SHARP

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To ;

PRELIMINARY

SPECIFICATIONS

Product Type 1/3-type Color CCD Area Sensor with 410k Pixels for NTSC

LZ2353B

Model No.

※This specifications contains 18 pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

DATE:

BY:

PRESENTED

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IC Development Center
Integrated Circuits Group
SHARP CORPORATION

SHARP CORPORATION
LOGIC IC ENG. DEPT III
OCT. 31. 1996
MAIL DATE
IC TEAM GROUP

CONTENTS

【Note】

The contents of this specification may be changed due to an improvement in characteristics or any other reason. 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.

This product is designed to be used in electrical products such as office equipment, audio-visual equipment and other consumer products. You are requested to contact Sharp Corporation if you intend to use this product for specific applications such as automobiles, trains or aircraft which have critical control or safety requirements, antidisaster, anticrime systems or any other applications which require extremely high reliability. This product shall not be used in any medical equipment which affects human life.

1. GENERAL DESCRIPTION

LZ2353B is a 1/3-type(6mm) solid-state image sensor consists of PN phote-diodes and CCDs(charge-coupled devices). Having approximately 410,000 pixels(horizontal 811 x vertical 507), the sensor provides a high resolution stable color image.

Features

1) Number of image pixels : Horizontal 768 x vertical 494
   Pixel pitch : Horizontal 6.4 μm x vertical 7.5 μm
   Number of optical black pixels : Horizontal; front 3 and rear 40
   Vertical ; front 11 and rear 2
2) Complementary color filter composed of Mg, G, Cy, and Ye
3) Low fixed pattern noise and lag
4) No burn-in and no image distortion
5) Blooming suppression structure
6) Built-in output amplifier
7) 16-pin half-pitch DIP
   (Row space: 11.43 mm)
8) Variable electronic shutter(1/60 to 1/10000 s)
9) N-type silicon substrate, N-MOS process
10) Not designed or rated as radiation hardened
11) Compatible with NTSC standard

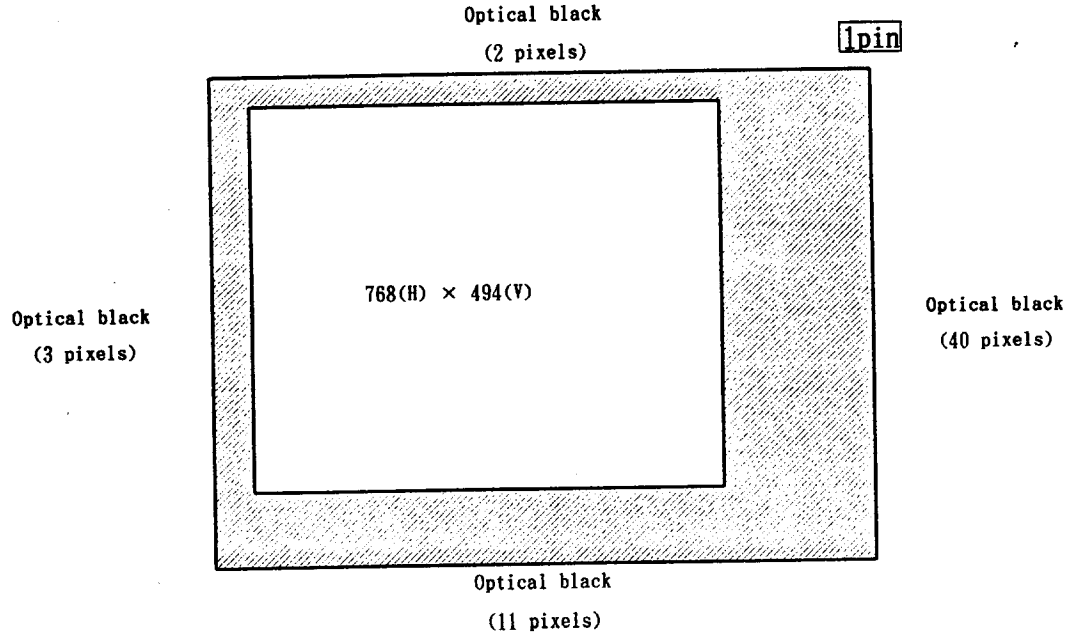
Applications

1) Cameras(Cam corders, industrial monitor cameras, etc.)
2) Pattern recognition

Others

Combined with the timing IC(LZ95D42/M or LZ95D43/M), SSG IC(LZ93N33 or LZ95D52), V driver IC(LR36683N), and sample/hold IC(IR3P66), this product operates under the performance satisfying these specifications.

2. ARRANGEMENT OF PIXELS AND COLOR FILTERS



(1, 494) (768, 494)

Cy	Ye	Cy	Ye	Cy
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

Ye	Cy	Ye	Cy	Ye
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

Cy	Ye	Cy	Ye	Cy
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

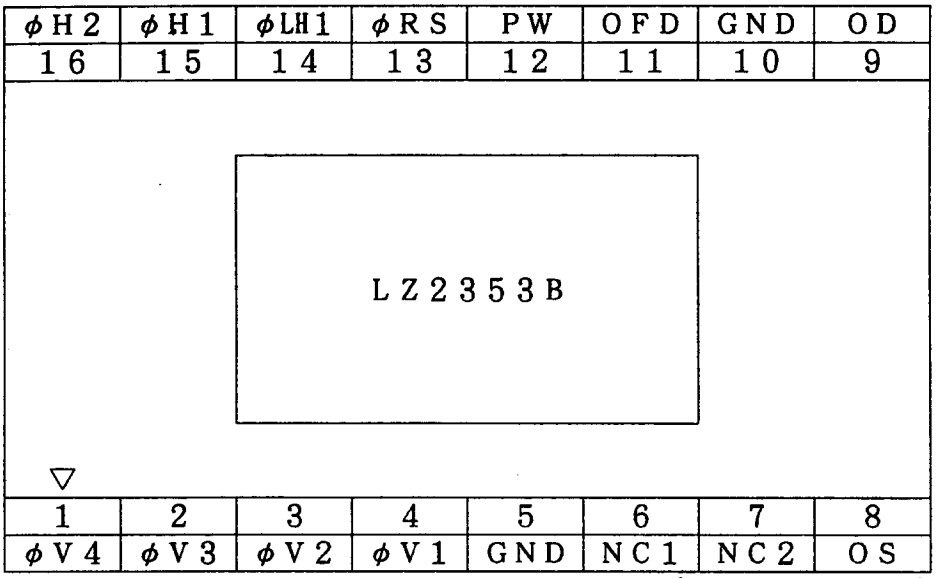
ODD field

Ye	Cy	Ye	Cy	Ye
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

EVEN field

(1, 1) (768, 1)

3. PIN IDENTIFICATION



(TOP VIEW)

Symbol	Pin name
OD	Output transistor drain
OS	Video output
φRS	Reset transistor clock
φV1, φV2, φV3, φV4	Vertical shift register clock
φH1, φH2	Horizontal shift register clock
φLH1	Horizontal shift register final stage clock
OFD	Overflow drain
PW	P well
GND	Ground
NC1, NC2	Non connection

4. ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

Parameter	Symbol	Ratings	Unit
Output transistor drain voltage	VOD	0～+18	V
Reset gate clock voltage	Vφ RS	−0.3～+18	V
Vertical shift register clock voltage	Vφ V	VPW～+18	V
Horizontal shift register clock voltage	Vφ H	−0.3～+18	V
Horizontal shift register final stage clock voltage	Vφ LH	−0.3～+18	V
Overflow drain voltage	VOFD	0～+55	V
Voltage difference between Pwell and clock (* Note)	VPW-Vφ	−28～ 0	V
Storage temperature	Tstg	−20～+80	℃
Operating ambient temperature	Topr	−20～+70	℃

* Note: The OFD clock ϕ_{OFD} is excluded.

5. RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	Minimum	Typical	Maximum	Unit
Operating ambient temperature		Topr		25.0		℃
Output transistor drain voltage		VOD	14.5	15.0	16.0	V
Overflow drain voltage	When DC is applied (note1)	VOFD	5.0		19.0	V
	When pulse is applied p-p level (note2)	$V\phi_{OFD}$	21.5			V
Ground		GND		0.0		V
P well voltage		VPW	-10.0		VφVL	V
Vertical shift register clock LOW level		Vφ V1L, Vφ V3L Vφ V2L, Vφ V4L	-9.5	-9.0	-7.5	V
Vertical shift register clock INTERMEDIATE level		Vφ V1I, Vφ V3I Vφ V2I, Vφ V4I		0.0		V
Vertical shift register clock HIGH level		Vφ V1H, Vφ V3H	14.5	15.0	17.0	V
Horizontal shift register clock LOW level		Vφ H1L, Vφ H2L	-0.05	0.0	0.05	V
Horizontal shift register clock HIGH level		Vφ H1H, Vφ H2H	4.7	5.0	6.0	V
Horizontal shift register final stage clock LOW level		VφLH1L	-0.05	0.0	0.05	V
Horizontal shift register final stage clock HIGH level		VφLH1H	4.7	5.0	6.0	V
Reset gate clock LOW level		VφRSL	0.0		VOD-14.0	V
Reset gate clock HIGH level		VφRSH	VOD-9.5		10.0	V
Vertical shift register clock frequency		fφ V1, fφ V2 fφ V3, fφ V4		15.73		kHz
Horizontal shift register clock frequency		fφ H1, fφ H2 fφ LH1		14.32		MHz
Reset gate clock frequency		fφ RS		14.32		MHz

* Connect NC1 and NC2 to GND directly or through a capacitor lager than 0.047μF.

(note1) When DC voltage is applied, shutter speed is 1/60 second.
(note2) When pulse is applied, shutter speed is less than 1/60 second.

6. CHARACTERISTICS (Drive method : Field accumulation)

Ambient temperature : +25℃, but +60℃ for parameter No. 4 and 5, 13.
Operating conditions : the typical values specified in recommended conditions.
Color Temperature of light source : 3200K / IR cut-off filter(CM-500, 1mmt) is used.

No.	Parameter	Symbol	Note	Minimum	Typical	Maximum	Unit
1	Standard output voltage	Vo	(a)		150		mV
2	Photo response non-uniformity	PRNU	(b)			10	%
3	Saturation output voltage	Vsat	(c)	700			mV
4	Dark output voltage	Vdark	(d)		0.5	3.0	mV
5	Dark signal non-uniformity	DSNU	(e)		0.5	2.0	mV
6	Sensitivity	R	(f)	260	350		mV
7	Smear ratio	SMR	(g)		-84	-76	dB
8	Image lag	AI	(h)			1.0	%
9	Blooming suppression ratio	ABL	(i)	1000			
10	Current dissipation	IOD			4.0	8.0	mA
11	Output impedance	Ro			350		Ω
12	Dark noise	Vnoise	(j)		0.2	0.3	mV
13	OB difference in level		(k)			1.0	mV
14	Vector breakup		(l)			5.0	°, %
15	Line crawling		(m)			1.5	%
16	Lumminance flicker		(n)			2.0	%

【Note】

(a) The average output voltage under the uniform illumination. The standard exposure condition is defined when Vo is 150 mV.

(b) The image area is divided into 10 x 10 segments under the standard exposure condition. The voltage of a segment is the average output voltage of all pixels within the segment. PRNU is defined by (Vmax - Vmin) / Vo, where Vmax and Vmin are the maximum and minimum values of each segment's voltage respectively.

(c) The image area is divided into 10 x 10 segments. The segment's voltage is the average output voltages of all pixels within the segment. Vsat is the minimum segment's voltage under 10 times exposure of the standard exposure condition.

(d) The average output voltage under the non-exposure condition.

(e) The image area is divided into 10 x 10 segments under the non-exposure condition. DSNU is defined by (Vdmax - Vdmin), where Vdmax and Vdmin are the maximum and minimum values of each segment's voltage respectively.

(f) The average output voltage when a 1000 lux light source with a 90% reflector is imaged by a lens of F4, f50 mm.

(g) The sensor is exposed only in the central area of V/10 square with a lens at F4, where V is the vertical image size. SMR is defined by the ratio of the output voltage detected during the vertical blanking period to the maximum of the output voltage in the V/10 square.

(h) The sensor is exposed at the exposure level corresponding to the standard 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.

(i) The sensor is exposed only in the central area of V/10 square, where V is the vertical image size. ABL is the ratio between the exposure at the standard condition and the exposure at a point where a blooming is observed.

(j) The RMS value of the dark noise (after CDS). (100k ~ 4.2MHz, SC Trap on.)

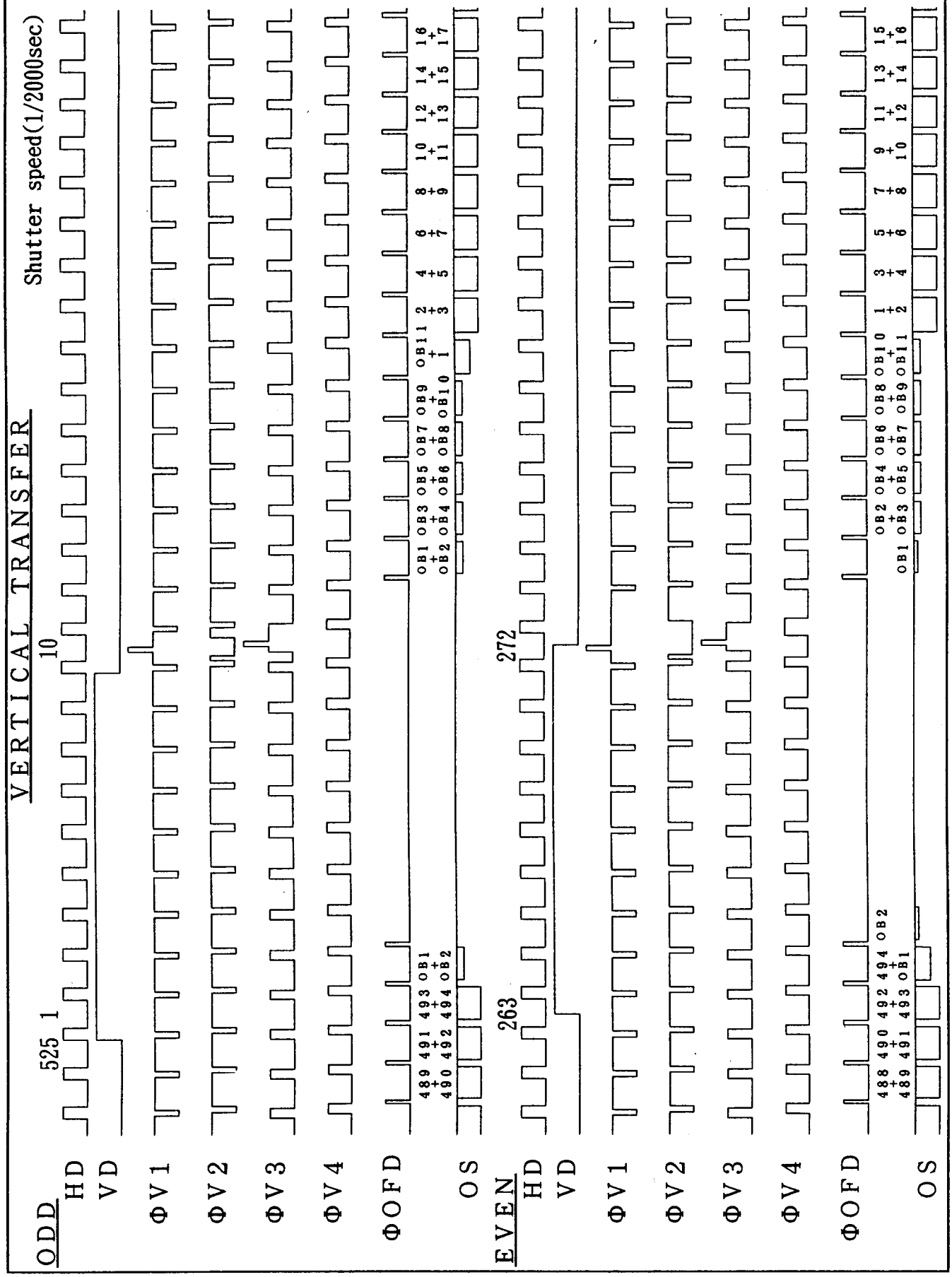
(k) The difference of the average output voltage between the effective area and the OB area under the non-exposure condition.

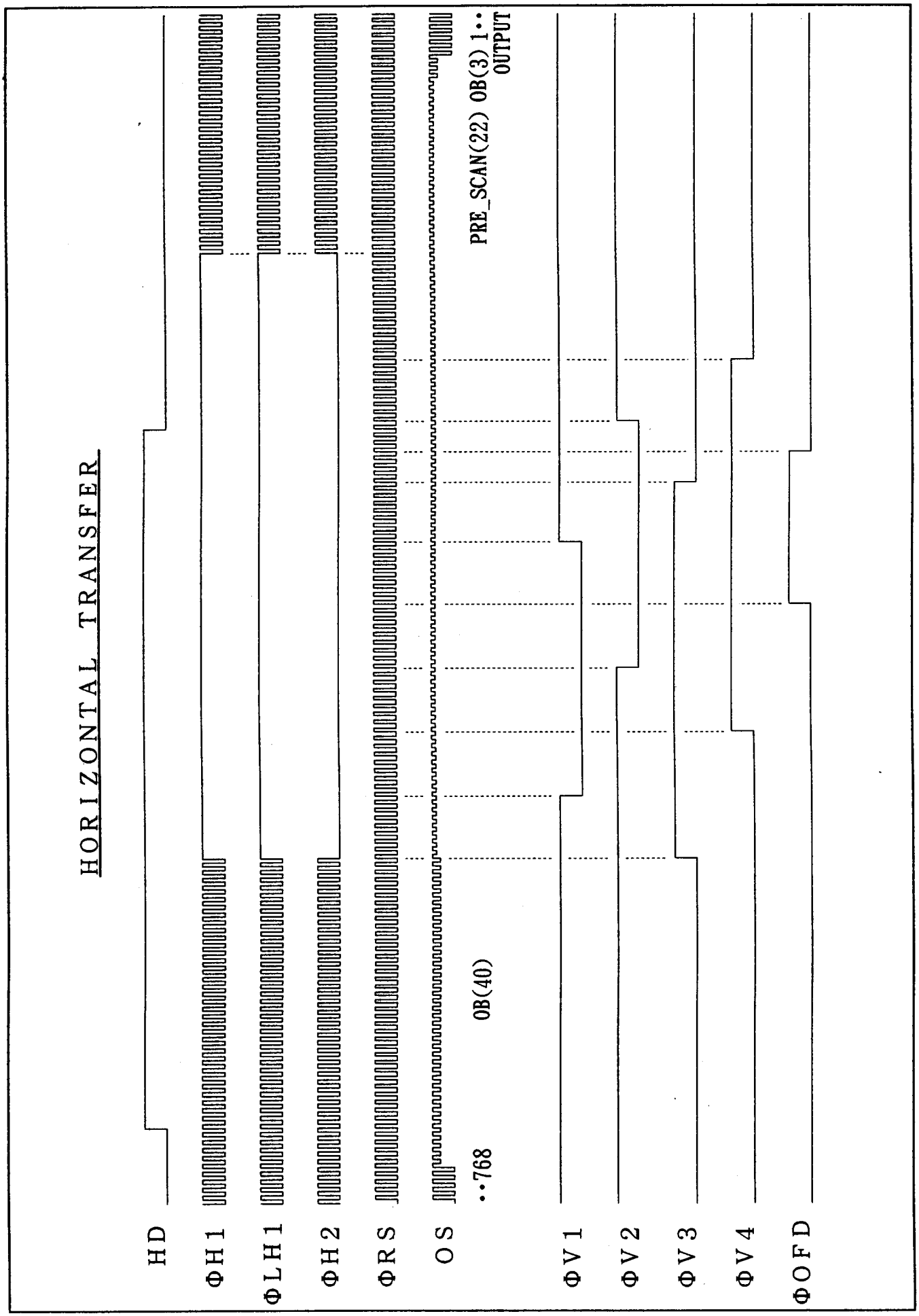
(l) Observe with a vector scope when the color bar chart is imaged under the standard exposure condition.

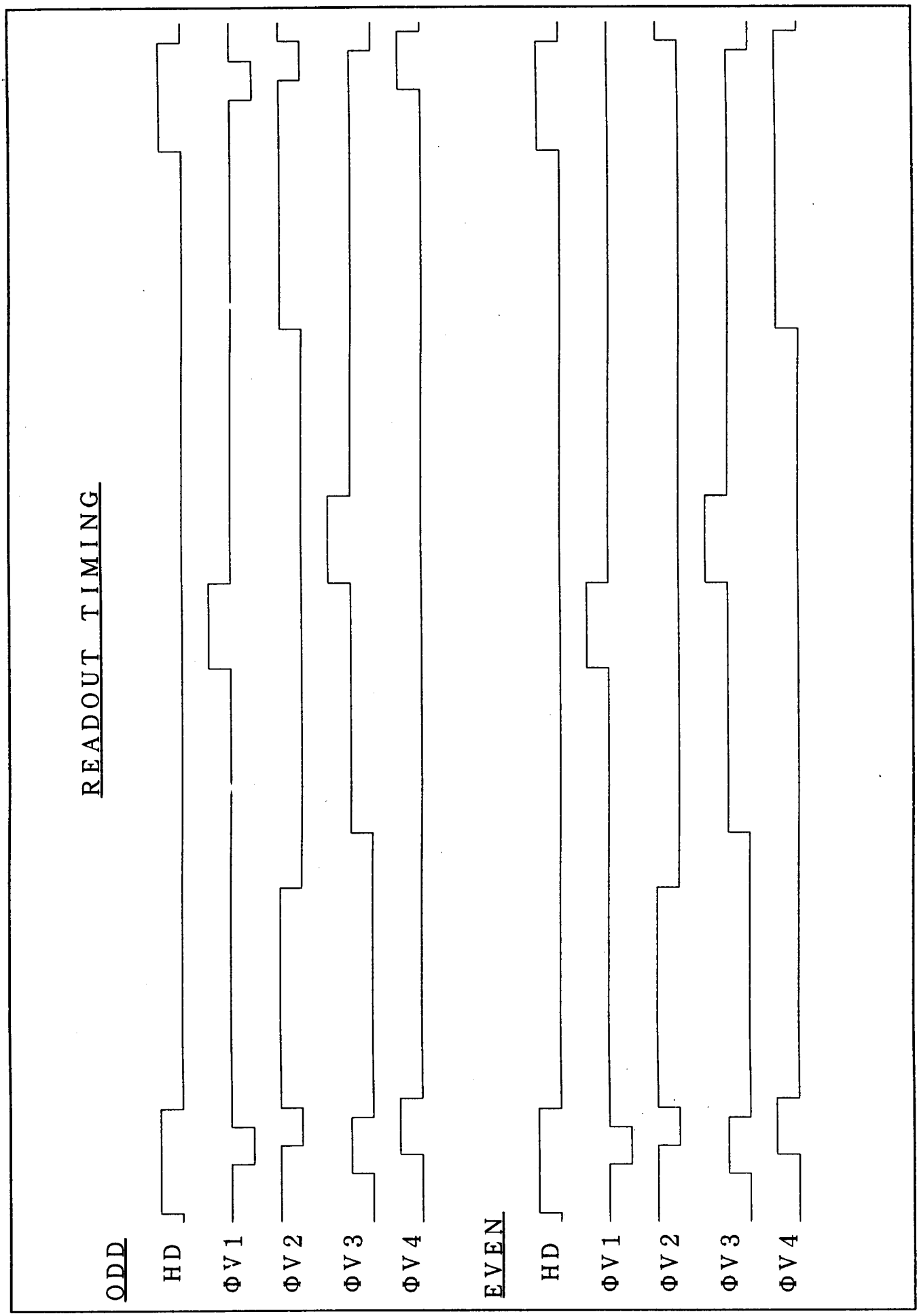
(m) The difference of the average output voltage between the (Mg+Cy), (G+Ye) line and the (Mg+Cy), (G+Ye) line under the standard exposure condition.

(n) The difference of the average output voltage between odd field and even field under the standard exposure condition.

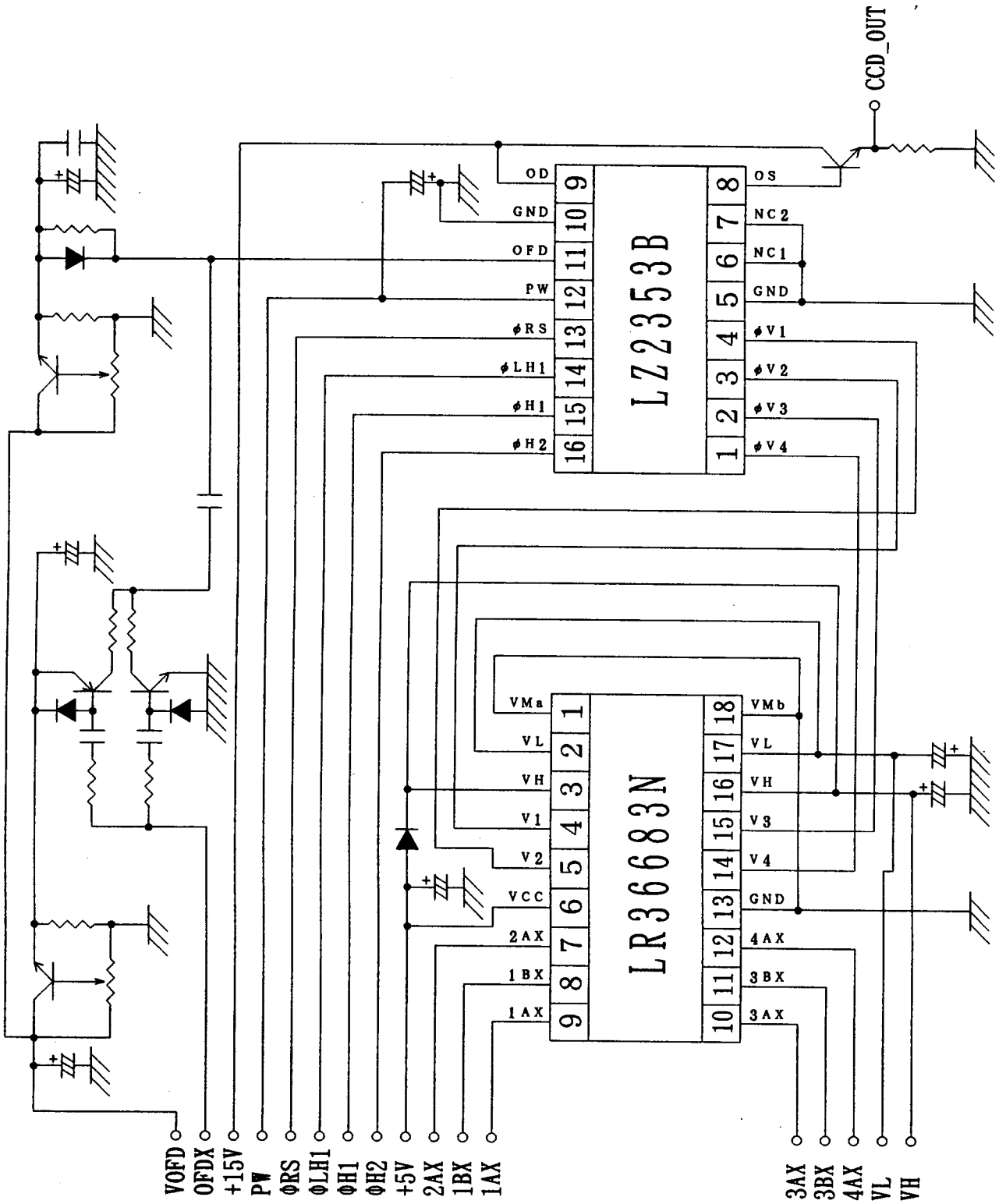
7. TIMING DIAGRAM EXAMPLE




HORIZONTAL TRANSFER
HD
ΦH1
ΦLH1
ΦH2
ΦRS
OS
••768
OB(40)
PRE_SCAN(22) OB(3) 1••
OUTPUT
ΦV1
ΦV2
ΦV3
ΦV4
ΦOFD


READOUT TIMING
ODD
HD
ΦV1
ΦV2
ΦV3
ΦV4
EVEN
HD
ΦV1
ΦV2
ΦV3
ΦV4

8. STANDARD OPERATING CIRCUIT EXAMPLE



9. SPECIFICATION FOR BLEMISH

1) Definition of blemish

	Level of blemish (mV)	Permitted number of blemish		Comment
White blemish (Exposed)	26 ≦ B	0		• See fig. 9-1(a)、fig. 9-2. • Vout = Vstd • M + N = 10 Up to 4 blemishes are allowed in AREA I
	18 ≦ B < 26	M		
	B < 18	no count		
Black blemish (Exposed)	26 ≦ B	0		
	18 ≦ B < 26	N		
	B < 18	no count		
White blemish (Non_exposed)		AREA I	AREA II	• See fig. 9-1(b)、fig. 9-2. • Sum of the blemishes in AREA I and II are allowed up to 6.
	12 < B	0	0	
	9 < B ≦ 12	1	3	
	7 < B ≦ 9	2	4	
	6 < B ≦ 7	4	5	
	B ≦ 6	no count		
White blemish (Shutter mode)	5.5 ≦ B	0		• See fig. 9-1(a)、fig. 9-2. • Vout = Vstd/10 • The electronic shutter speed is set at 1/10000 s
	B < 5.5	no count		
Black blemish (Shutter mode)	5.5 ≦ B	0		
	B < 5.5	no count		

《note》

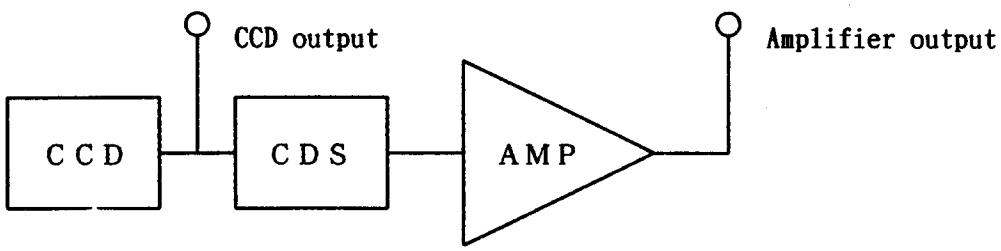
- B : Blemish level defined in fig. 9-1.
- Vout : Average output voltage
- Vstd : 150 mV. The standard output voltage defined in the specification of the characteristics.

2) Definition of stain.

The measuring area is devided into segments which include 20 x 20 pixels, respectively. The difference between the average output voltage of neighboring segments is permitted below 1.5 mV, under the condition that the average output voltage of all imaging pixels is 75 mV (= Vstd/2).

【MEASURING CONDITION】

・Ta : 60 ℃
・Measuring block diagram



The output voltage is measured at the CCD output.
The gain of the amplifier is adjusted to the unity between the CCD output and the amplifier output.

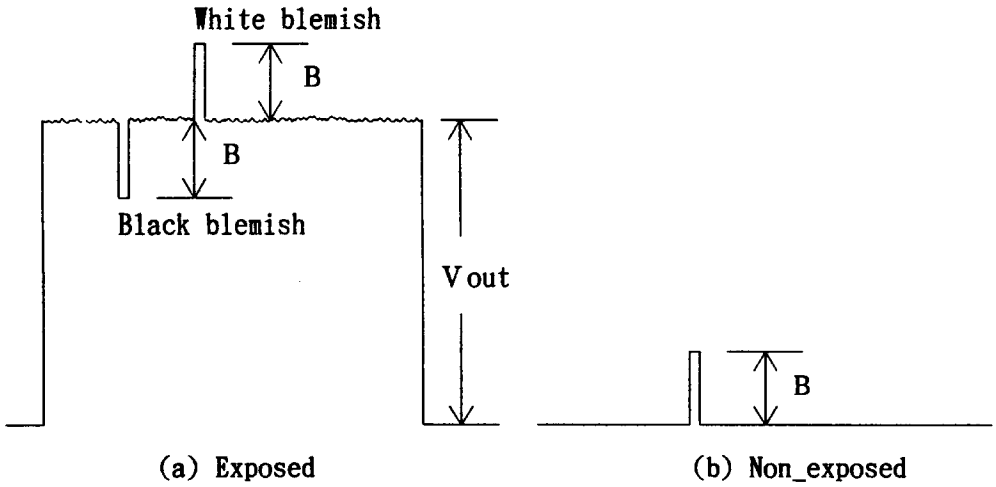


fig. 9-1 Definition of blemish level
(The wave form is the luminance signal measured at the Amplifier output.)

【MEASURING AREA】

Measuring area includes all pixels in the image and the optical black area excluding the outer 10 pixels of the left and right sides and the outer 9 lines of the upper and lower sides in the image area.

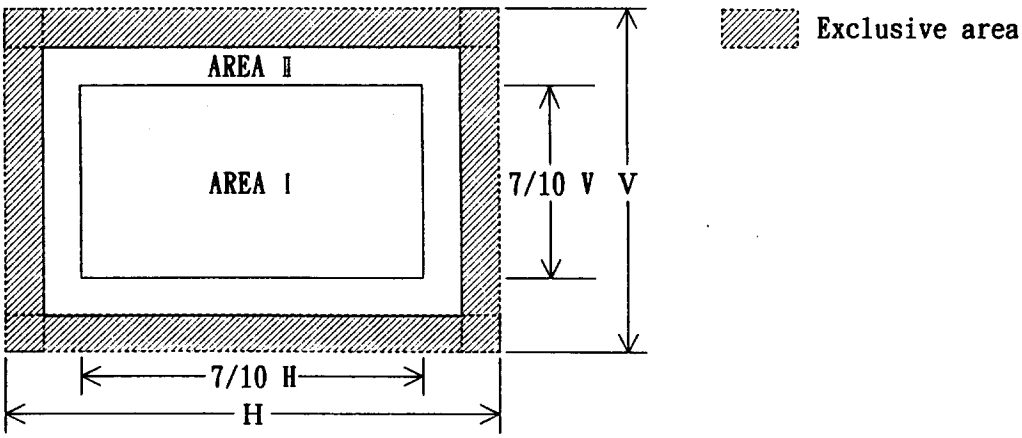


fig. 9-2 Definition of the measuring area

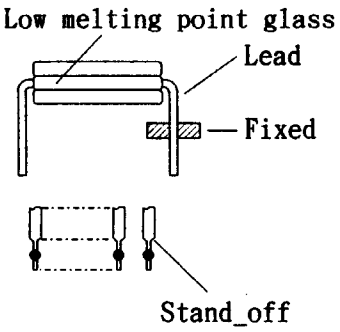
10. CAUTIONS FOR USE

1. Package Breakage

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

1) The CCD is a precise 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 addtion, 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.

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.

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.

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) Hanlde 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.

4. Other

1) Soldering should be manually performed within 5 seconds at 350℃ maximum at soldering iron.
2) Do not expose the device to strong light. For the color device, long exposure to strong light will fade the color of the color filters.
3) Avoid using or storing the CCD at high temperature or high humidity as it is a precise optical component. Do not give a mechanical shock to the CCD.
4) To apply power, first connect GND and then turn on OFD. After turning on OFD, 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.

11 PACKAGE OUTLINE AND PACKING SPECIFICATION

1. Package Outline Specification

Refer to drawing No. GDG016E-07E1.

(The seal resin stick out from the package shall be passed.)

2. Markings

Marking contents

(1) Product name : LZ2353B

(2) Campany name : SHARP

(3) Country of origin : JAPAN

(4) Date code : YY WW X XX

- XX: Denotes the production ref. cord. (1~2 figures)
- X: Denotes the production day of the week.

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

- WW: Denotes the production week. (01, 02, 03, ·····, 52, 53)
- YY: Denotes the production year. (Lower two digits of the year.)

Positions of markings are shown in the package outline drawing(No. GDG016E-07E1). 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
Device case	Paper (100devices/case)	Device packing (2trays/case)
Device tray	Conductive plastic (50devices/tray)	Device fixing
Cover tray	Conductive plastic (1tray/case)	Device covering
Buffer	Cardboard (1sheet/case)	Shock absorber of device tray
Plastic film bag	Plastic film	Device tray fixing
Air cushion	Plastic film	Shock absorber of device case
Tape	Plastic film	Sealing Plastic film bag

3-2. External appearance of packing

Refer to drawing No. KSEC-100T2-0.

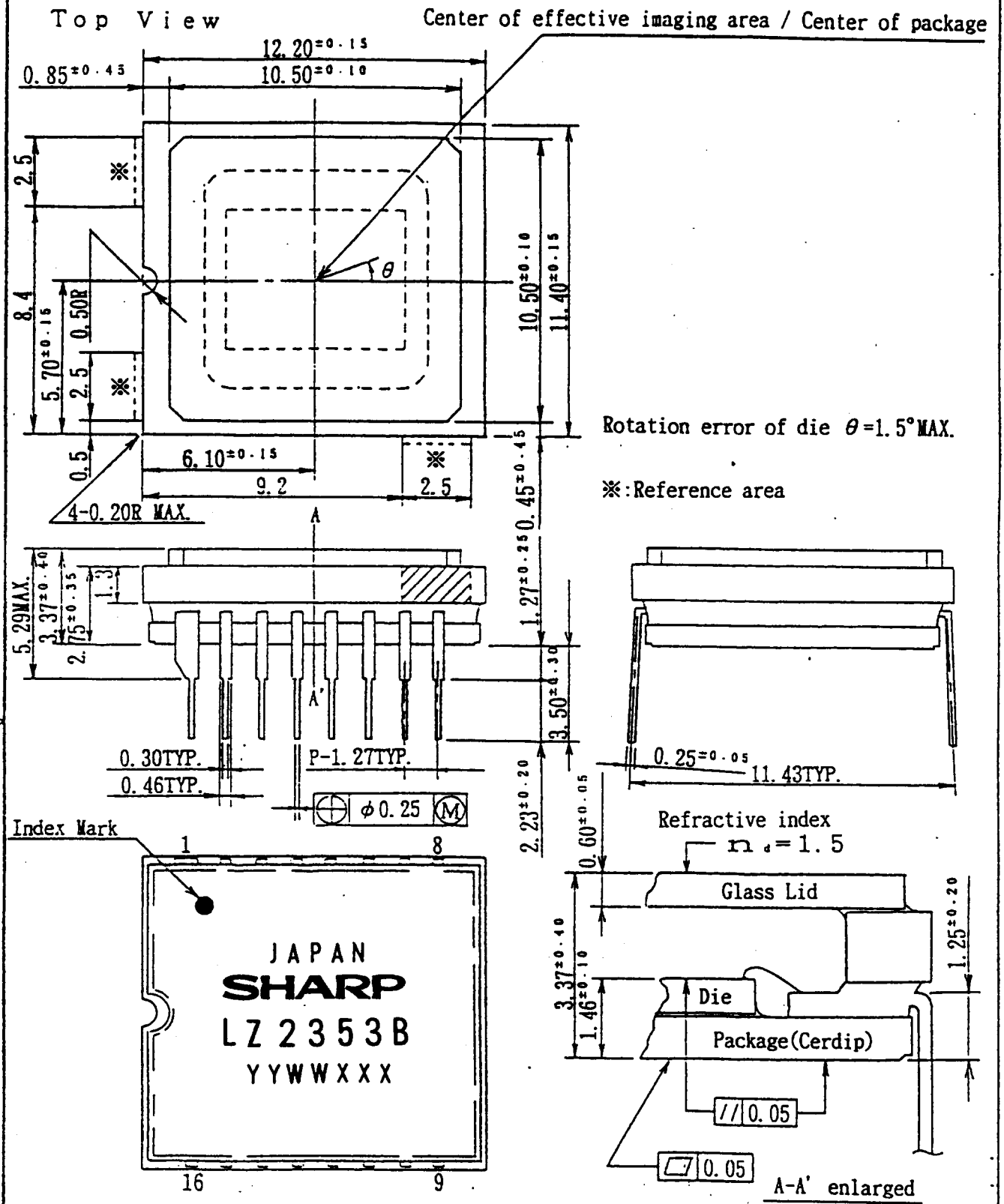
4. Precaution For Unpacking

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 operater's body, too.

ISSUE DATE	'94. 12. 02	A. Suzuki	Y. Takeda	T. Seko	(NOTE)
ISSUE NUMBER	4C0215DC				
S/C NUMBER	LZ2353B				

Top View



Bottom View

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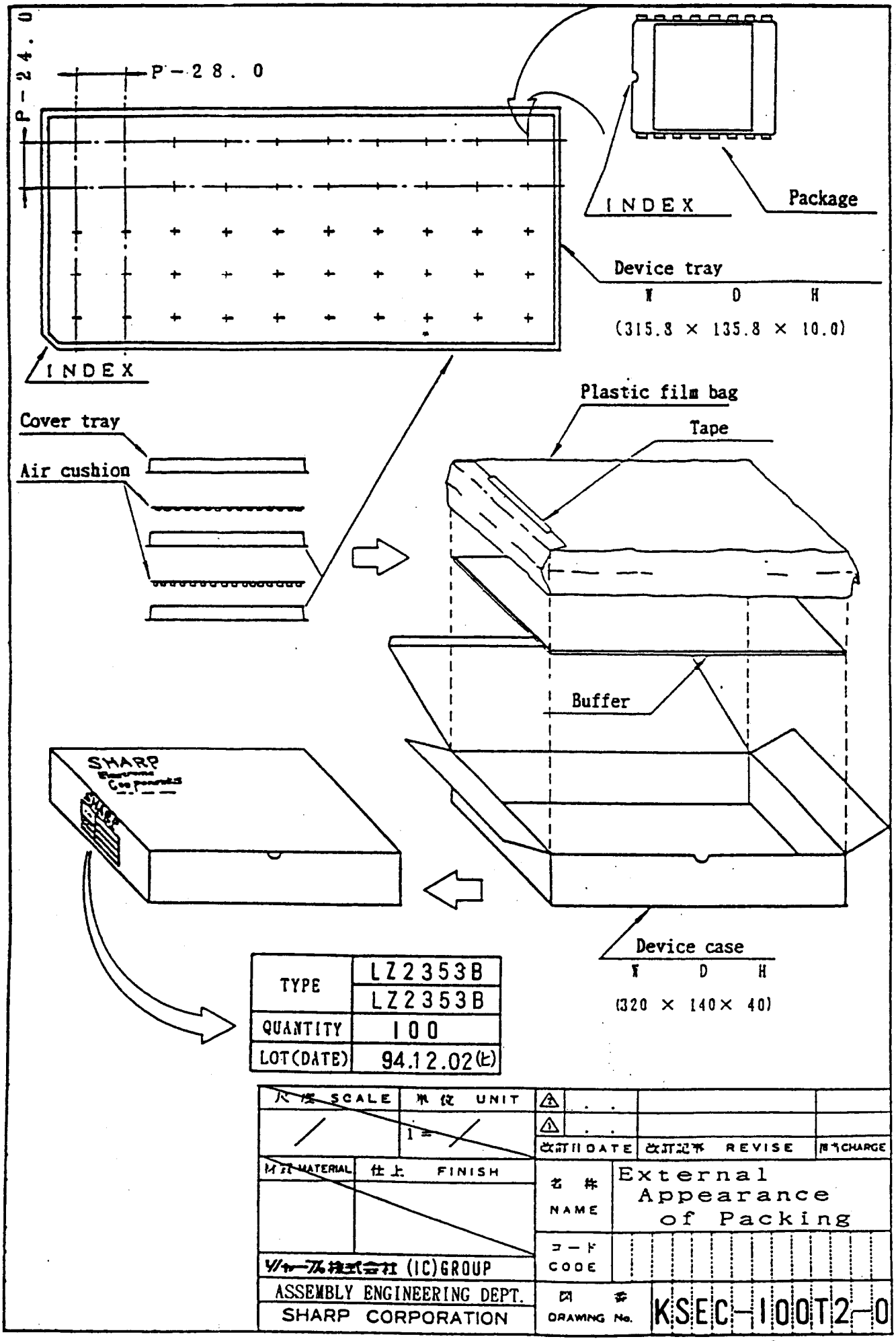
シャープ株式会社 IC Group		コード CODE	
ASSEMBLY ENGINEERING DEPT. SHARP CORPORATION		図番 DRAWING No.	GDG016E-07E1

LZ2353B



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	LZ2353B
QUANTITY	100
LOT(DATE)	94.12.02(七)

尺度 SCALE / 単位 UNIT			
/	1= /		
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材質 MATERIAL	仕上 FINISH	名称 NAME	External Appearance of Packing
		コード CODE	
シャープ株式会社 (IC)GROUP			
ASSEMBLY ENGINEERING DEPT.		図番 DRAWING No.	KSEC-100T2-0
SHARP CORPORATION			