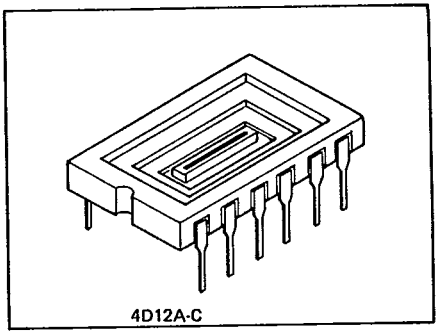
CCD IMAGE SENSOR
CCD (Charge Coupled Device)

TCD104C

The TCD104C is a high resolution and high sensitivity 128 element linear image sensor. The device can be used for OCR, POS handscanner (bar-code type), and other optical measurements. The device is operated by only 12V, power supply. The device is mounted in 12 pin dual-in-line package with hermetic sealed optical glass window.



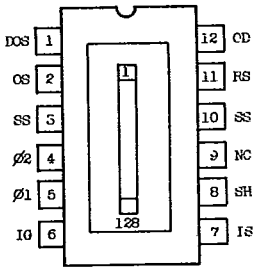
4D12A-C

FEATURES:

- Number of Image Sensing Elements : 128
- Image Sensing Element Size
  : 32μm by 28μm on 32μm Centers
- Photo Sensor Structure
  : High sensitive pn photodiode
- Clock : 2 Phase
- Dynamic Range : 1000 (Typ.)
- Package : 12 pin DIP (Ceramics)

PIN CONNECTIONS

(TOP VIEW)

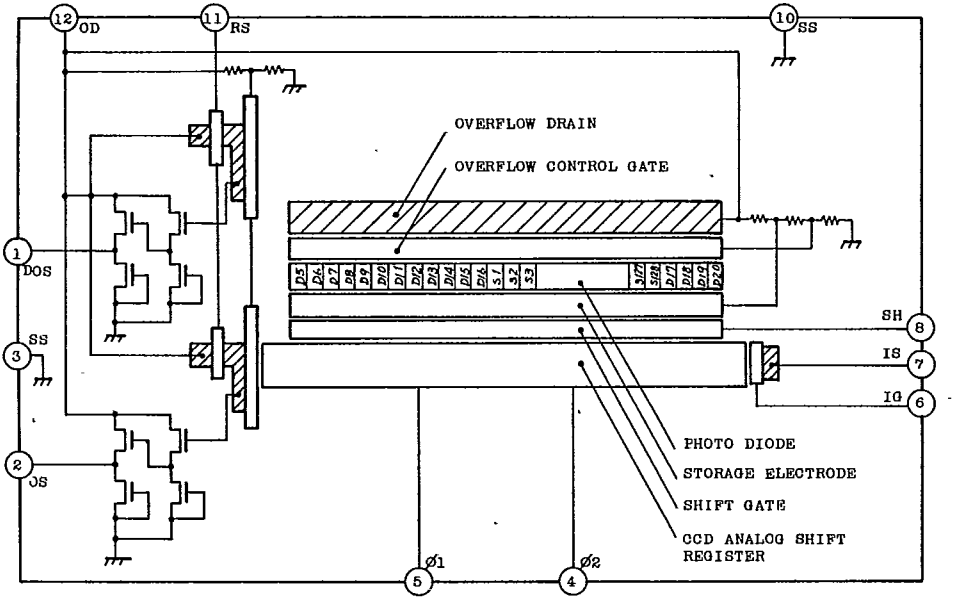


MAXIMUM RATINGS

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 voltages are with respect to SS terminal.

CIRCUIT DIAGRAM



PIN NAMES

ø1	Clock (Phase 1)
ø2	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 AND ELECTRICAL CHARACTERISTICS

$Ta=25^{o}C$, $V_{OD}=V_{IS}=12V$, $V_{IG}=0V$, $V_P=V_{RS}=V_{SH}=12V$ (PULSE)

$f\phi=f_{RS}=1MHz$, t_{INT} (INTEGRATION TIME)=1 msec. Light source=daylight fluorescent lamp.

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Responsivity	R		4.0	5.0	6.0	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	0.13	0.18	-	lx·sec
Dark Signal Voltage	V_{DRK}	V_{OD}=13V	-	-	10	mV
DC Power Dissipation	P_D	V_{OD}=13V	-	50	100	mW
Total Transfer Efficiency	TTE		92	96	-	%
Output Impedance	Z_O		-	0.5	2	kΩ
Dynamic Range	DR	V_{SAT}/V_{DRK}	-	1000	-	-
DC Mismatch Voltage	$\lvert V_{OS}-V_{DOS}\rvert$		-	-	300	mV

Note (1) : Measured at 50% of SE (Typical)

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

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

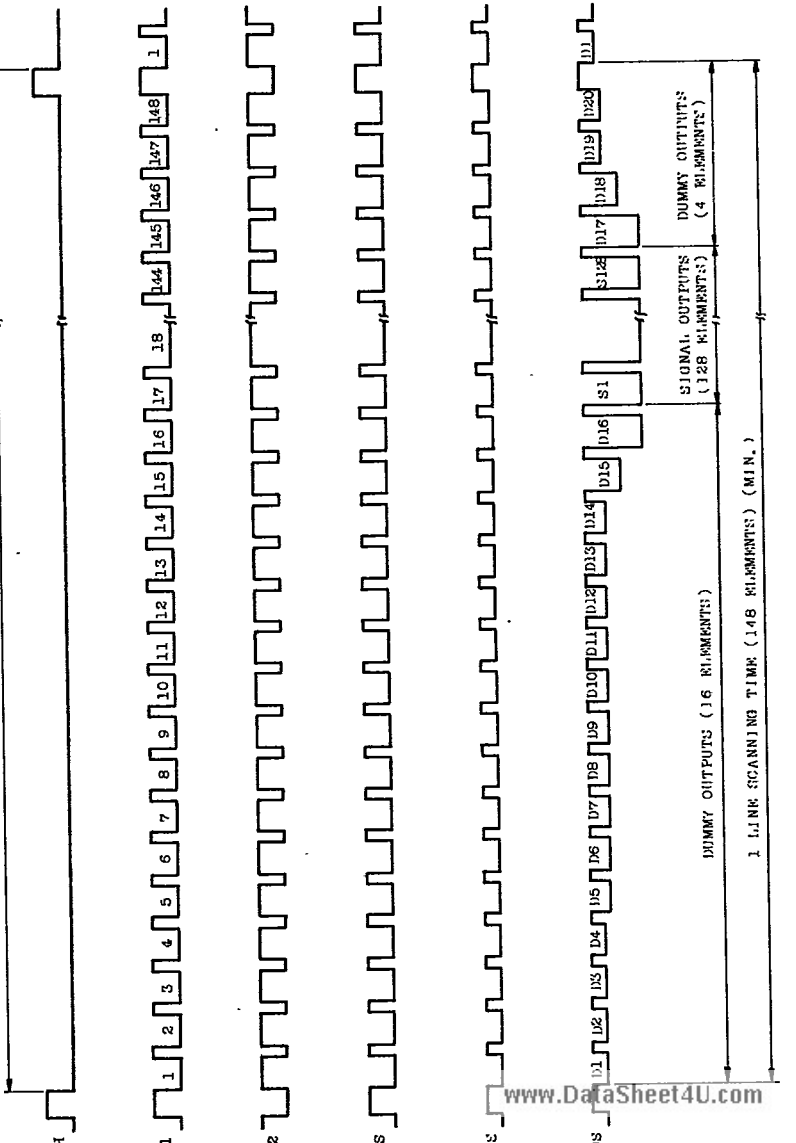
OPERATING CONDITION (Ta=25°C)

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

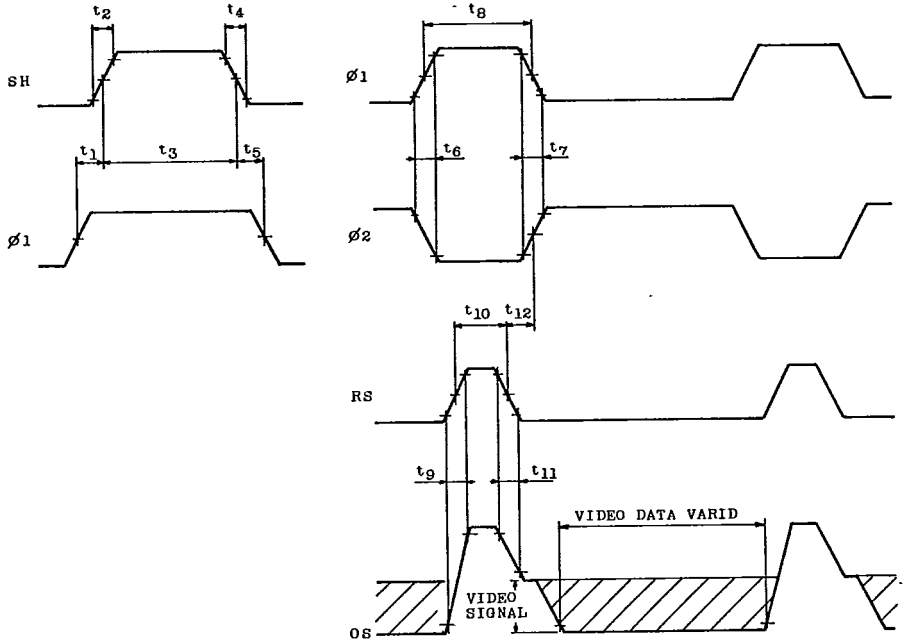
CLOCK CHARACTERISTICS (Ta=25°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock Pulse Frequency	f_ϕ	-	1	-	MHz
Reset Pulse Frequency	f_{RS}	-	1	-	MHz
Clock Input Terminal Capacitance	C_ϕ	-	100	-	pF
Shift Gate Capacitance	C_{SH}	-	30	-	pF
Reset Gate Capacitance	C_{RS}	-	5	-	pF

TIMING CHART



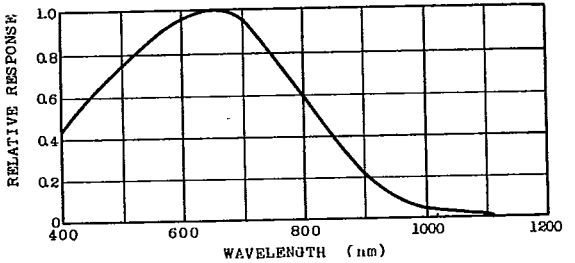
TIMING REQUIREMENTS



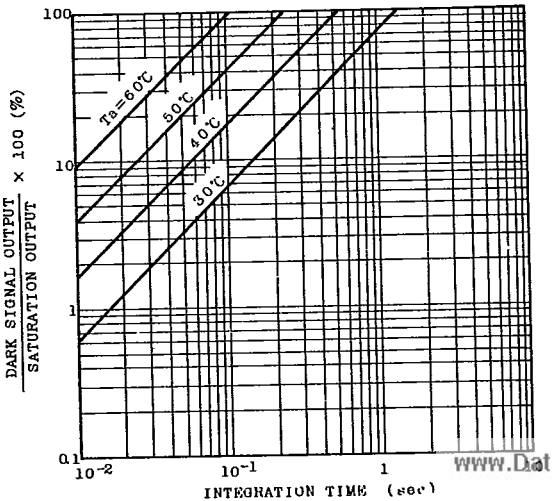
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Pulse Timing of SH and ϕ1	t_1, t_5	0	20	-	nsec
SH Rise Time, Fall Time	t_2, t_4	10	20	-	nsec
SH Pulse Width	t_3	100	100	-	nsec
ϕ1, ϕ2 Rise Time, Fall Time	t_6, t_7	10	20	-	nsec
ϕ1 Pulse H-Level Width (ϕ2 Pulse L-Level)	t_8	40	100	-	nsec
RS Rise Time, Fall Time	t_9, t_{11}	10	20	-	nsec
RS Pulse Width	t_{10}	40	60	-	nsec
Pulse Timing of ϕ11, ϕ2 and RS	t_{12}	0	20	-	nsec

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

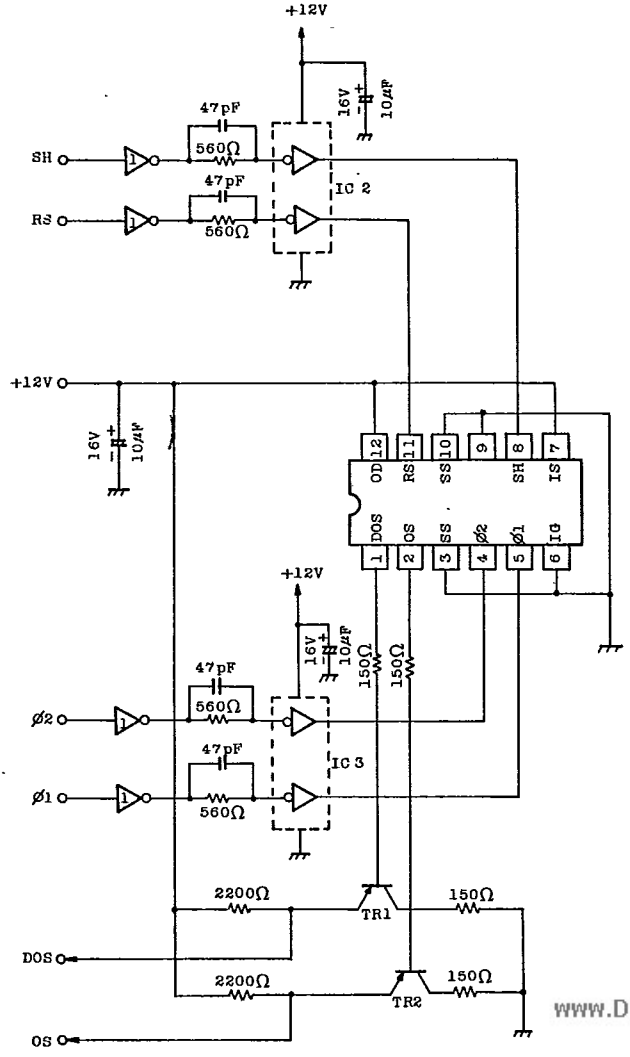
TYPICAL SPECTRAL RESPONSE (Ta=25℃)



AVERAGE DARK SIGNAL – INTEGRATION TIME
AT DIFFERENT TEMPERATURES



TYPICAL DRIVE CIRCUITRY



IC 1 : SN7404

IC 2 : DS0026CN

IC 3 : DS0026CN

TR1 : 2SA1015

TR2 : 2SA1015

ø1
ø2
RS
SH
} TTL LEVEL INPUT

CAUTION

1. Window Galss

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

Keep the galss 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 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.

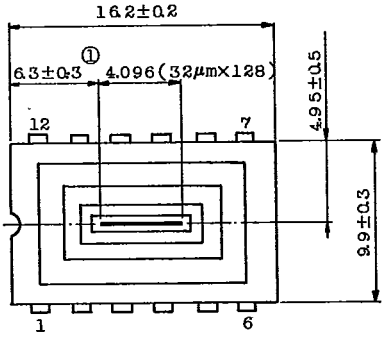
3. Incident Light

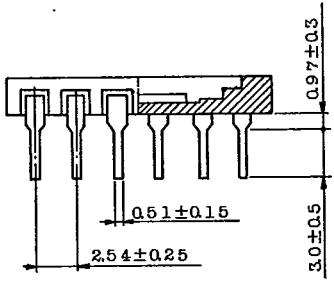
CCD sensor is sensitive to infrared light.

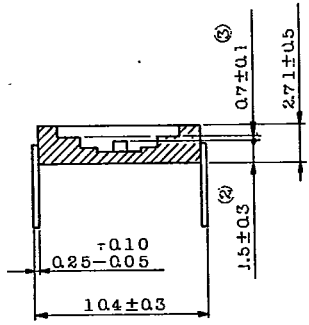
Note that infrared light component degrades resolution and PRNU of CCD sensor.

PACKAGE OUTLINE (4D12A-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)