Mono PERC Cell G1 5BB

Created date: 4/8/2025
Revision status: V.02
Model name: MZ22-10

MetZilla™ is a CNT-enhanced silver paste designed to keep conductors electrically continuous when cells experience micro-cracking. In third-party testing referenced to IEC 61215-2 methods, modules using MetZilla exhibited comparable performance to control modules and smaller fracture-related progression in select stress legs. Integration uses standard screen printing and firing profiles.

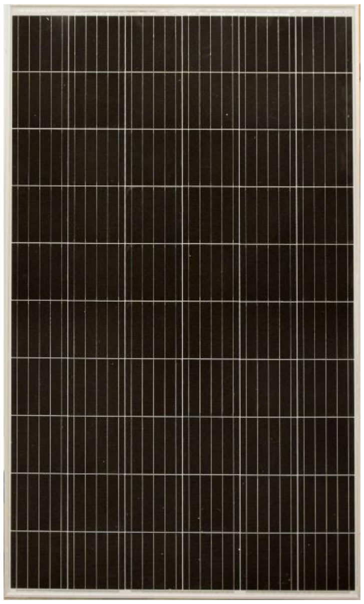
Module Performance

Beginning of Life Electrical Performance

Electrical Properties (STC*)

Model		Baseline	MetZilla
Maximum Power (Pmax)	[W]	303.08 (±1.6)	302.48 (±2.6)
MPP Voltage (Vmpp)	[V]	32.76 (±0.28)	33.46 (±0.10)
MPP Current (Impp)	[A]	9.25 (±0.05)	9.04 (±0.06)
Open Circuit Voltage (Voc)	[V]	40.16 (±0.06)	39.98 (±0.12)
Short Circuit Current (Isc)	[A]	9.64 (±0.02)	9.43 (±0.06)
Module Efficiency [%]	[%]	20.24 (±0.12)	20.20 (±0.17)

*STC (Standard Test Condition): Irradiance 1000 W/m^2, Cell Temperature 25 C, AM 1.5



Features

- ✓ Comparable electrical performance
- ✓ Modules with MetZilla metallization experience significantly less cell fracture during mechanical stress testing performed by two independent testing facilities.
- ✓ The average change in Pmp from stabilized to post-mechanical stress was measured to be –0.29% and -1.70% for the OSA and control modules, respectively.
- ✓ The average change in Pmp from stabilized to post-humidity freeze stress was measured to be *-2.39%* and *-3.53%* for the OSA and control modules, respectively.

General Data

Testing Reference Method	IEC 61215-2:2021
Cell Properties (Material/Type)	Monocrystalline PERC
Module manufacturer	D2 Solar
Cell Configuration	60 Cells (6 x 10)
Backsheet (Color)	White
Frame (Material)	Anodized Aluminum

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ENERGY

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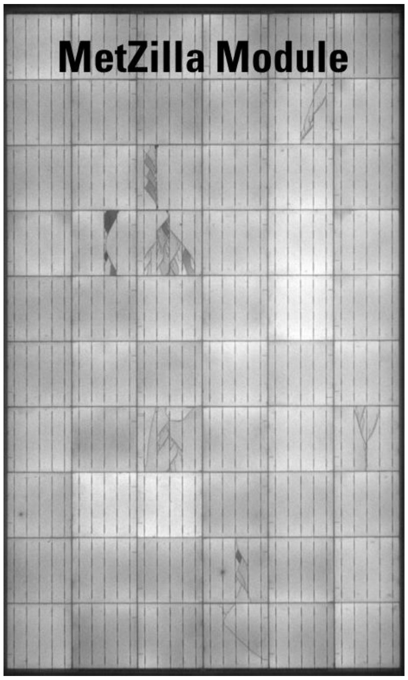
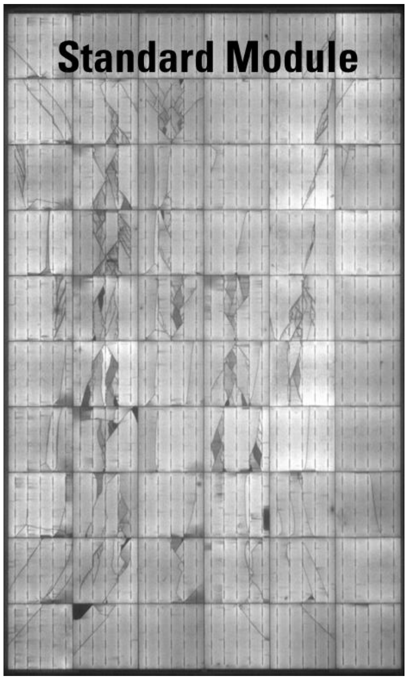
Mechanical Stress Testing

EL Images Post-Mechanical Load and Humidity Freeze (IEC 61215-2:2021)





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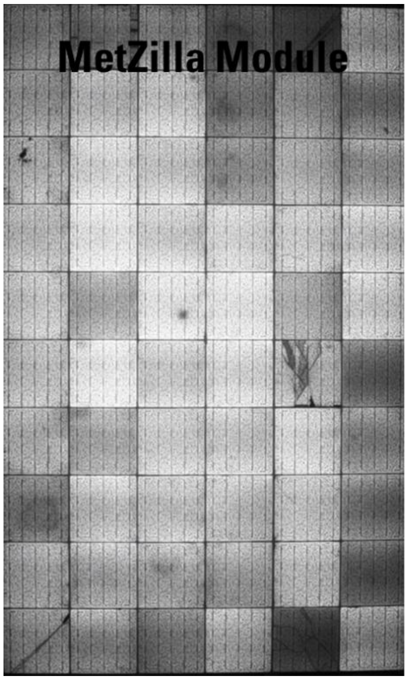
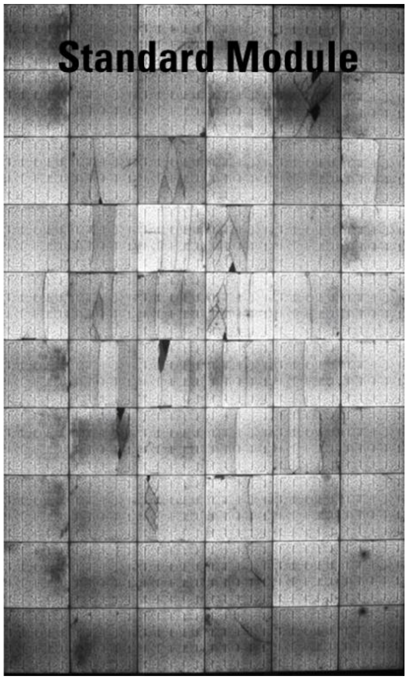
Test Category	MetZilla Module Degradation Rate (%)	Standard Module Degradation Rate (%)
Mechanical Load Test	-0.29	-1.70
Humidity Freeze Test	-2.39	-3.53

EL Images Post-Mechanical Load Testing

Sandia
National
Laboratories





Cell Performance

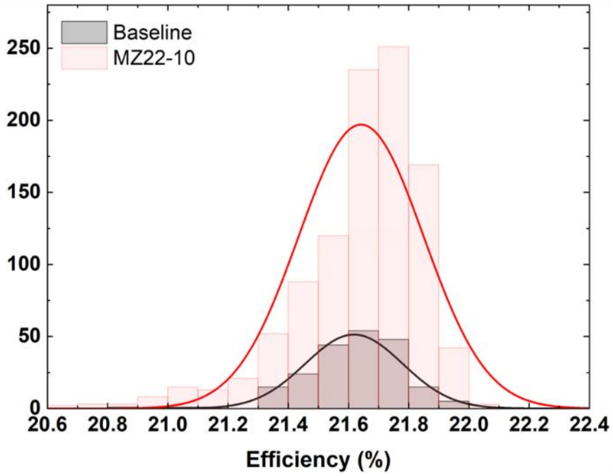
Physical Characteristics

Dimension	158.75 mm × 158.75 mm ± 0.25 mm
Thickness (Si)	180 µm ± 20 µm
Front Side (-)	Blue silicon nitride anti-reflection coating 70-80 nm thick; emitter sheet resistance $\rho = 95\text{-}100$ Ω/□; 5 silver busbars (0.8 ± 0.1 mm); 83 µm wide gridlines
Back Side (+)	Full-surface aluminum BSF; 5 × 4 soldering pads; 1.2 mm ± 0.1 mm wide silver/aluminum busbars

Features

- ✓ Superior efficiency (+0.024%)
- ✓ Higher throughput of better efficiency cells
- ✓ MetZilla paste is more ductile and has superior fracture strength (7×)
- ✓ Capable of gap-bridging cell cracks (≥ 40 µm)
- ✓ No adverse effects on corrosion from damp heat, thermal shock, and HAST

***Paste products are research grade, and some difficulty printing at 20 µm has been observed.**



Electrical Performance

		Baseline	MetZilla
Efficiency	η (%)	21.62 (±0.2)	21.64 (±0.2)
Fill Factor	FF (%)	80.88 (±0.4)	80.79 (±0.4)
Rated Power	P_{mpp} (W)	5.316 (±0.04)	5.322 (±0.05)
Max Power Voltage	V_{mp} (V)	0.570 (±0.002)	0.568 (±0.003)
Max Power Current	I_{mp} (A)	9.330 (±0.06)	9.368 (±0.06)
Open Circuit Voltage	V_{oc} (V)	0.666 (±0.001)	0.666 (±0.003)
Short Circuit Current	I_{sc} (A)	9.860 (±0.05)	9.889 (±0.05)

*Standard testing conditions (STC): 1000 W/m^2, AM 1.5, 25 °C.

Paste Performance

Paste Properties

Analysis Characteristic	Unit of Measure	Specification	Test Value
Fineness of grind: 4th Scratch	µm	</= 12	6
Fineness of grind: 50% Point	µm	</= 7	4
Solids (750 °C) wt./20 min	%	90.5 ~ 92.5	91.3
Viscosity: [HBDV/#14 at 20 rpm/3 min] 15°C	Pa.s	170.0 ~ 350.0	232

Features

- ✓ Viscosity and fineness of grind match baseline commercial paste
- ✓ Comparable screen-printing performance
- ✓ No additional steps are required during the printing and firing process.