SHARP

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To ;

PRELIMINARY

SPECIFICATIONS

Product Type : 1/4-type CMOS Black and White with 350k Pixels for VGA

Model No. LZ34B20

※This specifications contains 28 pages including the cover.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

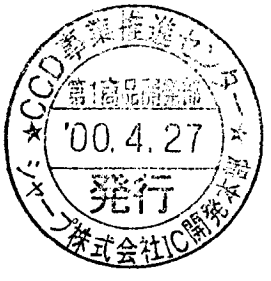
DATE:

BY:

PRESENTED

BY: Satoru Kubo

N. KUBO
Dept. General Manager



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(1) The products covered herein are designed and manufactured for the following application areas. When using the products covered herein for the equipment listed in Paragraph (2), even for the following application areas, be sure to observe the precautions given in Paragraph (2). Never use the products for the equipment listed in Paragraph (3).

- ·Office electronics
- ·Instrumentation and measuring equipment
- ·Machine tools
- ·Audiovisual equipment
- ·Home appliances
- ·Communication equipment other than for trunk lines

(2) Those contemplating using the products covered herein for the following equipment which demands high reliability, should first contact a sales representative of the company and then accept responsibility for incorporating into the design fail-safe operation, redundancy, and other appropriate measures for ensuring reliability and safety of the equipment and the overall system.

- ·Control and safety devices for airplanes, trains, automobiles, and other transportation equipment
- ·Mainframe computers
- ·Traffic control systems
- ·Gas leak detectors and automatic cutoff devices
- ·Rescue and security equipment
- ·Other safety devices and safety equipment, etc.

(3) Do not use the products covered herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.

- ·Aerospace equipment
- ·Communications equipment for trunk lines
- ·Control equipment for the nuclear power industry
- ·Medical equipment related to life support, etc.

(4) Please direct all queries and comments regarding the interpretation of the above three Paragraphs to a sales representative of the company.

● Please direct all queries regarding the products covered herein to a sales representative of the company.

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1. GENERAL DESCRIPTION

LZ34B20 is a 1/4-type(4.5mm) solid-state image sensor consists of PN photodiodes and CMOS (Complementary Metal-Oxide-Semiconductor) devices. The sensor further includes a timing generator (TG), a correlated double sampling (CDS) circuit, an auto gain control (AGC) circuit and an analog-to-digital converter (ADC) circuit. All the circuits of the sensor can be driven by 3.3V single power supply. Having approximately 350,000 pixels (horizontal 703 x vertical 499), the sensor provides a stable digital black and white image with extremry low power consumption.

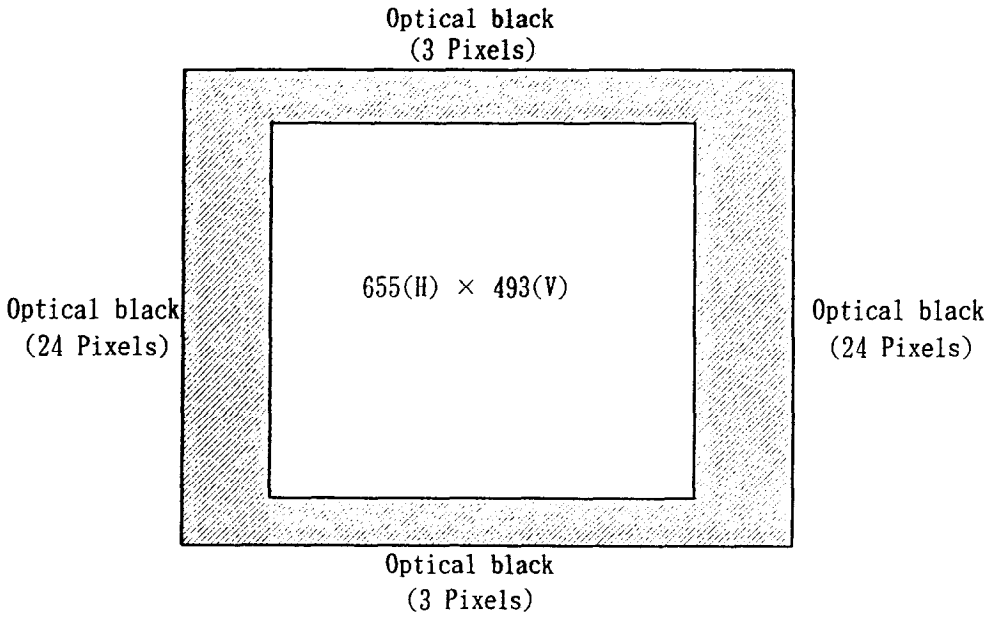
Features

1) Progressive scan
2) Square pixel
3) Compatible with VGA Format
4) Number of image pixels : Horizontal 655 x vertical 493
   Pixel pitch : Horizontal 5.6 μm x vertical 5.6 μm
   Number of optical black pixels : Horizontal; front 24 and rear 24
   Vertical ; front 3 and rear 3
5) Analog output and 8-bit digital output
6) Variable gain control (3 to 30 dB)
7) Variable electronic shutter (1/30 to 1/15750)
8) Image inversion function (horizontally and/or vertically)
9) Monitoring mode (60 fields/sec)
10) 3.3V single power supply
11) Power save mode
12) 36-pin LCC (leadless chip carrier) package
13) P-type silicon substrate, CMOS process
14) Not designed or rated as radiation hardened

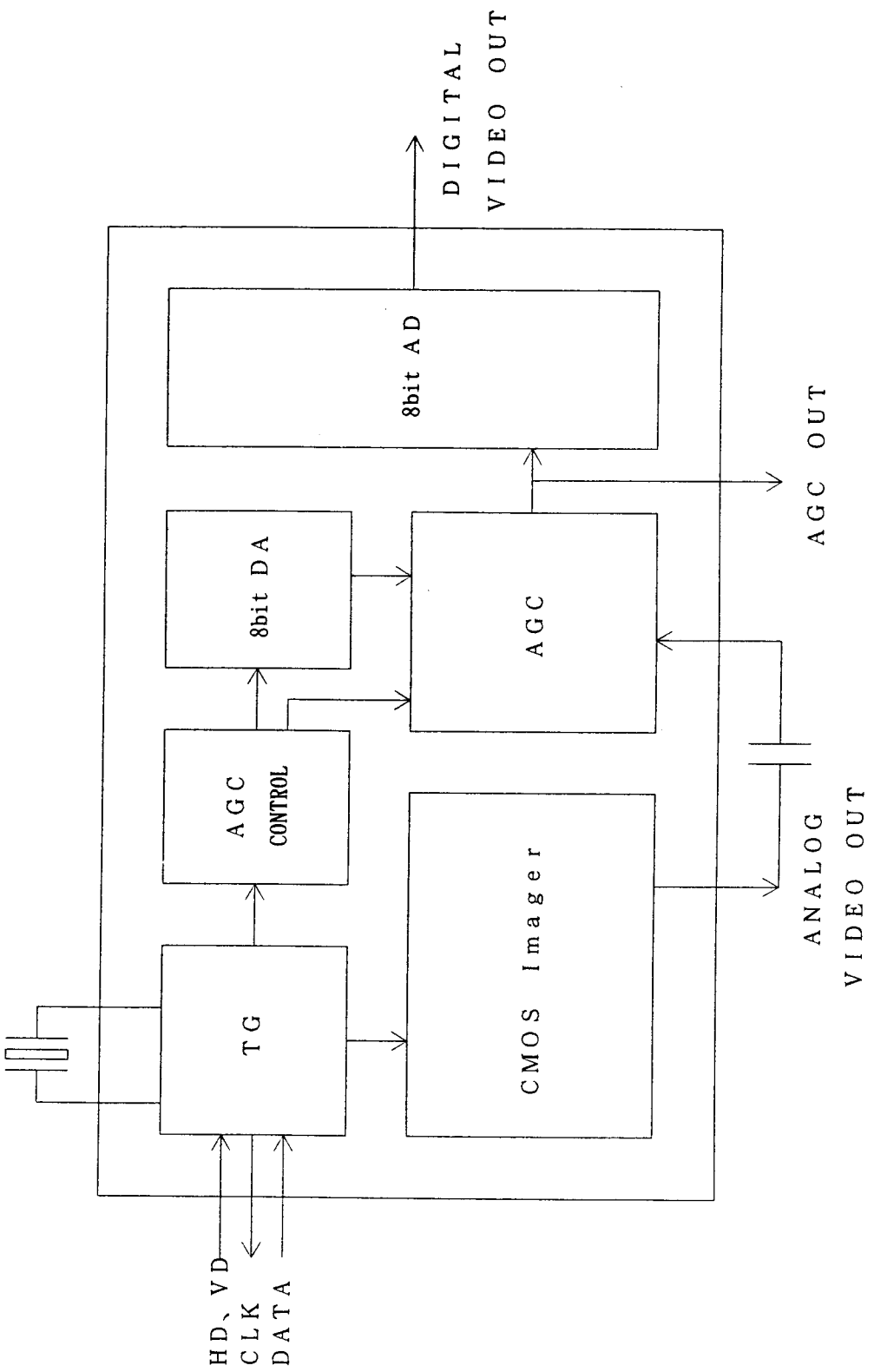
Applications

1) Survaillance camera
2) Pattern recognition
3) Finger print recognition

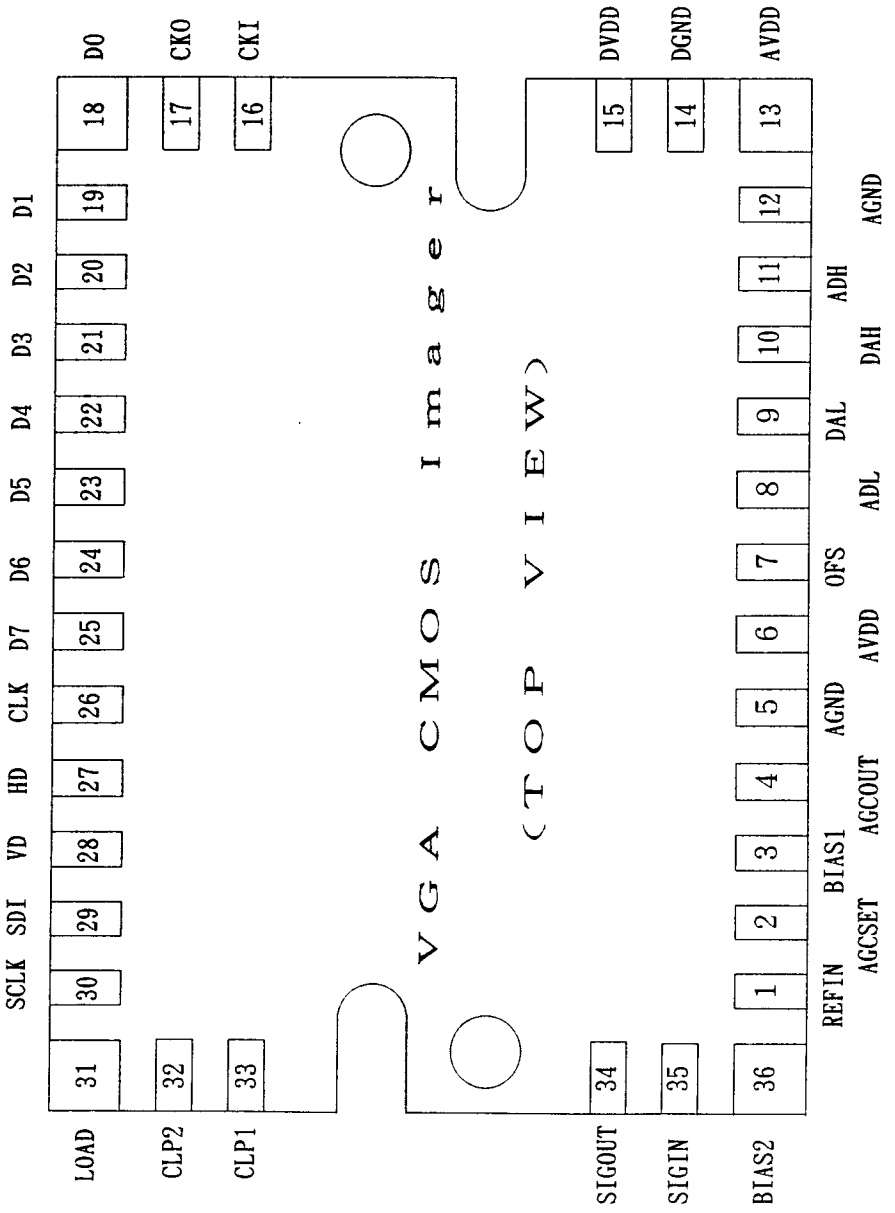
2. ARRANGEMENT OF PIXELS



3. BLOCK DIAGRAM



4. PIN CONFIGURATION



5. PIN DESCRIPTION

Pin No	Symbol	I/O	A/D	Description
1	REFIN	I	A	Reference Voltage for Analog Input
2	AGCSET	–	A	Resistor for AGC
3	BIAS1	–	A	Analog Bias Voltage 1 for Image Sensor
4	AGCOUT	O	A	AGC Output
5	AGND	–	A	Analog Ground
6	AVDD	–	A	Analog Power Supply
7	OFS	–	A	Offset Bias Voltage for AGC
8	ADL	–	A	Bottom ADC Reference Voltage
9	DAL	–	A	Bottom DAC Reference Voltage
10	DAH	–	A	Top DAC Reference Voltage
11	ADH	–	A	Top ADC Reference Voltage
12	AGND	–	A	Analog Ground
13	AVDD	–	A	Analog Power Supply
14	DGND	–	D	Digital Ground
15	DVDD	–	D	Digital Power Supply
16	CKI	I	D	Input for Oscillator (24.54MHz *)
17	CKO	O	D	Output for Oscillator
18	D0	O	D	ADC Output (LSB)
19	D1	O	D	ADC Output
20	D2	O	D	ADC Output
21	D3	O	D	ADC Output
22	D4	O	D	ADC Output
23	D5	O	D	ADC Output
24	D6	O	D	ADC Output
25	D7	O	D	ADC Output (MSB)
26	CLK	O	D	Clock output (12.27MHz *)
27	HD	I	D	Horizontal Drive Pulse Input
28	VD	I	D	Vertical Drive Pulse Input
29	SDI	I	D	Data Input (AGC Gain, Offset, Shutter control, Image Inversion, etc.)
30	SCLK	I	D	Shift Clock for Data
31	LOAD	I	D	Load Pulse for Data Input
32	CLP2	–	A	Analog Bias Voltage 2 for Clamp Circuit
33	CLP1	–	A	Analog Bias Voltage 1 for Clamp Circuit
34	SIGOUT	O	A	Analog Image Signal Output
35	SIGIN	I	A	Analog Image Signal Input
36	BIAS2	–	A	Analog Bias Voltage 2 for Image Sensor

* : In the case of "Normal Mode" and "Monitoring Mode".
In the case of "USB Mode", CKI is 24.00MHz and CLK is 12.00MHz.

6. ELECTRIC CHARACTERISTICS

6-1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Power Supply Voltage	VDD	−0.3 ~ 4.6	V
Input Signal Voltage	Vφ	−0.3 ~ VDD+0.3	V
Storage Temperature	Tstr	−40 ~ 80	℃

6-2. RECOMENDED OPERATING CONDITIONS

Parameter		Symbol	MIN	TYP	MAX	Unit	Comment
Power Supply Voltage		VDD	3.0	3.3	3.6	V	
Operating Temperature		Topr	−20	25	60	℃	
Oscillator Frequency	Normal Mode	Fck		24.54		MHz	
	Monitoring Mode						
	USB Mode			24.00		MHz	
Digital Input Voltage	Low Level	Vφ L	0.0		0.2VDD	V	1
	High Level	Vφ H	0.8VDD		VDD	V	
Analog Input Voltage			(Connect to Terminal through Capacitor)				2
Analog Bias Voltage			(Connect to GND through Capacitor)				3

Comment 1. Apply to input pins HD, VD, SDI, SCLK and LOAD.
Comment 2. Apply to input pins SIGIN and REFIN. Do not connect to DC directly.
Comment 3. Apply to pins BIAS1, BIAS2, OFS, ADL, DAL, DAH, ADH, CLP1 and CLP2.
Do not connect to GND directly.

7. IMAGING CHARACTERISTICS

Readout mode : 1/30 sec, Normal mode
Ambient temperature : 25 ℃
Driving voltage : 3.3 V
Color temperature of light source : 3200K/IR cut-off filter (CM500, 1mmt) is used.
• Measurement point : Analog image signal output (pin no.34) before AGC and AD.

No.	Parameter	Symbol	Note	Min.	Typ.	Max.	Unit
1	Standard output voltage	Vo	(a)		150		mV
2	Photo response non-uniformity	PRNU	(b)			20	%
3	Saturation output voltage	Vsat	(c)		700		mV
4	Dark output voltage	Vdark	(d)		2		mV
5	Sensitivity	R	(e)		630		mV
6	Current dissipation	IVDD	(f)		20		mA
7	Vertical line Fixed Pattern Noise	VFPN	(g)		0.5		mVpp

【Note】

(a) Vo is the average output voltage of analog signal under uniform illumination. Standard exposure condition is defined when Vo is 150 mV.

(b) Image area is divided into 10 x 10 segments under the standard exposure condition. Segment voltage is defined as average output voltage of all pixels within the segment. PRNU is defined by (Vmax - Vmin)/Vo, where Vmax and Vmin are maximumm and minimum values of all the segments voltage, respectively.

(c) Image area is divided into 10 x 10 segments under 10 times of the standard exposure condition. Vsat is the minimum segment voltage of all the segments voltage.

(d) Vdark is the difference between average output voltage of the effective area and that of the OB area, under non-exposure condition.

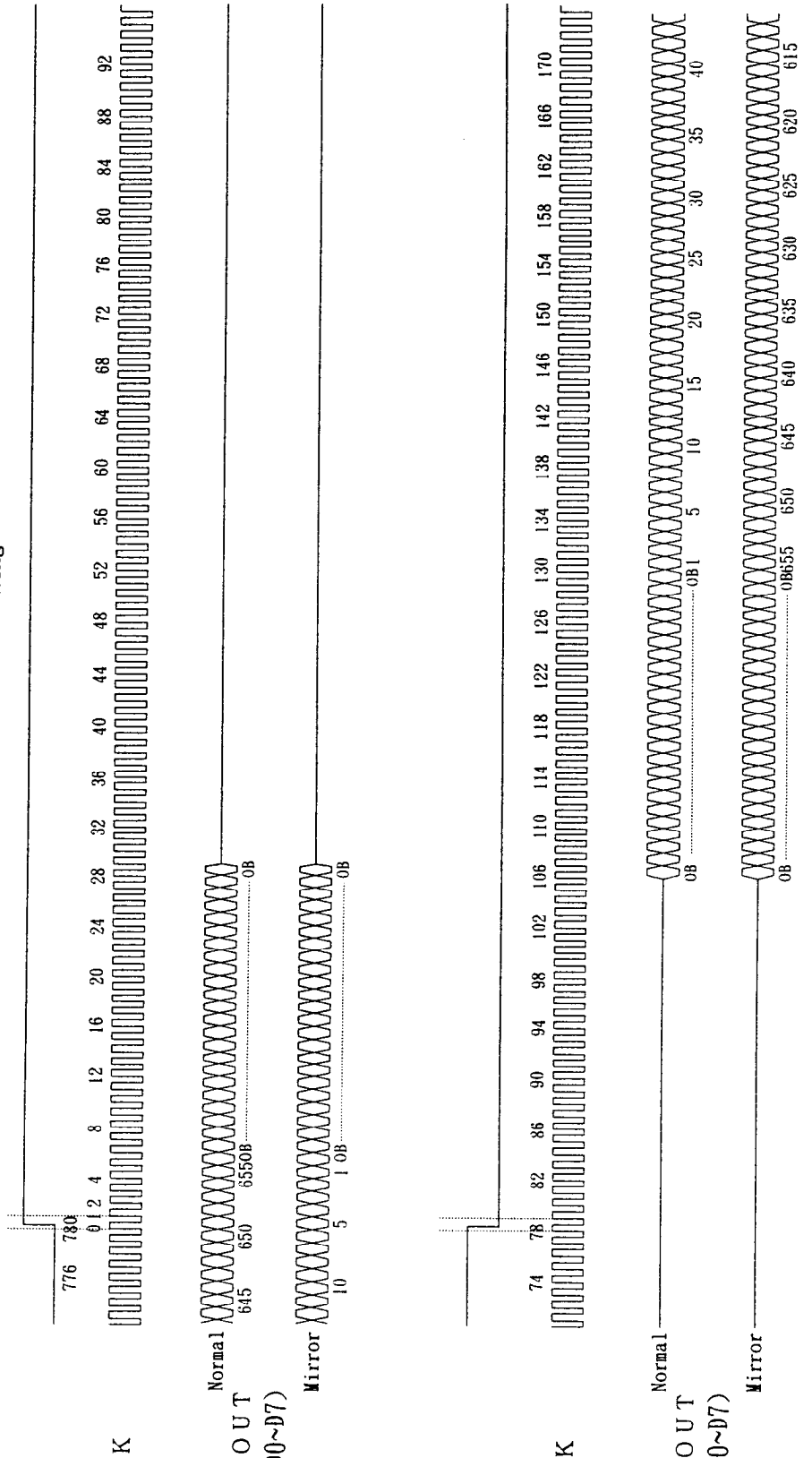
(e) R is the average output voltage of analog signal when a 1000 lux light source on a 90% reflector is imaged by a lens of F:4 and f=50 mm.

(f) IVDD is the total current of analog and digital power supply in the dark and on the standard load condition.

(g) One mean horizontal line signal <bi> is obtained by adding all the horizontal line signals <aij> vertically and dividing them by the line number. <xi> is the deviation of the center pixel from the average of successive 5 pixels in <bi>. V-FPN is the maximum absolute value of <xi>.

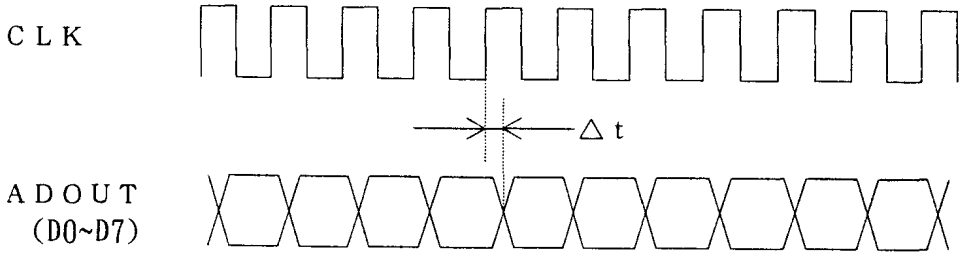
8. TIMING DIAGRAM (NORMAL MODE)

8 - 1. Horizontal Pulse Timing



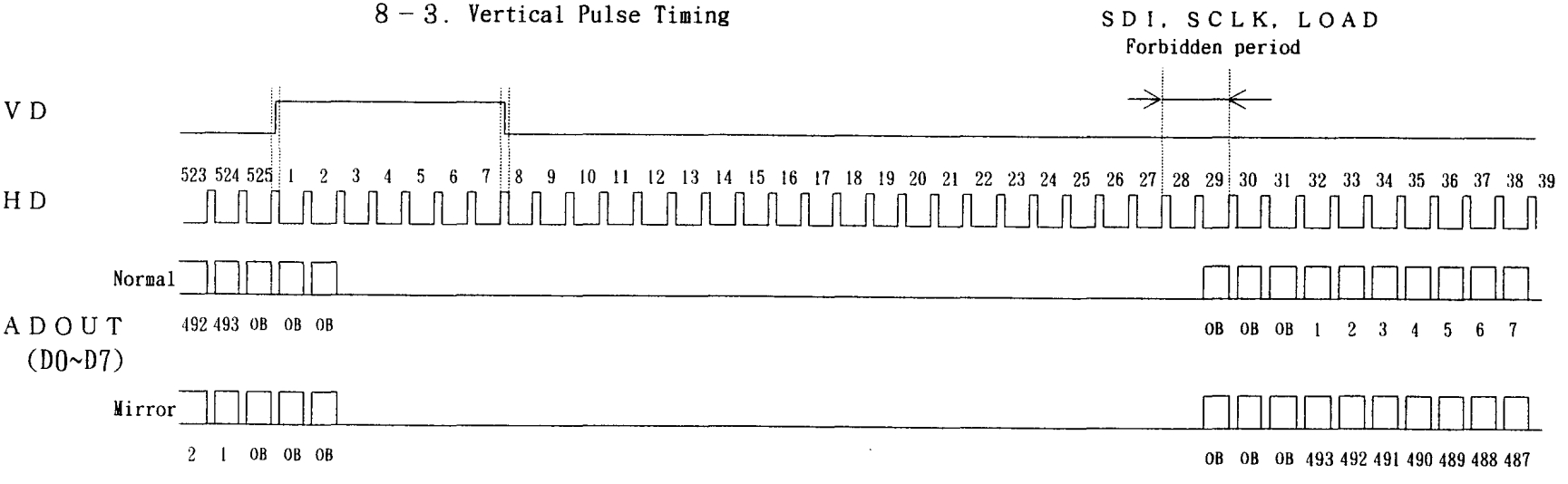
- The rising edge of HD pulse must be between two rising edges of CLK(0) and CLK(1).
- The falling edge of HD pulse must be between two rising edges of CLK(78) and CLK(79).

8 – 2. Phase Relations between Digital Output (ADOUT) and Clock (CLK).



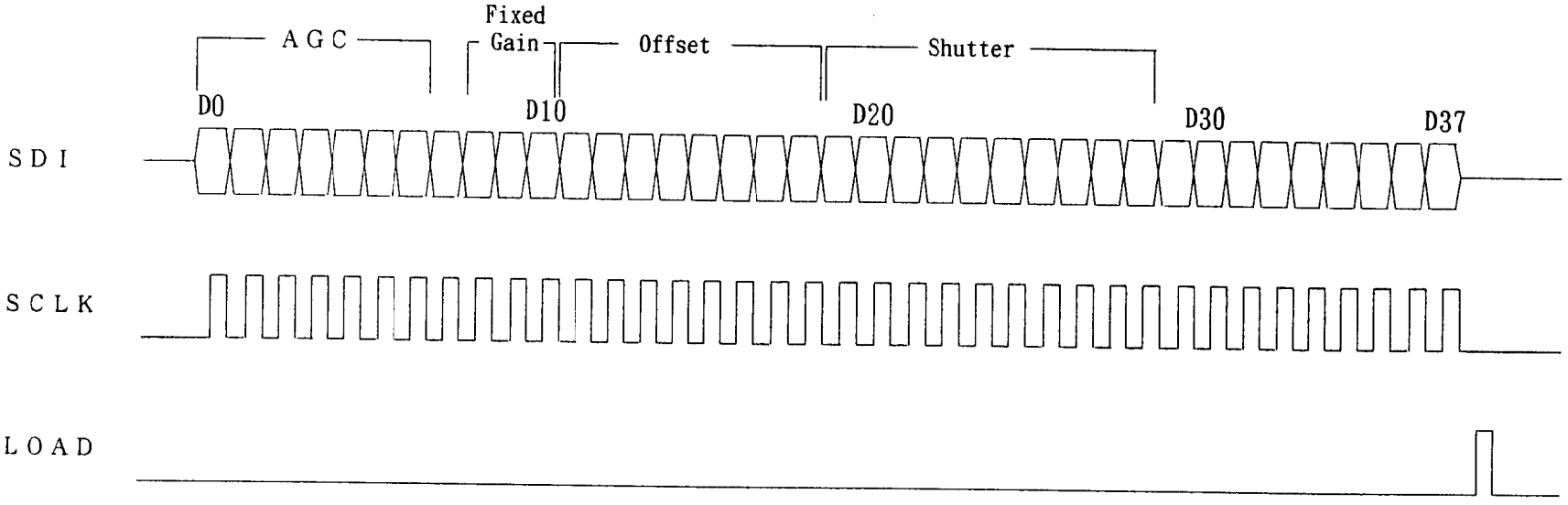
Symbol	Min.	Typ.	Max.	Unit
△ t		45		nS

8 – 3. Vertical Pulse Timing



・The rising edge and falling edge of VD pulse must be in high periods of HD pulses.

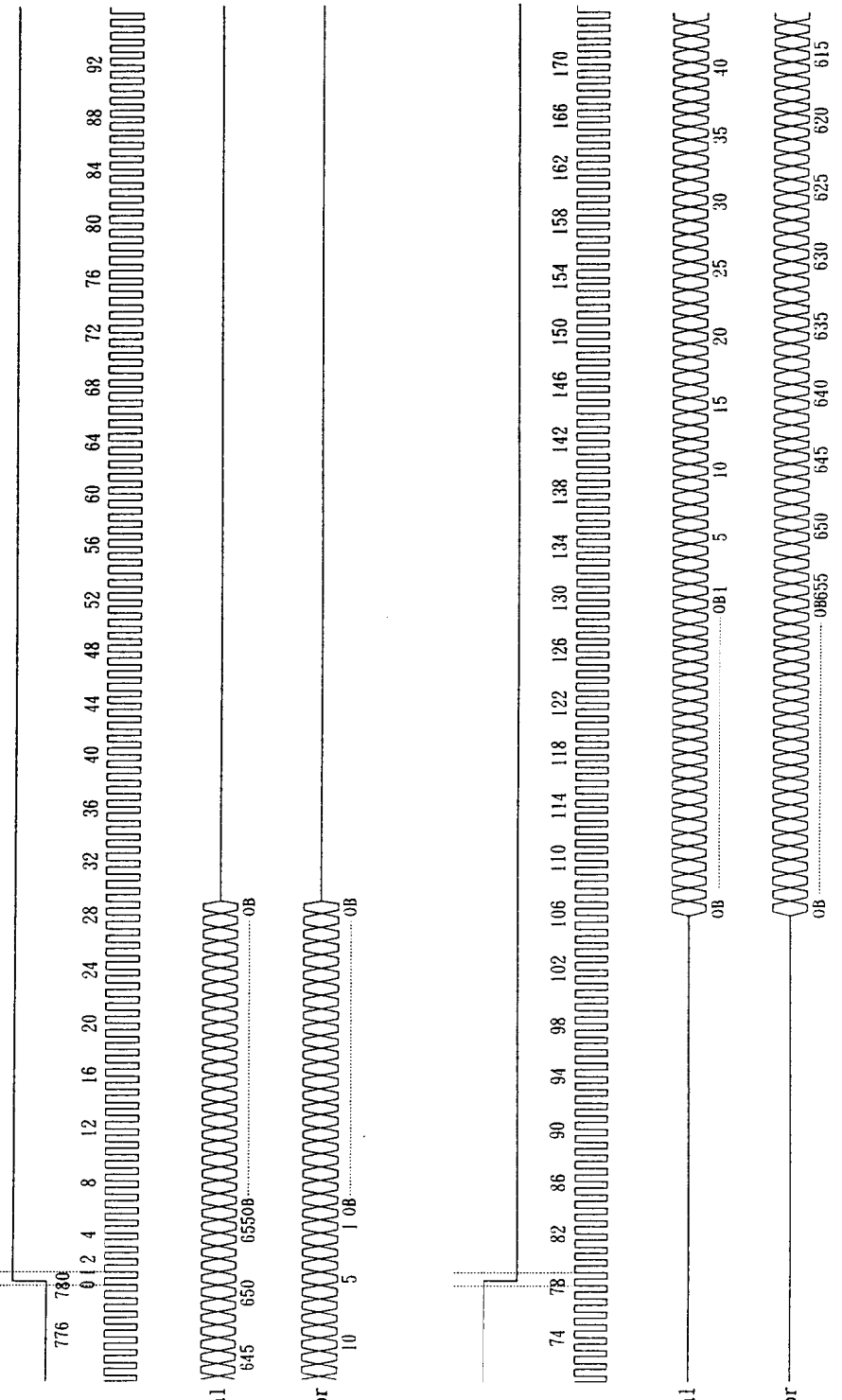
8 – 4. Serial Data Timing (SDI, SCLK, LOAD)



- Data in SDI are taken at the rising edge of SCLK.
- Clock frequency of SCLK should be less than 1/2 of that of CLK.
- Do not insert the pulses SDI, SCLK and LOAD between 28H and 29H, that is described in section 8-3.
- The contents of serial data from D0 to D37 are refered to "Section 11. Description of Serial Data".

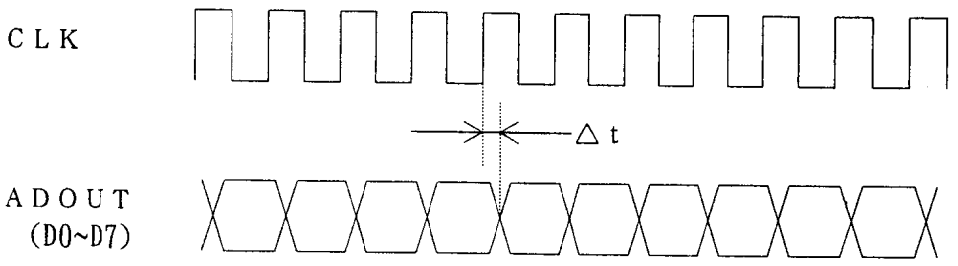
9. TIMING DIAGRAM (MONITORING MODE)

9 – 1. Horizontal Pulse Timing



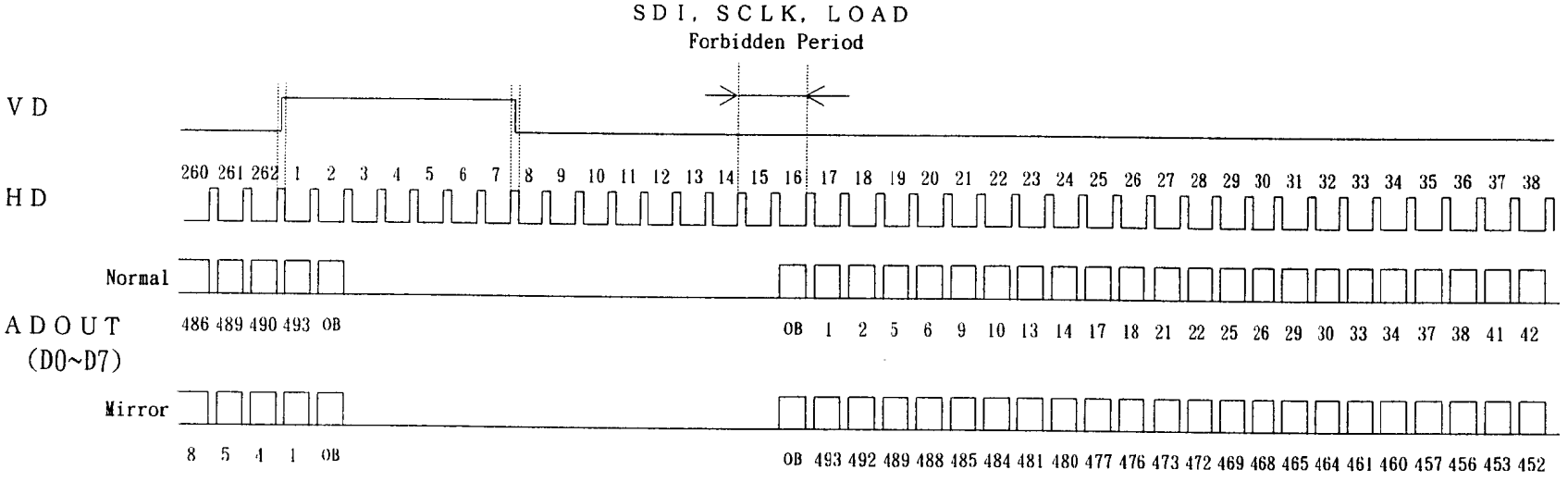
- The rising edge of HD pulse must be between two rising edges of CLK(0) and CLK(1).
- The falling edge of HD pulse must be between two rising edges of CLK(78) and CLK(79).

9 – 2. Phase Relations between Digital Output (ADOUT) and Clock (CLK).



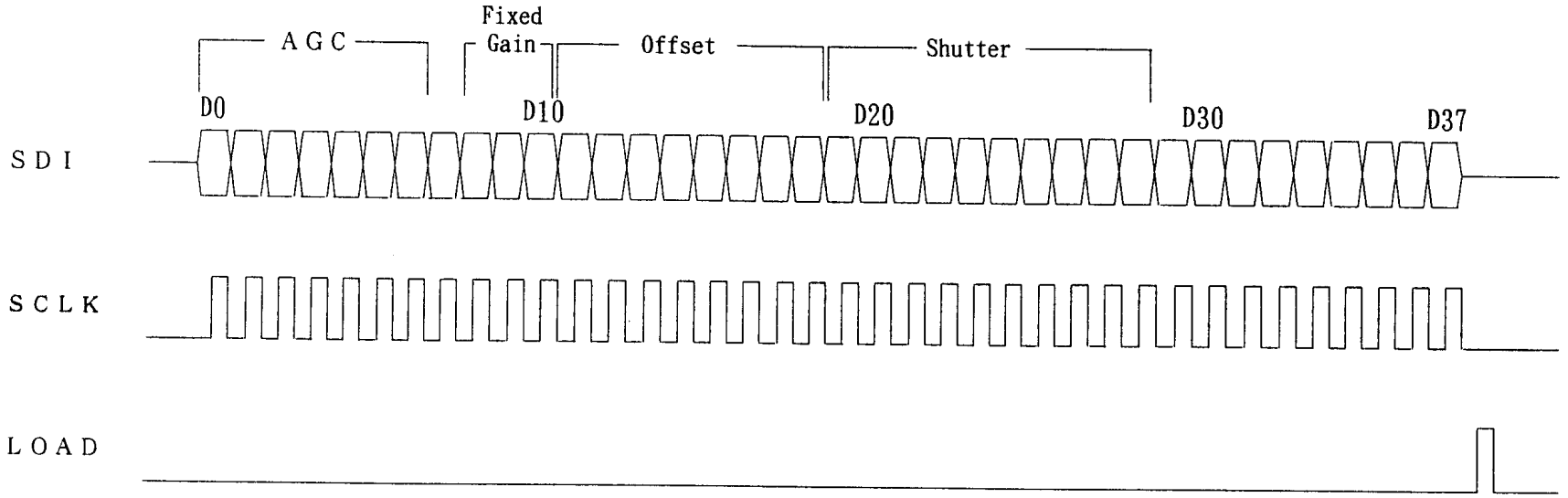
Symbol	Min.	Typ.	Max.	Unit
△t		45		nS

9 – 3. Vertical Pulse Timing



・The rising edge and falling edge of VD pulse must be in high periods of HD pulses.

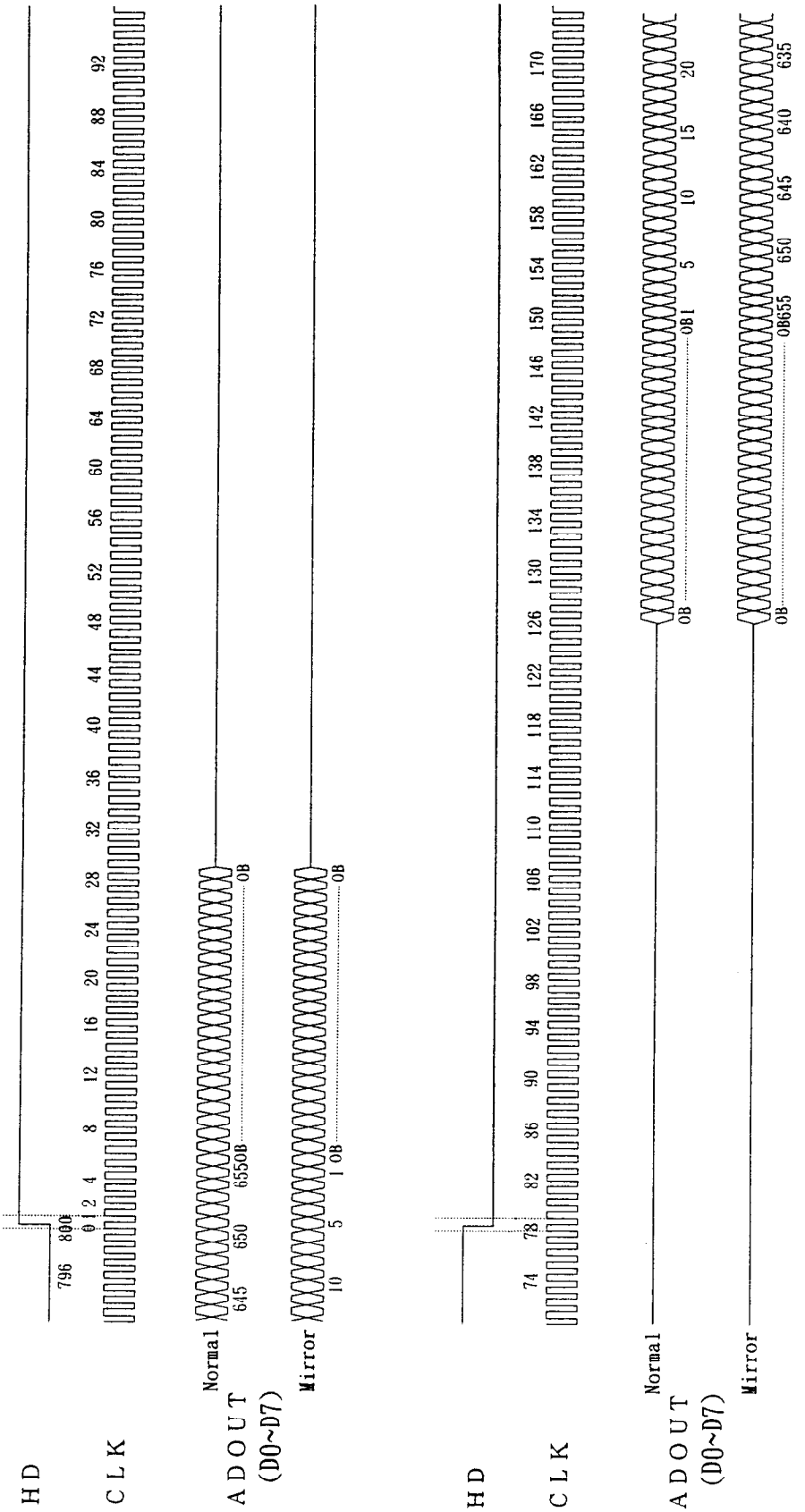
9 – 4. Serial Data Timing (SDI, SCLK, LOAD)



- Data in SDI are taken at the rising edge of SCLK.
- Clock frequency of SCLK should be less than 1/2 of that of CLK.
- Do not insert the pulses SDI, SCLK and LOAD between 15H and 16H, that is described in section 9-3.
- The contents of serial data from D0 to D37 are refered to "Section 11. Description of Serial Data".

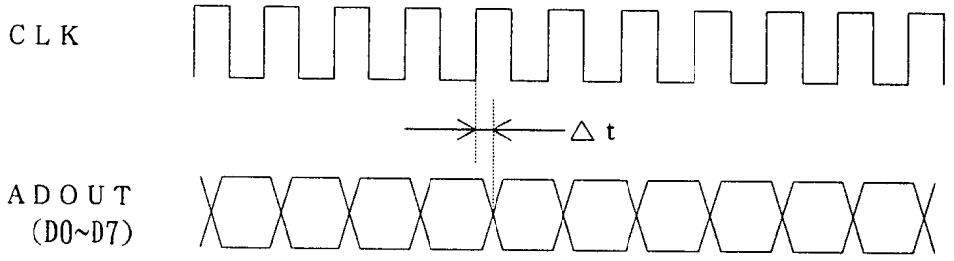
10. TIMING DIAGRAM (USB MODE)

10-1. Horizontal Pulse Timing



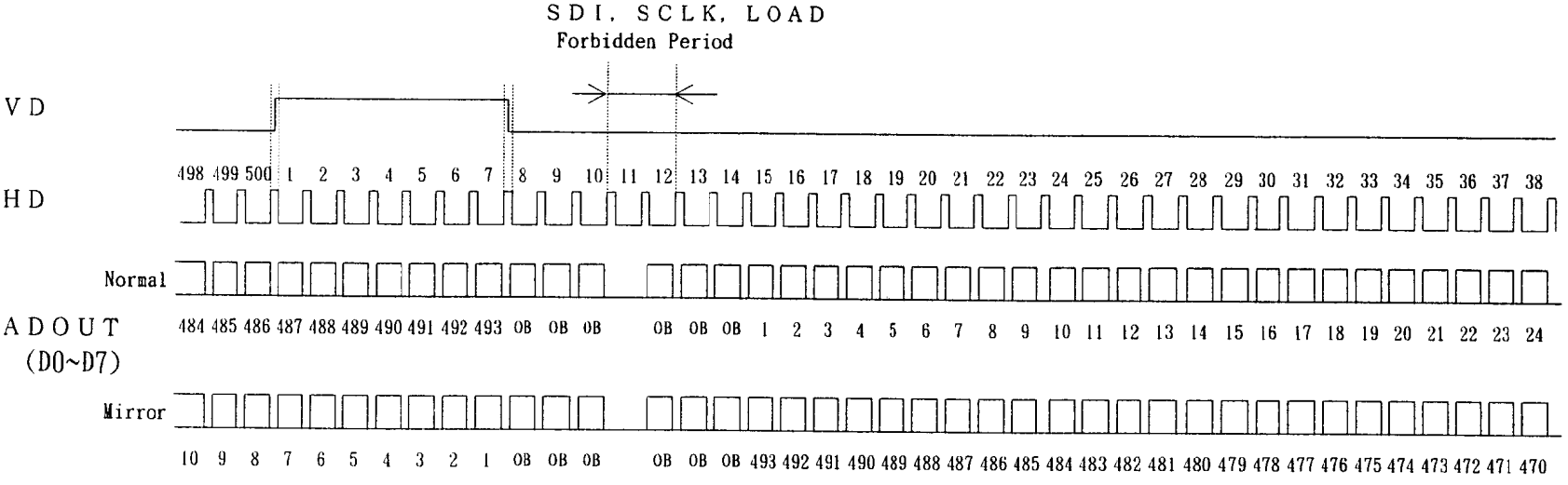
- The rising edge of HD pulse must be between two rising edges of CLK(0) and CLK(1).
- The falling edge of HD pulse must be between two rising edges of CLK(78) and CLK(79).

10－2. Phase Relations between Digital Output (ADOUT) and Clock (CLK).



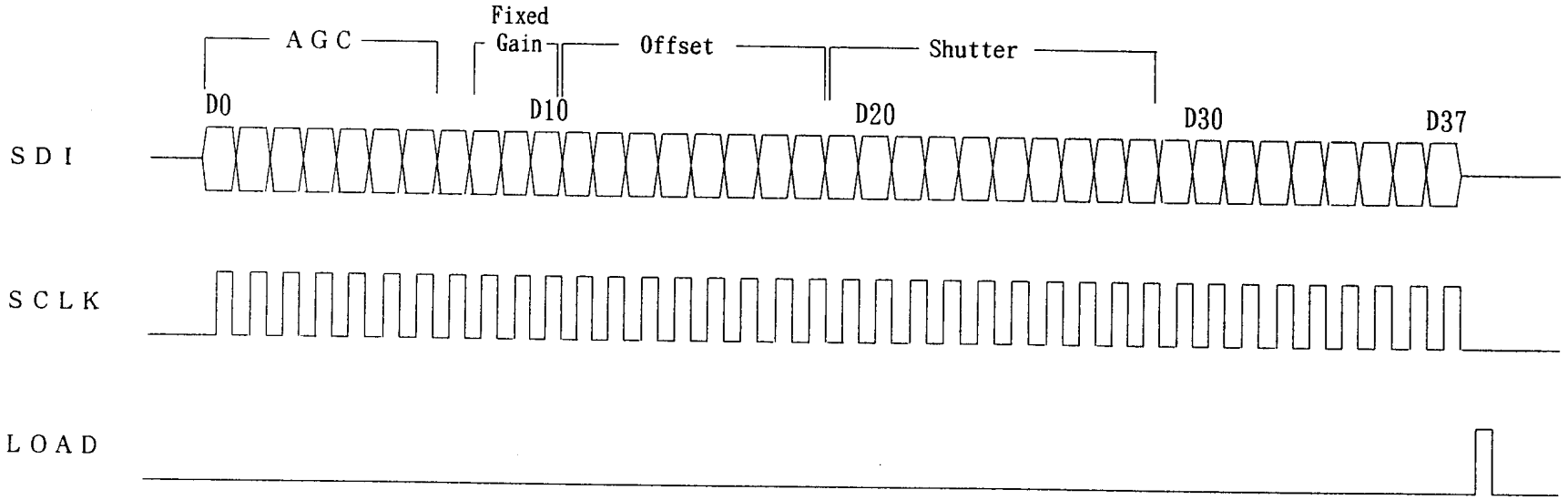
Symbol	Min.	Typ.	Max.	Unit
△t		45		nS

10－3. Vertical Pulse Timing



・The rising edge and falling edge of VD pulse must be in high period of HD pulses.

10-4. Serial Data Timing (SDI, SCLK, LOAD)



- Data in SDI are taken at the rising edge of SCLK.
- Clock frequency of SCLK should be less than 1/2 of that of CLK.
- Do not insert the pulses SDI, SCLK and LOAD between 11H and 12H, that is described in section 10-3.
- The contents of serial data from D0 to D37 are refered to "Section 11. Description of Serial Data".

11. DESCRIPTION OF SERIAL DATA

Address	Symbol	Function
D0	AGC6 (MSB)	Auto gain control (0 to 20 dB)
D1	AGC5	
D2	AGC4	
D3	AGC3	
D4	AGC2	
D5	AGC1	
D6	AGC0 (LSB)	
D7		No use (Fix to Low Level)
D8	MAX2 (MSB)	Fixed gain select (3 to 10 dB)
D9	MAX1	
D10	MAX0 (LSB)	
D11	OFS7 (MSB)	Offset level control of AGC output (0.9 to 1.5 V)
D12	OFS6	
D13	OFS5	
D14	OFS4	
D15	OFS3	
D16	OFS2	
D17	OFS1	
D18	OFS0 (LSB)	
D19	SHT9 (MSB)	Shutter speed control (Normal mode : exposure time is 1 to 1/525 frame period) (Monitoring mode : exposure time is 1 to 1/262 frame period) (USB mode : exposure time is 1 to 1/500 frame period)
D20	SHT8	
D21	SHT7	
D22	SHT6	
D23	SHT5	
D24	SHT4	
D25	SHT3	
D26	SHT2	
D27	SHT1	
D28	SHT0 (LSB)	
D29	MIRH	H:Horizontal mirror inversion image, L:Normal image
D30	MIRV	H:Vertical mirror inversion image, L:Normal image
D31	MON	H:Monitoring mode(*1), L:Normal or USB mode
D32	SAD2 (MSB)	Phase select of AD clock D32/D33/D34=L/L/L : -30° D32/D33/D34=L/L/H : -15° D32/D33/D34=L/H/L : 0° D32/D33/D34=L/H/H : 15°
D33	SAD1	
D34	SAD0 (LSB)	
D35	LPMD1	Power save mode D35/D36=L/L : all active, D35/D36=L/H : AD, AGC off D35/D36=H/L : AD off, D35/D36=H/H : Inhibited mode
D36	LPMD0	
D37	USB	H:USB mode, L:Normal mode

(*1) Even if Monitoring mode is selected by D31, the sensor becomes USB mode when USB mode is selected by D37.

11-1. SETTING OF AUTO GAIN CONTROL

- One LSB of the gain code represents approximately 0.156dB.
- Nominal gain values at typical codes are shown below.

Auto Gain Control (dB)	D0	D1	D2	D3	D4	D5	D6
0	L	L	L	L	L	L	L
1	L	L	L	L	H	H	L
2	L	L	L	H	H	L	H
3	L	L	H	L	L	H	H
4	L	L	H	H	L	L	H
5	L	H	L	L	L	L	L
6	L	H	L	L	H	H	L
7	L	H	L	H	H	L	L
8	L	H	H	L	L	H	H
9	L	H	H	H	L	L	H
10	H	L	L	L	L	L	L
11	H	L	L	L	H	H	L
12	H	L	L	H	H	L	L
13	H	L	H	L	L	H	H
14	H	L	H	H	L	L	H
15	H	L	H	H	H	H	H
16	H	H	L	L	H	H	L
17	H	H	L	H	H	L	L
18	H	H	H	L	L	H	H
19	H	H	H	H	L	L	H
20	H	H	H	H	H	H	H

11-2. SETTING OF FIXED GAIN

- One LSB of the gain code represents 1dB.

Fixed Gain (dB)	D8	D9	D10
3	L	L	L
4	L	L	H
5	L	H	L
6	L	H	H
7	H	L	L
8	H	L	H
9	H	H	L
10	H	H	H

11-3. SETTING OF OFFSET LEVEL

- One LSB of the offset code represents approximately 0.002V.
- Nominal offset values at typical codes shown below.

Offset Level (V)	D11	D12	D13	D14	D15	D16	D17	D18
0.9	L	L	L	L	L	L	L	L
1.0	L	L	H	L	H	L	H	H
1.1	L	H	L	H	L	H	L	H
1.2	H	L	L	L	L	L	L	L
1.3	H	L	H	L	H	L	H	L
1.4	H	H	L	H	L	H	L	H
1.5	H	H	H	H	H	H	H	H

11-4. SETTING OF SHUTTER SPEED

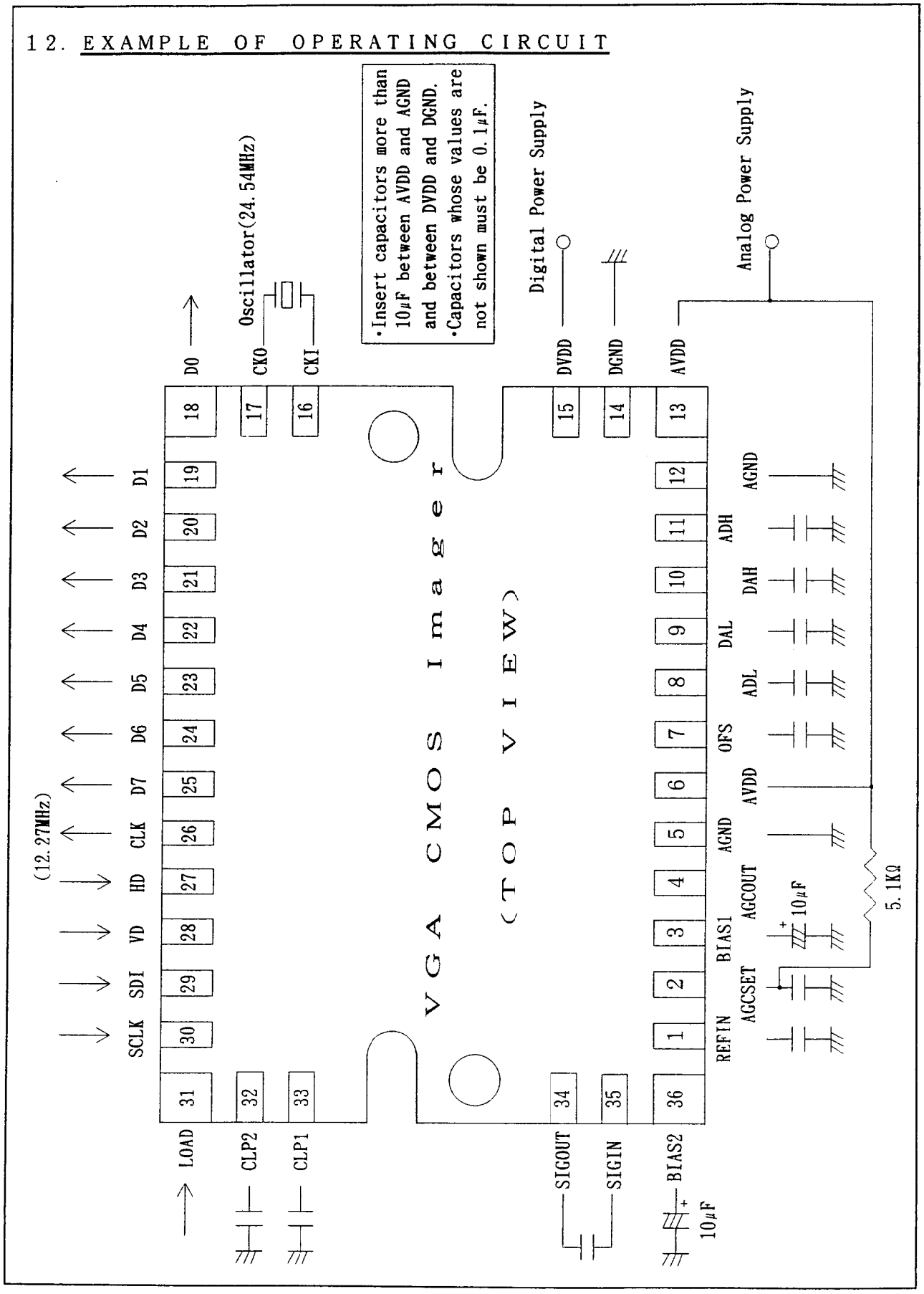
- One LSB of the shutter speed code represents 1H, where 1H is HD pulse period.
- Shutter speed values at typical codes are shown belowin the case of Normal, Monitoring and USB Modes.

Shutter Speed (Exposure Time Unit:1H)			D19	D20	D21	D22	D23	D24	D25	D26	D27	D28
Normal	Monitoring	USB										
525	262	500	L	L	L	L	L	L	L	L	L	L
•	•	•										
•	•	•										
265	2	240	L	H	L	L	L	L	L	H	L	L
264	1	239	L	H	L	L	L	L	L	H	L	H
263	262	238	L	H	L	L	L	L	L	H	H	L
•	•	•										
•	•	•										
27	262	2	L	H	H	H	H	H	L	L	H	L
26	262	1	L	H	H	H	H	H	L	L	H	H
25	262	500	L	H	H	H	H	H	L	H	L	L
•	•	•										
•	•	•										
2	262	500	H	L	L	L	L	L	H	L	H	H
1	262	500	H	L	L	L	L	L	H	H	L	L
525	262	500	H	L	L	L	L	L	H	H	L	H
•	•	•										
•	•	•										
525	262	500	H	H	H	H	H	H	H	H	H	H

11-5. SETTING OF DRIVING MODES

Function	D31	D37
Normal Mode	L	L
USB Mode	L	H
Monitoring Mode	H	L
USB Mode	H	H

12. EXAMPLE OF OPERATING CIRCUIT



13. CAUTIONS FOR USE

1. Package Breakage

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

1) The CMOS imager 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 the package 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 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.

3) 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 flaws to scratch the glass.

2. Electrostatic damage

Please take the following anti-static measures when handling the CMOS imager:

1) Always discharge static electricity by grounding the human body and the instrument to be used. To ground the human body, provide resistance of about1 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 terminal and do not touch any terminals.
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) Handle CMOS imager 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 2 seconds per terminal at 400℃ maximum at soldering iron.
2) Avoid using or storing the CMOS imager at high temperature or high humidity as it is a precise optical component. Do not give a mechanical shock to the CMOS imager.
3) The exit pupil position of lens should be 15mm from the top surface of CMOS imager.

14.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,while and transparency)

2. Markings

Marking contents

(1). Product name : LZ34B20
(2). Company name : SHARP
(3). Country of origin : JAPAN
(4). Date code : YY WW X XX

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.)

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
Device case	Cardboard(100devices/case)	Device tray fixing
Device tray	Conductive plastic (50devices/tray)	Device packing(2trays/case)
Cover tray	Conductive plastic(2tray/case)	Device packing
Air cushion bag	Plastic film	Device tray fixing
Buffer	Cardboard	Shock absorber of device tray
Tape	Paper	Sealing plastic film bag and device case
Label	Paper	Indicates part number,quantity and date of manufacture

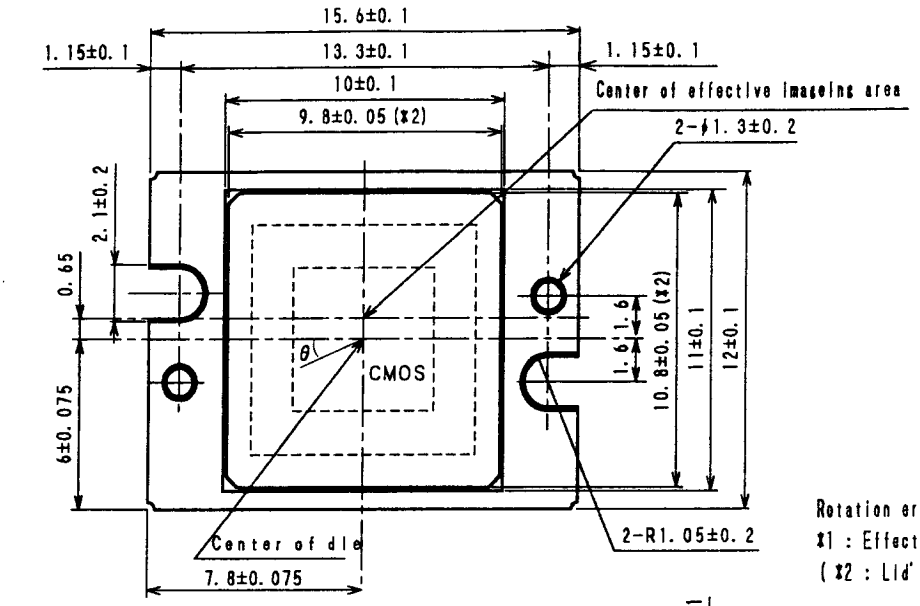
3－2. External appearance of packing

Refer to attached drawing

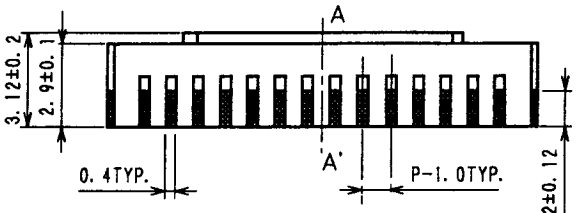
4. Precaution

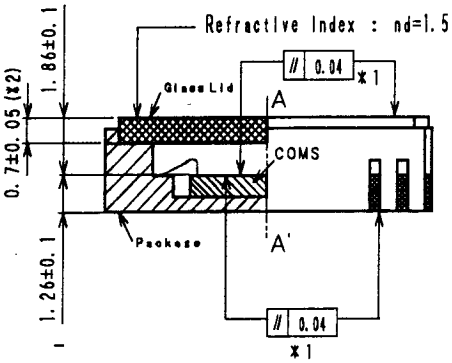
1). Before unpacking,confirm the imports of the chapter "Handling Precaution" in this device specification.

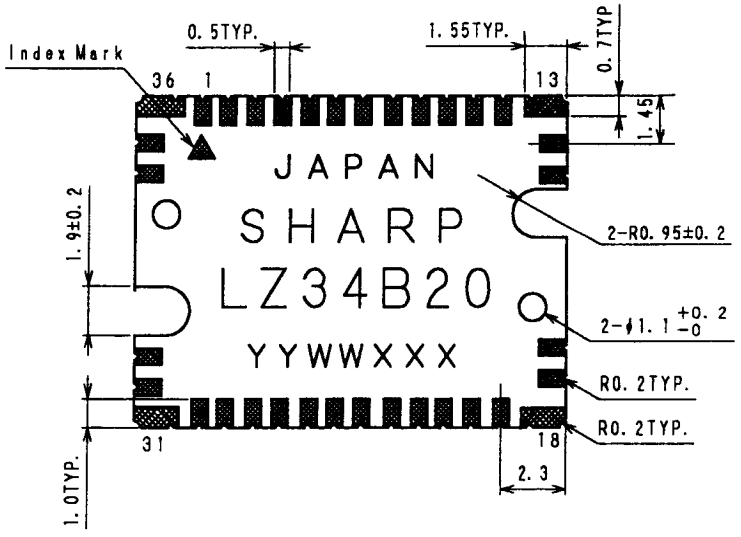
2). Unpacking should be done on the stand treated with anti-ESD. At that time,the same anti-ESD treatment should be done to operater's body,too.



Rotation error of die : θ=1.0° MAX.
※1 : Effective imaging area
(※2 : Lid's size)

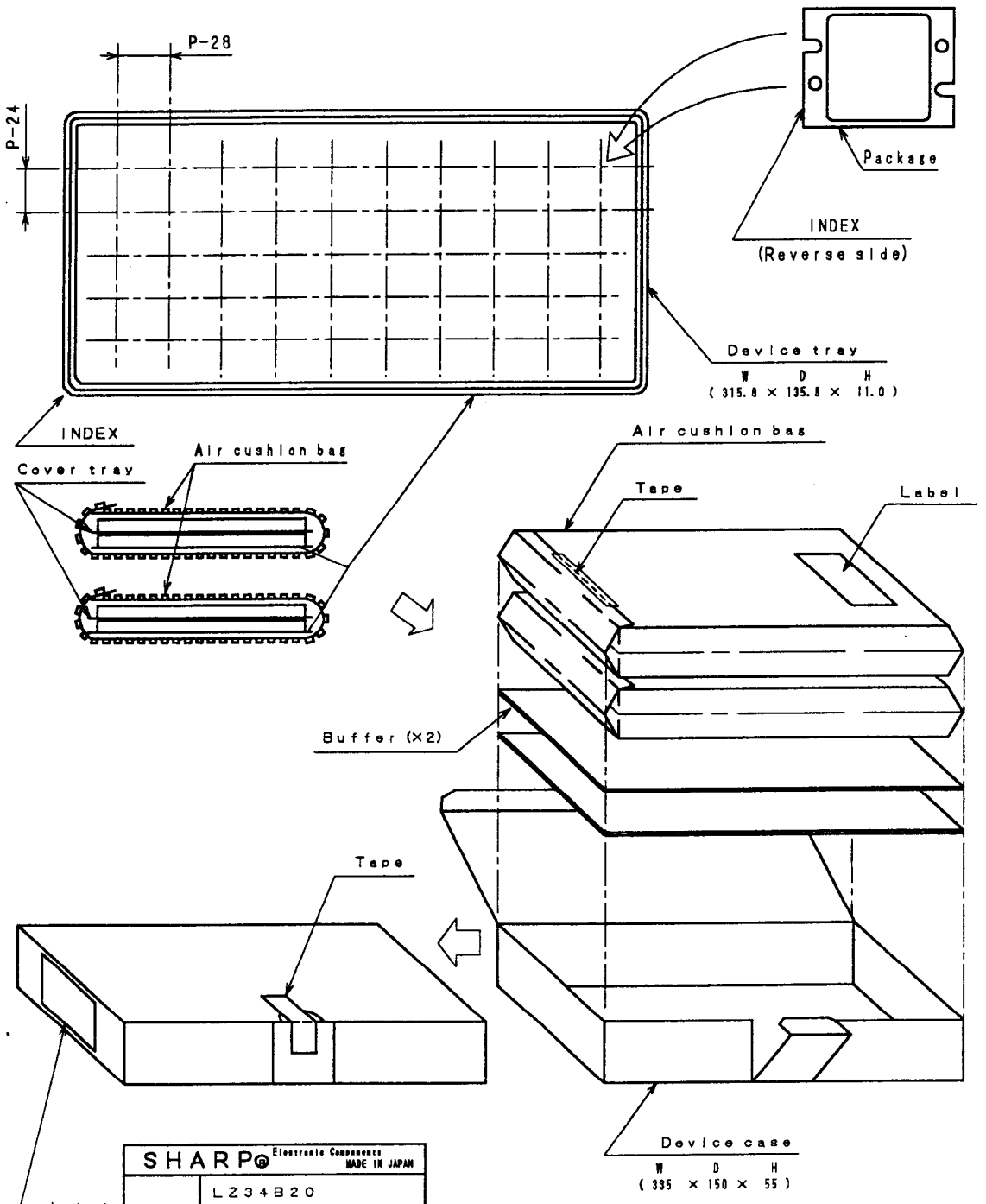






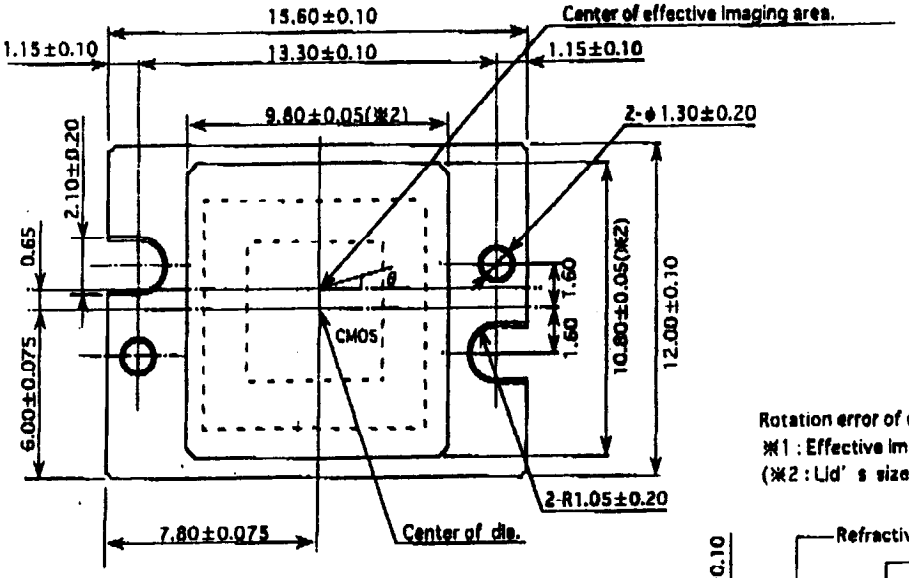
(UNIT : mm)

材質 MATERIAL	仕上 FINISH	名称 NAME	WLCC36-N-R625 Package Outline Specification
		コード CODE	
MODULE ASSEMBLY APPLICATION ENGINEERING DEPARTMENT			
INTEGRATED CIRCUITS(IC)		図番 DRAWING No.	GLC036A-11E0
SHARP CORPORATION			

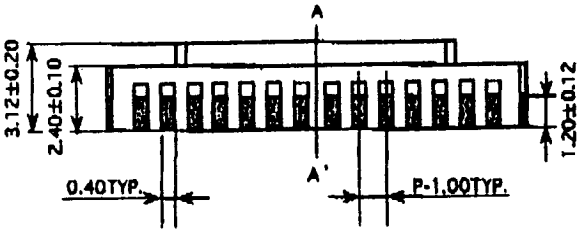


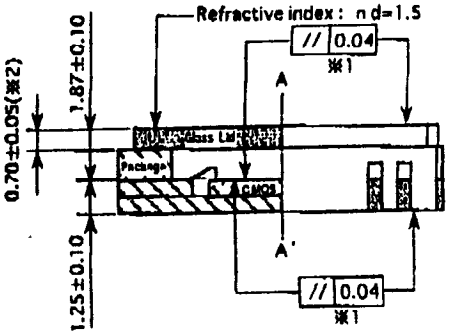
(UNIT : mm)

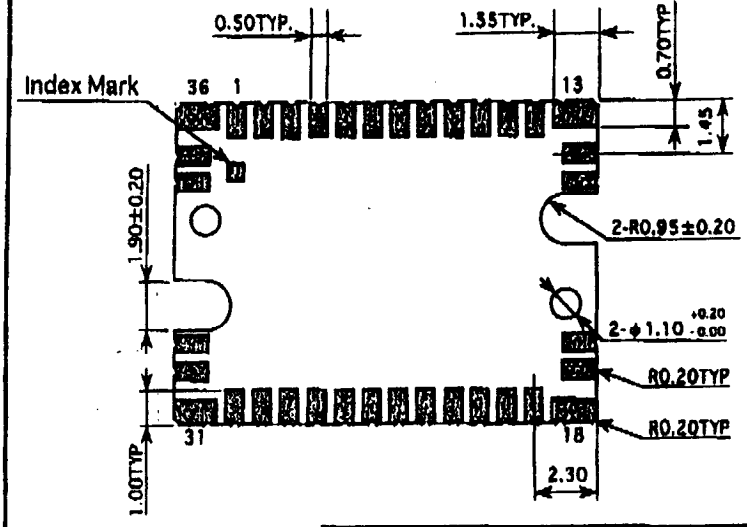
材質 MATERIAL	仕上 FINISH	名称 NAME	External Appearance of Packing
		コード CODE	
MODULE ASSEMBLY APPLICATION ENGINEERING DEPARTMENT			
INTEGRATED CIRCUITS(IC)		図番 DRAWING No.	KSEC-100T8-0
SHARP CORPORATION			



Rotation error of die : θ=1.0° MAX.
※1 : Effective imaging area
(※2 : Lid's size)







PRELIMINARY

参考図面

(UNIT : mm)

材質 MATERIAL	仕 上 FINISH	名 称 NAME	LMP36DK CMOS Package Outline Specification
		コード CODE	
IMAGE DEVICE ENGINEERING DEPT. 2			
INTEGRATED CIRCUITS (IC) GROUP		図 番 DRAWING No.	POS00002-0
SHARP CORPORATION			