



LONGi

# Hi-MO X10

Peak of Crystalline Silicon  
First Choice for Value

HPBC  
2.0

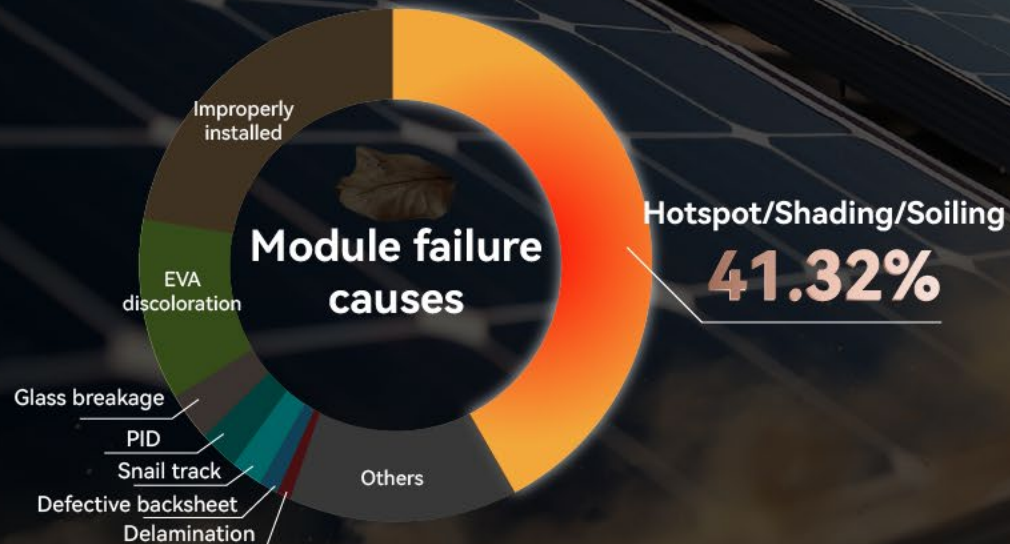


# Shading and Hot Spots are Core Challenges for Safe and Efficient Operation

Frequent Shading and Hot Spot Problems | Threatening Power Station Safety and Return

## Nearly 50% of Module Failures are Caused by Shading

- Rooftop equipment shading  
Fans, air floors, attics, etc.
- Surroundings shading  
Buildings, tree shade, etc.
- Dust and scale shading  
Dust, scale adhesion, etc.



## Shading and Hot Spots Have a Serious Impact on the Stable Operation of Modules and Systems



### Reduction in power generation

Shading dramatically reduces module power generation efficiency



### Aging

Destroys module encapsulation materials  
Accelerates module aging



### Safety hazard

Hot spots may cause fire and other safety accidents



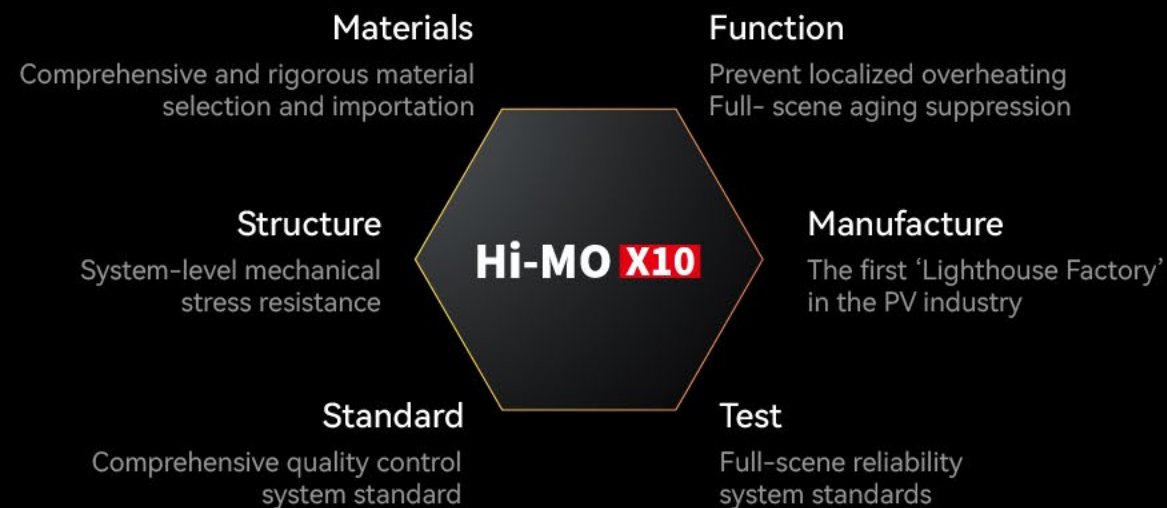
### Increasing O&M

Increase frequency of O&M  
Increase electricity cost

# Hi-MO X10 Ultra-High Safety | New Pilotage

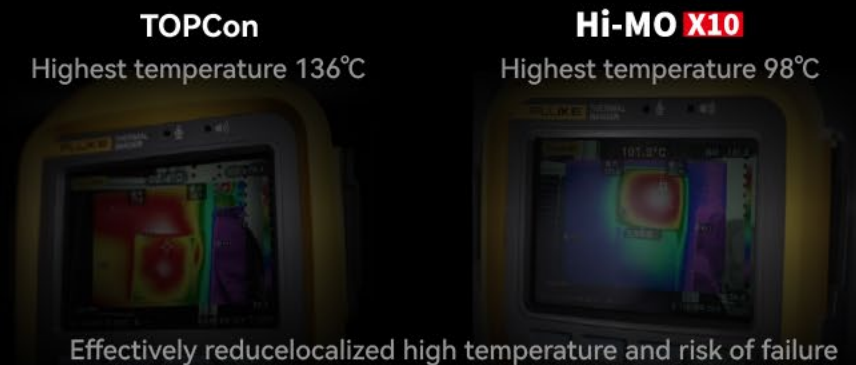
Product Reliability Ensures Stable Operation of Power Plants

## ‘Hexagonal Warrior’, Reliable Cornerstone of Station



Compared to competitors, reduce product failure risk by 45.2%+

## Prevent localized overheating



## Full-Scene Aging Suppression

Humidity & heat

High UV

High temperature difference

Combating multiple environmental stresses, reduces reliability risk

# Hi-MO X10 Ultra-High Return | New Pilotage

Higher Capacity, Higher Generation, More return

## Ultra-High Power | Ultra-Low Degradation

### High efficiency

Leading power of 30W higher

### Low degradation

Stronger long-term  
power generation gains

### Low failure

Reduce module loss

### Low temperature coefficient

Better performance at high temperatures

## Flexible Design | Shading Optimization



### Flexible design

Maximizing roof utilization

### Shading optimization

Reduction of power loss

TOPCon

65%



Hi-MO X10

92%



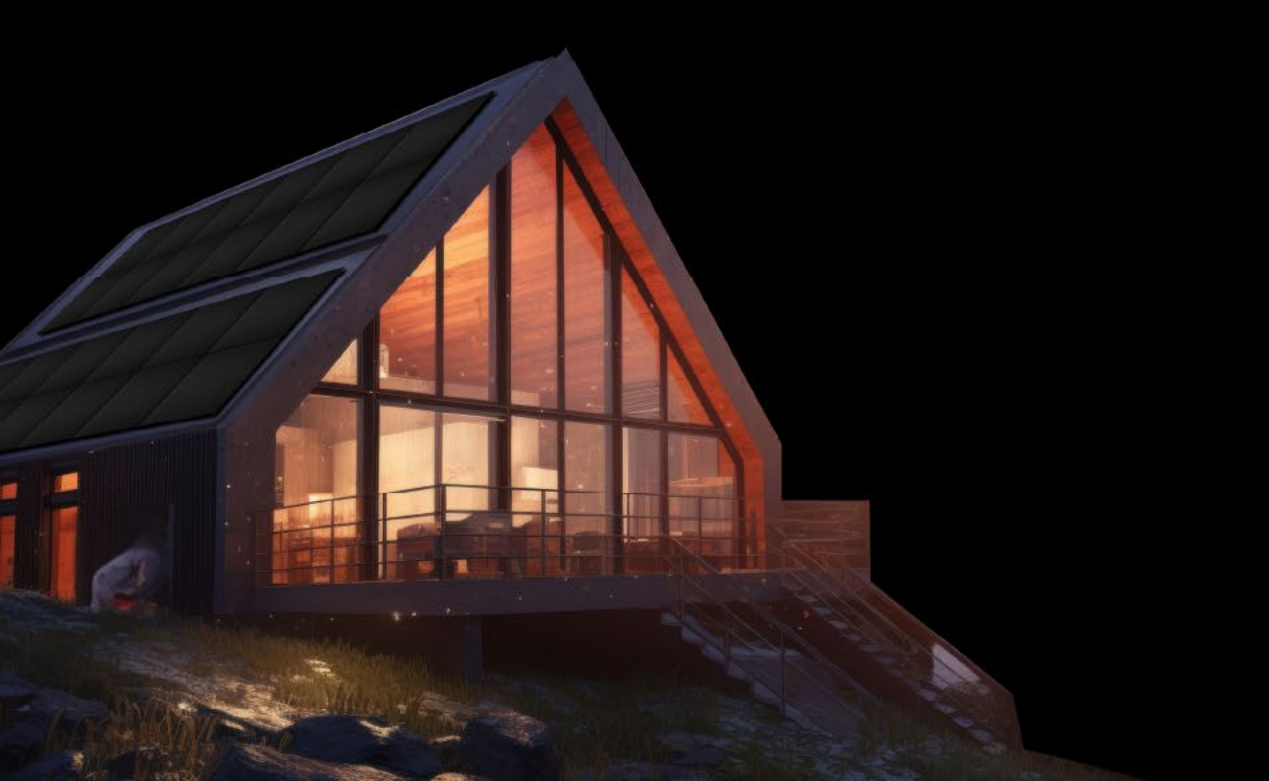
# Hi-MO X10 Scenario Matching | New Pilotage

Practicing Low Carbon Aesthetics | Function Matching Scenario

## Module Aesthetics | Architectural Integration

No frontal gridline, simplified appearance

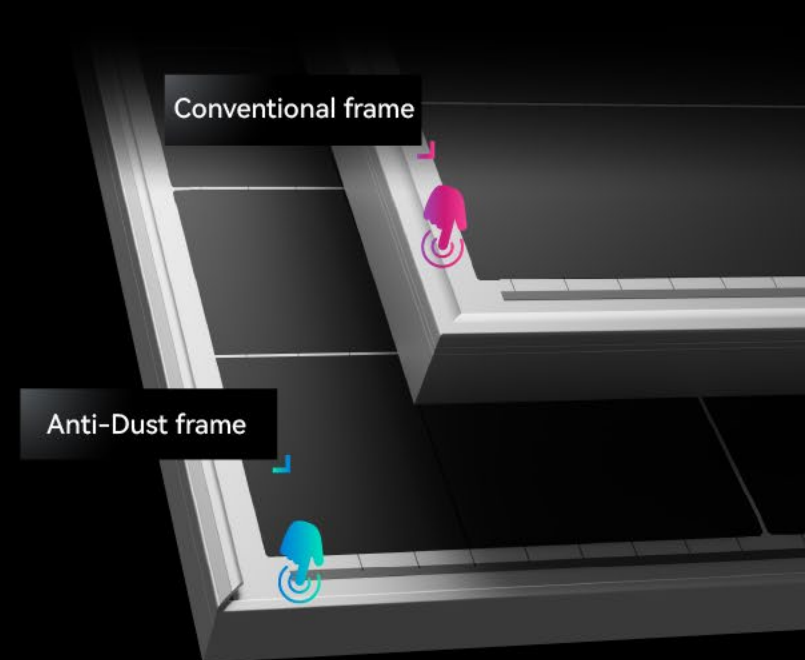
Technology and aesthetics are integrated into multiple scenarios



## Genetic Continuity | Innovative Design

Technology enablement, anti-dust design

Solve customer pain points, reduce the impact of dust accumulation and improve power generation revenue



# First Choice for High-Value Modules in Global DG Market

Three Key Leaps | Four Overall Leadings

Maximum  
conversion efficiency

**24.8%**

Maximum  
module power

**670w**

## Four Leadings



Performance  
leading



Reliability  
leading



Standard  
leading



Manufacturing  
leading

## Three Leaps



Silicon Substrate



Cell technology



BC Manufacturing

HPBC  
2.0

**54<sub>C</sub>**  
Monofacial

HPBC  
2.0

**72<sub>C</sub>**  
Monofacial

HPBC  
2.0

**72<sub>C</sub>**  
Anti-Dust

HPBC  
2.0

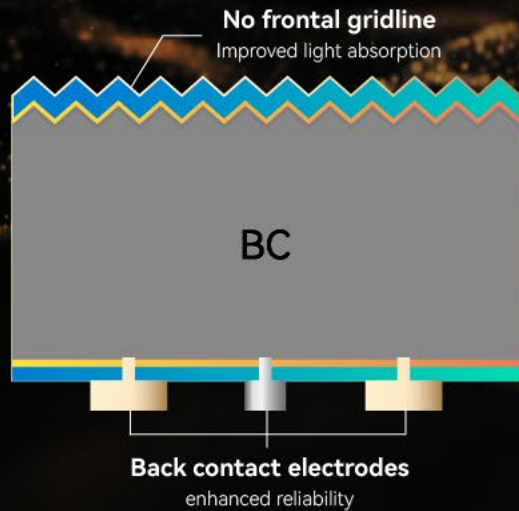
**72<sub>C</sub>**  
Bifacial

# BC: Peak of Silicon Cell Technology

Talent and Compatibility Coexist | Closest to Efficiency Limits

## Talent

No frontal gridline + Back contact electrodes  
Improved light absorption and enhanced reliability



## Compatibility

Platform technology  
compatible with other passivation processes

Tunneling oxide  
passivation contact

Heterojunction  
passivation

Passivated emitter  
and rear contact

## Peak Efficiency

BC closest to the crystalline silicon  
cell limit of 29.4 %

29.1%

XBC theoretical efficiency

# Successful Launch of HPBC 1.0 in 2022 Boosted BC Technology to Commercialization

Hi-MO X6 Enter Thousands of Industries and Households

Aerospace

High-end Villa

Transportation

Manufacture

Education

Family



## Hybrid Passivation Efficiency Improvement

Self-developed innovative hybrid passivation  
Cell efficiency: 25.8%  
Module efficiency: 23.3%



## Process Innovation Industrial Layout

Process innovation breakthrough  
Partner gathering and coexistence  
BC turn into mass production first time



## Empirical Test Performance Leading Power Generation

Customer-owned Station:  
2%+ higher than mainstream TOPCon  
PV Magazine Rank:  
No.1 in monofacial power generation in 2023



## Worldwide Shipment Customer Preferences

2024 H1 BC module shipments 10GW+  
2022 BC modules shipments 1GW

# HPBC 2.0 Sets Sail | Great Leaps in 3 Key Technologies

BC Platform x Bipolar Hybrid Passivation x TaiRay Core x 0BB Structure



## Leap the Cell Technology Barrier

Upgrade three-layer structure of light absorption/photovoltaic conversion/electricity transmission



## Leap the Silicon Substrate Limitations

Equipped with TaiRay core  
Enhances overall power generation potential and reliability



## Leap the BC Manufacturing Dilemma

Innovative development of 0BB structure,  
Breakthroughs in key processes and materials

# HPBC 2.0

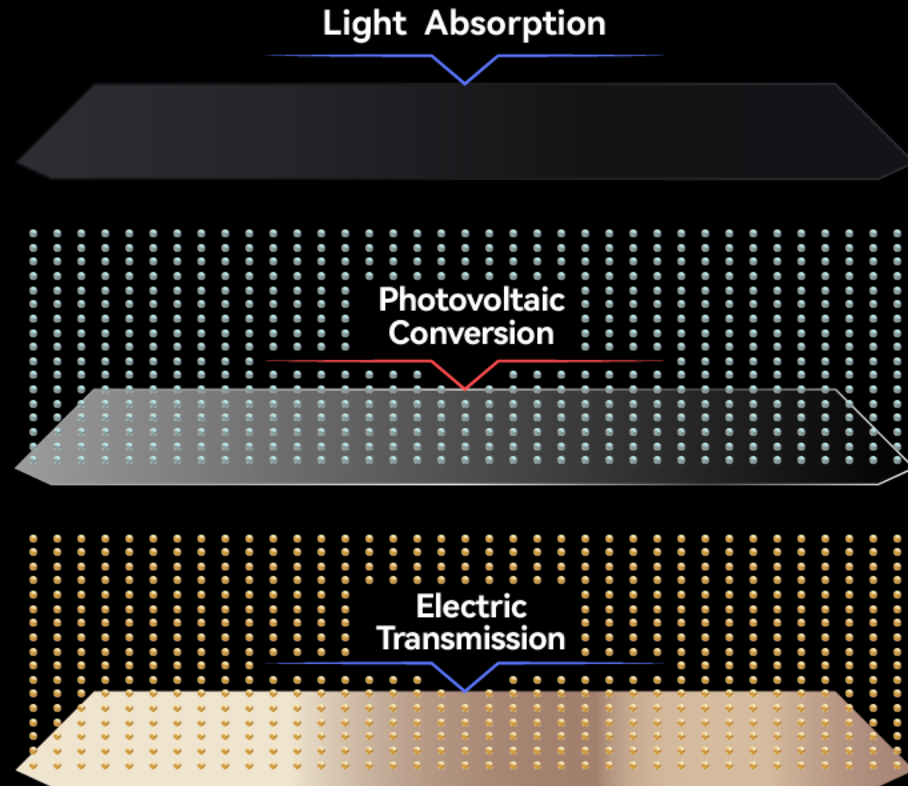
Mass  
Efficiency

# 26.6%+

Last generation of crystalline silicon cells to achieve 1% leap in absolute efficiency. Closest to the theoretical limit of 29.4% for mass production cells. Customer's best choice for performance/reliability/aesthetics

# Leap the Cell Technology Barrier

Bipolar Hybrid Passivation | Upgrade Three-layer Structure



## Optimised Multi-layer Anti-reflection Film: Increase Light Absorption

2.25% increase in short-circuit current  
12%+ reduction in reflections at short waves

## Self-developed Bipolar Hybrid Passivation

Mass production Voc exceeds 745 mV  
Effective against UV-induced degradation

## Soft Breakdown Design+ Bipolar Low Resistance Passivation Contacts

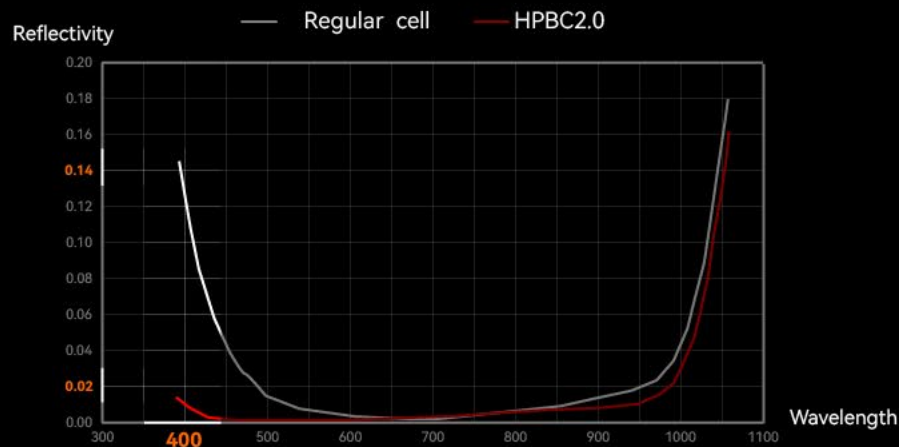
Reduced shading power loss  
Overall cell efficiency improvement

# Light Absorption Layer: Optimised Multi-layer Anti-reflection Film

Reduces Reflections and Boosts Current | Uniform Texture and Low Light Enhancement

## Regular Cell Texture

Unevenness  $> 2\mu\text{m}$   
Short-wave reflectivity  $> 14\%$



## High Irradiation Condition

Overall enhancement of power generation  
improves cell short-circuit current by about 2.25 %

## Low Irradiation Condition

Shortwave reflectivity reduced by 12%  
Additional 0.4% boost in power generation

## HPBC 2.0 Texture

Unevenness  $< 1\mu\text{m}$   
Short-wave reflectivity  $< 2\%$

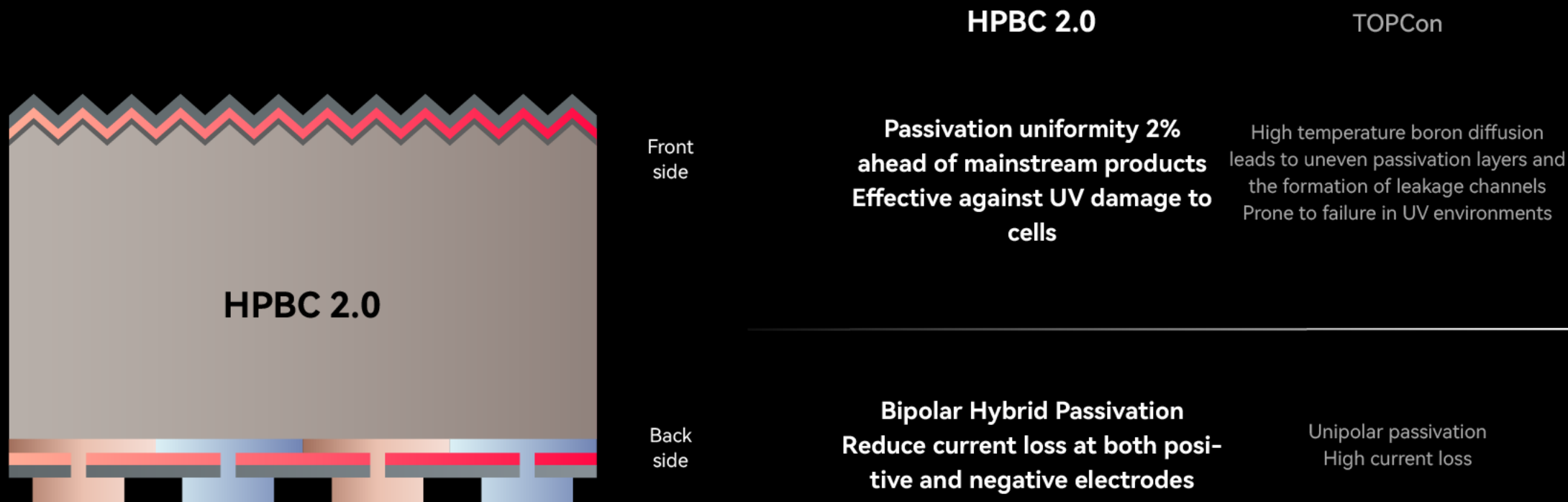


$> 2\mu\text{m}$

$< 1\mu\text{m}$

# Photovoltaic Conversion Layer: Self-developed Bipolar Hybrid Passivation

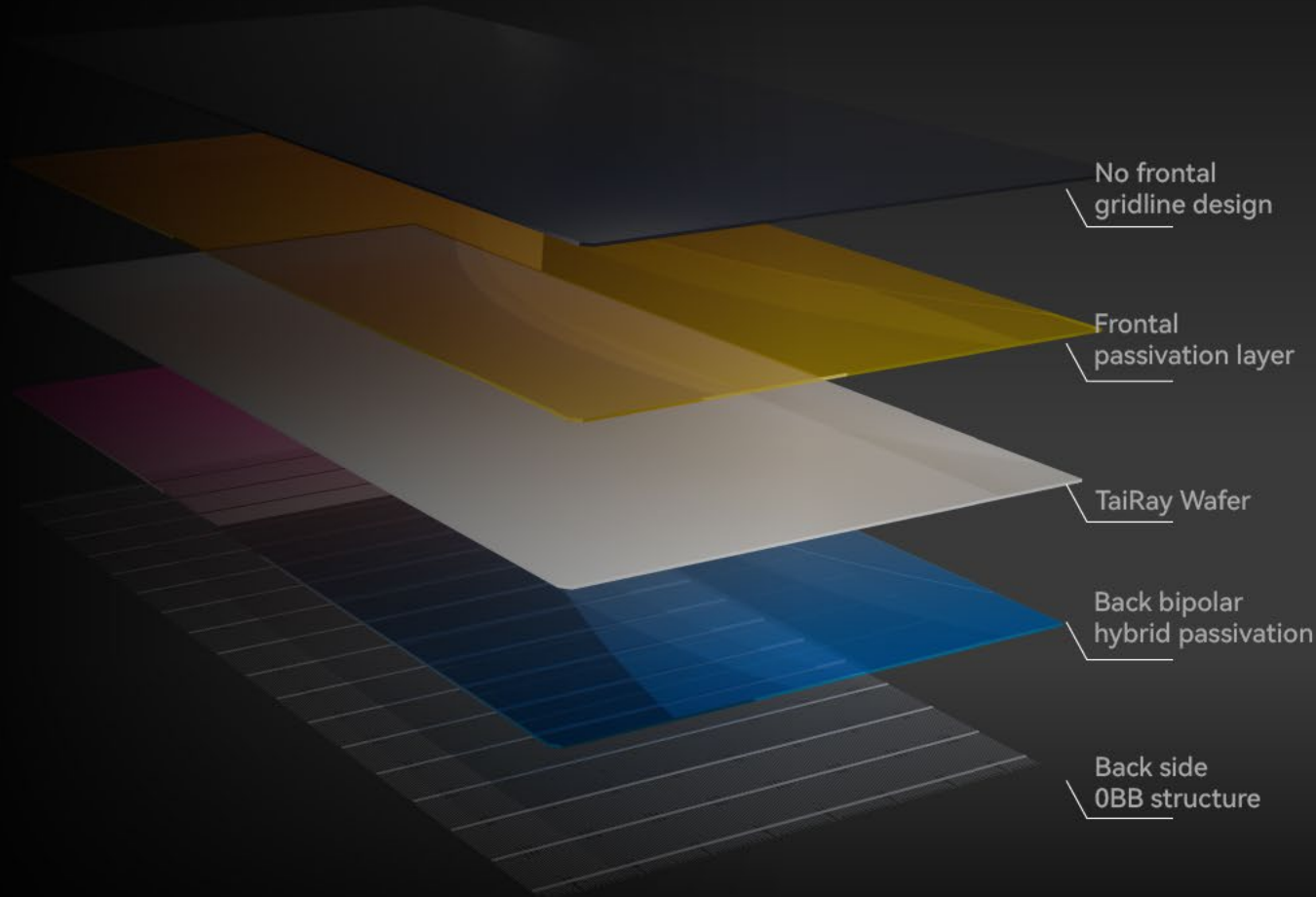
Bipolar Hybrid Passivation Boosts Voc | Uniform Passivation Reduces Aging Risk



Bipolar hybrid passivation process boosts open-circuit voltage by 15mV+. Mass production voltage exceeds 745mV  
Comprehensively improve cell efficiency and degradation performance

# Electricity Transmission Layer: Soft Breakdown Design+ Bipolar Low Resistance Passivation

Soft Breakdown Design Reduces Shading Power Loss | Low Resistance Contact Improves Overall Cell Performance



## Innovative Soft Breakdown Design

Similar to built-in bypass diode  
Reduces power loss by 70%+ under shading

## High-doped Bipolar Passivation Contact Layer

Lower contact resistance, lower manufacturing temperature, no silicon-based damage. Improve current efficiency

## Anode Paste Optimization

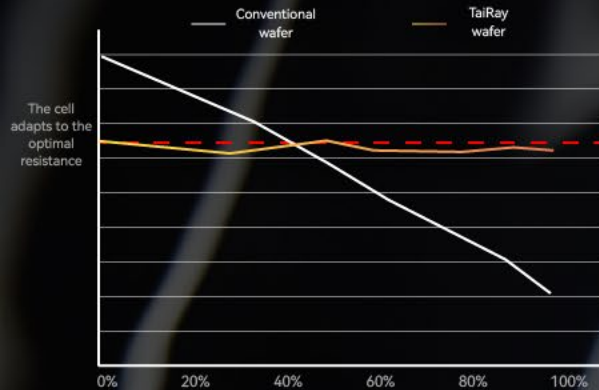
42% lower resistivity  
Fearless of moisture corrosion

# TaiRay Wafer: Revolutionary Changes in the Silicon Wafer Industry in the Last 10 Years

Better Matching | Higher Concentration | Lower Impurities | More Impact-Resistant

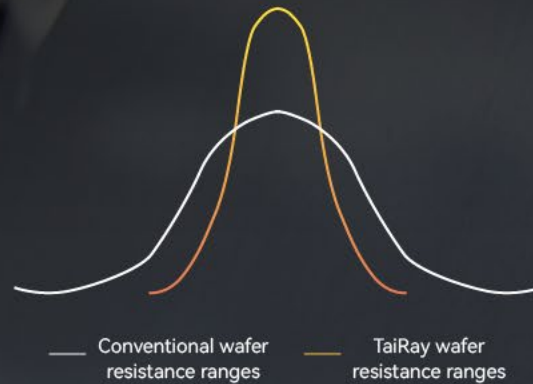
## Better Matching

Better matching of best cell resistance than conventional wafer



## Higher Concentration

The resistant distribution is more concentrated reduce the risk of mismatching



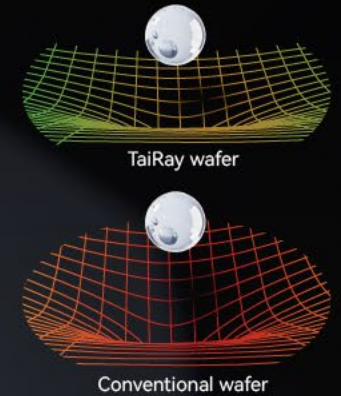
## Lower impurities

Reduce the migration and activation energy of impurities and better gettering performance



## More impact-resistant

Mechanical strength increased by 16%, less prone to cause breakage and micro-cracks

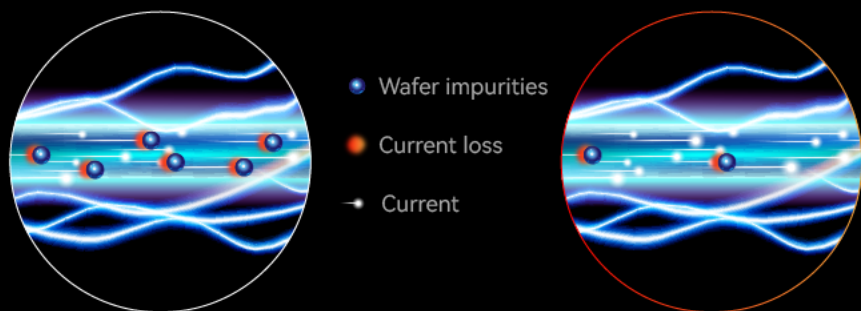


Under the same stress, the surface collapse of TaiRay wafer is smaller

# Leap the Silicon Substrate Limitations | TaiRay Comprehensively Enhance the Performance

Improve Power Generation Potential | Reduce Micro-Crack Risk

## Improve Power Generation Potential



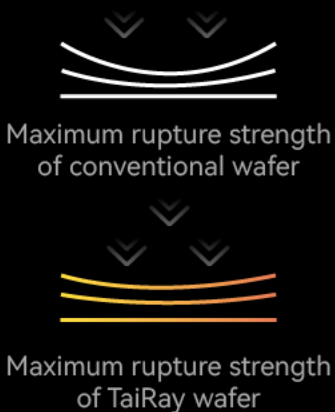
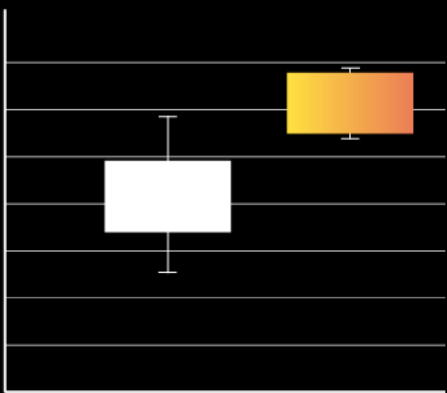
### Conventional wafer

More wafer impurities  
Poor resistance uniformity  
More current loss

### TaiRay wafer

Less wafer impurities  
High resistance uniformity  
Less current loss

## Reduce Micro-Crack Risk

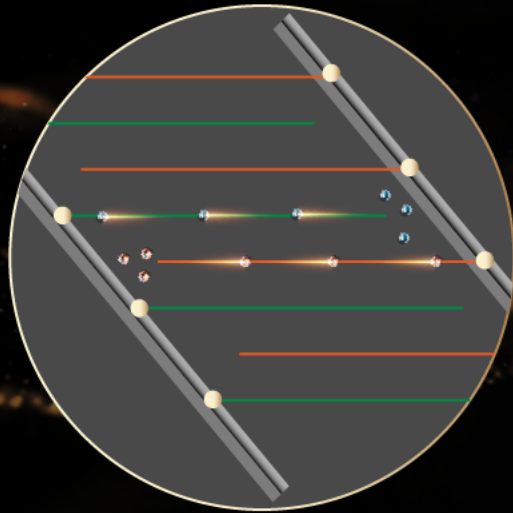


Maximum rupture strength increased by 16%  
significantly reducing the risk of cell micro-cracks

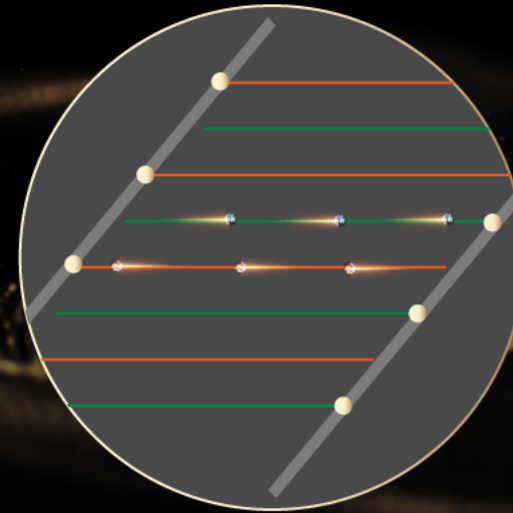
# Leap the BC Manufacturing Dilemma | Innovative Development of 0BB Structures

No Frontal Gridline | No Back Busbar

Traditional BC backside gridline structure



Hi-MO X10  
Backside 0BB structure



- Busbar
- Welding strip
- Positive charge
- Negative charge
- Solder joints

Remove the busbar, the finger directly connect with welding strip.

Reduce electricity transmission distance, increase module power by about 5 W, increase bifacial rate to 75%

# Leap the BC Manufacturing Dilemma | Breakthroughs in Key Processes and Materials

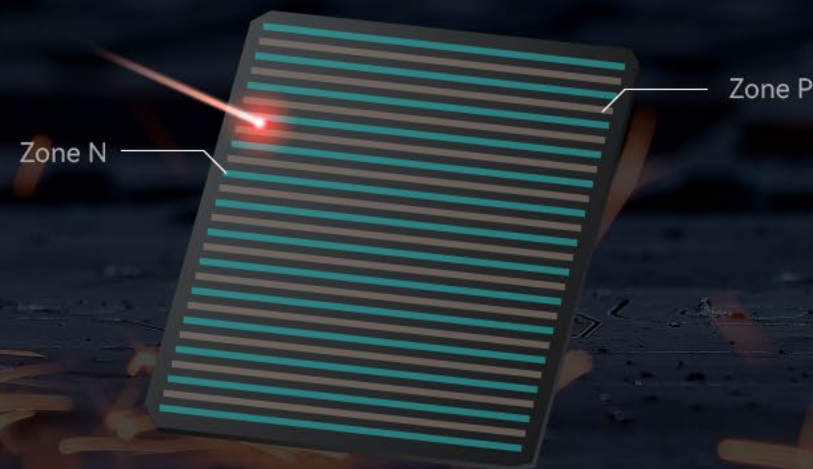
Innovative Insulation Materials Improves the Upper Limit of Cell Efficiency | Laser Etching Process Achieves Accurate PN Partitioning

## High-Transparency Insulation Material + High-Precision Printing



High-transparency insulation material improves the second absorption of light, matching high-precision printing to eliminate the leakage effects, improving cell efficiency by 0.2%+.

## Laser Etching Process



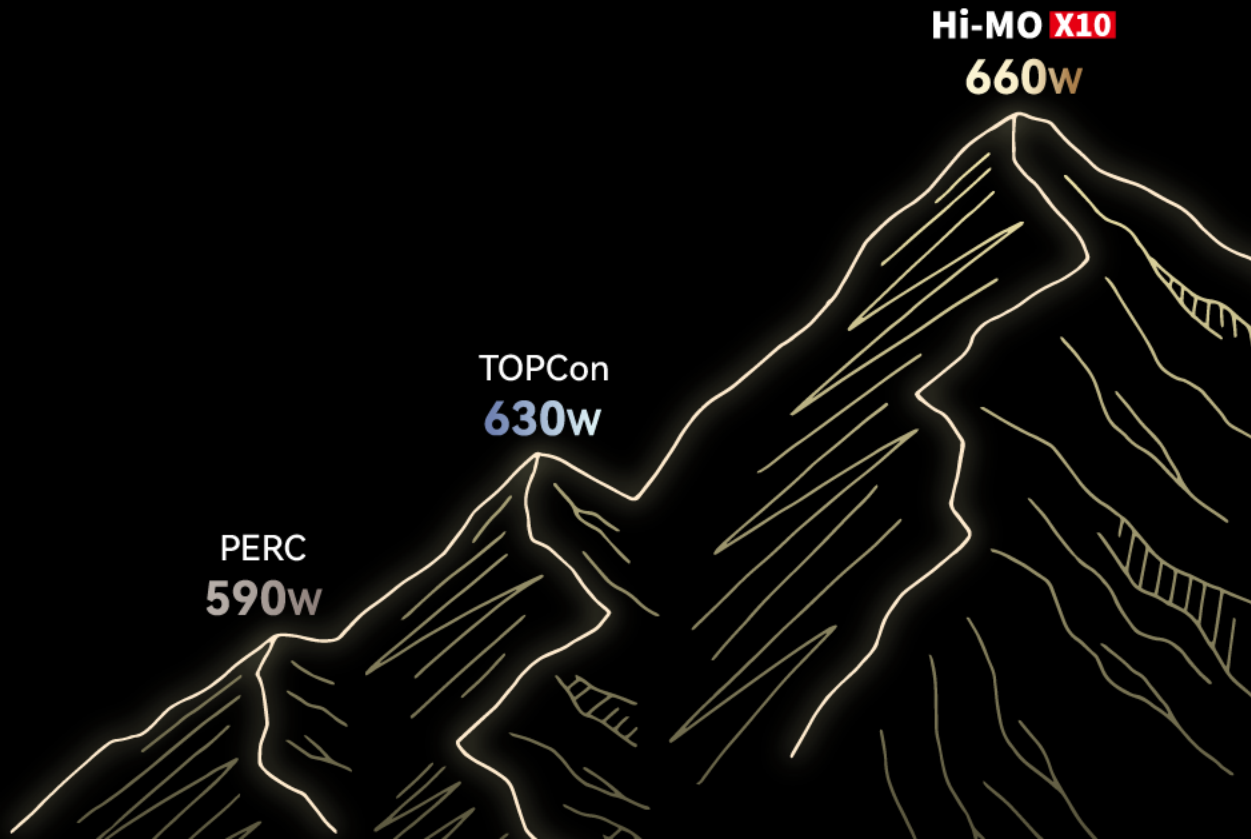
LONGi develops laser vision algorithms and control equipment to achieve fine control of pulse speed and pulse width, further achieving precise isolation of the PN zone.

# Peak Efficiency | Power Leads TOPCon by 30W

About 5% Increase in Installed Capacity on the Same Roof

## Ultra-High Power

The mass production power leads competitors by 30W



## Higher Installed Capacity

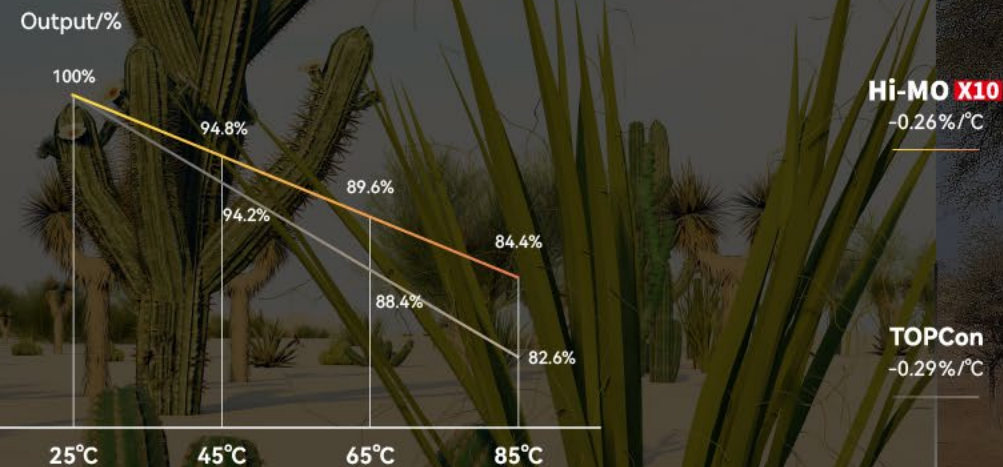
About 5% Increase in Installed Capacity compared to TOPCon for same area



# Fearless of High Temperature | Lasting Strength

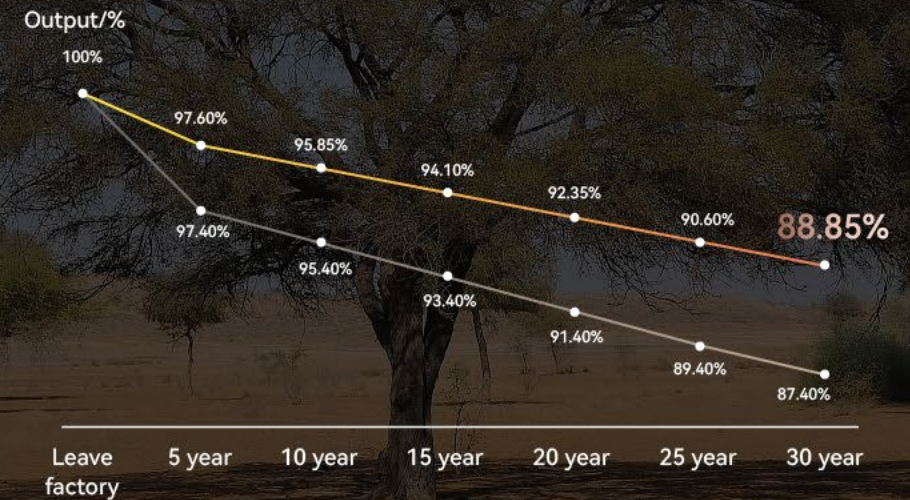
Better Power Generation Performance at High Temperatures | Stronger Long-term Power Generation Gain

## Fearless to High Temperature



Power temperature coefficient: -0.26%/°C. up by 0.03%/°C compared with TOPCon.  
Better power generation performance at high temperatures.

## Lasting Strength



First year degradation: 1%. linear degradation: 0.35%.  
Long-lasting power generation throughout life cycle.  
Lower degradation rate, lower mismatch loss, reduction of mismatch risk by over 2.36%.

# Anti-Shading | Can Recover 70% of Power Loss

Minimize Shading Loss | Maximize Roof Utilization

Equipment Shading

Leaves Shading

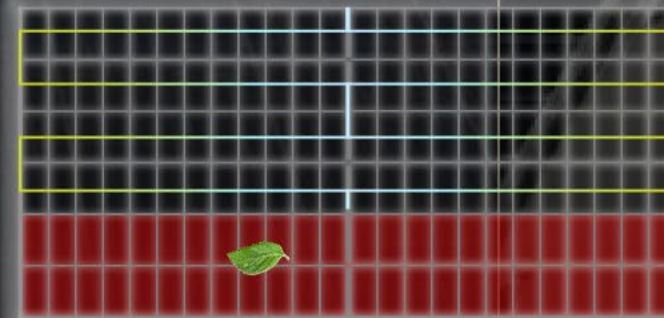
Dust Shading

Snow Shading



**Hi-MO X10**

Single-cell shading leads to self-bypass  
No affect to the power output of the entire string of cells.  
Less power loss



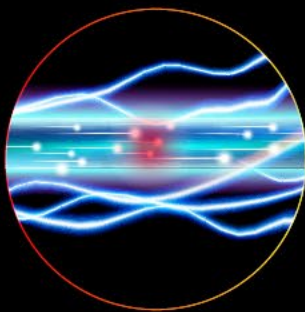
**Conventional moudle**

Single-cell shading leads to the entire string of cells to bypass  
Large power loss

In the case of one cell shaded, the power loss is 70% less than that of TOPCon modules

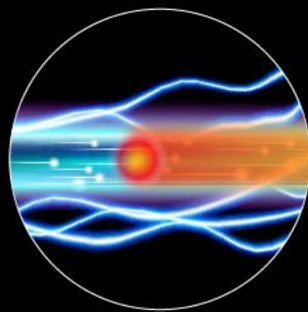
# Prevent Localized Overheating | Eliminate Fire Hazards

Innovative Soft Breakdown Design | Buy “Fire Insurance” for Your Roof



## Hi-MO X10

Soft breakdown design allows blocked current to bypass and prevent localized overheating



## TOPCon

The current is blocked, and occurs localized heating, the temperature rises to form a “hot spot”

Localized temperature reduced  
**28%+** compare with regular cell

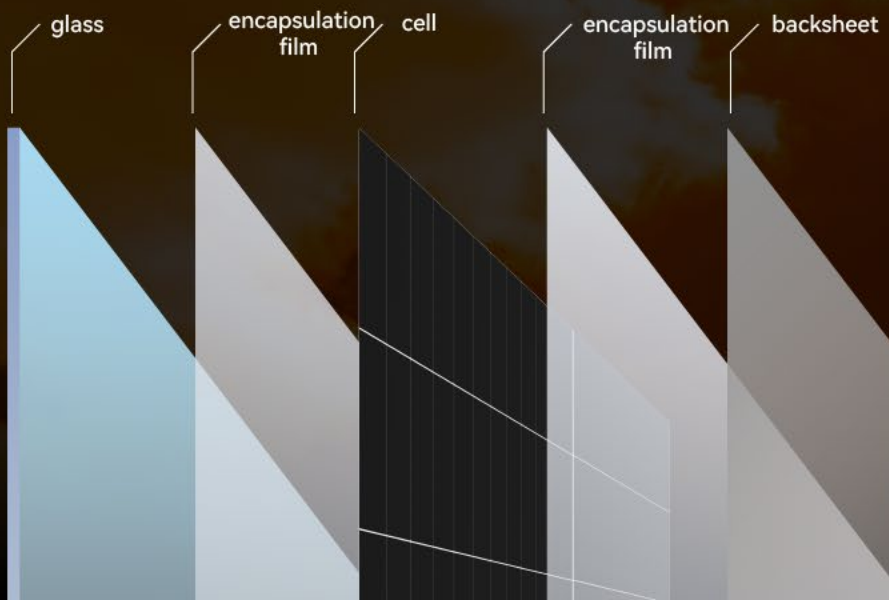
Even if the probability is one in ten thousand, once a fire occurs, the power station will suffer huge losses. The innovative Soft Breakdown function of Hi-MO X10 is equivalent to buying a 30-year fire insurance for the rooftop power station.

# Full-Scene Aging Suppression

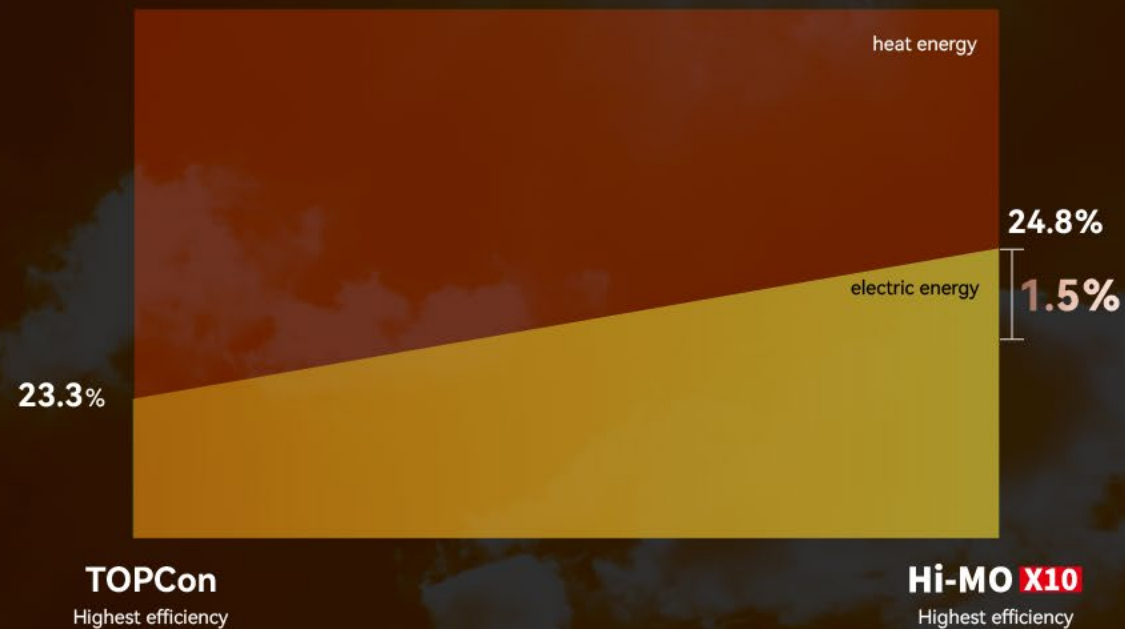
More Reliable Packaging Resists Aging | Lower Operating Temperature

## High-Reliability Packaging

- High density packaging
- POE encapsulation film
- Pure silver electrode paste
- Innovation bipolar hybrid passivation



## Low Operating Temperature

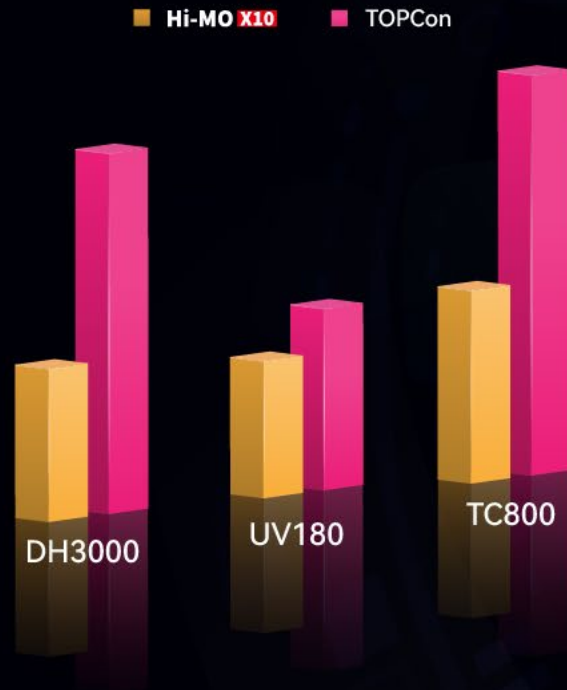


The operating temperature of the module is on average 0.5°C lower.  
Reduces long-term aging rate of films and metals.

# Full- Scene Aging Suppression

Heightened Test Shows the Reliable Quality | Ultra-long Warranty Protects Customer Value

Comparison of Module Degradation  
Under Multiple Rigorous Tests



15  
Provide 15 years  
product warranty

30  
Provide 30 years power warranty  
30th year, guarantee 88.85% output power

## DH test

At 85°C and 85% relative humidity,  
test for 1000 h/2000 h/3000 h.

## UVID test

Irradiate for a certain period of time  
under a specific UV light intensity

## TC test

High and low temperature environment  
simulation 85°C to - 40°C 200 runs

# System-Level Resistance to Mechanical Stress

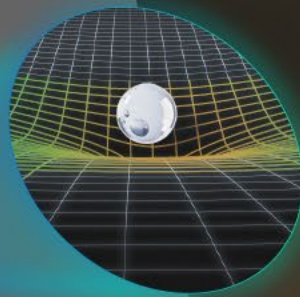
High Thickness TaiRay wafer | Full Back Contact One-line Welding Structure

**Hi-MO X10**

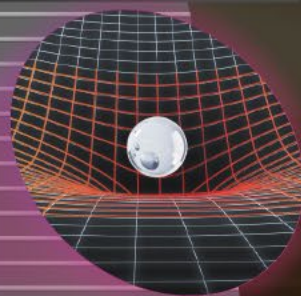
Cell edge stress **26Mpa**

**TOPCon**

Cell edge stress **50Mpa**



Under the same stress,  
the surface collapse of TaiRay wafer  
is smaller



## TaiRay Core

Ultra-high mechanical strength  
Maximum rupture strength increased by 16%.

## High Thickness TaiRay wafer

Wafer thickness is 10 $\mu$ m thicker than mainstream  
thicker for stronger reliability

## Full Back Contact One-line Welding Structure

Reduce cell edge stress  
improve anti-cracking performance

# LONGi

Thanks all