

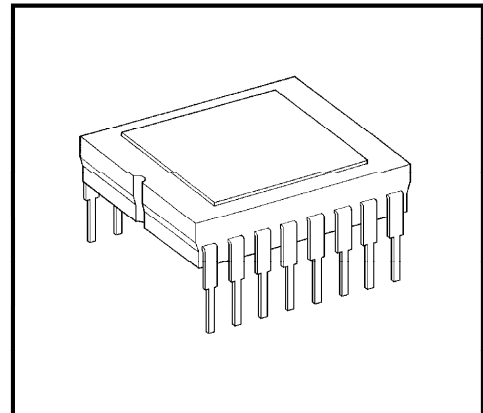
TOSHIBA CCD AREA IMAGE SENSOR CCD(Charge Coupled Device)

TCD5481AD

GENERAL

The TCD5481AD is an interline CCD area image sensor developed for a NTSC system Color television camera. This device has signal pixels of 858 (horizontal) × 614 (vertical), and its image size agrees with 1/3 inch type optical system.

This device offers high sensitivity 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 : 1.9g (Typ.)

FEATURES

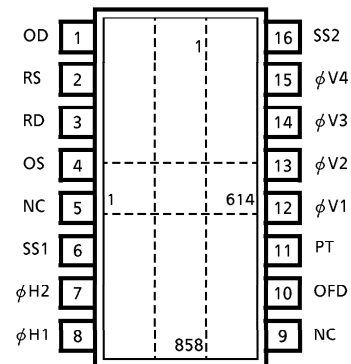
- Total Signal Pixel Number : 908 (H) × 623 (V)
- Signal Pixel Number : 858 (H) × 614 (V)
- Pixel Size : 5.7 μm (H) × 5.9 μm (V)
- Image Size : 4.9mm (H) × 3.6mm (V)
- Package : 16pin DIP, Cerdip
- Additional Function : Electronic Shutter (1/60~1/10000 s)
Correspondence with EIS (Electronic Imaging Stabilizer)
- Color Filter : Ye, Cy, Mg, G Mosaic

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Vertical CCD Clock Pulse Voltage	$V_{\phi V}$	-9~17	V
Horizontal CCD Clock Pulse Voltage	$V_{\phi H}$	-0.3~18	V
Reset Pulse Voltage	V_{RS}		
Reset Drain Voltage	V_{RD}		
Output Transistor Drain Voltage	V_{OD}		
Protective Transistor Bias Voltage	V_{PT}	-0.2~ -10	V
Overflow Drain Voltage	V_{OFD}	-0.2~45	V
Operating Temperature	T_{opr}	-20~70	°C
Storage Temperature	T_{stg}	-40~85	°C

(Note) All voltage are with respect to SS terminals. (Ground)

PIN CONNECTIONS

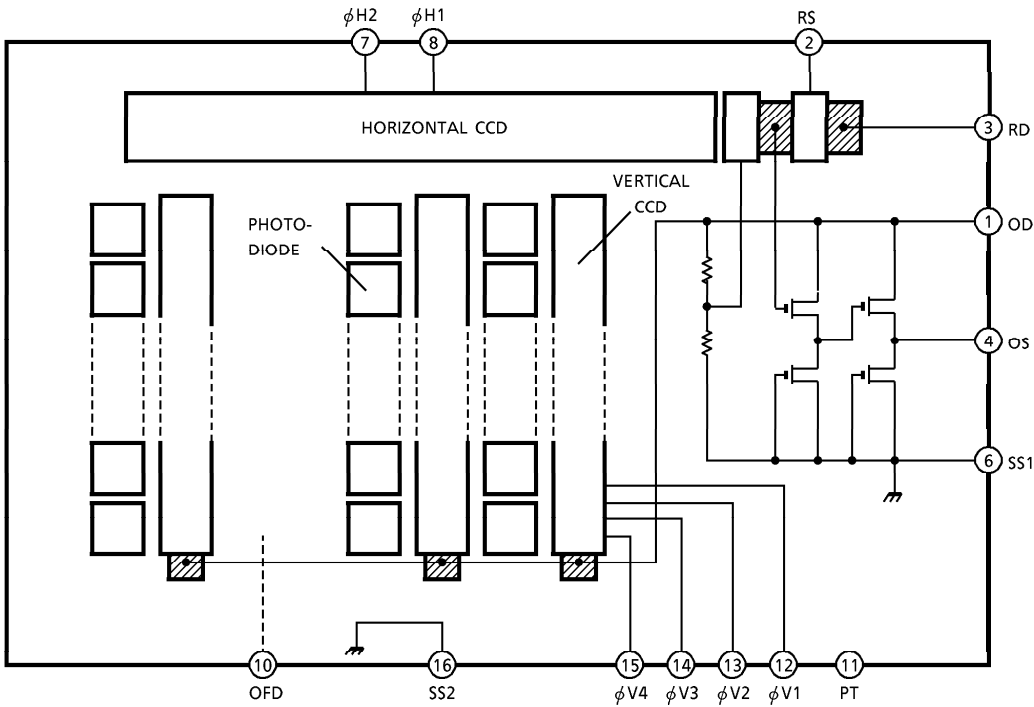


(TOP VIEW)

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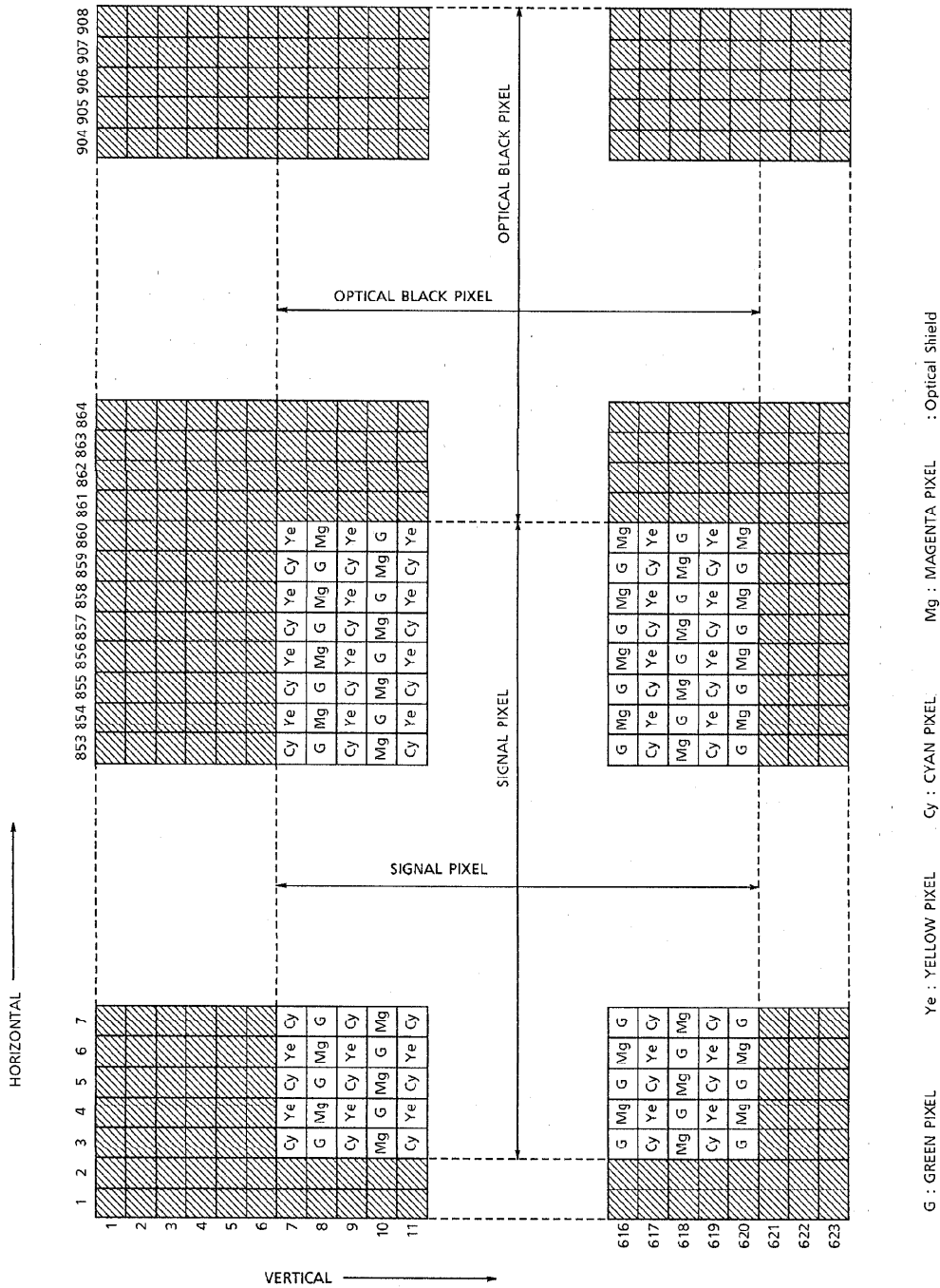
CIRCUIT DIAGRAM



PIN NAMES

SYMBOL	PIN NAME	SYMBOL	PIN NAME
$\phi V1$	Vertical CCD Clock (Phase 1)	OS	Output Transistor Source
$\phi V2$	Vertical CCD Clock (Phase 2)	OFD	Overflow Drain
$\phi V3$	Vertical CCD Clock (Phase 3)	SS1	Substrate (1) (Ground)
$\phi V4$	Vertical CCD Clock (Phase 4)	SS2	Substrate (2) (Ground)
$\phi H1$	Horizontal CCD Clock (Phase 1)	NC	No Connection
$\phi H2$	Horizontal CCD Clock (Phase 2)	RD	Reset Drain
RS	Reset Gate	PT	Protective Ttransistor Bias
OD	Output Transistor Drain		

PHOTOSENSING ELEMENT ARRANGEMENT



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OPTICAL AND ELECTRICAL CHARACTERISTICS

Tungsten electric lamp light of 3200K color temperature passing a cyan filter C500 (1.6mm thick, made by HOYA GLASS CO.).

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Photo Sensitivity	R		35	38	—	mV / lx
Saturation Voltage	V _{SAT}	V _{OFD} adjustment	600	—	—	mV
Dark Signal Voltage	V _{DRK}	T _c = 60°C	—	1.5	3.0	mV
Smear	SMR		—	—	0.03	%
Output Impedance	Z _o		—	400	—	Ω
Output Transistor Current	I _{OD}		—	6.0	10	mA
Lag	LAG _d	V _{sig} = 20mV	—	0	1.0	mV
Blooming Margin	BLM	V _{OFD} adjustment	500	—	—	Time

(Note) V_{OFD} adjustment

Operate CCD under 500 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	REMARKS
Vertical CCD Clock Pulse Voltage ($\phi V1$, $\phi V3$)	Field Shift	$V_{\phi FS}$	15.2	15.7	16.2	V	
	Line "H" Level	$V_{\phi VH}$	-0.2	0	0.2		
	Shif "L" Level	$V_{\phi VL}$	-6.7	-7.0	-7.3		
Vertical CCD Clock Pulse Voltage ($\phi V2$, $\phi V4$)	Line "H" Level	$V_{\phi VH}$	3.3	3.5	3.7	V	
	Shif "L" Level	$V_{\phi VL}$	-6.7	-7.0	-7.3		
Horizontal CCD Clock Pulse Voltage	"H" Level	$V_{\phi HH}$	4.7	5.0	5.3	V	
	"L" Level	$V_{\phi HL}$	-0.3	0	0.3		
Reset Pulse Voltage	"H" Level	$V_{\phi RSH}$	16.2	16.5	16.8	V_{p-p}	(Note 1)
	"L" Level	$V_{\phi RSL}$	11.2	11.5	11.8		
Reset Drain Voltage		V_{RD}	15.0	15.5	16.0	V	
Output Transistor Drain Voltage		V_{OD}	15.0	15.5	16.0	V	
Overflow Drain Voltage		V_{OFD}	7.0	(Adjustment)	14.0	V	(Note 2)
Electronic Shutter Pulse Voltage		$V_{\phi ES}$	21.9	22.7	23.5	V_{p-p}	(Note 3)

(Note 1) This pulse puts in through a capacitor.

(Note 2) V_{OFD} value is indicated on package. Adjustment voltage is $\pm 0.2V$.
Symbol and voltage is as follows;

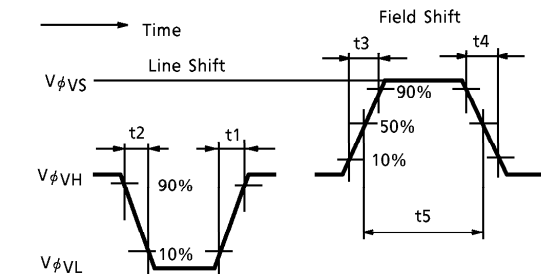
SYMBOL	A	B	C	D	E	F	G	H	J
Voltage (V)	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0
SYMBOL	K	L	M	N	P	Q			
Voltage (V)	11.5	12.0	12.5	13.0	13.5	14.0			

(Note 3) This pulse puts in through a capacitor.

CLOCK CHARACTERISTICS

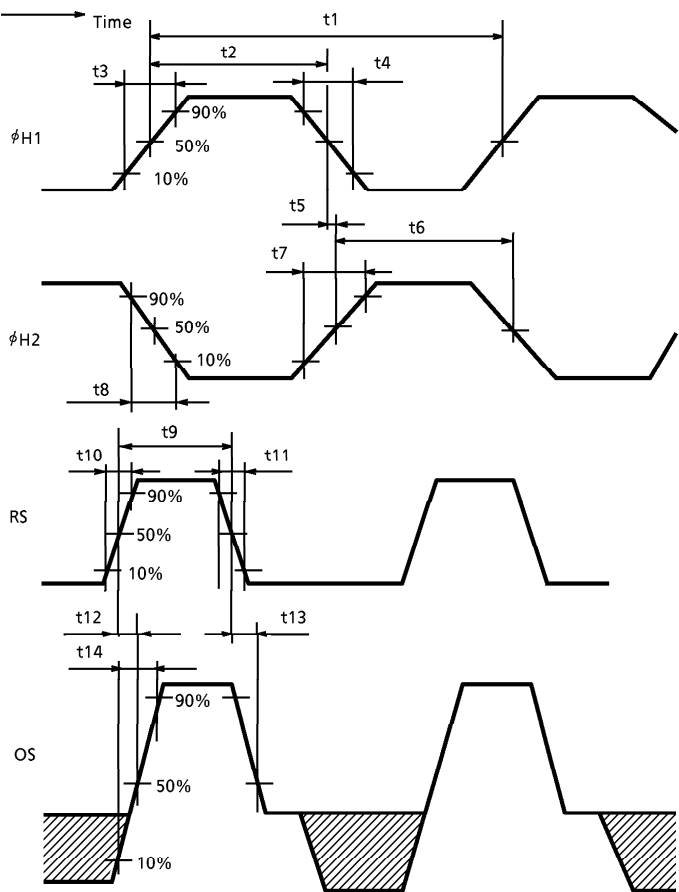
CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT
Horizontal CCD Clock Frequency		$f_{\phi H}$	—	15.892	—	MHz
Reset Pulse Frequency		f_{RS}	—	15.892	—	MHz
Vertical CCD Clock Frequency		$f_{\phi V}$	—	15.734	—	kHz
Vertical CCD Clock Capacitance	Phase 1	$C_{\phi V1}$	—	1800	—	pF
	Phase 2	$C_{\phi V2}$	—	1600	—	
	Phase 3	$C_{\phi V3}$	—	1800	—	
	Phase 4	$C_{\phi V4}$	—	1600	—	
Horizontal CCD Clock Capacitance	Phase 1	$C_{\phi H1A}$	—	150	—	pF
	Phase 2	$C_{\phi H2}$	—	150	—	
Reset Gate Clock Capacitance		C_{RS}	—	10	—	pF

TIMING REQUIREMENT (VERTICAL)



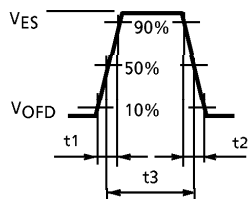
SYMBOL	MIN.	TYP.	MAX.	UNIT
t1	5	100	200	ns
t2	5	100	200	ns
t3	20	100	300	ns
t4	20	100	300	ns
t5	2.5	3.0	3.5	μs

TIMING REQUIREMENT (HORIZONTAL)



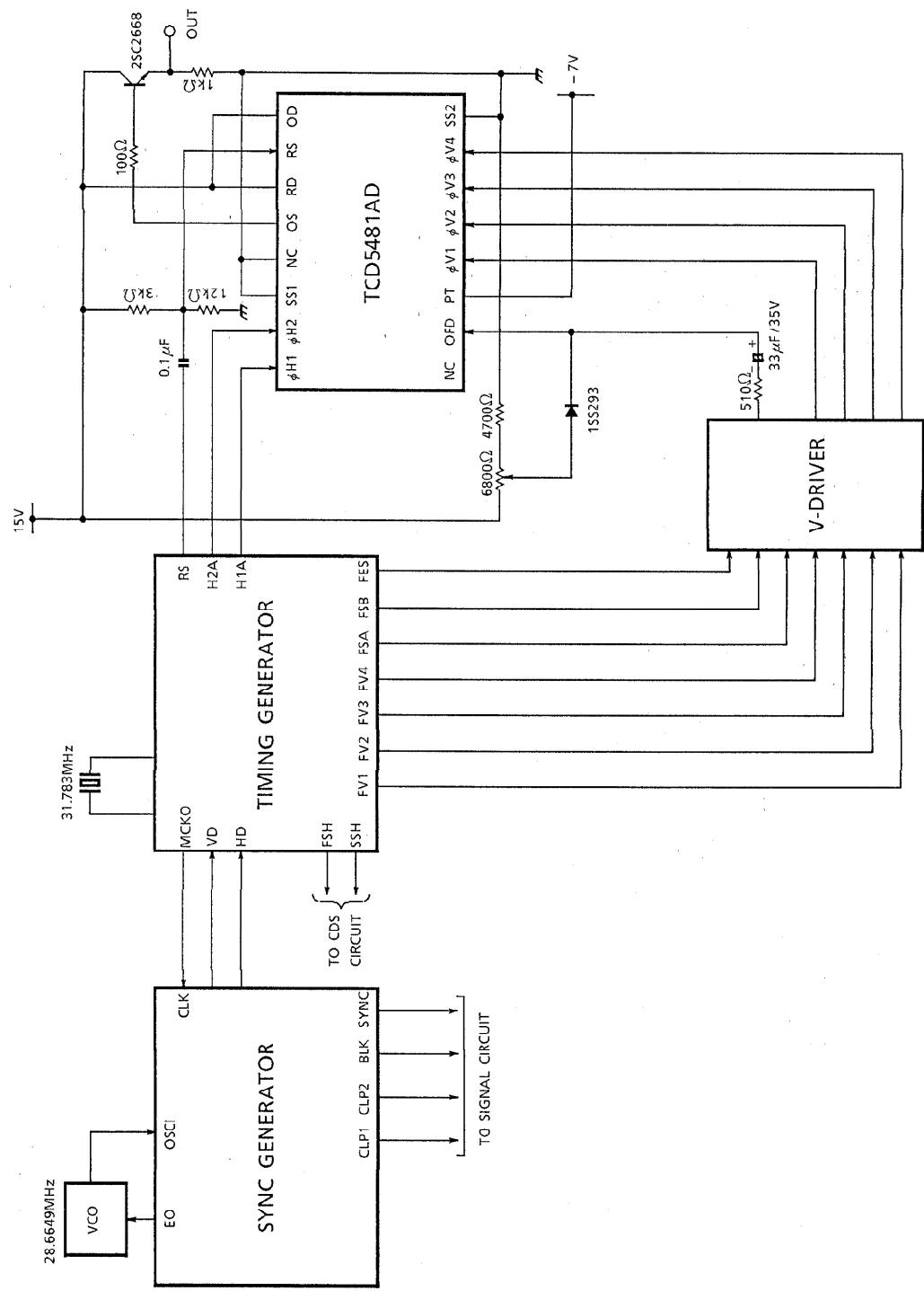
SYMBOL	MIN.	TYP.	MAX.	UNIT
t1	—	63.9	—	ns
t2	—	32.0	—	ns
t3	—	10	—	ns
t4	—	10	—	ns
t5	—	0	—	ns
t6	—	32.0	—	ns
t7	—	10	—	ns
t8	—	10	—	ns
t9	—	15.1	—	ns
t10	—	3	—	ns
t11	—	3	—	ns
t12	—	—	—	ns
t13	—	—	—	ns
t14	—	—	—	ns

TIMING REQUIREMENT (ELECTRICAL SHUTTER PULSE)



SYMBOL	MIN.	TYP.	MAX.	UNIT
t1	100	200	300	ns
t2	100	200	300	ns
t3	1.75	1.95	2.15	μs

TYPICAL DRIVE CIRCUIT



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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.

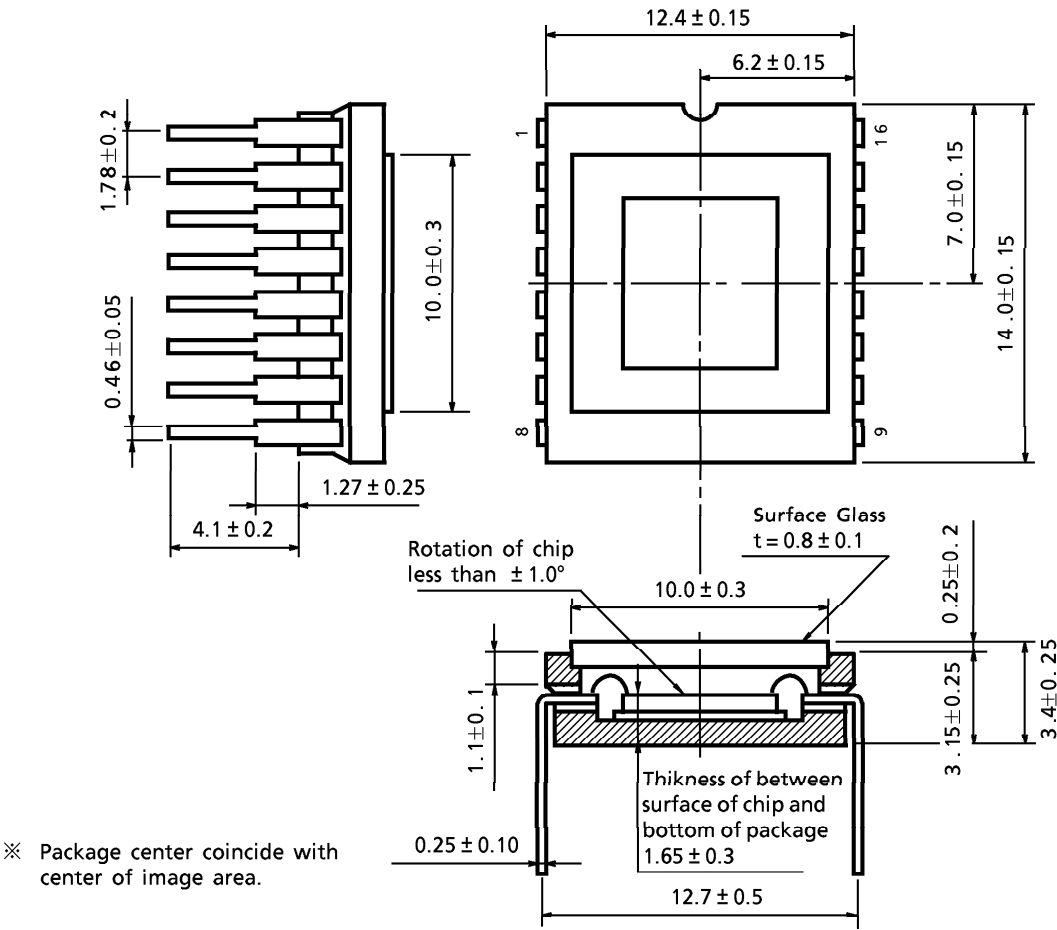
2. Window Glass

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.

OUTLINE DRAWING

Unit : mm



Weight : 1.9g (Typ.)