

TOSHIBA CCD AREA IMAGE SENSOR CCD(Charge Coupled Device)

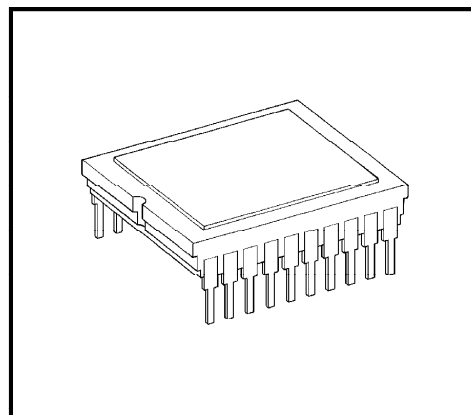
TCD5700D

2 / 3 INCH 640k IT CCD (EDTV-II)

TCD5700D is a frame interline CCD area image sensor developed for a 3-CCD wide aspect color camera (EDTV-II system).

This device has signal pixels of 1216 (horizontal) × 492 (vertical), and its image size agrees with 2 / 3 inch type wide aspect optical system.

This device offers high sensitivity, high resolution and low smearing, and reduces lag, picture sticking, after image, picture distortion and microphonic noise. It can be used for video cameras, surveillance cameras, object detection and pattern recognition.



Weight : 3.2g (Typ.)

FEATURES

- Total Signal Pixel Number : 1290 (H) × 496 (V)
(Signal Pixel Number within Effective Period: 1184 (H) × 485 (V))
- Signal Pixel Number : 1216 (H) × 492 (V)
- Pixel Size : 8.1 μm (H) × 11.1 μm (V)
- Image Size : 9.850mm (H) × 5.461mm (V)
(Image Size within Effective Period: 9.590mm (H) × 5.384mm (V))
- Package : 20 pin DIP, Ceramics, Multi-Coring Glass
- Additional Function : Electronic Shutter (1 / 60 ~ 1 / 10000)
- Transfer System : Interline Transfer
- Diagonal Length : 10.998mm (within Effective Image Area)
- Aspect Ratio : 0.193% (within Effective Image Area)

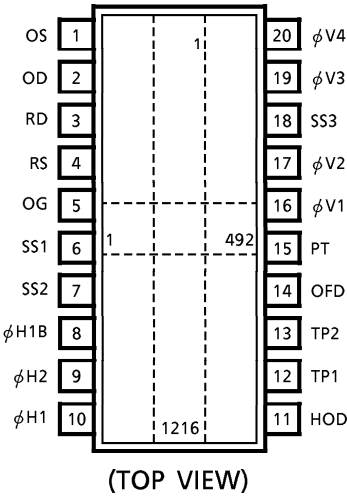
961001EBA1

- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

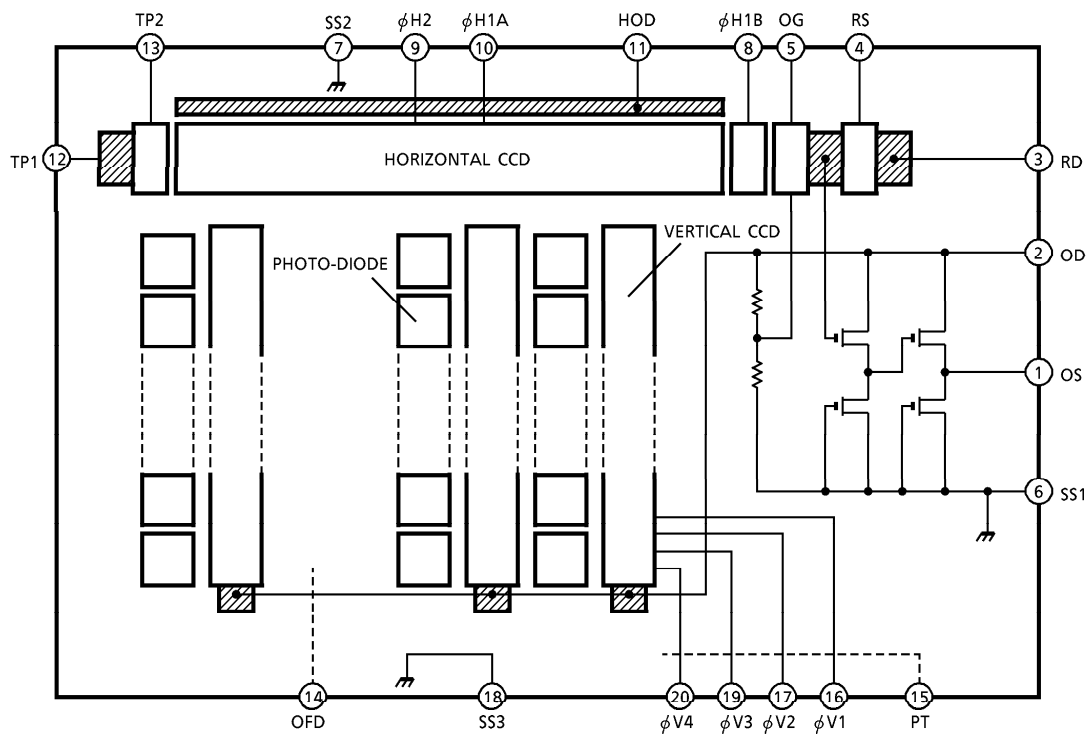
MAXIMUM RATINGS (V_{SS} = 0V)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Vertical CCD Clock Pulse Voltage	V _{φV}	− 10~18	V
Horizontal CCD Clock Pulse Voltage	V _H	− 0.3~18	V
Reset Pulse Voltage	V _{RS}		V
Reset Drain Voltage	V _{RD}		V
Output Transistor Drain Voltage	V _{OD}		V
Test Terminal Voltage	V _{TP}		V
Overflow Drain Voltage	V _{OFD}	− 0.3~45	V
Operating Temperature	T _{opr}	− 20~60	°C
Storage Temperature	T _{stg}	− 40~85	°C

PIN CONNECTIONS



CIRCUIT DIAGRAM



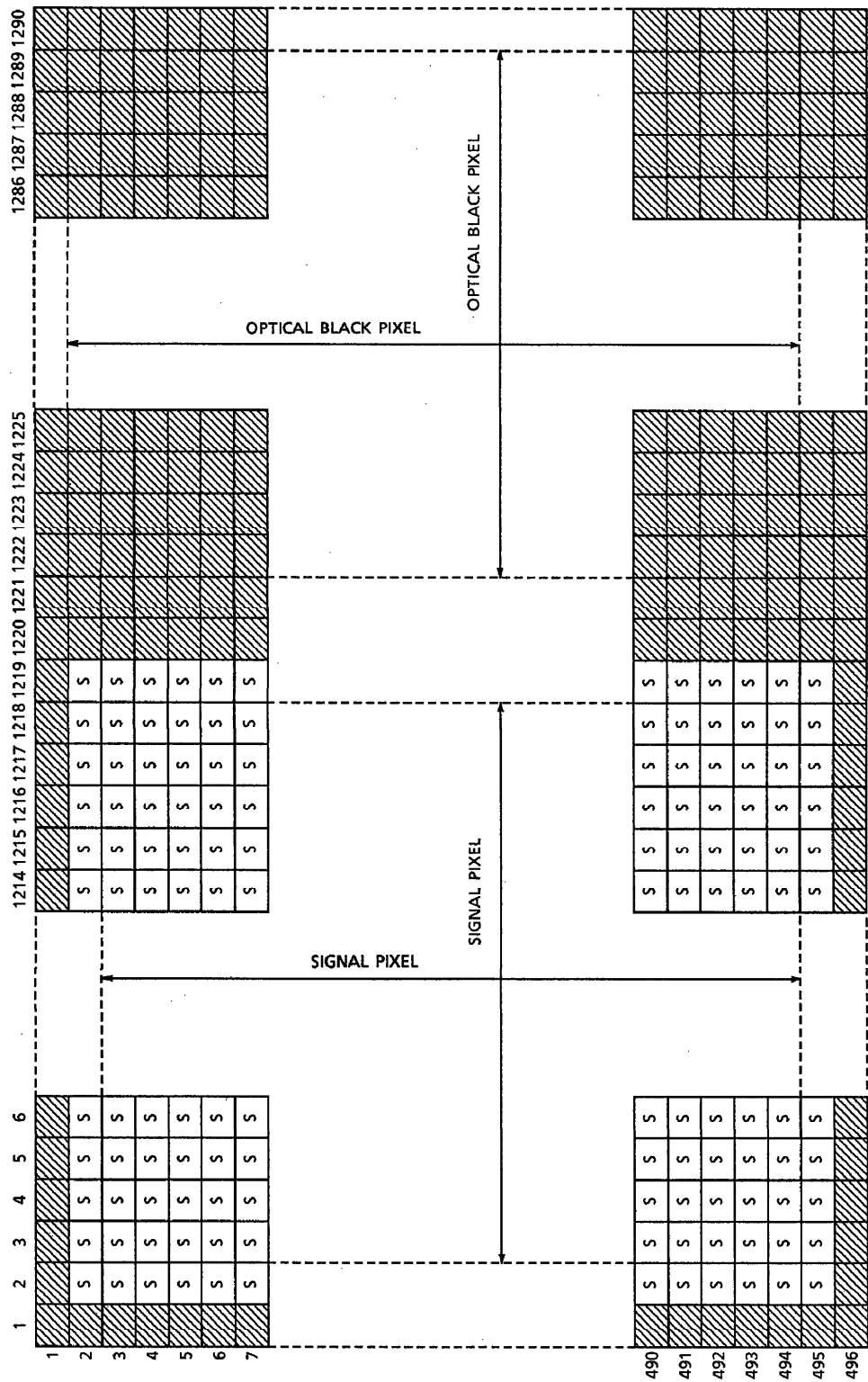
PIN NAMES

SYMBOL	PIN NAME	SYMBOL	PIN NAME
$\phi V1$	Vertical CCD Clock (Phase 1)	OD	Output Transistor Drain
$\phi V2$	Vertical CCD Clock (Phase 2)	HOD	Horizontal Overflow Drain
$\phi V3$	Vertical CCD Clock (Phase 3)	OS	Output Transistor Source
$\phi V4$	Vertical CCD Clock (Phase 4)	OFD	Overflow Drain
$\phi H1A$	Horizontal CCD Clock (Phase 1)	TP1	Test Pin 1
$\phi H1B$	Final Horizontal CCD Clock (Phase 1)	TP2	Test Pin 2
$\phi H2$	Horizontal CCD Clock (Phase 2)	SS1	Substrate (1) (Ground)
RS	Reset Gate	SS2	Substrate (2) (Ground)
OG	Output Gate	SS3	Substrate (3) (Ground)
RD	Reset Drain	PT	Protective Transistor Bias

PHOTOSENSING ELEMENT ARRANGEMENT

HORIZONTAL →

VERTICAL →



S : PHOTOSENSITIVE PIXEL

OPTICAL AND ELECTRICAL CHARACTERISTICS

Tungsten electric lamp light of 3000K color temperature passing a cyan filter C500 (1.0mm thick, made by HOYA GLASS CO.) and an infrared cut filter (mesial magnitude 680nm).

TC6335AF is available for CCD drive timing pulse generator IC and on the field storage mode.

A measurement point is CCD output signal (emitter follower output).

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Photo Sensitivity	R		90	120	—	mV / lx
Saturation Voltage	V_{SAT}	V_{OFD} adjustment	600	1000	—	mV
Dark Signal Voltage	V_{DRK}	$T_c = 60^\circ\text{C}$	—	2	3	mV
Reset Pulse Feed Through	RFT		—	400	700	mV
Smear	SMR		—	- 110	- 90	dB
Output Impedance	Z_O		—	250	300	Ω
Output Transistor Current	I_{OD}		—	11	15	mA
Lag	LAGd	$V_{sig} = 20\text{mV}$	—	0.1	1	mV
Blooming Margin	BLM	V_{OFD} adjustment	8500	—	—	Time

(Note) V_{OFD} adjustment

Operate CCD under 8500 times the light intensity of the standard condition.

CCD output signal is 200mV under the standard condition.

And then set up V_{OFD} to a voltage not to be occurred Blooming.

OPERATING CONDITION

CHARACTERISTIC			SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Vertical Clock Pulse Voltage	Field Shift		$V_{\phi FS}$	14.5	15.0	15.5	V	
	Line Shift	"H" Level	$V_{\phi VH}$	-0.5	0	0.5		
		"L" Level	$V_{\phi VL}$	-9.5	-9.0	-8.5		
Horizontal CCD Clock Pulse Voltage			$V_{\phi H}$	4.5	5.0	5.5	V_{p-p}	
Reset Pulse Voltage		"H" Level	$V_{\phi RSH}$	15.5	16.25	17.0	V	
		"L" Level	$V_{\phi RSL}$	11.0	11.25	11.5		
Output Gate Voltage			V_{OG}	3.1	3.6	4.1	V	
Reset Drain Voltage			V_{RD}	14.5	15.0	15.5	V	
Output Transistor Drain Voltage			V_{OD}	14.5	15.0	15.5	V	
Protective Transistor Bias Voltage			V_{PT}	$V_{\phi VL} - 1.0$			V	
Test Pin (1) Voltage			V_{TP1}	14.5	15.0	15.5	V	
Test Pin (2) Voltage			V_{TP2}	0	0	0	V	
Horizontal Overflow Drain Voltage			HOD	14.5	15.0	15.5	V	
Overflow Drain Voltage			V_{OFD}	7~20			V	(Note 1)
Electronic Shutter Pulse Voltage			V_{ES}	14.5	15.0	15.5	V_{p-p}	(Note 2)

(Note 1) V_{OFD} values is indicated on package. Adjustment voltage is $\pm 0.2V$. Symbol and voltage is as follows;

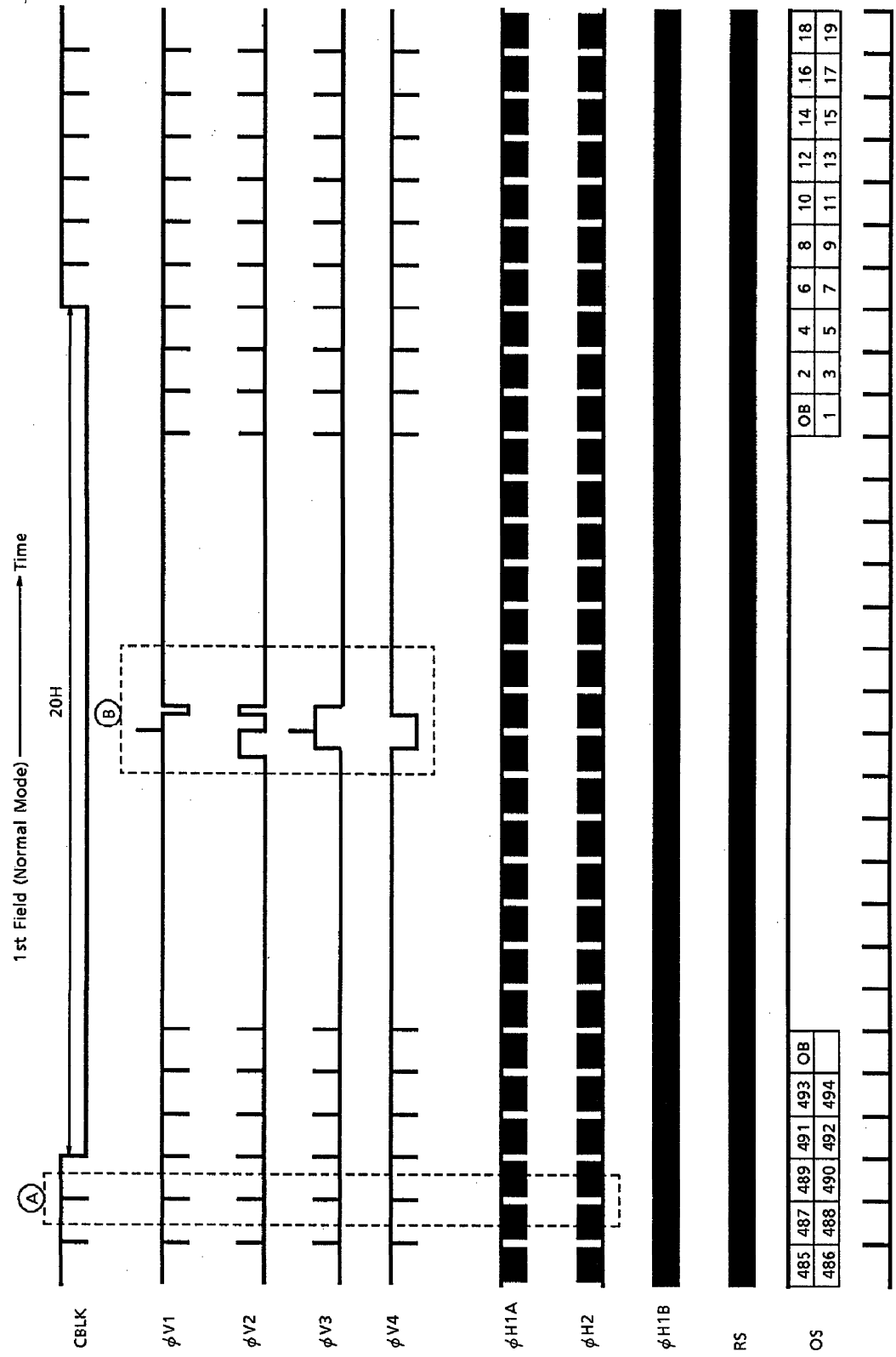
Symbol	A	B	C	D	E	F	G	H	J	K	L
Voltage (V)	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0
Symbol	M	N	P	Q	R	S	T	U	V	W	X
Voltage (V)	12.5	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.5
Symbol	Y	Z	1	2	3						
Voltage (V)	18.0	18.5	19.0	19.5	20.0						

(Note 2) This pulse puts in through a capacitor.

CLOCK CHARACTERISTICS

CHARACTERISTIC			SYMBOL	MIN.	TYP.	MAX.	UNIT
Horizontal CCD Clock Frequency			$f_{\phi H}$	—	22.5	—	
Reset Pulse Frequency			$f_{\phi RS}$	—	22.5	—	
Vertical Clock Pulse Frequency	Charge Sweep		$f_{\phi V (1)}$	—	1.25	—	kHz
	Line Shift		$f_{\phi V (2)}$	—	15.75	—	
Vertical CCD Clock Capacitance	Phase 1		$C_{\phi V1}$	—	4000	—	
	Phase 2		$C_{\phi V2}$	—	4600	—	
	Phase 3		$C_{\phi V3}$	—	4000	—	
	Phase 4		$C_{\phi V4}$	—	4600	—	
Horizontal CCD Clock Capacitance			$C_{\phi H1A}$	—	300	—	pF
			$C_{\phi H2}$	—	300	—	
Final Horizontal CCD Clock Capacitance			$C_{\phi H1B}$	—	7	—	
Reset Gate Clock Capacitance			C_{RS}	—	5	—	

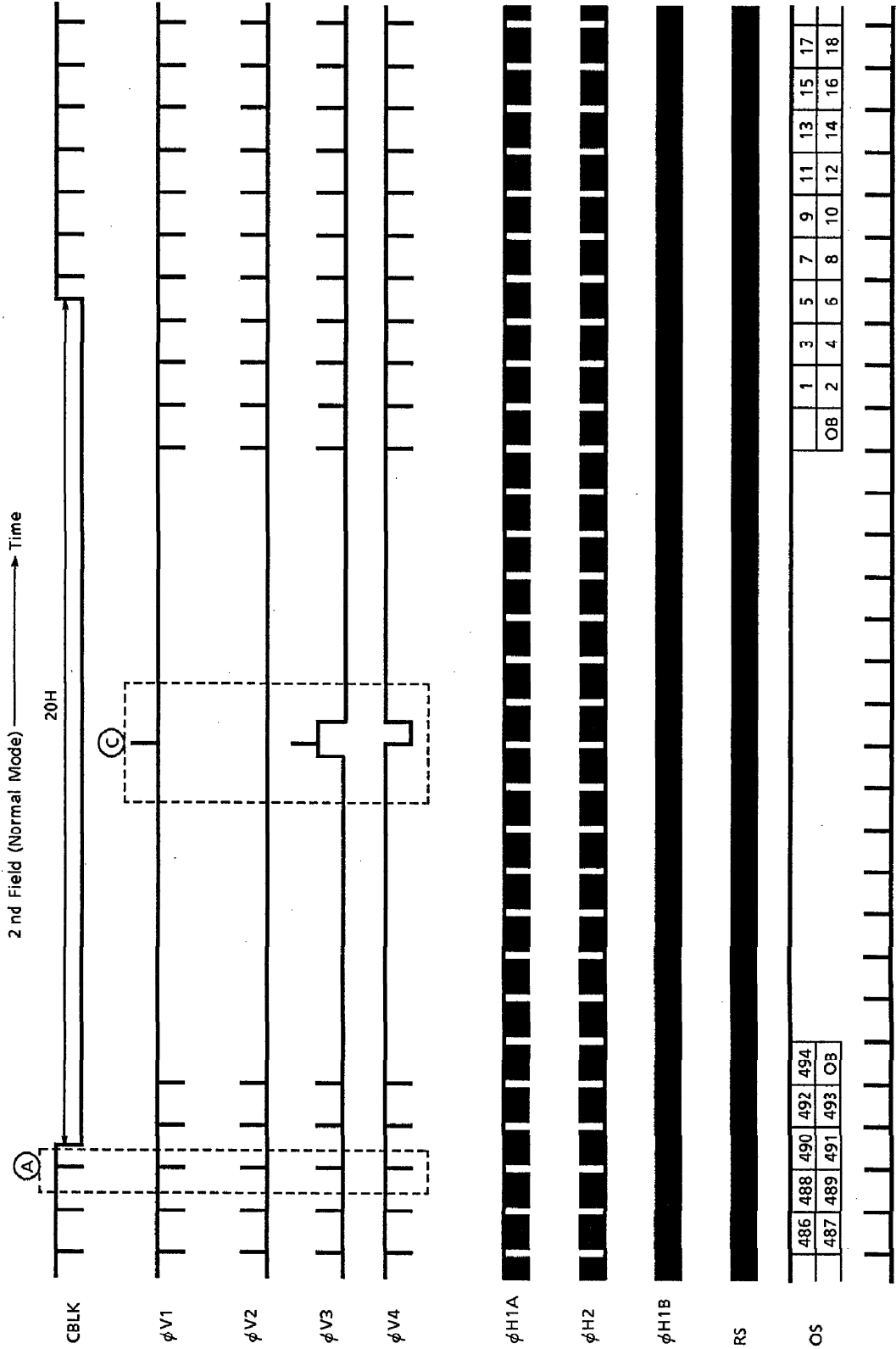
TIMING CHART



OB	2	4	6	8	10	12	14	16	18
1	3	5	7	9	11	13	15	17	19

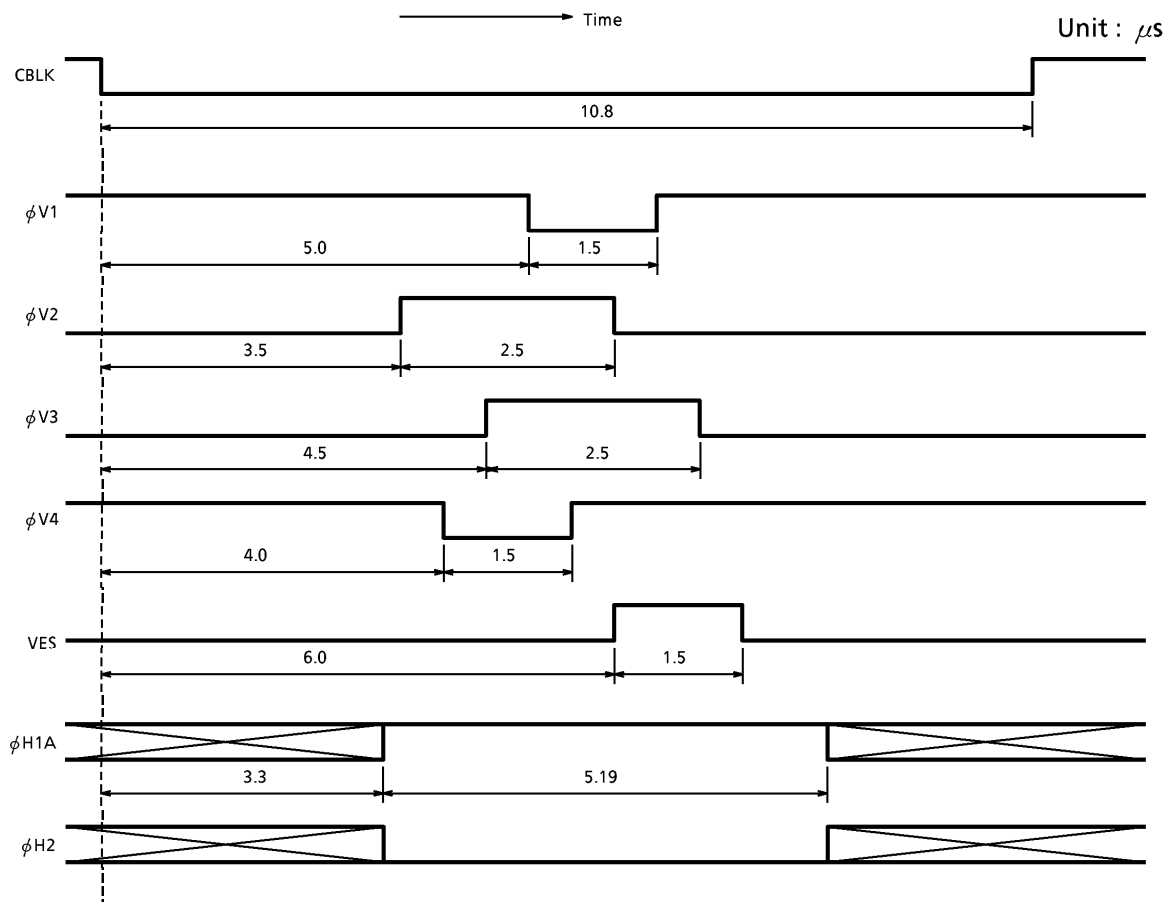
485	487	489	491	493	OB
486	488	490	492	494	

TIMING CHART

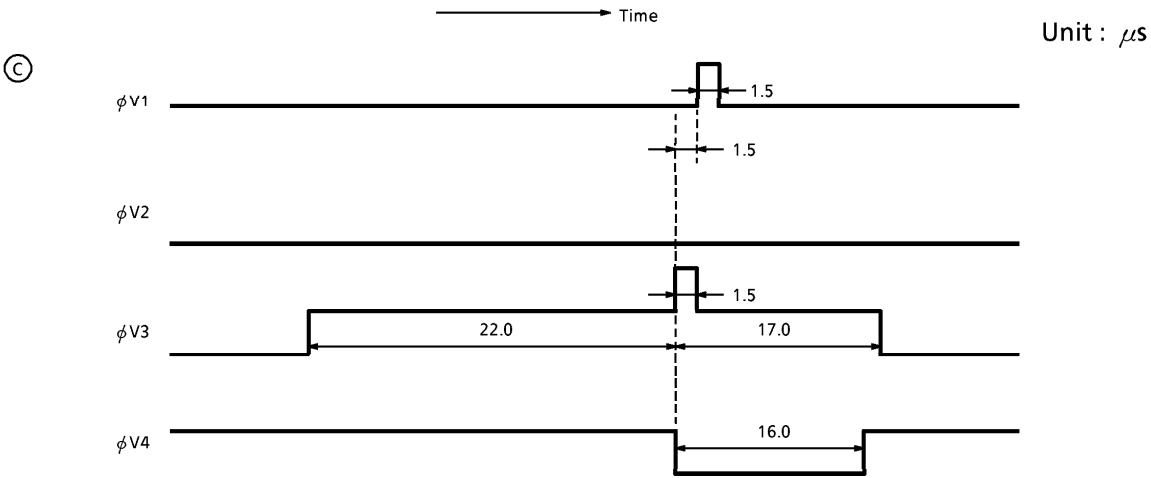
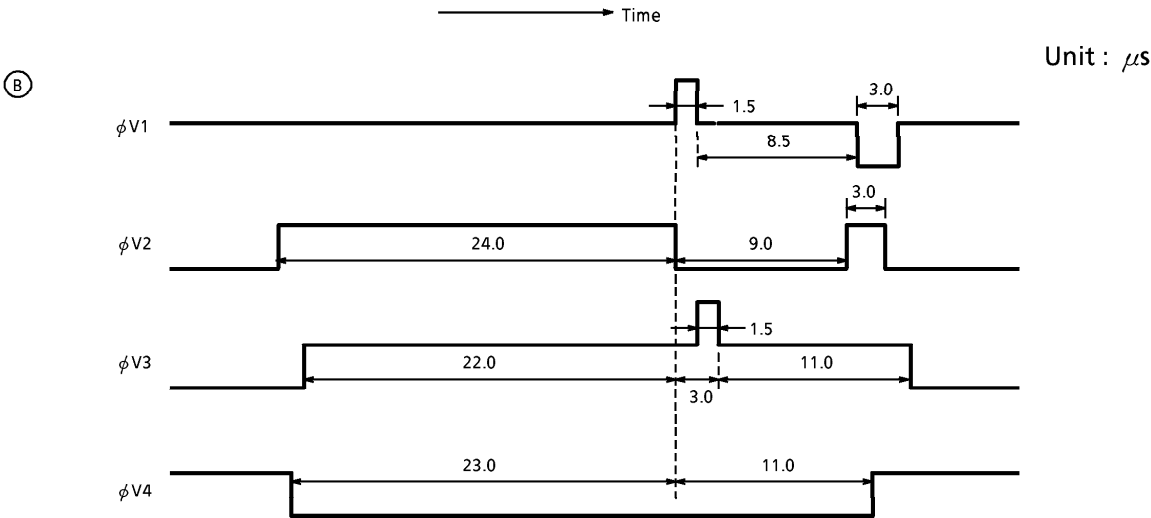


TIMING CHART (EXPANDED)

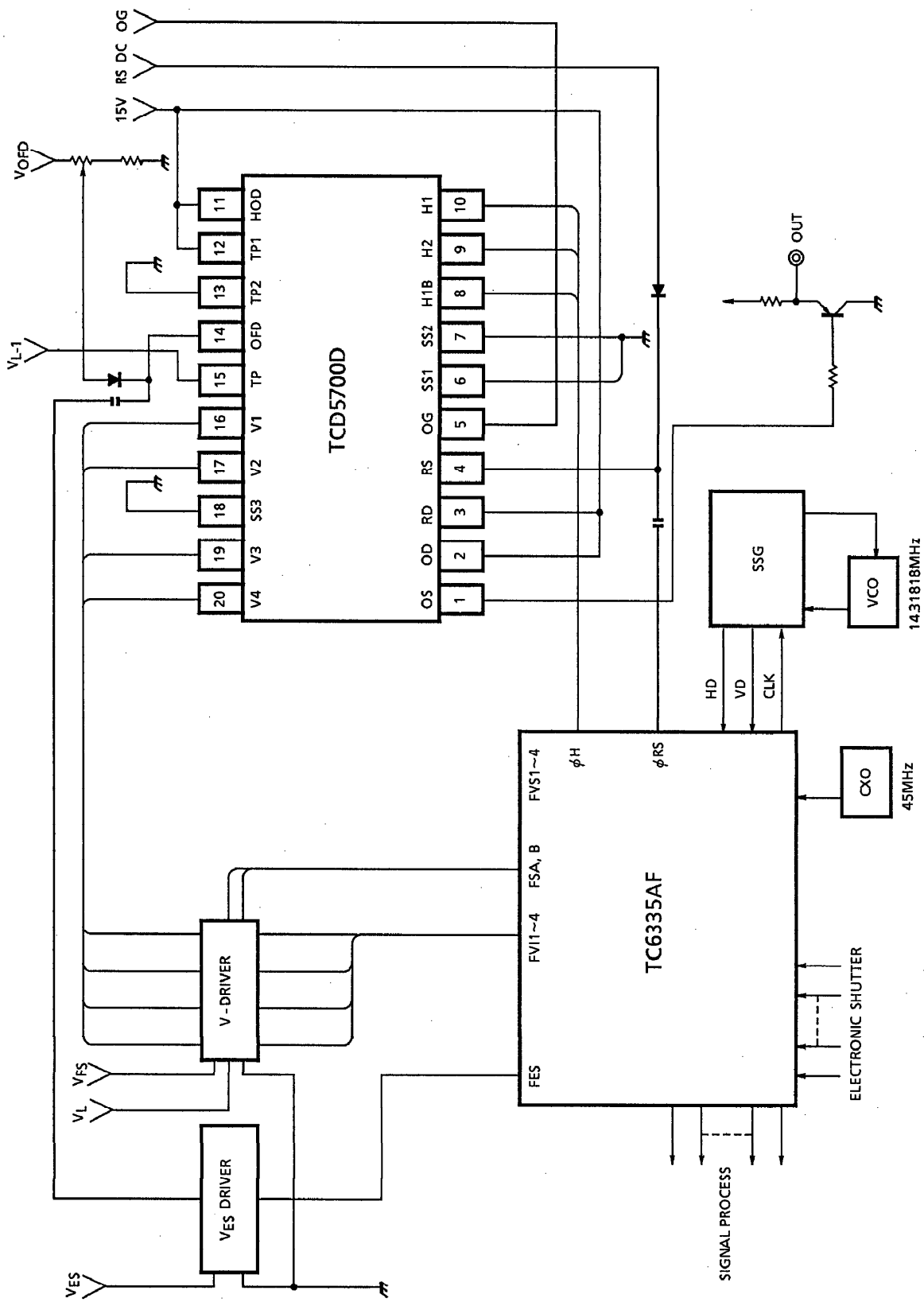
Ⓐ



TIMING CHART



TYPICAL DRIVE CIRCUIT



PRECAUTIONS FOR USE OF CCD IMAGE SENSOR**1. Static Electricity**

CCD Image Sensor is protected against static electricity, but inferior puncture mode device due to static electricity is sometimes detected. In handling the device, it is necessary to execute the following static electricity preventive measures, in order to prevent the trouble rate increase of the manufacturing system due to static electricity.

- a. Prevent the generation of static electricity due to friction by making the work with bare hands or by putting on cotton gloves and non-charging working clothes.
- b. Discharge the static electricity by providing earth plate or earth wire on the floor, door or stand of the work room.
- c. Ground the tools such as soldering iron, radio cutting plier or pincette.

It is not necessarily required to execute all precaution items for static electricity.

It is all right to mitigate the precautions by confirming that the trouble rate within the prescribed range.

2 Window Glass

As the dust and station on the glass window of the package will cause black flow on the picture, never fail to clean the glass surface before using. (Blow compressed vapor, and wipe off the dust, and dirt with soft cloth or paper slightly moistened with alcohol).

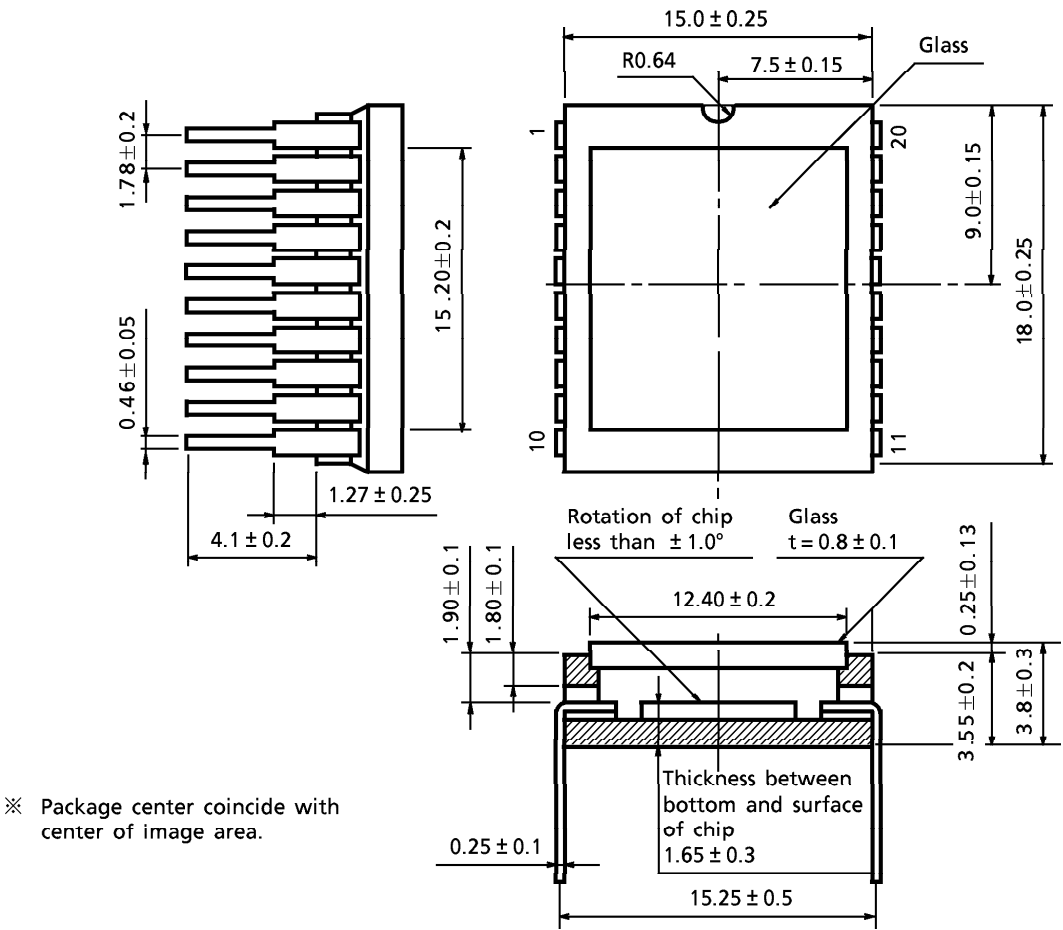
Fully take care for the handling of the device as the window glass will break or a strong friction is given to the window glass surface.

3. Incident Light

CCD image sensor has sensitivity in a wide range zone of light wave length, but its characteristics will sometimes widely change when used with loong wave length input light outside the visual light zone.

OUTLINE DRAWING

Unit : mm



Weight : 3.2g (Typ.)