





		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>	PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS		PS- 439 - 118			
					REV.02			
					PAGE 01 OF 02			
COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.		ITEM : 125 mm Pseudo Square Mono Crystalline Silicon Solar Cell						
		1.0 PHYSICAL CHARACTERISTICS						
		1.1 MATERIAL		: CZ grown – P type mono-crystalline silicon.				
		1.2 DIMENSIONS		: 125± 1 mm (Side to Side), 150 ± 1 or 165± 1 mm (Corner to Corner)				
		1.3 SHAPE		: Pseudo-Square				
		1.4 THICKNESS		: 200 microns				
		1.5 ORIENTATION		: <100> ± 1 Deg				
		1.6 METALISATION		: Front – Silver Back – Silver- Aluminium solderable pads with Aluminium BSF.				
		1.7 AR Coating		: PECVD Silicon Nitride (Deep blue colour)				
		2.0 ELECTRICAL CHARACTERISTICS						
		2.1 AVERAGE POWER OUTPUT (Pmax) : 2.30 Watts						
		2.2 VOLTAGE AT MAX.POWER POINT : 500 mV (Typical)						
		2.3 OPEN-CIRCUIT VOLTAGE : 600 mV (Typical)						
		2.4 SHORT-CIRCUIT CURRENT : 5.00 A (Typical)						
		2.5 FILL FACTOR : 0.72 (Typical)						
				REVISION : (02) Clause 3.4 added.		APPROVED BY :		
						SS		
PREPARED	ISSUED					DATE		
				SR	Engg.	21.12.2007		

		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>		<div>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</div>		<div>PS- 439 - 119</div> <div>REV.01</div> <div>PAGE 01 OF 02</div>	
		<div>ITEM : 125 mm Pseudo Square Mono Crystalline Silicon Solar Cell</div> <div>5.0 PHYSICAL CHARACTERISTICS</div> <div><div>1.1 MATERIAL</div><div>: CZ grown – P type mono-crystalline silicon.</div></div> <div><div>1.2 DIMENSIONS</div><div>: 125± 1 mm (Side to Side), 150 ± 1 or 165± 1 mm (Corner to Corner)</div></div> <div><div>1.3 SHAPE</div><div>: Pseudo-Square</div></div> <div><div>1.4 THICKNESS</div><div>: 200 microns</div></div> <div><div>1.5 ORIENTATION</div><div>: <100> ± 1 Deg</div></div> <div><div>1.6 METALISATION</div><div>: Front – Silver</div><div>Back – Silver- Aluminium solderable pads with Aluminium BSF.</div></div> <div><div>1.7 AR Coating</div><div>: PECVD Silicon Nitride (Deep blue colour)</div></div> <div>6.0 ELECTRICAL CHARACTERISTICS</div> <div><div>2.1 AVERAGE POWER OUTPUT (Pmax)</div><div>: 2.35 Watts</div></div> <div><div>2.2 VOLTAGE AT MAX.POWER POINT</div><div>: 500 mV (Typical)</div></div> <div><div>2.3 OPEN-CIRCUIT VOLTAGE</div><div>: 600 mV (Typical)</div></div> <div><div>2.4 SHORT-CIRCUIT CURRENT</div><div>: 5.10 A (Typical)</div></div> <div><div>2.5 FILL FACTOR</div><div>: 0.72 (Typical)</div></div>					
		<div>REVISION (01)</div> <div>Clause 3.4 added.</div>		<div>APPROVED BY :</div> <div>SS</div> <div><div>PREPARED</div><div>SR</div></div> <div><div>ISSUED</div><div>Engg.</div></div> <div><div>DATE</div><div>21.12.2007</div></div>			


		 <p>A4-10</p>	<p>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</p>	<p>PS- 439 - 119</p> <p>REV.01</p> <p>PAGE 02 OF 02</p>
<p>COPY RIGHT AND CONFIDENTIAL</p> <p>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</p>		<p>7.0 VISUAL CHARACTERISTICS :</p> <p>3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.</p> <p>3.2 Cells shall not have any discontinuity or gap or misalignment in the front grid pattern.</p> <p>3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.</p> <p>3.4 Cells shall not have Silicon Nitride coating colour variations or in homogeneity.</p> <p>8.0 PACKING CONDITIONS</p> <p>4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole boxes, carton box / plywood box suitable for air-freight.</p> <p>4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be identified on each packet.</p> <p>4.3 Test certificate shall be provided along with each consignment.</p>		


		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>	<div>PURCHASE SPECIFICATION</div> <div>GROUP : PHOTOVOLTAICS</div>		<div>PS- 439 - 137</div>		
					<div>REV.00</div>		
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<div>COPY RIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</div>		<div>ITEM : 125 mm Pseudo Square Mono Crystalline Silicon Solar Cell</div>					
		<div>9.0 PHYSICAL CHARACTERISTICS</div>					
		<div>1.1 MATERIAL : CZ grown – P type mono-crystalline silicon.</div>					
		<div>1.2 DIMENSIONS : 125± 1 mm (Side to Side), 150 ± 1 or 165± 1 mm (Corner to Corner)</div>					
		<div>1.3 SHAPE : Pseudo-Square</div>					
		<div>1.4 THICKNESS : 200 microns (Typical)</div>					
		<div>1.5 ORIENTATION : <100> ± 1 Deg</div>					
		<div>1.6 METALISATION : Front – Silver</div> <div>Back – Silver- Aluminium solderable pads with Aluminium BSF.</div>					
		<div>1.7 AR Coating : PECVD Silicon Nitride (Deep blue colour)</div>					
		<div>10.0 ELECTRICAL CHARACTERISTICS</div>					
		<div>2.1 AVERAGE POWER OUTPUT (Pmax) : 2.40 Watts</div>					
		<div>2.2 VOLTAGE AT MAX.POWER POINT : 500 mV (Typical)</div>					
		<div>2.3 OPEN-CIRCUIT VOLTAGE : 600 mV (Typical)</div>					
		<div>2.4 SHORT-CIRCUIT CURRENT : 5.10 A (Typical)</div>					
		<div>2.5 FILL FACTOR : 0.75 (Typical)</div>					
		<div>REVISION (00)</div>		<div>APPROVED BY :</div>			
				<div>SS</div>			
				<div>PREPARED</div> <div>SR</div>	<div>ISSUED</div> <div>Engg.</div>	<div>DATE</div> <div>30.4.2008</div>	


		<div><div><div>बि एच ई एल</div><div>BHEL</div></div></div>	<div>PURCHASE SPECIFICATION</div> <div>GROUP : PHOTOVOLTAICS</div>	<div>PS- 439 - 137</div>
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				<div>PAGE 02 OF 02</div>
		<div>11.0 VISUAL CHARACTERISTICS :</div> <div><div>3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.</div><div>3.2 Cells shall not have any discontinuity or gap or misalignment in the front grid pattern.</div><div>3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.</div><div>3.4 Cells shall not have Silicon Nitride coating colour variations or in homogeneity.</div></div>		
		<div>12.0 PACKING CONDITIONS</div> <div><div>4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole boxes, carton box / plywood box suitable for air-freight.</div><div>4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be identified on each packet.</div><div>4.3 Test certificate shall be provided along with each consignment.</div></div>		

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			PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS		PS- 439 - 138	
					REV.00	
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<div style="writing-mode: vertical-rl; transform: rotate(180deg);"> COPY RIGHT AND CONFIDENTIAL </div>	<div style="writing-mode: vertical-rl; transform: rotate(180deg);"> The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company. </div>	ITEM : 156 mm Square Multi Crystalline Silicon Solar Cell				
		13.0 PHYSICAL CHARACTERISTICS				
		<div> <div>1.1 MATERIAL</div> <div>: Multi Crystalline Silicon.</div> </div> <div> <div>1.2 DIMENSIONS</div> <div>: 156± 1 mm (Side to Side)</div> </div> <div> <div>1.3 SHAPE</div> <div>: Square</div> </div> <div> <div>1.4 THICKNESS</div> <div>: 200 microns (Typical)</div> </div> <div> <div>1.5 METALISATION</div> <div> : Front – Silver : Back – Silver- Aluminium solderable pads with Aluminium BSF. </div> </div> <div> <div>1.6 AR Coating</div> <div>: PECVD Silicon Nitride (Deep blue colour)</div> </div>				
14.0 ELECTRICAL CHARACTERISTICS						
<div>2.1 AVERAGE POWER OUTPUT (Pmax) : 3.50 Watts</div> <div>2.2 VOLTAGE AT MAX.POWER POINT : 500 mV (Typical)</div> <div>2.3 OPEN-CIRCUIT VOLTAGE : 600 mV (Typical)</div> <div>2.4 SHORT-CIRCUIT CURRENT : 7.60 A (Typical)</div> <div>2.5 FILL FACTOR : 0.75 (Typical)</div>						
		REVISION (00)		APPROVED BY : SS		
				PREPARED SR	ISSUED Engg.	DATE 30.4.2008

		 <p>A4-10</p>	<p>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</p>	<p>PS- 439 - 138</p> <p>REV.00</p> <p>PAGE 02 OF 02</p>
<p>COPY RIGHT AND CONFIDENTIAL</p> <p>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.</p>		<p>15.0 VISUAL CHARACTERISTICS :</p> <p>3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.</p> <p>3.2 Cells shall not have any discontinuity or gap or misalignment in the front grid pattern.</p> <p>3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.</p> <p>3.4 Cells shall not have Silicon Nitride coating colour variations or in homogeneity.</p> <p>16.0 PACKING CONDITIONS</p> <p>4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole boxes, carton box / plywood box suitable for air-freight.</p> <p>4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be identified on each packet.</p> <p>4.3 Test certificate shall be provided along with each consignment.</p>		

		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>		<div>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</div>		<div>PS- 439 - 139</div> <div>REV.00</div> <div>PAGE 01 OF 02</div>	
		<div>ITEM : 156 mm Square Multi Crystalline Silicon Solar Cell</div> <div>17.0 PHYSICAL CHARACTERISTICS</div> <div><div>1.1 MATERIAL</div><div>: Multi Crystalline Silicon.</div></div> <div><div>1.2 DIMENSIONS</div><div>: 156± 1 mm (Side to Side)</div></div> <div><div>1.3 SHAPE</div><div>: Square</div></div> <div><div>1.4 THICKNESS</div><div>: 200 microns (Typical)</div></div> <div><div>1.5 METALISATION</div><div>: Front – Silver</div><div>Back – Silver- Aluminium solderable pads with Aluminium BSF.</div></div> <div><div>1.6 AR Coating</div><div>: PECVD Silicon Nitride (Deep blue colour)</div></div> <div>18.0 ELECTRICAL CHARACTERISTICS</div> <div><div>2.1 AVERAGE POWER OUTPUT (Pmax)</div><div>: 3.60 Watts</div></div> <div><div>2.2 VOLTAGE AT MAX.POWER POINT</div><div>: 500 mV (Typical)</div></div> <div><div>2.3 OPEN-CIRCUIT VOLTAGE</div><div>: 600 mV (Typical)</div></div> <div><div>2.4 SHORT-CIRCUIT CURRENT</div><div>: 7.70 A (Typical)</div></div> <div><div>2.5 FILL FACTOR</div><div>: 0.75 (Typical)</div></div>					
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				SS			
				PREPARED	ISSUED	DATE	
				SR	Engg.	30.4.2008	

		<div><div><div>बि एच ई एल</div><div>BHEL</div></div></div>		<div>PURCHASE SPECIFICATION</div> <div>GROUP : PHOTOVOLTAICS</div>		<div>PS- 439 - 139</div>	
		A4-10				REV.00	
						PAGE 02 OF 02	
		<div>19.0 VISUAL CHARACTERISTICS :</div> <div><div>3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.</div><div>3.2 Cells shall not have any discontinuity or gap or misalignment in the front grid pattern.</div><div>3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.</div><div>3.4 Cells shall not have Silicon Nitride coating colour variations or in homogeneity.</div></div> <div>20.0 PACKING CONDITIONS</div> <div><div>4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole boxes, carton box / plywood box suitable for air-freight.</div><div>4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be identified on each packet.</div><div>4.3 Test certificate shall be provided along with each consignment.</div></div>					

		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>		<div>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</div>		<div>PS- 439 - 140</div> <div>REV.00</div> <div>PAGE 01 OF 02</div>	
		<div>ITEM : 156 mm Square Multi Crystalline Silicon Solar Cell</div> <div>21.0 PHYSICAL CHARACTERISTICS</div> <div><div>1.1 MATERIAL</div><div>: Multi Crystalline Silicon.</div></div> <div><div>1.2 DIMENSIONS</div><div>: 156± 1 mm (Side to Side)</div></div> <div><div>1.3 SHAPE</div><div>: Square</div></div> <div><div>1.4 THICKNESS</div><div>: 200 microns (Typical)</div></div> <div><div>1.5 METALISATION</div><div>: Front – Silver</div><div>Back – Silver- Aluminium solderable pads with Aluminium BSF.</div></div> <div><div>1.6 AR Coating</div><div>: PECVD Silicon Nitride (Deep blue colour)</div></div> <div>22.0 ELECTRICAL CHARACTERISTICS</div> <div><div>2.1 AVERAGE POWER OUTPUT (Pmax)</div><div>: 3.70 Watts</div></div> <div><div>2.2 VOLTAGE AT MAX.POWER POINT</div><div>: 500 mV (Typical)</div></div> <div><div>2.3 OPEN-CIRCUIT VOLTAGE</div><div>: 600 mV (Typical)</div></div> <div><div>2.4 SHORT-CIRCUIT CURRENT</div><div>: 7.80 A (Typical)</div></div> <div><div>2.5 FILL FACTOR</div><div>: 0.75 (Typical)</div></div>					
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				<div>PREPARED</div> <div>SR</div>	<div>ISSUED</div> <div>Engg.</div>	<div>DATE</div> <div>30.4.2008</div>	

		<div><div><div>बि एच ई एल</div><div></div></div><div>A4-10</div></div>		<div><div>PURCHASE SPECIFICATION GROUP : PHOTOVOLTAICS</div><div>PS- 439 - 140</div><div>REV.00</div><div>PAGE 02 OF 02</div></div>	
		<div><div>23.0 VISUAL CHARACTERISTICS :</div><div><div>3.1 Cells shall not have any edge chips or cracks or deep scratches on the surface.</div><div>3.2 Cells shall not have any discontinuity or gap or misalignment in the front grid pattern.</div><div>3.3 Cells shall not have any finger prints or stains or paste smudges on the surface.</div><div>3.4 Cells shall not have Silicon Nitride coating colour variations or in homogeneity.</div></div></div>			
		<div><div>24.0 PACKING CONDITIONS</div><div><div>4.1 Cells shall be packed tightly with heat shrinkable sleeves, then in foam or thermocole boxes, carton box / plywood box suitable for air-freight.</div><div>4.2 Manufacturer name, Cell type, lot number, wattage / efficiency quantity in each packet, date of manufacture to be identified on each packet.</div><div>4.3 Test certificate shall be provided along with each consignment.</div></div></div>			

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