) Make the wiring of the output signal line also as short as possible, because the inductance of a long signal line may affect the output waveforms adversely.

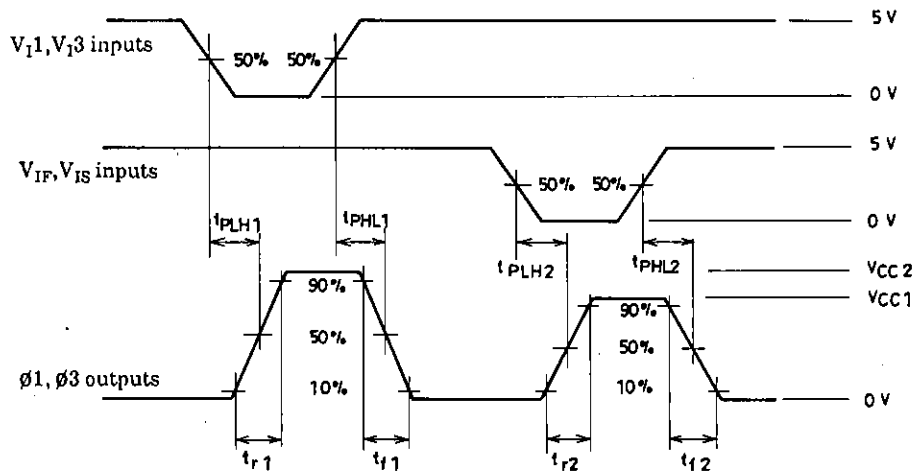
Take such necessary measures that a small resistance is inserted in series with a load.

- 5) When using a power save circuit, place it also as close to the IC as possible.



### Switching Waveforms

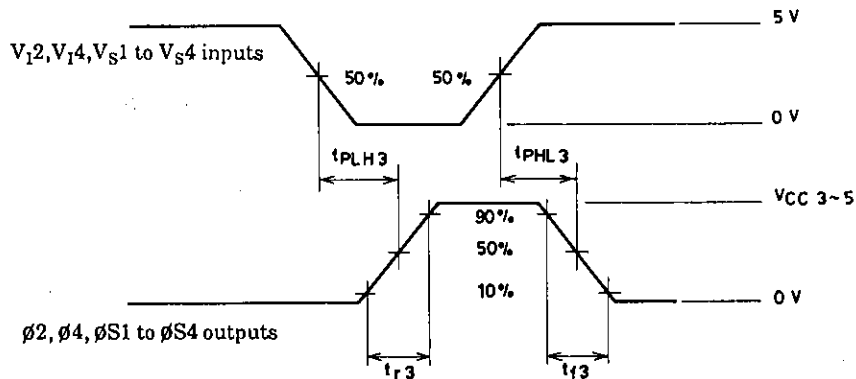
#### 1) Blocks 1,2



Truth Table

		$V_{IF}, V_{IS}$ inputs	
		HIGH	LOW
$V_1, V_3$ Input	HIGH	$V_{OL}$	$V_{OH2,4}$
	LOW	$V_{OH1,3}$	Inhibit

#### 2) Blocks 3 to 8



Truth Table

		Output
Input	HIGH	$V_{OL}$
	LOW	$V_{OH5 \text{ to } 7}$

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