
RECOM
TECHNOLOGIES
BloombergNEF
TIER
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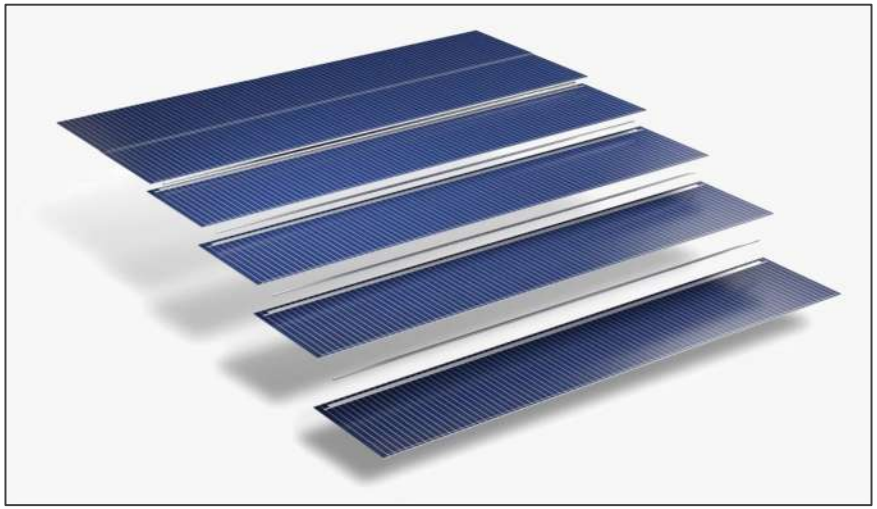
PUMA
SHINGLED SERIES

PUMA Series – Shingled technology

Puma Series



Puma modules are based on the shingled technology which allow a higher cells density than standard half-cut modules.

Cells are cut in 5 or 6 pieces, the obtained “shingles” are assembled in strings by connecting front and rear edges of consecutive shingles with an Electrical Conductive Adhesive (ECA).

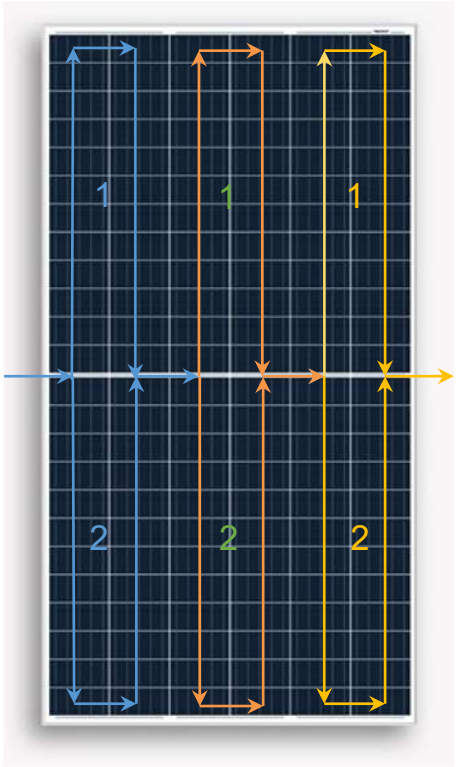
The ECA replaces the Copper Interconnection Ribbons usually soldered on solar cells, providing a flexible interconnection and avoiding the thermal/mechanical stresses on the Silicon – Copper interface

* Shingled picture: credit Henkel

PUMA Series – Shingled modules

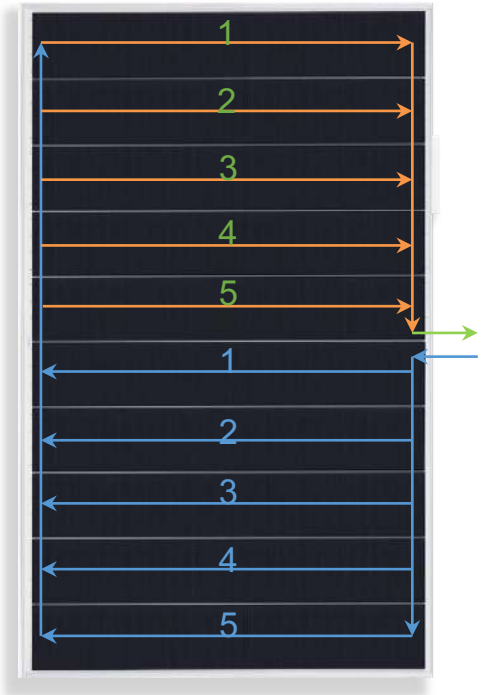
Standard Half-cut modules

- The crystalline silicon cells are connected by soldered copper ribbons.
- 2 strings of cells are connected in parallel (same colour), Three blocks are connected in series (different colours).



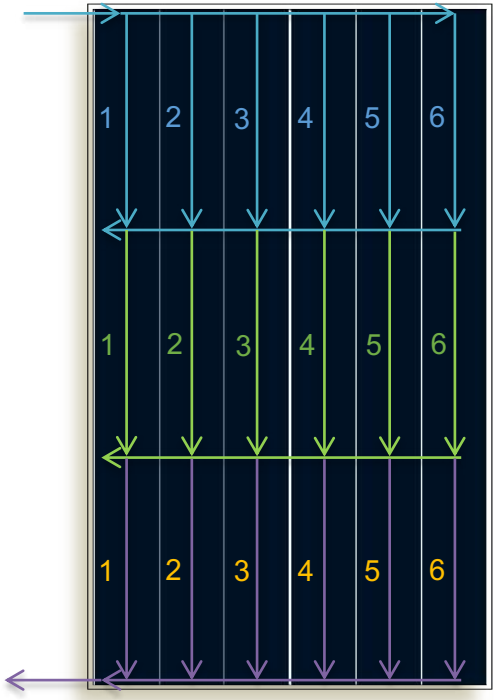
Shingled modules – G1

- The crystalline silicon cells are connected by a conductive adhesive.
- 5 or 6 strings of cells are connected in parallel, 2 blocks are connected in series.



Shingled modules – G12

- The crystalline silicon cells are connected by a conductive adhesive.
- 6 strings of cells are connected in parallel, 3 blocks are connected in series.



PUMA Series available modules

Monocrystalline –

- *black frame and white back sheet*
- *silver frame and white back sheet*
- *full black*

PUMA Series available modules

Bifacial –

- *single glass with transparent back sheet*
- *glass-glass*

PUMA Series available products

Small size for roof top installation

The PUMA module with power class up to 410 Wp (560 Wp from Q3/2021), efficiency up to 20,9% and 25 years product & output warranty is:

- Best “Value for money” choice
- Ideal for rooftop installations (in the same size of the rooftop, more power can be installed compared to standard modules)
- Low LCOE (levelized cost of energy)

For commercial & utility installations

The PUMA module with power class up to 490 Wp (660 Wp from Q3/2021), efficiency up to 20,9% and 25 years product & output warranty

PUMA Series –G1 Cells

G1	G1 cells size	158,75x158,75 mm	1/5 shingle size

- 432 cells – RCM SML – G1
- 360 cells – RCM SMK – G1

PEAK POWER
Up to 465 Wp

MODULE EFFICIENCY
20,7%

TEMPERATURE COEF.
- 0,34 % / °C

DIMENSIONS
1969 x 1140 x 35 mm

PEAK POWER
Up to 390 Wp

MODULE EFFICIENCY
20,8%

TEMPERATURE COEF.
- 0,34 % / °C

DIMENSIONS
1646 x 1140 x 35 mm

Performance at high temperatures

RCM SMK – G1

PEAK POWER
Up to 390 Wp

TEMPERATURE RATIO
- 0,34 % / °C

MODULE EFFICIENCY
20,8%

DIMENSIONS
1646x1140x35 mm

HIGHER OUTPUT IN HOT CLIMATE

+ 0,9 %

Specific yield (kWh/kWp) due to low temperature coefficient

MORE EFFICIENT SPACE UTILIZATION

- 3,1 %

Space required for 1MWp of PUMA modules

HIGHER GENERATION PER UNIT AREA

+ 4,1 %

PV plant Yield / sq.m. in Hot Climate

*In comparison with mass market PV modules Half-cut 120 cells G1 – 340W

Overall cost efficient

RCM–SMK 390W brings to the residential market the advantages of bigger modules for utility scale projects (higher output power and efficiency) but with lower currents (Imp 9,5A instead of 11,0A or 13,3A), ensuring the compatibility with a wide range of residential inverters.

Lower logistics costs
+16% kWp per 40' HC container

Lower installation BOS costs:
-13% modules to be installed due to the higher efficiency and power of shingled modules

The total installed peak power may be increased by 3,3%

*In comparison with mass market PV modules Half-cut 120 cells G1 – 340W

PUMA Series –M6 Cells

M6

M6 cells size	166 x 166mm	1/5 shingle size

- 408 cells – RCM SMA – M6
- 340 cells – RCM SMB – M6

408 cells – RCM SMA – M6	340 cells – RCM SMB – M6
PEAK POWER Up to 480 Wp	**PEAK POWER** Up to 405 Wp
MODULE EFFICIENCY 20,9%	**MODULE EFFICIENCY** 20,9%
TEMPERATURE COEF. - 0,34 % / °C	**TEMPERATURE COEF.** - 0,34 % / °C
DIMENSIONS 2056 x 1140 x 35 mm	**DIMENSIONS** 1719 x 1140 x 35 mm

PUMA Series – G12 Cells

G12	G12 cells size	210 x 210mm	1/6 shingle size

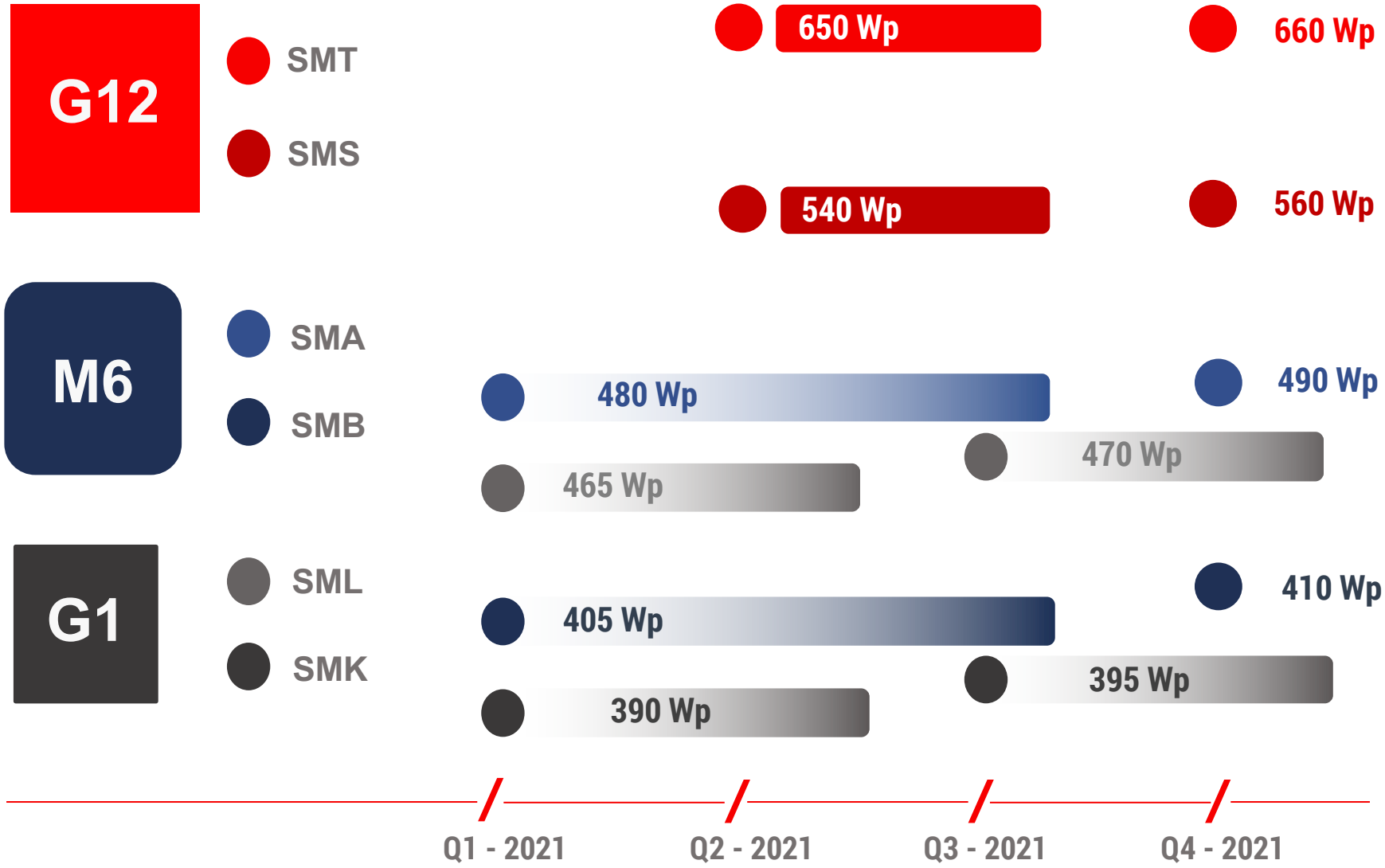
408 cells – RCM SMT – G12

PEAK POWER	Up to 650 Wp
MODULE EFFICIENCY	21,5%
TEMPERATURE COEF.	- 0,34 % / °C
DIMENSIONS	2355 x 1303 x 35 mm

340 cells – RCM SMS – G12

PEAK POWER	Up to 540 Wp
MODULE EFFICIENCY	21,8%
TEMPERATURE COEF.	- 0,34 % / °C
DIMENSIONS	2355 x 1090 x 35 mm

Roadmap PUMA Series



Warranties

25 years limited product warranty

Supreme **up to 30 years output warranty** with 84.95% performance output warranty at the end of the 30th year

Certifications:

RECOM plants are certified ISO 9001 & 14001

RECOM Shingled modules are tested by TUV NORD and certified IEC61215 and IEC61730 (additional certificates available)

Key Benefits at a glance

Key Benefits

- Higher yield per surface area
- Low Pmax at - 0,34 % / °C
- Higher yield in hot climate
- 25 Years Limited Product Warranty
- Low LCOE
- Low Resistive Losses

Advantages of RECOM shingled modules

HIGHER CELLS DENSITY AND IMPROVED AESTHETICS

The inactive area is considerably reduced, no ribbons and cells gaps on strings improving the efficiency and aesthetic in full black modules.

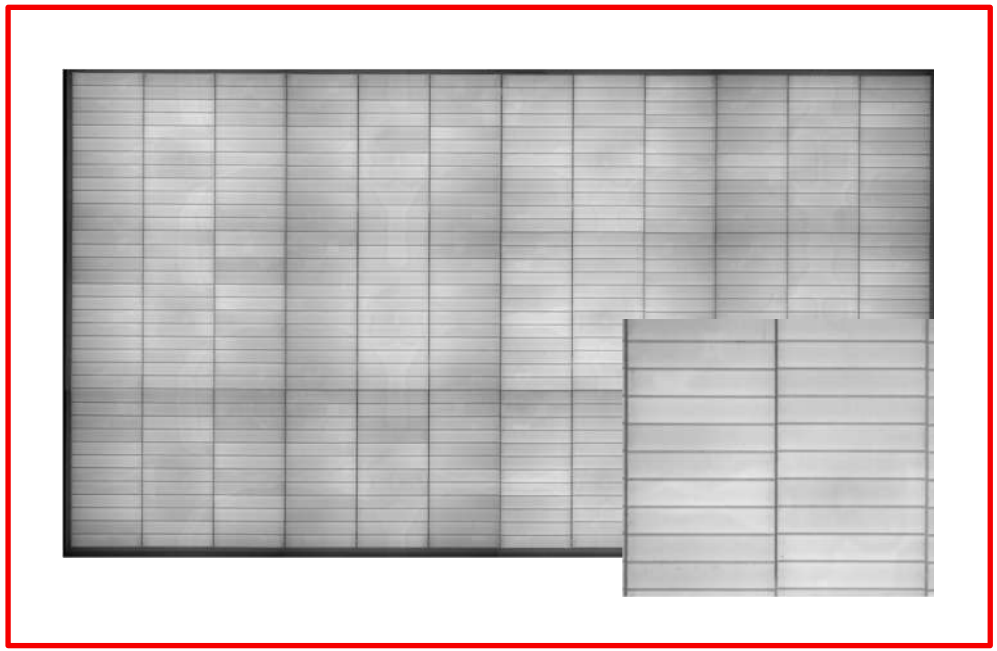
LOWER RESISTIVE LOSSES AND THERMAL COEFFICIENT

The resistive losses in strings are considerably decreased thanks to the lower current of shingles (1/5 or 1/6 of the original cell) and the lack of interconnection ribbons in strings, improving at the same time the performance at high temperatures.

Advantages of RECOM shingled modules

REDUCED RISK OF MICRO CRACKS

- The replacement of soldered ribbons with a low temperature and flexible ECA decreases thermal stresses during the modules production and operation, decreasing the risk of micro cracks formation.
- Mechanical stresses (e.g. snow load) are relieved by the flexible interconnection, improving the reliability in harsh environments (as reflected in the increased warranty provided).



Advantages of RECOM shingled modules

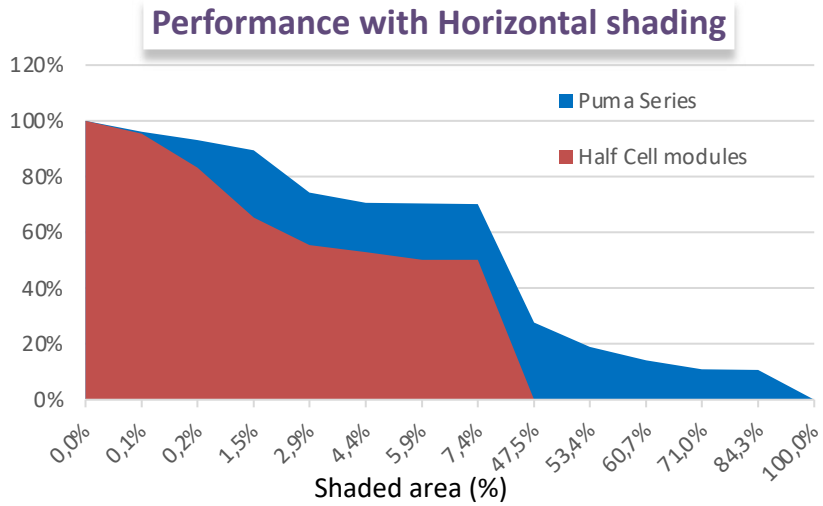
BETTER FOR HEALTH & ENVIRONMENT

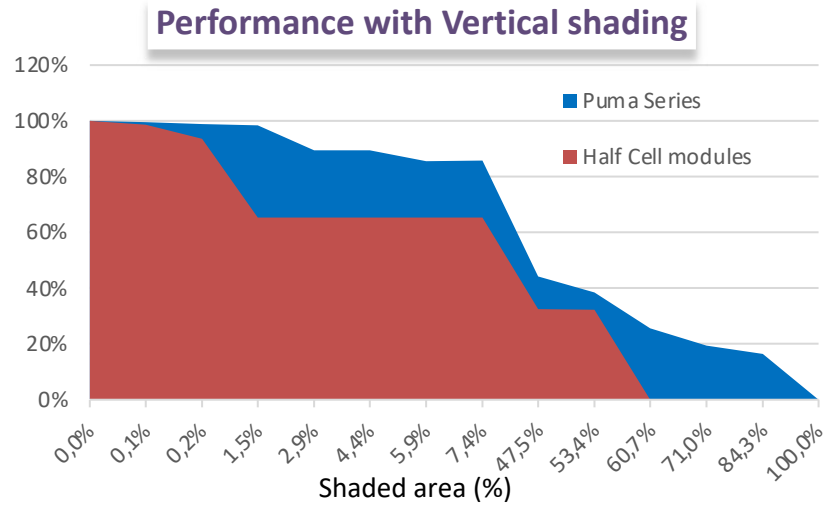
- The ECA replaces a part of Leaded Copper Ribbons, reducing the Lead content in each Puma module by - 60%.
- RECOM significantly reduces the quantity of Flux needed to manufacture a Shingled module. It's also a good advantage to reduce the Volatile Organic Compound (VOC) released in the environment during the production (some VOCs are dangerous to human health or may cause harm to the environment)

Advantages of RECOM shingled modules

BETTER PERFORMANCE VS SHADING EFFECT

- The innovative design of RECOM Puma series PV modules offers customers a significant gain of Yield over the time.
- In order to assess the behavior of the new shingled module in shaded conditions, tests were performed on the RECOM Puma series modules under different shading conditions to measure the effect on energy production.





Great appearance

RECOM shingled modules

blend perfectly with the rooftop

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SHAPING THE FUTURE OF SOLAR