



VIET NAM GREEN ENERGY SOLAR



2021.09



- 1. Company profile***
- 2. Milestones***
- 3. Our Customers***
- 4. Customer Core Team***
- 5. Our Process (500MW line)***
- 6. Our Product and Specifications***
- 7. Future Plan***

1. Company profile



1. Vietnam Green Energy, Solar (GES) is a fully Vietnam registered entity.
2. Registered with a capital of USD 5 millions in year 2016.
3. Up to Date, total investment exceeding USD 20 Million.
4. Currently, equip with 3 fully automatic and high efficiency 500 MW panel production line.
5. Total work force about 600.
6. Total installed capacity of 1.5 GW.



Our Factories Located in Bac Ninh Province, Vietnam



Dai Dong-Hoan Son Industrial Park



- Operation commences in yr2016.
- Located in Bac Ninh Province, nearer to Hanoi.
- Two 500MW module automation production lines.
- Total capacity is 1 GW.
- Capable to product module with difference varieties of cells :
 - a. full cell, half cell and small cell.
 - b. 5BB, 9BB, 10BB, 13BB (Bus Bar)
 - c. 166X166, 182X182, 210X210 mm

Viet Hung-Que Vo Industrial Park

- Operation commences in yr2020.
- Located in Bac Ninh Province, further from Hanoi.
- One 500MW module automation production line.
- Capable to product module with difference varieties of cells :
 - a. full cell, half cell and small cell.
 - b. 5BB, 9BB, 10BB, 13BB (Bus Bar)
 - c. 166X166, 182X182, 210X210 mm



CTO – Anthony Chia



Anthony Chia is a Singaporean. He joined Solar industry since years 2006, is one of the pioneers in the solar testing field. He worked many years in USA MNC and an expert Lean 6 Sigma Mentor.

He invented The HAST methods for super acceleration solar material aging test (It has become a important test methods that are used in most of the solar company) and Encapsulants test methods for determining the degree of cure for EVA which was awarded as IEC62788-1-6:2017.

In year 2009, he set up the Key state module Testing centre that covered all the solar module tests that under GB/T9535, IEC61215, IEC61730 and UL1703. In May, 2010 he led his organization to enter the first ever offsite testing with: TUV Rheinland for TMP program-; UL for WDTL program and Parallel endorsement program with CGC China.

2. milestone



2016

- Registered and set up factory
- Awarded TUV (SUD) Certificate
- Launched Smart Module (Sunsinifer) series
- Awarded ISO 9001-2015 certificate
- Launched our Own Brand and Full Black module series



2017

- Developed OBM,ODM & OEM business models
- Launched Customized Module Series and Smart Module (Tigo) Series
- First Yield Rate > 99.89%
- Equipment Utilization Rate >92.6%



2019

- Awarded CSA certificate
- Awarded BIS certificate



2020

- Compatible with 158.75 double half glass



2021

- Production of 182/210 half-cell large-size modules

3. Our customers



Our Products have been installed in the following countries:



Global projects



Turkey



United States



Germany



Portugal

4. Customer Core Team

They provide the best service by:

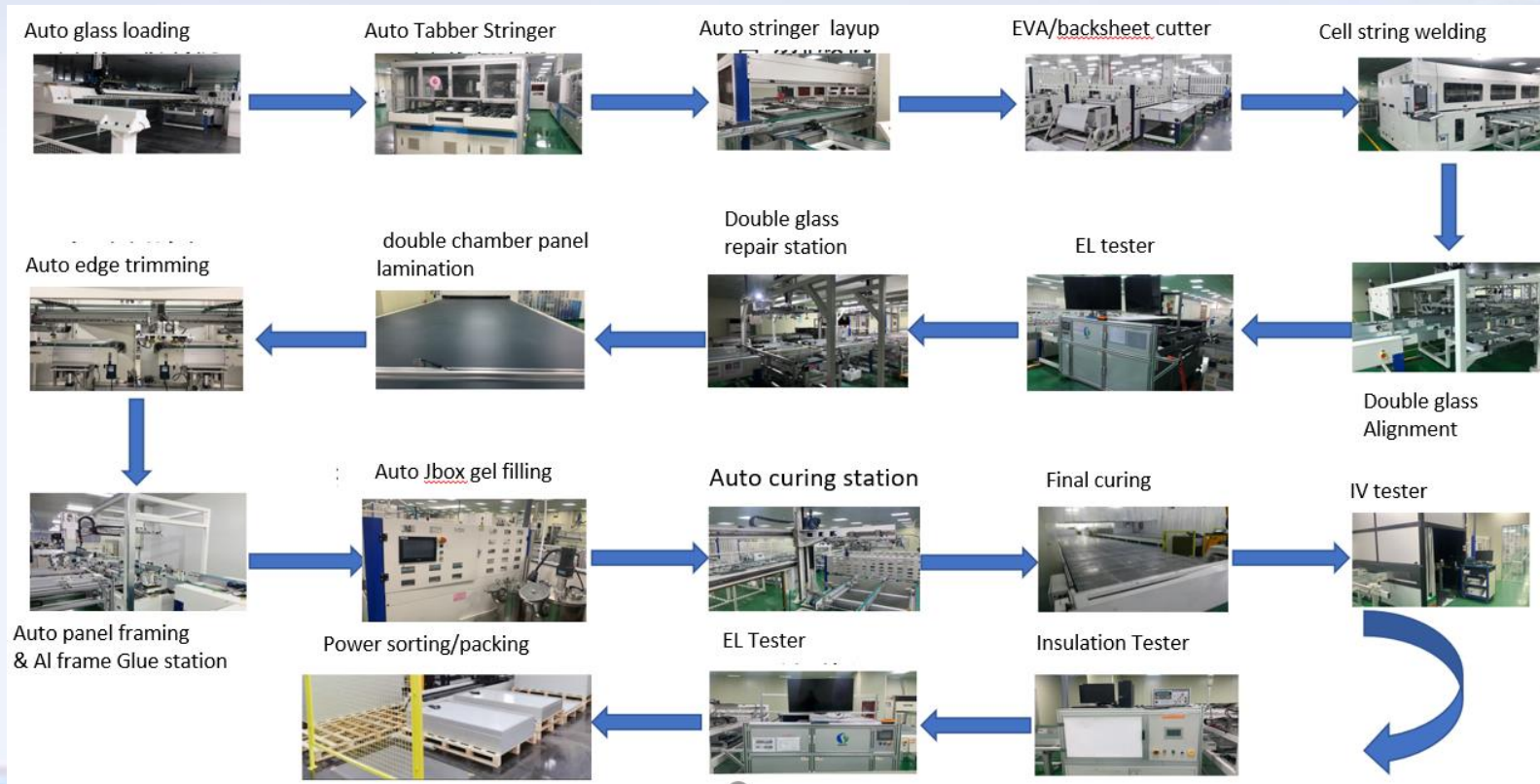
1. liaison with customer for product specifications.
2. Study into Product requirement
3. Studying into Testing and certification requirement
4. Review Material requirement
5. Set up Process and equipment

Customer Core Team Members:

- Leader : Product mgr
- Material and incoming : QA engr
- Process and testing : QA engr
- Process engineering : Process engr
- Equipment capabilities : Equipment engr
- Product requirement : product engr



5. Our Process and Specifications



In Process Quality Tools



EVA curing control



Tabber stringer pull strength testing



Solder Flux concentration tester



Ball bearing and hammer to test temper glass



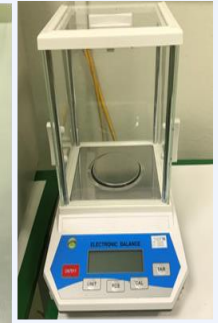
J Box Diode testing



J Box internal resistance loop testing

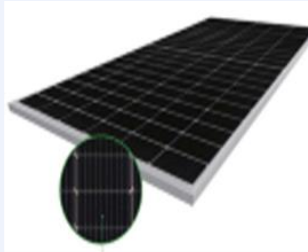


Light intensity tester

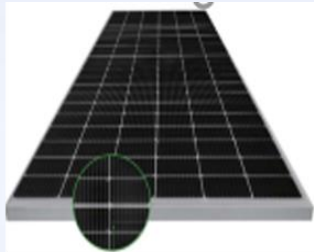


EVA/POE standard wt test

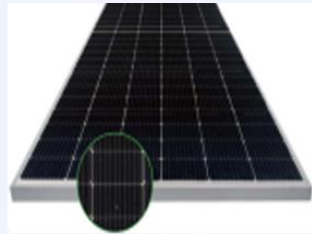
6. *Our Products and Specifications*



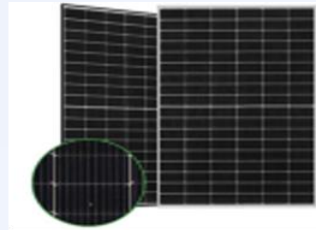
GES440-460M-60HL4-(V)



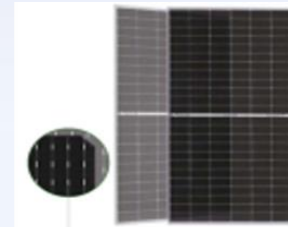
GES435-455M-72HLM-(V)



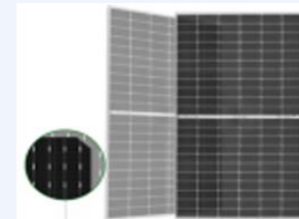
GES530-550M-72HL4-(V)



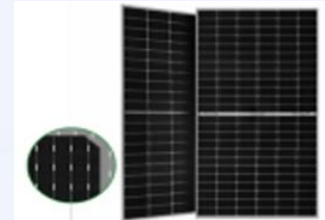
GES395-415M-54HL4-(V)



GES525-545M-72HL4-BDVP



GES435-455M-72HL4-BDVP

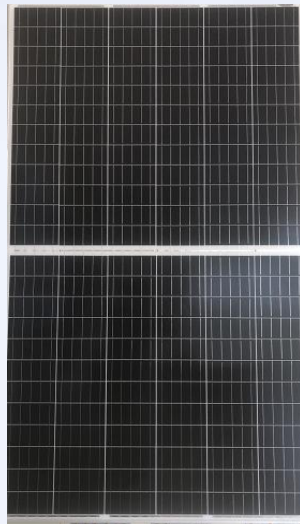


GES525-545M-72HL4-TV

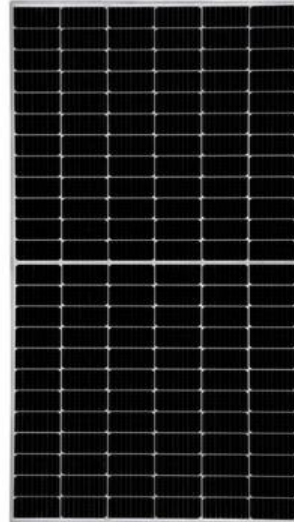
Difference modules configuration (Bus Bar)



Smart series



5BB



9BB



10BB



13BB

Production is ready but NO demand yet

single and double glass half cell series

GES 72HL4-(V)

530-550 Watt

MONO-FACIAL MODULE

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
 ISO14001:2015: Environment Management System
 ISO45001:2018 Occupational health and safety management systems



MBB HC Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



Reduced Hot Spot Loss

Optimized electrical design and lower operating current for reduced hot spot loss and better temperature coefficient.



Longer Life-time Power Yield

0.55% annual power degradation and 25 year linear power warranty.



Durability Against Extreme Environmental Conditions

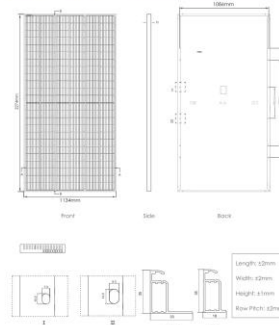
High salt mist and ammonia resistance.



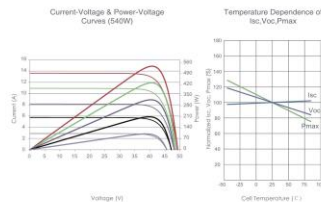
Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

Engineering Drawings



Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P type Mono-crystalline
No. of cells	144 (6x24)
Dimensions	2274x1134x35mm (89.53x44.65x1.38 inch)
Weight	28 kg (61.73 lbs)
Front Glass	3.2mm Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1x4.0mm [-], 200mm of Customized Length

Packaging Configuration

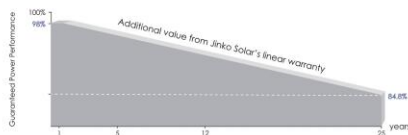
(2pcs/pallets, 62pcs/stack, 620pcs/ 40HQ Container

SPECIFICATIONS

Module Type	GES530M-72HL4		GES530M-72HL4-V		GES535M-72HL4		GES535M-72HL4-V		GES540M-72HL4		GES540M-72HL4-V		GES545M-72HL4		GES545M-72HL4-V		GES550M-72HL4		GES550M-72HL4-V					
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT				
Maximum Power (Pmax)	530Wp	394Wp	535Wp	398Wp	540Wp	402Wp	545Wp	405Wp	550Wp	409Wp	555Wp	409Wp	560Wp	413Wp	565Wp	416Wp	570Wp	419Wp	575Wp	422Wp	580Wp	425Wp		
Maximum Power Voltage (Vmp)	40.56V	37.84V	40.63V	37.91V	40.70V	38.08V	40.80V	38.25V	40.90V	38.42V	41.00V	38.59V	41.10V	41.20V	38.76V	41.30V	41.40V	41.50V	41.60V	41.70V	41.80V	41.90V	42.00V	
Maximum Power Current (Imp)	13.07A	10.42A	13.17A	10.50A	13.27A	10.55A	13.36A	10.60A	13.45A	10.65A	13.54A	10.70A	13.63A	10.75A	13.72A	10.80A	13.81A	10.85A	13.90A	10.90A	13.99A	10.95A	14.04A	11.00A
Open-circuit Voltage (Voc)	49.26V	46.50V	49.34V	46.57V	49.42V	46.65V	49.52V	46.74V	49.62V	46.84V	49.72V	46.94V	49.82V	47.04V	49.92V	47.14V	50.02V	47.24V	50.12V	47.34V	50.22V	47.44V	50.32V	47.52V
Short-circuit Current (Isc)	13.71A	11.07A	13.79A	11.14A	13.85A	11.19A	13.94A	11.26A	14.03A	11.33A	14.12A	11.40A	14.21A	11.47A	14.30A	11.54A	14.39A	11.61A	14.48A	11.68A	14.57A	11.75A	14.66A	11.82A
Module Efficiency STC (%)	20.55%		20.70%		20.94%		21.13%		21.33%		21.53%		21.73%		21.93%		22.13%		22.33%		22.53%		22.73%	
Operating temperature(°C)	-40°C~+85°C																							
Maximum system voltage	1000V(1500VDC, IEC)																							
Maximum series fuse rating	25A																							
Power tolerance	0~+3%																							
Temperature coefficients of Pmax	-0.35%/°C																							
Temperature coefficients of Voc	-0.28%/°C																							
Temperature coefficients of Isc	0.048%/°C																							
Nominal operating cell temperature (NOCT)	45±2°C																							

*STC: ☀ Irradiance 1000W/m² 🌡 Cell Temperature 25°C ☁ AM=1.5
 NOCT: ☀ Irradiance 800W/m² 🌡 Ambient Temperature 20°C ☁ AM=1.5 🌬 Wind Speed 1m/s

LINEAR PERFORMANCE WARRANTY



12 Year Product Warranty

25 Year Linear Power Warranty

0.55% Annual Degradation Over 25 years

LOT D1-1, Dai Dong-Hoan Son Industrial zone, Hoan Son Commune, Tien Du District, Bac Ninh Province, Viet Nam.
 Specifications included in this datasheet are subject to change without notice. GES530-550M-72HL4-(V)-F2-EN

GES 72HL4-BDPV

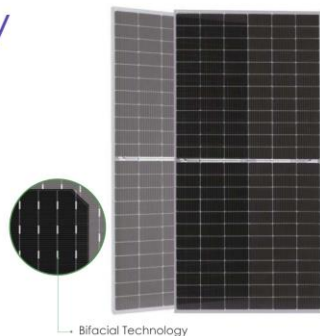
525-545 Watt

BIFACIAL MODULE WITH DUAL GLASS

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
ISO14001:2015: Environment Management System
ISO45001:2018
Occupational health and safety management systems



Bifacial Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



PID Resistance

Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



Higher Power Output

Module power increases 5-25% generally, bringing significantly lower LCOE and higher IRR.



Longer Life-time Power Yield

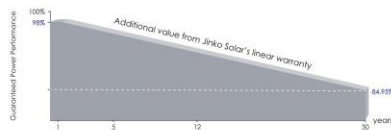
0.45% annual power degradation and 30 year linear power warranty.



Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

LINEAR PERFORMANCE WARRANTY

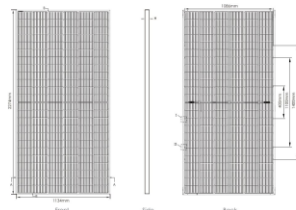


12 Year Product Warranty

30 Year Linear Power Warranty

0.45% Annual Degradation Over 30 years

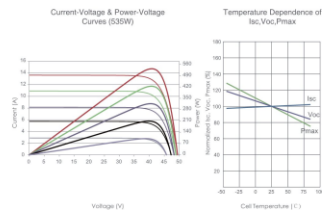
Engineering Drawings



Packaging Configuration

1 Two pallets = One stack
35pcs/pallets, 70pcs/stack, 700pcs/ 40HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P type Mono-crystalline
No. of cells	144 (6*24)
Dimensions	2274*1134*30mm (89.53*44.65*1.18 inch)
Weight	32 kg (70.55 lbs)
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, Heat Strengthened Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1x4.0mm (+), 4.0mm (-); 200mm or Customized Length

SPECIFICATIONS

Module Type	GES525M-72HL4-BDPV		GES530M-72HL4-BDPV		GES535M-72HL4-BDPV		GES540M-72HL4-BDPV		GES545M-72HL4-BDPV	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	525Wp	391Wp	530Wp	396Wp	535Wp	398Wp	540Wp	402Wp	545Wp	405Wp
Maximum Power Voltage (Vmp)	40.80V	37.81V	40.87V	37.88V	40.94V	37.94V	41.13V	38.08V	41.32V	38.25V
Maximum Power Current (Imp)	12.87A	10.35A	12.97A	10.41A	13.07A	10.49A	13.15A	10.55A	13.19A	10.60A
Open-circuit Voltage (Voc)	49.42V	46.65V	49.48V	46.70V	49.54V	46.76V	49.73V	46.94V	49.92V	47.12V
Short-circuit Current (Isc)	13.63A	11.01A	13.73A	11.09A	13.83A	11.17A	13.89A	11.22A	13.95A	11.27A
Module Efficiency STC (%)	20.36%		20.55%		20.75%		20.94%		21.13%	
Operating Temperature(°C)					-40°C~+85°C					
Maximum system voltage					1500VDC (IEC)					
Maximum series fuse rating					30A					
Power tolerance					0~+3%					
Temperature coefficients of Pmax					-0.35%/°C					
Temperature coefficients of Voc					-0.28%/°C					
Temperature coefficients of Isc					0.046%/°C					
Nominal operating cell temperature (NOCT)					45±2°C					
Refer: Bifacial Factor					70±5%					

BIFACIAL OUTPUT-REAR SIDE POWER GAIN

	5%	15%	25%
Maximum Power (Pmax)	551Wp	604Wp	656Wp
Module Efficiency STC (%)	21.38%	23.41%	25.43%
Maximum Power (Pmax)	557Wp	610Wp	663Wp
Module Efficiency STC (%)	21.58%	23.64%	25.69%
Maximum Power (Pmax)	562Wp	615Wp	669Wp
Module Efficiency STC (%)	21.78%	23.86%	25.93%
Maximum Power (Pmax)	567Wp	621Wp	675Wp
Module Efficiency STC (%)	21.99%	24.08%	26.18%
Maximum Power (Pmax)	572Wp	623Wp	681Wp
Module Efficiency STC (%)	22.19%	24.30%	26.42%

*STC: ☀️ Irradiance 1000W/m²

☁️ Cell Temperature 25°C

☁️ AM=1.5

NOCT: ☀️ Irradiance 800W/m²

☁️ Ambient Temperature 20°C

☁️ AM=1.5

🌀 Wind Speed 1m/s

LOT D1-1, Dai Dong-Hoan Son Industrial zone, Hoan Son Commune, Tien Du District, Bac Ninh Province, Viet Nam.

Specifications included in this datasheet are subject to change without notice.

GES525-545M-72HL4-BDPV-F2-EN

GES 72HL4-TV

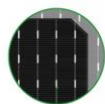
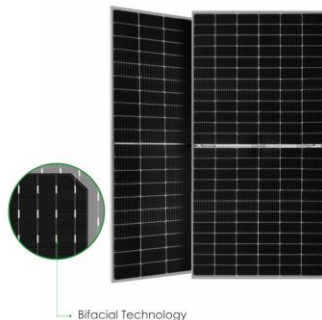
525-545 Watt

BIFACIAL MODULE WITH TRANSPARENT BACKSHEET

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
 ISO14001:2015: Environment Management System
 ISO45001:2018
 Occupational health and safety management systems



Bifacial Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



Light-weight design

Light-weight design using transparent backsheet for easy installation and low BOS cost.



Higher Power Output

Module power increases 5-25% generally, bringing significantly lower LCOE and Higher IRR.



Longer Life-time Power Yield

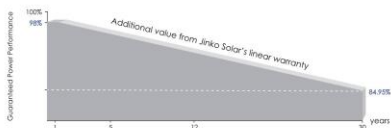
0.45% annual power degradation and 30 year linear power warranty.



Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (540 Pascal).

LINEAR PERFORMANCE WARRANTY

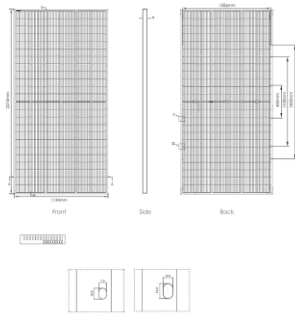


12 Year Product Warranty

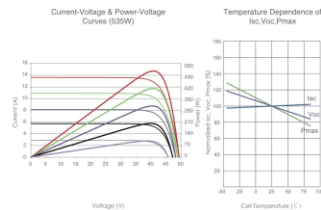
30 Year Linear Power Warranty

0.45% Annual Degradation Over 30 years

Engineering Drawings



Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P Type Mono-crystalline
No. of cells	144 (6x24)
Dimensions	2274*1134*40mm (89.53*44.65*1.57 inch)
Weight	29 kg (61.73 lbs)
Front Glass	3.2mm Anti-Reflection Coating High Transmission, Low Ion, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1x4.0mm (+): 400mm, (-): 200mm or Customized Length

Packaging Configuration

[Two pallets = One stack]
 27pcs/pallets, 54pcs/stack, 540pcs/ 40HQ Container

SPECIFICATIONS

Module Type	GES25M-72HL4-TV		GES35M-72HL4-TV		GES55M-72HL4-TV		GES45M-72HL4-TV		GES54M-72HL4-TV	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power [Pmax]	522Wp	391Wp	530Wp	394Wp	535Wp	395Wp	540Wp	402Wp	545Wp	403Wp
Maximum Power Voltage [Vmp]	40.61V	37.74V	40.71V	37.88V	40.81V	37.98V	40.91V	38.08V	41.07V	38.18V
Maximum Power Current [Imp]	12.93A	10.35A	13.02A	10.41A	13.11A	10.48A	13.20A	10.55A	13.27A	10.62A
Open-circuit Voltage [Voc]	49.27V	46.50V	49.35V	46.58V	49.42V	46.65V	49.49V	46.71V	49.65V	46.86V
Short-circuit Current [Isc]	13.64A	11.02A	13.71A	11.07A	13.79A	11.14A	13.87A	11.20A	13.94A	11.26A
Module Efficiency STC (%)	20.36%		20.55%		20.75%		20.94%		21.13%	
Operating Temperature(°C)	-40°C~+85°C									
Maximum system voltage	1500VDC (IEC)									
Maximum series fuse rating	30A									
Power tolerance	0~+3%									
Temperature coefficients of Pmax	-0.35%/°C									
Temperature coefficients of Voc	-0.28%/°C									
Temperature coefficients of Isc	0.048%/°C									
Nominal operating cell temperature (NOCT)	45±2°C									
Refer. Bifacial Factor	70±5%									

BIFACIAL OUTPUT-REAR SIDE POWER GAIN

		551Wp	557Wp	562Wp	567Wp	572Wp
5%	Maximum Power [Pmax]	551Wp	557Wp	562Wp	567Wp	572Wp
	Module Efficiency STC (%)	21.38%	21.58%	21.78%	21.99%	22.19%
15%	Maximum Power [Pmax]	604Wp	610Wp	615Wp	621Wp	629Wp
	Module Efficiency STC (%)	23.41%	23.64%	23.86%	24.08%	24.30%
25%	Maximum Power [Pmax]	656Wp	663Wp	669Wp	675Wp	681Wp
	Module Efficiency STC (%)	25.45%	25.69%	25.93%	26.18%	26.42%

*STC: ☀ Irradiance 1000W/m² 🌡 Cell Temperature 25°C ☁ AM=1.5
 NOCT: ☀ Irradiance 800W/m² 🌡 Ambient Temperature 20°C ☁ AM=1.5 🌀 Wind Speed 1m/s

GES 60HL4-(V)

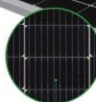
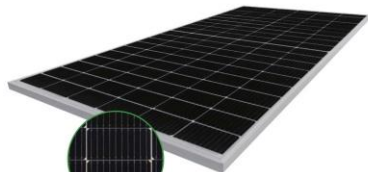
440-460 Watt

MONO-FACIAL MODULE

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
 ISO14001:2015: Environment Management System
 ISO45001:2018 Occupational health and safety management systems



MBB HC Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



Reduced Hot Spot Loss

Optimized electrical design and lower operating current for reduced hot spot loss and better temperature coefficient.



PID Resistance

Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



Durability Against Extreme Environmental Conditions

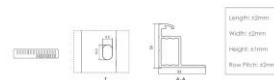
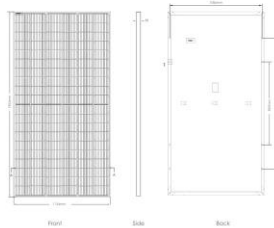
High salt mist and ammonia resistance.



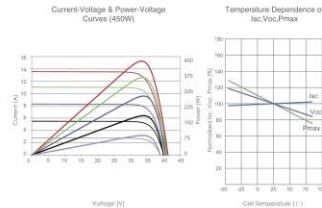
Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (3400 Pascal).

Engineering Drawings



Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P Type Mono-crystalline
No. of cells	120 (6x20)
Dimensions	1903*1134*30mm (74.92*44.65*1.18 inch)
Weight	24.2 kg (53.35 lbs)
Front Glass	3.2mm Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	UV 1x4.0mm (+): 400mm, (-): 200mm or Customized Length

Packaging Configuration

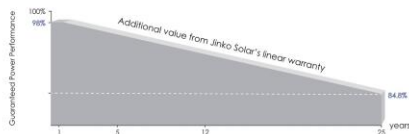
1 Two pallets = One stack
 33pcs/pallets, 70pcs/truck, 840pcs/ 40HQ Container

SPECIFICATIONS

Module Type	GES440M-60HL4		GES445M-60HL4		GES450M-60HL4		GES455M-60HL4		GES460M-60HL4	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	440Wp	327Wp	443Wp	331Wp	450Wp	335Wp	455Wp	339Wp	460Wp	342Wp
Maximum Power Voltage (Vmp)	33.72V	31.39V	33.82V	31.56V	33.91V	31.73V	34.06V	31.91V	34.20V	32.07V
Maximum Power Current (Imp)	13.05A	10.43A	13.16A	10.49A	13.27A	10.55A	13.36A	10.61A	13.45A	10.67A
Open-circuit Voltage (Voc)	41.02V	38.72V	41.10V	38.79V	41.18V	38.87V	41.33V	39.01V	41.48V	39.15V
Short-circuit Current (Isc)	13.73A	11.09A	13.79A	11.14A	13.85A	11.19A	13.93A	11.25A	14.01A	11.32A
Module Efficiency STC (%)	20.39%		20.42%		20.85%		21.08%		21.32%	
Operating Temperature(°C)	-40°C~+85°C									
Maximum system voltage	1000V (SC/NOCT) (IEC)									
Maximum series fuse rating	25A									
Power tolerance	0~+3%									
Temperature coefficients of Pmax	-0.35%/°C									
Temperature coefficients of Voc	-0.28%/°C									
Temperature coefficients of Isc	0.048%/°C									
Nominal operating cell temperature: (NOCT)	45±2°C									

*STC: ☀ Irradiance 1000W/m² 🌡 Cell Temperature 25°C 🌫 AM=1.5
 NOCT: ☀ Irradiance 800W/m² 🌡 Ambient Temperature 20°C 🌫 AM=1.5 🌀 Wind Speed 1m/s

LINEAR PERFORMANCE WARRANTY



12 Year Product Warranty

25 Year Linear Power Warranty

0.55% Annual Degradation Over 25 years

LOT D1-1, Dai Dong Huan Son Industrial zone, Huan Son Commune, Tien Du District, Bac Ninh Province, Viet Nam.

Specifications included in this datasheet are subject to change without notice.

GES440-460M-60HL4-(V)-F1-EN

GES 72HLM-(V)

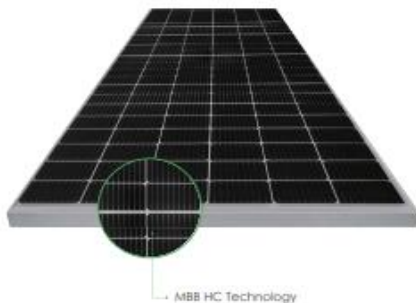
435-455 Watt

MONO-FACIAL MODULE

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
 ISO14001:2015: Environment Management System
 ISO45001:2018: Occupational health and safety management systems



MBB HC Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



PID Resistance

Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



Durability Against Extreme Environmental Conditions

High salt mist and ammonia resistance.



Reduced Hot Spot Loss

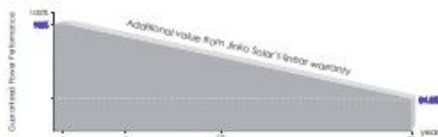
Optimized electrical design and lower operating current for reduced hot spot loss and better temperature coefficient.



Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (2400 Pascal).

LINEAR PERFORMANCE WARRANTY



12 Year Product Warranty

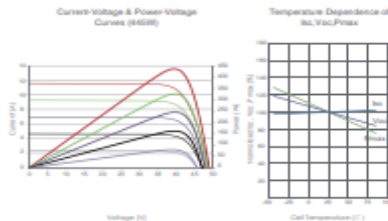
25 Year Linear Power Warranty

0.55% Annual Degradation Over 25 years

Engineering Drawings



Electrical Performance & Temperature Dependence



Packaging Configuration

(Two panels = One stack)

32pcs/pallet, 42pcs/stack, 482pcs/40HQ Container

Mechanical Characteristics

Cell Type	Mono PERC 166±144mm
No. of cells	144 (4×24)
Dimensions	2096±1039×35mm (82.52±140.91×1.38 inch)
Weight	25.1kg (55.34 lbs)
Front Glass	3.2mm Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	3W (4.0mm²) (4): 20mm, (1): 145mm or Customized Length

SPECIFICATIONS

Module Type	GES435M-72HLM		GES450M-72HLM		GES455M-72HLM		GES455M-72HLM-V		GES455M-72HLM-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power [Pmax]	435Wp	324Wp	440Wp	327Wp	445Wp	331Wp	450Wp	335Wp	455Wp	339Wp
Maximum Power Voltage [Vmp]	40.77V	37.74V	40.97V	37.89V	41.17V	38.10V	41.37V	38.31V	41.56V	38.47V
Maximum Power Current [Imp]	10.47A	8.57A	10.74A	8.64A	10.81A	8.69A	10.88A	8.74A	10.95A	8.80A
Open-circuit Voltage [Voc]	48.47V	45.84V	48.87V	46.03V	49.07V	46.22V	49.27V	46.41V	49.46V	46.59V
Short-circuit Current [Isc]	11.32A	9.14A	11.39A	9.20A	11.46A	9.26A	11.53A	9.31A	11.60A	9.37A
Module Efficiency STC [%]	19.97%		20.20%		20.43%		20.66%		20.89%	
Operating Temperature[°C]					-40C ~+85C					
Maximum System Voltage	1000/1500VDC (IEC)									
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.35%/C									
Temperature Coefficients of Voc	-0.29%/C									
Temperature Coefficients of Isc	0.048%/C									
Nominal Operating Cell Temperature (NOCT)	45±2C									

*STC: ☀️ Irradiance 1000W/m² 🌡️ Cell Temperature 25°C

NOCT: ☀️ Irradiance 800W/m² 🌡️ Ambient Temperature 20°C

☁️ AM=1.5

☁️ AM=1.5

🌀 Wind Speed 1m/s

LOT D1-1, Dai Dong-Hoan Son Industrial zone, Hoan Son Commune, Tien Du District, Bac Ninh Province, Viet Nam.

Specifications included in this datasheet are subject to change without notice.

GES435-455M-72HLM-(V)

GES 72HLM-BDPV

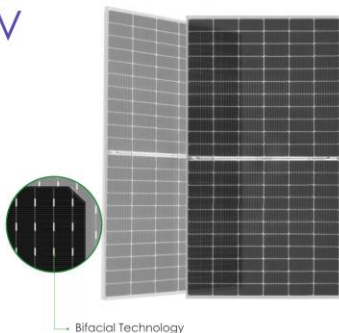
435-455 Watt

BIFACIAL MODULE WITH
DUAL GLASS

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
ISO14001:2015: Environment Management System
ISO45001:2018
Occupational health and safety management systems



Bifacial Technology

Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



Longer Life-time Power Yield

0.45% annual power degradation and 30 year linear power warranty.



PID Resistance

Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



Low-light Performance

Advanced glass and cell surface textured design ensure excellent performance in low-light environment



Higher Power Output

Module power increases 5-25% generally, bringing significantly lower LCOE and higher IRR.

LINEAR PERFORMANCE WARRANTY

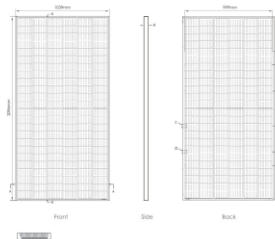


12 Year Product Warranty

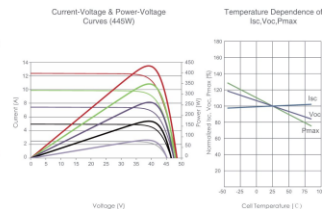
30 Year Linear Power Warranty

0.45% Annual Degradation Over 30 years

Engineering Drawings



Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P type Mono-crystalline
No. of cells	144 (6x24)
Dimensions	2094x1039x30mm (82.52x40.91x1.18 inch)
Weight	28.1kg (61.95 lb)
Front Glass	2.0mm, Anti-Reflection Coating
Back Glass	2.0mm, heat strengthened glass
Frame	Anodized Aluminium Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1x4.0mm (+): 250mm, (-): 130mm or Customized Length

Packaging Configuration

[20 panels = One stack]
35pcs/pallets, 70pcs/stack, 270pcs/ 40HQ Container

SPECIFICATIONS

Module Type	GES435M-72HLM-8DPV		GES440M-72HLM-8DPV		GES445M-72HLM-8DPV		GES450M-72HLM-8DPV		GES455M-72HLM-8DPV	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	435Wp	324Wp	440Wp	327Wp	445Wp	331Wp	450Wp	335Wp	455Wp	339Wp
Maximum Power Voltage (Vmp)	40.81V	37.63V	41.01V	37.80V	41.21V	38.01V	41.40V	38.22V	41.59V	38.38V
Maximum Power Current (Imp)	10.66A	8.60A	10.73A	8.66A	10.80A	8.71A	10.87A	8.76A	10.94A	8.82A
Open-circuit Voltage (Voc)	48.96V	46.11V	49.16V	46.30V	49.36V	46.49V	49.56V	46.68V	49.76V	46.87V
Short-circuit Current (Isc)	11.35A	9.17A	11.42A	9.22A	11.49A	9.28A	11.56A	9.34A	11.63A	9.39A
Module Efficiency STC (%)	19.97%		20.20%		20.43%		20.66%		20.89%	
Operating Temperature(°C)					-40°C~85°C					
Maximum System Voltage					1500VDC (IEC)					
Maximum Series Fuse Rating					25A					
Power Tolerance					0~+3%					
Temperature Coefficients of Pmax					-0.35%/°C					
Temperature Coefficients of Voc					-0.29%/°C					
Temperature Coefficients of Isc					0.048%/°C					
Nominal Operating Cell Temperature (NOCT)					45±2°C					
Refer. Bifacial Factor					70±5%					

BIFACIAL OUTPUT-REARSIDE POWER GAIN

		437Wp	462Wp	467Wp	473Wp	478Wp
5%	Maximum Power (Pmax)					
	Module Efficiency STC (%)	20.99%	21.21%	21.44%	21.72%	21.95%
15%	Maximum Power (Pmax)	500Wp	506Wp	512Wp	518Wp	523Wp
	Module Efficiency STC (%)	22.96%	23.24%	23.51%	23.79%	24.02%
25%	Maximum Power (Pmax)	544Wp	550Wp	556Wp	563Wp	569Wp
	Module Efficiency STC (%)	24.98%	25.26%	25.53%	25.85%	26.13%

*STC: ☀️ Irradiance 1000W/m² 🌡️ Cell Temperature 25°C 🌫️ AM=1.5
NOCT: ☀️ Irradiance 800W/m² 🌡️ Ambient Temperature 20°C 🌫️ AM=1.5 🌬️ Wind Speed 1m/s

LOT D1-1, Dai Dong-Hoan Son Industrial zone, Hoan Son Commune, Tien Du District, Bac Ninh Province, Viet Nam.

Specifications included in this datasheet are subject to change without notice.

GES435-455M-72HLM-8DPV

GES 54HL4-(V)

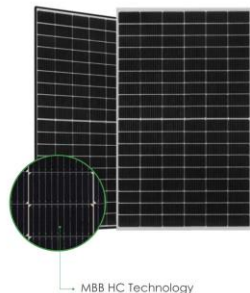
395-415 Watt

MONO-FACIAL MODULE

P-Type

Positive power tolerance of 0~+3%

ISO9001:2015: Quality Management System
 ISO14001:2015: Environmental Management System
 ISO45001:2018
 Occupational health and safety management systems



Key Features



Multi Busbar Technology

Better light trapping and current collection to improve module power output and reliability.



Reduced Hot Spot Loss

Optimized electrical design and lower operating current for reduced hot spot loss and better temperature coefficient.



PID Resistance

Excellent Anti-PID performance guarantee via optimized mass-production process and materials control.



Durability Against Extreme Environmental Conditions

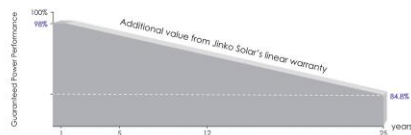
High salt mist and ammonia resistance.



Enhanced Mechanical Load

Certified to withstand: wind load (2400 Pascal) and snow load (5400 Pascal).

LINEAR PERFORMANCE WARRANTY

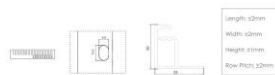
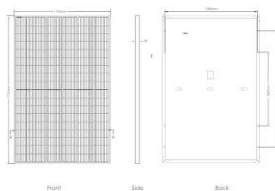


15 Year Product Warranty

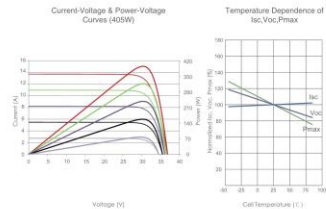
25 Year Linear Power Warranty

0.55% Annual Degradation Over 25 years

Engineering Drawings



Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	P Type Mono-crystalline
No. of cells	108 (2x54)
Dimensions	1722x1134x30mm (67.80x44.65x1.18 inch)
Weight	22.0 kg (48.30 lb)
Front Glass	3.2mm Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminum Alloy
Junction Box	IP68 Rated
Output Cables	TUV 1x4/0.6mm ² (±): 400mm, (-): 200mm or Customized Length

Packaging Configuration

1 Two pallets = One stack
 36pcs/pallet, 72pcs/stack, 336pcs/ 40HQ Container

SPECIFICATIONS

Module Type	GES395M-54HL4		GES400M-54HL4		GES405M-54HL4		GES410M-54HL4		GES415M-54HL4	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	395Wp	294Wp	400Wp	298Wp	405Wp	301Wp	410Wp	305Wp	415Wp	309Wp
Maximum Power Voltage (Vmp)	30.32V	28.26V	30.42V	28.42V	30.52V	28.56V	30.62V	28.72V	30.79V	28.88V
Maximum Power Current (Imp)	13.03A	10.40A	13.15A	10.47A	13.27A	10.55A	13.39A	10.62A	13.48A	10.69A
Open-circuit Voltage (Voc)	36.90V	34.83V	36.98V	34.90V	37.06V	34.98V	37.14V	35.05V	37.31V	35.21V
Short-circuit Current (Isc)	13.71A	11.07A	13.78A	11.13A	13.85A	11.19A	13.92A	11.24A	14.01A	11.32A
Module Efficiency STC, (%)	20.23%		20.48%		20.74%		21.00%		21.25%	
Operating Temperature(°C)					-40°C~+85°C		21.00%		21.25%	
Maximum system voltage	1000V(1500VDC [IEC])									
Maximum series fuse rating	20A									
Power tolerance	0~+3%									
Temperature coefficients of Pmax	-0.35%/°C									
Temperature coefficients of Voc	-0.28%/°C									
Temperature coefficients of Isc	0.048%/°C									
Nominal operating cell temperature (NOCT)	45±2°C									

*STC: ☀ Irradiance 1000W/m² 🌡 Cell Temperature 25°C

NOCT: ☀ Irradiance 800W/m² 🌡 Ambient Temperature 20°C

☁ AM=1.5

☁ AM=1.5

🌀 Wind Speed 1m/s

7. Future Plan



Viet Hung-Que Vo Industrial Park

- extra expansion of this facility to 1.5GW capacity is in the pipeline.(Our customers orders have been on hold due to U.S. Customs and Border Protection banned imports of silica-based products made by Hoshine Silicon Industry Company as well as goods made using those products)
- Our ultimate goal is fully expanded this factory to 5GW cap.



- Feasibility study on 2GW wafer fab.
- Collaborating with potential investor and bankers.
- Communicating with silicon material outside China.
- Promoting the partnerships with potential client outside China.

THANK YOU



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