

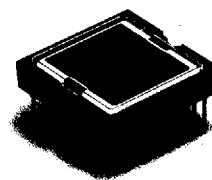
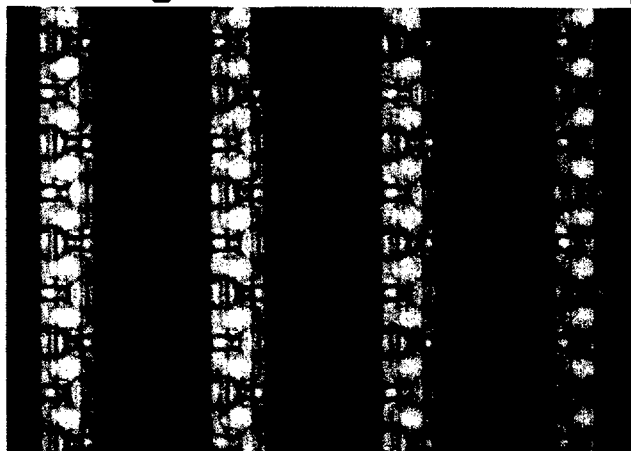
Applications and Features by CCD Type Number

Type Number		Main Applications	Features
Monochrome	LC9911	Monitor cameras Infrared cameras	● High sensitivity in near infrared region ● High resolution with 420 TV horizontal scan lines ● EIA TV system
	LC9913		● High sensitivity in near infrared region ● High resolution with 420 TV horizontal scan lines ● CCIR TV system
	LC9915G	Monitor cameras Image input cameras for image signal processors Special cameras for medical use	● High sensitivity ● High resolution with 560 TV horizontal scan lines ● High output with saturation output of 500mV ● EIA TV system
	LC9917G		● High sensitivity ● High resolution with 560 TV horizontal scan lines ● High output with saturation output of 500mV ● CCIR TV system
	LC9931B	Cameras for car use Bar code readers Gastrocameras	● 1/3 inch optical size ● High sensitivity in near infrared region ● Horizontal scan lines: 280 TV lines ● EIA TV system
	LC9943	Door vision cameras Videophones Toys	● 1/6 inch optical size ● High sensitivity in near infrared region ● Horizontal scan lines: 120 TV lines ● Low cost
Color	LC9965	8-millimeter VTRs	● High sensitivity ● Horizontal scan lines: 330 TV lines ● NTSC TV system ● High output with saturation output of 700mV
	LC9967		● High sensitivity ● Horizontal scan lines: 330 TV lines ● PAL TV system ● High output with saturation output of 700mV

Characteristics

● Color Frame Transfer CCD

■ Enlargement of Sensor Array ■ External View



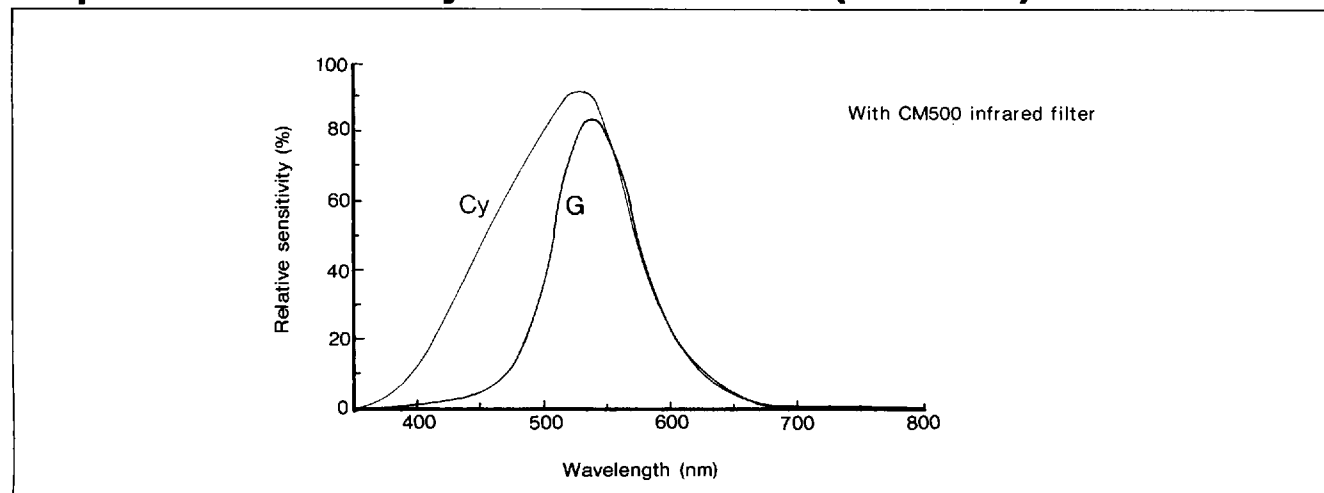
The pickup and storage sections of this second generation image sensor are separated to give both high sensitivity and high resolution. Color stripe filters allow easy configuration of a high-performance color camera system.

■ Sensor Characteristics (LC9965)

Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Sensitivity	S*1	200			mV	Ye signal
		100			mV	G signal
		160			mV	Cy signal
Pixel sensitivity uniformity	V _F			25	%	
Saturation voltage	V _{sat}	700			mV	
Smear	SM		0.08		%	Frame shift frequency 1.79MHz
γ characteristics	γ		1			

※1 With CCV 51F (illuminance 1550NT, color temperature 5100°K) pattern box, lens aperture F8 and infrared filter.

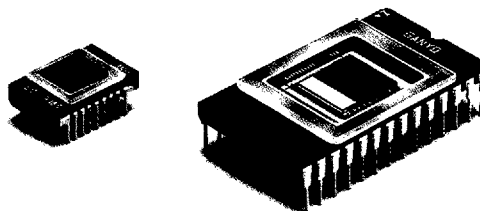
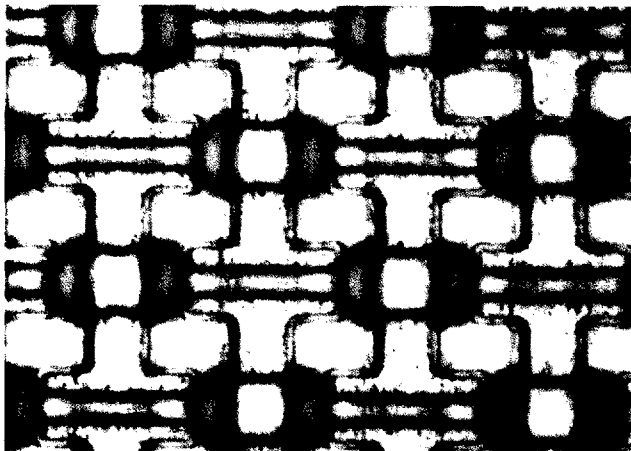
■ Spectral Sensitivity Characteristics (LC9965)



Characteristics

● Monochrome Frame Transfer CCD

■ Enlargement of Sensor Array ■ External View



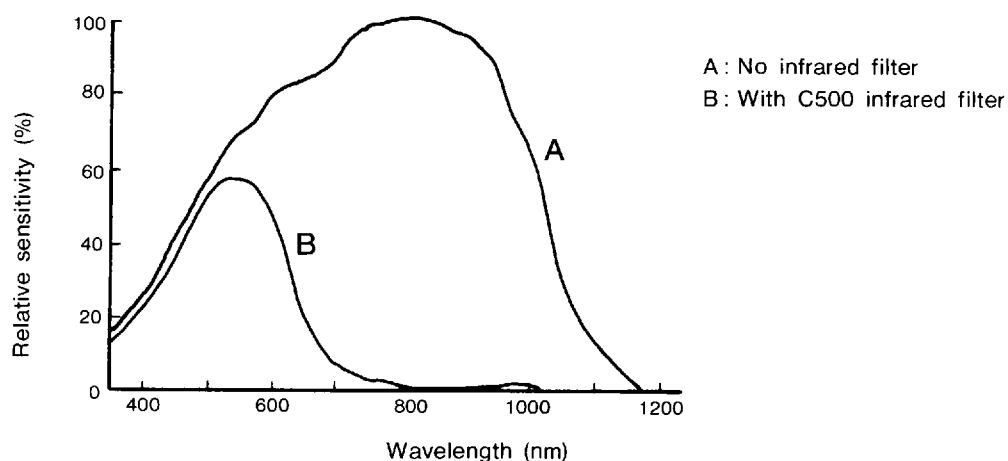
The pickup and storage sections of this second generation image sensor are separated to give excellent high sensitivity and high resolution with low smear in both the visible and infrared spectral regions.

■ Sensor Characteristics (LC9911)

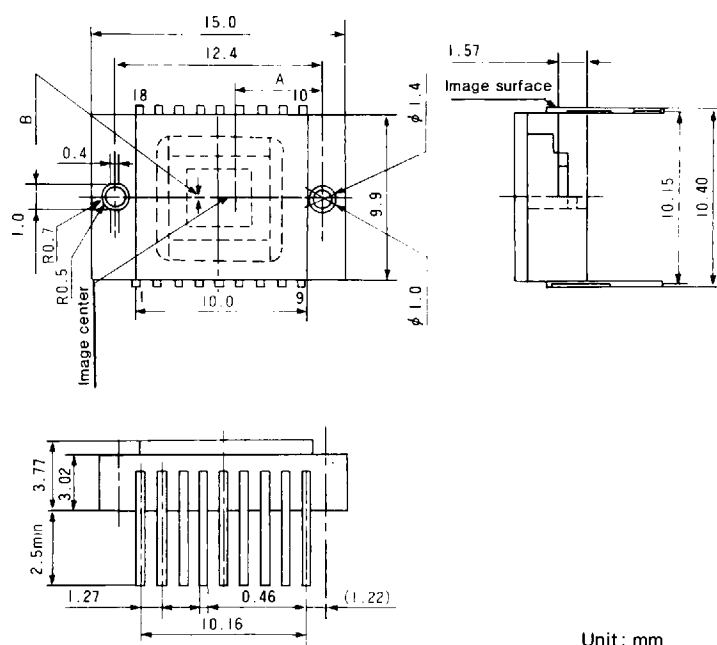
Parameter	Symbol	Min	Typ	Max	Unit	Remarks
Sensitivity	S^*2	100			mV	
Pixel sensitivity uniformity	V_F			15	%	
Saturation voltage	V_{sat}	400			mV	
Smear	SM		0.08		%	
γ characteristics	γ		1			

*2 With CCV 31F (illuminance 1320NT, color temperature 3100°K) pattern box, lens aperture F11.

■ Spectral Sensitivity Characteristics (LC9911)



[LC9943]

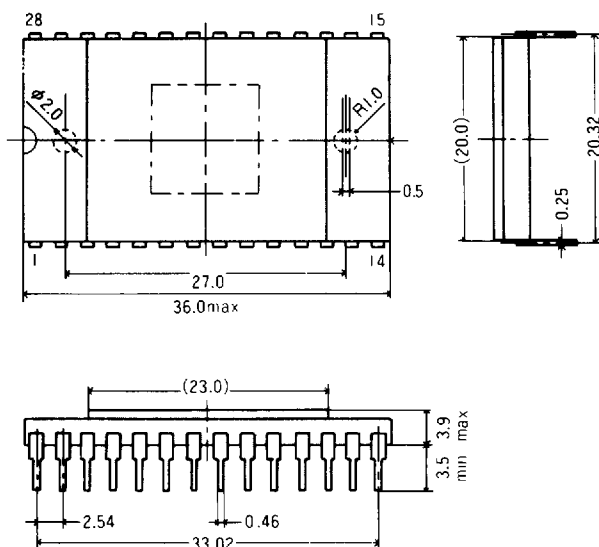


Pin Number	Symbol	Description
1	SUB	Substrate
2	OFD	Overflow drain
3	$\phi 1$	Sensor array clock
4	$\phi 2$	Sensor array clock
5	OG	CCD output gate
6	V _{SS}	Output driver source
7	V _{GG}	Load gate
8	OUT	Output data
9	V _{DD}	Output driver drain
10	GND	Protector GND
11	ϕ_{H2}	Horizontal clock
12	ϕ_{H1}	Horizontal clock
13	ϕ_{S4}	Storage array clock
14	ϕ_{S3}	Storage array clock
15	ϕ_{S2}	Storage array clock
16	ϕ_{S1}	Storage array clock
17	$\phi 4$	Sensor array clock
18	$\phi 3$	Sensor array clock

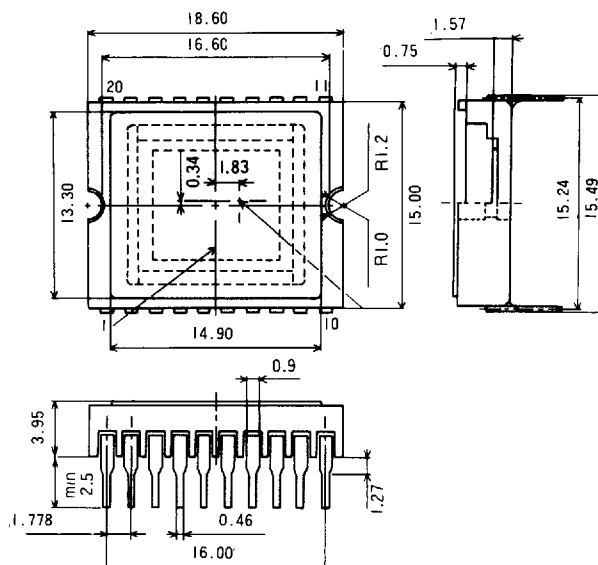
External Dimensions and Pinouts

[LC9911] [LC9913]

[LC9931B]



Unit: mm



Unit: mm

■ Pin Description (LC9911, 9913)

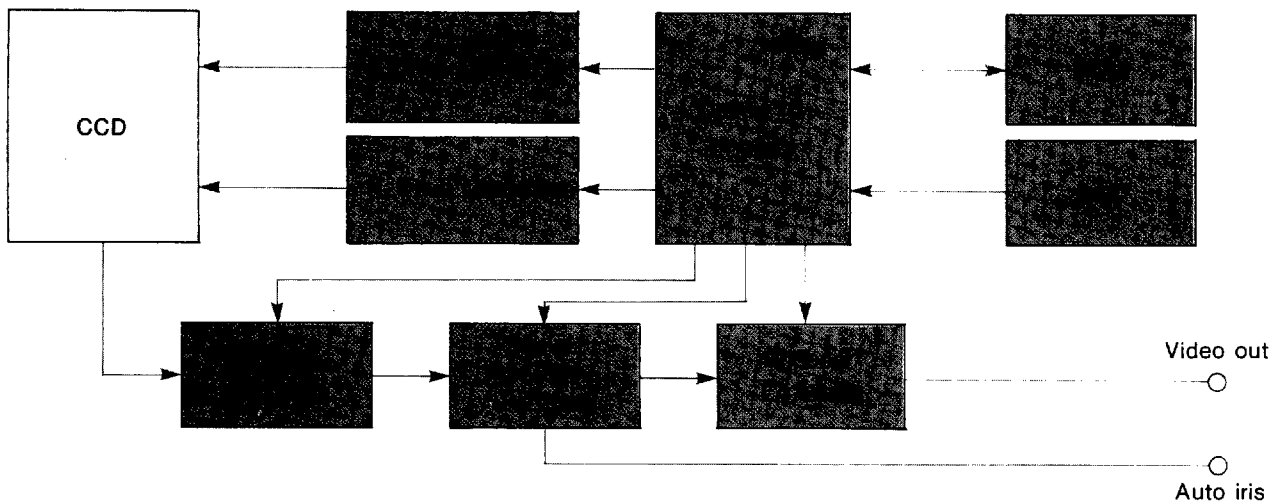
Pin Number	Symbol	Description
1	SUB	Substrate
2	OFD	Overflow drain
3	$\phi 4$	Sensor array clock
4	$\phi 2$	Sensor array clock
5	$\phi s1$	Storage array clock
6	$\phi s2$	Storage array clock
7	$\phi s3$	Storage array clock
8	$\phi s4$	Storage array clock
9	ϕR	Reset gate
10	V _{DD}	Positive power supply
11	OUT	Output data
12	V _{GG}	Load gate
13	V _{SS}	Output driver source
14	OG	CCD output gate
15	$\phi H2$	Horizontal clock
16	$\phi H1$	Horizontal clock
17	IG	Test pin
18	ID	Test pin
19	$\phi s3$	Storage array clock
20	$\phi s2$	Storage array clock
21	$\phi s1$	Storage array clock
22	$\phi s4$	Storage array clock
23	$\phi 3$	Sensor array clock
24	$\phi 1$	Sensor array clock
25	$\phi 4$	Sensor array clock
26	$\phi 2$	Sensor array clock
27	$\phi 3$	Sensor array clock
28	$\phi 1$	Sensor array clock

■ Pin Description (LC9931B)

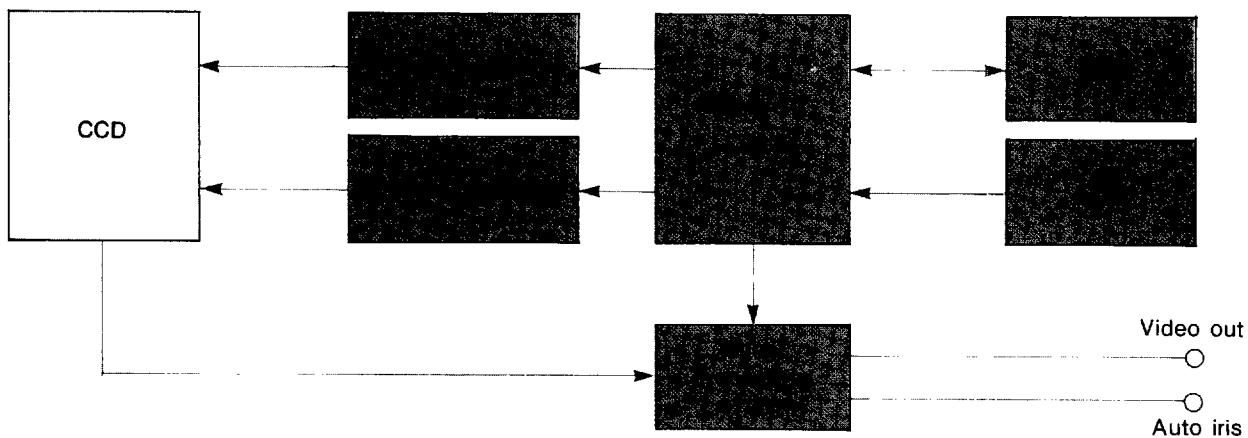
Pin Number	Symbol	Description
1	SUB	Substrate
2	OFD	Overflow drain
3	$\phi 1$	Sensor array clock
4	$\phi 3$	Sensor array clock
5	ϕR	Reset gate
6	V _{DD}	Positive power supply
7	OUT	Output data
8	V _{GG}	Load gate
9	V _{SS}	Output driver drain
10	OG	CCD output gate
11	$\phi H1$	Horizontal clock
12	$\phi H2$	Horizontal clock
13	IG	Test pin
14	ID	Test pin
15	$\phi s3$	Storage array clock
16	$\phi s2$	Storage array clock
17	$\phi s1$	Storage array clock
18	$\phi s4$	Storage array clock
19	$\phi 4$	Sensor array clock
20	$\phi 2$	Sensor array clock

Camera Block Diagram

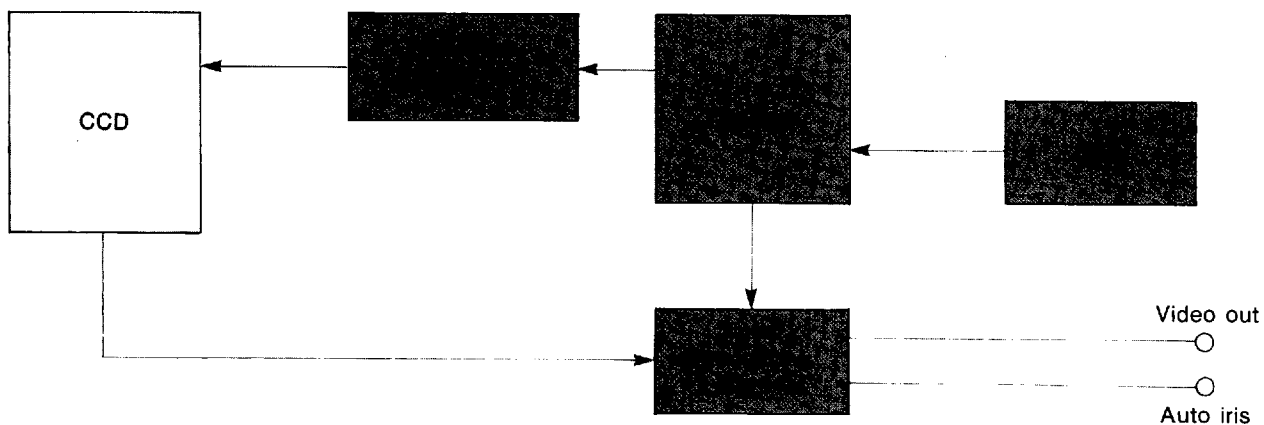
Color Camera [LC9965, 9967]



Monochrome Camera [LC9915G, 9917G]



[LC9943]



Device Families

■ Color Image Sensors

Type Number	Optical Size (inches)	Cell Size H × V (μm)	Resolution	Horizontal Scan Lines	Video Standard	Package
LC9965	2/3	11.5 × 13.5	800 × 490	340TV	NTSC	20S-DIC
LC9967	2/3	10.8 × 10.4	800 × 550	340TV	PAL	20S-DIC

■ Monochrome Image Sensors

Type Number	Optical Size (inches)	Cell Size H × V (μm)	Resolution	Horizontal Scan Lines	Video Standard	Package
LC9911	2/3	16.0 × 13.3	574 × 485	420TV	EIA	28R-DIC
LC9913	2/3	15.0 × 11.0	600 × 590	420TV	CCIR	28R-DIC
LC9915G	2/3	11.5 × 13.5	800 × 490	560TV	EIA	20S-DIC
LC9917G	2/3	11.5 × 11.0	800 × 582	560TV	CCIR	20S-DIC
LC9931	1/3	12.7 × 7.0	400 × 504	280TV	EIA	20S-DIC
LC9943	1/6	15.0 × 15.0	180 × 130	—	—	18H-DIC

CCD System Combinations

Monochrome CCD	Vertical Driver	Horizontal Driver	Timing	Sampling	AGC/Iris	Signal Processing	Sync Generator
LC9911	LB8900M	LB8902M	LC9901	CX10045	CX10046	CX10047	CX7930A
LC9913	LB8900M	LB8902M	LC9903	※1	※1	LA7261M	※2
LC9915G	LB8900M	LB8902M	LC9903	※1	※1	LA7261M	※2
LC9917G	LB8900M	LB8902M	LC9903	※1	※1	LA7261M	※2
LC9931B	LB8900M	LB8902M	LC9902	※1	※1	LA7261M	※2
LC9943	LB8904M		LC9904A	※1	※1	LA7261M	※2
※1 Contained in LA7261M ※2 Contained in timing IC.							
Color CCD	Vertical Driver	Horizontal Driver	Timing	Sampling	AGC/Iris	Signal Processing	Encoder
LC9965	LB8901M	LB8902M	LC9903	LA7264M	※3	LA7263M	LA7266M
LC9967	LB8901M	LB8902M	LC9903	LA7264M	※3	LA7263M	LA7266M
※3 Contained in LA7263M							

The application circuit diagrams and circuit constants herein are included as an example and provide no guarantee for designing equipment to be mass-produced.

The information herein is believed to be accurate and reliable. However, no responsibility is assumed by SANYO for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

Peripheral Devices

Type Number	Name	Applicable Type Number	Function	Package
LC9901	CCD timing IC	LC9911 LC9913	Generates drive and timing pulses for CCDs.	QIP64
LC9902	CCD timing IC	LC9931B	Generates drive and timing pulses for CCDs and signal processing pulses. Sync generator on chip. Capable of external sync, using the built-in phase comparator.	QIP64
LC9903	CCD timing IC	LC9915G LC9917G LC9965 LC9967	Generates drive and timing pulses for CCDs and signal processing pulses. Sync generator on chip. Capable of external sync, using the built-in phase comparator. Features electronic shutter and long-term exposure modes, non-interlacing capability.	QIP64
LC9904A	CCD timing IC	LC9943	Generates drive and timing pulses for CCDs. Sync generator on chip. Capable of external sync (V reset, H reset). Features electronic shutter.	QIP64
LB8900M	CCD vertical driver	All Type Nos.	Vertical eight-block driver, two of which are capable of providing drive on the three-value level.	MFP24
LB8901M	CCD vertical driver	All Type Nos.	Vertical eight-block driver, two of which are capable of providing drive on the three-value level.	MFP24S
LB8902M	CCD horizontal driver	All Type Nos.	Horizontal three-block driver.	MFP16FS
LB8904M	CCD vertical/horizontal driver	LC9943	Vertical eight-block/horizontal two-block driver, one of which is capable of providing drive on the three-value level.	MFP30S
LA7261M	B/W signal processor IC	All B/W CCDs	Correlation double sampling, AGC, γ -compensation, white clip, aperture compensation, 75 Ω driver, 1H select switch.	QIP48
LA7263M	Color signal processor IC	Color CCDs	NTSC/PAL use, clamping, blanking, AGC, color separation sampling, Y_H matrix, 4-channel processing (Y_H , R, G, B) with γ -compensation, WC, and pedestal setting, etc.	QIP48
LA7264M	Sampling IC	Color CCDs	Correlation double sampling.	MFP14
LA7266M	Color encoder IC	Color CCDs	NTSC/PAL use, color difference matrix, chroma modulation, fader, low illuminance suppression, aperture compensation, 75 Ω driver.	QIP44