

HITACHI COLOR IMAGING DEVICE

HE 98221

TENTATIVE DATA



The HE98221 is a MOS type imaging device. It contains n-p-n structure 384 x 485 picture elements with an on-chip color filter.

The size of the picture elements is $23\mu\text{m}$ (H) x $13.5\mu\text{m}$ (V). It provides horizontal resolution of 280 TV lines and vertical resolution of 350 TV lines.

This device is packaged in a 20-pin dual in-line package with an optical glass window.

■ Features

- 384 x 485 picture elements on a single chip.
- Resolution 280 TV lines (horizontal)
350 TV lines (vertical)
- Low voltage power supply requirements below 7V.
- Low power dissipation 60 mW typical.
- No blooming
- On-chip color filter
- Hermetically sealed package
- Sensing area 8.8 mm (H) x 6.6 mm (V)

■ Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Value	Unit
Operating temperature range	Topr	-10~60	°C
Storage temperature range	Tstg	-30~70	°C
Terminal voltage	Pin No. 1	0.0~9.0	V
	Pin No. 2	0.0~V _V	V
	Pin No. (*)	0.0~9.0	V
	Pin No. 10,15	0.0~0.7	V
Exposure value		500,000	1x · hour
Surface illumination		10,000	1x

Pin No. (*) : 3,4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 17, 18, 19, 20

Note1: Operational temperature should be the temperature at the time when the horizontal and vertical shift registers operate, and when the picture signal is obtained.

2: Terminal voltage should be the value when Pin No. 9 is GND.

3: If the conditions of $V_{S1}=V_V$, $V_{S2}=V_V$, $V_{S3}=V_V$, $V_{S4}=V_V$ and $V_{SUB}\geq V_V$ are not satisfied, voltage should not be applied.

4: If the condition of $V_{SUB}\geq 6.5\text{V}$ is not satisfied, voltage should not be applied.

5: When the undershoot of pulse becomes less than 0.0V at Pin No. 20 (HIN), limit it within the range of the footnote of the pulse waveform standard table on page 6.

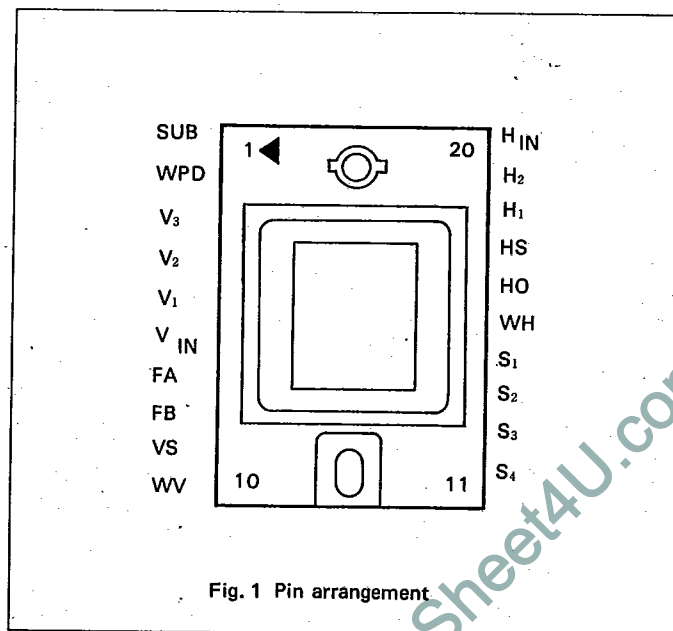
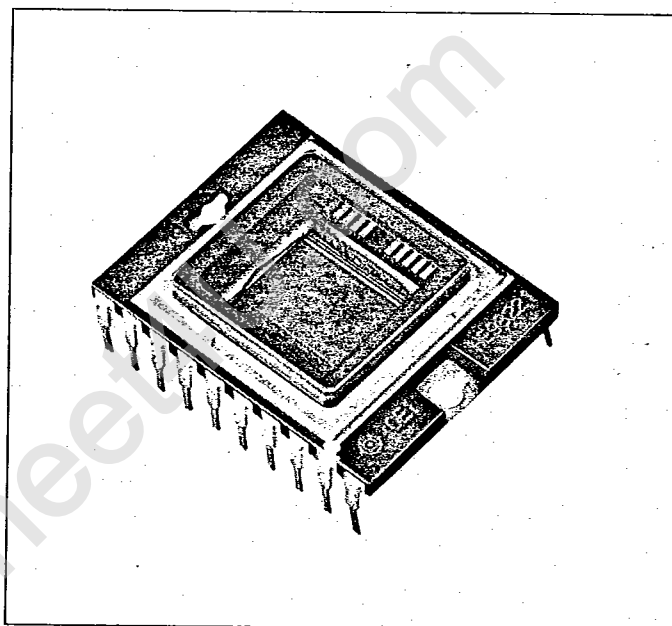


Fig. 1 Pin arrangement

Note: The information contained herein is tentative and may be changed without prior notice. It is therefore advisable to contact Hitachi before processing with the design of equipment in incorporating this product.

Recommended Operating Conditions

Pin No.	Pin name	Conditions (typical)
1	SUB	7.0 V
2	WPD	0.8 V
3	V ₃	Clock high level (ϕ_H) 7.0 V Clock low level (ϕ_L) 0.25 V ($\phi_L > 0V$)
4	V ₂	
5	V ₁	
6	V _{IN}	
7	FA	
8	FB	
9	VS	Ground 0.0 V
10	WV	Initial high level 0.65 V Initial low level 0.0 V
11	S ₄	2.5 V
12	S ₃	
13	S ₂	3.5 V
14	S ₁	
15	WH	Initial high level 0.65 V Initial low level 0.0 V
16	H \bar{O}	0.0 V
17	HS	0.0 V
18	H ₁	Clock high level (ϕ_H) 7.0 V Clock low level (ϕ_L) 0.25 V ($\phi_L > 0V$)
19	H ₂	
20	H _{IN}	

Clock Characteristics (T_a = 25°C)

Item	Symbol	Pin No.	min.	typ.	max.	unit	
Field change clock	High level	V _{FAH} , V _{FBH}	7, 8	6.65	7.0	7.35	V
	Low level	V _{FAL} , V _{FBL}	7, 8	0	0.25	0.35	V
Vertical S.R. input clock	High level	V _{VINH}	6	6.65	7.0	7.35	V
	Low level	V _{VINL}	6	0	0.25	0.35	V
Horizontal S.R. input clock	High level	V _{HINH}	20	6.65	7.0	7.35	V
	Low level	V _{HINL}	20	0	0.25	0.35	V
Vertical S.R. transfer clock	High level	V _{V1H} , V _{V2H} , V _{V3H}	3, 4, 5	6.65	7.0	7.35	V
	Low level	V _{V1L} , V _{V2L} , V _{V3L}	3, 4, 5	0	0.25	0.35	V
Horizontal S.R. transfer clock	High level	V _{B1H} , B _{2H}	18, 19	6.65	7.0	7.35	V
	Low level	V _{H1L} , H _{2L}	18, 19	0	0.25	0.35	V
Initial pulse	High level	V _{WHH} , V _{WVH}	15	0.60	0.65	0.70	V
	Low level	V _{WHL} , V _{WVL}	15	0	0.0	0.05	V
Horizontal S.R. transfer clock frequency	f _{H1} , H ₂	—	—	15.73	—	kHz	
Horizontal S.R. input clock frequency	f _{HIN}	—	—	15.73	—	kHz	
Vertical S.R. transfer clock frequency	f _{V1} , V ₂ , V ₃	—	—	15.73	—	kHz	
Vertical S.R. input clock frequency	f _{VIN}	—	—	60	—	Hz	
Field change clock frequency	f _{FA} , F _B	—	—	30	—	Hz	

Capacitance (T_a = 25°C, f = 1MHz)

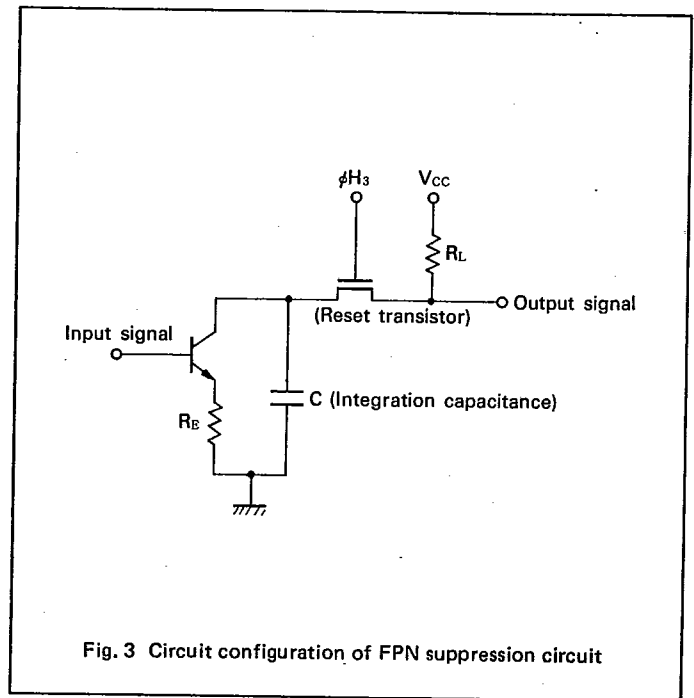
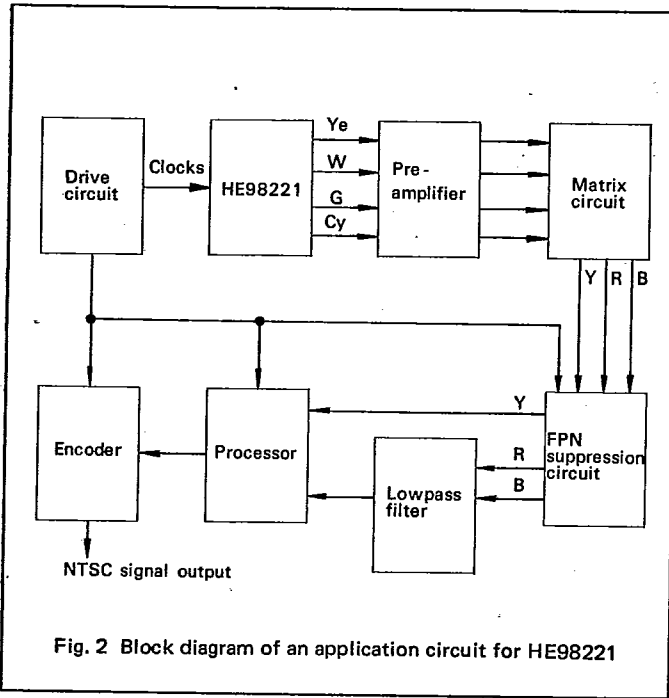
Item	Symbol	Test condition	typ.	max.	unit
S.R. transfer gate capacitance	C _{H1} , H ₂ , H ₃	V = 0 V	60	90	pF
	C _{V1} , V ₂	V = 0 V	35	50	pF
S.R. input gate capacitance	C _{HIN} , V _{IN}	V = 0 V	10	15	pF
Field change gate capacitance	C _{FA} , F _B	V = 0 V	35	50	pF
Well capacitance	C _{WV} , W _H	V = 0 V	600	900	pF
Video output capacitance	C _{S1} , S ₂	V = 2.7V, V _{SUB} = 7V	15	28	pF
	C _{S3} , S ₄	V = 1.7V, V _{SUB} = 7V	17	30	pF

Electrical Characteristics (T_a = 25°C)

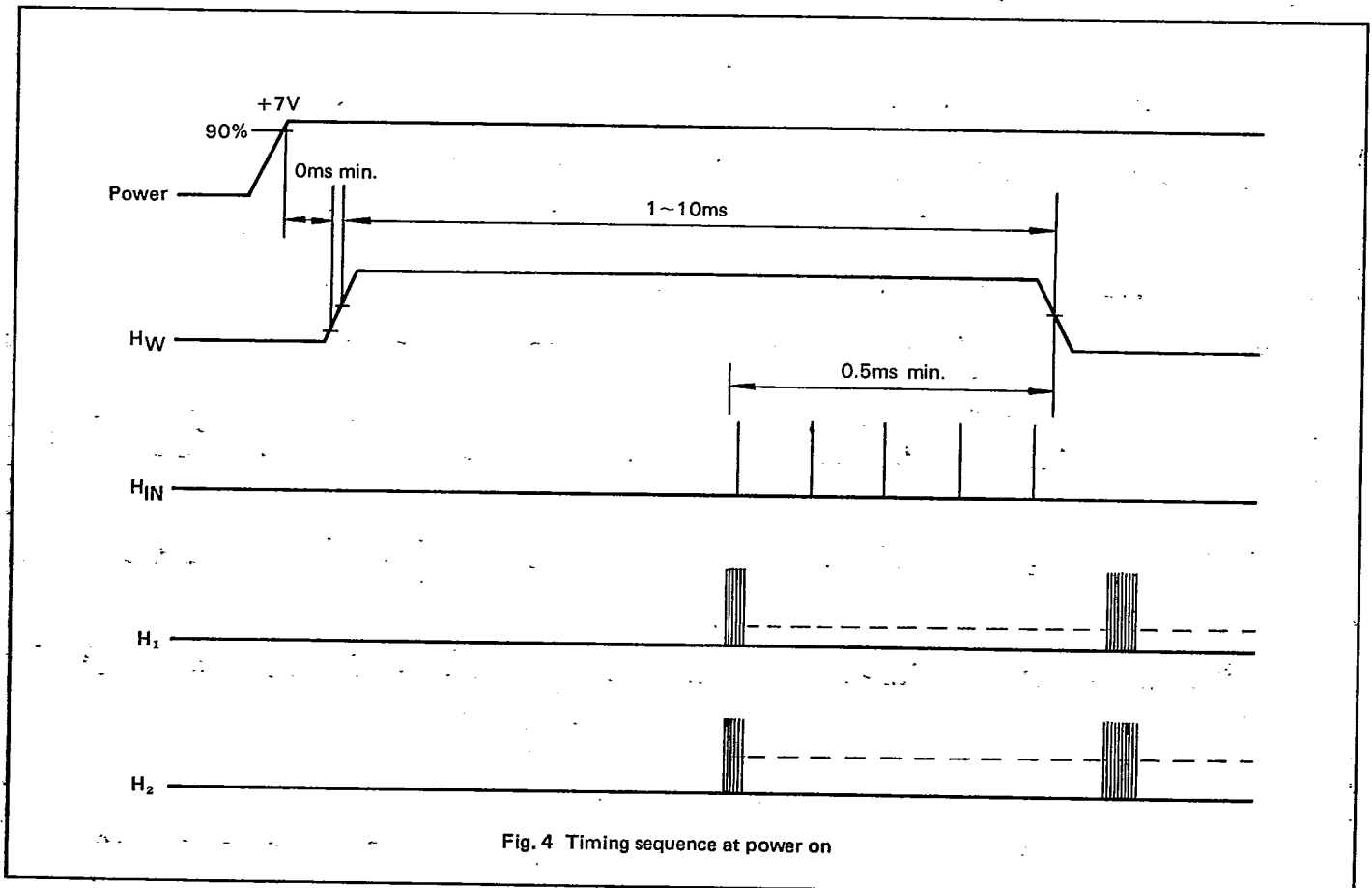
Item	Symbol	Test condition	min.	typ.	max.	unit
Saturation signal current	I _{W Sat}	V _V = 3.5V, L \approx 1.2L Sat	0.28	0.40		μ Ap-p
Sensitivity (Yellow channel) (White channel) (Green channel) (Cyan channel)	S ₁	V _V = 3.5V	1.55	2.15		nAp-p/lx
	S ₂	V _V = 3.5V	1.85	2.40		nAp-p/lx
	S ₃	V _V = 2.5V	0.6	1.0		nAp-p/lx
	S ₄	V _V = 2.5V	0.7	1.18		nAp-p/lx
Signal Uniformity (Yellow signal) (Red signal) (Blue signal)	SU _Y				±15	%
	SU _R				±15	%
	SU _B				±20	%
Horizontal Resolution	R _H			280		TV lines
Vertical Resolution	R _V			350		TV lines
Gamma	γ			1		
Dark current	I _d	V _V = 3V, T _a = 25°C			10	nA
Power dissipation	P			60	100	mW
Input sink current	I _{LI}	V _{SUB} = 7.0 V Maximum rating voltage			10	μ A

■ Application Circuit for HE98221

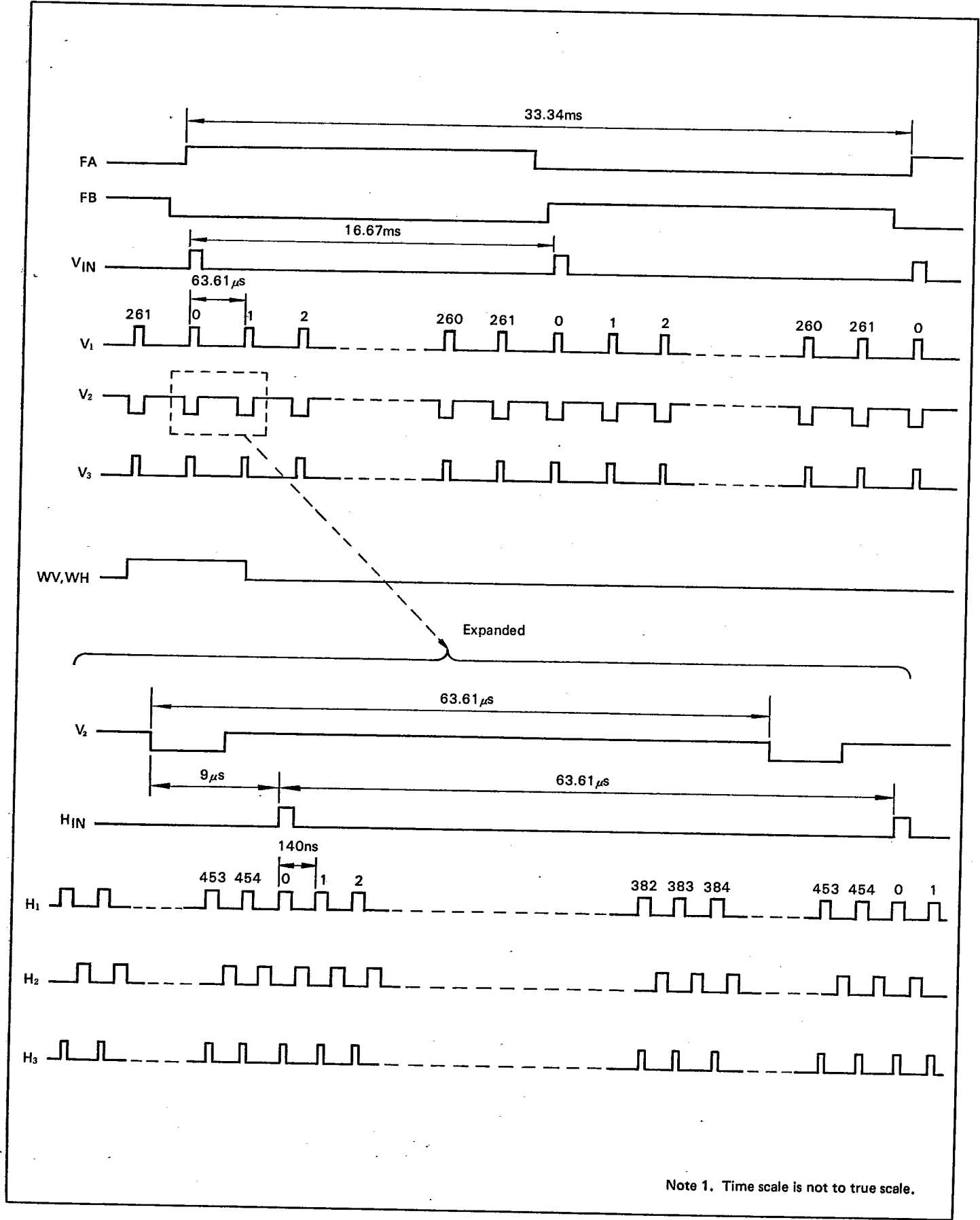
Block diagram of an application circuit is shown in Fig. 2.
Fig. 3 shows a circuit configuration of FPN suppression circuit.



■ Timing Sequence at Power On



■ Timing Pulses



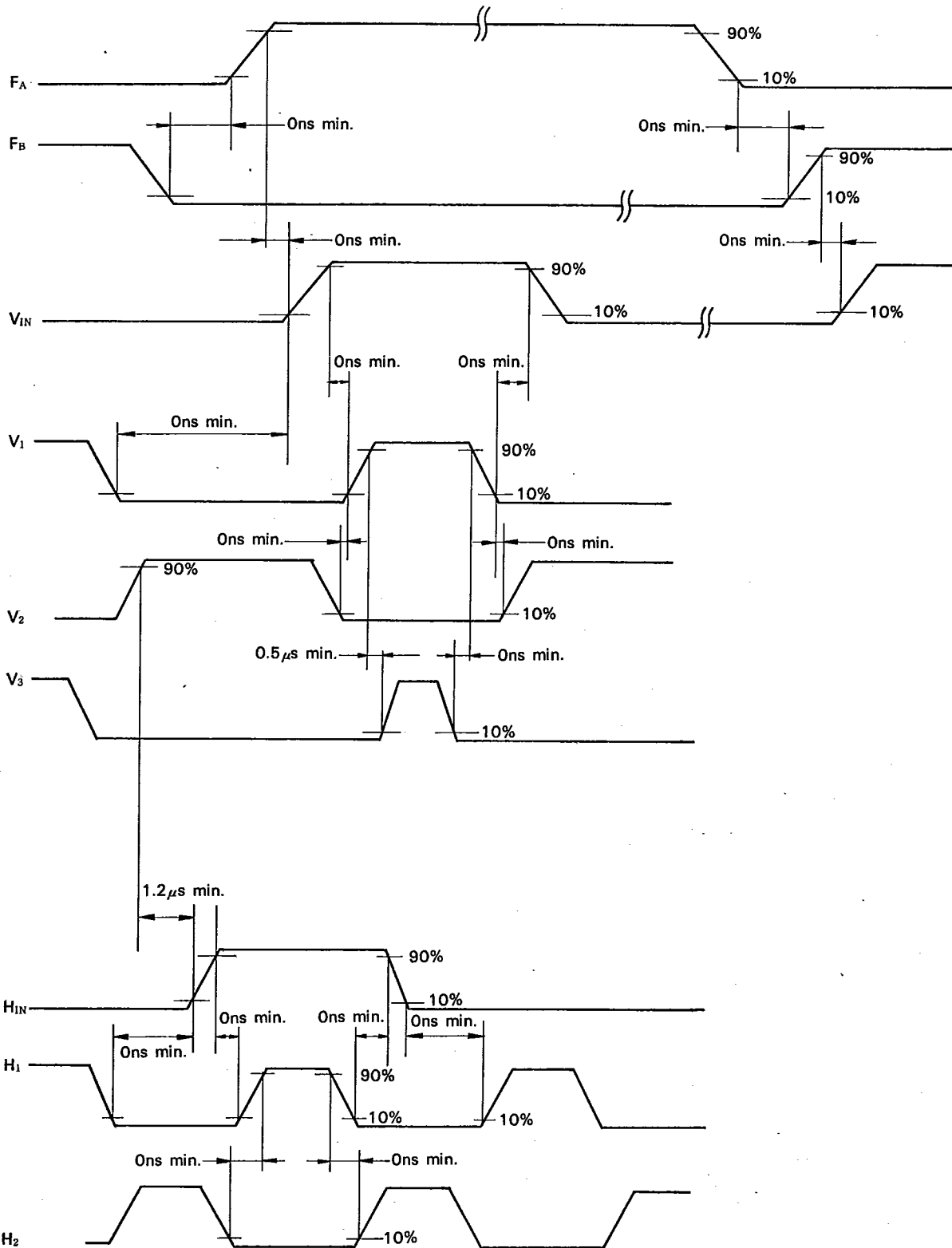


Fig. 5 Timing pulses

■ Typical Spectral Response Characteristics

Fig. 6 shows a typical spectral response of HE98221. Ye, W, G, CY stand for yellow color signal, white color signal, green color signal, and cyan color signal, respectively.

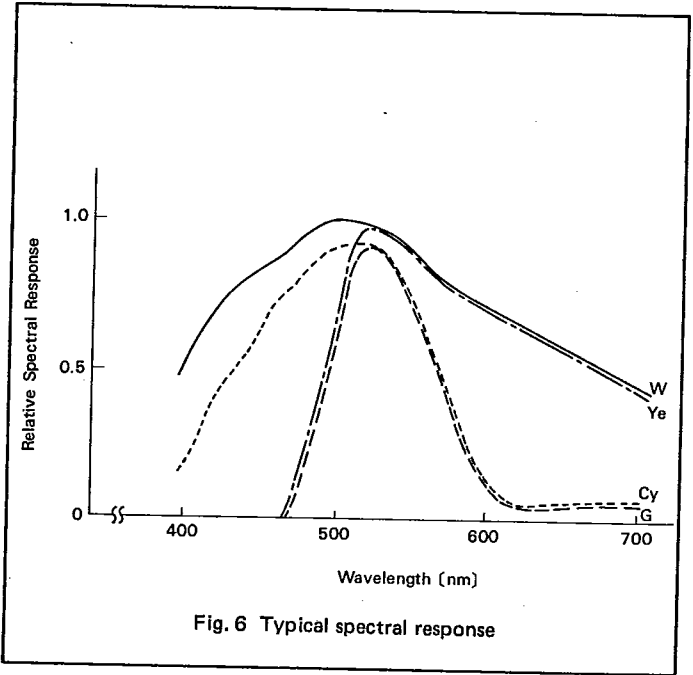
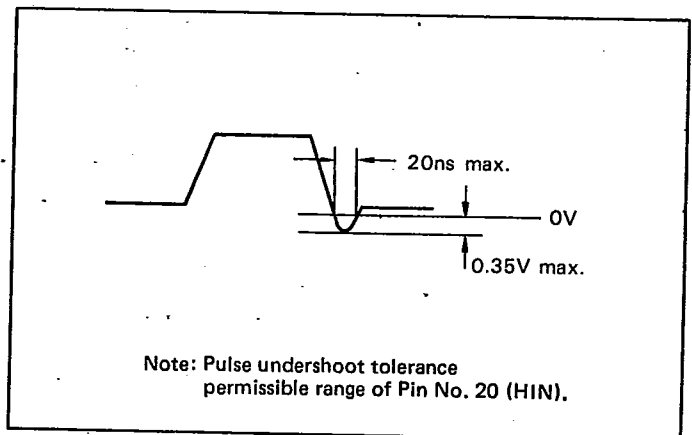
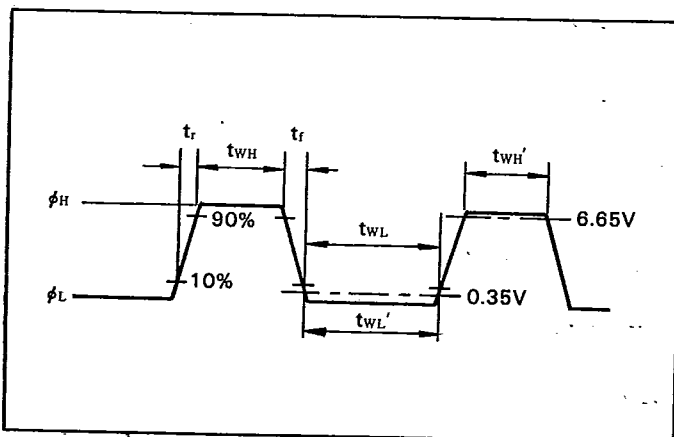


Fig. 6 Typical spectral response

■ Pulse Wave Form

Pin name	t _{WH}			t _{WH'}			t _{WL}			t _{WL'}			t _r			t _f			unit
	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
H ₁	35	40	45	30	37		55	70		50	67		10	15	20	10	15	20	ns
H ₂	35	40	45	30	37		55	70		50	67		10	15	20	10	15	20	ns
H _{IN}	65	100											10	15	20	10	15	20	ns
V ₁	4.5	7.3											50 ns	0.2	0.5	50 ns	0.2	0.5	μs
V ₂	54	56					7.7						50 ns	0.2	0.5	50 ns	0.2	0.5	μs
V ₃	4.0	6.0											50 ns	0.2	0.5	50 ns	0.2	0.5	μs
V _{IN}	4.6	64											50 ns	0.1	0.5	50 ns	0.1	0.5	μs
FA	15.0	15.5												0.2 μs	0.5 μs		0.2 μs	0.5 μs	ms
FB	15.0	15.5												0.2 μs	0.5 μs		0.2 μs	0.5 μs	ms
WV	100	150	200											1	2		1	2	μs
WH	1	-	10																ms



■ Cautions in Handling

Protective register connect method

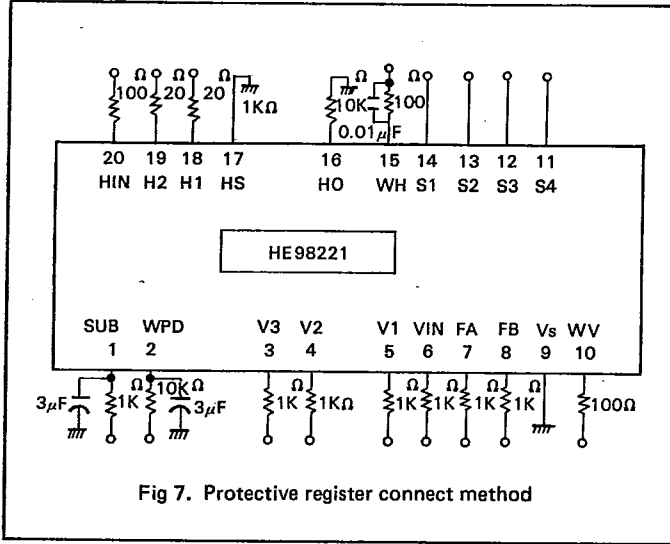
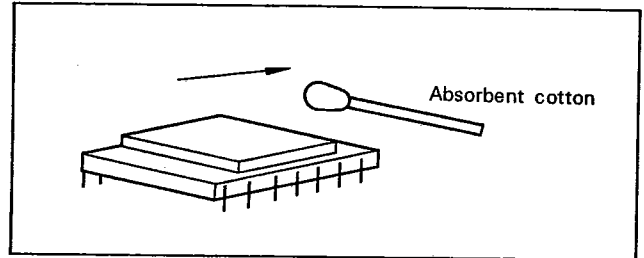


Fig 7. Protective register connect method

- (3) The above mentioned driving conditions assure the operation of the vertical and the horizontal shift registers, and obtaining the picture signals.
- (4) Do not solder on the kovar metal at the back because color filter will be decomposed and the device will be damaged.
- (5) Take care when handling the device because 7 volts (typical) is applied to the kovar metal at the back of the device under operating condition.
- (6) When handling the device, do not touch the glass. In case you touch it and leave fingerprints on it, wipe it slowly and gently with absorbent cotton after moistening with your breath. (From left to right, about once a second)



Cautions in Handling

- (1) As imaging device HE98221 is MOS-LSI, take care of electrostatic breakdown. When handling, the body and instrument must be grounded. Moreover several hundred kilohms registers should be added in series between the body and GND for safety, and to protect the device, add protective registers as stated above.
- (2) V_{SUB} should be more than 6.5 volts when the voltage or the clockpulse is applied to the terminal. When turning off the power, turn off the voltage and the clockpulse under the condition that V_{SUB} is more than 6.5 volts.

- (7) Take care not to drop the device because the glass cap is fragile.
- (8) When storing and carrying the device, keep in its case. When installing in the camera, do not expose the device to light except under operating conditions.

■ Dimensional Outline

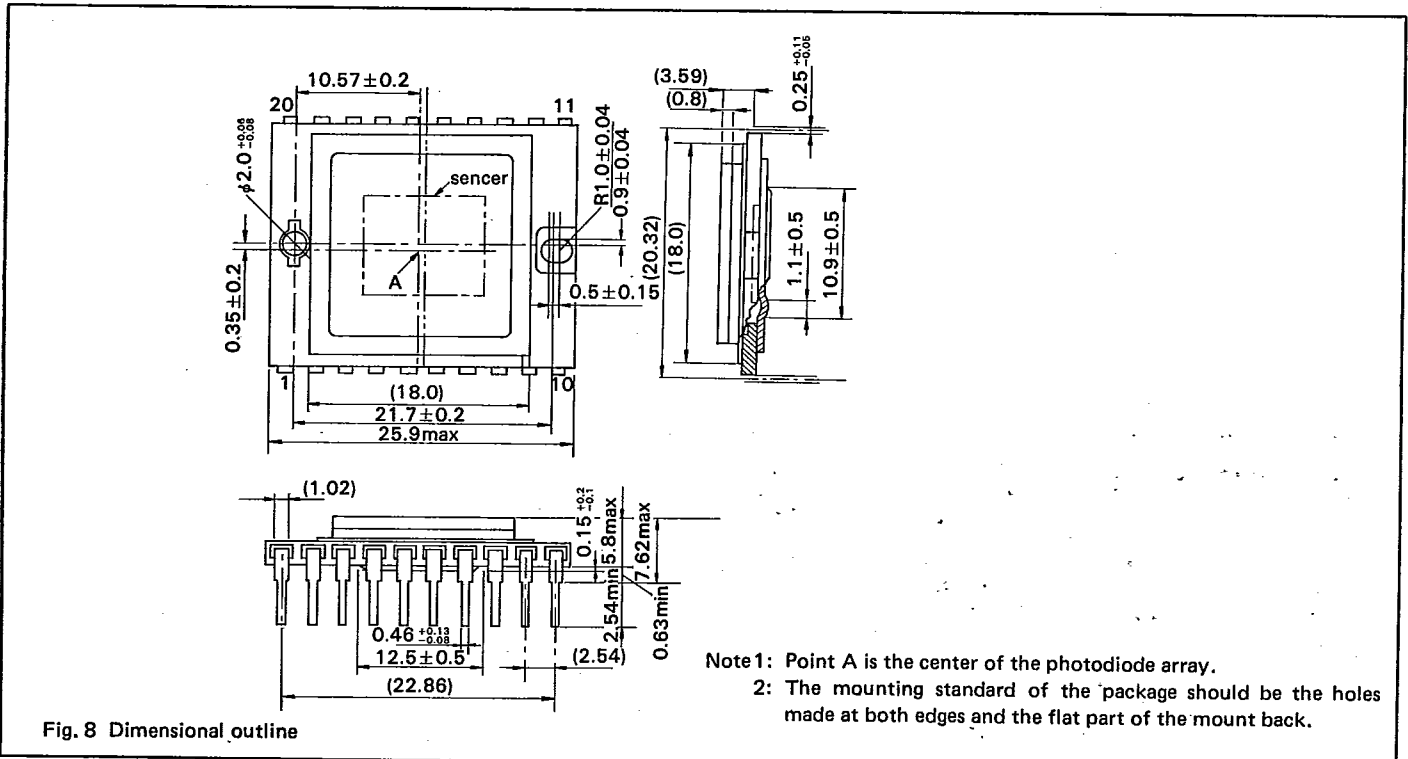


Fig. 8 Dimensional outline

Note 1: Point A is the center of the photodiode array.
 2: The mounting standard of the package should be the holes made at both edges and the flat part of the mount back.