



# 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.

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$	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	$P_d \text{ max}$		620	mW
Operating temperature	$T_{opr}$		-10 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

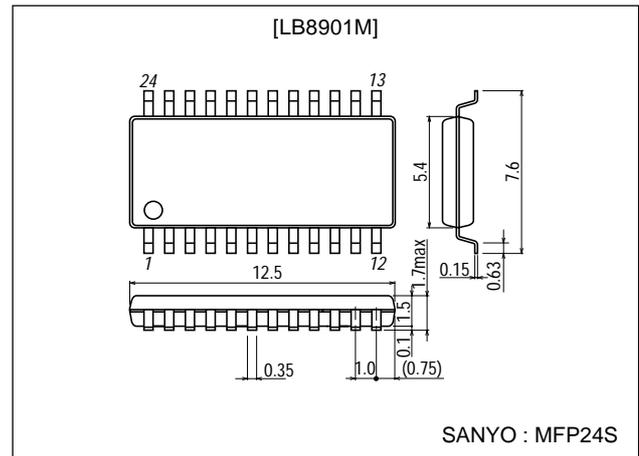
#### Allowable Operating Ranges at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	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 high-level voltage	$V_{IH}$	Each input pin	2.5 to 6.0	V
Input low-level voltage	$V_{IL}$	Each input pin	-0.3 to +0.3	V

### Package Dimensions

unit:mm

3112A-MFP24S



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# LB8901M

## Electrical Characteristics at Ta = 25°C, V<sub>CC1</sub>=9.0V, V<sub>CC2</sub> to 5=13.0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input high-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 low-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
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

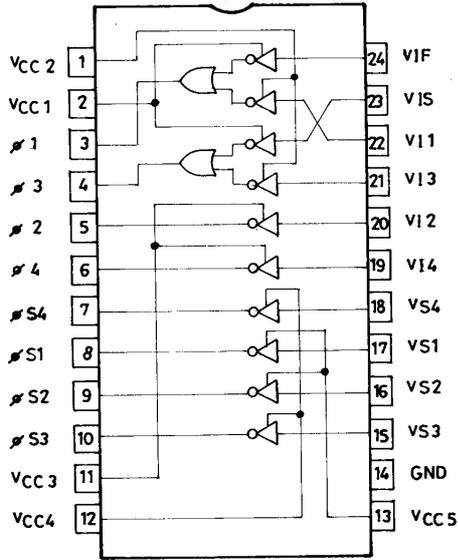
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation time low-level → high-level	t <sub>PLH1</sub>	ø1, 3 outputs ; V <sub>IF</sub> , V <sub>IS</sub> =5.0V fixed		30		ns
	t <sub>PLH2</sub>	ø1, 3 outputs ; V <sub>I1</sub> , V <sub>I3</sub> =5.0V fixed		2		μs
	t <sub>PLH3</sub>	ø2, 4, øS1 to 4 outputs		30		ns
Propagation time high-level → low-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

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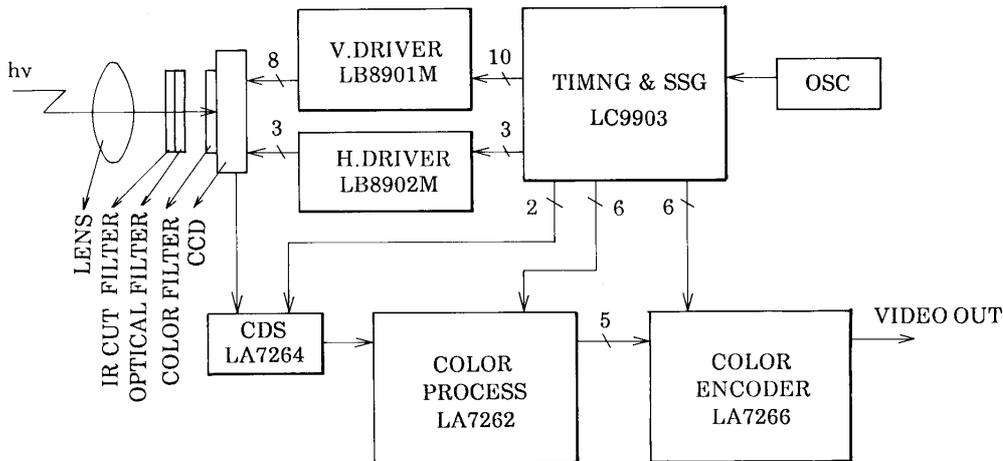
## Equivalent Circuit Block Diagram



## Pin Function

Pin No.	Pin Name	Pin Description
1	V <sub>CC2</sub>	Power supply for frame shift pulse at ø1, 3
2	V <sub>CC1</sub>	Power supply for three-value pulse at ø1, 3
3	ø1	Positive three-value drive output, for ø1 of CCD
4	ø2	Positive three-value drive output, for ø3 of CCD
5	ø3	Positive two-value drive output, for ø2 of CCD
6	ø4	Positive two-value drive output, for ø4 of CCD
7	øS4	Positive two-value drive output, for øS4 of CCD
8	øS1	Positive two-value drive output, for øS1 of CCD
9	øS2	Positive two-value drive output, for øS2 of CCD
10	øS3	Positive two-value drive output, for øS3 of CCD
11	V <sub>CC3</sub>	Power supply for ø2, 4
12	V <sub>CC4</sub>	Power supply for øS3, S4
13	V <sub>CC5</sub>	Power supply for øS1, S2
14	GND	Ground pin
15	V <sub>S3</sub>	Clock input for øS3 driver
16	V <sub>S2</sub>	Clock input for øS2 driver
17	V <sub>S1</sub>	Clock input for øS1 driver
18	V <sub>S4</sub>	Clock input for øS4 driver
19	V <sub>I4</sub>	Clock input for ø4 driver
20	V <sub>I2</sub>	Clock input for ø2 driver
21	V <sub>I3</sub>	Clock input for ø3 driver
22	V <sub>I1</sub>	Clock input for ø1 driver
23	V <sub>I<sub>S</sub></sub>	Three-value pulse input for ø3 driver
24	V <sub>I<sub>F</sub></sub>	Three-value pulse input for ø1 driver

## Sample Application Circuit : Camera Block Diagram



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

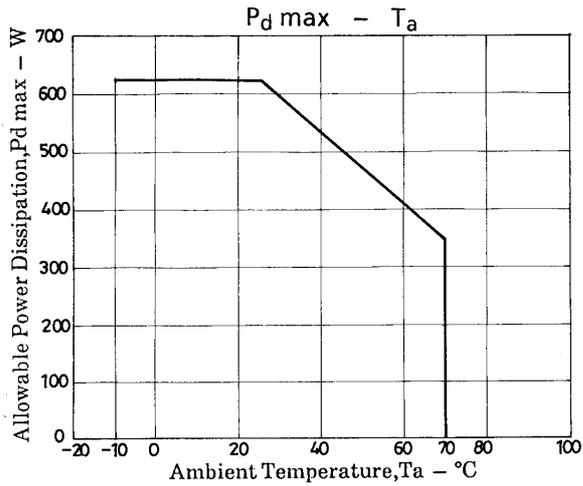
The LB8901M draws a large instantaneous current when it drives a load. The LB8901M is also designed to drive a load at a very high speed. When designing a printed circuit board, keep in mind the following points to prevent the output waveforms from being adversely affected.

- 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.

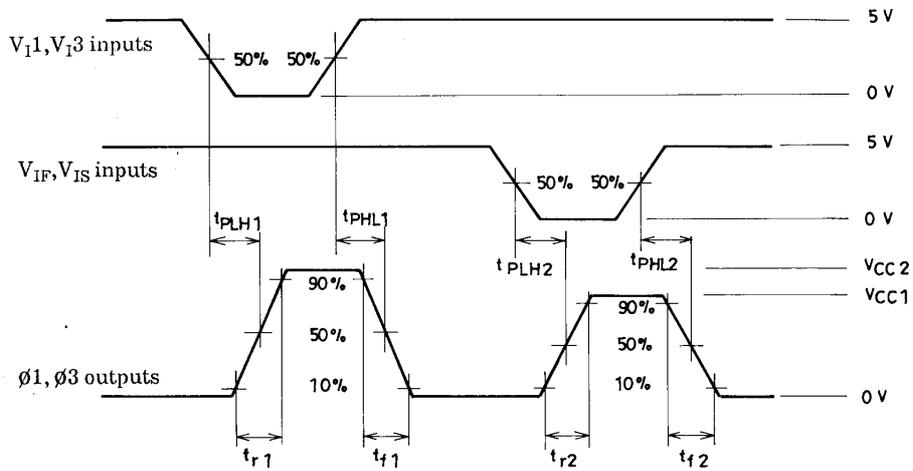
- 5) When using a power save circuit, place it also as close to the IC as possible.

# LB8901M



## Switching Waveforms

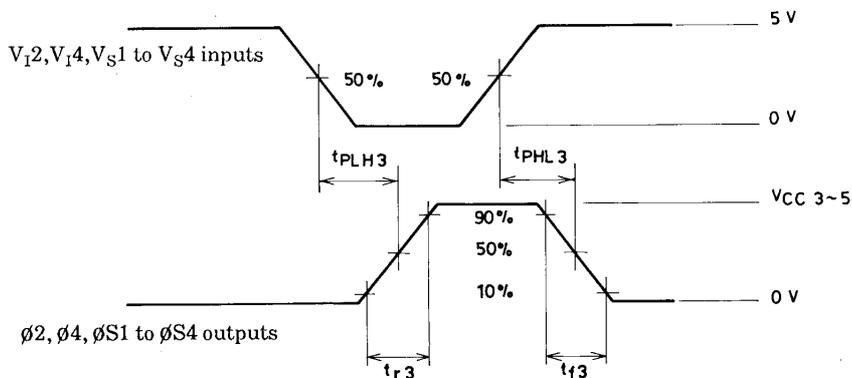
1) Blocks 1, 2



**Truth Table**

		$V_{IF}, V_{IS}$ inputs	
		HIGH	LOW
$V_{I1}, V_{I3}$ 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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