

SHARP

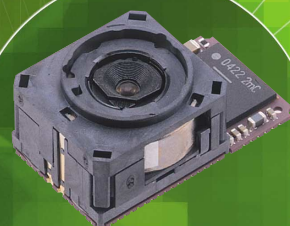
CCDs/CMOS IMAGE SENSORS
OCT. 2004

CCD / CMOS IMAGE SENSOR

Green

Blue

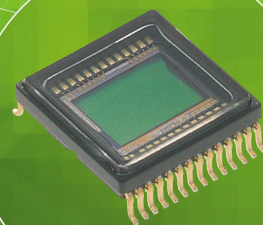
Digital Network



CCD
Camera Module



CMOS
Camera Module



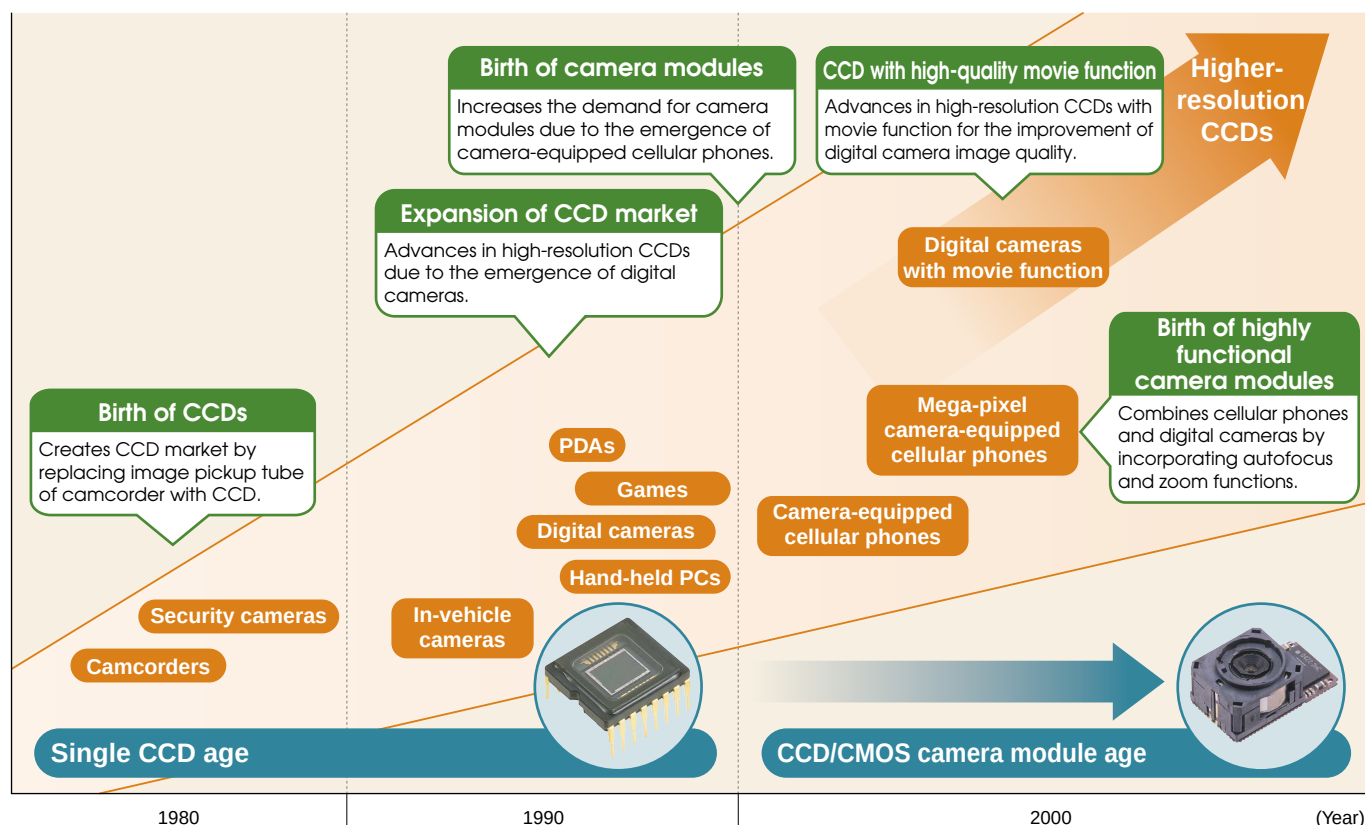
CCD

Notice : Applications above ar

SHARP's CCDs and CMOS Image Sensors

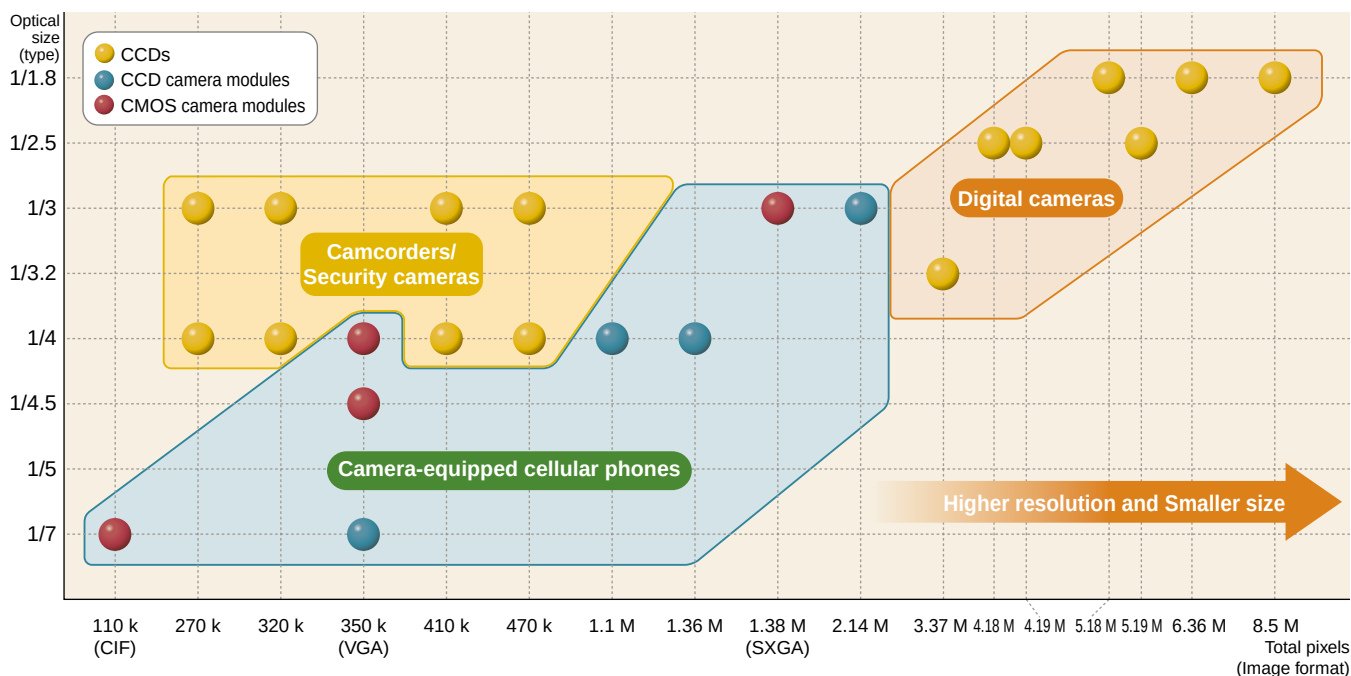
Application Trend

Expansion of Application Range of CCDs and CMOS Image Sensors



Product Lineup

SHARP has developed a varied product lineup of image devices, including compact camera modules in a range from CIF to millions of pixels for cellular phones, higher-resolution CCDs for digital cameras, as well as lower-pixel CCDs for camcorders and security cameras, deploying a wide range of devices suited for wide-ranging applications.



Product Development

■ Product Development of Camera Modules

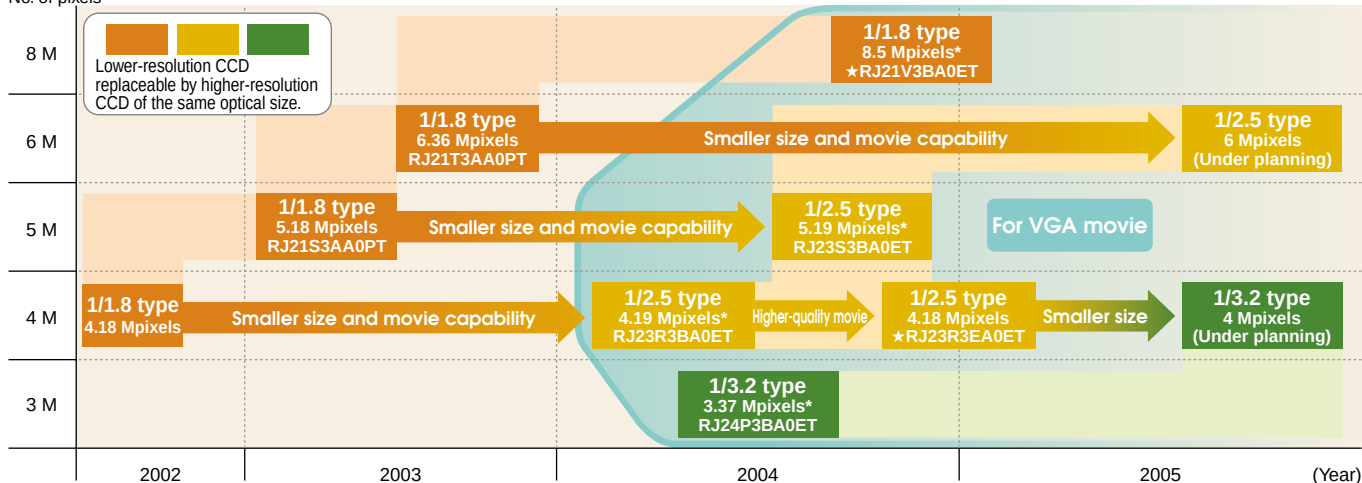
Unit : mm

	110 kpixels	350 kpixels	1.1 Mpixels	1.36 Mpixels	2.14 Mpixels	3 Mpixels
CCD camera modules		Smaller type 1/7 type 0.45 cc★  10.4 x 8.0 x (H) 5.4 Thinner type 1/7 type 0.60 cc  10.0 x 13.0 x (H) 4.6	1/4 type 1.65 cc  Built-in macro function 14.0 x 12.0 x (H) 9.8	Smaller type 1/4 type 1.51cc★  Built-in macro function 12.8 x 12.0 x (H) 9.82 Thinner type 1/4 type 1.97 cc  Built-in macro function 19.45 x 11.9 x (H) 8.5 1/4 type 1.95 cc★  Built-in auto focus function/power supply IC 16.2 x 12.8 x (H) 9.4	1/3 type 2.68 cc  Built-in auto focus function 22.0 x 13.0 x (H) 9.38 1/3 type 3.34 cc  Built-in 2x optical zoom/ auto focus functions 18.9 x 9.2 x (H) 19.2	Built-in 2x optical zoom/ auto focus functions (Under planning)
		For high-end mega-pixel camera-equipped cellular phones →				
CMOS camera modules	CIF	VGA		SXGA	UXGA	
	1/7 type 0.28 cc  7.0 x 6.5 x (H) 6.2 1/7 type 0.21 cc  6.5 x 6.5 x (H) 4.9 Wider angle lens 1/7 type 0.17 cc  6.5 x 6.5 x (H) 4.1	1/4.5 type 0.40 cc  8.5 x 8.5 x (H) 5.6 1/4 type 0.36 cc  8.0 x 8.0 x (H) 5.7 1/6 type (Under planning)		1/3 type 0.71 cc★  Built-in macro function 10.0 x 10.0 x (H) 7.1	(Under planning)	

(H) : Maximum height

■ Development Plan of Higher-resolution CCDs

No. of pixels



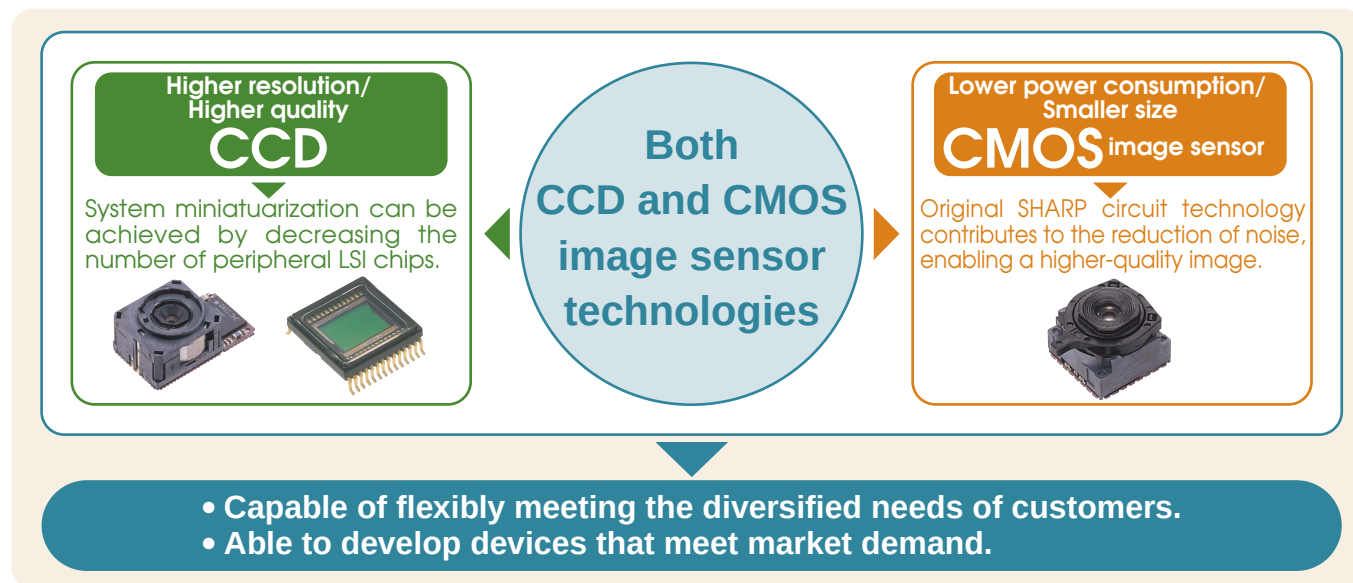
* The device without movie function is also available.

Support Technologies

Technologies that support SHARP's CCDs and CMOS Image Sensors

Both CCD and CMOS image sensor technologies

SHARP has both CCD technology which features higher pixel resolution as well as higher picture quality, and CMOS image sensor technology which features smaller size and lower power consumption, enabling the development of a variety of image sensors, including single CCDs, CCD and CMOS camera modules, to meet a wide range of customer's needs.

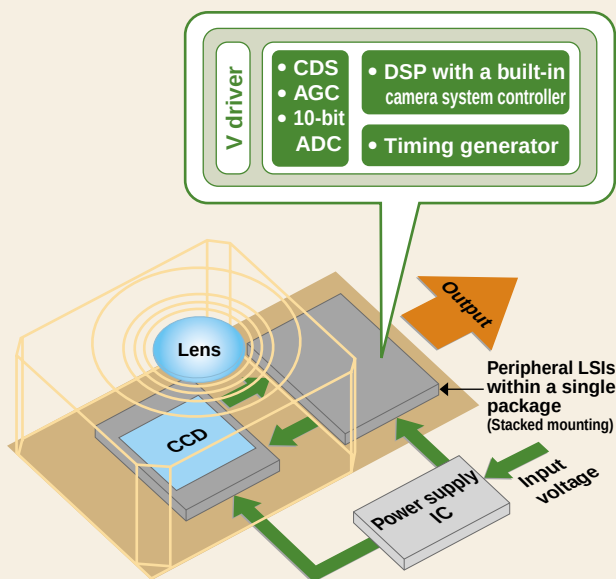


Compact camera system thanks to original SHARP mounting technology

To achieve a compact camera system, SHARP provides a system in combination with peripheral LSIs, such as DSP, timing generator, CDS/PGA/ADC and V driver, together with image sensor, thanks to the employment of original SHARP mounting technology. In addition, a varied lineup of camera modules which integrate an image sensor, a lens and peripheral LSIs are fully developed and can contribute to making cellular phones compact.

Example of CCD camera module structure

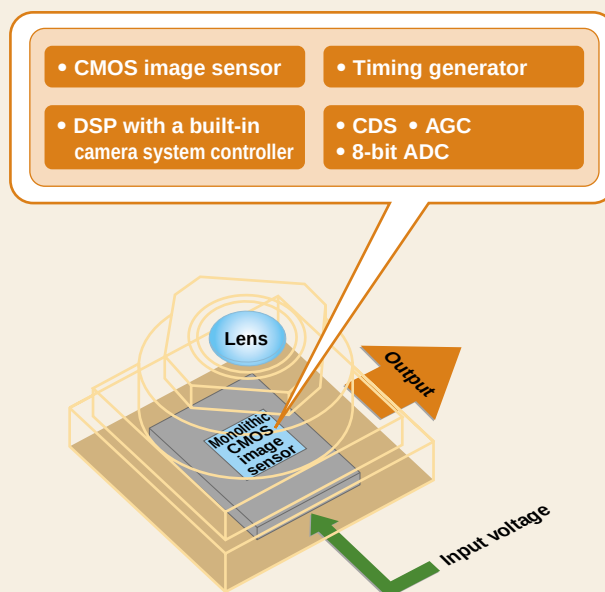
Higher quality (high sensitivity/low noise)



Example of CMOS camera module structure

Lower power consumption

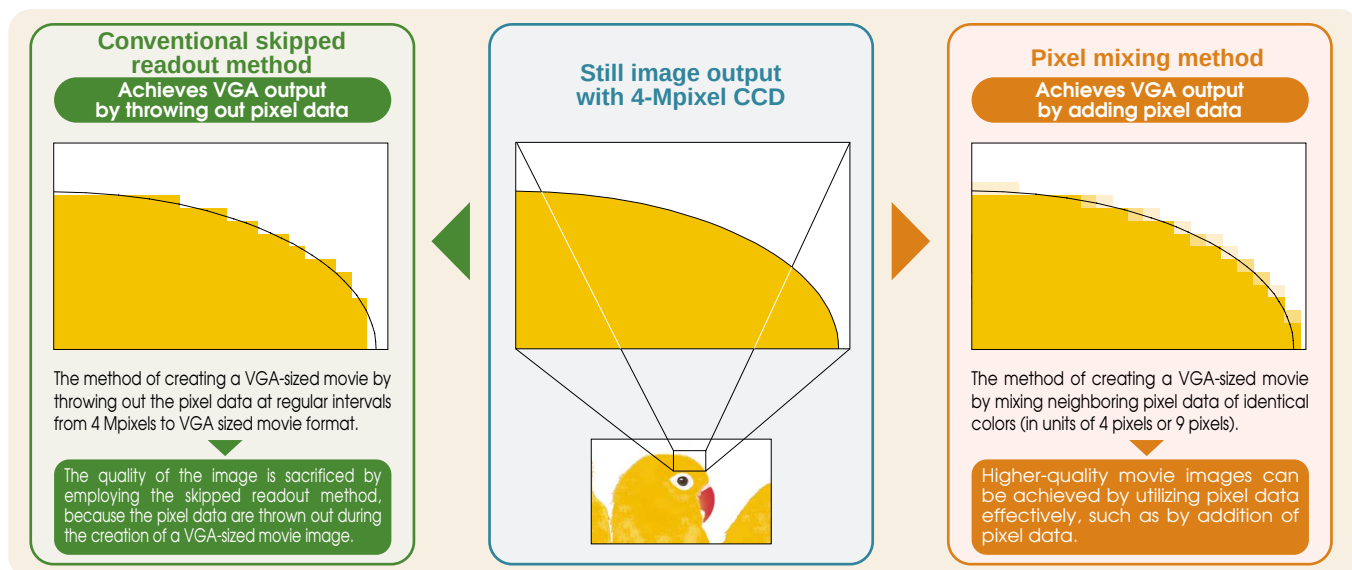
Smaller size



■ Original SHARP Technology Improves the Movie Performance of Digital Cameras ~Pixel Mixing Technology~

With the improvement of digital camera movie functions, the need for a VGA-sized 30 frames/s movie which is indispensable for displaying natural movies has become increasingly evident. To achieve a 30 frames/s movie output with higher-resolution CCDs, the image data must be read out by adjusting the pixel data to the VGA format.

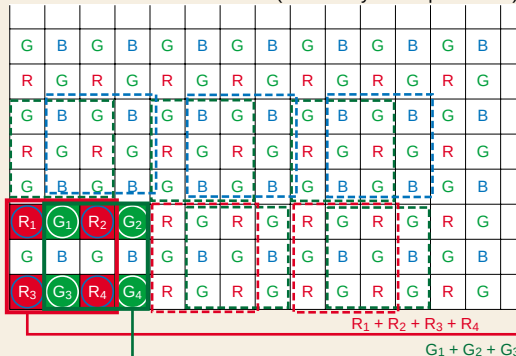
Now SHARP has achieved the improvement of the movie image, by employing SHARP's original pixel mixing technology, which enables higher-quality VGA-sized 30 frames/s movies, by addition of neighboring pixel data of identical colors and effective utilization of pixel data.



Examples of Pixel Mixing Method

● Four-pixel mixing method

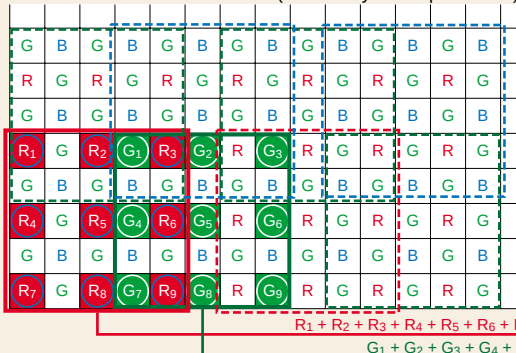
(Pixel array of 4-Mpixel CCD)



Adds the pixel data in units of 4 pixels by color, R, G and B. After adding each color of pixel data, the pixel data are output as VGA-sized movie format.

● Nine-pixel mixing method

(Pixel array of 4-Mpixel CCD)



Adds the pixel data in units of 9 pixels by color, R, G and B. After adding each color of pixel data, the pixel data are output as VGA-sized movie format.

Achieves higher-quality VGA-sized movie image thanks to a dedicated LR38669Y DSP for digital cameras.



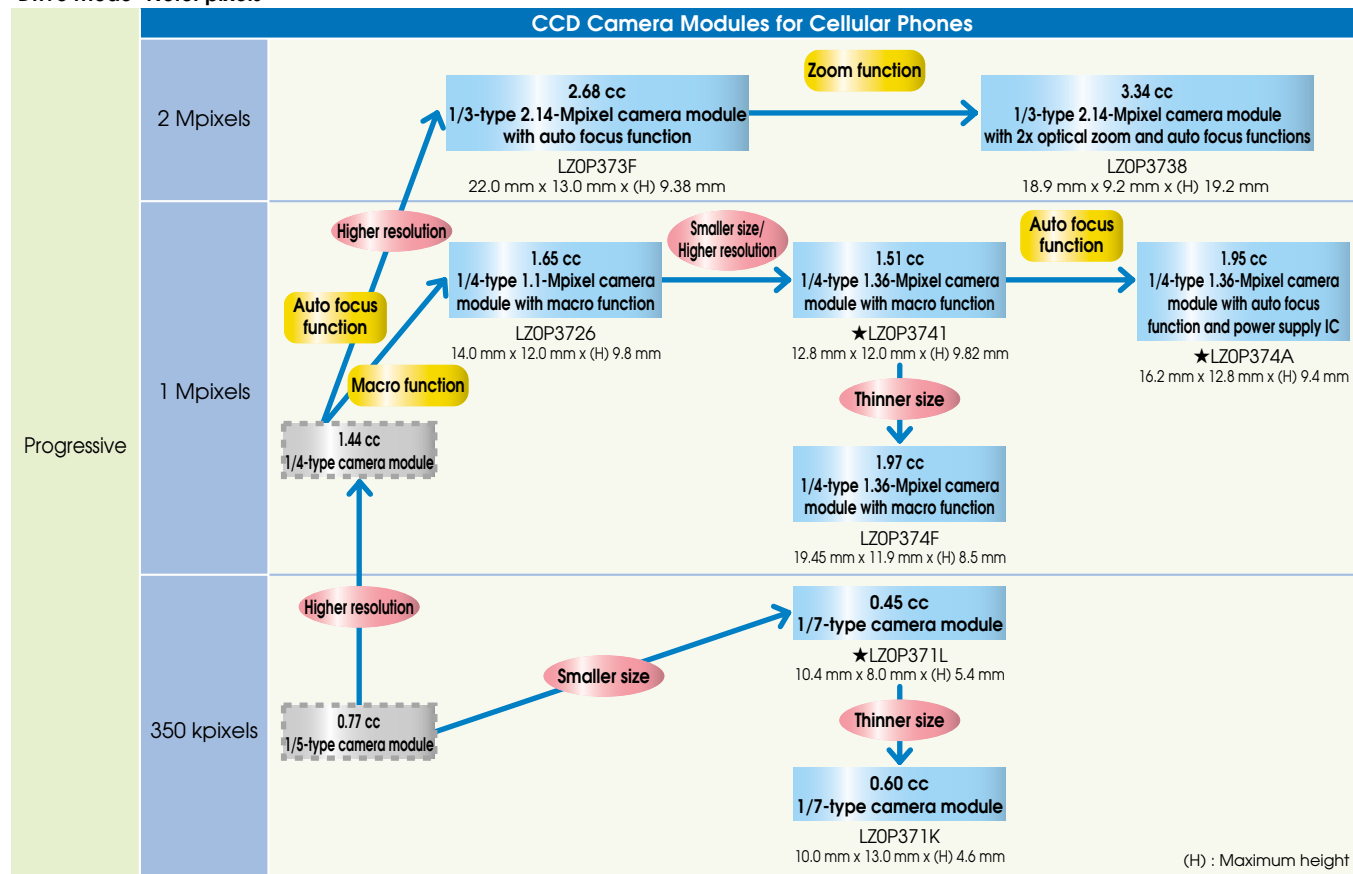
CCD Camera Modules for Cellular Phones

★ Under development

Original SHARP high-density multi-chip mounting technology can help create a CCD camera module which incorporates a CCD, a DSP, a CDS/AGC/ADC, a timing generator, a V driver and a lens. This camera module also enables a single power supply drive, in combination with a dedicated power supply IC.

Road Map

Drive mode No. of pixels



CCD Camera Modules

Model No.	Configuration	Features	Image sensor				Lens			DSP control interface	Output signal	Supply voltage (V)	Power consumption (mW) TYP.	Operating temp. (°C)	Package	
			Optical size	Total pixels	Color filter	Output pixels (H x V) MAX.	F No.	Con-struction	Horizontal viewing angle (°)							
LZ0P3738*1	CCD, DSP, CDS/AGC/ 10-bit ADC, timing generator, V driver, lens, peripheral components	• 1 632 x 1 224 to SubQCIF • 4.7 fps at UXGA/10 fps at VGA (16 Mps MAX.) • 2x optical zoom • 5x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	1/3 type	2.14 M	Primary color mosaic filters	1 632 x 1 224	F3.3 to 4.9	5 pcs.	Wide : 52.6 Tele : 28.4	DSP serial	8-bit parallel, UYVY	1.8, 3.1, 15, -8	400 [1 200 to 1 300 at motor drive] (at 4.7 fps)	-20 to 60	40FPC type*5	
LZ0P373F*1		• 1 632 x 1 224 to SubQCIF • 4.7 fps at UXGA/10 fps at VGA (16 Mps MAX.) • 5x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)				1 632 x 1 224		50	1.8, 2.6 to 3.1 (external I/F), 3.1, 15, -8			400 (at 4.7 fps)	63LCC type*6			
★LZ0P374A*1,*2		• 1 280 x 960 to SubQCIF • 7.5 fps at 1 144 x 880/ 15 fps at QVGA (16 Mps MAX.) • 4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	1/4 type	1.36 M		1 280 x 960	F2.8	3 pcs.	46			3.4 to 4.5	TBD		50LCC type*7	
LZ0P374F*3		• 1 280 x 960 to SubQCIF • 7.5 fps at 1 144 x 880/ 15 fps at QVGA (16 Mps MAX.) • 4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)				1 280 x 960			54			1.8, 2.6 to 3.1 (external I/F), 3.1, 15, -8	366 (at 7.5 fps)		61LCC type*8	
★LZ0P3741*3		• 1 280 x 960 to SubQCIF • 7.5 fps at 1 144 x 880/ 15 fps at QVGA (16 Mps MAX.) • 4x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)				1 280 x 960			54			3.4 to 4.5	TBD		54LCC type*9	
LZ0P3726*3		• 1 144 x 880 to SubQCIF • 7.5 fps at 1 144 x 880/ 15 fps at QVGA (16 Mps MAX.) • 3.6x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	1/7 type	350 k		1 144 x 880						2.5, 3.1, 15, -8	430 (at 7.5 fps)		54LCC type*10	
LZ0P371K		• VGA/CIF/QVGA/QCIF/SubQCIF 15 fps (12 Mps MAX.) • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)				640 x 480*4	F2.4	2 pcs.	58			1.8, 3.1, 15, -8	240 (at 12 fps)		36LCC type*11	
★LZ0P371L		• VGA/CIF/QVGA/QCIF/SubQCIF 15 fps (12 Mps MAX.) • 2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)				640 x 480*4			58			1.8, 3.1, 15, -8	240 (at 12 fps)		36LCC type*12	

*1 Built-in auto focus function *2 Built-in power supply IC *3 Built-in macro function *4 at VGA output *5 Outline dimensions : 18.9 mm x 9.2 mm x 19.2 mm

*6 Outline dimensions : 22.0 mm x 13.0 mm x 9.38 mm *7 Outline dimensions : 16.2 mm x 12.8 mm x 9.4 mm *8 Outline dimensions : 19.45 mm x 11.9 mm x 8.5 mm

*9 Outline dimensions : 12.8 mm x 12.0 mm x 9.82 mm *10 Outline dimensions : 14.0 mm x 12.0 mm x 9.8 mm *11 Outline dimensions : 10.0 mm x 13.0 mm x 4.6 mm

*12 Outline dimensions : 10.4 mm x 8.0 mm x 5.4 mm

■ Power supply ICs for CCDs

Model No.	Features	Output voltage 1 [for CCD](V)	Output voltage 2 [for CCD](V)	Output voltage 3 [for CCD](V)	Output voltage 4 [for DSP](V)	Output voltage 5 [for I/O](V)	Input voltage (V)	Package
IR3M47U6	Multi-output power supply for 1/4-type 1.1-Mpixel CCD camera modules, built-in LED driver for back light/RGB LED driver	15/13	-8	-	-	-	2.7 to 3.3	P-VQFN036-0505
IR3M48U6	Multi-output power supply for 1/7-type 350 kpixel CCD camera modules	15		-	1.8	-	2.7 to 3.2	P-VQFN032-0505
IR3M49U6	Multi-output power supply for 1/3-type 2.14-Mpixel, 1/4-type 1.1-Mpixel/1.36-Mpixel CCD camera modules			3.1	1.8/2.5	-	2.7 to 4.5 ^{*1}	P-VQFN036-0505
★IR3M52Y6	Multi-output power supply for 1/3-type 2.14-Mpixel, 1/4-type 1.1-Mpixel/1.36-Mpixel CCD camera modules			2.5 to 3.3	1.2/1.8	2.5 to 3.3		WL-CSP ^{*2}

*1 Since output voltages 3, 4 and 5 are outputs for LDO, an input voltage higher than the output voltages (0.2 to 0.3 V), is required. *2 WL-CSP : Wafer Level CSP

Features of CCD Camera Modules

- Compact profile

Using high-density multi-chip mounting technology, this module integrates a CCD, a DSP, a CDS/AGC/ADC, a timing generator, a V driver and a lens, with the following outline dimensions :

Model No.	Outline dimensions (mm)	Volume (cc)
LZ0P3738	18.9 x 9.2 x (H) 19.2	3.34
LZ0P373F	22.0 x 13.0 x (H) 9.38	2.68
★LZ0P374A	16.2 x 12.8 x (H) 9.4	1.95
LZ0P374F	19.45 x 11.9 x (H) 8.5	1.97
★LZ0P374I	12.8 x 12.0 x (H) 9.82	1.51
LZ0P3726	14.0 x 12.0 x (H) 9.8	1.65
LZ0P371K	10.0 x 13.0 x (H) 4.6	0.60
★LZ0P371L	10.4 x 8.0 x (H) 5.4	0.45

(H) : Maximum height

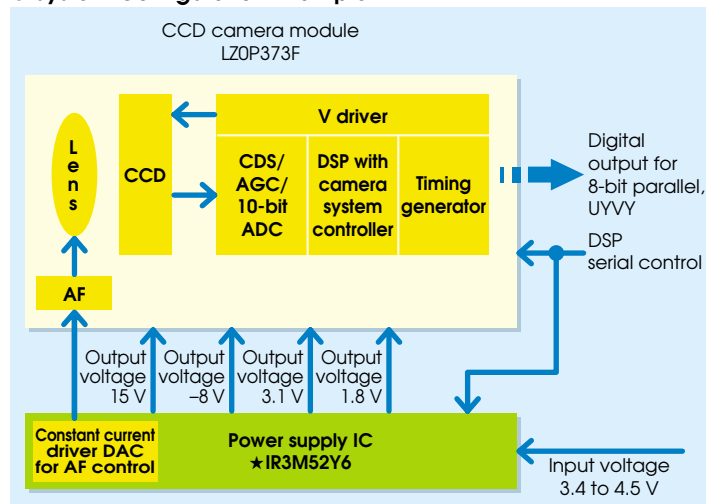
- **Single power supply**

Capable of being driving by a single power supply, in combination with the following power supply ICs :

Model No.	Recommended power supply IC
LZ0P3738*	★IR3M52Y6
LZ0P373F	
★LZ0P374A*	
LZ0P374F	
★LZ0P3741*	
LZ0P3726	
LZ0P371K*	IR3M48U6
★LZ0P3711 *	

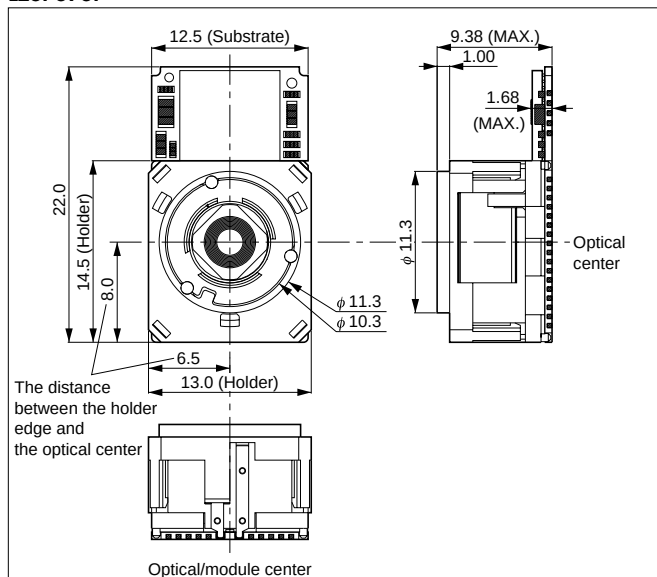
* With a built-in control signal for power supply IC

● System Configuration Example



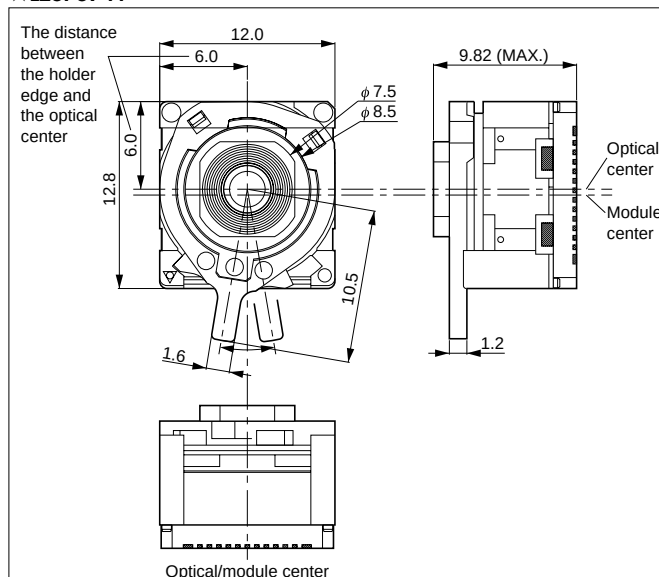
● Dimensions

LZOP373F



★LZOP3741

(U_{int} : mm)





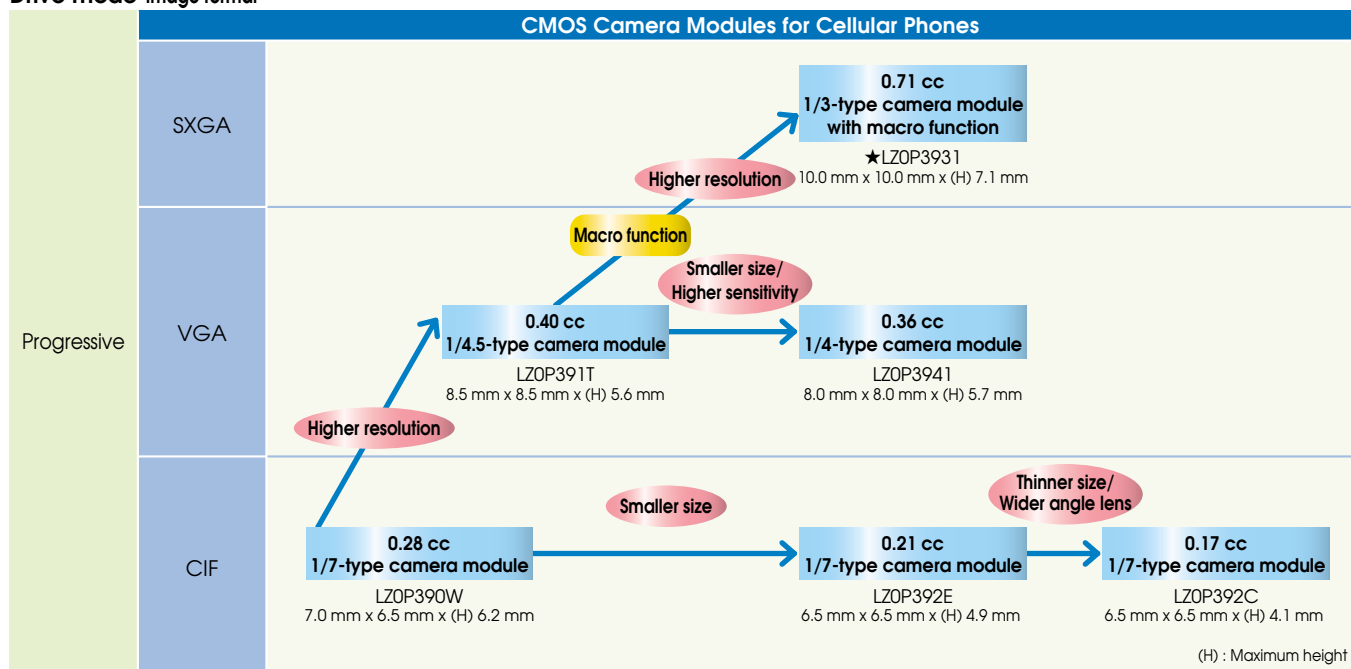
CMOS Camera Modules for Cellular Phones

★ Under development

The CMOS camera module uses original SHARP high-density multi-chip mounting technology to integrate a CMOS image sensor, a DSP, a CDS/AGC/ADC, a timing generator and a lens, to create a super-compact camera module. This module not only reduces the power consumption of equipment, but its compact size also makes it easier to install in cellular phones.

Road Map

Drive mode Image format



CMOS Camera Modules

Model No.	Configuration	Features	Image sensor				Lens			DSP control interface	Output signal	Supply voltage (V)	Power consumption (mW) TYP.	Operating temp. (°C)	Package
			Optical size	Image format	Color filter	Output pixels (H x V) MAX.	F No.	Construction	Horizontal viewing angle (°)						
★LZ0P3931	CMOS image sensor, CDS/AGC/ 10-bit ADC, timing generator, DSP, lens, peripheral components	• SXGA to SubQCIF • 15 fps at SXGA/ 30 fps at QSXGA (27 Mps MAX.) • Macro function • 4.2x electronic zoom at QVGA size (MAX.) • Image inversion function (right and left)	1/3 type	SXGA	Primary color mosaic filters	1 280 x 1 024 ^{*1}	F2.8	3 pcs.	58	DSP serial	8-bit parallel, UYVY	2.8 (I/O : 1.8 or 2.8)	170 (at 15 fps)	-20 to 60	28LCC type ^{*4}
LZ0P3941		• VGA to SubQCIF • 30 fps at VGA (12 Mps MAX.) • 2x electronic zoom at QVGA size • Image inversion function (right and left)	1/4 type	VGA		640 x 480 ^{*2}		2 pcs.	54			2.8 (at 30 fps)	112 (at 30 fps)		24LCC type ^{*5}
LZ0P391T	CMOS image sensor, CDS/AGC/9-bit ADC, timing generator, DSP, lens, peripheral components	• VGA/QVGA/QQVGA • 30 fps at VGA (13.5 Mps MAX.) • 2x electronic zoom at QVGA size • Image inversion function (right and left)	1/4.5 type	VGA		F2.4	51	2.5 (I/O : 2.5 or 3.3)	70 (at 15 fps)			24LCC type ^{*6}			
LZ0P390W	CMOS image sensor, CDS/AGC/ 8-bit ADC, timing generator, DSP, lens, peripheral components	• CIF/QCIF • 15 fps at CIF (4.5 Mps MAX.) • Image inversion function (right and left)	1/7 type	CIF		F2.8	Single	58	2.8			45 (at 15 fps)	30LCC type ^{*7}		
LZ0P392E		• CIF/QCIF • 30 fps at CIF (9 Mps MAX.) • Image inversion function (right and left)			2.5 (I/O : 1.8 or 2.8)				30 (at 15 fps)	24LCC type ^{*8}					
LZ0P392C									65		24LCC type ^{*9}				

*1 at SXGA output *2 at VGA output *3 at CIF output *4 Outline dimensions : 10.0 mm x 10.0 mm x 7.1 mm *5 Outline dimensions : 8.0 mm x 8.0 mm x 5.7 mm

*6 Outline dimensions : 8.5 mm x 8.5 mm x 5.6 mm *7 Outline dimensions : 7.0 mm x 6.5 mm x 6.2 mm *8 Outline dimensions : 6.5 mm x 6.5 mm x 4.9 mm

*9 Outline dimensions : 6.5 mm x 6.5 mm x 4.1 mm

Features of CMOS Camera Modules

● Compact profile

Using a high-density multi-chip mounting technology, this module integrates a CMOS image sensor, a DSP, a CDS/AGC/ADC, a timing generator and a lens, with the following outline dimensions :

Model No.	Outline dimensions (mm)	Volume (cc)
★LZ0P3931	10.0 x 10.0 x (H) 7.1	0.71
LZ0P3941	8.0 x 8.0 x (H) 5.7	0.36
LZ0P391T	8.5 x 8.5 x (H) 5.6	0.40
LZ0P390W	7.0 x 6.5 x (H) 6.2	0.28
LZ0P392E	6.5 x 6.5 x (H) 4.9	0.21
LZ0P392C	6.5 x 6.5 x (H) 4.1	0.17

(H) : Maximum height

● Low power consumption

This module achieves the low power consumption stated below. The module also has a standby function.

Model No.	Image format	Power consumption (mW) TYP.
★LZ0P3931	SXGA	170 (at 15 fps)
LZ0P3941	VGA	112 (at 30 fps)
LZ0P391T		70 (at 15 fps)
LZ0P390W		45 (at 15 fps)
LZ0P392E	CIF	30 (at 15 fps)
LZ0P392C		

● Wide-angle lens ideal for cellular videophones (LZ0P392C)

● Compatible with a variety of image formats

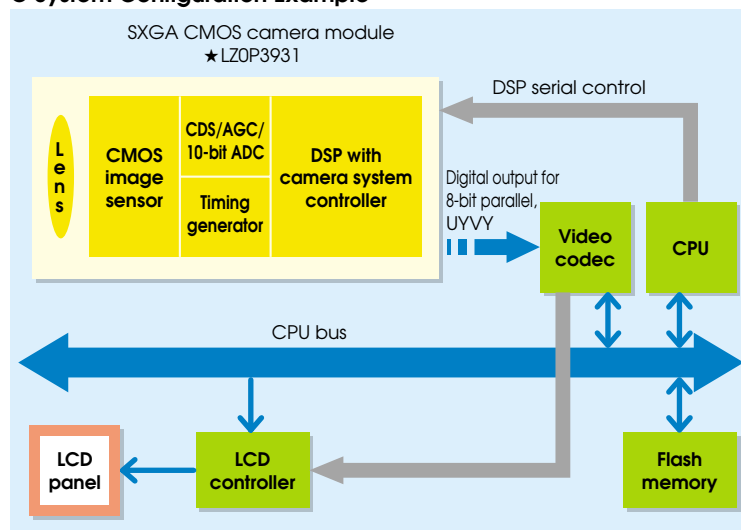
This module can be set for a variety of formats, as described below :

Model No.	Image format
★LZ0P3931	SXGA/XGA/SVGA/VGA/CIF/QVGA/QCIF/QQVGA/SubQCIF
LZ0P3941	VGA/CIF/QVGA/QCIF/QQVGA/SubQCIF
LZ0P391T	VGA/QVGA/QQVGA
LZ0P390W	
LZ0P392E	CIF/QCIF
LZ0P392C	

< Image format >

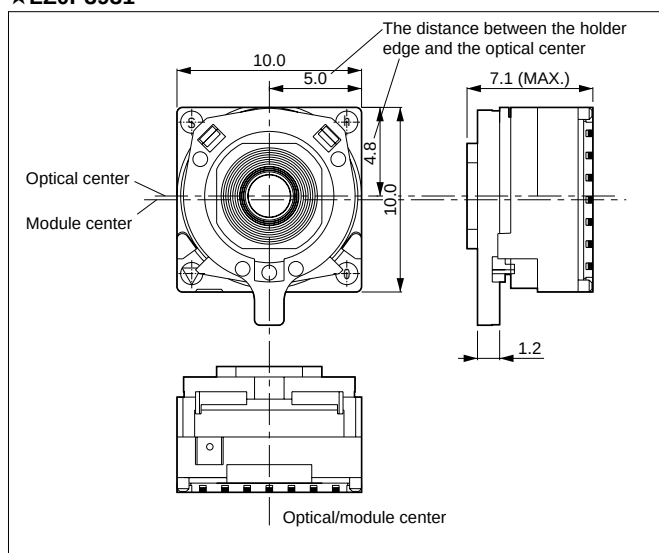
SXGA	: 1 280 x 1 024
XGA	: 1 024 x 768
SVGA	: 800 x 600
VGA	: 640 x 480
CIF	: 352 x 288
QVGA	: 320 x 240
QCIF	: 176 x 144
QQVGA	: 160 x 120
SubQCIF	: 128 x 96

● System Configuration Example

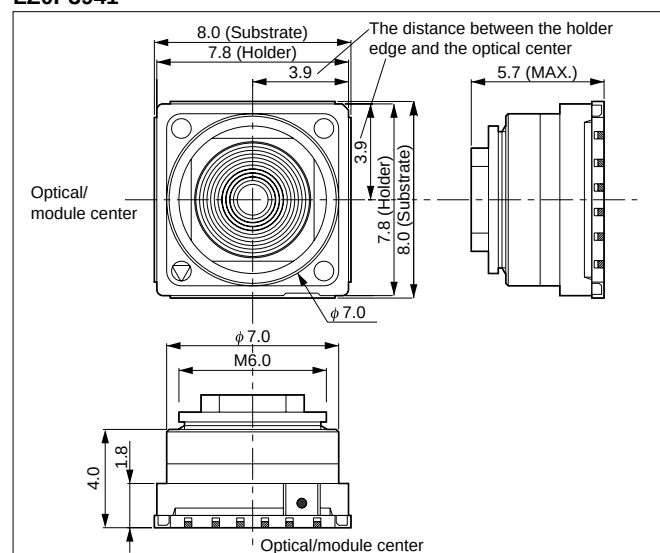


● Dimensions

★LZ0P3931



LZ0P3941

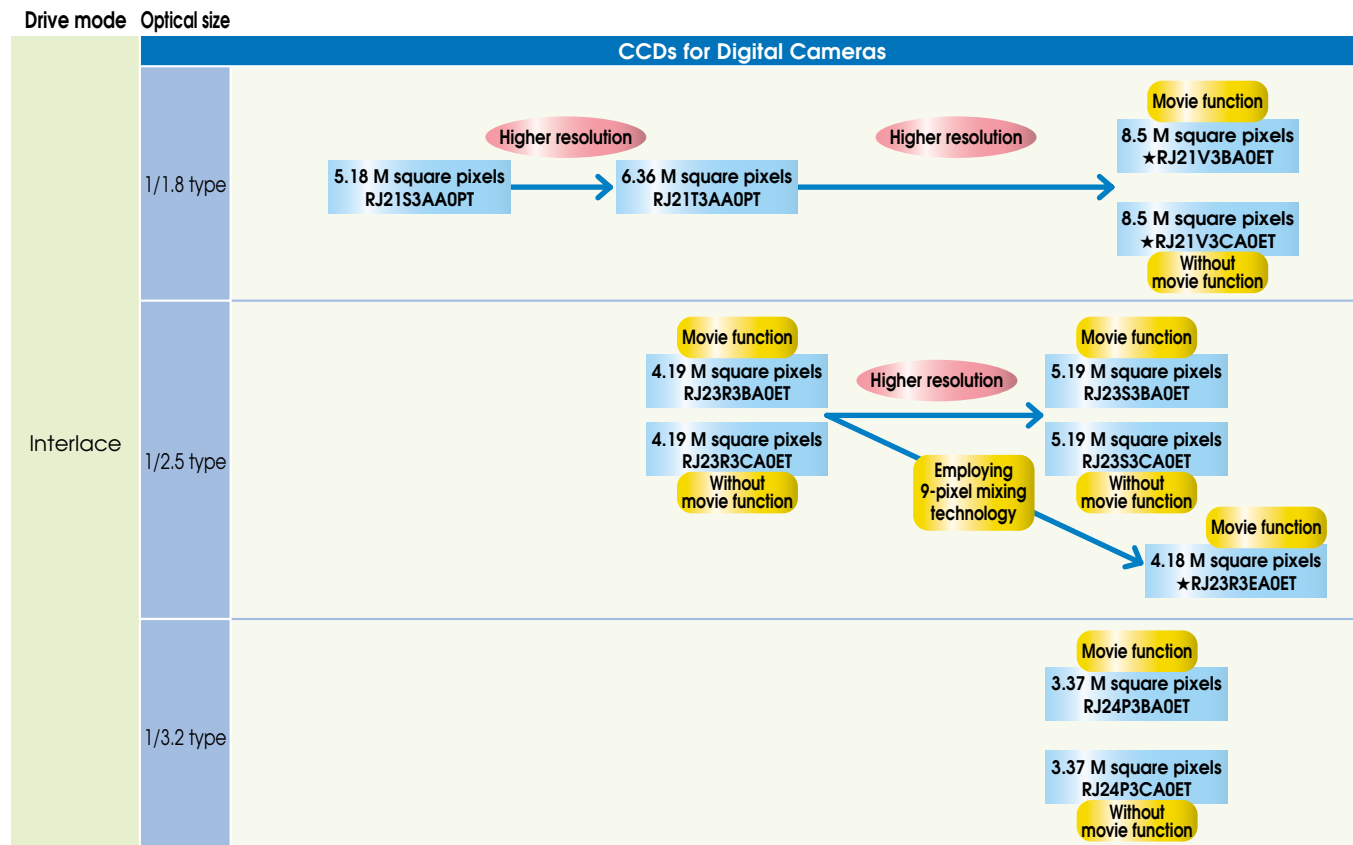


(Unit : mm)

CCDs for Digital Cameras

★ Under development

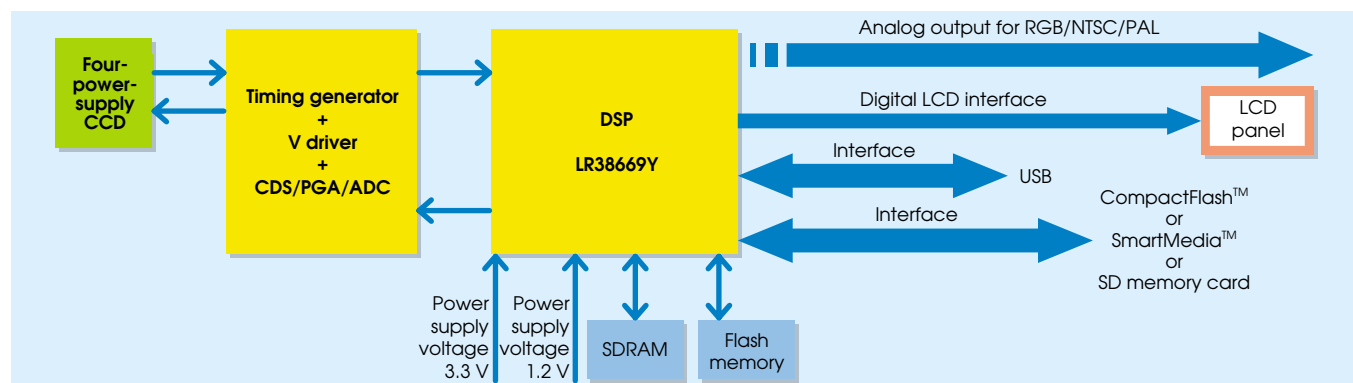
Road Map



High-resolution Digital Camera System with Three-chip Configuration

Selling Points

- Wide range of pixel size from 3.37 Mpixels to 8.5 Mpixels for digital camera system solutions.
- Incorporates JPEG hardware for high-speed photography. Incorporates resize hardware for high-speed zoom.
- Analog output (NTSC/PAL) capability.
- Built-in USB line driver, CompactFlash™/SmartMedia™/SD memory card interface and LCD interface.



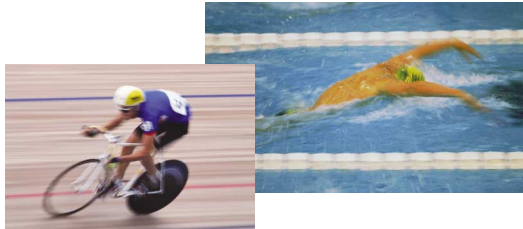
■ Four-power-supply CCDs and peripheral LSIs

CCD				30 fps VGA movie	Timing generator + V driver + CDS/PGA/ADC	DSP
Interface	1/1.8 type	5.18 Mpixels	RJ21S3AA0PT	—	LR38647	LR38669Y
		6.36 Mpixels	RJ21T3AA0PT	—	LR38649	
		8.5 Mpixels	★RJ21V3BA0ET	○	★LR38674	
			★RJ21V3CA0ET	—		
	1/2.5 type	4.18 Mpixels	★RJ23R3EA0ET	○	★LR386XX	
		4.19 Mpixels	RJ23R3BA0ET	—	LR38649	
			RJ23R3CA0ET	—		
		5.19 Mpixels	RJ23S3BA0ET	○	LR38667	
	1/3.2 type		RJ23S3CA0ET	—		
		3.37 Mpixels	RJ24P3BA0ET	○	LR38649	
			RJ24P3CA0ET	—		

Features

LR38669Y

- Single-chip signal processor for digital cameras
- Built-in CCD signal processing circuit
- Built-in ARM core
- Ability to process VGA-sized movie at 30 fps with built-in JPEG encoder/decoder



Enables high-quality VGA movies

- Designed for 1.3-Mpixel to 10-Mpixel CCDs
- Support for CCDs with a movie function employing 4-pixel/9-pixel mixing technology
- Built-in memory controller
- Built-in video encoder : analog outputs for RGB/NTSC/PAL
- Built-in USB line driver
- Supports major media interfaces for CompactFlash™/SmartMedia™/SD memory cards
- Supports 4-bit SD bus mode
- Supports several types of LCD digital interfaces, such as an interface for CG silicon LCD panel
- Capable of reducing system power consumption by supporting mobile SDRAM (168 mW in monitoring mode)

- High-performance image-processing capability enables fast shooting interval time for digital cameras : less than 1.0 second at 4-Mpixel CCDs



Supports up to 10-Mpixel still images

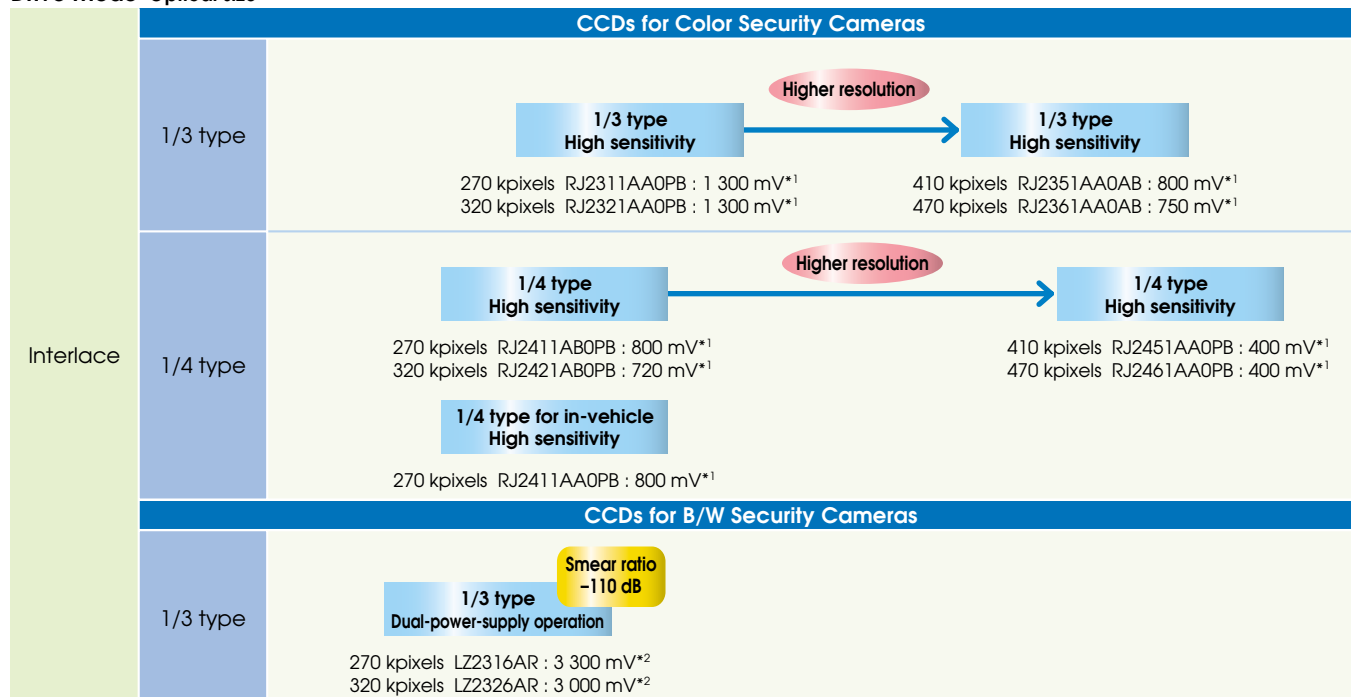
- Operating frequency : 64 MHz (MAX.)
- Lower voltage operation
 - Analog system : 3.0 to 3.6 V
 - Digital system (IO) : 3.0 to 3.6 V/2.25 to 2.75 V
 - Digital system (Core) : 1.08 to 1.32 V
- Built-in OSD (On Screen Display) function
- Package : 260 CSP

CCDs for Security Cameras

★ Under development

Road Map

Drive mode Optical size

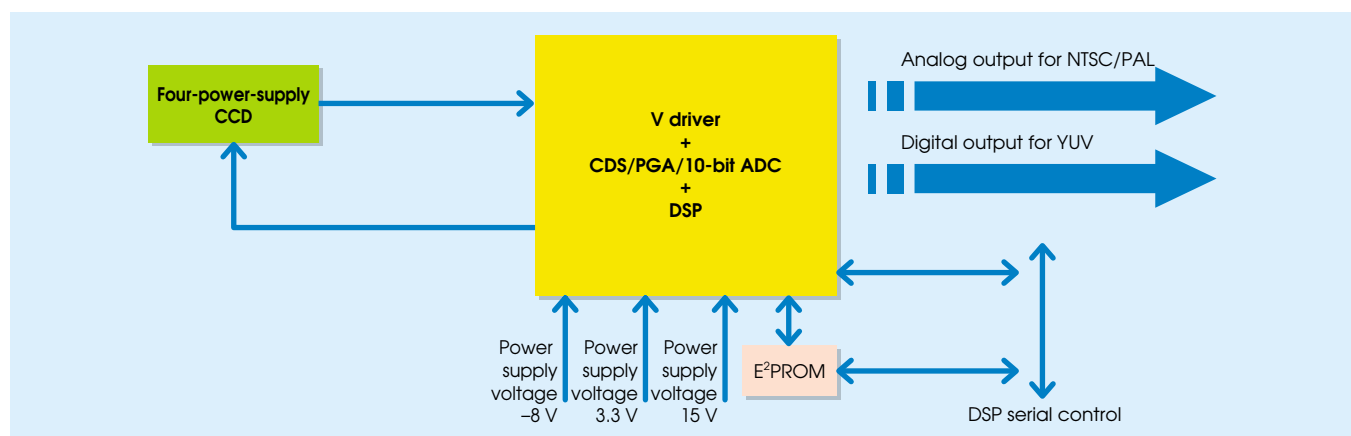


*1 Sensitivity *2 Sensitivity when IR cut-off filter is not used.

Color Security Camera System with Two-chip Configuration

Selling Points

- Analog output (NTSC/PAL) capability.
- Two-chip configuration helps reduce mounting surface area.
- Small optical size contributes to size reduction of camera products.



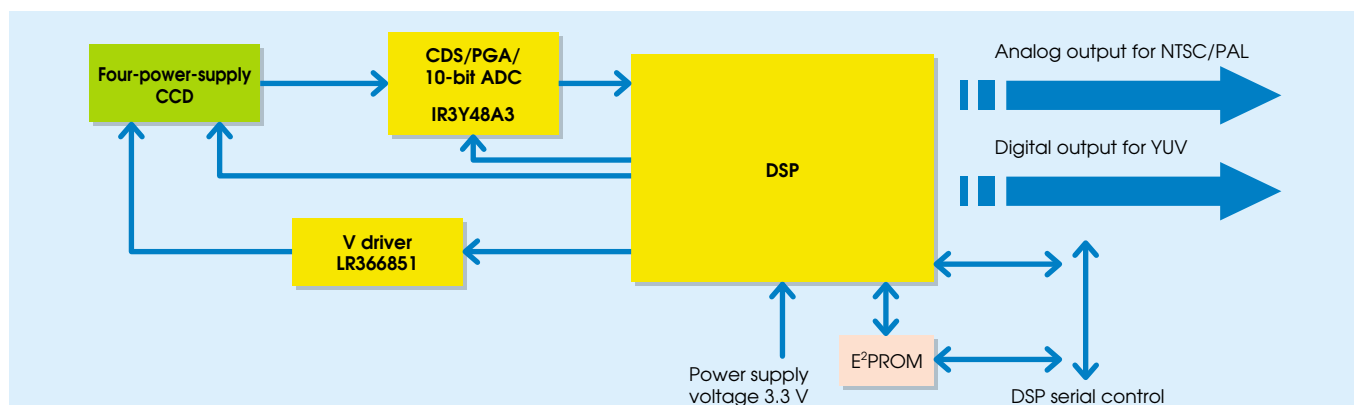
Four-power-supply CCDs and peripheral LSIs

CCD			V driver + CDS/PGA/ADC + DSP
1/3 type	270 kpixels	RJ2311AA0PB	LR386431/★LR38645
	320 kpixels	RJ2321AA0PB	
	410 kpixels	RJ2351AA0AB	
	470 kpixels	RJ2361AA0AB	
1/4 type	270 kpixels	RJ2411AA0PB	
		RJ2411AB0PB	
	320 kpixels	RJ2421AB0PB	
	410 kpixels	RJ2451AA0PB	
	470 kpixels	RJ2461AA0PB	

■ Color Security Camera System with Four-chip Configuration

Selling Points

- Analog output (NTSC/PAL) capability.
- Camera system with four-chip configuration.
- Small optical size contributes to size reduction of camera products.



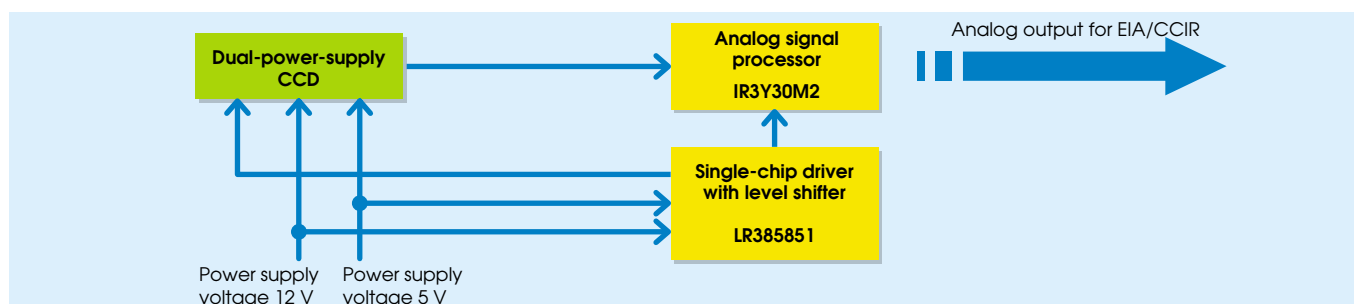
■ Four-power-supply CCDs and peripheral IC/LSIs

	CCD		V driver	CDS/PGA/ADC	DSP
1/3 type	270 kpixels	RJ2311AA0PB	LR366851	IR3Y48A3	LR386032/★LR38607
	320 kpixels	RJ2321AA0PB			
	410 kpixels	RJ2351AA0AB			
	470 kpixels	RJ2361AA0AB			
1/4 type	270 kpixels	RJ2411AB0PB			
	320 kpixels	RJ2421AB0PB			
	410 kpixels	RJ2451AA0PB			
	470 kpixels	RJ2461AA0PB			

■ B/W Security Camera System

Selling Points

- Analog output (EIA/CCIR) capability.
- Camera system with three-chip configuration.
- High-sensitivity dual-power-supply CCDs make possible size reduction, lower cost and lower power consumption.



■ Dual-power-supply CCDs and peripheral IC/LSI for analog interface

	CCD		Single-chip driver (Timing generator + Synchronous signal generator)	Signal processor
1/3 type	270 kpixels	LZ2316AR	LR385851	IR3Y30M2
	320 kpixels	LZ2326AR		

Features

LR386032

- Signal processor for 270 k/320 k/410 k/470 k-pixel CCDs
- Built-in 9-bit DAC
- Built-in synchronous signal generation circuit
- Built-in CCD drive timing generator
- Built-in processing circuit for AWB/AE control
- Built-in 2-Kbit E²PROM drive circuit
- Mirror image function
- Digital output for YUV
- Analog output for NTSC/PAL
- Supports monitoring output of IR3Y48A3
- Package : 80 LQFP (pin pitch : 0.5 mm)

CCDs and Peripheral ICs/LSIs

★ Under development

CCDs

Higher-resolution CCDs

Optical size	Total pixels	Color filter	Model No.	30 fps VGA movie	Resolution	Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
					Image pixels (H x V)				
1/1.8 type	5 180 000	Primary color mosaic filers	RJ21S3AA0PT	—	2 592 x 1 944	2.8 x 2.8	155	−90	P-DIP020-0500
	RJ21T3AA0PT		2 872 x 2 160		2.5 x 2.5	105	−88		
	8 500 000		★RJ21V3BA0ET	○	3 320 x 2 496	2.2 x 2.2		90	P-SOP032-0525
	★RJ21V3CA0ET		—						
1/2.5 type	4 180 000	Primary color mosaic filers	★RJ23R3EA0ET	○	2 332 x 1 740	2.5 x 2.5	105	−88	P-SOP028-0400
	RJ23R3BA0ET								
	RJ23R3CA0ET		—	2 600 x 1 944	2.2 x 2.2	90			
	5 190 000		RJ23S3BA0ET				○		
	RJ23S3CA0ET		—						
1/3.2 type	3 370 000	Primary color mosaic filers	RJ24P3BA0ET	○	2 096 x 1 560	2.2 x 2.2	90	−88	P-SOP028-0400
			RJ24P3CA0ET	—					

1/3-type CCDs

Total pixels	Standard		Model No.	Electronic shutter (s)	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
					Horizontal TV lines	Image pixels (H x V)				
270 000	Color	NTSC	RJ2311AA0PB	1/60 to 1/10 000	330	512 x 492	9.6 x 7.5	1 300	−120	P-DIP016-0500C
320 000		PAL	RJ2321AA0PB	1/50 to 1/10 000		512 x 582	9.6 x 6.3			
410 000		NTSC	RJ2351AA0AB	1/60 to 1/10 000	480	768 x 494	6.4 x 7.5	800	−105	N-DIP016-0450
470 000		PAL	RJ2361AA0AB	1/50 to 1/10 000		752 x 582	6.5 x 6.3	750		

1/4-type CCDs

Total pixels		Standard		Model No.	Electronic shutter (s)	Resolution		Pixel size H x V (μm²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
						Horizontal TV lines	Image pixels (H x V)				
270 000	Color	NTSC	RJ2411AA0PB*	1/60 to 1/10 000	330	512 x 492	7.2 x 5.6	800	−105	P-DIP014-0400A	
RJ2411AB0PB											
320 000		PAL	RJ2421AB0PB	1/50 to 1/10 000	480	512 x 582	7.2 x 4.7	720			
410 000		NTSC	RJ2451AA0PB	1/60 to 1/10 000		768 x 494	4.9 x 5.6	400			
470 000		PAL	RJ2461AA0PB	1/50 to 1/10 000		752 x 582	5.0 x 4.7				

* For in-vehicle use

Dual-power-supply (5 V/12 V) Operation 1/3-type CCDs*¹

Total pixels	Standard		Model No.	Electronic shutter (s)	Resolution		Pixel size H x V (μm ²)	Sensitivity (mV) TYP.	Smear ratio (dB) TYP.	Package
					Horizontal TV lines	Image pixels (H x V)				
270 000	B/W	EIA	LZ2316AR	1/60 to 1/10 000	380	512 x 492	9.6 x 7.5	3 300* ²	−110	N-DIP016-0500C
320 000		CCIR	LZ2326AR	1/50 to 1/10 000		512 x 582	9.6 x 6.3	3 000* ²		

*¹ With mirror image function

*² When IR cut-off filter is not used.

■ CCD Peripheral ICs/LSIs

Description	Model No.	Features		Package
Single-chip driver (Timing generator + Synchronous signal generator) V driver	LR385851	For 270-k/320-kpixel CCDs with dual-power-supply operation (5 V/12 V)	Electronic shutter, electronic exposure, mirror image function, for B/W CCDs, level shifter, smooth shutter, line lock	P-QFP048-0707
	LR366851	Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter		P-SSOP024-0275
	LR36687U/Y	Vertical pulse driver for CCDs, 2-level output x 10, 3-level output x 10, 2-level output circuit for electronic shutter		P-VQFN064-0808/ TFBGA068-0606
	LR36688U	Vertical pulse driver for CCDs, 2-level output x 4, 3-level output x 8, 2-level output circuit for electronic shutter		P-VQFN052-0707
Signal processor	IR3Y30M2	Available for signal processing from CCD output to 75 Ω video output, for B/W CCDs, comparator for electronic exposure, high-speed S/H circuit, H aperture, LPF, AGC		P-QFP048-0707
CDS/PGA/ADC	IR3Y48A3	Low power consumption [80 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC (18 MHz)		P-QFP048-0707
	IR3Y50U6	Low power consumption [75 mW (TYP.)], high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC (25 MHz)		P-VQFN036-0606
	IR3Y51U	Low power consumption [84 mW (TYP.) at 40 MHz, 63 mW (TYP.) at 27 MHz], high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC (40 MHz)		P-VQFN052-0707
Timing generator + V driver + CDS/PGA/ADC	LR38647	For 1/1.8 type 5.18-Mpixel CCD	Timing generator : Monitoring mode/still mode V driver : Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter CDS/PGA/ADC : 40 MHz, high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC	LFBGA160-1010
	LR38649	For 1/1.8 type 6.36-Mpixel CCD, For 1/2.5 type 4.19-Mpixel, 1/3.2 type 3.37-Mpixel CCDs with/without movie function	Timing generator : Monitoring mode/still mode V driver : Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter CDS/PGA/ADC : 25 MHz (LR38649)/ 30 MHz (LR38667/★LR386XX)/ 36 MHz (★LR38674), high-speed S/H circuit, high-gain PGA circuit, 12-bit ADC	LFBGA192-1010
	★LR386XX	For 1/2.5 type 4.18-Mpixel CCD with movie function employing 9-pixel mixing technology		
	LR38667	For 1/2.5 type 5.19-Mpixel CCDs with/without movie function		
	★LR38674	For 1/1.8 type 8.5-Mpixel CCDs with/without movie function		
V driver + CDS/PGA/ADC + DSP	LR386431		V driver : Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter CDS/PGA/ADC : 18 MHz, high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC DSP : YUV digital output, NTSC/PAL analog output, mirror image function, 9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, processing circuit for AWB/AE control, supports monitoring output of IR3Y48A3	LFBGA168-1212
	★LR38645	For 270-k/320-k/410-k/ 470-kpixel CCDs	V driver : Vertical pulse driver for CCDs, 2-level output x 2, 3-level output x 4, 2-level output circuit for electronic shutter CDS/PGA/ADC : 18 MHz, high-speed S/H circuit, high-gain PGA circuit, 10-bit ADC DSP : YUV digital output, NTSC/PAL analog output, mirror image function, 9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, processing circuit for AWB/AE control, Y/C separation analog output, line lock function, supports monitoring output of IR3Y48A3	LFBGA180-1212
DSP	LR386032	For 270-k/320-k/410-k/ 470-kpixel CCDs	YUV digital output, NTSC/PAL analog output, mirror image function, 9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, processing circuit for AWB/AE control, supports monitoring output of IR3Y48A3	P-LQFP080-1212
	★LR38607		YUV digital output, NTSC/PAL analog output, mirror image function, 9-bit DAC, synchronous signal generation circuit, CCD drive timing generator, processing circuit for AWB/AE control, Y/C separation analog output, line lock function, supports monitoring output of IR3Y48A3	P-LQFP100-1414
	LR38669Y	For 1.3-M to 10-Mpixel CCDs	CCD signal processing circuit, ARM core, JPEG (hardware), memory controller, video encoder (NTSC/PAL), USB line driver, supports CompactFlash™/SmartMedia™/SD memory card interfaces, 4-bit SD bus mode, supports several types of LCD digital interfaces, support for CCDs with movie function	TFBGA260-1313

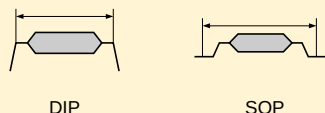


■ Packages for CCDs

Package type	Appearance (Package material)	Package code	No. of pins	Pin pitch mm	Nominal dimensions mm (mil)	Package width & length x (seated height) mm [design value]
DIP	 (Plastic)	P-DIP014-0400A	14	1.27	10.16 (400)	10.0 x 10.0
		P-DIP016-0500C	16	1.78	12.7 (500)	12.4 x 14.0
		P-DIP020-0500	20	1.27	12.2	12.0 x 13.8
	 (Ceramic)	N-DIP016-0450	16	1.27	11.43 (450)	11.4 x 12.2
		N-DIP016-0500C		1.78	12.7 (500)	12.4 x 14.0
SOP	 (Plastic)	P-SOP028-0400	28	0.69	10.16 (400)	10.0 x 10.0 x (3.5)
		★P-SOP032-0525	32	0.78	13.3 (525)	12.0 x 13.8 x (3.9)

100 mil = 2.54 mm

Nominal dimensions



DIP : Dual Inline Package
SOP : Small Outline Package

- ARM is a trademark of ARM Ltd.
- BGA is a trademark of Motorola Nippon Ltd.
- CompactFlash is a trademark of SanDisc Corporation.
- SmartMedia is a trademark of Toshiba Corporation.
- All other product or company names are trademarks of their respective holders.

CCD Camera Modules

LZ0P371K	7, 8
LZ0P371L	7, 8
LZ0P3726	7, 8
LZ0P3738	7, 8
LZ0P373F	7, 8
LZ0P3741	7, 8
LZ0P374A	7, 8
LZ0P374F	7, 8

Power Supply ICs for CCDs

IR3M47U6	8
IR3M48U6	8
IR3M49U6	8
IR3M52Y6	8

CMOS Camera Modules

LZ0P390W	9, 10
LZ0P391T	9, 10
LZ0P392C	9, 10
LZ0P392E	9, 10
LZ0P3931	9, 10
LZ0P3941	9, 10

CCDs

LZ2316AR	13, 14, 15
LZ2326AR	13, 14, 15
RJ21S3AA0PT	4, 11, 12, 15
RJ21T3AA0PT	4, 11, 12, 15
RJ21V3BA0ET	4, 11, 12, 15
RJ21V3CA0ET	11, 12, 15
RJ2311AA0PB	13, 14, 15
RJ2321AA0PB	13, 14, 15
RJ2351AA0AB	13, 14, 15

RJ2361AA0AB	13, 14, 15
RJ23R3BA0ET	4, 11, 12, 15
RJ23R3CA0ET	11, 12, 15
RJ23R3EA0ET	4, 11, 12, 15
RJ23S3BA0ET	4, 11, 12, 15
RJ23S3CA0ET	11, 12, 15
RJ2411AA0PB	13, 15
RJ2411AB0PB	13, 14, 15
RJ2421AB0PB	13, 14, 15
RJ2451AA0PB	13, 14, 15
RJ2461AA0PB	13, 14, 15
RJ24P3BA0ET	4, 11, 12, 15
RJ24P3CA0ET	11, 12, 15

CCD Peripheral ICs/LSIs

IR3Y30M2	14, 16
IR3Y48A3	14, 16
IR3Y50U6	16
IR3Y51U	16
LR366851	14, 16
LR36687U	16
LR36687Y	16
LR36688U	16
LR385851	14, 16
LR386032	14, 16
LR38607	14, 16
LR386431	13, 16
LR38645	13, 16
LR38647	12, 16
LR38649	12, 16
LR38667	12, 16
LR38669Y	11, 12, 16
LR38674	12, 16
LR386XX	12, 16



SHARP CORPORATION

SALES & MARKETING GROUP

-ELECTRONIC COMPONENTS & DEVICES

22-22, NAGAIKE-CHO, ABENO-KU, OSAKA 545-8522, JAPAN

PHONE : (81) 6-6621-1221

FAX : (81) 6117-725300, (81) 6117-725301, (81) 6117-725302

<http://sharp-world.com/products/device/>

COUNTRIES and AREAS

U.S.A.

SHARP MICROELECTRONICS OF THE AMERICAS

North American Head Office

5700 North West Pacific Rim Boulevard

Camas, WA 98607 USA

PHONE : (1) 360-834-2500

FAX : (1) 360-834-8903

<http://www.sharpsma.com>

Western area

1980 Zanker Road, San Jose, CA 95112

PHONE : (1) 408-436-4900

FAX : (1) 408-436-0924

5901 Bolsa Avenue

Huntington Beach, CA 92647-2053

PHONE : (1) 714-903-4600

FAX : (1) 714-903-0295

6390 Greenwich Drive, Suite 175

San Diego, CA 92122

PHONE : (1) 858-597-0982

FAX : (1) 858-597-8701

Central area

85 W Algonquin Road, Suite 280

Arlington Heights, IL 60005

PHONE : (1) 847-258-2750

FAX : (1) 847-439-2479

6303 Commerce Drive, Suite 175

Irving, TX 75063

PHONE : (1) 972-582-1710

FAX : (1) 972-580-7537

8911 Capitol of Texas Hwy, Suite 3130

Austin, TX 78759

PHONE : (1) 512-349-7262

FAX : (1) 512-349-7002

20333 State Hwy. 249, Suite 200

Houston, TX 77070

PHONE : (1) 281-378-1520

FAX : (1) 281-378-1521

W129 S9647 Tony Lema Lane

Muskego, WI 53150

PHONE : (1) 414-529-9568

FAX : (1) 414-529-9569

3001 West Big Beaver Road, Suite 722

Troy, MI 48084

PHONE : (1) 248-458-1527

FAX : (1) 248-458-6255

Eastern area

1070 N. Kimbles Road, Yardley, PA 19067

PHONE : (1) 215-321-5530

FAX : (1) 215-321-5534

200 Wheeler Rd., Burlington, MA 01803

PHONE : (1) 781-270-7979/781-229-5100

FAX : (1) 781-229-9117

8000 Regency Parkway, Suite 280

Cary, NC 27511

PHONE : (1) 919-460-0695

FAX : (1) 919-460-0795

2321 Sidney St. Pittsburgh, PA 15203

PHONE : (1) 412-381-1191

FAX : (1) 412-381-1192

4875 North Federal Highway, Third Floor

FL Lauderdale, FL 33318

PHONE : (1) 954-267-8883

FAX : (1) 954-267-0254

EUROPE

SHARP MICROELECTRONICS EUROPE a division of Sharp Electronics (Europe) GmbH

Head Office

Sonninstrasse 3, 20097, Hamburg,

Germany

PHONE : (49) 180-5073507

FAX : (49) 40-2376-2232

<http://www.sharpsme.com/>

Germany :

SME München Office

Fuerstenriederstrasse 5,

80687 München, Germany

PHONE : (49) 89-54 6842 0

FAX : (49) 89-54 6842 50

France :

SME Paris Office

1 Rue Raoul Follereau

Bussy Saint Georges

77608 Marne la Vallée Cedex 3

PHONE : (33) 1 6476 22 22

FAX : (33) 1 6476 22 23

Italy :

SME Milano Office

Centro Direzionale Colleoni,

Palazzo Taurus Ingresso 2

20041 Agrate Brianza, Milano, Italy

PHONE : (390) 39-68 99 946

FAX : (390) 39-68 99 948

U.K. :

SME London Office

Centennial Court, Easthampstead Road,

Bracknell, Berkshire RG12 1YQ,

United Kingdom

PHONE : (44) 1344-86 99 22

FAX : (44) 1344-36 09 03

Ireland :

SME Dublin Office

First Floor, Block 1, St. Johns Court,

Santry, Dublin 9, Ireland

PHONE : (353) 1-842 87 05

FAX : (353) 1-842 84 55

ASIA

SHARP ELECTRONICS (SHANGHAI) CO., LTD.

Microelectronics Sales & Marketing Division

16F, King Tower, 28 Xin Jin Qiao Road,

Pudong DIST, Shanghai 201206 P.R. China

PHONE : (86) 21-5854-7710/21-5834-6056

FAX : (86) 21-5854-4340/21-5834-6057

Registered Address

No. 11, De Bao Road, Xin Development

BLDG 46 Wai Gao Qiao Free Trade Zone,

Shanghai 200131, P.R. China

Beijing office

Room 1062, Beijing Jing An Center No. 8

East Bei San Huan Road, Chao Yang

DIST, Beijing 100028 P.R. China

PHONE : (86) 10-6466-7543/10-6466-6561

FAX : (86) 10-6468-8920

<http://sharp-world.com/products/device-china/index.html>

SHARP-ROXY (HONG KONG) LTD.

Device Sales Division, 17/F, Admiralty Centre, Tower 1,

18 Harcourt Road, Hong Kong

PHONE : (852) 28229311

FAX : (852) 28660779

<http://www.sharp.com.hk>

Shenzhen Representative Office

Room 13B1, Tower C,

Electronics Science & Technology Building,

Shen Nan Zhong Road, Shenzhen, P.R. China

PHONE : (86) 755-83273731

FAX : (86) 755-83273735

SHARP ELECTRONIC COMPONENTS (TAIWAN) CORPORATION

8F-A, No. 16, Sec. 4, Nankang E. Rd., Taipei, Taiwan

PHONE : (886) 2-2577-7341

FAX : (886) 2-2577-7326/2-2577-7328

SHARP ELECTRONICS (SINGAPORE) PTE., LTD.

396 Alexandra Road #07-00

BP Tower Singapore 119954

PHONE : (65) 62713566

FAX : (65) 62713855

<http://www.sesi-sharp.com>

SHARP MICROELECTRONICS TECHNOLOGY (M) SDN BHD.

Suite E408, 4th Floor, East Tower, Wisma Consplant 1,

No. 2 Jin. SS 16/4, Subang Jaya, 47500, Selangor

Darul Ehsan, Malaysia

PHONE : (60) 3-5637-8964

FAX : (60) 3-5638-4029

SHARP ELECTRONIC COMPONENTS (KOREA) CORPORATION

RM 501 ilsin B/D, 541, Dohwa-dong,

Mapo-ku, Seoul, Korea, 121-701

PHONE : (82) 2-711-5813 to 5818

FAX : (82) 2-711-5819

The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property right. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP devices.

SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structures and other contents described herein at any time without notice in order to improve design or reliability.

Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. Manufacturing locations are also subject to change without notice.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any SHARP devices shown in catalogs, data books, etc.

Observe the following points when using any device in this publication. SHARP takes no responsibility for change caused by improper use of the devices, which does not meet the conditions and absolute maximum ratings for use specified in the relevant specification sheet nor meet the following conditions :

- The devices in this publication are designed for use in general electronic equipment designs such as :

- Personal computers
- Office automation equipment
- Telecommunication equipment (except for trunk lines)
- Test and measurement equipment
- Industrial control
- Audio visual equipment
- Consumer electronics

- Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as :

- Main frame computers
- Transportation control and safety equipment (i.e. aircraft, trains, automobiles, etc.)
- Traffic signals
- Gas leakage sensor breakers
- Alarm equipment
- Various safety devices, etc.

- SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as :

- Military and aerospace applications
- Telecommunication equipment (trunk lines)
- Nuclear power control equipment
- Medical and other life support equipment (e.g., scuba)

If the SHARP devices listed in the publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

Contact and consult with a SHARP representative if there are any questions about the contents of this publication.

The contents of this catalog as of September 30, 2004

Ref. No. WT 339C © SHARP CORP. OCT. 2004 G3E1 Printed in Japan