

TÜV Rheinland (Shanghai) Co., Ltd.
Solar/ Fuelcell Technology

Test Report

Photovoltaic Cell Performance Measurement under
Standard Test Conditions (STC)

TÜV Report No. 15080806.001

Shanghai, April 2015

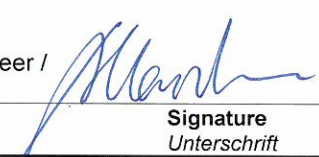

Test report No.: 15080806.001		Page 1 / 7	
<i>Prüfbericht - Nr.:</i>			
Client (Customer No. + address): <i>Auftraggeber</i> (Kunden-Nr. + Adresse):	Jiangsu Green Power PV Co., Ltd. No.1 Longmen Road, New District, Wujin ChangZhou ,Jiangsu 213161 P. R. China		
Test Item: <i>Gegenstand der Prüfung:</i>	Photovoltaic (PV) Cell(s)	Date of receipt: <i>Eingangsdatum:</i>	15/03/2015
Identification: <i>Bezeichnung:</i>	6" poly c-Si solar cell		
Order No.: <i>Auftragsnummer:</i>	154082013	Quotation No.: <i>Angebotsnummer:</i>	52111342
Testing location: <i>Prüfart:</i>	TÜV Rheinland (Shanghai) Co., Ltd. B1-13F No. 177, Lane 777, West Guangzhong Road Zhabei District, Shanghai 200072 P. R. China		
Test specification: <i>Prüfgrundlage:</i>	IEC60904 parts -1, -3 IEC60891		
tested by / geprüft:	reviewed by / kontrolliert:		
09/04/2015 Date Datum	Project Engineer / Allen Zhou Title/Name Titel/Name	10/04/2015 Date Datum	Technical Certifier / James Ha Title/Name Titel/Name
			
	Signature Unterschrift		Signature Unterschrift
Other Aspects / Sonstiges:			
N/A			
Abkürzungen:	P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet	Abbreviations:	P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested
<p>This test report relates to the listed test samples. Without permission of the test centre this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</p> <p>Dieser Prüfbericht bezieht sich nur auf die gelisteten Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</p>			

Table of Contents

Sampling procedure	3
Cell group assignment:.....	3
Visual inspection (Initial).....	4
Performance at STC (IEC60904 -1, -3).....	4
Appendix 1: Measuring equipment and used software	5
Appendix 2: Statement of the estimated uncertainty of the test verdicts.....	5
Appendix 3: Measurement report of IV characteristics	6
Appendix 4: Photos of the cells	7

Sampling procedure

<input type="checkbox"/>	Random sampling from production
<input type="checkbox"/>	Random sampling from the warehouse, container or transportation boxes
<input checked="" type="checkbox"/>	Cells have been submitted by the manufacturer/ client without random sampling by TÜV Rheinland

Cell group assignment:

Serial no.	Cell type	Remarks / constructional characteristics	Test item
33	Poly	156mm×156mm, 3 busbars	STC
98			

Tables

Visual inspection (Initial)

Test Date [DD/MM/YYYY].....:	30/03/2015	—
Serial no.	Nature and position of initial findings	Verdict
33	No visual defects	P
98	No visual defects	P
Supplementary information: Refer to Appendix 4: Photos of the cells		

Performance at STC (IEC60904 -1, -3)

Test Date [DD/MM/YYYY].....:	30/03/2015					—
Test method.....:	<input checked="" type="checkbox"/> indoor		<input type="checkbox"/> outdoor		—	
Irradiance [W/m ²].....:	1000					—
Cell temperature [°C].....:	25					—
Serial no.	Pmpp [W]	Vmpp [mV]	Impp [A]	Voc [mV]	Isc [A]	FF [%]
33	4.209	532.0	7.912	630.3	8.509	78.5
98	4.231	530.6	7.973	629.7	8.541	78.7
Supplementary information: Refer to Appendix 2: Statement of the estimated uncertainty of the test verdicts						

Appendix 1: Measuring equipment and used software

Measuring equipment

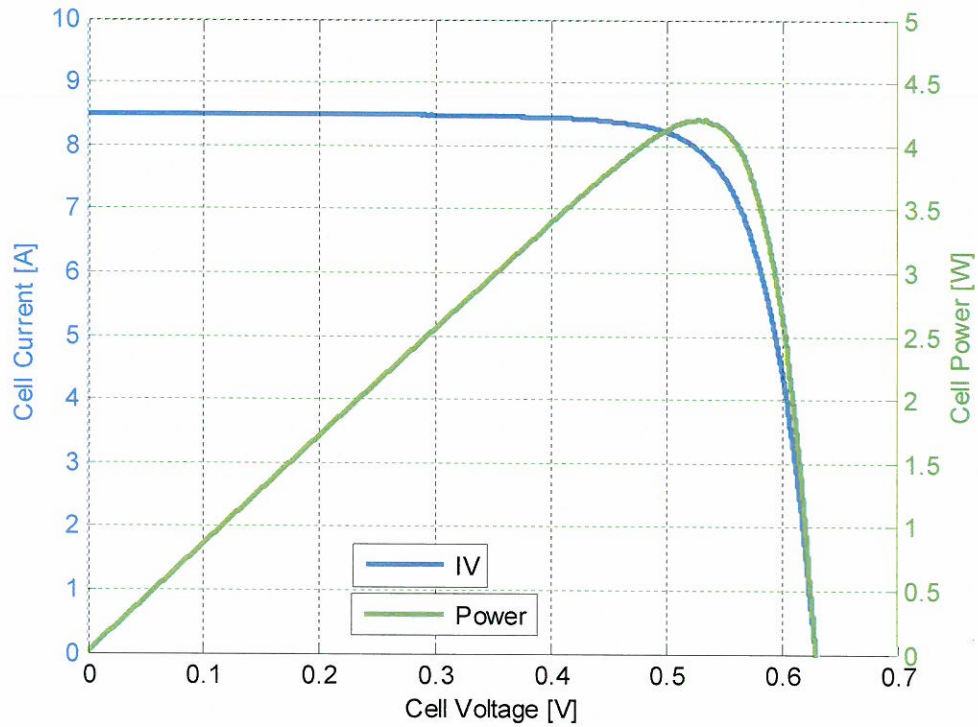
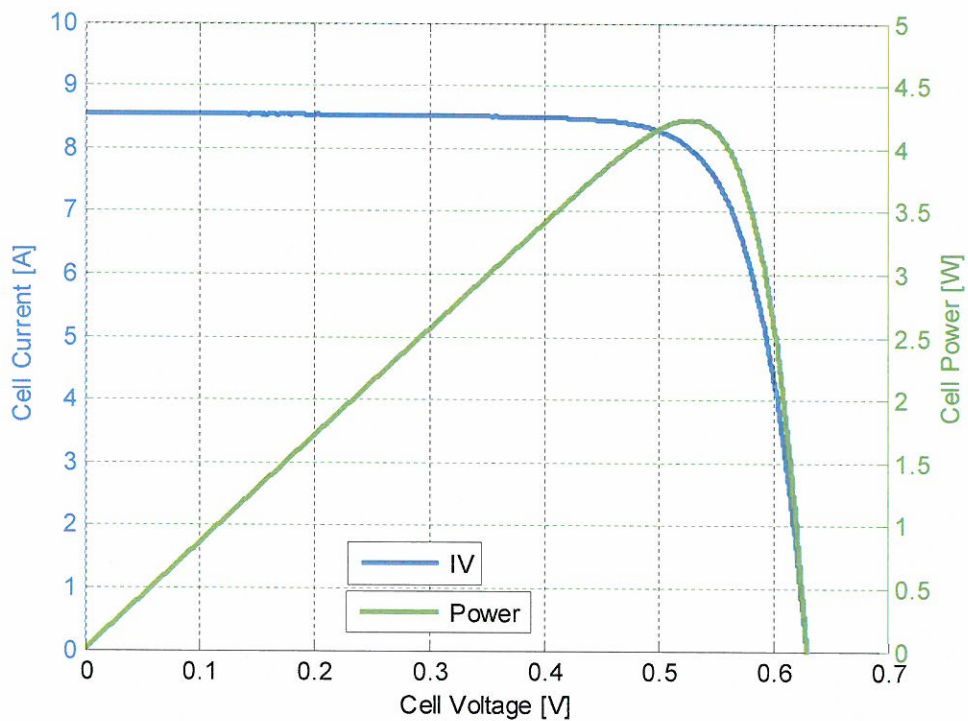
Device	Index no	Measured variable	Application
Reference solar cell PTB	076-2010	Global irradiance calibrated reference	Pulsed solar simulator measurements
Monitoring Cell	20003500000215	Global irradiance coplanar with specimen	Pulsed solar simulator measurements
Pulsed solar load	200565000000103 01002966 1002969	Current, voltage, temperature, irradiance	Pulsed solar simulator measurements

Measurement related software

Program name	Version no.	Date	Application
Pulsed Solar Simulator Software	SROD v2.7.4	12.07.2011	Operating software pulsed solar simulator

Appendix 2: Statement of the estimated uncertainty of the test verdicts

- The verdicts of performance rating are only related to the test samples that were subjected to the tests. They cannot be generalised to the cells from the series production.
- The STC measurement was performed with a pulsed solar simulator of Class AAA according to the requirements of IEC60904-1,-2,-3,-9 and -10. Corrections were applied in accordance with IEC60891. The extended measurement uncertainty is:
 - o $2\sigma P_{mpp} \leq \pm 3.0 \%$
 - o $2\sigma I_{sc} \leq \pm 2.8 \%$
 - o $2\sigma V_{oc} \leq \pm 1.5 \%$

Appendix 3: Measurement report of IV characteristics*Fig. 1: IV characteristic of cell (serial no.: 33)**Fig. 2: IV characteristic of cell (serial no.: 98)*

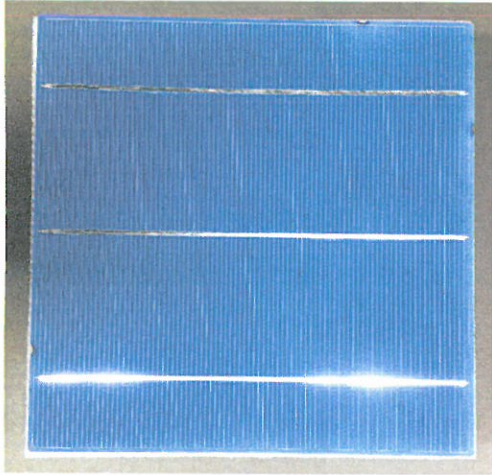
Appendix 4: Photos of the cells

Fig. 3: front view of the 6" poly c-Si cell

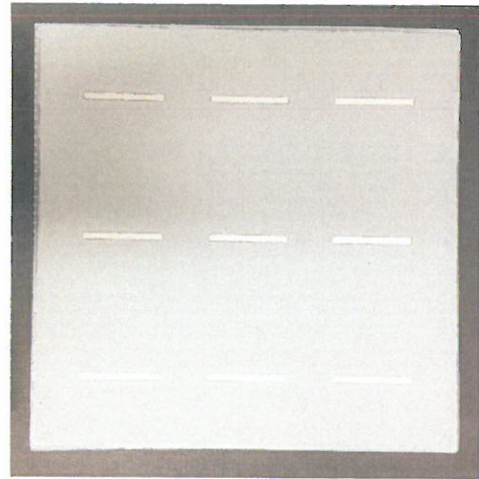


Fig. 4: rear view of the 6" poly c-Si cell

End of Test Report