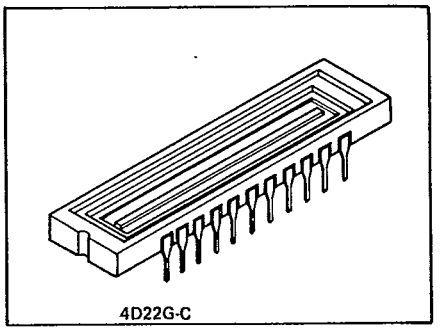
CCD LINEAR IMAGE SENSOR
CCD (Charge Coupled Device)

TCD103C

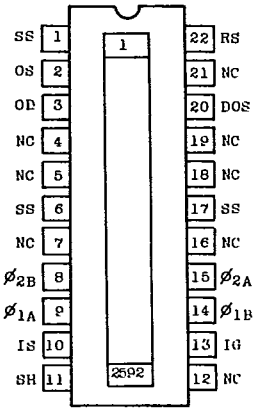
The TCD103C is a high resolution and high sensitivity 2592 elements linear image sensor.
The sensor is designed for Facsimile, OCR and copy M/C.
The device contains a row of 2592 photo-diodes which provide a 8 line/mm resolution across a A3 size paper, and a 12 line/mm resolution across a A4 size paper.
The device is operated by only 12V power supply, and mounted in 22 pin dual-in-line package with hermetic sealed optical glass window.



FEATURES:

- Number of Image Sensing Elements : 2592
- Image Sensing Element Size : 11μm by 11μm on 11μm centers
- Photo Sensing Region : High sensitive pn photodiode
- Clock : 2 Phase
- Dynamic Range : 600 (Typ.)
- Package : 22 pin DIP

PIN CONNECTIONS
(TOP VIEW)



MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Clock Pulse Voltage	V_ϕ	-0.3~15	V
Shift Pulse Voltage	V_{SH}		
Reset Pulse Voltage	V_{RS}		
Output Transistor Drain Voltage	V_{OD}		
Input Gate Voltage	V_{IG}		
Input Source Voltage	V_{IS}		
Operating Temperature	T_{op}	-25~60	°C
Storage Temperature	T_{stg}	-40~100	°C

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

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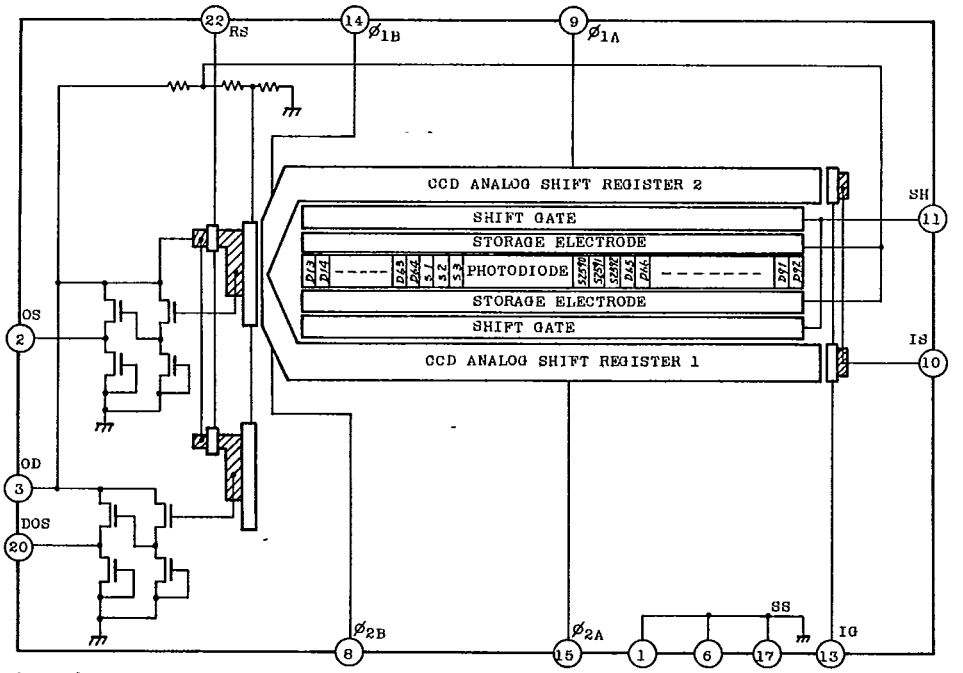
CIRCUIT DIAGRAM



PIN NAMES

ϕ1A	Clock (Phase 1)
ϕ2A	Clock (Phase 2)
ϕ1B	Final Stage Clock (Phase 1)
ϕ2B	Final Stage Clock (Phase 2)
SH	Shift Gate
RS	Reset Gate
OS	Output Transistor Source
DOS	Compensation Transistor Source
OD	Output Transistor Drain
SS	Substrate (Ground)
IS	Input Source (Test Point)
IG	Input Gate (Test Point)
NC	Non Connection

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OPTICAL/ELECTRICAL CHARACTERISTICS

Ta=25°C, V_{OD}=V_{IS}=12V, V_{IG}=0V, V_{ϕ}=V_{SH}=V_{RS}=12V (PULSE), f_{ϕ}=0.5MHz, f_{RS}=1MHz, t_{INT} (INTEGRATION TIME)=10msec, LIGHT SOURCE=DAYLIGHT FLUORESCENT LAMP

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Responsivity	R		0.84	1.05	1.26	V/lx·sec
Photo Response Non Uniformity	PRNU	Note (1)	-	-	±10	%
Saturation Output Voltage	V_{SAT}	V_{OD}=11.4V	0.8	1.0	-	V
Saturation Exposure	SE	V_{SAT}/R	0.63	1.05	-	lx·sec
Dark Signal Voltage	V_{DRK}	V_{OD}=13V	-	1.8	10	mV
DC Power Dissipation	P_D	V_{OD}=13V	-	100	150	mW
Total Transfer Efficiency	TTE		90	95	-	%
Output Impedance	Z_o		-	0.5	1.0	kΩ
Dynamic Range	DR	V_{SAT}/V_{DRK}	-	600	-	-
DC Mismatch Voltage	$\lvert V_{OS}-V_{DOS} \rvert$		-	-	300	mV

Note (1) : Measured at 50% of SE (Typ.)

PRNU is defined as follows, $PRNU = \frac{\Delta x}{\bar{x}} \times 100$ (%)

where $\bar{x}$ is average of total photodiode outputs and Δx is deviation of photodiode output under uniform illumination.

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OPERATING CONDITION (Ta=25°C)

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Voltage	H-Level	$V_{\phi 1A,B}$	11	12	13	V
	L-Level	$V_{\phi 2A,B}$	0	0.5	0.8	V
Shift Pulse Voltage	H-Level	V_{SH}	11	12	13	V
	L-Level		0	0.5	0.8	V
Reset Pulse Voltage	H-Level	V_{RS}	11	12	13	V
	L-Level		0	0.5	0.8	V
Output Transistor Drain Voltage		V_{OD}	11.4	12	13	V
Input Gate Voltage		V_{IG}	0	0	1	V
Input Source Voltage		V_{IS}	11	12	13	V

CLOCK CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Frequency	f_{ϕ}	-	0.5	-	MHz
Reset Pulse Frequency	f_{RS}	-	1.0	-	MHz
Clock Capacitance	$C_{\phi A}$	-	900	-	pF
Final Stage Clock Capacitance	$C_{\phi B}$	-	25	-	pF
Shift Gate Capacitance	C_{SH}	-	160	-	pF
Reset Gate Capacitance	C_{RS}	-	10	-	pF

Note : You can connect electrically $\phi 1A$ and $\phi 1B$ ($\phi 1B$ and $\phi 2B$) terminals for supplying clock pulses by one clock driver in case that $f_{RS} \leqq 5MHz$.

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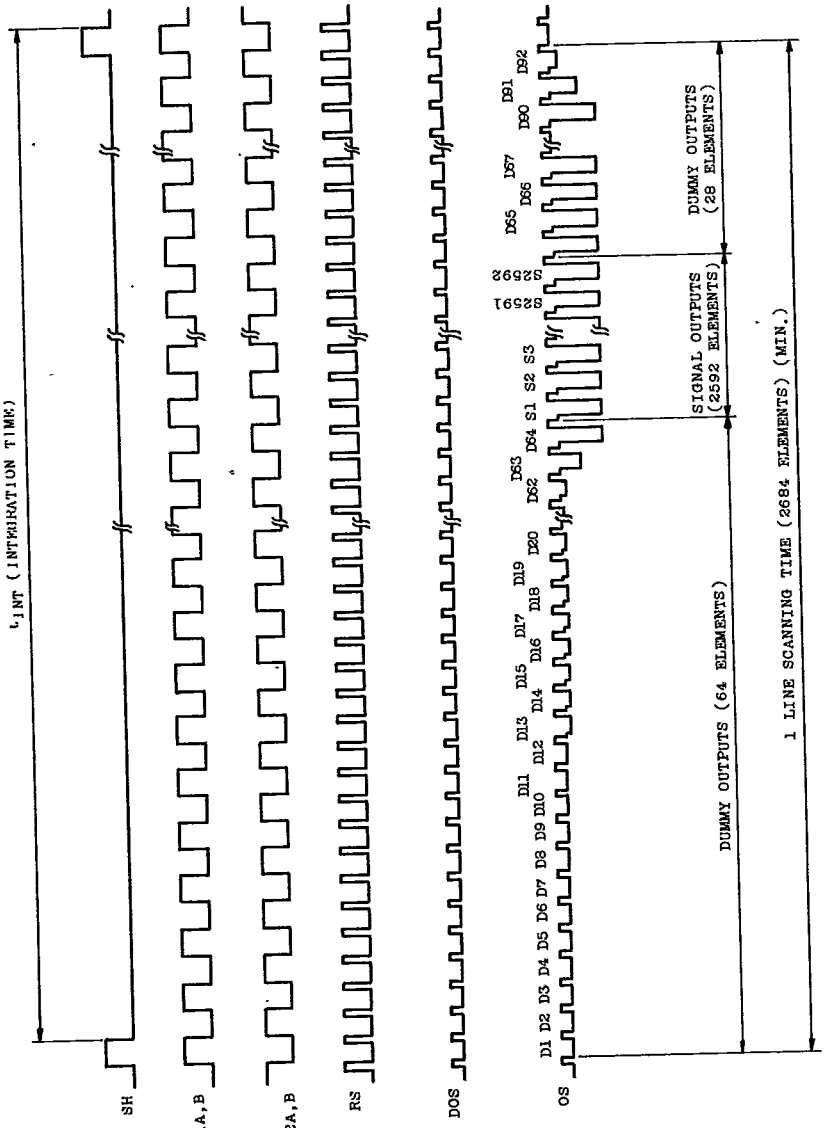
TIMING CHART



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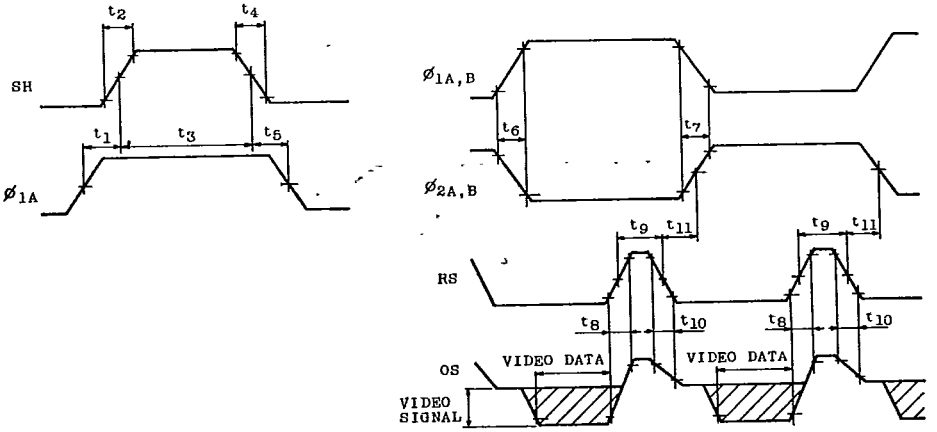
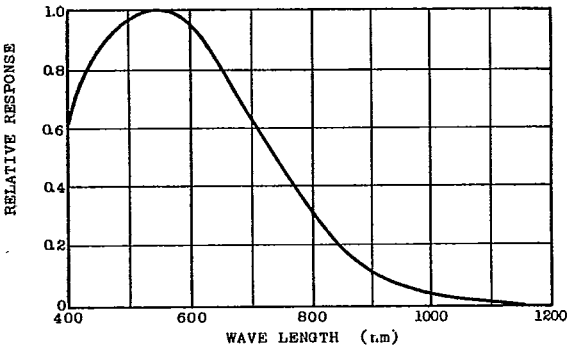
TIMING REQUIREMENTS



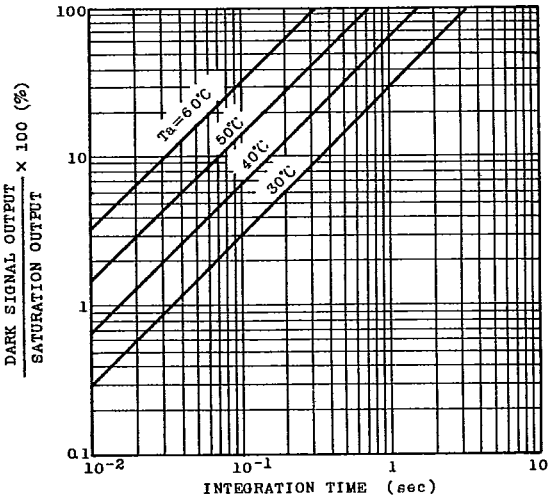
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Pulse Timing of SH and $\phi_{1A,B}$	t_1, t_5	0	100	-	nsec
SH Pulse Rise Time, Fall Time	t_2, t_4	0	50	-	nsec
SH Pulse Width	t_3	60	300	-	nsec
$\phi_{1A,B}$, $\phi_{2A,B}$ Pulse Rise Time, Fall Time	t_6, t_7	0	100	-	nsec
RS Pulse Rise Time, Fall Time	t_8, t_{10}	0	20	-	nsec
RS Pulse Width	t_9	30	250	-	nsec
Pulse Timing of $\phi_{1A,B}$, $\phi_{2A,B}$ and RS	t_{11}	0	250	-	nsec

Note : f_{RS}=1MHz(Typ.)

TYPICAL SPECTRAL RESPONSE (Ta=25℃)



AVERAGE DARK SIGNAL— INTEGRATION TIME AT DIFFERENT TEMPERATURES



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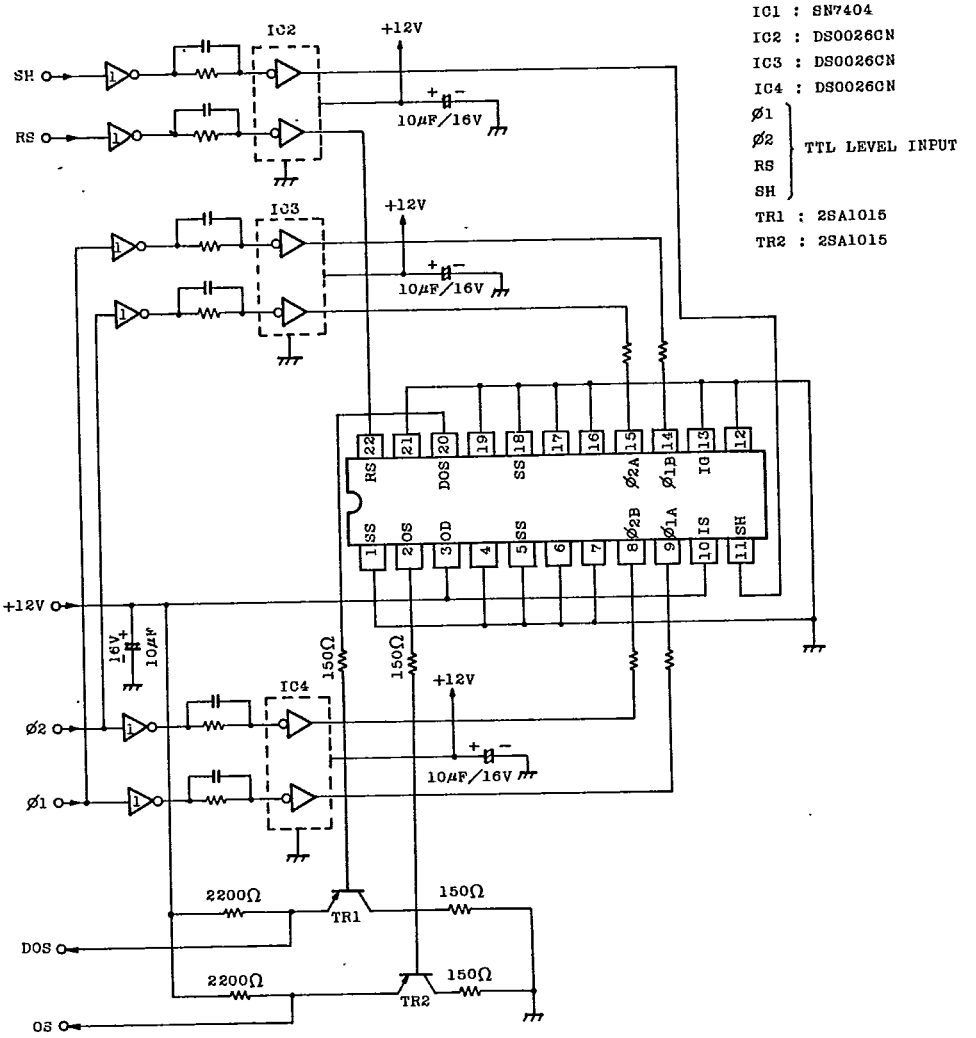
TYPICAL DRIVE CIRCUITRY



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 alchol and lightly wiping the surface, and allow the glass to dry, by blowing with filtered dry N2 or Fleon Gas.

   Care should be taken to aboid 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.

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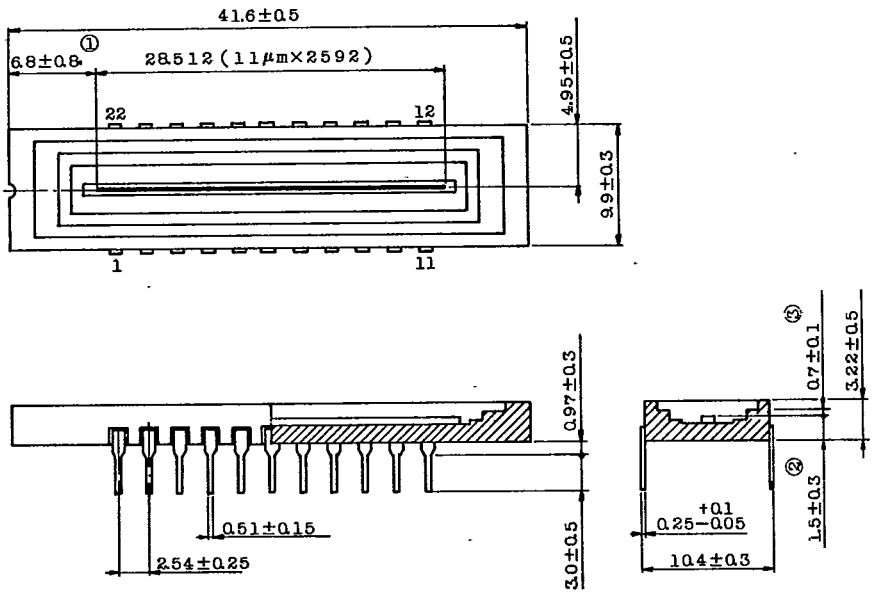
PACKAGE OUTLINE (4D22G-C)

Unit in mm



① No. 1 SENSOR ELEMENT(S1) TO EDGE OF PACKAGE.

② TOP OF CHIP TO BOTTOM OF CERAMIC.

③ GALSS THICKNESS (n=1.5)