LZ0P3641/3642★/3645★/3646

1/4-type Built-in Lens Color CCD Area Sensors with 350 k Pixels

★Under development

DESCRIPTION

The LZ0P3641/42★/45★/46 are 1/4-type (4.5 mm) 350 000-pixel built-in lens color CCD (charge-coupled device) area sensors. All pixel signals can be read independently via the vertical shift register and horizontal shift register. With their small lens and WLCC-type flat package, it is possible to make ultra small color camera easily.

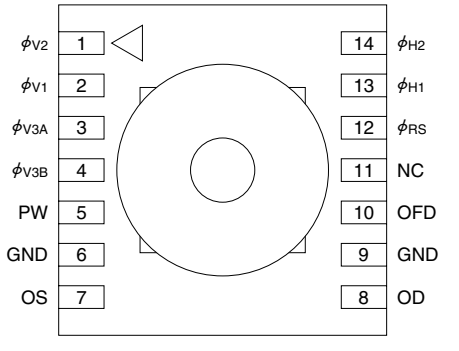
FEATURES

- Progressive scan
- Square pixel
- Compatible with VGA format
- Number of effective pixels : 659 (H) x 494 (V)
- Number of optical black pixels
  - – Horizontal : 2 front and 31 rear
  - – Vertical : 8 front and 2 rear
- Number of dummy bits
  - – Horizontal : 16
  - – Vertical : 5
- Pixel pitch : 5.6 µm (H) x 5.6 µm (V)
- R, G and B primary color mosaic filters
- Low fixed-pattern noise and lag
- Blooming suppression structure
- Built-in output amplifier
- Built-in overflow drain voltage circuit and reset gate voltage circuit
- Horizontal shift register clock and reset gate clock voltage : 3.3 V (TYP.)
- Variable electronic shutter (1/30 to 1/10 000 s)
- Built-in optical low-pass-filter
- Integrated lens :
  Horizontal viewing angle
  LZ0P3641/46 : 50˚
  ★LZ0P3642 : 62˚
  ★LZ0P3645 : 115˚
- Package
  - – 14-pin half-pitch WLCC* type
  - – Base section size : 12 mm (H) x 11 mm (V)
  - – Outline dimensions (MAX.) : 18 mm (H) x 11 mm (V)
- Package height : approx. 13 mm (two pcs. of lenses)

* Window Leadless Chip Carrier

PIN CONNECTIONS

14-PIN HALF-PITCH WLCC TYPE TOP VIEW



COMPARISON TABLE

	LZ0P3641	★LZ0P3642	★LZ0P3645	LZ0P3646
Horizontal viewing angle	50˚	62˚	115˚	50˚
F no.	3.4	2.8		
Characteristics	Refer to each following specification.			
Lens specification				

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

PIN DESCRIPTION

SYMBOL	PIN NAME
OD	Output transistor drain
OS	Output signals
ϕ_{RS}	Reset transistor clock
ϕ_{V1}, ϕ_{V2}, ϕ_{V3A}, ϕ_{V3B}	Vertical shift register clock
ϕ_{H1}, ϕ_{H2}	Horizontal shift register clock
OFD	Overflow drain
PW	P-well
GND	Ground
NC	No connection

ABSOLUTE MAXIMUM RATINGS

(T_A = +25 ˚C)

PARAMETER	SYMBOL	RATING	UNIT	NOTE
Output transistor drain voltage	V_{OD}	0 to +18	V	
Overflow drain voltage	V_{OFD}	Internal output	V	1
Reset gate clock voltage	$V_{\phi RS}$	Internal output	V	2
Vertical shift register clock voltage	$V_{\phi V}$	−11.5 to +17.5	V	
Horizontal shift register clock voltage	$V_{\phi H}$	−0.3 to +12	V	
Voltage difference between P-well and vertical clock	V_{PW}-$V_{\phi V}$	−29 to 0	V	
Voltage difference between vertical clocks	$V_{\phi V}$-$V_{\phi V}$	0 to +15	V	3
Storage temperature	T_{STG}	−20 to +70	˚C	
Ambient operating temperature	T_{OPR}	−10 to +60	˚C	

NOTES :

1. Do not connect to DC voltage directly. When OFD is connected to GND, connect V_{OD} to GND. Overflow drain clock is applied below 27 Vp-p.
2. Do not connect to DC voltage directly. When ϕ_{RS} is connected to GND, connect V_{OD} to GND. Reset gate clock is applied below 8 Vp-p.
3. When clock width is below 10 µs, and clock duty factor is below 0.1%, voltage difference between vertical clocks will be below 28 V.

RECOMMENDED OPERATING CONDITIONS

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Ambient operating temperature		T_{OPR}		25.0		˚C	
Output transistor drain voltage		V_{OD}	14.55	15.0	15.45	V	
Overflow drain clock	p-p level	$V_{\phi OFD}$	22.5			V	1
Ground		GND		0.0		V	
P-well voltage		V_{PW}	−10.0		$V_{\phi VL}$	V	2
Vertical shift register clock	LOW level	$V_{\phi V1L}$, $V_{\phi V2L}$ $V_{\phi V3AL}$, $V_{\phi V3BL}$	−9.5	−9.0	−8.5	V	
	INTERMEDIATE level	$V_{\phi V1I}$, $V_{\phi V2I}$ $V_{\phi V3AI}$, $V_{\phi V3BI}$		0.0		V	
	HIGH level	$V_{\phi V3AH}$, $V_{\phi V3BH}$	14.55	15.0	15.45	V	
Horizontal shift register clock	LOW level	$V_{\phi H1L}$, $V_{\phi H2L}$	−0.05	0.0	0.05	V	
	HIGH level	$V_{\phi H1H}$, $V_{\phi H2H}$	3.0	3.3	5.5	V	
Reset gate clock	p-p level	$V_{\phi RS}$	3.0	3.3	5.5	V	1
Vertical shift register clock frequency		$f_{\phi V1}$, $f_{\phi V2}$ $f_{\phi V3A}$, $f_{\phi V3B}$		15.73		kHz	
Horizontal shift register clock frequency		$f_{\phi H1}$, $f_{\phi H2}$		12.27		MHz	
Reset gate clock frequency		$f_{\phi RS}$		12.27		MHz	

NOTES :

1. Use the circuit parameter indicated in **"SYSTEM CONFIGURATION EXAMPLE"**, and do not connect to DC voltage directly.
2. V_{PW} is set below $V_{\phi VL}$ that is low level of vertical shift register clock, or is used with the same power supply that is connected to V_L of V driver IC.

* To apply power, first connect GND and then turn on V_{OD}. After turning on V_{OD}, turn on PW first and then turn on other powers and pulses. Do not connect the device to or disconnect it from the plug socket while power is being applied.

CHARACTERISTICS FOR LZ0P3641 (1/30 s progressive scan readout mode)

(T_A : +25 °C, Operating conditions : The typical values specified in **"RECOMMENDED OPERATING CONDITIONS"**. Color temperature of light source : 3 200 K)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Standard output voltage	V_O		150		mV	1
Saturation output voltage	V_{SAT}	450			mV	2
Sensitivity (Green channel)	R	150	230		mV	3
Resolution (at center)		250	300		TV line	4
Resolution (at corner)		150	200		TV line	5
Shading		45	60		%	6
Difference of center position				±10	%	7
Output transistor drain current	I_{OD}		4.0	8.0	mA	

NOTES :

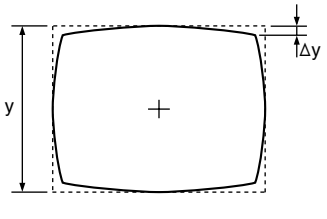
1. The average output voltage of G signal in the central area (H/10, V/10) under uniform illumination.
   The standard exposure conditions are defined as when V_O is 150 mV.
2. The average output voltage of G signal in the central area (H/10, V/10) under 10 times exposure of the standard exposure conditions.
3. The average output voltage of G signal in the central area (H/10, V/10) when a 1 000 lux light source with a white board of 90% reflector is imaged.
4. The resolution in the central area (H/10, V/10) at which the image of the TV resolution chart (ex. EIAJ test chart) can be distinguished on the B/W video monitor when converted into composite video signals.
5. The resolution in the peripheral area (image height : Y = 0.8) under the conditions mentioned above.
6. Defined by the following formula at the brightness of standard output voltage : (Vco/Vce) x 100 [%]
   Vco : Output voltage at edge of the image (at NTSC video output).
   Vce : Output voltage at center of the image (at NTSC video output).
7. The difference between the center position of image and that of the monitor. This is the ratio for the horizontal underscanning monitor size which includes the decentering eccentricity when turning the lens head one time.

LENS SPECIFICATION FOR LZ0P3641

PARAMETER	SPECIFICATION	NOTE
Construction	2 pcs. (non-spherical, plastic)	
Focal length	3.9 mm [TYP. : reference]	
F No.	3.4±5%	
Viewing angle	H : 50°, V : 38°, Diagonal : 60° [TYP. : reference]	
TV distortion	≤ −1.0%	1
Focus adjustment range	∞ to 10 cm	2
Torque of focusing	0.00005 to 0.001 N · m	3

NOTES :

1. TV distortion is defined by the formula, (Δy/y) x 100 [%] at capturing rectangular pattern sized horizontal by vertical as 4 by 3.
   "y" is defined as the vertical height of the center of the horizontal line.
   Δy is defined as the difference between the vertical height of the center of the horizontal line and an edge of it.



2. The best focus point of an object can be obtained by turning the lens head within this range.
3. Torques which are necessary for turning the lens.

* Be careful not to remove the lens head by turning it counterclockwise too much when adjusting macro.

★Under development

CHARACTERISTICS FOR LZ0P3642★ (1/30 s progressive scan readout mode)

(T_A : +25 °C, Operating conditions : The typical values specified in **"RECOMMENDED OPERATING CONDITIONS"**. Color temperature of light source : 3 200 K)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Standard output voltage	V_O		150		mV	1
Saturation output voltage	V_{SAT}	450			mV	2
Sensitivity (Green channel)	R	150	230		mV	3
Resolution (at center)		250	300		TV line	4
Resolution (at corner)		150	200		TV line	5
Shading		40	55		%	6
Difference of center position				±10	%	7
Output transistor drain current	I_{OD}		4.0	8.0	mA	

NOTES :

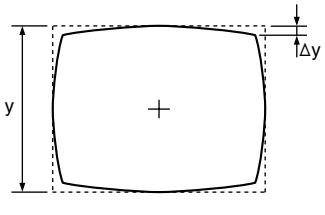
1. The average output voltage of G signal in the central area (H/10, V/10) under uniform illumination.
   The standard exposure conditions are defined as when V_O is 150 mV.
2. The average output voltage of G signal in the central area (H/10, V/10) under 10 times exposure of the standard exposure conditions.
3. The average output voltage of G signal in the central area (H/10, V/10) when a 1 000 lux light source with a white board of 90% reflector is imaged.
4. The resolution in the central area (H/10, V/10) at which the image of the TV resolution chart (ex. EIAJ test chart) can be distinguished on the B/W video monitor when converted into composite video signals.
5. The resolution in the peripheral area (image height : Y = 0.8) under the conditions mentioned above.
6. Defined by the following formula at the brightness of standard output voltage : (Vco/Vce) x 100 [%]
   Vco : Output voltage at edge of the image (at NTSC video output).
   Vce : Output voltage at center of the image (at NTSC video output).
7. The difference between the center position of image and that of the monitor. This is the ratio for the horizontal underscanning monitor size which includes the decentering eccentricity when turning the lens head one time.

LENS SPECIFICATION FOR LZ0P3642★

PARAMETER	SPECIFICATION	NOTE
Construction	2 pcs. (non-spherical, plastic)	
Focal length	3.0 mm [TYP. : reference]	
F No.	2.8±5%	
Viewing angle	H : 62°, V : 49°, Diagonal : 74° [TYP. : reference]	
TV distortion	≤ −1.0%	1
Focus adjustment range	∞ to 10 cm	2
Torque of focusing	0.00005 to 0.001 N · m	3

NOTES :

1. TV distortion is defined by the formula, (Δy/y) x 100 [%] at capturing rectangular pattern sized horizontal by vertical as 4 by 3.
   "y" is defined as the vertical height of the center of the horizontal line.
   Δy is defined as the difference between the vertical height of the center of the horizontal line and an edge of it.



2. The best focus point of an object can be obtained by turning the lens head within this range.
3. Torques which are necessary for turning the lens.

✻ Be careful not to remove the lens head by turning it counterclockwise too much when adjusting macro.

★Under development

CHARACTERISTICS FOR LZ0P3645★ (1/30 s progressive scan readout mode)

(T_A : +25 °C, Operating conditions : The typical values specified in **"RECOMMENDED OPERATING CONDITIONS"**. Color temperature of light source : 3 200 K)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Standard output voltage	V_O		150		mV	1
Saturation output voltage	V_{SAT}	450			mV	2
Sensitivity (Green channel)	R	150	230		mV	3
Resolution (at center)			300		TV line	4
Resolution (at corner)			200		TV line	5
Shading			40		%	6
Difference of center position				±10	%	7
Output transistor drain current	I_{OD}		4.0	8.0	mA	

NOTES :

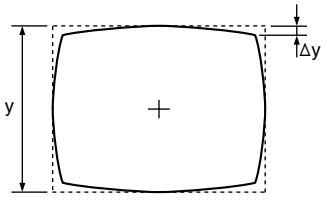
1. The average output voltage of G signal in the central area (H/10, V/10) under uniform illumination.
   The standard exposure conditions are defined as when V_O is 150 mV.
2. The average output voltage of G signal in the central area (H/10, V/10) under 10 times exposure of the standard exposure conditions.
3. The average output voltage of G signal in the central area (H/10, V/10) when a 1 000 lux light source with a white board of 90% reflector is imaged.
4. The resolution in the central area (H/10, V/10) at which the image of the TV resolution chart (ex. EIAJ test chart) can be distinguished on the B/W video monitor when converted into composite video signals.
5. The resolution in the peripheral area (image height : Y = 0.8) under the conditions mentioned above.
6. Defined by the following formula at the brightness of standard output voltage : (Vco/Vce) x 100 [%]
   Vco : Output voltage at edge of the image (at NTSC video output).
   Vce : Output voltage at center of the image (at NTSC video output).
7. The difference between the center position of image and that of the monitor. This is the ratio for the horizontal underscanning monitor size which includes the decentering eccentricity when turning the lens head one time.

LENS SPECIFICATION FOR LZ0P3645★

PARAMETER	SPECIFICATION	NOTE
Construction	2 pcs. (non-spherical, plastic)	
Focal length	1.53 mm [TYP. : reference]	
F No.	2.8±5%	
Viewing angle	H : 115°, V : 89°, Diagonal : 138° [TYP. : reference]	
TV distortion	≤ −14%	1
Focus adjustment range	∞ to 10 cm	2
Torque of focusing	0.00005 to 0.001 N · m	3

NOTES :

1. TV distortion is defined by the formula, (Δy/y) x 100 [%] at capturing rectangular pattern sized horizontal by vertical as 4 by 3.
   "y" is defined as the vertical height of the center of the horizontal line.
   Δy is defined as the difference between the vertical height of the center of the horizontal line and an edge of it.



2. The best focus point of an object can be obtained by turning the lens head within this range.
3. Torques which are necessary for turning the lens.

* Be careful not to remove the lens head by turning it counterclockwise too much when adjusting macro.

CHARACTERISTICS FOR LZ0P3646 (1/30 s progressive scan readout mode)

(T_A : +25 °C, Operating conditions : The typical values specified in **"RECOMMENDED OPERATING CONDITIONS"**. Color temperature of light source : 3 200 K)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Standard output voltage	V_O		150		mV	1
Saturation output voltage	V_{SAT}	450			mV	2
Sensitivity (Green channel)	R	150	230		mV	3
Resolution (at center)		250	300		TV line	4
Resolution (at corner)		150	200		TV line	5
Shading		45	60		%	6
Difference of center position				±10	%	7
Output transistor drain current	I_{OD}		4.0	8.0	mA	

NOTES :

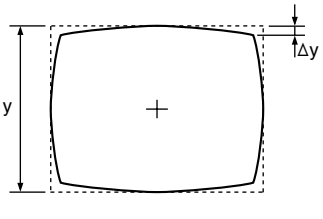
1. The average output voltage of G signal in the central area (H/10, V/10) under uniform illumination.
   The standard exposure conditions are defined as when V_O is 150 mV.
2. The average output voltage of G signal in the central area (H/10, V/10) under 10 times exposure of the standard exposure conditions.
3. The average output voltage of G signal in the central area (H/10, V/10) when a 1 000 lux light source with a white board of 90% reflector is imaged.
4. The resolution in the central area (H/10, V/10) at which the image of the TV resolution chart (ex. EIAJ test chart) can be distinguished on the B/W video monitor when converted into composite video signals.
5. The resolution in the peripheral area (image height : Y = 0.8) under the conditions mentioned above.
6. Defined by the following formula at the brightness of standard output voltage : (Vco/Vce) x 100 [%]
   Vco : Output voltage at edge of the image (at NTSC video output).
   Vce : Output voltage at center of the image (at NTSC video output).
7. The difference between the center position of image and that of the monitor. This is the ratio for the horizontal underscanning monitor size which includes the decentering eccentricity when turning the lens head one time.

LENS SPECIFICATION FOR LZ0P3646

PARAMETER	SPECIFICATION	NOTE
Construction	2 pcs. (non-spherical, plastic)	
Focal length	3.9 mm [TYP. : reference]	
F No.	2.8±5%	
Viewing angle	H : 50°, V : 38°, Diagonal : 60° [TYP. : reference]	
TV distortion	≤ −1.0%	1
Focus adjustment range	∞ to 10 cm	2
Torque of focusing	0.00005 to 0.001 N · m	3

NOTES :

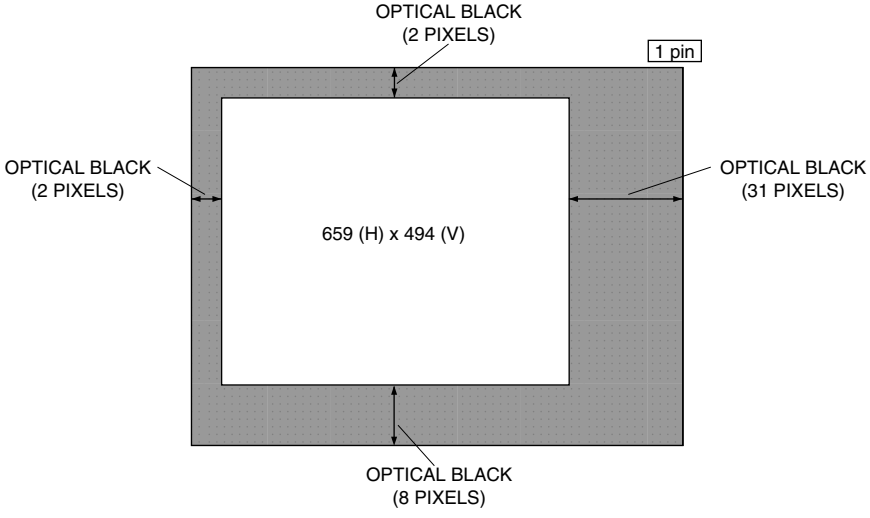
1. TV distortion is defined by the formula, (Δy/y) x 100 [%] at capturing rectangular pattern sized horizontal by vertical as 4 by 3.
   "y" is defined as the vertical height of the center of the horizontal line.
   Δy is defined as the difference between the vertical height of the center of the horizontal line and an edge of it.



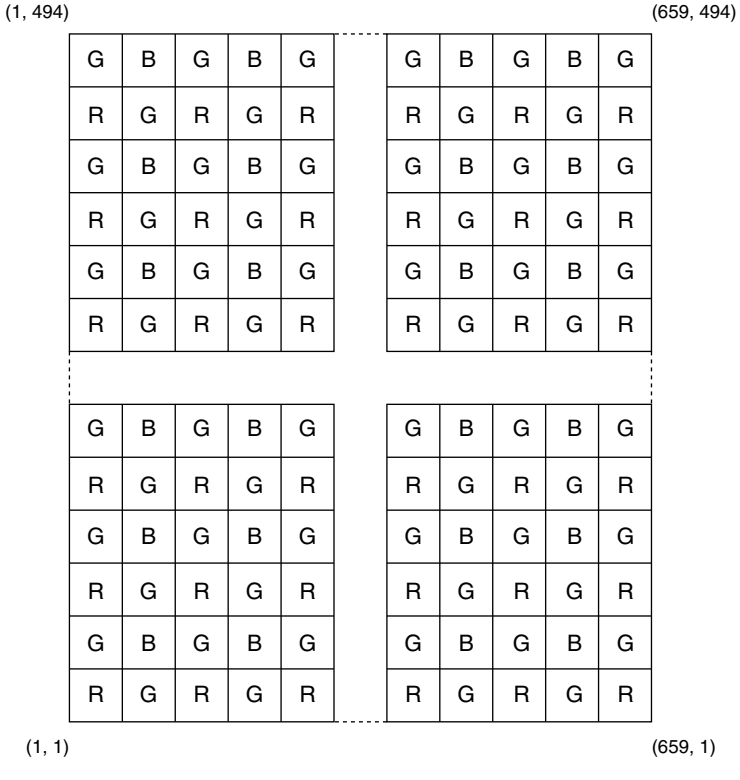
2. The best focus point of an object can be obtained by turning the lens head within this range.
3. Torques which are necessary for turning the lens.

* Be careful not to remove the lens head by turning it counterclockwise too much when adjusting macro.

PIXEL STRUCTURE

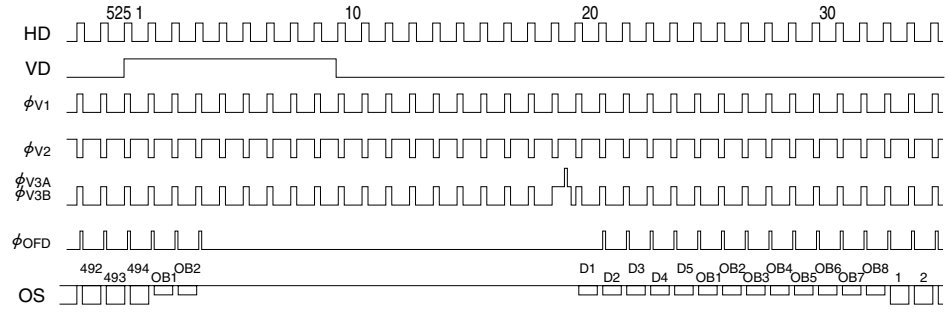


COLOR FILTER ARRAY

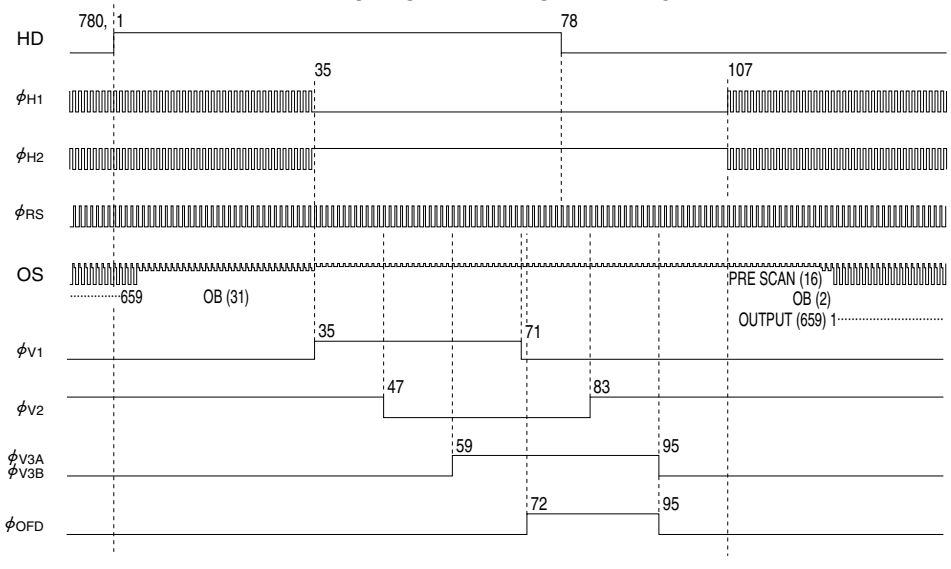


TIMING CHART

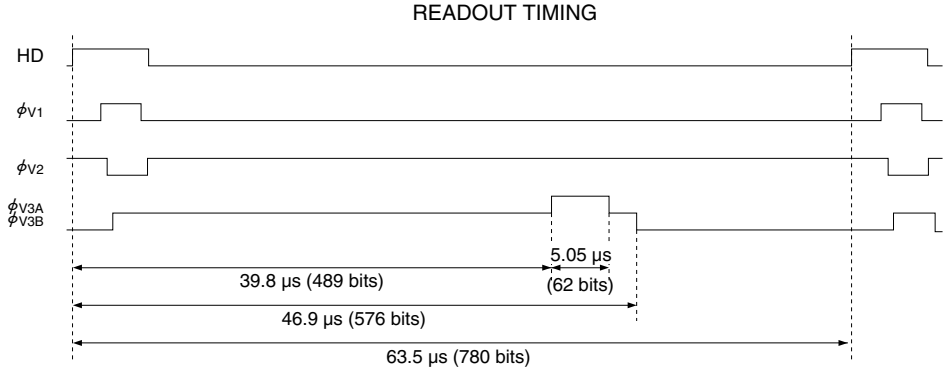
VERTICAL TRANSFER TIMING



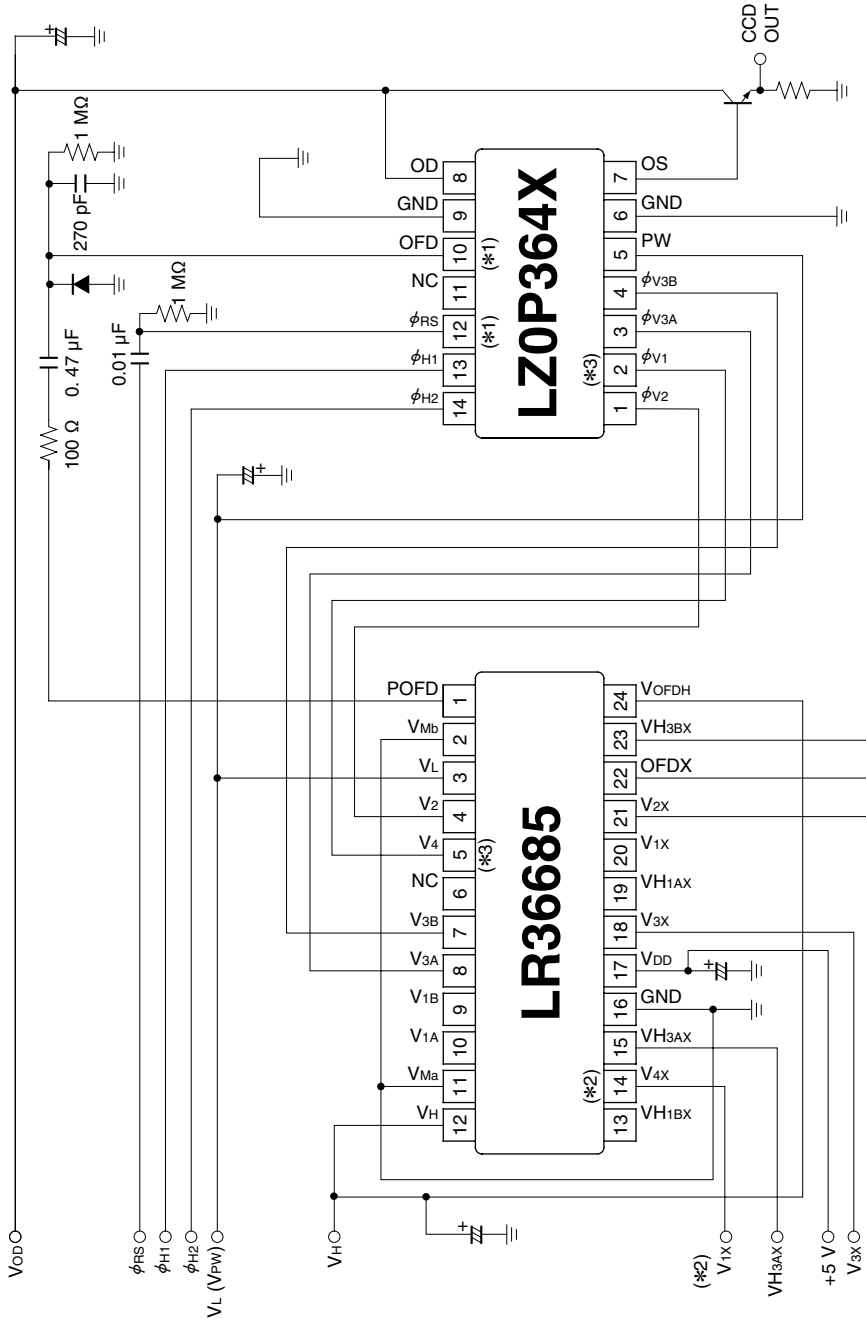
HORIZONTAL TRANSFER TIMING



READOUT TIMING



SYSTEM CONFIGURATION EXAMPLE

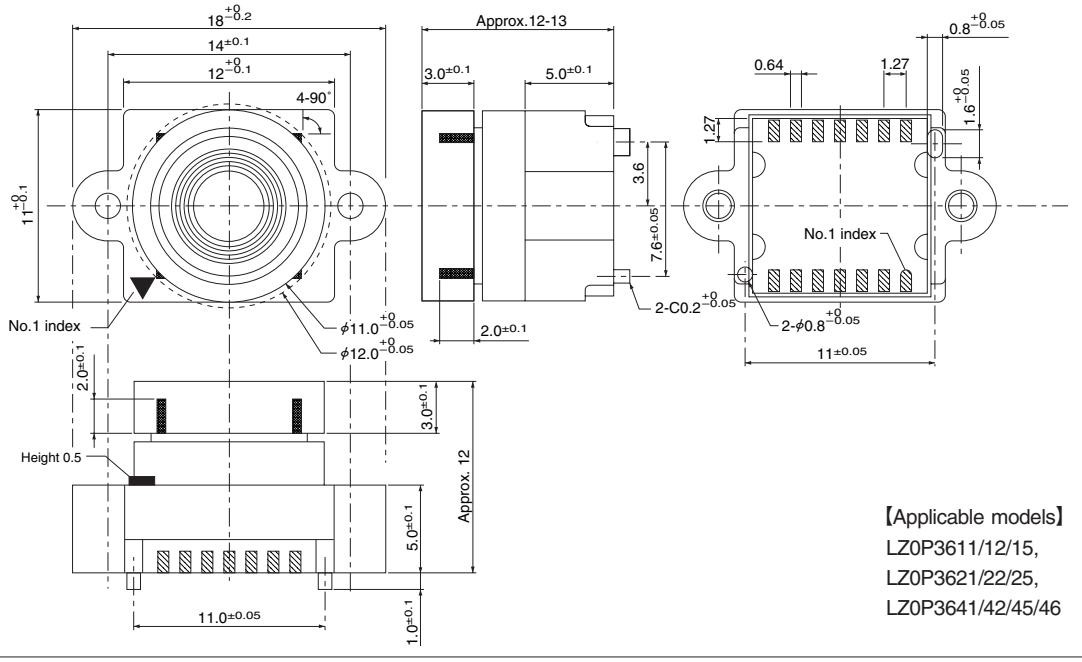


(*1) ϕ_{RS}, OFD :
Use the circuit parameter indicated in this circuit example, and do not connect to DC voltage directly.
(*2) Connect V_{1X} of timing generator to V_{4X} of V driver IC, LR36685.
(*3) Connect V_4 of V driver IC to ϕ_{V1} of LZ0P364X.

PACKAGE

(Unit : mm)

14 WLCC TYPE



【Applicable models】
LZ0P3611/12/15,
LZ0P3621/22/25,
LZ0P3641/42/45/46

PRECAUTIONS FOR BUILT-IN LENS CCD AREA SENSORS

1. Package Breakage

In order to prevent the package, the lens holder, and the lens from being broken, follow the instructions below :

1) The CCD is a precise optical component and the package-base material is ceramic.
   Therefore,
   - Take care not to drop the device when mounting, handling, or transporting.
   - Avoid giving a shock to the package.
     Especially when leads are fixed to the socket or the circuit board, a small shock could break the package more easily than when the package isn't fixed.
2) When adjusting the focus, screw the lens holder to the circuit board before soldering the leads. At that time, make sure to use a circuit board with plenty of strength, and to avoid the package and the lens holder from being broken, the following screw and clamp torque are recommended.
   - Recommended mounting screw :
     ϕ1.7 tapping screw (B-tight type),
     Length, L = the thickness of the circuit board + 5 mm
   - Recommended clamp torque : 0.012 N·m
     [however, when the thickness of the circuit board is thinner than t = 2.0 mm]
3) If any damage or breakage occurs on the surface of the lens, its characteristics could deteriorate.
   Therefore,
   - Do not hit the lens.
   - Do not give a shock large enough to cause distortion.
   - Do not scrub or scratch the surface of the lens.
   – Even a soft cloth or applicator, if dry, could cause dust to scratch the lens.

2. Electrostatic Damage

As compared with general MOS-LSI, CCD has lower ESD. Therefore, take the following anti-static measures when handling the CCD :

1) Always discharge static electricity by grounding the human body and the instrument to be used. To ground the human body, provide resistance of about 1 MΩ between the human body and the ground to be on the safe side.
2) When directly handling the device with the fingers, hold the lens holder and do not touch the lead.
3) To avoid generating static electricity,
   a. do not scrub the device with cloth or plastic.
   b. do not attach any tape or labels.
   c. do not clean the device with dust-cleaning tape.
4) When storing or transporting the device, put it in a container of conductive material.

3. Dust and Contamination

Dust or contamination on the surface of the lens and the inside of the lens holder could deteriorate the output characteristics or cause a scar. In order to minimize dust or contamination on the device, take the following precautions :

1) Do not remove the lens from the body. Especially when adjusting macro, be careful not to remove the lens by turning it counter-clockwise too much.
2) Do not touch the surface of the lens with the fingers. If dust or contamination gets on the surface of the lens, the following cleaning method is recommended :
   - Handle the built-in lens CCD in a clean environment such as a cleaned booth. (The cleanliness level should be, if possible, class 1 000 at least.)