



LB8904M

CCD Clock Driver

Overview

The LB8904M is a monolithic IC designed to drive clock gates of a CCD image sensor (LC9943, etc.) at high speed.

Features

- Capable of driving capacitive gates of a CCD, etc.
- On-chip eight-block vertical driver, one of which is capable of providing drive on the three-value level, and on-chip two-block horizontal driver. No more than one chip is required to drive clock gates of the LC9943, etc.
- Placed in a 30-pin miniflat package, facilitating miniaturization of equipment.
- Capable of being driven direct with CMOS, etc.

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$	V_{CC1} to 4	-0.3 to +16.0	V
Input supply voltage	V_{IN}	Each input pin	-0.3 to +6.0	V
Maximum output current	I_{OUT}	Each output pin	150	mA
Allowable power dissipation	$P_d\text{ max}$		665	mW
Operating temperature	T_{opr}		-10 to +70	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

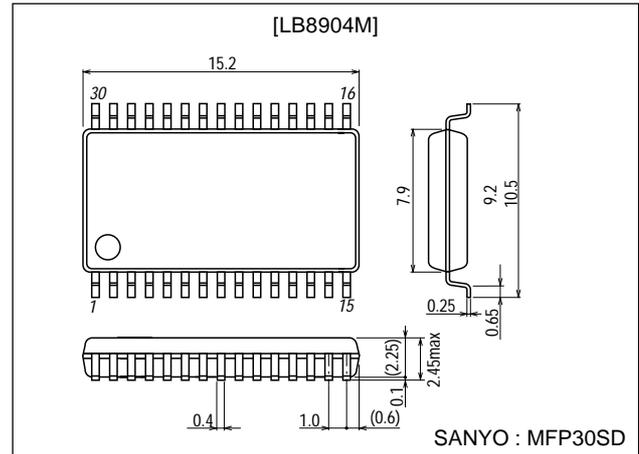
Allowable Operating Ranges at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	Each V_{CC} pin	5 to 16	V
	$V_{CC1}-V_{CC2}$	Voltage difference ($V_{CC1} \leq V_{CC2}$ to 4)	0 to 6.0	V
Input high-level voltage	V_{IH}	Each input pin	3.5 to 6.0	V
Input low-level voltage	V_{IL}	Each input pin	-0.3 to +0.3	V

Package Dimensions

unit:mm

3073B-MFP30SD



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22801TN (KT)/N2195YK/1100YT/3029YT, TS No.3046-1/5

LB8904M

Electrical Characteristics at Ta = 25°C, V_{CC1} to 3=14V, V_{CC4}=11V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input high-level current	I _{IH1}	Block1, V _{I1} input, V _{IN} =5.0V			2	mA
	I _{IH2}	Block1, V _{GCNT} input, V _{IN} =5.0V			2	mA
	I _{IH3}	Blocks2 to 8, V _{I2} to 4 inputs, V _{IN} =5.0V, V _{S1} to 4 inputs, V _{IN} =5.0V			2	mA
	I _{IH4}	Blocks9, 10, HP1, 2 inputs, V _{IN} =5.0V			2	mA
Input low-level current	I _{IL1}	Blocks1 to 10, V _{I1} to 4 inputs, V _{S1} to 4 inputs, V _{IN} =0V	-30			μA
	I _{IL2}	Block1, V _{GCNT} input, V _{IN} =0V	-100	-20		μA
Supply current	I _{CCH1}	Each input, V _{IN} =5.0V			0.5	mA
	I _{CCH2}	Each input, V _{IN} =5.0V			16	mA
	I _{CCH3}	Each input, V _{IN} =5.0V			16	mA
	I _{CCH4}	Each input, V _{IN} =5.0V			8	mA
	I _{CCL1}	V _{I1} =0V, V _{GCNT} =0V			150	μA
	I _{CCL2}	V _{I2} to 4 inputs, V _{IN} =0V			200	μA
	I _{CCL3}	V _{S1} to 4 inputs, V _{IN} =0V			200	μA
	I _{CCL4}	HP1, 2 inputs, V _{IN} =0V			100	μA
Output voltage	V _{OH1}	V _{I1} =0V, V _{GCNT} =5V	V _{CC2} -2.0			V
	V _{OH2}	V _{I1} =5V, V _{GCNT} =0V	V _{CC1} -2.0			V
	V _{OH3}	V _{I2} to 4=0V	V _{CC2} -2.0			V
	V _{OH4}	V _{S1} to 4=0V	V _{CC3} -2.0			V
	V _{OH5}	HP1, 2=0V	V _{CC4} -2.0			V
	V _{OL}	Each input V _{IN} =5V			0.5	V

Switching Characteristics at Ta = 25°C, V_{CC1} to 3=14V, V_{CC4}=11V, V_{IN}=5.0V, t_r, t_f≤10ns

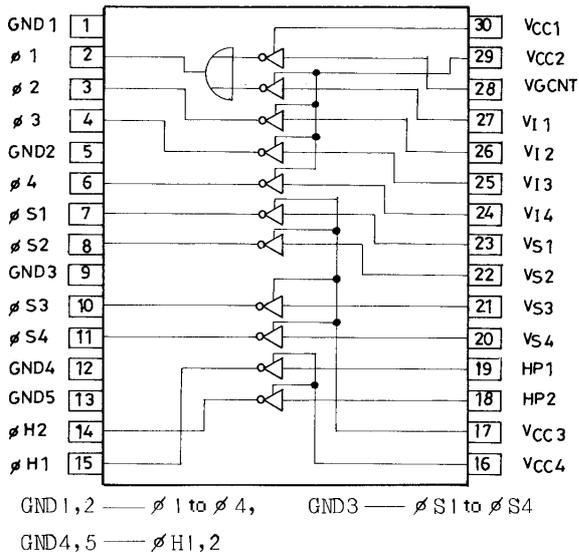
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation time low-level → high-level	t _{PLH1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	t _{PLH2}	ø1 output, V _{I1} =5.0V fixed		2		μs
	t _{PLH3}	ø2 to 4, ø _{S1} to 4, øH1, 2 outputs		30		ns
Propagation time high-level → low-level	t _{PHL1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	t _{PHL2}	ø1 output, V _{I1} =5.0V fixed		1		μs
	t _{PHL3}	ø2 to 4, ø _{S1} to 4 outputs, øH1, 2 outputs		30		ns
Transient rise time	t _{r1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	t _{r2}	ø1 output, V _{I1} =5.0V fixed		6		μs
	t _{r3}	ø2 to 4, ø _{S1} to 4 outputs, øH1, 2 outputs		30		ns
Transient fall time	t _{f1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	t _{f2}	ø1 output, V _{I1} =5.0V fixed		1		μs
	t _{f3}	ø2 to 4, ø _{S1} to 4, øH1, 2 outputs		30		ns

Note : Load conditions

- Vertical three-value driver (ø1) R_S=62Ω, C_L=140pF
- Vertical two-value driver (ø2 to 3, ø_{S1} to 4) R_S=62Ω, C_L=140pF
- Horizontal two-value driver (øH1, 2) R_S=430Ω, C_L=45pF

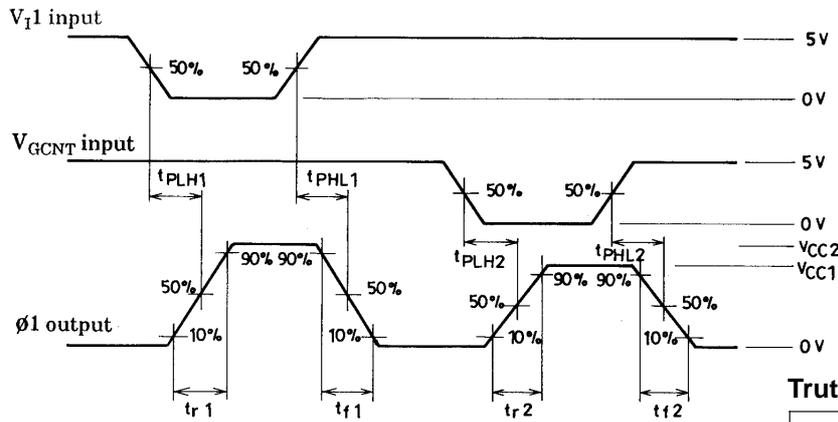
LB8904M

Equivalent Circuit Block Diagram

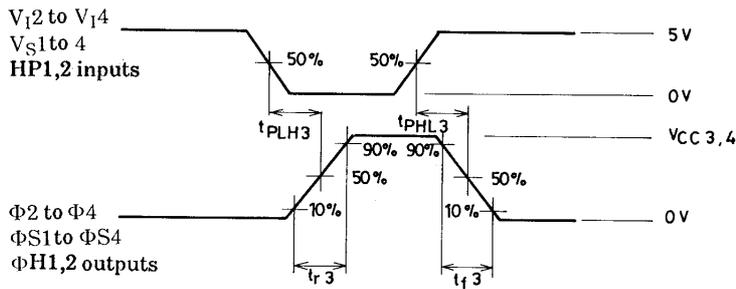


Switching Waveforms

1. Block 1



2. Blocks 2 to 10

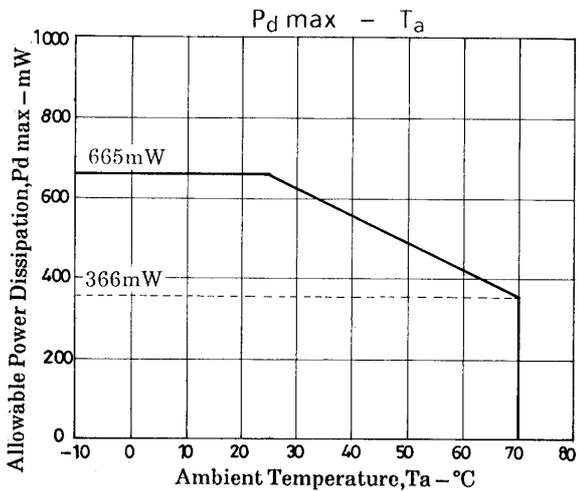


Truth Table

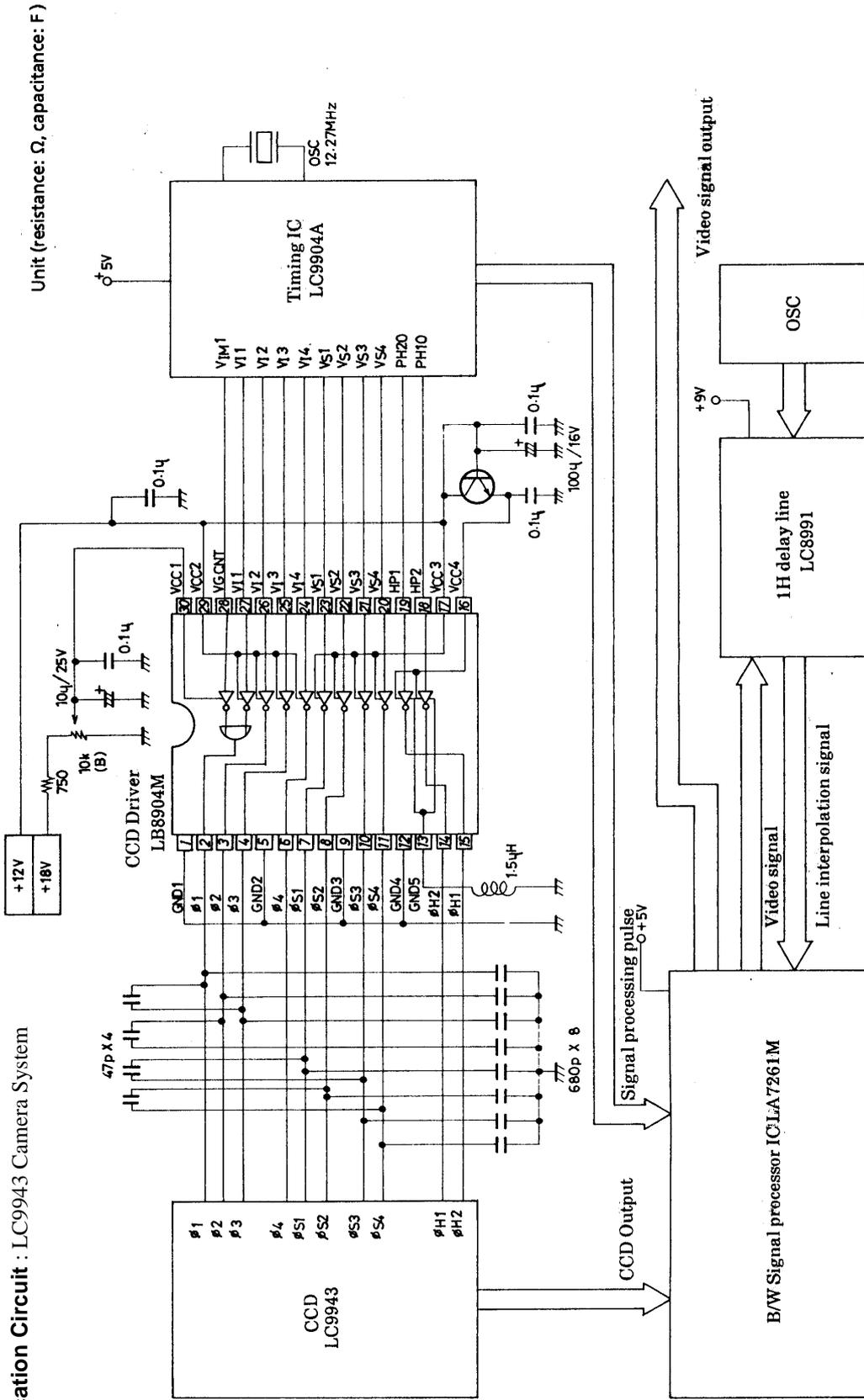
Item	V _{GCNT} inputs	
	H	L
V _{I1} Input	H	V _{OL}
	L	V _{OH1} / Inhibit

Truth Table

Item	Output	
Input	H	V _{OL}
	L	V _{OH3 to 7}



Sample Application Circuit : LC9943 Camera System



Proper Cares to be Taken in Designing a Printed Circuit Board

When operating the LB8904M at high speed, design the printed circuit board with the following points kept in mind.

- 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.

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