PRODUCT NUMBER: HML3531

DESCRIPTION: L5300 × 3 ELEMENT LINEARIMAGE SENSOR

ISSUE DATE: 09/18/1998

REVISED DATA:

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HML3531

L5300 ELEMENTS LINEAR IMAGE SENSOR

GENERAL DESCRIPTION

◆The HML3531 is a low cost and high sensitive color linear image sensor with 5300 × 3 elements of sensor.

The sensor size is 7μm × 7μm on 7μm pitch and the distance between two sensor line is 28μm. The device is operated by 12V power supply and 5V puls .

Built in sample and hold . The package is 22 pin plastic package.

The device are manufactured using charge coupled device P-WELL buried-channel technology.

APPLICATIONS

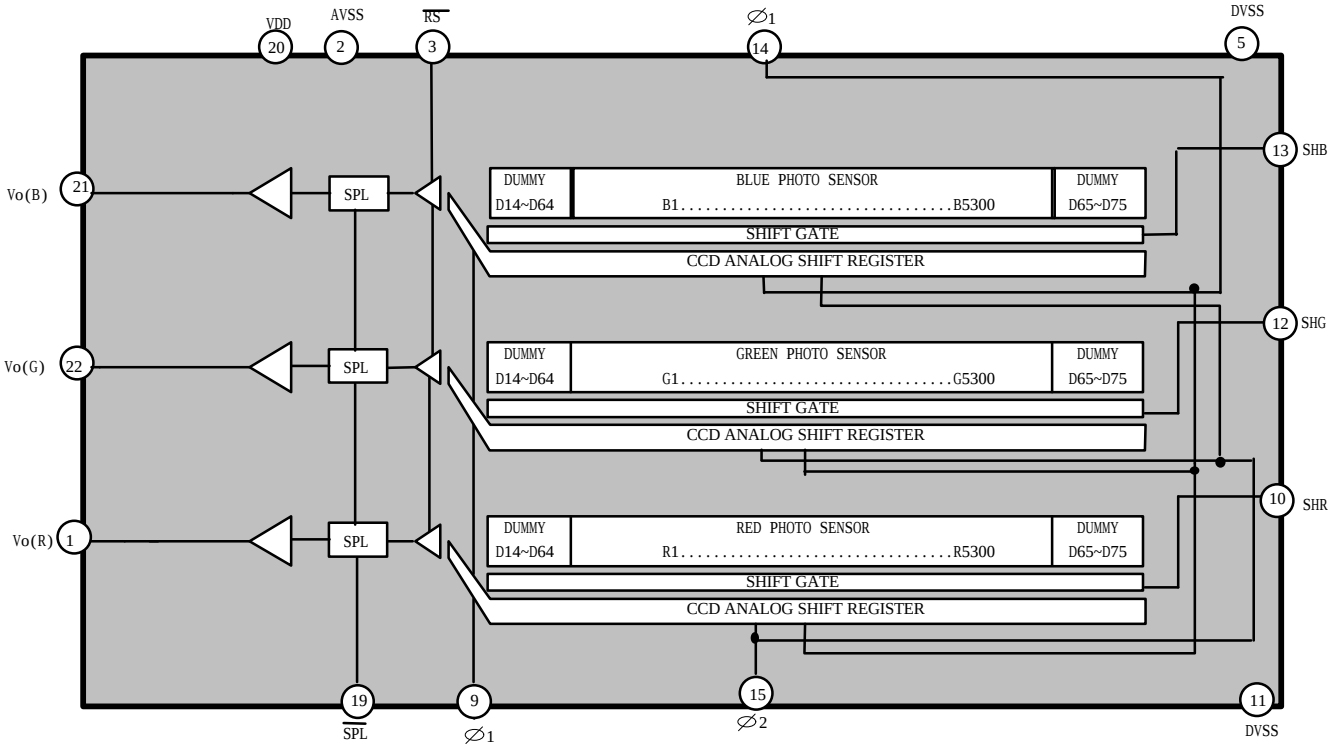
◆color image scanner 600DPI for A4 size documents.

◆color image scanner 400DPI for A3 size documents.

FEATURES

◆5300´3 elements of image sensor.
◆sensor size 7mm ´7mm on 7mm pitch.
◆the sensor line spacing is 28mm.
◆operation frequency(max) :3MHZ.
◆high sensitive pin photodiode.
◆2 phase clocking.
◆12V DC power, 5V pulse clocking.
◆built in sample and hold circuit.
◆22 pin plastic package.

CIRCUIT DIAGRAM



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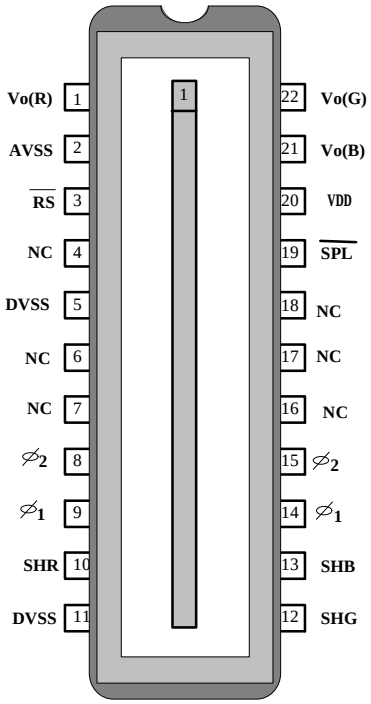
PIN ASSIGNMENT



PIN DESCRIPTION		
Pin NO	**Name**	**Description**
1	Vo(R)	Red signal output
22	Vo(G)	Green signal output
21	Vo(B)	Blue signal output
6	NC	Nonconnection
17	NC	Nonconnection
20	VDD	DC power supply
2	AVSS	Analog ground
5, 11	DVSS	Digital ground
3	$\overline{RS}$	Reset gate clock input
9, 14	ϕ1	Clock1 pulse gate input
8, 15	ϕ2	Clock2 pulse gate input
10	SHR	Red channel shift gate clock input
12	SHG	Green channel shift gate clock input
13	SHB	Blue channel shift gate clock input
19	$\overline{SPL}$	Sample and hold clock input
4, 7, 16, 18	NC	Nonconnection

ABSOLUTE MAXIMUM RATINGS

Parameter	Rating		
	Min	Max	Unit
Operating temperature	-25	+60	°C
Storage temperature	-40	+80	°C
Operating humidity	35%	80%	at 40°C
Storage humidity	20%	90%	at 40°C
Clock pulse voltage	-0.2	Vdd	V
Power supply voltage	-0.2	+13	V

OPTICAL /ELECTRICAL CHARACTERISTICS

Temperature=25°C, Vdd=12V, ϕ1(ϕ2, RS, SH, SPL)=5V pulse, f_{CK} =2MHZ, f_{RS} =2MHZ, Tint =10ms , Load resistance=100KΩ, Light source = 3200°K halogen lamp +CM500(infrared IR cutoff filter)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Responsivity	Rred	9.0	12.0	15.0	$V/lx \bullet sec$	
	Rgreen	9.0	12.0	15.0	$V/lx \bullet sec$	
	Rblue	7.5	10.0	12.5	$V/lx \bullet sec$	
Dynamic range	DR	---	3000	---		1
Saturation Voltage	Vsat	2	3.0	---	V	2
Saturation exposure	SE_R		0.25		lx•sec	2
	SE_G		0.25		lx•sec	2
	SE_B	---	0.3	---	lx•sec	2
Total transfer efficiency	TTE	92	96	---	%	
Output impedance	Z	---	450	1000	Ω	
DC power dissipation	P	---	400	700	mW	
Photorespons non-uniformity	PRNU1	---	6	20	%	3
Photorespons non-uniformity	PRNU2	---	6	20	%	3
Dark signal voltage	DS	---	1	5	mV	4
Dark signal non-uniformity	DSNU	---	---	10	mV	5
Output DC level	Vo	4.0	5.0	6.5	V	6
Random noise	σ	---	3.0	---	mV	7

NOTE:

1.Dynamic range (DR):

Dynamic range is defined as

$$DR = \frac{V_{SAT}}{DS}$$

¡ DS is proportional to Tint (integration time)

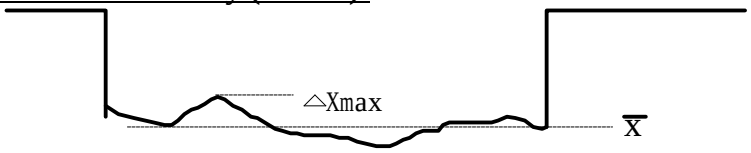
2.Saturation voltage (Vsat) and Saturation exposure(SE):

Vsat is defined as the minimum saturation output voltage of all effective pixels.

And the saturation exposure is defined as follows

$SE = \frac{V_{sat}}{R}$ where R indicates Rred , Rgreen, Rblue, and SE indicates SE_R, SE_G, SE_B.

3.Photorespons nonuniformity (PRNU):



PRNU1 is defined as $PRNU1 = \frac{\Delta X_{max}}{\overline{X}} \times 100\%$

$\overline{X}$ is average of total output signal ,

ΔX_{max} is the maximum deviation from $\overline{X}$

PRNU2 is defined as $PRNU2 = \frac{\Delta X_{next}}{\overline{X}} \times 100\%$

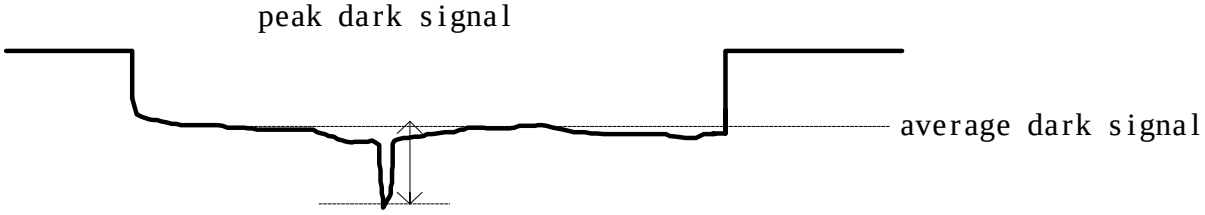
ΔX_{next} is maximum difference of next pixel

4.Dark signal voltage (DS):

Dark signal is defined as average dark signal voltage of all effective pixels under room temperature 25°C, and integration time 10ms.

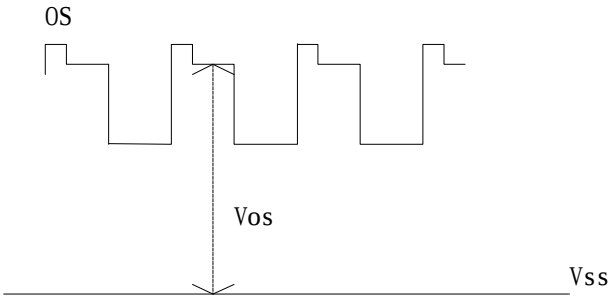
5.Dark signal nonuniformity (DSNU):

The DSNU is defined as the different dark voltage between the peak voltage and average voltage under room temperature 25°C and integration time 10ms.



6.Output DC level (Vo):

Output DC level is defined as



7.Random noise (s):

Random noise σ is defined as the standard deviation of a valid pixel output signal width 100 times. The test condition is at dark .

$$s = \sqrt{\frac{\sum_{i=1}^{i=100}(V_i - \overline{V})^2}{100}} \quad , \quad \overline{V} = \frac{1}{100}\sum_{i=1}^{100} V_i$$

OPERATING CONDITION

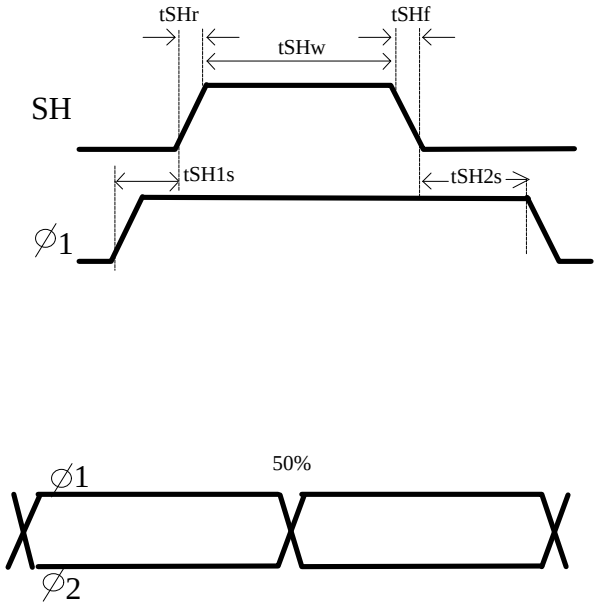
Characteristic		Symbol	Min	Typ	Max	Unit
Clock pulse voltage	H-level	$\phi 1, \phi 2$	4.5	5.0	Vdd	V
	L-level		-0.2	0	0.5	V
Shift pulse voltage	H-level	SH	4.5	5.0	Vdd	V
	L-level		-0.2	0	0.5	V
Reset pulse voltage	H-level	$\overline{RS}$	4.5	5.0	Vdd	V
S/H pulse voltage	L-level	$\overline{SPL}$	-0.2	0	0.5	V
Power supply voltage		Vdd	11	12	13	V

CLOCK CHARACTERISTICS

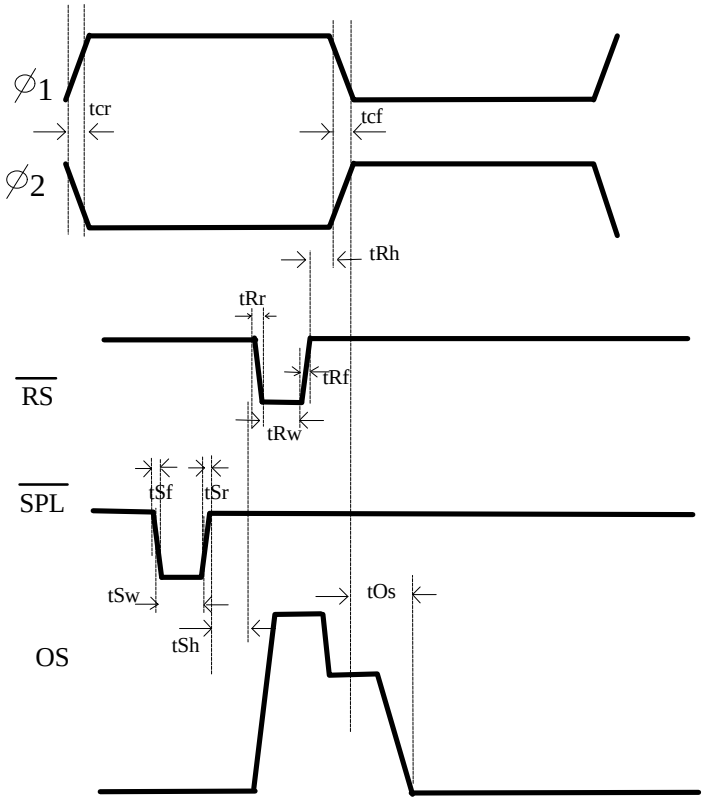
Temperature 25°C

Parameter	Symbol	Min	Typ	Max	UNIT
Clock pulse frequency	$f\phi 1, f\phi 2$	0.2	1	3	MHZ
Reset pulse frequency	f_{RS}	0.2	1	3	MHZ
Clock capacitance	C_{f1}	---	400	800	pF
	C_{f2}	---	400	800	pF
Shift gate capacitance	$C_{\overline{SH}}$	---	150	200	pF
S/H gate capacitance	$C_{\overline{SPL}}$	---	15	---	pF
Reset gate capacitance	$C_{\overline{RS}}$	---	15	---	pF

Pulse Timing of SH and ∅1



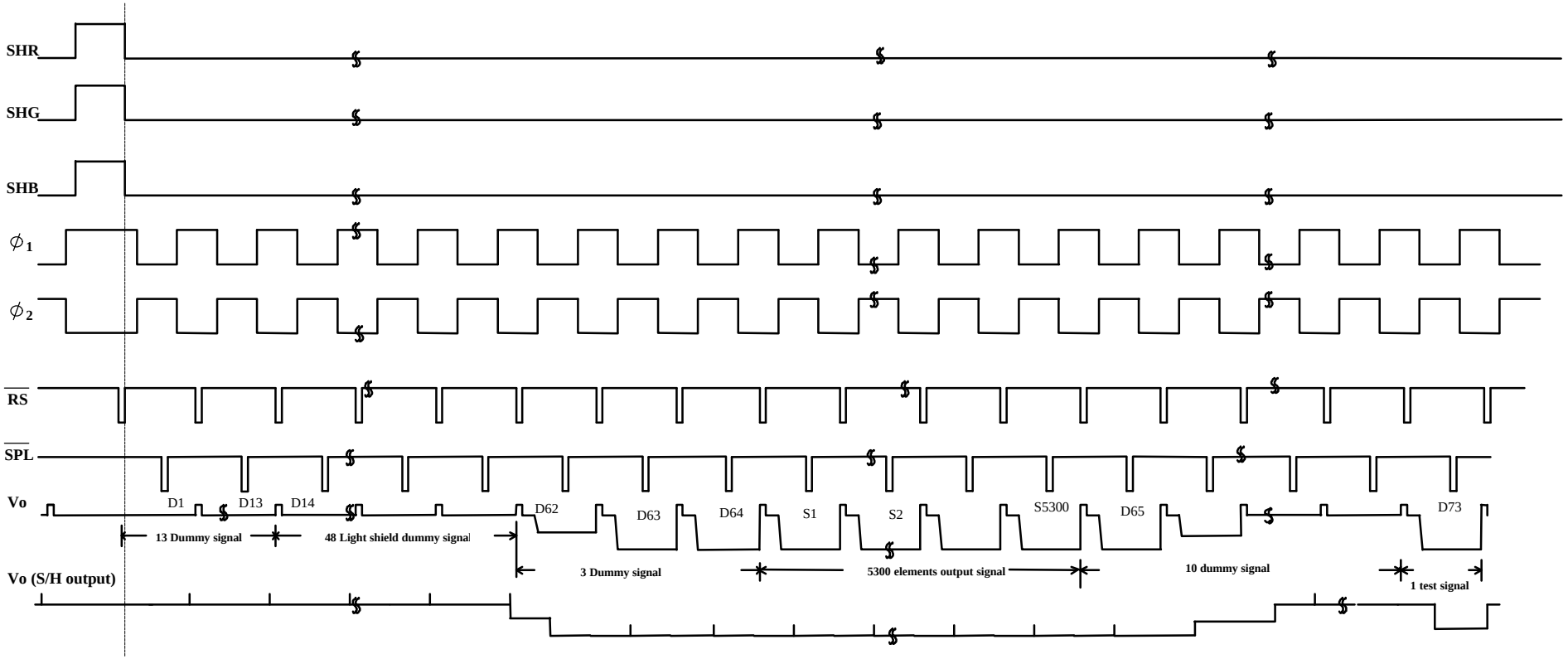
Pulse timing of ∅1, ∅2 , $\overline{RS}$, $\overline{SPL}$ and Vo



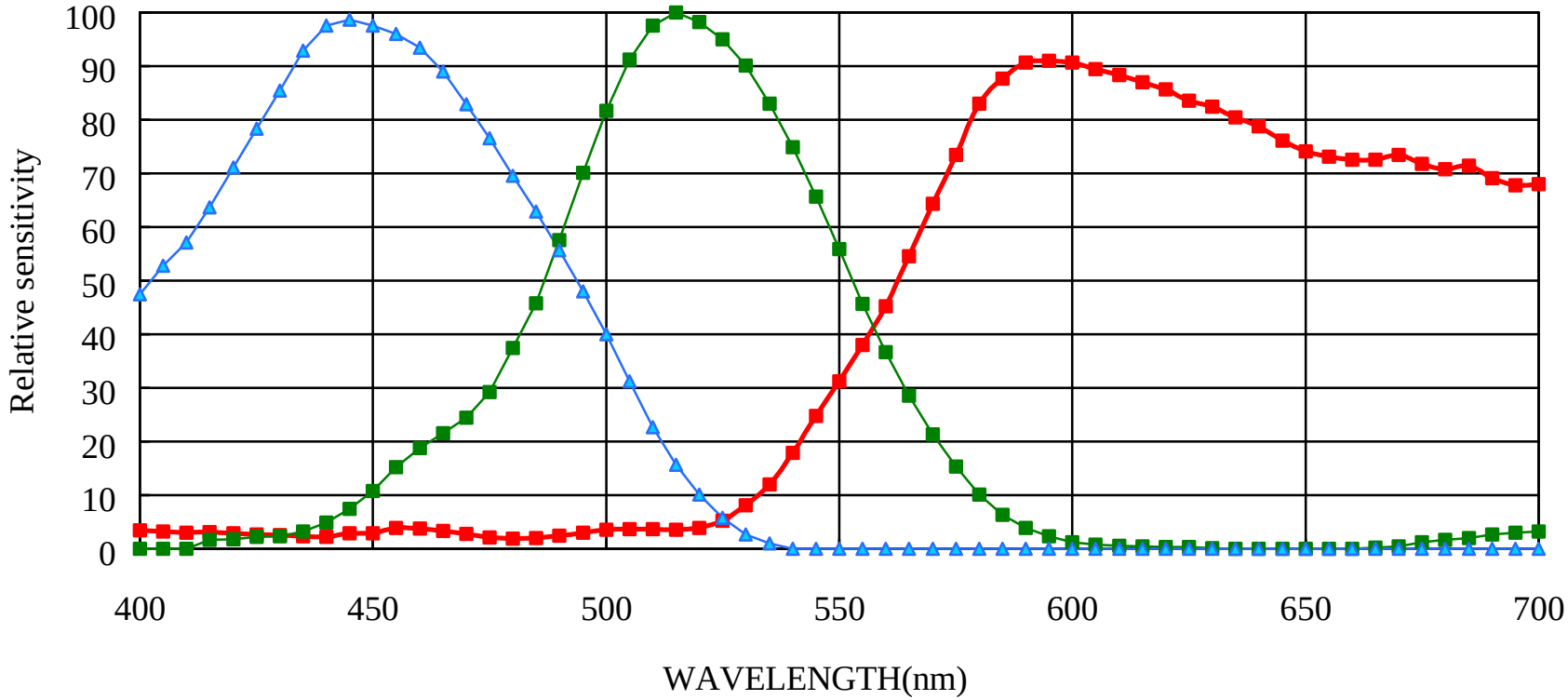
TIMING REQUIRMENT

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Pulse timing of SH and ϕ1	tSH1s, tSH2s	25	100	---	ns
SH pulse rise time, fall time	tSHr, tSHf	0	50	---	ns
SH pulse width	tSHw	3.0	5.0	20.0	μs
ϕ1, ϕ2 pulse rise and fall time	tcr, tcf	0	50	---	ns
$\overline{RS}$, $\overline{SPL}$ pulse rise and fall time	tRr, tRf, tSr, tSf	0	20	---	ns
$\overline{RS}$ pulse width	tRw	40	100	---	ns
$\overline{SPL}$ pulse width	tSw	60	150	---	ns
Pulse time of ϕ1, ϕ2, RS	tRh	50	100	---	ns
Pulse time of RS and SPL	tSh	25	50	---	ns
Video data delay time	tOs	40	60	100	ns

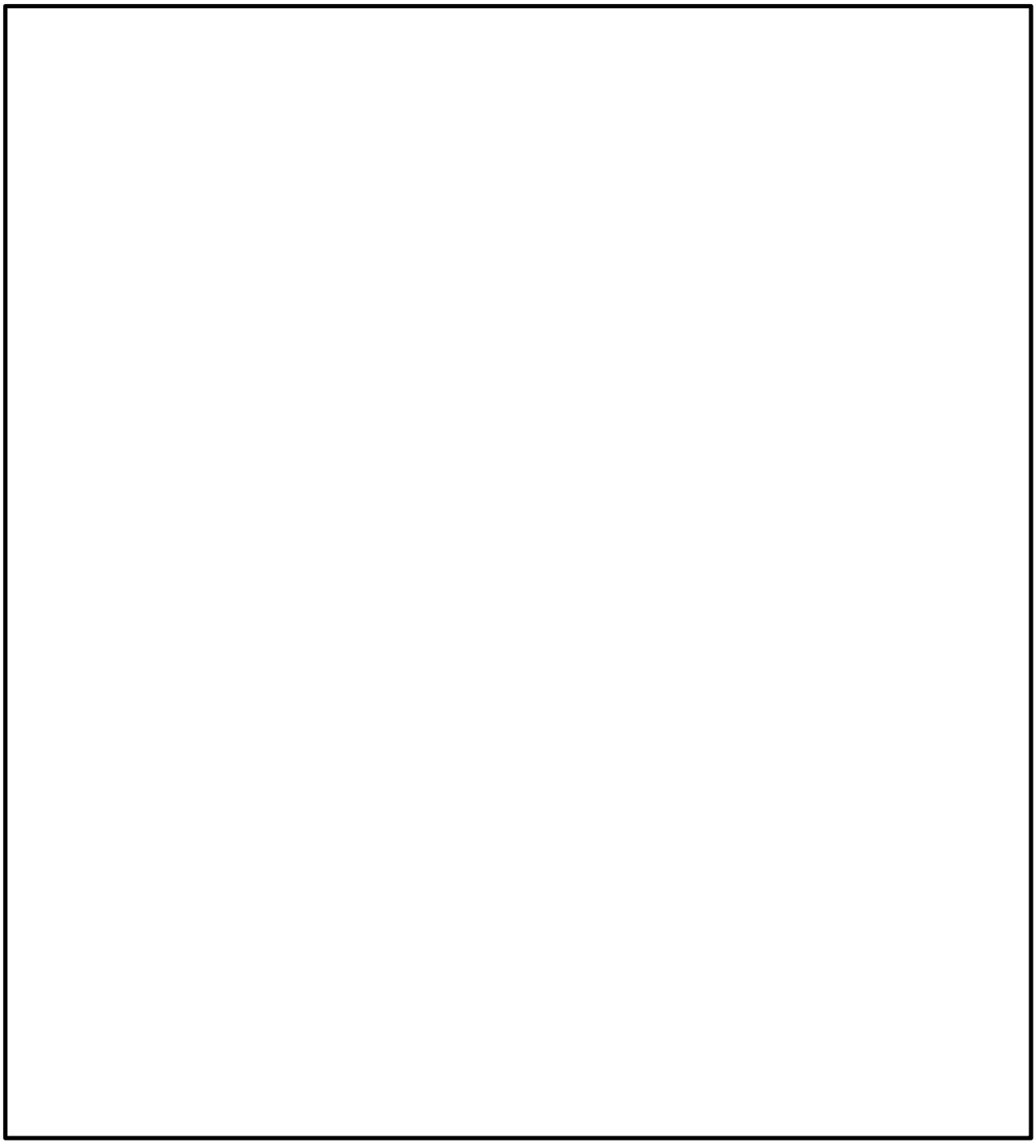
TIMING CHART



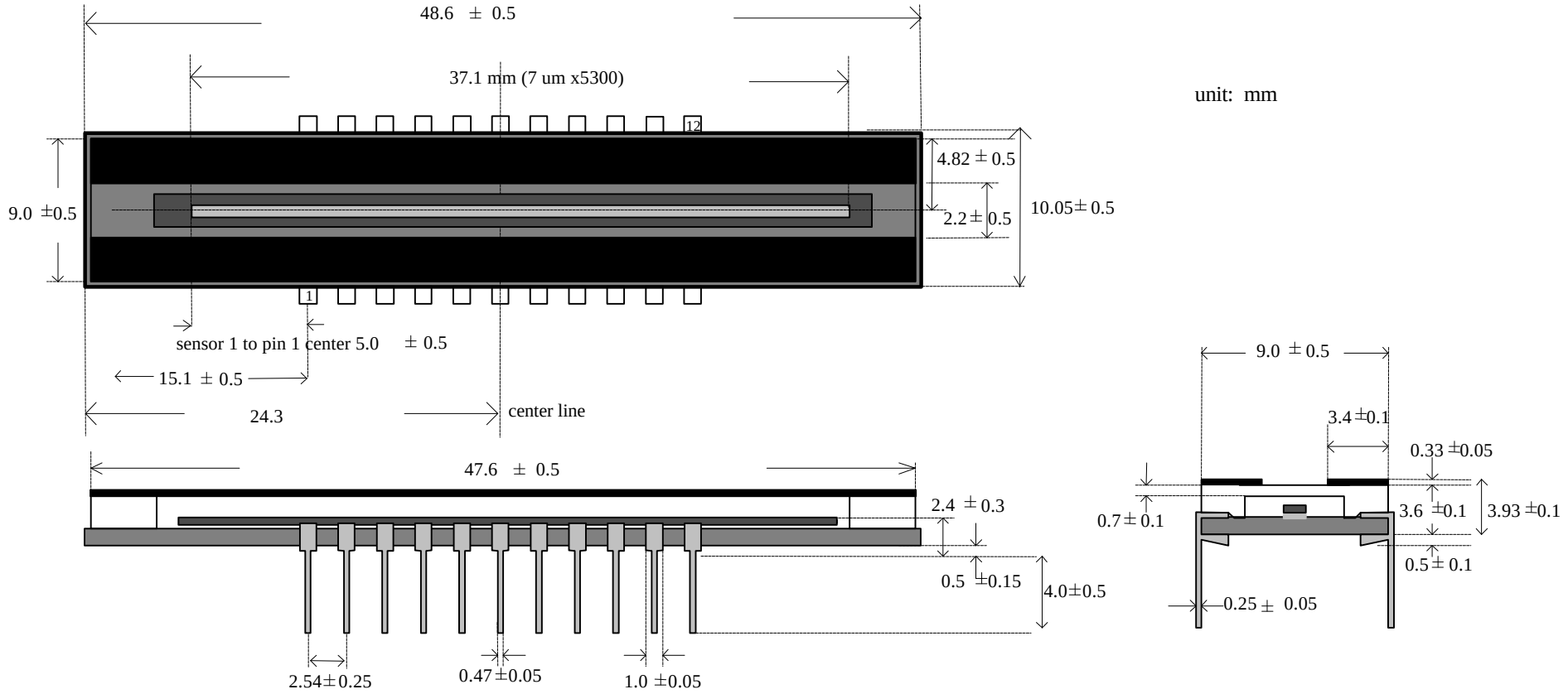
Spectral sensitivity characteristic



APPLICATION CIRCUIT



PACKAGE OUTLINE



package structure

package material	**plastic**
lead material	**alloy**
glass refractive index	**1.51**