



# The Dangers of Ultraviolet Rays and Handling Precautions for UV LEDs

## Table of contents

1. Ultraviolet Light Information	• • • • • • • •	2
2. Cautions	• • • • • • • • • • • •	3
3. How Ultraviolet Rays Affect the Human Body	• • • •	4
4. Handling Precautions	• • • • • • • • • •	4
5. Ozone Generation from UV Rays	• • • • • • •	5
6. Summary	• • • • • • • • • • • •	5

This document contains tentative information, Nichia may change the contents without notice.

# The Dangers of Ultraviolet Rays and Handling Precautions for UV LEDs

## 1. Ultraviolet Light Information

UV LEDs are LEDs that emit ultraviolet rays. Ultraviolet rays have shorter wavelengths than visible light; they are generally defined as electromagnetic rays with wavelengths ranging from 10 to 400nm.

There are three categories depending on the wavelength:

UV-C (200-280nm), UV-B (280-315nm), UV-A (315-400nm)

	10nm				400nm		780nm	
	UV							
X-ray	V-UV 10~200nm	UV-C 200~280nm	UV-B 280~315nm	UV-A 315~400nm		Visible Light	Infrared	

The key features of UV-C, UV-B, and UV-A are summarized below.

UV-C (200-280nm):

It is absorbed by the atmospheric layer (the ozone layer) and therefore does not normally reach the earth's surface. Due to its strong disinfectant properties, it is highly dangerous to living organisms.

UV-B (280-315nm):

Most of this is absorbed by the atmospheric layer (99.5%) though some reaches the surface and is harmful to skin and eyes. This can cause sunburns and skin cancer.

UV-A (315-400nm):

Approximately 5.6% passes through the atmospheric layer without being absorbed and reaches the surface. Although it is not as harmful as UV-B, prolonged exposure may affect health.

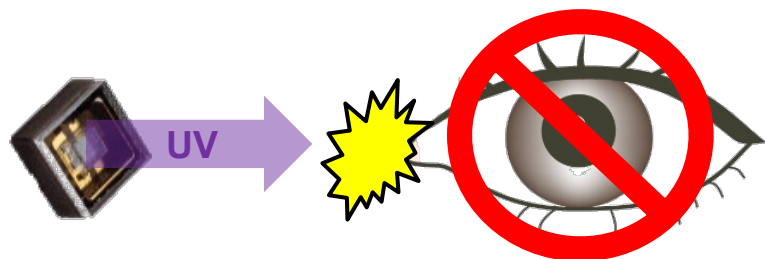
This document contains tentative information, Nichia may change the contents without notice.

# The Dangers of Ultraviolet Rays and Handling Precautions for UV LEDs

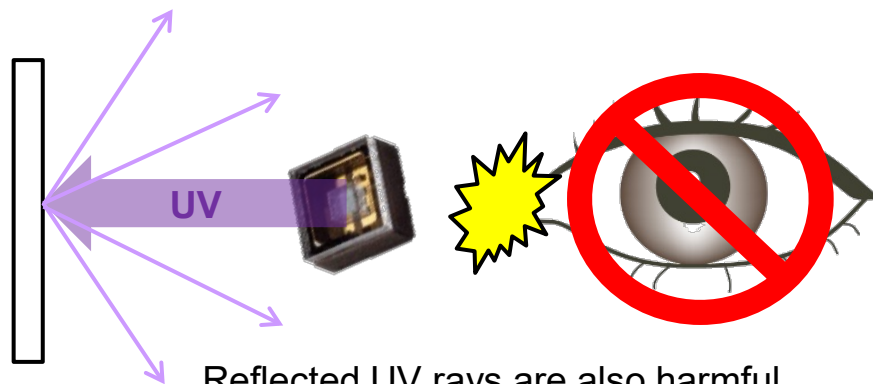
## 2. Cautions

The UV LEDs emit strong ultraviolet rays (i.e. UV-C, UV-B, and UV-A) during operation.

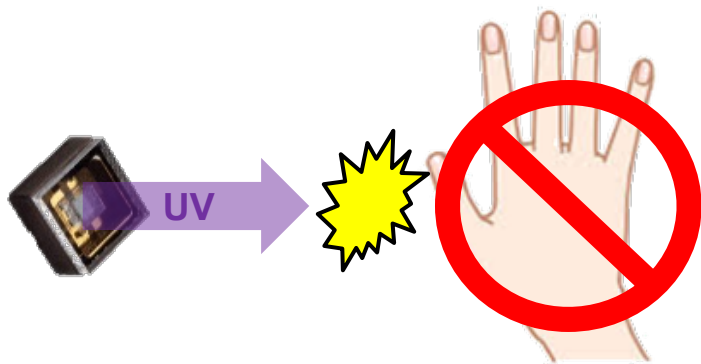
When handling the UV LEDs, it must be ensured that the eyes and skin are not directly exposed to the ultraviolet rays. Even reflected or leaked rays are harmful.



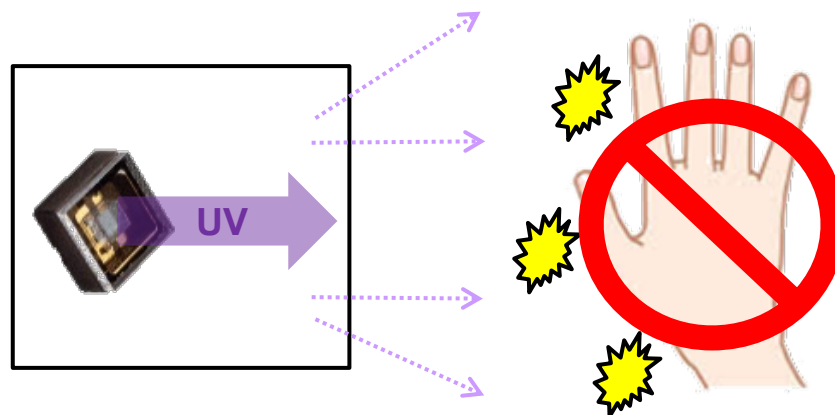
Do not directly view the UV rays.



Reflected UV rays are also harmful.



Do not directly expose skin to the UV rays.



Leaked UV rays are also harmful.

This document contains tentative information, Nichia may change the contents without notice.

## 3. How Ultraviolet Rays Affect the Human Body

### Dangers of ultraviolet rays (eye damage)

Intense ultraviolet is dangerous to the eyes and can cause snow blindness (photokeratitis), ultraviolet eye infections (electro-optic ophthalmitis), cataracts, pterygium, and pinguecula.

### Dangers of ultraviolet rays (skin damage)

Proteins are one of the most important components of living organisms. Ultraviolet rays can denature proteins. When the skin is exposed to UV light, it damages collagen fibers and elastic fibers. This results in aging of the skin, damage to DNA, and risk of skin cancer.

## 4. Handling Precautions

When performing a measurement of the ultraviolet rays with a UV illuminance meter, a camera, etc. and/or a light-up test for the UV LEDs, ensure that they are done in an enclosed area to prevent direct exposure of the eyes and skin to the ultraviolet rays. Unintended exposure may occur if the area is not completely sealed. To reduce the damage that may be caused by exposure, wear appropriate protective clothing and gear (i.e. gloves, thick clothing with long sleeves, a face mask, goggles, etc.).

Ensure that both the operators who actually handle the UV LEDs and personnel who may be around the UV LEDs fully understand the dangers of ultraviolet rays and are protected from exposure as appropriate.

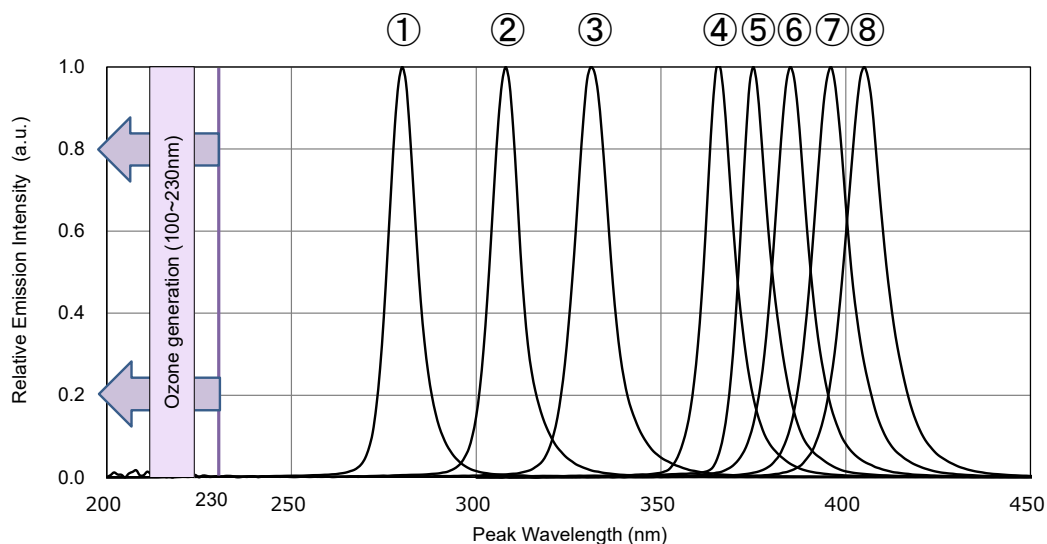
## 5. Ozone Generation from UV Rays

At wavelengths of 100-230nm, it can react with oxygen in the air to produce ozone.

Ozone is a powerful oxidizing agent (several times more powerful than chlorine).

Due to its powerful oxidizing properties, ozone can deteriorate rubber and plastics and may affect the human body depending on the concentration.

The figure below shows examples of the spectrums for Nichia's UV LEDs; Nichia's UV LEDs will not generate ozone.



- ① Part No. NCSU434D (U280)
- ② Part No. NCSU434B (U308bc)
- ③ Part No. NCSU434B (U330)
- ④ Part No. NVSU233B (U365)
- ⑤ Part No. NVSU119C (U375)
- ⑥ Part No. NVSU233B (U385)
- ⑦ Part No. NVSU233B (U395)
- ⑧ Part No. NVSU233C (U405)

## 6. Summary

As described in the previous sections, ultraviolet rays can be harmful to the human body; however, they can be useful if they are used properly.

When handling and/or using Nichia's UV LEDs, and/or designing a chosen application that uses Nichia's UV LEDs, ensure that all applicable laws and regulations are followed for the intended use and/or in the concerned countries/regions.

This document contains tentative information, Nichia may change the contents without notice.

## Disclaimer

This application note is a controlled document of Nichia Corporation (Nichia) published to provide technical information/data for reference purposes only. By using this application note, the user agrees to the following:

- This application note has been prepared solely for reference on the subject matters incorporated within it and Nichia makes no guarantee that customers will see the same results for their chosen application.
- The information/data contained herein are only typical examples of performances and/or applications for the product. Nichia does not provide any guarantees or grant any license under or immunity from any intellectual property rights or other rights held by Nichia or third parties.
- Nichia makes no representation or warranty, express or implied, as to the accuracy, completeness or usefulness of any information contained herein. In addition, Nichia shall not be liable for any damages or losses arising out of exploiting, using, or downloading or otherwise this document, or any other acts associated with this document.
- The content of this application note may be changed without any prior or subsequent notice.
- Copyrights and all other rights regarding the content of this document are reserved by Nichia or the right holders who have permitted Nichia to use the content. Without prior written consent of Nichia, republication, reproduction, and/or redistribution of the content of this document in any form or by any means, whether in whole or in part, including modifications or derivative works hereof, is strictly prohibited.

**NICHIA CORPORATION**

<http://www.nichia.co.jp>

Phone: +81-884-22-2311 Fax: +81-884-21-0148

491 Oka, Kaminaka-Cho, Anan-Shi,  
TOKUSHIMA 774-8601, JAPAN

This document contains tentative information, Nichia may change the contents without notice.