

## Monocrystalline Silicon Wafer

**Pseudo Square P-type 156 mm 180/200/220 μm**

### 1. Crystal- and material properties

| Property                               | Target          | Unit               | Lower Limit | Upper Limit | Standard          |
|--|-----------------|--------------------|-------------|-------------|-------------------|
| Ingotting method                       | CZ              |                    |             |             |                   |
| Crystallinity                          | Monocrystalline | –                  | –           | –           |                   |
| Conductivity type                      | P-type          | –                  | –           | –           | SEMI MF 42-02     |
| Dopant                                 | Boron           | –                  | –           | –           |                   |
| Oxygen concentration [Oi]              | –               | at/cm <sup>3</sup> | –           | 1E+18       | ASTM F 121-83     |
| Carbon concentration [Cs]              | –               | at/cm <sup>3</sup> | –           | 5E+16       | ASTM F 123-86     |
| Etch pit density (dislocation density) | –               | cm-2               | –           | 300         | SEMI MF 1725-1103 |
| Surface orientation                    | <100>           | –                  | – 3°        | + 3°        | SEMI MF 26-0305   |
| Orientation of square sides            | <010> <001>     | –                  | – 3°        | + 3°        | SEMI MF 26-0305   |

### 2. Electrical properties

| Property                     | Target | Unit | Lower Limit | Upper Limit    | Standard          |
|------------------------------|--------|------|-------------|----------------|-------------------|
| Resistivity (variant 1)      | –      | Ωcm  | 2.5         | 6              | SEMI MF 43-99     |
| Other dopants' concentration | –      | ppba | –           | 45 (no umg-Si) |                   |
| Lifetime                     | –      | μs   | 10          | –              | SEMI MF 1535-1104 |

### 3. Geometry

| Property                           | Target                              | Unit | Lower Limit | Upper Limit | Standard        |
|------------------------------------|-------------------------------------|------|-------------|-------------|-----------------|
| Geometry                           | pseudo square                       | –    | –           | –           |                 |
| Side length                        | 156.0                               | mm   | – 0.5       | + 0.5       |                 |
| Angle between adjacent sides       | 90                                  | °    | – 0.2       | + 0.2       |                 |
| Bevel edge shape                   | 195                                 | mm   | – 0.5       | + 0.5       |                 |
| Bevel cathetus                     | round                               | –    | –           | –           |                 |
| Bevel edge angle                   |                                     | mm   | –           | 0.2         |                 |
| Average thickness (over 1 wafer)   | 180/200/220 (= "nominal thickness") | μm   | – 30        | + 30        | SEMI MF 533-02a |
| Thickness mean (over the delivery) | 180/200/220                         | μm   | - 5         | + 5         |                 |
| TTV (Total thickness variation)    | –                                   | μm   | –           | 50          | SEMI MF 533-02a |

4. Surface properties

| Property                              | Specification  | Unit | Lower Limit | Upper Limit |  |
|---------------------------------------|--|------|-------------|-------------|--|
| <b>Surface quality</b>                | as-cut and cleaned; no visible contamination as oil or grease, finger prints, soap stains, slurry stains, epoxy/water stains, (Detection equipment: Hennecke system) | –    | –           | –           |  |
| <b>Saw marks / steps</b>              | (Detection equipment: Hennecke system)   | µm   | –           | 20          |  |
| <b>Chippings</b>                      | below 1 mm from the edge are allowed   |      |             |             |  |
| <b>Micro cracks/ inclusions/holes</b> | prohibited   |      |             |             |  |

5. Packaging

| Property                                  | Target  | Unit | Lower Limit | Upper Limit |  |
|---|---|------|-------------|-------------|--|
| <b>Packing method</b>                     | Wafer stacks in shrink foil packed in styrofoam boxes packed in cardboard cartons   | –    | –           | –           |  |
| <b>Labelling on each styrofoam boxes</b>  | Supplier, Date / Time, Ingot No., Box No., Amount of wafers, Thickness, Furnace Run, Furnace No., Supplier's internal Order No.                     | –    | –           | –           |  |
| <b>Labelling on each cardboard carton</b> | Supplier, Carton No., Wafer description (thickness, size, Crystallinity), Article No., Amount of wafers per cardboard carton, Amount of boxes, Date | –    | –           | –           |  |