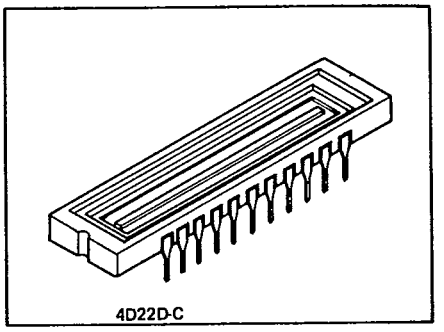
CCD LINEAR IMAGE SENSOR
CCD (Charge Coupled Device)

TCD102C-1

67C 09521 D T-41-55

The TDS102C-1 is a high resolution and high sensitivity 2048 element linear image sensor.

The sensor is designed for Facsimile readers, optical Character Recognition and other optical applications. The device contains a row of 2048 photodiodes which provide a 8-line/mm resolution across a B4 size paper with well blue response. The TCD102C-1 is capable of high speed operation up to a 10 MHz data rate, and incorporate on-chip sample-and-hold circuitry.



FEATURES:

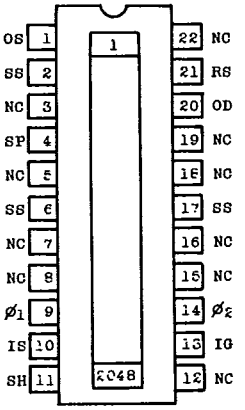
- Number of Image Sensing Elements: 2048
- Image Sensing Element Size: 14μm by 14μm on 14μm centers.
- Photo Sensor Structure: High sensitive P-n photo diode.
- Clock: 2-phase.
- On-chip Circuitry: Sample-and-hold circuitry.
- Dynamic Range: 600(Typ.).
- Package: 22 pin DIP with Hermetic sealed optical glass window.

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}		
Sample-and-Hold Pulse Voltage	V_{SP}		
Output Transistor Drain Voltage	V_{OD}		
Input Gate Voltage	V_{IG}		
Input Source Voltage	V_{IS}		
Operating Temperature	T_{opr}	-25∿60	°C
Storage Temperature	T_{stg}	-40∿100	°C

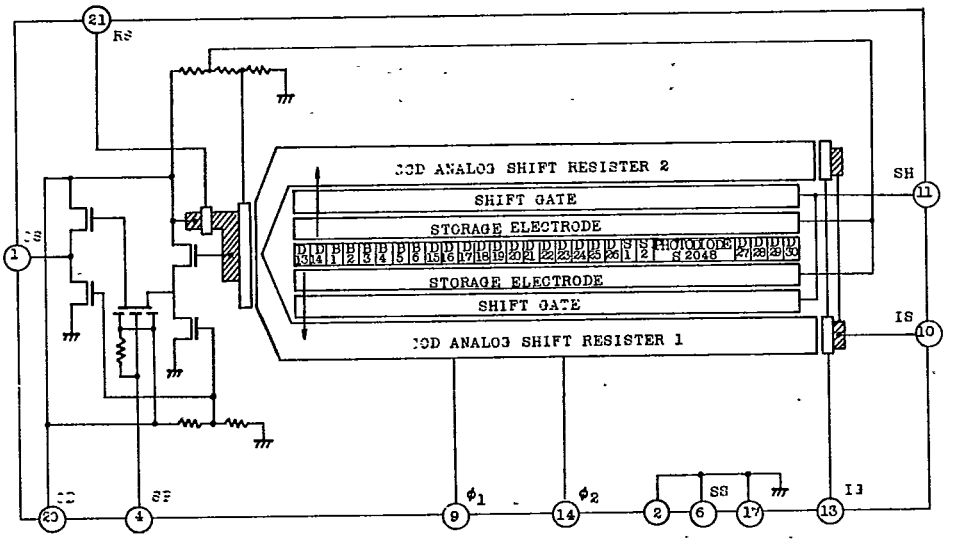
Note: All Voltages are with respect to SS terminal.

PIN CONNECTIONS
(TOP VIEW)



TCD102C-1

CIRCUIT DIAGRAM



PIN NAMES

ϕ1	Clock (Phase 1)
ϕ2	Clock (Phase 2)
SH	Shift Gate
RS	Reset Gate
OS	Output Transistor Source
SP	Sample-and-hold Gate
OD	Output Transistor Drain
SS	Substrate (Ground)
IS	Input Source (Test Point)
IG	Input Gate (Test Point)
NC	Non Connection

OPTICAL AND ELECTRICAL CHARACTERISTICS

Ta=25°C, $V_{OD}=V_{IS}=12V$, $V_{IG}=0V$, $V_{\phi}=V_{RS}=V_{SH}=12V$ (PULSE)

$f_{\phi}=0.5$, $f_{RS}=1MHz$, t_{INT}(INTEGRATION TIME)=10 msec,

LIGHT SOURCE=DAYLIGHT FLUORESCENT LAMP

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Responsivity	R		0.86	1.08	1.30	V/lx·sec
Rhoto Response Non Uniformity	PRNU	(Note 1)	-	-	±10	%
Saturation Output Voltage	V_{SAT}	V_{OD}=11.4V	0.8	1.0	-	V
Saturation Exposure	SE	VSAT/R	0.62	1.0	-	lx·sec
Dark Signal Voltage	V_{DRK}	V_{OD}=13V	-	1.8	10	mV
DC Power Dissipation	P_D	V_{OD}=13V	-	30	60	mW
Total Transer Efficiency	TTE		92	95	-	%
Output Impedance	Z_O		-	900	2500	Ω
Dynamic Range	DR	V_{SAT}/V_{DRK}	-	600	-	

Note: (1) Measured at 50% of SE

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

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

TCD102C-1

OPERATING CONDITION (Ta=25°C)

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Clock Pulse Voltage	H-LEVEL	V_ϕ	11	12	13	V	
	L-LEVEL		0.0	0.5	0.8	V	
Shift Pulse Voltage	H-LEVEL	V_{SH}	11	12	13	V	
	L-LEVEL		0.0	0.5	0.8	V	
Reset Pulse Voltage	H-LEVEL	V_{RS}	11	12	13	V	
	L-LEVEL		0.0	0.5	0.8	V	
Sample-and-hold Pulse Voltage	H-LEVEL	V_{SP}	11	12	13	V	(1)
	L-LEVEL		0.0	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	

Note: (1) Supply DC12V to SP terminal when sample-and-hold circuitry is not used.

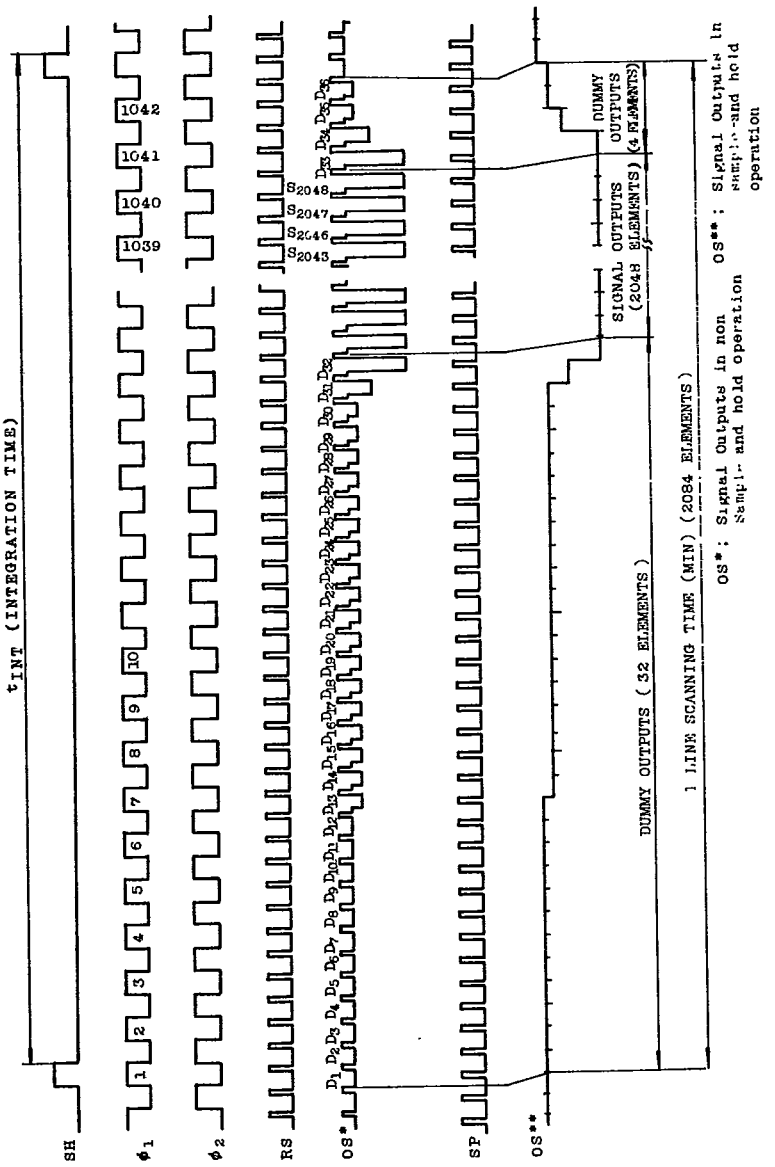
CLOCK CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Clock Pulse Frequency	f_ϕ	-	0.5	-	MHz	
Reset Pulse Frequency	f_{RS}	-	1	-	MHz	
Clock Input Terminal Capacitance	C_ϕ	-	900	-	pF	
Shift Gate Capacitance	C_{SH}	-	250	-	pF	
Reset Gate Capacitance	C_{RS}	-	10	-	pF	
Sample-and-hold Gate Capacitance	C_{SP}	-	10	-	pF	

Note: Insert load resister (1KΩ) between OS and SS in case that $f_{RS} \geqq 5$MHz

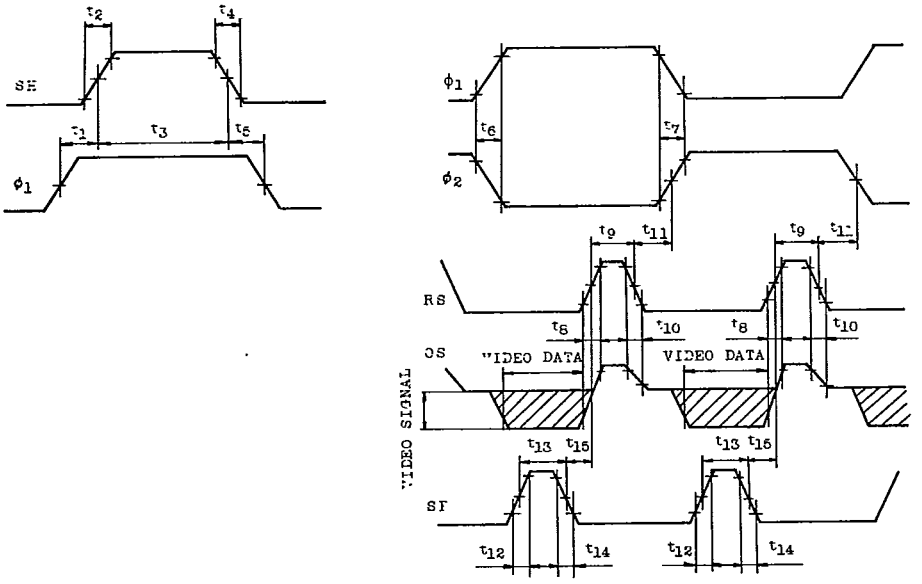
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TIMING CHART



TCD102C-1

TIMING REQUIREMENTS

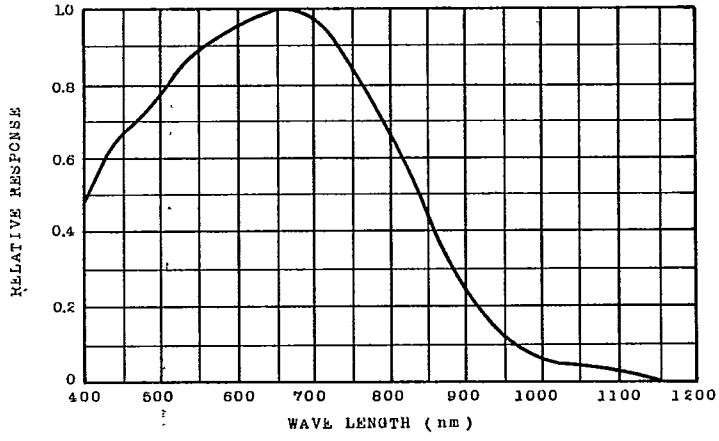


CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Pulse Timing of SH and ϕ_1	t_1 , t_5	0	100	-	nsec
SH Rise Time, Fall Time	t_2 , t_4	0	50	-	nsec
SH Pulse Width	t_3	60	300	-	nsec
ϕ_1,ϕ_2 Rise Time, Fall Time	t_6 , t_7	0	100	-	nsec
RS Rise Time, Fall Time	t_8 , t_{10}	0	20	-	nsec
RS Pulse Width	t_9	40	250	-	nsec
Pulse Timing of ϕ_1,ϕ_2 and RS	t_{11}	10	250	-	nsec
SP Rise Time, Fall Time	t_{12}, t_{14}	10	20	-	nsec
SP Pulse Width	t_{13}	60	100	-	nsec
Pulse Timing of SP and RS	t_{15}	20	50	-	nsec

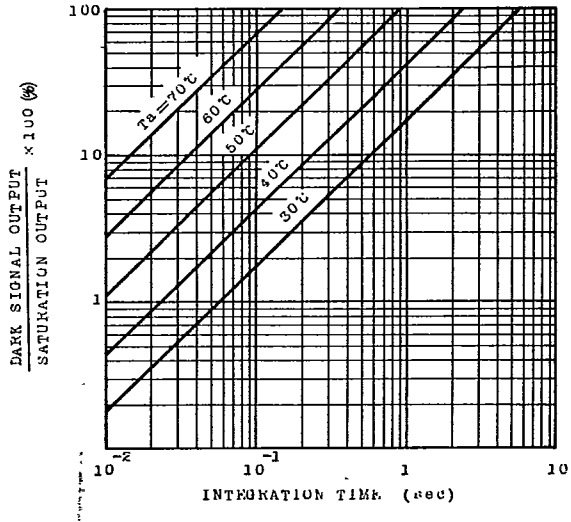
Note : f_{RS}=1MHz(Typ.)

TCD102C-1

TYPICAL SPECTRAL RESPONSE (T_a=25°C)



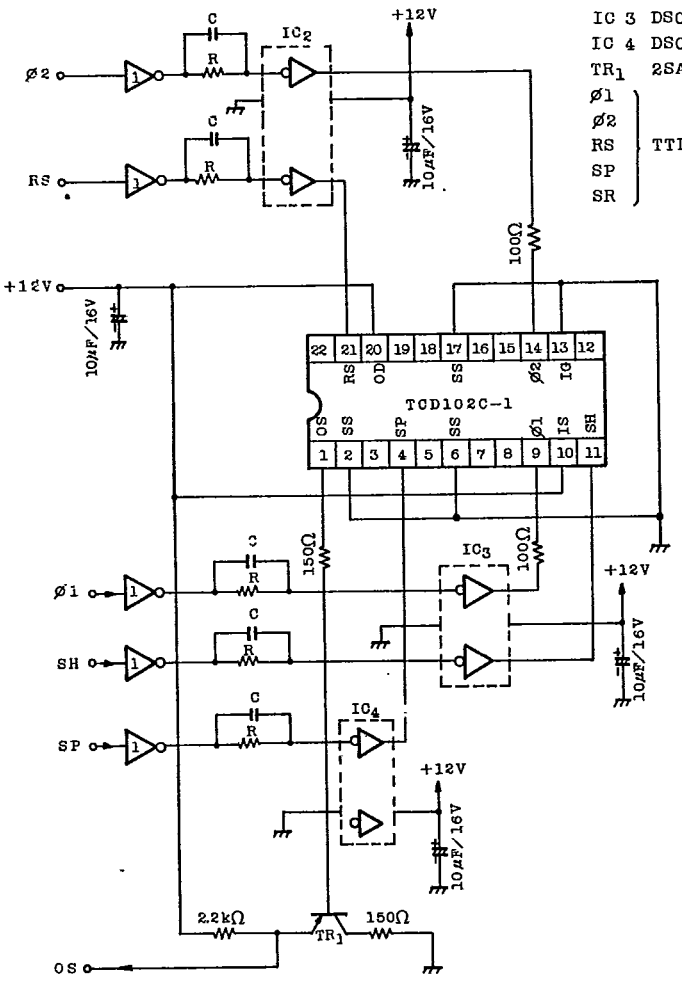
AVERAGE DARK SIGNAL - INTEGRATION TIME AT DIFFERENT TEMPERATURES



PROBLEM HARD COPY

TCD102C-1

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 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.

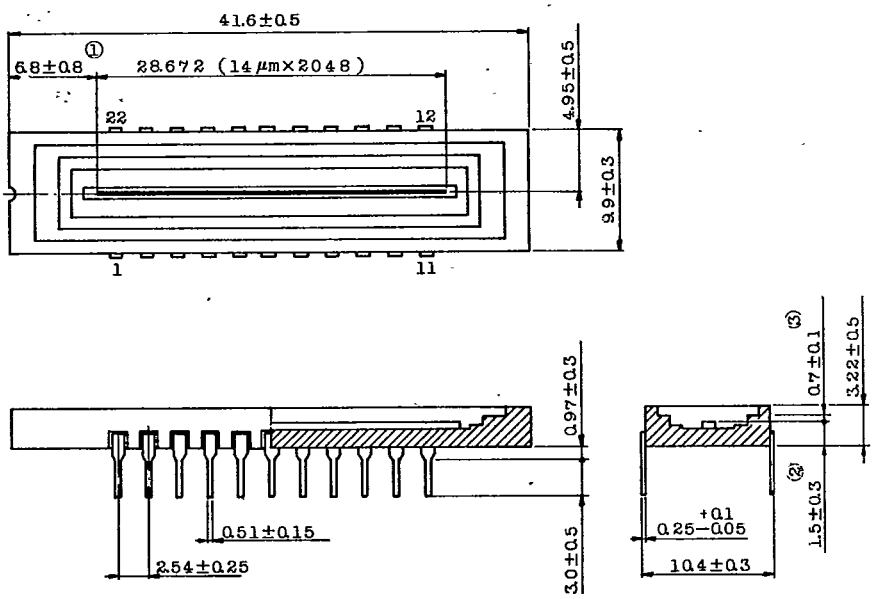
3. Incident Light

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

TCD102C-1

PACKAGE OUTLINE (4D22D-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)