



CPS289AT

RGB COLOR SENSOR

(Convert Light to R,G,B Voltage Output)



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Note: This document may be changed without prior notice. Please check the latest document for examination.

1. Description

CPS289AL is a light to voltage converting sensor and combines a photodiode array and three transimpedance amplifiers in a single monolithic IC. With a Red (R), Green (G) and Blue (B) color filters coated over the photodiode array, the sensor converts RGB light to analog voltage outputs, denoted by VROUT, VGOUT and VBOUT, respectively. Also an IR cut-off filter on the chip blocks the transmission of the infrared while passing the visible. The sensor packaged in a 3.5x3.0x0.7 [mm] surface mount COB-12 package is ideal for various small optical units.

2. Features

- 3 Channel RGB Color Sensor
- Converts Light Intensity to Voltage
- Single-Voltage Supply Operation (4.5 V to 5.5 V)
- 12 × 12 array of photodiodes (photosensitive area:1.39mm×1.39mm)
- Independent gain selection for each R,G,B channel (6-step gain adjustment)
- Compact and thin COB package (3.5mm ×3.0mm ×0.7mm, COB-12PIN)
- Solder re-flow permitted
- Halogen free permitted

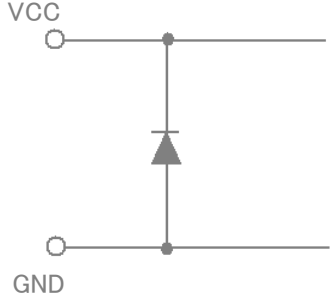
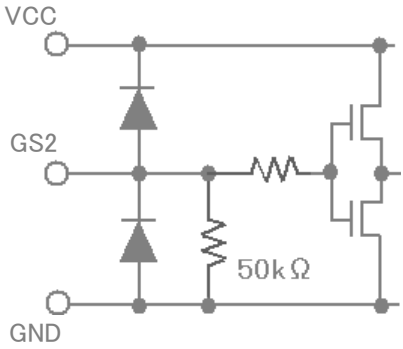
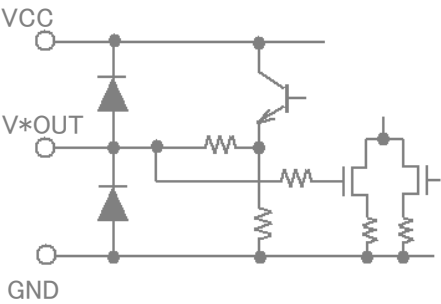
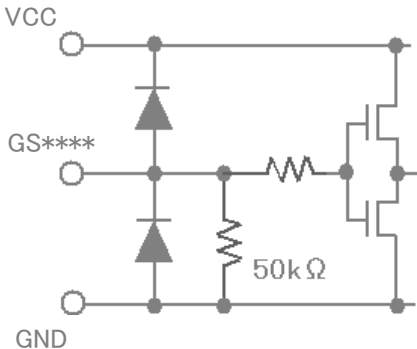
3. Maximum Ratings

| Item | Symbol | MIN | TYP | MAX | Unit |
|---------------------|--------|-----|-----|-----|------|
| Supply Voltage | VCC | - | - | 6 | V |
| Storage Temperature | Tstg | -40 | - | 85 | °C |

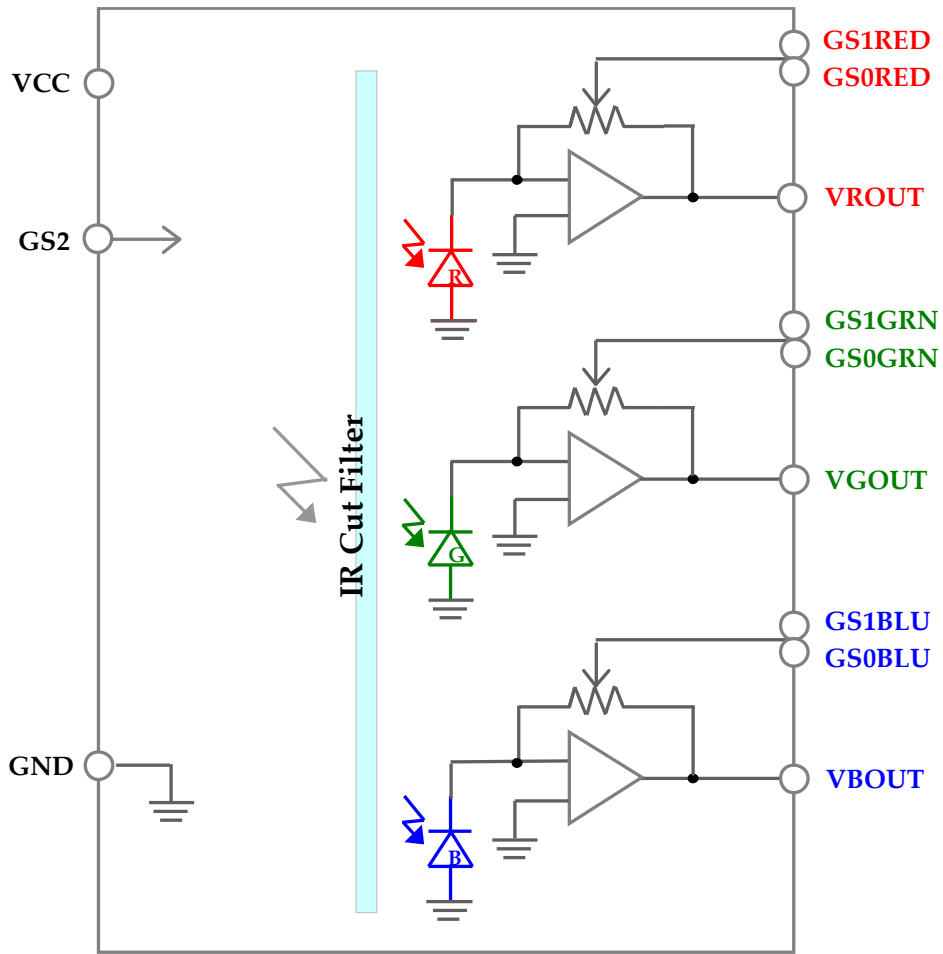
4. Recommended Operating Condition

| Item | Symbol | MIN | TYP | MAX | Unit |
|-----------------------|--------|---------|-----|---------|------|
| Supply Voltage | VCC | 4.5 | 5.0 | 5.5 | V |
| Operation Temperature | Topr | -30 | - | 85 | °C |
| Input Voltage (High) | | 0.8×VCC | - | VCC | V |
| Input Voltage (Low) | | GND | - | 0.2×VCC | V |

5. Pin Descriptions

| PinNumber | Terminal Sign | Terminal Function | Terminal Function |
|-----------|---------------|--------------------|--|
| 1 | VCC | Power Supply |  |
| 2 | GND | Ground | |
| 3 | GS2 | Gain Select2 |  |
| 4 | VROUT | OUTPUT for RED |  |
| 5 | VGOUT | OUTPUT for GREEN | |
| 6 | VBOUT | OUTPUT for BLUE | |
| 7 | GS0BLU | Gain Select0 BLUE |  |
| 8 | GS1BLU | Gain Select1 BLUE | |
| 9 | GS0GRN | Gain Select0 GREEN | |
| 10 | GS1GRN | Gain Select1 GREEN | |
| 11 | GS0RED | Gain Select0 RED | |
| 12 | GS1RED | Gain Select1 RED | |

6. Block Diagram



7. Gain Selection Feedback Resistor Table

| Mode | GS2 | GS1*** | GS0*** | Feedback resistor | Unit |
|------|-----|--------|--------|-------------------|------|
| HHH | H | H | H | 9.600 | MΩ |
| HHL | H | H | L | 4.800 | |
| HLH | H | L | H | 2.400 | |
| HLL | H | L | L | 1.200 | |
| LHH | L | H | H | 2.400 | |
| LHL | L | H | L | 1.200 | |
| LLH | L | L | H | 0.600 | |
| LLL | L | L | L | 0.300 | |

8. Electrical and Optical Characteristics

(Operating Conditions : VCC=5.0V Ta=25°C)

| Item | Symbol | Terminal Sign | Condition | λ [nm] | MIN | TYP | MAX | Unit |
|--|--------|---------------|-----------|----------------|------|-------|-------|-------------------------|
| Supply Current | ICC | | LLL | – | 1.5 | 2.0 | 2.5 | mA |
| Dark Voltage | Voff | V※OUT | LLL | – | 10 | 25 | 40 | mV |
| Irradiance Responsivity *(1)*(2) | ReG1 | VBOUT | LLL | 460 | -30% | 0.31 | 30% | V/(mW/cm ²) |
| | | VGOUT | | 540 | -30% | 0.39 | 30% | |
| | | VROUT | | 630 | -30% | 0.61 | 30% | |
| | ReG2 | VBOUT | LLH | 460 | -30% | 0.62 | 30% | |
| | | VGOUT | | 540 | -30% | 0.79 | 30% | |
| | | VROUT | | 630 | -30% | 1.21 | 30% | |
| | ReG3 | VBOUT | HLL , LHL | 460 | -30% | 1.23 | 30% | |
| | | VGOUT | | 540 | -30% | 1.57 | 30% | |
| | | VROUT | | 630 | -30% | 2.43 | 30% | |
| | ReG4 | VBOUT | HLH , LHH | 460 | -30% | 2.46 | 30% | |
| | | VGOUT | | 540 | -30% | 3.15 | 30% | |
| | | VROUT | | 630 | -30% | 4.86 | 30% | |
| | ReG5 | VBOUT | HHL | 460 | -30% | 4.92 | 30% | |
| | | VGOUT | | 540 | -30% | 6.29 | 30% | |
| | | VROUT | | 630 | -30% | 9.71 | 30% | |
| | ReG6 | VBOUT | HHH | 460 | -30% | 9.84 | 30% | |
| | | VGOUT | | 540 | -30% | 12.58 | 30% | |
| | | VROUT | | 630 | -30% | 19.43 | 30% | |
| Maximum Output Voltage Swing*(3) | Vomax | V※OUT | – | – | 2.9 | 3.1 | – | V |
| Gain Ratio | GRG1 | V※OUT | ReG6/ReG1 | – | 30.4 | 32.0 | 33.6 | |
| | GRG2 | | ReG6/ReG2 | | 15.2 | 16.0 | 16.8 | |
| | GRG3 | | ReG6/ReG3 | | 7.6 | 8.0 | 8.4 | |
| | GRG4 | | ReG6/ReG4 | | 3.8 | 4.0 | 4.2 | |
| | GRG5 | | ReG6/ReG5 | | 1.9 | 2.0 | 2.1 | |
| Input Current | IIH | GS※※ | VOH=5V | – | – | 100 | 130 | μ A |
| | IIL | | VOL=0V | | -1 | 0 | 1 | |
| Pulse Response Rise Time *(3) | TrG1 | V※OUT | LLL | – | – | 1.35 | 2.00 | μ s |
| | TrG6 | | HHH | | – | 9.20 | 13.80 | |
| Pulse Response Fall Time *(3) | TfG1 | | LLL | | – | 1.35 | 2.00 | |
| | TfG6 | | HHH | | – | 9.20 | 13.80 | |
| Noise characteristic *(3)*(4) | Vnoise | V※OUT | HHH | – | – | – | 2.5 | μ V/ \sqrt Hz |

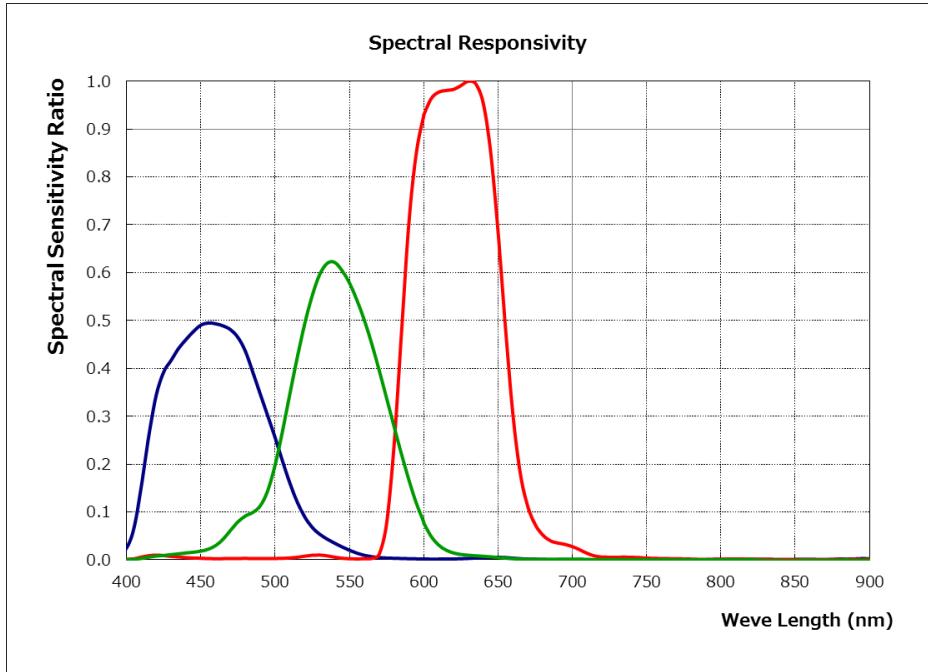
*(1) White LED is used as light source in shipping inspection.

*(2) The irradiance responsivities are the values for the areas of each R/G/B.

*(3) Design guaranteed item

*(4) Measured value at f=80kHz in dark condition.

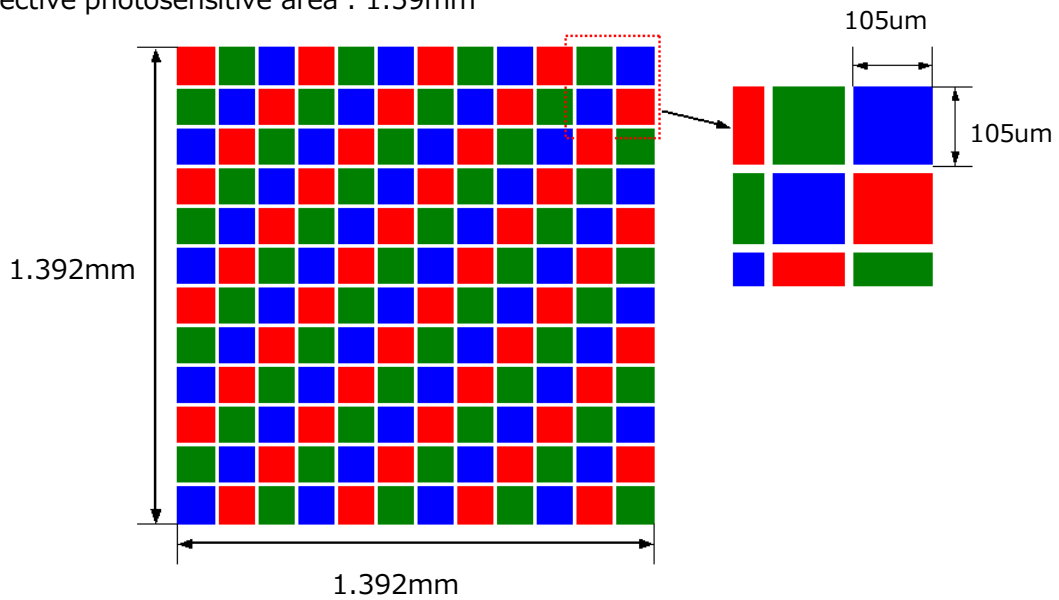
9. Photodiode Spectral Responsivity (RGB : Reference Data)



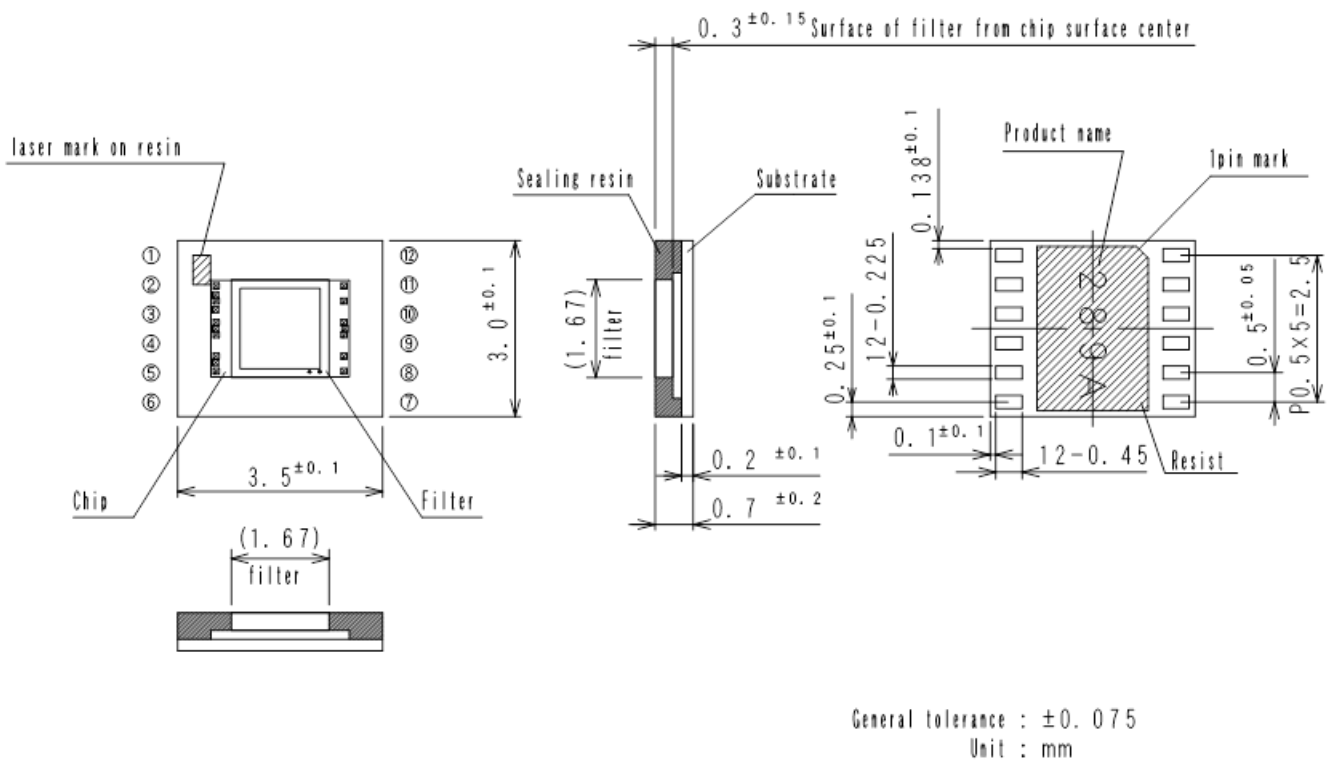
10. Details of Photosensitive Area

Photosensitive area : 1.392mm × 1.392mm

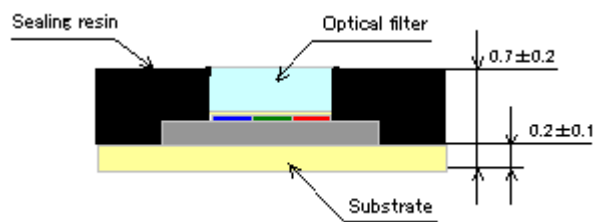
Effective photosensitive area : 1.59mm²



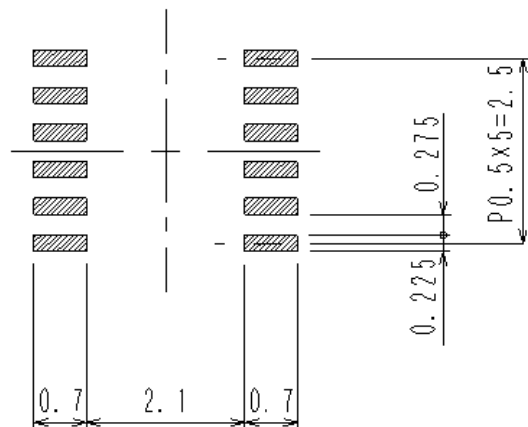
11. Package Dimensions



Cross Section Image



12. Recommended Land Pattern



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