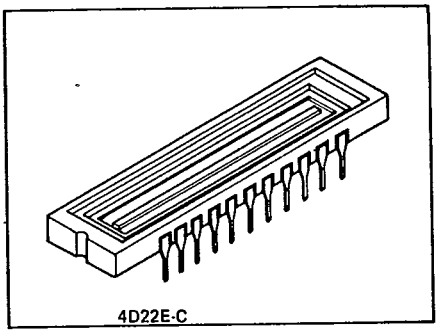
TCD101AC

CCD IMAGE SENSOR
CCD (Charge Coupled Device)

The TCD101AC is a high resolution and high sensitivity 1728 element linear image sensor. The device is designed for facsimile readers, optical character recognition and other imaging applications.
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:

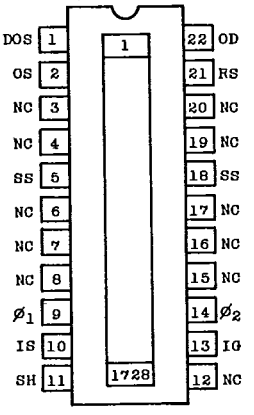
- Nomber of Image Sensing Elements : 1728
- Image Sensing Element Size : 15μm by 15μm on 15μm centers
- Photo Sensing Region : High sensitive pn photodiode
- Clock : 2 Phase
- Dynamic Range : 600 (Typ.)
- Package : 22 pin DIP

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	Topr	-25~60	°C
Storage Temperature	Tstg	-40~100	°C

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

PIN CONNECTIONS
(TOP VIEW)



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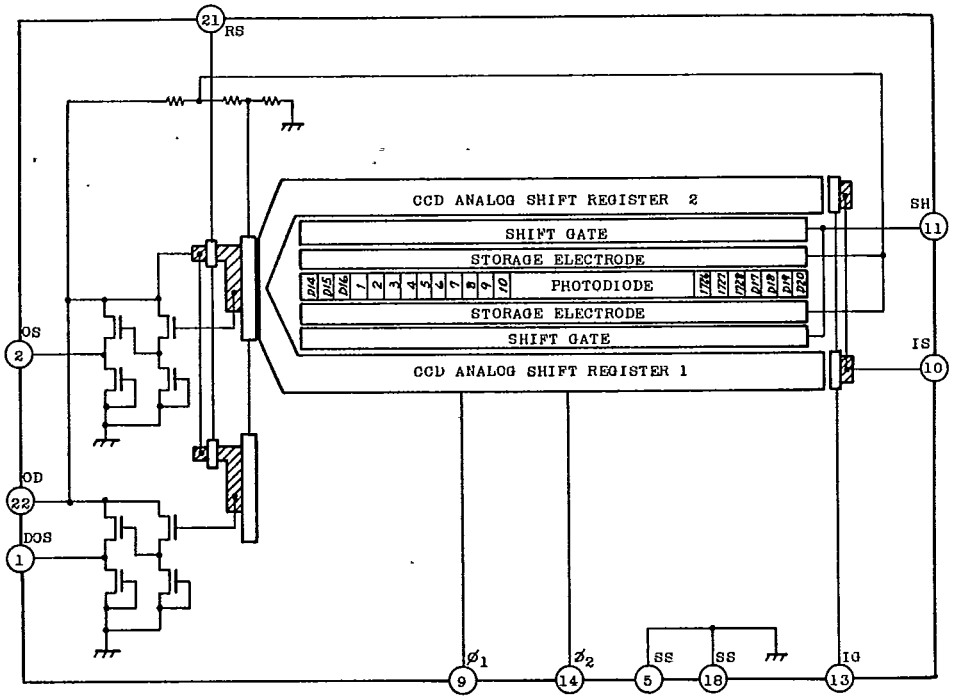
CIRCUIT DIAGRAM



PIN NAME

ϕ_1	Clock (Phase 1)
ϕ_2	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

OPTICAL/ELECTRICAL CHARACTERISTICS

Ta=25°C, $V_{OD}=V_{IS}=12V$, $V_{IG}=0V$, $V_{\phi}=V_{SH}=V_{RS}=12V$ (Pulse),
$f_{\phi}=0.5MHz$, $f_{RS}=1.0MHz$, t_{INT} (INTEGRATION TIME) = 10msec,
LIGHT SOURCE = DAYLIGHT FLUORESCENT LAMP.

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Responsivity	R	-	0.6	0.8	1.0	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	0.8	1.25	-	ℓx·sec
Dark Signal Voltage	V_{DRK}	V_{OD}=13V	-	1.0	6	mV
DC Power Dissipation	P_D	V_{OD}=13V	-	30	58	mW
Total Transfer Efficiency	TTE	-	92	95	-	%
Output Impedance	Z_O	-	-	1.2	3.5	kΩ
Dynamic Range (V_{SAT}/V_{DRK})	DR	V_{SAT}/V_{DRK}	-	600	-	
DC Mismatch Voltage	$\lvert V_{OS}-V_{DOS}\rvert$	-	-	-	150	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_ϕ	11	12	13	V
	L-Level		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_ϕ	-	750	-	pF
Shift Gate Capacitance	C_{SH}	-	250	-	pF
Reset Gate Capacitance	C_{RS}	-	10	-	pF

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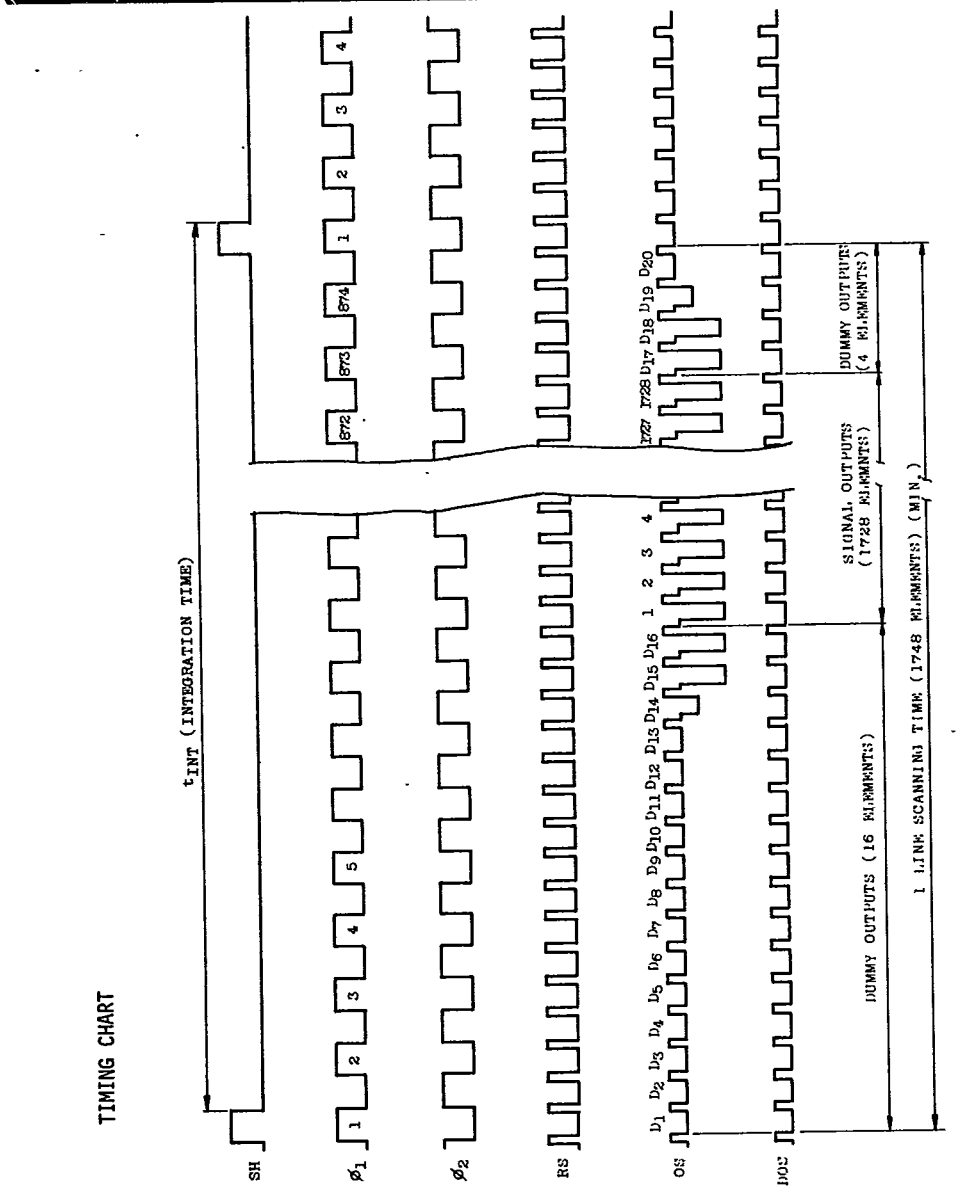
TIMING CHART



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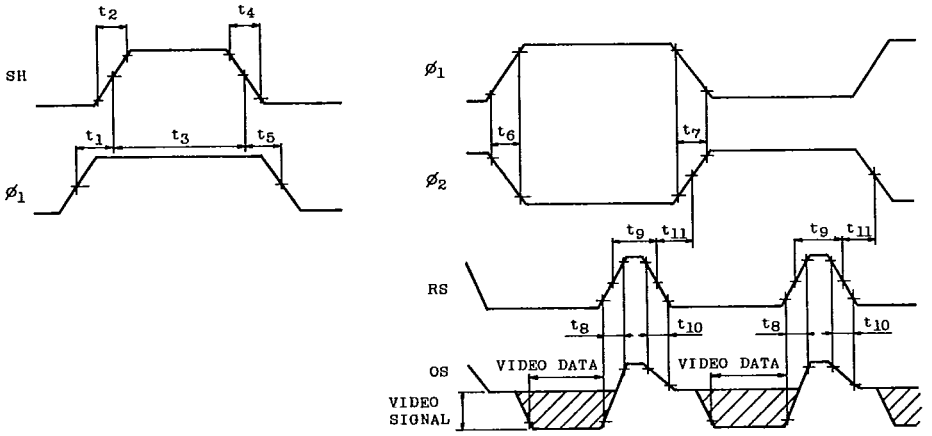
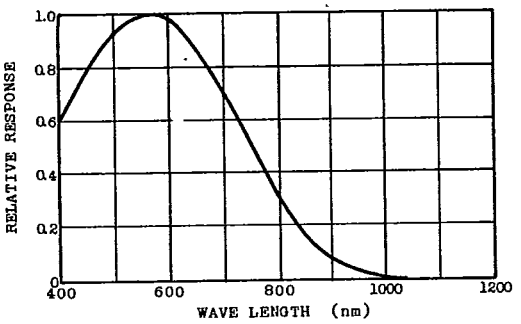
TIMING REQUIREMENTS



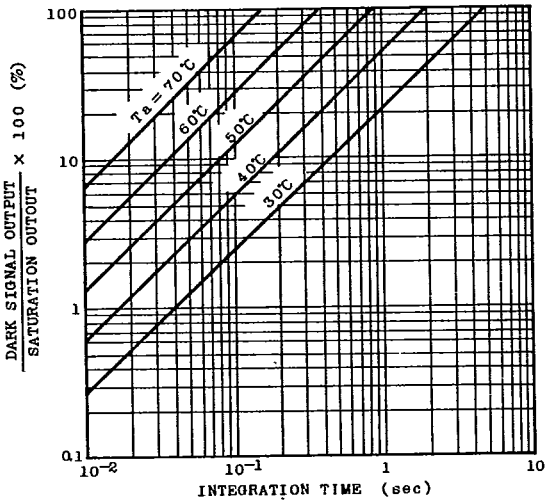
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Pulse Timing of SH and ϕ_1	t_1, t_5	0	100	-	nsec
SH Pulse Rise Time, Fall Time	t_2, t_4	0	50	-	nsec
SH Pulse Width	t_3	60	300	-	nsec
ϕ_1, ϕ_2 Pulse Rise Time, Fall Time	t_6, t_7	0	100	-	nsec
RS Pulse Rise Time, Fall Time	t_8, t_{10}	0	20	-	nsec
RS Pulse Width	t_9	40	250	-	nsec
Pulse Timing of ϕ_1, ϕ_2 and RS	t_{11}	20	250	-	nsec

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

TYPICAL SPECTRAL RESPONSE (Ta = 25°C)



AVERAGE DARK SIGNAL – INTEGRATION TIME AT DIFFERENT TEMPERATURES



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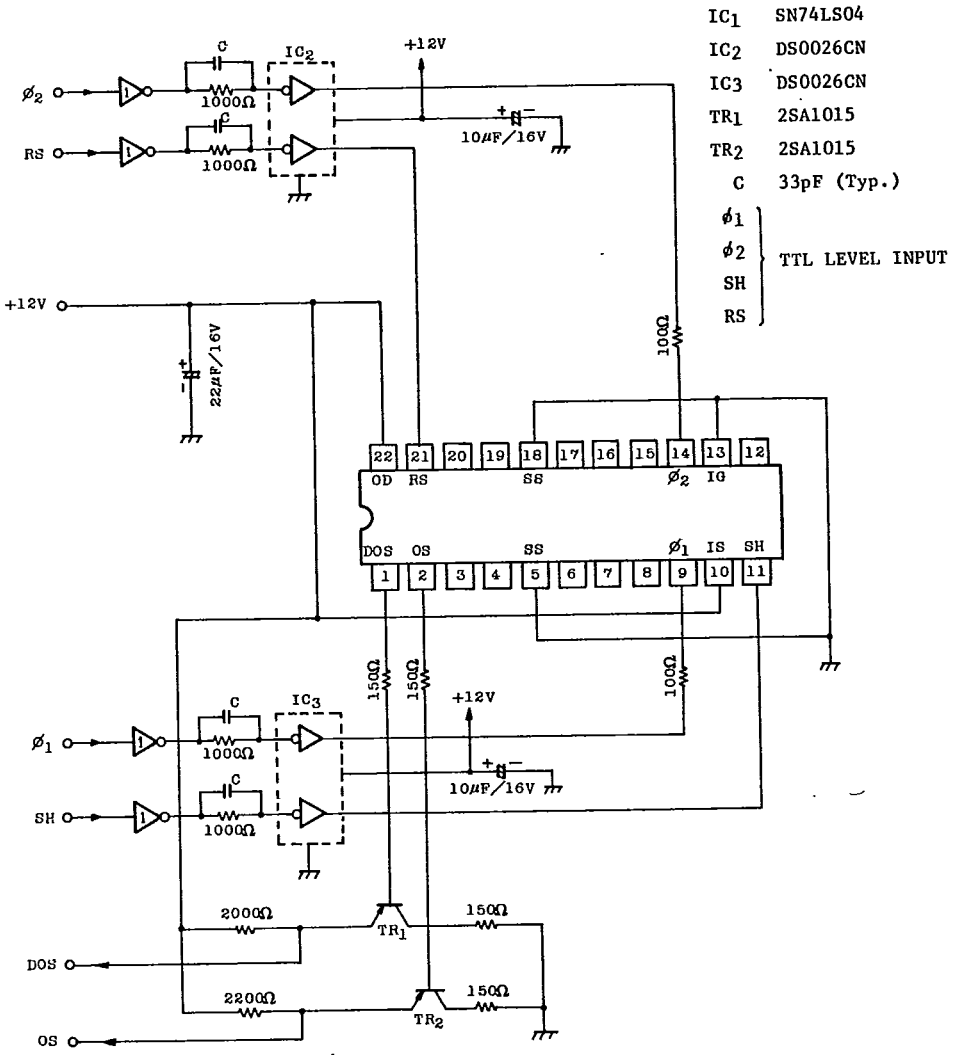
TYPICAL DRIVE CIRCUITRY



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 alcohol and lightly wiping the surface, and allow the glass to dry, by blowing with filtered dry N_2 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 sgorting 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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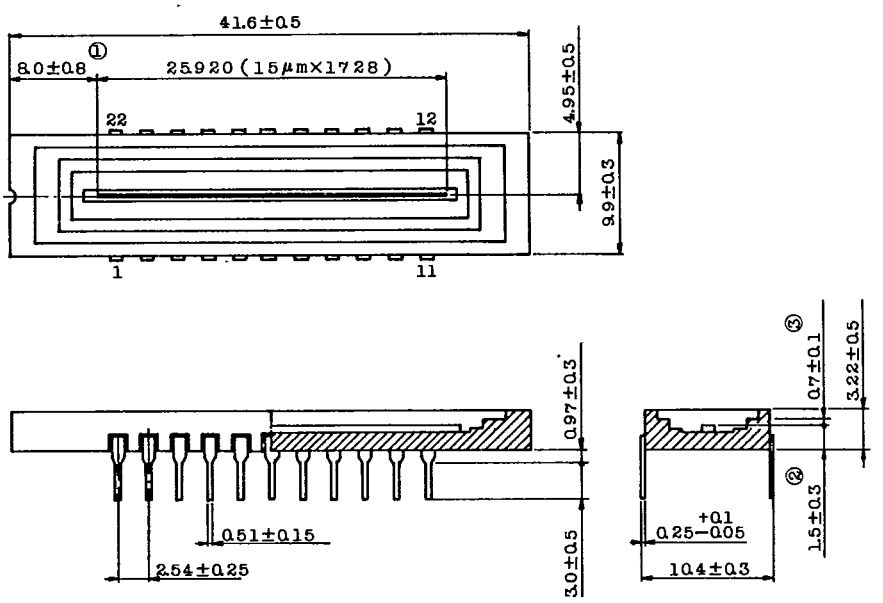
PACKAGE OUTLINE (4D22E-C)

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)