

# ML8511

## UV Sensor with Voltage Output

### GENERAL DISCRIPTION

The ML8511 is a UV sensor, which is suitable for acquiring UV intensity indoors or outdoors. The ML8511 is equipped with an internal amplifier, which converts photo-current to voltage depending on the UV intensity. This unique feature offers an easy interface to external circuits such as ADC. In the power down mode, typical standby current is 0.1 $\mu$ A, thus enabling a longer battery life.

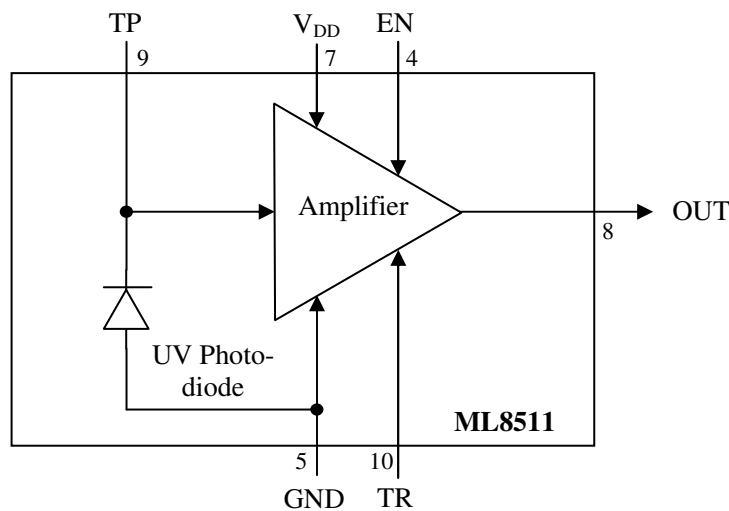
### FEATURES

- Photodiode sensitive to UV-A and UV-B
- Embedded operational amplifier
- Analog voltage output
- Low supply current (300 $\mu$ A typ.) and low standby current (0.1 $\mu$ A typ.)
- Small and thin surface mount package (4.0mm x 3.7mm x 0.73mm, 12-pin ceramic QFN)

### APPLICATIONS

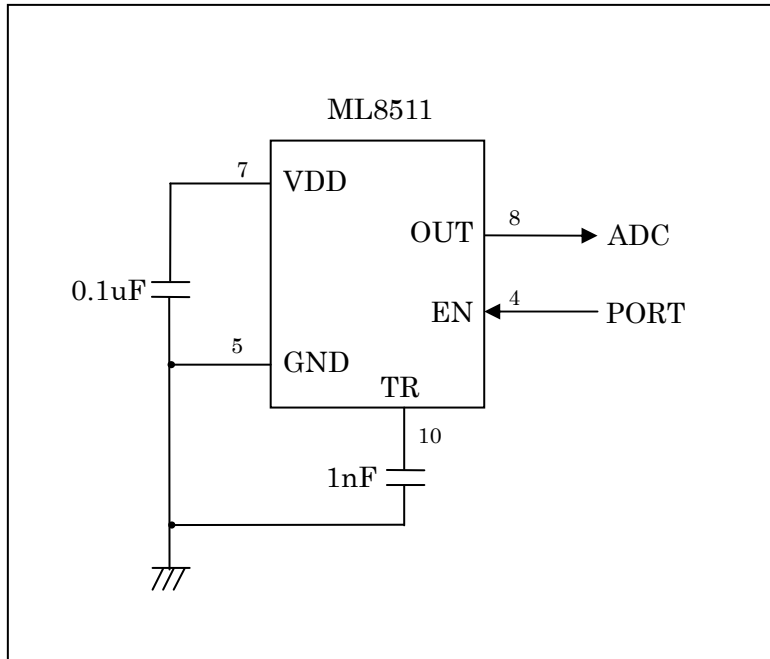
- Smart phone, Watch, Weather station, Bicycle navigation, Accessory, Gaming

### BLOCK DAIAGRAM



### PIN CONFIGURATIONS

| Pin            | Symbol | I/O | Function   |
|----------------|--------|-----|--|
| 7              | VDD    | PW  | Supply voltage. Decouple this pin to ground with 0.1 $\mu$ F capacitor.      |
| 5              | GND    | PW  | Ground   |
| 4              | EN     | I   | Active high enable pin. (High: Active mode, Low: Standby mode)               |
| 8              | OUT    | O   | Output (Low in power down or standby mode)                                   |
| 9              | TP     | I/O | Test pin. Do not connect.  |
| 10             | TR     | I/O | Internal reference voltage. Decouple this pin to ground with 1 nF capacitor. |
| 1,2,3, 6,11,12 | NC     | -   | No Connection. Do not connect.   |

**EXAMPLE OF CONNCTING DIAGRAM**

\* Load resistance of OUT port is recommended more than 100 k $\Omega$ .

**ABSOLUTE MAXIMUM RATINGS**

| Parameter            | Symbol    | Condition | Rating       | unit |
|----------------------|-----------|-----------|--------------|------|
| Supply Voltage       | $V_{DD}$  | Ta=25 °C  | -0.3 to +4.6 | V    |
| Input Voltage        | $V_I$     | Ta=25 °C  | -0.3 to +4.6 | V    |
| Output Short Current | $I_{OS}$  | Ta=25 °C  | 5            | mA   |
| Power Dissipation    | $P_D$     | Ta=25 °C  | 30           | mW   |
| Storage Temperature  | $T_{stg}$ | -         | -30 to +85   | °C   |

**RECOMENDED OPERATION CONDITIONS**

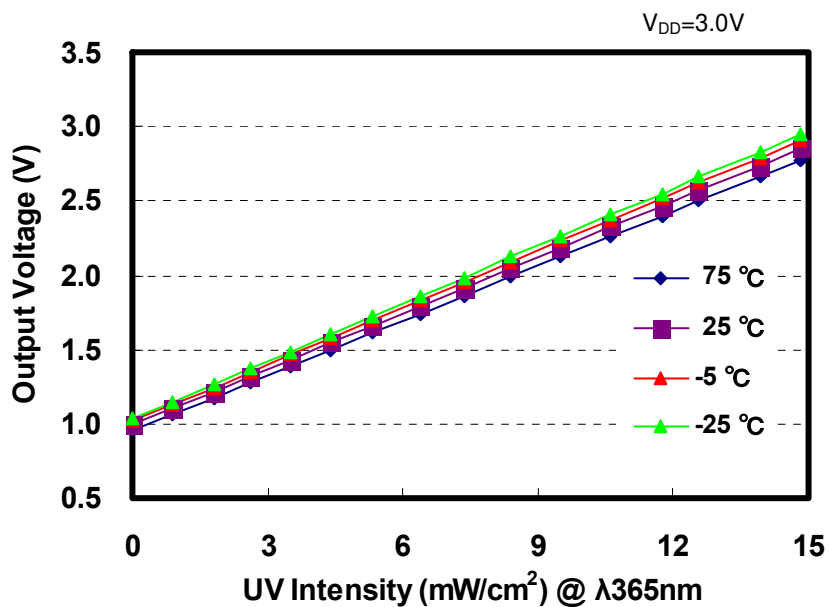
| Parameter             | Symbol   | Min. | Typ. | Max. | unit |
|-----------------------|----------|------|------|------|------|
| Operating Voltage     | $V_{DD}$ | 2.7  | 3.3  | 3.6  | V    |
| Operating Temperature | Ta       | -20  | -    | 70   | °C   |

**ELECTRO-OPTICAL CHARACTERISTICS**(V<sub>DD</sub>=+2.7V to +3.6V, Ta= -20°C to +70°C)

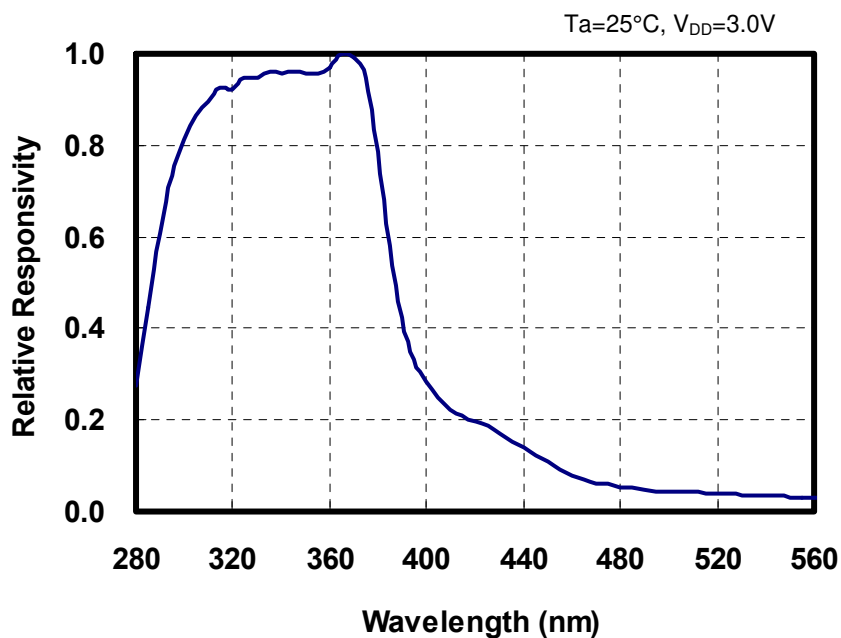
| Parameter   | Symbol      | Condition                   | Min.                | Typ. | Max.           | unit |
|---|-------------|-----------------------------|---------------------|------|----------------|------|
| Supply Current (active mode)                            | $I_{DDA}$   | $V_{EN}=V_{DD}$             | -                   | 300  | 500            | μA   |
| Supply Current (standby mode)                           | $I_{DDs}$   | $V_{EN}=0$                  | -                   | 0.1  | 1              | μA   |
| Input Voltage (High level)                              | $V_{IH}$    | -                           | $V_{DD} \times 0.8$ | -    | $V_{DD} + 0.3$ | V    |
| Input Voltage (Low level)                               | $V_{IL}$    | -                           | -0.2                | -    | 0.72           | V    |
| High level input current                                | $I_{IH}$    | $V_{EN}=V_{DD}$             | -                   | -    | 1              | μA   |
| Low level input current                                 | $I_{IL}$    | $V_{EN}=0$                  | -1                  | -    | -              | μA   |
| Wavelength of maximum sensitivity                       | $\lambda_p$ | Ta=25°C                     | -                   | 365  | -              | nm   |
| Output Setup Time                                       | $T_{SU}$    | $V_{EN}=V_{DD}$             | -                   | -    | 1              | ms   |
| Output Voltage (Shading) *                              | $V_{REF}$   | Ta=25°C,<br>$V_{EN}=V_{DD}$ | 0.95                | 1.0  | 1.05           | V    |
| Output Voltage (10mW/cm <sup>2</sup> at $\lambda_p$ ) * | $V_O$       | Ta=25°C,<br>$V_{EN}=V_{DD}$ | 2.08                | 2.2  | 2.32           | V    |

\* Load resistance of OUT port is recommended more than 100 kΩ.

**OUTPUT VOLTAGE- UV INTENSITY CHARACTERISTICS**



**SPECTRAL RESPONSIVILITY CHARACTERISTICS**

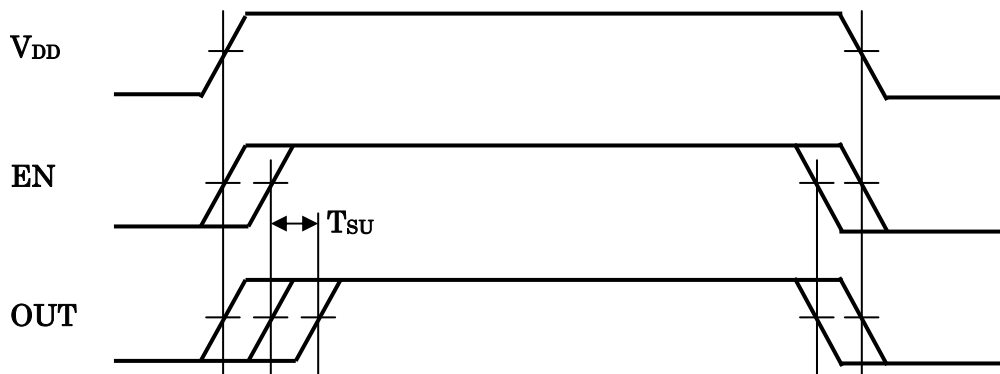


## TIMING CHART

Supply voltage and EN signal state should take one of the following procedures:

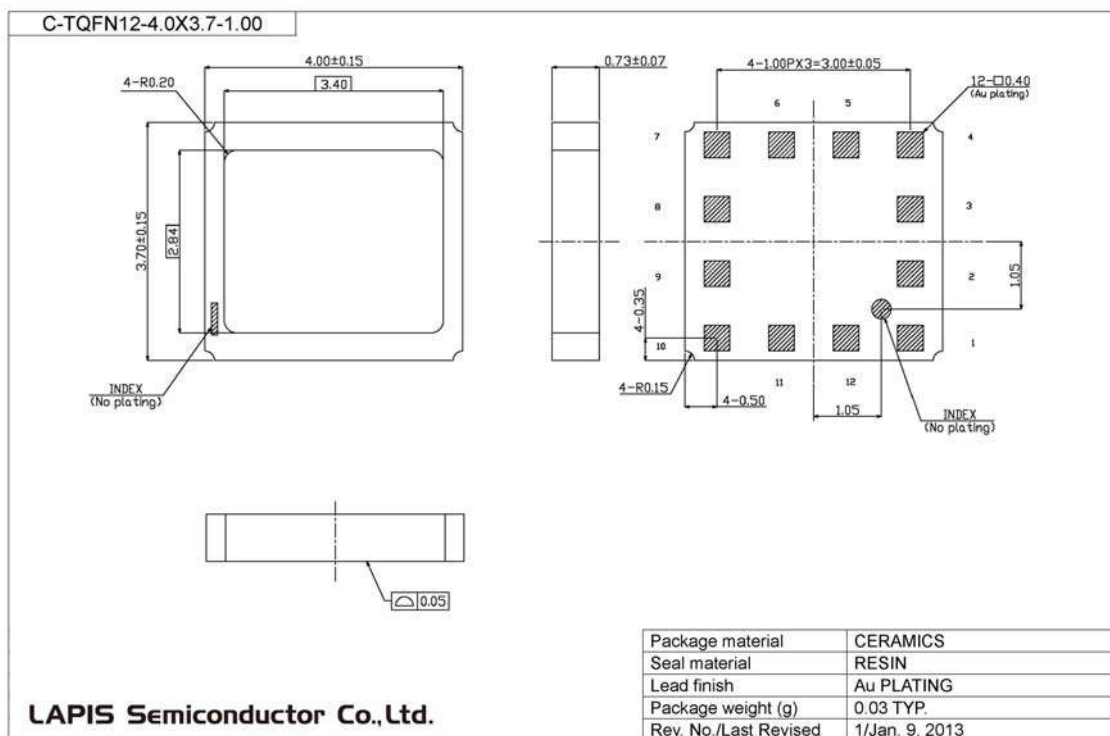
1. EN should be HIGH or LOW at the same time when  $V_{DD}$  is applied.
2. EN should be HIGH or LOW while  $V_{DD}$  is applied.

Output should be read after output voltage level becomes stable. Maximum time required until stable output voltage reaches is 1 millisecond after EN goes HIGH.



**PACKAGE DIMENTIONS**

(Unit: mm)



**Notes for Mounting the Surface Mount Type Package**

The surface mount type packages are very susceptible to heat in reflow mounting and humidity absorbed in storage. Therefore, before you perform reflow mounting, contact our responsible sales person for the product name, package name, pin number, package code and desired mounting conditions (reflow method, temperature and times).

Specifications are defined without considering the UV absorption by an external cover material. Please contact our sales representative when the cover material is applied.

Do not press or rub the surface of the resin covering the top of the package where, which is on the UV-ray is light received. In addition, do not apply pressure at high temperature.

**REVISION HISTORY**

| Document No.    | Date          | Page             |                 | Description  |
|-----------------|---------------|------------------|-----------------|--|
|                 |               | Previous Edition | Current Edition |  |
| FEDL851100FC-01 | Sep. 3, 2008  | -                |                 | Preliminary edition  |
| FEDL8511-02     | Jan. 24, 2008 | -                | 1               | Added disclaimer   |
| FEDL8511-03     | Nov. 7, 2008  | -                | -               | Changed Logo OKI to OKI SEMICONDUCTOR  |
|                 |               | 1                | 5               | The following items has been moved: PACKAGE, NOTICE, PRECAUTION and DISCLAIMER.                                    |
|                 |               | 2                | 1               | The following items have been moved: BLOCK DIAGRAM and PIN CONFIGURATION   |
|                 |               | 3                | 2               | The following tables has been partially modified: RECOMMENDED OPERATING CONDITIONS ELECTRO-OPTICAL CHARACTERISTICS |
|                 |               | 3                | 2               | Changed load resistance 500 kΩ to 100 kΩ   |
|                 |               | -                | 3               | Added graphs   |
|                 |               | -                | 4               | Added "TIMING CHART"   |
| FJDL8511-04     | Jan. 17, 2013 | 1                | 1               | Feature description is removed. Applications section is added.   |
|                 |               | 4                | 4               | Explanation is provided to the timing chart.   |
|                 |               | 5                | 5               | Package drawing is updated. Descriptions in the NOTE are modified. DISCLIMER is removed.                           |
| FJDL8511-05     | Mar. 8, 2013  | 1                | 1               | Descriptions in Pin configurations are modified.   |
|                 |               | -                | 2               | Example of connecting diagram is added.  |

NOTES

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