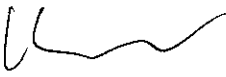




Photovoltaic Module Performance Report

Report Reference No.	160102159SHA-001
Compiled by (+signature)	Ken Gu 
Approved by (+signature)	William Cheng 
Date of Issue	2016/01/29
Total number of pages	14
Testing Laboratory	Intertek Testing Services Shanghai
Address.....	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Testing location/procedure.....	Intertek Testing Service Shanghai PV laboratory
Address.....	1-2F, No. 2, Alley 1218, Wan Rong Road, Shanghai, China, 200436
Applicant's name	Boviet Solar Technology Co., Ltd.
Address.....	B5-B6, Song Khe-Noi Hoang Industrial Zone, 21000 Bac Giang Province, Vietnam.
Test specification	Thermal cycling test (800 cycles)
Standard.....	IEC 61215:2005 2 nd Edition Sections, Clause 10.1, Clause 10.2, Clause 10.3, Clause 10.11
Test Item description	Photovoltaic(PV) Module(s)
Model/Type reference.....	BVM6612P-305
Manufacturer.....	Boviet Solar Technology Co., Ltd.
Brand name.....	
Address.....	B5-B6, Song Khe-Noi Hoang Industrial Zone, 21000 Bac Giang Province, Vietnam.
Rating.....	See Page2
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- This report shall not be reported except in full without prior authorization from Intertek Testing Services Shanghai.
- The services are provided subject to the terms and condition of the company, which can be furnished upon request.
- Throughout this report a point is used as the decimal separator.

General Product information:			
Description of module construction:			
Model	Module dimension(mm)	Cell technology	No. of cells
BVM6612P-305	1956x992x40	Poly-crystalline	72

Product Electrical Rating:					
Model No.	Voc (V)	Isc (Amps)	Pmp (W)	Vmp (V)	Imp (Amps)
BVM6612P-305	45.6	9.05	305	37.4	8.16

Summary of testing:	
At the request of the applicant, the purpose of this report is to perform the 4 times Thermal Cycling 200 test which is specified in IEC 61215: 2005 2 nd Edition.	
Tests performed (name of test and test clause)	
Tests	Clause
Visual inspection	IEC 61215: 2005 2 nd Edition: Cl. 10.1
Maximum power determination	IEC 61215: 2005 2 nd Edition: Cl. 10.2
Insulation test	IEC 61215: 2005 2 nd Edition: Cl. 10.3
Thermal cycling test	IEC 61215: 2005 2 nd Edition: Cl. 10.11

List of test samples		
Sample No.	Type / model	Remark
P39000B060300019	BVM6612P-305	Control
P39000B060300011	BVM6612P-305	Thermal Cycling 200 sequence
P39000B060300047	BVM6612P-305	Thermal Cycling 200 sequence

Supplementary information: Preconditioning of test samples was performed within IEC 61215 performance testing.

IEC 61215 – Design qualification and type approval

Clause	Requirement + Test	Result - Remark	Verdict
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10.1 Initial	TABLE: Visual inspection (Initial)		—
Test Date [MM/DD/YYYY]..... :	07/29/2015		—
Sample #	Nature and position of initial findings – comments or attach photos		—
P39000B060300019	No Visual Defects		P
P39000B060300011	No Visual Defects		P
P39000B060300047	No Visual Defects		P
Supplementary information: N/A			

10.2 Initial	TABLE: Maximum power determination (initial)					—
Test Date [MM/DD/YYYY]..... :	07/29/2015					—
Module temperature [°C]	25					—
Irradiance [W/m ²]	1000					—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
P39000B060300019	45.24	36.53	8.79	8.28	302.55	76.07
P39000B060300011	45.34	36.67	8.90	8.38	307.25	76.18
P39000B060300047	45.33	36.28	8.92	8.45	306.64	75.81
Supplementary information: N/A						

10.3 Initial	Table: Insulation test (initial)				—
Test Date [MM/DD/YYYY]..... :	07/29/2015				—
Test Voltage applied [V]	1000/3000				—
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	-
P39000B060300019	>500	20.6		No	P
P39000B060300011	>500	20.6		No	P
P39000B060300047	>500	20.6		No	P
Supplementary information: Size of the module: 1.94[m ²]					

IEC 61215 – Design qualification and type approval

Clause	Requirement + Test	Result - Remark	Verdict
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10.11 A	TABLE: Thermal cycling 200 test (1st 200 cycles)					—
Test Date [MM/DD/YYYY] start/end..... :		07/29/2015 to 09/11/2015			—	
Total cycles (200)		200			—	
Applied current [A]		8.90 / 8.92			—	
Sample #	Open circuits (yes/no)				—	
P39000B060300011	No				P	
P39000B060300047	No				P	
Supplementary information: N/A						
(10.1 Visual inspection after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]		09/11/2015			—	
Sample #	Nature and position of initial findings – comments or attach photos				—	
P39000B060300011	No visual defects				P	
P39000B060300047	No visual defects				P	
Supplementary information: N/A						
(10.2 Maximum power determination after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]		09/11/2015			—	
Module temperature [°C]		25			—	
Irradiance [W/m ²]		1000			—	
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
P39000B060300011	45.31	36.28	8.89	8.36	303.45	75.31
P39000B060300047	45.32	35.89	8.91	8.38	300.71	74.44
Pmp degradation after this test [%] ≤ 5%			1.24 / 1.93		P	
Supplementary information: N/A						
(10.3 Insulation test after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]		09/11/2015			—	
Test Voltage applied [V]		1000/3000			—	
Sample #	Measured	Required	Dielectric breakdown		Result	
	MΩ	MΩ	Yes (description)	No		
P39000B060300011	>500	20.6		No	P	

IEC 61215 – Design qualification and type approval				
Clause	Requirement + Test		Result - Remark	Verdict
P39000B060300047	>500	20.6		No P
Supplementary information: Size of the module: 1.94[m ²]				

10.11 B	TABLE: Thermal cycling 200 test (2nd 200 cycles)					—
Test Date [MM/DD/YYYY] start/end..... :			09/11/2015 to 10/19/2015		—	
Total cycles (200)			200		—	
Applied current [A]			8.90 / 8.92		—	
Sample #	Open circuits (yes/no)				—	
P39000B060300011	No				P	
P39000B060300047	No				P	
Supplementary information: N/A						
(10.1 Visual inspection after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]..... :			10/19/2015		—	
Sample #	Nature and position of initial findings – comments or attach photos				—	
P39000B060300011	No visual defects				P	
P39000B060300047	No visual defects				P	
Supplementary information: N/A						
(10.2 Maximum power determination after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]..... :			10/19/2015		—	
Module temperature [°C]..... :			25		—	
Irradiance [W/m ²]..... :			1000		—	
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
P39000B060300011	45.24	35.84	8.92	8.35	299.25	74.08
P39000B060300047	45.22	35.16	8.93	8.36	294.06	72.99
Pmp degradation after 2nd 200 cycles [%] ≤ 5%			1.38 / 2.21		—	
Pmp degradation after total 400 cycles [%] ≤ 5%			2.61 / 4.10		—	
Supplementary information: N/A						
(10.3 Insulation test after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]..... :			10/19/2015		—	

IEC 61215 – Design qualification and type approval

Clause	Requirement + Test	Result - Remark	Verdict
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Test Voltage applied [V].....:		1000/3000		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
P39000B060300011	>500	20.6		No	P
P39000B060300047	>500	20.6		No	P
Supplementary information: Size of the module: 1.94[m ²]					

10.11 C	TABLE: Thermal cycling 200 test (3rd 200 cycles)					—
Test Date [MM/DD/YYYY] start/end..... :		10/19/2015 to 11/23/2015			—	
Total cycles (200)		200			—	
Applied current [A]		8.90 / 8.92			—	
Sample #	Open circuits (yes/no)				—	
P39000B060300011	No				P	
P39000B060300047	No				P	
Supplementary information: N/A						
(10.1 Visual inspection after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]		11/23/2015			—	
Sample #	Nature and position of initial findings – comments or attach photos				—	
P39000B060300011	No visual defects				P	
P39000B060300047	No visual defects				P	
Supplementary information: N/A						
(10.2 Maximum power determination after thermal cycling 200 test)					—	
Test Date [MM/DD/YYYY]		11/23/2015			—	
Module temperature [°C]		25			—	
Irradiance [W/m ²]		1000			—	
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
P39000B060300011	45.03	35.94	8.93	8.29	297.96	74.15
P39000B060300047	44.87	35.30	8.95	8.31	293.21	72.85

IEC 61215 – Design qualification and type approval					
Clause	Requirement + Test		Result - Remark	Verdict	
Pmp degradation after 3rd 200 cycles [%] ≤ 5%			0.43 / 0.29	—	
Pmp degradation after total 600 cycles [%] ≤ 5%			3.03 / 4.38	—	
Supplementary information: N/A					
(10.3 Insulation test after thermal cycling 200 test)					
Test Date [MM/DD/YYYY]		11/23/2015		—	
Test Voltage applied [V]		1000/3000		—	
Sample #	Measured	Required	Dielectric breakdown		Result
	MΩ	MΩ	Yes (description)	No	
P39000B060300011	>500	20.6		No	P
P39000B060300047	>500	20.6		No	P
Supplementary information: Size of the module: 1.94[m ²]					

10.11 D	TABLE: Thermal cycling 200 test (4th 200 cycles)			—
Test Date [MM/DD/YYYY] start/end		11/24/2015 to 12/30/2015		—
Total cycles (200)		200		—
Applied current [A]		8.90 / 8.92		—
Sample #	Open circuits (yes/no)			Result
P39000B060300011	No			P
P39000B060300047	No			P
Supplementary information: N/A				
(10.1 Visual inspection after thermal cycling 200 test)				—
Test Date [MM/DD/YYYY]		12/30/2015		—
Sample #	Nature and position of initial findings – comments or attach photos			Result
P39000B060300011	No visual defects			P
P39000B060300047	No visual defects			P
Supplementary information: N/A				
(10.2 Maximum power determination after thermal cycling 200 test)				—
Test Date [MM/DD/YYYY]		12/30/2015		—

IEC 61215 – Design qualification and type approval

Clause	Requirement + Test	Result - Remark	Verdict
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Module temperature [°C]..... :		25				—
Irradiance [W/m ²]..... :		1000				—
Sample #	Voc [V]	Vmp [V]	Isc [A]	Imp [A]	Pmp [W]	FF [%]
P39000B060300011	45.01	35.50	8.92	8.36	296.92	73.95
P39000B060300047	44.82	34.81	8.95	8.31	289.16	72.12
Pmp degradation after 4th 200 cycles [%]			0.35 / 1.38			—
Pmp degradation after total 800 cycles [%]			3.36 / 5.70			—
Supplementary information: N/A						
(10.3 Insulation test after thermal cycling 200 test)						
Test Date [MM/DD/YYYY]..... :		12/30/2015				—
Test Voltage applied [V]..... :		1000/3000				—
Sample #	Measured	Required	Dielectric breakdown		Result	
	MΩ	MΩ	Yes (description)	No		
P39000B060300011	>500	20.6		No	P	
P39000B060300047	>500	20.6		No	P	
Supplementary information: Size of the module: 1.94[m ²]						

ANNEX 1: PRODUCT DESCRIPTION SHEET (MANUFACTURERS AND TYPE REFERENCES)

A1.1	MODULES TYPE/S	
		BVM6612P-305

A1.2	SOLAR CELL	
	Cell type reference.....:	156P
	Cell dimensions L x W (mm).....:	156 x 156
	Cell thickness (µm).....:	200±20
	Cell area (cm ²).....:	243.36

A1.3	IDENTIFICATION OF MATERIALS	
	Front cover.....:	CSG glass CO.,LTD. Tempered low iron patterned solar glass Nominal thickness 4.0mm
	Rear cover.....:	Toyo Aluminium K.K Type: FPL-FAW-T250-W50-4, layer: PVDF/PET/LE overall thickness: 0.35mm.
	Encapsulate.....:	Changzhou Sveck Photovoltaic New Material Co., Ltd. 15297 Nominal Thickness 0.5mm
	Frame.....:	TTERGY New Materials Co., LTD Aluminium alloy, 6063-T5
	Adhesive for frame.....:	Shanghai Huitian New Material Co., Ltd. HT906Z, white
	Adhesive for junction box.....:	Shanghai Huitian New Material Co., Ltd. HT906Z, white
	Potting material.....:	Shanghai Huitian New Material Co., Ltd. 5299W-S

	Internal wiring.....:	<p>Cell connector Wuxi Sveck Technology Co., Ltd. 1.6*0.25mm, Sn 60%/Pb 40% Nominal Thickness/Width: 0.25/1.6mm</p> <p>String connector Wuxi Sveck Technology Co., Ltd. 5*0.35mm, Sn 60%/Pb 40% Nominal Thickness/Width: 0.35/5mm</p>
	Soldering material	Shenzhen Wise Technology Co.,Ltd WS-868B-13C
	Other	N/A

A1.4	IDENTIFICATION OF COMPONENTS	
	Junction box	<p>ZHEJIANG JIAMING TIANHEYUAN PHOTOVOLTAIC TECHNOLOGY CO., LTD. JM805A, 15A/1000VDC</p>
	Cable	<p>ZHEJIANG JIAMING TIANHEYUAN PHOTOVOLTAIC TECHNOLOGY CO., LTD. PV wire, rated 1000 V, Sunlight resistant, 90°C wet or dry, 12 AWG conductor size,</p>
	Connector	<p>ZHEJIANG JIAMING TIANHEYUAN PHOTOVOLTAIC TECHNOLOGY CO., LTD. PV-JM601, rated 1000 V dc, 25 A max, with 12AWG PV cable.</p>
	Bypass diode	<p>ZHEJIANG JIAMING TIANHEYUAN PHOTOVOLTAIC TECHNOLOGY CO., LTD. THY2550</p>

A1.5	MODULE DESIGN –DIMENSIONS	
	Module dimensions L x W x H (mm)	1956x992x40

ANNEX 2: Photos of sample BVM6612P-305

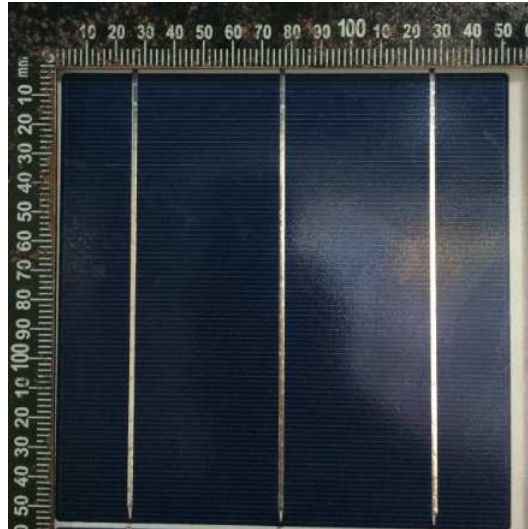


Front view



Rear view

ANNEX 2: Photos of sample BVM6612P-305



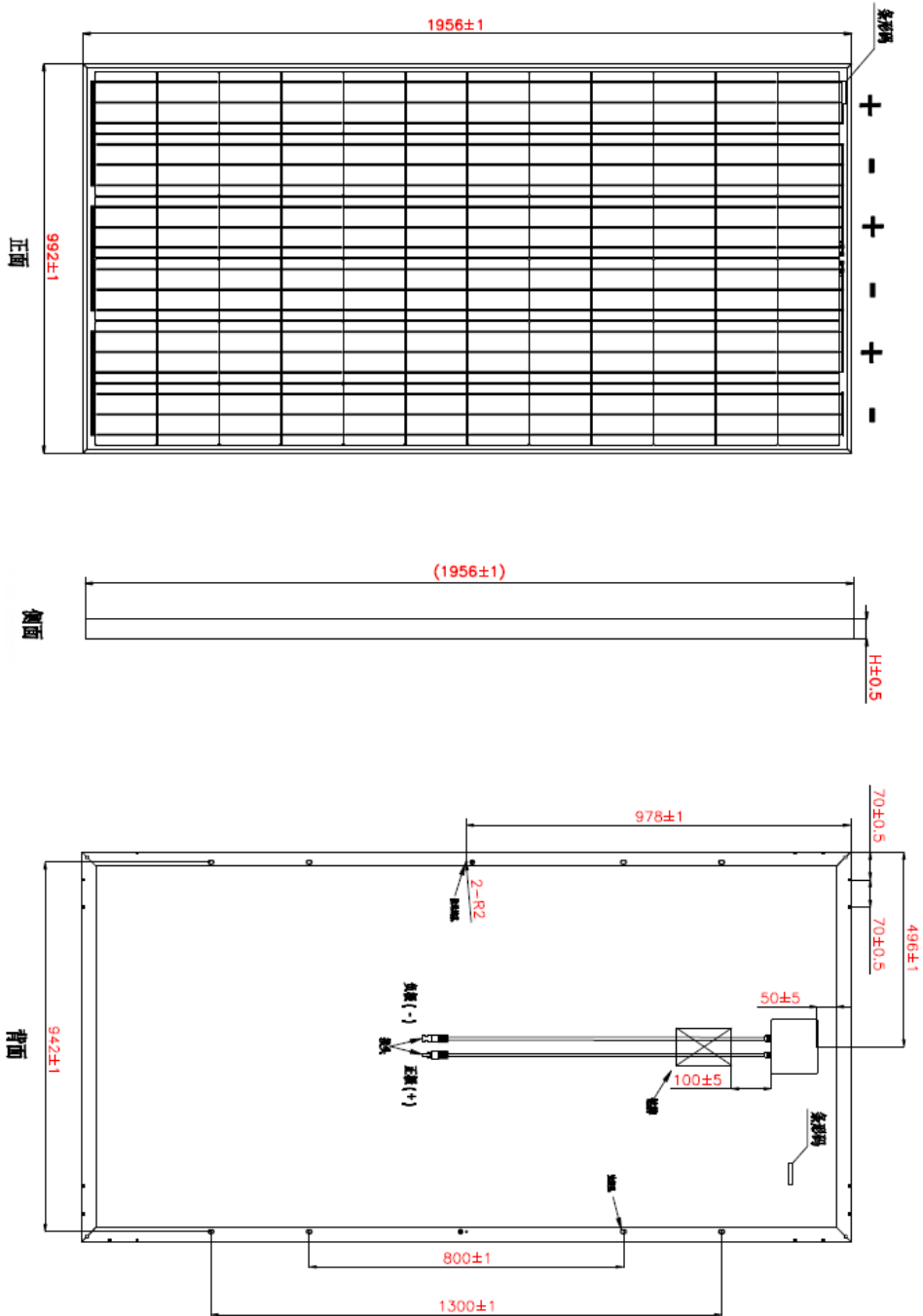
Cell



Junction box & connector

ANNEX 3: CONSTRUCTION DETAILS (UNIT: mm)

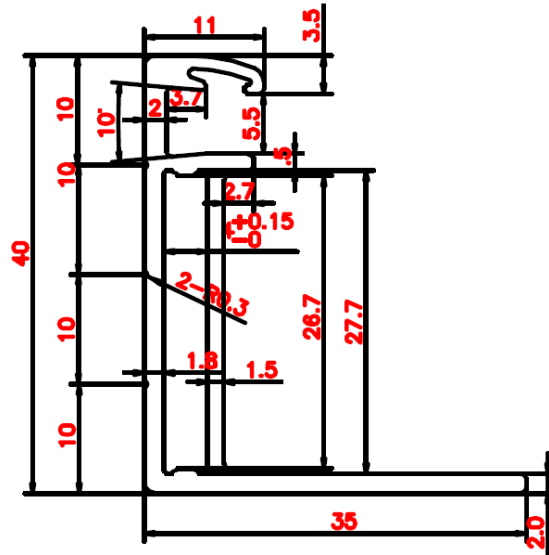
SCHMATIC of BVM6612P-305



H=40

ANNEX 3: CONSTRUCTION DETAILS (UNIT: mm)

Frame cross



40mm frame