Ambient Light Sensor – Surface Mount
EAALSDIC2012A3

Features
• Close responsively to the human eye spectrum
• Light to Current, analog output
• Good output linearity across wide illumination range
• Low sensitivity variation across various light sources
• Operating temperature performance, -40°C to 85°C
• Wide supply voltage range, 1.8V to 5.5V
• Size : 1.6mm(L)*1.6mm(W)*0.55mm(H)
• RoHS compliant, Pb Free and halogen free package
• Compliance with EU REACH.

Description
The EAALSDIC2012A3 is consisting of a photodiode and a current amplification IC. Everlight Americas ALS series product is a good effective solution to the power saving of display backlighting of mobile appliances, such as the mobile phones, NB and PDAs. Due to the high rejection ratio of infrared radiation, the spectral response of the ambient light sensor is close to that of human eyes.

Applications
• Detection of ambient light to control display backlighting
  Mobile devices – mobile phones, PDAs
    Computing device – TFT LCD monitor for Notebook computer
    Consumer device – TFT LCD TV, plasma TV, video camera, digital camera, toys

• Automatic residential and commercial management
• Automatic contrast enhancement for electronic signboard
• Ambient light monitoring device for daylight and artificial light
  – Street light, CCD/CCTV
Package Dimensions

Top View

Side View

Bottom View

Recommended Soldering Pattern

Note: Tolerances unless mentioned ±0.2mm. Unit = mm
Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td>$-0.5 \sim 6.0$</td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>$V_O$</td>
<td>$0 \sim V_{CC} - 0.8$</td>
<td>V</td>
</tr>
<tr>
<td>Output Photo Current</td>
<td>$I_{PH}$</td>
<td>$0 \sim 5$</td>
<td>mA</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>$T_{opr}$</td>
<td>$-40 \sim +85$</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_{stg}$</td>
<td>$-40 \sim +100$</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering Temperature Range [Note1]</td>
<td>$T_{sol}$</td>
<td>$260$</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note1: For detail reflow time and the recommended temperature profile, please refer to page 8.

Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>$T_{opr}$</td>
<td>$-40$</td>
<td>$+85$</td>
<td>°C</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td>$1.8$</td>
<td>$5.5$</td>
<td>V</td>
</tr>
</tbody>
</table>
**Electro-Optical Characteristics (Ta=25°C)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current</td>
<td>$I_{CC}$</td>
<td>-----</td>
<td>480</td>
<td>950</td>
<td>μA</td>
<td>$V_{CC}=3V$, $E_{V}=1000$Lux</td>
</tr>
<tr>
<td>Dark Current</td>
<td>$I_D$</td>
<td>-----</td>
<td>-----</td>
<td>100</td>
<td>nA</td>
<td>$V_{CC}=3V$, $E_{V}=0$Lux</td>
</tr>
<tr>
<td>Light Current</td>
<td>$I_{PH1}$</td>
<td>2.7</td>
<td>4</td>
<td>5.4</td>
<td>μA</td>
<td>$V_{CC}=3V$, $E_{V}=10$Lux, [Note1]</td>
</tr>
<tr>
<td></td>
<td>$I_{PH2}$</td>
<td>27</td>
<td>40</td>
<td>54</td>
<td>μA</td>
<td>$V_{CC}=3V$, $E_{V}=100$Lux, [Note1]</td>
</tr>
<tr>
<td></td>
<td>$I_{PH3}$</td>
<td>-----</td>
<td>48</td>
<td>92</td>
<td>μA</td>
<td>$V_{CC}=3V$, $E_{V}=100$Lux, [Note2]</td>
</tr>
<tr>
<td></td>
<td>$I_{PH4}$</td>
<td>-----</td>
<td>400</td>
<td>540</td>
<td>μA</td>
<td>$V_{CC}=3V$, $E_{V}=1000$Lux, [Note1]</td>
</tr>
<tr>
<td>Photocurrent Ratio</td>
<td>$I_{PH3}/I_{PH2}$</td>
<td>-----</td>
<td>1.2</td>
<td>1.7</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Saturation Output Voltage</td>
<td>$V_O$</td>
<td>2.20</td>
<td>2.35</td>
<td>-----</td>
<td>V</td>
<td>$V_{CC}=3V$, $E_{V}=100$Lux, $R_L=150KΩ$, [Fig.3]</td>
</tr>
<tr>
<td>Peak Sensitivity Wavelength</td>
<td>$\lambda_P$</td>
<td>-----</td>
<td>550</td>
<td>-----</td>
<td>nm</td>
<td>-----</td>
</tr>
<tr>
<td>Switching Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rise Time</td>
<td>$t_r$</td>
<td>-----</td>
<td>11</td>
<td>1000</td>
<td>μs</td>
<td>$V_{CC}=3V$, $E_{V}=1000$Lux, $R_L=5KΩ$, [Fig.4]</td>
</tr>
<tr>
<td>Fall Time</td>
<td>$t_f$</td>
<td>-----</td>
<td>400</td>
<td>2000</td>
<td>μs</td>
<td></td>
</tr>
<tr>
<td>Delay Time</td>
<td>$t_d$</td>
<td>-----</td>
<td>250</td>
<td>-----</td>
<td>μs</td>
<td></td>
</tr>
<tr>
<td>Storage Time</td>
<td>$t_s$</td>
<td>-----</td>
<td>35</td>
<td>-----</td>
<td>μs</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. White Fluorescent light (Color Temperature = 6500K) is used as light source. However, White LED is substituted in mass production.
2. Illuminance by CIE standard illuminant-A / 2856K, incandescent lamp.
Fig. 1  Block Diagram

Fig. 2  Measurement Method of Light Current

Fig. 3  Measurement Method of Saturation Output Voltage

Fig. 4  Switching Time Measurement Method
Typical Electro-Optical Characteristics Curves

**Fig 5. Light Output vs. Illuminance**

![Light Output vs. Illuminance](Typ.)

- Fluorescent light
- Incandescent lamp

**Fig 6. Dark Current vs. Temperature**

![Dark Current vs. Temperature](Typ.)

\[ V_{CE} = 3V \]
\[ E_{IL} = 100 \text{ Lux} \]

**Fig 7. Light current vs. Temperature**

![Light current vs. Temperature](Typ.)

\[ V_{CC} = 3V \]
\[ T_a = 25°C \]

**Fig 8. Light current vs. Supply Voltage**

![Light current vs. Supply Voltage](Typ.)

**Fig 9. Spectral Response**

![Spectral Response](Typ.)

- EAALSDIC2012A3
- Human Eye

**Fig 10. Output Voltage vs. Illuminance**

![Output Voltage vs. Illuminance](Typ.)

\[ V_{CC} = 3V \]
\[ T_a = 25°C \]
Converting Photocurrent to Voltage

Note:
1. The output voltage (Vout) is the product of photocurrent (IPH) and loading resistor (RL)
2. A right loading resistor shall be chosen to meet the requirement of maximum ambient light, and output saturation voltage:

\[ V_{\text{out}}(\text{max.}) = I_{\text{out}}(\text{max.}) \times R_L \leq V_{\text{out}}(\text{saturation}) = V_{\text{cc}} - 0.8V \]

3. To avoid 60Hz ripple from fluorescent lamps, we suggest that the time constant must be greater than 0.5 second:

\[ R_L \times C_L \geq 0.5 \] (empirical data)
Recommended method of storage

1. Do not open moisture proof bag before devices are ready to use.

2. Shelf life in sealed bag from the bag seal date:
   18 months at 10°C~30°C and ≤ 60% RH.

3. After opening the package, the devices must be stored at 10°C~30°C and ≦ 60%RH, and used within 1 year (floor life).

4. If the moisture absorbent material (desiccant material) has faded or unopened bag has exceeded the shelf life or devices (out of bag) have exceeded the floor life, baking treatment is required.

5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure or recommend the following conditions:
   - 192 hours at 40°C ±5/−0°C and < 5 % RH (reeled/tubed/loose units) or
   - 96 hours at 60°C ±5°C and < 5 % RH (reeled/tubed/loose units) or
   - 24 hours at 125°C ±5°C, not suitable for reel or tubes.

Recommended Solder Profile

Notice:
(1) Reflow soldering should not be done more than two times.
(2) When soldering, do not put stress on the devices during heating.
(3) After soldering, do not warp the circuit board.
Soldering Iron

Each terminal is to go to the tip of soldering iron temperature less than 350°C for 3 seconds within once in less than the soldering iron capacity 25W. Leave two seconds and more intervals, and do soldering of each terminal. Be careful because the damage of the product is often started at the time of the hand solder.

Repairing

Repair should not be done after the device have been soldered. When repairing is unavoidable, a double-head soldering iron should be used (as below figure). It should be confirmed beforehand whether the characteristics of the device will or will not be damaged by repairing.
Package Quantity Specification

4000 PCS/ 1 Reel

Label Format

- CPN: Customer’s Product Number
- P/N: Product Number
- QTY: Packing Quantity
- CAT: Luminous Intensity Rank
- HUE: Dom. Wavelength Rank
- REF: Forward Voltage Rank
- LOT No: Lot Number
- MADE IN TAIWAN: Production Place

Reel Dimensions

Note: Tolerances unless mentioned ±0.1mm. Unit = mm
Tape Dimensions

Progressive direction

Unit: mm

Tolerance: ±0.05

Unit: mm

Tolerance: ±0.1mm

Unit: mm

Tolerance: ±0.02

Unit: mm

Tolerance: ±0.1mm

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