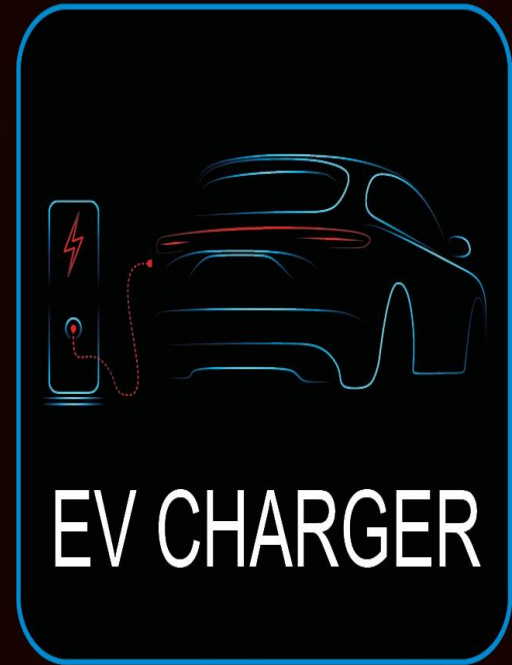
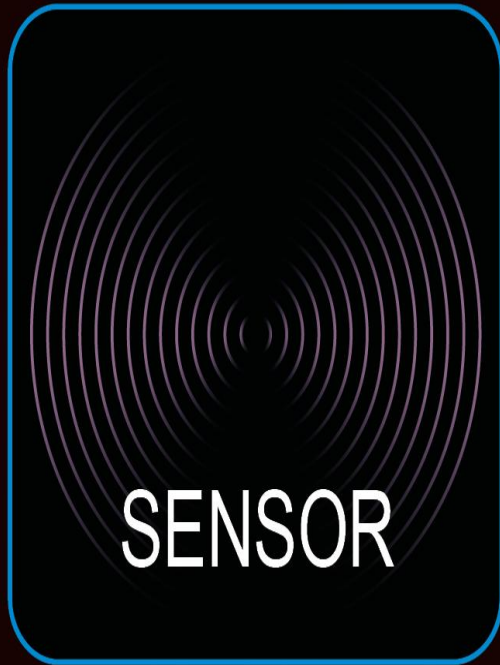


RUTRONIK TECHTALK MEETS



08.06. - 10.06.2021 | **ONLINE**

Full UV LED spectrum in UV-A, UV-B and UV-C for industrial,

consumer and disinfection solutions

Lorenz Bauer | FAE Optoelectronics

Rainer Huber | Distribution Manager Optoelectronics

LITEON



Welcome to
LITE-ON Group



About Lite-On

Founded: in 1975

Headquarters: Taipei, Taiwan

Worldwide Locations: 334

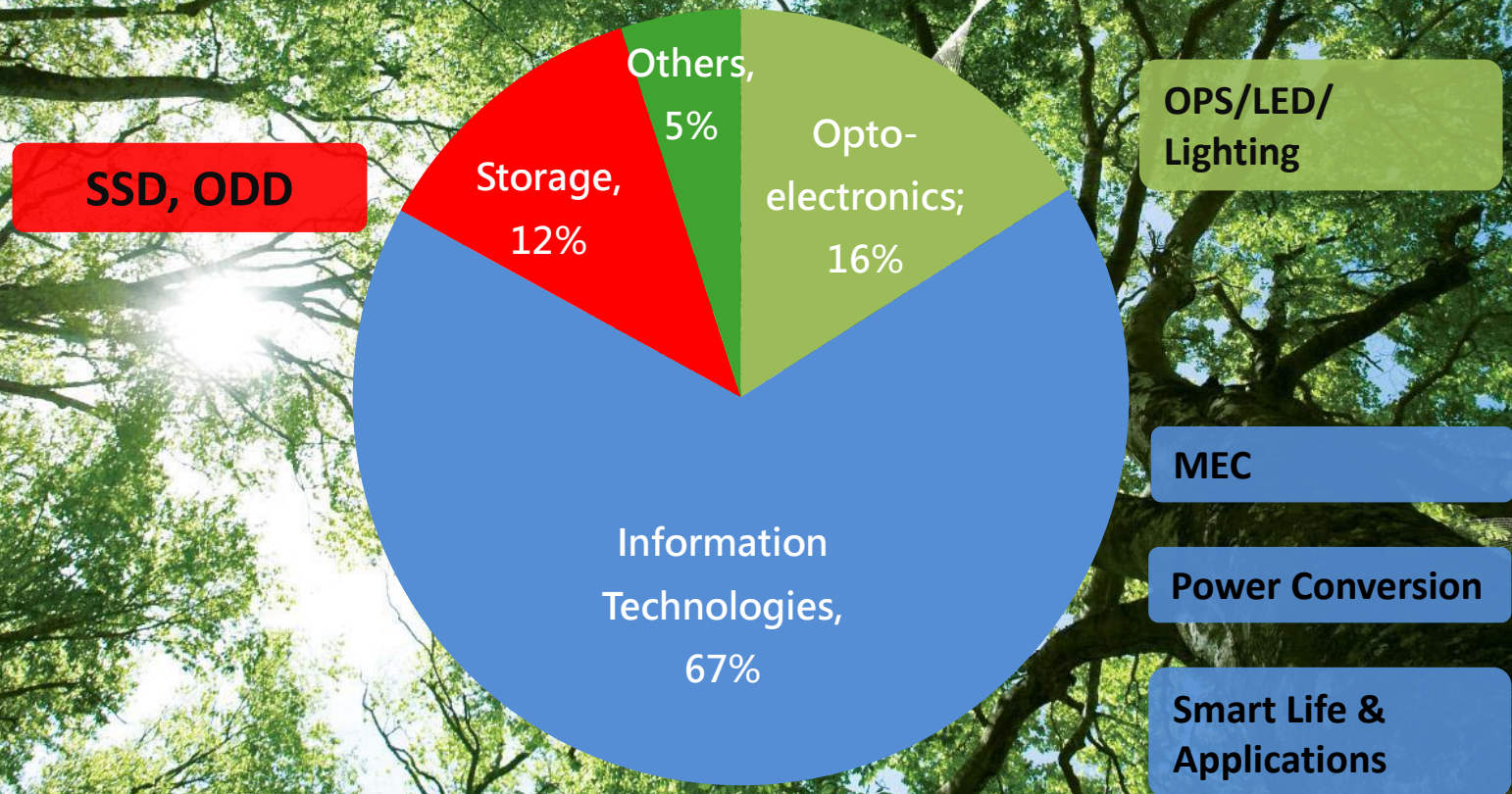
Employment: ~ 40,000

Market Cap:~USD 3.8 billion

Revenue: ~USD 6 billion (fiscal 2019)

- ◆ The first company in Taiwan to produce LEDs (Light-Emitting Diodes)
- ◆ The first technology company listed on the Taiwan Stock Exchange (1983)
- ◆ Thomson Reuters Top 100 Global Tech Leader
- ◆ Member of DJSI since 2011
- ◆ Member of MSCI ESG Leaders Indexes
- ◆ Ranked No.2 in the “Computer Components” Category by Common Wealth Magazine
- ◆ “Corporate Citizenship Award” for 13 consecutive years since 2007 by Common Wealth Magazine
- ◆ “Corporate Social Responsibility Award” for 10 years since 2005 by Global Views Magazine

Best Partner in Opto-Electronic, Eco-Friendly and Intelligent Technologies



【 2019 Revenue breakdown 】

LITE-ON TECHNOLOGY CORPORATION

A World-Class Company Striving for Excellence

Optoelectronics Product Solution SBG

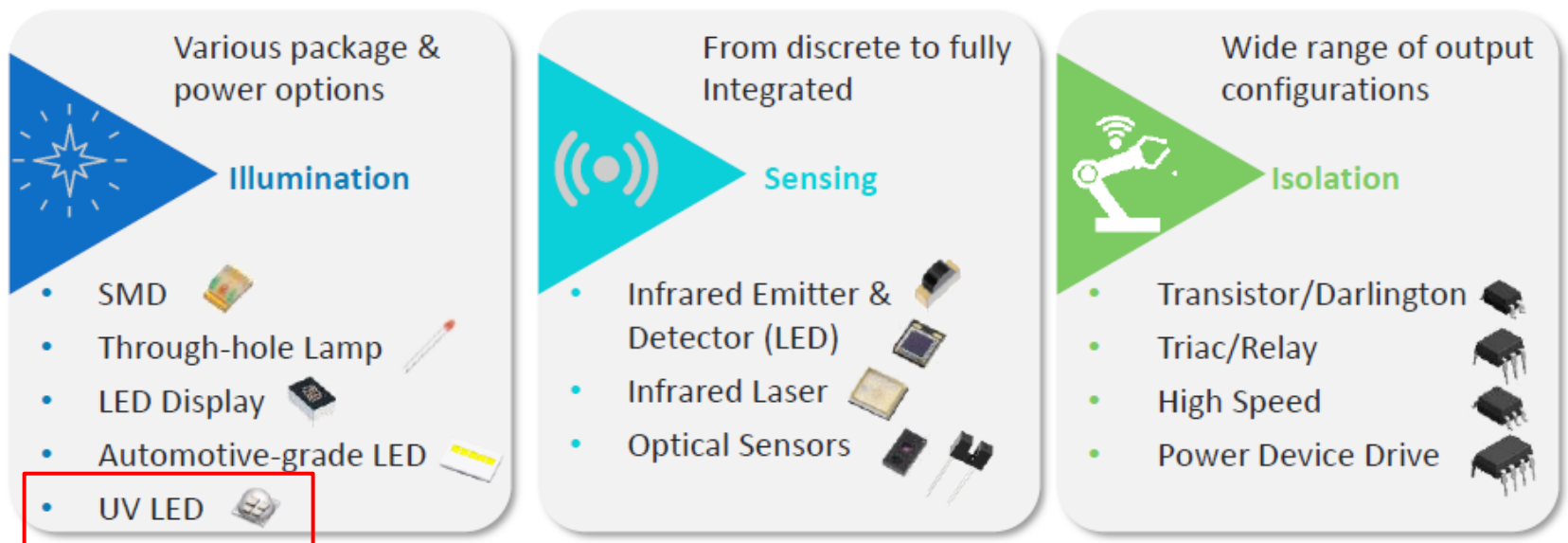
A world-class Optoelectronic Components provider

June 2021

About OPS SBG

Founded in 1975, LITE-ON Technology is the longest running and largest-scale optoelectronic semiconductors supplier in Taiwan. LITE-ON is the leading global provider of optoelectronic semiconductors , with a comprehensive portfolio from illumination to sensing, from low power to high power, from custom-made to commodity, from LED to Laser, from visible lights to infrared & UV.

Offering one of the industry's broadest product portfolios, Lite-ON's optoelectronic based product solutions are used in a wide variety of applications covering various segments of the computer, communications, consumer, automotive and industrial.



LITE-ON OPS at a glance

Key Figures

45

years LED package experience, offering the industry's broadest product portfolios

7

product division to cover the market needs completely

3

world-class manufacturing sites provide great flexibility and quality
(Changzhou, Tianjin, Bangkok)
Cap. Over 2.5kkpcs/mth

3

R&D centers enhance competitiveness while propelling the industry and technology forward
(Taipei, Singapore, Changzhou)

35

sales offices serve customers across the globe

1,539

global LED related IP
(I:1079, U:244, D:216)

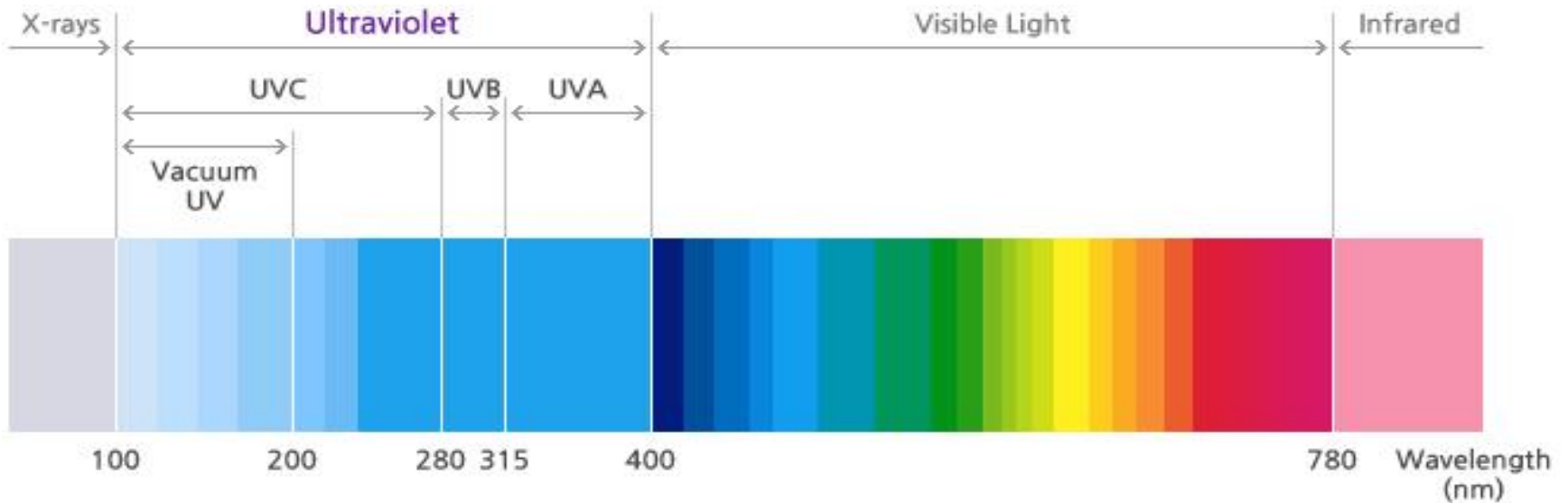
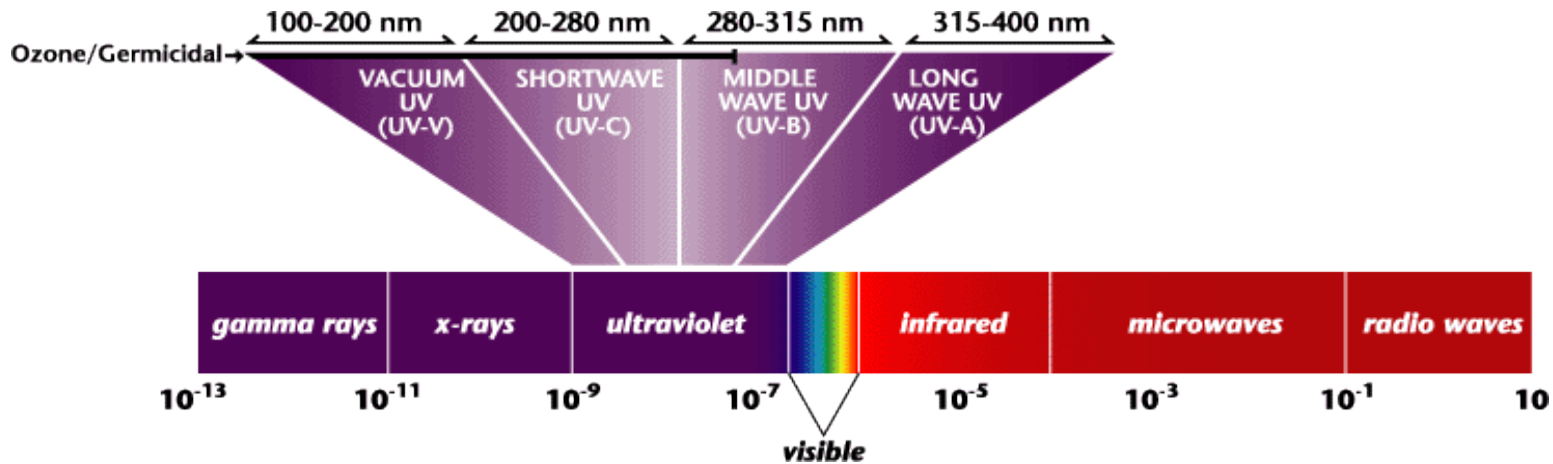
LITE-ON TECHNOLOGY CORPORATION

A World-Class Company Striving for Excellence

Optoelectronics Product Solution SBG

UV - SMD LED

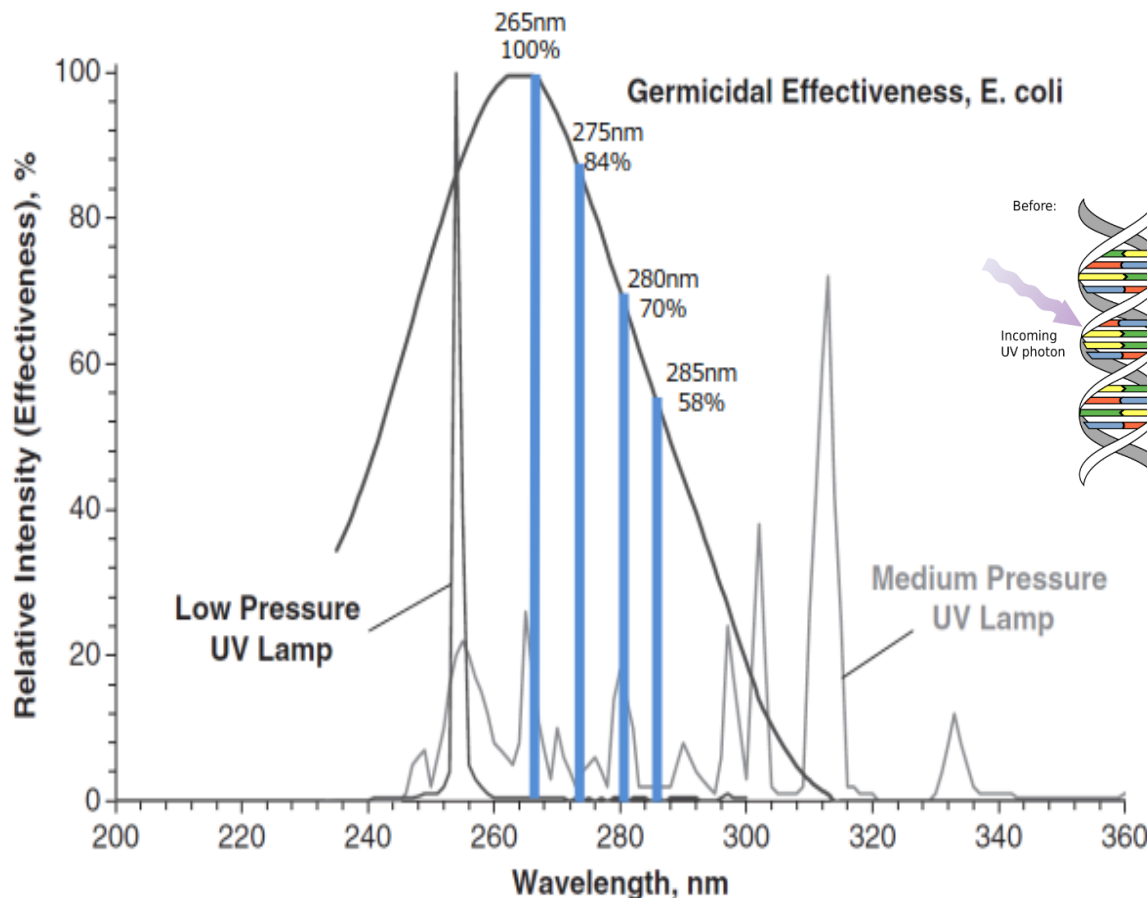
UV Wavelength Definition



UVC Disinfection – DNA Absorbance Wavelength

$$\text{Dose (J/cm}^2\text{)} = \text{UVC mW / cm}^2 \times \text{Radiation time (sec)}$$

Germicidal Effectiveness vs Wavelength



Portable Sanitizer



Water Disinfection



Dynamic water disinfection



Water Treatment



Medical Disinfection

UVC LED Advantage

Why UV LED is getting popular ?

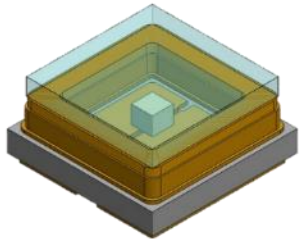
| UV LED | Item | UV Lamp |
|------------------------------|----------------------------|--------------------------------|
| New, Light, Simple, Compact | Technology | Old, Bulky, Heavy, Complex |
| 10,000~30,000 hours | Lifetime | 2,000~10,000 hours |
| Low | Energy Consumption | High |
| Zero | Warm-up time | Slow |
| No Mercury, No Ozone | Environmental Friendliness | Mercury used, Ozone generation |
| Low | Heat Generation | High |
| Single UV Band, Customizable | Emission Wavelength | Multiple Peaks |
| None | Heavy Metals | Mercury (20-200mg) |

(From LEDinside)

Comparing the Characteristics of UV LED & Mercury UV Lamp

Because UV LED does not contain mercury, it's environment friendly, long-lifetime, less heat loss.

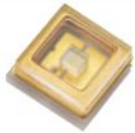
UVC G35 Package Structure



Quartz lens

- ✓ Quartz purity – mW output
- ✓ Lens adhesion glue
- ✓ Adhesion process
- Qualified for various application

Zener



G35: Metal plating on all surfaces of frame

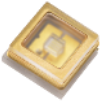

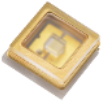
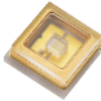
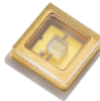
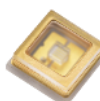
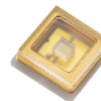
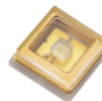
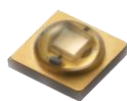
UVC Chip

- ✓ Thermal conductivity
- ✓ Leading mW efficiency
- ✓ Quality consistent
- ✓ Lifetime stability
- Tier 1 Chip Partner

Substrate/Frame

- ✓ Reflectivity with metal plating
- ✓ Thermal conductivity
- ✓ Mechanical Strength
- ✓ UV Power resistant
- High Power UVC Carrier

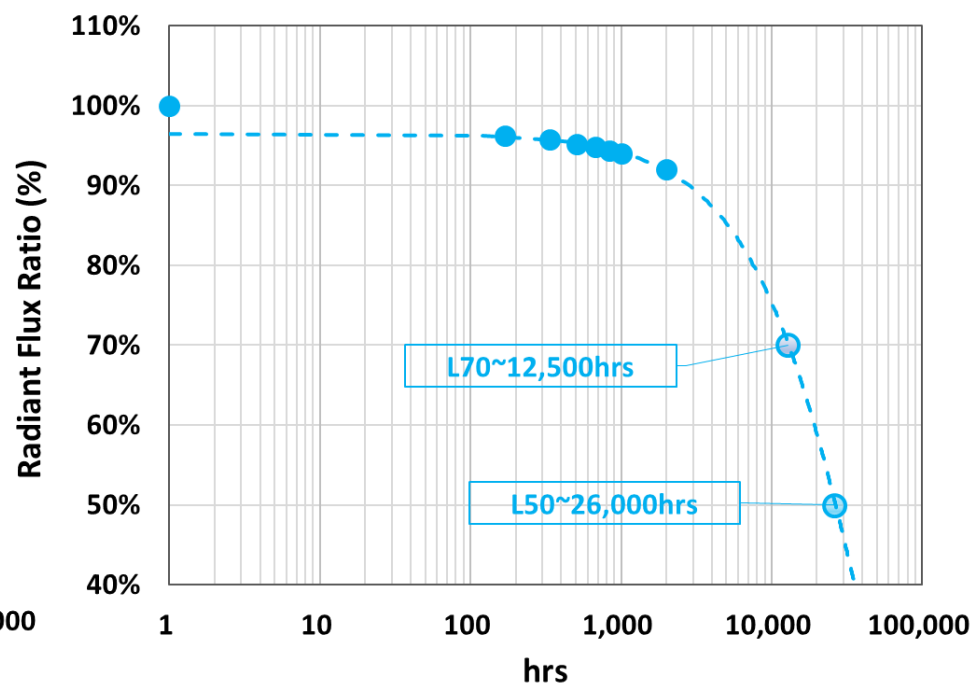
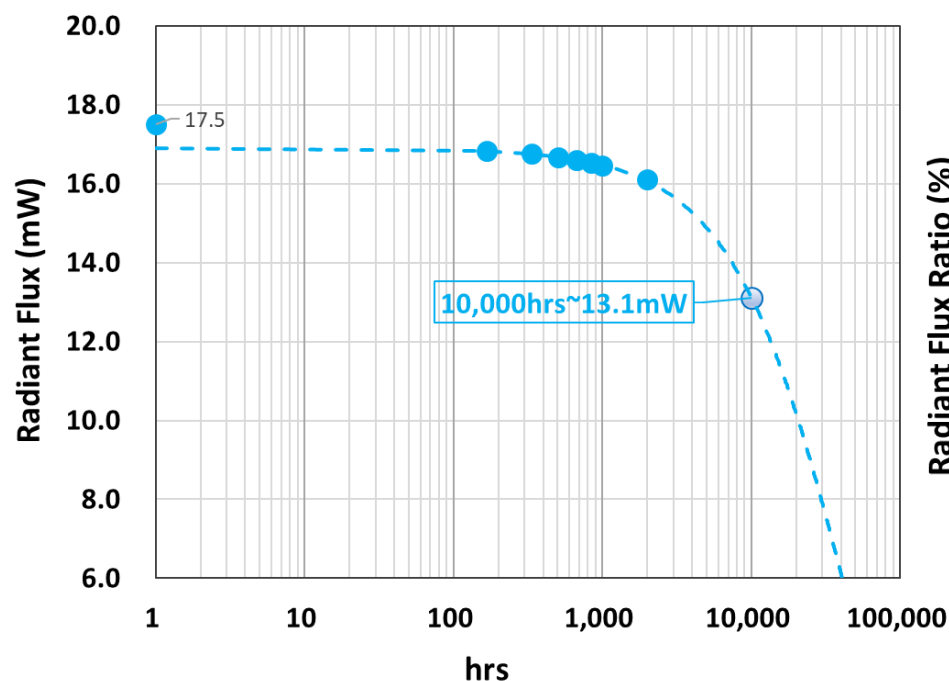
UVC Lineup Specifications

| Part No. | G35GS | G35GS-P | G35GC-E | G35GC-P | G35GR-E | G35GR-P | G35GZ-P | G35GH-P | W35GH |
|--------------------------------|---|---|---|---|---|---|---|---|---|
| Diagram |  |  |  |  |  |  |  |  |  |
| Dimension (mm) | 3.5 x 3.5 x1.68 | | | | | | | | 3.5 x 3.5 x 1.65 |
| Wp (nm) | 270~280 | | | | | | | | |
| Typ. Current (mA) | 40 | 40 | 100 | 100 | 180 | 180 | 350 | 700 | 600 |
| mW @ Typ IF | 4.5 | 6 | 12 | 14 | 21 | 25 | 50 | 81 | 150 |
| Max. Current (mA) | 80 | 80 | 150 | 150 | 280 | 280 | 600 | 800 | 700 |
| mW @ Typ IF | 8 | 10 | 18 | 20 | 30.8 | 35 | 72 | 90 | 165 |
| Vf (V) Typ. | 6.0 | 5.7 | 6.0 | 5.7 | 6.0 | 5.7 | 6.2 | 6.7 | 6.7 |
| Rth j-s (K/W) | 38 | 38 | 24.4 | 24 | 17 | 16.8 | 12.3 | 11.5 | 10.5 |
| Max. Allow Tj (°C) | 90 | 105 | 90 | 105 | 90 | 105 | 105 | 105 | 110 |
| Lifetime (hrs) L70, Ts=25°C | 5,000 @ 40mA 2,000 @ 80mA | 5,000 @ 40mA 2,000 @ 80mA | 10,000 @ 100mA 5,000 @ 120mA 1,000 @ 150mA | 10,000 @ 100mA 5,000 @ 120mA 1,000 @ 150mA | 10,000 @ 180mA 5,000 @ 220mA 1,000 @ 280mA | 10,000 @ 180mA 5,000 @ 220mA 1,000 @ 280mA | 10,000 @ 350mA 4,000 @ 600mA | 4,000 @ 600mA 2,500 @ 700mA 1,000 @ 800mA | 5,000 @ 350mA 3,000 @ 600mA 1,000 @ 700mA |
| Features Applications | Low power for portable | Low power for portable | Mainstream High mW/\$ | Mainstream High mW/\$ | Mainstream High mW/\$ | Mainstream High mW/\$ | High power for Water/Air | High power for Water/Air | The highest WPE% |

LTPL-G35UV275GR-E Life Estimation

Test Condition: 150mA @ Ta=25°C

- L70: 12,500 hrs
- L50: 26,000 hrs



SGS - UVC Sterilization Test Result Summary

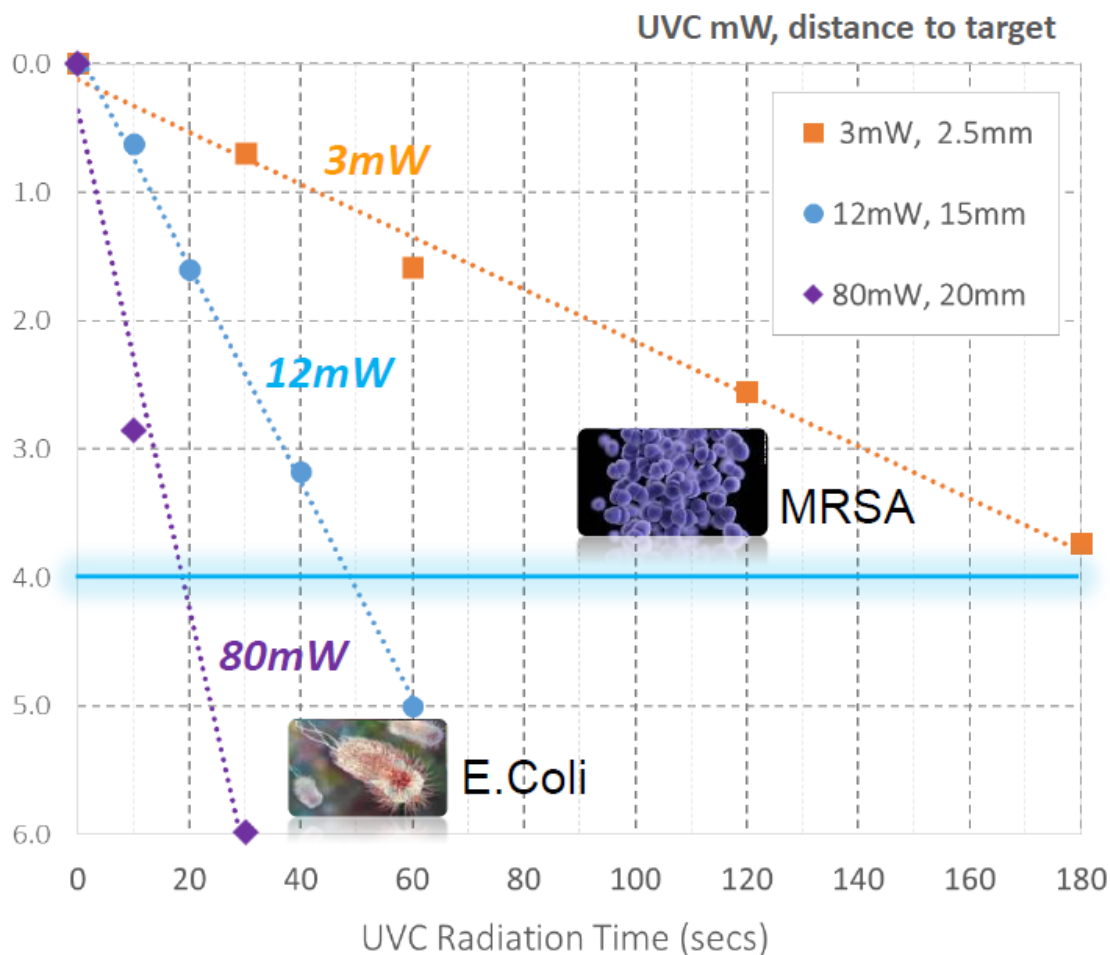
SGS
Test Report



Organism

E. coli
S. Aureus

Log1 (90%) =
Log2 (99%) =
Log3 (99.9%) =
Log4 (99.99%) =
Bacteria Killing Rate



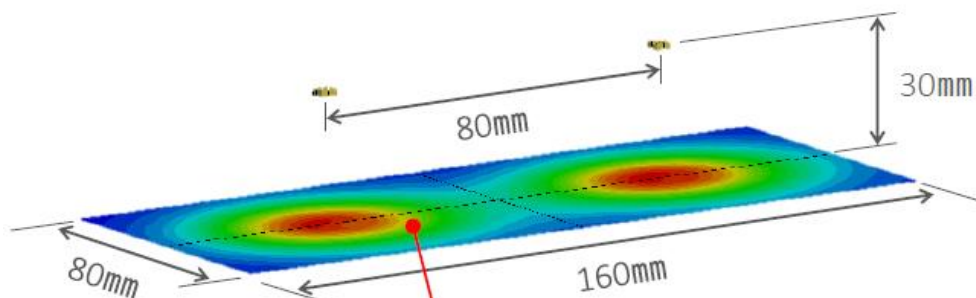
Design Recommend for Sterilization Box

Sterilization

Surface Sterilization



2pcs UVC LEDs, D=30mm



UVC Radiant Power $_{Avg}$:

99.9% sterilization rate:



G35GC

10mW @ 100mA

128 $\mu\text{W}/\text{cm}^2$

52 sec $_{E.coli}$

50 sec $_{COVID-19}$

G35GR

21mW @ 150mA

269 $\mu\text{W}/\text{cm}^2$

25 sec $_{E.coli}$

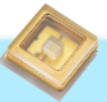
24 sec $_{COVID-19}$

- 6.6 mJ/cm² of UVC radiant power is required to have 99.9% sterilization rate against E.Coli (from USEPA, 2003 *NOTE)

Phone Sanitizer



LTPL-G35UV275GC-E*2
14mW from each LED, TTL 28mW
Distance: 30mm
30secs, 99.9% killing rate



UVC LED Application – TWS Surface Sterilization

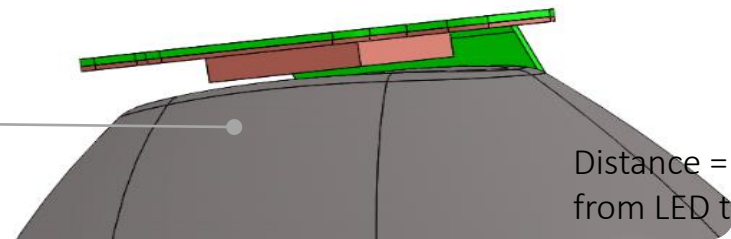
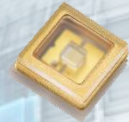


Sterilization

Surface Sterilization

P/N: LTPL-G35UVC280GE

Output Power = 2.6mW @20mA



Distance = 2mm
from LED to earbuds

Water Purifier Application (2l/min Module)

Disinfection Area

Quartz Glass

- ✓ High purity quartz glass
- ✓ Optimized optical design for UV light sterilization
- ✓ Integrated system by dynamic fluid flow

LTPL-G35UV275GR-E*6
Drive each LED@180mA
Killing rate 99.999%

Purified Light

UVC LED

- ✓ Highest power UVC LED for sterilization
- ✓ Long lifetime to save maintenance fees
- ✓ Standard connector for LED operation

Water Inlet/Outlet

PP material

- ✓ Food-grade PP material for drinking application
- ✓ Friendly assembly

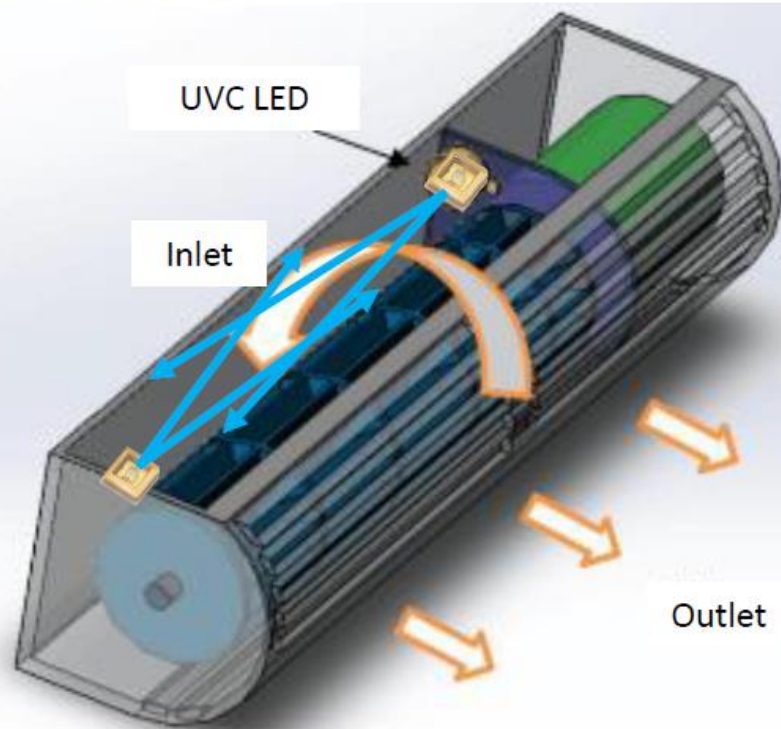
Module Holder

Aluminum Alloy

- ✓ Alloy with water leak-free design
- ✓ High thermal dissipation to keep better lifetime

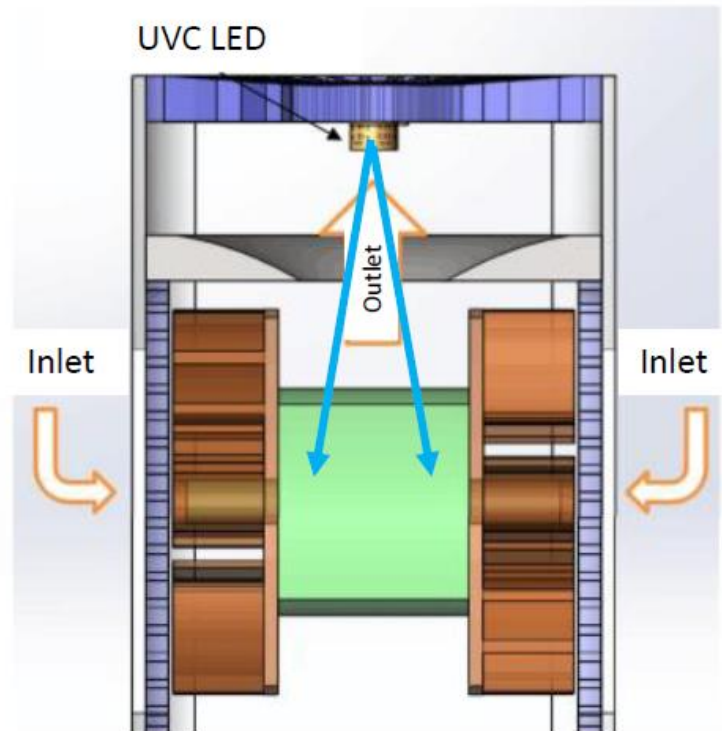
UVC LED for Air Purify Application

Air Conditioner




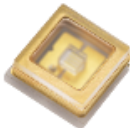
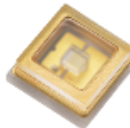
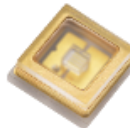
LTPL-G35UV275GR-E*2
18mW from each LED, TTL 36mW
1hr, 70% killing rate in 30m³ room
Air flow 300m³/hr

Air Purifier



LTPL-G35UV275GR-E*1
18mW from the single LED
1hr, 99.9% killing rate in 1m³
Air flow 14m³/hr

UVB Lineup Specifications & Application

| Part No. | G35UV308GS | G35UV308GC | G35UV308GR | G35UV308GH |
|--------------------|---|--|---|---|
| Diagram |  |  |  |  |
| Dimension (mm) | 3.5 x 3.5 x1.68 | | | |
| Wp (nm) | 300~315 | | | |
| Typ. Current (mA) | 40 | 100 | 180 | 350 |
| mW @ Typ IF | 7.3 | 12.7 | 22.5 | 37.6 |
| Max. Current (mA) | 80 | 150 | 280 | 700 |
| mW @ Typ IF | 14 | 19 | 36 | 75 |
| Vf (V) Typ. | 5.9 | 5.5 | 5.4 | 5.2 |
| Max. Allow Tj (°C) | 85 | 85 | 100 | 100 |

- ✓ Phototherapy
- ✓ Horticulture



LITEON UVA LEDs Portfolio



Air Purifier on Table



Open Space Air Purifier

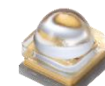
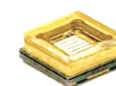


Commercial System Purifier



3D Printer Industrial

S35 (Quartz Glass)



(3.5x3.5x1.5)

(3.5x3.5x2.8)

L Series
@1500mA
VA 120°

F Series
@1500mA
VA 60°

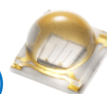
● 2380mW
● 2380mW
● 2350mW
● 2310mW
● 2220mW

● 2380mW
● 2380mW
● 2350mW
● 2310mW
● 2220mW

● 430nm
● 405nm
● 395nm
● 385nm
● 365nm

● MP
○ Development

C034
(3.5x3.5x2.1)



C036
(3.5x3.5x3.2)



E Series
@350mA
VA 130°

● 810mW
● 810mW
● 780mW
● 760mW
● 630mW

G Series
@700mA
VA 130°

● 1455mW
● 1455mW
● 1425mW
● 1400mW
● 1340mW

E Series
@350mA
VA 30°

● 690mW
● 690mW
● 670mW
● 660mW
● 530mW

G Series
@700mA
VA 55°

● 1230mW
● 1230mW
● 1210mW
● 1190mW
● 1140mW

C16

(1.6x1.6x0.8)



E Series
@350mA
VA 135°

● 440mW
● 440mW
● 420mW
● 410mW
● 340mW

K28

(2.8x3.5x0.7)



M Series
@20mA
VA 120°

● 21mW
● 21mW
● 20mW
● 20mW
● 17mW

A Series
@200mA
VA 120°

● 250mW
● 250mW
● 240mW
● 210mW

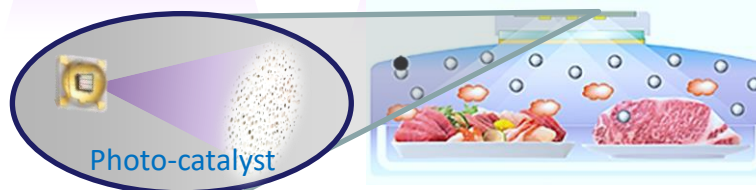


Photo-catalyst

Radiant Power (mW)

UVA + Photo-Catalyst for Air Sterilization



- **UVA LED + TiO₂ Photocatalyst - “Cleaning Purify” Tech**
- ✓ Physical treatment Process to decompose harmful bacterial & VOC with zero side-effect.
- ✓ The Lifetime is over 60,000hrs while UVA LED continue light on Photo-Catalyst

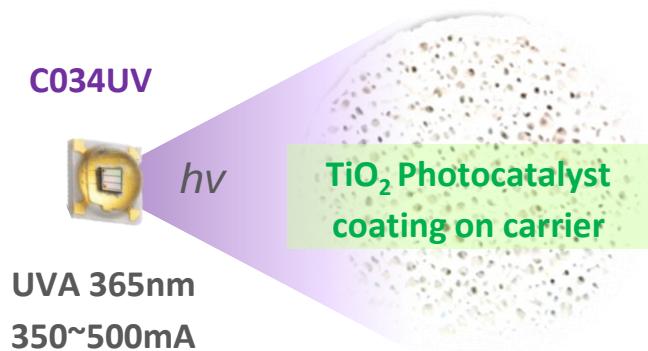
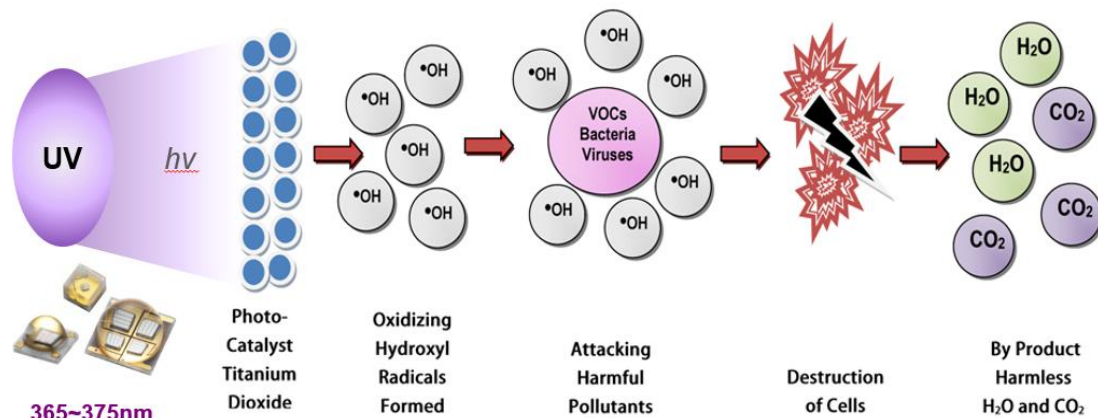


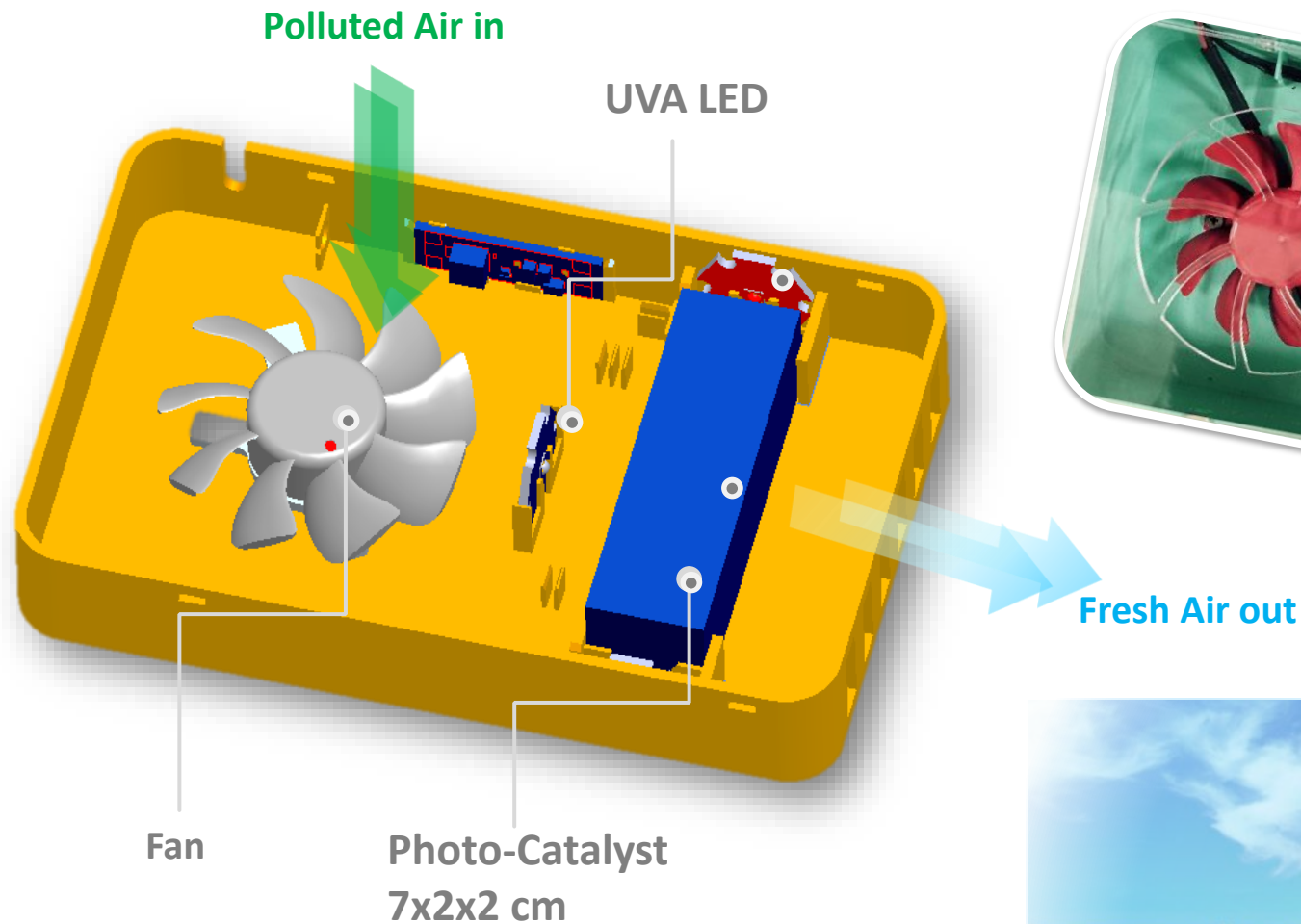
Photo-catalyst is available in Liteon

Photo Catalyst Mechanism



©Zander Scientific, Inc. 2013

Purify Module Example – UVA LED + Photo-Catalyst



UVA + Photo Catalyst Application

Air Cleaner

- ✓ Disinfection
- ✓ Odors decomposition

Do=10cm

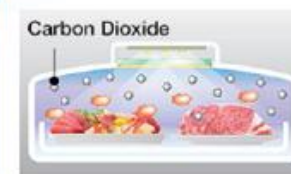
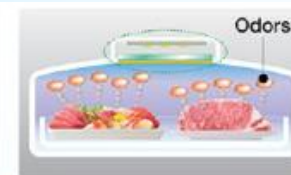
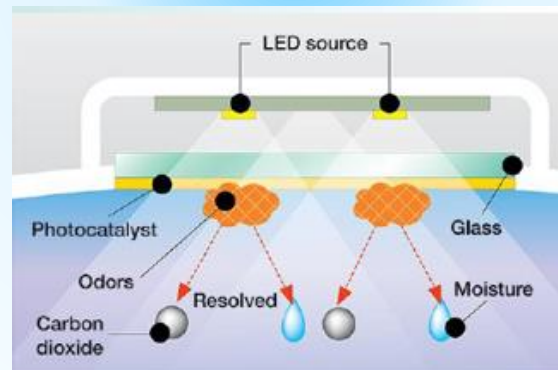


Photo-Catalyst carrier



Refrigerator

- ✓ Odors decomposition
- ✓ Food preservation



Thank you