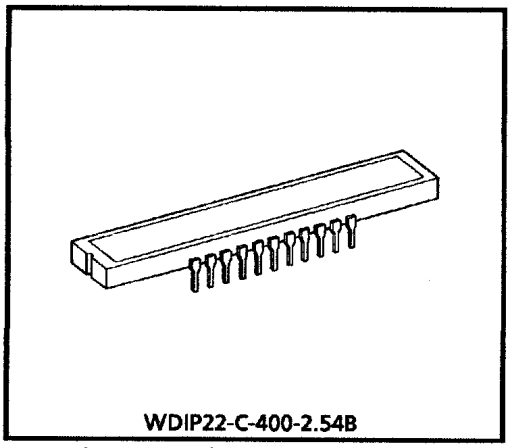
TOSHIBA CCD LINEAR IMAGE SENSOR CCD(Charge Coupled Device)

TCD1500C

The TCD1500C is a high sensitive and low dark current 5340-elements linear image sensor. The sensor can be used for facsimile, imagescanner and OCR. The signal pre-processing circuit which is composed of Sample and Hold circuit and Pre-amplifier circuit. The device contains a row of 5340 photodiodes, which provide a 16 lines/mm (400DPI) across a A3 size paper and besides 24 lines/mm (600DPI) across a A4 size paper.



WDIP22-C-400-2.54B

Weight : 5.4g (Typ.)

FEATURES

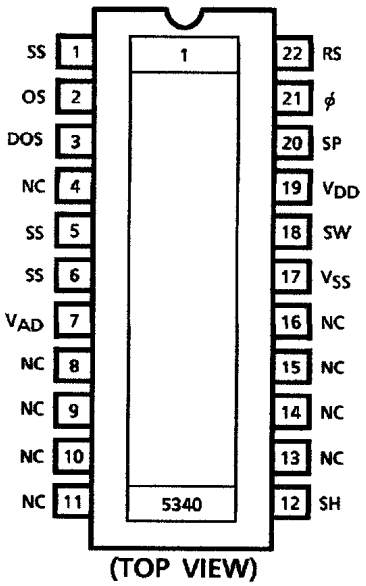
- Number of Image Sensing Elements : 5340
- Image Sensing Element Size : 7μm by 7μm on 7μm centers
- Photo Sensing Region : High sensitive pn photodiode
- Clock : 2 phase
- Internal Circuit : S/H circuit, Pre-Amplifier circuit
- Package : 22 pin cerdip

MAXIMUM RATINGS (Note 1)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Clock Pulse Voltage	V_ϕ	−0.3~15	V
Shift Pulse Voltage	V_{SH}		V
Reset Pulse Voltage	V_{RS}		V
Sample and Hold Pulse Voltage	V_{SP}		V
Power Supply Voltage (Analog)	V_{AD}		V
Power Supply Voltage (Driver)	V_{DD}		V
Operating Temperature	T_{opr}	−25~60	°C
Storage Temperature	T_{stg}	−40~100	°C

(Note 1) All voltage are with respect to SS and V_{SS} terminals (Ground).

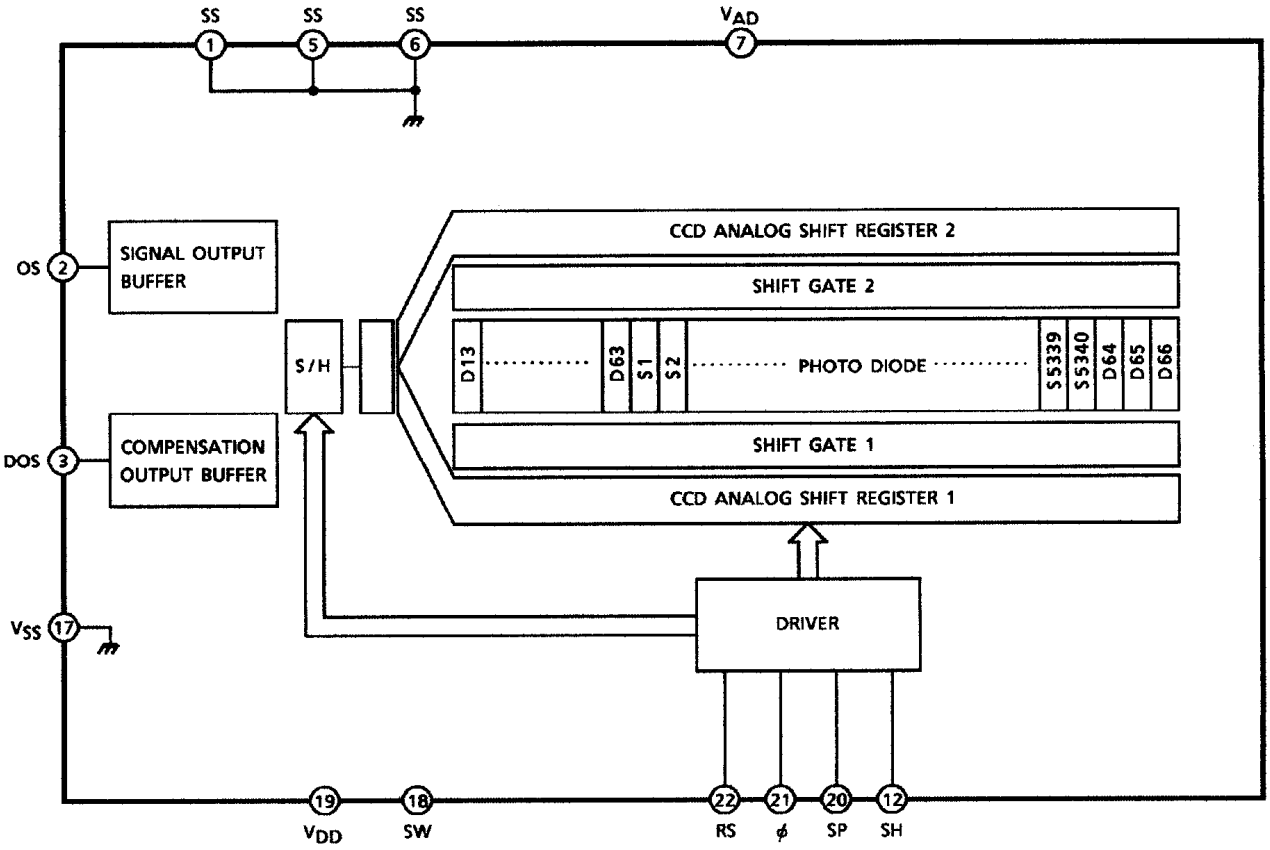
PIN CONNECTIONS



(TOP VIEW)

961001EBA2

CIRCUIT DIAGRAM



PIN NAMES

ϕ	Clock
SH	Shift Gate
RS	Reset Gate
SP	Sample Hold Gate
OS	Signal Output
DOS	Compensation Output
V_{AD}	Power (Analog)
V_{DD}	Power (Driver)
SS	Ground (Analog)
V_{SS}	Ground (Driver)
SW	Final Clock Select Switch
NC	Non Connection

OPTICAL / ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{AD} = 12V, V_{DD} = 12V, $V_\phi = V_{SH} = V_{RS}$ = 5V (PULSE), f_ϕ = 0.5MHz, f_{RS} = 1MHz, t_{INT} (INTEGRATION TIME) = 10ms, LIGHT SOURCE = DAYLGIHT FLUORESCENT LAMP)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Sensitivity	R	3.8	4.8	5.8	V / lx·s	
Photo Response Non Uniformity	PRNU	—	—	10	%	(Note 2)
	PRNU (3)	—	3	8	mV	(Note 3)
Register Imbalance	RI	—	—	3	%	(Note 4)
Saturation Output Voltage	V_{SAT}	1.0	1.5	—	V	(Note 5)
Saturation Exposure	SE	0.17	0.3	—	lx·s	(Note 6)
Dark Signal Voltage	V_{DRK}	—	—	2	mV	(Note 7)
Dark Signal Non Uniformity	DSNU	—	—	3	mV	(Note 7)
Analog Current Dissipation	I_{AD}	—	—	20	mA	
Driver Current Dissipation	I_{DD}	—	—	10	mA	
Total Transfer Efficiency	TTE	92	—	—	%	
Output Impedance	Z_O	—	0.5	1	kΩ	
Dynamic Range	DR	—	1500	—		(Note 8)
DC Signal Output Voltage	V_{OS}	3.5	4.5	6.0	V	(Note 9)
DC Compensation Output Voltage	V_{DOS}	3.5	4.5	6.0	V	(Note 9)
DC Mismatch Voltage	$\lvert V_{OS}-V_{DOS}\rvert$	—	—	100	mV	

(Note 2) Measured at 50% of SE (Typ.)

Definition of PRNU : $PRNU = \frac{\Delta x}{\overline{x}} \times 100\ (\%)$

Where $\overline{x}$ is average of total signal outputs and Δx is the maximum deviation from $\overline{x}$ under uniform illumination.

(Note 3) PRNU (3) is defined as maximum voltage with next pixel, where measured 5% of SE (Typ.)

(Note 4) Measured at 50% of SE (Typ.)
RI is defined as follows:

$$RI = \frac{\sum_{n=1}^{5339} |xn - xn+1|}{5339 \times \overline{x}} \times 100\ (\%)$$

Where xn and $xn+1$ are signal outputs of each pixel. $\overline{x}$ is average of total signal outputs.

(Note 5) V_{SAT} is defined as minimum saturation output voltage of all effective pixels.

(Note 6) Definition of SE : $SE = \frac{V_{SAT}}{R}$ (lx·s)

OPERATING CONDITION

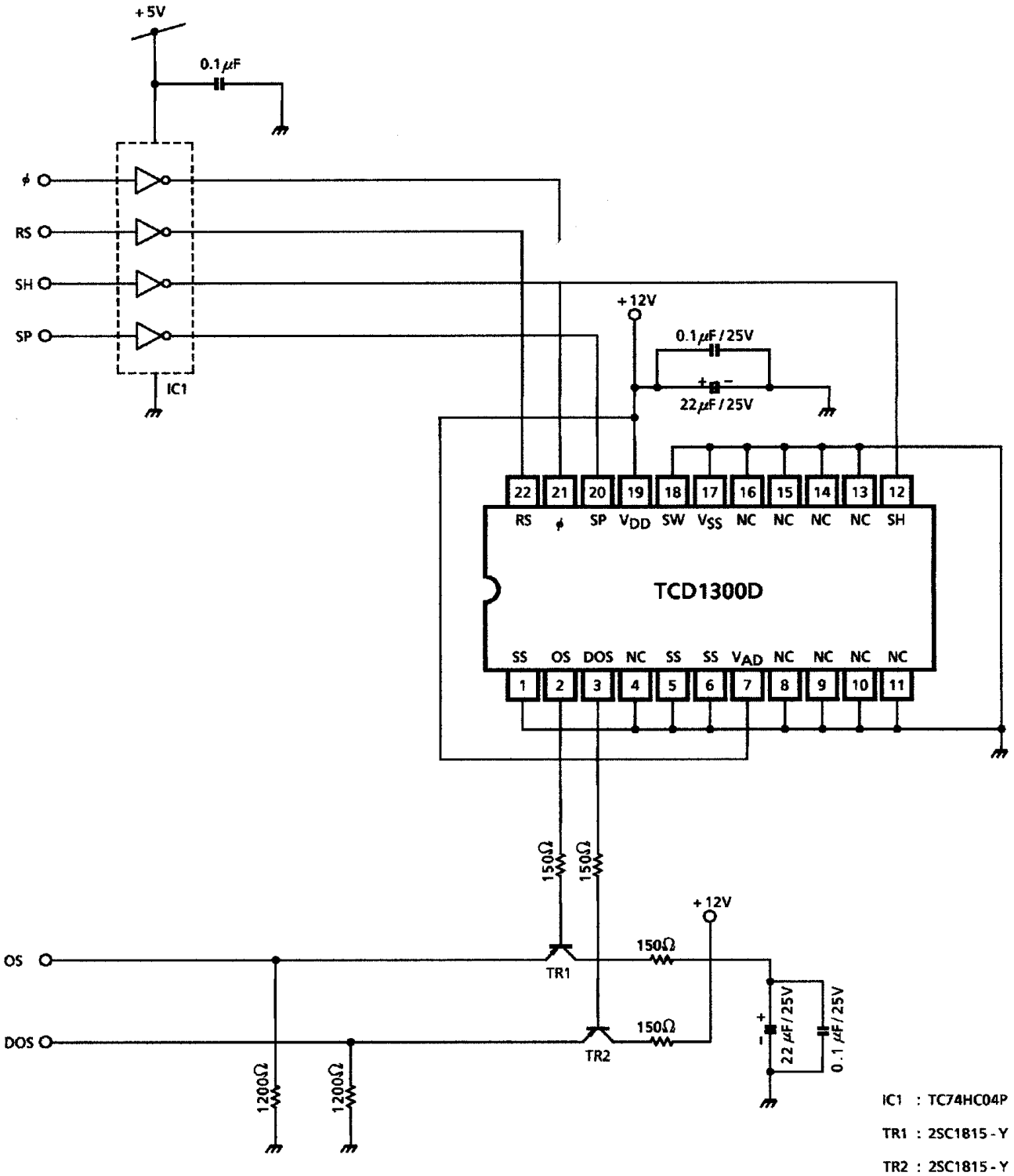
CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Voltage	"H" Level	V_ϕ	4.5	5.0	5.5	V
	"L" Level		0	—	0.5	
Shift Pulse Voltage	"H" Level	V_{SH}	4.5	5.0	5.5	V
	"L" Level		0	—	0.5	
Reset Pulse Voltage	"H" Level	V_{RS}	4.5	5.0	5.5	V
	"L" Level		0	—	0.5	
Sample and Hold Pulse Voltage (Note 9)	"H" Level	V_{SP}	4.5	5.0	5.5	V
	"L" Level		0	—	0.5	
Switch Voltage	"H" Level	V_{SW}	4.5	5.0	5.5	V
	"L" Level		0	—	0.5	
Power Supply Voltage (Analog)		V_{AD}	11.4	12	13	V
Power Supply Voltage ((Driver)		V_{DD}	11	12	13	V

(Note 9) Supply "H" level to SP terminal when sample-and-hold circuitry is not used.

CLOCK CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Frequency	f_ϕ	—	0.5	4.0	MHz
Reset Pulse Frequency	f_{RS}	—	1	8.0	MHz
Sample and Hold Pulse Frequency	f_{SP}	—	1	8.0	MHz
Clock Capacitance	C_ϕ	—	—	10	pF
Final Stage Clock Capacitance	C_ϕ	—	—	10	pF
Shift Gate Capacitance	C_{SH}	—	—	10	pF
Sample and Hold Gate Capacitance	C_{SP}	—	—	10	pF
Switch Capacitance	C_{SW}	—	—	10	pF

TYPICAL DRIVE CIRCUIT



IC1 : TC74HC04P

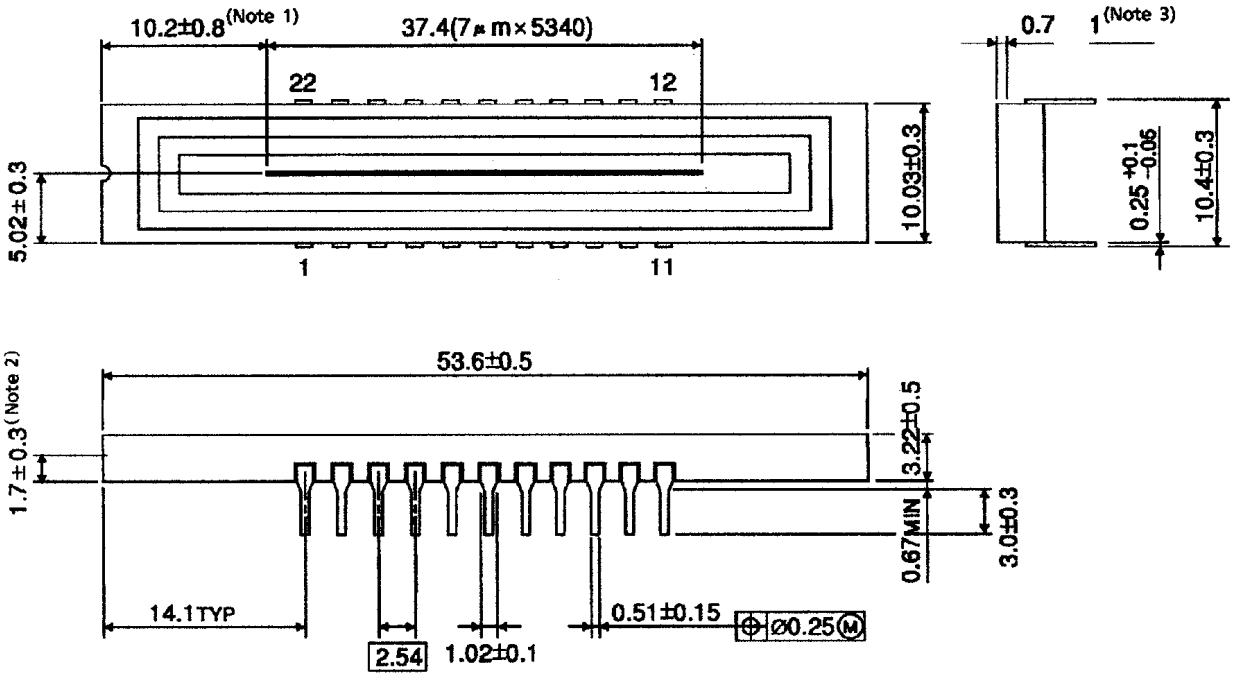
TR1 : 2SC1815-Y

TR2 : 2SC1815-Y

OUTLINE DRAWING

WDIP22-C-400-2.54B (C)

Unit : mm



(Note 1) No. 1 SENSOR ELEMENT (S1) TO EDGE OF PACKAGE.
(Note 2) TOP OF CHIP TO BOTTOM OF PACKAGE.
(Note 3) GLASS THICKNES (n = 1.5)

Weight : 5.4g (Typ.)