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### 1. Mechanical Data and Design

Model	158.75
Product	Multi-Crystalline Solar Cell based on Diamond Wire Saw
Code	PEPPL-MC-5BB-FBB0.70-RBB2.0L-112F
Format	158.75 mm x 158.75mm $\pm$ 0.25 mm
Thickness	180-220 $\mu$ m
Front side (-)	Iso – textured, blue antireflective coating (silicon nitride), 5 Bus bars padded, 0.70 $\pm$ 0.1 mm wide, 157 $\pm$ 0.20mm length, Silver)
Back side (+)	Soldering pads, 2.0 $\pm$ 0.2 mm wide, silver, Aluminium coated (back surface field), Back Al Printing 157mm x 157mm $\pm$ 0.20 mm
Center to center Bus bar distance	31.2 $\pm$ 0.20 mm



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### 3. Electrical Performance

- Shunt resistance: Greater than 60  $\Omega$  with 98% population greater than 100  $\Omega$ .
- Leakage current at -12V: Maximum Irev 1.0A with 98% population having Irev less than 0.50A.
- 100% PID Resistive
- 100% Inline EL Testing
- Compliance as per RoHS Directive(EU)2015/863

### 4. Cells grading & Color Classification

Eff. Class	Eff., Class, Color, Wattage, Imp	Eff. Min (%)	Eff. Max (%)	Imp Min(A)	Imp Max(A)
18.20	PEPPLDMC18.2L4.59W8.43	18.20	18.40	8.43	8.53
	PEPPLDMC18.2L4.59W8.53			8.53	8.63
18.40	PEPPLDMC18.4L4.64W8.45	18.40	18.60	8.45	8.55
	PEPPLDMC18.4L4.64W8.55			8.55	8.65
18.60	PEPPLDMC18.6L4.69W8.51	18.60	18.70	8.51	8.61
	PEPPLDMC18.6L4.69W8.61			8.61	8.71
18.70	PEPPLDMC18.7L4.71W8.54	18.70	18.80	8.54	8.64
	PEPPLDMC18.7L4.71W8.64			8.64	8.74
18.80	PEPPLDMC18.8L4.74W8.60	18.80	18.90	8.60	8.70
	PEPPLDMC18.8L4.74W8.70			8.70	8.80
18.90	PEPPLDMC18.9L4.76W8.62	18.90	19.00	8.62	8.72
	PEPPLDMC18.9L4.76W8.72			8.72	8.82
19.00	PEPPLDMC19.0L4.79W8.64	19.00	19.10	8.64	8.74
	PEPPLDMC19.0L4.79W8.74			8.74	8.84
19.10	PEPPLDMC19.1L4.81W8.66	19.10	19.20	8.66	8.76
	PEPPLDMC19.1L4.81W8.76			8.76	8.86
19.20	PEPPLDMC19.2L4.84W8.68	19.20	19.30	8.68	8.78
	PEPPLDMC19.2L4.84W8.78			8.78	8.88
19.30	PEPPLDMC19.3L4.86W8.69	19.30	19.40	8.69	8.79
	PEPPLDMC19.3L4.86W8.79			8.79	8.89
19.40	PEPPLDMC19.4L4.89W8.72	19.40	19.60	8.72	8.82
	PEPPLDMC19.4L4.89W8.82			8.82	8.92

**Note:** Above individual IV data for different efficiency class is taken from process statistics data and for rest IV parameter ( I<sub>sc</sub>, V<sub>oc</sub>, R<sub>shunt</sub>, R<sub>s</sub> & I<sub>rev</sub> ) referred to sample IV data along with the certificate of conformance of the shipment. All data measured at standard testing conditions: 1000W/m<sup>2</sup>, 25°C, AM1.5G IEC 60904-3 Ed. 2(2008) and Reference cell calibrated by the Fraunhofer ISE in Freiburg

#### **For All $\geq 18.60\%$**

- Imp of 0.1A interval with efficiency binning of 0.1%. For example

**"PEPPLDMC18.8L4.74W8.60"**



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18.8 Class means, cell efficiency from 18.80% to 18.90%, Minimum Imp<sub>p</sub> 8.60Amp

**For All <18.6**

- Imp<sub>p</sub> of 0.1A interval with efficiency binning of max. 0.2%. For example

**"PEPPLDMC18.4L4.64W8.45"**

Class means, cell efficiency from 18.40% to 18.60%, Minimum Imp<sub>p</sub> 8.45Amp

**Color Classification:**

**5. Behavior of electrical parameters**

**Temperature Coefficients**

Power	- 0.42 %/ K
Current	+0.06 %/ K
Voltage	- 0.35 %/ K

**Or Equivalent Temperature Coefficients:**

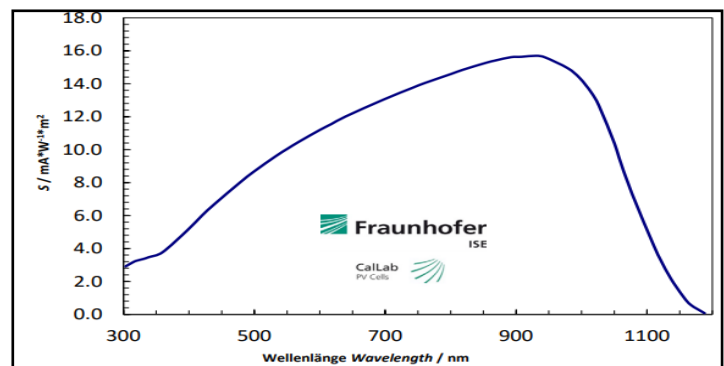
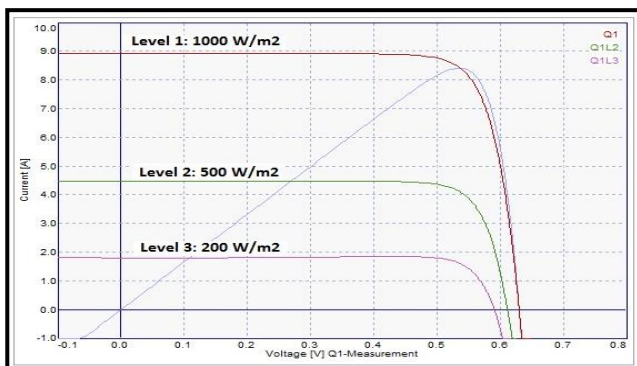
Power	- 19.23 mW/ K
Current	+5.17 mA/ K
Voltage	- 2.24 mV/ K

**Intensity Dependence**


Intensity [W/m <sup>2</sup> ]	U <sub>MPP</sub> *	I <sub>MPP</sub> *
1000	1	1
800	0.998	0.8
500	0.981	0.5
400	0.975	0.4
300	0.960	0.3
200	0.938	0.2
100	0.904	0.1

\*Ratio of Umpp/Imp<sub>p</sub> at reduced intensity to value at 1000w/m<sup>2</sup>

**6. Typical Current/Voltage-Curve and Spectral Response**



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**7. Processing Recommendations**

**Solder Joint:** 0.9 (width) x 0.27 mm thicknesses including Sn62Pb36Ag2 coating Thickness 20 to 25 um on both sides.

**8. Reliability Test**

Test Name	Test Condition	Acceptance Criteria
Soldering Test	Material – Copper coated with 20-25um Ribbon type – 62Sn/36Pb/2Ag preferable Supplier - Telison / Luvata/G&G Ribbon dimension - 0.9 (width) x 0.27 mm thickness including Sn62Pb36Ag2 coating thickness 20 to 25 um on both side Temperature - 380 +/- 10 Deg C Soldering flux - Kester 952S / HENKEL Pull angle - 180 +/- 3 Deg Pull method - Manual Force measuring method - digital force gauge (IMADA)	Peak force on soldering pad $\geq$ 2.0N for both FBB & RBB in manual soldering
Hot water Dip test (Back Al)	Deionized water resistivity $> 18M \Omega.cm$ Test Duration: 30 min Temperature: $80 \pm 5^{\circ}C$	After test: Should not be black and no bump over the BSF.
Tape Test (Back Al)	3M Adhesive tape, Pull angle 180deg without jerking.	If Aluminum paste detached & stuck on adhesive tape then failed Otherwise passed.

**9. PID Test - 100% PID Resistive**

As per IEC 62804 - System voltage durability qualification test for crystalline silicon Modules - PID test at 85 °C, 85%RH, 96x3 Hrs at -1500V.

**10. Cell Visual Specification**

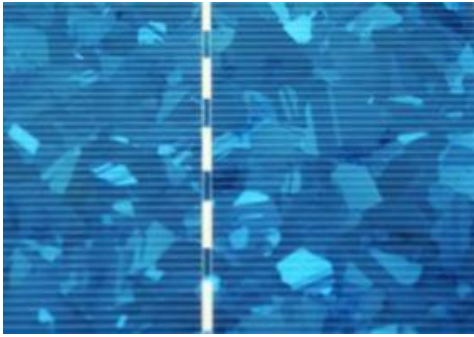
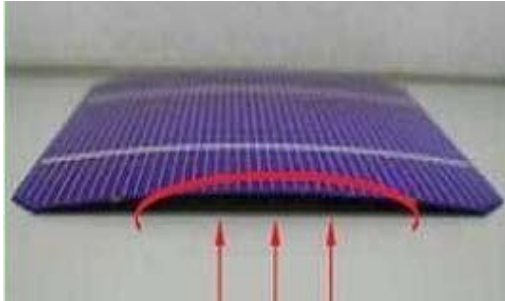
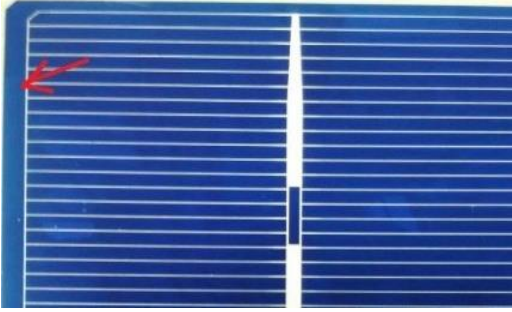

Sr. No	Description	Image	Acceptance Criteria
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1	Visual Shiny Crystal		Allowed
2	Bow		$H \leq 1.0 \text{ mm}$
3	Printing off set		$\leq 0.25 \text{ mm}$ Printing distance from Cell edge Min.-0.75mm Max.-1.25mm
4	PECVD Button Mark		$W < 1.5 \text{ mm}$ $L < 3.0 \text{ mm}$


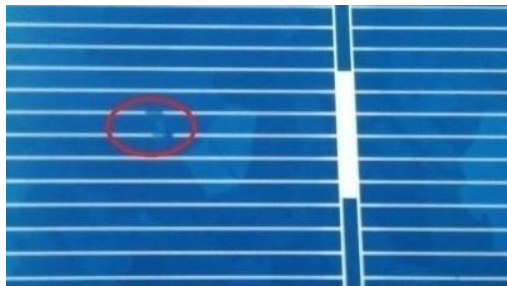
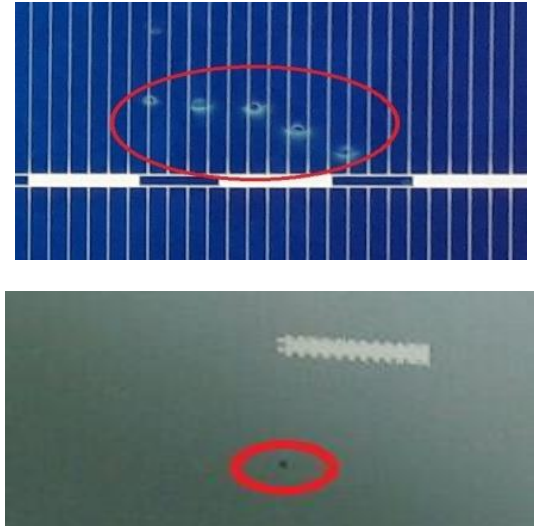
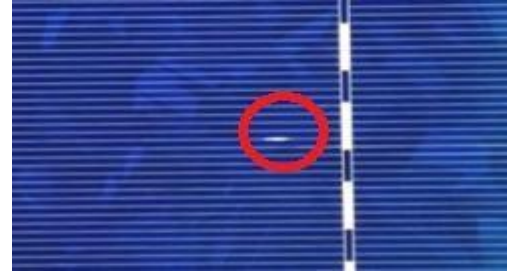


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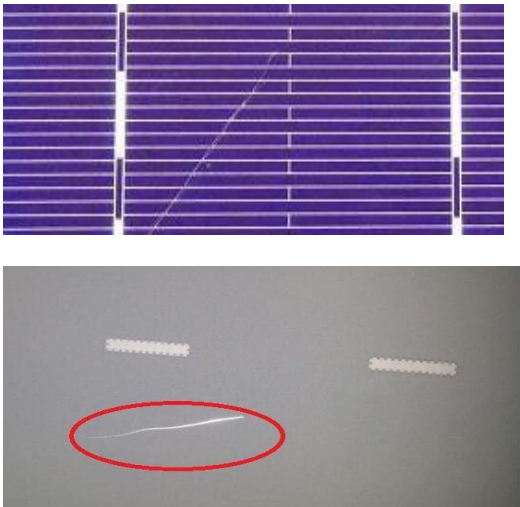
5	Surface Chipping		Area $\leq$ 0.18 mm <sup>2</sup>
6	Finger Interruptions		L < 0.5mm, N $\leq$ 2, > 95% material with Zero Finger interruption < 5 % Material N $\leq$ 2 interruptions
7	Chemical mark/stain/dot marks		Area $\leq$ 0.25 mm <sup>2</sup> ,
8	Finger Knots		Thickness < 0.10mm, L < 1mm, N $\leq$ 2



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9	Scratch Mark		L≤5mm
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### 11. Product Identification & Traceability

- Every primary packing having unique lot number, Eff. class, Product description, quantity and Date /time of manufacturing

Lot number provide the traceability of single cells with complete IV data Described as below :

Supplier Name	Unique Lot number and Bar code	Product description																												
<table border="1"> <tr> <td colspan="2" data-bbox="207 1457 440 1514">  <b>PREMIER ENERGIES</b> </td> <td colspan="2" data-bbox="500 1457 1349 1514"> <b>Premier Energies Photovoltaic Pvt. Ltd</b> </td> </tr> <tr> <td data-bbox="207 1528 630 1570"> <b>Cell Type</b> </td> <td colspan="3" data-bbox="662 1528 1349 1570"> <b>PEPPL-MC-5BB-FBB0.70-RBB2.0,112F</b> </td> </tr> <tr> <td data-bbox="207 1570 630 1612"> <b>Lot No.</b> </td> <td data-bbox="412 1570 574 1612">  </td> <td colspan="2" data-bbox="662 1570 1349 1612"> <b>1030359</b> </td> </tr> <tr> <td data-bbox="207 1612 630 1654"> <b>Date</b> </td> <td colspan="3" data-bbox="662 1612 1349 1654"> <b>04-06-2021</b> </td> </tr> <tr> <td data-bbox="207 1654 630 1696"> <b>Quantity (Nos)</b> </td> <td data-bbox="662 1654 873 1696"> <b>125</b> </td> <td colspan="2" data-bbox="883 1654 1349 1696">  </td> </tr> <tr> <td data-bbox="207 1696 630 1738"> <b>Eff., Color, Wattage</b> </td> <td data-bbox="662 1696 873 1738"> <b>PEPPLMUL</b> </td> <td colspan="2" data-bbox="883 1696 1349 1738"> <b>18.90D4.64W8.45A</b> </td> </tr> <tr> <td data-bbox="207 1738 630 1780"> <b>Sign</b> </td> <td colspan="3" data-bbox="662 1738 1349 1780"> </td> </tr> </table>			 <b>PREMIER ENERGIES</b>		<b>Premier Energies Photovoltaic Pvt. Ltd</b>		<b>Cell Type</b>	<b>PEPPL-MC-5BB-FBB0.70-RBB2.0,112F</b>			<b>Lot No.</b>		<b>1030359</b>		<b>Date</b>	<b>04-06-2021</b>			<b>Quantity (Nos)</b>	<b>125</b>			<b>Eff., Color, Wattage</b>	<b>PEPPLMUL</b>	<b>18.90D4.64W8.45A</b>		<b>Sign</b>			
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<b>Sign</b>																														
Date/time of Mfg.	Quantity	Eff. class, Wattage and Minimum Imp																												



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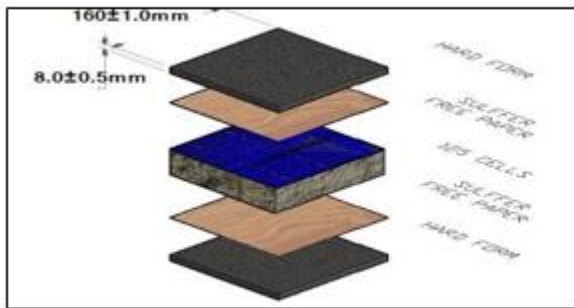
## 12. EL Specification

EL Specification as per Annexure -02

## 13. Packing

### Primary Packing:

Maximum 125 pcs cells in a primary stack (350 + 350 GSM back to back pasted Board with die cutting and one side lock with self adhesive tape) covered with sulphur free paper and hard Foam on top and bottom side. Air Tight packing of shrink wrapping.



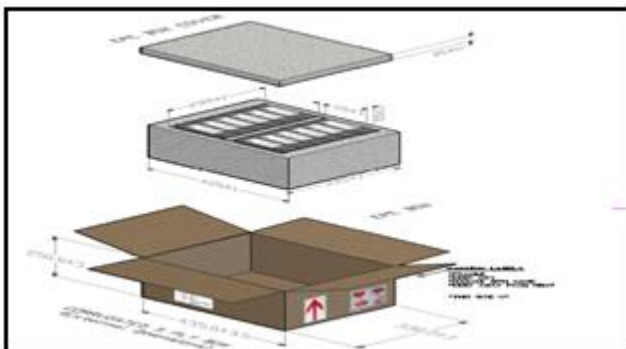
**a. Comprehensive view**



**b. Front View**

### Secondary Packing:

Maximum 12 primary stack (1500 pcs) in a secondary packing (5Ply, Bursting Strength >18Kg/cm<sup>3</sup>) cover with EPE sheet from all sides. Proper Material labeling and marking on the Master carton.



**b. Comprehensive view**



**b. Front View**

### Transport Packing Transport Standard Pallet size:

Standard packing of 24 x1500pcs, 18x1500pcs, 12 x1500pcs and 08x1500pcs. Transport packing on the wooden pallet base covered with 7Ply box . Transport packing with proper



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labeling, Marking, wrapping and Stripping. Maximum Stack-04 Layer



#### 14. Storage Recommendation

Solar cells are fragile and sensitive to storage conditions. So, Cells should be stored in the situation of good airing in relative humidity  $50\% \pm 5\%$  and temperature  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ . Solar cells are extremely susceptible to the humidity. It is recommended to make panels using the cells within the Six months of the storage period for paramount performance. Once cells are opened from its original primary packing then cells should be used within 2hrs.

**Specifications subject to technical changes © Premier Energies Photovoltaic Pvt Ltd.**



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