

# **A Practical Guide for UV sensor Application**

**2005. 05**

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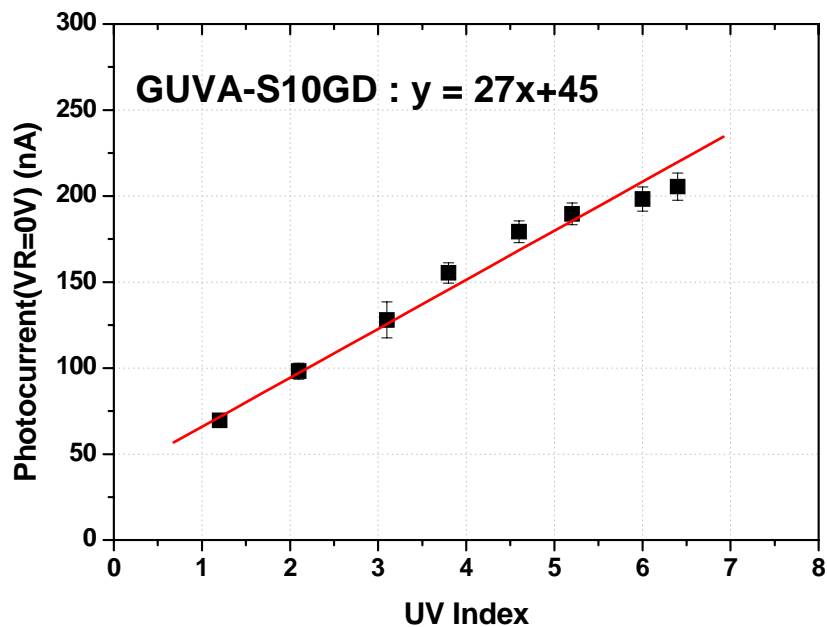
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## 1. Field Test Data for Sunlight UV meter

- ❑ Measurement Date : 2004. 04. 14 ~ 2004. 04. 17
- ❑ UV Source : Sunlight
- ❑ Weather : the clear blue sky
- ❑ Location : Jinchun, Korea (37 degrees[37°] north latitude)
- ❑ Measuring Equipment : Parameter Analyzer (measurement of photo-current)
- ❑ Model No. : GUYA-S10GD (I<sub>ph</sub> variation : < ± 10%)



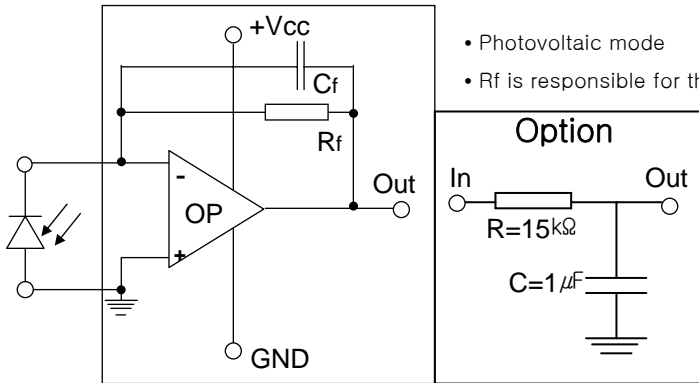
The relationship between UV Index and the photocurrent (I<sub>ph</sub>) is a linear one under the sunlight. Since the solar irradiance in Korea and another country is dissimilar situations, you have to obtain the field test data by regional groups for sunlight UV meter.

\* I<sub>ph</sub> value with UV Index for GUYA-S10GD :  **$I_{ph}(nA) = 27 \times UVI + 45$**

UVI	1.2	2.1	3.1	3.8	4.6	5.2	6.0	6.4
I <sub>ph</sub> (nA)	70	98	128	155	179	190	198	205

## 2. Circuit

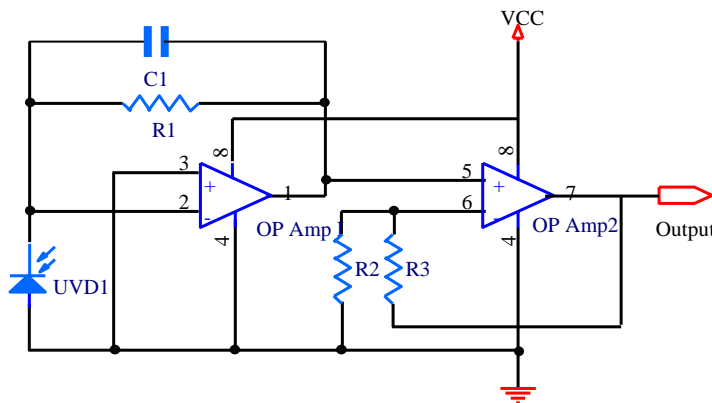
### □ Standard Circuit



- Photovoltaic mode
- Rf is responsible for the gain of the circuit

- Cf compensates the reverse junction capacitance of the photodiode and input capacitance of the OPV. (Typical 0.1 μF)
- Option circuit is helpful for stabilization of output voltage.

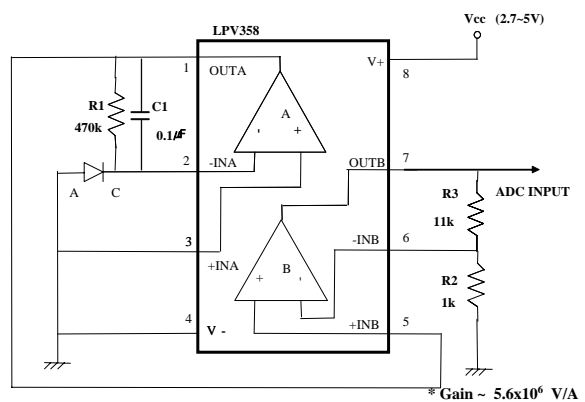
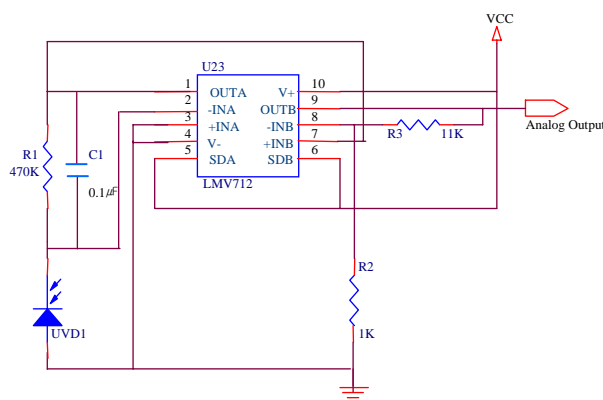
### □ Basic Circuit for Genicom's Demo-kit



< Gain >

- \* OP Amp 1 :  $R1[V/A]$
- \* OP Amp 2 :  $1+R3/R2$
- \* Total Gain :  $R1*(1+R3/R2) [V/A]$
- \*  $I_{ph} = (R2*V)/(R1*(R2+R3)) [A]$

### □ Basic Circuit for common OP Amp. (LMV712, LPV358)



\* Gain ~  $5.6 \times 10^6 V/A$

※ Note : We recommend that you should use the low-noise circuit including suitable capacitors because the basic circuit is used high gains to amplify very low photocurrent.

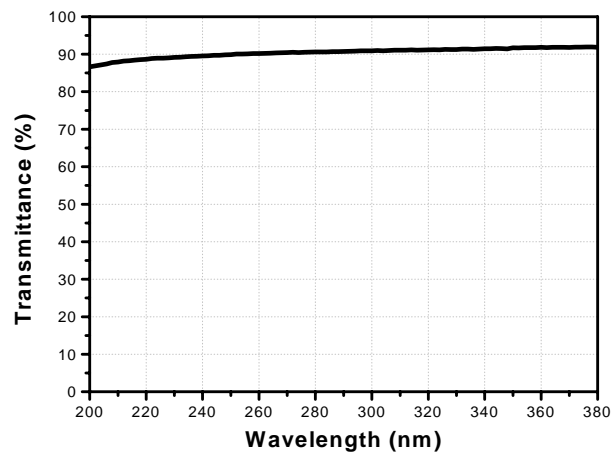
### 3. Cover glass for potable UV meter

- ❑ Material : crystal quartz
- ❑ Thickness : typ. <math>\lt; 0.5\text{mm}</math> ( $\pm 0.02$ )
- ❑ Diameter and Opening size : depend on your design of the potable UV meter
  - The observation angle is reduced by cosine law according to the opening size and the distance from opening widow to device.

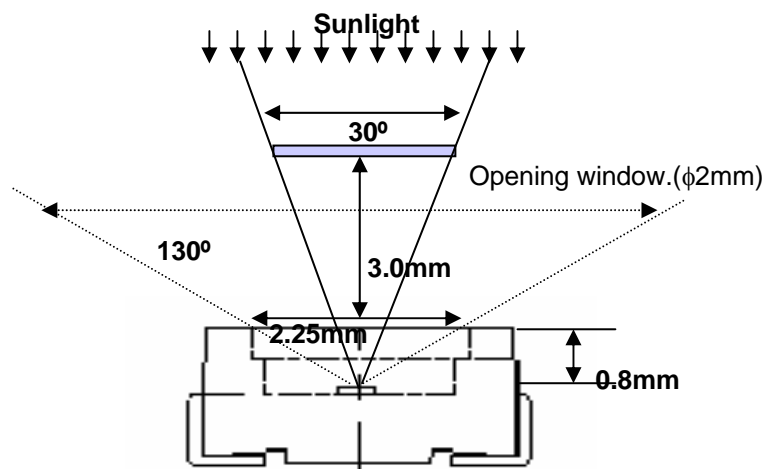
#### < Best conditions >

opening size : > 2.25mm

the distance from opening widow to device (UV detector PKG) : 0.0 mm (The closer the better)



< Transmittance of Crystal Quartz >



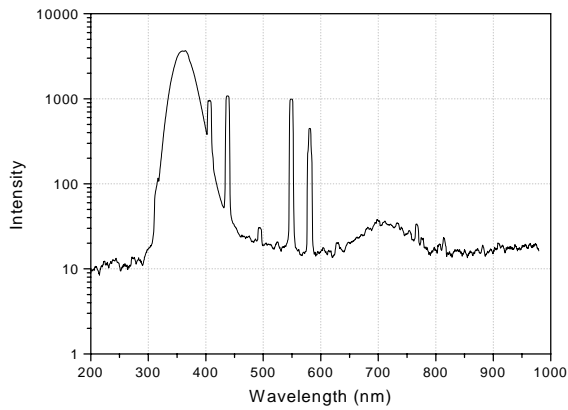
## 4. Testing Equipment (1)

□ UV Source : UV(A+B) lamp

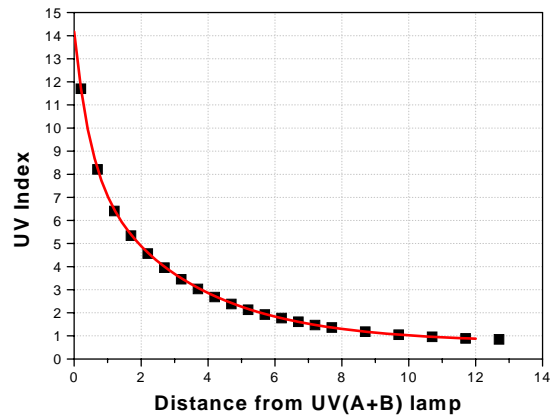
6W black light lamp ( Model : FL6 BL, Sankyo Denki, Japan )

wavelength : 300~400nm (352nm peak)

the stand of a controllable height



< Spectrum of the UV(A+B) lamp >



< UV Index vs. Distance from UV lamp >



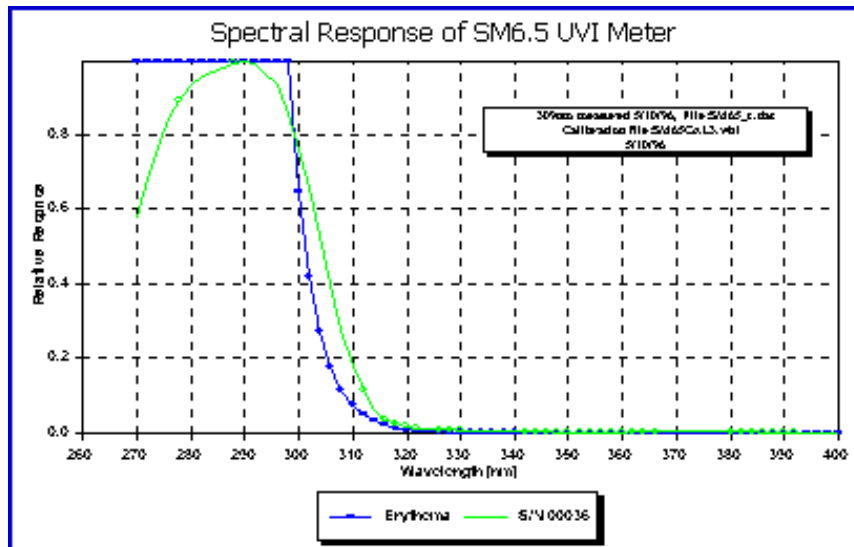
< Application Example for the UV lamp >

## 4. Testing Equipment (2)

### □ UV Index Meter

Manufacturer : Solarmeter (Homepage : [www.solarmeter.com](http://www.solarmeter.com))

Model No. : SM6.5 UVI Meter



### Sensor

Silicon Carbide (SiC) Photodiode packaged on gold plated header via gold wire bonding under UV glass window cap, hermetically sealed.

### Radiometer

Peak sunlight response bandwidth:

297-310nm

Total solar response: 290-400nm, Diffey

Display: 3 ½ digit LCD

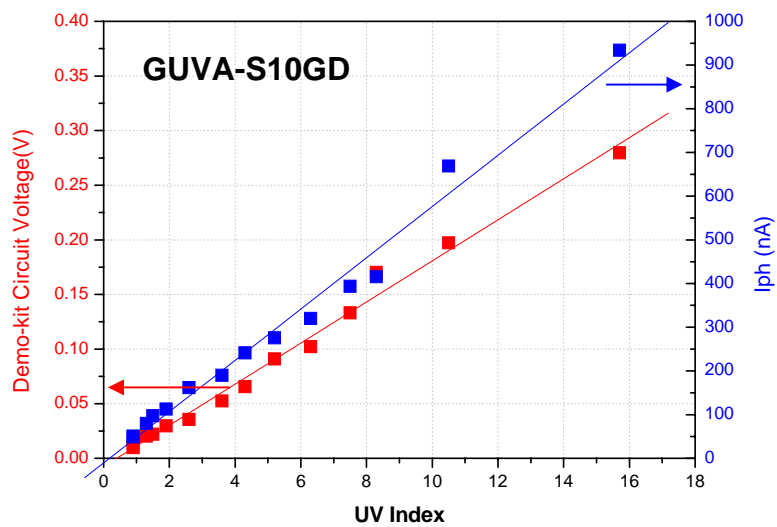
Resolution: 0.1 UVI

Power Source: 9V DC battery

Accuracy: +-10% ref NIST (NBS) standards

## 5. Genicom's Demo-kit

- ❑ Circuit : Basic Circuit for Genicom's Demo-kit
- ❑ UV Source : UV(A+B) 6W black light lamp
- ❑ Model No. : GUVA-S10GD
- ❑ Measurement : I<sub>ph</sub> – parameter analyzer, Voltage of demo-kit circuit



The photocurrent and the demo-kit voltage increase linearly with UV Index (UV irradiance).

\* I<sub>ph</sub> value and output voltage with UV Index for GUVA-S10GD (@UVA Lamp)

UI	0.9	1.3	1.5	1.9	2.6	3.6	4.3	5.2	6.3	7.5	8.3	10.5	15.7
I <sub>ph</sub> (nA)	51	80	97	113	162	190	241	276	320	394	416	669	934
V <sub>out</sub> (mV)	13	20	22	30	36	53	66	91	102	133	170	197	280



## 6. UV Safety Precautions

- Limit access to areas where UV sources are used.
- Post warning signs at the entrance to labs or other work areas using UV sources.
- Wear protective eyewear and gloves.
  - Wear sunglasses that absorb 99-100% of the full UV spectrum.
  - Wear clothing that covers the body and shades the face.
- Cover arms and neck and limit exposure time
- Never look directly at the beam.
- Use a manual or electronic shutter to close the beam when the source is not in use.
- Use enclosed beam paths where possible.

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