

PURCHASE SPECIFICATION GROUP: PHOTOVOLTAICS

PS- 439 - 109
REV. 02

				LIAICS			
		A4-10			PAGE 0	1 OF 02	
		TECHNICAL SPECIFICATION					
		1. MATE	CRIAL : 125 mm Pseudo S	Square CZ single cr	ystal sili	con wafer	
	Limited, of the company.	2. APPLI	CATION: It is used as start cells production.	ing material for So	lar Photo	ovoltaic	
		SL. CH	HARACTERISTICS	I		ETHODS / NDARDS.	
		1.0 AF	PPEARANCE	As cut cleane			
TIAL	t Heavy to the	1.1 SU	JRFACE CONDITION		ins	pection.	
CONFIDENTIAL	property of Bharat Heavy anyway detrimental to the	process		d to detergent solution cleaning rocess for removal of greases, stains ny kind of chemical etching.			
H AND		1.2 SA	AW MARKS DEPTH		Visual ins nd surfac	spection e profiling.	
RIGHT	nent is ndirectl	2.0 DI	IMENSIONS				
COPY	is docur tly or i	2.1 Siz	ze (Side to Side)	125±0.5 mm	,	Go-No Go gauges	
	information on this document is the not be used diretly or indirectly in	2.2 Siz	ze (Corner to Corner) Option Option	1 : 150±1.0 mm 2 : 165±1.0 mm		- do	
	informa not be	2.3 Sh	nape	Pseudo Square			
	The	2.4 Th	nickness	220±20 microns	AST	ГМ-F533	
		2.5 TI	TV (Total Thickness Variation) <=30 microns	s AS'	ГМ-F533	
		2.6 BO	WC	<=70 microns	s AS'	ΓM-F534	
	r						
		REVISION: (Thickness revi		APPROVED BY:			
				PREPARED	ISSUED	DATE	
				SR	Engg.	30.4.2008	
					-J1155.	30.7.2000	





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CHARACTERISTICS 3.0

3.1	TYPE	P(Boron doped)	ASTM-F42
3.2	ORIENTATION	$<100> \pm 3.0$ 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

>= 10 micro seconds ASTM F28-91

4.0 PACKING

3.6

Life Time

- 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.

Actuals Test Procedure / Characteristics Value Specified Observed 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.

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REV. 0				
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TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION								
1. MA	1. MATERIAL : 125 mm Square Multi crystalline silicon wafer							
2. AP	PPLICATION : It is used as star cells production.	0	Solar Photovoltaic					
SL. NO.		VALUE UNIT	TESTING METHODS / REF. STANDARDS.					
1.0			aned 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					
2.2	Shape	Square	gauges					
2.3	Thickness	220±20 microns	ASTM-F533					
2.4	TTV (Total Thickness Variation	n) <=50 micr	ons ASTM-F533					
2.5	BOW	<=70 micr	ons ASTM-F534					
		APPROVED BY:						
Rev. 04 Thickn	ess revised.	SS						

PREPARED

SR

ISSUED

Engg.

DATE

30-04-2008





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3.1

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ASTM-F42

5.0 CHARACTERISTICS

TYPE

3.2	RESISTIVITY	0.5 – 3.0 ohm.cm	Four point probe
3.3	OXYGEN CONCENTRATION	<=1 * 10 ¹⁸ Atoms/CM ³	3 ASTM-F121
3.4	CARBON CONCENTRATION	<=2 * 10 ¹⁸ Atoms/CM ³	3 ASTM-F123
3.5	Life time	> 2 micro seconds	ASTM F28-91

P(Boron doped)

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.

Characteristics Value Actuals Test Procedure /
Specified Observed standards followed.

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.

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PURCHASE SPECIFICATION **GROUP: PHOTOVOLTAICS**

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TECHNICAL SPECIFICATION

	1. MATERIAL	:	156 mm	Sc	uare	Multi	cr	ystalline	silicon	wafer
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2. AF	PLICATION: It is used as star cells production.	_	Solar Photovoltaic
SL. NO.	CHARACTERISTICS	VALUE UNIT '	TESTING METHODS / REF. STANDARDS.
1.0	APPEARANCE		aned Unaided Visual inspection.
1.3	SURFACE CONDITION		
proce	rs after slicing shall be subjecte ess and ultrasonic degreasing p It shall be not be subjected to a	rocess for remova	al of greases, stains
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	gauges
2.3	Thickness	220±20 microns	ASTM-F533
2.4	TTV (Total Thickness Variation	n) <=50 micro	ons ASTM-F533
2.5	BOW	<=70 micro	ons ASTM-F534
		APPROVED BY:	
(01) Thi	ickness revised.	AII KOVED BI:	

APPROVED BY:			
SS			
PREPARED	ISSUED	DATE	
SR	Engg.	30-04-2008	
	SS PREPARED	SS PREPARED ISSUED	SS PREPARED ISSUED DATE



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7.0 CHARACTERISTICS

3.1 TYPE P(Boron doped) ASTM-F42 3.2 RESISTIVITY 0.5 - 3.0 ohm.cmFour point probe 3.3 OXYGEN CONCENTRATION <=1 * 10¹⁸ Atoms/CM³ ASTM-F121 3.4 CARBON CONCENTRATION <=2 * 10¹⁸ Atoms/CM³ 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.

Characteristics Value Actuals Test Procedure /
Specified Observed standards followed.

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.