

Newborn with Shingled module Technology

ECO-470-480M-78SA



15 YEARS
PRODUCT MATERIAL &
WORKMANSHIP
25 YEARS 84.8%
LINEAR PERFORMANCE
WARRANTY

INNOVATIONAL
SHINGLED
MODULE
TECHNOLOGY

REDUCE SHADOW
LOSS UP TO **35%**
COMPARING WITH
CONVENTIONAL
HALF CUT MODULE

REDUCE
INTERNAL
MISMATCH
LOSS

PASSED THREE
TIMES IEC
STANDARD TEST

PASSED HAIL
TEST (ICE BALL
SIZE : d=45mm)

ECO DELTA High Efficiency Mono SHINGLED MODULE



ECO-470-480M-78SA

| ELECTRICAL DATA @ STC | | ECO-470M-78SA | ECO-475M-78SA | ECO-480M-78SA |
|-----------------------------|-----|---------------|---------------|---------------|
| Peak Power(Pmax) | (W) | 470 | 475 | 480 |
| Maximum Power Voltage (Vmp) | (V) | 40.90 | 41.00 | 41.10 |
| Maximum Power Current(Imp) | (A) | 11.49 | 11.59 | 11.68 |
| Open-circuit Voltage (Voc) | (V) | 49.40 | 49.50 | 49.60 |
| Short-circuit Current(Isc) | (A) | 12.07 | 12.12 | 12.17 |
| Module Efficiency | (%) | 20.90 | 21.20 | 21.40 |
| Operating Temperature | | -40°C~+85°C | | |
| Maximum System Voltage | | □1500V | | |
| Maximum Series Fuse Rating | | 20A | | |
| Power Tolerance | | 0~5W | | |

*STC (Standard Test Condition): Irradiance 1000W/ m² , Module Temperature 25°C, AM 1.5
 *Performance deviation of Voc [V], Isc [A], Vm [V] and Im [A] : ±3%

| ELECTRICAL DATA @ NMOT | | ECO-470M-78SA | ECO-475M-78SA | ECO-480M-78SA |
|----------------------------|-----|---------------|---------------|---------------|
| Peak Power(Pmax) | (W) | 354 | 358 | 362 |
| MPP Voltage (Vmp) | (V) | 39.00 | 39.10 | 39.20 |
| MPP Current(Imp) | (A) | 9.08 | 9.15 | 9.22 |
| Open Circuit Voltage (Voc) | (V) | 47.10 | 47.20 | 47.30 |
| Short Circuit Current(Isc) | (A) | 9.72 | 9.76 | 9.80 |

*Under Nominal Module Operating Temperature (NMOT), Irradiance of 800W/ m² , Spectrum AM 1.5, Ambient Temperature 20°C, Wind Speed 1m/s

TEMPERATURE CHARACTERISTICS

| | |
|---------------------------------|--------|
| Temperature coefficient of Pmax | -0.34% |
| Temperature coefficient of Voc | -0.27% |
| Temperature coefficient of Isc | 0.04% |
| NMOT | 43±2°C |

MECHANICAL DATA

| | |
|-------------------|------------------------------|
| Cell Type | Mono, 158.75*31.75mm cut 1/5 |
| Cell Arrangement | 432pcs (1/5 , 158.75) |
| Dimension (L×W×H) | 1969 x 1140 x 35 mm |
| Weight | 24.5kg |
| Front Cover | 3.2mm Tempered Glass |
| Frame | Anodized Aluminium Alloy |
| Junction Box | IP68, 2 Bypass Diodes |
| Cable Type | 4mm ² |
| Length of Cable | 1200mm |
| Connector | PV Connector |

OPTIONAL

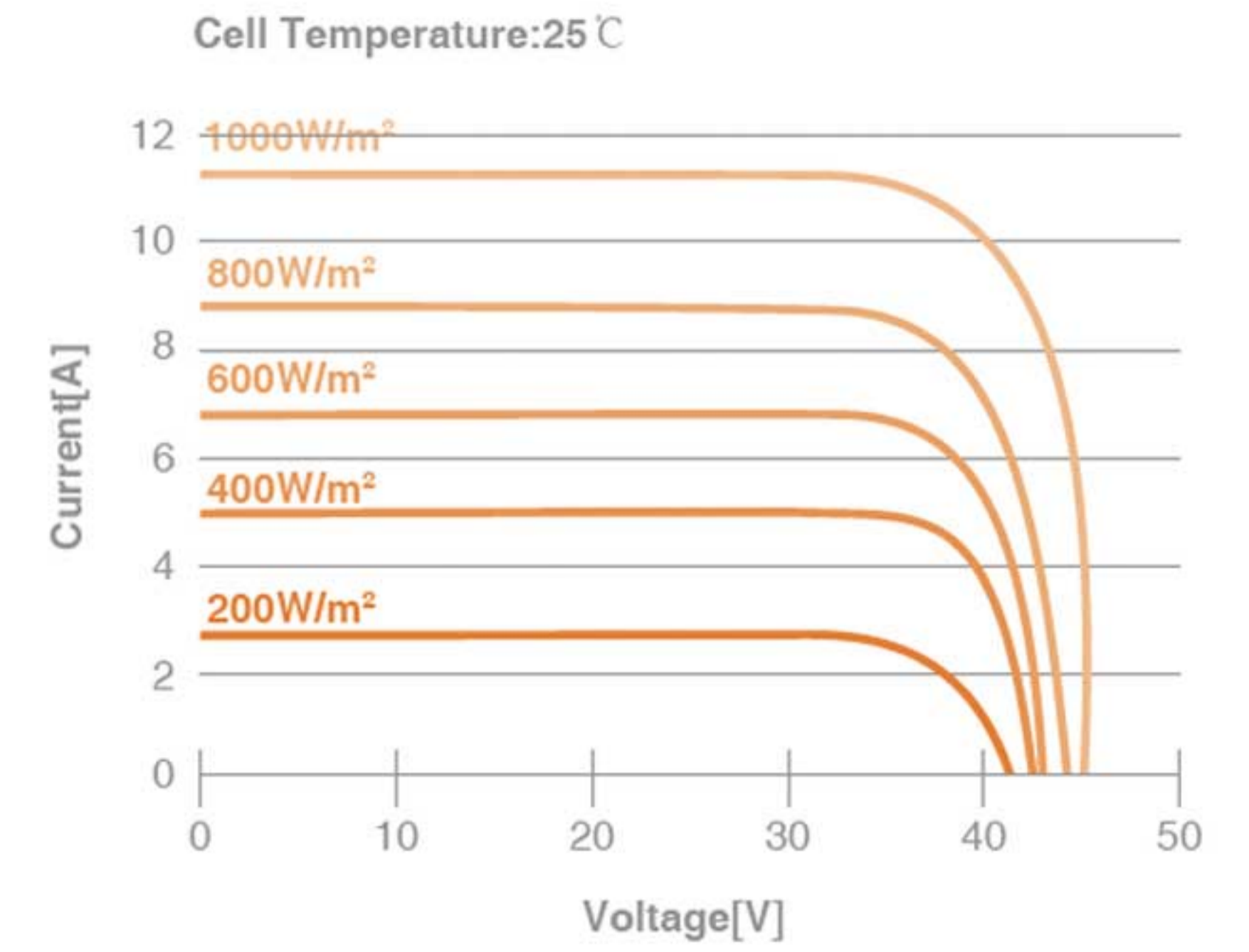
| | |
|--------------|---------------|
| Frame | □Black |
| Backsheet | □Black |
| Connector | □Original MC4 |
| Cable | □Customized |
| Junction Box | □Customized |

PACKING MANNER

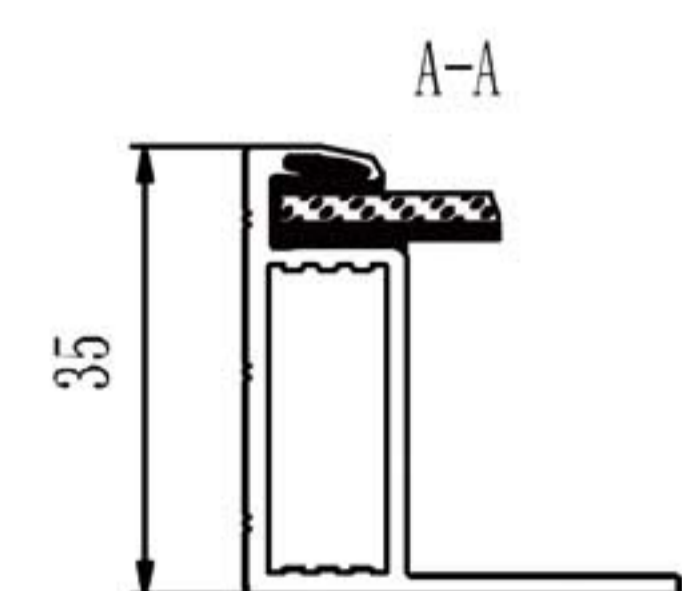
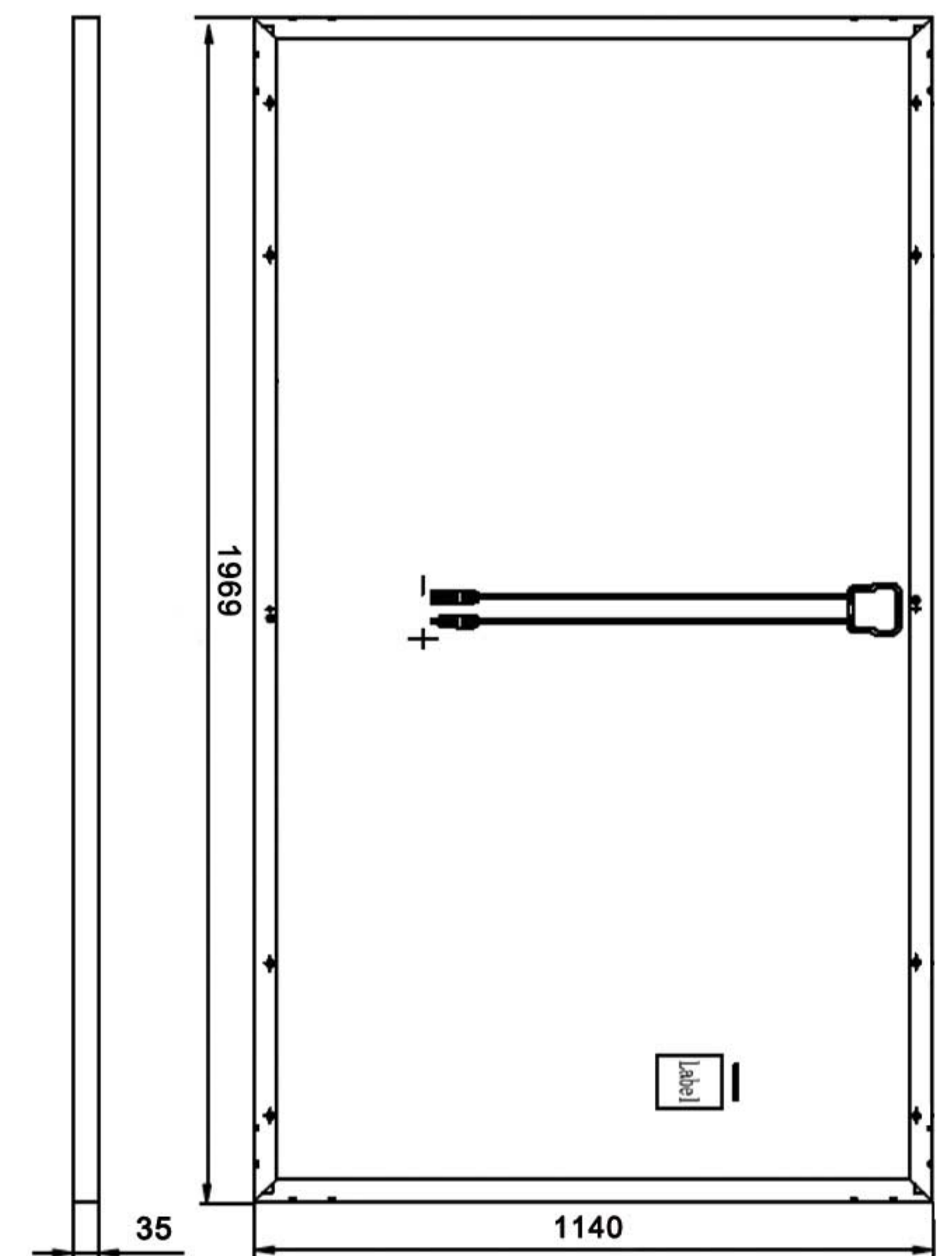
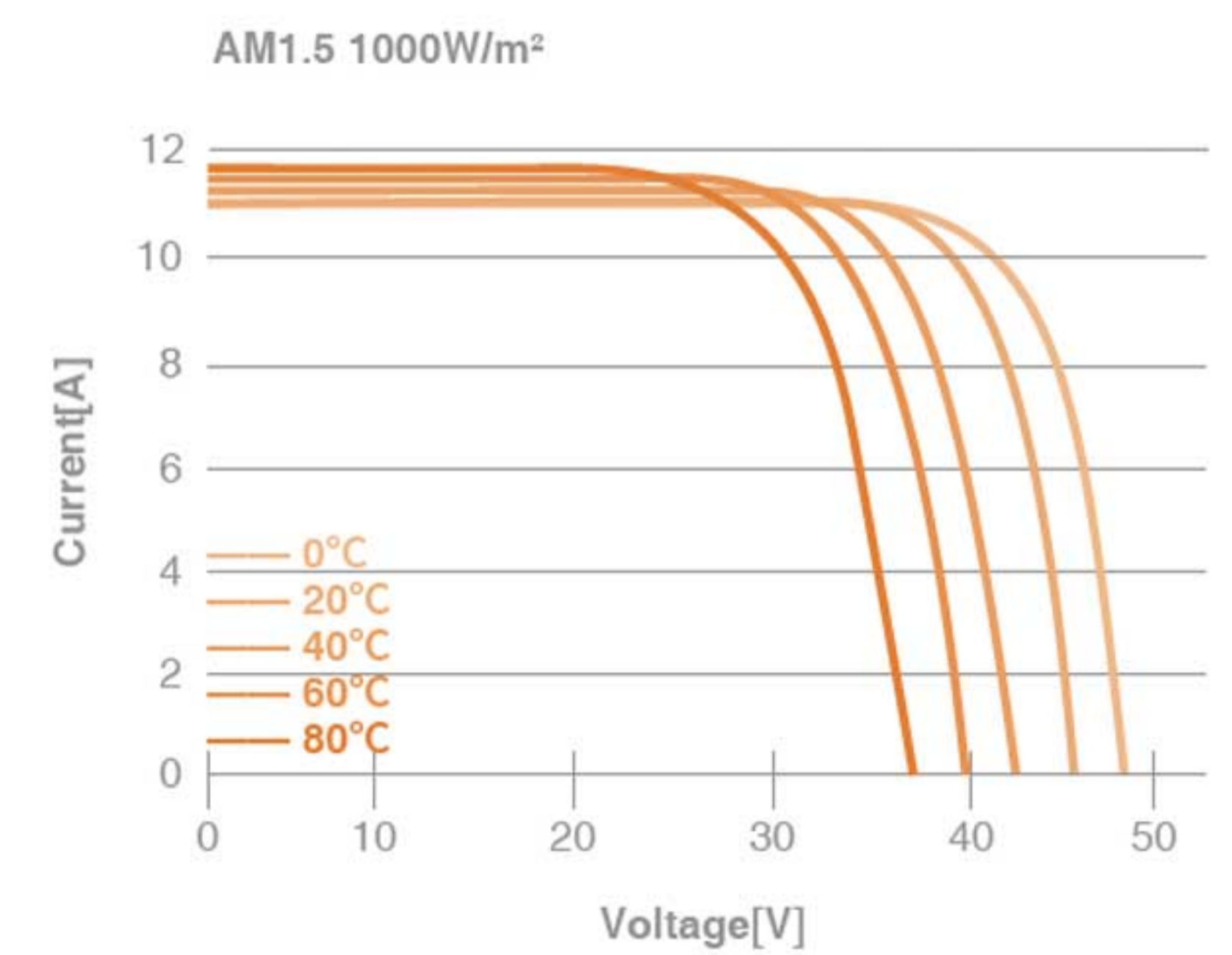
| | |
|-----------------|-------|
| Packing Type | 40'HQ |
| Piece/Pallet | 30 |
| Piece/Container | 660 |

*The specification and key features described in this datasheet may deviate slightly and are not guaranteed.
 Due to ongoing innovation, R&D enhancement, ECO DELTA POWER CO., LTD Reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.

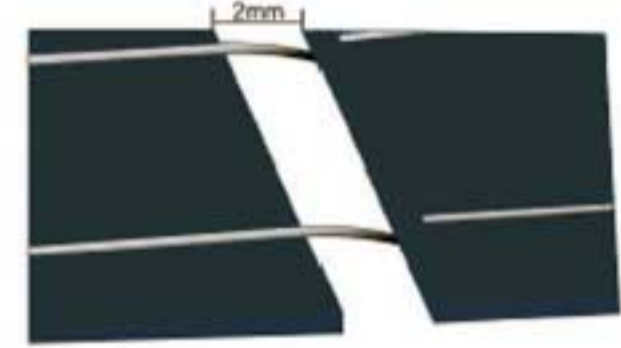
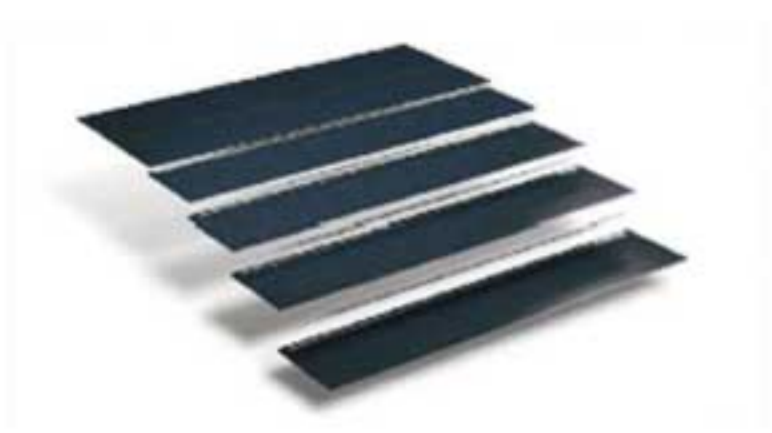
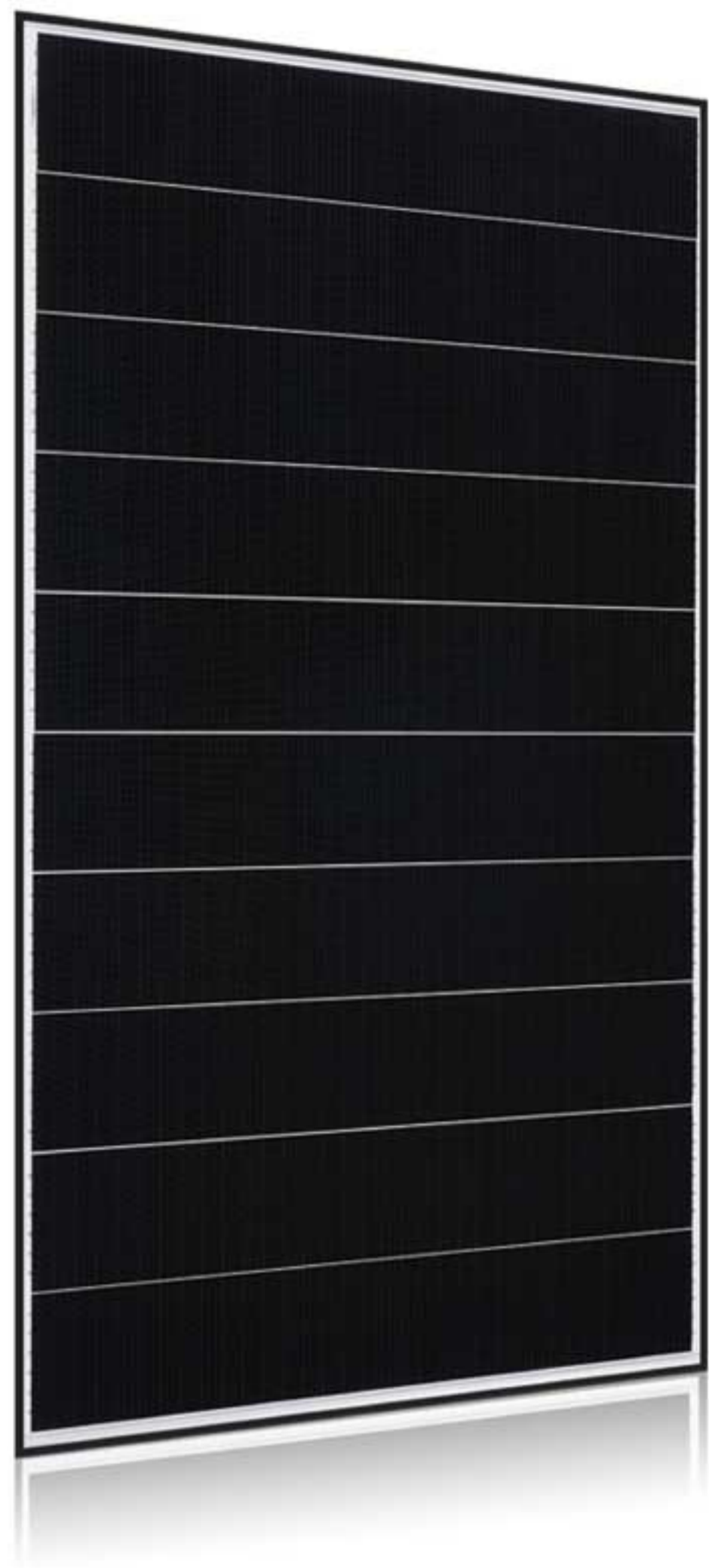
Current-Voltage Curve under different irradiance



Current-Voltage Curve under different working temperatures



ECO DELTA High Efficiency Mono SHINGLED MODULE



9A-->1.8A

Shingled modules use ECA instead of solder ribbon and reduce cracking among cells during production and it can also improve greatly the reliability in outdoors.

Adhesive cures at 150 °C, lower thermal stress. Conventional welding, High temperature soldering >250 °C

Technical features of shingled module



Lower String Current

Isc of a full cell is ~9A, and the 1/5 shingle has an Isc of (~1.8A)

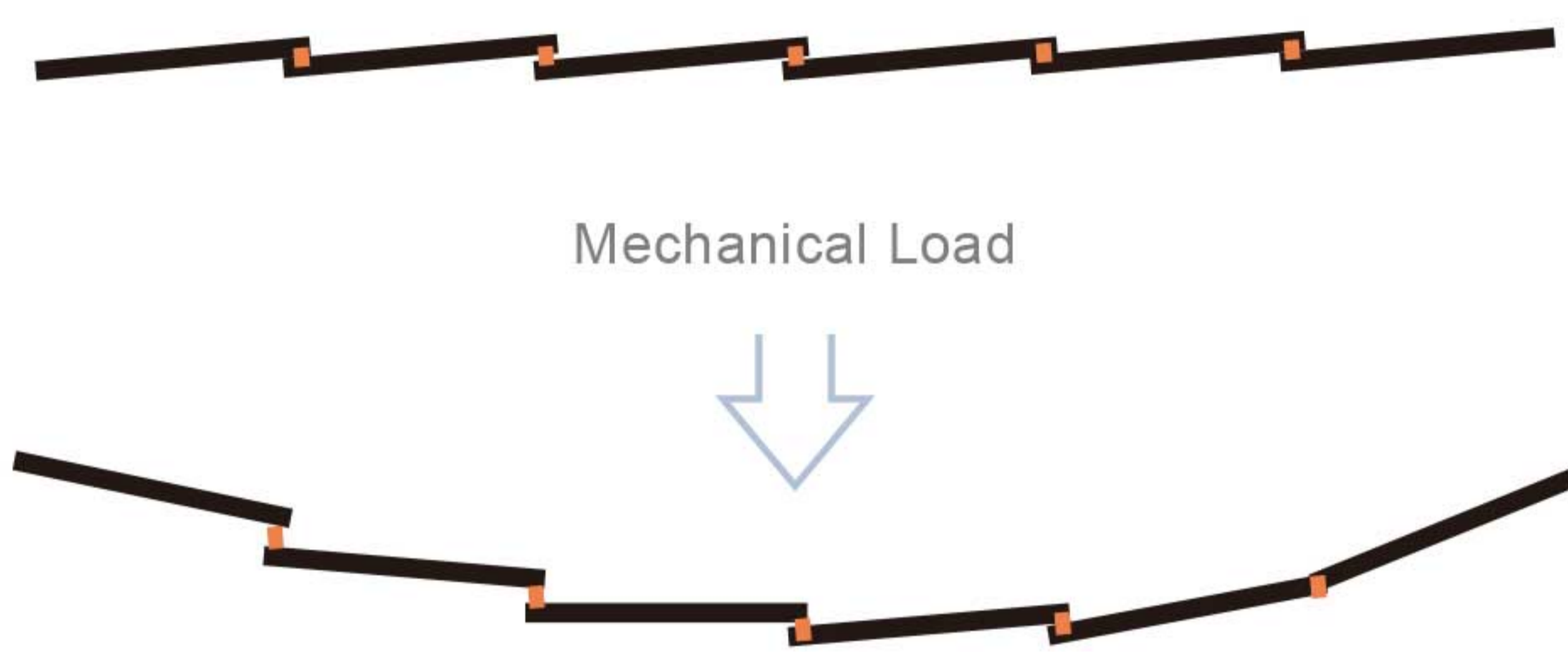


Lower Operating Temperature

Lower string current results in lower cell operating temperature (-5 °C)

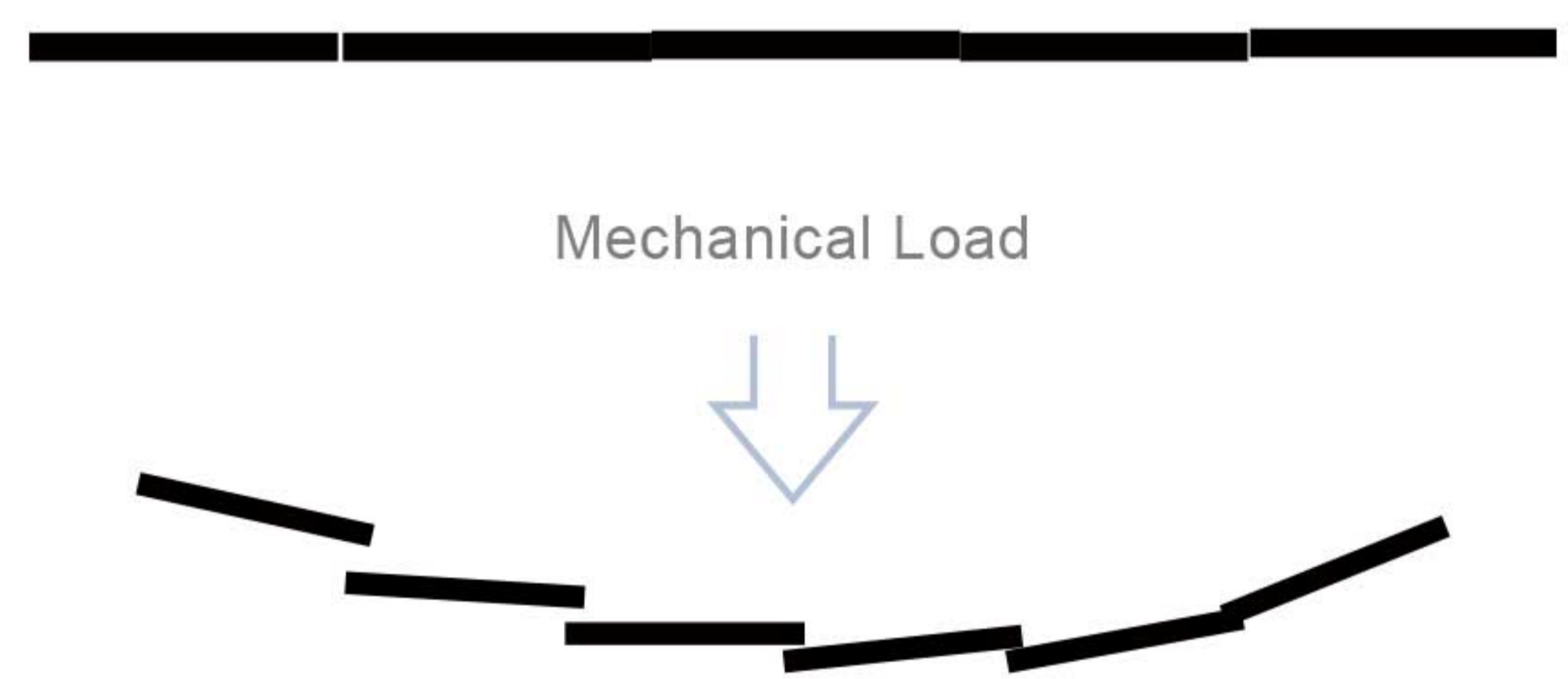
Technical features of shingled module (under load)

Shingle Cell String



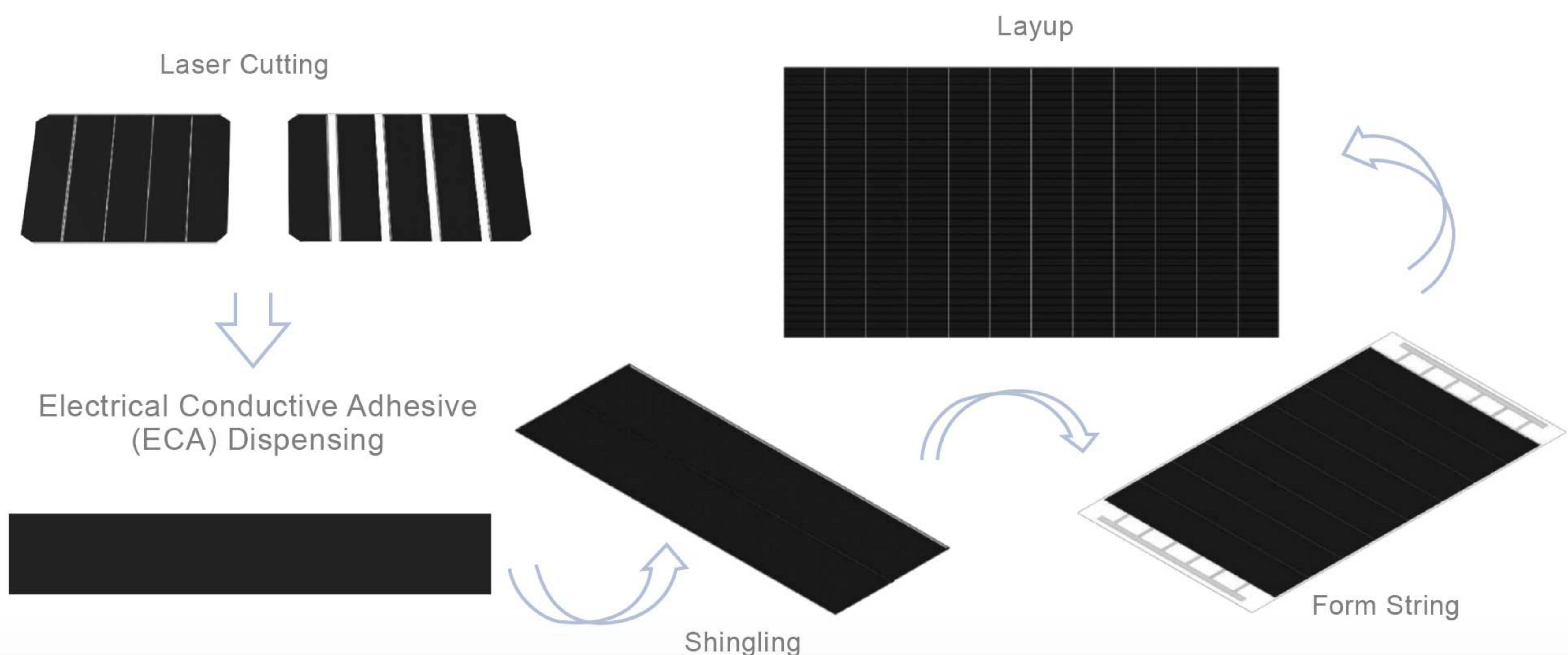
Flexible ECA Relieves the Stress from Bending

Conventional Cell String



Bending Stress Concentrate on the Connect Points

Shingled Module process



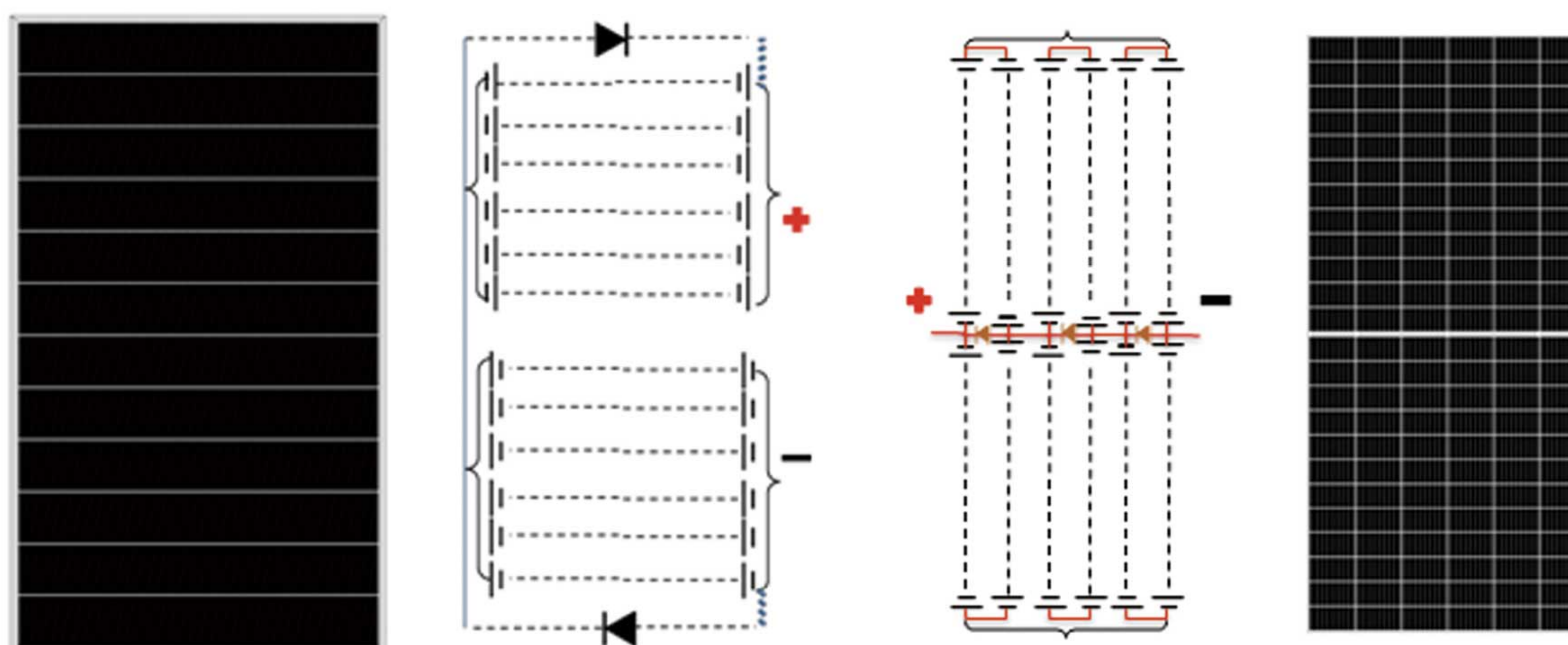
ECO DELTA High Efficiency Mono SHINGLED MODULE

**ECO DELTA Shingled Module is designed to live in a very harsh environ-
Passed 3 X IEC standard test**



| | IEC CERTIFICATION | VDE QUALITY TESTED | ECO DELTA QUALITY PROGRAM |
|---------------------------------|--------------------------------------|--|------------------------------------|
| Test frequency | once, only for initial certification | continuous sampling quarterly monitoring | continuous sampling and monitoring |
| UV | 15km/m ² | * | 45kWh/m ² |
| Humidity test (DH) | 1000h | 1500h | 3000h |
| Humidity-frost test (HF) | 10cycles | 10cycles | 30cycles |
| Hot-Spot test | * | * | 100% of cell production |
| EL Test | only certification module | 100% of module production | 100% high-resolution EL inspection |
| PID Test | - | - | Monitoring of weekly production |

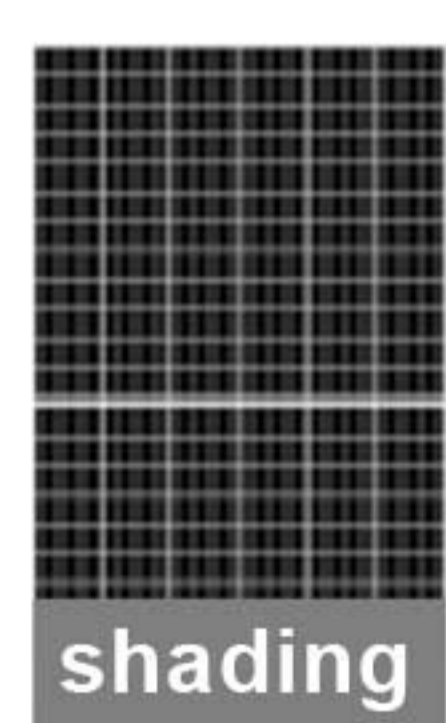
Optimized electrical circuit--all parallel connection



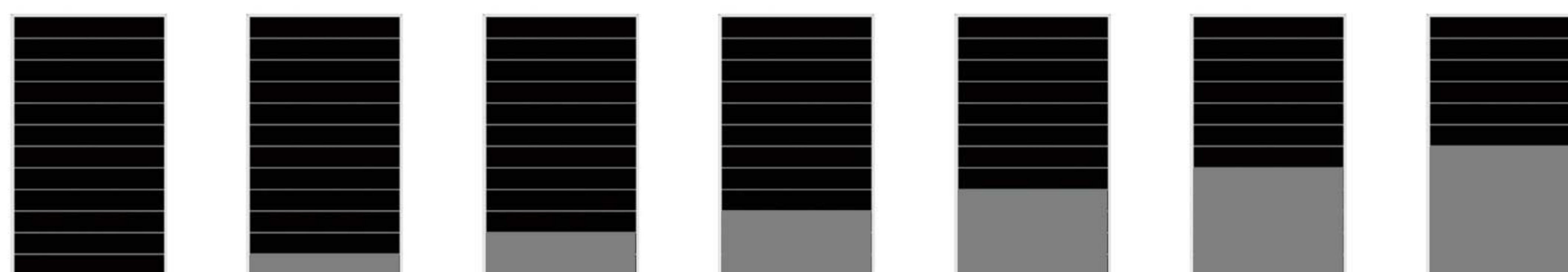
Shingled module Vs Half-Cut module - Less Influences from Shadows

Case Study

When the panels are installed in portrait orientation, shingled modules have the best output under horizontal shading!
Half-cut module is covered and stop modules from working, while shingled module still has power generation.



Stop Working



| NO. of Shaded rows | None | 1 Row | 2 Row | 3 Row | 4 Row | 5 Row | 6 Row |
|---------------------|--------|-------|-------|-------|--------|--------|--------|
| Current(A) | 10.665 | 9.082 | 7.313 | 5.504 | 10.614 | 10.612 | 10.609 |
| Max.Power(W) | 400.5 | 348.0 | 258.1 | 216.2 | 192.4 | 191.5 | 191.4 |