TECHNICAL SPECIFICATION

1. MATERIAL : 125 mm Pseudo Square CZ single crystal silicon wafer

2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
1.0	APPEARANCE	As cut cleaned		Unaided Visual inspection.
1.1	SURFACE CONDITION			

Wafers after slicing shall be subjected to detergent solution cleaning process and ultrasonic degreasing process for removal of greases, stains etc. It shall be not be subjected to any kind of chemical etching.

1.2	SAW MARKS DEPTH	<=20 microns	Visual inspection and surface profiling.
2.0	DIMENSIONS		
2.1	Size (Side to Side)	125±0.5 mm	Vernier/Go-No Go gauges
2.2	Size (Corner to Corner)	**Option 1** : 150±1.0 mm **Option 2** : 165±1.0 mm	--- do ---
2.3	Shape	Pseudo Square	
2.4	Thickness	220±20 microns	ASTM-F533
2.5	TTV (Total Thickness Variation)	<=30 microns	ASTM-F533
2.6	BOW	<=70 microns	ASTM-F534

PURCHASE SPECIFICATION
GROUP : PHOTOVOLTAICS

3.0 CHARACTERISTICS

3.1	TYPE	P(Boron doped)	ASTM-F42
3.2	ORIENTATION	<100> ± 3.0 Deg.	ASTM-F26
3.3	RESISTIVITY	0.5 – 3.0 ohm.cm	Four point probe
3.4	OXYGEN CONCENTRATION	<=1 x 10^{18} Atoms/CM^3	ASTM-F121
3.5	CARBON CONCENTRATION	<=1 x 10^{17} Atoms/CM^3	ASTM-F123
3.6	Life Time	>= 10 micro seconds	ASTM F28-91

4.0 PACKING

1. Wafers shall be kept sealed in polythene / polypropylene sachets.
2. Each sachets shall have not more than 100 wafers with a label giving manufacturer name, Ingot no., quantity and wafer characteristics.
3. Sachets shall be packed in thermocole boxes with soft spacers on both ends or in polyethylene foam packing to absorb transit handling shocks. Final packing shall be in carton/wooden cases for easy handling. Wooden cases shall be suitable for air freight.
4. Each lot must be accompanied with a test certificate containing actual values in the format given below.

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Characteristics	Value Specified	Actuals Observed	Test Procedure / standards followed.

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5.0 BHEL ACCEPTANCE / INSPECTION PLAN

Inspection of wafers shall be carried out either in BHEL or at the supplier's works as per single sampling plan IS 2500 (Part I) , Inspection level II and Acceptance Quality Level (AQL) of 0.65 % for visual inspections and IS 2500 (Part II), Inspection level IV and AQL of 0.65 % for dimensional and resistivity measurements.

TECHNICAL SPECIFICATION

1. MATERIAL : 125 mm Square Multi crystalline silicon wafer

2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
1.0	APPEARANCE	As cut cleaned		Unaided Visual inspection.
1.2	SURFACE CONDITION			

Wafers after slicing shall be subjected to detergent solution cleaning process and ultrasonic degreasing process for removal of greases, stains etc. It shall be not be subjected to any kind of chemical etching.

1.2	SAW MARKS DEPTH	<=30 microns	Visual inspection and surface profiling.
4.0	DIMENSIONS		
2.1	Size (Side to Side)	125±1 mm	Vernier/Go-No Go gauges
2.2	Shape	Square	
2.3	Thickness	220±20 microns	ASTM-F533
2.4	TTV (Total Thickness Variation)	<=50 microns	ASTM-F533
2.5	BOW	<=70 microns	ASTM-F534

PURCHASE SPECIFICATION
GROUP : PHOTOVOLTAICS

5.0 CHARACTERISTICS

3.1	TYPE	P(Boron doped)	ASTM-F42
3.2	RESISTIVITY	0.5 – 3.0 ohm.cm	Four point probe
3.3	OXYGEN CONCENTRATION	$<=1 * 10^{18}$ Atoms/CM^3	ASTM-F121
3.4	CARBON CONCENTRATION	$<=2 * 10^{18}$ Atoms/CM^3	ASTM-F123
3.5	Life time	> 2 micro seconds	ASTM F28-91

4.0 PACKING

5. Wafers shall be kept sealed in polythene / polypropylene sachets.
6. Each sachets shall have not more than 100 wafers with a label giving manufacturer name, Casting no., quantity and wafer characteristics.
7. Sachets shall be packed in thermocole boxes with soft spacers on both ends or in polyethylene foam packing to absorb transit handling shocks. Final packing shall be in carton/wooden cases for easy handling.
8. Each lot must be accompanied with a test certificate containing actual values in the format given below.

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Characteristics	Value Specified	Actuals Observed	Test Procedure / standards followed.

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5.0 BHEL ACCEPTANCE / INSPECTION PLAN

Inspection of wafers shall be carried out either in BHEL or at the supplier's works as per single sampling plan IS 2500 (Part I) , Inspection level II and Acceptance Quality Level (AQL) of 0.65 % for visual inspections and IS 2500 (Part II), Inspection level IV and AQL of 0.65 % for dimensional and resistivity measurements.

TECHNICAL SPECIFICATION

1. MATERIAL : 156 mm Square Multi crystalline silicon wafer

2. APPLICATION : It is used as starting material for Solar Photovoltaic cells production.

SL. NO.	CHARACTERISTICS	VALUE	UNIT	TESTING METHODS / REF. STANDARDS.
1.0	APPEARANCE	As cut cleaned		Unaided Visual inspection.
1.3	SURFACE CONDITION			

Wafers after slicing shall be subjected to detergent solution cleaning process and ultrasonic degreasing process for removal of greases, stains etc. It shall be not be subjected to any kind of chemical etching.

1.2	SAW MARKS DEPTH	<=20 microns	Visual inspection and surface profiling.
6.0	DIMENSIONS		
2.1	Size (Side to Side)	156±1 mm	Vernier/Go-No Go gauges
2.2	Shape	Square	
2.3	Thickness	220±20 microns	ASTM-F533
2.4	TTV (Total Thickness Variation)	<=50 microns	ASTM-F533
2.5	BOW	<=70 microns	ASTM-F534

(01) Thickness revised.

APPROVED BY :
SS

PREPARED	ISSUED	DATE
SR	Engg.	30-04-2008

PURCHASE SPECIFICATION
GROUP : PHOTOVOLTAICS

7.0 CHARACTERISTICS

3.1	TYPE	P(Boron doped)	ASTM-F42
3.2	RESISTIVITY	0.5 – 3.0 ohm.cm	Four point probe
3.3	OXYGEN CONCENTRATION	<=1 * 10^{18} Atoms/CM^3	ASTM-F121
3.4	CARBON CONCENTRATION	<=2 * 10^{18} Atoms/CM^3	ASTM-F123
3.5	Diffusion Length	80 microns (min.)	
3.6	Life time	> 2 micro seconds	ASTM F28-91

4.0 PACKING

9. Wafers shall be kept sealed in polythene / polypropylene sachets.
10. Each sachets shall have not more than 100 wafers with a label giving manufacturer name, Casting no., quantity and wafer characteristics.
11. Sachets shall be packed in thermocole boxes with soft spacers on both ends or in polyethylene foam packing to absorb transit handling shocks. Final packing shall be in carton/wooden cases for easy handling.
12. Each lot must be accompanied with a test certificate containing actual values in the format given below.

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Characteristics	Value Specified	Actuals Observed	Test Procedure / standards followed.

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5.0 BHEL ACCEPTANCE / INSPECTION PLAN

Inspection of wafers shall be carried out either in BHEL or at the supplier's works as per single sampling plan IS 2500 (Part I) , Inspection level II and Acceptance Quality Level (AQL) of 0.65 % for visual inspections and IS 2500 (Part II), Inspection level IV and AQL of 0.65 % for dimensional and resistivity measurements.