

SHARP

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To: _____

PRELIMINARY SPECIFICATIONS

Product Type 1/5 type solid state color imaging device for PAL system

Model No. LZ2547
(LZ2547F)

*This specifications contains 19 pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

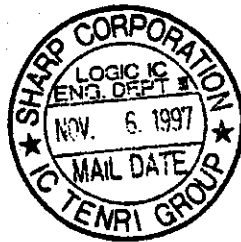
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 - Traffic control systems
 - Gas leak detectors and automatic cutoff devices
 - Rescue and security equipment
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 - Communications equipment for trunk lines
 - Control equipment for the nuclear power industry
 - Medical equipment related to life support, etc.
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- Please direct all queries regarding the products covered herein to a sales representative of the company.

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1. GENERAL

LZ2547F is a 1/5 type (3.6mm) solid state imaging device driven by only 5V single power supply.

Having about 220,000 pixels(horizontal 384 x vertical 582), it allows a stable color image.

1 Features

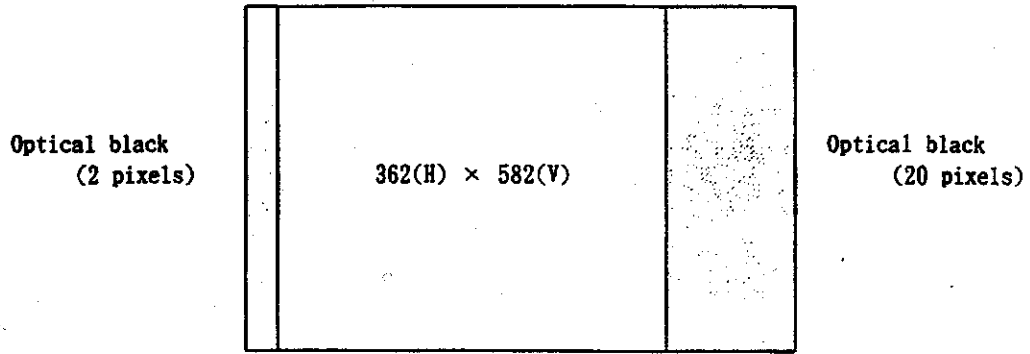
- 1) Number of video picture elements : Horizontal 362 x vertical 582
Pixel pitch : Horizontal 8.2 μm x vertical 3.8 μm
Number of optically black pixel : Horizontal: front 2 and rear 20
- 2) Reduced fixed pattern noise and lag
- 3) No sticking and no image distortion
- 4) Blooming suppression structure
- 5) Built-in output amplifier, voltage generator, pulse mix circuit
- 6) 16-pin half-pitch DIP
(Row space: 11.43mm)
- 7) Variable electronic shutter
- 8) N-type silicon substrate
- 9) Not designed or rated as radiation hardened
- 10) Compatible with PAL standard

2 Applications

- 1) Multi-media cameras
- 2) Monitor cameras (TV doorphone, Video phone, etc.)
- 3) Pattern recognition

※ The circuit diagram and others included in this specification are intended for use to explain typical application examples. Therefore, we take no responsibility for any problem as may occur due to the use of the included circuit and for any problem with industrial proprietary rights or other rights.

**2. COMPOSITION OF PIXELS
AND ARRANGEMENT OF COLOR FILTERS**



(1. 582)

(362. 582)

Ye	Cy	Ye	Cy	Ye
Mg	G	Mg	G	Mg
Ye	Cy	Ye	Cy	Ye
G	Mg	G	Mg	G
Ye	Cy	Ye	Cy	Ye
Mg	G	Mg	G	Mg

Cy	Ye	Cy	Ye	Cy
G	Mg	G	Mg	G
Cy	Ye	Cy	Ye	Cy
Mg	G	Mg	G	Mg
Cy	Ye	Cy	Ye	Cy
G	Mg	G	Mg	G

Ye	Cy	Ye	Cy	Ye
Mg	G	Mg	G	Mg
Ye	Cy	Ye	Cy	Ye
G	Mg	G	Mg	G
Ye	Cy	Ye	Cy	Ye
Mg	G	Mg	G	Mg

Cy	Ye	Cy	Ye	Cy
G	Mg	G	Mg	G
Cy	Ye	Cy	Ye	Cy
Mg	G	Mg	G	Mg
Cy	Ye	Cy	Ye	Cy
G	Mg	G	Mg	G

ODD field

EVEN field

(1. 1)

(362. 1)

3. PIN ASSIGNMENT AND PIN IDENTIFICATION

GND	VCC	$\phi V4$	$\phi V2$	$\phi V3$	$\phi V1$	ϕTG	VD2
16	15	14	13	12	11	10	9
LZ2547F							
▽							
1	2	3	4	5	6	7	8
ϕRS	OS	VD1	OFD	$\phi H2$	$\phi H1$	LOFX	ϕOFD

(TOP VIEW)

Symbol	In/Out	Pin name
VCC	Input	Power supply
OS	Output	Video output
GND	Input	Ground
$\phi V1, \phi V2, \phi V3, \phi V4$	Input	Vertical shift register gate clock (*1)
VD1, VD2	Output	Voltage-generator output (*2)
ϕRS	Input	Reset transistor gate clock (*3)
$\phi H1, \phi H2$	Input	Horizontal shift register gate clock
ϕTG	Input	Transfer gate clock
OFD	Input	Over flow drain (*4)
LOFX	Input	Electronic shutter clock
ϕOFD	Output	Electronic shutter clock (*5)

(*1)~(*5) : Refer to " 8. STANDARD OPERATING CIRCUIT EXAMPLE (P10)".

◆ Do not connect the device to or disconnect it from the plug socket while power is being applied.

4. ABSOLUTE MAXIMUM RATING(T_a = 25°C)

Item	Symbol	Rating	Unit
Power supply	VCC	0 to 7.3	V
Overflow drain voltage	V OFD	0 to 35	V
Reset gate clock p-p level	V ϕRS	0 to VCC	V
Vertical shift register clock p-p level	V ϕV	0 to VCC	V
Horizontal shift register clock voltage	V ϕH	0 to VCC	V
Electronic shutter clock voltage	V LOFX	0 to VCC	V
Transfer gate clock voltage	V ϕTG	0 to VCC	V
Storage temperature	T stg	-40 to +85	°C
Operating ambient temperature (*)	T opr	0 to +60	°C

(*) Operating ambient temperature is restricted within 0 to +60°C (at 15.5±0.5V) by characteristic of zener diode as shown " 8. STANDARD OPERATING CIRCUIT EXAMPLE (P10)".

5. RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Minimum	Typical	Maximum	Unit
Operating ambient temperature	T _{opr}		25.0		°C
Power supply voltage	V _{CC}	4.75	5.0	5.25	V
Overflow drain voltage	When DC is applied	V _O FD	3.0 (adjust)	16.0	V
	When pulse is applied p-p level	V _φ OFD		16.0	V
Ground voltage	GND		0.0		V
Reset gate clock					
	p-p level	V _φ RS		V _{CC}	V
Vertical shift register clock					
	p-p level	V _φ V1-4		V _{CC}	V
Horizontal shift register clock	LOW level	V _φ H1-2L		0.0	V
	HIGH level	V _φ H1-2H		V _{CC}	V
Transfer gate clock	LOW level	V _φ TGL		0.0	V
	HIGH level	V _φ TGH		V _{CC}	V
Electronic shutter clock	LOW level	V _L OFLXL		0.0	V
	HIGH level	V _L OFLXH		V _{CC}	V
Vertical shift register clock freq.	f _φ V1-4		15.63		kH z
Horizontal shift register clock freq.	f _φ H1-2		6.75		MH z
Reset gate clock freq.	f _φ RS		6.75		MH z

6. CHARACTERISTICS

No.	Item	Symbol	Note	Min.	Typ.	Max.	Unit
1	Photo response non-uniformity	PRNU	(a)			15	%
2	Saturation signal	V _{sat}	(b)	450			mV
3	Dark output voltage	V _{dark}	(c)		0.5		mV
4	Dark signal non-uniformity	DSNU	(d)		0.5		mV
5	Sensitivity	R	(e)		170		mV
6	Smear ratio	SMR	(f)		-85		dB
7	Image lag	AI	(g)			1.0	%
8	Blooming suppression ratio	ABL	(h)	1000			
9	Current dissipation	I _{oo}			4.0	8.0	mA
10	Output impedance	R _o			400		Ω
11	Vector breakup		(i)			10.0	°, %
12	Line crawling		(j)			3.0	%
13	Luminance flicker		(k)			2.0	%

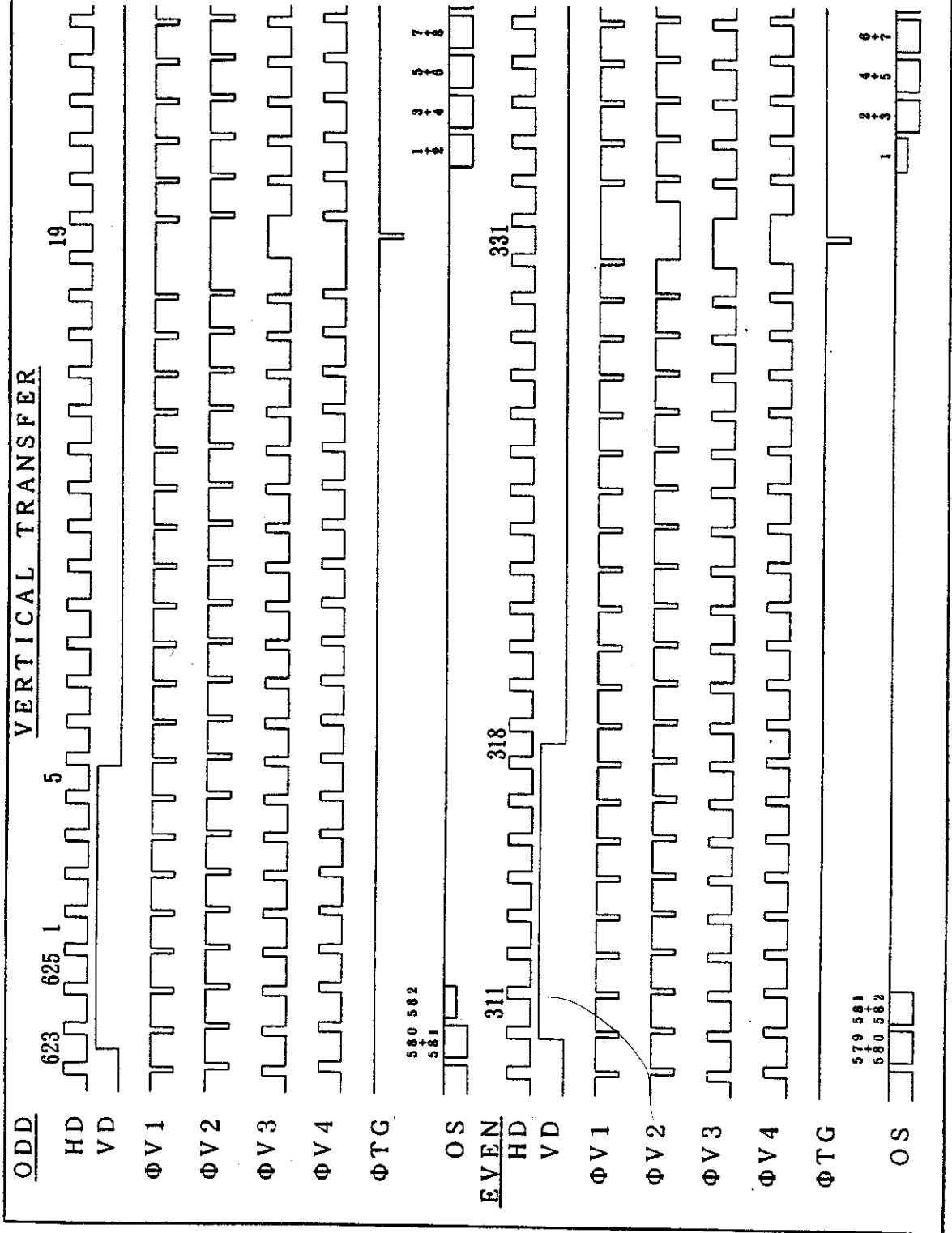
【 Conditions 】

- Drive method : Field accumulation.
- DC and AC conditions : the typical values under the recommended operating conditions.
- T_a : +25°C. but +60°C for Item No. 3 and 4.
- Temperature of light source : 3200 K.
Infrared absorbing filter (CM-500, 1 mm) is used.

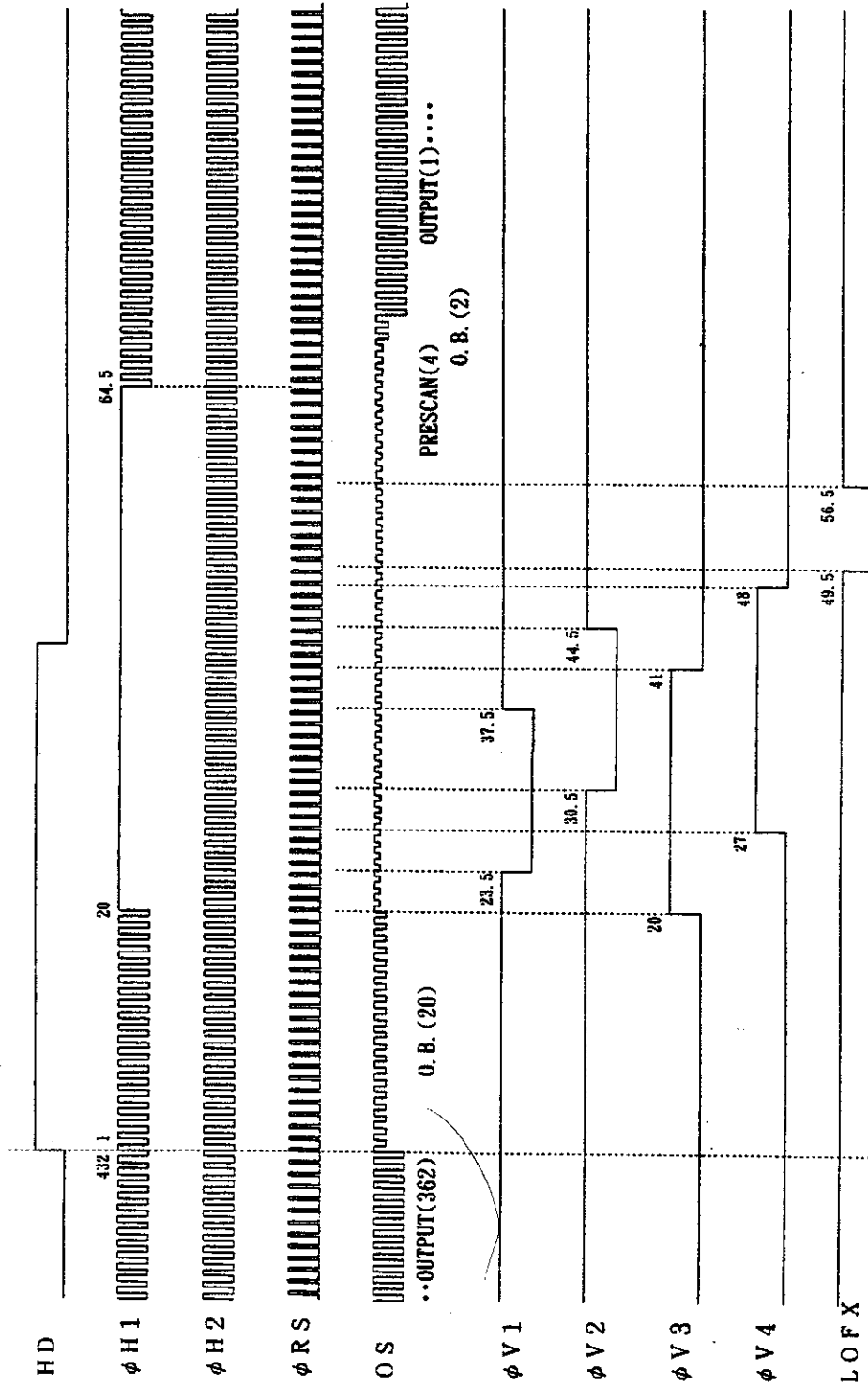
【 Notes 】

- The standard output voltage is defined as 150 mV by the average output voltage under uniform illumination.
 - The standard exposure level is defined when the average output voltage is 150 mV under uniform illumination.
 - VOFD is adjusted to the minimum voltage with that ABL satisfy the specification or to the value displayed on the device.
- (a) The image area is divided into 10 x 10 segments. The voltage of a segment is the average of output voltage from all the pixels within the segment. PRNU is defined by $(V_{max} - V_{min}) / V_o$, where V_{max} and V_{min} are the maximum and the minimum values of each segment's voltage respectively, when the average output voltage V_o is 150 mV.
- (b) The image area is divided into 10 x 10 segments. The saturation signal is defined as the minimum of each segment's voltage which is the average of output voltage from all the pixels within the segment, when the exposure level is set as 10 times, compared to standard level.
- (c) The average output voltage under a non-exposure condition.
- (d) The image area is divided into 10 x 10 segments. DSNU is defined by $(V_{dmax} - V_{dmin})$ under the non-exposure condition where V_{dmax} and V_{dmin} are the maximum and the minimum values of each segment's voltage, respectively, that is the average output voltage over all pixels in the segment.
- (e) The average output voltage when a 1000 lux light source attached with a 90% reflector is imaged by a lens of F4, f50 mm.
- (f) The sensor is adjusted to position a V/10 square at the center of image area where V is the vertical length of the image area. SMR is defined by the ratio of the output voltage detected during the vertical blanking period to the maximum of the pixel voltage in the V/10 square.
- (g) The sensor is exposed at the exposure level corresponding to the standard condition preceding non-exposure condition. AI is defined by the ratio between the output voltage measured at the 1st field during the non-exposure period and the standard output voltage.
- (h) The sensor is adjusted to position a V/10 square at the center of image area. ABL is the ratio between the exposure at the standard condition and the exposure at a point where a blooming is observed.
- (i) Observed with a vector scope when the color bar chart is imaged under the standard exposure condition.
- (j) The difference between the average output voltage of the (Mg+Ye), (G+Cy) line and the (Mg+Cy), (G+Ye) line under the standard exposure condition.
- (k) The difference between the average output voltage of the odd field and the even field.

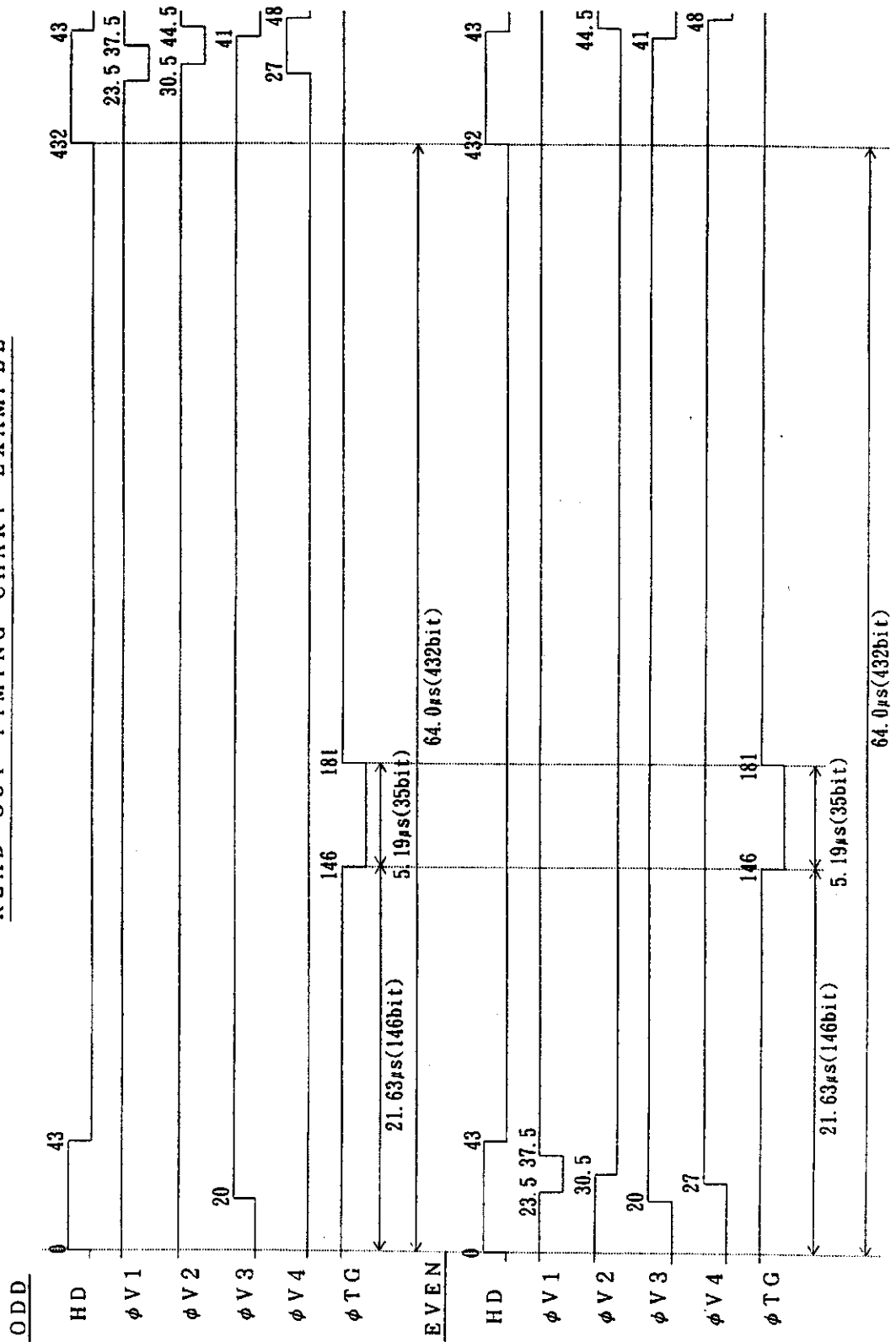
7. TIMING DIAGRAM EXAMPLE



HORIZONTAL TRANSFER TIMING CHART EXAMPLE

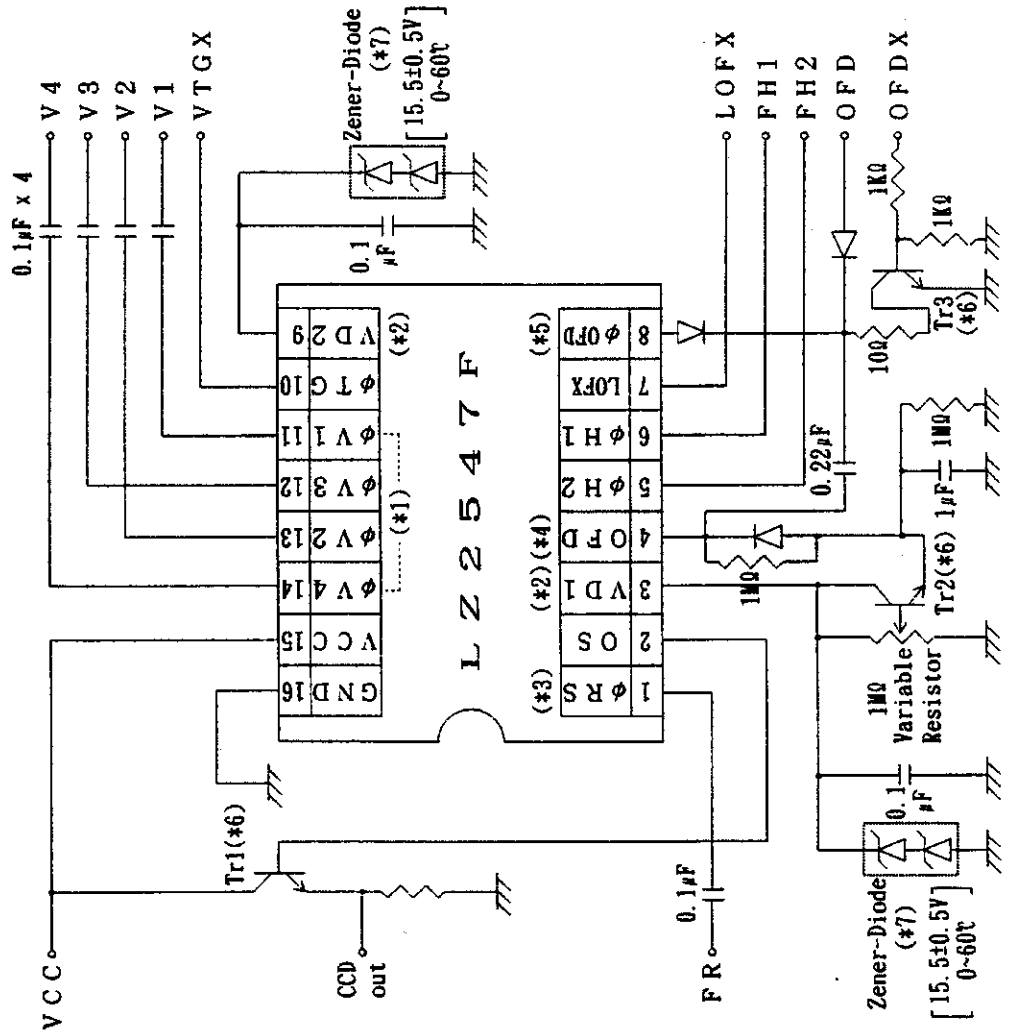


READ OUT TIMING CHART EXAMPLE



8. STANDARD
OPERATING
CIRCUIT
EXAMPLE

- (*1) V1-V4: Input the clock through a 0.1 μ F capacitor.
- (*2) VD1, VD2: Connect to GND through a 0.1 μ F capacitor and a zener-diode (15.5 \pm 0.5V).
VD1: Connect to GND through a 1M Ω variable resistor.
- (*3) VRS: Input the clock through a 0.1 μ F capacitor.
- (*4) OFD: Supply DC voltage with a following emitter-follower circuit (with a 1M Ω emitter resistance).
- collector connects VD1
- emitter connects OFD through a diode
- base connects a 1M Ω variable resistor
- (*5) OFD: Connect to OFD through a diode and a 0.22 μ F capacitor.
- (*6) Tr1: Use transistor for RF amplifier.
Tr2: Use transistor for RF amplifier.
Tr3: Use transistor for high speed switching.
- (*7) Use zener-diode with 15.5 \pm 0.5V (0 to 60 $^{\circ}$ C) zener voltage.
[2-serial connection is recommended using small temperature coefficient zener-diode with around 7.5V zener voltage.]



9. SPECIFICATION FOR BLEMISH

1) Definition of blemish

Blemish	Level of blemish (mV)	Permitted number of blemish	COMMENT
White blemish(I) (Exposed)	$25 \leq B$	0	<ul style="list-style-type: none"> • B is defined in fig. 9(a). • $V_{out} = 75mV$. • $M + N = 10$.
	$15 \leq B < 25$	M	
	$B < 15$	no count	
Black blemish(I) (Exposed)	$25 \leq B$	0	
	$15 \leq B < 25$	N	
	$B < 15$	no count	
White blemish(II) (Non-exposed)	$12 \leq B$	0	<ul style="list-style-type: none"> • B is defined in fig. 9(b). • Non-exposure condition.
	$B < 12$	no count	
White blemish(III) (Shutter mode)	$5.5 \leq B$	0	<ul style="list-style-type: none"> • B is defined in fig. 9(a). • $V_{out} = 15mV$. • The electronic shutter speed is set at 1/10000 s
	$B < 5.5$	no count	
Black blemish(III) (Shutter mode)	$5.5 \leq B$	0	
	$B < 5.5$	no count	

B : Blemish level defined in fig. 9.
 V_{out} : Average output voltage

2) Measuring condition

1. Operating temperature : 60°C
2. Measuring area : Measurement excludes the outer 10 pixels; includes the optical black pixels.

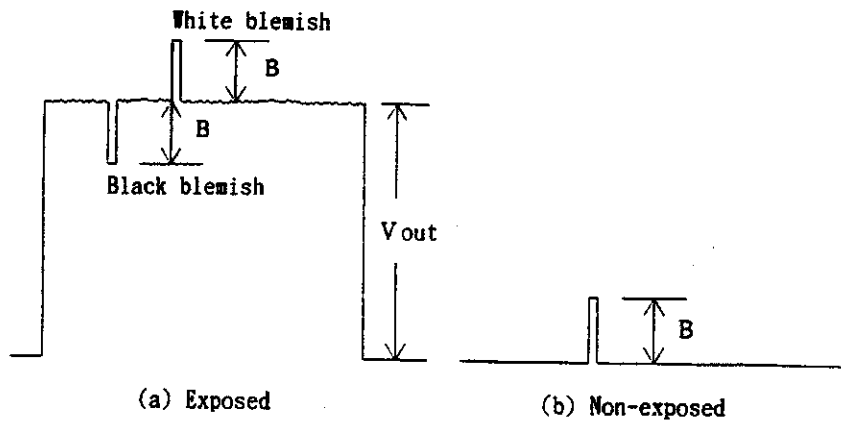


fig. 9 Definition of the blemish level

10. CAUTIONS FOR USE

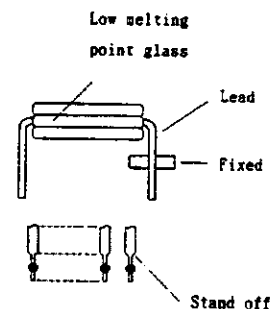
10.1 Package Breakage

In order to prevent the package from being broken, observe the following instructions:

- 1) The CCD is a precision optical component and the package 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 and the circuit board, small shock could break the package more easily than when the package isn't fixed.
- 2) When applying force for mounting the device or any other purposes, fix the leads between a joint and a stand-off, so that no stress will be given to the jointed part of the lead. In addition, when applying force, do it at a point below the stand-off part.
 - ... The leads of the package are fixed with low melting point glass, so stress added to a lead could cause a crack in the low melting point glass in the jointed part of that lead.
- 3) When mounting the package on the housing, be sure that the package is not bent.
 - ... If a bent package is forced into place between a hard plate or the like, the package may be broken.

Example for mounting

 - * Place the buffers between the package and the housing.
 - * Keep the bottom side of the package free.
- 4) If any damage or breakage occur on the surface of the glass cap, its characteristics could deteriorate. Therefore,
 - * Do not hit the glass cap.
 - * Do not give a shock large enough to cause distortion.
 - * Do not scrub or scratch the glass surface. Even a soft cloth or applicator, if dry, could cause dust to scratch the glass.



10.2 Electrostatic damage

As compared with general MOS-LSI, CCD has lower ESD.

Therefore, please 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 Meg ohm between the human body and the ground to be on the safe side.
- 2) When directly handling the device with fingers, hold the part without leads and do not touch any lead.
- 3) To avoid generating static electricity,
 - a. do not scrub the glass surface with cloth or plastic
 - b. do not attach any tape or labels
 - c. do not clean the glass surface with dust-cleaning tape
- 4) When storing or transporting the device, put it in a container of conductive material.

10.3 Dust and contamination

Dust or contamination on the glass surface could deteriorate the output characteristic or cause a scar. In order to minimize dust or contamination on the glass surface, take the following precautions:

- 1) Handle CCD in a clean environment such as a cleaned booth.
(The cleanliness level should be, if possible, class 1000 at least.)
- 2) Do not touch the glass surface with fingers. If dust or contamination gets on the glass surface, the following cleaning method is recommended:
 - * Dust from static electricity should be blown off with an ionized air blower. For anti-electrostatic measures, however, ground all the leads on the device before blowing off the dust.
 - * The contamination on the glass surface should be wiped off with a clean applicator soaked in Isopropyl alcohol. Wipe slowly and gently in one direction only.
 - ... Frequently replace the applicator and do not use the same applicator to clean more than one device.

Note: In most cases, dust and contamination are unavoidable, even before the device is first used. It is, therefore, recommended that the above procedures should be taken to wipe out dust and contamination before using the device.

10.4 Cautions

- 1) Soldering should be manually performed within 5 seconds at 350°C maximum at soldering iron.
- 2) Avoid using or storing the CCD at high temperature or high humidity as it is a precision optical component. Do not give a mechanical shock to the CCD.
- 3) Do not connect the device to or disconnect it from the plug socket while power is being applied.
- 4) The exit pupil position of lens should be more than 25mm from the top surface of CCD.

1 1 PACKAGE OUTLINE AND PACKING SPECIFICATION

1. Package Outline Specification

Refer to attached drawing

(The seal resin stick out from the package shall be passed. And, the seal resins are two kinds of colors, white and transparency.)

2. Markings

Marking contents

- (1) Product name : L Z 2 5 4 7
- (2) Company name : S H A R P
- (3) Country of origin : J A P A N
- (4) Date code : Y Y W W X X X

Denotes the production ref. code.(1 ~ 2 figures)

Denotes the production day of the week.

1	2	3	4	5	6	7
SUN.	MON.	TUE.	WED.	THU.	FRI.	SAT.

Denotes the production week.

(01,02,03, ,52,53)

Denotes the production year.

(Lower two digits of the year.)

- (5) Over flow drain : E E Denotes the corresponding code of over flow drain voltage.

Positions of markings are shown in the package outline drawing .

But, markings shown in that drawing are not provided any measurements of their characters and their positions.

3. Packing Specification

3 - 1. Packing materiales

Material Name	Material Spec.	Purpose
Cover tape	Plastic film(1device/tape)	Glass lid covering
Device case	Cardboard(150devices/case)	Device tray fixing
Device tray	Conductive plastic (50devices/tray)	Device packing(3trays/case)
Cover tray	Conductive plastic(1tray/case)	Device packing
PP band	Polypropylene	Device tray fixing
Buffer	Cardboard(2sheets/case)	Shock absorber of device tray
Plastic film bag	Plastic film	Device tray fixing
Tape	Paper	Sealing plastic film bag and device case
Label	Paper	Indicates part number, quantity and date of manufacture

3 - 2. External appearance of packing

Refer to attached drawing

4. Precaution

- 1) Before unpacking, confirm the imports of the chapter "Handling Precaution" in this device specifications.
- 2) Unpacking should be done on the stand treated with anti-ESD. At that time, the same anti-ESD treatment should be done to operator' s body, too.
- 3) Printer' s ink of over flow drain voltage isn' t solvent-proof, so it is possible to be defaced by using a solvent.

ISSUE NUMBER	(NOTE)
7A281ADC	

5. Corresponding code of over flow drain voltage
Contents of the corresponding code

Numerical value of over flow drain voltage (V) (Down to one decimal place)		Corresponding code of over flow drain voltage (English alphaner and numeral of two figures)	
Integral value	3.	One figure	3
	4.		4
	5.		5
	6.		6
	7.		7
	8.		8
	9.		9
	10.		A
	11.		B
	12.		C
	13.		D
	14.		E
	15.		F
16.	G		
17.	H		
18.	J		
19.	K		
20.	L		
Decimal value	. 0	Two figures	0
	. 1		1
	. 2		2
	. 3		3
	. 4		4
	. 5		5
	. 6		6
	. 7		7
	. 8		8
	. 9		9

Example of the corresponding code

Numerical value of voltage : 9. 5 (V) → Corresponding code of voltage : 9 5
 14. 3 (V) → E 3

