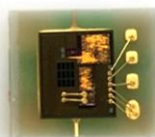# Application Note

Product Name : Digital Sensor

Model No. : GUVA-C32SM

GUVB-C31SM

Revision No. : 1

Date : 2015. 12

Genuine UV Technology

GENUV

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T a b l e of C o n t e n t s

1. FEATURES

1-1. FEATURES
- Sensing with 16-bit resolution
- Support UV index measurement (0~16)
- Programmable gain and integration time
- I²C slave interface up to 400KHz
- Power management modes
- Shutdown current : 0.8uA typical
- Supply voltage of 2.2V to 3.6V
- 2.0mm×2.3mm×1.4mm , 4-pin COB package

1-2. APPLICATIONS
- Smartphone, Wearable devices, IoT, watch, weather station, bicycle navigation, gaming, accessary

1-3. GENERAL DESCRIPTION
- Digital Sensor supports integrated functions of ultraviolet light sensors such that can be easily configured and used in user applications.
  Digital Sensor comprises photodiodes, amplifiers, ADC, digital control logic and I²C interface circuit The Digital Sensor receives UVB (GUVB-C31SM) or UVA(GUVA-C32SM) and outputs digital count according to the intensity.
 Power consumption can be minimized by proper use of power management mode.

GUVB-C31SM

GUVA-C32SM
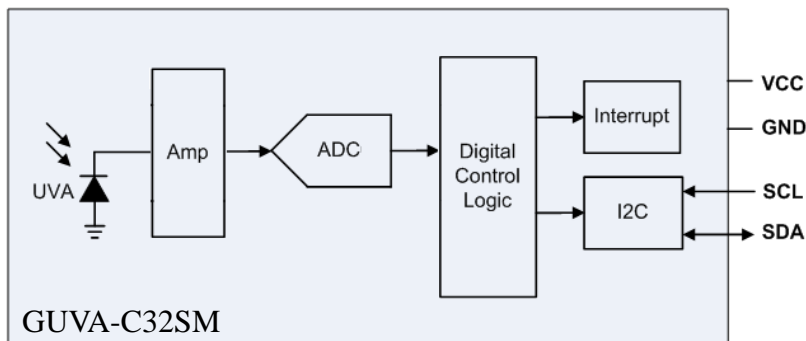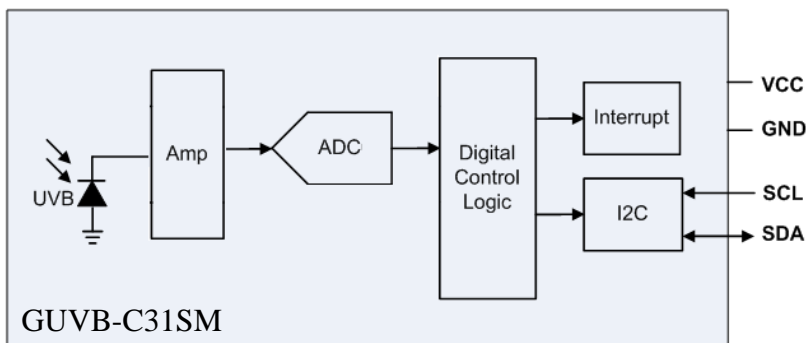
2. Method of Test

2-1. Test Method by Demoboard

Users are able to check its operation simply by using Demoboard as following instruction.
(*Additional cost caused)

1) Install "UVI_Checker_BLE.apk" file on your mobile phone.
   (Now only install in Android, and now developing Apple, Xiaomi app.)
2) Turn on Bluetooth on Demo Board

Switch off

Switch on
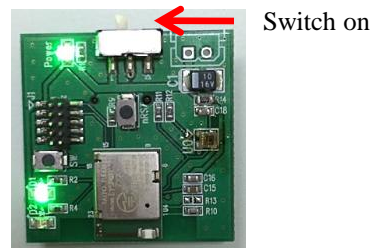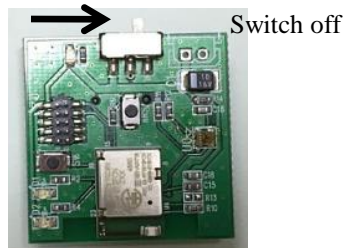
3) Turn on Bluetooth on your mobile phone. Click search button. When RECOS-HRM is searched on the phone, connect with phone.
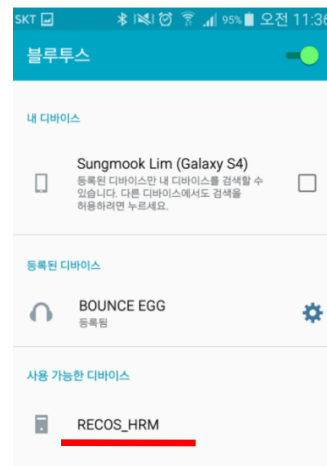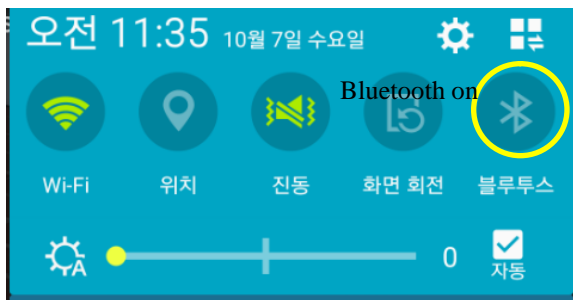
4) Start Smart UVI Checker BLE Application → Make Demo board face to sun or UV light and touch Smart UVI Checker app's measure button. → You can check UVI.
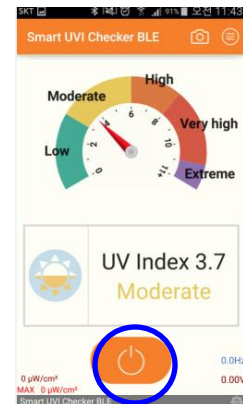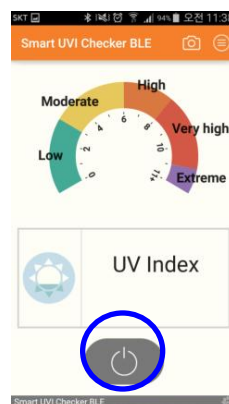
2-2. Single component Test

Component shall be installed on PCB to proceed with operating test.
(Reference : page6, Soldering Condition)
 In case there is no applicable PCB, It shall be provided by Genicom upon user's request like as
  following the pictures below.

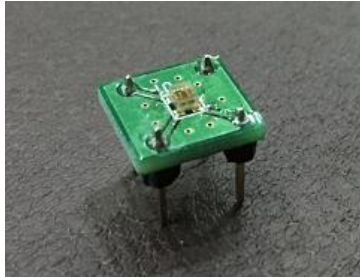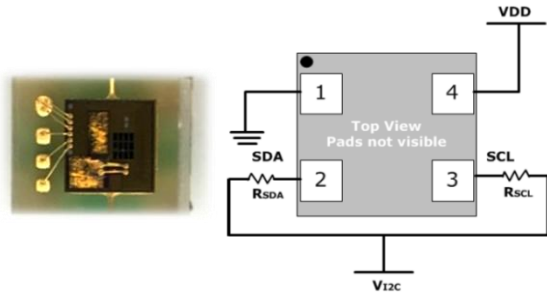Fig.1 Digital Sensor on PCB   Fig.2 Digital Sensor Pin information

Reference for Use of Digital Sensor : Data Sheet 10~12 page resister map

The formula as below is needed to implement UVI

GUVA-C32SM UVI = (A_Value*2.5) - (Offset)/(A_scale)

GUVB-C31SM   UVI = (B value *0.8)/(B_scale)

* Digital Sensor currently provided shall be calibrated by Solarsimulator (Luzchem)

The formula above is based on the situation of UVI checked without any window.
If there is a window, the constant of formula should be different according to the transmissivity.

2-3) Regular Operation Test

- User is able to test the regular operation of a product when the product is exposed
   352nm peak UVA Lamp, 310nm LED, Solarsimulator or directly the rays of the sun.
   (Reference : page7, Selection of product in development of UVI source)

-   For accurate UVI measurement, user shall compare Reference Meter with Digital Sensor as a result
    of solar simulator or solarlight. Measurment. (page8, Reference UV Index meter)

■ Appendix 1. Soldering Condition

1) Soldering Pattern
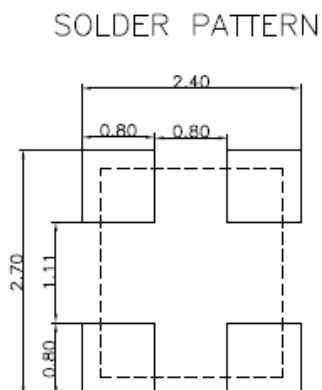
SOLDER PATTERN

Fig. 1. Recommended Soldering Pattern

2) Reflow Soldering Profile
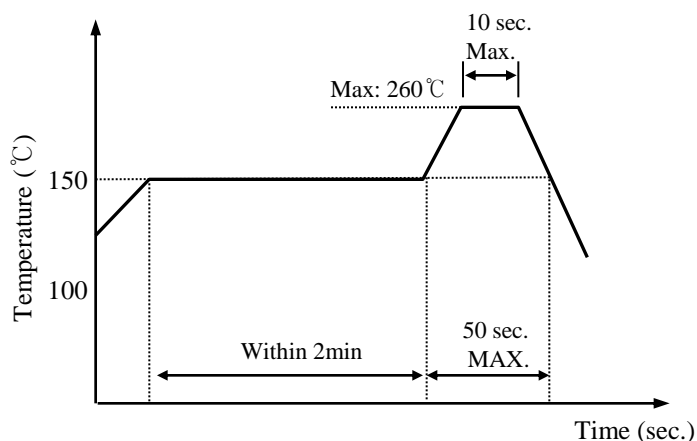

Fig. 2. Recommended Reflow Soldering Profile

3) Manual Soldering Conditions

   a. Temperature : Max. 260°C

   b. Time : Max. 10 sec.

   c. Caution : You must put to earth and shield the package from ESD damage.

              (eg.: wrist strap or anti-electrostatic gloves)

■ Appendix 2. Selection of product in development of UVI source

	Solarsimulator	UVA Lamp
Company	Luzchem	Sankyodenki
Model.	Solar Simulator Solar Simulator reproduces AM1.5 solar spectrum from 280-800nm	F4T5BLB(4Watt Lamp,352nm peak) homepage: http://www.sankyo-denki.co.jp/e2_06.html
Cost	20,000USD	10 USD
Strength	Similar with solar Spectrum	Inexpensive
Weakness	Expensive	Little bit difference with Solar but it is usable, by matching with solar

1) Measuring under the solar is the most accurate way when developing UVI measuring product,

   but because of the weather condition, need to use artificial light source.

   There are many simulator products, among them Solarsimulator by Luzchem company is very similar

   with solar so it is best for calibration light source so solarsimulator is proper as .

   Calibration source of light in the developing stage. In the Producing stage we recommend to use

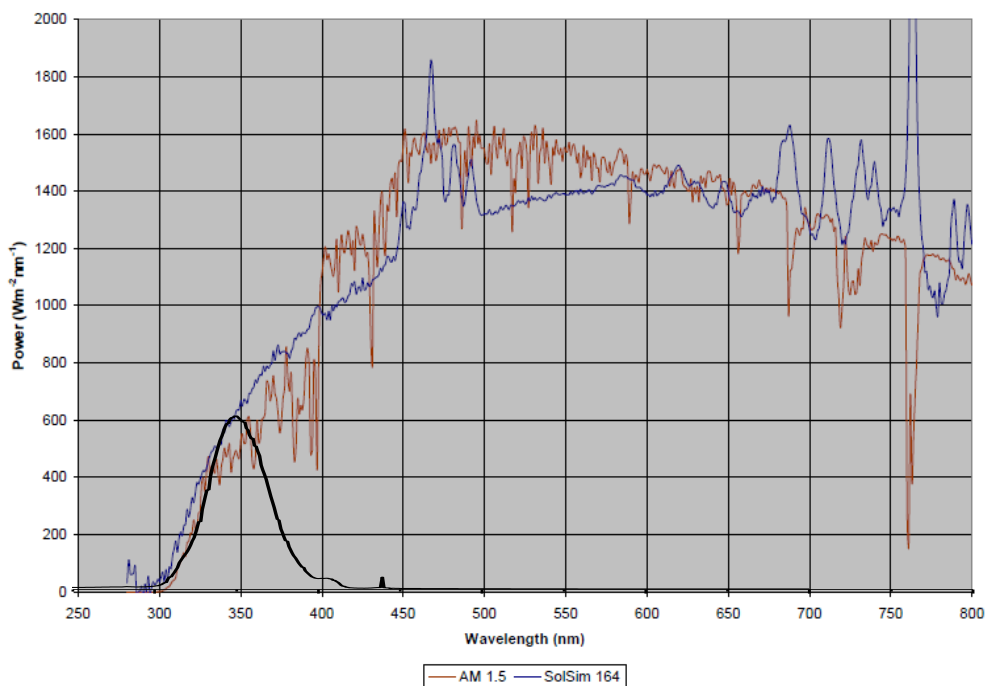   UVA Lamp matching with solar as the calibration light of source.

Fig. 1 Red : Sun Spectrum, Blue : Solarsimulator (Luzchem),
Black : UV-A Lamp (Sankyo Denki) Spectrum

■ Appendix 3. UV Index meter

1) Necessary UVI Reference meter for development of UVI measuring product

Series Name	**Smart UVI Meter**	**GUVI-T11S7-L**	**Solarmeter6.5**
Picutre			
Company	**GENICOM**	**GENICOM**	**Solartech**
Dimension(㎣)	51mm , 16 ∅	70x135x25	61 x 107 x 23
Power supply	Not needed	DC9V battery	DC9V battery
Mount type	Earjack	Hand held	Hand held
Input channel	1	1	1
Communicaiton	Smart phone (App)	X	X
Ref. UV Source for Calibration	Solarsimulator	Solarsimulator	UV-A Lamp
Cost	70 USD	200 USD	250 USD

=> Three of them have high accuracy, Smart UVI Meter has strenghth of portability

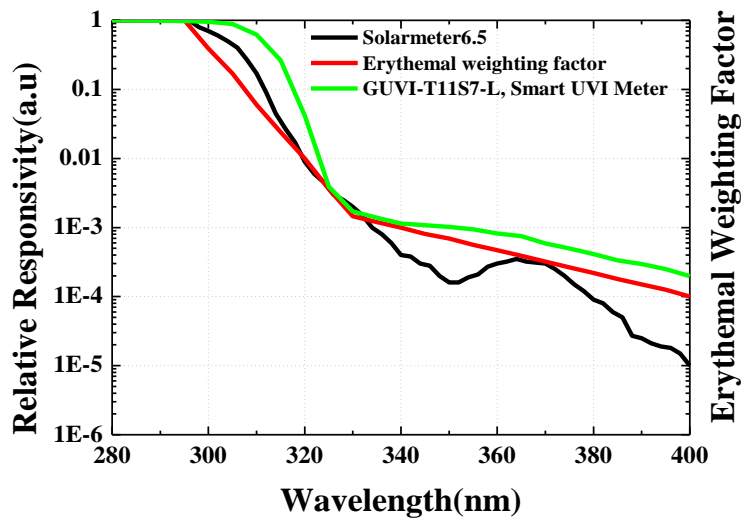=> As a Reference meter,we recomended to use GUVI-T11S7-L,since the result has no gap between each model

Fig . 1. Comparison Erythemal weighting Factor with Solar meter6.5, GUVI-T11S7-L and Smart UVI Meter

■ **Appendix 4. Cover & Structure**

1. Cover Window

1) Cover Window Material : Quartz Glass or PC

2) Requirement : Transmittance of cover window is over than 40% in UVA/UVB region.

3) Fig. 1 is example. Transmittance of Quartz or PC in UV range is changed by product method.

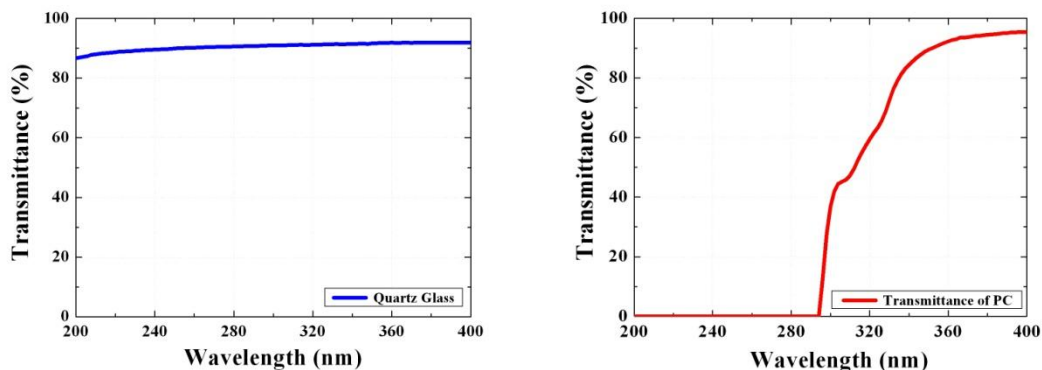   We can check the transmittance of cover material of customer.

Fig. 1 Transmittance of Quartz & PC

2. Structure

1) There are 3 parameter in Fig. 2

   - A : distance from bottom of Case to top of UV sensor + Thickness of Case)

   - B : Opening Size

   - C : Viewing Angle

2) C is over 50 degree at least. Generally, A in Fig. 2 is fixed and C is 60 ˚.

   Relation : $B = (A+0.5 \text{ mm}) \times \tan(C/2) \times 2$

3) Table A3-1 is the B value table along A value. We recommend the C= 60 ˚ due to tolerance.

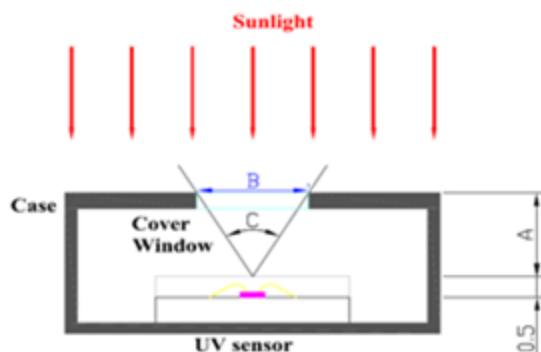| C (°)	A (mm)	B (mm)
60	0.5	1.15
60	1.0	1.73
60	1.5	2.31
60	2.0	2.89
60	2.5	3.46
60	3.0	4.04

Fig. 2 Structure of UV Sensing parts   **Table. 1 B along A**

3. Cautions

1) Caution for Use UV Detector

-. In case of cleaning, use only IPA.

-. To be kept under clean environment. For more than 3months storage, put in sealed containers.

-. It should be soldered within 7days after opening a seal.

-. Use a wrist strap or anti-electrostatic gloves for handling, to protect from a static electricity

and surge.

-. If you operate it over the absolute maximum ratings, that may cause a permanent damage.

-. It can be damaged by working environment which is not shielded from a static electricity.

-. Damaged products show unusual characteristics such as large leakage current, or do not work.

2) 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.