



NO.3046B

Monolithic Digital IC

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.

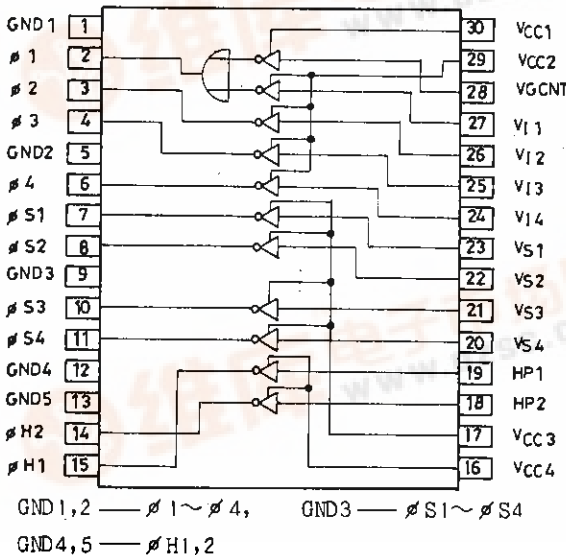
Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Condition	Value	unit
Maximum Supply Voltage	VCC max	VCC1 to 4	-0.3 to +16.0	V
Input Supply Voltage	VIN	Each input pin	-0.3 to +6.0	V
Maximum Output Current	IOUT	Each output pin	150	mA
Allowable Power Dissipation	Pd max		665	mW
Operating Temperature	Topr		-10 to +70	°C
Storage Temperature	Tstg		-40 to +125	°C

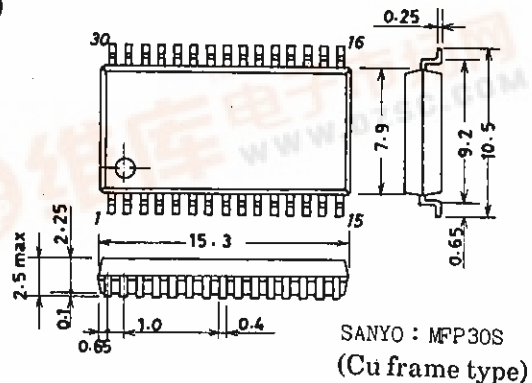
Allowable Operating Conditions at Ta = 25°C

Parameter	Symbol	Condition	Value	unit
Supply Voltage	VCC	Each VCC pin	5 to 16	V
	VCC1 - VCC2	Voltage difference (VCC1 ≤ VCC2 to 4)	0 to 6.0	V
Input 'H'-Level Voltage	VIH	Each input pin	3.5 to 6.0	V
Input 'L'-Level Voltage	VIL	Each input pin	-0.3 to +0.3	V

Equivalent Circuit Block Diagram



Package Dimensions 3073A-M30IC (unit : mm)



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Electrical Characteristics at Ta=25°C, V _{CC1} to 3=14V, V _{CC4} =11V			min	typ	max	unit
Input 'H'-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
Input 'L'-Level Current	I _{IH4}	Blocks9,10,HP1,2 inputs, V _{IN} =5.0V			2	mA
	I _{IL1}	Blocks1 to 10, V _{I1} to 4 inputs V _{S1} to 4 inputs V _{IN} =0V	-30			μA
Supply Current	I _{IL2}	Block1, V _{GCNT} input, V _{IN} =0V	-100	-20		μA
	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 _{CC1}	V _{I1} =0V, V _{GCNT} =0V			150	μA
	I _{CC2}	V _{I2} to 4 inputs, V _{IN} =0V,			200	μA
	I _{CC3}	V _{S1} to 4 inputs, V _{IN} =0V			200	μA
Output Voltage	I _{CC4}	HP1,2 inputs, V _{IN} =0V			100	μA
	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

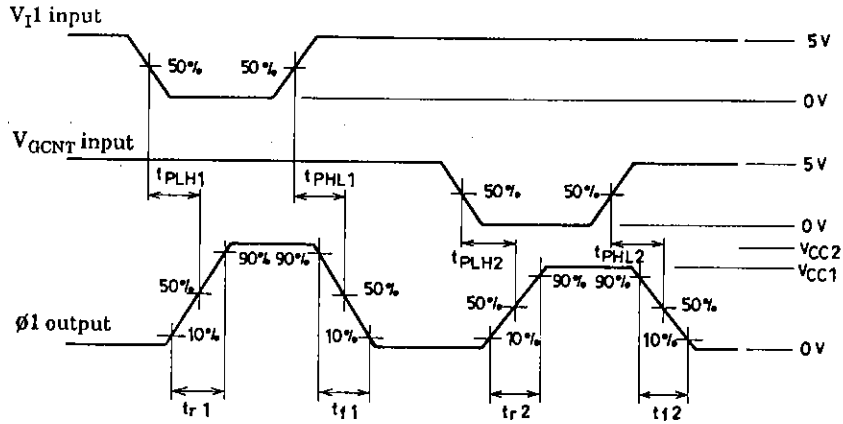
			min	typ	max	unit
Propagation Time 'L'-Level → 'H'-Level	t _{PLH1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	t _{PLH2}	ø1 output, V _{I1} =5.0V fixed		2		μs
	t _{PLH3}	ø2 to 4, ø _{S1} to 4, øH1,2 outputs		30		ns
Propagation Time 'H'-Level → 'L'-Level	t _{PHL1}	ø1 output, V _{GCNT} =5.0V fixed		30		ns
	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 (ø H1,2) R_S=430Ω, C_L=45pF

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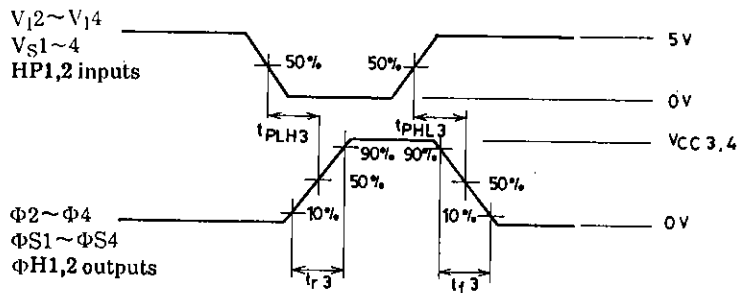
Switching Waveforms 1. Block 1



Truth Table

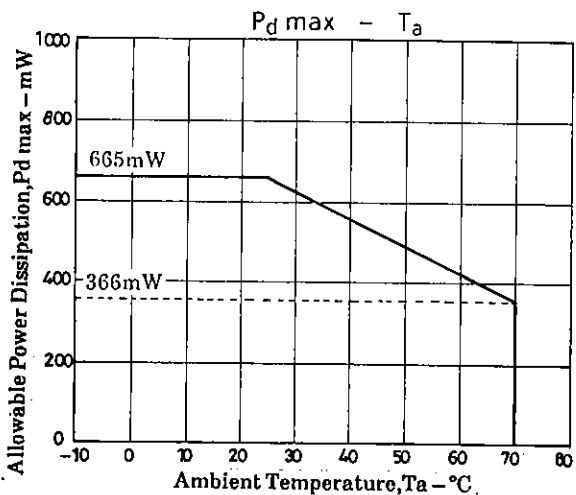
Item		V_{GCNT} inputs	
		H	L
V_{I1} input	H	V_{OL}	V_{OH2}
	L	V_{OH1}	Inhibit

2. Blocks 2 to 10

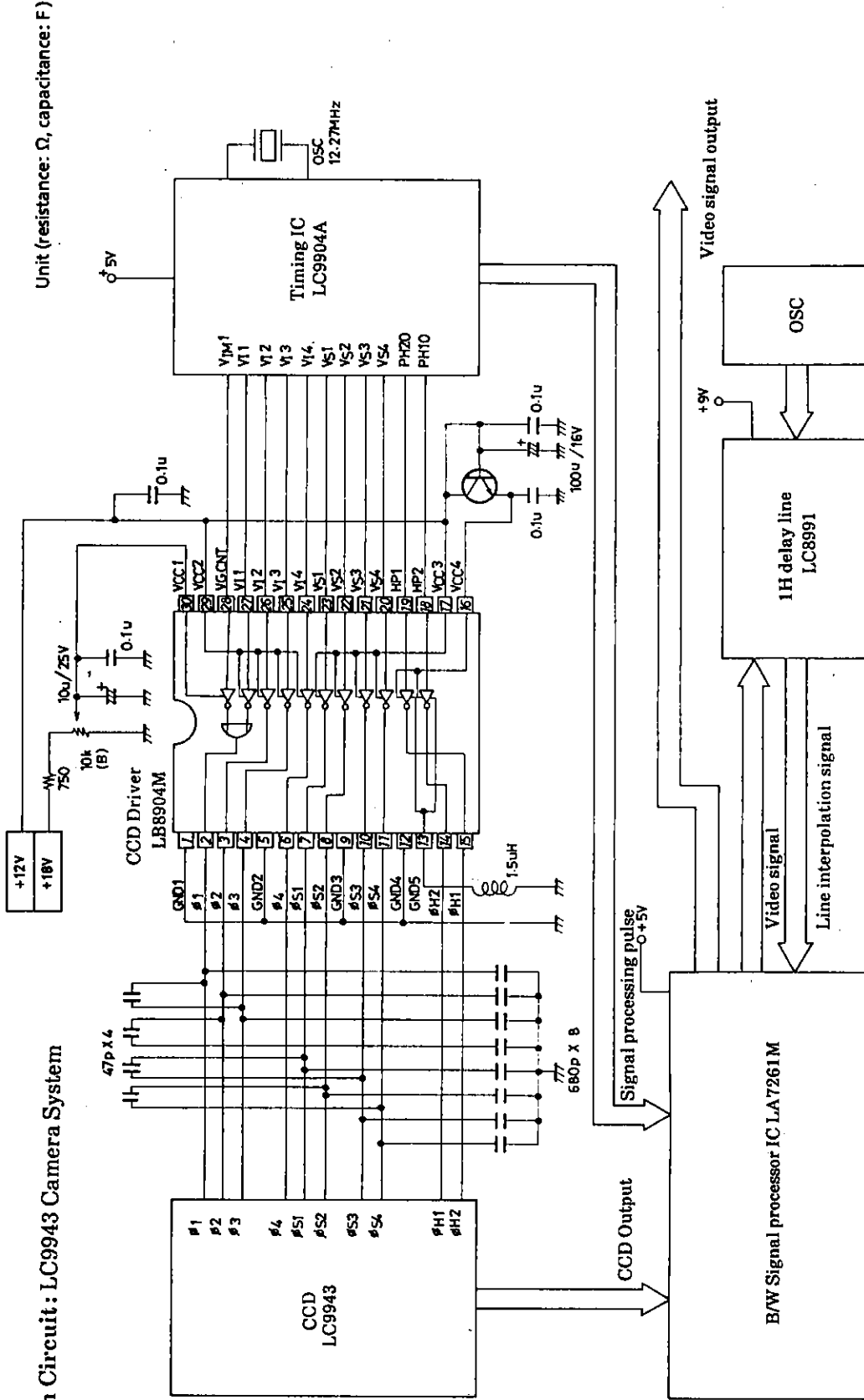


Truth Table

Item		Output
Input	H	V_{OL}
	L	$V_{OH3 \text{ to } 7}$



ample 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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