MAXEON: 25 YEARS OF IBC MANUFACTURING AND INNOVATION

David Smith Dec 9, 2025

COMPANY AT A GLANCE

Founded in 2020 as the innovation-focused spin-off of SunPower Corporation, Maxeon leverages 40 years of experience.

Maxeon is a public company listed on NASDAQ (MAXN).

Headquarters & Corporate Offices	Singapore and San Jose, California
2024 revenues	$ 509M
Employees	< 300
Experience	Technology leader in the solar industry since 1985
Innovation Engine	2,000+ granted patents
Customer segments	Residential | Commercial | Power Plants
Channels to market	~300 Sales & Installation Partners in the U.S.
2024 volume	+1.4 GW shipments
Number of customers	+1,000,000 globally. Now focused exclusively on U.S.

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GENERATIONS OF SOLAR CELL INNOVATION

First >20% Efficient Commercial Solar Cell	World Record Panel Efficiency	World Record Panel Efficiency	First 400W Residential Panel	World Record Panel Efficiency	Next Generation For deployment
GEN 1	GEN 2	GEN 3	GEN 5 & GEN 6	GEN 7	GEN 8
2004	2007	2010-pilot 2015 production	2019	2023	2026
First commercially available IBC solar cell panels	**New architecture.** First IBC laser processing, higher efficiency, lower cost.	**New architecture.** First commercial tunnel junction solar cells, higher efficiency.	**Simplified process,** larger wafer size, reduced cost.	**New architecture.** Higher efficiency and extends leadership in reliability.	**New architecture.** Higher efficiency, larger wafer size, reduced cost.

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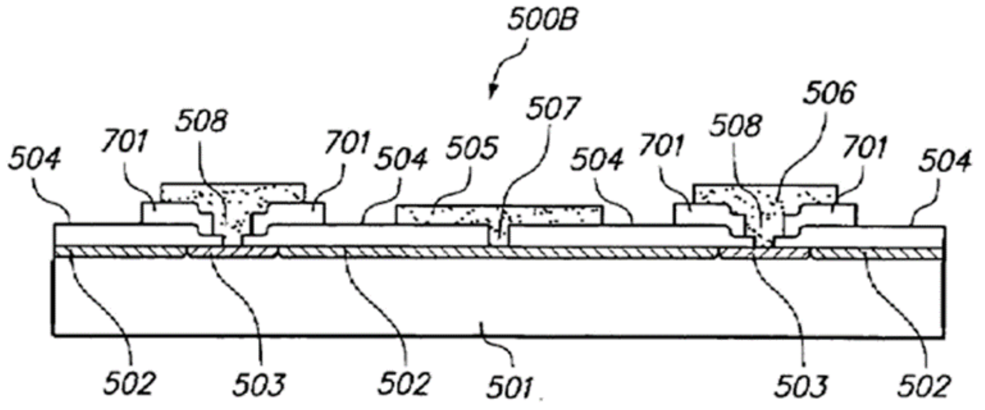
Patents

Maxeon will continue to defend its IP

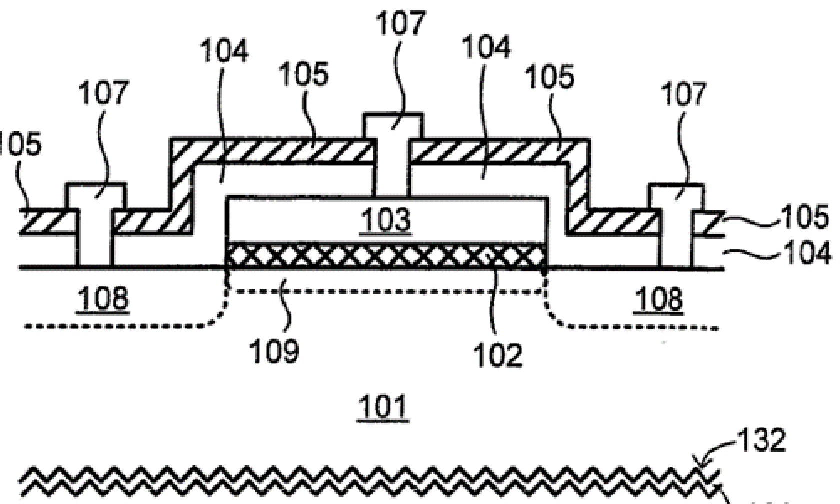
- Maxeon and SunPower before it has spent 25 year developing IBC solar cells.
- Note wide Range of structures covered:

1. Trench patent. (US 7,812,250)
2. Partial trench configuration. (US 8673673B2)
3. One poly contact, One diffused emitter. (US 9,312,406)
4. Two poly contact separated by tunnel oxide. (US 9,196,758)
5. One poly contact, one heterojunction emitter. (US 12,009,449)

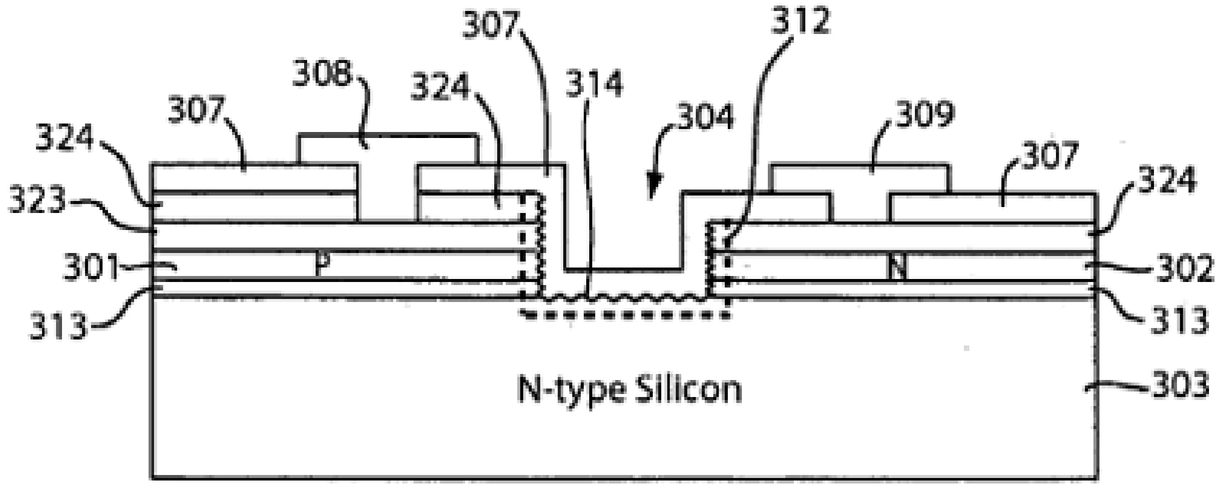
Patent	Industry acronym
1	“TBC/ABC”
2	“TBC/ABC 2.0”
3	“HPBC”
4	“TBC/ABC 2.0”
5	“HIBC”



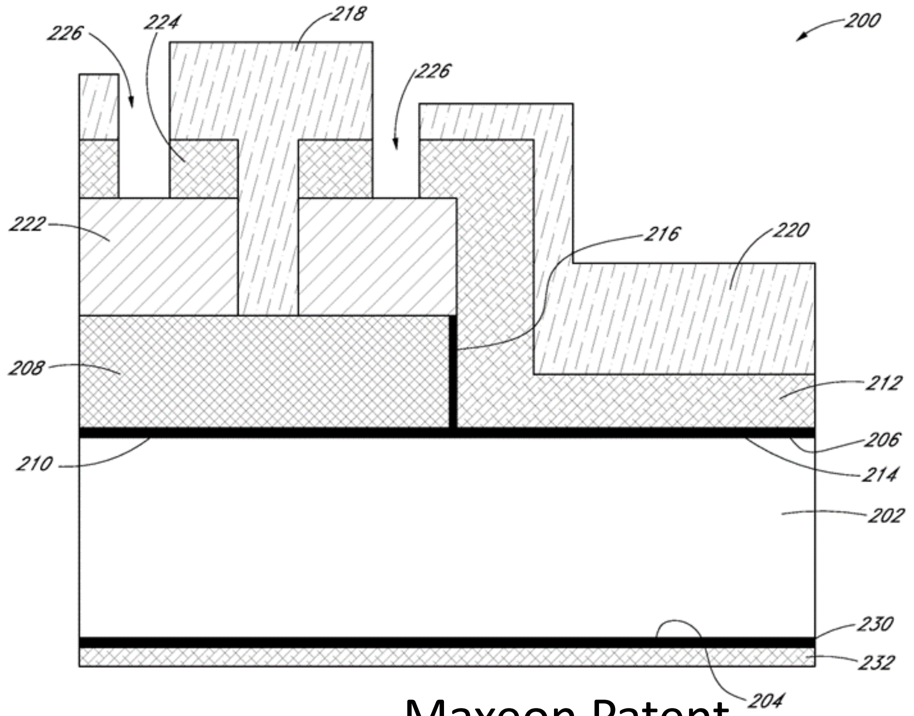
Maxeon Patent
US 8,008,575 B2



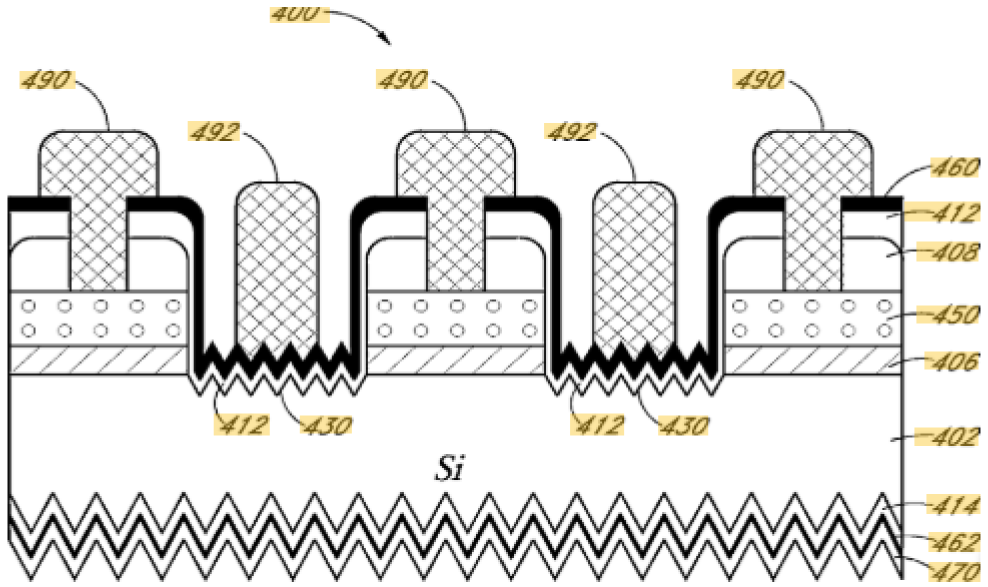
Maxeon Patent
US 9,312,406 B2



Maxeon Patent
US 7,812,250 B2



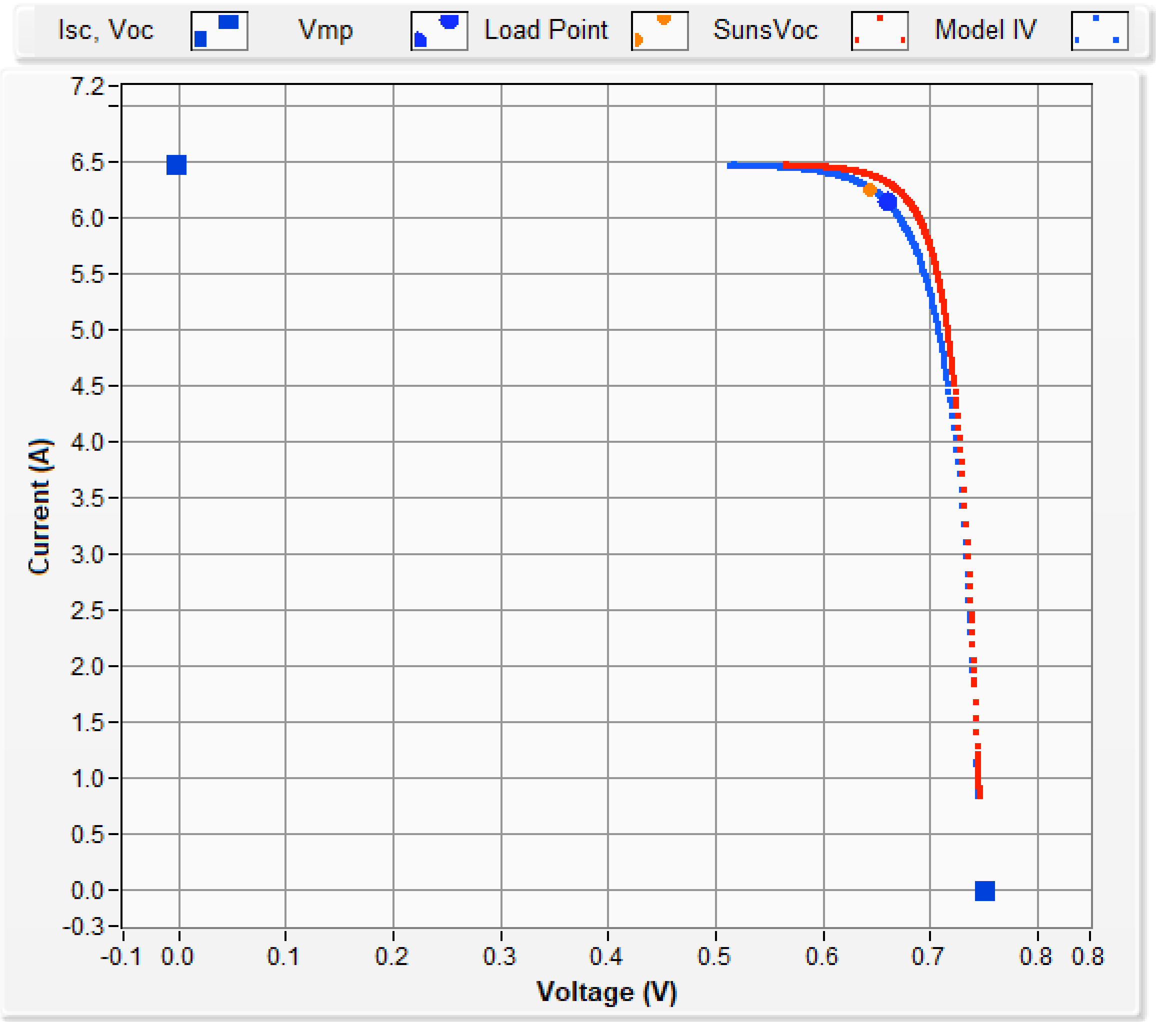
Maxeon Patent
US 9,196,758 B2



Maxeon Patent
US 12,009,449 B2

>26 % efficiency

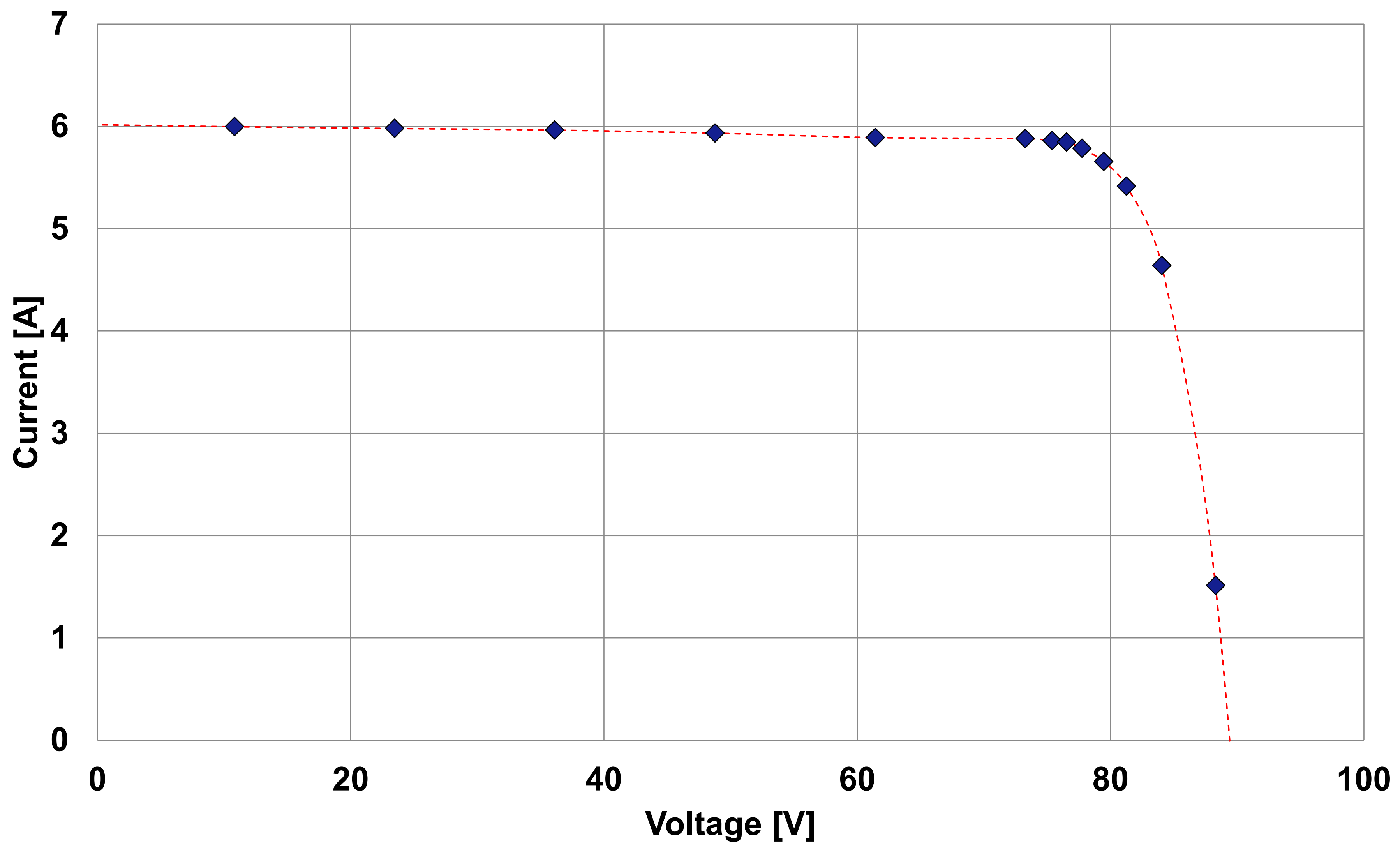
I-V curve



- ❑ Poly contacts for both polarities with self-aligned structure. “Hy5”
- ❑ Single LPVCD deposition.
- ❑ Produced in Fab4 facility on legacy 5 inch manufacturing line.

Eff [%]	FF [%]	Voc [mV]	Jsc [mA/cm2]	Jo [fA/cm2]	Bulk tau [msec]	Rsh [ohm-cm2]	Rs [ohm-cm2]	Vr [V]
26.13	83.46	748.8	41.81	3.65	19.6	51,262	0.532	-2.3

Module



Area: 1.740 m^2
Isc – 6.02 A
Voc – 88.6 V
Power – 450.5 W
FF – 84.6%
EFF – 25.9%

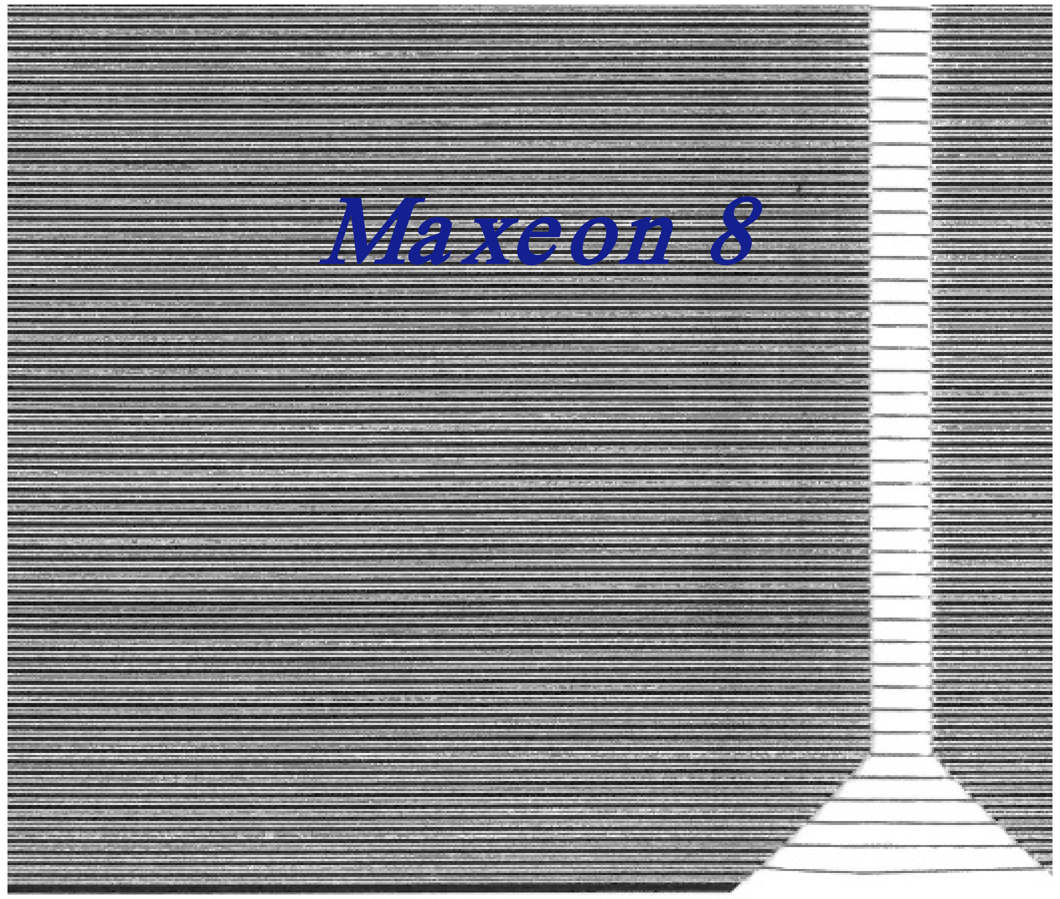
- ❑ Shingled IBC module made with high bin > 26 % efficiency cells.
- ❑ In-house test. Currently undergoing third party test.
- ❑ Electroplated copper metallization.

Baseline module
1 mm gaps

Shingled module
1.8 mm overlap

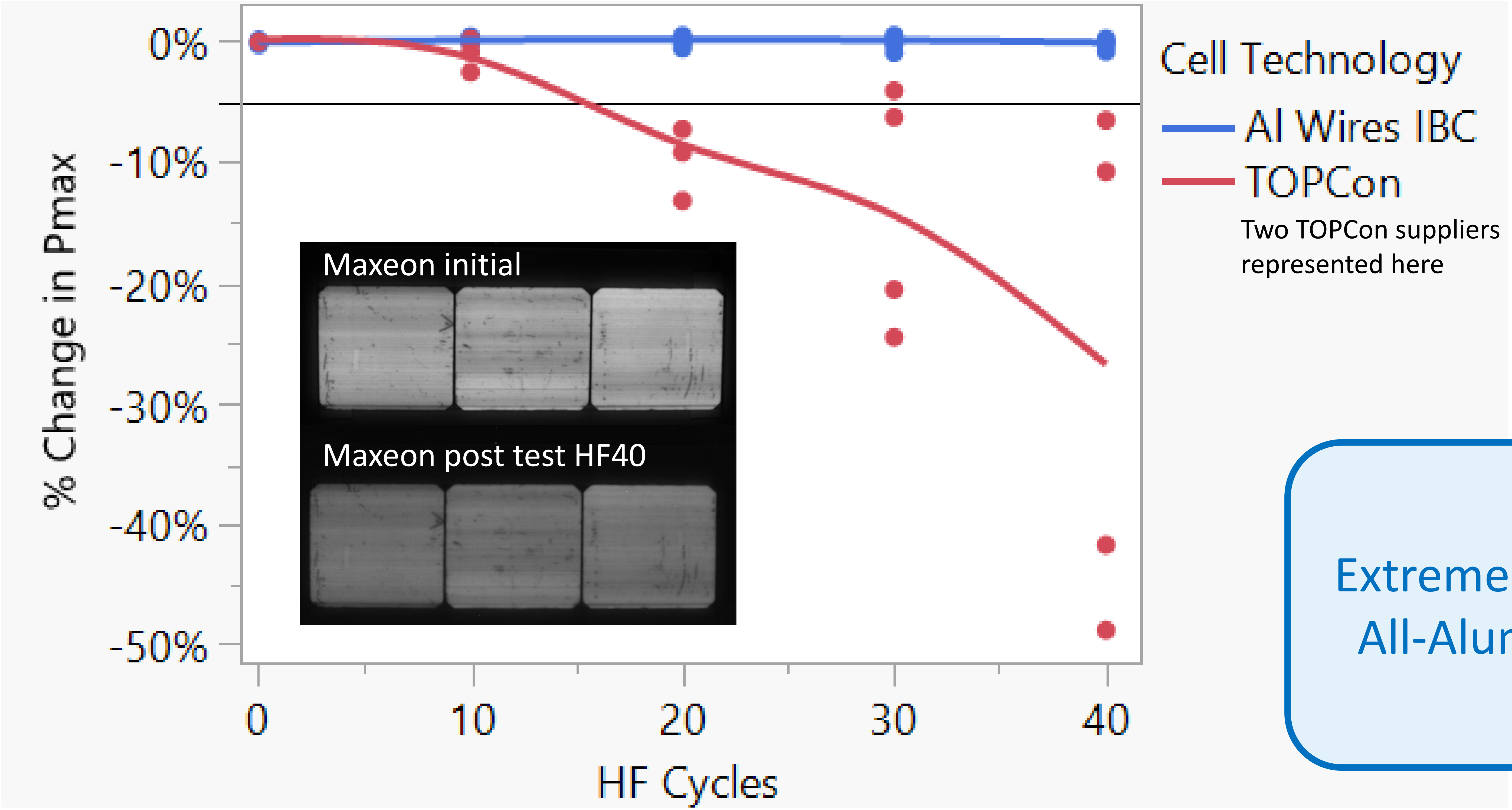
Aluminum wires metallization

- Maxeon 8 – Aluminum wire metallization system for cells, stringing, and matrix formation
- 25.7 % cells demonstrated, higher potential than copper, no solder pad dead space.
- Exceeds reliability tests for 40-year warranty
- Metal costs 30% of standard TOPCon systems, Aluminum $3/kg, Silver >$1000/kg
- Developed in San Jose R&D lab, manufacturing tool in development.
- No lead or heavy metals, Earth abundant and better able to recycle, continues excellent crack tolerance of Maxeon's electroplated copper metal products.



IBC Stability in Damp Heat and Humidity Freeze

All coupons have a PET backsheet and use POE encapsulant



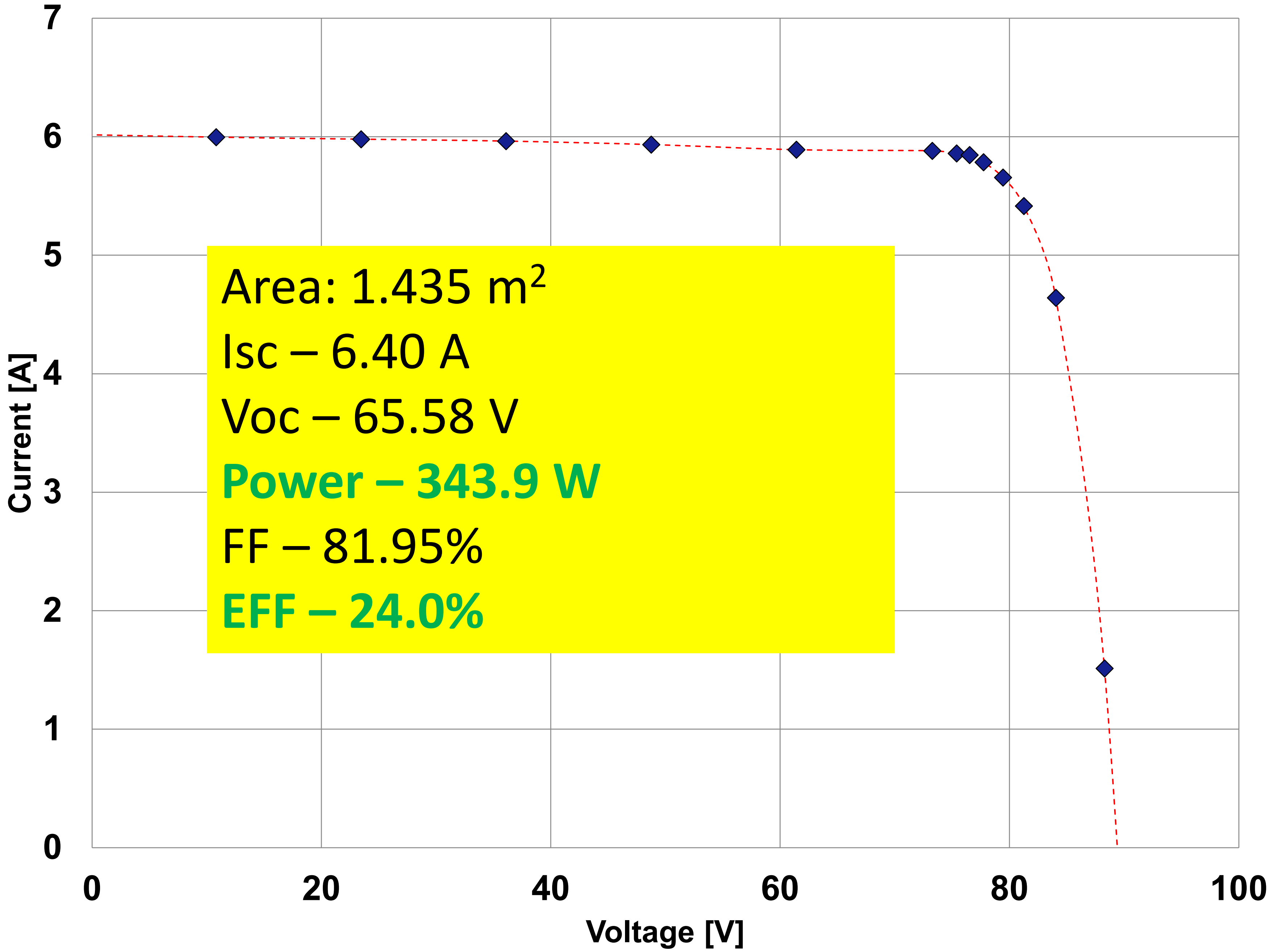
Vigorous reliability criteria at Maxeon: 5% after HF**40**

versus IEC:

5% after HF10

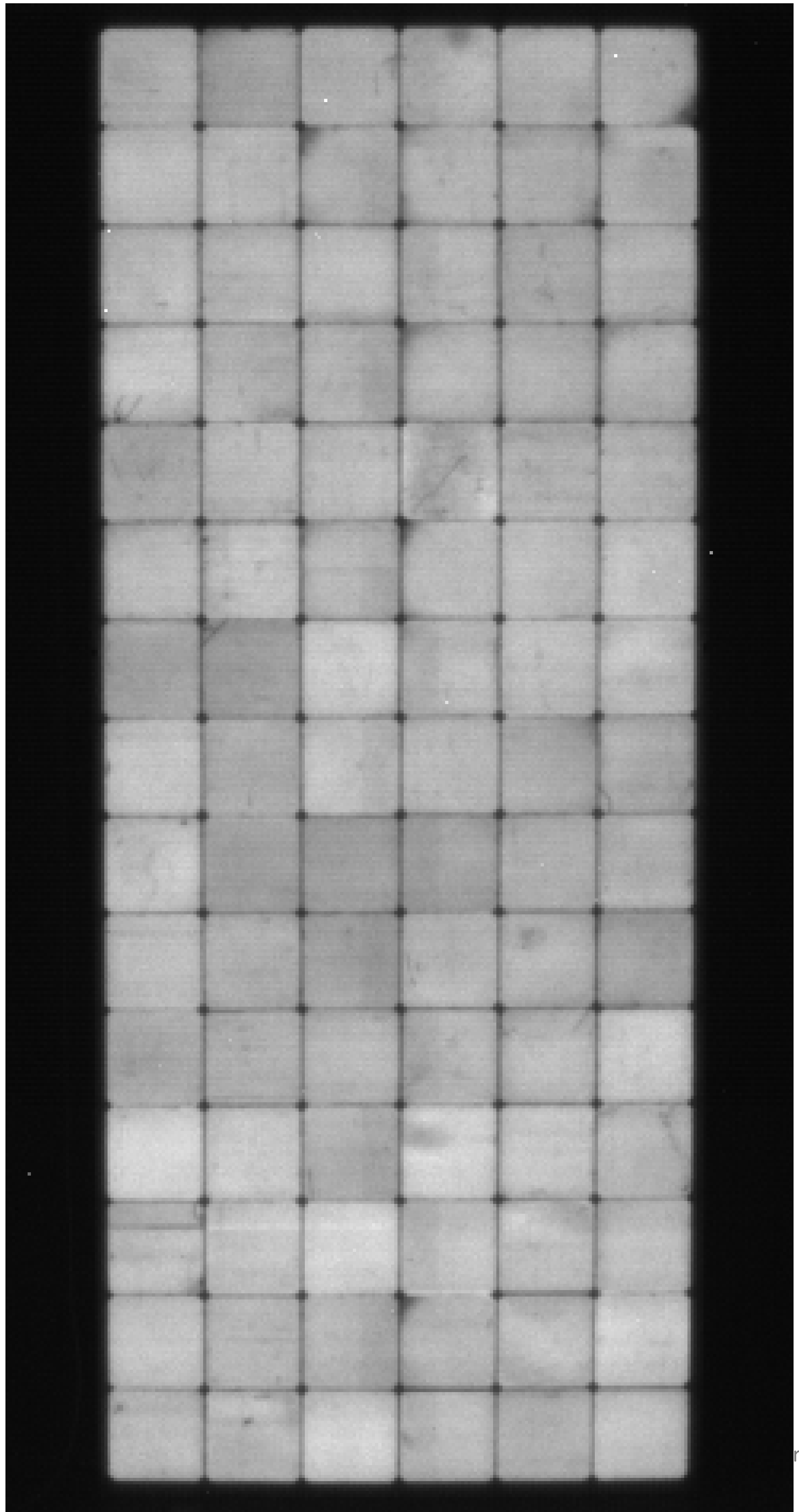
Extremely robust and reliable All-Aluminum metallization

All Aluminum wire module



- ❑ 90 cells (5”)
- ❑ 2mm cell-cell gap
- ❑ 750um string-string gap
- ❑ White backsheet

Electroluminecense Image



Aluminum wires metallization

- ❑ Why do we continue to drive Aluminum metal?
- ❑ Silver is widely accepted, low-cost high-performance tools available.
- ❑ However, silver cost itself is very high and trending higher as PV industry consumes significant portion of world supply
- ❑ Also, not earth abundant, not easily recyclable, and very price volatile.

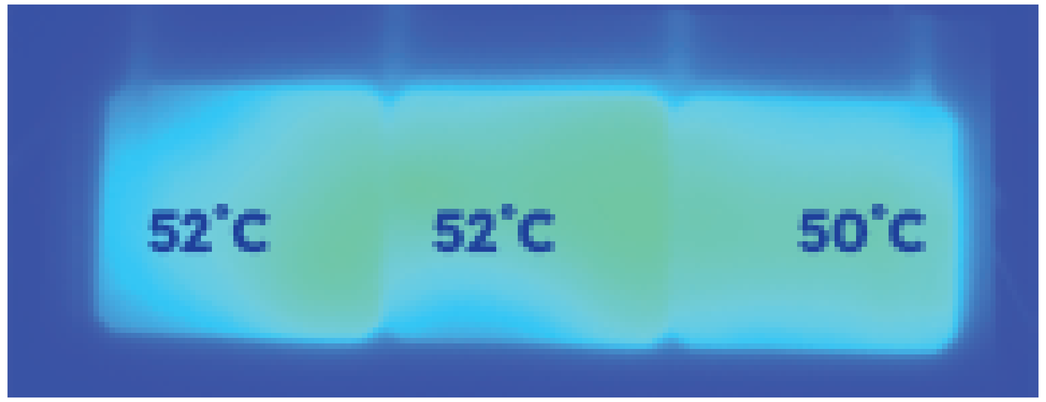
https://markets.businessinsider.com/commodities/silver-price

REVERSE BIAS AND SHADING

Conventional cell

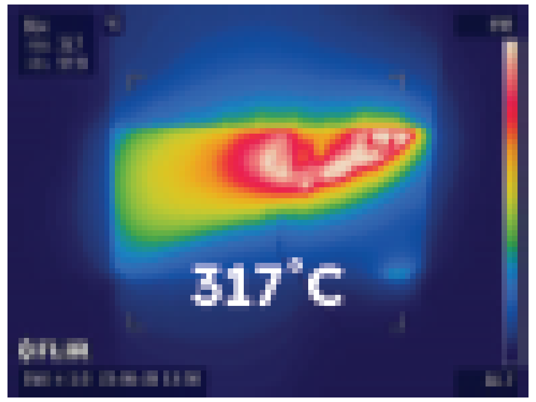
Thermal image of a conventional cell with a defect and failed bypass diode

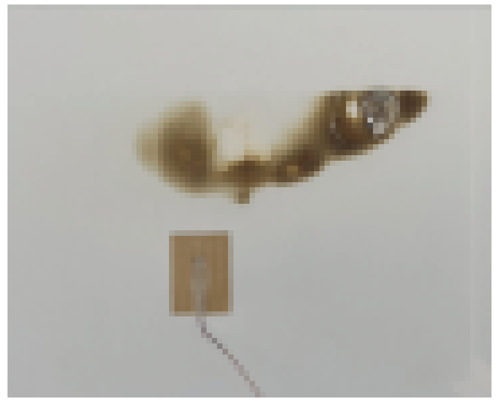
Maxeon's latest-generation IBC



Maximum temperature of Maxeon IBC cells at -Isc in reverse bias with no diodes, 20˚C ambient

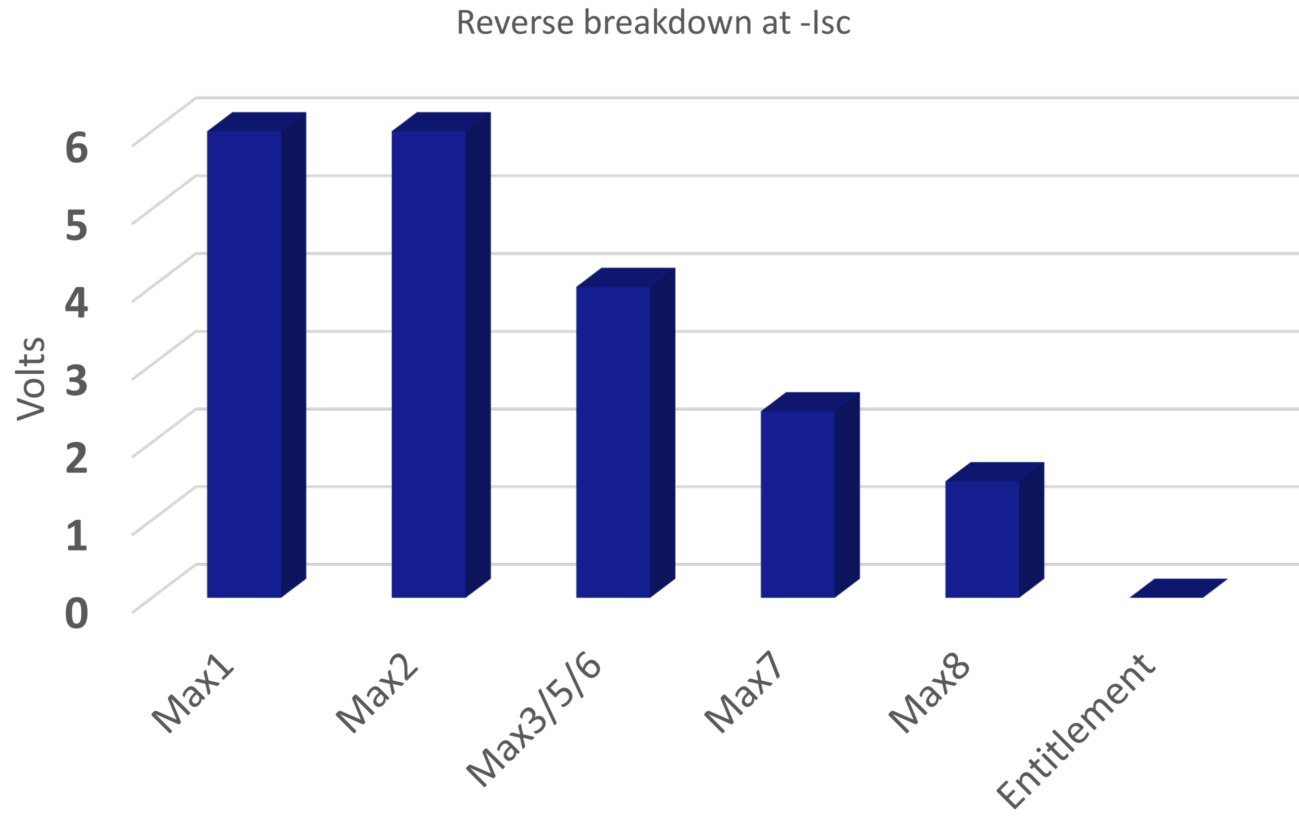
A competitor's IBC





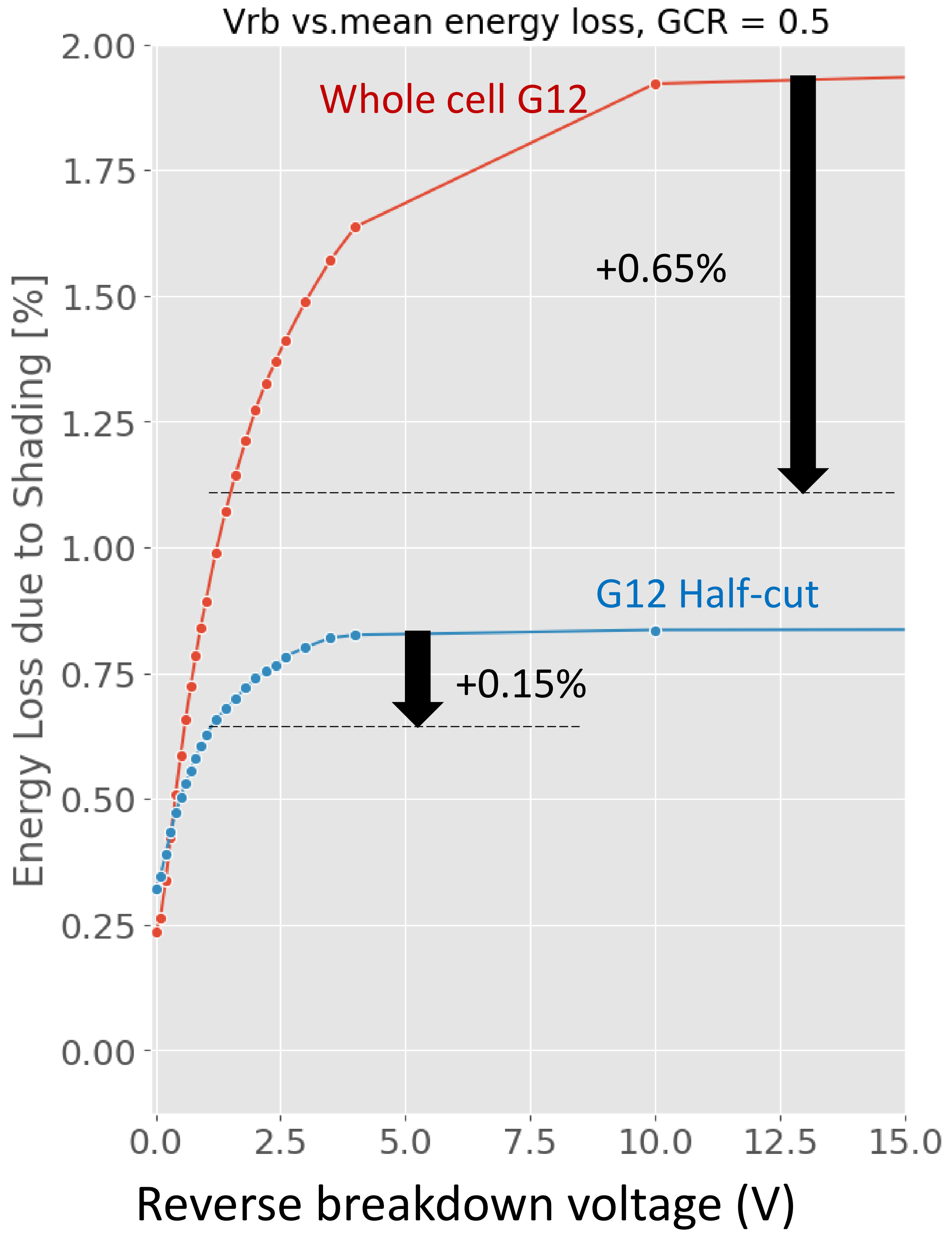
A competitor IBC module with partial shading of a cell and diodes removed resulted in backsheet burning within 30 minutes

- ❑ Max7 reverse voltage at –Isc is -2.3 volts, current production product. Max8 in pilot achieved -1.5 volts.
- ❑ Shaded conditions increase cell temperature only 30 C
- ❑ Higher energy yield and fewer reliability issues with local heating.
- ❑ Compare to front contact with very elevated temperatures during diode failure.

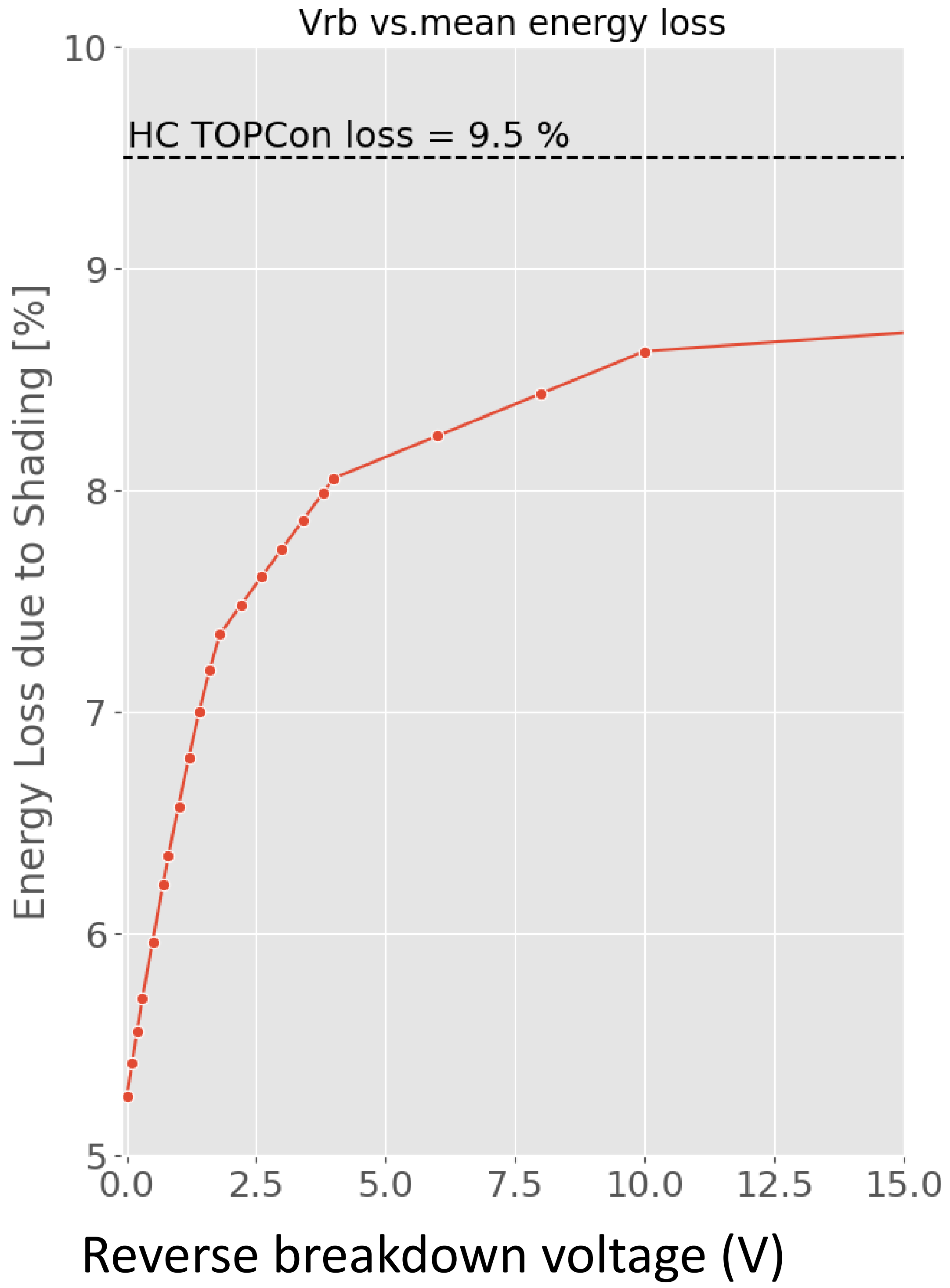


Effect of Reverse voltage on energy loss due to shading

Power plant with row-row shading



Residential with string inverters



Low reverse breakdown voltage drives improved energy yield

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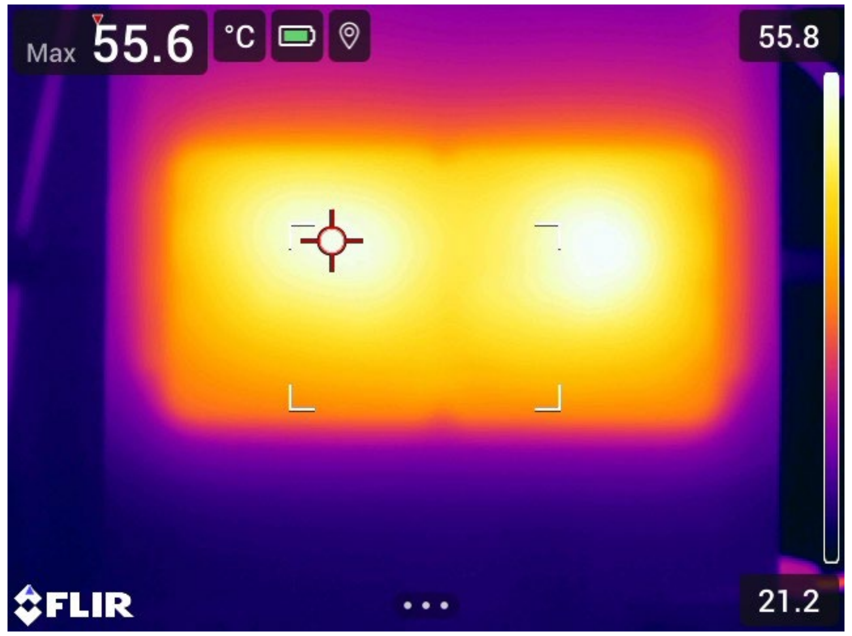
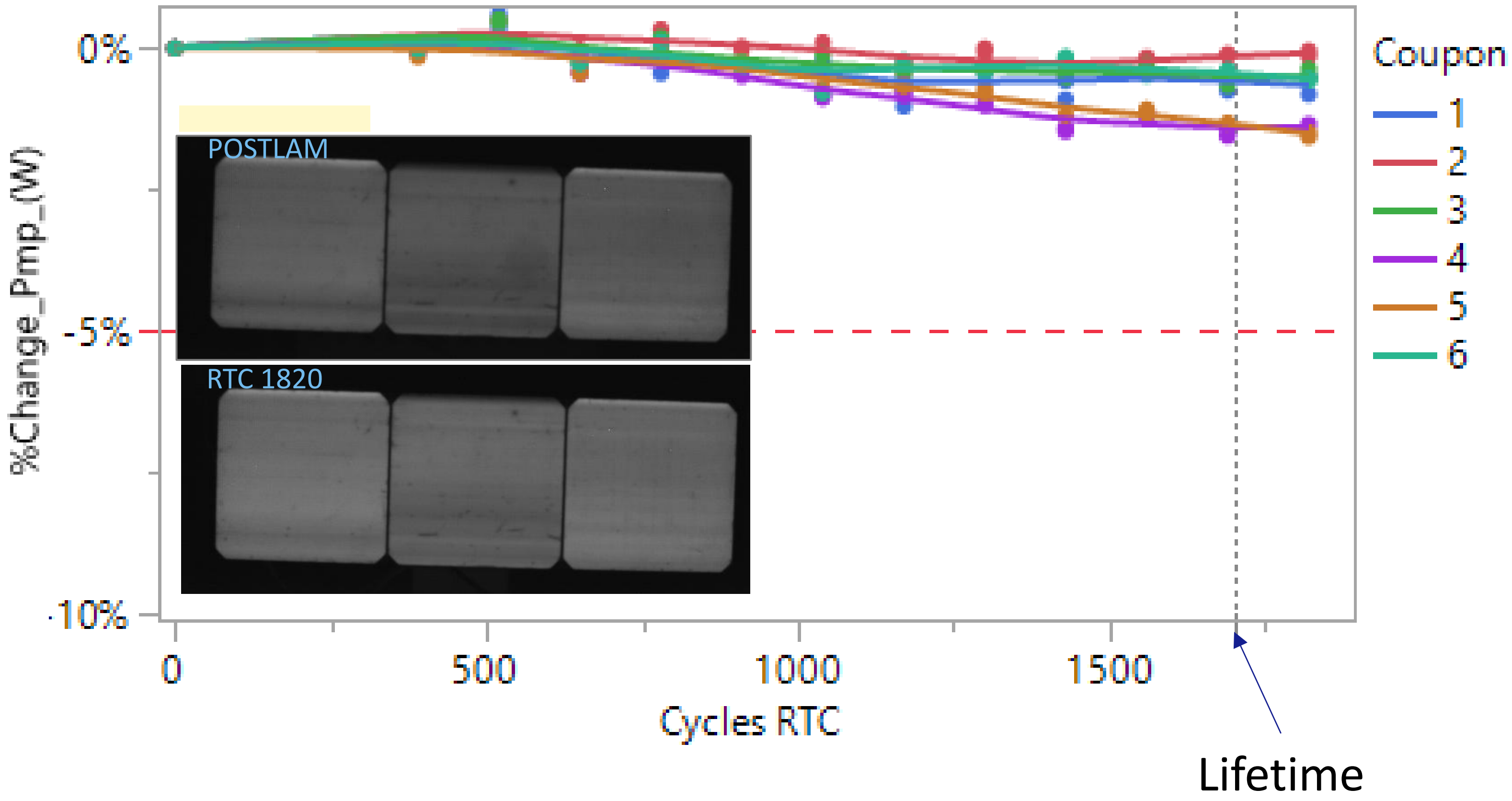
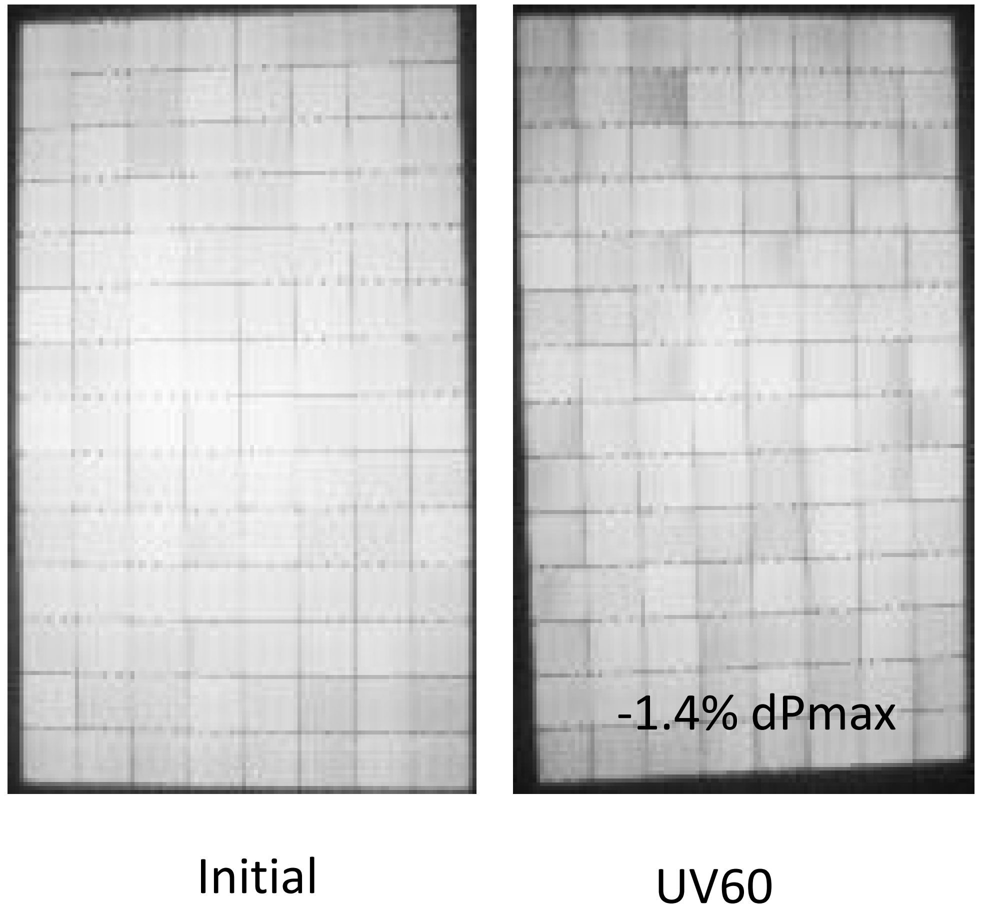
Maxeon's Reliability Advantage



Maxeon IBC: 56˚C
TOPCon: >500˚C





Safer

- Low Peak temperature in shade
- Very low, uniform reverse bias breakdown voltage
- Inherent safety upon shading, hot spots

Stronger

- Aluminum metal held to same stringent standards as robust copper plated design
- Thermal cycling test to end of product warranty, not just IEC limit.

Resilient

- UV front surface degradation is controlled through a proprietary rapid screening test
- Power loss due to UVID is minimal and controlled

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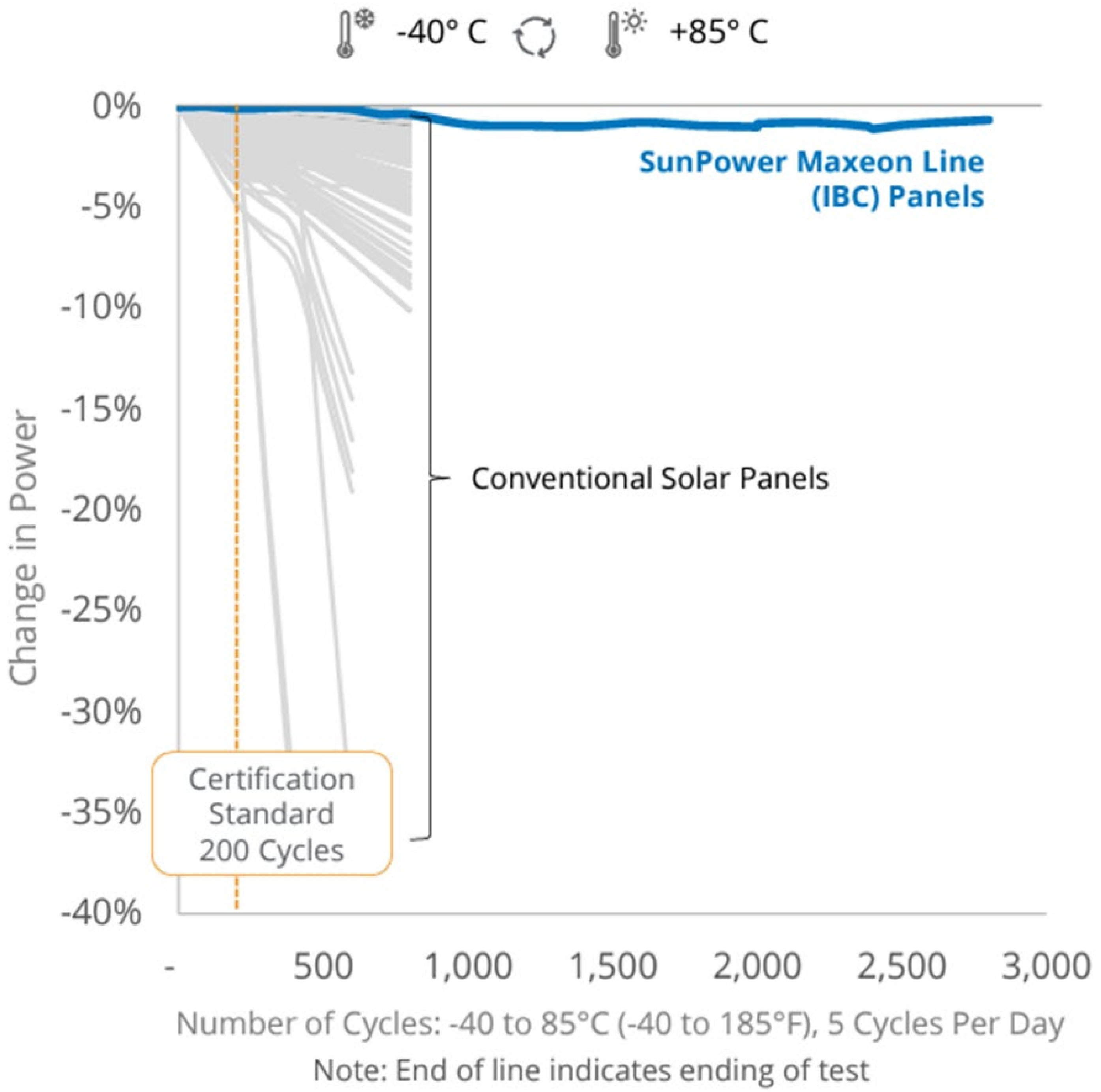
MAXEON IBC vs. CONVENTIONAL CELLS, OTHER xBC

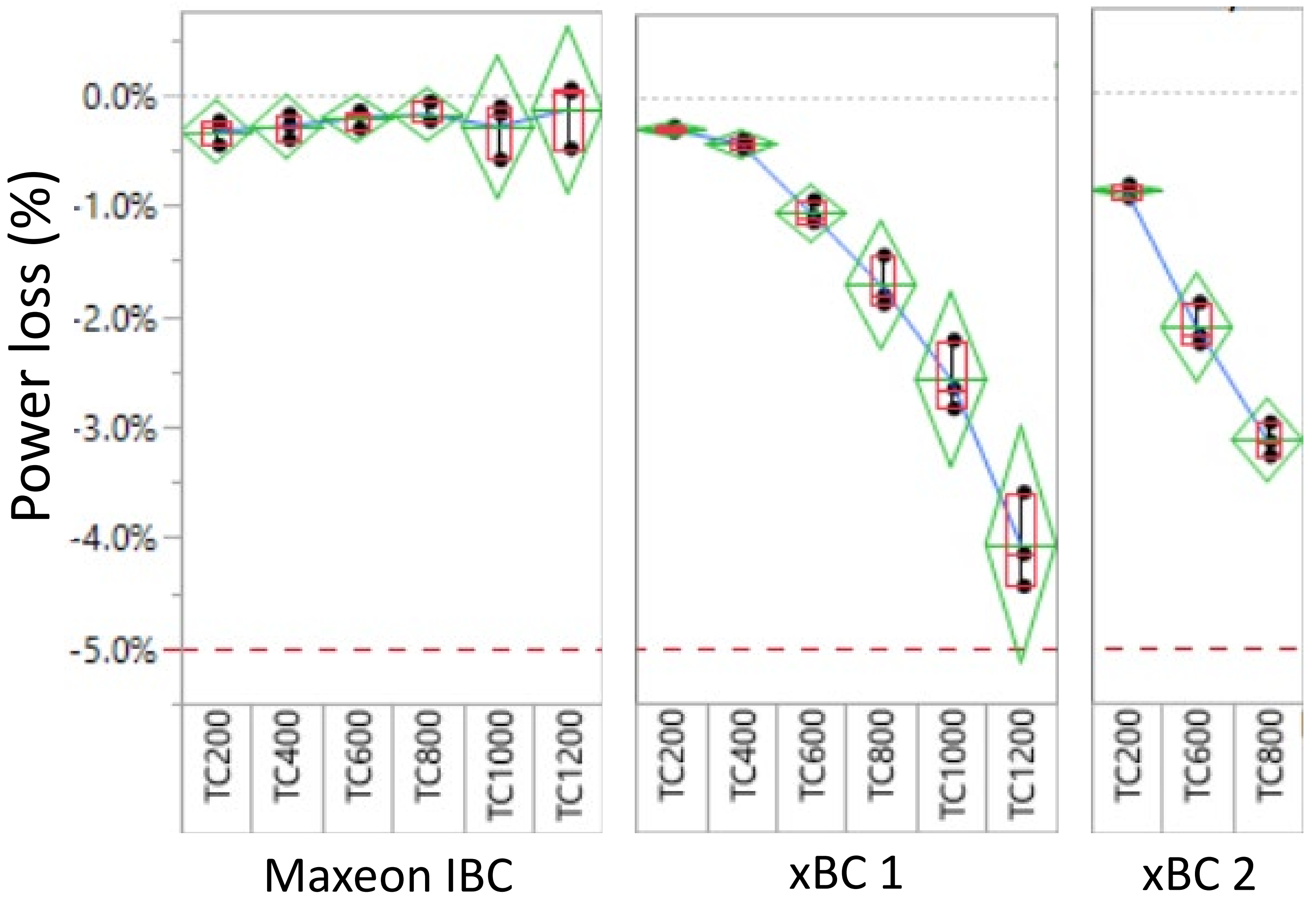
Power Loss from Thermal Cycling



SunPower Panel data (collected prior to Maxeon spin-out): 1 Data beyond TC800 from internal SunPower test programs 2 SunPower data to TC800 from PVEL test reports

Conventional Panel data: 1 Strevel, Nicholas, et al. "Improvements in CdTemodule reliability and long-term degradation through advances in construction and device innovation."Photovoltaics International22 (2013): 66-74. 2 Kawai, Shinji, et al. "Causes of degradation identified by the extended thermal cycling test on commercially available crystalline silicon photovoltaic modules."IEEE Journal of Photovoltaics7.6 (2017): 1511-1518. 3 Tang, Jing, et al. "The performance of double glass photovoltaic modules under composite test conditions."Energy Procedia130 (2017): 87-93. 4 Zhang, Yingbin, et al. "Long-term reliability of silicon wafer-based traditional backsheetmodules and double glass modules." RSC Advances 5.81 (2015): 65768-65774. 5 PVEL Module Reliability Scorecard, 2019.

IBC = Interdigitated Back Contact
xBC = All back contact technologies



Note: results above are from Maxeon internal testing on competitor xBC modules. xBC 1 and 2 are commercially available solar modules.

SOME CONCLUDING THOUGHTS

- Maxeon has been developing IBC for 20+ years and has learned some painful lessons.
- Not all IBC is the same. Reliability is not a given but **vigorously engineered at Maxeon**.
- >26 % cells and 25 % efficiency modules have been achieved in manufacturing.
- Reverse voltage -1.5 volts achieved: **Best energy yield, hotspot risk eliminated.**
- Perhaps a side comment to our colleagues in the Perovskite world:
  Do not fear over-testing. Maxeon built its reputation with it.
- Aluminum metallization is almost here.   **Sustainable, low-cost, reliable.**

Thank you!

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POWERING POSITIVE CHANGE