DYE-SENSITIZED CELL (DSC)

Simple Version

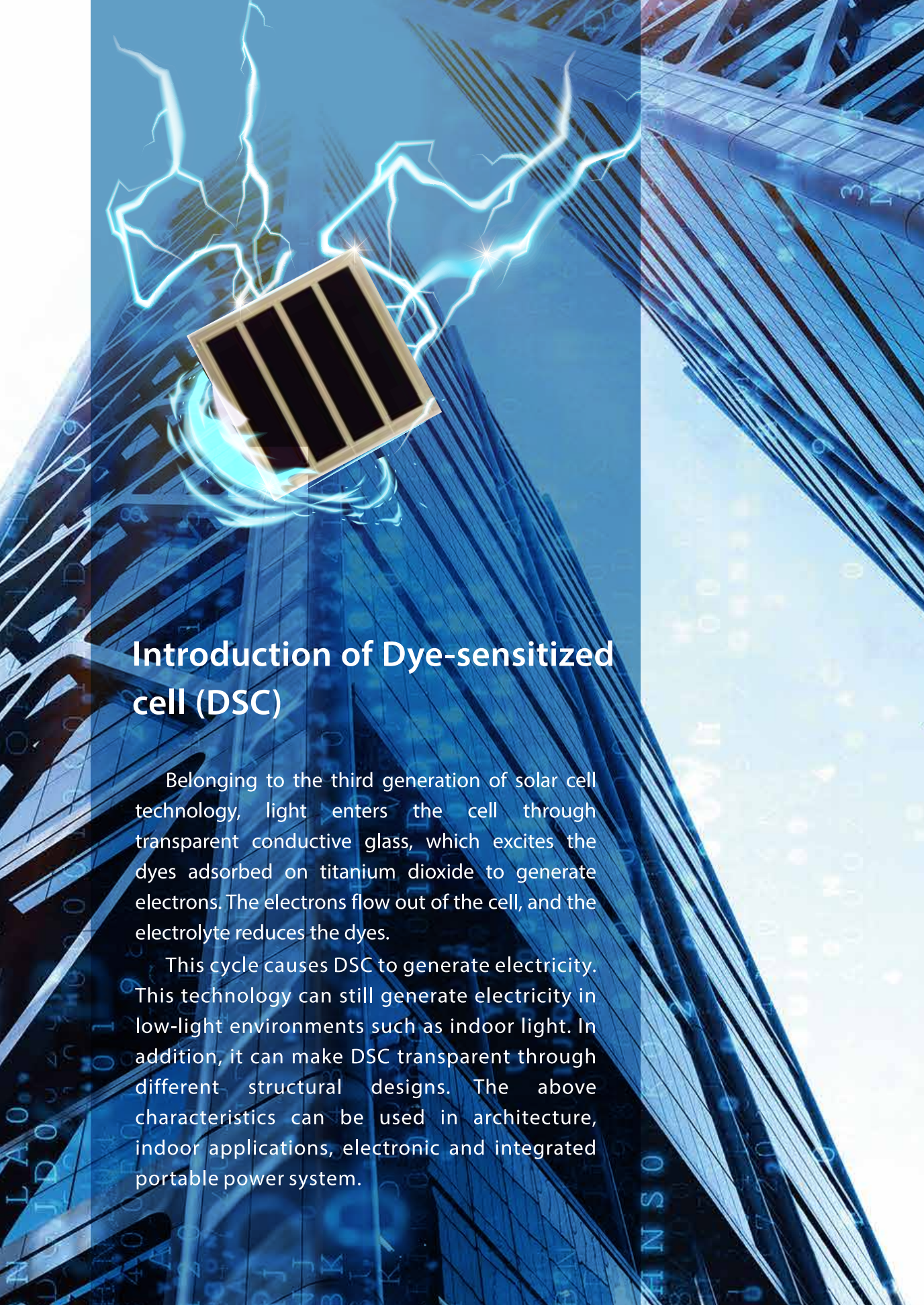
Eco-friendly

Energysaving

Innovation

Light up for Life

台灣塑膠工業股份有限公司
FORMOSA PLASTICS CORPORATION



Introduction of Dye-sensitized cell (DSC)

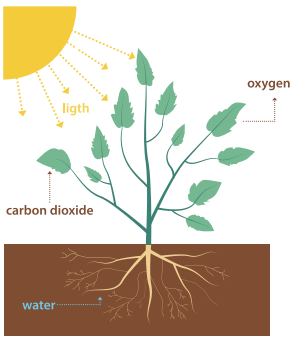
Belonging to the third generation of solar cell technology, light enters the cell through transparent conductive glass, which excites the dyes adsorbed on titanium dioxide to generate electrons. The electrons flow out of the cell, and the electrolyte reduces the dyes.

This cycle causes DSC to generate electricity. This technology can still generate electricity in low-light environments such as indoor light. In addition, it can make DSC transparent through different structural designs. The above characteristics can be used in architecture, indoor applications, electronic and integrated portable power system.

Dye-sensitized cell

Principle

STEP1 Natural PhotoSynthesis → **STEP2** Artificially Designed Dyes → **STEP3** Light converted into electricity = Light sensitizing

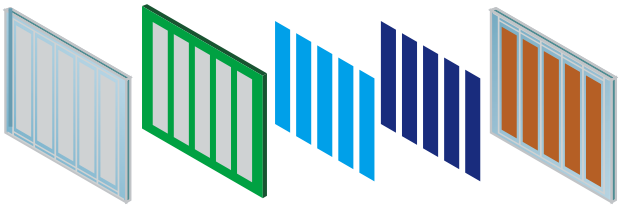


Introducing nanotechnology significantly improves light utilization efficiency

Dye-sensitized cell

Structure

Counter electrode and working electrode are assembled together, and the space between the two electrodes is filled with electrolyte.



Dye-sensitized cell

Features

LOW COST,
SIMPLE PROCESS,
And GOOD ACCUMULATION POWER GENERATION

- All screen printing (cells) technology
- Without large vacuum processing equipment
- Equipment and material sources can be localized
- Self-owned development technology

❶ Conversion efficiency less affected by sunlight angle.

❷ Both sides of the cell can absorb light, which is good for absorbing scattered light.

❸ In dim light, such as indoor light sources, it also can generate electricity.

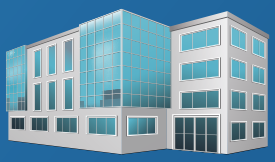
Dye-sensitized cell

Livelihood Application

Integrating building materials, the Internet of Things(IoT), and consumer electronic products with DSC make it possible to utilize ambient light to achieve a more convenient, comfortable, eco-friendly and energy saving life.

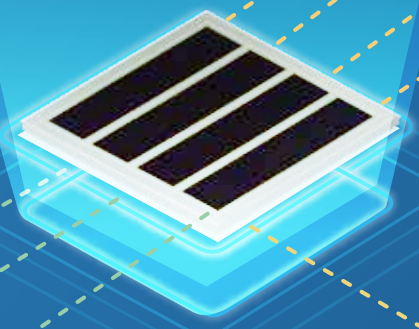
Outdoor Architecture

Negligible angle influence,
Short energy payback time,
Low temperature effect



IOT

Lightweight,
Customized design



Indoor Equipment

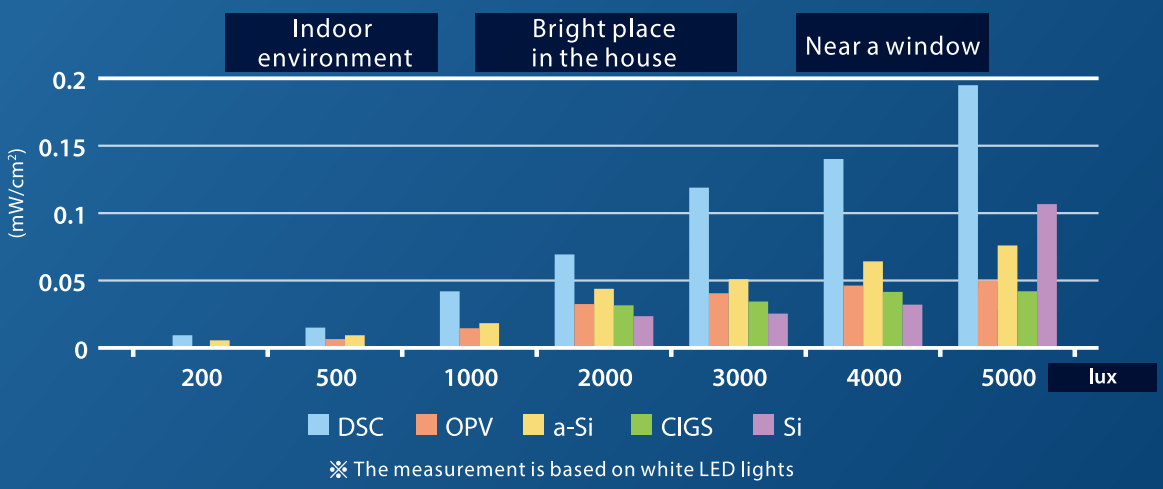
Good dim light power generation,
Customized design

Dye-sensitized cell

Actual power generation comparison

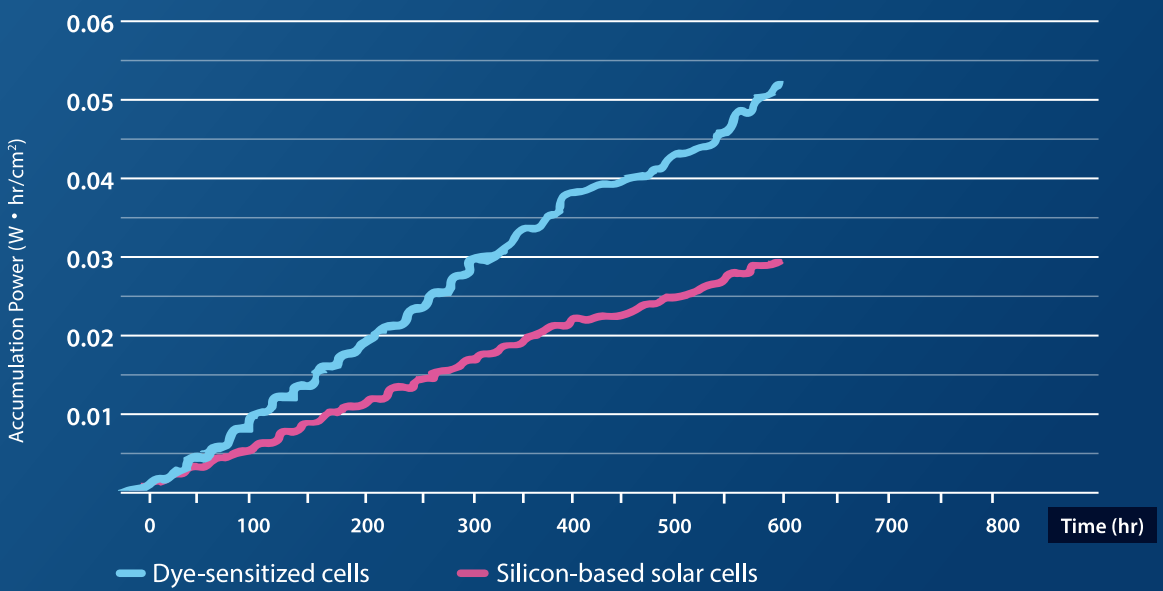
A best solution for light-driven self-powered system.

Power generation per unit area of various solar cells under different light intensities



※ The measurement is based on white LED lights

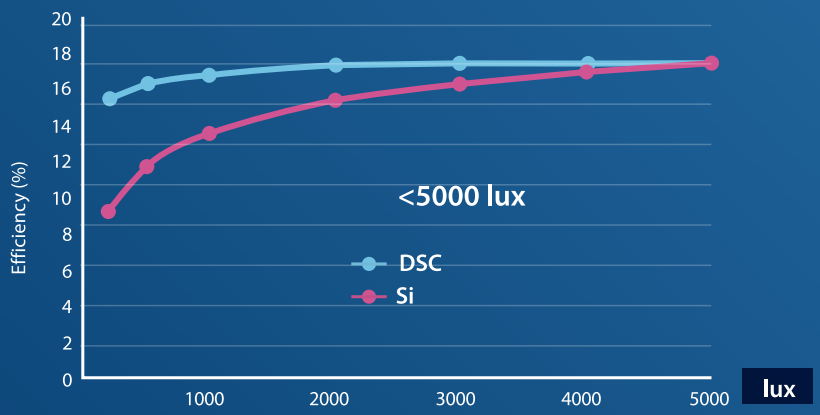
When light energy is converted into electricity near a window(environment), the accumulation power generation of dye-sensitized cell is 1.68 times that of the silicon-based solar cell.



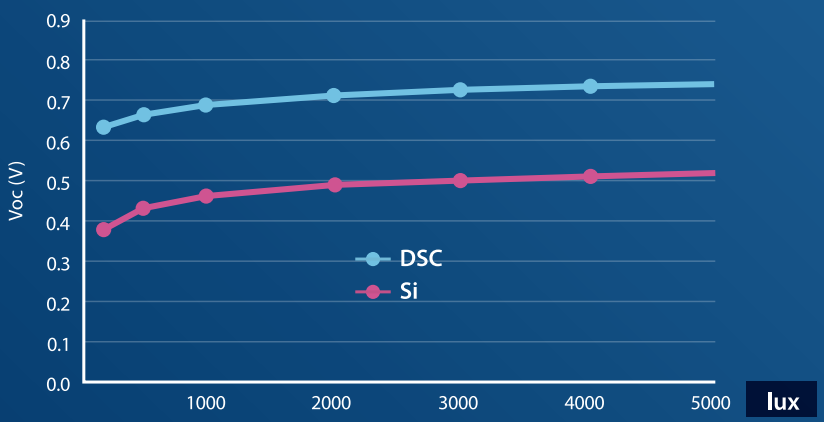
Dye-sensitized cell

Dim light power performance

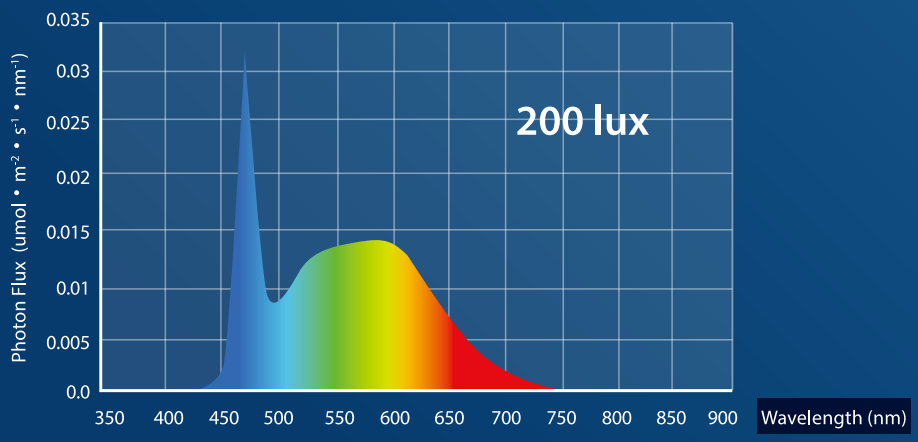
The DSC modules have excellent dim light power generation performance, which is more suitable for the Internet of Things(IoT) and consumer applications.



Dye-sensiized cells (DSC)



Silicon-based solar cells (Si)



Light source spectrum used for the measurement

Dye-sensitized cell

Power generation by the home ambient light source

- Power generation by a 121cm² DSC module with the efficiency of 15%(@1000 lux)

Dye-sensitized cell

Green energy office concept

Attachable light harvesting window

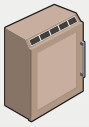
Dye-sensitized cells, which are installed on the attached window frame, can absorb the ambient light energy and convert into electricity at any time, and can charge the mobile device.

Light-driven clock

Dye-sensitized cells are used to drive the clock, replacing disposable batteries and reducing the generation of waste batteries.

Self-powered electronic desktop calendar

The schedule is wirelessly transmitted to the electronic desktop calendar through the mobile phone to display and remind. The electronic desktop calendar is powered by a dye-sensitized cell.

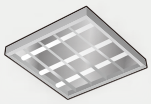


Ambient light harvesting locker

Dye-sensitized cells, which are installed in front of a locker, can absorb ambient light energy at any time and convert into electricity to supply the light in the locker.

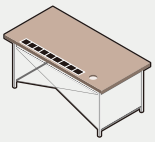
Self-powered wireless temperature and humidity sensor

It can be set anywhere with light and wirelessly transmits the detected temperature and humidity information to the client. The devices powered by dye-sensitized cells solve the trouble of battery replacement.



Power recovery lamp holder

Dye-sensitized cells, which are installed behind the fluorescent lamp, absorb excess light and convert into electricity. A set of 60cm^2 fluorescent lamp holder can recover 1 W of power.



Ambient light harvesting power generation table

Dye-sensitized cells, which are installed on the desktop, can absorb the ambient light energy and convert into electricity at any time, and can charge the mobile device.

Light-driven fragrance generator

The atomizer is driven by dye-sensitized cells to spread the fragrance in the air, and the device starts automatically when the light is illuminated.

Dye-sensitized cell

Environmental monitoring and smart home

Library temperature and humidity monitoring

Supermarket commodity (environmental) monitoring

Clean room (equipment) monitoring

Equipment temperature and power consumption monitoring

(Plant cultivation) Greenhouse monitoring

Computer facilities humidity monitoring

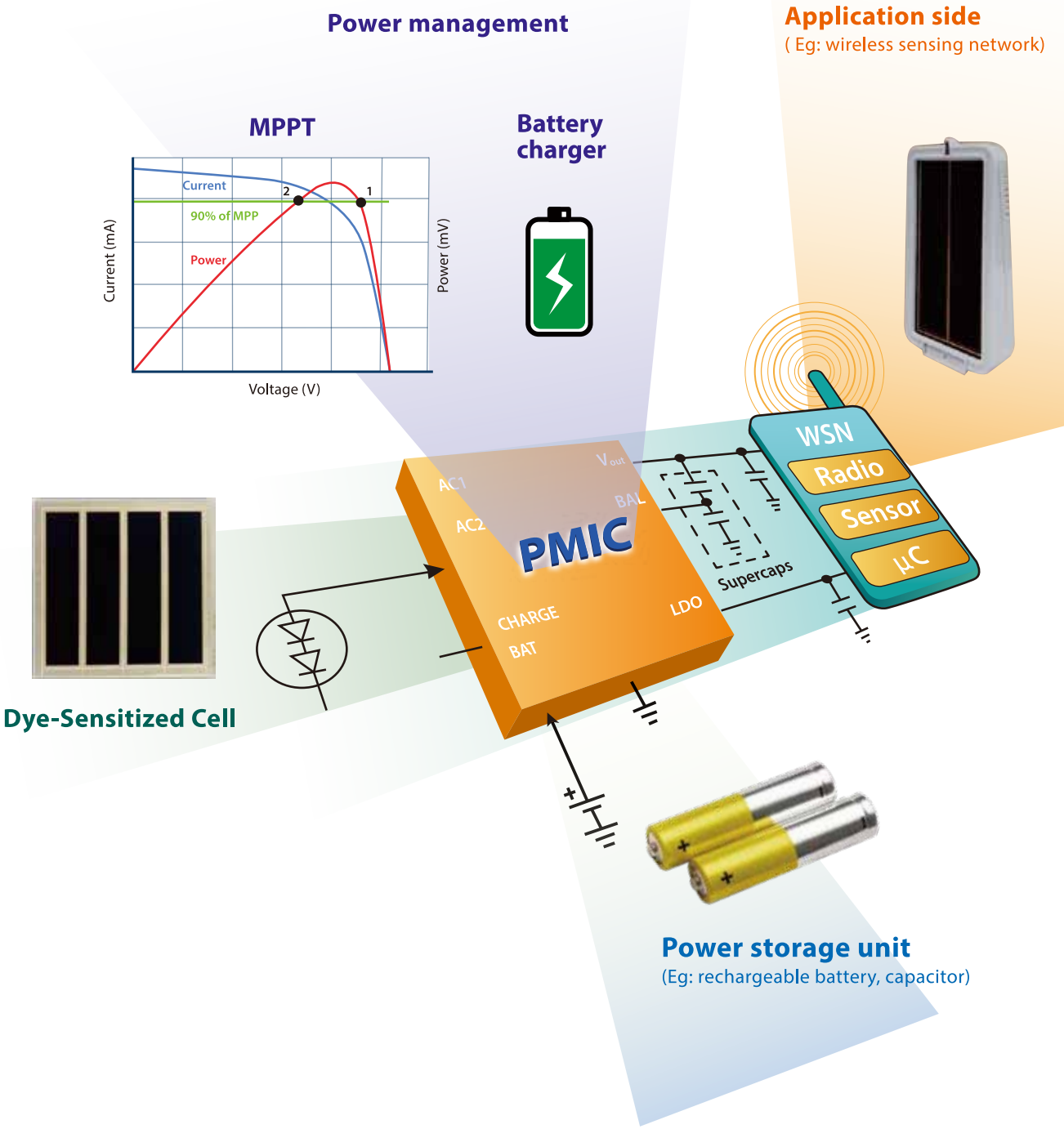
Drawstring curtains

Self-powered electric curtains replace drawstring curtains

Self-powered electric curtains

Dye-sensitized cell

Power management



Dye-sensitized cell

DSC Module Specifications

Item number	S-AF4-S3	S-AF6-S4	T-CF2-S1	T-CF2-S2	T-CF4-S3
	Transparent DSC module		Ultra-thin DSC module		
					
Size (mm^2)	110x112.25	150x153.6	55x55	55x110	110x110
Thickness (mm)	5.6	5.6	2.4	2.4	2.4
Power (mW)	TYP. 3.48 SPEC. ≥2.94	6.21 ≥5.43	0.79 ≥0.61	1.96 ≥1.67	3.62 ≥2.94
V_{oc} (V)	TYP. 0.63 SPEC. 0.55~0.65	0.63 0.55~0.65	0.64 0.55~0.65	0.65 0.55~0.65	0.63 0.55~0.65
I_{sc} (mA)	TYP. 7.06 SPEC. ≥6.30	12.60 ≥11.66	1.73 ≥1.41	4.10 ≥3.51	7.14 ≥6.30
Material	Glass	Glass	Glass ▪ Ti foil	Glass ▪ Ti foil	Glass ▪ Ti foil

Light source for measurement: 1000lux LED

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