Ordering number:ENN3046B

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.

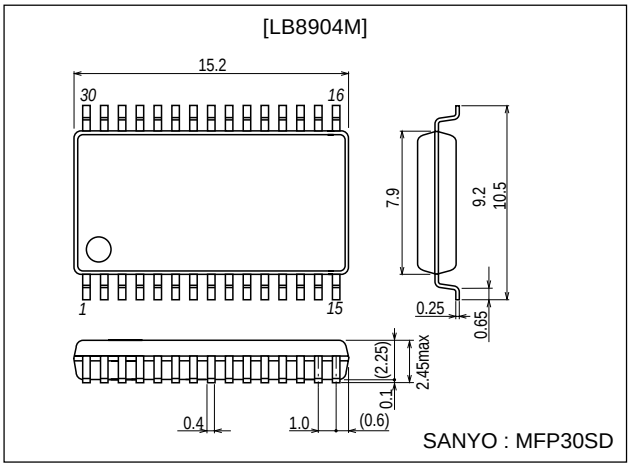
Features

- 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.

Package Dimensions

unit:mm

3073B-MFP30SD



Specifications

Absolute Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max	V_{CC}1 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	Pd max		665	mW
Operating temperature	Topr		–10 to +70	˚C
Storage temperature	Tstg		–40 to +125	˚C

Allowable Operating Ranges at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	Each V_{CC} pin	5 to 16	V
	$V_{CC}1$–$V_{CC}2$	Voltage difference ($V_{CC}1 \leq V_{CC}2$ 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

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Electrical Characteristics at Ta = 25˚C, V_{CC}1 to 3=14V, V_{CC}4=11V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input high-level current	$I_{IH}1$	Block1, V_I1 input, V_{IN}=5.0V			2	mA
	$I_{IH}2$	Block1, V_{GCNT} input, V_{IN}=5.0V			2	mA
	$I_{IH}3$	Blocks2 to 8, V_I2 to 4 inputs, V_{IN}=5.0V, V_S1 to 4 inputs, V_{IN}=5.0V			2	mA
	$I_{IH}4$	Blocks9, 10, HP1, 2 inputs, V_{IN}=5.0V			2	mA
Input low-level current	$I_{IL}1$	Blocks1 to 10, V_I1 to 4 inputs, V_S1 to 4 inputs, V_{IN}=0V	–30			µA
	$I_{IL}2$	Block1, V_{GCNT} input, V_{IN}=0V	–100	–20		µA
Supply current	$I_{CCH}1$	Each input, V_{IN}=5.0V			0.5	mA
	$I_{CCH}2$	Each input, V_{IN}=5.0V			16	mA
	$I_{CCH}3$	Each input, V_{IN}=5.0V			16	mA
	$I_{CCH}4$	Each input, V_{IN}=5.0V			8	mA
	$I_{CCL}1$	V_I1=0V, V_{GCNT}=0V			150	µA
	$I_{CCL}2$	V_I2 to 4 inputs, V_{IN}=0V			200	µA
	$I_{CCL}3$	V_S1 to 4 inputs, V_{IN}=0V			200	µA
	$I_{CCL}4$	HP1, 2 inputs, V_{IN}=0V			100	µA
Output voltage	$V_{OH}1$	V_I1=0V, V_{GCNT}=5V	V_{CC}2–2.0			V
	$V_{OH}2$	V_I1=5V, V_{GCNT}=0V	V_{CC}1–2.0			V
	$V_{OH}3$	V_I2 to 4=0V	V_{CC}2–2.0			V
	$V_{OH}4$	V_S1 to 4=0V	V_{CC}3–2.0			V
	$V_{OH}5$	HP1, 2=0V	V_{CC}4–2.0			V
	V_{OL}	Each input V_{IN}=5V			0.5	V

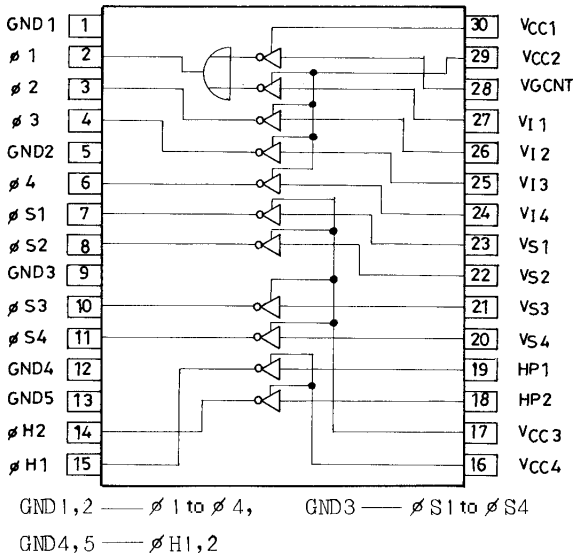
Switching Characteristics at Ta = 25˚C, V_{CC}1 to 3=14V, V_{CC}4=11V, V_{IN}=5.0V, t_r, t_f≤10ns

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Propagation time low-level →high-level	$t_{PLH}1$	ø1output, V_{GCNT}=5.0V fixed		30		ns
	$t_{PLH}2$	ø1output, V_I1=5.0V fixed		2		µs
	$t_{PLH}3$	ø2 to 4, $ø_S$1 to 4, øH1, 2 outputs		30		ns
Propagation time high-level →low-level	$t_{PHL}1$	ø1output, V_{GCNT}=5.0V fixed		30		ns
	$t_{PHL}2$	ø1output, V_I1=5.0V fixed		1		µs
	$t_{PHL}3$	ø2 to 4, $ø_S$1 to 4 outputs, øH1, 2 outputs		30		ns
Transient rise time	t_r1	ø1output, V_{GCNT}=5.0V fixed		30		ns
	t_r2	ø1output, V_I1=5.0V fixed		6		µs
	t_r3	ø2 to 4, $ø_S$1 to 4 outputs, øH1, 2 outputs		30		ns
Transient fall time	t_f1	ø1output, V_{GCNT}=5.0V fixed		30		ns
	t_f2	ø1output, V_I1=5.0V fixed		1		µs
	t_f3	ø2 to 4, $ø_S$1 to 4, øH1, 2 outputs		30		ns

Note : Load conditions

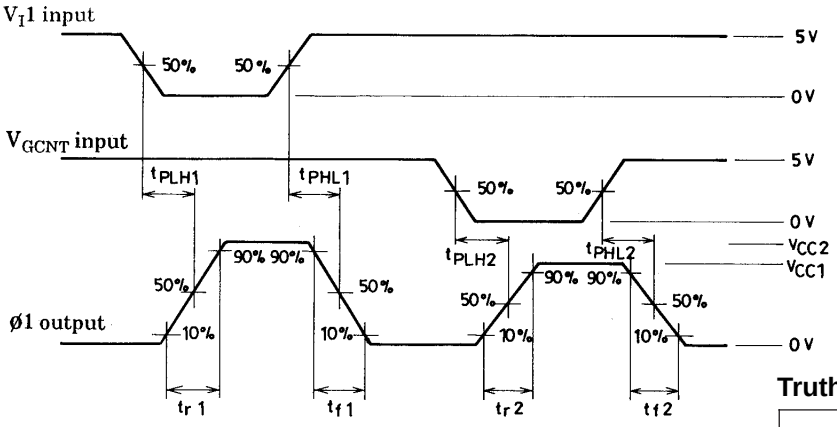
- Vertical three-value driver (ø1) ..... R_S=62Ω, C_L=140pF
- Vertical two-value driver (ø2 to 3, $ø_S$1 to 4) ..... R_S=62Ω, C_L=140pF
- Horizontal two-value driver (øH1, 2) ..... R_S=430Ω, C_L=45pF

Equivalent Circuit Block Diagram

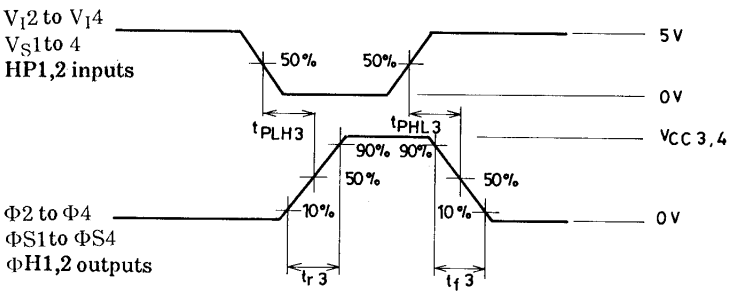


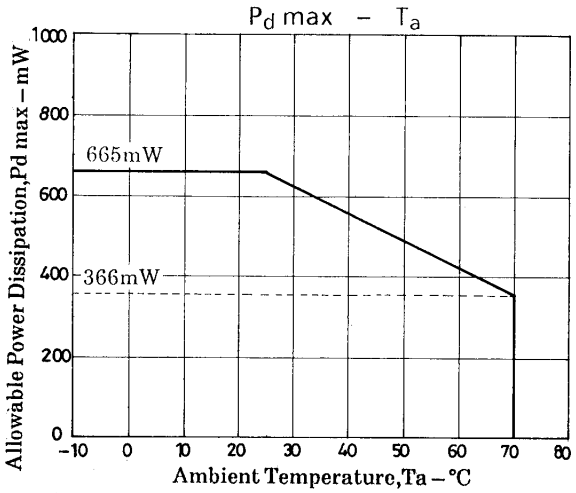
Switching Waveforms

1. Block 1



2. Blocks 2 to 10





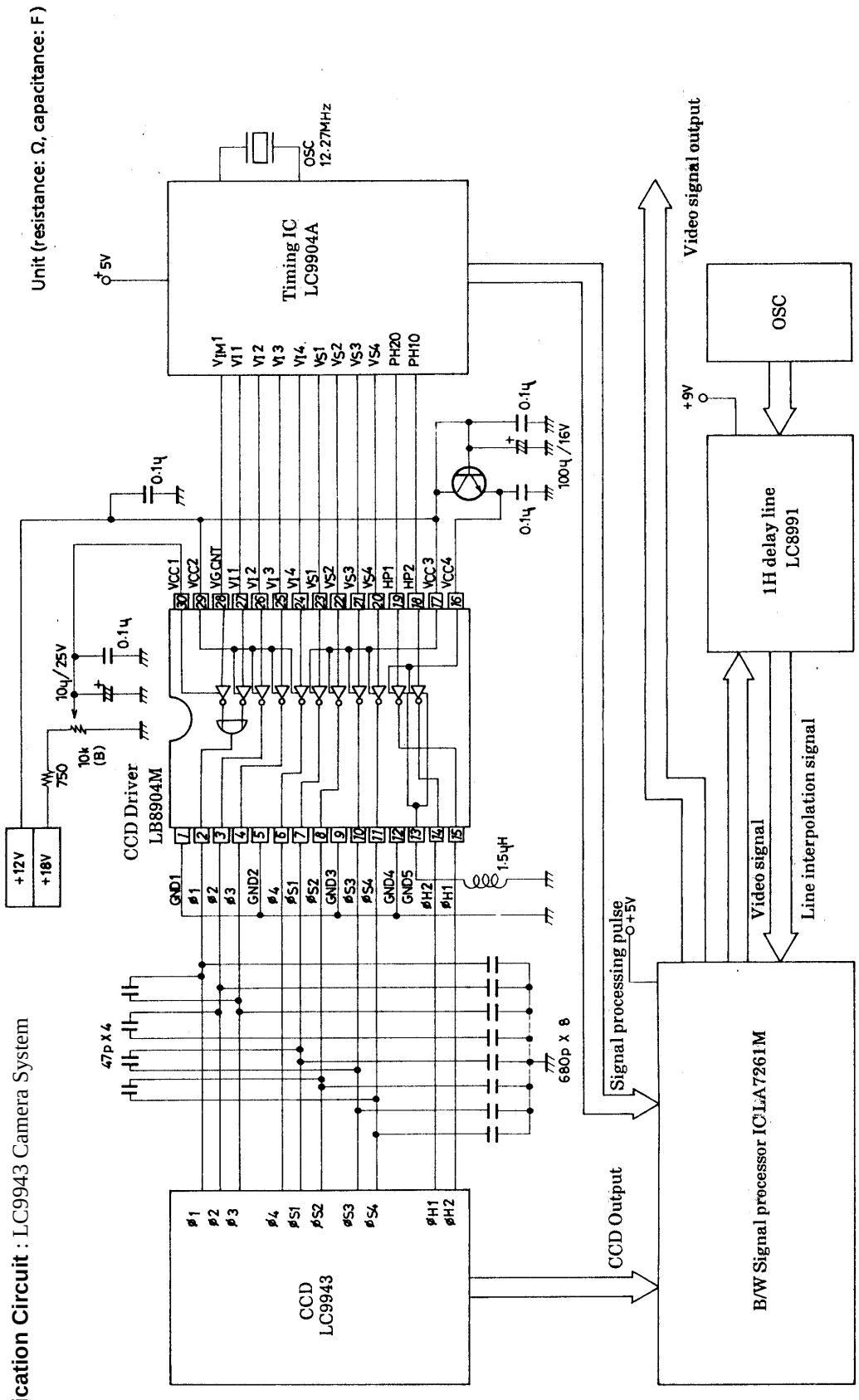
Truth Table

Item		V_{GCNT} inputs	
		H	L
V_I1 Input	H	V_{OL}	$V_{OH}2$
	L	$V_{OH}1$	Inhibit

Truth Table

Item		Output
Input	H	V_{OL}
	L	V_{OH}3 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.