

TENTATIVE TOSHIBA CCD LINEAR IMAGE SENSOR CCD(Charge Coupled Device)

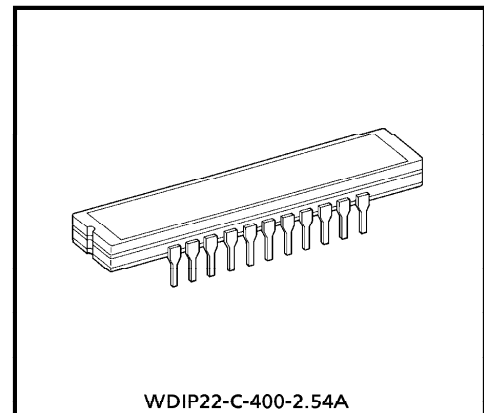
TCD136C-2

The TCD136C-2 is 520-elements×3 color (1560 elements) CCD color linear image sensor. CCD chip covered with Red, Green and Blue Color Filters.

The sensor can be used for color copy M/C and color image scanner.

FEATURES

- Number of Image Sensing Elements : 1560 (520×3 color sequential)
- Image Sensing Element Size : 12μm by 47μm on 63.5μm centers
- Photo Sensing Region : High sensitive pn photodiode
- Clock : 2 phase
- Package : 22 pin DIP
- Color Filter : Red, Green, Blue



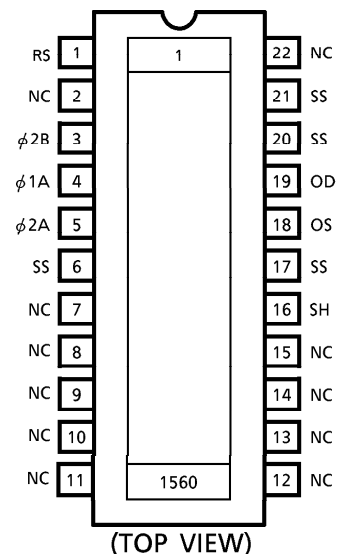
Weight : 4.9g (Typ.)

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
Power Supply Voltage	V_{OD}		V
Operating Temperature	T_{opr}	0~60	°C
Storage Temperature	T_{stg}	- 25~85	°C

(Note 1) All voltage are with respect to SS terminals (Ground).

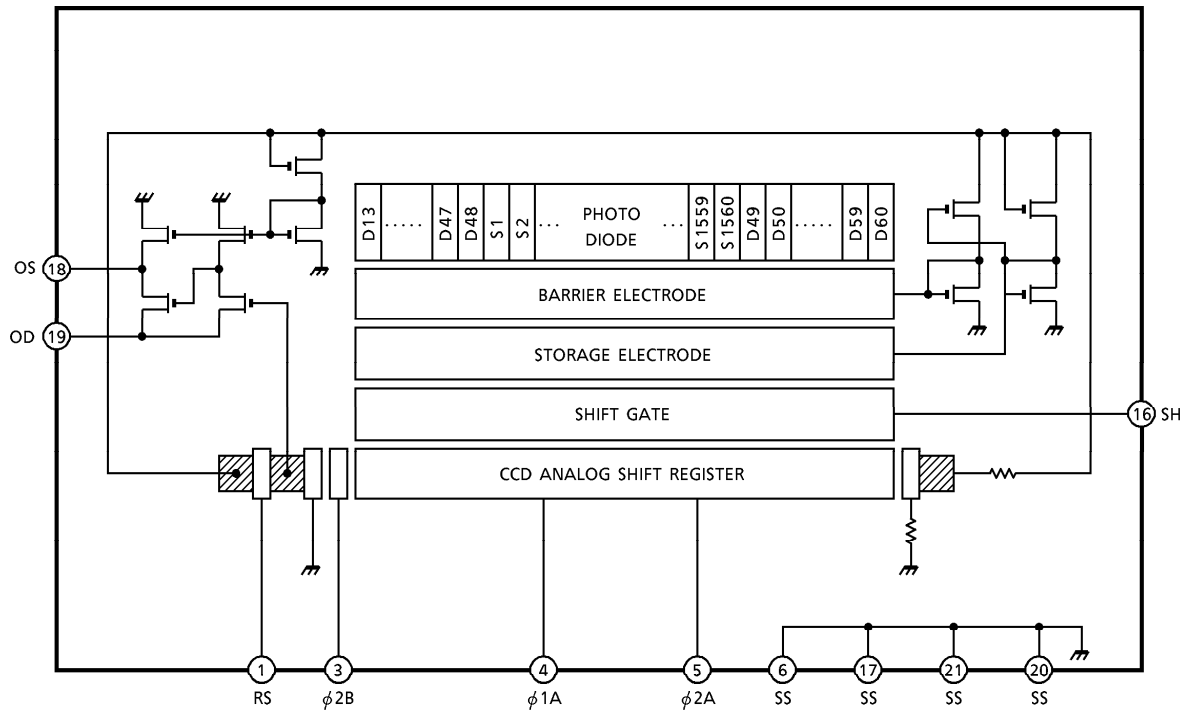
PIN CONNECTIONS



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CIRCUIT DIAGRAM



PIN NAMES

$\phi 1A$	Clock (Phase 1)
$\phi 2A$	Clock (Phase 2)
$\phi 2B$	Final Stage Clock (Phase 2)
SH	Shift Gate
RS	Reset Gate
OS	Signal Output
OD	Power
SS	Ground
NC	Non Connection

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OPTICAL / ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{OD} = 12V, V_φ = V_{RS} = V_{SH} = 12V (PULSE), f_φ = 1MHz, t_{INT} (INTEGRATION TIME) = 10ms, LIGHT SOURCE = A LIGHT SOURCE + CM500S FILTER (t = 1.0mm), LOAD RESISTANCE = 100kΩ)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Sensitivity (Red)	R _R	1.7	2.5	3.3	V / lx·s	(Note 2)
Sensitivity (Green)	R _G	1.6	2.3	3.0	V / lx·s	(Note 2)
Sensitivity (Blue)	R _B	0.6	0.9	1.2	V / lx·s	(Note 2)
Photo Response Non Uniformity	PRNU	—	—	10	%	(Note 3)
Saturation Output Voltage	V _{SAT}	0.8	1.0	—	V	(Note 4)
Saturation Exposure	SE	—	0.4	—	lx·s	(Note 5)
Dark Signal Voltage	V _{DRK}	—	5	10	mV	(Note 6)
Dark Signal Non Uniformity	DSNU	—	—	5	mV	(Note 7)
DC Power Dissipation	P _D	—	80	150	mW	
Total Transfer Efficiency	TTE	92	95	—	%	
Output Impedance	Z _O	—	0.4	1.0	kΩ	
Dynamic Range	DR	—	160	—		(Note 8)
DC Signal Output Voltage	V _{OS}	3.0	—	8.0	V	(Note 9)

(Note 2) Sensitivity is defined for each color of signal outputs average when the photosensitive surface is applied with the light of uniform illumination and uniform color temperature.

(Note 3) PRNU is defined for each color on a single chip by the expressions below when the photosensitive surface is applied with the light of uniform illumination 1 and uniform color temperature.

$$PRNU = \frac{\Delta\bar{x}}{\bar{x}} \times 100 (\%)$$

Where \bar{x} is average of referred outputs and $\Delta\bar{x}$ is the maximum deviation from \bar{x} . The amount of the incident light is shown below.

$$\begin{aligned} \text{Red} &= \frac{1}{2} \text{ SE} \\ \text{Green} &= \frac{1}{2} \text{ SE} \\ \text{Blue} &= \frac{1}{4} \text{ SE} \end{aligned}$$

(Note 4) V_{SAT} is defined as minimum saturation output voltage of all effective pixels.

(Note 5) Definition of SE : $SE = \frac{V_{SAT}}{R}$ (lx·s)

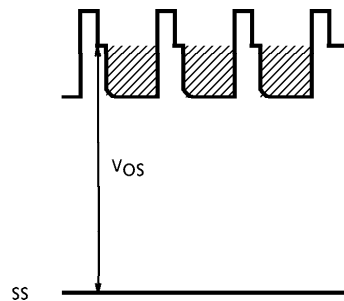
(Note 6) V_{DRK} is defined as average dark signal voltage of all effective pixels.

(Note 7) DSNU is defined as different voltage between V_{DRK} and V_{MDK} when V_{MDK} is maximum dark signal voltage.

(Note 8) Definition of DR : $DR = \frac{V_{SAT}}{V_{DRK}}$

V_{DRK} is proportional to t_{INT} (Integration Time).
So the shorter t_{INT} gets condition makes wider DR value.

(Note 9) DC output voltage is defined as follows:



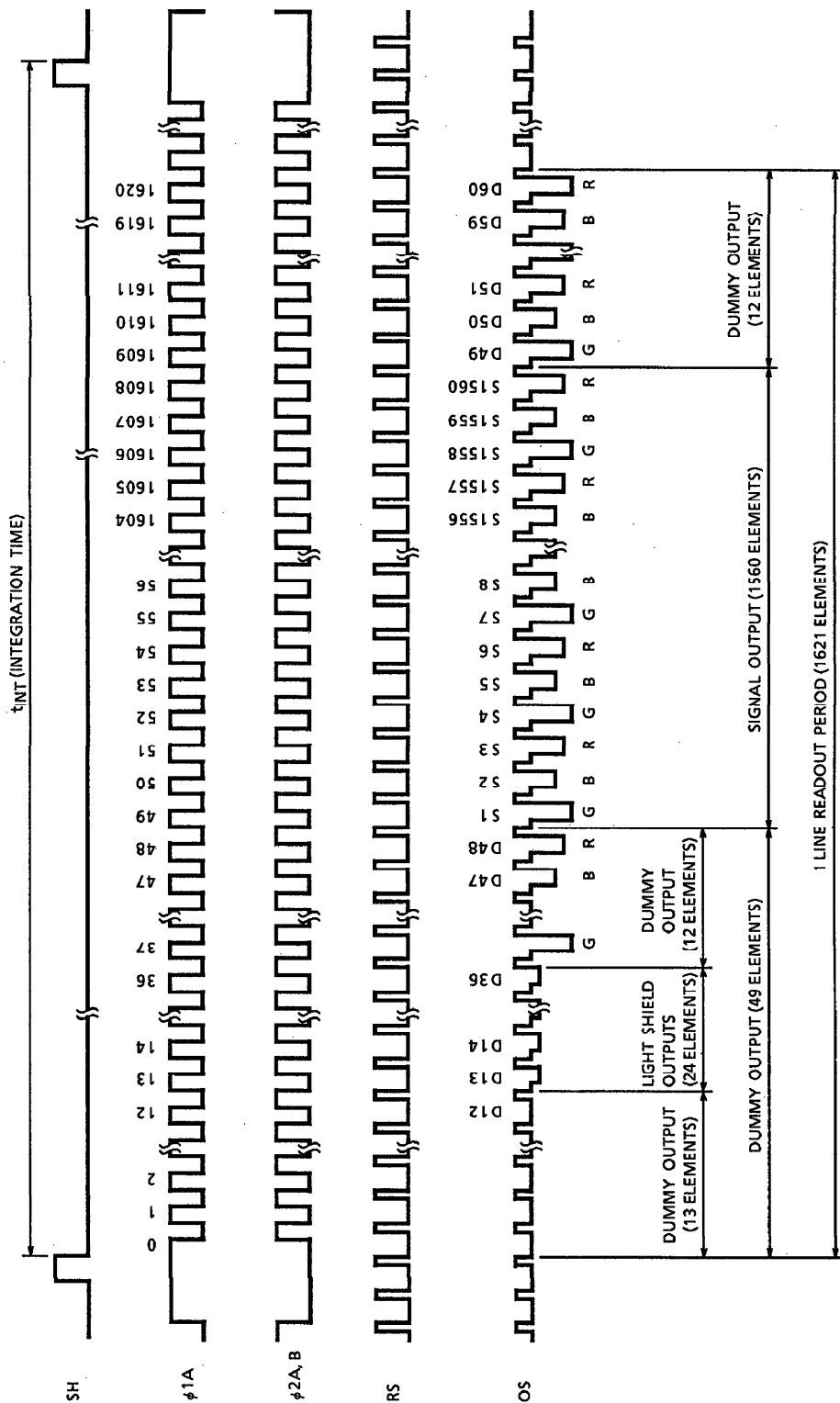
OPERATING CONDITION

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Voltage	"H" Level	$V_{\phi 1A}$	11	12	13	V
	"L" Level	$V_{\phi 2A}$	0	0.5	0.8	
Final Stage Clock Pulse Voltage	"H" Level	$V_{\phi 2B}$	11	12	13	V
	"L" Level		0	0.5	0.8	
Shift Pulse Voltage	"H" Level	V_{SH}	11	12	13	V
	"L" Level		0	0.5	0.8	
Reset Pulse Voltage	"H" Level	V_{RS}	11	12	13	V
	"L" Level		0	0.5	0.8	
Power Supply Voltage		V_{OD}	11.4	12	13	V

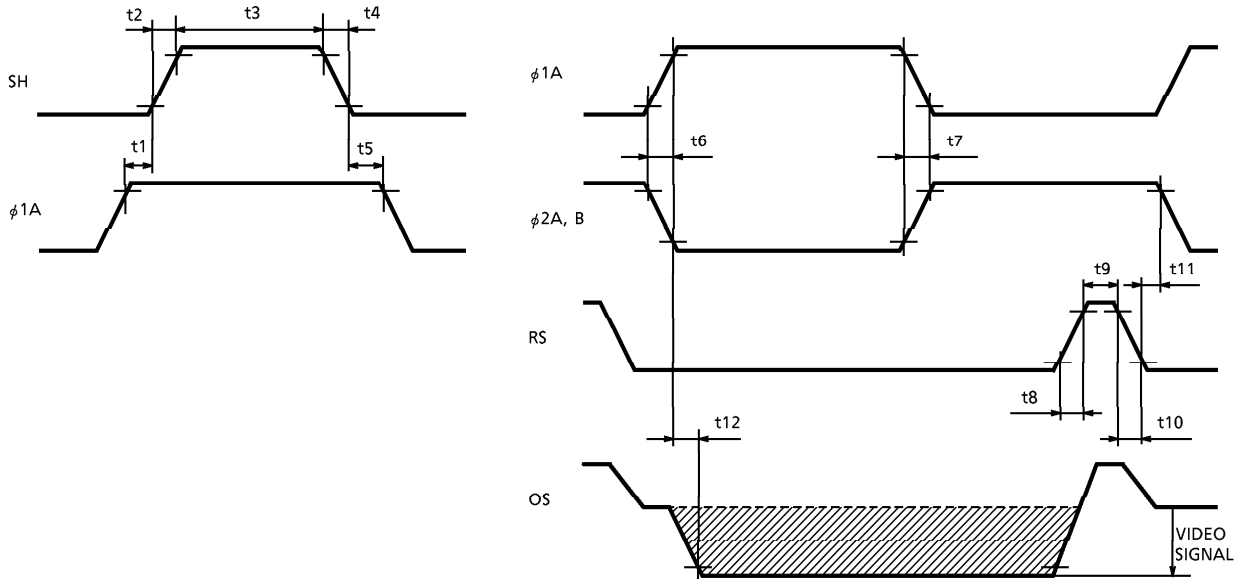
CLOCK CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Frequency	f_{ϕ}	—	1	5	MHz
Reset Pulse Frequency	f_{RS}	—	1	5	MHz
Clock Capacitance	$C_{\phi A}$	—	450	700	pF
Final Stage Clock Capacitance	$C_{\phi B}$	—	20	40	pF
Shift Gate Capacitance	C_{SH}	—	200	300	pF
Reset Gate Capacitance	C_{RS}	—	10	20	pF

TIMING CHART



TIMING REQUIREMENTS

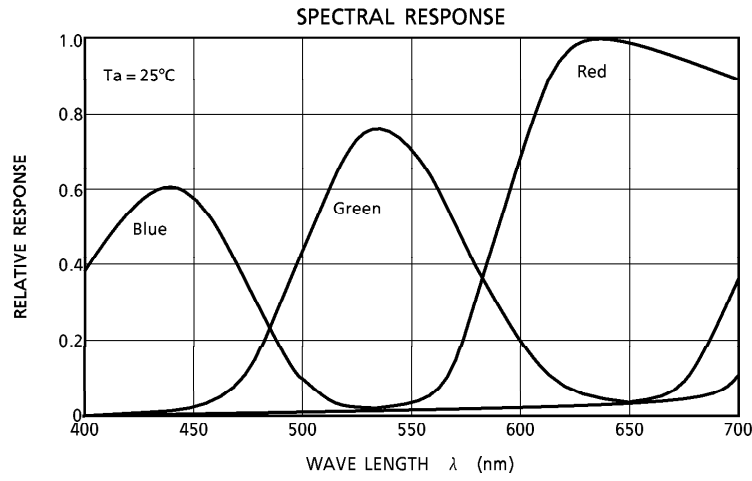


CHARACTERISTIC	SYMBOL	MIN.	TYP. (Note 10)	MAX.	UNIT
Pulse Timing of SH and $\phi 1A$	t1, t5	0	100	—	ns
SH Pulse Rise Time, Fall Time	t2, t4	0	50	—	ns
SH Pulse Width	t3	1000	5000	—	ns
$\phi 1A, \phi 2A, B$ Pulse Rise Time, Fall Time	t6, t7	0	100	—	ns
RS Pulse Rise Time, Fall Time	t8, t10	0	50	—	ns
RS Pulse Width	t9	40	250	—	ns
Pulse Timing of $\phi 2B$ and RS	t11	0	250	—	ns
Video Data Delay Timing (Note 11)	t12	—	50	—	ns

(Note 10) TYP, is the case of $f_{RS} = 1\text{MHz}$.

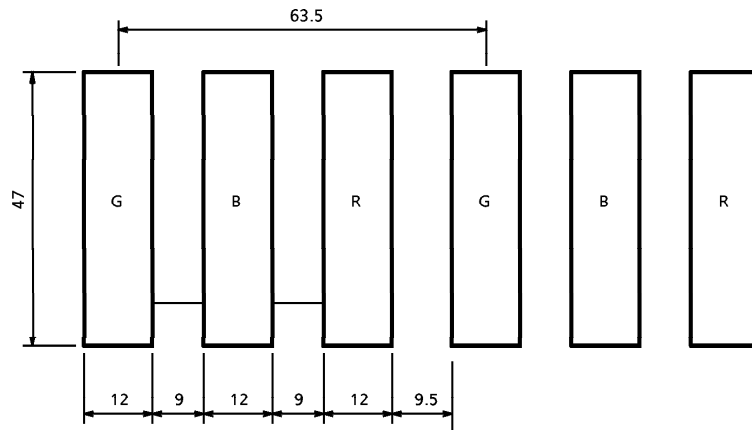
(Note 11) Load Resistance is $100\text{k}\Omega$.

TYPICAL PERFORMANCE CURVES



ELEMENT SHAPE

Unit in mm



CAUTION**1. Window Glass**

The dust and stain on the glass window of the package degrade optical performance of CCD sensor.

Keep the glass window clean by saturating a cotton swab in alcohol and lightly wiping the surface, and allow the glass to dry, by blowing with filtered dry N₂.

Care should be taken to avoid mechanical or thermal shock because the glass window is easily to damage.

2. Electrostatic Breakdown

Store in shorting clip or in conductive foam to avoid electrostatic breakdown.

3. Incident Light

CCD sensor is sensitive to infrared light.

Note that infrared light component degrades resolution and PRNU of CCD sensor.

4. Lead Frame Forming

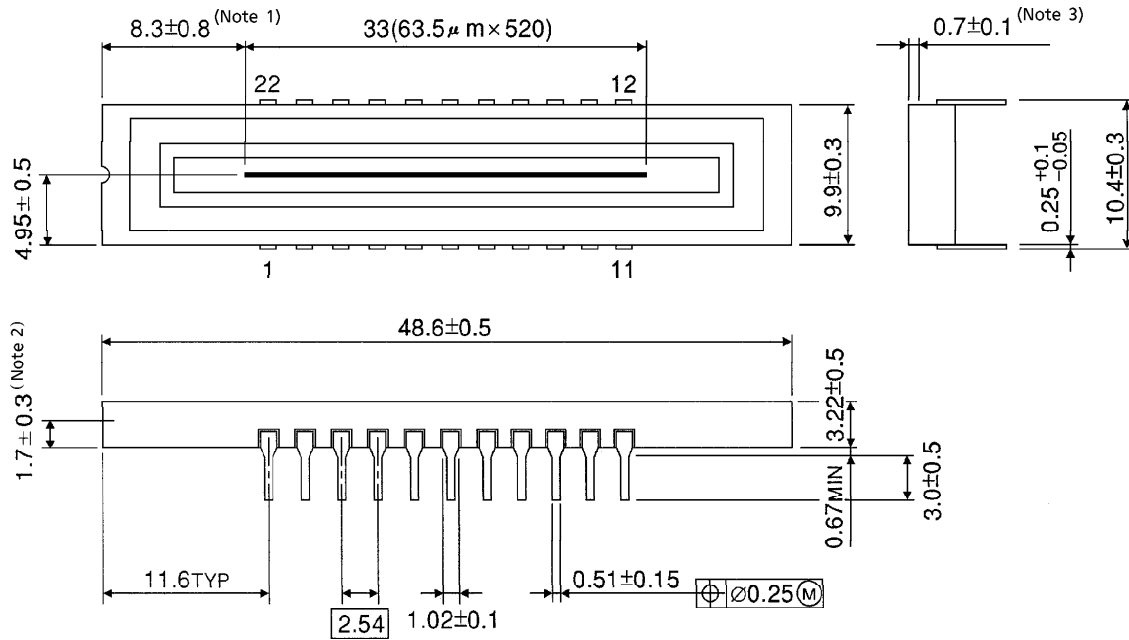
Since this package is not strong against mechanical stress, you should not reform the lead frame.

We recommend to use a IC-inserter when you assemble to PCB.

OUTLINE DRAWING

WDIP22-C-400-2.54A (A)

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 : 4.9g (Typ.)