



SOLAR BUILDING INTEGRATED PHOTOVOLTAICS

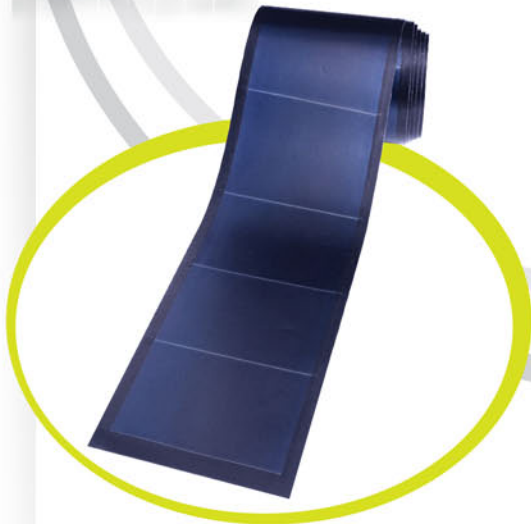


BIPV



TMA SOLAR Cells

Tm



Warranty

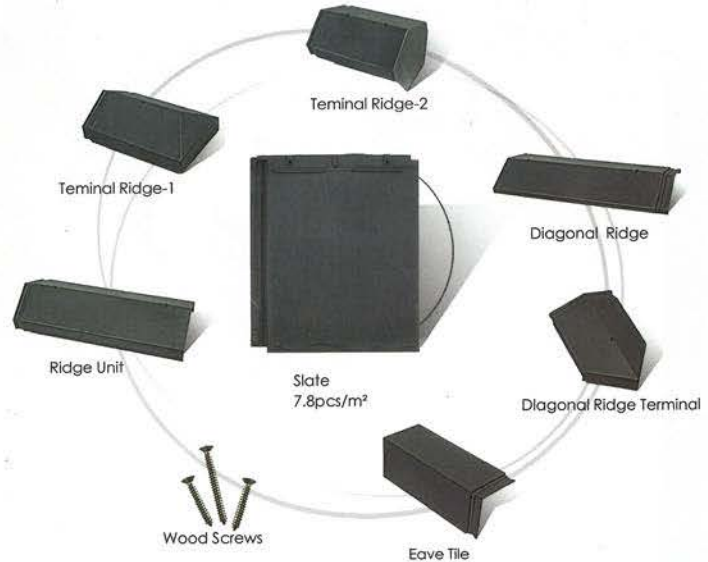
Power output guaranteed for 25 years from date of commissioning (80% performance).

10 year product warranty.



Solar Cell	Monocrystalline Silicon 12 pieces in series connection (156mm x 156mm)
Overall Size (mm)	1068 x 435
Effective Size (mm)	1020 x 375
Thickness (mm)	31
Weight (kg/pc) :	12±0.25
Power under standard Test Conditions (wp).-pm	50
Optimum Operating Voltage (V).-Vmp	6.24
Optimum Operating Current (A).-Imp	8.01
Open Circuit Voltage (V).-Voc	7.59
Short Circuit Current (A).-Isc	8.51
Power Output Tolerance (%)	±3%
Operating Temperature Rating (°C)	46±2
Short Circuit Current Temperature Coefficient (%)	-0.06/°C
Open Circuit Voltage Temperature (%)	-0.34/°C
Coefficient (%)	-0.47/°C
Power Temperature Coefficient Under standard Test Condition Operating Temperature °C	-40~ +85
Maximum System Voltage (V)	1000
Standard Test Conditions : Illumination 1000W/m ² , Module Temperature 25 °C , AM =1.5	

Accessory Tiles and Fittings



Product Name	Dimension(mm) Length X Width X Height	Effective Dimension(mm) Length X Width	Weight (kg/pc)
Slate	435X384	375 × 340	2.8 ± 0.1
Ridge Unit	500X200	470X200	0.95 ± 0.05
Diagonal Ridge	500X200	470X200	0.85 ± 0.05
Terminal Ridge-1	300X200X95	270X200	0.65 ± 0.05
Terminal Ridge-2	300X200X200	270X200	0.8 ± 0.05
Diagonal Ridge Terminal	290X200	260X200	0.5 ± 0.05
Eave Tile	330X170	300X170	0.5 ± 0.05
Fittings	Wood Screws	3.9X35	2.2/thousand pcs
Fittings	Wood Screws	3.9X50	2.9/thousand pcs

Quantity of Fittings: 24pcs/ m² for Slate, 2pcs/pc for Accessory Tile

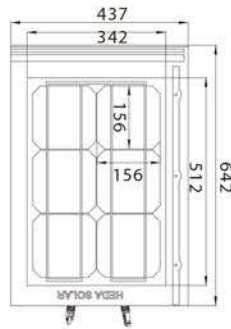


**SOLAR TILE
BY ITALIG**

Mechanical Specifications



HDS08M-2



HDSF24M-6



HDSA08M-2



HDSF24M-6

Warranty

Industry leading power output warranty (12 years/90%, 25 years/80%)
10-year warranty on product materials and processing technology. Tile life span 50 years.

Applications

- On-grid residential roof-tops
- On-grid commercial/industrial roof-tops
- Solar power plants
- Other on-grid applications
- Off-grid system
- Building roof

Electrical Characteristics

All specified Parameters at STC 25°C Ambient, 1000W/m² irradiance and AM 1.5.

Type		HDSA08M-2	HDSF24M-6
Max-Power Pm	(W)	8	24.5
Power Tolerance	(W)	±3%	±3%
Open-Circuit Voltage	Voc(V)	1.23	3.7
Short-Circuit Current	Isc(A)	8.31	8.53
Max-Power Voltage	Vm(V)	1.04	3.10
Max-Power Current	Im(A)	7.78	7.90
Cell Efficiency	(%)	17%	17.75%



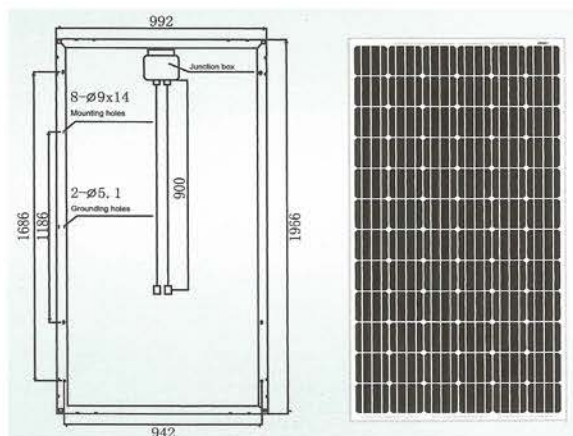
TERRAMAT[®]
SOLAR PV



MONO-CRYSTALLINE SILICON PV-MODULES

Mechanical data & Electrical Characteristics

No. of cells and connections	72
Dimension	1966x992x50mm(77.4x39.1x2.0 inches)
Net Weight	23Kgs (50.7lbs)
IP	67
Electrical Characteristics	
Pmax	300
Max power Current(Lmp)	8.13
Max power Voltage (Vmp)	36.9
Short circuit Current (Isc)	8.67
Open circuit Voltage (Voc)	45.5
Practical Module Efficiency	15.38%
Max Series Fuse Rating (A)	15
Mechanical Load Testing (Pa)	5400
Max System Voltage (VDC)	1000
Temperature coefficients of Pmax	-0.44%/°C
Temperature coefficients of Voc	-0.33%/°C
Temperature coefficients of Isc	0.05%/°C
Noct	45±2 °C
Standard Test Condition	Irradiance 1000w/m ² , module temperature 25 °C Am=1.5



Product warranty 10 years
Performance warranty 90% > 12 Years
80% > 25 Years

Mechanical data & Electrical Characteristics

No. of cells and connections	60
Dimension	1650x992x(40-50mm)
Net Weight	19.5Kgs (43.0lbs)
IP	67
Pmax	240
Max power Current(Lmp)	7.89
Max power Voltage (Vmp)	30.4
Short circuit Current (Isc)	8.51
Open circuit Voltage (Voc)	37.4
Practical Module Efficiency	14.66%
Max Series Fuse Rating (A)	15
Mechanical Load Testing (Pa)	5400
Max System Voltage (VDC)	1000
Temperature coefficients of Pmax	-0.44%/°C
Temperature coefficients of Voc	-0.33%/°C
Temperature coefficients of Isc	0.05%/°C
Noct	45±2 °C
Standard Test Condition	Irradiance 1000w/m ² , module temperature 25 °C Am=1.5

TM SOLAR PANEL

POLY-CRYSTALLINE SILICON PV-MODULES

Product warranty 10 years

Performance warranty 90% > 12 Years
80% > 25 Years

SOLAR

THIN FILMSOLAR PHOTOVOLTAIC SYSTEM

PERFORMANCE CHARACTERISTICS

Rated Power (P_{max}): 144Wp
 Production P_{max} Tolerance: $\pm 5\%$

CONSTRUCTION CHARACTERISTICS

Dimensions : Length : 5486mm (216"), Width : 394 mm (15.5"), Depth : 4 mm (0.2"),
 16 mm (0.6") including potted terminal housing assembly
 Weight : 1.85 kg (17.0 lbs)
 Output Cables : 4 mm² (12 AWG) cable with weatherproof DC rated quick - connect terminals*

By - pass Diodes : Connected across every solar cell
 Encapsulation : Durable ETFE high light - transmissive polymer
 Adhesive : Ethylene propylene copolymer adhesive - sealant with microbial inhibitor
 Cell Type : 22 triple junction amorphous silicon solar cells 356 mm \times 239 mm
 (14" \times 9.4") connected in series

LAMINATE STANDARD CONFIGURATION

Photovoltaic laminate with potted terminal housing assembly with output cables and quick - connect terminals on top*

APPLICATION CRITERION

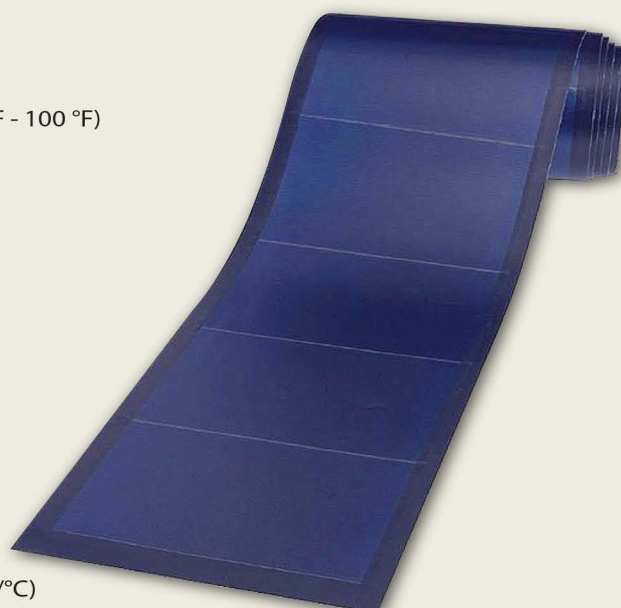
Installation temperature between 10 °C - 40 °C (50 °F - 100 °F)
 maximum roof temperature 85 °C (185 °F)
 Minimum slope : 3 ° (5/8 : 12)
 Maximum slope : 60 ° (21 : 12)

Maximum Power (P_{max}) : 31 W
 Voltage at P_{max} (V_{mp}) : 7.5 V
 Current at P_{max} (I_{mp}) : 4.13 A
 Short - circuit Current (I_{sc}): 5.1 A
 Open - circuit Voltage (V_{oc}): 46.2 V
 Maximum Series Fuse Rating : 8 A

TEMPERATURE COEFFICIENTS

(at AM 1.5, 1000 W/m² irradiance)

Temperature Coefficient (TC) of I_{sc} : 0.001/°K (0.10%/°C)
 Temperature Coefficient (TC) of V_{oc} : - 0.0038/°K (- 0.38%/°C)
 Temperature Coefficient (TC) of P_{max} : - 0.0021/°K (-0.21%/°C)
 Temperature Coefficient (TC) of I_{mp} : 0.001/°K (- 0.31%/°C)
 Temperature Coefficient (TC) of V_{mp} : - 0.0031/°K (- 0.31%/°C)
 $y = y_{reference} \cdot [1 + TC \cdot (T - T_{reference})]$



NOTES :

1. During the first 8 - 10 weeks of operation, electrical output exceeds specified ratings. Power output may be higher by 15%, operating voltage may be higher by 11% and operating current may be higher by 4%
2. Electrical specifications are based on measurements performed at standard test conditions of 1000 W/m² irradiance, Air Mass 1.5, and cell temperature of 25 °C after stabilization.
3. Actual performance may vary up to 10% from rated power due to low temperature operation, spectral and other related effects. Maximum system open - circuit voltage not to exceed 600 VDC per UL, 1000 VDC per TÜV Rheinland.

Type			PVL72	PVL128	PVL144
Standard test Conditions - (1000 W/m ² , AM 1.5, 25°C Cell Temperature)					
Maximum Power	P _{max}	(W)	72	128	144
Voltage at P _{max}	V _{mp}	(V)	18.5	33	33
Current at P _{max}	I _{mp}	(A)	4.36	3.88	4.36
Short - Circuit Current	I _{sc}	(A)	5.3	4.8	5.3
Open - Circuit Voltage	V _{oc}	(V)	23.1	46.2	46.2
Nominal Operating Cell Temperature (800 W/m ² , AM 1.5 m/sec. Wind , 46 °C)					
Maximum Power	P _{max}	(W)	56	100	111
Voltage at P _{max}	V _{mp}	(V)	15.4	30.8	30.8
Current at P _{max}	I _{mp}	(A)	3.6	3.24	3.6
Short - Circuit Current	I _{sc}	(A)	4.3	3.9	4.3
Open - Circuit Voltage	V _{oc}	(V)	21.1	42.2	42.2
Length		mm	2849	5486	5486
Width		mm	394	394	394
Area	A	m ²	1.12	2.16	2.16
Power Density Unit Area	P _{p - a}	W/m ²	84.14	59.22	66.62
Weight	W	Kg	3.9	7.7	7.7
Power Density Unit Weight	P _{p - w}	W/Kg	18.48	16.62	18.70

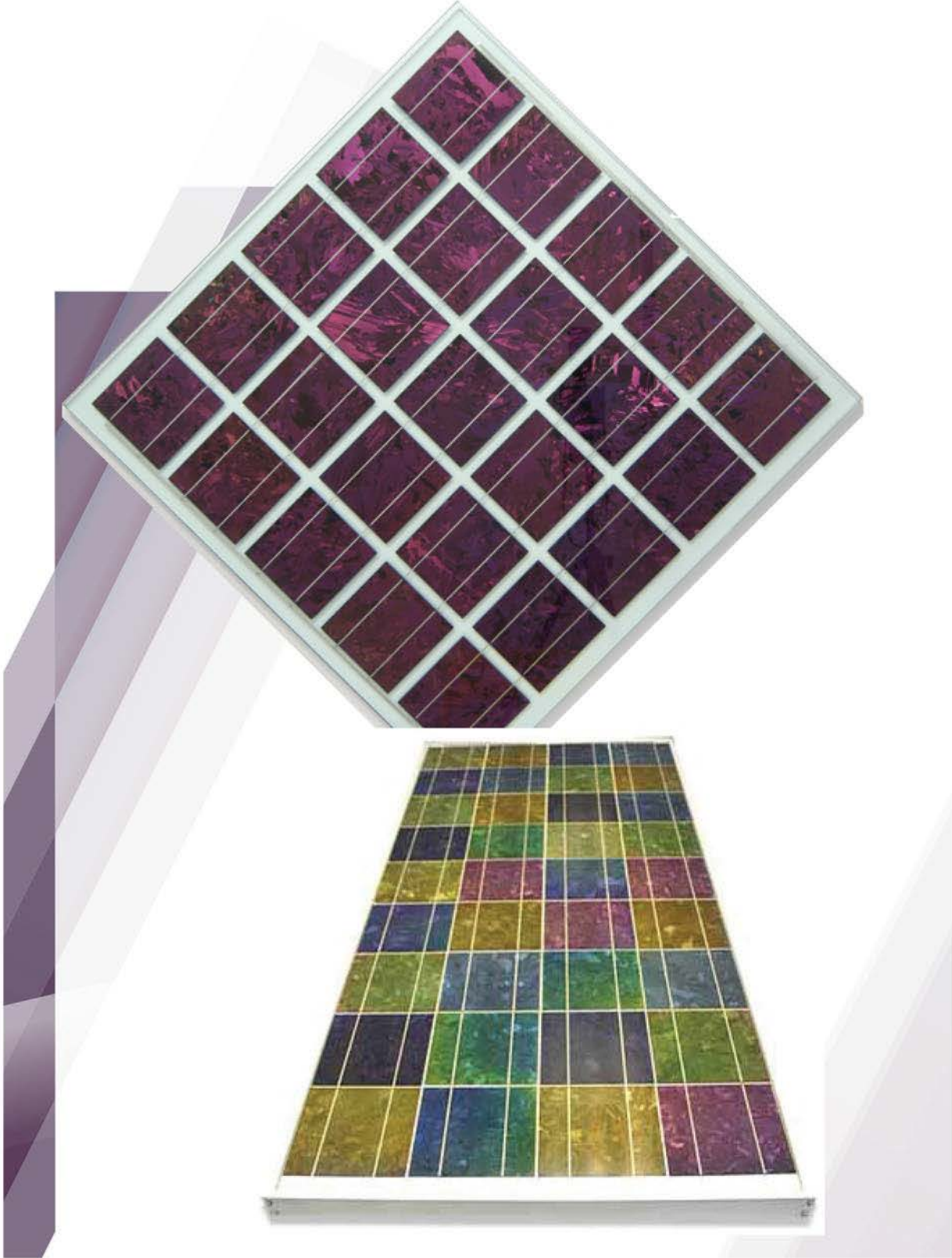
Total 36 Pcs.

Project Solar Cell



มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี วิทยาลัย





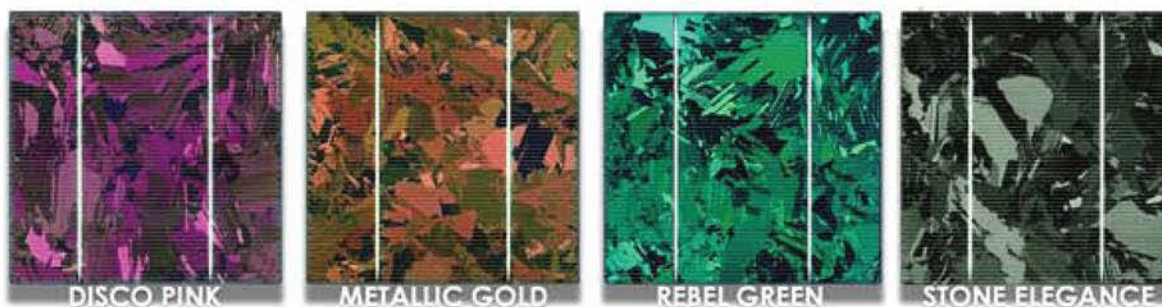
TERRAMAT®

TM POLY CRYSTALLINE **ပီပီ** COLOURCELL

Classic Series



Marble Series



POWER RABGE AT CELL LEVEL

Color	True Steel	Forest Green	Leavender	Tile Red
Efficiency range (%)	16.80-15.6	16.60-15.60	16.60-14.80	15.60-14.40
POWER range (W)	4.09-3.80	4.40-3.80	4.04-3.60	3.80-3.50
Color	Stone Elegance	Emerald Green	Disco pink	Metallic Gold
Efficiency range (%)	16.80-14.80	16.40-14.80	16.40-14.50	15.20-13.60
POWER range (W)	4.09-3.60	3.99-3.60	3.98-3.50	3.70-3.30