

The Prime Grade Portfolio of 150 mm Silicon Carbide Wafers

KEY FEATURES

- Dow Corning's Prime Grade portfolio optimizes targeted performance and total cost of ownership for next generation power electronic devices
- Large-diameter 150 mm SiC wafers offer improved economies of scale in semiconductor manufacturing.
- Offering the power electronic industry's first product grading structure for 150 mm SiC wafers, our Prime Grade portfolio allows customers to choose low densities of defects – such as MPD, TSD and BPD – to maintain yields, performance and ultimately the development of next generation power electronic devices.
- SiC crystal quality increases with each substrate grade in the portfolio to deliver, at the highest-quality tier, defect densities as low as $MPD \leq 1 \text{ cm}^{-2}$, $TSD < 200 \text{ cm}^{-2}$ and $BPD < 3,000 \text{ cm}^{-2}$.

TYPICAL APPLICATIONS

- *Dow Corning*[®] Prime Standard Wafers: Schottky and Junction Barrier Schottky diodes
- *Dow Corning*[®] Prime Select Wafers: Pin diodes and switches
- *Dow Corning*[®] Prime Ultra Wafers: High-current and -voltage metal oxide semiconductor field effect transistors (MOSFETs), junction field effect transistors (JFETs), insulated gate bipolar transistors (IGBTs), bipolar junction transistors (BJTs), and pin diodes with large die areas

Three Product Tiers of High Crystal Quality 150 mm Silicon Carbide Wafers

The Prime Grade portfolio from Dow Corning offers three product tiers of 150 mm silicon carbide (SiC) substrates, labeled *Dow Corning*[®] Prime Standard, *Dow Corning*[®] Prime Select and *Dow Corning*[®] Prime Ultra. This industry-leading SiC substrate grading structure sets a higher standard for specifying tolerances on defects, such as micropipe density (MPD), threading screw dislocations (TSD) and basal plane dislocations (BPD). By offering three product tiers of increasingly tighter tolerances, the Prime Grade portfolio allows power electronic designers to more confidently pinpoint the SiC substrate that optimizes the performance and cost of their next generation device design while leveraging the improved economies of scale offered by transitioning from 100 mm to 150 mm device fabrication. All 150 mm wafers in the Prime Grade portfolio offer consistently excellent mechanical characteristics to ensure compatibility with existing and developing device fabrication processes.

Potential Uses

Enables the design and volume manufacture of a broad range of SiC power electronic devices with more highly targeted performance and cost profiles.

Important Features and Benefits

FEATURES	BENEFITS
<i>Dow Corning</i>[®] Prime Standard Wafers Guaranteed MPD tolerances	Balances performance and cost for electronic components with low to medium current ratings
<i>Dow Corning</i>[®] Prime Select Wafers More stringent tolerances for MPD and TSD	Allows for manufacturing with mid-range current ratings
<i>Dow Corning</i>[®] Prime Ultra Wafers Extremely low MPD, TSD and BPD tolerances; tightened wafer resistivity	Ensures product quality and improves cost efficiency in manufacturing high-current devices

Material Properties

Property	Dow Corning® Prime Standard Wafers	Dow Corning® Prime Select Wafers	Dow Corning® Prime Ultra Wafers
Diameter (mm)	150 ± 0.2		
Thickness (µm) ⁽¹⁾	350 ± 25		
Primary Flat Length (mm) ⁽²⁾	47.5 ± 2.5		
Bow (µm)	± 40	± 30	± 25
Warp (µm)	≤ 60	≤ 50	≤ 40
TTV (µm)	≤ 10	≤ 8	≤ 6
SBIR (µm)	≤ 5	≤ 4	≤ 3
Resistivity (ohm-cm)	0.014 – 0.024	0.014 – 0.023	0.014 – 0.022
Total Usable Area (%)	≥ 90		
X-pol Defects	Yes ⁽³⁾	No	No
Dislocation Distribution (cm ⁻²)			
Total TSD	NR ⁽⁴⁾	≤ 300	≤ 200
Total BPD	NR ⁽⁴⁾	≤ 5,000	≤ 3,000
Total MPD (cm ⁻²)	≤ 1		
Visual Carbon Inclusion (% area)	≤ 0.05		
Surface & Crystal Imperfections (cm ⁻²)	≤ 5		
Planar Defects II	≤ 2		
Hex Plates	0		
Visual Edge Inclusions (% area)	0		
Visible Scratches (mm)	≤ 40		
Edge Chips and Indents	0		
Cracks	0		
Pinholes	0		
Pits	≤ 20		

⁽¹⁾Thickness of 500 ± 25 may be available upon request.

⁽²⁾Flat length of 57.5 ± 2.5 mm may be available upon request.

⁽³⁾Cross-polarization: "Yes" means feature of area < 400 mm² and length < 50 mm may be present.

⁽⁴⁾"NR" means data not reported.

How Can We Help You Today?

Tell us about your performance, design and manufacturing challenges. Let us put our silicon-based materials expertise, application knowledge and processing experience to work for you.

For more information about our materials and capabilities, visit dowcorning.com.

To discuss how we could work together to meet your specific needs, email electronics@dowcorning.com or go to dowcorning.com/ContactUs for a contact close to your location. Dow Corning has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

Photos: AV21745, AV20766

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