

<b>SANYO</b>	No.3030A	<b>LB8901M</b>
	<b>CCD Clock Driver</b>	

**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.

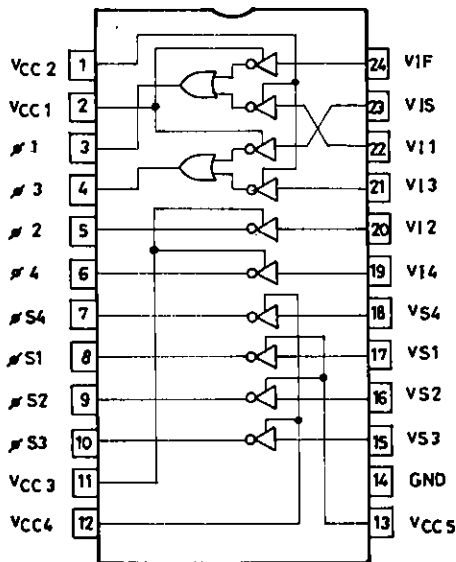
**Absolute Maximum Ratings at Ta = 25°C**

				unit
Maximum Supply Voltage	V <sub>CC</sub> max	Each V <sub>CC</sub> pin	-0.3 to +18.0	V
Input Supply Voltage	V <sub>IN</sub>	Each input pin	-0.3 to +6.0	V
Maximum Output Current	I <sub>OUT</sub>	Each output pin	250	mA
Allowable Power Dissipation	Pd max		620	mW
Operating Temperature	T <sub>opr</sub>		-10 to +70	°C
Storage Temperature	T <sub>stg</sub>		-40 to +125	°C

**Allowable Operating Conditions at Ta = 25°C**

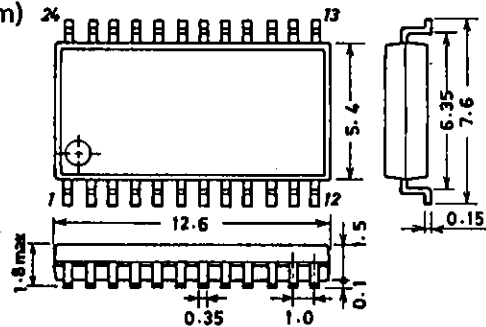
				unit
Supply Voltage	V <sub>CC</sub>	Each V <sub>CC</sub> pin	5 to 18	V
	ΔV <sub>CC1-2</sub>	V <sub>CC1</sub> - V <sub>CC2</sub>  voltage difference	0 to 6.0	V
Input 'H'-Level Voltage	V <sub>IH</sub>	Each input pin	2.5 to 6.0	V
Input 'L'-Level Voltage	V <sub>IL</sub>	Each input pin	-0.3 to +0.3	V

**Equivalent Circuit Block Diagram**



**Package Dimensions 3112**

(unit : mm)



LB8901M

Electrical Characteristics at Ta = 25°C, VCC1 = 9.0V, VCC2 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>CCCL1</sub>	Each input ; V <sub>IN</sub> = 0V			300	μA
	I <sub>CCCL2</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCCL3</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCCL4</sub>	Each input ; V <sub>IN</sub> = 0V			100	μA
	I <sub>CCCL5</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	VCC2 - 2.0			V
	V <sub>OH2</sub>	V <sub>I1</sub> = 0V, V <sub>IF</sub> = 0V	VCC1 - 1.0			V
	V <sub>OH3</sub>	V <sub>I3</sub> = 0V, V <sub>IS</sub> = 5V	VCC2 - 2.0			V
	V <sub>OH4</sub>	V <sub>I3</sub> = 5V, V <sub>IS</sub> = 0V	VCC1 - 1.0			V
	V <sub>OH5</sub>	V <sub>I2</sub> , V <sub>I4</sub> = 0V	VCC3 - 2.0			V
	V <sub>OH6</sub>	V <sub>S3</sub> , V <sub>S4</sub> = 0V	VCC4 - 2.0			V
	V <sub>OH7</sub>	V <sub>S1</sub> , V <sub>S2</sub> = 0V	VCC5 - 2.0			V
	V <sub>OL</sub>	Each input V <sub>IN</sub> = 5V			1.0	V

Switching Characteristics at Ta = 25°C, VCC1 = 9.0V, VCC2 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

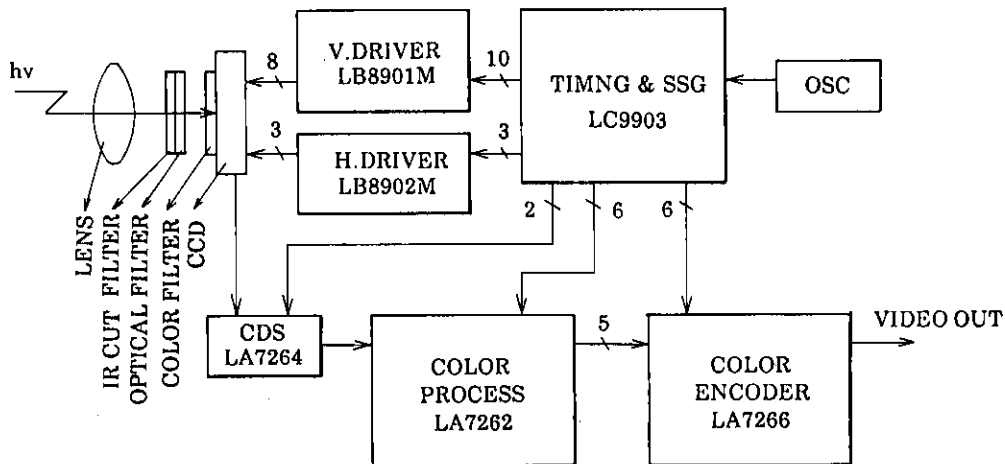
Note : Load conditions

- 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



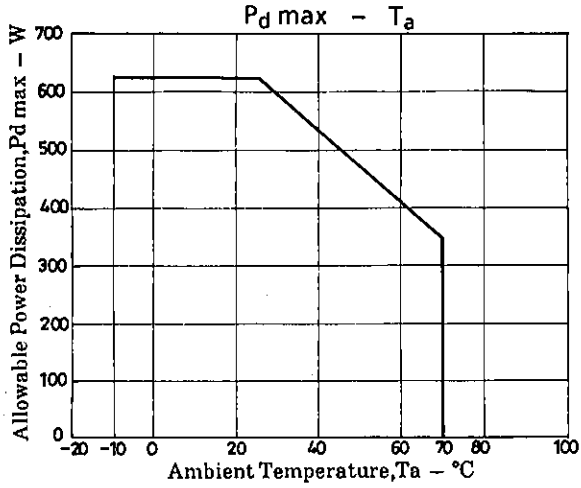
Proper Cares to be Taken in Designing a Printed Circuit Board

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.

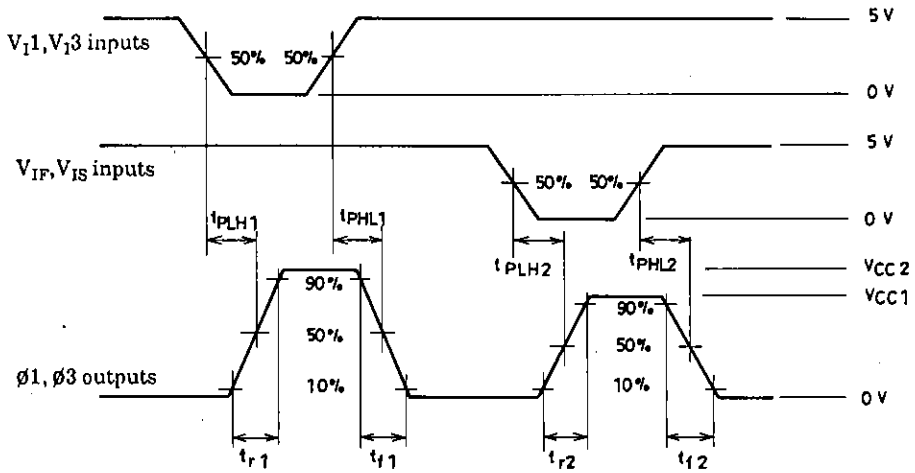
Take such necessary measures that a small resistance is inserted in series with a load.

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



Switching Waveforms

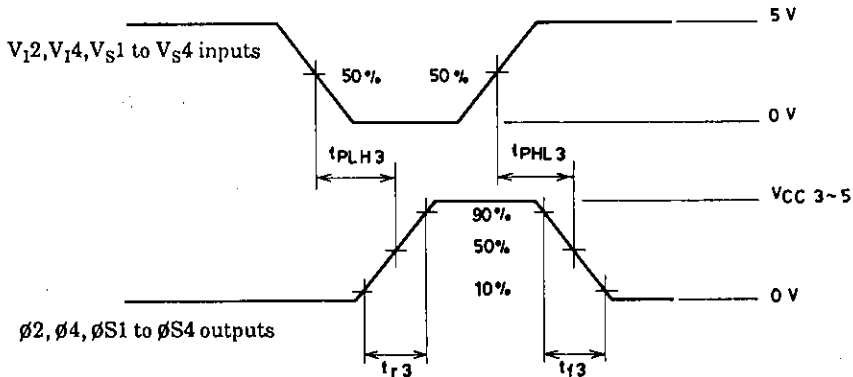
1) Blocks 1,2



Truth Table

		V <sub>IF</sub> , V <sub>IS</sub> inputs	
		HIGH	LOW
V <sub>I1</sub> , V <sub>I3</sub> Input	HIGH	V <sub>OL</sub>	V <sub>OH2,4</sub>
	LOW	V <sub>OH1,3</sub>	Inhibit

2) Blocks 3 to 8



Truth Table

		Output
		V <sub>OL</sub>
Input	HIGH	V <sub>OH5 to 7</sub>
	LOW	V <sub>OH5 to 7</sub>

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