

Digital color sensor

S9706

12-bit digital output

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)



S9706 is a digital color sensor sensitive to red ($\lambda=615$ nm), green ($\lambda=540$ nm) and blue ($\lambda=465$ nm) regions of the spectrum. Detected signals are serially output as 12-bit digital data. Built-in three 12-bit registers allow simultaneous measurement of RGB three colors. Sensitivity level is adjustable in two steps to cover a wide photometric range.

Features

- 12-bit serial output
- Low voltage (3.3 V) operation
- Simultaneous measurement of RGB three colors
- 2-step sensitivity switching (sensitivity ratio of 1:9)
- CMOS monolithic photo IC
- No external components required

Applications

- Display color adjustment
- Various applications involving color detection

Absolute maximum ratings ($T_a=25^\circ\text{C}$)

Parameter	Symbol	Value	Unit
Supply voltage	Vdd	-0.3 to 6	V
Load current	I _o	± 10	mA
Power dissipation	P	100	mW
Operating temperature	T _{opr}	-20 to +85	°C
Storage temperature	T _{stg}	-40 to +85	°C

Electrical and optical characteristics

($T_a=25^\circ\text{C}$, Vdd=5 V, T_g=100 ms, A light source, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Active area size	-	All elements (9 × 9 elements)	-	1.2 × 1.2	-	mm
Effective active area	-	Per 1 color, High range	-	0.32	-	mm ²
Spectral response range	λ	Blue	-	400 to 540	-	nm
		Green	-	480 to 600	-	
		Red	-	590 to 720	-	
Peak sensitivity wavelength	λ_p	Blue	-	465	-	nm
		Green	-	540	-	
		Red	-	615	-	
Supply voltage	Vdd		3.0	-	5.5	V
Current consumption	I _{dd}	Dark state, no load	-	5	10	mA
Photo sensitivity	S _{bl}	Blue, Low range	0.15	0.21	0.27	LSB/lx
	S _{gl}	Green, Low range	0.32	0.45	0.59	
	S _{rl}	Red, Low range	0.45	0.64	0.83	
	S _{bh}	Blue, High range	1.3	1.9	2.5	
	S _{gh}	Green, High range	2.8	4.1	5.4	
	S _{rh}	Red, High range	4.0	5.8	7.6	
Incident light power (Conversion value in A light source)	I _{bl}	Blue, Low range	-	-	240	kIx
	I _{gl}	Green, Low range	-	-	110	
	I _{rl}	Red, Low range	-	-	78	
	I _{bh}	Blue, High range	-	-	26	
	I _{gh}	Green, High range	-	-	12	
	I _{rh}	Red, High range	-	-	8.6	
Dark output	Dark	T _g =0.5 s	-	-	1	LSB
Input high level	V _{ih}		4.1	5	-	V
Input low level	V _{il}		-	0	0.9	V
Integration time	T _g	Refer to "Output vs. illuminance"				-
Hold time	t ₁		4	-	-	μs
	t ₂		3	-	-	μs
	t ₃		3	-	-	μs
	t ₄		2000	-	-	μs
	t ₅		3	-	-	μs
Readout clock period	t _{ck}		500	-	-	ns
Readout pulse width (positive)	t _w		200	-	-	ns
Readout pulse width (negative)	t _{ck-tw}		200	-	-	ns

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Sensitivity setting

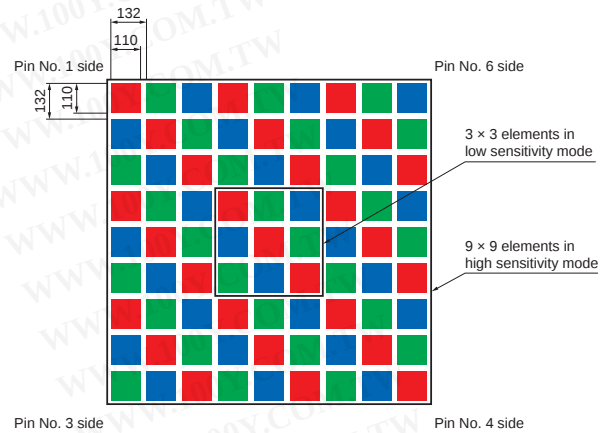
Range	Mode	Effective active area *
High	High sensitivity	9 × 9 elements
Low	Low sensitivity	3 × 3 elements

* The active area of S9706 consists of 9 × 9 elements in a mosaic pattern. The effective active area changes depending on which sensitivity mode is used, "high" or "low", as explained below.

- High sensitivity mode: 9 × 9 elements
- Low sensitivity mode: 3 × 3 elements in center

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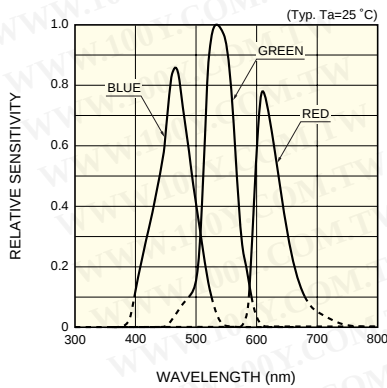
Details of active area (unit: μm)



Note: Spacing between elements is light-shielded.

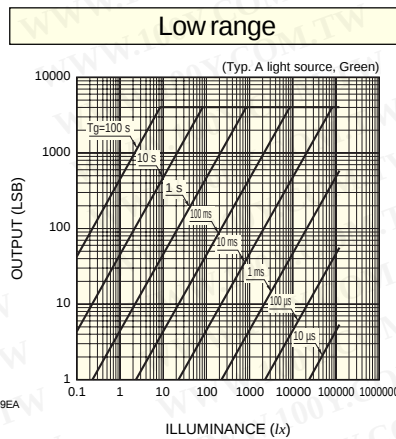
KPIC00124EB

Spectral response



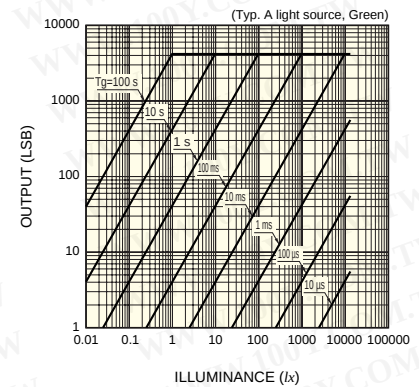
KPICB0089EA

Output vs. illuminance



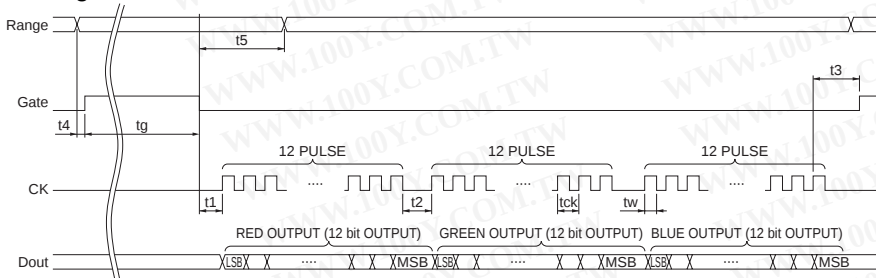
KPICB0099EA

High range



KPICB0100EA

Timing chart



Operating sequence

- 1) Set the Gate terminal and CK terminal to "Low".
- 2) Select the desired sensitivity with the Range terminal.
- 3) Set the Gate terminal from "Low" to "High", to start integrating the light intensity.
- 4) After the desired integration time (tg) has passed, set the Gate terminal from "High" to "Low" to end the light intensity integration.
- 5) Measurement data is output from the Dout terminal by inputting 36 CK pulses to the CK terminal.

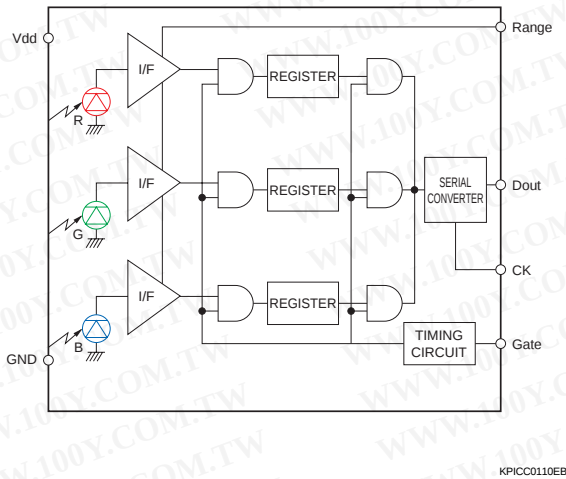
Note 1: A total of 36 CK pulses are required to read out 3-color measurement data. Red data is output by the first 12 pulses, green data by the next 12 pulses, and blue data by the last 12 pulses. Measurement data is output from the LSB side.

Note 2: Measurement data changes at the CK pulse rising edge.

Note 3: Do not switch the Range terminal during integration time (tg).

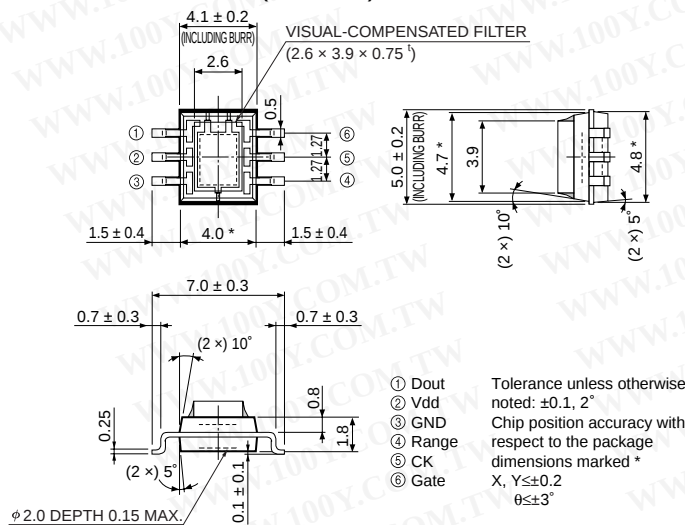
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■ Block diagram



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■ Dimensional outline (unit: mm)



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