

PowerFilm[®]
MADE IN THE USA
SOLAR



NGK INSULATORS

PowerFilm Solar & NGK Collaboration

Energy Harvesting Development Kit

PV

PowerFilm
MADE IN THE USA
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- ✓ 3.6mW/cm² @Full Sun
- ✓ thin (0.22mm), light(0.58g)
- *Dimensions: 54.0 x 36.5 (mm)
- ✓ Single Cell Operating Voltage: 1.2V
- ✓ Low cost

Outdoor Solar Cell

Battery



EnerCera ET series



NGK INSULATORS

- ✓ High resistance in “Float Charging”
*Keeping full charged
- ✓ High resistance in “Over Discharging”
- ✓ Low self-discharge current

Battery For Energy Harvesting

This collaboration will contribute to develop outdoor devices with “Light”, “High efficiency”, “Long life”.

Application example:

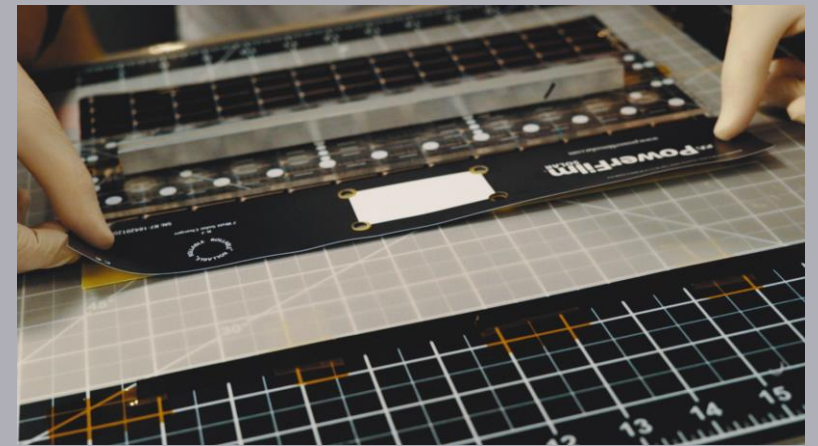
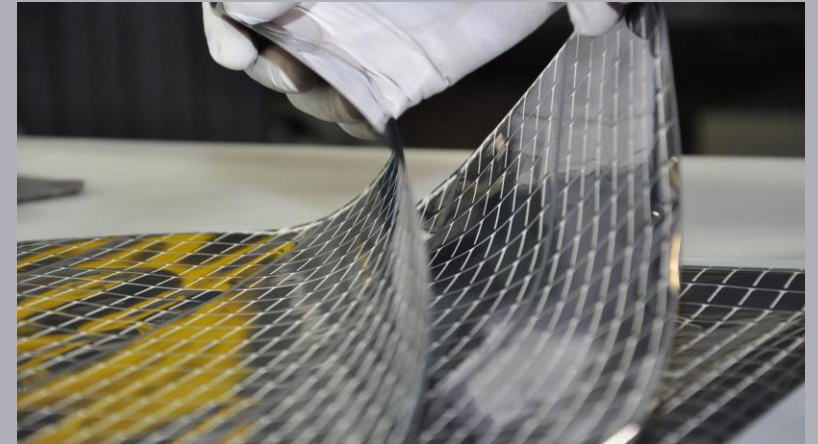
Asset tracking (tracking device), Smart Agriculture (monitoring device)

PowerFilm Brief

We design and manufacture custom solar cells, modules, panels and power solutions for energy harvesting and portable power applications using proprietary thin-film or high-efficiency crystalline PV technology.

With over 200 staff years of engineering experience, we have provided rugged and high-performance solar solutions across a wide range of IoT, transportation, government, and consumer markets.

We take great pride in supporting our customers with high-quality solar solutions. Located in Ames, Iowa, our products are completely designed and manufactured in the United States.



The Problem

Battery Life



Battery life is often measured in months rather than years.

Dead batteries must be recharged or replaced, putting a heavy maintenance burden and cost on end users and hindering wider spread implementation of large IoT networks.

Limited Power



IoT solution providers are forced to cut features or reduce functionality based on the limited capacity of a battery.

Devices can't recover from unexpected high power events, such as firmware updates and loss of connection.

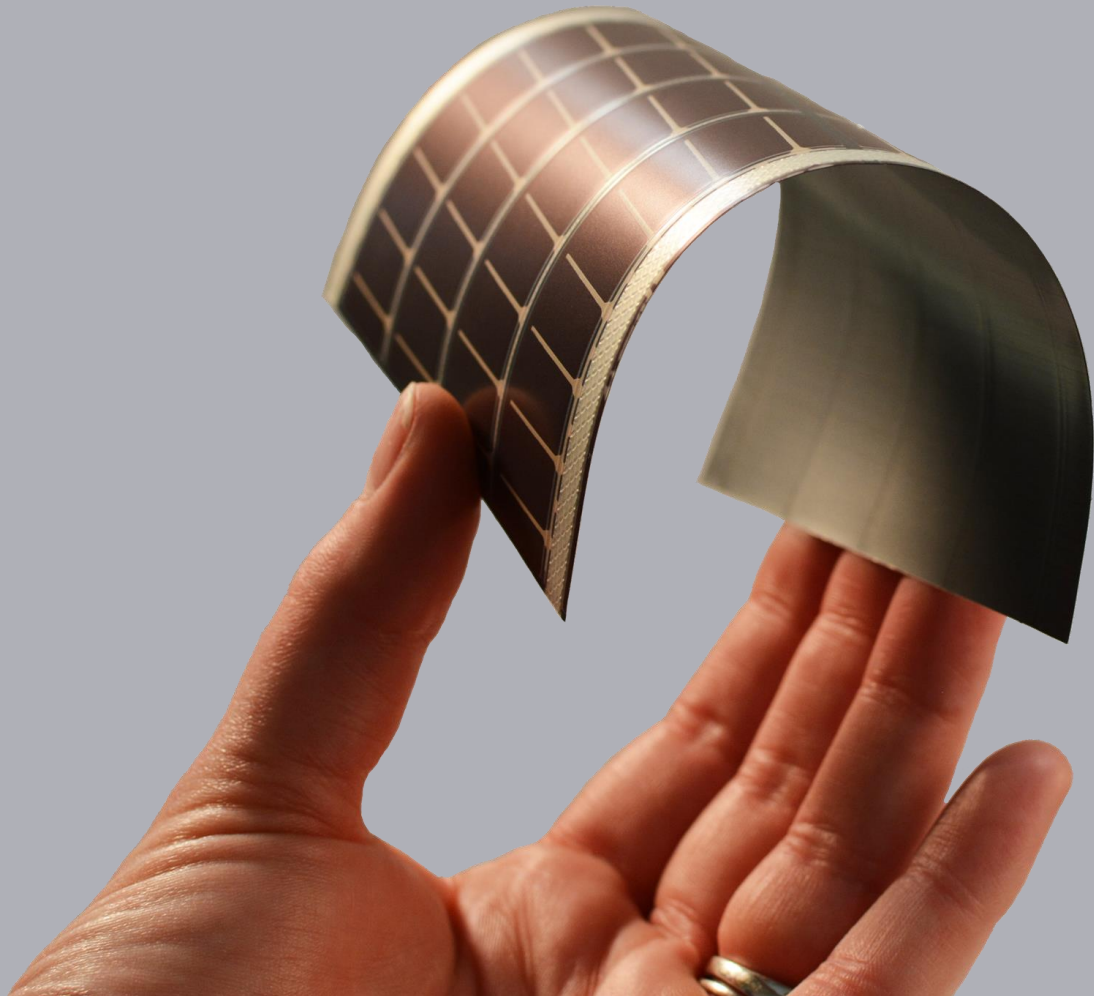
Battery Bulk



Batteries take up significant physical space compared to the electronics they power.

This is problematic for wearables and other low-profile electronics where reducing bulk volume is critical.

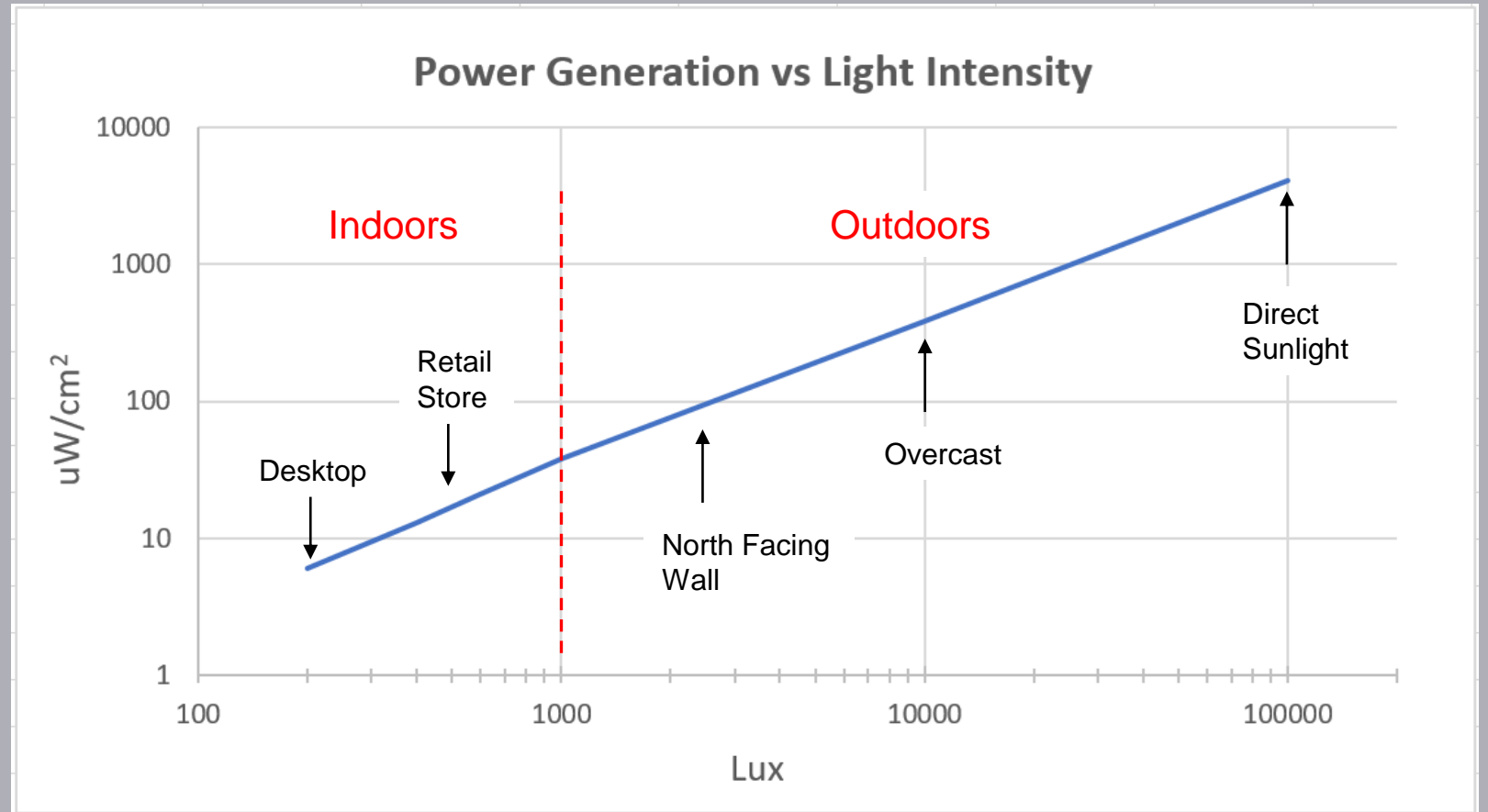
Electronic Component Solar Panels



- Panels are lightweight, paper-thin, and durable. Their ultra-thin, flexible profile enables easy integration into devices for solar recharging or direct power.
- The Indoor Light Series opens new opportunities for developing remote power solutions in low light and indoor applications.
- The Classic Application Series provides power for wireless electronics designed for outdoor portable and remote applications.

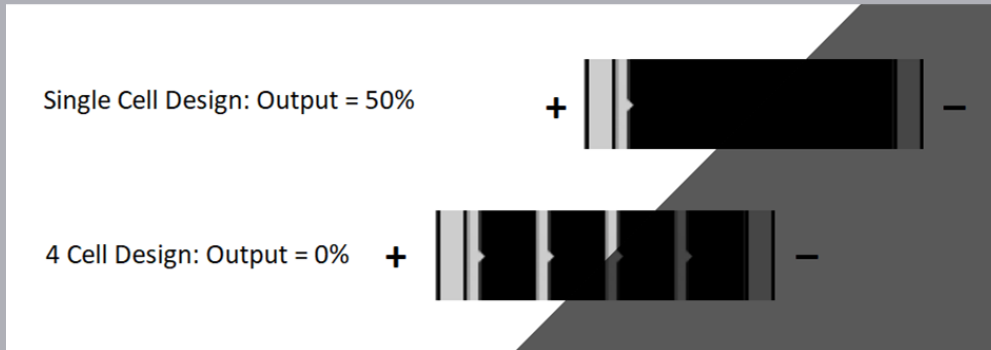
Light Intensity

- Power generation scales linearly with light intensity.
- Intensity indoors is up to 1000x lower than direct sunlight.
- Minute material defects become significant at lower light levels.



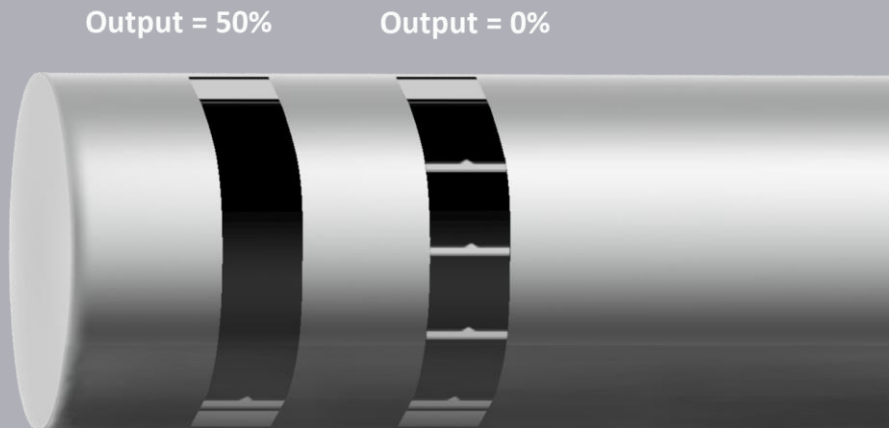
Can Cell Configuration Effect Output?

Shading Effects



- Current is limited to the least illuminated cell (Kirchoffs Law).
- Larger cells are more spatially efficient – less interconnect area.
- ~85% boost efficiency from 0.8V to 3.7V.
- Single cell modules are advantages for applications with irregular lighting – wearables, portables, indoor.

Curvature Effects



PowerFilm & NGK Development Kit Concept

Solar Panels:

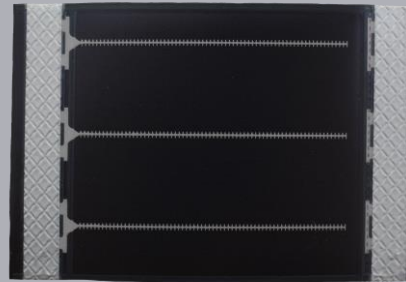
— ONP1.2-12x24

- Operating Voltage: 1.2V
- Full Sun (100,000 lux)
 - Current 3.3mA
- ¼ Sun (25,000 lux)
 - Current: 0.7mA



— ONP1.2-37x54

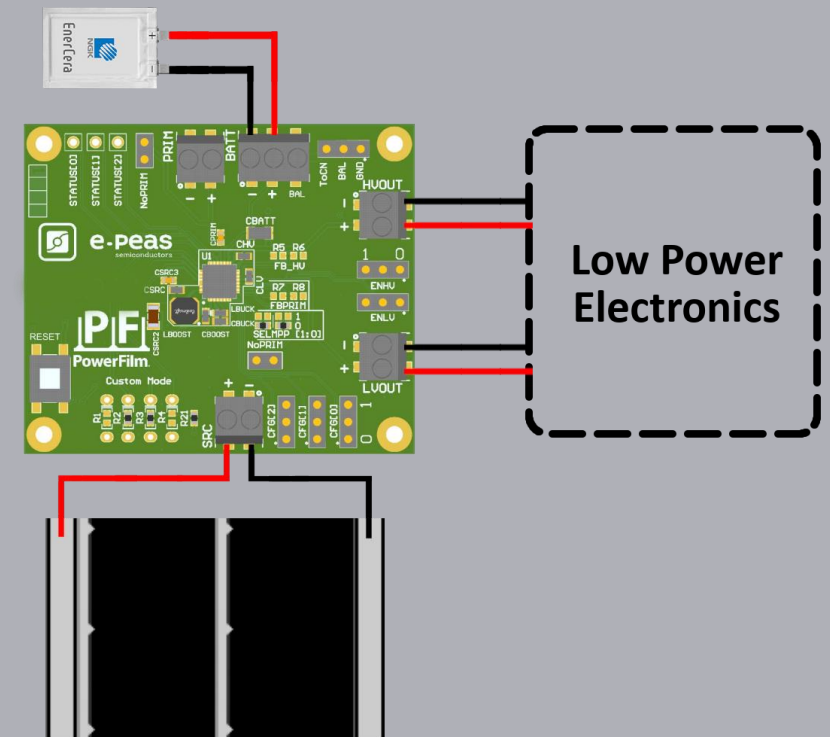
- Operating Voltage: 1.2V
- Full Sun (100,000 lux)
 - Current 50.8mA
- ¼ Sun (25,000 lux)
 - Current: 11.4mA



Battery:

— EnerCera Pouch : ET382704P-T

- 38mm×27mm×0.45mm
- Capacity : 20mAh, Nominal Voltage : 2.3V
- Peak Discharge Current : 300mA
 - *Voltage drop is less than 0.5V with continuous discharge for 0.1 sec. (at 25°C)
- Operating Temp. : -40 ~ 70°C
- Charging Voltage : 2.7V (Constant Voltage charging)
 - *No current control required



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NGK: https://form2.ngk-event.com/form/contact_en/input